Yellowstone River Compact as Enacted by Congress,
65 Stat. 663
AN ACT

Granting the consent of Congress to a compact entered into by the States of Montana, North Dakota, and Wyoming relating to the waters of the Yellowstone River.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of the Congress is hereby given to an interstate compact relating to the waters of the Yellowstone River which was signed (after negotiations in which a representative of the United States duly appointed by the President participated) by the Commissioners for the States of Montana, North Dakota, and Wyoming on December 8, 1950, at Billings, Montana, and which was thereafter ratified by the legislatures of each of the States aforesaid as provided by Public Law 83, Eighty-first Congress, approved June 2, 1949, which compact reads as follows:

YELLOWSTONE RIVER COMPACT

The State of Montana, the State of North Dakota, and the State of Wyoming, being moved by consideration of interstate comity, and desiring to remove all causes of present and future controversy between said States and between persons in one and persons in another with respect to the waters of the Yellowstone River and its tributaries, other than waters within or waters which contribute to the flow of streams within the Yellowstone National Park, and desiring to provide for an equitable division and apportionment of such waters, and to encourage the beneficial development and use thereof, acknowledging that in future projects or programs for the regulation, control and use of water in the Yellowstone River Basin the great importance of water for irrigation in the signatory States shall be recognized, have resolved to conclude a Compact as authorized under the Act of Congress of the United States of America, approved June 2, 1949 (Public Law 83, 81st Congress, First Session), for the attainment of these purposes, and to that end, through their respective governments, have named as their respective Commissioners:

For the State of Montana:
Fred E. Buck
A. W. Bradshaw
H. W. Bunson
John Horseg
John M. Jarussi
Ashton Jones
Chris. Josephson
A. Wallace Kingsbury
P. F. Leonard
Walter M. McLaughlin
Dave M. Manning
Joseph Muggli
Chester E. Onstad
Ed F. Parriott
R. E. Renne
Keith W. Trout

For the State of North Dakota:
I. A. Acker
Einar H. Dahl
J. J. Walsh

For the State of Wyoming:
L. C. Bishop
Earl T. Bower
J. Harold Cash
Ben F. Cochrane
Ernest J. Goppert
Richard L. Greene
E. C. Gwillim
E. J. Johnson
Lee E. Keith
N. V. Kurtz
Harry L. Littlefield
R. E. McNally
Will G. Metz
Mark N. Partridge
Alonzo R. Shreve
Charles M. Smith
Leonard F. Thornton
M. B. Walker

who, after negotiations participated in by R. J. Newell, appointed as
the representative of the United States of America, have agreed upon
the following articles, to-wit:

ARTICLE I

A. Where the name of a State is used in this Compact, as a party
thereto, it shall be construed to include the individuals, corporations,
partnerships, associations, districts, administrative departments,
bureaus, political subdivisions, agencies, persons, permittees,
appropriators, and all others using, claiming, or in any manner asserting any
right to the use of the waters of the Yellowstone River System under
the authority of said State.

B. Any individual, corporation, partnership, association, district,
administrative department, bureau, political subdivision, agency, person,
permittee, or appropriator authorized by or under the laws of a
signatory State, and all others using, claiming, or in any manner asserting any
right to the use of the waters of the Yellowstone River System under
the authority of said State, shall be subject to the terms of this Compact. Where the singular is used in this article, it shall be
construed to include the plural.

ARTICLE II

A. The State of Montana, the State of North Dakota, and the State
of Wyoming are hereinafter designated as "Montana," "North
Dakota," and "Wyoming," respectively.

B. The terms "Commission" and "Yellowstone River Compact Com-
mission" mean the agency created as provided herein for the admin-
istration of this Compact.

C. The term "Yellowstone River Basin" means areas in Wyoming,
Montana, and North Dakota drained by the Yellowstone River and its
tributaries, and includes the area in Montana known as Lake Basin,
but excludes those lands lying within Yellowstone National Park.

D. The term "Yellowstone River System" means the Yellowstone
River and all of its tributaries, including springs and swamps, from
their sources to the mouth of the Yellowstone River near Buford,
North Dakota, except those portions thereof which are within or
contribute to the flow of streams within the Yellowstone National Park.

E. The term "Tributary" means any stream which in a natural state
contributes to the flow of the Yellowstone River, including interstate
tributaries and tributaries thereof, but excluding those which are
within or contribute to the flow of streams within the Yellowstone National Park.

F. The term "Interstate Tributaries" means the Clarks Fork, Yellowstone River; the Bighorn River (except Little Bighorn River); the Tongue River; and the Powder River, whose confluences with the Yellowstone River are respectively at or near the city (or town) of Laurel, Big Horn, Miles City, and Terry, all in the State of Montana.

G. The terms "Divert," and "Diversion" mean the taking or removing of water from the Yellowstone River or any tributary thereof when the water so taken or removed is not returned directly into the channel of the Yellowstone River or of the tributary from which it is taken.

H. The term "Beneficial Use" is herein defined to be that use by which the water supply of a drainage basin is depleted when usefully employed by the activities of man.

I. The term "Domestic Use" shall mean the use of water by an individual, or by a family unit or household for drinking, cooking, laundering, sanitation and other personal comforts and necessities; and for the irrigation of a family garden or orchard not exceeding one-half acre in area.

J. The term "Stock Water Use" shall mean the use of water for livestock and poultry.

**ARTICLE III**

A. It is considered that no Commission or administrative body is necessary to administer this Compact or divide the waters of the Yellowstone River Basin as between the States of Montana and North Dakota. The provisions of this Compact, as between the States of Wyoming and Montana, shall be administered by a Commission composed of one representative from the State of Wyoming and one representative from the State of Montana, to be selected by the Governors of said States as such States may choose, and one representative selected by the Director of the United States Geological Survey or whatever Federal agency may succeed to the functions and duties of that agency, to be appointed by him at the request of the States to sit with the Commission and who shall, when present, act as Chairman of the Compact without vote, except as herein provided.

B. The salaries and necessary expenses of each State representative shall be paid by the respective State; all other expenses incident to the administration of this Compact not borne by the United States shall be allocated to and borne one-half by the State of Wyoming and one-half by the State of Montana.

C. In addition to other powers and duties herein conferred upon the Commission and the members thereof, the jurisdiction of the Commission shall include the collection, correlation, and presentation of factual data, the maintenance of records having a bearing upon the administration of this Compact, and recommendations to such States upon matters connected with the administration of this Compact, and the Commission may employ such services and make such expenditures as reasonable and necessary within the limit of funds provided for that purpose by the respective States, and shall compile a report for each year ending September 30 and transmit it to the Governors of the signatory States on or before December 31 of each year.

D. The Secretary of the Army; the Secretary of the Interior; the Secretary of Agriculture; the Chairman, Federal Power Commission; the Secretary of Commerce, or comparable officers of whatever Federal agencies may succeed to the functions and duties of these agencies, and such other Federal officers and officers of appro-
priate agencies of the signatory States having services or data useful or necessary to the Compact Commission, shall cooperate, ex-officio, with the Commission in the execution of its duty in the collection, correlation, and publication of records and data necessary for the proper administration of the Compact; and these officers may perform such other services related to the Compact as may be mutually agreed upon with the Commission.

E. The Commission shall have power to formulate rules and regulations and to perform any act which they may find necessary to carry out the provisions of this Compact, and to amend such rules and regulations. All such rules and regulations shall be filed in the office of the State Engineer of each of the signatory States for public inspection.

F. In case of the failure of the representatives of Wyoming and Montana to unanimously agree on any matter necessary to the proper administration of this Compact, then the member selected by the Director of the United States Geological Survey shall have the right to vote upon the matters in disagreement and such points of disagreement shall then be decided by a majority vote of the representatives of the States of Wyoming and Montana and said member selected by the Director of the United States Geological Survey, each being entitled to one vote.

G. The Commission herein authorized shall have power to sue and be sued in its official capacity in any Federal Court of the signatory States, and may adopt and use an official seal which shall be judicially noticed.

Article IV

The Commission shall itself, or in conjunction with other responsible agencies, cause to be established, maintained, and operated such suitable water gaging and evaporation stations as it finds necessary in connection with its duties.

Article V

A. Appropriate rights to the beneficial uses of the water of the Yellowstone River System existing in each signatory State as of January 1, 1950, shall continue to be enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation.

B. Of the unused and unappropriated waters of the Interstate tributaries of the Yellowstone River as of January 1, 1950, there is allocated to each signatory State such quantity of that water as shall be necessary to provide supplemental water supplies for the rights described in paragraph A of this Article V, such supplemental rights to be acquired and enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation, and the remainder of the unused and unappropriated water is allocated to each State for storage or direct diversions for beneficial use on new lands or for other purposes as follows:

1. Clarks Fork, Yellowstone River
   a. To Wyoming-------------------------------------- 60%
      To Montana-------------------------------------- 40%
   b. The point of measurement shall be below the last diversion from Clarks Fork above Rock Creek.

2. Bighorn River (Exclusive of Little Bighorn River)
   a. To Wyoming-------------------------------------- 80%
      To Montana-------------------------------------- 20%
b. The point of measurement shall be below the last diversion from the Bighorn River above its junction with the Yellowstone River, and the inflow of the Little Bighorn River shall be excluded from the quantity of water subject to allocation.

3. Tongue River
   a. To Wyoming------------------------------------------ 40%
   To Montana------------------------------------------ 60%
   b. The point of measurement shall be below the last diversion from the Tongue River above its junction with the Yellowstone River.

4. Powder River (including the Little Powder River)
   a. To Wyoming------------------------------------------ 40%
   To Montana------------------------------------------ 58%
   b. The point of measurement shall be below the last diversion from the Powder River above its junction with the Yellowstone River.

C. The quantity of water subject to the percentage allocations, in Paragraph B 1, 2, 3 and 4 of this Article V, shall be determined on an annual water year basis measured from October 1st of any year through September 30th of the succeeding year. The quantity to which the percentage factors shall be applied through a given date in any water year shall be, in acre-feet, equal to the algebraic sum of:

1. The total diversions, in acre-feet, above the point of measurement, for irrigation, municipal, and industrial uses in Wyoming and Montana developed after January 1, 1950, during the period from October 1st to that given date;
2. The net change in storage, in acre-feet, in all reservoirs in Wyoming and Montana above the point of measurement completed subsequent to January 1, 1950, during the period from October 1st to that given date;
3. The net change in storage, in acre-feet, in existing reservoirs in Wyoming and Montana above the point of measurement, which is used for irrigation, municipal, and industrial purposes developed after January 1, 1950, during the period October 1st to that given date;
4. The quantity of water, in acre-feet, that passed the point of measurement in the stream during the period from October 1st to that given date.

D. All existing rights to the beneficial use of waters of the Yellowstone River in the States of Montana and North Dakota, below Intake, Montana, valid under the laws of these States as of January 1, 1950, are hereby recognized and shall be and remain unimpaired by this Compact. During the period May 1 to September 30, inclusive, of each year, lands within Montana and North Dakota shall be entitled to the beneficial use of the flow of waters of the Yellowstone River below Intake, Montana, on a proportionate basis of acreage irrigated. Waters of tributary streams, having their origin in either Montana or North Dakota, situated entirely in said respective States and flowing into the Yellowstone River below Intake, Montana, are allotted to the respective States in which situated.

E. There are hereby excluded from the provisions of this Compact:
   1. Existing and future domestic and stock water uses of water: Provided, That the capacity of any reservoir for stock water so excluded shall not exceed 20 acre-feet;
   2. Devices and facilities for the control and regulation of surface waters.

F. From time to time the Commission shall re-examine the allocations herein made and upon unanimous agreement may recommend
modifications therein as are fair, just, and equitable, giving consideration among other factors to:

Priorities of water rights;
Acreage irrigated;
Acreage irrigable under existing works; and
Potentially irrigable lands.

ARTICLE VI

Nothing contained in this Compact shall be so construed or interpreted as to affect adversely any rights to the use of the waters of Yellowstone River and its tributaries owned by or for Indians, Indian tribes, and their reservations.

ARTICLE VII

A. A lower signatory State shall have the right, by compliance with the laws of an upper signatory State, except as to legislative consent, to file application for and receive permits to appropriate and use any waters in the Yellowstone River System not specifically apportioned to or appropriated by such upper State as provided in Article V; and to construct or participate in the construction and use of any dam, storage reservoir, or diversion works in such upper State for the purpose of conserving and regulating water that may be apportioned to or appropriated by the lower State: Provided, That such right is subject to the rights of the upper State to control, regulate, and use the water apportioned to and appropriated by it: And provided further, That should an upper State elect, it may share in the use of any such facilities constructed by a lower State to the extent of its reasonable needs upon assuming or guaranteeing payment of its proportionate share of the cost of the construction, operation, and maintenance. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.

B. Each claim hereafter initiated for an appropriation of water in one signatory State for use in another signatory State shall be filed in the Office of the State Engineer of the signatory State in which the water is to be diverted, and a duplicate copy of the application or notice shall be filed in the office of the State Engineer of the signatory State in which the water is to be used.

C. Appropriations may hereafter be adjudicated in the State in which the water is diverted, and where a portion or all of the lands irrigated are in another signatory State, such adjudications shall be confirmed in that State by the proper authority. Each adjudication is to conform with the laws of the State where the water is diverted and shall be recorded in the County and State where the water is used.

D. The use of water allocated under Article V of this Compact for projects constructed after the date of this Compact by the United States of America or any of its agencies or instrumentalities, shall be charged as a use by the State in which the use is made: Provided, That such use incident to the diversion, impounding, or conveyance of water in one State for use in another shall be charged to such latter State.

ARTICLE VIII

A lower signatory State shall have the right to acquire in an upper State by purchase, or through exercise of the power of eminent domain, such lands, easements, and rights-of-way for the construction, operation, and maintenance of pumping plants, storage reservoirs, canals,
Article IX

Should any facilities be constructed by a lower signatory State in an upper signatory State under the provisions of Article VII, the construction, operation, repairs, and replacements of such facilities shall be subject to the laws of the upper State. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.

Article X

No water shall be diverted from the Yellowstone River Basin without the unanimous consent of all the signatory States. In the event water from another river basin shall be imported into the Yellowstone River Basin or transferred from one tributary basin to another by the United States of America, Montana, North Dakota, or Wyoming, or any of them jointly, the State having the right to the use of such water shall be given proper credit therefor in determining its share of the water apportioned in accordance with Article V herein.

Article XI

The provisions of this Compact shall remain in full force and effect until amended in the same manner as it is required to be ratified to become operative as provided in Article XV.

Article XII

This Compact may be terminated at any time by unanimous consent of the signatory States, and upon such termination all rights then established hereunder shall continue unimpaired.

Article XIII

Nothing in this Compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, in any Federal Court or the United States Supreme Court, for the protection of any right under this Compact or the enforcement of any of its provisions.

Article XIV

The physical and other conditions characteristic of the Yellowstone River and peculiar to the territory drained and served thereby and to the development thereof, have actuated the signatory States in the consummation of this Compact, and none of them, nor the United States of America by its consent and approval, concedes thereby the establishment of any general principle or precedent with respect to other interstate streams.

Article XV

This Compact shall become operative when approved by the Legislature of each of the signatory States and consented to and approved by the Congress of the United States.
PUBLIC LAW 231—OCT. 30, 1951

ARTICLE XVI

Nothing in this Compact shall be deemed:
(a) To impair or affect the sovereignty or jurisdiction of the United States of America in or over the area of waters affected by such compact, any rights or powers of the United States of America, its agencies, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin nor its capacity to acquire rights in and to the use of said waters;
(b) To subject any property of the United States of America, its agencies, or instrumentalities to taxation by any State or subdivision thereof, nor to create an obligation on the part of the United States of America, its agencies, or instrumentalities, by reason of the acquisition, construction, or operation of any property or works of whatsoever kind, to make any payments to any State or political subdivision thereof, State agency, municipality, or entity whatsoever in reimbursement for the loss of taxes;
(c) To subject any property of the United States of America, its agencies, or instrumentalities, to the laws of any State to an extent other than the extent to which these laws would apply without regard to the Compact.

ARTICLE XVII

Should a Court of competent jurisdiction hold any part of this Compact to be contrary to the constitution of any signatory State or of the United States of America, all other severable provisions of this Compact shall continue in full force and effect.

ARTICLE XVIII

No sentence, phrase, or clause in this Compact or in any provision thereof, shall be construed or interpreted to divest any signatory State or any of the agencies or officers of such States of the jurisdiction of the water of each State as apportioned in this Compact.

In Witness Whereof the Commissioners have signed this Compact in quadruplicate original, one of which shall be filed in the archives of the Department of State of the United States of America and shall be deemed the authoritative original, and of which a duly certified copy shall be forwarded to the Governor of each signatory State.

Done at the City of Billings in the State of Montana, this 8th day of December, in the year of our Lord, One Thousand Nine Hundred and Fifty.

Commissioners for the State of Montana:

Fred E. Buck /s/ Fred E. Buck
A. W. Bradshaw /s/ A. W. Bradshaw
H. W. Bunston /s/ H. W. Bunston
John Herzog /s/ John Herzog
John M. Jarussi /s/ John M. Jarussi
Ashton Jones /s/ Ashton Jones
A. Wallace Kingsbury /s/ A. Wallace Kingsbury
P. F. Leonard /s/ P. F. Leonard
Walter M. McLaughlin /s/ Walter M. McLaughlin
Dave M. Manning /s/ Dave M. Manning
Joseph Muggli /s/ Joseph Muggli
Chester E. Onstad /s/ Chester E. Onstad
Ed F. Parriott /s/ Ed F. Parriott
R. R. Renne /s/ R. R. Renne
Keith W. Trout /s/ Keith W. Trout
Commissioners for the State of North Dakota:
I. A. Acker /s/ I. A. Acker
Einar H. Dahl /s/ Einar H. Dahl
J. J. Walsh /s/ J. J. Walsh

Commissioners for the State of Wyoming:
L. C. Bishop /s/ L. C. Bishop
Earl T. Bower /s/ Earl T. Bower
J. Harold Cash /s/ J. Harold Cash
Ben F. Cochrane /s/ Ben F. Cochrane
Ernest J. Goppert /s/ Ernest J. Goppert
Richard L. Greene /s/ Richard L. Greene
E. C. Gwillim /s/ E. C. Gwillim
E. J. Johnson /s/ E. J. Johnson
Lee E. Keith /s/ Lee E. Keith
N. V. Kurtz /s/ N. V. Kurtz
Harry L. Littlefield /s/ Harry L. Littlefield
R. E. McNally /s/ R. E. McNally
Will G. Metz /s/ Will G. Metz
Mark N. Partridge /s/ Mark N. Partridge
Alonzo R. Shreve /s/ Alonzo R. Shreve
Charles M. Smith /s/ Charles M. Smith
Leonard F. Thornton /s/ Leonard F. Thornton
M. B. Walker /s/ M. B. Walker

"I have participated in the negotiation of this Compact and intend to report favorably thereon to the Congress of the United States.
/s/ R. J. Newell
R. J. Newell,
Representative of the United States of America."

Sec. 2. The right to alter, amend or repeal section 1 of this Act is expressly reserved. This reservation shall not be construed to prevent the vesting of rights to the use of water pursuant to applicable law and no alteration, amendment, or repeal of section 1 of this Act shall be held to affect rights so vested.

Approved October 30, 1951.

Public Law 232
AN ACT

For the relief of the town of Mount Desert, Maine.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury is authorized and directed to pay, out of any money in the Treasury not otherwise appropriated, to the town of Mount Desert, Maine, the sum of $38,986.60. The payment of such sum shall be in full settlement of all claims of such town against the United States for reimbursement of expenditures made by such town in combating a forest fire in the Acadia National Park from October 24, 1947, to November 1, 1947: Provided, That no part of the amount appropriated in this Act in excess of 10 per centum thereof shall be paid or delivered to or received by any agent or attorney on account of services rendered in connection with this claim, and the same shall be unlawful, any contract to the contrary notwithstanding. Any person violating the provisions of this Act shall be deemed guilty of a misdemeanor and upon conviction thereof shall be fined in any sum not exceeding $1,000.

Approved October 30, 1951.
82nd Congress, Senate Report No. 883 (Oct. 2, 1951)
GRANTING THE CONSENT OF CONGRESS TO A COMPACT ENTERED INTO BY THE STATES OF MONTANA, NORTH DAKOTA, AND WYOMING RELATING TO THE WATERS OF THE YELLOWSTONE RIVER

October 2 (legislative day, October 1), 1951.—Ordered to be printed

Mr. O'MAHONEY, from the Committee on Interior and Insular Affairs, submitted the following

REPORT

[To accompany S. 1311]

The Committee on Interior and Insular Affairs, to whom was referred the bill (S. 1311) granting the consent of Congress to a compact entered into by the States of Montana, North Dakota, and Wyoming relating to the waters of the Yellowstone River, having considered the same report favorably theron without amendment and with the recommendation that the bill do pass.

THE PURPOSE OF THE BILL

The bill would give the consent of Congress to a compact entered into between the States of Montana, North Dakota, and Wyoming providing for an equitable division of the use of waters from the Yellowstone River and its tributaries. Public Law 83, Eighty-first Congress, approved June 2, 1949, gave the consent of Congress to negotiate and enter into a compact, provided for the appointment of a Federal representative to represent the United States in the negotiations and to report thereon to the Congress. The compact was agreed to by the several representatives of the affected States at Billings, Mont., on December 8, 1950, and the States ratified the compact early in 1951.

APPORTIONMENT OF USE OF WATER

The compact appears to be fair and equitable in apportioning the use of waters of the Yellowstone Basin, as defined. The compact provisions are easily administered, and require no elaborate organization. In all respects, it presents an unusually practicable solution to the problems which, during the early years of negotiations, seemed highly complicated and difficult.
The Yellowstone River Basin and the Yellowstone River system (i.e., the river and its tributaries) are, for the purposes of the compact, exclusive of the Yellowstone National Park area and its waters, and the waters of the Little Bighorn River.

The apportionment, or division, of the waters of the basin is provided in article V, subsections A, B, and D, as follows:

V-A. Existing appropriative rights as of January 1, 1950, are recognized in each of the signatory States. No regulation of the supply is mentioned for the satisfaction of these rights, and it is clear, then, that a demand of one State upon another for a supply different from that now obtaining under present conditions of supply and diversion, is not contemplated, nor would such a demand have legal standing. Where these rights have deficient supplies they would be supplemented by rights obtained from "unused and unappropriated waters" in the basin as of January 1, 1950, from the allocated waters under subsection B. North Dakota rights are covered specifically in subsection D.

V-B. Unused and unappropriated waters as of January 1, 1950, of the four interstate tributaries, the Clarks Fork of the Yellowstone, the Big Horn, Tongue, and Powder Rivers, all of which rise in Wyoming and join the main stem of the Yellowstone River in Montana, are allocated in variable percentages between Montana and Wyoming. The definition of these waters is found in subsection C of article V. The allocations (by the method of computation of the waters not appropriated and used as of January 1, 1950) are percentages of divertible and storable waters in each tributary basin during any water year or at any time in the water year after its beginning (October 1). Allocations, thereby, take into account return flows and uses of them, as well as original runoff. This results from the computation directive which says, in effect, that allocated flows are the sum of diversions and outflows from the tributary basin corrected for changes in the storage of such waters.

V-D. Below Intake, Mont., the flows in the Yellowstone River are apportioned between Montana and North Dakota on the basis of acreages irrigated in each State. Tributary streams below Intake are allotted to the States in which they are situated.

The use of the waters of the Yellowstone River which flow from the Yellowstone National Park and accrue from Montana tributaries and general runoff in Montana is not affected by the compact, provided, that uses originating subsequent to January 1, 1950, do not deplete the flows below Intake to a point where older priorities are injured. Subsection V-E provides that:

1. Existing and future, domestic and stock-water uses of water: Provided, that the capacity of any reservoir for stock water shall not exceed 20 acre-feet are excluded from the provisions of the compact. Thus, the States have agreed that domestic and stock-water uses shall be unrestricted, subject only to the limitation in capacity of a stock-water reservoir. This subsection is identical in its effect to like provisions of the Belle Fourche River compact.

COMMENTS OF BUREAU OF THE BUDGET AND DEPARTMENT OF THE INTERIOR

The report of the Bureau of the Budget of September 14, 1951, states that the Department of Justice believes that the compact does not adequately preserve, protect, or recognize the interests, sovereignty or jurisdiction of the United States in the "area of waters" affected. Justice believes the term quoted above to be obscure and possibly conflicting; that the allocations between the States of "unused and unappropriated waters" may possibly deprive the United States of the use of surplus water it has anticipated would flow into the Missouri
River; that the provisions that the commission (created by the compact to administer the compact) may sue and be sued might be construed to waive the sovereign immunity of the Federal Government from suit.

Justice recommends that the undesirable provisions be alleviated, or made impotent, by substituting a different form of consent to the compact, and such a form is included in its comments.

The committee has considered these objections and the recommendation. In article XVI (a), it seems clear that the "area of waters" can only refer to the places where Yellowstone River waters may be held or may be flowing, and that such sovereignty or jurisdiction as the United States may have over them is not impaired by the compact. The sentence containing the ambiguous term, "area of waters," continues to say that the compact does not impair or affect any rights or powers of the United States—in and to the use of the waters of the Yellowstone River Basin nor its capacity to acquire rights in and to the use of said waters.

Article V-B, it is true, allocates to the States the "unused and unappropriated waters," but this follows V-A which recognizes all existing beneficial uses as of January 1, 1950. As to these "unused and unappropriated waters," the United States is not barred if their uses conform to the division between the States, as, for example, in developing a reclamation project in compliance with Federal and State water laws. Nothing new is involved here; only customary practices are contemplated by the affected States. If the Department of Justice has in mind new theories of Federal ownership of these waters respecting navigation, for example, this matter is settled by the O'Mahoney-Millikin amendment to the Flood Control Acts of 1944 and 1946. If the use of water for power is in question, the agreement of Federal agencies and the States upon the water supply studies of April 1951 is sufficient to indicate that it is the view of those agencies and the States that, as a practical matter, the provisions of the O'Mahoney-Millikin amendment will also apply to water use for power.

As to article III-G, relating to suits by or against the Commission in the Federal courts, the fears of Justice that the language might waive the sovereign immunity of the United States seem to have little basis. The Commission is created for specific purposes only. The powers of the Commission are limited to carrying out the provisions of the compact, namely, to require that the division of the waters among the affected States be in conformity with compact articles V to X, inclusive, and affect only Montana and Wyoming operations. The Federal member of the three-man Commission will represent the United States Geological Survey, an agency entrusted with the survey of the water resources of the basin. The Federal member may vote only when the Montana and Wyoming members fail to agree on the administration of the terms of the compact. His action would bind the Commission, not the United States. The United States is not a party to the compact.

Public Law 83, Eighty-first Congress, approved June 2, 1949, gave the consent of Congress to the negotiation of the Yellowstone River compact:

upon condition that one suitable person, who shall be appointed by the President of the United States, shall participate in said negotiations as the representative
COMPACT RELATING TO WATERS OF YELLOWSTONE RIVER

of the United States and shall make a report to Congress of the proceedings and
of any compact or agreement entered into... *

This provision does not make the United States a party to the
compact.

The Federal representative, appointed pursuant to Public Law 83,
was Mr. R. J. Newell, formerly regional director, Bureau of Recla-
mation, being stationed at Boise, Idaho, for many years. In his
report, Mr. Newell says that when the negotiations began he received
specific instructions from the President concerning the protection of
the interests of the United States. He says these instructions were
carefully and fully observed, and the compact meets his approval.

The report of the Secretary of the Interior of September 27, 1961,
is favorable, and notes that the compact will enable the Federal
Government and the States to expedite developments of works in
upper portion of the Missouri River Basin which are presently
authorized.

Following is the report of Mr. R. J. Newell, Federal representative,
and reports of the Bureau of the Budget and the Department of the
Interior, all of which are presented in full:

BOISE, IDAHO, March 18, 1961.

HON. ALDEN W. BARKLEY,
President of the Senate, Washington, D. C.

MY DEAR MR. PRESIDENT: I have the honor to enclose a conformed copy of a
compact entered into on December 8, 1950, among the States of Montana, North
Dakota, and Wyoming to determine the rights and obligations of those States
respecting uses of the waters of the Yellowstone River and its tributaries.

By virtue of my appointment by the President as the representative of the
United States, I participated in the negotiations which led to the compact. My
report thereon is enclosed.

Sincerely yours,

R. J. NEWELL,
Representative of the United States,
Yellowstone River Compact Negotiations.

REPORT TO THE CONGRESS BY THE FEDERAL REPRESENTATIVE ON THE
YELLOWSTONE RIVER COMPACT

By the act of June 2, 1949 (Public Law 83, 81st-Cong.), Congress granted its
consent to the States of Montana, North Dakota, and Wyoming to negotiate and
enter into a compact or agreement for the division of the waters of the Yellowstone
River excepting waters within or tributary to the Yellowstone National Park.

Commissioners representing these States, after negotiations extending over a
year, have reached final agreement on the provisions of the proposed compact at
a meeting held in Billings, Mont., on December 7 and 8, 1950, and each one of
them has affixed his signature thereto. The State Legislature of Wyoming ratified
the agreement by an act signed by the Governor on January 27, 1951. Montana's
Legislature likewise approved and the Governor signed on February 13, 1951, and
North Dakota's Legislature approved and the Governor signed on March 7, 1951.

The authorizing act required that a Federal representative be appointed to
participate in the negotiations and to report to the Congress on the proceedings
and on any compact or agreement entered into. Accordingly, the President, on
October 19, 1949, appointed me as such Federal representative, and I have
participated in the negotiations of the commissioners and hereby report as
directed.

I believe that the proposed compact is a sound basis for further development
in the use and control of waters of the Yellowstone River for multiple purposes,
especially for irrigation, that the division of the waters among the States as agreed
on is equitable, and that the rights of the United States are properly protected;
and, therefore, I recommend that the consent of Congress be given the proposed
compact, a copy of which is attached.

Further report follows:

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COMPACT RELATING TO WATERS OF YELLOWSTONE RIVER

PREVIOUS NEGOTIATIONS

Three previous compacts have been negotiated on the Yellowstone River. The first of these was signed in February 1936. It concerned only the States of Montana and Wyoming, and was never acted upon by the legislatures. The second compact was negotiated in 1942 and went to the legislatures in 1943. This concerned the three States—Montana, Wyoming, and North Dakota. The Wyoming Legislature was the first to take action on this compact and failed to ratify it. A third compact, quite similar in form to the previous compact, was negotiated in 1944, and reached the Legislatures of Montana, Wyoming, and North Dakota in 1945. This compact was ratified by North Dakota, Montana, and by the Legislature in Wyoming, but was vetoed by the Governor of Wyoming. The present compact is therefore the fourth that has been negotiated by Montana and Wyoming, and the third to concern all three States.

AREA INVOLVED

The drainage basin of the Yellowstone River, from its source in the highlands of the Rocky Mountains extending downstream through north central Wyoming and southeastern Montana to its mouth a few miles below the Montana-North Dakota line, is involved in the proposed compact.

The area drained comprises over 70,000 square miles, of which roughly 1,500,000 acres are being irrigated. The irrigated land is almost equally divided between Montana and Wyoming with less than 2 percent in North Dakota. Investigations indicate that suitable land is at hand feasible to irrigate and available water supply is adequate if conserved, to increase the irrigated area by about 34 percent. The increased area is also about equally divided between Montana and Wyoming with a minor acreage in North Dakota.

PURPOSES

The major purposes of the proposed compact, as stated therein, are to promote interstate comity, to remove causes of present and future controversy between the States with respect to the waters of the Yellowstone River and its tributaries, to provide for an equitable division and apportionment of such waters and to encourage the beneficial development and use thereof. Installation of physical works needed to foster that use has been delayed pending an agreement between the States as to division of waters.

STATE COMMISSIONERS

The following commissioners were appointed by the respective governors to represent their States in the negotiation of the proposed compact:

FOR MONTANA

Fred E. Buck
A. W. Bradshaw
R. W. Burton
John Herzog
John M. Jarusel
Ashton Jones
Chris Josephson
A. Wallace Kingsbury
P. F. Leonard
Walter M. McLaughlin
Dave M. Manning
Joseph Muggli
Chester E. Onstad
Ed F. Parriott
Axel Persson ²
R. R. Renne ³
Keith M. Trout

FOR WYOMING

L. C. Bishop ¹
Earl T. Bower
J. Harold Cash
Ben F. Cootkran
Ernest J. Goppert
Richard L. Greene
E. O. Gwillim
E. J. Johnson
Lee E. Keith
N. V. Kurtz
Harry L. Littlefield
R. E. McNally
Will G. Metz
Mark N. Partridge
Fred V. Portz ⁴
Alonso R. Shreve
Charles M. Smith
Leonard F. Thornton

FOR NORTH DAKOTA

I. A. Acker
Einar H. Dahl
J. J. Walsh

¹ Resigned.
² Appointed just prior to final meeting.
³ Represented at formal meetings by Deputy Earl Lloyd.
⁴ Died.
COMPACT RELATING TO WATERS OF YELLOWSTONE RIVER

The State engineer was included in each State group as that officer bears important responsibilities in connection with the administration of the State's water supplies. However, these responsibilities vary from State to State. Consultants and advisors assisted in the negotiations.

FEDERAL CONTRIBUTION

The office of region 6 of the Bureau of Reclamation furnished a legal advisor and a secretary and took care of all recording, duplicating, correspondence and the like. The Bureau also contributed a great amount of data on land surveys, water records, etc. The Bureau of Indian Affairs, through the area engineer at Billings, also furnished similar data concerning the large area of Indian lands in the basin.

NEGOTIATIONS

Four formal meetings of the full commission, all at Billings, Mont., were held on the following dates: November 28, 1949; February 1 and 2, 1950; October 21 and 25, 1950; December 7 and 8, 1950.

Minutes of these meetings were made and adopted officially by the commissioners. They have been assembled and labeled "Yellowstone River compact—Minutes of formal meetings of the Yellowstone River compact commissioners." They are not being sent out as part of the text of this report, but copies are being furnished for the official files of the appropriate committees of Congress and for the General Services Administration of the United States for filing with the original of the compact. Each of the meetings was well attended, though three were held in winter and the commissioners came from widely scattered points over a huge area. Meetings were open to the public and the press. Because of the size of the group, including 39 commissioners and a number of advisors, consultants, and other interested parties, much of the detail work of collecting and drafting information and drafting language had to be done in smaller committees. Informal meetings of representatives of interested Federal agencies were held on November 28, 1949, and February 2, 1950.

A drafting committee made up of attorneys from each of the three States held one meeting in August 1950, and attempted to draft language satisfactory to all parties.

However, most of the ground work was laid, most of the material gathered and most of the questions answered by an engineering committee made up of the State engineers of the three States, the area engineer of the Bureau of Indian Affairs, and the district engineer of the Bureau of Reclamation, Yellowstone district, and assisted on occasion by numerous others, from private, State and Federal ranks, who had information of value to offer. This committee held a number of meetings and made one field trip throughout the length of the Big Horn River (largest tributary of the Yellowstone) to check field data on the ground.

MAIN FEATURES OF THE COMPACT

The compelling reason for the negotiation of a compact was the need for agreement on division of the waters of inter-state tributaries in the Yellowstone River Basin that would allow further development to go forward. Because the main stem of the river is almost entirely in Montana and its water supply under any future program appears adequate for feasible developments along its course, it was given little consideration in the negotiations. While North Dakota's representatives contributed in an important measure to the work of the commission, the real interest of the State in the compact is minor on account of the very small part of the drainage basin that is within its borders. The waters in Yellowstone National Park and tributary thereto were expressly excluded by the language of the authorizing act. The real problem and the purpose of the undertaking was then to divide the waters of four principal tributaries, the Clark's Fork, Big Horn, Tongue, and Powder, all rising in Wyoming and flowing across the State line into Montana, with developments, existing and proposed, in both States.

In earlier attempts to arrive at a compact and in the early meetings here reported, there was searching discussion as to whether the agreement sought on division of waters should include the water now appropriated and in use or should apply only to the unappropriated and unused balance which is available for further development. The latter principle was decided on (art. V-A) for several reasons. First, it would be a huge and time-consuming task to determine and fix comparable values for existing rights in three States with differing water laws and practices in establishing water rights. Second, the basic fact that there is enough
COMPACT RELATING TO WATERS OF YELLOWSTONE RIVER

water if properly conserved by storage to take care of all existing and all feasible future developments points up the importance of arriving promptly at the simplest workable agreement that would permit such storage projects to proceed. When these are built, even the operation provisions of the compact are expected to become easy of administration.

It is further agreed (art. V-B) that existing irrigation developments with an inadequate supply should have a preferred right to the unused remainder over new projects.

The final residue of supply was then divided between the States for further development. The basis for the division on each tributary was the acreage of land in each State that could be feasibly irrigated from that tributary, the requirements used to determine feasibility being the same in each State.

For supervision of the operation of the compact, a commission is provided for, made up of one member from each of the States of Montana and Wyoming, to be appointed by the respective Governors, and one member to be appointed by the Director of the Geological Survey. The State representatives on this operating commission could be the State engineers who are usually charged with the supervision of water right matters in irrigation States, in which case no new positions would be created. The Geological Survey was made responsible for the third member for the reason that traditionally its Surface Water Division has intimate contact and accepted responsibilities in connection with the flow of streams and water surveys generally and the States have generally depended on the cooperation of this agency. The State of North Dakota, at the request of its representatives, was rather reluctantly relieved of the responsibility and expense of operations because the interests of the State in the results were so disproportionately small.

In determining the amount of water subject to allocation, the "divertible flow" principle was chosen over the "depletion" principle, because the former had been used in earlier negotiations and was more familiar to the commissioners, who were assured by the consultants that the latter had no outstanding advantages even though it had been selected on the upper Colorado.

Existing and future domestic and stock water uses were excluded from the provisions of the compact, with a limitation on the size of stock ponds. A large number of stock ponds have been constructed or are contemplated by individuals and agencies in the open range country, and the question has been raised whether their multiplication might have a material effect on water supplies available for major purposes. A study of the proposed developments in the Yellowstone River Basin discloses that the feasibility of no project depends on or would be affected appreciably by these ponds, located as they are in the plains area away from live streams and collecting water that otherwise would probably never reach the river system anyway.

FEDERAL INTERESTS.

In the course of the negotiations, a letter was received from the President enclosing a memorandum from the Bureau of the Budget and calling attention to questionable provisions in recent interstate compacts which were apparently contradictory and which imposed restrictions on the use of water by the United States. The suggestions in that letter have been followed and incorporation in this compact of provisions such as were referred to has been scrupulously avoided.

In article XVI of the compact, it is specifically provided that nothing in that document shall "impair or affect . . . any rights or powers of the United States of America, its agents, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin . . . ." This unmistakable clear language, together with the provision that nothing in the compact shall "subject any property of the United States of America, its agents or instrumentalities, to the laws of any State to an extent other than the extent to which these laws would apply without regard to the compact," furnishes complete protection to the United States against any possible adverse effect, the existence of which I cannot foresee, that might arise from any other portion of the compact to which the "Congress' consent is given. Attention is specifically invited, moreover, to the fact that although the States have, in paragraph D of article VII of the compact, agreed among themselves that the use of allocated waters on Federal projects constructed after the date of the compact shall be "charged" to the State in which the water is used, they have not attempted to limit its use to those waters.

The particular concerns of the United States, and agencies of the Federal Government were inquired into and given serious consideration throughout the negotiations. All agencies known to have interests in the basin were kept informed of.
the progress of negotiations and were invited to have representatives present at the meetings. These included the Department of the Army, Department of Interior, Department of Agriculture, Federal Power Commission, Department of Commerce, Reconstruction Finance Corporation.

Two separate meetings were held with Federal men to bring out their views. Regular meetings of the commissioners were attended by 12 to 20 men from Federal agencies. When a draft of compact was ready for final consideration, copies were circulated to the following agencies with request for comment in 30 days. Helpful comments and suggestions were received from Department of Agriculture, Corps of Engineers, Bureau of Reclamation, National Park Service, Bureau of Indian Affairs.

All comments were given consideration, some suggested language was adopted verbatim and other suggestions were taken care of in various ways. It is believed that there are no provisions in this compact and no omissions to which Federal agencies seriously object. However, attention has been directed by the Bureau of Reclamation to subparagraph E-2 of article V which excludes from the provisions of the compact "Devices and facilities for the control and regulation of surface waters." This language was inserted to meet a request by the Department of Agriculture for exclusion of so-called "water-spreading devices" which are recommended for installation on the open plains to reduce erosion from heavy local rains. It is not believed that this could be interpreted as applying to major storage reservoirs.

It should be specially noted that there are great areas of Indian land in the Yellowstone River Basin in both Montana and Wyoming, much of which is irrigated or proposed to be irrigated, and the interest of the Bureau of Indian Affairs in the compact is important. Indian Bureau men attended all meetings, furnished much information, and lent continuous engineering help to subcommittees. The language submitted by them to cover Indian interests in the compact was adopted verbatim.

CONCLUSION

The effort that has been carried on by the States for nearly 20 years to secure a compact for the division of the waters of the Yellowstone River and its tributaries would seem to be conclusive evidence that such a compact is needed. The instrument submitted herewith is the result of a year's intensive study and discussion by a large number of qualified State commissioners with the benefit of all past negotiations and the cooperation of many Federal agencies and private individuals, ending finally in agreement by all. The plan proposed appears to be easily installed, practical, and does not require the establishment of a large regulatory organization for its operation. The division of the waters is believed to be equitable and fair. Obstacles to the continued orderly development of resources would be removed. The rights of the United States seem to be fully protected. Therefore I recommend that the proposed compact be approved by the Congress of the United States.

R. J. NEWELL,
Federal Representative,
Yellowstone River Compact Negotiations.

NOTE.—It is now understood that the archives of the Department of State are no longer the proper depository for such documents as the Yellowstone compact. The General Services Administration having taken over this function, the authoritative original of the compact, if finally approved, will be filed with that body.

R. J. N.

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,
Washington 25, D. C., September 14, 1951.

Hon. Joseph C. O'Maroney,
United States Senate, Washington 25, D. C.

Mr. Dear Senator O'Maroney: Receipt is acknowledged of your letter, dated April 13, 1951, requesting our report on S. 1311, a bill granting the consent of Congress to a compact entered into by the States of Montana, North Dakota, and Wyoming relating to the waters of the Yellowstone River.

In response to my request for the views of the Department of Justice, the Deputy Attorney General indicates that while article VI of the compact is apparently designed to protect the interests of the United States, the language used is rather ambiguous. The preservation of the rights of the United States is
COMPACT RELATING TO WATERS OF YELLOWSTONE RIVER

rendered somewhat obscure due to the possible conflicting interpretations of the terminology 'area of waters' in the language "To impair or affect the sovereignty or jurisdiction of the United States of America in or over the area of waters affected by such compact, any rights or powers of the United States of America, its agencies, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin nor its capacity to acquire rights in and to the use of said waters."

He also calls attention to article V, B of the compact under which the signatory States allot themselves all "unused and unappropriated waters of the interstate tributaries of the Yellowstone River" as possibly depriving the United States of the use of surplus water it has been anticipated would flow into the Missouri River.

Also in the Deputy Attorney General's opinion, the broad authority contained in the provision that the commission may sue and be sued might be construed, in view of the Federal representative thereon, to indicate that the Federal Government has waived its sovereign immunity from suit.

Finally, he recommends that in the event Congress should desire to approve the compact as drafted, such approval be essentially in the following language:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That approval by the Congress is hereby given to the Yellowstone River compact: Provided, however, That this approval of the compact does not in any way subject the United States to the terms of the compact or affect its sovereignty, jurisdiction, power, authority, rights to the use of water, property, prerogatives, or responsibilities in, to, or over the Yellowstone River and its tributaries."

The Secretary of the Interior, in his proposed report on H. R. 3644, the companion bill to S. 1311, expresses the opinion that the provisions in the compact for the selection of the Federal representative by the Geological Survey rather than the President and that the commission should be subject to suit are regrettable and that the latter "may raise some interesting constitutional questions in the future."

Similarly conflicting provisions appearing in previously consummated compacts prompted the President on May 3, 1960, to write the Federal representatives on various compact commissions cautioning them to exert all efforts to eliminate or correct the areas of possible conflict which might impose restrictions on the use of waters by the United States.

This office is in agreement that the compact method is the proper and logical manner for States to allocate the waters of interstate streams. It is essential, however, that such compacts include adequate provisions to preserve the rights and interests of the United States and for appointment by the President of a Federal representative as a member of the compact commission. Since the Yellowstone River compact which would be approved by S. 1311 has been ratified by the States of Montana, North Dakota, and Wyoming, it may not now be feasible of revision to provide for the selection of the Federal representative by the President rather than by Geological Survey. While I believe that as a general rule the former is preferable, there may be some question whether in this case the submission of the compact to the States to provide for selection of a Federal representative by the President rather than by Geological Survey is justified. It is of fundamental importance, however, that the compact protect the rights and interests of the United States in these waters. The language of the proposed amendment to the bill prepared by the Department of Justice would seem to provide such protection. Accordingly, subject to the consideration of the above comments by the Congress, there would appear to be no objection to enactment of S. 1311 if amended to assure the protection of the interests of the United States as recommended by the Department of Justice.

Sincerely yours,

ELMER B. STAATS,
Acting Director.

DEPARTMENT OF THE INTERIOR,
Office of the Secretary,

HON. JOSEPH C. O'MAHONEY,
Chairman, Committee on Interior and Insular Affairs,
United States Senate, Washington 25, D. C.

MY DEAR SENATOR O'MAHONEY: I have for report S. 1311, a bill granting the consent of Congress to a compact entered into by the States of Montana, North Dakota, and Wyoming, relating to the waters of the Yellowstone River. The

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compact, as approved by the 1951 legislative assemblies of the signatory States, is set out in the subject bill.

One very important part of the plan of this Department for improvements in the Missouri River Basin set forth in Senate Document 191, Seventy-eighth Congress, and approved and authorized for construction in the acts of December 22, 1944 (58 Stat. 887, 891), and July 24, 1946 (60 Stat. 641, 653), is that of supplying new and supplemental water for the irrigation of well over 700,000 acres of land in the Yellowstone River Basin, the installation in that basin of more than 300,000 kilowatts of hydroelectric generating capacity, and provision of reservoirs for these and other purposes with a total capacity of more than 4,250,000 acre-feet. While these figures cannot be regarded as final, they are indicative of the great importance of that basin to the economy of the entire Missouri River Basin and of the Nation. The negotiation of the Yellowstone River Basin compact was, and the Congress' consent to it will be, an important step toward permitting realization of the basin's potentialities without bickering between the States.

The compact provides that its operation shall not "impair or affect, the sovereignty or jurisdiction of the United States of America in and over the area of waters affected" by it or "any rights or powers of the United States of America, its agents, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin" or its capacity to acquire such rights, that it shall not be taken to "subject any property of the United States of America, its agencies, or instrumentalities, to the laws of any State to an extent other than the extent to which these laws would apply without regard to the compact," and that its terms do not cover "waters within or waters which contribute to the flow of streams within the Yellowstone National Park." The compact, moreover, provides that its terms shall not "be so construed or interpreted as to affect adversely any rights to the use of the waters of the Yellowstone River and its tributaries owned by or for Indians, Indian tribes, and their reservations." The water rights of the Indians were reserved by the Indians at the time of the creation of the respective reservations by the treaties entered into by the Indians with the United States. These Indian water rights have been recognized by the Supreme Court of the United States. The most important decision is the case of Winters v. United States reported in 207 U. S. 364. This situation explains the inclusion of the language just quoted. A further safeguard to Federal interests is to be found in section 2 of S. 1311; i. e., in the express reservation to Congress of its right to alter, amend, or repeal the act.

It long has been recognized that the fuller use of the water resources of the Yellowstone River Basin contemplated in Senate Document 191 is dependent upon the construction and operation of storage reservoirs to regulate and conserve the water yields of the principal streams of the basin. These streams, in addition to the Yellowstone River itself, are its four large interstate tributaries, each rising in Wyoming and flowing into Montana: the Clark Fork, Yellowstone River; the Big Horn River; the Tongue River; and the Powder River. Of these streams, the Yellowstone River, which is the main stem of the river system of the Yellowstone Basin, needed little consideration in the negotiation of the compact because it is almost entirely in Montana and its water yield seems to be adequate for any program of feasible developments along its course, and the Clark Fork, Yellowstone River, one of the tributaries, is not likely to experience water shortages. Hence, the problem streams are the three remaining large interstate tributaries. Hence, the problem streams are the three remaining large interstate tributaries. The elements that make these interstate tributaries problem streams are the existing irrigated developments and the potential and possible irrigated developments. (In this connection, I am advised that the compact commissioners recognized a distinction between potential developments and possible developments. Potential developments were those which, it was thought, are definitely feasible, while possible developments are those which could be developed only at a very high cost or for which a water supply seemed questionable.)

The practical accomplishment, in the circumstances, of an equitable apportionment of the benefits of the waters of the Yellowstone River system among the States of Wyoming, Montana, and North Dakota will require the construction, at strategic sites, at or near the Wyoming-Montana State line, of storage reservoirs so that the residual flows from Wyoming can be controlled and conserved for use in the lower States of Montana and North Dakota. Fortunately, such strategic reservoir sites are available on the Big Horn River, the Tongue River, and the Powder River.

Article V of the compact is the article that sets out the apportionment of the benefits of the water resources of the basin among the signatory States that they have agreed upon. Extensive studies by an engineering committee, appointed by
the commission to advise it, disclosed that little could be gained, from a water supply standpoint, by attempting, in the compact, the regulation and administration of irrigation water rights in the signatory States. (The engineering committee comprised the State engineers of the three States and two Federal engineers from the Bureau of Reclamation and the Bureau of Indian Affairs.) Accordingly, paragraph A of article V recognizes the appropriative rights to the beneficial uses of the water of the Yellowstone River system existing in each signatory State as of January 1, 1950, and it permits the continued enjoyment of such rights in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation.

Paragraph B of article V is the core of the compact. The following analysis of this paragraph is made:

(1) The unused and unappropriated waters of the interstate tributaries only are treated; i.e., the waters that are residual to those required for the enjoyment of the appropriative rights that are recognized in paragraph A of article V.

(2) The supplemental water supplies that are needed for the better enjoyment of the rights recognized in paragraph A of article V are given a preferred status over water supplies for new projects.

(3) The water that is residual after the enjoyment of the rights in paragraph A of article V and after the furnishing of the supplemental water supplies to the projects with which those rights are associated in paragraph A are allocated to Wyoming and Montana in stated percentages. I am informed that these percentages were calculated, in accordance with the recommendation of the engineering committee, by dividing the total of the potential and possible acres in Wyoming and Montana by the total of the potential and possible acres in both States. In paragraph C of article V, there is adopted a modified version of the divertible flow principle. Under the formula adopted, the apportionments stated in paragraph A are made operative in terms of cumulative volumes of water throughout a water year, fixed as October 1 of any year through September 30 of the succeeding year, in order to accommodate the new projects in the basin which must rely on storage water rather than on natural flow.

Considered with paragraph A of article V, paragraph D of article V gives to the Lower Yellowstone Federal reclamation project in Montana and North Dakota the protection of a right existing January 1, 1950. Additionally, paragraph D recognizes all rights in the beneficial use of water than existed in Montana and North Dakota on January 1, 1950, and that divert below Intake, Mont., and it permits the beneficial use of the flow of water of the Yellowstone River below Intake, Mont., on lands within Montana and North Dakota on a proportionate basis of acreage irrigated. This latter provision is important, particularly to North Dakota, because the flow of water of the Yellowstone River below Intake, Mont., will be residual water after the use of water above Intake, Mont. The flow will thus be not only a regulated flow, as a consequence of the construction and operation of the reservoirs at the strategic sites on the Big Horn River, the Tongue River, and the Powder River, but it will also include the return flows that are certain to appear below Intake, Mont., with the expansion of storage that becomes available. The apportioning of this residual flow by Montana and North Dakota, on a proportionate basis of acreage irrigated, will keep the new developments in the two States in balance and minimize future interstate disputes.

The inclusion in paragraph E of article V of special provisions relating to stock water ponds and to "devices and facilities for the control and regulation of surface waters" is a recognition of the importance of stock raising, and modern soil-conservation practices in the economy of the area. Neither of these items will adversely affect existing Federal projects in the basin. Item 2 of paragraph E, moreover, recognizes and rests upon the distinction between surface waters and appropriable waters. In other words, waters which diffuse over the land and do not flow intermittently or continually through and into natural water courses are permitted, so far as the compact is concerned, to be controlled and regulated by devices and facilities installed by the owner of the land on which such waters are diffused.

Paragraph F of article V amounts to a recognition that the allocations made in article V may have to be reconsidered from time to time so that they can be made to conform to demonstrated experience where that proves to be at variance with the calculated belief, such belief necessarily governing the allocations in the first instance.

Articles VII, VIII, and IX implement the use of allocations made in article V. Of particular interest is the provision in article VII expressly permitting diver-
sions to be made and structures to be erected in one State for the benefit of users in another. The inclusion of this provision is in harmony with the decision of the Supreme Court in Weiland v. Pioneer Irrigation Co. (238 U. S. 498 (1915)).

Also of importance is the phrasing of article VII, paragraph D, which, while providing that the use of allocated waters on Federal projects constructed after the date of the compact shall be charged to the State in which the water is used, does not attempt to limit the use of water in any of the States of the basin by the Federal Government.

I regret the spirit of localism that induced the inclusion in article X of a provision that “No water shall be diverted from the Yellowstone River Basin without the unanimous consent of all the signatory States.” Though I agree that preference in the use of water resources ought generally to be given to the basin of origin, it is hard for me to believe that this is more than a generally desirable rule, let alone that any deviation from a very tight version of it should require the sanction of three State legislatures. Much as I regret its inclusion, however, I do not believe that it warrants a refusal by the Congress to enact S. 1311. The same is true of that portion of paragraph A of article III which provides for selection of the United States representative on the Yellowstone River Commission by the Director of the Geological Survey rather than by the President of the United States, that portion of paragraph D of the same article which purports to cast certain duties on specified Federal officials, and that portion of paragraph G of the same article which provides that the Yellowstone River Commission “shall have power to sue and be sued in its official capacity in any Federal court of the signatory States.” All of these are matters which should properly be dealt with in Federal legislation rather than in a compact and the last may raise some interesting constitutional questions in the future.

As between the States of Wyoming and Montana—North Dakota being excepted in accordance with its wishes—the compact, in article III, is to be administered by a commission composed of a representative from Wyoming and a representative from Montana, each to be selected by the Governor in the manner that the State may choose, and, as I have already noted, one representative selected by the Director of the United States Geological Survey or whatever Federal agency may succeed to the functions and duties of that agency. The Federal official is to act as chairman of the commission, but he is not to vote except upon questions of procedure and points upon which the States’ representatives may be in disagreement.

Generally, article III is in line with the over-all purpose of an interstate compact to employ the methods of negotiation and arbitration rather than of adjudication in interstate disputes, the negotiation and arbitration methods being the more adaptable to changing conditions.

The remaining articles of the compact are those usual in such an instrument and do not call for specific comment. From the advice that has been given to me, it is my belief that the appointments agreed upon by the compact commission was entered into with due inquiry, that it is an honest exercise of judgment, and that it is equitable.

You have been advised by the Bureau of the Budget, I understand, that the Department of Justice recommends revision of S. 1311 to include provision that the Congress’ consent to the Yellowstone compact “does not in any way subject the United States to the terms of the compact or affect its sovereignty, jurisdiction, powers, authority, rights to the use of water, property, prerogatives, or responsibilities in, to, or over the Yellowstone River and its tributaries.” The Bureau of the Budget has further advised that, subject to consideration by the Congress of certain other comments contained in its letter to you dated September 14, “there would appear to be no objection to enactment of S. 1311 if amended to assure the protection of the interests of the United States as recommended by the Department of Justice.” I recommend enactment of S. 1311 with such amendments as are required in the light of the views expressed by Mr. States in the letter just referred to.

The Bureau of the Budget has advised that there is no objection to the submission of this report to your committee.

Sincerely yours,

Oscar L. Chapman,
Secretary of the Interior.
82nd Congress, House Report No. 1118 (Oct. 10 1951)
GRANTING THE CONSENT AND APPROVAL OF CONGRESS TO A COMPACT ENTERED INTO BY THE STATES OF MONTANA, NORTH DAKOTA, AND WYOMING RELATING TO THE WATERS OF THE YELLOWSTONE RIVER.

OCTOBER 10, 1951.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. ENGLE, from the Committee on Interior and Insular Affairs, submitted the following

REPORT

[To accompany H. R. 3544]

The Committee on Interior and Insular Affairs, to whom was referred the bill (H. R. 3544) granting the consent and approval of Congress to a compact entered into by the States of Montana, North Dakota, and Wyoming relating to the waters of the Yellowstone River, having considered the same, report favorably thereon with amendments and recommend that the bill, as amended, do pass.

The amendments are as follows:

AMENDMENTS TO H. R. 3544

Page 1, line 3, strike the following words: "and approval".
Page 1, line 3, after the word "of" insert the word "the".
Page 1, line 5, after the comma insert the words "which was".
Page 1, line 9, after the word "and" insert the words "which was".
Page 12, line 16, after the word "period" insert the word "from".
Page 20, line 20, place a period after the word "Chris" which appears in two places.
Page 21, line 1, strike the initial "R" and insert the initial "E".
Page 21, line 18, strike in two places the initial "K" and insert in two places the initial "E".
Page 22, line 2, strike in two places the initial "H" and insert in two places the initial "M".
Page 22, line 3, place quotation marks at the beginning of the paragraph.
Page 22, line 8, place quotation marks after the word "America".

303 (WY)
2 COMPACT RELATING TO WATERS OF THE YELLOWSTONE RIVER

Page 22, line 9, strike out the words "and repeal this act" and insert in lieu thereof "or repeal section 1 of this Act".

Page 22, line 10, after the period insert the following new sentence:

This reservation shall not be construed to prevent the vesting of rights to the use of water pursuant to applicable law and no alteration, amendment, or repeal of section 1 of this Act shall be held to affect rights so vested.

Amend the title so as to read as follows:

A bill granting the consent of Congress to a compact entered into by the States of Montana, North Dakota, and Wyoming relating to the waters of the Yellowstone River.

PURPOSE OF THE BILL

The negotiation of the Yellowstone River Basin compact was an important step toward full utilization of the waters of the Yellowstone River. The consent of the Congress to the compact entered into by the States of Montana, Wyoming, and North Dakota will be another forward move toward maximum beneficial use of these waters without unnecessary conflict between the States over the right to its use.

It has long been recognized that the maximum beneficial use of the water resources of the Yellowstone River in the Missouri River Basin is dependent upon the construction and operation of storage reservoirs. A plan for such reservoirs was set forth in Senate Document No. 191, Seventy-eighth Congress. If such a plan is to become a reality for the Yellowstone River Basin, construction of storage reservoirs will be required at sites at or near the Wyoming-Montana line so that the residual flows from Wyoming can be controlled for use in the lower States of Montana and North Dakota.

REASONS FOR THE AMENDMENTS

One of the reasons for the numerous amendments is to make H. R. 3544 conform to Senate bill 1311. Also, other amendments were made to correct H. R. 3544 so it reads exactly as the official copy of the compact adopted by the States.

EXPLANATION OF THE BILL

Article V of the compact is the article that sets out the apportionment of the benefits of the water resources of the basin among the signatory States that they have agreed upon. Extensive studies by an engineering committee, appointed by the commission to advise it, disclosed that little could be gained, from a water-supply standpoint, by attempting, in the compact, the regulation and administration of existing appropriative rights in the signatory States. (The engineering committee comprised the State engineers of the three States and two Federal engineers from the Bureau of Reclamation and the Bureau of Indian Affairs.)

Accordingly, paragraph A of article V recognizes the appropriative rights to the beneficial uses of the water of the Yellowstone River system existing in each signatory State as of January 1, 1950, and it permits the continued enjoyment of such rights in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation.
Paragraph B of article V is the core of the compact. The following analysis of this paragraph is made:

(1) The unused and unappropriated waters of the interstate tributaries only are treated—i. e., the waters that are residual to those required for the enjoyment of the appropriative rights that are recognized in paragraph A of article V.

(2) The supplemental water supplies that are needed for the better enjoyment of the rights recognized in paragraph A of article V are given a preferred status over water supplies for new projects.

(3) The water that is residual after the enjoyment of the rights in paragraph A of article V and after the furnishing of the supplemental water supplies to the projects with the rights recognized in paragraph A are allocated to Wyoming and to Montana in stated percentages. I am informed that these percentages were calculated, in accordance with the recommendation of the engineering committee, by dividing the total of the potential and possible acres in Wyoming and in Montana by the total of the potential and possible acres in both States.

In paragraph C of article V, there is adopted a modified version of the divertible flow principle. Under the formula adopted, the apportionments stated in paragraph B are made operative in terms of cumulative volumes of water throughout a water year, fixed as October 1 of any year through September 30 of the succeeding year, in order to accommodate the new projects in the basin which must rely on storage water rather than on natural flow.

Considered with paragraph A of article V, paragraph D of article V gives to the lower Yellowstone Federal reclamation project in Montana and North Dakota the protection of a right existing on January 1, 1950. Additionally, paragraph D recognizes all rights to the beneficial use of water that existed in Montana and North Dakota on January 1, 1950, and that divert below Intake, Mont., and it permits the beneficial use of the flow of water of the Yellowstone River below Intake, Mont., on lands within Montana and North Dakota on a proportionate basis of acreage irrigated. This latter provision is important, particularly to North Dakota, because the flow of water of the Yellowstone River below Intake, Mont., will be residual water after the use of water above Intake, Mont. The flow will thus be not only a regulated flow, as a consequence of the construction and operation of the reservoirs at the strategic sites on the Big Horn River, the Tongue River, and the Powder River, but it will also include the return flows that are certain to appear below Intake, Mont., with the expansion of irrigation after storage water becomes available. The sharing of this residual flow by Montana and North Dakota, on a proportionate basis of acreage irrigated, will keep the new developments in the two States in balance and minimize future interstate disputes.

The inclusion in paragraph E of article V of special provisions relating to stock water ponds and to “devices and facilities for the control and regulation of surface waters” is a recognition of the importance of stock raising and modern soil conservation practices in the economy of the area. Neither of these items will adversely affect existing Federal projects in the basin. Item 2 of paragraph E, moreover, recognizes and rests upon the distinction between surface...
waters and appriopriable waters. In other words, waters which
diffuse over the land and do not flow intermittently or continually
through and into natural water courses are permitted, so far as the
compact is concerned, to be controlled and regulated by devices and
facilities installed by the owner of the land on which such waters
are diffused.

Paragraph F of article V amounts to a recognition that the alloca-
tions made in article V may have to be reconsidered from time to
time so that they can be made to conform to demonstrated experience
where that proves to be at variance with the calculated belief, such
belief necessarily governing the allocations in the first instance.

Articles VII, VIII, and IX implement the use of allocations made in
article V. Of particular interest is the provision in article VII expressly
permitting diversions to be made and structures to be erected in one
State for the benefit of users in another. The inclusion of this pro-
vision is in harmony with the decision of the Supreme Court in Wetland
v. Pioneer Irrigation Co. (259 U. S. 488 (1922)). Also of importance
is the phrasing of article VII, paragraph D, which, while providing that
the use of allocated waters on Federal projects constructed after the
date of the compact shall be charged to the State in which the water
is used, does not attempt to limit the use of water in any of the States
of the basin by the Federal Government.

Generally, article III is in line with the over-all purpose of an in-
terstate compact to employ the methods of negotiation and arbitration
rather than that of adjudication in interstate disputes, the negotiation
and arbitration methods being the more adaptable to changing condi-
tions.

The remaining articles of the compact are those usual in such an
instrument and do not call for specific comment.

RIGHTS OF THE UNITED STATES ARE PROTECTED

The compact provides that its operation shall not "impair or affect
the sovereignty or jurisdiction of the United States of America in
and over the area of waters affected" by it or "any rights or powers
of the United States of America, its agents, or instrumentalities, in
and to the use of the waters of the Yellowstone River Basin" or its
capacity to acquire such rights, that it shall not be taken to "subject
any property of the United States of America its agencies, or instru-
mentalities, to the laws of any State to an extent other than the
extent to which these laws would apply without regard to the com-
pact," and that its terms do not cover "waters within or waters which
contribute to the flow of streams within the Yellowstone National
Park." The compact, moreover, provides that its terms shall not
be so construed or interpreted as to affect adversely any rights to
the use of the waters of the Yellowstone River and its tributaries
owned by or for Indians, Indian tribes, and their reservations." The
water rights of the Indians were reserved by the Indians at the time
of the creation of the respective reservations by the treaties entered
into by the Indians with the United States. These Indian water
rights have been recognized by the Supreme Court of the United
States. The most important decision is the case of Winters v. United
States (reported in 207 U. S. 564). This situation explains the in-
cision of the language just quoted. A further safeguard to Federal
interests is to be found in section 2 of H. R. 3544—i. e., in the express reservation to Congress of its right to alter, amend, or repeal the act. The favorable report of the Department of the Interior reads as follows:

UNITED STATES DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,

Hon. John R. Murdock,
Chairman, Committee on Interior and Insular Affairs,
House of Representatives, Washington, D. C.

MY DEAR MR. MURDOCK: I have for report H. R. 3544, a bill granting the consent and approval of Congress to a compact entered into by the States of Montana, North Dakota, and Wyoming, relating to the waters of the Yellowstone River. The compact, as approved by the 1961 legislative assemblies of the signatory States, is set out in the subject bill.

One very important part of the plan of this Department for improvements in the Missouri River Basin set forth in Senate Document No. 191, Seventy-eighth Congress, and approved and authorized for construction in the acts of December 22, 1944 (58 Stat. 887, 888), and July 24, 1946 (60 Stat. 641, 653), is that of supplying new and supplemental water for the irrigation of well over 700,000 acres of land in the Yellowstone River Basin, the installation in that basin of more than 300,000 kilowatts of hydroelectric generating capacity, and provision of reservoirs for these and other purposes with a total capacity of more than 4,250,000 acre-feet. While these figures cannot be regarded as final, they are indicative of the great importance of that basin to the economy of the entire Missouri River Basin and of the Nation. The negotiation of the Yellowstone River Basin compact was, and the Congress' consent to it will be, an important step toward permitting realization of the basin's potentialities without straining between the States.

The compact provides that its operation shall not "impart or affect the sovereignty or jurisdiction of the United States of America in and over the area of waters affected" by it or "any rights or powers of the United States of America, its agents, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin or its capacity to acquire such rights, that it shall not be taken to "subject any property of the United States of America, its agencies, or instrumentalities, to the laws of any State to an extent other than the extent to which these laws would apply without regard to the compact," and that its terms do not cover "waters within or waters which contribute to the flow of streams within the Yellowstone National Park." The compact, moreover, provides that its terms shall not "be so construed or interpreted as to affect adversely any rights to the use of the waters of the Yellowstone River and its tributaries owned by or for Indians, Indian tribes, and their reservations." The water rights of the Indians were reserved by the Indians at the time of the creation of the respective reservations by the treaties entered into by the Indians with the United States. These Indian water rights have been recognized by the Supreme Court of the United States. The most important decision is the case of Winters v. United States (reported in 207 U. S. 564). This situation explains the inclusion of the language just quoted. A further safeguard to Federal interests is to be found in section 2 of H. R. 3544—i. e., in the express reservation to Congress of its right to alter, amend, or repeal the act.

It long has been recognized that the fuller use of the water resources of the Yellowstone River Basin contemplated in Senate Document No. 191 is dependent entirely upon the construction and operation of storage reservoirs to regulate and conserve the water yields of the principal streams of the basin. These streams, in addition to the Yellowstone River itself, are its four large interstate tributaries, each rising in Wyoming and flowing into Montana: The Clark's Fork, Yellowstone River; the Big Horn River; the Tongue River; and the Powder River. Of these streams, the Yellowstone River, which is the main stem of the river system of the Yellowstone Basin, needed little consideration in the negotiation of the compact because it is almost entirely in Montana and its water yield seems to be adequate for any program of feasible developments along its course, and the Clark's Fork, Yellowstone River, one of the tributaries, is not likely to experience water shortages. Hence, the problem streams are the three remaining large interstate tributaries. The elements of these three streams are the existing irrigated developments and the potential and possible irrigated developments. (In this connection, I am advised that the compact commissioners recognized a distinction between potential developments
and possible developments. Potential developments are those which, it was thought, are definitely feasible, while possible developments are those which could be developed only at a very high cost or for which a water supply seemed questionable.

The practical accomplishment, in the circumstances, of an equitable apportionment of the benefits of the waters of the Yellowstone River system among the States of Wyoming, Montana, and North Dakota will require the construction, at strategic sites, at or near the Wyoming-Montana State line, of storage reservoirs so that the residual flows from Wyoming can be controlled and conserved for use in the lower States of Montana and North Dakota. Fortunately, such strategic reservoir sites are available on the Big Horn River, the Tongue River, and the Powder River.

Article V of the compact is the article that sets out the apportionment of the benefits of the water resources of the basin among the signatory States that they have agreed upon.

Extensive studies by an engineering committee, appointed by the Commission to advise it, disclosed that little could be gained, from a water-supply standpoint, by attempting, in the compact, the regulation and administration of existing appropriative rights in the signatory States. (The engineering committee comprised the State engineers of the three States and two Federal engineers from the Bureau of Reclamation and the Bureau of Indian Affairs.) Accordingly, paragraph A of Article V recognizes the appropriative rights to the beneficial uses of the water of the Yellowstone River system existing in each signatory State as of January 1, 1950, and it permits the continued enjoyment of such rights in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation.

Paragraph B of Article V is the core of the compact. The following analysis of this paragraph is made:

1. The unused and unappropriated waters of the interstate tributaries only are treated—i.e., the waters that are residual to those required for the enjoyment of the appropriative rights that are recognized in paragraph A of Article V.

2. The supplemental water supplies that are needed for the better enjoyment of the rights recognized in paragraph A of Article V are given a preferred status over water supplies for new projects.

3. The water that is residual after the enjoyment of the rights in paragraph A of Article V and after the furnishing of the supplemental water supplies to the projects with the rights recognized in paragraph A are allocated to Wyoming and to Montana in stated percentages. I am informed that these percentages were calculated, in accordance with the recommendation of the engineering committee, by dividing the total of the potential and possible areas in Wyoming and in Montana by the total of the potential and possible areas in both States.

In paragraph C of Article V, there is adopted a modified version of the divertible flow principle. Under the formula adopted, the apportionments stated in paragraph B are made operative in terms of cumulative volumes of water throughout a water year, fixed as October 1 of any year-through September 30 of the succeeding year, in order to accommodate the new projects in the basin which must rely on storage water rather than on natural flow.

Considered with paragraph A of Article V, paragraph D of Article V gives to the lower Yellowstone Federal reclamation project in Montana and North Dakota the protection of a right existing on January 1, 1950. Additionally, paragraph D recognizes all rights to the beneficial use of water that existed in Montana and North Dakota on January 1, 1950, and that divert below Intake, Mont., and it provides the beneficial use of the flow of water of the Yellowstone River below Intake, Mont., on lands within Montana and North Dakota on a proportionate basis of forage irrigated. This latter provision is important, particularly to North Dakota, because the flow of water of the Yellowstone River below Intake, Mont., will be residual water after the use of water above Intake, Mont. The flow will thus be not only a regulated flow, as a consequence of the construction and operation of the reservoirs at the strategic sites on the Big Horn River, the Tongue River, and the Powder River, but it will also include the return flows that are certain to appear below Intake, Mont., with the expansion of irrigation after storage water becomes available. The sharing of this residual flow by Montana and North Dakota, on a proportionate basis of forage irrigated, will keep the new developments in the two States in balance and minimize future interstate disputes.
The inclusion in paragraph E of article V of special provisions relating to stock water ponds and to "devices and facilities for the control and regulation of surface waters" is a recognition of the importance of stock raising and modern soil conservation practices in the economy of the area. Neither of these items will adversely affect existing Federal projects in the basin. Item 2 of paragraph E, moreover, recognizes and rests upon the distinction between surface waters and deep water, waters which diffuse over the land and do not flow interminently or continually through and into natural water courses are permitted, so far as the compact is concerned, to be controlled and regulated by devices and facilities installed by the owner of the land on which such waters are diffused.

Paragraph F of article V amounts to a recognition that the allocations made in article V may have to be reconsidered from time to time so that they can be made to conform to demonstrated experience where that proves to be at variance with the calculated belief, such belief necessarily governing the allocations in the first instance.

Articles VII, VIII, and IX implement the use of allocations made in article V. Of particular interest is the provision in article VII expressly permitting diversions to be made and structures to be erected in one State for the benefit of users in another. The inclusion of this provision is in harmony with the decision of the Supreme Court in Weiland v. Pioneer Irrigation Co. (269 U.S. 498 (1923)). Also of importance in the phrasing of article VII, paragraph D, which, while providing that the use of allocated waters on Federal projects constructed before the date of the compact shall be charged to the State in which the water is used, does not attempt to limit the use of water in any of the States of the basin by the Federal Government.

I regret the spirit of localism that induced the inclusion in article X of a provision that "No water shall be devoted from the Yellowstone River Basin without the unanimous consent of all the signatory States". Though I agree that preference to the use of water resources ought generally to be given to the basin of origin, it is hard for me to believe that this is more than a generally desirable rule, let alone that any deviation from a very tight version of it should require the sanction of three State legislatures. Much as I regret its inclusion, however, I do not believe that it warrants a refusal by the Congress to enact H. R. 3544. The same is true of that portion of paragraph A of article III which provides for selection of the United States representative on the Yellowstone River Commission by the Director of the Geological Survey rather than by the President of the United States, that portion of paragraph D of the same article which purports to cast certain duties on specified Federal officials, and that portion of paragraph G of the same article which provides that the Yellowstone River Commission "shall have power to sue and be sued in its official capacity in any Federal court of the signatory States." All of these are matters which should properly be dealt with in Federal legislation rather than in a compact and the best may raise some interesting constitutional questions in the future.

As between the States of Wyoming and Montana—North Dakota being excepted in accordance with its wishes—the compact, in article III, is to be administered by a commission composed of a representative from Wyoming and a representative from Montana, each to be selected by the Governor in the manner that the State may choose, and, as I have already noted, one representative selected by the Director of the United States Geological Survey or whatever Federal agency may succeed to the functions and duties of that agency. The Federal official is to act as chairman of the commission, but he is not to vote except upon matters and points upon which the States' representatives may be in disagreement.

Generally, article III is in line with the over-all purpose of an interstate compact to employ the methods of negotiation and arbitration rather than that of adjudication in interstate disputes, the negotiation and arbitration methods being the more-adaptable to changing conditions.

The remaining articles of the compact are those usual in such an instrument and do not call for specific comment.

From the advice that has been given to me, it is my belief that the apportionment agreed upon by the compact commission was entered into with due inquiry, that it is an honest exercise of judgment, and that it is equitable.

I invite your committee's attention to two minor differences between H. R. 3544 and S. 1311, the Senate companion. In line 3, page 1, of H. R. 3544, the "consent and approval" of the Congress is given to the compact; in line 3, page 1, of S. 1311, the "consent" of the Congress is given. The latter follows the
language of the Constitution, and is therefore, I believe, to be preferred. Section 2 of H. R. 3544 merely states an express reservation of the Congress' right to alter, amend, or repeal the act; section 2 of S. 1311 couples this with a declaration that "This reservation shall not be construed to prevent the vesting of rights to the use of water pursuant to applicable law and no alteration, amendment, or repeal of section 1 of this act shall be held to affect rights so vested." Though I believe that this additional language is not strictly necessary, it will, I believe, serve to allay doubts and fears. I, therefore, recommend that section 2 of H. R. 3544 be amended to conform to the language adopted in section 2 of S. 1311.

I have been advised by the Bureau of the Budget, in connection with S. 1311, that the Department of Justice recommends revision of the bill to include provision that the Congress' consent to the Yellowstone compact "does not in any manner subject the United States to the terms of the compact or affect its sovereignty, jurisdiction, power, authority, rights to the use of water, property, prerogatives, or responsibilities in, to, or over the Yellowstone River and its tributaries."

I have been further advised by the Bureau of the Budget that, subject to consideration by the Congress of certain other comments contained in a letter dated September 14 from its Acting Director to Senator O'Mahoney, a copy of which is attached, "there would appear to be no objection to enactment of S. 1311 if amended to secure the protection of the interests of the United States as recommended by the Department of Justice." This advice is, I believe, equally applicable to H. R. 3544, the enactment of which I recommend with such amendments as are required in the light of the views expressed by Mr. Staats in the letter just referred to.

The Bureau of the Budget has advised that there is no objection to the submission of this report to your committee.

Sincerely yours,

Oscar L. Chapman,
Secretary of the Interior.

Enclosure.

EXECUTIVE OFFICE OF THE PRESIDENT,
BUREAU OF THE BUDGET,

Hon. Joseph C. O'Mahoney,
United States Senate, Washington, D. C.

My Dear Senator O'Mahoney: Receipt is acknowledged of your letter dated April 12, 1961, requesting our report on S. 1311, a bill granting the consent of Congress to a compact entered into by the States of Montana, North Dakota, and Wyoming relating to the waters of the Yellowstone River.

In response to my request for the views of the Department of Justice; the Deputy Attorney General indicates that while article XVI of the compact is apparently designed to protect the interests of the United States, the language used is rather ambiguous. The preservation of the rights of the United States is rendered somewhat obscure due to the possible conflicting interpretations of the terminology "area of waters" in the language "To impair or affect the sovereignty or jurisdiction of the United States of America in or over the area of waters affected by such compact, any rights or powers of the United States of America, its agencies, or instrumentalities, in and to the use of the waters of the Yellowstone River basin nor its capacity to acquire rights in and to the use of said waters."

He also calls attention to article V, B, of the compact under which the signatory States allot themselves all "unused and unappropriated waters of the interstate tributaries of the Yellowstone River" as possibly depriving the United States of the use of surplus water it has been anticipated would flow into the Missouri River.

Also in the Deputy Attorney General's opinion, the broad authority contained in the provision that the commission may use and be sued might be construed, in view of the Federal representative therein, to indicate that the Federal Government has waived its sovereign immunity from suit.

Finally, he recommends that in the event Congress should desire to approve the compact as drafted, such approval be essentially in the following language:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That approval by the Congress is hereby given to the Yellowstone River Compact: Provided, however, That this approval of the Compact does not in any way subject the United States to the terms of the Compact or affect its sovereignty, jurisdiction, power, authority, rights to the use of water, property, prerogatives, or responsibilities in, to, or over the Yellowstone River and its tributaries."
The Secretary of the Interior, in his proposed report on H. R. 3544, the companion bill to S. 1311, expresses the opinion that the provisions in the compact for the selection of the Federal representative by the Geological Survey rather than the President and that the commission should be subject to suit are regrettable and that the latter "may raise some interesting constitutional questions in the future."

Similarly, conflicting provisions appearing in previously consummated compacts prompted the President on May 3, 1950, to write the Federal representatives on various compact commissions cautioning them to exert all efforts to eliminate or correct the areas of possible conflict which might impose restrictions on the use of waters by the United States.

This office is in agreement that the compact method is the proper and logical manner for States to allocate the waters of interstate streams. It is essential, however, that such compacts include adequate provisions to preserve the rights and interests of the United States and for appointment by the President of a Federal representative as a member of the compact commission. Since the Yellowstone River compact which would be approved by S. 1311 has been ratified by the States of Montana, North Dakota, and Wyoming, it may not now be feasible of revision to provide for the selection of the Federal representative by the President rather than by Geological Survey. While I believe that as a general rule the former is preferable, there may be some question whether in this case the resubmission of the compact to the States to provide for selection of a Federal representative by the President rather than by Geological Survey is justified. It is of fundamental importance, however, that the compact protect the rights and interests of the United States in these waters. The language of the proposed amendment to the bill prepared by the Department of Justice would seem to provide such protection. Accordingly, subject to the consideration of the above comments by the Congress, there would appear to be no objection to enactment of S. 1311 as amended to assure the protection of the interests of the United States as recommended by the Department of Justice.

Sincerely yours,

ELMER B. STAATS, Acting Director.

The Committee on Interior and Insular Affairs unanimously recommends the enactment of H. R. 3544.
YRCC Meeting Minutes
of December 7-8, 1950
To Mr. John S. Vallen and Mr. John S. Vallen, Commissioners

Enclosed is a copy of the final or minutes of the April meeting of the Commission, held December 17, 1950. These minutes are not now considered final, and a meeting will be held at which the minutes can be approved by the Commission and sealed as to seal for corrections or additions or omissions. If you have any such corrections or additions please send them to me by February 24, 1951. As of that date the minutes will be sealed as approved and approved by the Chairman and become available for his use in the report as much as for your records.

Also enclosed is a copy of the Commission's report. The report has been transmitted to each district engineer and requests for additional service would be processed to their offices.

[Signature]

[Date]
To all Members of the HellsGate River Compact Commission

Sincerely:

In preparing final acts of minutes for Mr. Newall to use in making his report, certain mechanical errors in the draft minutes have been corrected. Also some corrections have been made in the draft minutes of the last meeting. In order that you may confirm your acts of minutes to the official acts the corrections are listed below. For pages are enclosed as indicated for insertion. The word "DELT" on the first page of each act of minutes should be deleted.

November 27, 1950

✓ page 3, line 16 - come after "facilities", period at end of line
✓ page 6, line 13 - comes before and after "comparatively"
✓ page 10 - insert revised page
✓ page 16, add at end - "Approved: R. J. Newall, Chairman February 1, 1950"
✓ Attendance list - should be "R. J. Johnson" not "Johnston"

February 1-3, 1950

✓ page 7 - insert revised page
✓ page 11, add at end - "Approved: R. J. Newall, Chairman October 21, 1950"

October 24-25, 1950

✓ page 8, last par., line 6 - change "Big Horn" to "Higher"
✓ page 9 - insert revised page
✓ page 12, line 12 - insert comma before "Montana"; delete comma after "Hornet"
✓ page 17, line 13 - delete comma after "consideration"
✓ page 18, line 9 - change "Hyde" to "Dr. Hyde"
✓ page 18, add at end - "Approved: R. J. Newall, Chairman December 7, 1950"
No attempt has been made to update the official copies of "Highway" and "Little Highway" in the first two sets of minutes, the last two sets (and the Ombuds) do contain.

The following documents which have already now been distributed are being made a part of the official set of minutes:

(a) Engineering Committee report with maps
(b) Addendum of September 27, 1950
(c) Engineering Committee report of October 21, 1950
(d) Burke's draft of compact
(e) Leonard's draft of compact
(f) Engineering Committee draft of compact

The Draney-Nunnally draft and the Lyons draft were mentioned in the meeting of October 24-25, 1950, but were never presented to the Commission, duplicated now distributed. They are, therefore, not included with the minutes.

The compact has been, as you probably know, assisted by all three states, and legislation giving the consent of the United States has been introduced in the Congress. A copy of Mr. Nunnally's report to the Congress is enclosed for your information.

Copies of the Compact have been bound with a paper cover, a title page, and a page at the end to show date of ratification and consent. When the Congress gives its consent, that date will be inserted and copies will be sent to those who request them. A supply will also be sent to each state engineer for distribution.

Sincerely yours,

[Signature]

C. C. Miceli, Secretary

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The fourth meeting of the Yellowstone River Compact Commission was held at the Northern Hotel at Billings, Montana on December 7 and 8, 1950, and was called to order at 10:15 a.m. by R. J. Newell, Chairman.

The Chairman announced that Dr. Renne, President of the Montana State College, and a member of the President's Water Resources Policy Commission, had been appointed as a new Commissioner from Montana.

The Chairman pointed out that the minutes of the third meeting had been distributed and asked if there were any corrections. There being none, the minutes were declared approved.

The Chairman stated that the meeting had been called for the purpose of considering the draft of Compact prepared by the Engineering Committee with the advice and assistance of Mr. Burke, pursuant to instructions given at the third meeting, and distributed to the Commissioners by mail. He stated that the draft would be read and considered, article by article, and that as rapidly as possible a Compact would be finally typed for approval as a whole.

Mr. Burke asked that the State Engineers furnish by noon lists of the Commissioners from the respective states with the names as they are to appear in the Compact.

The introduction and Article I were separately read, and as to each a motion was made, seconded, and carried that it be approved.

Article II was read. Mr. Lloyd moved to amend paragraph H by putting a period after the word "man" in line 3 and deleting the balance of the paragraph. The motion was seconded. There was discussion as to the purpose of the amendment and the reasons therefor. Mr. Lloyd explained the recent change in the Cheyenne River Compact and the attitude taken by various Federal Agencies in connection with that Compact. The motion was passed.

The Chairman pointed out that the National Park Service had recommended that in paragraph C the lands lying within Yellowstone National Park be excluded. Mr. Clemans moved to replace the period at the end of paragraph C with a comma and add the following: "and exempting lands within Yellowstone National Park." The motion
was seconded and discussed. Mr. Greene moved to amend the motion by revising the added language to read "but excludes those lands lying within Yellowstone National Park." The motion was seconded and passed.

Paragraph C was approved as amended.

It was announced that certain changes in spelling would be made in Article II and throughout the Compact to conform to current official usage.

A motion was made, seconded, and carried that Article II as amended in paragraphs C and H be approved.

Article III, paragraph A, was read and discussed. Paragraph F was also read for reference. It was moved and seconded that paragraph A be approved. Mr. Metz raised the question as to whether serious problems involving the administration of the Compact should be left to the vote of one man in the case of disagreement between the two state representatives.

Mr. Bunston suggested striking the expression "Director of the United States Geological Survey" and substituting "Secretary of the Interior." Mr. Vernon recommended that the language stand as drafted. Mr. Burke spoke of the importance of setting up machinery for resolving disagreements as pointed out by Mr. Metz and recommended that the Director of the Geological Survey appoint the third member of the Commission. Mr. Metz raised the question as to the desirability of having a larger Commission, say five or seven, possibly composed of representatives of the major watersheds. Mr. Jones stated that he felt that the matter had been adequately discussed at the October meeting. Dr. Renne asked whether a single state representative would not properly reflect the feelings of the affected areas of the state. Mr. Metz indicated that his only interest in discussing the matter was to insure that it had been thoroughly considered and that the solution arrived at was the best to protect the interests of all concerned.

Mr. Burke commented that at the October meeting he had argued for including North Dakota on the Commission in order to keep the balance of power within the states rather than having it pass to an outside representative, and suggested that if that were not desired it might be proper to provide that the Governors of the two states, in the event of disagreement, should agree on a third party to sit on the Commission. Mr. Metz supported Mr. Burke.

Mr. Thornton objected to the imposition on North Dakota of requiring that state to participate in the cost of administration.
Mr. Kurtz pointed out the opportunity of recourse to the courts under Article XIII of the Compact if there was disagreement or dissatisfaction with the actions of the Commission. Mr. Leonard suggested that North Dakota not be represented on the Commission because of the lack of interest of that state in most of the administrative problems which would arise between Montana and Wyoming. He favored having a Bureau of Reclamation representative on the Commission rather than one from the Geological Survey, but did not propose to press the matter.

Paragraph A was approved.

Paragraphs B and C were read, and as to each a motion was made, seconded, and carried that it be approved.

Paragraph D was read. It was moved and seconded that the paragraph be approved. Mr. Metz asked whether paragraph D added anything to the Compact, and Mr. Burke pointed out that the provision was of particular help in getting appropriations for Federal Agencies to perform the specific functions listed. Mr. James pointed out certain objections of the Department of Agriculture to the language of paragraph D. Messrs. Lloyd and Person stated that similar language in the Cheyenne River Compact was modified. There was further discussion. Mr. Clements referred to a suggestion by the National Park Service that the phrase "to the extent of available funds" be inserted after the word "ex officio" in line 7. Dr. Renne moved that the suggestion be approved. The motion was seconded, but after some discussion withdrawn.

The Chairman stated that the Corps of Engineers had pointed out that proper terminology would be "The Secretary of the Army" rather than the "Secretary of Defense" and indicated that the change would be made. Paragraph D was approved.

Paragraph E was read. A motion was made, seconded, and passed that the paragraph be approved.

Paragraph F was read. A motion was made, and seconded to approve. There was discussion on the need for clarification of the term "Federal representative" and the desirability of adding after the word "representative" in line 3 the expression "(excepting those acting ex officio)." After some discussion Dr. Renne moved to insert in place of "Federal representative" in line 3 the following: "member selected by the Director of the United States Geological Survey."
The motion was seconded and carried. A motion was made, seconded, and carried that a similar change be made in the last two lines of the paragraph.

Paragraph F was approved.

Paragraph G was read. A motion was made and seconded to approve. Upon a question by Mr. Bower Mr. Burke explained why the term "Federal Court" was used. There was some discussion. The paragraph was approved.

Article IV was read. A motion was made, seconded, and passed that the Article be approved.

At 12:05 the Commission recessed until 1:30.

The meeting reconvened at 1:40 p.m.

Article V, paragraph A was read. A motion was made, seconded, and carried that the paragraph be approved.

Paragraph B was read. A motion was made and seconded to approve the paragraph. Mr. Bunston commented on the language and suggested that it should be the same as in paragraph A. Mr. Burke discussed the basis on which the Compact was drafted and the general theory of the Compact. Yields of the basin are to be burdened by (1) existing appropriative rights and (2) supplemental water for existing developments. The remainder, the unappropriated and unused water, or residual water, is to be compacted. He called attention to an ambiguous situation in the language of paragraph B respecting supplemental water rights and suggested rewriting paragraph B as follows:

B. Of the unused and unappropriated waters of the inter-state tributaries of the Yellowstone River as of January 1, 1950, there is allocated to each signatory state such quantity of that water as shall be necessary to provide supplemental water supplies for the rights described in paragraph A of this Article V, such supplemental rights to be acquired and enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation, and the remainder of the unused and unappropriated water is allocated to each State for storage or direct diversions for beneficial use on new lands or for other purposes as follows:
Mr. Bower moved to substitute Mr. Burke's proposed language in place of the draft provision and to delete paragraph E 2 of Article V. The motion was seconded. There was discussion of the meaning of the terms "tributaries" and "interstate tributaries," Mr. Bunston expressed concern over the possible drying up of intrastate tributaries in Wyoming and the consequent reduction of interstate tributaries. Mr. Humpherys asked about the effect of hold-over storage in connection with supplemental supplies. The question was discussed by Mr. Burke. There was further discussion of the general question involved, particularly with respect to supplemental water. The language proposed by Mr. Burke was approved, and paragraph B as modified was approved.

Paragraph B 1 was read, and a motion to approve was made, seconded, and carried.

Paragraph B 2 was read. A motion to approve was made and seconded. Mr. Manning stated that he favored this paragraph. Mr. Humpherys asked that it be clearly understood that he was acting for the Bureau of Indian Affairs only in the capacity of obtaining information for consideration by the Bureau and relaying the comments of the Bureau, and was not in a position to approve any action taken. Mr. Bunston asked whether water for Indian lands would be supplied from the allocation to each state or would be provided for prior to allocation. Mr. Lloyd said that he intended to propose with respect to Article VI that water for Indian lands should be charged to the states. There was discussion by Messrs. Bower and Bunston. Mr. Myers stated that the percentage division provided for in the Compact draft was based on lands potentially irrigable whether Indian or non-Indian. Mr. Thornton discussed this provision. Mr. Humpherys pointed out ways in which this Compact differs from others, in that it refers to unused water and as yet undeveloped land, and that the language suggested for Article VI recognized this difference. He stated that he was instructed to wire the Bureau of Indian Affairs in the event a change is desired in Article VI in order that a proper recommendation may be made by that Bureau. There was further discussion by Messrs. Bunston and Vernon. It was pointed out that if use of water on Indian lands is to be provided for prior to allocation, the percentages would have to be changed. Mr. Bunston proposed providing for Indian Treaty rights in a block, prior to allocation. Mr. Metz stated that it was his opinion that the Engineering Committee's determination of irrigable areas on which the allocation is based was a correct determination and should be accepted. Mr. Leonard referred to previous compact drafts and the manner in which the problem was handled therein, and also to the Burke draft of April 1950. He suggested that Article VI be modified so that Indian rights would be provided for prior to allocation. Mr. Manning stated that he had thought in reading the Compact that Indian rights were to be so provided for. He discussed the effect of this on the
percentages to be used in the allocation and asked whether this effect had been considered in the engineering studies. Mr. Myers stated that it had been.

A recess was taken for twenty minutes.

Mr. Burke discussed the general situation respecting the potential irrigable land and the basis used for determining percentages. He analyzed the application of Article VI in the event of inaccurate determination by the Engineering Committee. Mr. Myers pointed out that engineering and economic factors which determine irrigability are the principal check on the use of water. This position was supported by Mr. Hanna. Mr. Burke discussed provisions in other compacts and their manner of application. Paragraph B 2 was approved. Messrs. Manning and Bunston reserved their votes.

Paragraph B 3 was read, and a motion to approve was seconded and carried.

Paragraph E 4 was read. A motion was made and seconded to approve. Mr. Metz asked where the last diversion was on the Powder River above its mouth. In answer Mr. Myers pointed out the point might shift as new land was developed and that the Compact provisions were drawn so as to permit taking account of such a shift. The paragraph was approved.

Paragraph C was read. Mr. Burke suggested, as clarifying language which should have been included in the original draft, that the word "above" in the first line be stricken, a comma added after "allocations", and the following wording: "in paragraph E1, 2, 3 and 4 of this Article V", A motion was made, seconded, and carried to approve the paragraph as clarified.

Paragraph C 1, C 2, C 3, and C 4 were read, and as to each a motion was made, seconded, and carried that it be approved.

Paragraph V D was read. It was moved and seconded to approve. There was discussion as to the desirability of placing Montana and North Dakota on the same basis in the last sentence of the paragraph. A motion was made and seconded to amend the last sentence to read "Waters of tributary streams, having their origin in either Montana or North Dakota, situated entirely in said respective states and flowing into the Yellowstone River below Intake, Montana, are allotted
to the respective states in which situated." The motion was carried, and the paragraph as amended was approved.

Paragraph E 1 was read, and a motion was made and seconded to approve. Mr. Lloyd said that he had language to propose for E 2 as follows: "Spreader dams, dikes, and other structures which do not permanently store water." Mr. Jones suggested that these would be covered under paragraph V A. There was discussion. Mr. Burke suggested that the purpose might be accomplished by modifying E 1 to insert after "water" and before the colon language "by whatsoever means accomplished." There was discussion of the general problem of spreaders and the extent to which they might reduce the flow. The desirability of such structures as a conservation measure was pointed out together with the difficulty of determining the overall effect on water production. Mr. Vernon suggested a possible size limitation on any one spreader device. Mr. Humphreys pointed out that on the Gila River spreader devices and stock ponds were extensively used and caused serious depletions, and that the Department of the Interior took an adverse view toward the exclusion of such devices. There was further discussion of the extent of depletions and whether general policy should be changed to cover these spreaders specifically. The question was raised as to whether the waters used were subject to appropriation. Mr. Jones expressed an affirmative view. Mr. Leonard referred to the S-H Ranch on the Tongue River which had no storage but extensive diversions. At the request of the Chairman, Mr. James explained the general problem of spreader dams which constitute a major potential development within the Missouri River Basin. He pointed out that while they will cause some depletion on the stream they will increase low water flows, reduce floods, and lessen erosion and sedimentation of reservoirs. The question was raised as to the right of an individual to build spreaders on dry gulches in order to save soil and reduce flash floods. Mr. James indicated that he did not feel that either state would be particularly benefited in the event spreader devices were excluded from the Compact. Mr. Kurtz suggested language along the following lines: After "water" and before the colon in E 1 "provided further there is excluded from this Compact spreader dams not exceeding four feet in height," or "there is excluded herefrom dams placed in the channel of dry streams as a conservation measure and not exceeding four or five feet in height." Mr. Burke suggested excluding "devices and facilities for the control by the land owner of surface water," but suggested that water in a natural water course should be subject to existing law. Paragraph E 1 was approved.

There was further discussion with respect to spreader devices, and it was reiterated that there was general approval of such devices as a conservation measure, but that their overall effect on stream flow was not known. Mr. Burke urged that in discussion a distinction be
maintained between "control and regulation of water" and "use of water."
He suggested as paragraph E 2 the following: "Devices and facilities
for the control and regulation of surface water." Mr. Bower moved
that Mr. Burke's language be adopted. The motion was seconded and
carried.

Paragraph V F was read, and a motion was made and seconded
to delete. After some discussion as to the desirability of the
provision, the motion was withdrawn, and a motion made, seconded,
and carried to approve.

Article VI was read. A motion was made and seconded to
approve. Mr. Leonard moved to amend by deleting the period, adding
a comma in the following: "and such rights are excluded from this
Compact." The motion was seconded. Mr. Humphreys pointed out the
effect of the proposal and the difficulty of determining exactly what
was being excluded. Mr. Myers expanded on the problem of existing
and potential development and the difficulties encountered by the
Engineering Committee in analyzing the problem. Mr. Bower spoke in
opposition to the amendment. Mr. Bunston suggested passing this
question and moving on to the balance of the Compact. Mr. Leonard
explained his position that the existing language might adversely
effect Montana rights, but would not adversely affect Indian rights.
He felt that the Legislature of Montana would not approve a Compact
in which Indian rights would be provided for out of the allocation to
the state. A vote was taken on the motion to amend which was declared
lost. Upon request from the floor, the Montana Commissioners opposed
to the motion were asked to stand. There was some further discussion,
following which the Montana Commissioners favoring the amendment were
asked to stand. Mr. Leonard stated that it appeared to him that the
Montana group favored the amendment.

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Mr. Thornton pointed out that this was the first time in the
series of meetings discussing this particular Compact that the question
of exclusion of Indian rights had been raised. There was discussion
as to the relative use of water by Indians and non-Indians, both now
and in the future. Mr. Bunston expressed concern that future use by
Indians might not be limited to presently projected use as estimated
by the Engineering Committee, but might become relatively unlimited.
Mr. Bower stated that he saw no difference between excluding or
recognizing rights, that neither one would affect the rights of
the Indians which would have to be taken care of. Mr. Humphreys
said that as an individual lawyer he had never understood that any
court had held that the rights of Indians were unlimited, but that
they were subject to the general requirements as to reasonable
beneficial use in the same way as other rights. He suggested that as time goes on the Indians, as well as others, will learn better methods of agriculture and irrigation with probable reduction in water requirements. A vote was taken on Article VI, which was declared approved. Mr. Bunston reserved his vote.

Mr. Leonard pointed out that Montana had voted for the amendment and that approval of Article VI under the circumstances was impossible. There was further discussion, during which Mr. Greene suggested a recess to consider the matter. Mr. Bunston advised continuing. Mr. Jones stated that he intended to stand by his vote at the October meeting, which favored the present language of Article VI. Mr. Humphreys agreed that there was some possibility that the potentially irrigable land owned by Indians might be increased, that the language of Article VI was drafted on the premise that the engineering and other data were accurate. In the Upper Colorado River Compact sessions at Vernal, New Mexico, was allotted (11½ percent of the water. The potential requirements of the Navajo Reservation could utilize more than this amount. Mr. Humphreys was assigned to negotiate as to the portion of the New Mexico allocation which would go to the Navajos. He said that in all of the negotiations it had never occurred to him that the Navajos would propose to use more than their share at the expense of other users. This situation is similar. If there are errors in the areas determined by the Engineering Committee they can and should be rectified.

At 6:05 the meeting recessed until 8:00 p.m.

The meeting reconvened at 8:15. Paragraphs VII A, B, and C were read, and as to each a motion was made, seconded, and carried that it be approved.

Articles VIII and IX were read, and as to each a motion was made, seconded, and carried that it be approved.

Article X was read, and the motion was made and seconded to approve. There was discussion. Mr. Leonard read a proposal which would require unanimous agreement of all the states prior to diversions from the Yellowstone Basin and moved to amend the Article by deleting the period, adding a comma, and the following: "but no water shall be diverted from the Yellowstone River Basin or from one tributary basin thereof to another without the unanimous consent of all the signatory states to this Compact, excepting that where such diversions already exist by reason of water works already constructed the same are excepted from the provisions of this article." Mr. Leonard agreed to eliminate the language affecting "from one tributary basin to
another" and the provision relative to existing works. Mr. Vernon objected to the inclusion of language which would hand the hands of persons planning future developments, following which there was general discussion of the desirable and undesirable features of restrictions of this nature by Messrs. Buck, Renne, and others. Mr. Kurtz questioned whether the amendment was applicable to Article I or should be included in some other article. Mr. Burke indicated that he felt the amendment might cause difficulty unless the entire article were clarified. Mr. Leonard's motion was declared lost for want of a second.

It was moved by Mr. Kingsbury and seconded that Article I be amended by inserting as the first sentence the following: "No water shall be diverted from the Yellowstone River Basin without the unanimous consent of all the signatory states." The motion was carried. The Chairman suggested changing the word "drainage" to "river" in the first line, and this was agreed to. Article I as amended was approved.

Mr. Bower proposed the following language as a new article XII and moved its adoption: "Subject to the provisions of this Compact, water of the Yellowstone River system may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use of such waters for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purpose." The motion was seconded. There was discussion of the meaning and effect of the proposal, including the question as to whether a junior irrigation right would take precedence over a senior power right. It was suggested that in the event of water shortage for irrigation, power water might be cut in order to provide for irrigation needs. There was discussion of reclamation feasibility and repayment by Messrs. Vernon and Renne. Mr. Kurtz pointed out the need for power for industrial development in Wyoming and the danger of jeopardizing such development in the event of removal of water from power production use. Mr. Burke discussed the legal implications of the proposal, referring to the provisions of Wyoming law and the decisions of Montana courts. He also discussed the question of Federal control of water and the various aspects of Federal water development.

Reference was made to a letter sent to Mr. Newell by the President, which discussed certain aspects of recently negotiated compacts which tended to restrict the activities of the United States in the development of water resources, particularly power generation. The letter pointed out that inclusion of such provisions might jeopardize the prospect of consent and approval of compacts, and urged that the Federal Representative use his influence to see that such provisions
were not included. Copies of this letter and supporting documents were sent to all Commissioners on June 1, 1950. Inquiry was made as to whether it would be likely that a Compact containing such a provision would be vetoed, and Mr. Burke said that he would forecast such a veto.

In discussions which followed Mr. Burke analyzed Section 6 of the Reclamation Act of 1902 and the Supreme Court Decision in the Three-State Case. Dr. Renna suggested emphasizing the importance of irrigation without prohibiting or operating against other uses. There was further discussion by Messrs. Bower and Jones. The latter mentioned the practical political problem in Montana. Mr. Bunston asked about the application of the Flood Control Act of 1944, to which Mr. Burke replied that the only pertinent provision of this Act was with respect to navigation and related to irrigation, mining, and industrial uses, but that power was not mentioned. Mr. Bower further discussed the overall situation, and he and Mr. Burke analyzed the practical political problem in Wyoming. Mr. Manning pointed out the need of power for pumping, and Mr. Vernon further discussed the question of Reclamation operations. Mr. Bower withdrew his motion with the consent of the second.

It was moved, seconded, and carried that Article XI be approved.

Articles XIII and XIV were read, and as to each a motion was made, seconded, and carried that it be approved.

Dr. Renna read a policy statement, which was discussed and somewhat modified as to wording; and moved to amend the policy statement at the beginning of the Compact by inserting after "thereof," in the middle of the ninth line the following language: "acknowledging that in future projects or programs for the regulation, control, and use of water in the Yellowstone River Basin the great importance of water for irrigation in the signatory states shall be recognized."

The motion was seconded and carried.

Article XIV was read, and a motion was made and seconded to approve. Upon question Mr. Burke discussed the reason for such a provision in the Compact. The Article was approved.

Article XV was read, and a motion was made, seconded, and carried to approve.

Article XVI was read. A motion was made, seconded, and carried to approve. The Chairman stated that the Department of the Army had suggested revision by inserting after the word "affect" in the first line the following: "the sovereignty or jurisdiction of
the United States of America in or over the area of waters affected by such compact, or "A motion was made, seconded and carried to adopt this language. Article XVI as amended was approved.

Articles XVII and XVIII were read, and as to each a motion was made, seconded, and carried that it be approved.

Mr. Lloyd suggested adoption of a new Article VIII as follows: "The use of water allocated under Article V of this Compact for projects constructed after the date of this Compact by the United States of America or any of its agencies, instrumentalities, or wards shall be charged as a use by the state in which the use is made; provided that such use incident to the diversion, impounding, or conveyance of water in one state for use in another shall be charged to such latter state."
A motion was made and seconded to adopt this language as paragraph VII D. There was discussion during which Mr. Leonard objected to the use of the words "or wards". Mr. Burke and Mr. Humphreys discussed the situation on the Colorado River and the legality and other background material. There was additional discussion by Messrs. Metz, Leonard, and Renne. Mr. Leonard asked whether Article VI had been adopted.
The Chairman answered in the affirmative. Mr. Leonard moved to delete the words "or wards". The motion was seconded and passed. The language as amended was adopted as paragraph VII D.

Mr. Leonard stated that the Montana Commissioners did not consider that Article VI had been adopted. This situation was discussed.
Mr. Leonard stated that he had voted against Article VI in the form in which it did not exclude Indian rights. He did not object further if Messrs. Bunston and Manning were agreeable as it stands.

Mr. Metz stated that nothing new had been introduced beyond the general trend of thinking in the western states, as such thinking was reflected in recent compacts. Mr. Burke stated that he had never devised any language with respect to Indian rights, but had always adopted language furnished by those in a position to speak for the Indians.

Mr. Leonard pointed out his respect for Mr. Burke and the members of the Engineering Committee and for the work that they had done in preparing the Compact draft.

Mr. Humphreys and Mr. Burke discussed briefly the language with respect to Indian rights. Mr. Bunston asked Mr. Manning for his views on Article VI. Mr. Manning suggested that the Commissioners from the Big Horn River discuss that situation with the Engineering Committee since the group seemed near agreement. He suggested a recess until 11:45. The recess was taken at 11:45.

The meeting reconvened at 12:30 a.m. The Chairman stated that he considered the matter at hand was the lack of a unanimous vote on Article VI. Mr. Manning stated that he was satisfied with percentages given in paragraph V B 2. Mr. Bunston agreed that the
present provisions of this paragraph appeared to the other members to be equitable and he would concur. Mr. Bunston moved that the vote on paragraph V B 2 be made unanimous, and the motion was seconded and carried.

A motion was made, seconded, and carried that the vote approving Article VI be made unanimous.

The Chairman stated that a Compact had been agreed to and that it should be signed by all present before leaving Billings. He stated that the completed typed Compact would be available by noon. He indicated that he would obtain, by telephone, confirmation from North Dakota Commissioners of the provisions affecting that state. At 1:35 a.m. a recess was taken until 9:30 a.m.

The meeting reconvened at 10:00 a.m. The Chairman reported that he had talked to Mr. Walsh of North Dakota by telephone. Mr. Walsh said he had a conflicting meeting and had assumed that Mr. Acker would attend the Compact Commission meeting; but on his return to Bismarck had learned that Mr. Acker had been disabled by sudden illness and for that reason North Dakota was not represented at the meeting. Mr. Walsh had agreed to the change made in paragraph V D and to the provisions of Article III as approved.

While waiting for the completed draft of Compact, Mr. Thornton presented to Mr. Newell a token from the Yellowstone Basin Association in appreciation of his efforts and leadership in guiding the negotiation of a Compact. Mr. Newell responded briefly.

Mr. Bunston spoke of the services of Mr. Burke and presented to him a token of appreciation from the Yellowstone Basin Association. Mr. Burke thanked the group and spoke of the Constitutional Convention and the difficulties which were faced by that convention in drafting the Constitution of the United States, indicating the need for compromise of differing views in order to reach solutions of difficult problems.

Mr. McNally spoke further of the Constitutional Convention and the difficulties which it faced. There was further general discussion.

The complete Compact as previously approved paragraph by paragraph was presented and read in its entirety. Mr. Buck moved that the Compact as read be adopted. The motion was seconded and by Mr. Bower and unanimously carried.
Mr. Bunston moved that the Yellowstone River Compact Commission express its appreciation to the Engineering Committee and to the other agencies which participated in the Compact negotiations. The motion was seconded and carried.

Mr. Buck, as interstate Compact Commissioner from Montana, extended his thanks to Mr. Newell and to the others who had participated in the negotiations.

Upon signature of the Compact, the meeting adjourned at 11:45 a.m.

O. C. Ready, Secretary

Approved: R.J. Newell, Chairman

February 19, 1951
ATTENDANCE RECORD

Dec. 7-8, 1950

Montana

Commissioners

Fred E. Buck
A. W. Bradshaw
H. W. Bunton
John Herzog
Ashton Jones
Chris Josephson
A. Wallace Kingsbury
P. F. Leonard
D. M. Manning
Joseph Nuggli
Chester E. Onstad
Ed. F. Parriott
R. R. Renne
Keith W. Trout

Others

Hans L. Bills
James E. Cook
David A. Parriott

Wyoming

Commissioners

Earl T. Bower
E. F. Cochrane
R. L. Greene
E. C. Gwillim
E. J. Johnson
N. V. Kurtz
Harry L. Littlefield
Will G. Matz
R. E. McNally
A. R. Shreve
L. F. Thornton
Dr. M. B. Walker
Wyoming (cont.)

Others

Earl Lloyd
H. T. Person
J. A. Cole
Clark Ritchie
Dr. John R. Watt

Others

R. J. Newell - Chairman, Federal Representative
O. G. Reedy - Secretary
C. L. Myers - Chairman, Engineering Committee
       Bureau of Reclamation
W. S. Hanna - Member of Engineering Committee
W. J. Burke - Bureau of Reclamation
K. F. Vernon - Bureau of Reclamation
C. T. Judah - Bureau of Reclamation
Geraint Humphreys - Bureau of Indian Affairs
Charles R. Cocks - Corps of Engineers
John G. Lightfoot - Corps of Engineers
D. F. Clemens - for D. F. Burroughs,
               National Park Service
J. S. James - for Kirk Sandals, SCS
YRCC Meeting Minutes
of October 24-25, 1950
YELLOWSTONE RIVER COMPACT COMMISSION

Minutes of Meeting
Oct. 24-25, 1950

The third meeting of the Yellowstone River Compact Commission was held at the Northern Hotel in Billings, Montana, on October 24 and 25, 1950, and was called to order at 10:05 a.m. by R. J. Newell, Chair-
man. Mr. Ed Parriott and Mr. Chris Josephson were announced as new
Commissioners for Montana and Mr. Harry Littlefield as a new Commissioner
from Wyoming.

The Chairman pointed out that the minutes of the second meeting
had been distributed and asked if there were any corrections. Mr. Johnson
moved that the minutes be approved. The motion was seconded and carried.

The Chairman outlined the general situation in which the
Commission finds itself. Specific principles had not been adopted at
the last meeting to guide Mr. Burke in the preparation of a work draft
which he was requested to prepare and did prepare. Subsequently, the
Drafting Committee met with the Engineering Committee, but no single
draft of Compact was agreed upon.

The Chairman then called on Mr. Leonard for his views on the
present status of the work of the Drafting Committee. Mr. Leonard
reported that no meeting had been held, except the one early in August
when the Committee met with the Engineering Committee and advisors in
Billings. At that time the basic principles were discussed, and it
was agreed that Messrs. Leonard and McNally would each prepare a draft.
The Committee was unable to agree on basic principles, and the Leonar-
d and McNally drafts proved to be diametrically opposed at many points,
with no basis for agreement. Mr. Leonard then discussed the history
of Compact negotiations and spoke of a proposed compact prepared in
1935, signed by Messrs. Lamb, James, and Burritt. This proposed
Compact was based on the doctrine of appropriation. Mr. Leonard then
discussed the question of storage construction, mentioned the Wyoming
Nebraska-Colorado suit and its settlement on the basis of appropriati-
on the question of whether the United States owns the unappropriated water
in the stream.

The Chairman then asked Mr. Acker for his views. Mr. Acker
stated that the provision proposed with respect to North Dakota seemed
to be agreeable to Montana and Wyoming. It applied to streams which
were out of reach of Montana and Wyoming. He stated that he had
reviewed a good many decisions of the Supreme Court and believed that
the Court had laid down the firm proposition of "equitable apportionment," but had not laid down the specific principles for general application. He believed that the states could agree on a Compact and that they could better do justice to the area involved than could an authority or some other agency. He raised the question as to whether the Commission was attempting to apportion the natural flow only or whether its apportionment covered all the water, including stored water.

The Chairman then called on Mr. McNally. He said that he had before him three suggested drafts of Compact and that a fourth would be mentioned a little later. He discussed briefly the points of disagreement between himself and Mr. Leonard with respect to the Tongue River. The first filing on the Tongue River in Wyoming was in 1879, and by 1886 there were filings on 45,000 acres. The first Montana filing was made August 9, 1886. The Wyoming Constitution provides that water arising in Wyoming belongs to the state. However, because of the interstate nature of the streams constituting the Yellowstone River system, the state may have to surrender some of its rights to this water.

Wyoming is trying to recognize existing rights. On the Tongue River it would have the first right to water for 45,000 acres. The water would then go to Montana, but for use 150 miles downstream. In the Laramie River case the Supreme Court held that it would protect junior rights where the economy was dependent thereon and where the distance to downstream point of use by senior rights would result in waste of water through channel loss. It held that a lower state should take advantage of storage possibilities and construction of storage works.

In application to the Tongue River situation Mr. McNally pointed out that the Tongue River Reservoir which has been constructed with the holding of the Court that storage possibilities should be developed. Mr. McNally then reviewed briefly the principal draft articles, Article V prepared by Myers, Article III by McNally and Wehrli, and Article III prepared by Leonard, which cover protection of existing rights and division of water. He then suggested hearing from the Engineering Committee.

Mr. Myers reported for the Engineering Committee that at the joint meeting held with the Drafting Committee in August two jobs were given to the Engineering Committee. The first job was to analyze the situation on the Big Horn River to determine whether the "potential" and "possible" acreages given in the Engineering Report were correct, and if not to determine proper acreages. The Committee took a field trip in September covering the entire Big Horn River Basin and submitted its report, as an addendum to the original report, by letter of September 24, to the Chairman of the Commission.
The second job given the Committee was to attempt to prepare an article for inclusion in a draft of compact covering the apportionment of water. The Committee spent considerable time on this problem with the help of Mr. H. T. Parsons, Dean of Engineering at the University of Wyoming, and an Engineering Advisor to the Wyoming Commission, and Mr. J. E. Ritter, Chief of Hydrology Division, Bureau of Reclamation. Two principles were considered for use in the preparation of the draft. The first is the depletion theory used in the Upper Colorado River Compact, which places a ceiling on the beneficial consumptive use of water permitted in each state. The second is the divertible flow theory which limits the amount or percentage of total amount of water which can be diverted in a state. The Committee believed that a modification of the divertible flow principle was most appropriate in this case, this being the principle considered in all previous compact negotiations on the Yellowstone.

Mr. Myers then read a letter to the Chairman of the Commission dated October 23, 1950, which discussed the opinion of the Engineering Committee in respect to this matter and transmitted a suggested draft of an apportionment article. Copies of the letter were distributed to those present. Mr. Leonard inquired whether the draft prepared by the Committee proposed to affect existing rights or only unappropriated water. There was discussion by Messrs. Myers, Leonard, Bower, Vernon, Acker, Bunston, and others. Messrs. Bunston and Lloyd discussed the necessity for a compact before storage development could proceed.

At 11:30 a.m. the Chairman called a recess.

The Commission reconvened at 1:15 p.m.

Mr. Leonard moved that the report of the Engineering Committee be laid on the table. Mr. Acker questioned the advisability of tabling the report, and thus withdrawing it from consideration. He spoke of the need for a compact, but the important matter for discussion was the division of water. Mr. Leonard's motion was withdrawn.

Mr. Acker moved that the October 23, 1950, report of the Engineering Committee be adopted and approved by the Commission. The motion was seconded by Mr. McNally. Mr. Jones stated that the Montana Commissioners would be willing to abide by the decisions reached at the February meeting. He suggested an examination of the Engineering Report in the light of these decisions. Mr. Bunston stated that the people on the Bighorn River in Montana did not agree to accept the acreages in the Engineering Report as a basis for the division of water, but would be willing to consider the report in arriving at proper percentages. He read a statement giving the position of the Bighorn people in Montana and objected to the inconsistent data as to "potential"
and "possible" irrigable acreages in the Bighorn River Basin. Mr.
Thornton suggested that the data presented by the Engineering Committee
were probably as accurate as could be developed at this time and that
they be used as a basis for division of water. There was discussion by
Messrs. Bunston and Bower.

Mr. Myers outlined in some detail the method of derivation of
data in the original report, the reasons why that report was felt to be
inaccurate in some respects, the procedures followed by the Committee in
modification, and the basis for the information in the addendum. There
was discussion of certain details. Mr. Vernon outlined in general the
plan of the Missouri River Basin Project for development on the Bighorn.

Mr. Acker questioned whether there was not some confusion as
to which report was before the group for consideration and stated that
his motion covered the October 23 report which suggested a basis for
apportionment of the water and included as an attachment a draft article
on apportionment.

Mr. McNally inquired what information Mr. Bunston and the
Bighorn group from Montana would require in order to be able to agree
on acreage figures.

There was discussion as to whether the Engineering Committee
Report being considered by the group included the draft of Compact
article. Mr. Leonard said that no Compact could be signed that asked
Montana to give up rights to water now in use in Montana. Mr. Acker
asked for a specific proposal, but Mr. Leonard replied that they would
insist on recognition of the doctrine of appropriation.

There was discussion of the terms of the agreements reached in
February, and whether they are still applicable. Messrs. McNally and
Leonard agreed that the February provisions could still be adhered to,
but there was some disagreement as to details.

Mr. Burke pointed out that the Report of the Engineering
Committee contained 20 specific questions, and that it was not wise to
try to consider the report as a whole without identifying the individual
problems. He read particularly items in the third paragraph which
contained problems 7 to 11. In this paragraph the Committee has made
a recommendation as to the method of handling vested rights, a problem
which will have to be solved by the Commission. Mr. Burke then discussed
the claim of the United States to the water of interstate streams and the
history of the claim and of court decisions which bear on the matter.
After a short recess Mr. Leonard thanked Mr. Burke for his discussion and suggested that he draft a suggested division of the water which could be presented to Montana and Wyoming, following which the Commission could meet and adopt the draft. Mr. Acker withdrew his motion with the consent of the second.

Mr. Acker moved that the Report of the Engineering Committee be adopted in principle only and that the points analyzed by Mr. Burke be considered individually. Mr. McNally seconded the motion. Mr. Newell asked Mr. Burke whether he now had adequate information from the Commission on which to base a draft of Compact. Mr. Burke stated that he had neither the information nor the time. The Chair called for a vote on the motion, and Montana being opposed to the motion, it was declared lost.

There was discussion as to the basis for voting, and it was generally agreed that the vote must be taken by states, each state having one vote.

Mr. Acker moved that the Report of the Engineering Committee be received for consideration and possible adoption of each of the principles stated. The motion was seconded by Mr. McNally and passed.

The items as identified by Mr. Burke in the Engineering Committee letter were considered as follows:

1. It is a generally accepted fact that irrigation development in the Yellowstone River Basin, particularly on the interstate tributaries, has very nearly reached its maximum practicable limit without the provision of additional new storage capacity.

   It was moved and seconded to adopt this item, and the motion was carried.

2. The committee feels that clearing the way for this new storage should be the underlying objective of any interstate compact.

   It was moved and seconded that the item be adopted. Upon objection it was moved to amend the motion to insert the words, "one of" between "be" and "the" and change the word, "objective" to "objectives." The amendment was carried, and the motion as amended was carried.

3. From an interstate standpoint, the situation in the Yellowstone River Basin is extremely favorable since on three of the four interstate tributaries there is a reservoir site at or near the State line which can provide adequate control of residual flows from the upper State for continued development in the lower State.
4. The fourth tributary, Clarks Fork, is not likely to experience water shortages.

5. The reservoir on Tongue River has already been constructed, and those on the Big Horn River and the Powder River are authorized by Congress for construction by the Bureau of Reclamation.

As to each of these items individual motions that the item be adopted were made, seconded, and carried.

6. When these reservoirs are in operation they will have the practical effect of permitting full development in the upper States without affecting the progress of development in the lower States. That fact should be borne in mind.

It was moved and seconded to adopt this item. Upon objection, it was passed over.

7. Concerning treatment of existing developments in the Compact, the committee is of the opinion that there is little to be gained from a water supply standpoint by regulating and administering existing diversions under a Compact.

This item was passed over.

8. It is, of course, entirely up to the Commission whether or not existing rights are to be administered under the Compact, but from an engineering standpoint, the committee feels that the expense and difficulties of such an administration would in no way be justified by the benefits that might be obtained.

9. There are insufficient data upon which to base this type of administration due principally to differences in the water laws of the States involved.

10. It would be a major research project to place existing rights in all States on an equivalent basis.

11. Such procedure undoubtedly would involve interstate adjudication proceedings.

Mr. Leonard stated that it is Montana's position that there should be a provision in the Compact that existing rights shall be administered under the Compact by the Administrative Commission that may be established. Mr. McNally stated that Wyoming did not want such a provision. There was discussion of the problem. It was agreed that both States want existing rights recognized in the Compact. Mr. Burke
suggested recognizing existing rights and providing that they be administered under state law. There was discussion of the relative merit of the two positions from the standpoint of protection of property rights. Mr. Acker suggested adding a phrase to provide that the Compact would "recognize vested rights under the doctrine of appropriation." Mr. Vernon moved that with respect to item 8 of the Engineering Report the Commission desires that (a) the Compact recognize existing vested rights and (b) the procedure for recognizing these rights not be changed. There was no second.

Mr. Bower moved to adopt items 6 to 11 inclusive. Mr. Leonard stated that Montana objected. There was further discussion. Mr. Burke stated that there seemed to be no question about recognizing existing rights, that the question was what body would enforce those rights, the Courts or a Compact Commission. Items 6 to 11 were passed over.

12. There are two principles upon which a satisfactory allocation of the unused waters of the Yellowstone River could be based. One is the so-called divertible flow principle, which has been used in previous Yellowstone River Compact attempts. The other is the depletion principle as used in the Upper Colorado River Basin Compact.

13. The committee feels, that since the divertible flow principle has been previously used as a basis for a compact, it should be retained, but modified to make the apportionment operative on other than a daily basis so that allocation could be in terms of cumulative volumes of water through an entire year, or portion thereof rather than by daily stream flow. This is because substantially all new development will be based on storage rather than direct flow.

14. A suggested draft of an apportionment article is attached, together with the supporting definitions.

There was discussion of the item. Mr. Thornton moved to adopt the divertible flow principle as modified in accordance with Committee recommendations. The motion was seconded. Mr. Leonard stated that he favored the divertible flow principle, but objected to modification. In the following discussion Wyoming proposed leaving the question of modification open for the present. By consent the group adopted the divertible flow principle as a basis for Compact, modification to be considered later.

15. Whatever principle is used in allocating the water under the Compact, it is necessary to select some index upon which to base apportionment, either directly in acre-feet or by percentage.
The committee believes that the most practicable basis of apportionment of the unused water is the area of irrigable land in the States.

16. The irrigable lands in the States are tabulated in the report and the addendum, dated September 24, 1950, of the engineering committee.

17. The committee feels the irrigable lands as shown by this report and addendum are a reasonable measure of the new development that is likely to take place in the basin for a long time to come.

Mr. Bunston objected to the irrigable land figures on the Bighorn as given in the Committee Report and addendum. It was moved to adopt the principle of using "potential" and "possible" irrigable land as the index to determine the percentage apportionment. There was no second. It was moved to adopt item 17. The motion was seconded. Following discussion, it was moved to add after the word, "addendum" the expression, "except as to the Bighorn River." The motion was seconded and carried, and the motion as amended was carried.

18. If the Commission feels that the available data are insufficient on any of the interstate tributaries (Clarks Fork, Big Horn, Tongue, or Powder Rivers) to allocate all of the unused waters of that tributary, it could apportion a first block of water sufficient to take care of the presently indicated potential development.

This item was passed over.

19. Some consideration must be given to supplemental water supply and since such water is for use on existing projects, it is felt that such allocation should be made under the category of existing irrigation works rather than potential.

It was moved and seconded that this item be adopted, and the motion was carried.

20. The committee definitely feels that there is enough information available at the present upon which to base a workable and realistic Compact, and that nothing would be gained but much might be lost if a Compact were postponed until all the development possibilities in the basin are completely and thoroughly studied. This will take a long time and cost a great deal of money, and if a Compact is delayed until it is completed, the basin may well be deprived of the use and benefit of many worth-while projects which otherwise could be constructed.
This item was read as a statement, but not put as a question.

The meeting recessed at 5:45.

The meeting reconvened at 8:35 p.m. Mr. Leonard discussed the numerous meetings of the Commission that have been held and the numerous drafts of compacts. He stated that the draft prepared by Messrs. McNally and Wehrli and presented by Wyoming was wholly unacceptable to Montana and gave the reasons therefor. He concluded that the Commission was not approaching agreement and stated that if the Commission could not come nearer agreement, he was prepared to move that the Commission adjourn permanently.

Mr. McNally pointed out that the McNally-Wehrli draft is not before the group, that it is the Engineering Committee's draft which is before the group. The Chairman brought up for consideration, the Engineering Committee's draft and asked Mr. Burke to conduct the discussion. Mr. Burke outlined the provisions of the draft article and proceeded to take up the article by sections.

There was agreement on the first paragraph of the article, reading as follows:

"The waters of the Yellowstone River System, exclusive of existing development and other uses coming within the provisions of paragraph C of this Article, are hereby allocated to each State for storage or direct diversion as follows:

Clarks Fork River

To Wyoming ___%
To Montana ___%

Big Horn River

To Wyoming ___%
To Montana ___%

Tongue River

To Wyoming ___%
To Montana ___%

Powder River

To Wyoming ___%
To Montana ___%"
subject to the following stipulations concerning the point of measurement:

The provision as to point of measurement on Clarks Fork was agreed on as follows:

"1. For the Clarks Fork River the point of measurement shall be below the last diversion from Clarks Fork River above Rock Creek.

There was discussion as to the point of measurement on Bighorn River, as to which the Committee's draft provided as follows:

"2. For the Big Horn River the point of measurement shall be below the last diversion from the Big Horn River and the inflow from the Little Big Horn River shall be excluded from the quantity of water subject to allocation."

Mr. Bunston suggested that the point of measurement be at a point at the state line or at a point just above the Little Bighorn River. Mr. Leonard objected to measurement for division except at the state line on any tributary and also objected to excluding existing rights.

Mr. Burke discussed the preparation of the report by the Committee, on which the state engineers of the three states constitute a majority. He expressed his feeling that the group should have confidence in the report representing the best judgment of the three state engineers who are men of long experience and high standing. He urged that the engineering matters discussed in the report and recommended by the Engineering Committee not be tampered with by the group. There was restatement of suggestion by Mr. Leonard. Mr. Person pointed out that the Commission is attempting to divide the entire water produced in the basin, not just the water produced in Wyoming.

Mr. Acker inquired of Mr. Leonard precisely what the problems were that called this Compact negotiation. Mr. Kurtz spoke of the history of a previous compact and its consideration. He pointed out the importance of drafting a compact and having it approved and some of the problems to be resolved.

Mr. Bunston agreed that the problem is one of dividing the water of the basin, not just that which arises in Wyoming. As to the division of the water, he believed that a "block" division can be effective—probably the first block on the basis of the engineering report and the remaining block, after serving existing and potential irrigation, to be subject to appropriation by both states. As to the point of measurement, he suggested that it be at the Hardin Bridge just above the mouth of the Little Bighorn River.
Following a review by Mr. Burke of Mr. Bunston's proposal, there was a discussion of the proposal by Messrs. Vernon, Bunston, and Burke. Mr. Burke stated the proposition that "potential" developments be divided on the basis of acreage in the engineering report, and that "possible" acreage be included but percent not stated.

Mr. Bunston moved that the group favor compacting unappropriated water on the divertible flow theory using for percentages as to potential acreages the figures in the engineering report, and as to possible acreages, figures to be determined later. Mr. McNally seconded the motion. There was an objection by Mr. Leonard as to adopting this motion. Mr. Bunston suggested that the question as to the theory proposed be subject to further consideration.

There was discussion as to the point of measurement and the relationship between various points of measurement and percentages apportioned. On a question by Mr. Bunston, Mr. Burke stated as his opinion that the draft article by the Engineering Committee was the best method of accomplishing the development of the area. There was further discussion of the recognition of existing rights.

Mr. Thornton moved that the Engineering Committee Report be tentatively adopted as to measuring points on all streams. The motion was seconded. Mr. Leonard objected. Mr. Jones spoke of the problem of voting—the necessity of the Commissioners from a state voting as a unit. He expressed regret that the Montana group had not met to agree on various points. He stated that Montana will insist on recognition of Doctrine of Appropriation and some method of caring for periods of low flow.

Mr. Thornton asked to recess to the next morning. Mr. Leonard again stated his proposal that unless Wyoming suggested some other basis for a compact, there appeared to be no basis for agreement. Mr. McNally again stated that no Wyoming proposal is before the Commission, that Wyoming will be satisfied with any one of several paragraphs submitted providing for the apportionment of water. Mr. Williams stated that he was tired of hearing the discussion apparently getting nowhere and was going to leave. It was moved and seconded to recess. The motion was carried and at 11:00 p.m., the Commission recessed until the next morning.

The meeting reconvened at 9:10 a.m. on October 25, 1950. Mr. Newell asked whether further discussion of the Engineering Committee's Report was desirable. The tentative approval such as had been given the specific items of the report would hardly bind a Commissioner to sign the compact when prepared.

Mr. Bunston read a letter addressed to Mr. Newell, copy of which is attached.
There was discussion of the method of division of Bighorn River waters. It was pointed out that there was substantial agreement on potential irrigation possibilities on the Bighorn as presented in the Engineering Committee's Report.

Mr. Leonard stated that he could not agree to Mr. Bunston's proposal to turn over to the Engineering Committee the problem of drafting a compact for the signature of the Commissioners nor to the suggestion that laymen on the Commission be supplanted by engineers. Mr. Bunston stated that he did not by any means intend to imply any requests for the resignation of any members of the Commission. His comments were submitted in view of the nearness of the legislative sessions in Wyoming and Montana, and because of the fact that the job of drafting the compact was largely a technical engineering job. Mr. Williams stated that although he had no official status in the meeting he wished to offer as his opinion that he agreed with Mr. Bunston. The Engineering Committee should be capable of drawing a compact. If it were then found not satisfactory it could be reviewed in the legislatures.

Mr. Cochran asked whether all the tributaries needed to be considered in a draft or whether a compact could be drawn covering some streams and omitting others. He stated that the Bighorn River group wants a compact so that it can go ahead with developments; even if some of the tributaries cannot agree on compact provisions.

Mr. Jones asked for a statement from Wyoming as to some specific proposals to which they felt Montana might agree. Ten minutes recess was taken. Following the recess Mr. Leonard called attention to the fact that North Dakota was not represented in this day's sessions and that no action was possible without them. He hoped that Wyoming would submit a draft of a compact which would be agreed upon. No agreement can be reached on dividing the basin and compacting individual streams. The basin must be covered as a whole.

Mr. Bunston stated that he was not in favor of adjourning or having anybody resign. If it is found that a compact cannot be drafted to cover all the tributaries he would like an opportunity to see what can be done on the Bighorn.

Mr. Newall discussed the various drafts which were available for consideration. No one draft had been submitted by the Drafting Committee. Mr. Burke had prepared a preliminary work draft for the use of the Drafting Committee. Messrs. McNelly and Wehrli had prepared a draft representing a Wyoming view. Mr. Leonard had prepared a draft representing his views. Copies of the Leonard and Burke drafts were distributed.
Mr. Lloyd moved to recess into river groups to try to reach agreement and report back shortly after noon. There was no second. Mr. Leonard asked what Wyoming thought of the Burke draft. He stated that he felt it covered the agreements reached in February but that it should cover the manner of settling disagreements in questions of interstate administration. Mr. Bunston moved to consider the Burke draft paragraph by paragraph.

Mr. McNally referred to the draft paragraph in the Engineering Committee's Report and to corresponding paragraphs in the Leonard draft, McNally-Neihill draft and a Myers draft. He stated that Wyoming would not agree to interstate administration. He read from the draft paragraph by the Engineering Committee and stated that Wyoming wanted division of the water on an annual basis as provided for in this draft. He then read from a paragraph of the Myers' draft which used as a basis for division of water the allocation of beneficial consumptive use on an annual basis, October to September, placing a ceiling on the amount of water which can be consumptively used in each of the states. He read from the McNally-Neihill draft which also provided for division on the consumptive use basis and from the Leonard draft which provided for the application of the Doctrine of Appropriation on an interstate basis. Mr. McNally stated that he objected to interstate administration. He stated that he would insist on "equitable apportionment" which includes priorities and other factors. He stated that if agreement could be reached on the language to be used in the article, of which he read from several examples, and on the question of interstate administration, then agreement could be reached on a compact.

In answer to a question Mr. Newell explained that the Myers draft was a draft prepared by Mr. Myers utilizing as a basis the Burke draft and substituting in the appropriate place the principle of apportionment on the basis of consumptive use rather than apportionment of divertible flow. This draft was prepared for the use of the Engineering Committee. Copies were furnished only to members of that Committee. When the Committee considered the draft it leaned toward the divertible flow method and prepared its own draft which was presented to the Commission.

Mr. Jones agreed that the basis of division of water is the essential feature to be decided. He felt that there should be some machinery for discussion of problems which would arise under the compact either through a Commission, through the state engineers or by some other means which should be provided for in the compact.

Mr. Leonard insisted that under the Doctrine of Appropriation state lines must be wiped out. He insisted on recognition of established rights under interstate administration, and on apportionment of natural flow, not storage.
Mr. McNally moved to remove the Tongue River from compact consideration and let the Commission proceed to consider the Big Horn, Powder and Clark's Fork. Mr. Kurtz seconded the motion. The Chairman called for discussions. Mr. Kurtz discussed the situation existing on the Tongue River which results in problems differing from those on the other tributaries and may necessitate excluding the Tongue from consideration. He called attention to a portion of Mr. Leonard's draft relative to the division of water, particularly the statement reading "... in accordance with the general law governing the acquisition and use of water..." He pointed out additional language in the draft which it seemed to him tended to modify or restrict this statement and called attention to the importance of agreeing on major items and delegating to others the resolution of details.

Mr. Leonard discussed some of the questions raised. He spoke particularly of previous proposals to exclude the Tongue River and read from a letter prepared in 1945 pointing out in detail reasons for not excluding the Tongue. There was discussion between Messrs. Kurtz and Leonard relative to points of agreement and disagreement on the Tongue River.

In response to comments relative to having the courts, not a Commission, determine certain matters of administration, Mr. Muggli stated that he wanted to avoid law suits if possible, that he was a practical irrigator and believed that from the standpoint of a practical irrigator the question of dividing water between upstream and downstream users could be resolved on a friendly basis.

Mr. Vernon suggested that there seemed to be some basis for agreement which should be explored.

At 11:45 a.m. the meeting recessed.

The meeting reconvened at 1:50 p.m. Mr. McNally spoke on the general subject of administration of the compact. He stated that Wyoming did not want a "super-government" and control by two non-residents such as might occur with a board of three persons. He stated that in his opinion Article VI of the Snake River Compact presented a satisfactory form, with modifications to suit the differing situation. This article in its unmodified form is as follows:

"C. In the case of failure of the administrative officials of the two States to agree on any matter necessary to the administration of this Compact, the Director of the United States Geological Survey, or whatever official succeeds to his duties, shall be asked to appoint a Federal representative to participate as to the matters in disagreement, and points of disagreement shall be decided by majority vote."
Mr. Newell asked Mr. Vernon whether he considered that a U. S. Geological Survey representative, as suggested in the Snake River Compact, was a logical person for Federal representative. Mr. Vernon stated that he did; that he felt it should not be a Bureau of Reclamation representative because of the Bureau's direct interest in projects with respect to which decisions on administration of the stream would be made. Mr. Leonard stated that he preferred the Bureau of Reclamation representative, but suggested that nothing be placed in the Compact which would restrict the judgment of the President in making an appointment. He suggested that North Dakota not be a part of the administrative body, there being little opportunity for controversy involving North Dakota.

Mr. McNally objected to the provision that the Commission might change the apportionment as provided for in a portion of Article IV of the Leonard draft reading as follows:

"From time to time the Commission between Wyoming and Montana shall re-examine the allocations herein made and upon unanimous agreement may make modifications therein as are fair, just and equitable, giving consideration among other factors to:

Priorities of water rights;
Acreage irrigated;
Acreage irrigable under existing works; and
Potentially irrigable lands."

Mr. Leonard suggested that the language be changed to provide that the Commission might "recommend" modifications. There was general agreement. Mr. Leonard stated that he had been told by Mr. Acker that North Dakota was agreeable to not being represented on the administrative commission.

Mr. Thornton suggested that the Engineering Committee should be given an opportunity to hear the ideas of the group on specific articles of a compact in order to be in a position to draft a compact.

The Chairman called for a vote on the motion to exclude the Tongue River. The motion was lost. There was discussion of whether the Engineering Committee should be asked to draft a compact. Mr. Bower moved that the Commission ask the Engineering Committee, with the advice and assistance of Mr. Burks, to prepare a draft of proposed compact for presentation at an early date. The motion was seconded and carried. Mr. Leonard stated that he agreed that the Engineering Committee might properly draft a compact if given adequate instructions but he did not want the Committee to undertake this task if it was permitted to insert its own ideas of policy.
Mr. Bower moved that the Commission consider the Burke draft. The motion was seconded and carried. There was no objection with respect to the preamble or Article I.

Article II: It was suggested that unnecessary definitions be excluded at the discretion of the Committee. It was agreed that in Article II, (C), (D), and (F) where necessary the Little Bighorn River should be expressly excluded from the compact. It was pointed out that tributaries lying within Yellowstone Park must also be excluded. The type of instructions to be given to the Committee were discussed. Mr. Myers asked specifically whether the Commission wanted to operate on a daily basis or on an annual basis, subject to check as required. Mr. Bower moved to have operations on an annual basis with provisions to make a check at any time desirable, but not required on a daily basis. The motion was seconded. In respect to a question, Mr. Buck stated he agreed to the annual basis with provision to check as required. The motion was passed.

Article II (J), (K): To be dropped.

Article III: Mr. Leonard suggested substituting Article IV of his draft for Article III of the Burke draft. Article IV of the Leonard draft was read by paragraphs and discussed. It was agreed to modify the first paragraph beginning after the comma in the eighth line so that the balance of the paragraph would read as follows:

"and one representative selected by the director of the Geological Survey or whatever Federal agency may succeed to the functions and duties of that agency to be appointed by him at the request of the states to sit with the Commission, and who shall, when present, act as Chairman of the Commission without vote except as herein provided."

The second, third, fourth, fifth, and sixth paragraphs of the article were approved. It was moved, seconded and carried that the seventh paragraph be omitted and the same action was taken in respect to the eighth paragraph. The ninth paragraph was approved as previously amended to provide that the Commission might recommend modification in allocation. The tenth and eleventh paragraphs were approved. It was moved, seconded, and carried that Article IV of the Leonard draft as changed, be substituted for Article III of the Burke draft. It was moved, seconded, and carried that old Article III (D) of the Burke draft be added to the new Article III (modified Article IV of the Leonard draft).

Article IV of the Burke draft was approved.
Article V: It was suggested that the article in the Engineering Committee report be substituted for Article V. There was discussion on this article and of Article III of the Leonard draft, principally paragraph 2 thereof. There was discussion of the language, the Theory of Appropriation, and whether adding separate reference to the use of priorities in single streams regardless of state lines materially affected the sense of the paragraph. Mr. Leonard moved that paragraph 2 of Article III of the Leonard draft, with suggested modifications, be substituted for Article V of the Burke draft. The motion was seconded and after discussion, withdrawn. Mr. Bunston moved that the Engineering Committee should use in its draft the language in the Burke draft which appears as the first paragraph under the discussion of Tongue River, for each of the interstate tributaries included in the Compact, with this amendment: to strike the period after "appropriations" and a comma and "including the principle of priority, regardless of state line". Motion was seconded by Mr. Jones. There was discussion following which the motion was modified to eliminate the amendment to the language. The motion was passed.

It was moved, seconded, and carried to include as a separate article of the Compact, the following:

"No sentence, phrase, or clause in this Compact, or in any provision thereof, shall be construed or interpreted to divest any signatory state or any of the agencies or officers of such states of the jurisdiction of the water of each state as apportioned in this compact."

Article V (D): It was agreed that the percentages agreed to in February, and with respect to the Eighorn determined from the addendum to the engineering report, would be used.

Article VI: Agreed to eliminate.

Article VII: Mr. Humphries read the following language which he had been authorized by the Commissioner of the Bureau of Indian Affairs to propose:

"Nothing contained in this compact shall be so construed or interpreted as to affect adversely any rights to the use of the waters of Yellowstone River and its tributaries owned by or for Indians, Indian Tribes and their reservations."

It was moved, seconded, and carried that the language be adopted.
Article VIII to end: Accepted.

Following discussion of Article XI, it was moved to adjourn subject to call of the Chairman. It was agreed that about two weeks would be allowed for study after the draft of Compact had been sent to the Commissioners. The motion was seconded and carried and the meeting adjourned at 5:55 p.m.

C. C. Reed
Secretary

"Approved: R. J. Newell, Chairman
December 7, 1950"
ATTENDANCE RECORD
October 24-25, 1950

Montana

Commissioners
Fred E. Buck
H. W. Bunston
John Herzog
Ashton Jones
A. Wallace Kingsbury
P. F. Leonard
Joseph Muggli
Ed F. Parriott
Keith W. Trout

Others:
Wayne W. Linthacum
H. A. Williams

North Dakota

Commissioners
T. A. Acker
Einer Dahl
J. J. Walsh

Wyoming

Commissioners
Earl T. Bower
Ben F. Cochrane
E. C. Gwillim
E. J. Johnson
N. V. Kurtz
H. L. Littlefield
R. E. McNally
Mark H. Partridge
L. F. Thornton
Dr. M. B. Walker
Wyoming

Others

Earl T. Lloyd
H. T. Person

Others

R. J. Newell - Chairman, Federal Representative
O. C. Reedy - Secretary
C. L. Myers - Chairman, Engineering Committee-Bureau

of Reclamation
W. S. Hanna - Member of Engineering Committee
W. J. Burka - Bureau of Reclamation
K. F. Vernon - Bureau of Reclamation
C. T. Judah - Bureau of Reclamation

Geraint Humphreys - Bureau of Indian Affairs
Firman H. Brown - Bureau of Indian Affairs
John G. Lightfoot - Corps of Engineers
D. F. Clemens - for D. F. Burroughs, National Park Service
E. L. Doeling - Fish & Wildlife Service
J. S. James - for Kirk Sandals, SCS
J. Elliot Hall - Bureau of Land Management
R. A. Bethune - Reconstruction Finance Corp
R. E. Bocley - Adm. Assistant to U.S. Senator

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YRCC Meeting Minutes
of February 1-2, 1950
YELLOWSTONE RIVER COMPACT COMMISSION

Minutes of Meeting
Feb. 1-2, 1950

The second meeting of the Yellowstone River Compact Commission was held at the Northern Hotel in Billings, Montana, on February 1 and 2, 1950, and was called to order at 10:10 a.m. by Mr. R. J. McNeill, Chairman. The persons not at the previous meeting were introduced. Included were two Commissioners from Montana appointed since the first meeting, one Commissioner from Wyoming, and an Engineering advisor from Wyoming, and several observers from Federal agencies and the states.

The Chairman pointed out that the minutes of the first meeting had been distributed and asked if there were any corrections. Mr. Ackerman moved that the minutes be approved. The motion was seconded and carried.

The Chairman called on Mr. C. L. Myers, Chairman of the Engineering Committee, who reported on the two meetings which the Committee had held and presented the report of the Committee, which had previously been distributed to all Commissioners. There was discussion as to the proper disposition of the report. A motion to approve was modified by the maker and as finally stated read "that the report be accepted as a basis for negotiation and that sincere thanks be extended to the Committee for its work." The motion was seconded and carried.

Mr. Bunston raised the question as to whether a committee on publicity might be desirable. The Chairman stated that at the first meeting it was decided that meetings would be open to the public and members of the press. Mr. Bower moved that any information going to the press be cleared by the Chairman of the Commission and the three State Engineers. The motion was seconded and carried.

Mr. Thornton moved that permanent committees be appointed to specifically consider problems for particular sections of the Basin. The motion was seconded. There was discussion of the meaning of the motion. It was agreed that representatives from the several areas would constitute these committees and would act to resolve differences arising in the general discussions of the Commission. The motion was carried.
There was discussion as to whether the report of the Engineering Committee was unanimous, which it was found to be, also the relationship of the Engineering Committee to the Area Committees. It was the consensus that this Committee be kept intact and be available for consultation and advice. The Chairman stated that unless there were objections he would recognize all who had something to contribute to the discussions, including advisors from the states, as well as the Commissioners themselves.

Mr. Gravitz discussed the basis of the Engineering Committee Report and questioned whether some additional details should not be included in the matter of irrigable acreages.

Mr. Myers described the survey made by the Bureau of Reclamation and Mr. Hanna that made by the Bureau of Indian Affairs.

Mr. Leonard requested that certain comparative data be read from the report prepared in 1943 and the current report. Mr. Leonard suggested consideration of the former Compact and specific items objectionable to the states with discussion of these objections. Mr. Acker suggested that the former Compact be considered in terms of new physical data available.

The Chairman pointed out that the Engineering Report was before the Commission and suggested that its status be clarified and agreed to.

Mr. Bunston discussed the progress being made and pointed out some of the requirements of an equitable Compact. He mentioned the requirement for storage in order to utilize fully the available water and the fact that conditions will change after storage is developed.

Mr. Thornton suggested discussion of Compact policy, forgetting the prior drafts, and the discussion proceeded along these lines, including the questions of whether inter-state priorities would be considered, whether storage would enter into the negotiations, and the general proposition that water would be divided on the basis of acres irrigated and potentially irrigable.
Mr. Partridge moved to accept and approve the Engineering Report as the best data available at this time and use it as the basis for division of the water. The motion was seconded. There was discussion as to the need for such a motion in the light of that previously passed, and whether the motion as made would require that the figures appearing in the report be used without change. The motion was withdrawn.

It was moved to recess for lunch and to reconvene at 1:30 p.m. The motion was seconded and carried, and the meeting recessed at 12:00 o'clock.

The meeting reconvened at 1:45 p.m. and was called to order by the Chairman.

Data on the Tongue River Reservoir, Montana, and maps of the Basin were distributed.

The Chairman suggested that the several Area Committees meet before the adjournment of this meeting of the Commission in order to expedite progress as much as possible. He suggested that he be authorized to appoint a Committee to draft the framework of a Compact.

Mr. Leonard moved to recess and that the Area Committees meet immediately, and that since the Tongue River was the main bone of contention that the Committee for that area meet in the Green Room, and that all Committees report to the Commission this evening. The motion was seconded.

Mr. Person urged that overall principles to be used in developing the Compact be established before recessing. There was considerable discussion on the motion and the importance of agreeing on principles prior to the recess. The Chairman stated his reluctance to put controversial matters to a vote because of the great difference in size of the state delegations. The motion was withdrawn.

Mr. Person suggested two principles to be followed:
(1) Existing rights shall be recognized and remain unimpaired.
(2) The unappropriated unused water shall be divided on the basis of potential development. Mr. Leonard asked whether interstate priorities should be considered. Mr. Person replied that they should not.
Mr. Bunston asked Mr. Myers about the rights of Montana in Boysen Reservoir. Mr. Myers pointed out the interrelated situation in the development of the Missouri River Basin and the difficulty, if not impossibility, of differentiating the benefits between the states under these circumstances.

There was further discussion regarding the principles under which the Compact should be developed.

Mr. Bunston asked Mr. Myers about the situation at Moorhead and the status of studies in the Upper Powder River which were described.

Mr. Leonard reviewed some of the meetings in connection with previous efforts to draw a Compact and read some correspondence relating thereto.

Mr. Johnson suggested forgetting about the question of appropriated water and working on the problem of unappropriated water.

There was some general discussion of the diversion of water from the Tongue River to the Little Horn.

There was discussion of the desirability of recessing to allow the Area Committees to meet, and by general agreement the meeting recessed at about 3:30 to reconvene at 8:00 p.m.

The meeting reconvened at 8:20 p.m. and was called to order by the Chairman.

Mr. Johnson for the Powder River, Mr. Cowlin for the Tongue River, and Mr. Bunston for the Big Horn River, all reported that progress was being made toward reaching agreement on the proposed Compact provisions affecting the respective streams, and each stated that his group would like about two hours' additional time for further study. No representative of the Clarks Fork was present from either state.

Mr. McNally moved to recess until 11:00 February 2, with the Area Committees to meet at 9:00 a.m. The motion was seconded and passed, and the meeting recessed at 6:30 p.m.
The meeting reconvened at 11:10 a.m. on Thursday, February 2, 1950. Mr. Greene representing the Powder River Committee submitted three items on which the Committee had reached agreement with respect to that stream:

1. All existing rights to the beneficial use of the waters of the Powder River in the States of Montana and Wyoming valid under the Laws of these States as of January 1, 1950, are hereby recognized and shall be and remain unimpaired by this Compact.

2. The total unused or unappropriated divertible flow of the Powder River Basin is divided:

   58% to Montana  
   42% to Wyoming

3. Same agreement for stock reservoirs as in the 1944 Compact.

Mr. Greene moved to accept the preliminary draft and refer it to the Drafting Committee. The motion was seconded.

There was discussion by Messrs. Leonard, Jones, Gravota, Penson, Buck, and Burke with respect to the questions of whether any unappropriated water existed, how storage enters the picture, and how the stored water would be administered. Mr. Humpherys inquired about Indian Lands in the Powder River Basin and was informed that there were none.

Mr. McNally, speaking for the Wyoming members of the Tongue River Committee, stated that the Committee had not been able to agree on the question of existing rights. He stated that the Wyoming Commissioners wanted all such rights recognized in both states, but that the Montana Commissioners were not willing to let those rights remain unimpaired.

Mr. Leonard, speaking for the Montana Commissioners, stated that it was the sense of his group that no Compact could be agreed upon unless the division of the Tongue River water was on an equitable basis, and that the proposal suggested by Wyoming was not considered to be on such a basis. Montana proposed as one possible basis for the Compact, consideration of the rights on the stream in terms of priority without respect to State line.
Tho Chairman suggested referring the question back to the Committee with instructions to attempt further to reach an agreement.

Mr. Metz asked whether the Committee would like additional members to assist them. Messrs. Burke, Myers, Buck, and Goodrich were suggested.

Mr. Lloyd reported that the Committee studying the Big Horn was making progress, but had no specific report to make. It was requested that Messrs. Myers, Burke, and Hanna be available to assist on this problem.

There was no meeting on the Clarks Fork. Mr. Greene suggested a recess until evening.

Mr. Buck asked whether the Little Horn should be included in the Compact or excluded as had been the case in prior drafts.

Mr. Bunston asked whether the Law did not provide that the Little Horn and the main stream of the Yellowstone should be covered. The matter was discussed further by Messrs. Burke and Ackar. Mr. Ackar argued that the "residual flow" paragraph in the last draft of Compact (par. 2 of Art. 5) be not included in any future drafts of the Compact.

The Chair called on Mr. Vernon, Regional Director of the Bureau of Reclamation, who discussed the importance of reaching agreement from the standpoint of the overall development of the Missouri River Basin and the significance which is attached to local agreements and local interest in the Project by the public as a whole.

The Chair announced that the meeting would recess until 8:00 p.m., and that in the meantime the Committees for the Tongue and Big Horn Rivers would meet, and that there would be a separate meeting of representatives of Federal agencies at 2:00 p.m. The meeting recessed at 12:30 p.m.

The meeting reconvened at 8:15 p.m. The Chair called for a report of the Tongue River Committee, and Mr. McNally stated that the Committee had reached agreement on the following principles:

1. Appropriate rights to the beneficial uses of the water of the Tongue River system existing in each signatory
state as of January 1, 1950, shall continue to be enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation.

2. Wyoming and Montana agree that the unappropriated waters of the Tongue River system subsequent to January 1, 1950, shall be allocated to each state as follows:

- 60% to Montana
- 40% to Wyoming

Mr. McNally moved that the report be accepted and referred to the Drafting Committee. The motion was seconded and carried.

Mr. Bunston reported for the Big Horn Committee that agreement had been reached on the following principles:

1. Subject to existing Indian Treaty Rights, all existing rights to the beneficial use of the waters of the Big Horn River Basin in the States of Montana and Wyoming, valid under the laws of these states as of January 1, 1950, are hereby recognized and shall be and remain unimpaired by this Compact; provided, that at times when insufficient water is available to supply all existing rights in both states the water that is available will be apportioned to rights in the two states on the basis of priority of rights in the two states.

2. The total unused or unapportioned divertible flow of the Big Horn River Basin is divided:

- ___ % to Montana
- ___ % to Wyoming

(The percentages are to be based on potential irrigable areas in the two states as determined by the Engineering Committee and approved by the Compact Commissioners).

3. Same agreement for stock water diversions as in the 19th Compact.

Mr. Bunston moved that the report be accepted and referred to the Drafting Committee. The motion was seconded and carried.
In the absence of any Commissioners from the Clarks Fork area, Mr. Lloyd reported that he and Mr. Buck had agreed on certain principles for use in the preliminary draft and that these principles should be subject to review by Commissioners in the area. The principles are as follows:

1. All existing rights to the beneficial use of the waters of the Clarks Fork Basin in the States of Montana and Wyoming valid under the laws of these states as of January 1, 1950, are hereby recognized and shall be and remain unimpaired by this Compact.

2. The total unused or unappropriated divertible flow of the Clarks Fork River Basin is divided:

   40% to Montana
   60% to Wyoming

3. Same provision for stock reservoirs as in the 19th Compact.

Mr. Lloyd moved that the report be accepted and referred to the Drafting Committee.

Mr. Jones moved that the Chairman be authorized to appoint a Drafting Committee. The motion was seconded by Mr. McNally and carried.

After some discussion it was agreed that the States of Montana and Wyoming would hold state caucuses to suggest members for the Drafting Committee. Mr. Walsh suggested that Mr. Acker be appointed to the Committee from North Dakota with such engineering assistants as needed.

It was moved to recess for 20 minutes for the states to caucus. The motion was seconded and carried. The meeting recessed at 8:30 p.m.

The meeting reconvened at 8:55 p.m.

No

Mr. Walsh asked that Mr. Axel Persson be included on the Drafting Committee.
Mr. Buck, reporting for Montana, suggested Mr. Leonard as a member of the Drafting Committee, with Mr. Buck and members of the Engineering Committee as a whole to be available for engineering advice.

Mr. Lloyd, reporting for Wyoming, suggested Mr. McNally as a member of the Drafting Committee, with the State Engineer and Engineering Advisors Mr. Goodrich and Mr. Person to be available for engineering assistance.

The Chair announced that Mr. Burke and Mr. Myers would be available for assistance as needed. Mr. Humphreys asked whether the Drafting Committee would have before it the paragraph suggested by the Commissioner of Indian Affairs and presented by Mr. Turnbull at the November meeting of the Commission, reading as follows:

"Notwithstanding all other provisions in this Compact, the apportionment of water for which provision is made in this Compact is subject to the first and prior water rights reserved for Indians, for Indian Tribes and for Indian reservations, whether such first and prior water rights of the Indians are inchoate or covered by Federal Court decrees at the date of this Compact."

The Chair stated that the paragraph would be placed in the hands of the Drafting Committee.

Mr. Buck said that he supposed that Mr. Hanna would sit with the Drafting Committee to assist in matters pertaining to Indian rights. This was agreed to.

The Chair asked how much time would be needed for the Commissioners to consider a draft of Compact after it is circulated, and it was agreed that at least two weeks would be required.

Mr. Bunston inquired about including the Little Horn in the Compact. Mr. Buck suggested that the Little Horn be included. There is some irrigated land in Wyoming. The entire drainage area in Montana is within the Indian reservation, but there is some white-owned land included therein.
The Chairman asked whether the Little Horn could properly be included in the provisions relating to the Big Horn. It was agreed that this probably should not be done. Messrs. Metz and Bunston asked whether there was any representation from the Little Horn. There being none, it was agreed that Mr. McNally from Wyoming and Messrs. Bunston and Hanna from Montana would discuss the matter with irrigators in the two states. Messrs. Lloyd and Buck will take up with the Governors of the two states the question of Commissioners representing these areas.

Mr. Leonard requested that Mr. Burke, Regional Counsel of the Bureau of Reclamation, and the Engineering Committee submit to the Drafting Committee a suggested form of Compact. He discussed the procedure of drafting previous Compacts and asked whether Mr. Burke would be willing to prepare the first draft. Mr. McNally and Mr. Acker concurred in the request. Mr. Pratt agreed to phone Mr. Burke and inquire whether he would accept this assignment. Following the phone call, Mr. Pratt reported that Mr. Burke would accept the assignment, but wanted specific instructions as to whether he should fit the agreed upon provisions into the 1942 draft or should begin with a completely new draft. Mr. Acker moved that the draft prepared by Mr. Burke should be a completely new start, built from the ground up. The motion was seconded and unanimously carried.

Mr. Thornton suggested the importance of discussing the draft of Compact with the water users in the various areas, and pursuant to this subject there was discussion as to the number of copies of the draft which would be required by each Commissioner. It was requested that the Secretary arrange to send copies of the draft to parties in the Upper Yellowstone Valley in Montana for their information.

It was agreed that the call for the next meeting would be made by the Chairman and would be transmitted with the drafts of the Compact at least two weeks in advance of the date of the meeting.

It was requested that the Drafting Committee and the Engineering Committees each meet for a short time after adjournment.
The Chair asked the Secretary to express the thanks of the Commission to the hotel for the accommodations furnished.

It was moved that the meeting adjourn, subject to the call of the Chairman. The motion was seconded and carried. The meeting adjourned at 9:50 p.m.

O. C. Reedy
Secretary

Approved:
R. J. Newell, Chairman
October 24, 1950
ATTENDANCE RECORD
February 1-2, 1950

Montana

Commissioners
J. W. Bradshaw
Fred E. Buck
H. W. Bunston
John Herzog
Ashton Jones
A. Wallace Kingsbury
P. F. Leonard
Joseph Muggli
Chester E. Omstad
Xel Persson
Keith W. Trout

Others
Gerald J. Gravetz
James E. Cook
D. A. Foulet
E. L. Bille
Wayne W. Linthacum

North Dakota

Commissioners
T. A. Acker
J. J. Walsh

Wyoming

Commissioners
Earl T. Bower
J. Harold Cash
Ben F. Cochrane
R. L. Greens
E. C. Swillim
E. J. Johnson
Lee E. Keith
N. V. Kunts
R. E. McNally
Will G. Netz
Mark N. Partridge
A. R. Shreve
Charles M. Smith
L. F. Thornton
Dr. M. B. Walker

Others

D. A. Geier
R. D. Goodrich
Earl Lloyd
H. T. Person

R. J. Newell - Chairman - Federal Representative
C. C. Ready - Secretary
C. L. Myers - Chairman, Engineering Committee

K. F. Vernon - Bureau of Reclamation
G. O. Pratt - Bureau of Reclamation
D. C. Ketcham - Bureau of Reclamation
R. J. Young - Bureau of Reclamation
W. S. Hanna, - Bureau of Indian Affairs
A. B. Melzner - Bureau of Indian Affairs
Geraint Humphreys - Bureau of Indian Affairs

D. F. Burroughs - National Park Service
J. D. Goshorn - U.S. Geologic Survey
K. B. Revnian - U.S. Geologic Survey
R. E. Morgan - Bureau of Land Management
H. T. Tysk - Bureau of Land Management
C. A. Cocks - Corps of Engineers
R. J. Pafford - Corps of Engineers
J. G. Lightfoot - Corps of Engineers
C. A. Stiles - Corps of Engineers
Kirk H. Sandals - Soil Conservation Service
YRCC Meeting Minutes
of November 29, 1949
YELLOWSTONE RIVER COMPACT COMMISSION
MINUTES 1949-1950
YELLOWSTONE RIVER COMPACT COMMISSION

Billings, Montana

Dec. 7, 1949

Members of Yellowstone River Compact Commission

Gentlemen:

Attached is a draft copy of the minutes of the first meeting of the Yellowstone River Compact Commission held at Billings, Montana, on November 29, 1949.

Sincerely yours,

[Signature]

C. C. Read, Secretary
c/o Bureau of Reclamation
P. O. Box 2130
Billings, Montana
YELLOWSTONE RIVER COMPACT COMMISSION

Minutes of Meeting
Nov. 29, 1949

The first meeting of the Yellowstone River Compact Commission
was held at the Northern Hotel in Billings, Montana, on November 29,
1949, and was called to order at 10:00 a.m. by Mr. R. J. Newell,
Federal representative on the Commission.

Mr. Fred Buck moved that Mr. Newell serve as permanent Chairman
of the Compact Commission. Mr. Lloyd seconded the motion which was
unanimously carried.

It was moved, seconded, and unanimously carried that a secretary
be elected. Mr. O. C. Reedy was nominated, and there being no further
nominations was unanimously elected to serve.

The members of the Wyoming delegation were introduced by Mr. Earl
Lloyd, Deputy State Engineer of Wyoming, and the members of the
Montana delegation by Mr. Fred Buck, State Engineer of Montana. Mr.
I. A. Acker was the only representative from North Dakota. Representatives
of Federal agencies and unofficial observers were introduced by
the Chairman. A complete attendance list is appended.

The Chairman asked for an expression of the desires of the
Commission with respect to whether the meetings would be open to the
public and the press, closed, or partially open. Messrs. Lloyd, Buck,
and Acker expressed the belief that the meetings should be open, and
there being no objections it was so ordered.
The Chairman inquired whether a verbatim transcript of the record would be required or whether a complete set of minutes would suffice. Messrs. Buck and Lloyd recommended that a verbatim transcript not be required; and there being no objection, it was so ordered.

The Chair suggested that approval of the minutes be deferred until the following meeting, with a draft copy of the proposed minutes being furnished to each member of the Commission, and others entitled to copies, as soon as possible after each meeting. After some discussion, there being no objection, it was so ordered.

The Chair asked whether anyone had objection to standardizing on 8 x 10\(\frac{1}{2}\)\" paper for the records, and there being no objection it was agreed that this would be done.

The Chair inquired as to the matter of voting procedure. After discussion, it was concluded that voting was not important in Commission meetings. The Compact, as negotiated, must be unanimously supported by the Commission, and the disparity of the size of delegation from the three states will not be of consequence.

At the request of the Chairman, for use in preparation of mailing lists and record of attendance, all present filled out cards giving names, addresses, and official connections.

The Chairman suggested that unless someone desired otherwise, he would call on the State delegations for introductory statements with respect to the problems which would be encountered in drawing up the Compact. Mr. Earl Lloyd made a brief introductory statement.
for the State of Wyoming. Wyoming feels that a Compact on the
Yellowstone River and tributaries is essential in view of new
developments proposed. He described the area in Wyoming and its
tributaries and pointed out that all areas were represented by
members of the Commission. The provisions of prior Compacts have
been satisfactory with respect to the Clarks Fork and the Big
Horn Rivers, and in general the Powder River. There has been
difficulty, however, in reaching a satisfactory solution of the
problems on the Tongue River.

Mr. Goppart, representing the Clarks Fork area, indicated that
no serious controversy between Wyoming and Montana existed with
respect to that stream. There was in general sufficient water for
present irrigation, and probable future irrigation. This was par-
ticularly true if reservoirs proposed to be built for power purposes
were constructed, as they would provide adequate regulation. These,
or some other storage facilities, would be required for ultimate development.

Mr. Bower, representing the Big Horn River area, indicated that storage
would be necessary to permit full beneficial use of the water of the
Big Horn. He indicated that there is sufficient water, if properly
stored and conserved to meet needs of both states. Mr. Cochrane,
representing the Wind River area, described the extensive potential
developments in Fremont County and emphasized the need for a
supplemental supply for existing irrigators. He described the pro-
cedure under which present appropriators divert more than the legal
allowance, spreading water on their lands and affecting storage in this manner. He pointed out that if their diversions were cut back to the legally permissible quantities it would work a hardship on them unless other storage facilities were provided. Mr. Owillim described the Tongue River as a typical mountain stream, fed by two main tributaries. It has heavy runoff in the spring, with a shortage in the late season, and will require storage facilities to permit conservation and use of the water. Mr. Greene, representing the Powder River, also spoke of the problem of storage, that stream being very similar to the Tongue River.

The Chair then called on Mr. Fred Buck, who described the Yellowstone Basin in Montana. He pointed out that all consequential tributaries of the river entered from the south, except for the Shields River which flows from the north. This fact creates a situation under which Montana is dependent on Wyoming for water in the Yellowstone River. Mr. Buck then described previous attempts to reach an agreement, beginning in the early 1930's and extended through 1947. He pointed out the methods used in reaching the conclusions expressed in the 1944 draft of Compact, describing the three blocks of water which were allocated; first, that needed for existing irrigation; second, that for potential irrigation; and third, that which remained.

Mr. Jarussi stated that Carbon County, Montana, has an adequate supply of water to serve existing and potential irrigation.
the problem being how best to use the water. Mr. Bunston described
the Big Horn Basin, Montana, and pointed out the importance of
storage. There is considerable runoff between the last diversion
in Wyoming and the first diversion in Montana, but this runoff
comes too early in the season to be of much use to the Montana
irrigators, and for useful water they must depend on flow across
the State line. Yellowtail Dam and Reservoir proposed for construc-
tion may solve the problem of storage. Another complicating factor
is the treaty rights of the Indians, which must be considered. Mr.
Manning suggested that the problem is principally mechanical and
that if the factual data are made available an equitable determina-
tion can be made to form the basis for a Compact. He recommended
the importance of telling the people in the area that the problem
can be solved and is being solved in an equitable and amicable
manner and not taking a defeatist attitude.

Mr. Leonard described briefly the Tongue River situation. He
pointed out that storage has been mentioned by nearly every speaker,
but that the Compact does not concern storage but rather deals with
natural flow, and that this fact must be kept in mind. Previous
Compacts were based on lands irrigated without regard to priorities
of irrigation as between the states. He suggested that there might
be some difference of opinion as to the validity of this approach.
He further pointed out that the water being divided is that which
crosses the State line, not that which exists at any other point.
Mr. Huggli, also representing the Tongue River area, reiterated that the problem was one of an equitable division of the water, not a question of storage. Mr. Omstad, speaking for the Powder River interests, pointed out that there had not been much difficulty in reaching an accord on the Powder River previously, and he saw no reason for serious problems to arise this time. He agreed that storage was not a part of the Compact, but suggested that the construction of storage facilities might likely prove a solution to many of the problems which would arise with or without a Compact. Mr. McLaughlin and Mr. Harzog spoke briefly about the interests of the irrigators along the main stem.

Mr. Ackers described the relatively small drainage area in North Dakota. He pointed out that, comparatively, North Dakota has a minor interest in the water of the Yellowstone, but does desire adequate water for all its potentially irrigable area amounting to some 24,000 acres, including that now irrigated. Some of the area now irrigated diverts in Montana, and this introduces a minor complication in the drawing up of a Compact. Mr. Ackers also mentioned the minor tributaries of the Yellowstone, which rise in North Dakota and pass through Montana before reaching the river. There has been some development along these streams, and more development is in prospect; and the state is, of course, interested in protecting these water users.

Mr. Ackers pointed out specifically the second paragraph of sub-

Article A5 of Article V of the 1944 draft of Compact and suggested
that consideration be given to eliminating this paragraph, since it seemed to have no meaning. He felt that it was not necessary to have a Compact, including Federal ratification thereof, for every agreement that the states might reach on the division of water. Sometimes this would be necessary, but in many instances where Federal interests are not involved he felt that an agreement between the states themselves might serve as well as the more formal Compact to accomplish division of water. He returned to the discussion of storage and indicated ways in which storage might modify some of the problems, giving as an example the construction of Baldhill Reservoir on Shoshone River by the Corps of Engineers. The Corps is taking no part in the use of the stored water, but has indicated that this is a problem for the State and other agencies to solve.

Mr. Newell presented the interests of the several Federal agencies very briefly, the overall Basin development activity of the Bureau of Reclamation and the Corps of Engineers, the general interest of the Department of Agriculture in anything that affects farming and the specific interests of the Forest Service and Soil Conservation Service of that Department in conservation measures on areas which they control. He emphasized the many extensive interests of the Bureau of Indian Affairs in the area, particularly in the Wind River Basin at the head of the Big Horn and in the Lower Big Horn. The Bureau of Land Management has extensive interests in the public domain within the Yellowstone Basin in Wyoming and Montana, and
minor, if any, interests in North Dakota. The National Park Service
is interested in protecting Yellowstone National Park and in the
overall recreational aspects of development of the Missouri River
Basin.

The Chairman posed the question of how to approach the assignment.
Mr. Lloyd suggested setting up an Engineering Subcommittee which
would assemble all available data. The states and the Bureau of
Reclamation would be represented on the Committee, and possibly the
Geological Survey and Federal Power Commission. (It was pointed
out that Mr. Lesher S. Wing of the Federal Power Commission will be
present at future meetings of the Compact Commission.)

Mr. Buck stated that the idea of the Engineering Subcommittee
had struck him somewhat suddenly, and compared that suggestion with
the manner in which the International Joint Commission operated with
respect to International streams through an Engineering Board and
Engineering Committees. He pointed out that the same method was
used in negotiating a Compact on the Upper Colorado River, and con-
ccluded by concurring in the suggestion. Other Commissioners from
Montana and Wyoming also concurred, and Mr. Bower suggested the
importance of having accurate basic data for use in selling a pro-
posed Compact to the legislatures of the several states. Messrs.
Gwillim and Lloyd discussed the extent of the data already available
in Wyoming and that which they believed would be available in the
files of the Bureau of Reclamation. Mr. Leonard stated that he
concurred in the idea, that it necessarily followed that the present meeting would be a preliminary organization meeting only, that the collection of data would take some time, and he raised the question of how much time would be required. He pointed out that the study should cover not only lands irrigated, but also other physical factors involved. The Chair urged the necessity of limiting the activities of the Committee by means of specific instructions, and suggested a recess so that the State delegations could discuss the question, outline proposed instructions, and recommend Committee appointments.

Mr. Lloyd suggested the possibility that the Committee might meet today and make recommendations as to the data which would be required. Dean Goodrich described the complexity of the situation on the Upper Colorado and stated that it took about two years to collect the data, but that he saw no need for any such length of time to be required in this case.

Mr. Bunston moved that an Engineering Committee be appointed to study the problem, the motion was seconded, and after some discussion withdrawn.

It was moved to recess after the news picture was taken until 2:00 p.m. The motion was seconded and carried.

The discussion continued on the activities of the Committee with a suggestion that the Committee be furnished the order in which the streams would be studied so that data could be collected
in that order. It was suggested that the Commissioners representing areas along each stream might meet to discuss specific problems prior to the next meeting of the full Commission. The Chair suggested that data should be available at the earliest possible date, and asked Dean Goodrich to be prepared to estimate how long the study would require.

Mr. Gwillim stated that the time would be largely dependent on the amount available from the Bureau. Mr. Pratt promised, on the behalf of the Bureau, that all available material could be utilized and all possible help would be given. Portions of the 1938 report to the Wyoming legislature were read, which outlined data lacking at that time, but in process of collection. It was pointed out that most of these data have been collected and are now available. There was further discussion of the basis of negotiating former Compacts.

After a news photo the Commission recessed to meet at 2:00 p.m. at the Commercial Club.

The Commission reconvened at 2:00 p.m.

The Chair introduced the Honorable John W. Bonner, Governor of Montana, who welcomed the Committee to the state, pointed out the importance of the job of drawing a Compact for the division of the waters of the Yellowstone River and of the need of having a report to present to the Montana legislature at its next session in January 1951. He spoke of this activity as democracy in action.
where three states meet to consider their mutual problems and reach agreement thereon.

The Chair called for further discussion of procedures.

Mr. Lloyd urged that an Engineering Committee be set up to assemble basic data.

Mr. McNally moved that the Chair appoint an Engineering Advisory Committee consisting of three representatives from Montana, three from Wyoming, and representatives of Governmental agencies to investigate, gather data and assist the Compact Commission. The motion was seconded.

It was recommended that the Bureau of Reclamation, Geological Survey and Federal Power Commission have representatives on the Committee.

It was suggested that North Dakota should be represented and the maker of the motion stated that the omission was an oversight. Mr. Acker asked that the State Engineer of North Dakota be the only Committee member from that state. It was suggested that the State Engineers of the three states be designated on the Committee with power to call on others for assistance. Mr. Lloyd stated that the State Engineer of Wyoming, as ex-officio Interstate Streams Commissioner, would probably prefer not to serve on the Engineering Committee. Mr. Buck suggested that three representatives from each state should not be necessary, that one would be sufficient.
There was general discussion of the makeup of similar committees to advise other compact commissions. That for the Snake River consisted of one from each state and one Federal representative from the Bureau of Reclamation. For the Upper Colorado Committee each state appointed whatever number of Committee men it desired, and the Federal representative added assistants as he wished.

It was moved to amend the motion by reducing the representation to one from each state and one from the Bureau of Reclamation.

Motion was seconded and unanimously carried.

The motion as amended was unanimously carried.

The Chair asked the state groups to furnish names of the state representatives. Mr. Fred Buck was suggested as Montana representative. There was some discussion of the situation in Wyoming.

Mr. Acker moved that the representatives on the Engineering Committee be authorized to deputize any persons that they see fit to assist them.

The motion was seconded and carried.

The Chair appointed the State Engineers of the three states, Mr. Fred Buck from Montana, Mr. J. J. Walsh from North Dakota, and Mr. L. C. Bishop from Wyoming, together with Mr. Carl L. Myers as the Bureau of Reclamation representative.

The Chair asked if written instructions would be required for the guidance of the Committee.
Mr. Manning suggested four items to be required, and as discussion continued the list was expanded to the following:

1. A flow table on the main stem and tributaries.
2. Acreage irrigated.
3. Potential irrigable acreage together with the source of records and estimate.
4. Record of priorities in the three states.
5. Consumptive use of water including industrial use.
6. Climatological data.
7. Storage available.

Mr. Buck suggested that the compact should be based on the same general theory as the previous Compact. Mr. Gwillim moved that the Committee report by January 15 what information is available and what will be required. There was discussion of the time required to make such a report by Messrs. Gwillim, Buck, Acker, and Myers. The motion was withdrawn.

Mr. Manning moved that the Chair be authorized to appoint a representative of the Bureau of Indian Affairs on the Engineering Committee.

The motion was seconded, and after brief discussion carried.

Mr. W. S. Hanna was appointed.
Mr. Gwillim moved that as soon as the Committee convened and
elected a Chairman it would, at the call of its Chairman, issue
a report. The motion was seconded.

Mr. Bower commented that a time limit only would constitute
sufficient restriction on the activities of the Committee. Mr.
Pratt suggested that the Committee report should include a tabula-
tion of data available and a suggestion as to further items which
would be needed.

Mr. Gwillim's motion was withdrawn.

Mr. Pratt moved that the Engineering Committee heretofore
selected be instructed by the Commission to prepare as soon as
possible, but not later than January 15, 1950, a tabulation of
existing information included within the eight items previously
discussed, and a tabulation of further items which the Committee
feels are required to enable the Commission to arrive at a solution.

The motion was seconded.

Mr. Bunston suggested that in its initial tabulation the
Committee might add such items as it had available and felt would
be necessary. There was discussion of the instructions and the
time limit imposed.

The motion was carried unanimously.

Mr. Hyers asked that the Committee members present meet at his
office to look over data available and determine what portions
thereof can be used in present form.
Mr. Hanna asked for a discussion of future program of the Commission after the Committee report was issued. There was a discussion of the date for the next meeting. Mr. Bower suggested that the Chairman call a meeting of the Commission whenever he felt anything could be accomplished. Mr. Nowell asked if the report should not be circulated to the Commission members a few days before the next Commission meeting. There was general concurrence on the proposal, and it was agreed that the call for the next meeting would go out with the Engineering report.

The Chair asked for further discussion of procedure or of any details that might be taken up.

Mr. Leonard brought up a discussion of a second paragraph of sub-article A5 of Article V of the 1944 draft of Compact, reading as follows:

"All residual flows of the Yellowstone River below Sidney, Montana, after the states of Montana and Wyoming have made, or may make, full beneficial use of the waters of said stream, is hereby allotted to the State of North Dakota."

Mr. Acker moved that this paragraph be excluded from the proposed Compact.

The motion was seconded.

The Chair ruled the motion out of order since the details of the Compact were not under discussion.
Mr. Bunston inquired whether North Dakota should not be entitled to a specific amount of water based on acreage within that state rather than having only a right to whatever was left. There was discussion of the problem and of the related matters of the rights to water in streams rising in North Dakota and flowing into the Yellowstone River, and of extensive sprinkler irrigation. There was considerable discussion of the division of the water between Montana and North Dakota at the lower end of the river.

Question was asked whether any of the Boulder River Drainage Basin extended into Wyoming. Mr. Myers stated that neither the Boulder nor the Stillwater Basins extended over the Wyoming state line.

The question of the status of treaty rights of the Indians came up for discussion, and Mr. Turnbull presented language prepared to serve as a substitute for Article XIV of the 19th draft, which language was proposed by the Commissioner of Indian Affairs. There was considerable discussion of the meaning of the language, the need for such language, and of the position of the Bureau of Indian Affairs in general and the legal niceties involved.

It was moved that the meeting adjourn subject to the call of the Chairman. Motion was seconded and passed, and the meeting adjourned at 3:50 p.m.

O. C. Reedy
Secretary
ATTENDANCE LIST
November 29, 1949

Members of the Commission

Federal Representative
R. J. Newell

Montana
A. J. Bradshaw
Fred E. Buck
H. "T. Bunston
John Herzog
John M. Jarussi
A. Wallace Kingsbury
P. F. Leonard
Walter M. McLaughlin
Dave M. Menning
Joseph Muggli
Chester Onstad
Keith W. Trout

North Dakota
I. A. Acker

Wyoming
Earl T. Bower
J. Harold Cash
Ben F. Cochrane
Ernest J. Goppert
R. L. Greene
E. C. Gwillim
E. J. Johnston
Lee E. Keith
N. V. Kurtz
Earl Lloyd
R. E. McNally
Mark N. Partridge
A. R. Shreve
Charles M. Smith
L. F. Thornton
Dr. M. E. Walker
R. D. Goodrich - Engineering Advisor
Others

T. M. Berry, Prairie Farms Rehabilitation Adm., Canada
Gerald J. Oravetz, Montana State Engineer's Office
Oscar Niberg, " " " "
Mr. Cock " " " "
Walter J. Turnbull, Jr., Bureau of Indian Affairs
A. B. Meilner " " " "
T. S. Henna " " " "
John D. Goshorn, Geological Survey
Frank A. Swenson, " " " "
K. R. Molin " " " "
Harold T. Tyak, Bureau of Land Management
D. F. Burroughs, National Park Service
E. L. Doeling, Fish and Wildlife Service
Geo. O. Pratt (for K. F. Vernon), Bureau of Reclamation
Alvin E. Biclfeld, Bureau of Reclamation
D. N. Lindeman " " " "
Leonard B. Desmul " " " "
D. C. Ketcham " " " "
K. H. Werninger " " " "
Carl L. Myers " " " "
R. J. Young " " " "
O. C. Roedy, Secretary

129 (WY)
MAILING LIST

YELLOWSTONE RIVER COMMISSION

Montana Commissioners

A. W. Bradley, Lockwood, Montana
Fred E. Beck, State Engineer, P. O. Box 2720, Helena, Mont.
H. W. Bunston, Hardin, Montana
John Horace, Miles City, Montana
John H. Jurgens, Joliet, Montana
A. W. Kingsbury, Valier, Montana
F. F. Leonard, Miles City, Montana
Walter M. McLaughlin, P. O. Box 1016, Billings,Mont.
Dave M. Manning, Elywood, Montana
Joseph Maglia, Miles City, Montana
Chester Chestad, Brandon, Montana
Keith W. Troutt, 312 N. 6th St., Miles City, Mont.
Arael Pernot, 1120 Lewis Klamathstone Project, Sidney, Mont.

Other

Gerald J. Otvos, Nort. State Engr. Office, P. O. Box 273, Billings

North Dakota Commissioners

of N. Dakota, Bismarck, North Dakota

J. J. Weide, Bismarck, North Dakota
(State Engineer)
NAMING LIST

MAY BE TABLED OR PLACED ON FILE

Faculty Members

E. C. Truck, State Engineer, Cheyenne, Wyo.
Paul T. Leto, Laramie, Wyoming
J. Harold Amo, Cheyenne, Wyoming
R. F. Cookware, Lander, Wyoming
Thomas J. Cooper, Cody, Wyoming
E. G. Gillihan, 113 Kildare Ave., Cheyenne, Wyo.
R. G. Johnson, Lander, Wyoming
Law E. Keith, Cheyenne, Wyoming
H. W. Murdock, 110 Park Ave., Cheyenne, Wyo.
F. G. Hayer, Buffalo, Wyoming
R. E. McShane, Rawlins, Wyoming
Mark M. Patterson, Casper, Wyo.
A. R. Hams, Cheyenne, Wyoming
Charles M. Smith, Evansville, Ind., Wyo.
A. E. Thurston, Thermopolis, Wyo.
Dr. H. H. Walsworth, Laramie, Wyo.

Other

E. B. Goodrich, Laramie, Wyo. (University of Wyo.)
E. W. Lloyd, Fruit St., Dep. of Wyo., Cheyenne, Wyo.
E. G. F. Davis, University of Wyo., Laramie, Wyo.
Dr. L. R. D. Curley, Cheyenne, Wyoming
ILLINOIS GMT

TILLINGHAST WATER COMPACT COMMISSION

Representatives of Federal Agencies

A. J. Howell, P. O. Box 1866, Boise, Idaho
O. C. Black, P. O. Box 2130, Billings, Montana

9) Harrell T. Worsham, Supervisor, Missouri R.R. Co., Inc.,
    Fish & Wildlife Service, Billings, Montana
    Chief Irrigation Council, Bureau of Indian Affairs,
    540 - 5th & Figueroa Bldg., 751 S. Figueroa St.,
    Los Angeles 17, Calif.
    Paul Pfohl, Area Director, Region 2, Bureau of Indian
    Affairs, 606 N. 29th St., Billings, Montana
    W. S. Ewing, Area Engineer, Region 2, Bureau of Indian
    Affairs, 606 N. 29th St., Billings, Montana
    H. G. Buxton, Regional Engineer, Geological Survey,
    Box 135, Rolla, Missouri

6) Lawrence C. Buxton, Regional Director, Region 2, 307 Federal
    Office Bldg., Omaha, Nebraska (Nat'l. Park Serv.)
    Dan Burrowes, Recreation Planner, Nat'l. Park Service,
    Box 107, Billings, Montana
    Luther S. Wing, Regional Engineer, Federal Power Commission,
    Custom House, 555 Battery St., San Francisco 11, Calif.

5) Charles T. Frey, Regional Director, Dept. of Commerce,
    C 28 - 17th St., Denver 2, Colo.
    Edward F. Young, Dept. of Agriculture, Reservoir Ind.,
    Lincoln, Nebraska
    Brig. Gen. E. L. Strongy, Jr., Division Engineer, Corps of
    Engineers, Farm Credit Bldg., Omaha 2, Neb.
    Dist. Engineer, Corps of Engineers, Ft. Peck, Mont.
    Attn: John G. Lightfoot
    W. C. Siler, Interior Missouri River Basin Field Committee,
    Federal Bldg., Billings, Montana

K. F. Trench, Bureau of Reclamation, Box 1130, Billings
    Regional Council, Bureau of Reclamation, Box 2130, Billings
    C. O. Kavanagh, District Manager, Tillinghast Dist., Bureau of
    Reclamation, Box 1344, Billings
    C. M. Hynes, Tillinghast Dist., Bureau of Reclamation, Box 1244,
    Billings, Montana

H. J. Weiklet, District Manager, Big Horn District, Box 259,
    Cody, Wyoming (Bur. of Recl.)

H. J. Zein, Dist. Hydrologist, Big Horn District, Bureau of
    Reclamation, Cody, Wyoming
    Albert E. Hagen, Bureau of Land Management, 1205 N. 30th St.,
    Billings, Montana
YRCC Meeting Minutes
of October 10, 1940
Minutes of the Meeting of the
YELLOWSTONE RIVER COMPACT COMMISSION

Held in the Chamber of Commerce Building, Billings, Montana

October 10, 1940

(The statements as given in these minutes are not verbatim, except as indicated by quotation marks)

Commissioner Clyde L. Seavey of the Federal Power Commission opened the meeting at 10:00 a.m. and asked Mr. Wing to make a statement covering the work of the Compact Commission to date.

Mr. Wing: Two previous meetings of the Compact Commission have been held. The first was held at Billings, Montana on May 5, 1938, and the second, at Thermopolis, Wyoming on November 21 and 22, 1938. The first meeting was held for the purpose of determining the information needed for drafting the Compact and how it might best be obtained. It soon became obvious that insufficient information regarding present and potential uses of water was available and that it would require considerable time in which to gather it.

At the meeting in Thermopolis a report was presented which contained such information as had been collected up to that time. Based on this information, a "progress report" was drafted for submission to the State legislatures and to the Congress. Subsequent to the submission of this progress report, Congress passed an amendment to the act extending the time for the drafting of the compact, and also included North Dakota as a party to any agreement that might be entered into.

In addition to the data secured by the Compact Commission, information relating to existing and potential irrigation development in the Yellowstone Basin has also been compiled by the National Resources Planning Board. This information was compiled in the Omaha District Office of the U. S. Engineer Department under the direction of Lt. Col. W. M. Hoge. This information was subsequently made available to the Compact Commission and, to a large extent, has been incorporated in its latest revised report. Since the meeting at Thermopolis, the U. S. Bureau of Reclamation also has begun a survey of the irrigated and irrigable areas in the Big Horn Basin and in portions of the Yellowstone Basin above Billings. Additional and up-to-date information relating to irrigated lands and priorities of water-use is also being
collected under the sponsorship of the Montana State College and the Montana Water Conservation Board. Mr. Donohue will presently submit a report of the work done by Montana. The U. S. Bureau of the Census has completed its decennial census of irrigation. The report of this census, which will be available in 1941, should contain data of value to the Compact Commission.

Such data as are now available have been compiled by the Federal Power Commission in a report that is now in draft form. It plans to submit the report in the near future to the members of the Compact Commission for their information and criticism.

Mr. Seavey: "Up to what date does the report cover?"

Mr. Wing: The report has been kept up to date insofar as possible. The Army has made a new survey, but this information has not yet been made available. Perhaps Colonel Hoge could tell more about it.

Col. Hoge: A new report of the Yellowstone Basin has been finished but has not yet been released.

Mr. Wing: "Were there many revisions?"

Col. Hoge: "Yes, there were revisions of the irrigable areas, but no further studies of water use have been made."

Mr. Simmonds: The Indian Service is making a study of water use on the Big Horn.

Mr. Henne: The Indian Service has already submitted figures on areas that are irrigated in Indian projects. These figures were gathered from the projects shortly after the last Compact Commission meeting. A new survey of irrigated and irrigable land is now in progress on the Big Horn. This survey is a check on water available and water use. It covers the Wind River Reservation and Crow Reservation.

Mr. Simmonds: A major problem of the compact is the water rights of Indian lands. At the first meeting of the Compact Commission, the case of United States vs. Powers over the waters of the Little Horn was discussed. In this case the United States, on behalf of the Indians, brought suit against an individual irrigator, not on an Indian project ditch. The court decided that the Indians had treaty rights to irrigate all of their lands that were susceptible of irrigation. These rights date from the time of the treaty, and, since the statute of limitations does not apply to the United States or its wards, these rights are the senior rights in the basin and may
be taken up at any time. There are thousands of acres in the Crow and Wind River Reservations that have never been irrigated. What would be the situation if these lands were brought under irrigation under the Powers case decision? On both the Crow and the Wind River Reservations about 75 percent of the lands are owned by Indians and about 25 percent by whites. The Indian lands cannot, under present laws, be alienated.

The subject of reservoirs came up, and, since the Boysen project was mentioned, Mr. Wing asked Colonel Hoge if he could give any information on this project.

Col. Hoge: Representatives of both Montana and Wyoming have had an opportunity to examine the report and somehow it managed to get into the newspapers. The review of the 308 Report is not as detailed as is generally believed. It is concerned principally with flood control, and those tributaries having no flood control features were not examined thoroughly. Reservoir sites were examined and evaluated. It was concluded that the Lower Canyon site, the Boysen site, the upper and lower Big Horn Canyon sites and the Moorhead site were the best sites available. Water supply and foundations were studied. The report recommended that a dam be constructed on the Big Horn, but left the decision as to the site to the Chief of Engineers. The Boysen reservoir would have a capacity of about 3,000,000 acre-feet, and the lower Big Horn Canyon site would have a capacity of from 1,500,000 to 2,000,000 acre-feet. The other feasible sites included the Yankee Jim Canyon site, but the Big Horn sites were considered better. The general conclusion was that there was a surplus of water that could be stored and used for irrigation and other purposes.

At a Denver meeting of the National Resources Planning Board about a year ago it was agreed that if state and other agencies would submit new information to the Omaha office, the Engineer Office would compile it and keep the data up to date. So far we have received no additional information since the first was gathered.

Mr. Wing: "Mr. Sloan, will you make a statement on the work the Bureau is conducting?"

Mr. Sloan: The Bureau of Reclamation is trying to carry on where other agencies left off. It is attempting to make a complete survey of the Yellowstone basin in order to determine the best use for water, not only for irrigation, but for other purposes as well. The survey includes portions of the upper Missouri River basin, and follows down the main stem of the Missouri to the humid zone. The
problem is more involved than had been anticipated. All areas that are potentially irrigable are being investigated, without careful study of the water supply, in order to find those projects which merit more detailed study. An attempt is being made to avoid duplicating work that has been done before, and data furnished by other agencies is used whenever it is available. For example, the Indian Service data has been used without checking.

The survey on the Big Horn is progressing. The work on the upper Wind River is about 70 percent complete. On the Yellowstone below Billings the survey is practically finished. On the main stem above Billings the work is almost 100 percent complete, but the work on the tributaries and on possible tie-ins with the Missouri, is far from finished. With adequate storage, the water supply on the main stem of the Yellowstone and on the Big Horn is ample for the needs of the irrigable area, although this is not true of a number of the tributaries. On the Tongue and Powder the situation is quite different. The water supply, even with storage, is not sufficient to irrigate all the land susceptible of irrigation. The problem is further complicated by the maze of interstream diversions, by a wide choice of reservoir sites, and by the fact that the Wyoming portion of the basin is highly developed whereas the Montana portion has been developed to a minor degree.

Mr. Wing: "Will the report of the survey be made available within a year?"

Mr. Sloan: "Yes. It is best not to give out information until all the data are available. The best use of the water cannot be found until all of the possibilities have been investigated."

Mr. Brown: "Are you tabulating data on priorities in your survey?"

Mr. Sloan: "No."

Mr. Brown: "In my opinion that is the crux of the matter."

Mr. Sloan: "I don't think so. The problem is to provide an adequate supply by storage. With an adequate water supply, there is no problem of priorities."

Mr. Wing: Storage is going to be the answer to additional irrigation, but a tabulation of water rights should be made available if possible.

Mr. Brown: Montana is tabulating all of the priorities on the streams that have been adjudicated, and those that have been entered in the county records. This survey is an outgrowth of the Thermopolis meeting. We are getting information on the capacity of
the ditches, irrigated acres, and dates of filings. This information is very necessary, and some agency should devote itself to the task of collecting it.

Mr. Wing asked Mr. Donohue if his report was ready. Mr. Donohue read and submitted a progress report of the work done by Montana since 1938. A copy of this report is attached.

Mr. Monson: Water rights in Montana have not been recorded but have just accumulated for 75 years. It is hard to say to what extent priorities will enter into the compact. For present use, priorities are of extreme importance, although if there is enough storage, we can forget water rights. We are transcribing records of existing water rights, but other rights have been established for which there is no record. We must interview the farmers and tabulate their rights, priorities, and water use. It would perhaps be well to hold hearings in each county for the purpose of inspecting rights that have been recorded.

Mr. Wing: When do you estimate that this work will be finished?

Mr. Monson: In one year, perhaps. We are concentrating on the counties in the Yellowstone Basin.

Mr. Wing asked for a report from Wyoming.

Mr. Bishop: Mr. Sloan has covered the material in our progress report. Montana and Wyoming could cooperate on the Boysen dam. It would settle for all time the water problem on the Big Horn, including the silt problem.

Mr. Wing asked for a report from North Dakota.

Mr. McColly: Most of the acreage in North Dakota is in the Lower Yellowstone Project. The water rights for the other small projects are filed in the State Engineer's office.

Mr. Wing asked North Dakota to supply the same information that the other states had filed.

At Mr. Wing's request, Judge Stone discussed at some length the problems which confronted the states in making a compact, illustrating his points with examples from other basin compacts.
Mr. Stone: It is of the utmost importance to have all of the available information at the disposal of the Compact Commission. Most errors of past compacts can be traced to inadequate information at the time they were drafted. The Supreme Court has declared that decreed rights must give way when they exceed a state's equitable share of the stream. All factors must be considered in arriving at an equitable division between states, in order to avoid litigation years from now. Litigation is extremely expensive and must be avoided. The compact method is the best method of avoiding litigation. There should not be great concern over delay in the compact, for litigation is much slower. One law suit breeds another, and litigation, once started, never ceases.

Mr. Brown reiterated that water right priorities were of great importance, and requested the Bureau of Reclamation to include them in its survey, if possible.

Mr. Simmons: The question arises as to who will pay for storage. The early rights are not interested in storage because they have an ample water supply.

Mr. Wing asked the Wyoming delegation if Wyoming would accept the water right priorities now being compiled by Montana. A member of the Commission from Wyoming replied that Wyoming preferred to wait until the Bureau of Reclamation survey was finished, and suggested that a representative from Wyoming sit in on the county hearings to be held in Montana.

Mr. Brown: We are attempting to get only such facts as would be admitted as evidence before a court if there were actual litigation. If Wyoming will not accept the data we are collecting, the survey is a waste of money.

Mr. Seavey: Do any other agencies have any information to present? If not, I suggest we recess for lunch, and that during the recess each state hold a caucus to determine whether or not the data on water rights now being collected by Montana will be accepted. If this evidence is accepted, it will not be necessary to wait until adjudications are made.

This procedure was agreed upon and the meeting recessed until 3:00 p.m.
Mr. Seavey: Have the gentlemen from each state been able to reach an agreement among themselves?

Mr. Metz: To sum up — in order to make a compact that shall last for all time, two problems must be solved. They are, first, the condition which prevails today, and, second, the future situation. Wyoming suggests that the actual beneficial use now made of water be declared the principal factor in dividing the water to meet the needs of the situation as it is today. Actual use of water on land is of more importance than priorities or court decrees. Wyoming will give full faith and credit to the surveys the Montana Board is now making, and will not take advantage of its superior position on water-right filings. Expert surveys must be made by a competent agency to determine water use, water supply, and potential areas. Wyoming is willing to accept the finding of the Bureau of Reclamation. For the future, the division of water should be made with regard to the potential uses in the basin. This involves:

1. Soil study
2. Type of agriculture
3. Population
4. Cost of irrigation

Some competent authority should make a survey of the irrigable land in the basin, and determine how much water would be required to irrigate it. If there is not enough water for all the land, the less desirable projects should be eliminated without regard to state lines. Some agency, such as the Bureau of Reclamation, should decide on the average duty of water for all the potential lands, and then the water could be divided equally on the basis of the number of acres in each state. Wyoming is willing to accept the Bureau of Reclamation's estimate for the water duty.

Mr. Seavey: Do I understand that you want the Bureau to determine an average use of water for all potential lands, without regard to state lines, and that the states will divide the water among themselves on the basis of potential area in each state?

Mr. Metz: Yes. That the water be divided between the states proportionately to the irrigable area. It would be a mass allocation, and each state could distribute its share as it pleases.

Mr. Bishop: If an upper state promises a lower state a definite amount, the upper state will suffer in a dry year. The water available each year must be divided proportionately each year.
Mr. Brown: There is going to be an interval before storage can be developed when shortages will occur, and consideration must be given to existing priorities during this interval. Our legislature is not going to enter into a compact that does not protect the priorities of the irrigators.

Mr. Wing: May I suggest that the present supply in the dry years be divided on the basis of present use, and that storage water and surplus water in wet years be divided on the basis of the number of potential acres in each state.

Mr. Metz: Yes. We must not foreclose the future of any state in our endeavor to alleviate the present condition.

Mr. Brown: That's true. No one is going to sign a compact that closes the future.

There followed a discussion on reservoir sites on the Big Horn, but it was agreed that it was not the duty of the Compact Commission to recommend reservoir sites to the Army Engineers.

There was a discussion of the desirability of submitting a progress report to the legislatures.

There followed a discussion of Indian rights, particularly of the fear that the states might be "haggling over someone else's bone". The Indian lands are a minor portion of the entire basin but have prior rights.

Mr. Seavey: I asked the Secretary of the Interior to appoint someone to represent the Indians. The Office of Indian Affairs is making a survey of the needs of the Indians, and will submit a report of the findings to the Compact Commission.

Mr. Wing: It might be well to include in the compact a clause providing for subsequent rights of the Indians.

Mr. Metz requested Judge Stone to make available to the Compact Commission copies of the Rio Grande and La Plata Compacts. Judge Stone agreed to send them this material, together with copies of the proceedings.

Mr. Seavey: "Then is it agreed that Montana go ahead with its survey of water rights as planned?"
Mr. Metz: "Yes for Wyoming."

Mr. Whitney: "It is agreeable with North Dakota."

Mr. Seavey: Since Montana is including information of the actual use of water at present in its survey, would Wyoming and North Dakota be willing to collect this information in their states to supplement the water right filings?

Mr. Metz: I cannot speak definitely for the State Engineer, but I believe that Wyoming would rather accept the Bureau of Reclamation survey of water use. The water use in Wyoming is less than the decreed appropriations.

Mr. Whitney: We will cooperate to the fullest extent possible and get as much information as we can.

Mr. Wing: When this work was initiated two years ago we prepared an outline which each state was to follow in collecting data. We will send a copy of the outline to North Dakota.

There followed a discussion on the type of progress report that should be prepared. It was agreed that the Federal Power Commission would submit to each state copies of the report which it now has in draft form. Each state would be requested to criticize the report and to make any necessary corrections. It might then be found advisable to submit an abridged report to the state legislatures in order to keep them informed of the general direction of the negotiations. An effort will be made to have the abridged report prepared by January 1941.

The meeting adjourned at 4:30 p.m.

A list of those attending the meeting is given on the following page.

(1) Mr. Bishop was not present at this time.
<table>
<thead>
<tr>
<th>Name</th>
<th>Organization and Title</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clyde L. Seavey</td>
<td>Member, Federal Power Commission</td>
<td>Washington, D. C.</td>
</tr>
<tr>
<td>E. B. Winter</td>
<td>Montana Member, Compact Commission</td>
<td>Miles City, Montana</td>
</tr>
<tr>
<td>H. P. McColly</td>
<td>Secretary and Chief Engineer, North Dakota Water Conservation Comm.</td>
<td>Bismarck, N. D.</td>
</tr>
<tr>
<td>Frank P. Whitney</td>
<td>N. D. Member, Compact Commission</td>
<td>Dickinson, N.D.</td>
</tr>
<tr>
<td>Lt. Col. Wm. M. Hoge</td>
<td>District Engineer, U.S. Engineer Department</td>
<td>Omaha, Nebraska</td>
</tr>
<tr>
<td>W. G. Sloan</td>
<td>U. S. Bureau of Reclamation</td>
<td>Denver, Colorado</td>
</tr>
<tr>
<td>H. M. Tice</td>
<td>Assistant State Engineer</td>
<td>Helena, Montana</td>
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<tr>
<td>J. W. Emmert</td>
<td>Yellowstone National Park</td>
<td>Yellowstone Park</td>
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<tr>
<td>Wesley A. D'Evart</td>
<td>Montana Member, Compact Commission</td>
<td>Wilsall, Montana</td>
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<tr>
<td>E. Walter Hunke</td>
<td>State Supervisor, W.P.A. Research Projects</td>
<td>State College, Montana</td>
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<tr>
<td>O. W. Monson</td>
<td>Montana State College</td>
<td>Bozeman, Montana</td>
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<tr>
<td>Carl G. Krueger</td>
<td>Forest Supervisor, Shoshone National Forest</td>
<td>Bozeman, Montana</td>
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<tr>
<td>Clifford H. Stone</td>
<td>National Resources Planning Board</td>
<td>Cody, Wyoming</td>
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<tr>
<td>L. A. Campbell</td>
<td>Forest Service, Region 1</td>
<td>Denver, Colorado</td>
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<tr>
<td>Walter L. Schipull</td>
<td>Forest Service, Region 2</td>
<td>Missoula, Montana</td>
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<tr>
<td>Fred E. Buck</td>
<td>Secretary, Montana State Planning Board</td>
<td>Denver, Colorado</td>
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<tr>
<td>L. C. Bishop</td>
<td>Wyoming State Engineer and Wyoming Inter-state Streams Commissioner</td>
<td>Helena, Montana</td>
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<td>E. B. Donohue</td>
<td>Montana Member, Compact Commission</td>
<td>Cheyenne, Wyoming</td>
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<td>C. J. Doussman</td>
<td>Attorney, Montana Water Board</td>
<td>Helena, Montana</td>
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<tr>
<td>R. G. Lyman</td>
<td>W.P.A. District Supervisor, Water Resources Projects</td>
<td>Helena, Montana</td>
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<tr>
<td>Rockwood Brown</td>
<td>Montana Water Board and Member of Compact Commission</td>
<td>Billings, Montana</td>
</tr>
<tr>
<td>L. F. Thornton</td>
<td>Member, Wyoming Planning and Water Conservation Board; Member, Compact Commission</td>
<td>Thermopolis, Wyo.</td>
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<tr>
<td>Will G. Metz</td>
<td>Wyoming Member, Compact Commission</td>
<td>Buffalo, Wyo.</td>
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<tr>
<td>Kenneth R. L. Simmons</td>
<td>District Counsel, Indian Service</td>
<td>Billings, Montana</td>
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<tr>
<td>W. S. Henna</td>
<td>District Engineer, Indian Service</td>
<td>Billings, Montana</td>
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<tr>
<td>J. C. Cory</td>
<td>W.P.A.</td>
<td>Butte, Montana</td>
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<tr>
<td>C. Leon Anderson</td>
<td>Area Conservationist, Soil Conservation Service</td>
<td>Billings, Montana</td>
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<tr>
<td>Edgar Reeves</td>
<td>State Coordinator, Soil Conservation Service</td>
<td>Laramie, Wyoming</td>
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<tr>
<td>L. S. Wing</td>
<td>Federal Power Commission</td>
<td>Denver, Colorado</td>
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<tr>
<td>H. O. Caperton</td>
<td>Federal Power Commission</td>
<td>Denver, Colorado</td>
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Burke Draft, April 14, 1950
YELLOWSTONE RIVER COMPACT

The State of Montana, the State of North Dakota, and the State of Wyoming, being moved by consideration of interstate comity, and desiring to remove all causes of present and future controversy between said States and between persons in one and persons in another with respect to the waters of the Yellowstone River and its tributaries, other than waters within or waters which contribute to the flow of streams within the Yellowstone National Park, and desiring to provide for an equitable division and apportionment of such waters, and to encourage the beneficial development and use thereof, have resolved to conclude a Compact as authorized under the Act of Congress of the United States of America, approved June 2, 1949 (Public Law 83, 81st Congress, First Session), for the attainment of these purposes, and to that end, through their respective governments, have named as their respective Commissioners:

For the State of Montana:

For the State of North Dakota:

For the State of Wyoming:

who, after negotiations participated in by R. J. Newell, appointed as the representative of the United States of America, have agreed upon the following articles, to-wit:
ARTICLE I

A. Where the name of a State is used in this Compact, as a party thereto, it shall be construed to include the individuals, corporations, partnerships, associations, districts, administrative departments, bureaus, political subdivisions, agencies, persons, permittees, appropriators, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State.

B. Any individual, corporation, partnership, association, district, administrative department, bureau, political subdivision, agency, person, permittee, or appropriator authorized by or under the laws of a signatory State, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State, shall be subject to the terms of this Compact. Where the singular is used in this article, it shall be construed to include the plural.
ARTICLE II


B. The terms "Commission" and "Yellowstone River Compact Commission" mean the agency created as provided herein for the administration of this Compact.

C. The term "Yellowstone River Basin" means areas in Wyoming, Montana, and North Dakota drained by the Yellowstone River and its tributaries, and includes the area in Montana known as Lake Basin.

D. The term "Yellowstone River System" means the Yellowstone River and all of its tributaries, including springs and swamps, from their sources to the mouth of the Yellowstone River near Buford, North Dakota, except those portions thereof which are within or contribute to the flow of streams within the Yellowstone National Park.

E. The term "Tributary" means any stream which in a natural state contributes to the flow of the Yellowstone River, including interstate tributaries and tributaries thereof, but excluding those which are within or contribute to the flow of streams within the Yellowstone National Park.

F. The term "Interstate Tributaries" means the Clarks Fork, Yellowstone River; the Big Horn River; the Tongue River; and the Powder River; whose confluences with the Yellowstone River are respectively at or near the city (or town) of Laurel, Big Horn, Miles City, and Terry, all in the State of Montana.
G. The term "Point of Diversion" means the point or place at which water is taken or removed from the channel of the Yellowstone River or from any tributary thereof.

H. The terms "Divert" and "Diversion" mean the taking or removing of water from the Yellowstone River or any tributary thereof when the water so taken or removed is not returned directly into the channel of the Yellowstone River or of the tributary from which it is taken.

I. The term "Divertible Flow" means the quantity of water that could be diverted from the stream flow above a designated point of measurement during a specified period of time. It is comprised of three elements: (a) the total net inflow to storage; (b) the total diversions; and (c) the remaining flow in the stream at the designated point of measurement for which the divertible flow is being determined. It is computed as follows:

The algebraic sum of:

(a) The quantity of water (in acre-feet) that flowed into reservoirs situated above the point of measurement during the specified period of time; less the outflow and diversions made directly from reservoirs (in acre-feet) during the same period; plus

(b) The quantity of water (in acre-feet) that was diverted from the stream above the point of measurement (including diversions made directly from reservoirs) during the specified period of time; plus
(c) The quantity of water in the stream (in acre-feet) that flowed past the point of measurement for which divertible flows are being determined during the specified period of time.

J. The term "Mean Divertible Daily Flow" means the average divertible flow occurring during a twenty-four hour period, beginning at 12:00 midnight.

K. The term "Mean Daily Flow" at any point means the average stream flow occurring at that point during a twenty-four hour period, beginning at 12:00 midnight.

L. The term "Beneficial Use" is herein defined to be that use by which the water supply of a drainage basin is depleted when usefully employed by the activities of man, and includes water lost by evaporation, percolation, and other natural causes from streams, canals, ditches, irrigated areas, and reservoirs.
ARTICLE III

A. This Compact is entered into by each signatory State in the exercise of its sovereign powers for a governmental purpose, and its provisions shall be administered by a Commission, composed of one representative from each signatory State, to be known as the Yellowstone River Compact Commission. The State representatives on this Commission shall be selected in such manner as each signatory State shall choose. The State Engineer of each signatory State, or other similar official, shall be and act as the State representative on the Commission at all times when a vacancy may exist thereon either from failure to designate a method of selection or otherwise. The President of the United States shall be requested by the Commission to designate a representative of the United States to sit with such Commission, and such representative of the United States, if designated by the President, shall, when present, act as Chairman of the Commission without vote.

B. The salaries and necessary expenses of each State representative shall be paid by the respective State; all other expenses incident to the administration of this Compact not borne by the United States shall be allocated to and borne by each state as follows: one-fifth by the State of North Dakota; and two-fifths each by the States of Montana and Wyoming.

C. In addition to other powers and duties herein conferred upon the Commission and the members thereof, the jurisdiction of the Commission shall include the collection, correlation, and presentation
or factual data, the maintenance of records having a bearing upon the administration of this Compact, and, by unanimous action, the making of recommendations to the respective States upon matters connected with the administration of this Compact. In connection with the performance of its duties hereunder, the Commission may employ such services and make such expenditures as may be reasonably necessary, within the limit of funds provided for that purpose by the respective States. The Commission shall compile a report for each year ending September 30th, and shall transmit it to the Governors of the signatory States on or before December 31st of that year.

D. The Secretary of War; the Secretary of the Interior; the Secretary of Agriculture; the Chairman, Federal Power Commission; the Chief, Federal Weather Bureau, or comparable officers of whatever Federal agencies may succeed to the functions and duties of these agencies, and such other Federal officers and officers of appropriate agencies of the signatory States having services or data useful or necessary to the Compact Commission, shall cooperate, ex-officio, with the Commission in the execution of its duty in the collection, correlation, and publication of records and data necessary for the proper administration of the Compact; and these officers may perform such other services related to the Compact as may be mutually agreed on with the Commission.

E. The Commission shall have power to formulate rules of procedure, rules and regulations, and to perform any and all acts it may find necessary to carry out the provisions of this Compact, and to prescribe, issue, make, amend, and rescind such orders, rules, and
regulations. All rules of procedure, rules, and regulations of the
Commission shall be filed in the Office of the State Engineer of
each signatory State and shall be kept in a convenient form for
public inspection and examination during reasonable business hours.

F. The Commission herein authorized shall have power to sue and
be sued in its official capacity in any Federal Court of the signatory
States, and may adopt and use an official seal which shall be
judicially noticed.
ARTICLE IV

The Commission shall itself, or in conjunction with other responsible agencies, cause to be established, maintained, and operated such suitable water gaging and evaporation stations as it finds necessary in connection with its duties.
ARTICLE V

A. The States of Montana, North Dakota, and Wyoming hereby agree that the waters of the Yellowstone River and its interstate tributaries shall be apportioned among said States as follows:

1. Clarks Fork, Yellowstone River.

All existing rights to the beneficial use of the waters of the Clarks Fork Basin in the States of Montana and Wyoming valid under the laws of these States as of January 1, 1950, are hereby recognized and shall be and remain unimpaired by this Compact.

The total unused or unappropriated divertible flow of the Clarks Fork River Basin is divided:

40% to Montana
60% to Wyoming
2. Big Horn River (Exclusive of Little Horn River).

Subject to existing Indian Treaty Rights, all existing rights to the beneficial use of the waters of the Big Horn River Basin in the States of Montana and Wyoming, valid under the laws of these States as of January 1, 1950, are hereby recognized and shall be and remain unimpaired by this Compact: Provided, That at times when insufficient water is available to supply all existing rights in both States the water that is available will be apportioned to rights in the two States on the basis of priority of rights in the two States.

The total unused or unapportioned divertible flow of the Big Horn River Basin is divided:

____% to Montana

____% to Wyoming

(The percentages are to be based on potential irrigable areas in the two States as determined by the Engineering Committee and approved by the Compact Commissioners.)
3. **Tongue River**

Appropriative rights to the beneficial uses of the water of the Tongue River System existing in each signatory State as of January 1, 1950, shall continue to be enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation.

Wyoming and Montana agree that the unappropriated waters of the Tongue River System subsequent to January 1, 1950, shall be allocated to each State as follows:

- 60% to Montana
- 40% to Wyoming
1. **Powder River (Exclusive of Little Powder River).**

All existing rights to the beneficial use of the waters of the Powder River in the States of Montana and Wyoming valid under the laws of those States as of January 1, 1950, are hereby recognized and shall be and remain unimpaired by this Compact.

The total unused or unappropriated divertible flow of the Powder River Basin is divided:

- 58% to Montana
- 42% to Wyoming
5. Yellowstone River—Main Stem (Near Montana-North Dakota State Line).

During the period May 1st to September 30th, inclusive, of each year, lands within the Yellowstone River Basin in Montana and in North Dakota below Intake, Montana, shall be entitled to the beneficial use of the available residual flow of the waters of the Yellowstone River below Intake, Montana, on a pro rata basis of acreage irrigated.
B. From time to time following the consummation of this Compact, the Commission shall re-examine the allocations made under part "A" of this article and shall, after reaching unanimous agreement, make such modifications in these allotments as are fair, just, and equitable, giving consideration among other factors to:

(a) Priorities of water rights;
(b) Acreage irrigated;
(c) Acreage irrigable under existing works; and
(d) Potentially irrigable lands.

Provided, That if the Commission should fail to reach unanimous agreement as to the modification of any allotment provided for in this article, then, as to the stream affected, the allotment then existing shall continue in full force and effect until unanimous agreement thereon be reached; and

Provided further, That changes and amendments that are substantive and are not modifications of allotment as herein provided shall be subject to Article XII.
C. The allocations made herein shall be exclusive of the use of the waters for domestic and stock use, and each signatory State shall be allowed unrestricted use for these purposes, except that no reservoir for such use shall exceed 20 acre-feet in capacity.
D. It is recognized that variable climatic conditions, stream
flow regulation, the administration of the interstate tributaries in
Wyoming and Montana, and other causes will produce diurnal and other
unavoidable variations and fluctuations in the stream flows at the
interstate measuring stations, and it is agreed that in the perform-
ance of provisions of part "b" of this article and subsequent
modifications thereof, minor compensating irregularities and
fluctuations in the flow shall be permitted; but where any
deficiency of the mean daily flow at an interstate measuring
station may be occasioned by neglect, error, or failure in the
performance of the duty of the upstream-state water officials
having charge of the administration of the diversions from the
stream, each such deficiency shall be made up within the next
succeeding period of 72 hours by delivery of additional flow at
the interstate measuring station over and above the amount allotted,
sufficient to compensate for such deficiency. Notwithstanding the
allocations of this Compact, the Commission, in its administration,
shall direct the regulation of the streams within each of the
signatory States to avoid unreasonable carriage losses.
ARTICLE VI

All rights to the beneficial use of the waters of the Yellowstone River System, heretofore and hereafter established under the laws of any signatory State, shall be satisfied solely from the portion of the water allotted to that State as provided in Article V.
ARTICLE VII

Notwithstanding all other provisions in this Compact, the apportionment of water for which provision is made in this Compact is subject to the first and prior water rights reserved for Indians, for Indian tribes, and for Indian reservations, whether such first and prior water rights of the Indians are inchoate or covered by Federal Court decrees at the date of this Compact.
ARTICLE VIII

A. A lower signatory State shall have the right, by compliance with the laws of an upper signatory State, to file application for and receive permits to appropriate and use any waters in the Yellowstone River System not specifically apportioned to or appropriated by such upper State as provided in Article V; and to construct or participate in the construction and use of any dam, storage reservoir, or diversion works in such upper State for the purpose of conserving and regulating water that may be apportioned to or appropriated by the lower State: Provided, That such right is subject to the rights of the upper State to control, regulate, and use the water apportioned to and appropriated by it: And provided further, That should an upper State elect, it may share in the use of any such facilities constructed by a lower State to the extent of its reasonable needs upon assuming or guaranteeing payment of its proportionate share of the cost of the construction, operation, and maintenance. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.
B. Each claim hereafter initiated for an appropriation of water in one signatory State for use in another signatory State shall be filed in the Office of the State Engineer of the signatory State in which the water is to be diverted, and a duplicate copy of the application including a map showing the character and location of the proposed facilities and the lands to be irrigated shall be filed in the Office of the State Engineer of the signatory State in which the water is to be used. If a portion or all the lands proposed to be reclaimed are located in a State other than the one in which the water is to be diverted, then, before approval of the application shall be granted, said application shall be checked against the records of the appropriate office of the State in which the water is to be used, and a notation shall be placed thereon by the officer in charge of such records to the effect that the land description does not indicate a conflict with existing water rights. All endorsements shall be placed on both the original and duplicate copies of all such maps filed, to the end that the records in both States may be complete and identical.
C. Appropriations may hereafter be adjudicated in the State in which the water is diverted, and where a portion or all of the lands irrigated are in another signatory State, such adjudications shall be confirmed in that State by the proper authority. Each adjudication is to conform with the laws of the State where the water is diverted and shall be recorded in the County and State where the water is used.
ARTICLE IX

A lower signatory State shall have the right upon compliance with the laws of an upper signatory State, to acquire in such upper State by purchase, or through exercise of the power of eminent domain, such easements and rights-of-way for the construction, operation, and maintenance of pumping plants, storage reservoirs, canals, conduits, and appurtenant works as may be required for the enjoyment of the privileges granted herein to such lower State. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.
ARTICLE X

Should any facilities be constructed by a lower signatory State in an upper signatory State under the provisions of Article VIII, the construction, operation, repairs, and replacements of such facilities shall be subject to the laws of the upper State. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.
ARTICLE XI

In the event water from another drainage basin shall be imported into the Yellowstone River Basin or transferred from one tributary basin to another by the United States, Montana, North Dakota, or Wyoming, or any of them jointly, the State having the right to the use of such water shall be given proper credit therefor in determining its share of the divertible flows apportioned in accordance with Article V herein.
ARTICLE XII

The provisions of this Compact shall remain in full force and effect until amended in the same manner as it is required to be ratified to become operative as provided in Article XVII.
ARTICLE XIII

No action taken by the Compact Commission shall be valid except by the unanimous consent of the Commissioners representing the signatory States.
ARTICLE XIV

This Compact may be terminated at any time by unanimous consent to (of) the signatory States, and upon such termination all rights then established hereunder shall continue unimpaired.
ARTICLE XV

Nothing in this Compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, in any Federal Court or the United States Supreme Court, for the protection of any right under this Compact or the enforcement of any of its provisions.
ARTICLE XVI

The physical and other conditions characteristic of the Yellowstone River and peculiar to the territory drained and served thereby and to the development thereof, have actuated the signatory States in the consummation of this Compact, and none of them nor the United States by its consent and approval, concedes thereby the establishment of any general principle or precedent with respect to other interstate streams.
ARTICLE XVII

This Compact shall become operative when approved by the Legislature of each of the signatory States and consented to and approved by the Congress of the United States.
ARTICLE XVIII

Nothing in this Compact shall be deemed:

(a) To impair or affect any rights or powers of the United States, its agencies, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin nor its capacity to acquire rights in and to the use of said waters;

(b) To subject any property of the United States, its agencies, or instrumentalities to taxation by any State or subdivision thereof, nor to create an obligation on the part of the United States, its agencies, or instrumentalities, by reason of the acquisition, construction, or operation of any property or works of whatsoever kind, to make any payments to any State or political subdivision thereof, State agency, municipality, or entity whatsoever in reimbursement for the loss of taxes;

(c) To subject any property of the United States, its agencies, or instrumentalities, to the laws of any State to an extent other than the extent to which these laws would apply without regard to the Compact.
ARTICLE XIX

Should a Court of competent jurisdiction hold any part of this Compact to be contrary to the constitution of any signatory State or of the United States, all other severable provisions of this Compact shall continue in full force and effect.
IN WITNESS WHEREOF the Commissioners have signed this Compact in quadruplicate original, one of which shall be filed in the archives of the Department of State of the United States of America and shall be deemed the authoritative original, and of which a duly certified copy shall be forwarded to the Governor of each signatory State.

Done at the City of __________ in the State of __________, this ___ day of ________, in the year of Our Lord, One Thousand Nine Hundred and ________.

Commissioners for the State of Montana:

Commissioners for the State of North Dakota:

Commissioners for the State of Wyoming:

"I have participated in the negotiation of this Compact and intend to report favorably thereon to the Congress of the United States.

R. J. Newell,
Representative of the United States of America"
Engineering Committee Draft
Engineering Committee Draft of Compact
YELLOWSTONE RIVER COMPACT

The State of Montana, the State of North Dakota, and the State of Wyoming, being moved by consideration of interstate comity, and desiring to remove all causes of present and future controversy between said States and between persons in one and persons in another with respect to the waters of the Yellowstone River and its tributaries, other than waters within or waters which contribute to the flow of streams within the Yellowstone National Park, and desiring to provide for an equitable division and apportionment of such waters, and to encourage the beneficial development and use thereof, have resolved to conclude a Compact as authorized under the Act of Congress of the United States of America, approved June 2, 1949 (Public Law 83, 81st Congress, First Session), for the attainment of these purposes, and to that end, through their respective governments, have named as their respective Commissioners:

For the State of Montana:

For the State of North Dakota:

For the State of Wyoming:

who, after negotiations participated in by R. J. Newell, appointed as the representative of the United States of America, have agreed upon the following articles, to-wit:
ARTICLE I

A. Where the name of a State is used in this Compact, as a party thereto, it shall be construed to include the individuals, corporations, partnerships, associations, districts, administrative departments, bureaus, political subdivisions, agencies, persons, permittees, appropriators, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State.

B. Any individual, corporation, partnership, association, district, administrative department, bureau, political subdivision, agency, person, permittee, or appropriator authorized by or under the laws of a signatory State, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State, shall be subject to the terms of this Compact. Where the singular is used in this article, it shall be construed to include the plural.
ARTICLE II

A. The State of Montana, the State of North Dakota, and the State of Wyoming are hereinafter designated as "Montana," "North Dakota," and "Wyoming," respectively.

B. The terms "Commission" and "Yellowstone River Compact Commission" mean the agency created as provided herein for the administration of this Compact.

C. The term "Yellowstone River Basin" means areas in Wyoming, Montana, and North Dakota drained by the Yellowstone River and its tributaries, and includes the area in Montana known as Lake Basin.

D. The term "Yellowstone River System" means the Yellowstone River and all of its tributaries, including springs and swamps, from their sources to the mouth of the Yellowstone River near Buford, North Dakota, except those portions thereof which are within or contribute to the flow of streams within the Yellowstone National Park.

E. The term "Tributary" means any stream which in a natural state contributes to the flow of the Yellowstone River, including interstate tributaries and tributaries thereof, but excluding those which are within or contribute to the flow of streams within the Yellowstone National Park.

F. The term "Interstate Tributaries" means the Clarks Fork, Yellowstone River; the Big Horn River (except Little Big Horn River); the Tongue River; and the Powder River, whose confluences with the Yellowstone River are respectively at or near the city (or town) of Laurel, Big Horn, Miles City, and Terry, all in the State of Montana.
G. The terms "Divert" and "Diversion" mean the taking or removing of water from the Yellowstone River or any tributary thereof when the water so taken or removed is not returned directly into the channel of the Yellowstone River or of the tributary from which it is taken.

H. The term "Beneficial Use" is herein defined to be that use by which the water supply of a drainage basin is depleted when usefully employed by the activities of man, and includes water lost by evaporation, percolation, and other natural causes from streams, canals, ditches, irrigated areas, and reservoirs.

I. The term "Domestic Use" shall mean the use of water by an individual, or by a family unit or household for drinking, cooking, laundering, sanitation and other personal comforts and necessities; and for the irrigation of a family garden or orchard not exceeding one-half acre in area.

J. The term "Stock Water Use" shall mean the use of water for livestock and poultry.
ARTICLE III

A. It is considered that no Commission or administrative body is necessary to administer this Compact or divide the waters of the Yellowstone River Basin as between the States of Montana and North Dakota. The provisions of this Compact, as between the States of Wyoming and Montana, shall be administered by a Commission composed of one representative from the State of Wyoming and one representative from the State of Montana, to be selected by the Governors of said States as such States may choose, and one representative selected by the Director of the United States Geological Survey or whatever Federal agency may succeed to the functions and duties of that agency, to be appointed by him at the request of the States to sit with the Commission and who shall, when present, act as Chairman of the Commission without vote, except as herein provided.

Recommended Alternate:

A. The provisions of this Compact shall be administered by a Commission composed of the State Engineers of the signatory States, and one representative selected by the Director of the United States Geological Survey or whatever Federal agency may succeed to the functions and duties of that agency, to be appointed by him at the request of the States to sit with the Commission and who shall, when present, act as Chairman of the Commission without vote, except as herein provided. In matters concerning two States only, the representatives of those states, and the Federal
representative, shall constitute the Commission, in which case the Federal representative shall have a vote. All decisions of the Commission shall be by majority vote, except as provided in paragraph F of Article V (this exception to be deleted if recommendation as to paragraph F of Article V is adopted).

B. The salaries and necessary expenses of each State representative shall be paid by the respective State; all other expenses incident to the administration of this Compact not borne by the United States shall be allocated to and borne one-half by the State of Wyoming and one-half by the State of Montana.

Recommended Alternate:

B. The salaries and necessary expenses of each State representative shall be paid by the respective State; all other expenses incident to the administration of this Compact not borne by the United States shall be allocated to and borne by the signatory States as follows:

<table>
<thead>
<tr>
<th>State</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>North Dakota</td>
<td>10%</td>
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<tr>
<td>Montana</td>
<td>45%</td>
</tr>
<tr>
<td>Wyoming</td>
<td>45%</td>
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</table>

C. In addition to other powers and duties herein conferred upon the Commission and the members thereof, the jurisdiction of the Commission shall include the collection, correlation, and presentation of factual
data, the maintenance of records having a bearing upon the administration of this Compact, and recommendations to such States upon matters connected with the administration of this Compact, and the Commission may employ such services and make such expenditures as reasonable and necessary within the limit of funds provided for that purpose by the respective States, and shall compile a report for each year ending September 30 and transmit it to the Governors of the signatory States on or before December 31 of each year.

D. The Secretary of Defense; the Secretary of the Interior; the Secretary of Agriculture; the Chairman, Federal Power Commission; the Secretary of Commerce, or comparable officers of whatever Federal agencies may succeed to the functions and duties of these agencies, and such other Federal officers and officers of appropriate agencies of the signatory States having services or data useful or necessary to the Compact Commission, shall cooperate, ex-officio, with the Commission in the execution of its duty in the collection, correlation, and publication of records and data necessary for the proper administration of the Compact; and these officers may perform such other services related to the Compact as may be mutually agreed upon with the Commission.

E. The Commission shall have power to formulate rules and regulations and to perform any act which they may find necessary to carry out the provisions of this Compact, and to amend such rules and regulations. All such rules and regulations shall be filed in the office of the State Engineer of each of the signatory States for public inspection.
F. In case of the failure of the representatives of Wyoming and Montana to unanimously agree on any matter necessary to the proper administration of this Compact, then the Federal representative shall have the right to vote upon the matters in disagreement and such points of disagreement shall then be decided by a majority vote of the representatives of the States of Wyoming and Montana and said Federal representative, each being entitled to one vote.

Recommended Alternate:

Omit paragraph F if alternates A and B are adopted.

G. The Commission herein authorized shall have power to sue and be sued in its official capacity in any Federal Court of the signatory States, and may adopt and use an official seal which shall be judicially noticed.
ARTICLE IV

The Commission shall itself, or in conjunction with other responsible agencies, cause to be established, maintained, and operated such suitable water gaging and evaporation stations as it finds necessary in connection with its duties.
ARTICLE V

A. Appropriative rights to the beneficial uses of the water of the Yellowstone River System existing in each signatory State as of January 1, 1950, shall continue to be enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation.

B. The unused and unappropriated waters of the interstate tributaries of the Yellowstone River, exclusive of uses coming within the provisions of paragraph E of this Article V, are hereby allocated to each State for storage or direct diversion as follows:

1. Clarks Fork, Yellowstone River
   a. To Wyoming  60%
      To Montana  40%
   b. The point of measurement shall be below the last diversion from Clarks Fork above Rock Creek.

2. Big Horn River (Exclusive of Little Big Horn River)
   This paragraph being referred to Big Horn representatives and will be inserted later.

3. Tongue River
   a. To Wyoming  40%
      To Montana  60%
   b. The point of measurement shall be below the last diversion from the Tongue River above its junction with the Yellowstone River.
Article V, Paragraph B:

2. **Big Horn River (Exclusive of Little Big Horn River)**
   
a. To Wyoming 80%
   
   To Montana 20%

   b. The point of measurement shall be below the last diversion from the Big Horn River above its junction with the Yellowstone River, and the inflow of the Little Big Horn River shall be excluded from the quantity of water subject to allocation.
1. Powder River (including the Little Powder River)
   a. To Wyoming  42%
      To Montana  58%
   b. The point of measurement shall be below the last diversion from the Powder River above its junction with the Yellowstone River.

C. The quantity of water subject to the above percentage allocations shall be determined on an annual water year basis measured from October 1st of any year through September 30th of the succeeding year. The quantity to which the percentage factors shall be applied through a given date in any water year shall be, in acre-feet, equal to the algebraic sum of:

   1. The total diversions, in acre-feet, above the point of measurement, for irrigation, municipal, and industrial uses in Wyoming and Montana developed after January 1, 1950, during the period from October 1st to that given date;

   2. The net change in storage, in acre-feet, in all reservoirs in Wyoming and Montana above the point of measurement completed subsequent to January 1, 1950, during the period from October 1st to that given date;

   3. The net change in storage, in acre-feet, in existing reservoirs in Wyoming and Montana above the point of measurement, which is used for irrigation, municipal, and industrial purposes developed after January 1, 1950, during the period October 1st to that given date;

   4. The quantity of water, in acre-feet, that passed the point of measurement in the stream during the period from October 1st to that given date.
D. All existing rights to the beneficial use of waters of the Yellowstone River in the States of Montana and North Dakota, below Intake, Montana, valid under the laws of these States as of January 1, 1950, are hereby recognized and shall be and remain unimpaired by this Compact. During the period May 1 to September 30, inclusive, of each year, lands within Montana and North Dakota shall be entitled to the beneficial use of the flow of waters of the Yellowstone River below Intake, Montana, on a proportionate basis of acreage irrigated. Waters of tributary streams, having their origin in North Dakota, situated entirely therein and flowing into the Yellowstone River below Intake, Montana, are allotted to North Dakota.

E. There are hereby excluded from the provisions of this Compact:

1. Existing and future domestic and stock water uses of water: Provided, That the capacity of any reservoir for stock water so excluded shall not exceed 20 acre-feet;

2. Supplemental water for use on lands under existing developments.

F. From time to time the Commission shall re-examine the allocations herein made and upon unanimous agreement may recommend modifications therein as are fair, just, and equitable, giving consideration among other factors to:

Priorities of water rights;

---

Acreage irrigated;
Acreage irrigable under existing works; and
Potentially irrigable lands.

Recommended Alternate:

Omit paragraph F.
ARTICLE VI

Nothing contained in this Compact shall be so construed or interpreted as to affect adversely any rights to the use of the waters of Yellowstone River and its tributaries owned by or for Indians, Indian tribes, and their reservations.
ARTICLE VII

A. A lower signatory State shall have the right, by compliance with the laws of an upper signatory State, except as to legislative consent, to file application for and receive permits to appropriate and use any waters in the Yellowstone River System not specifically apportioned to or appropriated by such upper State as provided in Article V; and to construct or participate in the construction and use of any dam, storage reservoir, or diversion works in such upper State for the purpose of conserving and regulating water that may be apportioned to or appropriated by the lower State: Provided, That such right is subject to the rights of the upper State to control, regulate, and use the water apportioned to and appropriated by it: And provided further, That should an upper State elect, it may share in the use of any such facilities constructed by a lower State to the extent of its reasonable needs upon assuming or guaranteeing payment of its proportionate share of the cost of the construction, operation, and maintenance. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.

B. Each claim hereafter initiated for an appropriation of water in one signatory State for use in another signatory State shall be filed in the Office of the State Engineer of the signatory State in which the water is to be diverted, and a duplicate copy of the application or notice shall be filed in the office of the State Engineer of the signatory State in which the water is to be used.
C. Appropriations may hereafter be adjudicated in the State in which the water is diverted, and where a portion or all of the lands irrigated are in another signatory State, such adjudications shall be confirmed in that State by the proper authority. Each adjudication is to conform with the laws of the State where the water is diverted and shall be recorded in the County and State where the water is used.
ARTICLE VIII

A lower signatory State shall have the right to acquire in an upper State by purchase, or through exercise of the power of eminent domain, such lands, easements, and rights-of-way for the construction, operation, and maintenance of pumping plants, storage reservoirs, canals, conduits, and appurtenant works as may be required for the enjoyment of the privileges granted herein to such lower State. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.
ARTICLE IX

Should any facilities be constructed by a lower signatory State in an upper signatory State under the provisions of Article VII, the construction, operation, repairs, and replacements of such facilities shall be subject to the laws of the upper State. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.
ARTICLE X

In the event water from another drainage basin shall be imported into the Yellowstone River Basin or transferred from one tributary basin to another by the United States, Montana, North Dakota, or Wyoming, or any of them jointly, the State having the right to the use of such water shall be given proper credit therefor in determining its share of the water apportioned in accordance with Article V herein.
ARTICLE XI

The provisions of this Compact shall remain in full force and effect until amended in the same manner as it is required to be ratified to become operative as provided in Article XV.
ARTICLE XII

This Compact may be terminated at any time by unanimous consent of the signatory States, and upon such termination all rights then established hereunder shall continue unimpaired.
ARTICLE XIII

Nothing in this Compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, in any Federal Court or the United States Supreme Court, for the protection of any right under this Compact or the enforcement of any of its provisions.
ARTICLE XIV

The physical and other conditions characteristic of the Yellowstone River and peculiar to the territory drained and served thereby and to the development thereof, have actuated the signatory States in the consummation of this Compact, and none of them, nor the United States by its consent and approval, concedes thereby the establishment of any general principle or precedent with respect to other interstate streams.
ARTICLE XV

This Compact shall become operative when approved by the Legislature of each of the signatory States and consented to and approved by the Congress of the United States.
ARTICLE XVI...

Nothing in this Compact shall be deemed:

(a) To impair or affect any rights or powers of the United States, its agencies, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin nor its capacity to acquire rights in and to the use of said waters;

(b) To subject any property of the United States, its agencies, or instrumentalities to taxation by any State or subdivision thereof, nor to create an obligation on the part of the United States, its agencies, or instrumentalities, by reason of the acquisition, construction, or operation of any property or works of whatsoever kind, to make any payments to any State or political subdivision thereof, State agency, municipality, or entity whatsoever in reimbursement for the loss of taxes;

(c) To subject any property of the United States, its agencies, or instrumentalities, to the laws of any State to an extent other than the extent to which these laws would apply without regard to the Compact.
ARTICLE XVII

Should a Court of competent jurisdiction hold any part of this Compact to be contrary to the constitution of any signatory State or of the United States, all other severable provisions of this Compact shall continue in full force and effect.
ARTICLE XVIII

No sentence, phrase, or clause in this Compact or in any provision thereof, shall be construed or interpreted to divest any signatory State or any of the agencies or officers of such States of the jurisdiction of the water of each State as apportioned in this Compact.
IN WITNESS WHEREOF the Commissioners have signed this Compact in quadruplicate original, one of which shall be filed in the archives of the Department of State of the United States of America and shall be deemed the authoritative original, and of which a duly certified copy shall be forwarded to the Governor of each signatory State.

Done at the City of __________ in the State of __________, this ___ day of __________, in the year of Our Lord, One Thousand Nine Hundred and __________.

Commissioners for the State of Montana:

Commissioners for the State of North Dakota:

Commissioners for the State of Wyoming:

"I have participated in the negotiation of this Compact and intend to report favorably thereon to the Congress of the United States.

R. J. Newell, Representative of the United States of America."
ARTICLE V
Paragraph B
Subparagraph 2

Alternate No. 1

2. Big Horn River (Exclusive of Little Big Horn River)
   
   a. To Wyoming  82%
      To Montana  18%
   
      Provided, That when new land to the extent of 46,000 acres in Montana or 211,250 acres in Wyoming, shall have been irrigated subsequent to January 1, 1950, the remaining unused and unappropriated water in excess of that required for the irrigation of 46,000 acres in Montana and 211,250 acres in Wyoming shall be apportioned between the States of Montana and Wyoming, as provided in Article XI, on the basis of the then estimated ultimate requirements of each State:
      
      And provided further, That such additional apportionment shall not be made before January 1, 1970.
   
   b. The point of measurement shall be below the last diversion from the Big Horn River above its junction with the Yellowstone River, and the inflow of the Little Big Horn River shall be excluded from the quantity of water subject to allocation.
Alternate No. 2

2. Big Horn River (Exclusive of Little Big Horn River)
   a. The first 1,250,000 acre-feet of unused and unappropriated water subject to allocation under this Compact shall be divided as follows:
      To Wyoming  82%
      To Montana  18%
   b. When either State shall have beneficially applied its share of the water allocated in subparagraph 2.a. of paragraph B of this Article V, an agreement shall be made between the States of Montana and Wyoming for an equitable division of the remaining unused water in excess of the above allocation on a basis of need within the Big Horn River Basin in the two States; Provided, That said additional apportionment shall not be made before January 1, 1970.
   c. The point of measurement shall be below the last diversion from the Big Horn River above its junction with the Yellowstone River, and the inflow of the Little Big Horn River shall be excluded from the quantity of water subject to allocation.
ARTICLE V
Paragraph B
Subparagraph 2

Alternate No. 1

2. Big Horn River (Exclusive of Little Big Horn River)
   a. To Wyoming 82%
      To Montana 18%

   Provided, That when new land to the extent of 46,000 acres in Montana or 211,250 acres in Wyoming, shall have been irrigated subsequent to January 1, 1950, the remaining unused and unappropriated water in excess of that required for the irrigation of 46,000 acres in Montana and 211,250 acres in Wyoming shall be apportioned between the States of Montana and Wyoming, as provided in Article XI, on the basis of the then estimated ultimate requirements of each State:

And provided further, That such additional apportionment shall not be made before January 1, 1970.

b. The point of measurement shall be below the last diversion from the Big Horn River above its junction with the Yellowstone River, and the inflow of the Little Big Horn River shall be excluded from the quantity of water subject to allocation.
Alternate No. 2

2. Big Horn River (Exclusive of Little Big Horn River)
   a. The first 140,000,000 acre-feet of unused and unappropriated water subject to allocation under this Compact shall be divided as follows:
      To Wyoming  82%
      To Montana  18%

   b. When either State shall have beneficially applied its share of the water allocated in subparagraph 2.a. of paragraph B of this Article V, an agreement shall be made between the States of Montana and Wyoming for an equitable division of the remaining unused water in excess of the above allocation on a basis of need within the Big Horn River Basin in the two States; Provided, That said additional apportionment shall not be made before January 1, 1970.

   c. The point of measurement shall be below the last diversion from the Big Horn River above its junction with the Yellowstone River, and the inflow of the Little Big Horn River shall be excluded from the quantity of water subject to allocation.
Myers Draft, September 18, 1950, with cover letter
Memorandum

To: Fred Buck, Helena, Montana
    Earl Lloyd, Cheyenne, Wyoming
    W. S. Hanna, Billings, Montana
    J. J. Walsh, Bismarck, North Dakota

Subject: Draft of Compact

There is enclosed a rough draft of a possible Compact which I hope you can look over before our next meeting. It is based on these principles:

a. Existing rights are to be undisturbed and not administered under the Compact.

b. Each State is to be allotted sufficient water for its probable needs, to be consumptively used.

c. That the provisions made for the Yellowstone River will fit into any future Compact covering more, or all, of the Missouri River Basin.

d. That the total water production of an interstate basin is to be stored by the States concerned on the same basis. That is, an upper State is entitled to no special privilege by reason of its geography, and a lower State must include in the compacted water its own intrastate production.

There are several variations of this theory that might be considered. Existing rights might be included, in which case the depletions would be in terms of virgin flow at the basin mouth; administration could be through state officials instead of by a Commission; and apportionment might be on the basis of a moving 5 or 10 year average. You can think of others.

I had in mind that the consumptive use figures to be inserted would be made up as follows:
a. Consumptive use of potential and reasonably possible irrigable areas.

b. Losses from potential new reservoirs.

c. Miscellaneous expected uses, such as stock water, spreaders, and industrial uses.

d. A generous factor of safety.

All this should total considerably less than the annual run-off of the streams as now depleted. The balance will be available for appropriation as provided in Article IX and for future apportionment by the Commission.

Indian rights, though the draft does not specifically state, would come out of the State's apportionment, and their priorities would be exercised within the State. I know of no case to date where Indian priorities have been exercised across State lines, although I understand the Little Horn may provide one soon. At any rate, on the Big Horn this would actually involve Indians against Indians, since by the time a priority enforcement would be required the Indian rights in Wyoming would be about the only ones receiving water.

We will also want to consider including the Little Big Horn and Little Powder Rivers.

I am writing the Irma Hotel in Cody for reservations for Sunday night, September 24. I assume that we will finish in two days, arriving at Thermopolis on Tuesday night, and that Wednesday we will draft our report. Accordingly, I am writing the Carter Hotel for reservations on that date for all except Mr. Thornton. I am also having two members of our staff meet us there with aerial photos, maps, etc.

Very truly yours,

[Signature]

Carl L. Myers, Chairman
Engineering Committee
Yellowstone Compact Commission

Inclosure
YELLOWSTONE RIVER COMPACT

(Draft 9/18/50)

The State of Montana, the State of North Dakota, and the State of Wyoming, being moved by consideration of interstate comity, and desiring to remove all causes of present and future controversy between said States and between persons in one and persons in another with respect to the waters of the Yellowstone River and its tributaries, other than waters within or waters which contribute to the flow of streams within the Yellowstone National Park, and desiring to provide for an equitable division and apportionment of such waters, and to encourage the beneficial development and use thereof, have resolved to conclude a Compact as authorized under the Act of Congress of the United States of America, approved June 2, 1919 (Public Law 83, 61st Congress, First Session), for the attainment of these purposes, and to that end, through their respective governments, have named as their respective Commissioners:

For the State of Montana:

For the State of North Dakota:

For the State of Wyoming:

who, after negotiations participated in by R. J. Newell, appointed as the representative of the United States of America, have agreed upon the following articles, to-wit:
ARTICLE I

A. Where the name of a State is used in this Compact, as a party thereto, it shall be construed to include the individuals, corporations, partnerships, associations, districts, administrative departments, bureaus, political subdivisions, agencies, persons, permittees, appropriators, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State.

B. Any individual, corporation, partnership, association, district, administrative department, bureau, political subdivision, agency, person, permittee, or appropriator authorized by or under the laws of a signatory State, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State, shall be subject to the terms of this Compact. Where the singular is used in this article, it shall be construed to include the plural.
ARTICLE II


B. The terms "Commission" and "Yellowstone River Compact Commission" mean the agency created as provided herein for the administration of this Compact.

C. The term "Yellowstone River Basin" means areas in Wyoming, Montana, and North Dakota drained by the Yellowstone River and its tributaries, and includes the area in Montana known as Lake Basin.

D. The term "Yellowstone River System" means the Yellowstone River and all of its tributaries, including springs and swamps, from their sources to the mouth of the Yellowstone River near Buford, North Dakota, except those portions thereof which are within or contribute to the flow of streams within the Yellowstone National Park.

E. The term "Tributary" means any stream which in a natural state contributes to the flow of the Yellowstone River, including interstate tributaries and tributaries thereof, but excluding those which are within or contribute to the flow of streams within the Yellowstone National Park.

F. The terms "Divert" and "Diversion" mean the taking or removing of water from the Yellowstone River or any tributary thereof when the water so taken or removed is not returned directly into the channel of the Yellowstone River or of the tributary from which it is taken.
G. The term "Beneficial Use" is herein defined to be that use by which the water supply of a drainage basin is depleted when usefully employed by the activities of man, and includes water lost by evaporation, percolation, and other natural causes from streams, canals, ditches, irrigated areas, and reservoirs.

H. The term "Established Rights" means rights to the beneficial use of surface water acquired under the laws of a signatory State prior to June 1, 1951.

I. The term "Acre-foot" means the quantity of water required to cover an acre to the depth of one foot, and is equivalent to 43,560 cubic feet.

J. The term "Domestic Use" shall mean the use of water by an individual, or by a family unit or household for drinking, cooking, laundry, sanitation, and other personal comforts and necessities, and for the irrigation of a family garden or orchard not exceeding one-half an acre in area.

K. The term "Stock Water Use" shall mean the use of water for livestock and poultry.
ARTICLE III

A. This Compact is entered into by each signatory State in the exercise of its sovereign powers for a governmental purpose, and its provisions shall be administered by a Commission, composed of one representative from each signatory State, to be known as the Yellowstone River Compact Commission. The State representatives on this Commission shall be selected in such manner as each signatory State shall choose. The State Engineer of each signatory State, or other similar official, shall be and act as the State representative on the Commission at all times when a vacancy may exist thereon either from failure to designate a method of selection or otherwise. The President of the United States shall be requested by the Commission to designate a representative of the United States to sit with such Commission, and such representative of the United States, if designated by the President, shall, when present, act as Chairman of the Commission without vote.

B. The salaries and necessary expenses of each State representative shall be paid by the respective State; all other expenses incident to the administration of this Compact not borne by the United States shall be allocated to and borne by each State as follows: One-fifth by the State of North Dakota; and two-fifths each by the States of Montana and Wyoming.

C. In addition to other powers and duties herein conferred upon the Commission and the members thereof, the jurisdiction of the Commission shall include the collection, correlation, and presentation
of factual data, the maintenance of records having a bearing upon the administration of this Compact, and, by unanimous action, the making of recommendations to the respective States upon matters connected with the administration of this Compact. In connection with the performance of its duties hereunder, the Commission may employ such services and make such expenditures as may be reasonably necessary, within the limit of funds provided for that purpose by the respective States. The Commission shall compile a report for each year ending September 30th, and shall transmit it to the President and to the Governors of the signatory States on or before December 31st of that year.

D. The Secretary of the Army; the Secretary of the Interior, the Secretary of Agriculture; the Chairman, Federal Power Commission; the Chief, Federal Weather Bureau, or comparable officers of whatever Federal agencies may succeed to the functions and duties of these agencies, and such other Federal officers and officers of appropriate agencies of the signatory States having services or data useful or necessary to the Compact Commission, shall cooperate, ex-officio, with the Commission in the execution of its duty in the collection, correlation, and publication of records and data necessary for the proper administration of the Compact; and these officers may perform such other services related to the Compact as may be mutually agreed on with the Commission.

E. The Commission shall have power to formulate rules of procedure, rules and regulations, and to perform any and all acts it may find necessary to carry out the provisions of this Compact, and to prescribe, issue, make, amend, and rescind such orders, rules, and regulations.
All rules of procedure, rules, and regulations of the Commission shall be filed in the Office of the State Engineer of each signatory State and shall be kept in a convenient form for public inspection and examination during reasonable business hours.

F. The Commission herein authorized shall have power to sue and be sued in its official capacity in any Federal Court of the signatory States, and may adopt and use an official seal which shall be judicially noticed.
ARTICLE IV

The Commission shall itself, or in conjunction with other responsible agencies, cause to be established, maintained, and operated such suitable water gaging and evaporation stations as it finds necessary in connection with its duties.
ARTICLE V

A. There is hereby apportioned from the Yellowstone River System in perpetuity to the States of North Dakota, Montana, and Wyoming, respectively, exclusive of established rights and other uses coming within the provisions of paragraph D of this Article V, the consumptive use per annum of water, as follows:

Main Stem Yellowstone River

To Montana _____ acre-feet
To North Dakota _____ acre-feet

Powder River

To Montana _____ acre-feet
To Wyoming _____ acre-feet

Tongue River

To Montana _____ acre-feet
To Wyoming _____ acre-feet

Big Horn River

To Montana _____ acre-feet
To Wyoming _____ acre-feet

Clarks Fork River

To Montana _____ acre-feet
To Wyoming _____ acre-feet

B. The apportionment made to the respective States by paragraph A hereof shall be determined on an annual water year basis measured from October 1 of any year through September 30 of the succeeding year.
C. The consumptive use of water, which use is apportioned in paragraph A hereof, shall be determined for each State by the inflow-outflow method in terms of man made depletions in addition to existing depletions as of January 1, 1951.

D. There are hereby excluded from the provisions of this Compact:

1. Existing and future domestic and stock water uses of water: Provided, That the capacity of any reservoir for stock water so excluded shall not exceed 10 acre-feet.

2. Established rights to the beneficial use of water in each signatating State existing on January 1, 1951, including losses from reservoirs constructed prior to January 1, 1951.
ARTICLE VI

A. In the event that stream flow in the Yellowstone River System should be insufficient to meet the apportionment made herein, the shortage shall be prorated between the States concerned, according to their respective apportionments made in Article V.

B. If a signatory State, in any water year, shall have consumptively used more water than it was entitled to use under the apportionment made in Article V, such State, upon demand of the lower State, shall deliver to the lower State during the next water year a quantity of water equal to its overdraft.
ARTICLE VII

All rights to the beneficial use of the waters of the Yellowstone River System, heretofore and hereafter established under the laws of any signatory State, shall be satisfied solely from the portion of the water allotted to that State as provided in Article V.
ARTICLE VIII

Notwithstanding all other provisions in this Compact, the apportionment of water for which provision is made in this Compact is subject to the first and prior water rights reserved for Indians, for Indian tribes, and for Indian reservations, whether such first and prior water rights of the Indians are inchoate or covered by Federal Court decrees at the date of this Compact.
ARTICLE IX

A. A lower signatory State shall have the right, by compliance with the laws of an upper signatory State, to file application for and receive permits to appropriate and use any waters in the Yellowstone River System not specifically apportioned to or appropriated by such upper State as provided in Article V; and to construct or participate in the construction and use of any dam, storage reservoir, or diversion works in such upper State for the purpose of conserving and regulating water that may be apportioned to or appropriated by the lower State: Provided, That such right is subject to the rights of the upper State to control, regulate, and use the water apportioned to and appropriated by it: And provided further, That should an upper State elect, it may share in the use of any such facilities constructed by a lower State to the extent of its reasonable needs upon assuming or guaranteeing payment of its proportionate share of the cost of the construction, operation, and maintenance. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.

B. Each claim hereafter initiated for an appropriation of water in one signatory State for use in another signatory State shall be filed in the Office of the State Engineer of the signatory State in which the water is to be diverted, and a duplicate copy of the application including a map showing the character and location of the proposed facilities and the lands to be irrigated shall be filed in the Office of the State Engineer of the
Signatory State in which the water is to be used. If a portion or all the lands proposed to be reclaimed are located in a State other than the one in which the water is to be diverted, then, before approval of the application shall be granted, said application shall be checked against the records of the appropriate office of the State in which the water is to be used, and a notation shall be placed thereon by the officer in charge of such records to the effect that the land description does not indicate a conflict with existing water rights. All endorsements shall be placed on both the original and duplicate copies of all such maps filed, to the end that the records in both States may be complete and identical.

C. Appropriations may hereafter be adjudicated in the State in which the water is diverted, and where a portion or all of the lands irrigated are in another signatory State, such adjudications shall be confirmed in that State by the proper authority. Each adjudication is to conform with the laws of the State where the water is diverted and shall be recorded in the County and State where the water is used.
ARTICLE X

A lower signatory State shall have the right upon compliance with the laws of an upper signatory State, to acquire in such upper State by purchase, or through exercise of the power of eminent domain, such easements and rights-of-way for the construction, operation, and maintenance of pumping plants, storage reservoirs, canals, conduits, and appurtenant works as may be required for the enjoyment of the privileges granted herein to such lower State. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.
ARTICLE XI

Should any facilities be constructed by a lower signatory State in an upper signatory State under the provisions of Article VIII, the construction, operation, repairs, and replacements of such facilities shall be subject to the laws of the upper State. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.
ARTICLE XII

In the event water from another drainage basin shall be imported into the Yellowstone River Basin or transferred from one tributary basin to another by the United States, Montana, North Dakota, or Wyoming, or any of them jointly, the State having the right to the use of such water shall be given proper credit therefor in determining its share of the water apportioned in accordance with Article V herein. Water diverted from one basin to another, within the Yellowstone River System, shall be charged as a consumptive use to the originating basin.
ARTICLE XIII

The provisions of this Compact shall remain in full force and effect until amended in the same manner as it is required to be ratified to become operative as provided in Article XVIII.
ARTICLE XIV

No action taken by the Compact Commission shall be valid except by the unanimous consent of the Commissioners representing the signatory States.
ARTICLE XV

This Compact may be terminated at any time by unanimous consent to (of) the signatory States, and upon such termination all rights then established hereunder shall continue unimpaired.
ARTICLE XVI

Nothing in this Compact shall be construed to limit or prevent any state from instituting or maintaining any action or proceeding, legal or equitable, in any Federal Court or the United States Supreme Court, for the protection of any right under this Compact or the enforcement of any of its provisions.
ARTICLE XVII

The physical and other conditions characteristic of the Yellowstone River and peculiar to the territory drained and served thereby and to the development thereof, have actuated the signatory States in the consummation of this Compact, and none of them, nor the United States by its consent and approval, concedes thereby the establishment of any general principle or precedent with respect to other interstate streams.
ARTICLE XVIII

At intervals of 10 years subsequent to the approval of this Compact, the Commission shall meet to consider the apportionment of such additional waters of the Yellowstone River System as may be surplus. Such additional apportionments shall become part of this Compact, and have the same force and effect as though included in the original apportionment.
ARTICLE XIX

This Compact shall become operative when approved by the Legislature of each of the signatory States and consented to and approved by the Congress of the United States.
ARTICLE XX

Nothing in this Compact shall be deemed:

(a) To impair or affect any rights or powers of the United States, its agencies, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin nor its capacity to acquire rights in and to the use of said waters;

(b) To subject any property of the United States, its agencies, or instrumentalities to taxation by any State or subdivision thereof, nor to create an obligation on the part of the United States, its agencies, or instrumentalities, by reason of the acquisition, construction, or operation of any property or works of whatsoever kind, to make any payments to any State or political subdivision thereof, State agency, municipality, or entity whatsoever in reimbursement for the loss of taxes;

(c) To subject any property of the United States, its agencies, or instrumentalities, to the laws of any State to an extent other than the extent to which these laws would apply without regard to the Compact.
ARTICLE XXI

Should a Court of competent jurisdiction hold any part of this Compact to be contrary to the constitution of any signatory State or of the United States, all other severable provisions of this Compact shall continue in full force and effect.
IN WITNESS WHEREOF the Commissioners have signed this Compact in quadruplicate original, one of which shall be filed in the archives of the Department of State of the United States of America and shall be deemed the authoritative original, and of which a duly certified copy shall be forwarded to the Governor of each signatory State.

Done at the City of _______ in the State of ________, this ________ day of ________, in the year of Our Lord, One Thousand Nine Hundred and ________.

Commissioners for the State of Montana:

Commissioners for the State of North Dakota:

Commissioners for the State of Wyoming:

"I have participated in the negotiation of this Compact and intend to report favorably thereon to the Congress of the United States."
Engineering Committee Minutes of Meeting
August 22-23, 1950
Memorandum Notes of Meeting of Drafting and Engineering Committee
Billings, Montana
August 22 and 23, 1950

A joint meeting of the representatives of the Drafting and Engineering Committees of the Yellowstone River Compact Commission was called to order by O. C. Reedy, Secretary, at 10:30 a.m. on August 22, 1950. Mr. Reedy requested he be excused from the meeting as he felt his presence unnecessary. During the course of the meeting Mr. Carl L. Myers was elected chairman. Those attending were:

August 22:  E. C. Gwillim
Earl Lloyd
H. T. Person
P. F. Leonard
Fred Buck
Fred Buck
J. J. Walsh
I. A. Acker
R. E. McNally
W. S. Hanna
Earl T. Bower
H. W. Bunston
L. F. Thornton
C. L. Myers

August 23:  E. C. Gwillim
Earl Lloyd
H. T. Person
Fred Buck
R. E. McNally
W. S. Hanna
Earl T. Bower
H. W. Bunston
C. L. Myers
G. J. Oravetz
H. A. Williams
F. H. Brown

The nonmembers of the committees who attended were invited by the various members of the committees as advisors or observers.

There was considerable discussion on potential irrigable areas. Mr. McNally stated that the compact’s principal purpose is to clear the way for new storage in both states, with the mouth of the Tongue River an exception. The Tongue River Dam will always have a problem—cost proposition, change of administration, etc. The question of who was going to pay for this was brought up by Mr. Hanna. The necessity to use flood water and surplus water for future development was stressed by Mr. Myers. Mr. Leonard brought out the fact that if Moorhead and Yellowtail were built, the water problems would probably be solved for 100 years. Mr. Myers told about talking to Mr. J. R. Riter of Denver about dividing by percentages and suggested the use of some other method. Mr. McNally commented on the possibility of putting responsibility of administration on the state engineers, as in the case of the Belle-Fourche and Cheyenne compacts, since the people don’t want a compact administered by a commission of three states. The power of state engineers was discussed, and it was found that the State Engineer of Montana did not have the same power as the State Engineer of Wyoming.

It was then recommended by Mr. Leonard that the compact written by Mr. Burke be reviewed and objections voiced. The changes proposed by Mr. Leonard were discussed, together with those of Mr. McNally for Wyoming. Drafts of these changes were circulated.
Reference was made to a letter Mr. McNally wrote to Mr. Burke dated August 17, enclosing a letter to Mr. Thornton from Mr. McNally dated August 9. These letters were read. The letter to Mr. Newell from President Truman was also referred to. Mr. Myers explained that it was not prepared by the Bureau of Reclamation, but probably by the Bureau of Budget in terms of all streams in the United States and covering everything from navigation to irrigation. It was pointed out that our recommendations will be made to Mr. Newell only.

Mr. Leonard stated that the Commission will be entitled only to water that has been stored and would otherwise go to waste, other supplies are subject to appropriation of the states and no one else. Mr. Myers discussed the use of across-the-line administration of water rights (existing and future).

Mr. Acker made the suggestion that Mr. Leonard write a compact for Montana and Mr. McNally write one for Wyoming, in order to find out definitely what each State expects. When the Commission meets again, they can be read together to eliminate parts disagreeing and combine parts agreeing.

Mr. Bunston then started his arguments on potential, reading several reports, letters, and quoting figures, together with a suggested formula for dividing water at present and in the future. The Bureau was criticized for not having a survey of Montana such as has been accomplished for Wyoming. This was the basis for his not accepting the acreage that the Bureau gives for the Big Horn County. They also are not interested in the power development at Yellowtail—only irrigation. Mr. Myers stated that irrigation was always paramount with the Bureau of Reclamation, and that to pump water was the cheapest way to get it out. Mr. Bunston remarked that it should be diverted only, and that the percentage basis of potential cannot be made fair on the basis of our knowledge of surveys in the Big Horn. Mr. Lloyd then asked if he wanted to hold up development in one State until the other caught up with it, and Mr. Bunston stated he could interpret it the way he wished.

The meeting adjourned at 6:00 p.m., with the arrangement for the engineering committee and others who wish to attend to meet on August 23.

The meeting was called to order on August 23 by Mr. Myers at 9:00 a.m.

Mr. Bunston started the meeting by quoting figures from the Big Horn Power and Irrigation Company's report. Mr. Myers stated that the only problem he could see to solve was how to provide for new storage, and that the simplest kind of compact was most practical and easy to administer. One of the ways to make it simple is to put a ceiling on the depletion to take place upstream, using whatever standards we need.
Mr. McNally requested that "potential" be cleared up, asking if it was subject to priority. Mr. Myers stated that the Bureau was not concerned with priority dates as they worked only with surplus water.

It was finally decided to settle the matter of the Big Horn and any other questions by an inspection trip to the territories concerned. This trip will enable the engineering committee to obtain something specific to work with. Messrs. Person, Lloyd, Gwillim, Myers, Bower, Buck, and Hanna are to go. Mr. Walsh is to be invited, although he is not expected to attend. Mr. Bunston was excused from the trip due to his recent illness. It was suggested that the committee take along anyone else they think should go. It is planned to leave the morning of September 11 at 8:00 a.m., proceeding to Hardin. Mr. Buck suggested that they attend the Wyoming Reclamation Association meeting in Buffalo while on the trip.

The meeting adjourned at 12:30 p.m.

Carl L. Myers, Chairman
Engineering Committee

Enclosures: Suggested Changes by Mr. Leonard
Suggested Changes by Mr. McNally
Suggested Formula by Mr. Bunston
Letter to Mr. Burke dated August 17
with letter to Mr. Thornton dated August 9, both by Mr. McNally
Engineering Committee Letter to R.J. Newell of
October 23, 1950
YELLOWSTONE RIVER COMPACT COMMISSION
Engineering Committee
Billings, Montana

October 23, 1950

Mr. R. J. Newell
P. O. Box 1866
Boise, Idaho

Dear Mr. Newell:

At the joint meeting of the drafting and engineering committees of the Yellowstone River Compact Commission held in Billings, Montana on August 22-23, 1950, the engineering committee agreed to recommend a basis for the Yellowstone River Compact. This subject has been carefully considered by the committee, which herewith submits its report and recommendations.

It is a generally accepted fact that irrigation development in the Yellowstone River Basin, particularly on the interstate tributaries, has very nearly reached its maximum practicable limit without the provision of additional new storage capacity. The committee feels that clearing the way for this new storage should be the underlying objective of any interstate Compact. From an interstate standpoint, the situation in the Yellowstone River Basin is extremely favorable since on three of the four interstate tributaries there is a reservoir site at or near the state line which can provide adequate control of residual flows from the upper State for continued development in the lower State. The fourth tributary, Clarke Fork, is not likely to experience water shortages. The reservoir on Tongue River has already been constructed, and those on the Big Horn River and the Powder River are authorized by Congress for construction by the Bureau of Reclamation. When these reservoirs are in operation they will have the practical effect of permitting full development in the upper States without affecting the progress of development in the lower States. That fact should be borne in mind.

Concerning treatment of existing developments in the Compact, the committee is of the opinion that there is little to be gained from a water supply standpoint by regulating and administering existing diversions under a Compact. It is, of course, entirely up to the Commission whether or not existing rights are to be administered under the Compact, but from an engineering standpoint, the committee feels
that the expense and difficulties of such an administration would
in no way justify the benefits that might be obtained. There are
insufficient data upon which to base this type of administration
due principally to differences in the water laws of the States in-
volved. It would be a major research project to place existing
rights in all States on an equivalent basis. Such procedure un-
doubtedly would involve interstate adjudication proceedings.

There are two principles upon which a satisfactory allocation
of the unused waters of the Yellowstone River could be based. One is
the so-called divertible flow principle, which has been used in
previous Yellowstone River Compact attempts. The other is the depletion
principle as used in the Upper Colorado River Basin Compact. The
committee feels, that since the divertible flow principle has been
previously used as a basis for a compact, it should be retained, but
modified to make the apportionment operative on other than a daily
basis so that allocation could be in terms of cumulative volumes of
water through an entire year, or portion thereof rather than by daily
stream flow. This is because substantially all new development will
be based on storage rather than direct flow. A suggested draft of an
apportionment article is attached, together with the supporting
definitions.

Whatever principle is used in allocating the water under
the Compact, it is necessary to select some index upon which to base
apportionment, either directly in acre-feet or by percentage. The
committee believes that the most practicable basis of apportionment
of the unused water is the area of irrigable land in the States.
The irrigable lands in the States are tabulated in the report and
the addendum, dated September 27, 1950, of the engineering committee.
The committee feels the irrigable lands as shown by this report and
addendum are a reasonable measure of the new development that is
likely to take place in the basin for a long time to come.

If the Commission feels that the available data are in-
sufficient on any of the interstate tributaries (Clarks Fork, Big
Horn, Tongue, or Powder Rivers) to allocate all of the unused waters
of that tributary, it could apportion a first block of water sufficient
to take care of the presently indicated potential development.

Some consideration must be given to supplemental water
supply and since such water is for use on existing projects, it is
felt that such allocation should be made under the category of exist-
ing irrigation works rather than potential.
The committee definitely feels that there is enough information available at the present upon which to base a workable and realistic Compact, and that nothing would be gained but much might be lost if a Compact were postponed until all the development possibilities in the basin are completely and thoroughly studied. This will take a long time and cost a great deal of money, and if a Compact is delayed until it is completed, the basin may well be deprived of the use and benefit of many worth-while projects which otherwise could be constructed.

Sincerely yours,

(Signed)
Fred E. Buck

(Signed)
Earl Lloyd

(Signed)
J. J. Walsh

(Signed)
W. S. Hanna

(Signed)
Carl L. Myers

Attachment

Copy to: Each Commission Member
(with attachment)
Proposals made by P.F. Leonard,
August 23, 1950
Proposals made by P. E. Leonard
as a member of the drafting committee
of the Yellowstone River Compact

Article 3, Page 7, Division C, second and third line, modify so as to read, "and the making of commissions." The modification is to eliminate the words, "unanimous action."

Article 3, Division G to be added as follows:

G. In the case of failure of the administrative officials of the three states involved in this compact to unanimously agree on any matter necessary to the proper administration of this compact, then such points of disagreement shall be decided by a majority vote of the administrative officials on the basis that each of the states involved shall be entitled to one vote.

Article 4 to be read as follows:

ARTICLE IV

The Commission shall, itself, or in conjunction with other responsible agencies, cause to be established, maintained, and operated such suitable gaging, precipitation and evaporation stations as it finds necessary in connection with its duties, and the division or quantity of waters herein agreed upon as between the states of Wyoming and Montana of the Clark Fork, Big Horn, Tongue River and Powder River, tributaries of the Yellowstone River and which flow into Montana from Wyoming shall be determined as to each of said tributaries at the Wyoming-Montana State line by or on the basis of gaging stations located on each of said tributaries at or near the said state line between said states at points determined by said commissions.

Article 5 to be amended to read as follows:

ARTICLE V

As the states of Montana, North Dakota and Wyoming hereby agree that the waters of the Yellowstone River and its interstate tributaries shall be apportioned among said states as follows:

Appropriative water rights in the Yellowstone River Basin, including the Clark's Fork, Big Horn River, Tongue River and Powder River existing as of January 1, 1950, shall continue to be enjoyed in accordance with the general law governing the acquisition and use of waters under the Doctrine of Appropriation and on the basis of priorities thereunder as single streams and regardless of state lines.
The total unused or unappropriated divertible flow of said tributaries as of January 1, 1950, shall be divided as follows:

Clarke Fork River
35% to Montana
25% to Wyoming

Big Horn River
15% to Montana
15% to Wyoming

Tongue River
65% to Montana
15% to Wyoming

Powder River
25% to Montana
15% to Wyoming

Be. During the period May 1 to September 30, inclusive, of each year, lease within the Yellowstone River Basin in Montana and in North Dakota below Intake, Montana, shall be dedicated to the beneficial use of the flow of the waters of the Yellowstone River and divided as between said states under the Doctrine of Appropriation and priorities thereunder regardless of the boundary line between said states.

C. The compact commission appointed hereunder shall allocate, divide and apportion the waters of said Yellowstone River Basin between the states of this compact in accordance with the provisions herein.

Amend Article 11 to read as follows:

ARTICLE XI

Hereafter no water shall be diverted from the Yellowstone River Basin or from any tributary or water shed therein to another basin, tributary or water shed.

Amend Article 13 by entirely omitting said article.

Amend Article 19 by entirely omitting said article.
Proposal by Mr. Bunton which modifies the proposal which P. F. Leonard had made regarding Article V.

A. The states of Montana, North Dakota and Wyoming hereby agree that the navigable flow of the waters of the Yellowstone River and its interstate tributaries shall be apportioned among such states as follows:

(Bunton's proposal) Water put to actual beneficial use prior to January 1, 1950, on the Yellowstone River, Clarke Fork River, Big Horn River, Tongue River, and Powder River shall continue to be enjoyed in accordance with the general law governing the acquisition and use of water under the doctrine of appropriation and on the basis of priorities theretunder as simple streams and regardless of state lines. PROVIDED HOWEVER, that when a shortage of water is available for existing rights, such water shall be apportioned on the basis of priority of rights.
1944 Compact
YELLOWSONE
RIVER
COMPACT

Montana, North Dakota and Wyoming
YELLOWSTONE RIVER COMPACT

The State of Montana, the State of North Dakota, and the State of Wyoming, being moved by consideration of interstate comity, and desiring to remove all causes of present and future controversy between said States and between persons in one and persons in another with respect to the waters of the Yellowstone River and its tributaries, other than waters within or waters which contribute to the flow of streams within the Yellowstone National Park, and desiring to provide for an equitable division and apportionment of such waters, and to encourage the beneficial development and use thereof, have resolved to conclude a Compact as authorized under the Act of the Congress of the United States of America, approved March 16, 1944 (Public No. 257, 78th Congress, Second Session), for the attainment of these purposes, and to that end, through their respective governments, have named as their respective Commissioners:

For the State of Montana:
Fred E. Buck
W. E. Ogden
P. F. Leonard
H. W. Bunston
Wesley A. D'Ewart

E. E. Tiffany
D. M. Manning
Chester E. Omstad
Paul J. Hagan
Axel Persson

For the State of North Dakota:
J. J. Walsh
Kenneth W. Simons
Einar H. Dahl

M. M. Millhouse
Frank P. Whitney
John T. Tucker

For the State of Wyoming:
L. F. Thornton
John Gonin
Earl Bower
Ray Bower
R. E. McNally
E. J. Johnson
Ernest J. Goppert

David G. Anderson
W. E. Snyder
Mark N. Partridge
L. C. Bishop
H. J. Paustian
W. R. Holt

who, after negotiations participated in by Harold D. Comstock, appointed as the representative of the United States of America, have agreed upon the following articles, to-wit:

ARTICLE I

A. Where the name of a State is used in the Compact, as a party thereto, it shall be construed to include the individuals, corporations, partnerships, associations, districts, administrative departments, bureaus, political subdivisions, agencies, persons, permittees, appropriators, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State.
B. Any individual, corporation, partnership, association, district, administrative department, bureau, political subdivision, agency, person, permittee, or appropriator authorized by or under the laws of a signatory State, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State, shall be subject to the terms of this Compact. Where the singular is used in this article, it shall be construed to include the plural.

ARTICLE II

A. The State of Montana, the State of North Dakota, and the State of Wyoming are hereinafter designated as "Montana", "North Dakota", and "Wyoming", respectively.

B. The terms "Commission" and "Yellowstone River Compact Commission" mean the agency created as provided herein for the administration of this Compact.

C. The term "Yellowstone River Basin" means areas in Wyoming, Montana, and North Dakota drained by the Yellowstone River and its tributaries; and includes the area in Montana known as Lake Basin.

D. The term "Yellowstone River System" means the Yellowstone River and all of its tributaries, including springs and swamps, from their sources to the mouth of the Yellowstone River near Buford, North Dakota, except those portions thereof which are within or contribute to the flow of streams within the Yellowstone National Park.

E. The term "Tributary" means any stream which in a natural state contributes to the flow of the Yellowstone River, including interstate tributaries and tributaries thereof, but excluding those which are within or contribute to the flow of streams within the Yellowstone National Park.

F. The term "Interstate Tributaries" means the Clarks Fork, Yellowstone River; the Big Horn River; the Tongue River; and the Powder River; whose confluences with the Yellowstone River are respectively at or near the city (or town) of Laurel, Big Horn, Miles City, and Terry, all in the State of Montana.

G. The term "Point of Diversion" means the point or place at which water is taken or removed from the channel of the Yellowstone River or from any tributary thereof.

H. The terms "Divert" and "Diversion" mean the taking or removing of water from the Yellowstone River or any tributary thereof when the water so taken or removed is not returned directly into the channel of the Yellowstone River or of the tributary from which it is taken.
I. The term "Divertible Flow" means the quantity of water that could be diverted from the stream flow above a designated point of measurement during a specified period of time. It is comprised of three elements: (a) the total net inflow to storage; (b) the total diversions; and (c) the remaining flow in the stream at the designated point of measurement for which the divertible flow is being determined. It is computed as follows:

The algebraic sum of:

(a) The quantity of water (in acre-feet) that flowed into reservoirs situated above the point of measurement during the specified period of time; less the outflow and diversions made directly from reservoirs (in acre-feet) during the same period; plus

(b) The quantity of water (in acre-feet) that was diverted from the stream above the point of measurement (including diversions made directly from reservoirs) during the specified period of time; plus

(c) The quantity of water in the stream (in acre-feet) that flowed past the point of measurement for which divertible flows are being determined during the specified period of time.

J. The term "Mean Divertible Daily Flow" means the average divertible flow occurring during a twenty-four hour period, beginning at 12:00 midnight.

K. The term "Mean Daily Flow" at any point means the average stream flow occurring at that point during a twenty-four hour period, beginning at 12:00 midnight.

L. The term "Beneficial Use" is herein defined to be that use by which the water supply of a drainage basin is depleted when usefully employed by the activities of man, and includes water lost by evaporation, percolation, and other natural causes from streams, canals, ditches, irrigated areas, and reservoirs.

ARTICLE III

A. This Compact is entered into by each signatory State in the exercise of its sovereign powers for a governmental purpose, and its provisions shall be administered by a Commission, composed of one representative from each signatory State, to be known as the Yellowstone River Compact Commission. The State representatives on this Commission shall be selected in such manner as each signatory State shall choose. The State Engineer of each signatory State, or other similar official, shall be and act as the State representative on the Commission at all times when a vacancy may exist thereon either from failure to designate a method of selection or otherwise. The President of the United States
shall be requested by the Commission to designate a representative of
the United States to sit with such Commission, and such representative
of the United States, if designated by the President, shall, when pre-
sent, act as Chairman of the Commission without vote.

D. The salaries and necessary expenses of each State representative
shall be paid by the respective State; all other expenses incident
to the administration of this Compact not borne by the United States
shall be allocated to and borne by each State as follows: One-fifth
by the State of North Dakota; and two-fifths each by the States of
Montana and Wyoming.

G. In addition to other powers and duties herein conferred upon
the Commission and the members thereof, the jurisdiction of the Com-
misson shall include the collection, correlation, and presentation of
factual data, the maintenance of records having a bearing upon the
administration of this Compact, and, by unanimous action, the making
of recommendations to the respective States upon matters connected
with the administration of this Compact. In connection with the per-
formance of its duties hereunder, the Commission may employ such ser-
vice and make such expenditures as may be reasonably necessary, within
the limit of funds provided for that purpose by the respective States.
The Commission shall compile a report for each year ending September
30th, and shall transmit it to the Governors of the signatory States
on or before December 31st of that year.

E. The Secretary of War, the Secretary of the Interior, the Secre-
tary of Agriculture, the Chairman, Federal Power Commission, the Chief,
Federal Weather Bureau, or comparable officers of whatever Federal
agencies may succeed to the functions and duties of these agencies,
as well as Federal officers and officers of appropriate agencies
of the signatory States having services or data useful or necessary to
the Compact Commission, shall cooperate, ex-officio, with the Commission
in the execution of its duty in the collection, correlation, and publica-
tion of records and data necessary for the proper administration of
the Compact; and these officers may perform such other services related
to the Compact as may be mutually agreed on with the Commission.

F. The Commission shall have power to formulate rules of pro-
cedure, rules, and regulations, and to perform any and all acts it may
find necessary to carry out the provisions of this Compact, and to pre-
scribe, issue, make, amend, and rescind such orders, rules, and regula-
tions. All rules of procedure, rules, and regulations of the Commission
shall be filed in the Office of the State Engineer of each signatory
State and shall be kept in a convenient form for public inspection and
examination during reasonable business hours.

F. The Commission herein authorized shall have power to sue and
be sued in its official capacity in any Federal Court of the signatory
States, and may adopt and use an official seal which shall be judicially
noticed.
ARTICLE IV

The Commission shall itself, or in conjunction with other responsible agencies, cause to be established, maintained, and operated such suitable water gaging and evaporation stations as it finds necessary in connection with its duties.

ARTICLE V

A. The States of Montana, North Dakota, and Wyoming hereby agree that the waters of the Yellowstone River and its interstate tributaries shall be apportioned among said states as follows:

1. Clarks Fork, Yellowstone River

Each day, during the period May 1st to September 30th, inclusive, of each year, the first 1,600 acre-feet of mean divertible daily flow of the main stem of the Clarks Fork, Yellowstone River, determined immediately above the confluence of Rock Creek with Clarks Fork in Montana, shall be divided fourteen (14) per cent to Wyoming and eighty-six (86) per cent to Montana; however, either State may temporarily divert, consume, or store for its beneficial use any unused part of the above flow allotted to the other, but no continuing right to such unused flow shall be established thereby. Unappropriated divertible daily flows in excess of 1,600 acre-feet occurring during the period May 1st to September 30th, inclusive, of each year, and all presently unappropriated flows occurring during the period October 1st to April 30th, inclusive, shall be subject to future appropriation for beneficial use within the Yellowstone River Basin in Montana, North Dakota and Wyoming in accordance with the laws of said respective States.

2. Big Horn River (Exclusive of Little Horn River)

Each day during the period May 1st to September 30th, inclusive, of each year, after due consideration being given to all Indian-treaty-water rights of the lands in Wyoming and Montana served directly from the main stem of the Big Horn River, the first 15,000 acre-feet of mean divertible daily flow of the Big Horn River, determined at or near the Big Horn River Bridge on U. S. Highway 87 near Hardin, Montana, shall be divided ninety (90) per cent to Wyoming and ten (10) per cent to Montana; and the next 15,000 acre-feet of mean divertible daily flow shall be divided ninety-three (93) per cent to Wyoming and seven (7) per cent to Montana; provided, however, that either State may temporarily divert, consume, or store for its beneficial use any unused part of the above flows allotted to the other, but no continuing right to such unused flows shall be established thereby. Subject to Indian-treaty-water rights, the unappropriated divertible daily flows in excess of 30,000 acre-feet occurring during the period May 1st to September 30th, inclusive, of each year, and all presently unappropriated flows occurring during the period October 1st to April 30th, inclusive, shall be subject to future appropriation for beneficial use within the Yellowstone River Basin in Montana, Wyoming and North Dakota in accordance with the laws of said respective States.
3. **Tongue River**

Each day during the period May 1st to September 30th, inclusive, of each year, the first 2,200 acre-feet of mean divertible daily flow of the Tongue River, determined at the lowest point of diversion on this stream, shall be divided seventy-two (72) per cent to Wyoming and twenty-eight (28) per cent to Montana; and the next 1,200 acre-feet of mean divertible daily flow shall be divided forty-three (43) per cent to Wyoming and fifty-seven (57) per cent to Montana; provided, that either State may temporarily divert, consume, or store for its beneficial use any unused part of the above flows allotted to the other, but no continuing right to such unused flows shall be established thereby. Unappropriated divertible daily flows in excess of 3,400 acre-feet occurring during the period May 1st to September 30th, inclusive, and all presently unappropriated flows occurring during the period October 1st to April 30th, inclusive, of each year, shall be subject to future appropriation for beneficial use within the Yellowstone River Basin in Wyoming, Montana, and North Dakota in accordance with the laws of said respective States.

The provisions herein, and each of them, and in particular the allotments, and each of them, shall be subject to the following conditions:

(a) For the purpose of determining the engineering feasibility, particularly as to water supply, of any project or program of the United States for the further conservation and utilization of the waters of the Tongue River, particularly the storage of waters in the State of Wyoming for beneficial use in that State, the allotments hereinabove made, and each of them, may be assumed as the measure of an equitable apportionment of the waters of the Tongue River between the States of Wyoming and Montana to satisfy, as of the date of this Compact, those established rights for beneficial consumptive uses which are exercised beneficially and which are valid under the laws of the States of Wyoming or Montana, as the case may be.

(b) Such provisions and allotments shall become operative either ten (10) years from and after the date that this Compact is ratified by the Congress; or on June 15 of the year in which water is available for release through any adequate distributary system, other than the stream bed, from the Tongue River Reservoir of the Montana Water Conservation Board for beneficial uses in Montana, the amount of water so released, however, shall be equal to at least one-half of the working capacity of such reservoir; or on June 15 of the year in which water is available for release through any adequate distributary system, other than the stream bed, if such be necessary, from any storage reservoir constructed in Wyoming to conserve for beneficial uses in Wyoming the waters of the Tongue River, the amount of water released, however, shall be equal to at least one-half of the working capacity of such reservoir; or whichever of said dates is the earlier.
Powder River (Exclusive of Little Powder River)

Each day during the period May 1st to September 30th, inclusive, of each year, the first 2,000 acre-feet of mean divertible daily flow of the Powder River, determined at the Wyoming-Montana State Line, shall be divided ninety-six and one-half (96 1/2) per cent to Wyoming and three and one-half (3 1/2) per cent to Montana: Provided, That when in the judgment of the Compact Commission the carriage loss in and through the stream bed depletes the divertible flow to such an extent that an unreasonable waste of water would result if Wyoming were regulated to produce such percentage to Montana, then such regulation shall be enforced only to the extent directed by the Commission. The next 2,600 acre-feet of mean divertible daily flow shall be divided sixty (60) per cent to Wyoming, and forty (40) per cent to Montana; however, either State may temporarily divert, consume, or store for beneficial use any unused part of the above flows allotted to the other, but no continuing right to such unused flows shall be established thereby. Unappropriated divertible daily flows in excess of 4,600 acre-feet occurring during the period May 1st to September 30th, inclusive, and all presently unappropriated flows occurring during the period October 1st to April 30th, inclusive, of each year, shall be subject to future appropriation for beneficial use within the Yellowstone River Basin in Montana, Wyoming, and North Dakota in accordance with the laws of said respective States.

Yellowstone River—Main Stem (Near Montana-North Dakota State Line)

During the period May 1st to September 30th, inclusive, of each year, lands within the Yellowstone River Basin in Montana and in North Dakota below Intake, Montana, shall be entitled to the beneficial use of the available residual flow of the waters of the Yellowstone River below Intake, Montana, on a pro rata basis of acreage irrigated.

All residual flows of the Yellowstone River below Sidney, Montana, after the States of Montana and Wyoming have made, or may make, full beneficial use of the waters of said stream, is hereby allotted to the State of North Dakota.

B. From time to time following the consummation of this Compact, the Commission shall re-examine the allocations made under part "A" of this article and shall, after reaching unanimous agreement, make such modifications in these allotments as are fair, just, and equitable, giving consideration among other factors to:

(a) priorities of water rights;
(b) acreage irrigated;
(c) acreage irrigable under existing works; and
(d) potentially irrigable lands.

Provided, That if the Commission should fail to reach unanimous agreement as to the modification of any allotment provided for in this
article, then, as to the stream affected, the allotment then existing shall continue in full force and effect until unanimous agreement thereon be reached; and

Provided further, That changes and amendments that are substantive and are not modifications of allotments as herein provided shall be subject to Article XI.

C. The allocations made herein shall be exclusive of the use of the waters for domestic and stock use, and each signatory State shall be allowed unrestricted use for these purposes, except that no reservoir for such use shall exceed 20 acre-feet in capacity.

D. It is recognized that variable climatic conditions, stream flow regulation, the administration of the interstate tributaries in Wyoming and Montana, and other causes will produce diurnal and other unavoidable variations and fluctuations in the stream flows at the interstate measuring stations, and it is agreed that in the performance of provisions of part "A", of this article and subsequent modifications the roof, minor compensating irregularities and fluctuations in the flow shall be permitted; but where any deficiency of the mean daily flow at an interstate measuring station may be occasioned by neglect, error, or failure in the performance of the duty of the upstream-state water officials having charge of the administration of the diversions from the stream, each such deficiency shall be made up within the next succeeding period of 72 hours by delivery of additional flow at the interstate measuring station over and above the amount allotted, sufficient to compensate for such deficiency. Notwithstanding the allocations of this Compact, the Commission, in its administration, shall direct the regulation of the streams within each of the signatory States to avoid unreasonable carriage losses.

ARTICLE VI

Present vested rights within each State and between States relating to the beneficial use of the waters of the Yellowstone River System are recognized by this Compact and shall be administered by the proper officials of the respective States. All rights to the beneficial use of the waters of the Yellowstone River System, heretofore and hereafter established under the laws of any signatory State, shall be satisfied solely from the portion of the water allotted to that State as provided in Article V. All Indian Treaty rights pertaining to the waters of the Yellowstone River Basin are unaffected by this Compact and are excluded therefrom.

ARTICLE VII

A. A lower signatory State shall have the right, by compliance with the laws of an upper signatory State, to file application for and receive permits to appropriate and use any waters in the Yellowstone River System not specifically apportioned to or appropriated by such upper State as provided in Article V; and to construct or participate
in the construction and use of any dam, storage reservoir, or diversion works in such upper State for the purpose of conserving and regulating water that may be apportioned to or appropriated by the lower State, provided that such right is subject to the rights of the upper State to control, regulate, and use the water apportioned to and appropriated by it; and, provided further, that should an upper State elect, it may share in the use of any such facilities constructed by a lower State to the extent of its reasonable needs upon assuming or guaranteeing payment of its proportionate share of the cost of construction, operation, and maintenance. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.

B. Each claim hereafter initiated for an appropriation of water in one signatory State for use in another signatory State shall be filed in the Office of the State Engineer of the signatory State in which the water is to be diverted, and a duplicate copy of the application including a map showing the character and location of the proposed facilities and the lands to be irrigated shall be filed in the Office of the State Engineer of the signatory State in which the water is to be used. If a portion or all the lands proposed to be reclaimed are located in a State other than the one in which the water is to be diverted, then, before approval of the application shall be granted, said application shall be checked against the records of the appropriate office of the State in which the water is to be used, and a notation shall be placed thereon by the officer in charge of such records to the effect that the land description does not indicate a conflict with existing water rights. All endorsements shall be placed on both the original and duplicate copies of all such maps filed, to the end that the records in both States may be complete and identical.

C. Appropriations may hereafter be adjudicated in the State in which the water is diverted, and where a portion or all of the lands irrigated are in another signatory State, such adjudications shall be confirmed in that State by the proper authority. Each adjudication is to conform with the laws of the State where the water is diverted and shall be recorded in the County and State where the water is used.

APPENDIX VIII

A lower signatory State shall have the right, upon compliance with the laws of an upper signatory State, to acquire in such upper State by purchase, or through exercise of the power of eminent domain, such easements and rights of way for the construction, operation, and maintenance of pumping plants, storage reservoirs, canals, conduits, and appurtenant works as may be required for the enjoyment of the privileges granted herein to such lower State. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.
ARTICLE IX

Should any facilities be constructed by a lower signatory State in an upper signatory State under the provisions of Article VII, the construction, operation, repairs, and replacements of such facilities shall be subject to the laws of the upper State. This provision shall apply with equal force and effect to an upper State in the circumstance of the necessity of the acquisition of rights by an upper State in a lower State.

ARTICLE X

In the event water from another drainage basin shall be imported into the Yellowstone River Basin or transferred from one tributary basin to another by the United States, Montana, North Dakota, or Wyoming, or any of them jointly, the State having the right to the use of such water shall be given proper credit therefor in determining its share of the divertible flows apportioned in accordance with Article V herein.

ARTICLE XI

The provisions of this Compact shall remain in full force and effect until amended in the same manner as it is required to be ratified to become operative as provided in Article XVII.

ARTICLE XII

No action taken by the Compact Commission shall be valid except by the unanimous consent of the Commissioners representing the signatory States.

ARTICLE XIII

This Compact may be terminated at any time by unanimous consent of the signatory States, and upon such termination all rights then established hereunder shall continue unimpaired.

ARTICLE XIV

Nothing in this Compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, in any Federal Court or the United States Supreme Court, for the protection of any right under this Compact or the enforcement of any of its provisions.

ARTICLE XV

Nothing in this Compact shall be construed as affecting any rights to the use of the waters of the Big Horn or Wind River and the Little Horn River and their tributaries, existing by virtue of Indian treaties.

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ARTICLE XVI

The physical and other conditions characteristic of the Yellowstone River and peculiar to the territory drained and served thereby and to the development thereof, have actuated the signatory States in the consummation of this Compact, and none of them, nor the United States by its consent and approval, concedes thereby the establishment of any general principle or precedent with respect to other interstate streams.

ARTICLE XVII

This Compact shall become operative when approved by the Legislature of each of the signatory States and consented to and approved by the Congress of the United States.

ARTICLE XVIII

Nothing in this Compact shall be deemed:

(a) To impair or affect any rights or powers of the United States, its agencies, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin nor its capacity to acquire rights in and to the use of said waters;

(b) To subject any property of the United States, its agencies, or instrumentalities to taxation by any State or subdivision thereof, nor to create an obligation on the part of the United States, its agencies, or instrumentalities, by reason of the acquisition, construction, or operation of any property or works of whatsoever kind, to make any payments to any State or political subdivision thereof, State agency, municipality, or entity whatsoever in reimbursement for the loss of taxes;

(c) To subject any property of the United States, its agencies, or instrumentalities, to the laws of any State to an extent other than the extent to which these laws would apply without regard to the Compact.

ARTICLE XIX

Should a Court of competent jurisdiction hold any part of this Compact to be contrary to the constitution of any signatory State or of the United States, all other severable provisions of this Compact shall continue in full force and effect.

IN WITNESS WHEREOF the Commissioners have signed this Compact in quadruplicate original, one of which shall be filed in the archives of the Department of State of the United States of America and shall be deemed the authoritative original, and of which a duly certified copy shall be forwarded to the Governor of each signatory State.
Done at the City of Billings in the State of Montana, this 18th day of December, in the year of Our Lord, One Thousand Nine Hundred and Forty-four.

Commissioners for the State of Montana:

Fred E. Buck
(Fred E. Buck)

E. H. Tipton
(D. M. Manning)

W. E. Odgen
(W. E. Odgen)

P. F. Leonard
(P. F. Leonard)

Chester E. Custer
(Chester E. Custer)

H. W. Brunson
(H. W. Brunson)

Paul L. Hagan
(Paul L. Hagan)

Wesley A. D'Evart
(Wesley A. D'Evart)

Axel Persson
(Axel Persson)

Commissioners for the State of North Dakota:

John T. Tucker
(J. J. Walsh)

M. M. Millhouse
(M. M. Millhouse)

Kenneth W. Simons
(Kenneth W. Simons)

Frank F. Whitney
(Frank F. Whitney)

Einar Dahl
(Einar Dahl)

John T. Tucker
(John T. Tucker)
Commissioners for the State of Wyoming:

L. F. Thornton  
(D. Anderson)

John Goin  
(W. E. Snyder)

Earl Bower  
(Mark N. Partridge)

Ray Bower  
(L. C. Bishop)

(R. E. McNally)  
(H. J. Penistian)

(R. J. Johnson)  
(W. H. Holt)

Robert J. Gobin

I have participated in the negotiation of this Compact and intend to report favorably thereon to the Congress of the United States.

Harold D. Comstock  
Representative of the United States of America
1942 Compact
YELLOWSTONE RIVER COMPACT

Copy for Wyoming

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YELLOWSTONE RIVER COMPACT

The State of Montana, the State of North Dakota, and the State of Wyoming, being moved by consideration of interstate comity, and desiring to remove all causes of present and future controversy between said States and between persons in one and persons in another with respect to the waters of the Yellowstone River and its tributaries, other than waters within or waters which contribute to the flow of streams within the Yellowstone National Park, and desiring to provide for an equitable division and apportionment of such waters, and to encourage the beneficial development and use thereof, have resolved to conclude a Compact as authorized under the Act of the Congress of the United States of America, approved June 15, 1940 (Public No. 632, 76th Congress, Third Session), for the attainment of these purposes, and to that end, through their respective governments, have named as their respective Commissioners:

For the State of Montana:  
Fred E. Buck  
W. E. Ogden  
P. F. Leonard  
H. W. Bunston  
Wesley A. D'Ewart

For the State of North Dakota:  
John T. Tucker  
Kenneth W. Simons  
Einar Dahl  
M. M. Millhouse  
Frank P. Whitney

For the State of Wyoming:

L. C. Bishop  
L. F. Thornton  
John Gonin  
Earl Bower  
Ray Bower

Ernest Goppert  
David Anderson  
E. S. McNabb  
Will G. Metz  
Ed J. Johnson

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who, after negotiations participated in by Clyde L. Seavey, appointed as the representative of the United States of America, have agreed upon the following articles, to wit:

ARTICLE I

A. Where the name of a State is used in this Compact, as a party thereto, it shall be construed to include the individuals, corporations, partnerships, associations, districts, administrative departments, bureaus, political subdivisions, agencies, persons, permittees, appropriators, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State.

B. Any individual, corporation, partnership, association, district, administrative department, bureau, political subdivision, agency, person, permittee, or appropriator authorized by or under the laws of a signatory State, and all others using, claiming, or in any manner asserting any right to the use of the waters of the Yellowstone River System under the authority of said State shall be subject to the terms of this Compact. Where the singular is used in this article, it shall be construed to include the plural.

ARTICLE II

A. The State of Montana, the State of North Dakota, and the State of Wyoming are hereinafter designated as "Montana", "North Dakota", and "Wyoming", respectively.
B. The terms "Commission" and "Yellowstone River Compact Commission" mean the agency created as provided herein for the administration of this Compact.

C. The term "Yellowstone River Basin" means areas in Wyoming, Montana, and North Dakota drained by the Yellowstone River and its tributaries, and includes the area in Montana known as Lake Basin.

D. The term "Yellowstone River System" means the Yellowstone River and all of its tributaries, including springs and swamps, from their sources to the mouth of the Yellowstone River near Buford, North Dakota, except those portions thereof which are within or contribute to the flow of streams within the Yellowstone National Park.

E. The term "Tributary" means any stream which in a natural state contributes to the flow of the Yellowstone River, including interstate tributaries and tributaries thereof, but excluding those which are within or contribute to the flow of streams within the Yellowstone National Park.

F. The term "Interstate Tributaries" means the Clarks Fork, Yellowstone River; the Big Horn River; the Tongue River; and the Powder River; whose confluences with the Yellowstone River are respectively at or near the city (or town) of Laurel, Big Horn, Miles City, and Terry, all in the State of Montana.

G. The term "Point of Diversion" means the point or place at which water is taken or removed from the channel of the Yellowstone River or from any tributary thereof.
H. The terms "Divert" and "Diversion" mean the taking or removing of water from the Yellowstone River or any tributary thereof when the water so taken or removed is not returned directly into the channel of the Yellowstone River or of the tributary from which it is taken.

I. The term "Divertible Flow" means the quantity of water that could be diverted from the stream flow above a designated point of measurement during a specified period of time. It is comprised of three elements: (a) the total net inflow to storage; (b) the total diversions; and (c) the remaining flow in the stream at the designated point of measurement for which the divertible flow is being determined. It is computed as follows:

The algebraic sum of:

(a) The quantity of water (in acre-feet) that flowed into reservoirs situated above the point of measurement during the specified period of time; less the outflow and diversions made directly from reservoirs (in acre-feet) during the same period; plus

(b) The quantity of water (in acre-feet) that was diverted from the stream above the point of measurement (including diversions made directly from reservoirs) during the specified period of time; plus

(c) The quantity of water in the stream (in acre-feet) that flowed past the point of measurement for which divertible flows are being determined during the specified period of time.

J. The term "Mean Divertible Daily Flow" means the average divertible flow occurring during a twenty-four hour period, beginning at 12:00 midnight.
K. The term "Mean Daily Flow" at any point means the average stream flow occurring at that point during a twenty-four hour period, beginning at 12:00 midnight.

L. The term "Beneficial Use" is herein defined to be that use by which the water supply of a drainage basin is depleted when usefully employed by the activities of man, and includes water lost by evaporation, percolation, and other natural causes from streams, canals, ditches, irrigated areas, and reservoirs.

ARTICLE III

A. This Compact is entered into by each signatory State in the exercise of its sovereign powers for a governmental purpose, and its provisions shall be administered by a Commission, composed of one representative from each signatory State, to be known as the Yellowstone River Compact Commission. The State representatives on this Commission shall be selected in such manner as each signatory State shall elect. The President of the United States shall be requested by the Commission to designate a representative of the United States to sit with such Commission, and such representative of the United States, if designated by the President, shall, when present, act as Chairman of the Commission without vote.

B. The salaries and necessary expenses of each State representative shall be paid by the respective State; all other expenses incident to the administration of this Compact not borne by the United States shall be allocated to and borne by each state as follows: One-
fifth by the State of North Dakota, and two-fifths each by the States
of Montana and Wyoming.

C. In addition to other powers and duties herein conferred
upon the Commission and the members thereof, the jurisdiction of the
Commission shall include the collection, correlation, and presentation
of factual data, the maintenance of records having a bearing upon the
administration of this Compact, and, by unanimous action, the making
of recommendations to the respective States upon matters connected with
the administration of this Compact. In connection with the performance
of its duties hereunder, the Commission may employ such services and
make such expenditures as may be reasonably necessary, within the limit
of funds provided for that purpose by the respective States. The Com-
mission shall compile a report for each year ending September 30th, and
shall transmit it to the Governors of the signatory States on or before
December 31st following the year covered by the report.

D. The Commissioner, United States Bureau of Reclamation; The
Commissioner of Indian Affairs; The Chairman, Federal Power Commission;
The Chief, Federal Weather Bureau; The Chief of Engineers, U.S. Army;
The Director, United States Geological Survey, or comparable officers
of whatever Federal agencies may succeed to the functions and duties of
these agencies, and such other Federal officers and officers of appropriate
agencies of the signatory States having services or data useful or neces-
sary to the Compact Commission, shall cooperate, ex officio, with the
Commission in the execution of its duty in the collection, correlation,
and publication of records and data necessary for the proper administra-
tion of the Compact; and these officers may perform such other services
related to the Compact as may be mutually agreed on with the Commission.
E. The Commission shall have power to formulate rules of procedure, rules, and regulations, and to perform any and all acts it may find necessary to carry out the provisions of this Compact, and to prescribe, issue, make, amend, and rescind such orders, rules, and regulations. All rules of procedure, rules, and regulations of the Commission shall be filed in the Office of the State Engineer of each signatory State and shall be kept in a convenient form for public inspection and examination during reasonable business hours.

F. The Commission herein authorized shall have power to sue and be sued in its official capacity in any Federal Court of the signatory States, and may adopt and use an official seal which shall be judicially noticed.

ARTICLE IV

The Commission shall itself, or in conjunction with other responsible agencies, cause to be established, maintained, and operated such suitable water gaging and evaporation stations as it finds necessary in connection with its duties.

ARTICLE V

A. The States of Montana, North Dakota, and Wyoming hereby agree that the waters of the Yellowstone River and its interstate tributaries shall be apportioned among said states as follows:

1. Clarks Fork, Yellowstone River

Each day during the period May 1st to September 30th, inclusive, of each year, the first 1,600 acre-feet of mean divertible
daily flow of the Clarks Fork, Yellowstone River, determined immediately above the confluence of Rock Creek with Clarks Fork in Montana, shall be divided twenty-seven (27) per cent to Wyoming and seventy-three (73) per cent to Montana; however, either State may temporarily divert, consume, or store for its beneficial use any unused part of the above flow allotted to the other, but no continuing right to such unused flow shall be established thereby. Unappropriated divertible daily flows in excess of 1,600 acre-feet occurring during the period May 1st to September 30th, inclusive, of each year, and all presently unappropriated flows occurring during the period October 1st to April 30th, inclusive, shall be subject to future appropriation by Montana, North Dakota, and Wyoming for beneficial use within the Yellowstone River Basin.

2. Big Horn River (Exclusive of Little Horn River)

Each day during the period May 1st to September 30th, inclusive, of each year, after supplying the reasonable water requirements of the lands having Indian Treaty water rights in Wyoming, and the lands having Indian Treaty water rights in Montana served directly from the main stem of the Big Horn River, the remainder of the first 15,000 acre-feet of mean divertible daily flow of the Big Horn River, determined at the lowest point of diversion on this stream, shall be divided ninety (90) per cent to Wyoming and ten (10) per cent to Montana; and the next 15,000 acre-feet of mean divertible daily flow shall be divided ninety-three (93) per cent to Wyoming and seven (7) per cent to Montana; provided, however, that either State may temporarily divert, consume, or store for its beneficial use any unused part of the above flows allotted to the other, but no continuing right to such unused flow...
flows shall be established thereby. Unappropriated divertible daily flows in excess of 30,000 acre-feet occurring during the period May 1st to September 30th, inclusive, of each year, and all presently unappropriated flows occurring during the period October 1st to April 30th, inclusive, shall be subject to future appropriation by Montana, North Dakota, and Wyoming for beneficial use within the Yellowstone River Basin.

3. Tongue River

Each day during the period May 1st to September 30th, inclusive, of each year, the first 2,200 acre-feet of mean divertible daily flow of the Tongue River, determined at the lowest point of diversion on this stream, shall be divided seventy-two (72) per cent to Wyoming and twenty-eight (28) per cent to Montana; and the next 1,200 acre-feet of mean divertible daily flow shall be divided forty-three (43) per cent to Wyoming, and fifty-seven (57) per cent to Montana; however, either State may temporarily divert, consume, or store for its beneficial use any unused part of the above flows allotted to the other, but no continuing right to such unused flows shall be established thereby, Unappropriated divertible daily flows in excess of 3,400 acre-feet occurring during the period May 1st to September 30th, inclusive, and all presently unappropriated flows occurring during the period October 1st to April 30th, inclusive, of each year, shall be subject to future appropriation by Montana, North Dakota, and Wyoming for beneficial use within the Yellowstone River Basin.

4. Powder River (Exclusive of Little Powder River)

Each day during the period May 1st to September 30th, inclusive, of each year, the first 2,000 acre-feet of mean divertible daily
flow of the Powder River, determined at the Wyoming-Montana State line, shall be divided ninety-six and one-half (96½) per cent to Wyoming and three and one-half (3½) per cent to Montana; and the next 2,600 acre-feet of mean divertible daily flow shall be divided sixty (60) per cent to Wyoming, and forty (40) per cent to Montana; however, either State may temporarily divert, consume, or store for beneficial use any unused part of the above flows allotted to the other, but no continuing right to such unused flows shall be established thereby. Unappropriated divertible daily flows in excess of 4,600 acre-feet occurring during the period May 1st to September 30th, inclusive, and all presently unappropriated flows occurring during the period October 1st to April 30th, inclusive, of each year, shall be subject to future appropriation by Montana, North Dakota, and Wyoming for beneficial use within the Yellowstone River Basin.

5. Yellowstone River - Main Stem (Near Montana-North Dakota State Line)

During the period May 1st to September 30th, inclusive, of each year, lands within the Yellowstone River Basin in Montana and in North Dakota below Intake, Montana, shall be entitled to the beneficial use of the available residual flow of the waters of the Yellowstone River below Intake, Montana, on a pro rata basis of acreage irrigated.

All residual flows of the Yellowstone River below Sidney, Montana, after the States of Montana and Wyoming have made full beneficial use of the waters of said stream, is hereby allotted to the State of North Dakota subject to existing water rights of Lower States.

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B. Before the expiration of the first ten (10) year period following the consummation of this Compact and at the end of each ten (10) year period thereafter, the Commission shall re-examine the allocations made under part "A" of this article and shall, after reaching unanimous agreement, make such modifications in these allotments as are fair, just, and equitable, giving consideration among other factors to:

(a) priorities of water rights;
(b) acreage irrigated;
(c) acreage irrigable under existing works; and
(d) potentially irrigable lands.

Provided, that if the Commission by the end of the first ten (10) year period should fail to reach a unanimous agreement as to the continuation or the modification of any of the allotments specified in part "A" of this article, then, the allotment as to the stream affected shall be suspended, and during such suspension and until unanimous agreement be reached, the rights of appropriators thereon shall revert temporarily to the same status as would exist had the Compact not been entered into; and

Provided, that if the Commission should fail to reach unanimous agreement as to the modification of any allotment provided for in this article in any ten (10) year period subsequent to the first ten (10) year period, then, as to the stream affected, the allotment then existing shall continue in full force and effect until unanimous agreement thereon be reached; and
Provided further, that changes and amendments that are substantive and are not modifications of allotments as herein provided shall be subject to Article XI.

C. It is recognized that variable climatic conditions, stream flow regulation, the administration of the interstate tributaries in Wyoming and Montana, and other causes will produce diurnal and other unavoidable variations and fluctuations in the stream flows at the interstate measuring stations, and it is agreed that in the performance of provisions of part "A", of this article and subsequent modifications thereof, minor compensating irregularities and fluctuations in the flow shall be permitted; but where any deficiency of the mean daily flow at an interstate measuring station may be occasioned by neglect, error, or failure in the performance of the duty of the upstream-state water officials having charge of the administration of the diversions from the stream, each such deficiency shall be made up within the next succeeding period of 72 hours by delivery of additional flow at the interstate measuring station over and above the amount allotted, sufficient to compensate for such deficiency.

ARTICLE VI

Present vested rights within each State and between States relating to the beneficial use of the waters of the Yellowstone River System are recognized by this Compact. All rights to the beneficial use of the waters of the Yellowstone River System, heretofore and
hereafter established under the laws of any signatory State, shall be satisfied solely from the proportion of the water allotted to that State as provided in Article V. All Indian Treaty rights pertaining to the waters of the Yellowstone River Basin are unaffected by this Compact and are excluded therefrom.

ARTICLE VII

A. A lower signatory State shall have the right, by compliance with the laws of an upper signatory State, to file application for and receive permits to appropriate and use any waters in the Yellowstone River System not specifically apportioned to or appropriated by such upper State as provided in Article V; and to construct or participate in the construction and use of any dam, storage reservoir, or diversion works in such upper State for the purpose of conserving and regulating water that may be apportioned to or appropriated by the lower State, provided that such right is subject to the rights of the upper State to control, regulate, and use the water apportioned to and appropriated by it; and, provided further, that should an upper State elect, it may share in the use of any such facilities constructed by a lower State to the extent of its reasonable needs upon assuming and guaranteeing payment of its proportionate share of the cost of construction, operation, and maintenance.

B. Each claim hereafter initiated for an appropriation of water in one signatory State for use in another signatory State shall...
be filed in the Office of the State Engineer of the signatory State in which the water is to be diverted, and a duplicate copy of the application including a map showing the character and location of the proposed facilities and the lands to be irrigated shall be filed in the Office of the State Engineer of the signatory State in which the water is to be used. If a portion or all the lands proposed to be reclaimed are located in a State other than the one in which the water is to be diverted, then, before approval of the application shall be granted, said application shall be checked against the records of the appropriate office of the State in which the water is to be used, and a notation shall be placed thereon by the officer in charge of such records to the effect that the land description does not indicate a conflict with existing water rights. All endorsements shall be placed on both the original and duplicate copies of all such maps filed, to the end that the records in both States may be complete and identical.

C. Appropriations may hereafter be adjudicated in the State in which the water is diverted, and where a portion or all of the lands irrigated are in another signatory State, such adjudications shall be confirmed in that State by the proper authority. Each adjudication is to conform with the laws of the State where the water is diverted and shall be recorded in the County and State where the water is used.
ARTICLE VIII

A lower signatory State shall have the right, upon compliance with the laws of an upper signatory State, to acquire in such upper State by purchase, or through exercise of the power of eminent domain, such easements and rights of way for the construction, operation, and maintenance of pumping plants, storage reservoirs, canals, conduits, and appurtenant works as may be required for the enjoyment of the privileges granted herein to such lower State.

ARTICLE IX

Should any facilities be constructed by a lower signatory State in an upper signatory State under the provisions of Article VII, the construction, operation, repairs, and replacements of such facilities shall be subject to the laws of the upper State.

ARTICLE X

In the event water from another drainage basin shall be imported into the Yellowstone River Basin or transferred from one tributary basin to another by the United States, Montana, North Dakota, or Wyoming, or any of them jointly, the State having the right to the use of such water shall be given proper credit therefor in determining its share of the divertible flows apportioned in accordance with Article V. herein.
ARTICLE XI

The provisions of this Compact shall remain in full force and effect until amended by unanimous action of the Legislatures of the signatory States and consented to and approved by the Congress of the United States in the same manner as this Compact is required to be ratified to become effective.

ARTICLE XII

No action taken by the Compact Commission shall be valid except by the unanimous consent of the Commissioners representing the signatory States.

ARTICLE XIII

This Compact may be terminated at any time by unanimous consent of the signatory States, and upon such termination all rights then established hereunder shall continue unimpaired.

ARTICLE XIV

Nothing in this Compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, in any Federal Court or the United States Supreme Court, for the protection of any right under this Compact or the enforcement of any of its provisions.
ARTICLE XV

Nothing in this Compact shall be construed as affecting any rights which may legally exist to the use of the waters of the Big Horn or Wind River and the Little Horn River and their tributaries attaching to lands now being irrigated and susceptible of irrigation on the Crow Indian Reservation and the ceded portions thereof in Montana, and the Wind River Reservation and the ceded portions thereof in Wyoming, as established by the Crow Treaty of May 7, 1868 (15 Stat. 649) and the Fort Bridger Treaty of February 26, 1869 (15 Stat. 673).

ARTICLE XVI

The physical and other conditions characteristic of the Yellowstone River and peculiar to the territory drained and served thereby and to the development thereof, have actuated the signatory States in the consummation of this Compact, and none of them, nor the United States by its consent and approval, concedes thereby the establishment of any general principle or precedent with respect to other interstate streams.

ARTICLE XVII

This Compact shall become operative when approved by the Legislature of each of the signatory States and consented to and approved by the Congress of the United States.
ARTICLE XVIII

Nothing in this Compact shall be deemed:

(a) To impair or affect any rights or powers of the United States, its agencies, or instrumentalities, in and to the use of the waters of the Yellowstone River Basin nor its capacity to acquire rights in and to the use of said waters;

(b) To subject any property of the United States, its agencies, or instrumentalities to taxation by any State or sub-division thereof, nor to create an obligation on the part of the United States, its agencies, or instrumentalities, by reason of the acquisition, construction, or operation of any property or works of whatsoever kind, to make any payments to any State or political subdivision thereof, State agency, municipality, or entity whatsoever in reimbursement for the loss of taxes;

(c) To subject any property of the United States, its agencies, or instrumentalities, to the laws of any State to an extent other than the extent to which these laws would apply without regard to the Compact.

ARTICLE XIX

Should a Court of competent jurisdiction hold any part of this Compact to be contrary to the constitution of any signatory State or of the United States, all other severable provisions of this Compact shall continue in full force and effect.
IN WITNESS WHEREOF the Commissioners have signed this Compact in quadruplicate original, one of which shall be filed in the archives of the Department of State of the United States of America and shall be deemed the authoritative original, and of which a duly certified copy shall be forwarded to the Governor of each of the signatory States.

Done at the City of Billings in the State of Montana, this 31st day of December, in the year of Our Lord, One Thousand Nine Hundred and Forty-two.

Commissioners
For the State of Montana:
    Earl L. Bank
    W. E. Winger
    W.H. D. Croft
    T.C. Bixler
    S.F. Leonard

Commissioners
For the State of North Dakota:
    John J. Bebb
    Lynn M. Mason
    E. W. D. Dabel
    M.M. Millikan
    C. W. Westby

Commissioners for the State of Wyoming:
    J. W. Roberts
    W. L. Reichenbach
    J. A. Watson
    C. F. C. Coggin
    J. W. Bower
    W. F. Bower

Approved:

Clyde L. Shevey

Representative of the United States of America.
1935 Compact
YELLOWSTONE RIVER COMPACT
BETWEEN
THE STATES OF WYOMING AND MONTANA

The State of Wyoming and the State of Montana, desiring to remove all causes of present and future controversy between the said states, and between the citizens of one against citizens of the other with respect to the waters of the Yellowstone River and the waters of streams tributary thereof, and being moved by considerations of interstate comity and being theretofore duly authorized by Act of Congress of the United States approved June 14th, 1932, have resolved to conclude a compact for these purposes and have named as their Commissioners:

For the State of Wyoming - Mr. Edwin W. Burritt, and
For the State of Montana - Mr. J. S. James,

who, after negotiations participated in by Mr. W. A. Lamb, appointed by the President as the representative of the United States of America, have agreed upon the following Articles:

ARTICLE I

The principal purposes of this compact are to provide for the equitable division and apportionment of the use of the waters of the Yellowstone River; to so conserve and use the waters of the river as to obtain maximum benefits; to
promote interstate comity; to preserve the autonomy of the signatory states; to promote peaceful and expeditious agricultural and industrial development; and to promote the general welfare of each of the signatories.

ARTICLE II

As used in this compact:

The signatory states are designated as "Montana" and "Wyoming", respectively.

The term "Yellowstone River" means that river, together with all its tributaries, which rises in northwestern Wyoming, flows through Wyoming and Montana and joins the Missouri River near Buford, North Dakota.

The term "Tributary to the Yellowstone River" means any stream which naturally contributes water to said river.

The term "Domestic Use", as applied to the use of water, means all ordinary household, culinary and other domestic uses incident to residential properties, street sprinkling, sewer flushing, watering of parks and lawns, uses of water by cities through waterworks systems, and for transportation purposes, but shall not include the use of water for the generation of power.

The term "Agricultural Use", as applied to the use of water, means the application of water to land by
artificial means for agricultural purposes such as raising of crops and other products of the soil.

The term "Power Use", as applied to the use of water, means use for the development of electrical or any other form of energy by means of turbine, impulse or other forms of water wheels.

ARTICLE III

Where the name of a state is used in this compact, as a party thereto, it shall be construed to include the citizens, corporations, partnerships, associations, districts, administrative departments, bureaus, political subdivisions, agencies, persons, permittees, appropriators, and all others using, claiming, or in any manner asserting any right to the use of the waters of either the Yellowstone River or its tributaries within said state except as in this compact provided.

Any citizen, corporation, partnership, association, district, administrative department, bureau, political subdivision, agency, person, permittee or appropriator authorized by or under the laws of a signatory state, and all other using, claiming, or in any manner asserting any right to the use of the waters of either the Yellowstone River or its tributaries within said state, shall be subject to the terms of this compact. Where the singular is used in this paragraph, it shall be construed to include the plural.
ARTICLE IV

(a) The Yellowstone River and its tributaries are non-navigable.

(b) Subject to the provisions of this compact, water of the Yellowstone River may be used or impounded and used for the generation of power, provided such use or impounding and use shall, at all times, be subservient to the use and consumption of such water for either domestic or agricultural uses and shall not interfere with or prevent uses for such dominant purposes.

(c) Water for either agricultural or power uses shall be subservient to domestic use.

ARTICLE V

(a) The waters of the Yellowstone River and tributaries are public waters and as such are the properties of the states within which they originate and flow, but the use of such waters is subject to appropriation for beneficial use under the laws of the separate states and under general water-right law as interpreted by the Courts.

(b) Priority of appropriation for beneficial uses shall give the better right. The right of a prior appropriator is such that he is entitled to have the stream flow, within the amount of his right, and within the needs of the beneficial use for which appropriation was made, as it did when he appropriated, undiminished by the use of any later appropriator or by any increased
use of earlier priority. Beneficial use is the basis, the measure and the limit of any right to the use of public water.

(c) Wherever and whenever practical the waters of all interstate streams shall be divided at the state line, having due regard to elements of return flow, priority, and established uses. Such division shall be determined by mutual agreement as, in this compact, further provided.

(d) It is mutually agreed that no water shall be diverted from the Yellowstone River or any tributary for use in another watershed except as specifically provided in this compact or in compacts supplementary here-to.

(e) It is specifically provided that waters of Big Horn River may be diverted to the drainage basin of Clarks Fork of the Yellowstone, and that waters of Powder River drainage basin may be diverted to the drainage basin of Tongue River, and that waters of the Upper Yellowstone and tributaries may be diverted to the drainage basin of Big Horn River.

(f) That any unused and unappropriated waters of the Yellowstone River, whether the source of the same is in Wyoming or Montana, may be located, appropriated, and used either in Wyoming or Montana, or in both of said states by either of said states, and the respective states shall issue permits for such appropriations to
either state, without distinction or discrimination.

(g) Montana shall have the right by a compliance with the laws of Wyoming to file application for and receive permits to appropriate and use, in Montana, any unappropriated and unused water in the Yellowstone River in Wyoming, and also locate and file upon reservoir sites in said river, and also be entitled to the benefits of all laws of the State of Wyoming affecting reservoirs, to construct, operate and maintain reservoirs, to impound such water and may construct and maintain ditches and diversion works to divert said water into Montana and may use the natural streams for such purpose. Provided that as to any such impounded water, Wyoming shall have the right to acquire and use not exceeding fifty percent upon giving notice prior to the commencement of the construction of said works to the parties in interest and by financing its proportionate share of the cost of construction, operation and maintenance of such reservoirs, ditches and other diversion works. Wyoming may likewise, and under corresponding conditions, acquire such reciprocal rights in Montana.

(h) The signatories, for their common welfare, agree to cooperate: first, in the development of the water resources of the Yellowstone River within both states, particularly along the upper reaches of the stream and its tributaries thereby increasing the useful flow along
Page Seven.
the lower reaches through ground storage and return flow; second, in securing the construction of canals and reservoirs for the conservation and utilization of the waters of the Yellowstone River in both Montana and Wyoming; third, to prevent waste of water; fourth, to equalize stream flow; fifth, to obtain maximum benefits from uses of water.

ARTICLE VI
(a) To determine rights and relative priorities as between the states to the waters of any stream crossing the state boundary, there is hereby established a Commission, herein designated "The Commission", consisting of the State Engineer of Wyoming, The State Engineer of Montana, and such representatives of the Federal Government, as may be designated by the President of the United States.

(b) The Commission shall at once begin the study of the various interstate streams and shall determine the amount of water to be divided between the states at the state line. The conclusions reached are to be based on the law of priority, the law of beneficial use, due regard to stream increases caused by underground storage and return flow and any other salient facts, that in the opinion of the Commission, may have a bearing upon the equitable distribution of water, within the intents and purposes of this compact.
(c) When the Commission has made such determination for any interstate stream, it shall report its findings to the President of the United States and to the Governor of each state in the form of an agreement supplemental to this compact, which agreement shall be in full force and effect from the time of its approval by the Commission, until disapproved by the Congress of the United States or by the Legislature of Wyoming or by the Legislature of Montana.

(d) The Commission may employ personnel as may be necessary and make such surveys and studies in either state or both states, as may be needed.

(e) The costs of the Commission, including such surveys and studies, and including travel and personal expenses of the members of the Commission, shall be borne equally by the two states. The Commission shall keep account of all such expenditures and of the amount paid by each state, and at the end of each fiscal year, the account shall be balanced by the payment by Montana to Wyoming of any amount the latter may have paid in excess of the amount paid by the former, or by Wyoming to Montana of any amount the latter may have paid in excess of the amount paid by the former.

ARTICLE VII

Should any claim or controversy arise between

the signatory states:

6 (WY)
(a) With respect to the waters of the Yellowstone River;

(b) Over the meaning of interpretation of any of the terms of this compact;

(c) As to the construction or operation of any works in one state for the benefit of the other state; the Governors of the signatory states, upon request of one of them, shall forthwith appoint commissioners with power to consider and adjust any such claim or controversy, subject to ratification by the Legislatures of the signatory states. Nothing in this article contained, shall prevent the adjustment of any such claim or controversy by direct legislative action of the states, or be construed to limit or prevent any state from instituting or maintaining suit to protect any right under this compact or to enforce any of its provisions.

ARTICLE VIII

This compact may be terminated or modified by the mutual consent of the signatories hereto, provided, termination or modification thereof shall not impair rights previously established hereunder.

ARTICLE IX

This compact shall be in full force and effect as of the date when it shall have been approved by the Legislature of each of the signatory states and by the Congress of the United States.

MT v. WY/MTD App. 9 (WY)

Notice of approval by the Legislature of each
signatory state shall be given by the Governor to the
Governor of the other state and to the President of the
United States, and the President of the United States
is requested to give notice to the Governors of the
signatory states of approval by the Congress of the
United States.

Executed in three original copies at Cheyenne,
in the State of Wyoming, this Sixth day of February, A.D.
1935.

[Signatures]

COMMISSIONER FOR THE UNITED STATES.

COMMISSIONER FOR THE STATE OF MONTANA.

COMMISSIONER FOR THE STATE OF WYOMING.
Letter from R.E. McNally to Wyoming members of YRCC, Oct. 3, 1950
October 8, 1960

To the Wyoming members of the Yellowstone
River Compact Commission:

Gentlemen:

The time is rapidly approaching when we must do
something about this Compact. In a feeble sort of way
I am trying to contribute my part.

A few days ago I sent you a tentative draft of a
Compact which was largely prepared by Attorney W. J.
Wehrli and to which I contributed a small part.

Today I received from Mr. Ed Willim a tentative
draft of a Compact which was prepared presumably by Mr.
Carl Myers. In any event Mr. Myers handed it to Mr.
Ed Willim. In many ways I like the Myers version very
much. It may well be that between the Wehrli draft
and the Myers draft (so-called) we can find a common
ground of agreement.

I think that the Myers draft handles the matter
of "established rights" in a very satisfactory fashion.
Mr. Wehrli approaches the same thing in an entirely
different manner but also very effectively, I think.

Certainly there should be no disposition on the
part of anyone to want to disturb, or disturb, or in-
valid long-established water rights. I doubt if this
could be successfully done even if we wanted to and,
it is my humble opinion that those who have any idea
of disturbing vested rights, as impairing or restricting
these rights, such persons are simply looking for
trouble. These people just don't want a Compact at
all. And so, it being the beginning of the next session
of the legislature a poll should be taken of the
Commissioners. This question should be propounded to them individually: "Are you or are you not in favor of recognizing the existing vested and long-established rights of water appropriators in the Yellowstone River Basin?" If any sizeable number of the Commissioners should answer in the negative, then, a motion to adjourn would be in order, it seems to me.

Now, for purposes of comparison, I call your attention to Article III of the Wehrli draft which I mailed you a few days ago. And, at the same time, read Article V of the Myers draft which I enclose herewith. Mr. Myers excludes "established rights". Mr. Wehrli affirmatively makes an allotment in perpetuity of those rights based upon the maximum annual consumptive and beneficial use of water in the respective states during the ten year period ending January 1, 1951. After all, as stated in paragraph 7 of Article III of the Wehrli draft it is stated that "beneficial use shall be the basis, the measure, and the limit of the right to the use of water herein apportioned". In the Platte river decision the Court gave Wyoming the prior right to water for every acre of land actually irrigated. "Paper rights" were not recognized. We all know that a great many of these "paper rights" are fictitious. Mr. Wehrli seeks by his formula to eliminate these fictitious rights, while Mr. Myers excludes all "established rights" without providing a definite rule defining what those rights are. It will be up to the Commission to decide upon the best method of arriving at this result: the protection of all existing rights.

It will be noted that Mr. Wehrli apportions "unused" water on a percentage basis, whereas Mr. Myers makes his apportionment upon an "acre-foot" basis. It may be that this latter method will prove more desirable. In Article VI Mr. Myers provides that any shortage of water on an annual basis exclusive of established rights and other uses shall be apportioned according to the apportionments made in his Article V. Mr. Wehrli in his Article III, first paragraph, apportions the water of the Yellowstone River system according to the beneficial
consumptive use. If this apportionment of the waters is followed, then during the low flow period of Tongue River during July and August, Wyoming could be forced to restrict its diversions to supply Montana with about thirty percent of the stream flow on some measurement basis to be hereafter determined. The Tongue River water users in Wyoming objected to the former Compact because they would have to deliver twenty-eight percent of the "Daily Divertable Flow" to Montana users. The Wyoming people would never sign such a Compact. Therefore the first paragraph, Article III, of the Nehlil Compact must be changed to read: "there is hereby apportioned, on an annual basis, from the Yellowstone River system, etc."

You will note that Mr. Myers in paragraph C of his Article V provides that the apportionment shall be determined by the inflow-outflow method. This is good, in my opinion. Also, Mr. Myers provides in paragraph B of his Article V that the determination shall be made on an annual water year basis. I favor both of these ideas.

Neither draft contains a proper definition of "domestic use". In my opinion the Upper Colorado River Basin Compact was as carefully and skillfully prepared as any Compact that I know of. The definition of "domestic use" contained in paragraph (a) Article II should be adopted here. I might properly quote that definition as follows: "the term "domestic use" shall include the use of water for household, stock, municipal, mining, industrial, and other like purposes, but shall exclude the generation of electrical power". In sub-paragraph 1. of paragraph D of Article V of the Myers draft I think that the maximum capacity of any reservoir for stock water should be at least twenty acre-feet instead of ten acre-feet.

Mr. Myers does not exclude the Little Big Horn River. Mr. Nehlil, at my suggestion, excluded the Little Horn. I don't know what is best. I have told some of the ranchers on the Little Horn and its tributaries in Wyoming that the Little Horn was to be excluded. If it is to be included these ranchers ought to be given an
opportunity to be represented and to be heard before the Commission. There may be entanglements here between the Indian rights on the Crow Reservation and the rights in Wyoming. I had hoped to avoid these entanglements by omitting the Little Horn. This conflict of rights should be settled in the Courts and not elsewhere. This Commission is not a judicial tribunal.

And, speaking of Indian rights, I am dissatisfied with Article VIII of the Myers draft which speaks of the "first and prior water rights reserved for Indians, for Indian tribes, and for Indian reservations, whether such first and prior water rights of the Indians are inuse or covered by Federal Court decrees at the date of this Compact". I don't like this language. I prefer this language: "all prior existing water rights of Indians, Indian tribes, and Indian reservations are hereby recognized and shall be and shall remain unimpaired by this Compact."

This matter was discussed at great length in the negotiations leading up to the adoption of the Upper Colorado River Compact. This language was finally agreed upon: "nothing in this Compact shall be construed as affecting the obligations of the United States of America to Indian tribes".

I dislike very much the idea of a super-government in the form of an inter-state Commission. I think that the matter of administering the Compact should rest with our State Engineers as has been done with most of our other Compacts. I hesitate to see the power and control over our waters which was vested by our constitution in our State Engineer and our Board of Control taken away from them and given over to a Commission, two of whose members, a majority, are not even citizens of Wyoming. I think that Article VI of the Werlhi draft ought to take care of that situation. A part of this was taken from the Snake River Compact recently negotiated by the State of Wyoming.

I would favor striking the words "therefore and" from the second line of Article VII of the Myers draft.

Many of the Articles of the Werlhi draft and the Myers draft are identical and may be adopted in their entirety.
I believe that we are getting close to an agreement. The only thing that can prevent our getting together, as I have hereinbefore indicated, will probably be the disposition on the part of some members of the Commission to disregard, disrupt and invade the vested rights of the ancient appropriators and users of the waters of our streams and thereby to destroy the economy which has long been based upon these rights. I think that every Compact that Wyoming has negotiated from the Colorado River Compact to the Snake River Compact has protected "established rights". We cannot depart from that policy here.

Very sincerely yours,

[Signature]

R. B. Hoxsey

Encl.
R/M: main

RECEIVED
OCT 5 1950
STATE ENGINEER
ARTICLE 7 (Byers)

1. There is hereby apportioned from the Yellowstone River system in perpetuity to the States of North Dakota, Montana, and Wyoming, respectively, exclusive of established rights and other uses coming within the provisions of paragraph 2 of this Article 7, the consumptive use per annum of water, as follows:

Main Stem Yellowstone River

To Montana ___acre-feet
To North Dakota ___acre-feet

Powder River

To Montana ___acre-feet
To Wyoming ___acre-feet

 Tongue River

To Montana ___acre-feet
To Wyoming ___acre-feet

Big Horn River

To Montana ___acre-feet
To Wyoming ___acre-feet

Clark's Fork River

To Montana ___acre-feet
To Wyoming ___acre-feet

3. The apportionment made to the respective States by paragraph 1 hereof shall be determined on an annual water year basis measured from October 1 of any year through September 30 of the succeeding year.

4. The consumptive use of water, which use is apportioned in paragraph 1 hereof, shall be determined for each State by the law-flow-outflow method in terms of pan days as explained in addition to existing regulations as of January 1, 1931.
3. There are hereby excluded from the provisions of
this compact:

1. Existing and future domestic and stock water
uses of water

Provided, that the capacity of any reservoir for stock water
so excluded shall not exceed 10 acre-feet.

2. Established rights to the beneficial use of
water in each signating State existing on January 1, 1961,
including losses from reservoirs constructed prior to January
1, 1961.
Letter from R.E. McNally to Burke, 
Aug, 17, 1950
Mr. W. J. Burke
Regional Counsel
c/o Bureau of Reclamation
P. O. Box 1058
Billings, Montana

Dear Mr. Burke:

This will acknowledge your letter of August 14 in which you ask me for a copy of my letter of June 9, 1950, addressed to Governor Bunker.

I hasten to comply with your request. I am also enclosing a copy of a letter written under date of August 9, 1950 to Mr. L. F. Thornton of Montana, one of our Commissioners.

I am sending a copy of this letter and of both of the enclosed copies to Mr. M. W. Williams, in order that he may be fully informed as to our position in advance of our meeting. I hope in this way to save time when we get together in Billings.

I want you to know that most of our Wyoming Commissioners, including Mr. Thornton, got together last May and reached a tentative agreement on most of the important questions which will arise when the Drafting Committee meets. The Tongue River Water Users Association has employed Mr. Williams and we expect him to be present at our meeting next April. He is fully informed.

I want to mention here a few of the more important items upon which our Commissioners are agreed:

1. We will submit for consideration Paragraph A of Article V in the following words: "A. All existing rights to the beneficial use of the waters of the Clark Fork Basin, Yellowstone River, Big Horn River Basin (exclusive of the Little Horn River), Tongue River Basin, and Powder River Basin (exclusive of the Little Powder River), respectively, in the States of Montana and Wyoming valid under the laws of those States, respectively, as of January 1, 1940, are hereby recognized and shall be and remain untapped by this compact."
This phraseology, we think, should be made applicable to all of the rivers involved in these negotiations. As to the apportionment of the waters of each river basin we are favorable to the use of the following words: "The total unused or unappropriated divertible flow is divided _________% to Montana; _________% to Wyoming."

II

We are opposed to any interstate administration. We offer for adoption the plan used in the Cheyenne River and Bellefourche River Compacts. We are unyieldingly opposed to Mr. Leonard's suggestion of an interstate administration without regard to State boundary lines based upon the "priority rule". We believe that the rule of "equitable apportionment" as defined in the Platte River decision, 328 U.S. 589, should apply. As I stated in my letter to Mr. Thornton, "priority" is only one of many factors.

III

We have re-drawn Article VI and VII of the old compact. As to Article VI, in particular, we recognize all prior existing water rights of Indians, Indian Tribes, and Indian Reservations, and these rights shall remain unimpaired by the compact. We are not prepared to say with exactitude what these rights are. But, whatever they are, the compact will recognize them. And likewise, as to the Federal Government, we are glad to recognize all of the Government's rights, whatever they are, but we are not willing to extend or enlarge those rights by agreement.

It might be advantageous to all of us if the Government would lay out on the table its position with reference to the unappropriated waters of these interstate streams. If the Government is going to take the position and make the contention as to ownership of the unappropriated waters that it made in the Platte River Case, there isn't any use in devoting much time to these negotiations. After having recognized all existing rights of appropriators in the various States as of January 1, 1950 (and these rights would have to be recognized in any event), our meeting will have nothing to consider except the unappropriated water, and if the Government has a superior title to these rights, as it claimed to have in the Platte River Case, there wouldn't be much advantage in the States dealing
with something that they don't own. If the representatives of these three States recognize the superior right of the Government to these unappropriated waters, it would be equivalent to these States giving a quitclaim deed to the Federal Government for all of the unappropriated waters. I, personally, will never subscribe to the States' recognizing that the Government has any superior title to these waters. That is a matter beyond the powers and beyond the jurisdiction of our Commission. We must not, by agreement, make an adjudication here either for or against the Government. We must not by innuendo or by inference attempt to settle this matter of ownership of the unappropriated waters. That is not our province.

All co-laboration as all vested rights are, and must be, recognized and remain intact as of January 1, 1950, and inasmuch as the representatives of these States are dealing only with the unappropriated waters, if the Government intends to assert, and later establishes, its superior right to these waters, anything that may be agreed upon between the States as to these waters would be futile.

I am glad to have the opportunity of making my position perfectly clear. Of course, I am only one member of our Commission. I think that I reflect the views of most if not all of the other members. But I am speaking here only as an individual.

Very sincerely yours,

R. E. McNally
Letter from Burke to R.J. Newell,
Apr. 20, 1950
April 20, 1950

Mr. R. J. Nevoll, Chairman
Yellowstone River Compact Commission
Bureau of Reclamation
P. O. Box 937
Boise, Idaho

Dear Mr. Nevoll:

The Yellowstone River Compact Commission in its second meeting held in Billings, Montana, February 1 and 2, 1950, appointed a drafting committee and designated engineering advisors to prepare a draft of the Yellowstone River Compact. I agreed at the request of the drafting committee to undertake the preparation of a "work-draft" of the compact. That draft has been prepared and a copy is attached. Distribution of the draft to the drafting committee, to the engineering advisors, and to the Secretary of the Commission has been made as indicated at the foot of this letter.

In agreeing to assist the drafting committee, I asked for instructions as to whether the draft should be an amendment of the 1944 compact or a new draft. The minutes of the February 1-2, 1950, meeting show that a notion was adopted unanimously favoring the preparation of a completely new draft. In seeming contrast, the minutes of the November 29, 1949, meeting show that Mr. Fred Buck, State Engineer of Montana, suggested that the compact should be based on the same general theory as the 1944 compact. The minutes do not show the disposition of Mr. Buck's suggestion. For reasons which I shall develop, I was unable to prepare the draft in accordance with the instruction given to me by the Commission.

At the first meeting of the Commission, an engineering committee was appointed. From the minutes of that meeting, it seems that eight items were suggested for coverage by the engineering committee. An examination of the report of the engineering committee discloses that these items are covered.

The February 1-2, 1950, minutes of the Commission show:

(1) The report of the engineering committee was accepted as a basis for negotiation.

(2) The engineering committee report was a unanimous report.
(5) A motion to accept and approve the engineering committee report as the best data available and for use as a basis for the division of the water, although seconded, was, after discussion, withdrawn.

(4) The engineering committee was not discharged but continued for consultation and advice.

(5) While there was discussion as to the principles to be used in developing the compact, no action was taken by the Commission.

(6) Area committees were appointed to agree upon the division of the waters of each of the streams to be covered by the compact.

(7) The reports of the area committees generally were accepted and referred to the drafting committee.

While the report of the engineering committee contains data that are material to the development of a principle for compacting the several streams, the report does not recommend such a principle. As shown above, the Commission did not use the report of the engineering committee to develop a compact principle. The only principle that I can deduce from the report of the engineering committee is that existing appropriative rights in each State shall be recognized both as to validity and enjoyment and that the stream flows after depletion by existing appropriative rights shall be apportioned on a rate basis that shall be determined by taking the total of the interstate potential acreage as the base and the total of the intrastate potential acreage as the percentage. To give effect to this principle, and because of the action of the Commission that the report of the engineering committee be accepted as a basis for negotiation of the compact, it was necessary for me to use the "divertible flow" theory adopted by the Commission that negotiated the 1944 compact. Accordingly, the "work-draft" that I am submitting is not a new compact but an amendment of the 1944 compact. The amendments of the 1944 compact are:

(1) The deletion from the 1944 compact of the apportionments of each stream and the substitution of the apportionments reported by the area committees and accepted by the Commission for the use of the drafting committee. (This is Article V of the "work-draft.")

(2) The last paragraph of Article V, A, 5 of the 1944 compact, allotting residual flows of the Yellowstone River below Sidney, Montana, after Montana and Wyoming have made or may make full beneficial use of those waters, to North Dakota, is deleted. (This accords with the view expressed by Mr. Aker.)
(3) From Article VI of the 1944 compact the first and the last sentences have been deleted, because the subject of the first sentence, present vested rights, is covered in Article V, A of the "work-draft" in the compacting of each of the streams; and the subject of the last sentence, Indian rights, is covered in Article VII of the "work-draft."

(4) The deletion from the 1944 compact of Article XIV (Indian rights) and the inclusion of Article VII in the "work-draft" is as requested by the Bureau of Indian Affairs.

Your attention is called to the following particulars of the "work-draft":

(1) The proviso to Article V, A, 2 seems to be in conflict with the last sentence of Article V, D.

(2) In Article V, A, 3 (Tongue River), "unappropriated waters" are allocated, whereas in all other instances "unappropriated divertible flow" is allocated. (In Article V, A, 2 "unapportioned" is used rather than "unappropriated.""

For your convenience, I am enclosing a mimeographed copy of the 1944 compact. For your information, the 1944 compact as ratified by the Legislature of North Dakota is Chapter 61-23, 1947 Supplement to the North Dakota Revised Code of 1943; and as ratified by the Legislature of Montana is Chapter 35, Laws of Montana of 1945. Since the Wyoming ratifying act was vetoed by the Governor of Wyoming, there is no Wyoming citation. It is assumed that the Wyoming act as vetoed is available to the Wyoming representatives.

Very truly yours,

W. J. Burke

Enclosures

(See attached sheet for distribution)
Copy, in dupl., to drafting committee, with copy of "work-draft" of compact, in dupl.:  

F. F. Leonard, Miles City, Mont.  
I. A. Achter, State Capitol, Bismarck, N.D.  

Copy to engineering advisors, with copy of "work-draft" of compact:  

Carl Myers, Chairman, Engineering Committee,  
c/o Bureau of Reclamation, Box 1264, Billings, Mont.  
Fred Buck, State Engineer, Capitol Bldg., Helena, Mont.  
J. J. Walsh, State Engineer, Capitol Bldg., Bismarck, N.D.  
L. C. Bishop, State Engineer, Capitol Bldg., Cheyenne, Wyo.  
E. S. Hanna, Bureau of Indian Affairs, 303 N. 29th, Billings, Mont.  
Dean R. D. Goodrich, 603 Fromont St., Laramie, Wyo.  
H. T. Persons, c/o University of Wyoming, Laramie, Wyo.  
Axel Persson, c/o Bureau of Reclamation, Box 2130, Billings, Mont.  

Copy to:  

O. C. Roody, Secretary, Yellowstone River Compact Commission,  
c/o Bureau of Reclamation, Box 2130, Billings, Mont.,  
with 38 copies of draft or compact. (W.D.: It is suggested that no distribution be made by Mr. Roody, unless instructed to do so by Mr. Maxwell. Distribution, except as above, is not advised for the reason that better progress, it is thought, will be made if the "work-draft" be kept within the drafting committee and the engineering advisors pending agreement upon a draft for submission to the Commission sitting as a whole. W.J.B.)
Letter from R.E. McNally to Bishop,
Jan. 7, 1949
Mr. L. C. Bishop
State Engineer
Cheyenne, Wyoming

Dear Mr. Bishop:

I am going to make this final appeal to you on behalf of the water-users of the upper Tongue River Basin in Sheridan County. It seems to me that an appeal should not be necessary because it is your duty, as State Engineer, to protect and defend the rights and the interests of the people in all parts of this State. It appears to us, in Sheridan County, that your course of action in connection with the Yellowstone River Compact is directed toward the impairment of our water rights, and that for more than six years you have persisted in this endeavor.

You profess to be disinterested in this matter. You deny that you are sponsoring the re-submission of this matter to the State Legislature. And yet, your communications to the Governor and to many others are conclusive evidence of your purpose and design to force this Compact down the throats of our people.

If you are not sponsoring this thing, who is sponsoring it?

Why do you refer in your communications to threatened litigation, when there is no threatened litigation?

Why do you say that Attorney-General L. J. D’Merr was in favor of this Compact in 1945?

Why didn’t you bring this thing before the Legislature in 1947? Was it because you knew that Governor Hunt would again veto it? Do you think, now that Governor Hunt is gone, that there is less chance of the measure being vetoed?

You have not, in the last six years, made any attempt to obtain accurate information as to the irrigated and irrigable acreages on Tongue River in Montana or in Wyoming. The people here feel, and justly so, I think, that you have never visited
this part of the State except in an antagonistic attitude towards our best interests. They think that this matter of compacts has become an obsession with you, and that you favor compacts regardless of how they may injuriously affect the people of this State.

I am speaking very frankly in this letter, because I think that I must.

If you would study the decision of the Supreme Court of the United States in the Platte River Case, you would find that the Yellowstone River Compact, in terms of present-day thinking, is a monstrosity. It follows obsolete notions as regards the measurement, division and distribution of the waters of interstate streams. If a compact is necessary on Tongue River, it should be negotiated with a view to modern engineering methods of division, diversion, consumptive or beneficial use, measurement and allocation, and with a clear understanding of priorities and equities. None of these things are recognized in the old Compact.

In the Platte River Case, the Supreme Court did not disturb any existing water appropriations in Wyoming in the upper River Basin. All appropriations were recognized. These appropriations, all of them, amounted to 168,000 acres. The contention of Nebraska was that junior appropriators in Wyoming should have their headgates closed to supply water to senior appropriators in Nebraska. This contention by Nebraska was denied. Junior appropriators in Wyoming can freely use the waters of the Platte River without regard to senior appropriations in Nebraska. Said the Court in answer to this contention by Nebraska, "but as the Special Master points out, those Wyoming appropriations, though junior, represent old, established uses in existence from forty to over fifty years."

Many of our appropriations have been in existence for 69 years. You would reduce and impair those appropriations. This Compact does just that. But if the matter were submitted to the Supreme Court, these ancient rights would be protected as they were in the Platte River Case.

We should have no fear of litigation. The Courts would give us more, by far, than we are getting under this Compact. You have good irrigation lawyers available to you. Why don't you consult them, and take their advice?
Mr. L. C. Bishop--January 7, 1949--Page 3--Continued.

Why can't you negotiate the Tongue River problem separately? Why tie us in with the other interstate streams? You are forcing the other parts of the State who are satisfied with their part of the Compact to take a dog-in-the-manger attitude towards Tongue River. They are getting what they want even though, in doing so, they are jeopardizing and impairing the water rights on Tongue River.

Montana is getting such an advantage on Tongue River that they can afford to be generous in the division of the waters of the other interstate streams.

This is all wrong. You should be for justice and equity. Otherwise, when another dry cycle comes, and it will come, when our crops are withering and dying and when our headgates are closed by an Interstate Commission, a super-government, our misfortunes will be attributed to you.

You have said very emphatically to Mr. Munro and to others that this Compact will not become operative for ten years. What difference does that make? If it is a bad thing now, it will still be bad ten years from now. Do you find consolation in postponing the evil day?

But, the Compact provides that it shall become operative "on June 15 of the year in which water is available for release through any adequate distributary system, other than the stream bed, from the Tongue River Reservoir". Don't you know that there is 70,000 acre-feet now available for release in the Tongue River Reservoir? The Interstate Commission, the super-government, will decide what is an "adequate distributary system". An adequate system might consist of pumping stations installed along the river bottom. That might happen this year or next. This disaster may come upon us much sooner than ten years from now. You are careless in making that statement.

Now, Sheridan gets its municipal water supply from Big Goose Creek. There is no place in the Compact that provides protection for our municipal water supply. Sub-paragraph C of Article V provides "the allocations made herein shall be exclusive of the use of the waters for domestic and stock use". That reservation does not protect the right to use water for lawns and gardens and drinking fountains, or for industrial or commercial uses, such as our garages, filling stations, brewery, flour mill and our other industries that represent a considerable payroll in this town. These uses will be subject to regulation
by this Interstate Commission whenever the dry cycle comes. The term "domestic use" according to Court decisions means purely household and culinary uses, not municipal uses such as the sprinkling of our parks and cemetery. It is possible that in a dry year, our lawns and gardens, and parks and cemeteries will be regulated, and limited and restricted in their use of water by an Interstate Commission. Likewise our commercial, industrial and manufacturing establishments. When that day comes, if it does come, the names of those sponsoring or promoting this inequitable thing will be well, but not favorably, remembered by the victims of their folly.

In your letter addressed to Mr. James Munro, under date of December 21, 1948, you state very emphatically that "there will always be more water entering the river below the Wyoming state line than necessary to make up their seepage and evaporation between the state line, and the last point of diversion in Montana."

If you were familiar with the true situation you would not make that statement, because I have the positive statement of one man who has lived in that country for 70 years, a very prominent and honorable man, and another man who has lived there for more than half a century, to this effect:

That there is no living stream which contributes any water to Tongue River between the State line and the lowest point of diversion in July and August of any year.

You seem to have faith in Article V, sub-paragraph 5 D of the Compact which provides that the Commission shall direct the regulation of the streams to avoid unreasonable carriage losses. But you seem to overlook paragraph 5 B which provides that "if the Commission shall fail to reach unanimous agreement as to the modification of any allotment****then, as to the stream affected, the allotment then existing shall continue in full force and effect until unanimous agreement thereon be reached".

It takes a fertile imagination for anyone to think that in a dry year, when crops are withering for need of water, that the Montana representative on the Commission will become a "good fellow" and yield up any part of Montana's rights under this Compact. Can't you see that such a situation is unthinkable?

The Compact provides that the first block of 2200 acre-feet
shall be divided 72-28 between Wyoming and Montana. At many times in every year during the irrigation season, and always in a dry year, the gross, mass, production of water in the Tongue River Basin is less than that amount. In a dry year practically no water crosses the Montana line. And this is as it should be, because it would be uneconomic to close headgates in Wyoming to supply water to meet appropriations 150 miles distant, even senior appropriations. The Supreme Court of the United States has emphasized this point in the Colorado and Nebraska decisions. Why don't you apply those well-established principles to this Compact?

Assuming that the gross, daily, aggregate, mass production of water in the upper Tongue River should amount to exactly 2200 acre-feet, that would mean that we would have to shut off enough headgates in Sheridan County to give Montana a flow of water amounting to 308 cubic feet per second of time. That is more than double the size of any irrigation ditch in this entire region. And that water, or the part of it that would remain after deducting seepage and evaporation, would be released for beneficial uses 150 miles below. And that water in its 150-mile journey would flow serenely through a Reservoir in Montana, already constructed and already containing 70,000 acre-feet of stored water.

Think of the number of acres of fertile Wyoming land that could be irrigated with that quantity of water.

Do you know that in the upper Tongue River Basin in Wyoming there are 95,000 acres of adjudicated water rights? Do you know that we only have water for 60,000 acres of that land?

Does anyone know how many acres of irrigable land are situated in Sheridan County which could be added to our adjudicated acreage if our water supply could be augmented?

You have made no survey to ascertain this essential information. The Montana Legislature has appropriated money for a survey. Why have you not asked the Wyoming Legislature for an appropriation for a similar purpose?

Under this Compact, this new Commission, this new Interstate Board of Control will be required to measure each diversion every day.

Do you know that there are more than 400 diversions in Sheridan County out of Tongue River?
If this Compact is to work as a practical thing, the countryside in Sheridan County will be filled with the employees of this Interstate Board of Control measuring, and gauging, and checking each diversion every day.

Why wouldn't this be a simple solution to this whole controversy:

The Case of Wyoming versus Colorado (the Laramie River Case) was decided by the Supreme Court of the United States on May 31, 1932.

Mr. James A. Greenwood, Attorney-General of Wyoming, argued the case for Wyoming.

The Case of Nebraska versus Wyoming was decided by the United States Supreme Court on June 11, 1945.

Attorney W. J. Wehrli argued the case for the State of Wyoming.

Both of these lawyers are available to us now.

Why can't we submit this Compact to these very reputable and able men? Let us have them tell us whether my contentions are right or wrong, and whether your position in this matter is right or wrong. If these gentlemen tell us that this Compact is fair and equitable, if they tell us that it conforms with the law as enunciated in the Colorado and Nebraska cases, if they tell us that this Compact is intelligible and is in accordance with present-day thinking and present-day engineering practices, I believe that the people of this County will immediately yield and will join in asking for the ratification of this Compact.

If you will not consent to this compromise, I will recommend that the matter be exhaustively considered by the Wyoming Legislature and by Governor Crane, and that we be given an opportunity to be heard, and if it should pass the Legislature and be signed by the Governor, the people of this County will be compelled to demand a Congressional hearing when the matter reaches Congress, and lastly, if all else fails, we will have to have recourse to the Courts. All of these things will be expensive and unpleasant. It is well for you to remember that not a single Commissioner from the upper Tongue River Basin signed that Compact. And that it is being forced upon us in a sort of trade
in which Sheridan County is being unjustly and unfairly discriminated against.

I will certainly expect you to agree to my proposition that the whole matter be submitted to Mr. Greenwood and Mr. Wahrli, and that we all be bound by their findings.

Very sincerely yours,

R. E. McNally

REMC/mr
Letter from P.F. Leonard to Comstock,
June 29, 1944
Mr. E. D. Comstock
Regional Director
Bureau of Reclamation
Billings, Montana

Dear Mr. Comstock:

I have your letter of June 23rd in regard to the proposed meeting of the Yellowstone Compact on July 22nd.

In the first place allow me to congratulate you on your selection as a federal representative.

It is my opinion that the compact can be agreed to without delay provided two items be agreed upon:

1. Agreement be made as to the division of the waters of the Tongue River and

2. That the point of division be at the State line instead of some internal point within Montana.

I do not believe that Powder River need go in the compact as there is very little irrigation on Powder River in Montana and the proposed Moorhead dam should take care of the potential irrigation.

During our previous meetings we had more or less difficulty concerning the Tongue. I have recently written Mr. Bishop of Cheyenne suggesting that he get in touch with the water users in Wyoming on the Tongue River and see if they could not arrive at a mutual agreement that would give Montana at least 25% of the initial 2300 acre feet. That was in line with the compact proposed through the Power Commission and is less than the division proposed under the previous compact.

It is my theory that the only purpose of a compact is to divide the water at the State line in order to avoid the conflicts by reason of the State line. The compact can not settle or determine questions within the boundaries of a State. I do not believe that the commissioners appointed under a compact would have authority to come into the State of Montana and divide water or interstate tributaries at the point where such tributaries join the Yellowstone River in Montana. The compact commissioners have no business attempting to measure or divide waters that have their source within or supply from territory entirely within the State of Montana. Any attempt to do so would be unlawful and would lead to confusion and discord and I do not believe it has ever been attempted previously.
To - H. D. Comstock
Page two
June 29, 1944

If we could settle in advance the division of the Tongue River and the point of measurement I feel certain that we could agree upon a compact without any trouble or delay.

I might add that division five of Article five of the previously proposed compact provided that after the expiration of ten years the commission appointed could re-examine the allocations made. It is my opinion that that time is too short. I think it should be time for re-examination and re- allocation for 25 years.

I am sending a copy of this letter to Mr. Bishop and to Mr. Buck.

Sincerely yours,

F. F. LEONARD

PFL:JS
Letter from L.C. Bishop to L.C. Hunt,
Feb. 9, 1943
HON. LESTER C. HUNT, GOVERNOR
MEMBERS OF THE 27TH WYOMING LEGISLATURE

Gentlemen:

As Interstate Streams Commissioner for Wyoming I deem it my duty at this time to outline for your information a brief summary of the history of the Yellowstone River Compact and some pertinent facts concerning which, it would seem, you should be advised.

The first Congressional authorization for a Yellowstone River Compact was in 1932 and included only the states of Montana and Wyoming. Clyde L. Seavey was appointed as the Federal Representative.

The first attempt at an allocation of any portion of the Yellowstone watershed was a so-called "Declaration of Plan of Allocating Water in the Big Horn Basin", which was signed by members of the Big Horn Dam Association and by the Governors and State Engineers of Montana and Wyoming. It seems that this was not participated in or signed by a Federal representative, which may have been the reason it was never passed on by the Legislatures of the two states.

The next attempt at negotiations of which we have a record was February 6th, 1935, when a so-called Yellowstone River Compact, for allocation of the waters of the Yellowstone River between the states of Montana and Wyoming was negotiated and signed at Cheyenne, Wyoming, by representatives of the two states and of the United States.

We have no record of this having been submitted to the State Legislatures for ratification.

The record shows no other representatives than the Governors and State Engineers at the 1933 meeting and only the State Engineers and the Federal representative at the second meeting. The only representative provided by law to represent the State prior to 1941 was the Interstate Streams Commissioner.
On August 2nd, 1937, the Congress again authorized the states of Montana and Wyoming to negotiate and enter into a compact for the equitable division of the waters of the Yellowstone River watershed and Clyde L. Seavey was appointed by the President to represent the United States and the Governors of each state appointed four representatives.

These commissioners met in Billings, Montana, May 5th, 1938, and again in Thermopolis, Wyoming, November 21st and 22nd, 1938. Each time negotiations were deferred pending the final report of the Bureau of Reclamation with reference to their basin-wide investigations including the watershed of the Yellowstone River in Montana and Wyoming.

June 5th, 1940, Congress extended the time for negotiating the compact to June 1, 1943, and included North Dakota as a party to the negotiations.

October 10th, 1940, a meeting was held in Billings, Montana, where Wyoming was represented by Thornton, Metz and Bishop, and where it was agreed to postpone further negotiations until the basin-wide report of the Bureau of Reclamation was completed.

The 1941 Legislature amended the Interstate Streams Commissioner law to provide for appointment of assistant commissioners upon the recommendation of the Interstate Streams Commissioner. Upon my recommendation at that time, Governor Smith appointed L. F. Thornton, John Goin, Ray Bower, Ernest Goppert, David Anderson, R. E. McNally and Will G. Metz. Later Ed J. Johnson became a member of the Commission by virtue of his appointment on the Planning and Water Conservation Board, and just before November, 1942, meeting in Billings, Mr. Earl Bower was appointed as an assistant commissioner on my recommendation.

The first meeting where a tentative draft of the Yellowstone River Compact as prepared by Lesher S. Wing was considered, was held in the office of Mr. E. B. Debler, the Chief Hydraulic Engineer of the U. S. Bureau of Reclamation, in Denver, Colorado, from 7:30 to 9:30 p. m, on October 15th, 1942. Mr. Fred E. Buck represented the State of Montana, Mr. John T. Tucker, the State of North Dakota, and Mr. L. F. Thornton, Mr. Ed J. Johnson and Mr. L. C. Bishop, the State of Wyoming. Mr. Lesher S. Wing, Engineer of the Federal Power Commission, acted as a substitute for Mr. Clyde L. Seavey, Mr. W. G. Sloan, Engineer of the the Bureau of Reclamation, acted in an advisory capacity answering questions concerning the progress of the basin-wide investigations of his department. It was agreed that the entire day of October 17th was to be spent in further consideration of the tentative draft of the compact.

The meeting was held on October 17th and a preliminary draft was agreed upon with the understanding that Mr. Lesher S. Wing was to prepare it in proper form and furnish copies to the Commissioners of the three states.

The revised draft was submitted to the joint commission at a meeting held in Billings, Montana, on December 1st, 1942. (Our Wyoming Commissioners spent the entire day of November 30th in organizing and preparing for the negotiations that were to take place the following days.)
A public hearing was held at the Chamber of Commerce Building in Billings the entire day of December 2nd with Mr. Clyde L. Seavey presiding. This meeting had been advertised in all the papers covering the Yellowstone River watershed area.

December 3rd, the Commissioners of the three states met at the Chamber of Commerce Building with Mr. Clyde L. Seavey presiding, and, while a general plan was finally agreed upon, the Commissioners were not satisfied to sign a compact without further hearings in the basin and further consideration of the provisions. The meeting was adjourned at 11:50 a.m. to re-convene at the call of the chairman.

At the call of the chairman, the Commission again met at Billings, Montana, on December 29th, 1942, with Mr. Beebe presiding, and continued during December 30th and, at 1:15 a.m. December 31st, a unanimous agreement of the Commissioners was reached and all agreed to sign except Mr. R. E. McNally who was obliged to leave early in the evening of the 30th, and who later decided not to sign. Will G. Metz was not present at the meetings but signed the Compact as drafted and agreed upon.

The entire day of December 31st was spent by the engineers and some of the others in checking computations made by Mr. Wing and the wording of the draft as approved by the Commissioners.

This compact, as presented to the Legislature for ratification, represents conclusions which, in some instances, were compromises arrived at and unanimously agreed upon by the entire group of State representatives and the representative of the United States, assisted by engineers and attorneys of the Federal Power Commission, U. S. Bureau of Reclamation, Army Engineers and the U. S. Indian Service.

Mr. John A. Whiting, former State Engineer of Wyoming, Mr. Howard Bell, Civil Engineer of Cody, and Mr. Elmer E. Nelson, Civil Engineer of Laramie, were employed as engineer advisors for the Wyoming delegation with Mr. L. J. O'Marr, Wyoming Attorney General, and Mr. W. J. Wehrli, attorney from Casper, acting as legal advisors.

Also, on our commission, we had Mr. Ernest Goppert and Mr. R. E. McNally, attorneys, who rendered very able assistance, and contrary to the opinion expressed by some, the representatives of Federal Agencies have assisted by every means at their disposal to aid us in solving this problem.

Since the printed copies have been distributed, several protests have been registered, but, in my opinion, none have merits that will offset the benefits that will accrue to all concerned by approval of the Compact at this time. It is my opinion that without exception, the allotments are just and equitable and that the draft as a whole is as favorable to Wyoming as we could expect by any compact later entered into, and for reason stated herein, I recommend the passage of House Bill No. 99 entitled "A Bill for AN ACT to provide for the ratification and approval of the Yellowstone River Compact."

Respectfully submitted,

L. C. BISHOP, State Engineer and Interstate Streams Commissioner For Wyoming.
1952 Annual Report
YELLOWSTONE RIVER COMPACT COMMISSION

406 Federal Building
Helena, Montana

December 24, 1952

His Excellency, Frank A. Barrett
Governor of the State of Wyoming
Cheyenne, Wyoming

His Excellency, John W. Bommer
Governor of the State of Montana
Helena, Montana

His Excellency, Norman Brunsdale
Governor of the State of North Dakota
Bismarck, North Dakota

Sirs:

Pursuant to Article III of the Yellowstone River Compact, the Commission created by the terms of said Compact makes the following report for the period ending September 30, 1952.

The Yellowstone River Compact was made effective on October 30, 1951 upon approval of the Congress of the United States. The Governor of Wyoming appointed Mr. L. C. Bishop, Wyoming State Engineer as the representative of the State of Wyoming. The Governor of Montana appointed Mr. F. E. Buck, Montana State Engineer as the representative of the State of Montana. In mid-May 1952, the Governors of the States of Wyoming and Montana separately notified the Director of the United States Geological Survey of their selections and requested the appointment of a third party. The Director appointed Mr. Frank Stermitz on June 9, 1952, to sit with the Commission and act as Chairman. The Yellowstone River Compact Commission so constituted met at Helena, Montana on July 15, 16, 1952, and at Sheridan, Wyoming on November 25, 1952.

The Commission being satisfied that the allocations of the upstream state or states were not approached for the period ending September 30, 1952, did not factually determine the extent of allocable use.
The expenses of the Commission are being borne as stipulated in Article III (B) of the Compact. The sum of $1200 has been made available for the period ending June 30, 1955.


The Yellowstone River Compact apportions the waters of certain inter-state tributaries of the Yellowstone River which are available after the appropriative rights existing in the States of Wyoming and Montana on January 1, 1950 are supplied, and after appropriative rights to the use of necessary supplemental water therefor are also supplied. Your attention is called to the need for the enactment of regulations or laws in Wyoming and Montana which will make it feasible to maintain reliable records of the appropriative water rights and water use subject to allocation by this Compact. This matter is discussed in greater detail in the accompanying report under the heading of Diversions.

Respectfully Submitted,

L. C. Bishop
Commissioner for Wyoming

Fred H. Buck
Commissioner for Montana

Attest

Frank Stermitz, Chairman
Effective date:

The Yellowstone River Compact became effective on October 30, 1951 upon approval of the Congress of the United States of America.

Organization of the Commission:

As provided in Article III (A) of the Compact, Mr. L. C. Bishop, State Engineer of Wyoming was selected to represent the State of Wyoming and Mr. F. E. Buck, State Engineer of Montana was selected to represent that state. Upon the request of the Governors of those two states, the Director of the United States Geological Survey selected Frank Sternitz, District Engineer, Surface Water Branch, United States Geological Survey of Helena, Montana on June 9, 1952 to sit with the Commission and act as Chairman, without vote except as specifically provided.


The office of the Commission was designated as the business office of the Chairman, namely, 408 Federal Building, Helena, Montana. The Chairman was requested to make provisions for secretarial service as required.

The Commission has under advisement the formulation of rules and regulations as authorized in Article III (E) of the Compact.

Cost:

The work of the Commission is being financed by cooperative arrangements between the States of Wyoming and Montana and the United States of America. For the period ending June 30, 1953 the total sum of $1200 is being made available for that purpose. The following is a tentative budget for the collection of basic records and other expense of administration which may be incurred by the Commission during the fiscal year ending June 30, 1954:

3.
Gaging station operations $1800 $ 900 $ 450 $ 450
Replacement or improvement of gaging stations 3200 1600 800 800
Collection and assembly of miscellaneous data and administrative expense 1000 500 250 250
Annual Total $6000 $3000 $1500 $1500

The above budget does not include the salaries and necessary expenses of the State representatives which are to be borne by the respective states, nor the cost of collection of hydrologic data now being made available from the records of state and federal agencies.

Acknowledgements:

The Commission gratefully acknowledges the assistance and data furnished by various state and federal agencies.

Gaging stations:

The Commission considered the appropriateness of existing gaging stations for the determination of stream flows as required by Article IV and has under study future improvements or modifications. No critical error was considered to result from the use of data collected at existing gaging stations during the period ending September 30, 1952. The descriptions of the gaging stations and the summaries of monthly discharge are given in Appendix A.

Clarks Fork, Yellowstone River-

Records of discharge collected at a gaging station operated on the Clarks Fork at Edgar, Montana, have been accepted as being satisfactory for the designated point of measurement without adjustment for the time being. The effect of upstream diversions into the basin from Rock Creek was considered to be a balancing factor to diversions from the Clarks Fork between Edgar and the mouth of Rock Creek. Improvements of the existing station by the installation of a recording gage or the establishment of a gaging station further downstream are to be investigated further.
Bighorn River (Exclusive of Little Bighorn River).—

Discharge records of the Bighorn River as collected at the gaging station four and one half miles upstream from the mouth known as the Bighorn River near Custer, Montana, excluding the discharge records of the Little Bighorn River as collected at the gaging station fourteen miles upstream from its mouth and known as the Little Bighorn River near Crow Agency, Montana, were considered as sufficiently indicative of Compact requirements to be used for this first Annual report. No records of the quantities diverted from the Little Bighorn River below the gage by the Agency Ditch are available. More suitable means of determining the flow past the point of measurement designated in the Compact will be investigated promptly.

Tongue River.—

The existing gaging station, four miles south of Miles City, Montana, eight miles upstream from the mouth, and which is known as the Tongue River at Miles City, Montana, is considered the acceptable point of measurement on this stream.

Powder River (Including the Little Powder River).—

The existing station three miles upstream from Locate Creek and known as the Powder River near Locate, Montana, has been temporarily designated as the point of measurement. Location of a new gage nearer the mouth of the Powder River was not considered justifiable since the present extent of allocable water use is minor.

Diversions.

No records of the quantities of water subject to percentage allocation by this Compact were available to this Commission. The two state representatives assured the Commission that diversions subject to allocation in their states had been minor during the report period. The lack of information must be remedied if the Compact is to be properly administered.

The laws of Wyoming provide for the filing of all applications for water use with the State Engineer and the issuance of permits and certificates to the State Engineer for public inspection.
of appropriation upon proof of beneficial use of water. This centralized system is a distinct advantage, however, some modification would facilitate the work of the Commission.

In Montana the right to use water can be established by making a filing with the County Clerk and Recorder or by diversion without filing. The State Engineer has no jurisdiction over the issuance of water rights, nor information on rights acquired, nor the quantities of water used.

The States of Wyoming and Montana by entering into the Yellowstone River Compact have assumed a responsibility which cannot be properly discharged until information on water rights acquired since January 1, 1950 and the quantities of water diverted under those rights, can be made a matter of ready record. The Commission recommends to applicable authorities in Wyoming and Montana that the grant, adjudication or establishment of water rights or use which is subject to Compact allocation be upon condition that the user install satisfactory headgates or measuring devices in order that accurate data on diversions be made available to the Commission. The Commission further suggests that legislation be enacted in Montana which will make available to the State Engineer information on water rights whose enjoyment is subject to allocation under this Compact.

Storage:

**In reservoirs completed after January 1, 1950:**

Information available to the Commission indicated that Boysen Reservoir on the Bighorn River was the only reservoir of consequence coming under this category. Storage therein began October 11, 1951. The quantities in storage at given dates are shown in Appendix B.

**In reservoirs existing on January 1, 1950:**

Information available to the Commission indicated quantities of water stored therein and subject to Compact allocation was nil or inconsequential during the report period. No records of quantity stored will be incorporated in this report. Tabulation of reservoirs in this category and the summary by states are given in Appendix C.
MONTHLY SUMMARY OF DISCHARGE

Clarks Fork at Edgar, Montana

Location.—Lat 45°28', long. 108°51', in SW 1/4 sec. 24, T. 4 S., R. 23 E., near center of span on downstream side of highway bridge half a mile east of Edgar and 6 miles upstream from Rock Creek.

Records available.—July 1921 to September 1952.

Gage.—Wire-weight gage read twice daily.

Average discharge.—19 years (1930-31, 1934-52), 1,081 cfs.

Extremes.—Maximum discharge observed during year ending September 30, 1952, 7,990 cfs June 7 (gage height, 7.52 ft); minimum daily, 200 cfs Dec. 15, 1921-52: Maximum discharge observed, 10,900 cfs June 2, 1956 (gage height, 8.62 ft); minimum observed, 41 cfs July 25, 1931; minimum gage height observed, 1.13 ft Mar. 11, 1950.

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1950</td>
<td>11,570</td>
<td>410</td>
<td>350</td>
<td>373</td>
<td>22,950</td>
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<tr>
<td>February</td>
<td>10,640</td>
<td>410</td>
<td>370</td>
<td>380</td>
<td>21,100</td>
</tr>
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<td>March</td>
<td>11,600</td>
<td>590</td>
<td>188</td>
<td>374</td>
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<tr>
<td>April</td>
<td>14,215</td>
<td>759</td>
<td>341</td>
<td>474</td>
<td>26,200</td>
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<tr>
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<td>359</td>
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<tr>
<td>June</td>
<td>136,720</td>
<td>7,310</td>
<td>2,070</td>
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<tr>
<td>July</td>
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<td>7,110</td>
<td>1,840</td>
<td>3,863</td>
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<tr>
<td>August</td>
<td>32,083</td>
<td>1,640</td>
<td>609</td>
<td>1,035</td>
<td>63,660</td>
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<td>1,100</td>
<td>510</td>
<td>791</td>
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## MONTHLY SUMMARY OF DISCHARGE

Clarks Fork at Edgar, Montana

### Water Year 1951

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<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
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<tr>
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<td>658</td>
<td>896</td>
<td>55,080</td>
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<tr>
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<td>626</td>
<td>728</td>
<td>43,310</td>
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<td>760</td>
<td>300</td>
<td>583</td>
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<td>530</td>
<td>380</td>
<td>471</td>
<td>28,980</td>
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<tr>
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<td>14,380</td>
<td>600</td>
<td>440</td>
<td>514</td>
<td>28,520</td>
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<td>March</td>
<td>15,429</td>
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<td>381</td>
<td>498</td>
<td>30,600</td>
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<td>393</td>
<td>574</td>
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<td>7,710</td>
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</tr>
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<td>4,810</td>
<td>2,310</td>
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<td>2,960</td>
<td>783</td>
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<td>21,721</td>
<td>819</td>
<td>620</td>
<td>724</td>
<td>45,080</td>
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</thead>
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### Water Year 1952

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<th>Mean</th>
<th>Runoff in Acre-feet</th>
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<td>October 1952</td>
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<td>934</td>
<td>664</td>
<td>741</td>
<td>45,570</td>
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<tr>
<td>November</td>
<td>18,458</td>
<td>741</td>
<td>520</td>
<td>615</td>
<td>36,610</td>
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<tr>
<td>December</td>
<td>12,784</td>
<td>587</td>
<td>200</td>
<td>412</td>
<td>25,360</td>
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<td>550</td>
<td>340</td>
<td>455</td>
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<tr>
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<td>620</td>
<td>340</td>
<td>480</td>
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</tr>
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<td>540</td>
<td>342</td>
<td>405</td>
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<td>384</td>
<td>846</td>
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<td>May</td>
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<td>3,770</td>
<td>1,370</td>
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<td>150,500</td>
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<td>7,860</td>
<td>1,810</td>
<td>3,961</td>
<td>236,900</td>
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<td>50,520</td>
<td>2,960</td>
<td>753</td>
<td>1,630</td>
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<td>August</td>
<td>25,252</td>
<td>1,330</td>
<td>423</td>
<td>834</td>
<td>51,280</td>
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<tr>
<td>September</td>
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<td>826</td>
<td>288</td>
<td>400</td>
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<table>
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<td>403,877</td>
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331 (WY)
MONTHLY SUMMARY OF DISCHARGE

Bighorn River near Custer, Montana

Location.--Lat 46°07', long. 107°28', near center of sec. 10, T. 4 N., R. 34 E.,
on left bank just downstream from Manning diversion dam, 3 miles upstream
from Tullock Creek, 4 miles southeast of Custer, and 4/2 miles upstream from
mouth.

Records available.--May 1945 to September 1952.

Gages.--Water-stage recorder. Prior to December 7, 1945, wire-weight gage at
different datum.

Average discharge.--7 years, 4,287 cfs.

Extremes.--Maximum discharge during year ending September 30, 1952, 14,800 cfs
May 25 (gage height, 6.65 ft); minimum daily, 500 cfs Dec. 16.
1945-52; Maximum discharge, 26,200 cfs June 24, 1947 (gage height,
8.79 ft), from rating curve extended above 12,500 cfs by logarithmic
plotting; maximum gage height recorded, 10.65 ft Mar. 20, 1947 (ice jam);
minimum discharge, 786 cfs Dec. 13, 1950 (gage height, 0.89 ft).

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1950</td>
<td>51,400</td>
<td>1,650</td>
<td>1,300</td>
<td>1,562</td>
<td>102,100</td>
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<td>February</td>
<td>74,200</td>
<td>6,000</td>
<td>1,740</td>
<td>2,652</td>
<td>117,230</td>
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<td>March</td>
<td>150,100</td>
<td>6,400</td>
<td>3,200</td>
<td>4,845</td>
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<td>April</td>
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<td>3,530</td>
<td>2,320</td>
<td>3,021</td>
<td>179,700</td>
</tr>
<tr>
<td>May</td>
<td>114,300</td>
<td>6,120</td>
<td>2,000</td>
<td>3,690</td>
<td>226,900</td>
</tr>
<tr>
<td>June</td>
<td>315,350</td>
<td>13,700</td>
<td>5,940</td>
<td>10,510</td>
<td>625,500</td>
</tr>
<tr>
<td>July</td>
<td>272,550</td>
<td>12,800</td>
<td>4,610</td>
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<td>540,500</td>
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<tr>
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<td>100,660</td>
<td>5,610</td>
<td>2,030</td>
<td>3,247</td>
<td>199,700</td>
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<tr>
<td>September 1950</td>
<td>98,880</td>
<td>5,430</td>
<td>1,510</td>
<td>3,284</td>
<td>196,000</td>
</tr>
<tr>
<td>Period</td>
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<td>13,700</td>
<td>1,300</td>
<td>4,646</td>
<td>2,510,000</td>
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## Monthly Summary of Discharge

### Bighorn River near Custer, Montana

#### Water Year 1951

<table>
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<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
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</thead>
<tbody>
<tr>
<td>October 1950</td>
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<td>4,860</td>
<td>3,210</td>
<td>4,060</td>
<td>249,600</td>
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<tr>
<td>November</td>
<td>107,780</td>
<td>3,860</td>
<td>2,940</td>
<td>3,593</td>
<td>213,600</td>
</tr>
<tr>
<td>December</td>
<td>86,080</td>
<td>3,800</td>
<td>950</td>
<td>2,777</td>
<td>170,700</td>
</tr>
<tr>
<td>January 1951</td>
<td>67,200</td>
<td>2,700</td>
<td>1,100</td>
<td>2,168</td>
<td>133,300</td>
</tr>
<tr>
<td>February</td>
<td>73,100</td>
<td>3,000</td>
<td>1,900</td>
<td>2,611</td>
<td>145,000</td>
</tr>
<tr>
<td>March</td>
<td>96,910</td>
<td>6,000</td>
<td>1,700</td>
<td>3,126</td>
<td>192,200</td>
</tr>
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<td>April</td>
<td>109,940</td>
<td>5,170</td>
<td>2,530</td>
<td>3,655</td>
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</tr>
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<td>208,050</td>
<td>14,800</td>
<td>4,180</td>
<td>6,711</td>
<td>412,600</td>
</tr>
<tr>
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<td>18,300</td>
<td>8,400</td>
<td>12,430</td>
<td>759,600</td>
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<tr>
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<td>9,457</td>
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<td>4,865</td>
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<td>94,830</td>
<td>3,510</td>
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<td>3,161</td>
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<td><strong>18,300</strong></td>
<td><strong>950</strong></td>
<td><strong>4,894</strong></td>
<td><strong>3,543,000</strong></td>
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#### Water Year 1952

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<tr>
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<th>Mean</th>
<th>Runoff in Acre-feet</th>
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<td>3,209</td>
<td>127,300</td>
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<td>2,500</td>
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<td>62,560</td>
<td>2,870</td>
<td>800</td>
<td>2,050</td>
<td>126,100</td>
</tr>
<tr>
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<td>65,590</td>
<td>2,440</td>
<td>1,900</td>
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<td>2,540</td>
<td>1,750</td>
<td>2,280</td>
<td>131,200</td>
</tr>
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<td>March</td>
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<td>5,330</td>
<td>2,100</td>
<td>3,189</td>
<td>196,100</td>
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<td>7,080</td>
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<td>3,571</td>
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<td>2,830</td>
<td>2,040</td>
<td>2,535</td>
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<td><strong>800</strong></td>
<td><strong>3,223</strong></td>
<td><strong>2,340,000</strong></td>
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</table>
MONTHLY SUMMARY OF DISCHARGE

Little Bighorn River near Crow Agency, Montana

Location.—Lat 45°34', long. 107°27', in Sec. 15, T. 3 S., R. 34 E., on right bank, at Chicago, Burlington and Quincy Railroad bridge, 2 miles south of Crow Agency and 14 miles upstream from mouth.

Drainage area.—1,190 sq mi.

Records available.—September 1911 to September 1924, August 1928 to December 1932, April 1938 to September 1952 (few winter records in earlier years). March 1905 to June 1906 at site at Crow Agency, 2 miles downstream; records not equivalent owing to Crow Agency ditch which diverts water between the two sites.

Gage.—Water-stage recorder. March 1905 to June 1906, chain gage 2 miles downstream at different datum. Prior to May 7, 1847, recorder, staff or chain gage used for extensive intermittent periods.

Average discharge.—16 years (1928-29, 1931-32, 1935-52), 280 cfs.

Extremes.—Maximum discharge during year ending September 30, 1952, 1,560 cfs Mar. 30 (gage height, 7.67 ft); minimum daily, 35 cfs Jan. 24, 28, 1912-24, 1928-32, 1933-52. Maximum discharge observed, about 8,200 cfs July 23, 1923 (gage height, 14.0 ft); no flow July 28 to Aug. 6, 1921.

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-foot</th>
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<tr>
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<td>40</td>
<td>65.5</td>
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<td>88</td>
<td>96.2</td>
<td>5,450</td>
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<td>300</td>
<td>90</td>
<td>166</td>
<td>10,220</td>
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<td>6,456</td>
<td>305</td>
<td>157</td>
<td>215</td>
<td>12,810</td>
</tr>
<tr>
<td>May</td>
<td>5,976</td>
<td>298</td>
<td>106</td>
<td>193</td>
<td>11,850</td>
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<td>11,931</td>
<td>605</td>
<td>200</td>
<td>398</td>
<td>23,560</td>
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<td>91</td>
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<td>157</td>
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<td>69.3</td>
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<td>160</td>
<td>86,700</td>
</tr>
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</table>

MT v. WY/M.T.D. App. 334 (WY)
### MONTHLY SUMMARY OF DISCHARGE

**Appendix A**

**Little Bighorn River near Crow Agency, Montana**

#### Water Year 1961

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
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<td>October 1960</td>
<td>3,842</td>
<td>127</td>
<td>113</td>
<td>124</td>
<td>7,620</td>
</tr>
<tr>
<td>November</td>
<td>3,716</td>
<td>150</td>
<td>103</td>
<td>124</td>
<td>7,370</td>
</tr>
<tr>
<td>December</td>
<td>4,440</td>
<td>120</td>
<td>75</td>
<td>145</td>
<td>6,510</td>
</tr>
<tr>
<td>January 1961</td>
<td>3,760</td>
<td>140</td>
<td>106</td>
<td>121</td>
<td>7,460</td>
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<tr>
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<td>3,520</td>
<td>150</td>
<td>100</td>
<td>126</td>
<td>6,980</td>
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<tr>
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<td>7,575</td>
<td>650</td>
<td>110</td>
<td>244</td>
<td>15,020</td>
</tr>
<tr>
<td>April</td>
<td>6,560</td>
<td>430</td>
<td>149</td>
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<td>15,010</td>
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<td>May</td>
<td>8,089</td>
<td>510</td>
<td>168</td>
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<td>13,017</td>
<td>665</td>
<td>325</td>
<td>434</td>
<td>25,820</td>
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<td>July</td>
<td>8,382</td>
<td>515</td>
<td>146</td>
<td>270</td>
<td>16,630</td>
</tr>
<tr>
<td>August</td>
<td>4,594</td>
<td>225</td>
<td>83</td>
<td>142</td>
<td>8,720</td>
</tr>
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<td>September 1961</td>
<td>3,730</td>
<td>280</td>
<td>77</td>
<td>124</td>
<td>7,400</td>
</tr>
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</table>

| Water Year 1961 | 71,025           | 660     | 77      | 196  | 140,900             |

#### Water Year 1962

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1961</td>
<td>5,475</td>
<td>235</td>
<td>160</td>
<td>177</td>
<td>10,860</td>
</tr>
<tr>
<td>November</td>
<td>4,499</td>
<td>187</td>
<td>125</td>
<td>150</td>
<td>8,920</td>
</tr>
<tr>
<td>December</td>
<td>3,358</td>
<td>150</td>
<td>75</td>
<td>108</td>
<td>6,660</td>
</tr>
<tr>
<td>January 1952</td>
<td>2,140</td>
<td>95</td>
<td>35</td>
<td>69.0</td>
<td>4,240</td>
</tr>
<tr>
<td>February</td>
<td>3,060</td>
<td>140</td>
<td>90</td>
<td>107</td>
<td>6,130</td>
</tr>
<tr>
<td>March</td>
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<td>1,490</td>
<td>110</td>
<td>258</td>
<td>15,850</td>
</tr>
<tr>
<td>April</td>
<td>11,748</td>
<td>1,060</td>
<td>246</td>
<td>392</td>
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</tr>
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<td>May</td>
<td>16,956</td>
<td>805</td>
<td>306</td>
<td>547</td>
<td>33,630</td>
</tr>
<tr>
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<td>11,558</td>
<td>670</td>
<td>177</td>
<td>385</td>
<td>22,920</td>
</tr>
<tr>
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<td>5,426</td>
<td>490</td>
<td>49</td>
<td>175</td>
<td>10,760</td>
</tr>
<tr>
<td>August</td>
<td>3,251</td>
<td>184</td>
<td>44</td>
<td>105</td>
<td>6,450</td>
</tr>
<tr>
<td>September 1952</td>
<td>2,611</td>
<td>115</td>
<td>65</td>
<td>87.0</td>
<td>5,180</td>
</tr>
</tbody>
</table>

| Water Year 1962 | 78,102           | 1,490   | 35      | 213  | 184,900             |
MONTHLY SUMMARY OF DISCHARGE

Tongue River at Miles City, Montana

Location.--Lat 46°21', long. 105°48', in SE 1/4 sec. 23, T. 7 N., R. 47 E., on right bank 4 miles south of Miles City and 8 miles upstream from mouth.

Records available.--April 1938 to April 1942, April 1946 to September 1952. Published as "near Miles City" April 1938 to April 1942. Not equivalent to records published as "near Miles City" May 1929 to September 1932.

Gage.--Water-stage recorder. April 1938 to April 1942, wire-weight gage at site 8 miles upstream at different datum.

Average discharge.--8 years (1939, 1941, 1946-52), 431 cfs.

Extremes.--Maximum discharge during year ending September 30, 1952, 7,520 cfs March 30 (gage height, 7.95 ft); minimum, 58 cfs Aug. 2.

1938-42, 1946-52: Maximum discharge, 12,000 cfs Mar. 6, 1949 (float measurement during ice breakup); maximum gage height, 11.80 ft (corrected) Mar. 6, 1949 (ice jam); no flow at various times July to September 1940.

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1950</td>
<td>5,185</td>
<td>270</td>
<td>115</td>
<td>167</td>
<td>10,280</td>
</tr>
<tr>
<td>February</td>
<td>4,395</td>
<td>300</td>
<td>120</td>
<td>157</td>
<td>8,720</td>
</tr>
<tr>
<td>March</td>
<td>10,975</td>
<td>500</td>
<td>305</td>
<td>354</td>
<td>21,770</td>
</tr>
<tr>
<td>April</td>
<td>12,578</td>
<td>1,000</td>
<td>186</td>
<td>413</td>
<td>24,650</td>
</tr>
<tr>
<td>May</td>
<td>17,213</td>
<td>1,100</td>
<td>260</td>
<td>555</td>
<td>34,140</td>
</tr>
<tr>
<td>June</td>
<td>20,400</td>
<td>1,290</td>
<td>350</td>
<td>680</td>
<td>40,460</td>
</tr>
<tr>
<td>July</td>
<td>10,737</td>
<td>1,290</td>
<td>126</td>
<td>346</td>
<td>21,300</td>
</tr>
<tr>
<td>August</td>
<td>3,816</td>
<td>650</td>
<td>11</td>
<td>123</td>
<td>7,570</td>
</tr>
<tr>
<td>September 1950</td>
<td>7,437</td>
<td>532</td>
<td>67</td>
<td>246</td>
<td>14,750</td>
</tr>
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<td>Period</td>
<td>92,536</td>
<td>1,290</td>
<td>11</td>
<td>339</td>
<td>183,500</td>
</tr>
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</table>
### Monthly Summary of Discharge

**Tongue River at Miles City, Montana**

#### Water Year 1951

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1950</td>
<td>10,713</td>
<td>568</td>
<td>129</td>
<td>546</td>
<td>21,250</td>
</tr>
<tr>
<td>November</td>
<td>12,227</td>
<td>550</td>
<td>350</td>
<td>408</td>
<td>24,250</td>
</tr>
<tr>
<td>December</td>
<td>6,630</td>
<td>260</td>
<td>135</td>
<td>214</td>
<td>13,150</td>
</tr>
<tr>
<td>January 1951</td>
<td>6,425</td>
<td>270</td>
<td>150</td>
<td>207</td>
<td>12,740</td>
</tr>
<tr>
<td>February</td>
<td>6,280</td>
<td>240</td>
<td>180</td>
<td>224</td>
<td>12,420</td>
</tr>
<tr>
<td>March</td>
<td>7,200</td>
<td>320</td>
<td>200</td>
<td>232</td>
<td>14,280</td>
</tr>
<tr>
<td>April</td>
<td>7,563</td>
<td>466</td>
<td>61</td>
<td>245</td>
<td>14,500</td>
</tr>
<tr>
<td>May</td>
<td>15,285</td>
<td>667</td>
<td>36</td>
<td>493</td>
<td>30,320</td>
</tr>
<tr>
<td>June</td>
<td>18,108</td>
<td>1,170</td>
<td>135</td>
<td>604</td>
<td>35,910</td>
</tr>
<tr>
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<td>15,282</td>
<td>790</td>
<td>235</td>
<td>493</td>
<td>30,310</td>
</tr>
<tr>
<td>August</td>
<td>8,297</td>
<td>1,310</td>
<td>42</td>
<td>268</td>
<td>16,460</td>
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<td>September 1951</td>
<td>14,617</td>
<td>1,630</td>
<td>234</td>
<td>487</td>
<td>26,990</td>
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</table>

#### Water Year 1951 (Total)

| Water Year 1951 | 128,405 | 1,660 | 38 | 352 | 254,700 |

#### Water Year 1952

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1952</td>
<td>10,178</td>
<td>466</td>
<td>170</td>
<td>328</td>
<td>20,190</td>
</tr>
<tr>
<td>November</td>
<td>15,950</td>
<td>900</td>
<td>163</td>
<td>531</td>
<td>31,600</td>
</tr>
<tr>
<td>December</td>
<td>5,895</td>
<td>350</td>
<td>140</td>
<td>190</td>
<td>11,690</td>
</tr>
<tr>
<td>January 1952</td>
<td>4,265</td>
<td>145</td>
<td>130</td>
<td>137</td>
<td>8,440</td>
</tr>
<tr>
<td>February</td>
<td>4,740</td>
<td>180</td>
<td>140</td>
<td>163</td>
<td>9,400</td>
</tr>
<tr>
<td>March</td>
<td>15,880</td>
<td>5,420</td>
<td>160</td>
<td>512</td>
<td>31,500</td>
</tr>
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<td>43,987</td>
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<td>270</td>
<td>1,466</td>
<td>87,250</td>
</tr>
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<td>33,436</td>
<td>1,960</td>
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<td>1,079</td>
<td>66,320</td>
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<td>2,090</td>
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</tr>
<tr>
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<td>8,722</td>
<td>741</td>
<td>76</td>
<td>281</td>
<td>17,300</td>
</tr>
<tr>
<td>August</td>
<td>2,182</td>
<td>214</td>
<td>69</td>
<td>103</td>
<td>6,310</td>
</tr>
<tr>
<td>September 1952</td>
<td>3,616</td>
<td>182</td>
<td>80</td>
<td>121</td>
<td>7,170</td>
</tr>
</tbody>
</table>

#### Water Year 1952 (Total)

| Water Year 1952 | 181,474 | 8,420 | 69 | 496 | 360,000 |

*MT v WYM T.D. App.*

337 (WY)
### MONTHLY SUMMARY OF DISCHARGE

Powder River near Locate, Montana

**Location:** Lat 46°26', long. 105°18', in NE 1/4 sec. 26, T. 8 N., R. 51 E., on right bank 50 ft downstream from bridge on U.S. Highway 12, 3 miles upstream from Locate Creek, 5 miles west of former site of Locate, and 25 miles east of Miles City.

**Records available:** March 1938 to September 1952.

**Gage:** Water-stage recorder. Prior to July 11, 1947, wire-weight gage at bridge 50 ft upstream at same datum.

**Average discharge:** 14 years, 723 cfs.

**Extremes:** Maximum discharge during year ending September 30, 1952, 23,900 cfs (gage height, 9.55 ft); minimum daily, 40 cfs Sept. 23, 24.

- 1938-39: Maximum discharge observed, 31,000 cfs Feb. 19, 1943 (gage height, 11.23 ft), from rating curve extended above 14,000 cfs; no flow Jan. 16 to Feb. 12, Feb. 22-24, 1950.

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1950</td>
<td>140.5</td>
<td>20</td>
<td>0</td>
<td>4.55</td>
<td>279</td>
</tr>
<tr>
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<td>78.9</td>
<td>40</td>
<td>0</td>
<td>2.82</td>
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</tr>
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<td>200</td>
<td>25</td>
<td>80.2</td>
<td>4,930</td>
</tr>
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<td>April</td>
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<td>3,000</td>
<td>673</td>
<td>1,236</td>
<td>73,540</td>
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<tr>
<td>May</td>
<td>46,662</td>
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<td>829</td>
<td>1,447</td>
<td>88,960</td>
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<tr>
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<td>31,479</td>
<td>1,590</td>
<td>630</td>
<td>1,049</td>
<td>62,440</td>
</tr>
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<td>558</td>
<td>84</td>
<td>302</td>
<td>14,480</td>
</tr>
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<td>330</td>
<td>17</td>
<td>95.0</td>
<td>5,840</td>
</tr>
<tr>
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<td>98</td>
<td>3.4</td>
<td>27.9</td>
<td>1,660</td>
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<td><strong>3,000</strong></td>
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<td>473</td>
<td>256,300</td>
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---

338 (WY)
## MONTHLY SUMMARY OF DISCHARGE

Powder River near Locate, Montana

### Water Year 1951

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1950</td>
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<td>285</td>
<td>100</td>
<td>177</td>
<td>10,390</td>
</tr>
<tr>
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<td>3,666</td>
<td>210</td>
<td>58</td>
<td>122</td>
<td>7,070</td>
</tr>
<tr>
<td>December</td>
<td>4,015</td>
<td>150</td>
<td>80</td>
<td>130</td>
<td>7,960</td>
</tr>
<tr>
<td>January 1951</td>
<td>2,580</td>
<td>120</td>
<td>60</td>
<td>63.2</td>
<td>5,120</td>
</tr>
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<td>February</td>
<td>3,329</td>
<td>180</td>
<td>54</td>
<td>119</td>
<td>5,600</td>
</tr>
<tr>
<td>March</td>
<td>14,614</td>
<td>3,680</td>
<td>150</td>
<td>471</td>
<td>28,990</td>
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<td>13,448</td>
<td>2,410</td>
<td>241</td>
<td>448</td>
<td>26,670</td>
</tr>
<tr>
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<td>14,275</td>
<td>657</td>
<td>265</td>
<td>483</td>
<td>29,700</td>
</tr>
<tr>
<td>June</td>
<td>10,086</td>
<td>873</td>
<td>107</td>
<td>336</td>
<td>19,670</td>
</tr>
<tr>
<td>July</td>
<td>7,056</td>
<td>528</td>
<td>38</td>
<td>228</td>
<td>14,000</td>
</tr>
<tr>
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<td>11,215</td>
<td>2,640</td>
<td>58</td>
<td>362</td>
<td>22,240</td>
</tr>
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<td>18,940</td>
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<td>185</td>
<td>621</td>
<td>37,570</td>
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</table>

**Water Year 1951 Totals**: 109,392

### Water Year 1952

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<th>Second-foot-days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1951</td>
<td>8,392</td>
<td>429</td>
<td>225</td>
<td>271</td>
<td>16,650</td>
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<td>75</td>
<td>326</td>
<td>19,380</td>
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<td>2,500</td>
<td>100</td>
<td>384</td>
<td>28,600</td>
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<tr>
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<td>110</td>
<td>70</td>
<td>81.4</td>
<td>5,010</td>
</tr>
<tr>
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<td>6,245</td>
<td>400</td>
<td>120</td>
<td>215</td>
<td>12,380</td>
</tr>
<tr>
<td>March</td>
<td>53,960</td>
<td>22,100</td>
<td>160</td>
<td>1,741</td>
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</tr>
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<td>56,872</td>
<td>12,800</td>
<td>586</td>
<td>1,893</td>
<td>112,600</td>
</tr>
<tr>
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<td>7,010</td>
<td>550</td>
<td>1,610</td>
<td>98,970</td>
</tr>
<tr>
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<td>1,900</td>
<td>222</td>
<td>894</td>
<td>53,170</td>
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<td>1,590</td>
<td>124</td>
<td>449</td>
<td>27,610</td>
</tr>
<tr>
<td>August</td>
<td>3,558</td>
<td>230</td>
<td>44</td>
<td>114</td>
<td>7,020</td>
</tr>
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<td>1,687</td>
<td>105</td>
<td>40</td>
<td>56.2</td>
<td>3,550</td>
</tr>
</tbody>
</table>

**Water Year 1952 Totals**: 245,427

---

MT v. WY/M.T.D.; Append. 339 (WY)
Boysen Reservoir

Water-stage recorder at dam on Bighorn River, about 21 miles south of Thermopolis, Wyoming. Reservoir formed by earth fill dam, construction of which began in 1947. Storage began on October 11, 1951. Dead storage, 62,000 acre-feet at elevation 4657.0. Usable contents, 750,000 acre-feet at elevation 4725.0 (top of gates). Crest of dam at elevation 4758.

The filling of dead storage was aided by the release of about 53,000 acre-feet of water from Bull Lake Reservoir. Until April 1952 releases from Boysen Reservoir were made for municipal and industrial use, sewage dilution and maintenance of fish life. Releases thereafter were also made to meet irrigation requirements and beginning in July 1952 for the generation of electrical power. Data furnished by U. S. Bureau of Reclamation.

<table>
<thead>
<tr>
<th>Month</th>
<th>Usable contents in acre-feet</th>
<th>Change in contents during month (acre-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 30, 1951</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>October 31</td>
<td>25,200</td>
<td>+ 25,200</td>
</tr>
<tr>
<td>November 30</td>
<td>58,800</td>
<td>+ 33,600</td>
</tr>
<tr>
<td>December 31, 1951</td>
<td>71,400</td>
<td>+ 12,600</td>
</tr>
<tr>
<td>January 31</td>
<td>92,400</td>
<td>+ 21,000</td>
</tr>
<tr>
<td>February 29</td>
<td>122,000</td>
<td>+ 29,600</td>
</tr>
<tr>
<td>March 31</td>
<td>152,400</td>
<td>+ 30,400</td>
</tr>
<tr>
<td>April 30</td>
<td>233,400</td>
<td>+ 81,000</td>
</tr>
<tr>
<td>May 31</td>
<td>429,900</td>
<td>+196,500</td>
</tr>
<tr>
<td>June 30</td>
<td>656,500</td>
<td>+226,600</td>
</tr>
<tr>
<td>July 31</td>
<td>678,200</td>
<td>+ 21,700</td>
</tr>
<tr>
<td>August 31</td>
<td>668,500</td>
<td>- 9,700</td>
</tr>
<tr>
<td>September 30, 1952</td>
<td>647,800</td>
<td>- 20,700</td>
</tr>
</tbody>
</table>

Water year 1951-52 * +647,800

* Does not include dead storage of 62,000 acre-feet.
RESERVOIRS COMPLETED PRIOR TO JANUARY 1, 1950

YELL0STONE RIVER BASIN

List of existing reservoirs submitted by the Engineering Committee in a report to the commission negotiating the Yellowstone River Compact on February 1, 1950. Boysen Reservoir has been deleted from the list as information available indicates that completion thereof was not prior to January 1, 1950. Details regarding Boysen Reservoir will be found in Appendix B.

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>State</th>
<th>Stream</th>
<th>Capacity Acres-Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweetgrass Creek Basin</td>
<td>Mont.</td>
<td>Sweetgrass Cr.</td>
<td>9,700</td>
</tr>
<tr>
<td>Woltoord</td>
<td>Mont.</td>
<td>Sweetgrass Cr.</td>
<td>5,700</td>
</tr>
<tr>
<td>Stillwater River Basin</td>
<td>Mont.</td>
<td>W. Rosebud Cr.</td>
<td>20,300</td>
</tr>
<tr>
<td>Mystic Lake</td>
<td>Mont.</td>
<td>Red Lodge Cr.</td>
<td>27,500</td>
</tr>
<tr>
<td>Cooney</td>
<td>Mont.</td>
<td>Rock Cr.</td>
<td>4,200</td>
</tr>
<tr>
<td>Glacier Lake</td>
<td>Mont.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bighorn River Basin</td>
<td>Wyo.</td>
<td>Bull Lake Cr.</td>
<td>152,000</td>
</tr>
<tr>
<td>Bull Lake</td>
<td>Wyo.</td>
<td>Wind R.</td>
<td>31,500</td>
</tr>
<tr>
<td>Pilot Butte</td>
<td>Wyo.</td>
<td>S.Fk. Little Wind R.</td>
<td>2,000</td>
</tr>
<tr>
<td>Washakie</td>
<td>Wyo.</td>
<td>Little Wind R.</td>
<td>7,000</td>
</tr>
<tr>
<td>Ray Lake</td>
<td>Wyo.</td>
<td>Little Popo Agie R.</td>
<td>5,000</td>
</tr>
<tr>
<td>Christine Lake</td>
<td>Wyo.</td>
<td>M.Fk. Popo Agie R.</td>
<td>1,500</td>
</tr>
<tr>
<td>Frye Lake</td>
<td>Wyo.</td>
<td>Shoshone R.</td>
<td>530,730</td>
</tr>
<tr>
<td>Sunshine</td>
<td>Wyo.</td>
<td>Greybull R.</td>
<td>50,000</td>
</tr>
<tr>
<td>Meadow Lark Lake</td>
<td>Wyo.</td>
<td>Trib. Tensleep Cr.</td>
<td>7,100</td>
</tr>
<tr>
<td>Ralston</td>
<td>Wyo.</td>
<td>Shoshone</td>
<td>1,490</td>
</tr>
<tr>
<td>Lake Adelaide</td>
<td>Wyo.</td>
<td>Ad:Jaube Cr.</td>
<td>1,400</td>
</tr>
<tr>
<td>Lake Creek</td>
<td>Wyo.</td>
<td>Cottonwood Cr.</td>
<td>1,100</td>
</tr>
<tr>
<td>Beaver</td>
<td>Wyo.</td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>Willow Creek</td>
<td>Mont.</td>
<td>Willow Cr.</td>
<td>23,000</td>
</tr>
<tr>
<td>Tongue River Basin</td>
<td>Wyo.</td>
<td>E.Fk. Goose Cr.</td>
<td>7,250</td>
</tr>
<tr>
<td>Park</td>
<td>Wyo.</td>
<td>Mill Cr.</td>
<td>870</td>
</tr>
<tr>
<td>Weston</td>
<td>Wyo.</td>
<td>Cross Cr.</td>
<td>2,600</td>
</tr>
<tr>
<td>Big Horn</td>
<td>Wyo.</td>
<td>Little Goose Cr.</td>
<td>210</td>
</tr>
<tr>
<td>Last Chance</td>
<td>Wyo.</td>
<td>Little Goose Cr.</td>
<td>570</td>
</tr>
<tr>
<td>Farmers</td>
<td>Wyo.</td>
<td>Little Goose Cr.</td>
<td>80</td>
</tr>
<tr>
<td>Willetts</td>
<td>Wyo.</td>
<td>W.Fk. Goose Cr.</td>
<td>1,200</td>
</tr>
<tr>
<td>Twin Lake</td>
<td>Wyo.</td>
<td>W.Fk. Goose Cr.</td>
<td>1,800</td>
</tr>
<tr>
<td>Dome Lake</td>
<td>Wyo.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tongue River</td>
<td></td>
<td>Tongue R.</td>
<td></td>
</tr>
<tr>
<td>Powder River Basin</td>
<td>Wyo.</td>
<td>Piney Cr.</td>
<td>32,250</td>
</tr>
<tr>
<td>Lake DeSmet</td>
<td>Wyo.</td>
<td>S.Fk.Piney Cr.</td>
<td>2,720</td>
</tr>
<tr>
<td>Cloud Peak</td>
<td>Wyo.</td>
<td>S.Fk.Piney Cr.</td>
<td>1,880</td>
</tr>
<tr>
<td>Kearney Lake</td>
<td>Wyo.</td>
<td>S.Fk.Piney Cr.</td>
<td></td>
</tr>
</tbody>
</table>

(Summary by states on the following page.)
RESERVOIRS COMPLETED PRIOR TO JANUARY 1, 1960
YELLOWSTONE RIVER BASIN

- SUMMARY -

(From Engineering Committee Report of February 1, 1950, excluding Boysen Reservoir)

<table>
<thead>
<tr>
<th>Reservoir/Basin</th>
<th>Storage Capacity in Acre-Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>Yellowstone Main Stream..........</td>
<td>0</td>
</tr>
<tr>
<td>Shields River Basin.............</td>
<td>0</td>
</tr>
<tr>
<td>Sweetgrass Creek Basin..........</td>
<td>15,400</td>
</tr>
<tr>
<td>Stillwater River Basin..........</td>
<td>20,300</td>
</tr>
<tr>
<td>Bighorn River Basin.............</td>
<td>665,600</td>
</tr>
<tr>
<td>Tongue River Basin..............</td>
<td>83,600</td>
</tr>
<tr>
<td>Powder River Basin..............</td>
<td>36,800</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>821,700</td>
</tr>
</tbody>
</table>
1962 Annual Report
ELEVENTH ANNUAL REPORT
YELLOWSTONE RIVER COMPACT COMMISSION
1962
Honorable Jack R. Gage  
Governor of the State of Wyoming  
Cheyenne, Wyoming  

Honorable Tim M. Babcock  
Governor of the State of Montana  
Helena, Montana  

Honorable William L. Guy  
Governor of the State of North Dakota  
Bismarck, North Dakota  

Sirs:

Pursuant to Article III of the Yellowstone River Compact, the Commission created according to the terms of said Compact, makes the following eleventh annual report on activities for the period ending September 30, 1962.

The eleventh annual meeting of the Yellowstone River Compact Commission was held in the conference room of the U. S. Bureau of Reclamation at Billings, Montana on November 28, 1962. Mr. Earl Lloyd represented Wyoming and Mr. C. S. Heidel, deputy State Engineer for Montana was designated to act for Mr. F. E. Buck, Montana State Engineer. Others in attendance were Mr. E. J. Van Camp, of Wyoming Natural Resources Board and A. S. Solid of the U. S. Geological Survey at Billings, Montana. Mr. J. W. Ross, attorney-at-law of Fromberg, Montana appeared. Mr. Frank Stermitz, Federal representative, presided.

Stream flow was above average at all designated points of measurement for the water year as a whole. Flows of the fall and winter months were generally greater than usual. June and July flows were high and more than adequate for demands in the remainder of the water year. Storage during the water year increased by about 320,000 acre feet in the Bighorn River Basin in Wyoming.

The substantial flows of the year were indicative that the prescribed shares of Wyoming were not exceeded and no attempts at detailed administration were made. Mr. J. W. Ross told the Commission that critical situations of water supply arose on the Clark's Fork of Yellowstone River during 1961 and may be expected again with greater severity. He had no information to indicate that Wyoming has exceeded its prorata share. He stated new pumping installations have been made or are ready for installation in both states. Mr. Ross said clarification of water rights in Montana should be undertaken for proper administration of the Compact when that should become necessary and also for apportionment of limited flows in Montana. The Commission assured him of its desire to assist in matters pertinent to the Compact, but suggested the division of waters within either State was a matter of local or State control.
During the fiscal year ending June 30, 1962, the expense of the Commission was $8,000. Contributions of $2,000 each were made by the States of Wyoming and Montana and the Federal Government expended $4,000. A like budget is in force for the fiscal year ending June 30, 1963. A tentative budget of $9,000 was considered as being reasonable for each year of the succeeding biennium.

Respectfully submitted

Earl Lloyd
Commissioner for Wyoming

Fred E. Buck
Commissioner for Montana

Frank Stermitz
Federal Representative

Earl Lloyd

Fred E. Buck

Frank Stermitz

345 (WY)
The work of the Commission is financed through annual cooperative agreements between the States of Montana and Wyoming and the United States of America. The costs considered do not include the salaries and necessary expenses of the State representatives which are borne by the respective States, nor the cost of the collection of hydrologic data now being made available through other sources. The expense of the Commission during the fiscal year ending June 30, 1962 is given:

<table>
<thead>
<tr>
<th>Gaging Station operation, Maintenance</th>
<th>Total Cost</th>
<th>United States</th>
<th>Wyoming</th>
<th>Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data assembly and administration</td>
<td>1,000</td>
<td>4,000</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Total</td>
<td>8,000</td>
<td>4,000</td>
<td>2,000</td>
<td>2,000</td>
</tr>
</tbody>
</table>

The budget for the fiscal year ending June 30, 1963 was adopted for the above amount and the same proportionate share. It is expected the auxiliary gage on the Big Horn River at Big Horn, Montana will be installed after delays incident to the construction of the interstate highway in this vicinity.

At the eleventh annual meeting, tentative budgets of $9,000 were suggested for each year of the coming biennium. It is anticipated that the rising cost index, additions to data collection and items relating to administration will require this sum.

Gaging Stations:

Discharge records were generally collected at the designated points of measurement. Supplementary data were collected on the Clark's Fork Yellowstone River near Edgar, Montana to evaluate the change in discharge below the gaging station at Edgar. The records of discharge are given in Appendix B.

The annual flows at the points of measurement ranged from 131 to 206 percent of the 1931-40 average and 145 to 1,320 percent of those for 1961. The least relative increase was on the Clark's Fork Yellowstone River and the greatest on the Powder River. Flows of the first six months of the water year were generally above average. April flows were low on some streams. Rains of June and July resulted in a sharp upturn in stream flow and a higher base flow level. The bar graphs of Appendix B illustrate the relative magnitude of the monthly and annual flows in comparison with various bases.

Diversions:

The Commissioners for Montana and Wyoming agreed that allocable uses under the Compact were less than the proportionate shares in either State. The Compact only provides for the allocation of water uses originating after January 1, 1950.
Mr. Buck furnished a list of reported water right filings in Montana for the period November 21, 1961 through October 31, 1962. Three previous listings are on file. Mr. Lloyd stated he would soon furnish another list to supplement the furnished listing of 1957. The printed biennial reports of the Wyoming State Engineer carry complete lists for all of Wyoming.

Storage:

In reservoirs completed after January 1, 1950:

Boysen Reservoir on the Wind River, operated by the U. S. Bureau of Reclamation, is the principal reservoir in this category. There was a net gain of 279,000 acre feet of storage during the water year. Month-end storage data are given in Appendix C.

The sealing operation of Anchor Reservoir on Owl Creek in the Bighorn River basin continued. The limited use is illustrated in the data furnished by the U. S. Bureau of Reclamation in Appendix C.

The Commission is aware of some small reservoirs which may properly come in this category. At present their aggregate effect is considered to be insufficient to justify the collection of storage data that is not readily available.

In reservoirs existing on January 1, 1950:

Compact allocations are only affected by the storage in these reservoirs as it may be used for developments completed after January 1, 1950. The extent of pertinent use is considered to be minor. The quantities in storage in the principal reservoirs in this category are given in Appendix D as a matter of hydrologic information.
RULES AND REGULATIONS FOR ADMINISTRATION OF
THE YELLOWSTONE RIVER COMPACT

A compact, known as the Yellowstone River Compact between the States of Wyoming, Montana and North Dakota, having become effective on October 30, 1951 upon approval of the Congress of the United States, which apportions the waters of certain interstate tributaries of the Yellowstone River which are available after the appropriative rights existing in the States of Wyoming and Montana on January 1, 1950 are supplied, and after appropriative rights to the use of necessary supplemental water are also supplied as specified in the Compact, the following rules and regulations are adopted subject to the provisions for amendment, revision or abrogation as provided herein.


A. It shall be the joint and equal responsibility of the members of the states of Wyoming and Montana to collect, cause to be collected or otherwise furnish records of tributary stream flow at the points of measurement specified in Article V (B) of the Compact, or as near thereto as is physically or economically feasible or justified.

1. Clarks Fork

The gaging station known as Clarks Fork at Edgar, Montana and which is located in SW\(^4\), sec.24, T.4 S., R.26 E., shall temporarily be the point of measurement for the Clarks Fork, subject to whatever mutually agreeable corrections to the stream-flow records at this point as may be deemed practical to meet the terms of the Compact.

2. Bighorn River (exclusive of Little Bighorn River)

The gaging station known as the Bighorn River near Custer, Montana and located near the center of sec.10, T.4 N., R.34 E., shall temporarily be the designated point of measurement on that stream. The flow of the Little Bighorn River as measured at the gaging station near Hardin, Montana and located in SE\(^4\), SE\(^4\), sec.16, T.1 S., R.34 E., shall be considered the point of measurement for that stream, except that if or when satisfactory records are not available, the records for the nearest upstream station with practical corrections for intervening inflow or diversion shall be used.
3. Tongue River

The gaging station known as the Tongue River at Miles City, Montana and located in SE4, sec.73, T.7 N., R.47 E., shall temporarily be the point of measurement for that stream.

4. Powder River

The gaging station known as the Powder River near Locate, Montana and located in NE1, sec.26, T.8 N., R.51 E., shall temporarily be the designated point of measurement for that stream.

B. Records of total annual diversion in acre-feet above the points of measurement designated in the Compact for irrigation, municipal and industrial uses developed after January 1, 1950 shall be furnished by the members of the Commission for their respective states, at such time as the Commission deems necessary for interstate administration as provided by the terms of the Compact. Providing that if it be acceptable to the Commission, reasonable estimates thereof may be substituted.

C. Annual records of the net change in storage in all reservoirs, not excluded under Article V (E) of the Compact, above the specified point of measurement specified in the Compact and completed after January 1, 1950, and the annual net change in reservoirs existing prior to January 1, 1950, which is used for irrigation, municipal and industrial purposes developed after January 1, 1950, shall be the primary responsibility of the member of the Commission in whose state such works are located; providing, such data is not furnished by federal agencies under the provisions of Article III (D) of the Compact, or, collected by the Commission.

Article II. Office and Officers.

A. The office of the Commission shall be located, and be that of the United States Geological Survey in Helena, Montana.

B. The Chairman of the Commission shall be the federal representative as provided in the Compact.

C. The Secretary of the Commission shall be as provided for in Article III of these rules.

D. The credentials of each member of the Commission shall be placed on file in the office of the Commission.
Appendix A

Article III. Secretary

A. The Commission, subject to the approval of the Director of the United States Geological Survey, shall enter into cooperative agreements with the U. S. Geological Survey for such engineering and clerical services as may reasonably be necessary for the administration of the Compact. Said agreements shall provide that the Geological Survey shall:

1. Maintain and operate gaging stations at or near the points of measurement specified in Article V (A) of the Compact.

2. Assemble factual information on stream flow, diversion and reservoir storage for the preparation of an annual report to the Governors of the signatory states.

3. Make such investigations and reports as may be requested by the Commission in aid of its administration of the Compact.

B. Act as Secretary to the Commission.

Article IV. Budget

A. At the annual meeting of each even numbered year or prior thereto, the Commission shall adopt a budget for operation during the ensuing biennium beginning July first. Such budget shall set forth the total cost of construction, maintenance and operation of gaging stations, the cost of engineering and clerical aid, and other necessary expenses excepting the salaries and personal expenses of the Commissioners. On odd-numbered years revisions of the budget shall be considered.

B. It shall be the obligation of the Commissioners of the States of Montana and Wyoming to endeavor to secure from the Legislature of their respective states sufficient funds with which to meet the obligations of this Compact, except insofar as provided by the federal government.

Article V. Meetings

An annual meeting of the Commission shall be held on the third Tuesday of each November at some mutually agreeable point in the Yellowstone River Basin for consideration of the annual report for the water year ending the preceding September 30th, and for
the transaction of such other business consistent with its authority; provided that by unanimous consent of the Commission the date and place of the annual meeting may be changed. Other meetings as may be deemed necessary shall be held at a time and place set by mutual agreement, for the transaction of any business consistent with its authority.

No action of the Commission shall be effective until approval by the Commissioners for the States of Wyoming and Montana.

Article VI. Amendments, Revisions and Abrogations.

The Rules and Regulations of the Commission may be amended or revised by a unanimous vote at any meeting of the Commission.

Fred E. Buck  
Commissioner for Montana

Earl Lloyd  
Commissioner for Wyoming

Attested:

Frank Stermitz  
Federal Representative  
Adopted November 17, 1953  
Amended November 16, 1959
MONTHLY SUMMARY OF DISCHARGE
Clarks Fork Yellowstone River at Edgar, Montana

Location.--Lat 45°28'00", long 108°50'30", in SESE sec.23, T.4 S., R.23 E., on right bank just downstream from highway bridge, half a mile east of Edgar and 6 miles upstream from Rock Creek.

Drainage area.--2,032 sq mi.


Gage.--Water-stage recorder. Altitude of gage is 3,440 ft (by barometer).
Prior to Sept. 18, 1940, chain gage and Sept. 18, 1940, to Aug. 31, 1953, wire-weight gage, at same site and datum.

Average discharge.--41 years, 1,034 cfs (748,660 acre-ft per year).

Extremes.--Maximum discharge during year, 7,830 cfs June 16 (gage height, 7.40 ft); minimum daily, 200 cfs Jan. 20, Feb. 23, 28.

1921-62: Maximum discharge observed, 10,900 cfs June 2, 1936 (gage height, 8.62 ft); minimum, 36 cfs Apr. 22, 1961.

Remarks.--Records excellent except those for periods of ice effect, which are poor. Upstream diversions for irrigation of about 41,500 acres, of which 840 acres lie below the station. In addition, about 6,300 acres of land lying above station are irrigated by diversions from the adjoining Rock Creek basin. Information similar to that previously given herein for Whitehorse Canal will be found on page 10.

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1961</td>
<td>25,159</td>
<td>1,020</td>
<td>693</td>
<td>812</td>
<td>49,900</td>
</tr>
<tr>
<td>November</td>
<td>17,310</td>
<td>780</td>
<td>440</td>
<td>577</td>
<td>34,330</td>
</tr>
<tr>
<td>December</td>
<td>12,935</td>
<td>510</td>
<td>280</td>
<td>417</td>
<td>25,660</td>
</tr>
<tr>
<td>January 1962</td>
<td>9,825</td>
<td>460</td>
<td>200</td>
<td>317</td>
<td>19,490</td>
</tr>
<tr>
<td>February</td>
<td>11,195</td>
<td>800</td>
<td>200</td>
<td>400</td>
<td>22,200</td>
</tr>
<tr>
<td>March</td>
<td>11,043</td>
<td>480</td>
<td>230</td>
<td>356</td>
<td>21,960</td>
</tr>
<tr>
<td>April</td>
<td>26,768</td>
<td>2,040</td>
<td>335</td>
<td>892</td>
<td>53,090</td>
</tr>
<tr>
<td>May</td>
<td>54,830</td>
<td>2,650</td>
<td>748</td>
<td>1,769</td>
<td>108,800</td>
</tr>
<tr>
<td>June</td>
<td>146,980</td>
<td>7,210</td>
<td>2,260</td>
<td>4,899</td>
<td>291,500</td>
</tr>
<tr>
<td>July</td>
<td>66,390</td>
<td>4,250</td>
<td>1,200</td>
<td>2,142</td>
<td>131,700</td>
</tr>
<tr>
<td>August</td>
<td>28,197</td>
<td>1,960</td>
<td>407</td>
<td>910</td>
<td>55,930</td>
</tr>
<tr>
<td>September 1962</td>
<td>18,620</td>
<td>779</td>
<td>456</td>
<td>621</td>
<td>36,550</td>
</tr>
</tbody>
</table>

Water year 1961-62 429,261

200  1,176  851,400
MONTHLY SUMMARY OF DISCHARGE

Clarks Fork Yellowstone River at Edgar, Montana

Supplementary Data

The Compact specified the official point of measurement of the Clarks Fork Yellowstone River shall be just above the mouth of Rock Creek about 6 miles downstream from the gaging station at Edgar. The known intervening diversion is the Whitehorse Canal which begins in SW½ sec.1, T.4 S., R.23 E., about 4 miles downstream from the gaging station. The canal serves about 1,000 acres. Based upon periodic discharge measurements of the diversion and information on canal operation, that seasonal diversion is estimated at 6,000 acre-feet.

A cableway for discharge measurements was constructed across the Clarks Fork Yellowstone River about half a mile downstream from the Whitehorse Canal in SE½ sec.1, T.4 S. R.23 E. The periodic measurements of discharge of the stream at this point, those of the Whitehorse Canal and concurrent daily discharge flow at the gaging station are presented. No adjustment has been made to the mean daily flow at Edgar which could be a factor at times of significantly changing stage. The apparent inflow may generally be return flow from irrigated lands served by Rock Creek.

Discharge in cfs at selected points

<table>
<thead>
<tr>
<th>Date</th>
<th>Clarks Fork at Edgar</th>
<th>Whitehorse Canal</th>
<th>Clarks Fork at SE½ sec.1</th>
<th>Apparent Inflow in reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. 18, 1961</td>
<td>445</td>
<td>0</td>
<td>466</td>
<td>+21</td>
</tr>
<tr>
<td>Apr. 30, 1962</td>
<td>1,170</td>
<td>0</td>
<td>1,160</td>
<td>-10</td>
</tr>
<tr>
<td>June 11</td>
<td>5,760</td>
<td>-</td>
<td>3,760</td>
<td>0</td>
</tr>
<tr>
<td>June 21</td>
<td>5,880</td>
<td>12.7</td>
<td>5,870</td>
<td>-138</td>
</tr>
<tr>
<td>July 11</td>
<td>2,920</td>
<td>41.6</td>
<td>2,080</td>
<td>-100</td>
</tr>
<tr>
<td>Aug. 27</td>
<td>1,590</td>
<td>18.8</td>
<td>1,470</td>
<td>+79</td>
</tr>
<tr>
<td>Sept. 15</td>
<td>705</td>
<td>7.3</td>
<td>754</td>
<td>+56</td>
</tr>
</tbody>
</table>
Appendix B

CLARKS FORK YELLOWSTONE RIVER
AT EDGAR, MONT.

(1) 1962 water year.
(2) 1961 water year.
(3) 10-year average, 1931-40 water years.
(4) 16-year average, 1945-60 water years.

Comparison of discharge during 1962 water year with 1961 water year and with average discharge for water years 1931-40 and 1945-60.
MONTHLY SUMMARY OF DISCHARGE

Little Bighorn River near Hardin, Montana

Location.--Lat 45°44'20"N, long 107°33'40"W, in SE¼SE¼ sec.18, T.1 S., R.34 E., on right bank 425 ft upstream from highway bridge, half a mile upstream from mouth, and 2 miles east of Hardin.

Drainage area.--1,294 sq mi.

Records available.--June 1953 to September 1962, in reports of the Geological Survey and in annual reports of the Yellowstone River Compact Commission.

Gage.--Water-stage recorder. Altitude of gage is 2,880 ft (by barometer). Prior to Oct. 7, 1953, wire-weight gage on bridge 425 ft downstream at different datum.

Average discharge.--9 years, 182 cfs (131,800 acre-ft per year).

Extremes.--Maximum discharge during year, 1,300 cfs June 17; maximum recorded gage height, 8.99 ft Mar. 19 (backwater from ice); minimum daily discharge, 10 cfs Dec. 12, 13.

1953-62: Maximum discharge, about 3,000 cfs Mar. 21, 1960; maximum gage height, 11.78 ft Mar. 20, 1960 (backwater from ice); minimum discharge observed, 0.2 cfs Aug. 7, 1961, result of discharge measurement.

Remarks.--Records good except those for periods of ice effect, no gage-height record, and those for period June 14-17, which are poor. Diversions for irrigation of about 17,000 acres above station. Flow partly regulated since about 1940 by Willow Creek Reservoir (capacity, 23,000 acre-ft).

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1961</td>
<td>3,499</td>
<td>175</td>
<td>68</td>
<td>113</td>
<td>6,940</td>
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<tr>
<td>November</td>
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<td>167</td>
<td>55</td>
<td>115</td>
<td>6,820</td>
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<tr>
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<td>2,129</td>
<td>142</td>
<td>10</td>
<td>68.7</td>
<td>4,220</td>
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<tr>
<td>January 1962</td>
<td>2,545</td>
<td>190</td>
<td>.20</td>
<td>82.1</td>
<td>5,050</td>
</tr>
<tr>
<td>February</td>
<td>6,180</td>
<td>360</td>
<td>.65</td>
<td>221</td>
<td>12,260</td>
</tr>
<tr>
<td>March</td>
<td>6,103</td>
<td>377</td>
<td>.70</td>
<td>197</td>
<td>12,110</td>
</tr>
<tr>
<td>April</td>
<td>7,651</td>
<td>450</td>
<td>175</td>
<td>255</td>
<td>15,180</td>
</tr>
<tr>
<td>May</td>
<td>10,767</td>
<td>476</td>
<td>222</td>
<td>347</td>
<td>21,360</td>
</tr>
<tr>
<td>June</td>
<td>15,947</td>
<td>1,120</td>
<td>339</td>
<td>532</td>
<td>31,630</td>
</tr>
<tr>
<td>July</td>
<td>5,099</td>
<td>340</td>
<td>52</td>
<td>164</td>
<td>10,110</td>
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<tr>
<td>August</td>
<td>2,390</td>
<td>157</td>
<td>38</td>
<td>77.1</td>
<td>4,740</td>
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<tr>
<td>September 1962</td>
<td>3,496</td>
<td>177</td>
<td>90</td>
<td>117</td>
<td>6,930</td>
</tr>
<tr>
<td>Water year 1961-62</td>
<td>69,242</td>
<td>1,120</td>
<td>10</td>
<td>190</td>
<td>137,400</td>
</tr>
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</table>
MONTHLY SUMMARY OF DISCHARGE
Bighorn River at Bighorn, Montana

Location.--Lat 46°08'50", long 107°28'00" (revised), in NE 1/4 sec. 33, T. 5 N., R. 34 E., on right bank just downstream from bridge on U. S. Highway 10, three-quarters of a mile upstream from mouth, 1 mile southwest of Bighorn, and 4 miles east of Custer.

Drainage area.--22,885 sq mi. At site used prior to Oct. 7, 1935, 22,410 sq mi.


Gage.--Water-stage recorder. Altitude of gage is 2,690 ft (by barometer). May 11 to Dec. 6, 1945, wire-weight gage and Dec. 7, 1945, to Oct. 6, 1955, water-stage recorder, at site 4 miles upstream at different datum.

Average discharge.--17 years, 3,586 cfs (2,596,000 acre-ft per year).

Extremes.--Maximum discharge during year, about 15,000 cfs Feb. 15 (gage height, 10.29 ft, backwater from ice); minimum recorded, 767 cfs Dec. 10 (gage height, 0.94 ft).

1945-62: Maximum discharge, 26,200 cfs June 24, 1947 (gage height,8.79 ft, site and datum then in use), from rating curve extended above 12,500 cfs by logarithmic plotting; maximum gage height recorded, 10.65 ft, Mar. 20, 1947 (ice jam), site and datum then in use; minimum discharge, about 275 cfs Nov. 15, 1959, result of freezeup; minimum daily, 540 cfs July 22, 1960.

Remarks.--Records good except those for periods of ice effect or backwater from Yellowstone River, which are poor. Diversions for irrigation of about 465,000 acres above station. Major regulation by 14 reservoirs in Wyoming and 1 in Montana with combined usable capacity of about 1,400,000 acre-ft (see Appendices C and D).

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1961</td>
<td>99,160</td>
<td>6,550</td>
<td>2,620</td>
<td>3,199</td>
<td>196,700</td>
</tr>
<tr>
<td>November</td>
<td>93,680</td>
<td>3,430</td>
<td>2,720</td>
<td>3,123</td>
<td>185,800</td>
</tr>
<tr>
<td>December</td>
<td>73,790</td>
<td>3,010</td>
<td>1,400</td>
<td>2,380</td>
<td>146,400</td>
</tr>
<tr>
<td>January 1962</td>
<td>58,800</td>
<td>2,700</td>
<td>1,000</td>
<td>1,897</td>
<td>116,600</td>
</tr>
<tr>
<td>February</td>
<td>118,070</td>
<td>13,000</td>
<td>1,810</td>
<td>4,217</td>
<td>234,200</td>
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<tr>
<td>March</td>
<td>165,220</td>
<td>10,400</td>
<td>2,000</td>
<td>5,330</td>
<td>327,700</td>
</tr>
<tr>
<td>April</td>
<td>129,950</td>
<td>6,200</td>
<td>2,630</td>
<td>4,332</td>
<td>257,800</td>
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<td>May</td>
<td>141,460</td>
<td>10,100</td>
<td>3,310</td>
<td>4,563</td>
<td>280,600</td>
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<td>June</td>
<td>234,380</td>
<td>12,600</td>
<td>3,930</td>
<td>7,813</td>
<td>464,900</td>
</tr>
<tr>
<td>July</td>
<td>171,740</td>
<td>10,700</td>
<td>2,090</td>
<td>5,540</td>
<td>340,600</td>
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<tr>
<td>August</td>
<td>89,130</td>
<td>5,510</td>
<td>1,870</td>
<td>2,875</td>
<td>176,800</td>
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<tr>
<td>September 1962</td>
<td>95,040</td>
<td>3,870</td>
<td>2,720</td>
<td>3,168</td>
<td>188,500</td>
</tr>
</tbody>
</table>

Water year 1961-62 1,470,420 13,000 1,000 4,029 2,917,000
Comparison of discharge during 1962 water year with 1961 water year and with average discharge for water years 1931-40 and 1945-60.
MONTHLY SUMMARY OF DISCHARGE

Tongue River at Miles City, Montana

Location.--Lat 46°21', long 105°48', in SEk sec.23, T.7 N., R.47 E., on right bank
4 miles south of Miles City and 8 miles upstream from mouth.

Drainage area.--5,379 sq mi.

Records available.--April 1938 to April 1942, April 1946 to September 1962. Pub-
lished as "near Miles City" April 1938 to April 1942. Not equivalent to records
published as "near Miles City" May 1929 to September 1932. Monthly discharge
only for some periods, published in WSP 1309. Records since January 1930, avail-
able in annual report of Yellowstone River Compact Commission.

Gage.--Water-stage recorder. Altitude of gage is 2,370 ft (by barometer). April
1938 to April 1942, wire-weight gage at site 8 miles upstream at different datum.

Average discharge.--19 years (1938-41, 1946-62), 347 cfs (251,200 acre-ft per year).

Extremes.--Maximum discharge during year, 13,300 cfs June 15 (gage height, 11.33 ft);
From rating curve extended above 3,200 cfs on basis of float measurement; mini-
imum daily, 15 cfs Nov. 17.

height, 12.27 ft Mar. 19, 1960 (ice jam); no flow July 9-19, Aug. 13, 14,
Sept. 28, 1940.

Remarks.--Records good except those for periods of ice effect, which are poor.
Diversions for irrigation of about 90,000 acres above station. Flow regulated
by Tongue River Reservoir (Appendix C) and many small reservoirs (combined
capacity, about 15,000 acre-ft).

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-foot days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1961</td>
<td>2,475</td>
<td>139</td>
<td>45</td>
<td>79.8</td>
<td>4,910</td>
</tr>
<tr>
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<td>2,375</td>
<td>199</td>
<td>15</td>
<td>79.2</td>
<td>4,710</td>
</tr>
<tr>
<td>December</td>
<td>4,121</td>
<td>180</td>
<td>90</td>
<td>133</td>
<td>8,170</td>
</tr>
<tr>
<td>January 1962</td>
<td>4,215</td>
<td>220</td>
<td>85</td>
<td>136</td>
<td>8,360</td>
</tr>
<tr>
<td>February</td>
<td>7,650</td>
<td>460</td>
<td>180</td>
<td>273</td>
<td>5,170</td>
</tr>
<tr>
<td>March</td>
<td>17,563</td>
<td>1,600</td>
<td>290</td>
<td>567</td>
<td>34,840</td>
</tr>
<tr>
<td>April</td>
<td>18,503</td>
<td>1,140</td>
<td>274</td>
<td>617</td>
<td>36,700</td>
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<tr>
<td>May</td>
<td>24,961</td>
<td>1,540</td>
<td>191</td>
<td>805</td>
<td>49,510</td>
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<tr>
<td>June</td>
<td>65,293</td>
<td>9,290</td>
<td>833</td>
<td>2,176</td>
<td>129,500</td>
</tr>
<tr>
<td>July</td>
<td>12,707</td>
<td>1,610</td>
<td>73</td>
<td>410</td>
<td>25,200</td>
</tr>
<tr>
<td>August</td>
<td>4,060</td>
<td>220</td>
<td>35</td>
<td>131</td>
<td>8,050</td>
</tr>
<tr>
<td>September 1962</td>
<td>6,698</td>
<td>270</td>
<td>155</td>
<td>223</td>
<td>13,290</td>
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<tr>
<td>Water year 1961-62</td>
<td>170,621</td>
<td>9,290</td>
<td>15</td>
<td>467</td>
<td>338,400</td>
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</tbody>
</table>
TONGUE RIVER AT MILES CITY, MONT.

1. 1962 water year.
2. 1961 water year.
3. 10-year average, 1931-40 water years.
4. 14-year average, 1947-60 water years.
   * 15-year average, 1946-60 water years.

Comparison of discharge during 1962 water year with 1961 water year and with average discharge for water years 1931-40 and 1947-60.
MONTHLY SUMMARY OF DISCHARGE
Powder River near Locate, Montana

Location.—Lat 46°26', long 105°18', in NE 4 sec. 26, T.8 N., R.51 E., on right bank 50 ft downstream from bridge on U.S. Highway 12 at present site of Locate (5 miles west of former site of Locate), 3 miles upstream from Locate Creek, and 25 miles east of Miles City.

Drainage area.—13,189 sq mi.


Gage.—Water-stage recorder and wire-weight gage. Altitude of gage is 2,400 ft (by barometer). Prior to July 11, 1947, wire-weight gage at bridge 50 ft upstream at same datum.

Average discharge.—24 years, 590 cfs (427,100 acre-ft per year).

Extremes.—Maximum discharge during year, 19,400 cfs June 20 (gage height, 8.75 ft); minimum daily, 4 cfs Dec. 28.


Remarks.—Records fair except those for periods of ice effect or no gage-height record, which are poor. Diversions for irrigation of about 52,000 acres above station. Some regulation by tributary reservoirs with combined usable capacity of 36,800 acre-ft.

<table>
<thead>
<tr>
<th>Month</th>
<th>Second-four days</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
<th>Runoff in Acre-ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1961</td>
<td>3,638</td>
<td>301</td>
<td>58</td>
<td>117</td>
<td>7,200</td>
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<tr>
<td>November</td>
<td>2,680</td>
<td>150</td>
<td>60</td>
<td>89.3</td>
<td>5,320</td>
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<tr>
<td>December</td>
<td>1,559</td>
<td>150</td>
<td>4</td>
<td>50.3</td>
<td>3,090</td>
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<tr>
<td>January 1962</td>
<td>990</td>
<td>100</td>
<td>5</td>
<td>31.9</td>
<td>1,960</td>
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<tr>
<td>February</td>
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<td>10,000</td>
<td>45</td>
<td>1,389</td>
<td>77,170</td>
</tr>
<tr>
<td>March</td>
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<td>3,800</td>
<td>95</td>
<td>871</td>
<td>53,530</td>
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<tr>
<td>April</td>
<td>21,115</td>
<td>1,530</td>
<td>383</td>
<td>704</td>
<td>41,880</td>
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<tr>
<td>May</td>
<td>70,538</td>
<td>9,780</td>
<td>572</td>
<td>2,275</td>
<td>139,900</td>
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<td>15,000</td>
<td>1,640</td>
<td>4,518</td>
<td>268,800</td>
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<td>July</td>
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<td>11,200</td>
<td>505</td>
<td>2,004</td>
<td>123,200</td>
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<tr>
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<td>161</td>
<td>425</td>
<td>26,160</td>
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<td>723</td>
<td>117</td>
<td>217</td>
<td>12,890</td>
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<td>Water year 1961-62</td>
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<td>15,000</td>
<td>4</td>
<td>1,051</td>
<td>761,100</td>
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</tbody>
</table>
Appendix B

POWDER RIVER NEAR LOCATE, MONT.

(1) 1962 water year.
(2) 1961 water year.
(3) 10-year average, 1931-40 water years.
(4) 16-year average, 1945-60 water years.

Comparison of discharge for 1962 water year with 1961 water year and with average discharge for water years 1931-40 and 1945-60.
BOYSEN RESERVOIR

Water-stage recorder at dam on Wind River, about 21 miles south of Thermopolis, Wyoming. Reservoir formed by earth-fill dam, construction of which began in 1947. Storage began October 11, 1951. Dead storage, 62,000 acre-feet at elevation 4657.0. Usable contents, 758,000 acre-feet at elevation 4725.0 (top of gates). Crest of dam at elevation 4758.

Records given herein represent usable contents. Water is used for irrigation and power development. Allocation for flood control provided.

Date furnished by U. S. Bureau of Reclamation.

Extremes.--Maximum usable contents during year, 757,400 acre-feet Aug. 2, 3 (elevation, 4,724.98 ft); minimum, 319,100 acre-feet Apr. 19 (elevation, 4,696.73 ft).

1953-62: Maximum usable contents, 857,400 acre-feet, July 5, 1957 (elevation, 4,729.85 ft); minimum, 189,800 acre-ft March 18, 19, 1956 (elevation, 4,684.18 ft).

<table>
<thead>
<tr>
<th>Month</th>
<th>Water-Surface elevation in feet</th>
<th>*Contents in Acre-feet</th>
<th>Change in contents during month in acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 30, 1961</td>
<td>4,703.45</td>
<td>403,100</td>
<td>+8,900</td>
</tr>
<tr>
<td>October 31</td>
<td>4,704.10</td>
<td>412,000</td>
<td>-8,400</td>
</tr>
<tr>
<td>November 30</td>
<td>4,703.49</td>
<td>403,600</td>
<td>-25,700</td>
</tr>
<tr>
<td>December 31</td>
<td>4,701.55</td>
<td>377,900</td>
<td>-17,600</td>
</tr>
<tr>
<td>January 31, 1962</td>
<td>4,700.17</td>
<td>360,300</td>
<td>+41,000</td>
</tr>
<tr>
<td>February 28</td>
<td>4,703.32</td>
<td>401,300</td>
<td>-65,300</td>
</tr>
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<td>March 31</td>
<td>4,698.17</td>
<td>336,000</td>
<td>-5,500</td>
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<tr>
<td>April 30</td>
<td>4,697.88</td>
<td>322,500</td>
<td>+31,600</td>
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<tr>
<td>May 31</td>
<td>4,702.03</td>
<td>384,100</td>
<td>+289,500</td>
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<tr>
<td>June 30</td>
<td>4,720.33</td>
<td>673,600</td>
<td>+52,600</td>
</tr>
<tr>
<td>July 31</td>
<td>4,724.92</td>
<td>756,200</td>
<td>-62,600</td>
</tr>
<tr>
<td>August 31</td>
<td>4,722.71</td>
<td>713,600</td>
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</tr>
<tr>
<td>September 30, 1962</td>
<td>4,721.02</td>
<td>682,200</td>
<td>+279,100</td>
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</tbody>
</table>

Water year 1961-62

* Does not include dead storage of 62,000 acre-feet.
# RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

## ANCHOR RESERVOIR

Water-stage recorder at dam on South Fork Owl Creek, 31 miles west of Thermopolis, Wyoming. Reservoir formed by thin concrete arch dam, construction of which began in 1957. Closure of dam made November 21, 1960. Temporary outlet at elevation 6,304.30 ft still in use. Lowest permanent outlet sill at elevation 6,343.75 ft, total contents, 148 acre-feet. Total contents, 17,420 acre-feet at upper active capacity level of 6,441 ft. Crest of dam at elevation 6,452.5 ft.

Records given in this report are total contents to reflect storage changes below normal dead storage level. Water is to be used for irrigation. Data furnished by U. S. Bureau of Reclamation.

<table>
<thead>
<tr>
<th>Month</th>
<th>Water-Surface elevation in feet</th>
<th>*Contents in acre-feet</th>
<th>Change in contents during month in acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 30, 1961</td>
<td>6,339.00</td>
<td>89</td>
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<tr>
<td>October 31</td>
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<td>6,344.88</td>
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<td>-52</td>
</tr>
<tr>
<td>December 31, 1961</td>
<td>6,335.00</td>
<td>55</td>
<td>-15</td>
</tr>
<tr>
<td>January 31, 1962</td>
<td>6,332.09</td>
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<td>+156</td>
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<td>6,353.19</td>
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<td>6,354.50</td>
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<td>6,304.30</td>
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<td>+89</td>
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<td>6,304.30</td>
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<td>-89</td>
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</table>

*Water year 1961-62

* Includes dead storage
RESERVOIRS IN EXISTENCE ON JANUARY 1, 1950

The extent, if any, of the use of reservoirs in this category which may be subject to Compact allocations was not determined. As a matter of hydrologic interest, the month-end contents in acre-feet of four reservoirs are given. The first three reservoirs are in the Bighorn River Basin in Wyoming and data on contents were furnished by the U. S. Bureau of Reclamation. Tongue River Reservoir in Montana is operated under the supervision of the Montana State Water Conservation Board which agency furnished operating data.

Revisions.--Data received subsequent to publication of the Tenth Annual Report, reveals some interpolated month-end contents for Tongue River Reservoir are incorrect in the 1961 report. A revised yearly table is given herewith:

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<tr>
<th>Month</th>
<th>Contents in Acre-feet</th>
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<tr>
<td>November 30</td>
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<tr>
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<tr>
<td>January 31, 1961</td>
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<tr>
<td>February 28</td>
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<td>March 31</td>
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Contents in Acre-feet

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<th>Bull Lake Reservoir</th>
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<td>319,000</td>
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Change in contents during year +19,600 +400 +33,800 +6,600

a/ Revised capacity table based on survey of 1959; contents prior to October 1960, based on survey of 1941.

b/ Contents based upon sedimentation surveys of October, 1948.

c/ Contents for April, May, June, and July interpolated from readings made near end of month. Contents for February, August, and September 1962, estimated.
2004 Annual Report
DEAR GOVERNORS:

Pursuant to Article III of the Yellowstone River Compact, the Commission submits the following fifty-third annual report of activities for the period ending September 30, 2004.

Members of the Yellowstone River Compact Commission convened the first of two meetings in 2004 on April 15 at 9:30 a.m. in Sheridan, Wyoming. In attendance were Mr. James Kircher, U.S. Geological Survey, Chairman and Federal Representative; Mr. Jack Stults, Administrator, Water Resources Division, Montana Department of Natural Resources and Conservation and Commissioner for Montana; and Mr. Patrick Tyrrell, Wyoming State Engineer and Commissioner for Wyoming. Also in attendance were Ms. Sue Lowry, Mr. Mike Whitaker, and Mr. Loren Smith, Wyoming State Engineer's Office; Mr. Keith Kerbel, Mr. Kevin Smith, and Mr. James Robinson, Montana Department of Natural Resources and Conservation; Mr. Todd Parfitt and Mr. Dan Hengel, Wyoming Department of Environmental Quality; Mr. Roy Kaiser, Natural Resources Conservation Service; Mr. Art Hayes, Jr., Tongue River Water Users Association; Mr. Wade Irion, HKM Engineering; and Mr. Wayne Berkas, Mr. Robert Swanson, and Mr. Robert Davis, U.S. Geological Survey.

Mr. Kircher called the meeting to order. All attendees introduced themselves.

Mr. Davis reported that costs for the program of streamflow-data collection and preparation of the annual report are $70,000 for Federal fiscal year 2004 and are expected to be $73,500 or less for fiscal year 2005.

Mr. Berkas reported that most of the streamflows in the Yellowstone River basin are less than average for mid-April. Streamflows at several sites throughout Montana were at a record daily low for April 15.

Ms. Lowry provided a summary of the April 14, 2004, meeting of the Technical Committee (minutes appended). Less-than-average runoff is forecast for 2004. Possible formats for reporting storage and other information for additional reservoirs in the annual report were discussed. Possible ways of making all hydrologic information relevant to the Compact readily available to all also were discussed. Mr. Kerbel reported that options were considered for developing a process or plan for managing and sharing water under the rules of the Compact, particularly for dry years. The Commissioners expressed the need to include some flexibility in order to meet existing obligations and agreed to continue to discuss options for administering the Compact and managing the available water. Mr. Hayes noted that flow in the Tongue River presently is less than the flow desired by Montana Fish, Wildlife and Parks. Mr. Stults stated that Montana tries to meet the desired instream flows in the Tongue River and other rivers but is obligated to meet the needs of the senior water-rights holders.
Mr. Kaiser reported that streamflow forecasts for water year 2003 were useful for planning even though many of the forecasts were less than the actual streamflow volumes. Refinements are being made to forecasting procedures for the Tongue River basin to try to improve accuracy of future forecasts. For water year 2004, the average snow-water equivalent in snowpack for measurement sites in the upper and lower Yellowstone River basin is less than the 1971-2000 average and less than for 2003. Maximum snowpack, which typically occurs in mid- to late-April, appears to have reached the maximum in March 2004 and is decreasing. Streamflow forecasts for water year 2004 for the upper and lower Yellowstone River basin indicate less-than-average streamflows, and peak streamflows from snowmelt are anticipated to occur about one month earlier in the year than average. Mr. Kerbel reported that precipitation in March 2004 in southeastern Montana was much less than average and drought conditions continue to prevail in many parts of Montana. Mr. Tyrrell discussed indications by researchers that very prolonged droughts have occurred in some areas of the western United States in the past. He also noted that much of the current need for water in this area was established during the early 1900’s, which was a period of relatively abundant precipitation. Mr. Swanson noted that many of the streamflow stations in the Yellowstone River basin are operated on a seasonal basis that begins on April 1 of each year. If snowmelt-runoff peaks continue to occur earlier in the year than average, then cooperating agencies might want to consider support for full-year operation to avoid missing data collection for the peak periods. He also noted the importance of long-term streamflow information in preparing forecasts.

Ms. Lowry and others described the Technical Committee recommendations for reporting contents and other information for additional reservoirs in the annual Commission report. Mr. Davis and Mr. Berkas will consult with Ms. Lowry to prepare draft formats for reporting the reservoir information in future reports.

Mr. Tyrrell stated that semi-annual meetings of the Commission might be desirable, particularly during dry periods, and Mr. Stults and Mr. Kircher agreed. The Commissioners discussed the need to provide information from the spring Technical Committee and Commission meetings to the public in a timely manner. Mr. Kerbel, Ms. Lowry, and Mr. Davis agreed to try to develop a process for providing the information to the public.

Mr. Kircher asked for any other items recommended by the Technical Committee for consideration by the Commission for action. Ms. Lowry recommended consideration of preparing letters of support for snowpack and streamflow monitoring, along with a list of priority sites. Potential recipients of the letters include Congressional staff and officials of the U.S. Department of the Interior and the U.S. Department of Agriculture.

Mr. Stults stated his desire for the Commission to establish a process for developing some type of plan for water management in accordance with the Compact, on an annual basis or as needed. Mr. Tyrrell recommended sharing all pertinent administrative and technical information and defining specific issues that would need to be addressed in a plan. Mr. Stults concurred. The Commissioners agreed to continue discussions and asked for continued assistance from the Technical Committee.

Mr. Robinson thanked the Wyoming representatives for loaning the aerial photographs of Wyoming to Montana at the December 2003 meeting and returned them to the Wyoming representatives.

Mr. Stults reported that no new developments have occurred with Montana’s water conservation programs and that the Montana Governor’s Drought Advisory Committee continues to meet regularly. Mr. Tyrrell reported that the Wyoming Drought Task Force also continues to meet regularly due to drought conditions. Both Commissioners expressed concern about the persisting drought conditions.

Mr. Tyrrell introduced Mr. Parfitt of the Wyoming Department of Environmental Quality who described current water-quality aspects of coal-bed methane development in Wyoming. Development in the Powder and Tongue River drainage basins is increasing. A growing trend is for much of the produced water to be treated, if necessary, and discharged directly to perennial streams rather than to ephemeral or
intermittent tributary streams. Currently, Montana water-quality standards are being considered by Wyoming as part of the permitting process for coal-bed methane wells in Wyoming, particularly in the Tongue River basin. Wyoming is hiring additional field staff and inspectors and has obtained funds for additional streamflow and water-quality monitoring, beginning July 2004. The amount of produced water that reaches the Powder River is currently estimated to be about four cubic feet per second. Wyoming is working cooperatively with Montana in the process of determining TMDLs for the Tongue and Powder Rivers in Montana by sharing data and expertise. Mr. Parfitt reported that the main water-quality concerns for produced water and receiving streams are specific conductance and sodium adsorption ratio. Other concerns are iron and barium, though mostly on a local basis. Toxicity tests, developed by the U.S. Environmental Protection Agency, are being used to evaluate water for acute and chronic toxicity to biota. Future permitting in Wyoming will likely be based on a watershed concept and will utilize the results of the TMDL studies in Montana, as applicable, as part of the process. Mr. Parfitt was asked how water-quality standards were considered as part of Wyoming’s permitting process. He replied that the current procedure is to consider the most stringent standard of either Wyoming or the downstream State and permit to that standard with respect to water quality at the State boundary. Mr. Parfitt added that information on permit applications is shared with the downstream State before approval. Mr. Hayes asked if the difference between the standard and the existing water quality would be shared among Montana, Wyoming, and other entities. Mr. Parfitt replied that current procedure is to permit to the standard but added that the standard would not likely be equaled or exceeded at the State boundary. When asked about treatment procedures for produced water, Mr. Parfitt replied that reverse osmosis seems to be the mostly widely used process at present, although ion exchange is also used. Mr. Hayes expressed concern about water stored in ponds and the changes in water quality that can occur as water from the ponds infiltrates into the subsurface. He encouraged the assessment and use of information from studies conducted in the 1970s and 1980s as well as new information. Mr. Tyrrell and Mr. Parfitt noted that ground water is being monitored at several pond sites in Wyoming.

Mr. Davis reported that a surface-water-quality monitoring network is being implemented in the Tongue River basin. The network consists of 11 sites—6 on the mainstem and 5 at the mouths of major tributaries. Information about the network and data for the 11 sites are available on the web at http://TongueRiverMonitoring.cr.usgs.gov.

Mr. Tyrrell provided an update on permitting in Wyoming. As of April 2, 2004, Wyoming has received a total of 2,661 applications for reservoirs to hold water produced from coal-bed methane activities, of which 255 were received in 2004. Of the total, 201 are in the Belle Fourche River basin, 113 are in the Cheyenne River basin, and 2,347 are in the Tongue and Powder River basins. The types of reservoirs include both on-channel reservoirs and off-channel pits. Additional funds have become available for field inspections of the reservoirs. The Wyoming State Engineer’s Office permits off-channel pits only if a beneficial use of the water is specified. If no beneficial use is specified, then the permits are handled by the Wyoming Oil and Gas Conservation Commission. Permits with beneficial use are time limited. As of April 14, 2004, Wyoming has issued 24,271 active permits for coal-bed methane wells, of which 1,341 were issued in 2004. Mr. Tyrrell noted that not all permits result in active wells. Mr. Hayes asked if off-channel pits are reclaimed after the permit expires. Mr. Tyrrell replied that off-channel pits are not necessarily reclaimed because they are not considered to have a significant effect on the surface-water system. However, on-channel reservoirs do need to be breached when the permit expires. Mr. Tyrrell also noted that a suction-technology process is increasingly used in some mature methane-production areas. No water is involved in this process but methane yields are increased.

Mr. Kerbel reported that the Montana Department of Natural Resources and Conservation issues permits for discharge of coal-bed-methane produced water only when the water is put to beneficial use. To date, the only permits the Department has issued have been interim permits. Mr. Stults asked if land application of produced water is still being practiced in Wyoming. Mr. Whitaker replied that the practice is still being used. Mr. Tyrrell noted that the average water yield for coal-bed-methane production wells in Wyoming currently is about seven gallons per minute.
Ms. Lowry reported on water rights within the Bighorn Canyon National Recreation Area. A meeting is scheduled for April 30, 2004, to begin discussions on the final decree language and the disposition of active water rights and rights that are only utilized periodically. The total amount of water rights under consideration is about 10,000 acre-feet, mostly for irrigation. Wyoming will work with Montana, the Bureau of Reclamation, and other entities before making any final decisions.

Mr. Tyrrell noted that Mr. Swanson of the U.S. Geological Survey will be transferring from Wyoming to Nebraska and thanked him for his valuable service to the Commission and the State of Wyoming.

Mr. Swanson reported that the summary report for the Yellowstone River basin National Water-Quality Assessment (NAWQA) study is expected to be available in mid-May 2004. Mr. Stults and Mr. Hayes requested copies of the report when it is available.

The next meeting of the Commission is tentatively scheduled for Wednesday, December 1, 2004, in Montana. The next spring meeting is tentatively scheduled for Tuesday, April 12, 2005, in Wyoming. The Technical Committee will meet in the morning on those dates and the Commission will meet in the afternoon.

The meeting adjourned at 1:30 p.m.

Members of the Yellowstone River Compact Commission convened the second of two meetings in 2004 on December 6 at 1:00 p.m. in Billings, Montana. In attendance were Mr. James Kircher, U. S. Geological Survey, Chairman and Federal Representative; Mr. William Horak, U. S. Geological Survey and future Chairman; Mr. Jack Stults, Administrator, Water Resources Division, Montana Department of Natural Resources and Conservation and Commissioner for Montana; and Mr. Patrick Tyrrell, Wyoming State Engineer and Commissioner for Wyoming. Also in attendance were Ms. Sue Lowry, Mr. Mike Whitaker, and Mr. Loren Smith, Wyoming State Engineer’s Office; Mr. Richard Moy, Mr. Kevin Smith, and Mr. Keith Kerbel, Montana Department of Natural Resources and Conservation; Ms. Sarah Bond, Montana Department of Justice; Mr. Art Compton, Montana Department of Environmental Quality; Mr. Art Hayes, Jr., Tongue River Water Users Association; Mr. Orrin Ferris, HKM Engineering; Mr. Richard Aro, Bureau of Indian Affairs, Northern Cheyenne Agency; Mr. Douglas Davis, Bureau of Indian Affairs; Mr. Lenny Duberstein, Bureau of Reclamation; and Mr. Kirk Miller, Mr. Wayne Berkas, and Mr. Robert Davis, U. S. Geological Survey.

Mr. Kircher called the meeting to order. All attendees introduced themselves.

Mr. Davis presented budget information for the program of streamflow data collection and preparation of the annual report. The program cost was $70,000 for Federal fiscal year 2004 and will be $71,900 for fiscal year 2005. One-fourth of the cost is provided by the State of Wyoming, one-fourth by the State of Montana, and one-half by the U. S. Geological Survey through the Cooperative Water Program. Estimates of costs for future years were presented based on an approximate 5-percent inflation factor per year. Mr. Davis stated that salaries and travel for data collection were the major expenses of the program. He also noted that estimates typically have been higher than the final program costs of the program for a given year. Mr. Stults moved to accept the budget for the program for fiscal year 2005. The motion was seconded by Mr. Tyrrell.

Mr. Berkas reported that streamflow during water year 2004 was 74 percent of average for the Clarks Fork Yellowstone River at Edgar, 38 percent of average for the Bighorn River near Bighorn (adjusted for flow in the Little Bighorn River and change in contents in Bighorn Lake), 20 percent of average for the Tongue River at Miles City, and 14 percent of average for the Powder River near Locate, which is a new record annual low. Total adjusted streamflow in the four rivers in water year 2004 was 1,621,000 acre-feet, compared to 2,174,000 acre-feet in water year 2003 and 1,685,000 acre-feet in water year 2002.
Reservoir storage increased during water year 2004 in Boysen Reservoir, Anchor Reservoir, Bull Lake, and Pilot Butte Reservoir. Reservoir storage decreased in Bighorn Lake, Buffalo Bill Reservoir, and Tongue River Reservoir. The contents and amounts of increases and decreases are listed in the report. The total usable contents of these reservoirs at the end of water year 2004 was 1,739,800 acre-feet, which is an increase of 88,000 acre-ft from the end of water year 2003.

The Commission had previously requested that additional reservoirs be included in the annual report. Total usable contents of these additional reservoirs of interest in the Yellowstone River basin at the end of water year 2004 was 215,000 acre-feet, a decrease of 7,900 acre-feet from the end of water year 2003. A new table listing the additional reservoirs and their contents has been added to the annual report.

Mr. Stults inquired as to the amount of snow pack in the four basins for water year 2004 as compared to average snow pack and water year 2003 snow pack. Mr. Berkas did not have that information available, and Mr. Roy Kaiser, who normally would have that information, was not at the meeting. Mr. Stults felt that this information would be interesting, and asked if the Technical Subcommittee might provide that information in the future. Mr. Moy asked if the annual flow information was available with exceedance probabilities in addition to percentages of average. Mr. Berkas did not have that information at present but would ensure that flow-exceedance probabilities and snow-pack information would be available at next year's meeting.

Mr. Stults reported on water conservation programs in Montana. Montana producers are experiencing serious cumulative effects from the last 6 years of drought. However, good reservoir management and sharing of shortages has been an important part of making the best of the situation. Montana continues to have successful examples of that on the Big Hole River, Blackfoot River, Jefferson River, and several others in the State, where a sophisticated approach to timing of diversions and sensitivity to return flows has helped make the best use of available water supplies. This approach to water conservation—which includes traditional approaches to water conservation in terms of on-field efficiency along with developing systems to better understand the interrelationship between water supply, timing of diversion, location of diversions and return flows—has helped to maximize use of the water supply in any particular drainage.

Ms. Lowry reported on activities of the Wyoming Drought Task Force. The Wyoming State Climatologist has attempted to present data into a more usable format for irrigators and water users across the State. In the Wyoming system, water supplies are administered solely by prior-appropriation doctrine and the needs of senior water-rights holders are satisfied first. Water supplies and availability in Wyoming are similar to last year, although perhaps lower in some instances.

Mr. Stults and Mr. Tyrrell each described the water-right regulation procedures used in their respective States. Although "both States" water rights are based on prior-appropriation doctrine, the specific regulation procedures used in each State are different in some aspects.

Mr. Tyrrell reported on progress in developing a website for this Commission, and handed out sample web pages. Mr. Moy asked if the USGS would be the proper host for the website, which could have active links to Wyoming and Montana. Mr. Kircher stated that funding support and computer-security issues would likely need to be addressed with regard to USGS hosting the website, but offered to inquire further into these aspects and discuss his findings at the next meeting. Both Wyoming and Montana agreed with that process.

Mr. Tyrrell provided a handout from the Coalbed Natural Gas Interagency Work Group that lists the current hydrologic monitoring in the Tongue and Powder River basins. The work group was created last year as a result of the EIS process for Federal minerals in Wyoming.

Mr. Tyrrell discussed the policy Wyoming adopted in April 2003 regarding reservoirs constructed for use during coal-bed natural gas production. The Wyoming State Engineer's Office and Wyoming
Department of Environmental Quality (DEQ) are considering the bonding of reservoirs used in coal-bed natural gas production. Bonding will make money available to reclaim the reservoir sites when coal-bed natural gas production is completed. The Bureau of Land Management has a bonding process. Currently the Wyoming Oil and Gas Commission bonds backfilling and reclamation of off-channel pits, but does not bond reclamation of on-channel dams. The permits for reservoirs used in coal-bed natural gas production will require removal of reservoirs. One exception is if the land owner chooses to retain the reservoir for stock watering. The final reservoir has to be modified to store less than 15 acre-feet.

Mr. Tyrrell stated that bypassing of reservoirs is not required if there is no downstream irrigation. If there is downstream irrigation, the bypass is designed to handle the average annual peak flow. Wyoming will accept a bypass large enough to satisfy downstream rights, or an administrative plan that would satisfy downstream rights.

The Wyoming State Engineer's Office has processed approximately 32,000 coal-bed natural gas applications for wells (approved and not-approved) as of the first of December 2004. So far in 2004, Wyoming has processed more than 4,100 applications, averaging about 400 applications a month. As of December 1, 2004, 2,332 surface-water reservoir permit applications have been received. These applications comprise a total of about 30,000 acre-feet of storage. About 800 of the applications have advanced to permit status and the remaining are still in review.

Mr. Compton reported that Montana has gotten a belated start in coal-bed natural gas development. Currently, Montana has permitted about 250 wells. Three permits are currently in review. One permit is receiving public review, and the other two permits are receiving Departmental review. The total number of permits for wells in Montana, either operating or planned, is approximately 450 to 475.

Montana DEQ is developing water-quality models for the Tongue River, Powder River, and Rosebud Creek. The model for the Tongue River is calibrated and is working well. A stakeholder committee oversees the development of the models. The stakeholders include Montana and Wyoming producers, environmental groups, Tongue River water users, and Tribal representatives. The Wyoming DEQ and Montana DEQ are discussing acceptable water-quality standards that would be applicable at the border. The quality of Tongue River water is good and there is some assimilative capacity to divide between Wyoming and Montana. Montana water-quality standards are regularly exceeded in the Powder River. Also, water-quality standards are exceeded in Rosebud Creek, but not as often as in the Powder River.

Mr. Berkas updated the Commission on USGS monitoring activities in the Tongue River basin. Eleven sites are monitored in the Tongue River network. Three sites are in Wyoming and eight sites are in Montana. Daily discharge is computed at all sites. Water-quality samples are collected about 20 times per year at mainstem sites and about 12 times per year at tributary sites. Continuous specific-conductance data are collected at all sites from April 1 through September 30 of each year. However, some specific-conductance data for 2004 were not obtained due to equipment problems. Equipment problems have been corrected and the equipment in place is expected to provide acceptable record for the remainder of the monitoring project. Most of the funding for these activities is appropriated to the USGS by Congress, although funding from other Federal agencies, State agencies, and Tribal governments supplements the Congressional funding to provide for complete or nearly complete operation of the monitoring network.

Ms. Lowry stated that Wyoming is completing the description of the water rights that are within the high-water line at Bighorn Lake and the boundary of the Bighorn National Recreation Area which surrounds Bighorn Lake. The parties have agreed to the water rights and the priority dates. Bighorn Lake was given a Wyoming reservoir water right, even though the dam is located in Montana. A letter has been sent to the Montana Area Office, Bureau of Reclamation, requesting they sign the letter that describes the elevation of Bighorn Lake. Mr. Stults requested a copy of the letter. Mr. Tyrrell stated that Wyoming has abandoned a good portion of the water rights within the high-water line.
Mr. Kerbel reported on the Montana adjudication program. November 8, 2004 was the deadline for filing objections for people having temporary preliminary decree issues on the middle Yellowstone River. Those objections will be received by the Water Courts and the Water Courts will respond. Most of the claims in that particular area were for stock water. Montana has finished examining all the claims in the Little Bighorn and Bighorn River basins, and is beginning to examine claims in the Tongue River basin. The Montana Environmental Quality Council is submitting a bill to the State legislature to speed up adjudication in the State of Montana. If the bill passes, the Department of Natural Resources and Conservation will have 10 years to examine the remaining water-rights claims in the State.

Ms. Lowry reported that Wyoming has been organized into seven basins for water-planning purposes. Assessments of six of those basins are complete. Assessment of the final basin (Platte River) is approximately 80-percent complete.

Mr. Kerbel reported on the Montana/Crow Compact. The newly elected chair for the Crow Tribe wishes to draft Federal legislation to get the compact ratified with Congress. The State has ratified the Compact but the Compact still has to get Federal approval, and then Tribal approval. The Tribe is working with the Federal government to reach settlement on damage claims regarding water rights.

Mr. Miller reported on the USGS National Water-Quality Assessment (NAWQA) study of the Yellowstone River basin, which is currently in the low-intensity phase. Due to cuts in the NAWQA program, sampling will continue only at the Yellowstone River at Sidney site. The next high-intensity phase of the program is currently scheduled to begin in 2007 and probably will not involve fixed-site monitoring. However, due to projected budget cuts in the NAWQA program, the high-intensity phase might not start until 2010.

Mr. Stults stated that 2004 flows in the Tongue River in Montana were deficient such that water rights senior to 1950 were not filled. Due to the continuing drought in the basin and the likelihood that average runoff will not fill depleted reservoirs, Montana and Wyoming should discuss an equitable plan so that users in both States get a fair share of the water in 2005 according to Article V of the Yellowstone River Compact. Montana felt that water rights in both States senior to 1950 should be filled before water rights junior to 1950 are filled. Montana specifically requested that Wyoming release post-1950 stored water so that pre-1950 users in Montana could satisfy their water rights. Wyoming indicated that this call would not be needed as Wyoming believes there is no legal basis for making such deliveries.

Further discussion continued between the two States regarding terms of the Compact and interstate regulation of water rights. Montana posed the question concerning how water rights with priority dates prior to March 1945 were administered in Wyoming. Wyoming indicated that those rights were allowed to divert more than the one cubic foot per second per 70 acres during times of runoff events. Under a free river system, Wyoming appropriators are allowed to take more water when the system is full and no one is making a valid call for water. Wyoming streams are only administered when valid complaints are received and regulation is requested by an affected Wyoming appropriator. Mr. Stults and Mr. Tyrrell agreed to assign staff members (Mr. Moy and Ms. Lowry) to meet at a later date to discuss possible solutions for both States and report back to the Commission at the April 2005 meeting.

Montana asked if Wyoming had appointed a water commissioner for the mainstem of the Tongue River as requested at the June 2004 teleconference between Montana and Wyoming. Mr. Whittaker responded by saying that Wyoming does have two commissioners appointed to the Tongue River. However, Wyoming did not receive a valid call for regulation from a Wyoming appropriator on the mainstem Tongue River and therefore no one has been administering the Tongue River. Montana asked if a survey has been completed of the water rights on the mainstem of the Tongue River. Montana stated that it had appointed two commissioners for its portion of the mainstem Tongue River.

Discussion ensued regarding releases from Tongue River Reservoir. In summary, water is released sufficient to maintain water in the downstream river system to satisfy stock needs. Additional factors...
include maintaining flow during periods of icing conditions and conveyance losses. Trying to support these needs, while simultaneously trying to store water during non-runoff periods (late summer, fall, and winter) when Wyoming is not diverting and storing water, has been impossible during the recent drought years. Montana feels the solution is to allocate the early season runoff according to their interpretation of the Compact to ensure that pre-1950 water rights on both sides of the border are satisfied. Wyoming questioned the accounting of Tongue River Reservoir releases toward the filling of the reservoir. The point was made that in Wyoming, if an appropriator chooses to release water from a reservoir during the normal storage period, that amount of water is accounted against the fill of that reservoir.

The Commissioners decided that April 7-8, 2005 would be the primary target for the next meeting, with April 25-26 as an alternate target. The meeting will be held in Sheridan, Wyoming and the Wyoming State Engineer’s Office will make arrangements for the meeting.

Mr. Kircher advised this would be his last meeting as Chairman. Mr. Horak will be the new Chairman. The Commissioners expressed their appreciation to Mr. Kircher for his service to the Commission.

Mr. Kircher called for items that could be removed from the agenda. The committee agreed to remove Yellowtail Claims, Wyoming Water Planning Program, and NAWQA from future agendas.

The committee agreed to add ‘Post-1950 Water Rights Issues’ to the next agenda.

Mr. Davis announced Mr. Berkas will assume most of his duties at future meetings.

Mr. Tyrrell moved to adjourn the meeting. Mr. Stults seconded. The meeting adjourned at 4:30 p.m.

Patrick T. Tyrrell
Commissioner for Wyoming

Jack Stults
Commissioner for Montana

James E. Kircher
Chairman and Federal Representative
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<tr>
<td>Annual summary of reservoir content</td>
<td>2</td>
</tr>
<tr>
<td>Summary of discharge for Yellowstone River Compact Commission stations</td>
<td>3</td>
</tr>
<tr>
<td>Clarks Fork Yellowstone River at Edgar, Mont</td>
<td>3</td>
</tr>
<tr>
<td>Little Bighorn River near Hardin, Mont</td>
<td>5</td>
</tr>
<tr>
<td>Bighorn River above Tullock Creek, near Bighorn, Mont</td>
<td>7</td>
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<tr>
<td>Tongue River at Miles City, Mont</td>
<td>10</td>
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<tr>
<td>Powder River near Locate, Mont</td>
<td>13</td>
</tr>
<tr>
<td>Monthly summary of contents for Yellowstone River Compact reservoirs completed after January 1, 1950</td>
<td>16</td>
</tr>
<tr>
<td>Boysen Reservoir, Wyo</td>
<td>16</td>
</tr>
<tr>
<td>Anchor Reservoir, Wyo</td>
<td>17</td>
</tr>
<tr>
<td>Bighorn Lake near St. Xavier, Mont</td>
<td>18</td>
</tr>
<tr>
<td>Monthly summary of contents for Yellowstone River Compact reservoirs existing on January 1, 1950</td>
<td>19</td>
</tr>
<tr>
<td>Annual summary of contents for Yellowstone River Compact reservoirs or lakes</td>
<td>20</td>
</tr>
<tr>
<td>Rules and regulations for administration of the Yellowstone River Compact</td>
<td>21</td>
</tr>
<tr>
<td>Rules for the resolution of disputes over the administration of the Yellowstone River Compact</td>
<td>25</td>
</tr>
<tr>
<td>Rules for adjudicating water rights on interstate ditches</td>
<td>28</td>
</tr>
<tr>
<td>Claim form for interstate ditches</td>
<td>33</td>
</tr>
<tr>
<td>Conversion table</td>
<td>37</td>
</tr>
<tr>
<td><strong>ILLUSTRATIONS</strong></td>
<td></td>
</tr>
<tr>
<td>Plate 1. Map showing locations of Yellowstone River Compact gaging and reservoir-content stations</td>
<td>38</td>
</tr>
<tr>
<td>Figures 1-4. Graphs showing comparison of discharge during water year 2004 with discharge during water year 2003 and with 10-year and 30-year average discharges for:</td>
<td></td>
</tr>
<tr>
<td>1. Clarks Fork Yellowstone River at Edgar, Mont</td>
<td>4</td>
</tr>
<tr>
<td>2. Bighorn River above Tullock Creek, near Bighorn, Mont</td>
<td>9</td>
</tr>
<tr>
<td>3. Tongue River at Miles City, Mont</td>
<td>12</td>
</tr>
<tr>
<td>4. Powder River near Locate, Mont</td>
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<tr>
<td>MT v. WY/M.T.D. App.</td>
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</tr>
<tr>
<td>503 (WY)</td>
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</tbody>
</table>
GENERAL REPORT

Cost of operation and budget

The work funded by the Yellowstone River Compact Commission, which to date has been primarily concerned with the collection of required hydrologic data, has been financed through cooperative arrangements whereby Montana and Wyoming each bear one-fourth of the cost, and the remaining one-half is borne by the United States. The salaries and necessary expenses of the State and U.S. Geological Survey representatives to the Commission and the cost to other agencies of collecting hydrologic data are not considered as expenses of the Commission.

The expense of the Commission during fiscal year 2004 was $70,000, in accordance with the budget adopted for the year.

The estimated budgets for Federal fiscal years 2005, 2006, 2007, and 2008, based on an approximate 5-percent increase per year, were tentatively adopted subject to the availability of appropriations. The budgets for the four fiscal years are summarized as follows:

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Estimate for continuation of existing streamflow-gaging programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 1, 2004, to September 30, 2005 (fiscal year 2005)</td>
<td>$71,900</td>
</tr>
<tr>
<td>October 1, 2005, to September 30, 2006 (fiscal year 2006)</td>
<td>$76,000</td>
</tr>
<tr>
<td>October 1, 2006, to September 30, 2007 (fiscal year 2007)</td>
<td>$80,000</td>
</tr>
<tr>
<td>October 1, 2007, to September 30, 2008 (fiscal year 2008)</td>
<td>$84,000</td>
</tr>
</tbody>
</table>

Streamflow-gaging station operation

Streamflow-gaging stations at the measuring sites specified in the Yellowstone River Compact were continued in operation, and satisfactory records were collected at each station. Locations of streamflow-gaging stations, along with reservoir content stations, are shown on a map of the Yellowstone River Basin at the end of this report.

For measurement sites, horizontal coordinate information (latitude and longitude) is referenced to the North American Datum of 1927 (NAD 27). The gage datums and elevations listed in this report are referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29).

During water year 2004, annual streamflow was below normal\(^1\) at all reporting Yellowstone River Compact gaging stations.

<table>
<thead>
<tr>
<th>Station number</th>
<th>Streamflow-gaging station</th>
<th>Percent of streamflow(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>06208500</td>
<td>Clarks Fork Yellowstone River at Edgar, Mont., minus diversions to White Horse Canal</td>
<td>74</td>
</tr>
<tr>
<td>06294500</td>
<td>Bighorn River above Tullock Creek, near Bighorn, Mont., minus Little Bighorn River near Hardin, Mont. Adjusted for change in contents in Bighorn Lake</td>
<td>38</td>
</tr>
<tr>
<td>06308500</td>
<td>Tongue River at Miles City, Mont.</td>
<td>20</td>
</tr>
<tr>
<td>06326500</td>
<td>Powder River near Locate, Mont.</td>
<td>14</td>
</tr>
</tbody>
</table>

\(^1\)The "normal" range is 80 to 120 percent of average.

\(^2\)Average is based on period of record at station.
Tabulation of water-discharge records for water year 2004 and graphical comparisons of discharge during water year 2004 with discharge during water year 2003 and with 10-year and 30-year average discharges are provided in the section "Summary of discharge for Yellowstone River Compact Commission streamflow-gaging stations."

**Diversions**

No diversions were regulated by the Commission during water year 2004.

**Reservoir contents**

**Reservoirs completed after January 1, 1950**

Boysen Reservoir, located on the Wind River and operated by the Bureau of Reclamation, began the water year with 311,900 acre-feet in storage and ended the water year with 475,100 acre-feet. Anchor Reservoir began the water year with 345 acre-feet in storage and ended the water year with 429 acre-feet. Bighorn Lake, a Bureau of Reclamation storage project on the Bighorn River that is the largest in the basin, contained 769,900 acre-feet at the beginning of the water year and 694,300 acre-feet at the end of the water year. Daily contents ranged from 634,300 acre-feet on May 8, 2004 to 799,100 acre-feet on November 13, 2003. Month-end and year-end contents and a description of these reservoirs are given in the section "Monthly summary of contents for Yellowstone River Compact reservoirs completed after January 1, 1950."

**Reservoirs existing on January 1, 1950**

As a matter of record and general information, month-end contents data are given later in the report for four reservoirs in existence upstream from the points of measurement on January 1, 1950. The reservoirs are Bull Lake, Pilot Butte Reservoir, Buffalo Bill Reservoir, and Tongue River Reservoir. These data are pertinent to allocation under Article V, Section C, Item 3 of the Compact.

The storage capacity of Buffalo Bill Reservoir was increased in 1992 from 456,600 acre-feet to 644,540 acre-feet (listed as 646,565 acre-feet by Bureau of Reclamation). The storage capacity of Tongue River Reservoir was increased in 1999 from 68,000 acre-feet to 79,070 acre-feet.

**Annual summary of reservoir contents**

Information on reservoir contents at the end of the current and previous water years for the 7 reservoirs listed above plus 23 additional reservoirs was compiled at the request of the Commission. The information is provided in the section "Annual summary of contents for Yellowstone River Compact reservoirs or lakes."
SUMMARY OF DISCHARGE FOR YELLOWSTONE RIVER COMPACT COMMISSION STREAMFLOW-GAGING STATIONS 06235000 Clarks Fork Yellowstone River at Edgar, Mont.

LOCATION.—Lat 45°27'20", long 108°50'35" (NAD27), in SE\(^2\) SE\(^2\) SE\(^2\) 23, T 24 S, R 23 E, Carbon County, Hydrologic Unit 10070006, on right bank 400 ft downstream from county bridge, 0.5 mi east of Edgar, 6 mi upstream from Rock Creek, and at river mile 22.1.

DRAINAGE AREA.—2,022 mi\(^2\).

PERIOD OF RECORD.—July 1921 to September 1969, October 1969 to current year.


GAGE.—Water-stage recorder. Elevation of gage is 5,460 ft (NGVD29). Prior to Aug. 31, 1953, recording gage at same site and elevation.

REMARKS.—Records good except those for the estimated daily discharges, which are poor. Diversions for irrigation of about 41,500 acres, of which about 840 acres lies downstream from the station. In addition, about 6,300 acres of land upstream from the station are irrigated by diversions from the adjoining Rock Creek basin. U.S. Geological Survey survey tent hearing at station. Discharge values given herein have the diversion of White Horse Canal subtracted.

### DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 2003 TO SEPTEMBER 2004

#### DAILY MEAN VALUES

<table>
<thead>
<tr>
<th>DAY</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

#### TOTAL 12,598

<table>
<thead>
<tr>
<th>MEAN</th>
<th>8,043</th>
<th>3,896</th>
<th>2,995</th>
<th>1,505</th>
<th>575</th>
<th>432</th>
<th>340</th>
<th>284</th>
<th>230</th>
<th>190</th>
<th>157</th>
<th>123</th>
</tr>
</thead>
</table>

#### MEAN

<table>
<thead>
<tr>
<th>MEAN</th>
<th>350</th>
<th>400</th>
<th>501</th>
<th>609</th>
<th>701</th>
<th>801</th>
<th>901</th>
<th>1000</th>
<th>1100</th>
<th>1200</th>
<th>1300</th>
<th>1400</th>
</tr>
</thead>
</table>

#### TOTAL AC-Ft

<table>
<thead>
<tr>
<th>24,590</th>
<th>33,450</th>
<th>26,000</th>
<th>19,840</th>
<th>15,640</th>
<th>11,440</th>
<th>7,240</th>
<th>3,040</th>
<th>1,840</th>
<th>1,040</th>
<th>640</th>
<th>340</th>
</tr>
</thead>
</table>

#### STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1921 - 2004, BY WATER YEAR (WY)*

<table>
<thead>
<tr>
<th>MEAN</th>
<th>530</th>
<th>600</th>
<th>650</th>
<th>700</th>
<th>750</th>
<th>800</th>
<th>850</th>
<th>900</th>
<th>950</th>
<th>1,000</th>
<th>1,050</th>
<th>1,100</th>
</tr>
</thead>
</table>

#### SUMMARY STATISTICS

<table>
<thead>
<tr>
<th>FOR 2003 CALENDAR YEAR</th>
<th>FOR 2004 WATER YEAR</th>
<th>WATER YEARS 1921 - 2004*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANNUAL TOTAL</td>
<td>352,592</td>
<td>279,426</td>
</tr>
<tr>
<td>ANNUAL MEAN</td>
<td>966</td>
<td>763</td>
</tr>
</tbody>
</table>

### HIGHEST DAILY MEAN

<table>
<thead>
<tr>
<th>3,700</th>
<th>Jun 1</th>
<th>6,300</th>
<th>Jun 11</th>
<th>10,600</th>
<th>Jun 21, 1936</th>
</tr>
</thead>
</table>

### LOWEST DAILY MEAN

<table>
<thead>
<tr>
<th>1,16</th>
<th>Aug 28</th>
<th>140</th>
<th>Apr 28</th>
<th>37</th>
<th>May 11, 1961</th>
</tr>
</thead>
</table>

### ANNUAL SEVEN-DAY MINIMUM

<table>
<thead>
<tr>
<th>125</th>
<th>Aug 23</th>
<th>144</th>
<th>Apr 23</th>
<th>43</th>
<th>Apr 15, 1961</th>
</tr>
</thead>
</table>

### MAXIMUM PEAK FLOW

|-------|-----------|-------|-----------|--------|--------------|

### MAXIMUM PEAK STAGE

<table>
<thead>
<tr>
<th>1,820</th>
<th>Apr 22, 1961</th>
</tr>
</thead>
</table>

### INSTANTANEOUS LOW FLOW

<table>
<thead>
<tr>
<th>460</th>
<th>Apr 22, 1961</th>
</tr>
</thead>
</table>

### ANNUAL RUNOFF (AC-Ft)

<table>
<thead>
<tr>
<th>699,400</th>
<th>556,200</th>
<th>744,000</th>
</tr>
</thead>
</table>

### 10 PERCENT EXCEEDS

<table>
<thead>
<tr>
<th>2,300</th>
<th>1,820</th>
<th>2,820</th>
</tr>
</thead>
</table>

### 50 PERCENT EXCEEDS

<table>
<thead>
<tr>
<th>472</th>
<th>460</th>
</tr>
</thead>
</table>

### 50 PERCENT EXCEEDS

<table>
<thead>
<tr>
<th>259</th>
<th>271</th>
</tr>
</thead>
</table>

---

*During period of operation (water years 1921-69, 1987 to current year).

**Estimated.**
Figure 1. Comparison of discharge of the Clarks Fork Yellowstone River during water year 2004 with discharge during water year 2003 and with 10-year and 30-year average discharges.
06294ffiA Little Bigborn Rivernear Hardin. Mont.
LOCATION,-Let 45o44'09".long t0?o3,?24'(NAD
bridge on Sarpy Road, C.2 mi'rlpsE"am from

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mstewby of Agency Canal, 0-6 mi upsneam from moutl and 2.3 mi east of Hadin.

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DRAINAGE AREA.- -1.294 miz.
PERIOD OF RECORD.-Juae 1953 to cunent year.
REVISED RECORDS.--WDR ltrI-85-1 : I 978.
GAGE.-Water-slage recorder. Elevation of gage is 2,882.29 ft (NGVD 29) (levels by U.S. Arrry Corps of Engineers). Prior to Oct 7, 1953, nomeco.rding gage
at site 0.4 mi clo-wnstseam. Oct, 7, 1953 t6'May 6, 1953, water-stage recorder at site 0.3 mi d6wnstieam. May 6, 1963 to Nov. 6, 1963, nonrecording glge-a:t
site 0.4 mi dowrstream. All at differcntelevatibns. Nov.7, 1963 ttAug. i5, 1976, water-sagerecorde! atsite 35 ft downstseam atpresent elevation. A-ug. 15,
l9?6toSepL30, 1979,water-stagereco$erswerelocatedoneachbarkdomsteamftomSarpyRoadbridgeandwereuseddepeodingonco8holcotrditioDs.
REMARKS.-Records good except those for estimatect daily discharges, which are poor. Flow partly rcgujated_by Willow Creek Reservoir (capacity ?3,090_1cf'
fr). Divemions for iriigation oi20,980 acres upsaeamfrbm sation. Discharge values given herein include flow of terminal wasteway of Agelcy-pna! p. S'
Geological Srwey saEliite telemeter at sEtio;. Unpubiished records of bsianhaeous water temperature and specific conductruce available in files of the
Distric! office.
DISCHARGE, CIjBIC FEETPER SECOND, WATER YEAR OCTOBER
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STATISTICS OF MONTHLY MEAN DATA FOR TtrATERYEARS 1954 - 2004. BY WATER YEAR(WY)

MEAN I53
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(wY) (197e)
MIN
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(1979)
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(2002)

(n0?)

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(197s) (1971)
71.6
70.3

309
987

(1912)
71.1

(2002)

601
309
748 2,852
(196s) (1978)
7r.9
54.8
(196r) (i96i)

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(1968)
111
(1961)

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<table>
<thead>
<tr>
<th></th>
<th>FOR 2003 CALENDAR YEAR</th>
<th>FOR 2004 WATER YEAR</th>
<th>WATER YEARS 1954 - 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANNUAL TOTAL</strong></td>
<td>67,087</td>
<td>39,202</td>
<td></td>
</tr>
<tr>
<td><strong>ANNUAL MEAN</strong></td>
<td>184</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td><strong>HIGHEST ANNUAL MEAN</strong></td>
<td></td>
<td></td>
<td>775</td>
</tr>
<tr>
<td><strong>LOWEST ANNUAL MEAN</strong></td>
<td></td>
<td></td>
<td>676</td>
</tr>
<tr>
<td><strong>HIGHEST DAILY MEAN</strong></td>
<td>1,220</td>
<td>452</td>
<td>70.4</td>
</tr>
<tr>
<td><strong>LOWEST DAILY MEAN</strong></td>
<td>29</td>
<td>25</td>
<td>15,800</td>
</tr>
<tr>
<td><strong>ANNUAL SEVEN-DAY MINIMUM</strong></td>
<td>32</td>
<td>37</td>
<td>May 5</td>
</tr>
<tr>
<td><strong>MAXIMUM PEAK FLOW</strong></td>
<td>427</td>
<td></td>
<td>0.40</td>
</tr>
<tr>
<td><strong>MAXIMUM PEAK STAGE</strong></td>
<td>8.86</td>
<td></td>
<td>0.40</td>
</tr>
<tr>
<td><strong>INSTANTANEOUS LOW FLOW</strong></td>
<td></td>
<td></td>
<td>0.40</td>
</tr>
<tr>
<td><strong>ANNUAL RUNOFF (AC-FT)</strong></td>
<td>133,100</td>
<td>77,760</td>
<td>822,600</td>
</tr>
<tr>
<td><strong>10 PERCENT EXCEEDS</strong></td>
<td>391</td>
<td>161</td>
<td>Mar 20, 1960</td>
</tr>
<tr>
<td><strong>50 PERCENT EXCEEDS</strong></td>
<td>108</td>
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<tr>
<td><strong>90 PERCENT EXCEEDS</strong></td>
<td>70</td>
<td>40</td>
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</tbody>
</table>

*Includes Agency Canal.*

*b--Gage height, 11.20 ft.*

c--Backwater from lac.*

d--Gage height, 11.20 ft.*

e--Estimated.

f--Site and elevation than in use.

g--Result of discharge measurement.
### DRAINAGE AREA


### PERIOD OF RECORD

- October 1981 to current year. Previously published at "06294700 Bighorn River at Bighorn, MT" 1956-81, and as "near Cutter" 1945-55. Flows are equivalent at all sites.

### GAGE


### REMARKS

- Water-stage records good except those for estimated daily discharges, which are poor. Flow regulated by Bighorn Lake beginning November 1965 (usable capacity, 1,312,000 acre-ft). Major regulation prior to November 1965 by 14 reservoirs in Wyoming and 1 in Montana with combined usable capacity of about 1,400,000 acre-ft. Diversion for irrigation of about 445,200 acres upstream from station. U.S. Army Corps of Engineers satellite telemeter at station.

### DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 2003 TO SEPTEMBER 2004

| DAY | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     |     |     |     |     |     |     |     |     |     |     |     |     |

#### DAILY MEAN VALUES

### STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 2004

- By water year (WY)

### SUMMARY STATISTICS

- For 2003 calendar year
- For 2004 water year
- Waters years 1945 - 2004

### MT v. WW/M T.D. App.

- 510 (WY)
### SUMMARY STATISTICS

<table>
<thead>
<tr>
<th></th>
<th>WATER YEARS 1946 - 1961</th>
<th>WATER YEARS 1957 - 2004</th>
</tr>
</thead>
<tbody>
<tr>
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<td>3,745</td>
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<td>3,294</td>
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<td>1,623</td>
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<td>252</td>
<td>400</td>
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<td>ANNUAL SEVEN-DAY MINIMUM</td>
<td>592</td>
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<td>0.73</td>
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<tr>
<td>10 PERCENT EXCEEDS</td>
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<td>90 PERCENT EXCEEDS</td>
<td>1,200</td>
<td>1,710</td>
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*Prior to construction of Yellowtail Dam.

**After completion of Yellowtail Dam.

a--Gage height, 1.92 ft.
b--Backwater from ice.
c--Gage height, 0.12 ft.
d--Gage height, 14.50 ft. at different site and datum.
e--Estimated.
f--About, result of freezeup.
g--Gage height, 8.75 ft. at different site and datum.
Figure 2. Comparison of discharge of the Bighorn River during water year 2004 with discharge during water year 2003 and with 10-year and 30-year average discharges.
**Tongue River at Miles City, Mont.**

**Location:** Lar 46°33'30", long 105°50'41" (NAD 27), in SE 1/4, SE 1/4, SE 1/4, sec. 4, T.7 N, R.47 E, Custer County, Hydrologic Unit 10005102, on right bank 1.5 mi south of Miles City and at river mile 2.3.

**DRAINAGE AREA:** 5,397 mi². Area at site used prior to Oct. 4, 1995, 5,799 mi².

**Period of Record:** April 1938 to April 1942, April 1946 to current year. Published as "near Miles City" April 1938 to April 1942. Not equivalent to records published as "near Miles City" May 1929 to October 1932. April 1946 to Oct. 4, 1995, at site 2.5 mi upstream from present site. Flows at present site are equivalent with flows at site operated from 1946. Monthly discharge only for some periods, in WSP 1309.

**Revised Records:** WSP 1729: Drainage area.

**Gage:** Water-stage recorder. Elevation of gage is 2,360 ft (NGVD 29). April 1938 to April 1942, nonrecording gage at site 8 mi upstream from present site at different elevation. April 1946 to Sept. 30, 1963, at elevation 1.00 ft higher than present site. Oct. 4, 1995, gage was moved 2.5 miles downstream.

**Remarks:** Water-discharge records good except those for estimated daily discharges, which are poor. Flow regulation by Tongue River Reservoir (station 06307000) with capacity of 79,100 acre-feet, and many small reservoirs in Wyoming with combined capacity about 15,000 acre-ft. Diversion of irrigation of about 100,000 acres upstream from station. U.S. Army Corps of Engineers satellites telemeter at station.

### Discharge, Cubic Feet Per Second, Water Year October 2003 to September 2004

<table>
<thead>
<tr>
<th>Day</th>
<th>Daily Mean Values</th>
</tr>
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<tr>
<td><strong>Discharge, Cubic Feet Per Second, Water Year October 2003 to September 2004</strong></td>
<td><strong>Data for water years 1938-2004, by water year (WY)</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>WY</th>
<th>Mean</th>
<th>Max</th>
<th>Min</th>
<th>Statistics of Monthly Mean Data for Water Years 1938-2004, by Water Year (WY)*</th>
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<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>241</td>
<td>251</td>
<td>189</td>
<td>193</td>
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<tr>
<td><strong>Max</strong></td>
<td>694</td>
<td>385</td>
<td>423</td>
<td>529</td>
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<tr>
<td><strong>Min</strong></td>
<td>10.3</td>
<td>60.9</td>
<td>68.0</td>
<td>76.8</td>
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</table>

*MT V. WY/TD APP 513 (WY)
<table>
<thead>
<tr>
<th>SUMMARY STATISTICS</th>
<th>FOR 2003 CALENDAR YEAR</th>
<th>FOR 2004 WATER YEAR</th>
<th>WATER YEARS 1938 - 2004*</th>
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<tbody>
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<td>b13,300</td>
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<td>ANNUAL RUNOFF (AC-FT)</td>
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<td>291,000</td>
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<td>161</td>
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<tr>
<td>90 PERCENT EXCEEDS</td>
<td>69</td>
<td>16</td>
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</table>

*--During period of record (April 1938 to April 1942, April 1946 to current year).
b--At previous site and elevation.
e--Estimated.
Figure 3. Comparison of discharge of the Tongue River during water year 2004 with discharge during water year 2003 and with 10-year and 30-year average discharges.
LOCATION.—Lat 46°25'48"N, long 105°18'34" (NAD 27), in SW1/4, SW1/4, SE1/4 sec 23, T.8 S., R.51 E., Custer County, Wyoming. Hydrologic Unit 10090209, on left bank at downstream side of bridge on U.S. Highway 12, 0.1 mi west of Locate, and 23.5 mi east of Miles City, and at river mile 29.4.

DRAINAGE AREA.—13,068 mi².

PERIOD OF RECORD.—March 1938 to current year.


REMARKS.—Water-discharge records fair except those for estimated daily discharges, which are poor. Some regulation by three reservoirs in Wyoming with combined usable capacity of 36,800 acre-ft. Diversions for irrigation of about 101,800 acres upstream from station. U.S. Army Corps of Engineers satellite telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 2003 TO SEPTEMBER 2004

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<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
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<td>1,229</td>
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<td>1,965</td>
<td>1,991</td>
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<td>64.3</td>
<td>100</td>
<td>64.2</td>
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<td>290</td>
<td>164</td>
<td>51.2</td>
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<td>9.34</td>
<td>38.2</td>
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<td>23</td>
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<tr>
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<td>50</td>
<td>32</td>
<td>15</td>
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<td>6,150</td>
<td>3,950</td>
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<td>9,770</td>
<td>5,150</td>
<td>1,540</td>
<td>574</td>
<td>2,350</td>
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</table>

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939 - 2004, BY WATER YEAR (WY)

<table>
<thead>
<tr>
<th>Month</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
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</thead>
<tbody>
<tr>
<td>Mean</td>
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<td>217</td>
<td>149</td>
<td>142</td>
<td>425</td>
<td>415</td>
<td>1,215</td>
<td>732</td>
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<td>477</td>
<td>476</td>
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<td>3,582</td>
<td>3,970</td>
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<td>8,045</td>
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<td>125</td>
<td>453</td>
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<td>109</td>
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<td>AC-FT</td>
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<td>3,830</td>
<td>6,150</td>
<td>3,950</td>
<td>3,950</td>
<td>17,830</td>
<td>9,770</td>
<td>5,150</td>
<td>1,540</td>
</tr>
</tbody>
</table>

MT v. WY/M.T.D. App. 516 (WY)

0384
### SUMMARY STATISTICS

<table>
<thead>
<tr>
<th></th>
<th>FOR 2003 CALENDAR YEAR</th>
<th>FOR 2004 WATER YEAR</th>
<th>WATER YEARS 1939 - 2004</th>
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</thead>
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<td>512.20</td>
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<tr>
<td>ANNUAL RUNOFF (AC-FT)</td>
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<td>408,300</td>
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<td>10 PERCENT EXCEEDS</td>
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<td>170</td>
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<td>90 PERCENT EXCEEDS</td>
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</table>

- a-Gage height, 2.63 ft.
- b-Backwater from ice.
- e-Estimated.
Figure 4. Comparison of discharge of the Powder River during water year 2004 with discharge during water year 2003 and with 10-year and 30-year average discharges.
MONTHLY SUMMARY OF CONTENTS FOR YELLOWSTONE RIVER COMPACT RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

06258900 Boyse n Reservoir, Wyo.

LOCATION.--Lat 43°25'00", long 108°10'37" (NAD 27), in NW$^1/4$NW$^1/4$ sec. 16, T.5 N., R.6 E., Fremont County, Hydrologic Unit 10080005, at dam on Wind River and 13 mi north of Shoshoni, Wyoming.

DRAINAGE AREA.--7,700 mi$^2$.

PERIOD OF RECORD.--October 1951 to current year (month-end contents only).

GAGE.--Water-stage recorder. Datum of gage is NGVD of 1929 (levels by Bureau of Reclamation).

REMARKS.--Reservoir is formed by rock-fill dam completed in October 1951. Storage began Oct. 11, 1951. Usable capacity, 701,500 acre-ft between elevation 4,657.00 ft, invert of penstock pipe, and 4,725.00 ft, top of spillway gate. Dead storage, 40,080 acre-ft below elevation 4,657.00 ft. Prior to Jan. 1, 1956, usable capacity was 757,800 acre-ft and dead storage was 62,000 acre-ft at same elevations. Between January 1966 and October 1996, usable capacity was 742,100 acre-ft and dead storage was 59,880 acre-ft, at same elevations. Crest of dam is at elevation 4,758.00 ft. Water used for irrigation, flood control, and power generation.

COOPERATION.--Elevations and capacity table furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily contents, 862,500 acre-ft, July 6, 7, 1967, elevation, 4,730.83 ft; minimum daily contents since normal use of water started, 191,900 acre-ft, Mar. 18, 19, 1956, elevation, 4,684.18 ft, capacity table then in use.

EXTREMES FOR CURRENT YEAR.--Maximum daily contents, 496,800 acre-ft, July 14, 15, elevation, 4,713.09 ft; minimum daily contents, 312,500 acre-ft, Oct. 1, elevation, 4,698.59 ft.

<table>
<thead>
<tr>
<th>Month</th>
<th>Water-surface elevation, in feet</th>
<th>Usable contents, in acre-feet</th>
<th>Change in usable contents, in acre-feet</th>
</tr>
</thead>
<tbody>
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<td>September 30, 2003</td>
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<td>311,900</td>
<td>--</td>
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<td>October 31</td>
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<td>November 30</td>
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<td>December 31</td>
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<td>350,500</td>
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<tr>
<td>January 31, 2004</td>
<td>4,702.84</td>
<td>361,000</td>
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<tr>
<td>February 29</td>
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<tr>
<td>September 30, 2004</td>
<td>4,711.60</td>
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<td>+2,100</td>
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</tbody>
</table>

2004 water year +163,200
06260300  Anchor Reservoir, Wyo.

LOCATION.--Lat 43°39'50", long 108°49'27" (NAD 27), in sec. 26, T.43 N., R.100 W., Hot Springs County, Hydrologic Unit 10080007, at dam on South Fork Owl Creek, 2 mi downstream from Middle Fork, 3 mi southeast of Anchor, and 32 mi west of Thermopolis.

DRAINAGE AREA.--131 mi².

PERIOD OF RECORD.--November 1960 to current year (month-end contents only).

GAGE.--Water-stage recorder. Datum of gage is NGVD of 1929 (Bureau of Reclamation benchmark).

REMARKS.--Reservoir is formed by concrete arch dam completed in 1960. Usable capacity, 17,410 acre-ft (revised) between elevation 6,343.75 ft, invert of river outlet, and 6,441.00 ft, spillway crest, including 68 acre-ft below elevation 6,343.75 ft. Prior to Oct. 1, 1971, usable capacity was 17,280 acre-ft, including 149 acre-ft below the invert. Water is used for irrigation of land in Owl Creek basin.

COOPERATION.--Elevations and capacity table furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily contents, 9,250 acre-ft, July 4, 1967, elevation, 6,418.52 ft; no usable contents on many days some years.

EXTREMES FOR CURRENT YEAR.--Maximum daily contents, 540 acre-ft, Mar. 30, elevation, 6,363.10 ft; minimum daily contents, 254 acre-ft, many days, elevation, 6,355.00 ft.

<table>
<thead>
<tr>
<th>Month</th>
<th>Water-surface elevation, in feet</th>
<th>Usable contents, in acre-feet</th>
<th>Change in usable contents, in acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 30, 2003</td>
<td>6,358.11</td>
<td>345</td>
<td>---</td>
</tr>
<tr>
<td>October 31</td>
<td>6,357.00</td>
<td>314</td>
<td>-31</td>
</tr>
<tr>
<td>November 30</td>
<td>6,355.00</td>
<td>254</td>
<td>-60</td>
</tr>
<tr>
<td>December 31</td>
<td>6,355.00</td>
<td>254</td>
<td>0</td>
</tr>
<tr>
<td>January 31, 2004</td>
<td>6,355.60</td>
<td>271</td>
<td>+17</td>
</tr>
<tr>
<td>February 29</td>
<td>6,355.00</td>
<td>254</td>
<td>-17</td>
</tr>
<tr>
<td>March 31</td>
<td>6,363.00</td>
<td>535</td>
<td>+281</td>
</tr>
<tr>
<td>April 30</td>
<td>6,355.00</td>
<td>254</td>
<td>-281</td>
</tr>
<tr>
<td>May 31</td>
<td>6,358.30</td>
<td>355</td>
<td>+101</td>
</tr>
<tr>
<td>June 30</td>
<td>6,358.30</td>
<td>355</td>
<td>0</td>
</tr>
<tr>
<td>July 31</td>
<td>6,360.40</td>
<td>429</td>
<td>+74</td>
</tr>
<tr>
<td>August 31</td>
<td>6,360.40</td>
<td>429</td>
<td>0</td>
</tr>
<tr>
<td>September 30, 2004</td>
<td>6,360.40</td>
<td>429</td>
<td>0</td>
</tr>
</tbody>
</table>

2004 water year +84
Bighorn Lake near St. Xavier, Mont.

LOCATION.—Lat 45°18'27", long 107°57'26" (NAD 27), in SW\(^{1/4}\)SE\(^{1/4}\) sec.18, T.6 S., R.30 E., Big Horn County, Hydrologic Unit 10080010, in block 13 of Yellowtail Dam on Bighorn River, 1.3 mi upstream from Grapevine Creek, 15.5 mi southwest of St. Xavier, and at river mile 86.6.

DRAINAGE AREA.—19,626 mi\(^2\).

PERIOD OF RECORD.—November 1965 to current year (month-end contents only). Prior to October 1969, published as "Yellowtail Reservoir." Records of daily elevations and contents on file at the USGS office in Helena, Mont.

GAGE.—Water-stage recorder in powerhouse control room. Datum of gage is 3,296.5 feet (levels by Bureau of Reclamation).

REMARKS.—Reservoir is formed from thin concrete-arch dam; construction began in 1961; completed in 1967. Storage began Nov. 3, 1965. Usable capacity, 1,312,000 acre-ft, between elevation 3,296.50 ft, river outlet invert, and 3,657.00 ft, top of flood control. Elevation of spillway crest, 3,593.00 ft. Normal maximum operating level, 1,097,000 acre-ft, elevation, 3,640.00 ft. Minimum operating level, 483,400 acre-ft, elevation, 3,547.00 ft. Dead storage, 16,010 acre-ft, below elevation 3,296.50 ft. Water is used for power production, flood control, irrigation, and recreation.

COOPERATION.—Elevations and capacity table furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.—Maximum contents, 1,346,000 acre-ft, July 6, 1967, elevation, 3,656.43 ft; minimum contents since first filling, 591,400 acre-ft, Mar. 11, 2003, elevation, 3,572.81 ft.

EXTREMES FOR CURRENT YEAR.—Maximum contents, 799,100 acre-ft, Nov. 13, elevation, 3,611.84 ft; minimum contents, 634,300 acre-ft, May 8, elevation, 3,581.76 ft.

<table>
<thead>
<tr>
<th>Month</th>
<th>Water-surface elevation, in feet</th>
<th>Usable contents, in acre-feet</th>
<th>Change in usable contents, in acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 30, 2003</td>
<td>3,607.20</td>
<td>769,900</td>
<td>—</td>
</tr>
<tr>
<td>October 31</td>
<td>3,611.40</td>
<td>796,200</td>
<td>+26,300</td>
</tr>
<tr>
<td>November 30</td>
<td>3,610.52</td>
<td>790,500</td>
<td>-5,700</td>
</tr>
<tr>
<td>December 31</td>
<td>3,605.13</td>
<td>757,600</td>
<td>-32,900</td>
</tr>
<tr>
<td>January 31, 2004</td>
<td>3,594.58</td>
<td>699,300</td>
<td>-58,300</td>
</tr>
<tr>
<td>February 29</td>
<td>3,591.51</td>
<td>683,300</td>
<td>-16,000</td>
</tr>
<tr>
<td>March 31</td>
<td>3,588.22</td>
<td>666,500</td>
<td>-16,800</td>
</tr>
<tr>
<td>April 30</td>
<td>3,582.94</td>
<td>640,100</td>
<td>-26,400</td>
</tr>
<tr>
<td>May 31</td>
<td>3,584.12</td>
<td>646,000</td>
<td>+5,900</td>
</tr>
<tr>
<td>June 30</td>
<td>3,586.80</td>
<td>659,300</td>
<td>+13,300</td>
</tr>
<tr>
<td>July 31</td>
<td>3,587.29</td>
<td>661,800</td>
<td>+2,500</td>
</tr>
<tr>
<td>August 31</td>
<td>3,586.40</td>
<td>657,300</td>
<td>-4,500</td>
</tr>
<tr>
<td>September 30, 2004</td>
<td>3,593.63</td>
<td>694,300</td>
<td>+37,000</td>
</tr>
</tbody>
</table>

2004 water year —-75,600
MONTHLY SUMMARY OF CONTENTS FOR YELLOWSTONE RIVER COMPACT RESERVOIRS EXISTING ON JANUARY 1, 1950

The extent, if any, to which the use of reservoirs in this section may be subject to Compact allocations was not determined. As a matter of hydrologic interest, the month-end usable contents in acre-feet of four reservoirs are given. The first three reservoirs are in the Bighorn River basin, Wyoming, and data on contents were furnished by the Bureau of Reclamation. The Tongue River Reservoir in Montana is operated under the supervision of the Water Resources Division of the Montana Department of Natural Resources and Conservation, which furnished the water-level data and the reservoir-capacity table.

<table>
<thead>
<tr>
<th>Month</th>
<th>Usable contents, in acre-feet¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bull Lake</td>
</tr>
<tr>
<td>September 30, 2003</td>
<td>55,620</td>
</tr>
<tr>
<td>October 31</td>
<td>56,800</td>
</tr>
<tr>
<td>November 30</td>
<td>56,890</td>
</tr>
<tr>
<td>December 31</td>
<td>56,930</td>
</tr>
<tr>
<td>January 31, 2004</td>
<td>57,290</td>
</tr>
<tr>
<td>February 29</td>
<td>57,380</td>
</tr>
<tr>
<td>March 31</td>
<td>57,380</td>
</tr>
<tr>
<td>April 30</td>
<td>60,920</td>
</tr>
<tr>
<td>May 31</td>
<td>60,370</td>
</tr>
<tr>
<td>June 30</td>
<td>99,190</td>
</tr>
<tr>
<td>July 31</td>
<td>137,400</td>
</tr>
<tr>
<td>August 31</td>
<td>107,300</td>
</tr>
<tr>
<td>September 30, 2004</td>
<td>88,940</td>
</tr>
</tbody>
</table>

Change in contents during water year: +33,320 +6,340 -26,900 -12,430

¹Pre-Compact water rights and post-Compact water rights for these reservoirs are presented in the table. "Annual summary of contents for Yellowstone River Compact Commission reservoirs or lakes."
ANNUAL SUMMARY OF CONTENTS FOR YELLOWSTONE RIVER COMPACT RESERVOIRS OR LAKES

(Content are in acre feet. Reservoirs or lakes are listed in alphabetical order by drainage basin. Symbol: --, data not applicable or not available)

<table>
<thead>
<tr>
<th>Reservoir or lake name</th>
<th>Pre-Compact 1950 water right</th>
<th>Post-Compact 1950 water right</th>
<th>Usable capacity</th>
<th>Usable contents on Sept. 30, 2004</th>
<th>Usable contents on Sept. 30, 2003</th>
<th>Change in contents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bighorn River basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Lake) Adelaide Reservoir¹</td>
<td>1,450</td>
<td>4,760</td>
<td>6,210</td>
<td>800</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Anchor Reservoir²</td>
<td>17,410</td>
<td>1,312,000</td>
<td>1,312,000</td>
<td>694,300</td>
<td>769,900</td>
<td>-75,600</td>
</tr>
<tr>
<td>Bighorn Lake²</td>
<td>701,500</td>
<td>190,000</td>
<td>646,600</td>
<td>438,800</td>
<td>465,700</td>
<td>-26,900</td>
</tr>
<tr>
<td>Boyse Reserve²</td>
<td>152,000</td>
<td>23,170</td>
<td>23,170</td>
<td>1,100</td>
<td>1,480</td>
<td>-380</td>
</tr>
<tr>
<td>Sunshine Reserve¹</td>
<td>52,990</td>
<td>34,600</td>
<td>24,940</td>
<td>1,100</td>
<td>1,490</td>
<td>-480</td>
</tr>
<tr>
<td>Lower Sunshine Reserve¹</td>
<td>42,640</td>
<td>34,600</td>
<td>24,940</td>
<td>1,100</td>
<td>1,490</td>
<td>-480</td>
</tr>
<tr>
<td><strong>Powder River basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cloud Peak Reserve¹</td>
<td>3,400</td>
<td>1,312,000</td>
<td>1,312,000</td>
<td>694,300</td>
<td>769,900</td>
<td>-75,600</td>
</tr>
<tr>
<td>Dullknife Reserve¹</td>
<td>17,410</td>
<td>1,312,000</td>
<td>1,312,000</td>
<td>694,300</td>
<td>769,900</td>
<td>-75,600</td>
</tr>
<tr>
<td>Healy Reserve¹</td>
<td>701,500</td>
<td>190,000</td>
<td>646,600</td>
<td>438,800</td>
<td>465,700</td>
<td>-26,900</td>
</tr>
<tr>
<td>Kearney Reserve¹</td>
<td>152,000</td>
<td>23,170</td>
<td>23,170</td>
<td>1,100</td>
<td>1,480</td>
<td>-380</td>
</tr>
<tr>
<td>Lake DeSmet¹</td>
<td>52,990</td>
<td>34,600</td>
<td>24,940</td>
<td>1,100</td>
<td>1,490</td>
<td>-480</td>
</tr>
<tr>
<td>Muddy Guard Reserve¹</td>
<td>42,640</td>
<td>34,600</td>
<td>24,940</td>
<td>1,100</td>
<td>1,490</td>
<td>-480</td>
</tr>
<tr>
<td>The Hack Reserve¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toll Park Reserve¹</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tongue River basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bighorn Reserve¹</td>
<td>2,750</td>
<td>1,312,000</td>
<td>1,312,000</td>
<td>694,300</td>
<td>769,900</td>
<td>-75,600</td>
</tr>
<tr>
<td>Cross Creek Reserve¹</td>
<td>1,840</td>
<td>197,500</td>
<td>197,500</td>
<td>185,600</td>
<td>197,600</td>
<td>-12,000</td>
</tr>
<tr>
<td>Dome Reserve¹,²</td>
<td>1,840</td>
<td>197,500</td>
<td>197,500</td>
<td>185,600</td>
<td>197,600</td>
<td>-12,000</td>
</tr>
<tr>
<td>Granger Reserve¹</td>
<td>146</td>
<td>2,340</td>
<td>2,340</td>
<td>0</td>
<td>492</td>
<td>-492</td>
</tr>
<tr>
<td>Last Chance Reserve¹</td>
<td>90</td>
<td>2,440</td>
<td>2,440</td>
<td>0</td>
<td>2,440</td>
<td>0</td>
</tr>
<tr>
<td>Martin Reserve¹</td>
<td>1,650</td>
<td>2,440</td>
<td>2,440</td>
<td>0</td>
<td>2,440</td>
<td>0</td>
</tr>
<tr>
<td>Park Reserve¹</td>
<td>4,460</td>
<td>2,440</td>
<td>2,440</td>
<td>0</td>
<td>2,440</td>
<td>0</td>
</tr>
<tr>
<td>Sawmill Lakes Reserve¹</td>
<td>7,350</td>
<td>1,312,000</td>
<td>1,312,000</td>
<td>694,300</td>
<td>769,900</td>
<td>-75,600</td>
</tr>
<tr>
<td>Tongue River Reserve¹</td>
<td>68,000</td>
<td>11,070</td>
<td>9,970</td>
<td>26,620</td>
<td>39,050</td>
<td>-12,430</td>
</tr>
<tr>
<td>Twin Lakes Reserve¹,²</td>
<td>1,180</td>
<td>2,220</td>
<td>3,400</td>
<td>3,100</td>
<td>2,820</td>
<td>280</td>
</tr>
<tr>
<td>Weston Reserve¹</td>
<td>370</td>
<td>370</td>
<td>370</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Willis Reserve¹</td>
<td>79</td>
<td>79</td>
<td>79</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

¹Reservoirs managed by the State of Wyoming
²Reservoirs managed by Bureau of Reclamation.
³Data are combined contents of Dome Lake and Dome Lake Reservoir.
⁴Reservoir managed by the State of Montana.
⁵Data are combined contents of Twin Lakes Number 1 and Twin Lakes Number 2.
RULES AND REGULATIONS FOR ADMINISTRATION OF
THE YELLOWSTONE RIVER COMPACT

A compact, known as the Yellowstone River Compact, between the
States of Wyoming, Montana, and North Dakota, having become effec-
tive on October 30, 1951, upon approval of the Congress of the
United States, which apportions the waters of certain interstate
tributaries of the Yellowstone River which are available after the
appropriative rights existing in the States of Wyoming and Montana
on January 1, 1950 are supplied, and after appropriative rights to
the use of necessary supplemental water are also supplied as
specified in the Compact, is administered under the following rules
and regulations subject to the provisions for amendment revision or
abrogation as provided herein.

Article I. Collection of Water Records

A. It shall be the joint and equal responsibility of the
members of the States of Wyoming and Montana to collect,
cause to be collected, or otherwise furnish records of
tributary streamflow at the points of measurement spec-
ified in Article V (B) of the Compact, or as near thereto
as is physically or economically feasible or justified.

1. Clarks Fork

The gaging station known as Clarks Fork near Silesia,
Montana and located in NW1/4 SE1/4 sec. 1, T. 4 S.,
R. 23 E., shall be the point of measurement for the
Clarks Fork.

2. Bighorn River (exclusive of Little Bighorn River)

The gaging station known as the Bighorn River above
Tullock Creek, near Bighorn, Montana, and located in
SE1/4 SE1/4 NE1/4 sec. 3, T. 4 N., R. 34 E., shall
temporarily be the designated point of measurement on
that stream. The flow of the Little Bighorn River as
measured at the gaging station near Hardin, Montana,
and located in SE1/4 NE1/4 NE1/4 sec. 19, T. 1 S., R.
34 E., shall be considered the point of measurement
for that stream, except that if or when satisfactory
records are not available, the records for the nearest
upstream station with practical corrections for inter-
vening inflow or diversion shall be used.

3. Tongue River

The gaging station known as the Tongue River at Miles
City, Montana, and located in NE1/4 NE1/4 SE1/4 sec.
23, T. 7 N., R. 47 E., shall temporarily be the point
of measurement for that stream.
4. Powder River

The gaging station known as the Powder River near Locate, Montana, and located in NW1/4 SW1/4 sec. 14, T. 8 N., R. 51 E., shall temporarily be the designated point of measurement for that stream.

B. Records of total annual diversion in acre-feet above the points of measurement designated in the Compact for irrigation, municipal, and industrial uses developed after January 1, 1950, shall be furnished by the members of the Commission for their respective States, at such time as the Commission deems necessary for interstate administration as provided by the terms of the Compact. Providing that if it be acceptable to the Commission, reasonable estimates thereof may be substituted.

C. Annual records of the net change in storage in all reservoirs, not excluded under Article V (E) of the Compact, above the point of measurement specified in the Compact and completed after January 1, 1950, and the annual net change in reservoirs existing prior to January 1, 1950, which is used for irrigation, municipal, and industrial purposes developed after January 1, 1950, shall be the primary responsibility of the member of the Commission in whose State such works are located; providing such data are not furnished by Federal agencies under the provisions of Article III (D) of the Compact, or collected by the Commission.

Article II. Office and Officers

A. The office of the Commission shall be located at the office of the Chairman of the Commission.

B. The Chairman of the Commission shall be the Federal representative as provided in the Compact.

C. The Secretary of the Commission shall be as provided for in Article III of these rules.

D. The credentials of each member of the Commission shall be placed on file in the office of the Commission.

Article III. Secretary

A. The Commission, subject to the approval of the Director of the United States Geological Survey, shall enter into cooperative agreements with the U.S. Geological Survey for such engineering and clerical services as may reasonably be necessary for the administration of the Compact. Said agreements shall provide that the Geological Survey shall:
1. Maintain and operate gaging stations at or near the points of measurement specified in Article V (A) of the Compact.

2. Assemble factual information on stream flow, diversion, and reservoir storage for the preparation of an annual report to the Governors of the signatory States.

3. Make such investigations and reports as may be requested by the Commission in aid of its administration of the Compact.

B. The Geological Survey shall act as Secretary to the Commission.

Article IV. Budget

A. At the annual meeting of each even-numbered year or prior thereto, the Commission shall adopt a budget for operation during the ensuing biennium beginning July first. Such budget shall set forth the total cost of construction, maintenance and operation of gaging stations, the cost of engineering and clerical aid, and other necessary expenses excepting the salaries and personal expenses of the Commissioners. On odd-numbered years revisions of the budget shall be considered.

B. It shall be the obligation of the Commissioners of the States of Montana and Wyoming to endeavor to secure from the Legislature of their respective States sufficient funds with which to meet the obligations of this Compact, except insofar as provided by the Federal government.

Article V. Meetings

An annual meeting of the Commission shall be held each November at some mutually agreeable point in the Yellowstone River Basin for consideration of the annual report for the water year ending the preceding September 30th, and for the transaction of such other business consistent with its authority; provided that by unanimous consent of the Commission the date and place of the annual meeting may be changed. Other meetings as may be deemed necessary shall be held at a time and place set by mutual agreement, for the transaction of any business consistent with its authority.
No action of the Commission shall be effective until approval by the Commissioners for the States of Wyoming and Montana.

Article VI. Amendments, Revisions and Abrogations.

The Rules and Regulations of the Commission may be amended or revised by a unanimous vote at any meeting of the Commission.

ATTESTED:

L. Grady Moore
Federal Representative

Gary Fritz
Commissioner for Montana

George L. Christophulos
Commissioner for Wyoming

Adopted November 17, 1953
Amended December 16, 1986
RULES FOR THE RESOLUTION OF DISPUTES
OVER THE ADMINISTRATION OF THE
YELLOWSTONE RIVER COMPACT

December 19, 1995

Section I. General Framework

According to Article III(F) of the Yellowstone River Compact.

"In case of the failure of the representatives of Wyoming and Montana to unanimously agree on any matter necessary to the proper administration of this compact, then the member selected by the director of the United States Geological Survey shall have the right to vote upon the matters in disagreement and such points of disagreement shall then be decided by a majority vote of the representatives of the states of Wyoming and Montana and said member selected by the director of the United States geological survey, each being entitled to one vote."

Section II. Purpose and Goal

A. The purpose of these rules is to clarify and more fully develop the dispute resolution process outlined in Section I.

B. The goal of the dispute resolution process outlined in these rules is to encourage joint problem solving and consensus building. It consists of three phases -- unassisted negotiation, facilitation, and voting.

C. Any agreement reached through this process is binding on Montana, Wyoming, and the United States Geological Survey (USGS).

D. Either state can initiate the dispute resolution process defined in Sections IV, V, and VI, and the other state is obligated to participate in good faith. The states agree that the issues pursued under this dispute resolution process shall be both substantive and require timely resolution.

Section III. Consensus

A. In the process of administering the Yellowstone River Compact, the representatives from Montana and Wyoming agree to seek consensus.

B. For purposes of this rule, consensus is defined as an agreement that is reached by identifying the interests of Montana and Wyoming and then building an integrative solution that maximizes the satisfaction of as many of the interests as possible. The process of seeking consensus does not involve voting, but a synthesis and blending of alternative solutions.
Section IV. Unassisted Negotiation

A. In all situations, the representatives from Montana and Wyoming shall first attempt to seek consensus through unassisted negotiation. The federal representative will not serve as chairperson in the unassisted negotiation process.

B. During a negotiation process, the representatives from Montana and Wyoming shall identify issues about which they differ, educate each other about their needs and interests, generate possible resolution options, and collaboratively seek a mutually acceptable solution.

C. To help facilitate negotiations, the representatives from Montana and Wyoming in cooperation with the USGS agree to share technical information and develop joint data bases. Other data sources may also be used.

D. The USGS shall serve as technical advisor in the two-state negotiations.

Section V. Facilitation

A. If the representatives from Montana and Wyoming are not able to reach consensus through unassisted negotiation, they shall each identify, articulate, and exchange, in writing, the unresolved issues.

B. The representatives from Montana and Wyoming shall then jointly appoint a facilitator to assist in resolving the outstanding dispute. If the representatives from Montana and Wyoming cannot identify a mutually acceptable facilitator, the representative appointed by the USGS shall appoint a facilitator.

C. A facilitator, for purposes of this rule, is defined as a neutral third party that shall help the representatives from Montana and Wyoming communicate, negotiate, and reach agreements voluntarily. The facilitator is not empowered to vote or render a decision.

D. The facilitator shall assist the representatives from Montana and Wyoming in developing appropriate ground rules for each facilitated session including establishing a deadline for completion of the facilitation process, setting an appropriate agenda, identifying issues, collecting and analyzing technical information, developing options, packaging agreements, and preparing a written agreement. The facilitator reserves the right to meet privately with each representative during the facilitation process.

Section VI. Voting

A. If, and only if, the representatives from Montana and Wyoming are unable to reach consensus with the assistance of a facilitator, then a dispute may be settled by voting.

B. The representatives from Montana and Wyoming, along with the representative appointed by the director of the USGS, are each entitled to one vote.

C. If the USGS representative does not vote in accordance with Article III, then the director of the USGS will select, with concurrence from Wyoming and Montana, a neutral third party to vote.
D. If the representative appointed by the director of the USGS is not involved in the steps outlined in Sections IV and V, each state shall have the opportunity to present appropriate information to that representative. This information may be presented through both oral presentations and written documents. All information will be shared with the other state.

The representative of the USGS may also consult the facilitator referenced in Section V in an attempt to resolve any disputes.

E. The USGS shall pay the expenses of the representative appointed by the director of the USGS.

F. Points of disagreement shall be resolved by a majority vote.

Section VII. Funding

A. The USGS will pay one-half and the states of Montana and Wyoming shall each pay one-quarter of the expenses of the facilitator, which shall not exceed $10,000, unless agreed to by both states and the USGS.

Section VIII. Amendments

A. These rules may be amended or revised by a unanimous vote of the Commission.

Section IX. Execution

These rules for the resolution of disputes over the administration of the Yellowstone River Compact are hereby executed on the date indicated below.

Gary Fritz
Commissioner for Montana

Gordon W. Fassett
Commissioner for Wyoming

William F. Horak
Federal Representative

July 22, 1996

530 (WY)
RULES FOR ADJUDICATING WATER RIGHTS ON INTERSTATE DITCHES

Article I. Purpose

The purpose of this rule is to determine and adjudicate, in accordance with the laws of Montana and Wyoming, those pre-Compact (January 1, 1950) water rights diverting from the Powder, Tongue, Bighorn and Clarks Fork Rivers and their tributaries where the point of diversion is in one State and the place of use is in the other State which have not yet been adjudicated.

Article II. Authority

In accordance with the Yellowstone River Compact, the State of Montana and the State of Wyoming, being moved by consideration of interstate comity, desire to remove all causes of present and future controversy between the States and between persons in one State and persons in another State with respect to these interstate ditches. Article III (E) of the Compact provides the Yellowstone River Compact Commission with the authority "...to formulate rules and regulations and to perform any act which they may find necessary to carry out the provisions of this Compact...."

Article III. Definitions

The terms defined in the Yellowstone River Compact apply as well as the following definitions:

1. "Acre-feet" means the volume of water that would cover 1 acre of land to a depth of 1 foot.

2. "Cfs" means a flow of water equivalent to a volume of 1 cubic foot that passes a point in 1 second of time and is equal to 40 miners inches in Montana.

3. "Interstate Ditches" shall include ditches and canals which convey waters of the Bighorn, Tongue, Powder, and Clarks Fork Rivers and their tributaries across the Wyoming-Montana State line where the water is diverted in one State and the place of use is in the other State.

4. "Department of Natural Resources and Conservation," hereafter called the "Department," means the administrative agency and Department of the Executive Branch of the Government of Montana created under Title II, Chapter 15, MCA which has the responsibility for water administration in that State.
5. "Water Court" means a Montana District Court presided over by a water judge, as provided for in Title III, Chapter 7, MCA.

6. "State Engineer" shall be the current holder of the position created by the Wyoming Constitution as Chief Water Administration Official for the State of Wyoming.

7. "Board of Control," hereinafter called the "Board," is defined as the constitutionally created water management agency in Wyoming composed of the four Water Division Superintendents and the State Engineer.

8. "Superintendent" is the member of the Board who is the water administration official for the Water Division where the interstate ditch is located. (The two Water Divisions in the Yellowstone River drainage are Water Division Numbers Two and Three.)

9. "Date of Priority" shall mean the earliest date of actual beneficial use of water, unless evidence and circumstances pertaining to a particular claim establish an earlier date.

10. "Point of Diversion" is defined to be the legal land description by legal subdivision, section, township, and range of the location of the diversion structure for an interstate ditch from a natural stream channel.

11. "Place of Use" is defined to be the legal land description (legal subdivision, section, township, and range) of the lands irrigated by an interstate ditch.

12. "Person" is defined as an individual, a partnership, a corporation, a municipality or any other legal entity, public or private.

13. "Claimant" is defined as any person claiming the use of water from an interstate ditch as herein defined.

Article IV. Procedures

The procedures for determining and adjudicating water rights associated with interstate ditches shall be categorized as follows: (A) Where the point of diversion is in Wyoming and place of use in Montana, and (B) Where the point of diversion is in Montana and place of use in Wyoming.
A. Wyoming Procedure

1. The Yellowstone River Compact Commission will provide a claim form to be completed by the claimant that will describe the location and point of diversion and land being irrigated, the priority date claimed, method of irrigation and such other information required to describe the claim. (A sample form for this purpose is attached.)

2. The Yellowstone River Compact Commission will send the claim form to water users on the interstate ditches.

3. Water users will complete the claim form and file it with the Yellowstone Compact Commission, which, when found to be correct and complete, will be forwarded to the Board for verification.

4. Upon receipt of the form, the Board shall forward it to the appropriate Superintendent, who, in cooperation with the Department, will validate the information including the use that has been made of the water, the number of acres and location of lands being irrigated, the priority date, and all other relevant information. The Superintendent and the Department will utilize aerial photography and other information to have prepared a reproducible map showing the location of the ditch system, lands irrigated, point of diversion, etc., of the claim.

5. After the validation procedure, the Superintendent will hold a hearing, after appropriate notice and advertisement, at which time the claimant shall describe, in detail, the use that has been made of the water and the lands that are being irrigated, establish a priority date, etc. Costs incurred in advertising shall be paid by the claimant. If a single hearing is held to consider several claims, the costs of advertising shall be shared equally among the claimants. Anyone who opposes the claim shall appear and state the reasons, if any, for opposition to the claim. If there is no opposition to the claim, cost incurred in holding the hearing shall be paid by the claimant. If protesters do appear and oppose the claim, hearing costs will be paid 50 percent by the claimant and 50 percent by the protestant, or if there is more than one protestant, the remaining 50 percent shall be shared equally among the protestants.

6. At the conclusion of the hearing, the Superintendent shall forward the record to the Yellowstone River Compact Commission with his findings and recommendations. The Yellowstone River Compact Commission will make the
determination of the amount of the right, the location, and the priority date, and then send the record to the Board.

7. The Board shall review the record and integrate it into its water rights system. Upon entry of the record by the Board, the information shall be forwarded to the Department and the Chairman of the Yellowstone River Compact Commission.

8. Upon the entry of the right into the Board’s records, it will have the following attributes:

   a. The right will be a Wyoming water right with a priority date as established by this procedure.

   b. The amount of the right will be determined as provided by Wyoming law.

B. Montana Procedure

1. The Yellowstone River Compact Commission will provide a claim form to be completed by the claimant that will describe the location and point of diversion and land being irrigated, the priority date claimed, method of irrigation and such other information required to describe the claim.

2. The Commission will send the claim form to water users on the interstate ditches.

3. Water users will complete the claim form and file it with the Yellowstone River Compact Commission, which, when found to be correct and complete, will be forwarded to the Department for verification.

4. Upon receipt of the form, the Department, in cooperation with the Wyoming State Engineer’s Office, will validate the information, including the use that has been made of the water, the number of acres and location of lands being irrigated, the priority date, and all other relevant information. The appropriate Superintendent and the Department will utilize aerial photographs and other information to have prepared a reproducible map showing the location of the ditch system, land irrigated, point of diversion, etc., of the claim.
5. The Department will then forward the record to the Yellowstone River Compact Commission with its findings and recommendations. Upon approval by the Commission, the record shall be submitted to the Montana Water Court for adjudication. A duplicate record will be forwarded to the Wyoming State Engineer's Office, the Board, and the Chairman of the Yellowstone River Compact Commission upon adjudication.

6. Upon adjudication of the right by the Montana Water Court, it will have the following attributes:

a) The right will be a Montana water right with a priority date as established by this procedure.

b) The amount of the right will be determined as provided by Montana law.

Article V. Exclusions

A. These rules recognize the limitation in Article VI of the Yellowstone River Compact regarding Indian water rights.

B. These rules shall not be construed to determine or interpret the rights of the States of Wyoming and Montana to the waters of the Little Bighorn River.

Article VI. Claim Form Submission Period

All claims must be submitted to the Yellowstone River Compact Commission, c/o District Chief, United States Geological Survey, 821 E. Interstate, Bismarck, ND 58501, within 90 calendar days after the claimant has received the claim form from the Commission. The blank claim form will be sent certified mail to the water user and the submission period of 90 calendar days will begin with the next day following receipt of the form, as evidenced by the certified mail receipt card. For good cause shown in writing, an extension of time beyond the 90 days for submittal may be obtained from the Commission.
YELLOWSTONE RIVER COMPACT COMMISSION

CLAIM FORM FOR INTERSTATE DITCHES

1. Name of ditch or canal: ________________________________

2. Source of water supply: ________________________________
   Tributary of _________________________________________

3. Name of claimant: ____________________________________
   Address ____________________________________________
   City __________________ State ________ Zip Code _____
   Home Phone No. _____________ Business Phone No. _______

4. Person completing form: ________________________________
   Address ____________________________________________
   City __________________ State ________ Zip Code _____
   Home Phone No. _____________ Business Phone No. _______

5. Method of irrigation: ________________________________

6. Point of diversion: County ________ State ____________
   Headgate located in the __ ½ __ ½, Section ____, T. __ R. __
   (a) Description of headgate: (Briefly describe the materials
       and general features, date constructed or last known
       work, general condition.) ________________________________
       ___________________________________________________
       ___________________________________________________
(b) Describe water measuring device: 


(c) If the point of diversion is in Montana:

1. What flow rate has been claimed?
   
   □  cubic feet per second
   □  gallons per minute
   □  miner's inches

2. What volume of water has been claimed?
   
   □  acre-feet

7. Dimensions of ditch at headgate: Width at top (at waterline) 
   
   ______ feet; width at bottom ______ feet; side slopes
   (vertical:horizontal) ______:______; depth of water ______
   feet; grade ______ feet per mile.

8. Place of use and acres irrigated: County______ State______

Give legal subdivisions of land owned by you on which water
is being used (acres claimed): An example field is shown in
the first line.

<table>
<thead>
<tr>
<th>T. R. SEC</th>
<th>NE 1</th>
<th>NW 1</th>
<th>SW 1</th>
<th>SE 1</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NE 1</td>
<td>NW 1</td>
<td>SW 1</td>
<td>SE 1</td>
<td></td>
</tr>
<tr>
<td>58W 95W 18</td>
<td>25.1</td>
<td></td>
<td></td>
<td></td>
<td>10.2</td>
</tr>
</tbody>
</table>
9. Describe any additional uses of water claimed from the ditch: __________________________________________________________

10. Date of first beneficial use of water (priority date) on lands described above for _______________ Ditch is ____________ (mo/day/yr) and shall be the same for all lands claimed on this form.

11. Has irrigation water been diverted onto all lands shown in the above tabulation each year since completion of works? __ If not, state exceptions and reasons therefore: ________________________________________________________________

12. Attach documentary evidence or affidavits showing your ownership or control of the above lands, as well as the historic use of water on these lands. ________________________________________________________________

13. What permit or claim numbers have been assigned to known records filed with either the Wyoming State Engineer's Office or the Montana Department (DNRC) for irrigating the above lands? ________________________________________________________________

14. Have personnel in the Wyoming State Engineer's Office or the Montana Department (DNRC) been contacted to obtain the information given in No. 13? ( ) Yes ( ) No

15. Describe any flumes or pipelines in the ditch conveyance system: __________________________________________________________

MT v. WY/M.T.D. App. 538 (WY)
16. Describe ordinary annual period of use: ___________ to ___________.

17. Attach copies of aerial photographs, U. S. Geological Survey maps or other such documents showing the ditch and lands irrigated that give evidence to this claim and may be useful to the Commission.

** ** ** ** ** **

State of ________)

State of ________)

I, ________________________, having been duly sworn, depose and say that I, being of legal age and being the claimant of this claim for a water right, and the person whose name is signed to it as the claimant, know the contents of this claim and the matters and things stated there are correct.

________________________

________________________

Subscribed and sworn before me, this _____ day of _____, 19__.

Notary Public

Residing at: _____________________________

My commission expires: ___________________________
CONVERSION TABLE

Multiply inch-pound units     By                        To obtain SI units

Length
feet (ft)                     0.3048                      meters (m)
miles (mi)                    1.609                       kilometers (km)

Area
acres                         4,047                        square meters (m²)
                              0.4047                      *hectares (ha)
                              0.4047                      square hectometers (hm²)
                              0.004047                    square kilometers (km²)
square miles (mi²)            2.590                        square kilometers (km²)

Volume
cfs-day or second-foot day (ft³/s-day) 2,447    cubic meters (m³)
                                           0.002447                  cubic hectometers (hm³)
cubic feet                    0.02832                     cubic meters
acre-feet (acre-ft)          1,233                        cubic meters (m³)
                              0.001233                    cubic hectometers (hm³)
                              0.000001233                 cubic kilometers (km³)

Flow
cubic feet per second (ft³/s) 28.32                       liters per second (L/s)
                              28.32                       cubic decimeters per second (dm³/s)
                              0.02832                     cubic meters per second (m³/s)
acre-feet per year (acre-ft/yr) 1,233                      cubic meters per year (m³/yr)
                                   0.001233                   cubic hectometers per year (hm³/yr)
                                   0.000001233                cubic kilometers per year (km³/yr)

*The unit hectare is approved for use with the International System (SI) for a limited time. See National Bureau of Standards Special Bulletin 330, p. 12, 1977 edition.
2006 Annual Report
Yellowstone River
Compact Commission

Fifty-Fifth Annual Report

2006
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1Wyoming disagrees with the term "Compact reservoirs" as used throughout this annual report. Wyoming's acceptance of this annual report should not be construed as Wyoming's acceptance of the use of that term.
YELLOWSTONE RIVER COMPACT COMMISSION
DENVER FEDERAL CENTER, BUILDING 53, ROOM F-1200
LAKEWOOD, COLORADO 80225

Honorable David Freudenthal
Governor of the State of Wyoming
Cheyenne, Wyoming 82002

Honorable Brian Schweitzer
Governor of the State of Montana
Helena, Montana 59620

Honorable John Hoeven
Governor of the State of North Dakota
Bismarck, North Dakota 58501

Dear Governors:

Pursuant to Article II of the Yellowstone River Compact, the Commission submits the following fifty-fifth annual report of activities for the period ending September 30, 2006.

Minutes of April 13, 2006

Members of the Yellowstone River Compact Commission convened the first of two meetings in 2006 on April 13 at 8:30 a.m. in Thermopolis, Wyoming. In attendance were Mr. William Horak, U.S. Geological Survey, Chairman and Federal Representative; Mr. Jack Stults, Administrator, Water Resources Division, Montana Department of Natural Resources and Conservation and Commissioner for Montana; and Mr. Patrick Tyrrell, Wyoming State Engineer and Commissioner for Wyoming. Also in attendance were Ms. Sue Lowry, Mr. Loren Smith, and Mr. Bill Knapp, Wyoming State Engineer's Office; Mr. David Williams, Wyoming Attorney General's Office; Mr. Keith Kerbel and Mr. Chuck Dalby, Montana Department of Natural Resources and Conservation; Ms. Sarah Bond, Montana Attorney General's Office; Mr. Art Compton, Montana Department of Environmental Quality; Mr. Art Hayes, Jr., Tongue River Water Users Association; Mr. Jason Whiteman, Water Resources Department, Northern Cheyenne Tribe; Mr. Doug Davis, Bureau of Indian Affairs; and Mr. Wayne Berkas, Mr. Myron Brooks, and Mr. Kirk Miller, U.S. Geological Survey.

Mr. Berkas reported that costs for the program of streamflow-data collection and preparation of the annual report are $80,000 for Federal fiscal year 2007 and are expected to be $84,000 or less for fiscal year 2008. The budget was approved by the Commissioners.

Mr. Berkas passed out the 2005 Yellowstone River Compact Commission report to Mr. Stults and Mr. Tyrrell (the two Commissioners) and to Mr. Horak (the Chairman). Mr. Berkas announced that the report has been printed and would be mailed to all on the mailing list. Anyone wishing a copy or additional copies should contact Mr. Berkas.

Mr. Dalby asked why reservoirs noted in the Compact report are not included on the map in the report. Mr. Berkas thanked Mr. Dalby for discovering this discrepancy and said that all reservoirs listed in the report will be located on the map. Also, the operators of the reservoirs will be identified in the report.

Mr. Berkas will revise the table listing the reservoirs and revise the map and pass this to the Technical Committee. The Technical Committee will approve the revisions before the next Yellowstone River Compact Committee meeting in the fall of 2006.
Mr. Stults noted that the reservoir table listed a post-1950 water right of 11,070 acre-feet for the Tongue River Reservoir. This is incorrect because there is no post-1950 water in the reservoir. Although the reservoir was enlarged between 1994 and 1997, and it was physically enlarged to store 11,070 more acre-feet of water, the additional water carries a priority date of the reserved water rights of the Northern Cheyenne Tribe. The Tribe and State settled the Tribe’s claims, and the settlement was ratified by the U.S. Congress. Thus, the additional water stored in the reservoir has a water right decreed to the Northern Cheyenne Tribe with a date equivalent to the establishment of the Northern Cheyenne Reservation, and that water right predates 1950 (1884 or 1901) (See Art. II a. 2.h of the Northern Cheyenne State of Montana Reserved Water Rights Compact).

Mr. Berkas said that the correction would be made to reflect that the total water right of 79,070 acre-feet is a pre-1950 water right.

The Commissioners adopted the 2005 Yellowstone River Compact Commission report.

Ms. Lowry provided a summary of the April 12, 2006, meeting of the Technical Committee (minutes posted on the Web page). The Committee noted that the snow pack for 2006 is less than average, similar to the snow pack in 2005. Last year, above-normal rain and snow occurring after April helped streamflow conditions in the Yellowstone River basin tributaries to be near average for the 2005 water year. The Bureau of Reclamation projects that Buffalo Bill, Boysen, and Bull Lake Reservoirs will fill in 2006.

Mr. Tyrrell stated that Wyoming State Engineer’s Office received $200,000 from the State legislature for a joint water-use study with Montana, with $100,000 for internal use and $100,000 to partner with Montana to study water use. The two-State study would begin after July 2007 if Montana is successful in obtaining their cost-share portion. The objective would be to obtain information in the Yellowstone River basin that helps both States better manage water operations in the river basin. The study would be done jointly between Wyoming and Montana. Wyoming and Montana will begin scoping the study between now and the fall Compact meeting, with the goal of presenting a draft scope to the Technical Committee for review prior to the fall Compact Commission meeting. The scoping effort and the study is not a Commission-directed activity. If something comes out of the study that provides a tool for better Compact administration, the States will submit it to the Commission.

Mr. Stults replied that Montana has a request for the 2007 legislative session for about $125,000, and has received positive feedback from the Governor’s Office. Montana would like to see work focus on identifying the pre-January-1950 water uses in both States.

Mr. Stults stated that Montana’s Governor’s Drought Advisory Committee continues to meet on an ongoing basis to be prepared for drought response. Although drought conditions continue to improve, Montana feels that after 6 years of drought, conditions are tenuous and the State can slip back into drought fairly quickly. The Committee provides information that is disseminated across the State so that proactive actions can be taken to mitigate the effects of drought. The actions include water management and/or economic relief for affected parties. Montana has learned that the collaborative effort of managing water, scheduling diversions, and understanding return-flow regimes really works.

Mr. Tyrrell stated that Wyoming also has experienced drought. The difficulty is that sometimes there is a surplus of water in some areas and a deficit in others. Mr. Tyrrell also announced that Wyoming will fill the State Climatologist position in May 2006.

Mr. Stults announced that Montana has established a State Climatologist, and that person is Dr. Don Potts at the University of Montana College of Forestry and Conservation.

Mr. Stults announced that Montana had a request for more than 20 Water Court decrees to be enforced and many were enforced last year. These decrees are a result of the ongoing adjudication process. Many water managers are excited about the new Water Court decrees being enforceable. Historic District Court decrees, including the Miles City decree on the Tongue River, continue to be enforced as they always have been, by court-appointed Commissioners for those streams.

Mr. Tyrrell announced that Wyoming recently funded a weather-modification study for about $8.8 million. The study began in 2005 and is being run through the Water Development Commission under permits issued by the State Engineer. The Wyoming State Engineer’s Office permits cloud seeding. The study will last for 5 years. Wyoming is hoping this study will lead to some additional water for the State to administer.
Coal-bed methane discussions were covered during the Technical Committee meeting held on April 12, 2006, (minutes appended) and Ms. Lowry provided a summary of those discussions. The main topics were:

1. The distribution of a draft executive summary by the Montana Bureau of Mines and Geology that discussed a ground-water monitoring network near the Montana-Wyoming State line.

2. The amount of coal-bed methane development in Wyoming. Wyoming provided a table listing the coal-bed methane disposal reservoirs in the Tongue, Powder, and Little Powder River drainages where applications have been received and where permits have been issued. Wyoming is requiring all reservoirs to be permitted, even those being used for activities other than coal-bed methane development. There are currently 2,481 permits and the average volume stored in each of the permitted reservoirs is about 12.5 acre-feet. Wyoming also presented a graph showing the number of coal-bed methane well applications by month. There have been 36,543 coal-bed methane well applications throughout Wyoming received from January 1997 to March 2006. Wells have not been drilled for all permits.

3. The Wyoming legislature established a Coal-Bed Methane Task Force during the 2006 legislative session. The task force is charged with reviewing current statutes and regulations and produced-water management alternatives, including disposal, and will prepare a report to the legislature by December 6, 2006, and a final report by October 1, 2007. The legislature also appropriated $500,000 to the Water Development Commission to explore the feasibility of running a pipeline for coal-bed methane produced water from areas where coal-bed methane water is produced in the Powder River drainage to water-short areas outside the Yellowstone River drainage (the Platte River). This feasibility study will be completed within 2 years.

Mr. Stults said that Montana is concerned about the feasibility study to divert water out of the Yellowstone River drainage basin because Article 10 of the Yellowstone River Compact prohibits the diversion of water out of the Yellowstone River drainage basin without the unanimous consent of the Signatory States (Montana, North Dakota, and Wyoming). Montana strongly feels the Yellowstone River Compact Commission must be fully informed as the proposal is developed. Language in Article 10 of the Compact says “no water shall be diverted from the Yellowstone River basin,” and nowhere in the Compact is there a distinction made between ground water and surface water. Montana believes that all water, including ground water, falls under the Compact. Montana is comfortable with monitoring the proceedings of the study with the topic being on the agenda of the fall Compact Commission meeting.

Mr. Tyrrell replied that Wyoming feels that there is a window of opportunity under the Compact to look at the feasibility of transporting coal-bed methane (CBM) produced water out of the Yellowstone River drainage. Wyoming feels that the Yellowstone River Compact is a surface-water instrument and has no decision-making authority related to coal-bed methane produced water issues. Mr. Tyrrell explained that the feasibility study would look at numerous issues, including water treatment options, pipeline design, pumping costs, and potential ground-water connectivity.

Ms. Bond asked Wyoming what Wyoming Water Development Commission projects are in the Yellowstone River drainage?

Ms. Lowry replied that there are about 64 projects in Wyoming and about 25 percent are in the Yellowstone River drainage. A project that may be of interest to the Yellowstone River Compact Commission is a project in the Middle Fork Powder River drainage. Last November there were two applications to the Water Development Commission for storage projects on the Middle Fork, but these were withdrawn in favor of an application for a watershed study that focuses on irrigation scheduling.

Ms. Bond asked if the Middle Fork Powder River reservoir project had a pre-1950 development permit and if Wyoming considered that water right still viable after the project had been withdrawn in favor of a watershed study.

Mr. Tyrrell replied that the pre-1950 water right was still active because it is still on file in the Wyoming State Engineer's Office.

After questions regarding the Technical Committee's summary of coal-bed methane discussions ceased, Mr. Stults stated that Montana feels that coal-bed methane discussions pertain to Compact discussions because water is a unitary resource. Coal-bed methane development has the potential of manipulating large quantities of water. Montana believes that science shows that there are connections between ground water and surface water in some coal aquifers being de-pressurized and developed for coal-bed methane production within the basin, and that coal-bed methane development also affects the quality of ground water and surface water. Although water quality is not explicitly referenced within the Compact, Montana believes the
quality of water relates to the beneficial use of the water, and beneficial use is inherent within the fundamental principal of prior appropriation doctrine and is the foundation for the Yellowstone River Compact. Mr. Stults stated that a primary component of beneficial use is to have water with a quality to support the use.

Mr. Whiteman stated that the Northern Cheyenne Tribe has a first-right water right within the Tongue River drainage, and they are concerned that coal-bed methane development may alter the beneficial use of their water right. Thus, the Northern Cheyenne Tribe feels that water quality is an important topic for the Commission to discuss.

Mr. Stults reported that Montana passed a major piece of legislation (House Bill 22) to complete the adjudication of all water rights within the State. All basins are to have final decrees within 15 years. Montana Department of Natural Resources and Conservation (DNRC) is required to complete the work within 10 years. This work is being funded by the owners of the water rights. Currently, the DNRC is ahead of schedule in their work at processing water rights. Generally, the public is fully supporting the effort.

Mr. Kerbel added that the Billings DNRC office has concentrated their efforts on the Bighorn River. Currently, the Bighorn River adjudication is about 99 percent complete. Billings DNRC has examined 28 percent of the Tongue River Basin. The Powder River is fully adjudicated.

Mr. Kerbel reported that some claims with the Federal government under the Crow Compact have been resolved. There is hope that there may be some Federal legislation drafted to ratify the Compact.

Mr. Stults reported that DNRC also is working on compacts with other Tribes and the U.S. Forest Service. The compact with the U.S. Forest Service will establish instream-flow rights under the State reserve rights with a priority date of the date of compact.

Mr. Horak reported that both Commissioners have received a draft of the Yellowstone River Compact Commission Web site, and hopefully all the suggestions for improvement have been made. The USGS will soon have the 2005 Yellowstone River Compact Commission annual report available on the Web site, and all past reports will be scanned and added to the Web site. There will be two map options to access data: Google Earth and a static map. The static map will be available because Google Earth consumes a tremendous amount of resources and some users do not have high-speed Internet access. All active USGS sites within the Yellowstone River drainage will be displayed on the maps. In the future, other agencies' (State and local) data will be available through this site.

Mr. Whiteman reported that the Northern Cheyenne Tribe has a water-quality standard pending approval with EPA.

Mr. Compton reported that Montana Department of Environmental Quality has met with the Northern Cheyenne Tribe regarding minor differences between the State and Tribal standards. There remain a few differences that complicate permitting.

Mr. Hayes said that the water being pumped from coal aquifers to produce methane is "old water" that took a long time to get to its present location. He wondered how that water would be replaced and would like to see a study that identified the effect of coal-bed methane production on the reduction of other natural discharge points (such as springs) and the overall reduction of ground-water levels. Also, he is interested in restoring ground water to levels observed before coal-bed methane production.

Mr. Horak stated that at this time the Compact does not provide a clear mandate, nor does the Commission have the resources, to study effects of coal-bed methane development on ground water. Wyoming feels that the Technical Committee should continue to monitor and review coal-bed methane issues in the basin, but no extended agenda time for the full Commission should be dedicated to coal-bed methane or water-quality discussions.

Mr. Stults replied that large projects in the drainage basin that extract ground water may eventually affect surface-water characteristics, and thus should not be ignored. The Commission should not miss the opportunity to include coal-bed methane development and ground-water projects in their discussions because these projects are important in the overall budget and water management in the basin. The Commission has the Federal and State legal authority to understand and manage water resources in the Yellowstone River drainage basin.

The Commissioners agreed to have the next Yellowstone River Compact Commission meeting in Billings, in the morning of December 6, 2006. The Technical Committee would meet in the afternoon of December 5, 2006.
Minutes of December 6, 2006

Members of the Yellowstone River Compact Commission convened the second of two meetings in 2006 on December 6 at 8:30 a.m. in Billings, Montana. In attendance were Mr. William Horak, U.S. Geological Survey (USGS), Chairman and Federal Representative; Ms. Mary Sexton, Director, Montana Department of Natural Resources and Conservation (DNRC) and Acting Commissioner for Montana; and Mr. Patrick Tyrrell, Wyoming State Engineer and Commissioner for Wyoming. Also in attendance were Ms. Sue Lowry, Ms. Jodee Pring, Mr. Carmine LoGuidice, and Mr. Loren Smith, Wyoming State Engineer’s Office; Mr. David Willms, Wyoming Attorney General’s Office; Mr. Rich Moy, Mr. John Tubbs, Mr. Chuck Dalby, Mr. Keith Kerbel, Mr. Jim Robinson, and Mr. Kevin Smith, DNRC; Ms. Sarah Bond, Montana Department of Justice; Mr. Art Compton, Montana Department of Environmental Quality; Mr. Andy Brummond and Mr. Jim Darling, Montana Fish, Wildlife and Parks; Mr. Doug Haacke, Trout Unlimited; Mr. Tim Felchle, Mr. Gordon Aycock, Mr. Patrick Erger, and Mr. Lenny Duberstein, Bureau of Reclamation; Mr. Joe Fox, Jr., Mr. Allen Clubfoot, and Ms. Shanny Spang Gion, Northern Cheyenne Tribe; Ms. Jill Morrison, Powder River Basin Resource Council; Mr. Mark Fix, Northern Plains Resource Council; Mr. Roger Muggli, T&Y Irrigation District; Mr. Art Hayes, Jr., Tongue River Water Users Association; Ms. Susan Gilbertz, Montana State University, Billings; Mr. John Murdock, Department of the Interior Solicitor’s Office; Ms. Rose Rennie, Office of the Solicitor; and Mr. Kirk Miller, Mr. Myron Brooks, Mr. Robert Davis, and Mr. Wayne Berkas, U.S. Geological Survey.

Mr. Horak called the meeting to order and announced that two individuals will be working as reporters or transcribers for the meeting. Ms. Kristin Coil will record the meeting for the Montana delegation, and Ms. Gabrielle Patterson will record the meeting for the USGS, who will prepare the minutes for the meeting.

Mr. Horak presented the agenda and asked if there were any additions. There were no additions and both Commissioners accepted the agenda.

Ms. Sexton presented a letter to the Chairman (Mr. Horak) and the Wyoming Commissioner (Mr. Tyrrell) from the Montana Governor, Mr. Brian Schweitzer, appointing Ms. Mary Sexton as the Acting Commissioner from Montana to the Yellowstone River Compact Commission (Attachment A). Ms. Sexton stated that the past Montana Commissioner, Mr. Jack Stults, resigned in July of this year. She was appointed the Acting Commissioner for Montana and she will remain the Acting Commissioner until a Commissioner is appointed by Governor Schweitzer.

Mr. Horak asked that the minutes for the April 13, 2006, Yellowstone River Compact Commission meeting be accepted and approved. State Commissioners approved the minutes.

Mr. Berkas presented budget information for the program of streamflow-data collection and preparation of the annual report. The program cost was $76,000 for Federal fiscal year 2006 and will be $80,000 for fiscal year 2007. One-fourth of the cost is provided by the State of Wyoming, one-fourth by the State of Montana, and one-half by the U.S. Geological Survey through the Cooperative Water Program. Cost estimates for 2008, 2009, and 2010 are $84,000, $88,200, and $92,600, respectively. These estimates are based on an approximate 5-percent inflation factor per year.

The budget was accepted by both Commissioners.

Mr. Berkas reported that streamflows during water year 2006 were below normal at all streamflow sites monitored by the Commission. Streamflow at Clarks Fork Yellowstone River at Edgar was 79 percent of average, and ranked eleventh lowest in 68 years. The streamflow at Bighorn River near Bighorn (minus flow of the Little Bighorn River and adjusted for change of contents in Bighorn Lake) was 55 percent of average and ranked tenth lowest of 40 years. The streamflow at Tongue River at Miles City was 37 percent of average and ranked fifth lowest in 63 years. The streamflow at Powder River near Locate was 47 percent of average and ranked ninth lowest in 68 years. Total adjusted streamflow of the four rivers in water year 2006 was 2,237,000 acre-feet, compared to 2,950,000 acre-feet in water year 2005 and 1,621,000 acre-feet in water year 2004.

Reservoir storage decreased in all the reservoirs historically monitored for the Commission (Bighorn Lake, Boysen Lake, Anchor Reservoir, Bull Lake, Pilot Butte Reservoir, Buffalo Bill Reservoir, and Tongue River Reservoir). The contents and the amounts of decrease are listed in the annual report. The total usable contents of these reservoirs at the end of water year 2006 was 1,689,100 acre-feet, compared to 2,149,000 acre-feet in water year 2005 and 1,739,800 acre-feet in water year 2004. Storage in other reservoirs in the four river basins at the end of water year 2006 was 208,860 acre-feet, a decrease of 78,860 acre feet from the end of water year 2005. The total usable contents of these other reservoirs are listed in the annual report.
Mr. Moy stated that the annual report contains data for measured flows and does not account for depletions, such as water consumed by irrigation. He recommended that the annual report include a statement that the total volume of water flowing from the four rivers does not account for depletions. Mr. Berkas replied that a statement to that effect will be included in the annual report.

Mr. Tyrrell suggested that the Yellowstone River Technical Committee look at headwater gages that are upstream from most diversions in the basin to determine if the lack of streamflow is due to climatic effects or water-use effects. After discussion, Mr. Tyrrell moved that, at the April 2007 meeting, the Yellowstone River Technical Committee look at available gage data in the four drainages (Clarks Fork Yellowstone River, Bighorn River, Tongue River, and Powder River) and identify an indicator gage in each drainage. These gages would be used to help determine climatic effects on the water supply. Ms. Sexton seconded the motion, and the motion passed.

Mr. Moy reported that the Yellowstone River Technical Committee met yesterday (December 5, 2006). Montana and Wyoming are experiencing severe drought conditions and there are impacts to both States. The degree to which each State is impacted is still to be determined. The minutes for the Technical Committee meeting are posted on the Yellowstone River Compact Commission Web page at http://ccwaternugs.gov/YRCC/index.html.

Mr. Tyrrell reported on water-year administration highlights in Wyoming. In the Tongue River basin, water rights junior to 1883 were regulated on Little Goose Creek. Big Goose Creek was regulated to 1885 after June 27 and Sheridan was on water restrictions by mid-July. Reservoir water was released into Big Goose and Little Goose Creeks starting in mid-June and continued throughout the summer. Wolf Creek was regulated to 1883 after July 10. Little Tongue River was regulated to 1883 and Smith Creek was regulated to 1881 through the summer. By late August, only instream stock use was allowed on these rivers and creeks. In early September, flows in the Tongue River were regulated to 1891 on the reach above the Tongue River ditch at Ranchester.

This year (2006), Division 2 Superintendent Mike Whitaker ordered the construction of measuring devices for all diversions in the Tongue River. These measuring devices must be in place prior to the 2007 irrigation season.

In the Powder River drainage, water releases from Lake DeSmet began on May 19. The Powder River was regulated to 1894 on June 23. Piney Creek and lower Clear Creek were regulated to 1884 on June 30, and reservoir releases began from Willow Park and Kearney Lake Reservoirs. On Crazy Woman Creek, Muddy Guard Reservoir began releases on May 17, and by June 23 only the number two court-decreed appropriation for 17 ft³/s could be satisfied. Rock Creek and Clear Creek were regulated to 1885 on June 2. North Fork Powder River was regulated to 1885 on June 2, and Dull Knife Reservoir began releases on the next day. Once the streams were regulated, they continued to be regulated throughout the irrigation season.

Mr. Loren Smith added that all the major tributaries to the Bighorn River went into regulation. Shell Creek went into territorial pre-1890 rights after the middle of July. The Nowood River system was regulated to about 1900. This system normally does not get regulated. Tribal reserve rights (1868) could not be satisfied on Owl Creek. Gooseberry Creek went dry at the headwaters gage used to regulate the creek. The Greybull River system was regulated to territorial water rights from the end of June to the end of September.

Ms. Sexton reported that Montana made a call for water to the Wyoming State Engineer under the Yellowstone River Compact on July 28, 2006, regarding the Tongue and Powder Rivers (Attachments B, C, and D—call letter and responses). The situation on the Tongue River was dire and Montana was unable to fill the Tongue River Reservoir this year. Montana's biggest concern was their inability to fulfill all pre-1950 water rights.

Montana also was concerned about flow in the Powder River. The Powder River at Moorhead, Montana (Montana-Wyoming border) essentially went dry on July 25, 2006, and the average flow for that date was 215 ft³/s.

This was the second time that Montana made a call for water on Wyoming. A previous call was made in 2004.

Mr. Kevin Smith reported that Montana was about 6,000 acre-feet short of filling the Tongue River Reservoir this year. The peak storage was about 73,400 acre-feet. Contract deliveries from the reservoir began in the third week of June and ended the first week of September. Montana purchased water from the Northern Cheyenne Tribe (held in the reservoir) to maintain base flow for aquatic life in the river through September until precipitation occurred.
Mr. Kerbel said that Montana partially satisfied two water rights (Brown L&C Company and T&Y Irrigation District) that go back to 1886 on the Tongue River. If it wasn’t for these two users not taking their full right, the reservoir would not have stored as much water, and most users would not have gotten any contract water.

On the Powder River, there was no supply at the State line for most of the summer. There was no flow at the State line from July 28 to September 1. Much of the Powder River irrigation is serviced by high-volume pumps and water supply was limited by the end of June.

Ms. Lowry asked if the water rights for the high-volume pumps were for a set point on the river, or for acres of land that the pumps serve. Mr. Kerbel replied that generally the landowner had one pump that they move from field to field using multiple locations in the river. The water right describes the land to be irrigated in addition to withdrawal points and flow rates.

Ms. Lowry asked if the Powder River has been adjudicated. Mr. Kerbel replied the Powder River has been adjudicated and its status is a temporary final decree.

Mr. Horak asked Ms. Sexton to begin the discussion on Montana’s Proposed Resolution on Compact Administration Requirements by providing background information.

Ms. Sexton commented that the many years of drought in the basin has brought about discussion and interpretation of the Compact, particularly regarding the pre-1950 rights. The call that Montana made on Wyoming requested the curtailment of pre-1950 diversions and storage to the extent required by the Compact. The rationale for the call was based on the drought situation in Montana and Montana’s interpretation of the Compact. Additionally, Montana is concerned about the disposal of coal-bed methane produced water (within and outside the basin) and the effects of coal-bed methane production on the ground-water system. These two issues have been discussed in the past by the Commissioners. Given the conditions in the basin, Montana would like a clear interpretation of the Compact regarding the pre-1950 rights and full apportionment, and Article 10 and coal-bed methane produced water.

Montana presented a resolution (Attachment E) addressing the two issues. Montana feels that now is the time to try to find some common ground and some clear determination and interpretation of where the two States are with these two issues.

Mr. Tyrrell replied that the call placed on Wyoming by Montana and the corresponding letters harken back differences the two States have had in interpreting pre-1950 rights since 2004, and probably earlier. Mr. Tyrrell became aware of the resolution about a week prior to the meeting. The resolution is a product of Montana, not a product of negotiations between the two Commissioners or the two States. Mr. Tyrrell expressed concern that the resolution intends to interpret or amend the Compact. He stated that the resolution brings ground water into the Compact. Wyoming’s position is that the Compact clearly does not include ground water. He also stated that Wyoming clearly disagrees with Montana’s interpretation of the pre-1950 water-right issue in the Compact.

Wyoming feels it is not appropriate for the Commission, as an institution, to engage in what would be an interpretation of the Compact by accepting this resolution. Thus, Wyoming is not interested in dealing with the resolution at the meeting.

Ms. Bond asked for Wyoming’s position on ground water within the Compact. Mr. Tyrrell replied that Wyoming is not ready to state a position. There is a discussion of ground water in Montana’s resolution and Wyoming feels that a discussion of ground water is outside the scope of the Yellowstone River Compact. Wyoming received the resolution only a week ago; Wyoming is not prepared to make any additional statements.

Ms. Bond commented that she did not know if the Commission would be willing to make a statement whether this kind of resolution is appropriate, or that Compact interpretation is appropriate for the Commission to act upon, or whether the Commission has a position with respect to what she understands is Wyoming’s position (that it is not appropriate for the Commission to adopt a resolution interpreting the Compact). Ms. Bond asked if she articulated Wyoming’s position correctly, such that adopting the resolution would not be appropriate for the Commission.

Mr. Tyrrell replied that Wyoming has been looking at the resolution for about 4 working days. Wyoming feels that a resolution put before the Commission should be developed with some study and work by both States. The appropriateness of the resolution should be determined from meetings prior to the Compact Commission meeting so that when the Commission sits down, there are no questions as to whether the resolution is appropriate for the Commission to consider. No discussion has occurred in this case.

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Ms. Sexton replied that she was under the impression that when resolutions are presented, they come through the Chairman to be presented at the meeting. She sent the resolution to the Chairman, expecting it to be distributed with the minutes and agenda well in advance of the Commission meeting. She thought that a resolution was a means to begin discussing difficult issues. The Commission meeting seems to be the appropriate venue to discuss the issues described in the resolution; thus, she sent the resolution to the Chairman thinking the resolution would be distributed with the agenda.

Mr. Horak replied that he did not distribute the resolution with the agenda because he felt that the Wyoming Commissioner would not adopt the resolution without considerable discussion, if in fact, he was ever ready to adopt it. Therefore, because the resolution is not a product of a developmental process within the Commission, particularly between the two State Commissioners, Mr. Horak felt it inappropriate to distribute the resolution as Chairman of the Commission without some extensive explanation of the background and purpose of the resolution. Mr. Horak felt that Montana should offer the background and explanation to accompany the proposed resolution.

Ms. Sexton asked how else an issue should be brought forward for public discussion in a public process.

Mr. Horak replied if the resolution had been the product of a deliberative process among Commissioners, he would not have discomfort in distributing it, without considerable explanation and background, along with the agenda under his identity as the Federal member and the Chairperson. Given that the resolution was presented without that dialogue and developmental process, and because the resolution might well represent the perspective of the Montana Commissioner and likely not the Wyoming Commissioner, it was not appropriate for the Chairman to distribute the resolution. In a circumstance where a proposed resolution isn’t characterized by that evident conflict of opinion, he probably would have done as requested and distributed the resolution. However, he deemed this to be quite a different circumstance.

Ms. Sexton asked if the issues that are brought forward to the Commission are issues that are agreed upon beforehand.

Mr. Horak replied that this issue has a long history in this Commission. The position Montana put forth is a position that the Wyoming Commissioner would not embrace. Also, the resolution calls for the signatures of both Commissioners on the first distribution.

Ms. Sexton stated that certainly a resolution can be tabled through a formal process. If there is an issue that we do not agree on, how do we move through a process so there is open and public deliberation, so that we clearly understand our positions? How do we move forward in finding some common ground? It is suggested that common ground be found before it is brought to the Commission, because the Commission does not particular want to discuss something upon which all parties might not agree. This creates a rather awkward situation, where issues with no common agreement cannot be brought forward to the Commission for discussion. How does the Commission discuss the more difficult issues in a deliberative and clearly public and open process?

Mr. Horak asked for Mr. Tyrrell’s thoughts on Ms. Sexton’s comments.

Mr. Tyrrell replied that the Commission may be missing the role of this Commission in administering the Compact, versus the rights of the various signatories in this case—Montana and Wyoming—to disagree upon parts of the Compact, and interpreting parts of the Compact. Certainly the Commissioners can talk independently as parties over areas with which we disagree. Perhaps these discussions could be brought either to the Technical Committee meeting or to the Commissioners meeting.

Wyoming’s point of view is that the proposed resolution is not an instrument of discussion. The resolution is a commitment to positions that we have disagreed upon relatively strenuously for 2 years.

Mr. Horak asked for comments from Ms. Sexton.

Ms. Sexton stated that she appreciated the explanation of procedures that were used in the past. She asked that Commissioners discuss how they move forward on difficult issues. The two Commissioners can call each other, but those discussions are not public. Because there is an open-meeting law in Montana, the discussion should take place in a public forum. Ms. Sexton requested that a future agenda item be a discussion of processes and procedures to discuss difficult issues in public.

Mr. Horak stated that the resolution issue was on the agenda.

Ms. Sexton replied that she was aware of that.

Mr. Horak asked for Mr. Tyrrell’s thoughts on Ms. Sexton’s comments.
Mr. Tyrrell replied that he wanted to draw the distinction between State-to-State discussions over difficult issues versus the role of the Commission. Commissioners in the past have had discussions independent from the Commission, and that should continue. The discussions between the States should be about the appropriateness of the content of the proposed resolution, not that we adopt the resolution. The Commission is designed to administer under the Compact, not to interpret it differently or to make a decision that could be construed as amending the Compact. If we have issues among the States and we want to get together and change the language, we could consider changes to the Compact. Then we will come back and hand it to Mr. Chairman and say, “here is the book under which we operate.” But to do that as a Commission is troublesome.

Mr. Horak asked for further discussion from Ms. Sexton.

Ms. Sexton made a motion to move forward Montana’s resolution as proposed for the December 6th meeting, and that the Northern Cheyenne Tribe be given an opportunity to comment on their position regarding this resolution.

Mr. Horak asked for a second on the motion. There was no second.

Ms. Sexton asked if there would be an opportunity to discuss the motion.

Mr. Horak replied that the Compact says that the Federal member (U.S. Geological Survey) only votes under circumstances of disagreements between the two State Commissioners, and the U.S. Geological Survey made a determination (codified in 1996) that they not vote. Rather, they developed a procedure for resolving conflict. In this circumstance, the vote will be one to one, causing the motion to fail for lack of a second and the two Commissioners would enter a dispute-resolution process.

Ms. Sexton replied that her understanding is because Mr. Horak cannot vote, the next option would be to pursue a formal dispute-resolution process.

Mr. Horak responded that Ms. Sexton was correct and that the Commission would invoke the rules for resolution of dispute, and that would begin with unfacilitated communication between the two Commissioners.

Mr. Tyrrell responded that he would reserve his position on dispute resolution because dispute-resolution procedures apply to administrating the Compact rather than interpreting the Compact. Nothing precludes Wyoming and Montana from continuing to discuss what may be something suitable to bring back to the Commission.

Ms. Sexton agreed that it might not be appropriate to use dispute-resolution procedures to resolve Compact interpretation matters.

Ms. Bond replied that Montana agrees that a legal interpretation issue would be inappropriate for the dispute-resolution rules, which provide for a facilitated mediator to make a decision to resolve impasse. It is beyond the scope and authority of the Signatory parties to allow a third party to step in and decide what the Compact means because that is the province of the legislatures of each State. Thus, Montana agrees with Wyoming’s position that a legal interpretation would not be appropriate to send to dispute resolution.

Mr. Tyrrell agreed that congressional or other involvement is necessary to change the Compact.

Mr. Horak asked Mr. Tyrrell to brief the Commission on the Joint Water-Use study in Wyoming. Mr. Tyrrell stated that Wyoming received funding for a joint water-use study and they hoped that Montana will also find funding.

Ms. Sexton reported that Montana is presenting a proposal in the upcoming legislative session for funding a study in the Tongue and Powder River basins. Montana will have more news about this topic at the April meeting, as the legislative session will be over.

Ms. Pring updated the Commission about a weather modification project in Wyoming. The Wyoming Water Development Commission received $8.8 million from the legislature to do a 5-year project on weather modification (cloud seeding). The project will focus on the Sierra Madre/Medicine Bow Range and the Wind River Range. They have received a categorical exclusion during the National Environmental Policy Act (NEPA) process to install 12 ground-based generators in the Sierra Madre/Medicine Bow Range and are seeking approval to install generators in the Wind River Range. Also, they intend to use aircraft if the conditions are right. Weather modification will only occur during the winter. Ms. Lowry added that in addition to hoping to get additional moisture, Wyoming intends to scientifically determine if cloud seeding works.
Mr. Dalby asked if there is a ground-based snow-pack and precipitation-monitoring network and control and comparison area planned for the project. Ms. Pring said that she thought there would be some type of control. The project is science based; thus, there must be some way to monitor and verify the effects of cloud seeding.

Mr. Horak asked the States to summarize the coal-bed methane discussion that occurred yesterday (December 5, 2006) during the Yellowstone River Technical Committee meeting.

Mr. Tyrrell summarized coal-bed methane development in Wyoming. He reported that in the Tongue, Little Powder, and Powder drainages, a total of 2,993 storage-reservoir permits have been issued, which represent about 40,800 acre-feet of storage. This indicates the average capacity of the storage reservoirs is between 10 to 15 acre-feet. These permits are for both new reservoirs and old reservoirs that have been improved or were not previously permitted. Also, there are 567 temporary filings (that have been received but not yet approved) that represent about 11,100 acre-feet of storage, with most of the filings for the Powder River basin. Wyoming hired a reservoir inspector who is looking at reservoir to determine if the reservoir has been permitted correctly and if they have been constructed in compliance with their permit.

Wyoming has received 35,915 ground-water coal-bed methane well applications from 1997 through October 2006. Many of the permitted wells have not been drilled. Most of the well permits are for northeastern Wyoming (Powder River basin) and the remaining permits are for other areas of Wyoming.

Ms. Bond asked Mr. Tyrrell for an update on Wyoming’s Coal-Bed Methane Task Force and the proposed pipeline for diverting coal-bed methane water out of the Yellowstone River basin.

Mr. Tyrrell reported that two actions were taken by the 2006 Wyoming legislature. One was the creation of a task force to examine a variety of management options for coal-bed methane produced water. The task force discussed a pipeline from the Yellowstone River basin to the Platte River basin as an option. The second action was to fund the Wyoming Water Development Commission to study the pipeline option. Mr. Tyrrell did not believe the study had gone far because industry had not committed to a volume and duration of water.

Ms. Bond replied that she had seen a memo from Mr. Mike Besson on Wyoming’s Coal-Bed Methane Task Force Web site indicating that the task force was hoping to present a pipeline proposal to the 2007 legislature because there was a need for water in the Platte River. The Web page stated that the governors signed an agreement regarding the Endangered Species Act recovery and the amended Platte River decree, and the pipeline is viewed as a means to provide a short-term water supply to the Platte River until other water supplies can be developed.

Mr. Tyrrell replied that he was not aware of a pipeline project that Mr. Besson was proposing to the 2007 legislature.

Ms. Bond replied that the description in Mr. Besson’s memo generally covered the idea of piping some coal-bed methane produced water from the Powder River basin to the Platte River basin. She assumed that it was in accordance with the plans that were suggested as an alternative in the February 2006 ALL/DOE Wyoming — Phase II feasibility study of water management alternatives for coal-bed methane water (http://governor.wy.gov/policies/documents/FinalPhaseIIReport.pdf).

Mr. Tyrrell responded that the Wyoming Water Development Commission usually has an omnibus bill in the legislature that funds projects and he is not aware of initial funding for a pipeline study, beyond what he previously mentioned.

Mr. Tyrrell reported that the Wyoming State Engineer’s Office has received some money to work with the Wyoming Geological Survey on coal-bed methane water-level modeling. The intent is to develop a contemporaneous water-level-surface map in the coal-bed methane area in northeastern Wyoming. Wyoming hopes for a GIS product that will help them track the potentiometric surface in the coal area as a result of natural-gas production.

Mr. Compton summarized coal-bed methane development in Montana. There are two operators in Montana (Pinnacle Gas and Fidelity Exploration and Production) operating under three permits. One of the permitted operations uses a variety of treatment strategies and the other two use an ion-exchange treatment system. There are 697 producing wells in Montana and an additional 134 permitted wells.

Three Wyoming producers and the State of Wyoming have asked for judicial review in Federal court in Wyoming of EPA’s approval of the Montana Board of Environmental Review’s 2003 rulemaking regarding the adoption of the water-quality numeric standards. A slightly different set of Wyoming producers has sued Montana for the Board’s 2006 rulemaking that
adopted a numeric non-degradation threshold for certain waters in the Powder River basin. The Northern Cheyenne Tribe has challenged the last two Montana permits; one is a Fidelity expansion and the other is a Pinnacle Gas treatment system. Montana and Wyoming continue EPA-facilitated discussions (at Wyoming’s request) to resolve water-quality issues near the border.

Mr. Tubbs reported on a conversation he had with Mr. John Wheaton, from the Montana Bureau of Mines and Geology, regarding a ground-water well network in the coal-bed methane area of Montana. In the environmental impact statement (EIS), early findings from the monitoring network indicate that ground-water declines are smaller than anticipated. Also, flow from the coal-bed methane production wells has been less than anticipated. Mr. Wheaton felt that although the drawdown effects were significant, it looks like the EIS appeared so far to provide a good conservative review of drawdown effects in the coal-bed methane area. The monitoring project is funded by a 2-year grant and additional funding is needed to continue the monitoring into the future.

Ms. Sexton reported that Montana is continuing with the expedited statewide adjudication program. Mr. Kerbel added that there are about 5,000 water-right claims for the lower Tongue River (downstream from Hanging Woman Creek), and about 2,000 for the upper Tongue River. Currently, Montana is examining and verifying the claims on the lower Tongue River. They have not started on the upper Tongue River.

Mr. Tyrrell asked if there was any duty water assigned by the State of Montana, or does the State address each claim? Mr. Kerbel replied that they look at acreage and flow rates. If the flow rate exceeds 17 gallons per minute per acre, they ask the user to provide some historical information to justify using that much water. This is part of the rules from the Montana Water Courts and the Montana Supreme Court.

Ms. Sexton added that, previously, if there was an issue noted by DNRC on a claim, the claim might go through the Water Court and the issue not be addressed if no one objected. After the last legislative session, the Water Courts are required to address issue remarks. An issue remark occurs when DNRC can not reach a resolution with the user; then DNRC presents an issue remark for that particular filing. The user has an opportunity to state their case in front of the Water Court.

Ms. Bond added for clarification that the attachments to the call letter Montana sent to Wyoming referenced a decree on the Tongue River. The decree is commonly called the Miles City Decree. That’s a final adjudication and decree as to those individual water users. This is valid under Montana law until the new adjudication process is completed. So, for purposes of the Tongue River, it is also adjudicated for purposes of administration. The Water Commissioners get this charge from the judge to administer pursuant to those decrees. In addition, the Powder River decree is final.

Ms. Sexton updated the Commission on the Crow Compact. She said that Federal legislation has been drafted to ratify the Compact that has passed the Montana 1999 legislature. Federal legislation would ratify the Crow Compact and provide for Federal authority. Hopefully, this will be introduced to the 2007 congress. Montana has set aside $15 million in escrow, and it remains to be seen what the Federal Government will contribute.

Mr. Duberstein briefed the Commission on recreational use in Bighorn Lake. The Bureau of Reclamation sent a letter to the governors of the State of Montana and the State of Wyoming seeking representatives for their States to participate in a group to evaluate options and resources and provide recommendations for the Bureau of Reclamation to consider regarding recreational use on Bighorn Lake. The letter was mailed in November 2006. The Bureau of Reclamation is hoping to start the group in January 2007.

Mr. Darling added that discussions regarding management of Bighorn Lake began between the Lovell area Chamber of Commerce and Montana. The primary concern from Lovell (and Wyoming) is that they felt promises had not been realized from the formation of Bighorn Canyon National Recreation Area. Bighorn Lake inundated 73 farms and some of the economic benefits from the new reservoir have not been realized. Lovell’s concern is that water levels be high enough to allow for marina operations. They suggested that, to accommodate the needs of the Horseshoe Bend Marina, flow from the dam be reduced to maintain reservoir elevations. Montana is concerned with that proposal because it would harm the nationally renowned Bighorn River fishery. Mr. Darling said that it is good to hear that the Bureau of Reclamation has joined the discussions.

Mr. Horak stated the topics of the agenda have been covered and asked for additional comments or items to be discussed.

Mr. Clubfoot stated that the Northern Cheyenne Tribe had water rights in the Bighorn and Tongue River drainages and they were concerned about receiving their 1881 water right on the Tongue River.
Mr. Fox, Northern Cheyenne Tribal Councilman, said that the Northern Cheyenne Tribe supports the resolution presented by Montana.

Ms. Lowry updated the Commission on several water-development projects in Wyoming. A watershed study in the Middle Fork Powder River basin has received Level I funding. Level I funding essentially supports a reconnaissance study. If a project looks feasible then Level II funding is generally appropriated in the next year. Level III then looks at construction, such as a new dam or rehabilitation on an existing dam. The Water Development Commission will soon set up a meeting with interested landowners regarding the study.

Additionally, a regional municipal-water supply in the Thermopolis to Greybull area is being discussed. Water projects on Ray Lake and Washakie Lake in the Wind River Indian Reservation also are being discussed.

Mr. Fix said that he became aware that a congressional earmark to fund monitoring on the Tongue River, the Powder River, and Rosebud Creek may be in jeopardy. He drafted a letter for the Northern Plains Resource Council that will be signed by water users and T&Y Irrigation District urging Montana’s congressional delegation to continue funding the project. Mr. Davis added that the project Mr. Fix brought up is a surface-water-quality monitoring network in the Tongue River watershed. Most of the network is funded by the earmark. The remaining part of the network is funded by Federal cooperators and joint funding programs between the USGS and Wyoming and Montana through the USGS Cooperative Water Program. There are a total of 12 stations in the network, and seven of the stations are on the main stem of the Tongue River.

Mr. Dalby said that many of the streamflow gages in the network are important to both States for flow administration and water-quality monitoring. Only one gage is funded through the Compact. In the future, the other gages may be important in administering the Compact. It would be a shame to lose those gages. He requested that people or organizations write a letter in support of the network.

Mr. Davis said that funding for the monitoring project was added in the Senate appropriations bills for 2004, 2005, and 2006, and was added in the Senate committee version of the bill for 2007. Currently, the USGS is operating under a continuing resolution bill and it is uncertain if the earmark will remain in the Department of the Interior budget. Funding for the project in future years is currently uncertain.

Mr. Tyrrell said that it is appropriate for the Commission to support the monitoring project because it may lead to helpful understanding of administrative issues under the Compact. He made a motion that the Commission write a letter of support for funding the project (Attachment F). Ms. Sexton seconded the motion and the motion carried.

Mr. Horak said that now would be a good time to discuss the methods used to produce the record of the Commission (minutes). Previously, there was an exchange among the Commissioners and the Chairman through phone conversations and e-mails that got them to the method now used. He asked Mr. Berkas to describe the current method.

Mr. Berkas stated that the Commissioners agreed that the USGS would contract with a person to come to the Yellowstone River Compact Commission meeting and record the discussions at the meeting. The contracted person would provide a written transcript (an electronic text file) to the USGS (Mr. Berkas). The USGS would use the transcript to prepare the minutes of the meeting.

Mr. Horak asked Mr. Berkas to describe the full procedure that will be employed today through the date when the minutes are delivered to the Commissioners.

Mr. Berkas replied that Soteria Scoping (Ms. Patterson) has been hired to record the meeting and provide an electronic document transcript of the meeting. He would paraphrase the statements made at the meeting, using the transcript, to cover the main topics discussed at the meeting. Within 45 days from the meeting, a draft copy of the minutes will be distributed to the two Commissioners and they will have an opportunity to make editorial changes to better clarify their points and statements. Changes are to be returned to Mr. Berkas within 30 days. After both Commissioners are satisfied with the minutes, the minutes are approved. After the minutes from this meeting are approved, they will be incorporated into the annual report. The report will be mailed to the State Governors (Montana, North Dakota, and Wyoming) and the President’s Office, and displayed on the Yellowstone River Compact Commission Web page.

Mr. Horak stated that the Compact says that the Commission will produce an annual report that will be delivered to governors of the Signatory States by the end of the calendar year (December 31). The Commission recognized that in the meeting structure for the last few years, including the annual meeting in early December, that it is not feasible for the Commission to meet xvi
the December 31 deadline. The Commission has declared that if the Commission accomplishes the distribution of the final report between February and mid-March, then the Commission will have discharged their obligations for formal reporting of Commission proceedings.

Ms. Sexton thanked Mr. Horak for the discussion of producing the minutes because the method was not clear to her. She asked about the availability of the tape recording of the meeting. Minutes reflect what is said and generally are a summary reporting of the meeting. Montana was not aware if they had the ability to request a copy of the tape, and that is why they hired their own transcriber to attend the meeting. Mr. Moy commented that as he understands, tapes are not kept. The USGS was provided with an electronic version of what was transcribed from the tape. Ms. Sexton commented that tapes are not available to use to check minutes to make sure the minutes are accurate. If our memory fails, we have no means to try and correct the minutes. Montana would like to have either tape or transcript available to them.

Mr. Tyrrell replied that governing documents of the Commission do not say how we get our minutes. The Commission is free to choose among a number of methods. In the other Commissions of which he is a member, generally the meetings are not taped. Mr. Tyrrell is comfortable with the method currently employed. The tape is essentially a draft set of minutes and is not a formal product. The final minutes are the formal product. A real question is whether you want the tape to be available to the Commission and to the public. How do we want our draft minutes to be treated? What is the product of the Commission? Are draft products also considered products of the Commission?

Mr. Horak replied that a copy of the tape and the transcription could be provided to the Commissioners when they received the draft minutes to review. Regarding permanently archiving the tape, there may be some issues with the continued and eventual quality of that archived tape. Ms. Sexton replied that a copy of the tape and transcript would meet Montana’s request. Mr. Tyrrell commented that Wyoming would like the tape and transcript and would treat both as a draft, not a final product of the Commission. Ms. Sexton commented that the tape and transcript would only be used as an editing tool to make sure the discussions they had at the meeting were included in the final minutes.

Mr. Horak commented that the tapes would not need to be archived.

Mr. Dalby suggested that the tape is not necessary because the transcript will be easier to compare to the abridged minutes than listening to four hours of tapes.

Mr. Horak commented that the Commission, through Mr. Berkas, has contracted for a verbatim transcript. He recommended that Mr. Berkas provide the transcript and the minutes to the Commissioners. At the April meeting we can review the post-mortem of how all of that works and make a decision as to how the Commission will use those various tools in making the formal record of our December meeting a year from now.

Ms. Sexton commented that she was concerned that this procedure would increase cost.

Mr. Tyrrell also was concerned with increasing cost.

Mr. Horak asked the recording Secretary (Mr. Berkas) if he could produce the minutes in the usual fashion. If the contract services provide a verbatim transcript, could he send the verbatim transcript and the tapes to the two State Commissioners? The formal record (abridged minutes) that the Commission adopts will be done in a manner such that the content will be consistent with the way the minutes were prepared in the past. Also, could he do this with no additional cost?

Mr. Berkas replied that he could send the transcript and tapes to the two Commissioners at no additional cost.

Ms. Sexton replied that before we invite a motion she wanted to comment that it was Montana’s understanding there would not be a transcript. They thought it was to be taped, and the minutes would be made from the tape. They did not understand, until now, that a transcript would be made by the contractor (Soteria Scoping). This is why Montana brought along and paid for a court reporter. She wanted this as a point of clarification. Montana was not aware until this time that a transcript would be produced.

Mr. Horak asked for a motion.

Ms. Sexton moved that the minutes for this meeting with the transcript and tapes be distributed to the Commissioners and Chairman. At the April meeting they will revisit the issue and decide how to proceed in the future. Mr. Tyrrell seconded the motion and the motion carried.
Mr. Horak said that he appreciated how Ms. Sexton stated her motion, which was that the Commission will revisit this issue again. It was difficult to find somebody to provide these kinds of services for the meeting in Thermopolis. If the Commission had to bring somebody from Casper, the cost would be substantial. If the Commission feels it is necessary to have a verbatim record, then it needs to be aware that the funding currently budgeted may not be sufficient.

Ms. Sexton replied that Montana is most interested in a tape recording of the meeting.

Mr. Horak announced that the official Yellowstone River Compact Commission Web site is now accessible. Please provide him with suggestions for content on the Web site. The Web site is at http://cr.water.usgs.gov/YRCC/index.html.

After considerable discussion, the Commission decided to hold the next Yellowstone River Compact Commission meeting in Sheridan, Wyoming. The Technical Committee will meet in the afternoon of April 24 (Tuesday) and the Commission will meet in the morning of the April 25 (Wednesday), 2007.

Mr. Horak adjourned the meeting.

Patrick T. Tyrrell
Commissioner for Wyoming

Mary Sexton
Commissioner (Acting) for Montana

William F. Horak, Jr.
Chairman and Federal Representative
Attachments

Attachment A—Letter from the Governor of Montana Appointing Mary Sexton as the Acting Yellowstone River Compact Commissioner.

Attachment B—Letter from Jack Stults, Commissioner for Montana (Montana’s Call for Water).

Attachment C—Letter from Patrick Tyrrell, Commissioner for Wyoming (Wyoming’s Response).

Attachment D—Letter from Mary Sexton, Acting Commissioner for Montana (Montana’s Reply to Wyoming).

Attachment E—Yellowstone River Compact Commission Resolution (Resolution Proposed by Montana).

Attachment F—Letter from Montana and Wyoming Commissioners to Senator Max Baucus (Montana) in Support of USGS Tongue River Monitoring Network.
Attachment A—Letter from the Governor of Montana Appointing Mary Sexton as the Acting Yellowstone River Compact Commissioner.

OFFICE OF THE GOVERNOR
STATE OF MONTANA

BRIAN SCHWEITZER
GOVERNOR

September 28, 2006

Honorable David Freudenthal
Governor of the State of Wyoming
Cheyenne, Wyoming 82002

Mr. Patrick Tyrrell,
Wyoming State Engineer,
Yellowstone Compact Commission

Honorable John Hoeven
Governor of the State of North Dakota
Bismarck, North Dakota 58501

Mr. William Horak, U.S. Geological Survey,
Chairman and Federal Representative
Commissioner for Wyoming

Dear Sirs:

Please be advised that pursuant to Article III of the Yellowstone River Compact, I have appointed Mary Sexton, Director of the Montana Department of Natural Resources and Conservation to be Acting Commissioner for the state of Montana. This appointment is effective as of October 1, 2006 given the resignation from State employment of Jack Stults, prior Commissioner. This temporary appointment will remain effective for all purposes until such time as I appoint a permanent Commissioner for the State of Montana.

Please be assured that Montana holds the Commission in the highest esteem. I assure you that Montana will continue to take all means reasonable and necessary to ensure a smooth transition to a permanent commissioner in the near future.

Thank you in advance for your cooperation. Here is the contact information for the Acting Commissioner:

Mary Sexton, Director
Department of Natural Resources and Conservation
1625 Eleventh Avenue
PO Box 201601
Helena, MT 59601-1601
msexton@mt.gov
(406) 444-2074

Sincerely,

BRIAN SCHWEITZER
Governor

STATE CAPITOL • P.O. BOX 200801 • HELENA, MONTANA 59620-0801

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582 (WY)
Attachment B—Letter from Jack Stults, Commissioner for Montana (Montana’s Call for Water).

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION

Patrick T. Tyrrell
Wyoming State Engineer
WY State Engineer’s Office
Herschler Building, 4 East
Cheyenne, Wyoming 82002

RE: Call for Water under Yellowstone River Compact

July 28, 2006

Dear Pat:

I am writing today to request that Wyoming administer the waters of the Tongue and Powder Rivers by curtailing post-1950 diversions or storage to the extent required by the Yellowstone River Compact (“Compact”) under current conditions. I was unable to contact you by telephone on Friday to let you know this was coming, but I will try again on Monday morning.

The Tongue River. As you know, the situation in the Tongue is quite dire, as noted in the accompanying affidavits of the President of the Tongue River Water Users Association and the Montana Water Commissioner for the upper part of the Tongue River. The river flow is now about one-fourth of the previously recorded low, and is supporting only the first right on the river. We were unable to fill the reservoir this year, in part, we believe, because, during the normal filling period Wyoming was in a “free river” situation and had no regulation of its post-1950 water uses. Article V. A of the Yellowstone River Compact provides that each State is entitled to satisfy its pre-1950 water rights before either state may supply its supplemental or post-1950 uses. As a practical matter, that means that the upstream state, Wyoming, cannot allow its post-1950 users to take their water if pre-1950 users in Montana are not being satisfied. Our 1938 Reservoir contract holders are not able to use the full amount of their contracts and the decreed pre-1950 users of direct flow in Montana are being seriously shorted on rights they would normally receive to finish the irrigation season. The status of the river as of July 21, 2006 is indicated in the enclosed affidavits. Flows since then have been as low as 10 cfs at the state line gage, while the Dayton Gage was at 67 cfs and the Monarch gage at 13 cfs. This is consistent with Wyoming’s statement at the Compact Commission meeting in April that Wyoming does not regulate any uses on the mainstem.

As the water commissioner indicates, only the first right on the Tongue has been receiving any water. See Keeper Affidavit, ¶ 6. No other valid rights are currently being met out of the 1914 decree. I have attached a copy of the “Decree of the Waters of the Tongue River,” entered on May 20, 1914, for your reference. Water rights in the 1914 decree combine to

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Attachment B—Letter from Jack Stults, Commissioner for Montana (Montana's Call for Water).—Continued

a total flow rate of 431.64 cubic feet per second during the irrigation season. Current flow at the state line is at about 15 cubic feet per second, while the mean for this day is 234 cfs. Because the Reservoir did not fill this year, both the contract holders and the Northern Cheyenne Tribe are experiencing a shortage of storage water. The Northern Cheyenne Tribe also holds direct flow reserved water rights on the Tongue and contract water from the State of Montana that are being shorted. We have notified them of our intention to call upon Wyoming to administer the Compact waters and will apprise them of further activities between the States.

Wyoming is required by the Compact to regulate its post-1950 uses on the Tongue, including uses on the mainstem, until Montana's pre-1950 uses are satisfied. From the information provided at the April meeting, we understand that there is stored water in the headwaters of the Tongue that is post-1950 and was stored while Montana's pre-1950 uses were being shorted. If so, this water should be made available immediately to our users. See attached Wyoming Reservoirs Capacity Report.

The Powder River. As of Tuesday the 25th, there was essentially no water in the Powder River at the Moorhead gage. The gage reading is 1.1 cfs, while the mean for this day is 432 cfs. Most irrigators on the Powder have valid water rights to cover their irrigated lands two or three times each season, which would have allowed one more irrigation yet this season. Obviously, they are all shut down now until the river comes up considerably. Importantly, flows are extremely low and the water is very salty for this time of year.Degradation of water quality due to low flows results in water not fit for irrigation of some soils. Flows north of Powderville, Montana are inconsistent to nonexistent, and salt concentrations are extremely high. This is the worst some folks have seen at this time of year on the Powder in Montana.

We request an immediate meeting of the technical committee to supervise the release and delivery of this water. Additionally, the technical committee should develop a process for continued delivery of water to satisfy senior users throughout the summer. As we discussed, unless we all get an unprecedented amount of rain throughout the summer, this is a particularly bad year for water supply. It is essential that we work quickly and appropriately to administer our interstate waters to satisfy our users in a way that is least disruptive to water users in both States. Furthermore, the water administration should take into account that while many of those water users are irrigators, some are municipal water users in our cities and towns along the rivers, including the community of Miles City, Montana.

The continuation of the extreme drought seriously affects us all. The States can best serve the water needs of their citizens by developing a mutually workable process for timely delivery of waters necessary to meet calls on valid pre-1950 rights in addition to providing for the Compact apportionment of all waters developed after 1950. However, failing the cooperative approach, Montana is prepared to undertake whatever action we believe is in the best interests of our citizens to protect our rights that are secured in the Compact. Our first goal, as recognized and affirmed in the Compact, is to protect valid pre-1950 rights in both States, through cooperation between the States on behalf of the citizens of each State.

Although this letter is not required by the Compact, as Compact Commissioner for Montana, and as directed by Governor Schwirtzer, this letter constitutes Montana's call and demand, under the terms of the Compact, for water to satisfy our valid and protected pre-1950 water rights on the Tongue and Powder Rivers.

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Attached is documentation to support the call. Due to the dire need, we must request that you confirm that water will be administered as requested or otherwise respond within a week. Thank you in advance for your cooperation on this difficult matter.

Sincerely,

Jack Stults
Division Administrator
Water Resources Division
Commissioner for Montana

cc. Montana Governor Schweitzer
    Wyoming Governor Freudenthal
    Bill Horak, Chair, Yellowstone River Compact Commission
    Jeannie Whiting, Northern Cheyenne Tribe

Enc. Affidavit of President of the Tongue River Water Users Association
    1914 Decree Table
IN THE MATTER OF THE YELLOWSTONE RIVER COMPACT

AFFIDAVIT OF ART HAYES JR.

STATE OF MONTANA )

County of Rosebud )

Art Hayes Jr, being duly sworn, do hereby affirm and state as follows:

1. I am a competent adult citizen of Montana. I reside at Birney Montana. I have resided at that location since 1962. My address and telephone numbers are:

208 Hanging Woman Creek Road, phone (406) 984-6260.

2. I am a farmer/rancher and irrigate out of the Tongue River in Montana. My family has done so for 122 years. I do so under authority of water rights in name of The Brown Cattle Company, claim numbers 42C 145052-00 with a priority date of April 1, 1902, diverted at SW SW SW 6 Sec of Sec 6 Twp 68 Rge 43E Rosebud; Claim number 42B 145051-00 with a priority date of September 22, 1899, diverted at SW NE NE 6 Sec of Sec 13 Twp 6S Rge 42E Rosebud; claim number 42C 145047-00 with a priority date of June 1, 197, diverted at SE NE SW Qtr Sec of Sec 25 Twp 5S Rge 42E Rosebud; and water purchase contracts from the Tongue River Reservoir.

3. The state water purchase contract referred to above is a 1650 acre-foot contract from the Tongue River Reservoir, a Montana State owned Reservoir with a priority date of 1937.

4. I have resided in the rural area of the Tongue River, in the vicinity of Birney Montana for 44 years. My livelihood requires a reliable water supply for irrigation, stock, and domestic use. My work and way of life depend heavily on water of a quality sufficient
to meet the needs of irrigation, domestic, and stock use. For all or most of the years in which I have lived in the vicinity, I have personally and regularly observed the river conditions throughout the irrigation season and I have more generally observed the river conditions throughout the year.

5. In addition to being a water user myself, I am the President for the Tongue River Water Users Association, (TRWUA) a nonprofit water users association comprised of members with water purchase contracts for the delivery of water from the Tongue River Project. I have served in this capacity since 1991.

6. In my capacity as President for the TRWUA, I administer the water purchase contract deliveries of water by measuring actual stored water, observing snowpack, monitoring all available state and federal water data, including, United States Geologic Survey and National Resource Conservation Service, and Montana Department of Natural Resources and Conservation data for the basin, measuring inflow and outflow, and adjusting the Tongue River Dam outlet in response to calls for water purchase contracts. I also honor calls for senior water rights holders.

7. As Montana is a prior appropriation state, whenever a call for water from a water right holder senior to the state project calls for water, I must honor that call, even if that means the state water rights and other junior appropriators' needs will go unfulfilled. To perform these functions I maintain close contact with the water users all up and down the Tongue River, all the way to Miles City, so that I have a good understanding of when the shortages may occur and what the needs are, especially relative to what normal river levels
are. In this way I can anticipate shortages and attempt to satisfy the most senior rights while minimizing harm to the junior users whose water rights I cannot honor.

8. Based on my knowledge of the River and its users, and based on the training I received from the previous President, Herb Mobley, who performed these functions for twenty years, I try to run the dam so that there is 50 cfs of water at Miles City. The waters of the Tongue River are included in the 1914 Miles City decree, which I use to administer the water rights.

9. On January 18, 2006 the Tongue River Advisory Committee (an advisory group in the Northern Cheyenne compact) met in Billings, at that meeting the group looked at snowpack and projected inflows. The group concluded that because of low flows, diminishing snowpack, and expected continuation of low flows, the Reservoir would be managed to maximize storage between January and March 1, 2006. The Tongue River below the dam was staged down to its minimum 75cfs, but due to falling inflows I was not able to meet the set goal of 3000 acre-feet of storage. Between March and June, our normal period of storing, we left the outflow at its minimum to store the maximum amount of water coming down the river.

11. It is my understanding that Wyoming does not regulate its users during "free river" conditions, typically occurring during the period of year that we have a right to store water. This year, Montana was unable to fulfill its right to store its 1937 water right. Montana was short approximately 6,381 acre-feet of water. At this time, that shortage is shared between the Tongue River Reservoir contract holders and the Northern Cheyenne Tribe, although the state and the tribe do not necessarily agree on the proper method of...
Attachment B—Letter from Jack Stults, Commissioner for Montana (Montana’s Call for Water).—Continued

sharing the shortages. I do not speak for the Northern Cheyenne Tribe, but only on the basis of my personal observations and experiences in regulating the dam.

12. From my experience in administering the water rights from the Tongue River dam for over 16 years, and from my training from the previous dam manager who ran the project for over twenty years, it is my opinion and observation that there has been insufficient water this year to meet the 1937 storage right of the state project and the Federal Reserved Water right of the Northern Cheyenne Tribe.

13. June 17, 2006 is the last date that the river contained sufficient water to satisfy the 1914 Montana decreed rights in the Tongue River. By July 15, 2006 the river had dropped to a flow sufficient to satisfy only the first water right on the Tongue River.

14. To my knowledge, Montana water rights with perfected prior appropriative dates before 1950 are not being satisfied at this time in the Tongue River Drainage. The 1937 right in the project is not being satisfied at this time, nor are other valid senior water rights of the 1914 Miles City Decree and the Northern Cheyenne Tribe. Without significant additional inflows into the drainage, the project contracts and Tribe will only receive partial service and all but the very most senior water rights will receive no further water at all this irrigation season. The need for irrigation water is serious and immediate.

15. Water quality sufficient to meet the appropriative right purposes requires that the water delivered to the project meet Montana’s water quality standards for B-1 Rivers under the Montana Water Quality Act.
Attachment B—Letter from Jack Stults, Commissioner for Montana (Montana’s Call for Water).—Continued

FURTHER AFFIANT SAYETH NOT

DATED this ___ day of ___ July_, 2006.

[Signature]

ART HAYES Jr.

On ___ day of ___ July_ 2006, the aforementioned affiant appeared before me and swore or affirmed that the above facts were within his or her personal knowledge and that they believed them to be true.

SUBSCRIBED AND SWORN to before me this ___ day of ___ July_, 2006.

[Signature]

PRINTED NAME

[Signature]

Notary Public for the State of Montana
Residing at Holland MT
My Commission Expires ___ August 18, 2007 ___

AFFIDAVIT OF ART HAYES JR.
Page 5
Attachment B—Letter from Jack Stults, Commissioner for Montana (Montana's Call for Water).—Continued

IN THE MATTER OF THE YELLOWSTONE RIVER COMPACT

AFFIDAVIT OF CHARLES KEPPEL

STATE OF MONTANA
County of Rosebud

RECEIVED
JUL 24 2006
ATTORNEY GENERAL'S OFFICE
HELENA, MONTANA

1. Chuck Kepper, being duly sworn, do hereby affirm and state as follows:

1. I am a competent adult citizen of Montana. I reside at Bismarck, Montana. I have resided at that location since 1993. My address and telephone numbers are: East Fork Hanging Woman Creek Road, phone (406) 984-6284. I have resided there since 2000.

2. I am a retired maintenance foreman for Shell Oil. I have no irrigations rights in Montana. For most of the years since 2000, including this year, I have been appointed a water commissioner on the Tongue River by the Honorable Judge Hegel, Montana District Court in and for the Sixteenth Judicial District in Forsyth, Montana. I have attended the water commissioner training given by the Department of Natural Resources and Conservation.

3. In my capacity as water commissioner for the Tongue River, I administer the water rights established in what is commonly referred to as the 1914 miles City Decree, as well as the water released from the Tongue River Dam for water purchase contract holders. In some years I have performed this function for the entire stretch of the mainstem of the Tongue River from the dam to the T and Y Ditch Company at Miles City. For this year and the last three years, the Honorable Judge Hegel has appointed another commissioner to administer the Decree for the rights below the Brandenburg Bridge. That Commissioner this year is Charlie Gephart. Charlie administers the river.
in my capacity as Commissioner for the Upper Tongue, I work closely with Charlie to assure that only the most senior rights are satisfied in order of priority, and that our records of water deliveries are accurate.

4. In my capacity as water commissioner, I am required personally and regularly to observe the river conditions throughout the irrigation season. I have more generally observed the river conditions throughout the year since I have lived in Montana.

5. Between May 2006 when I was first appointed, and June 17, 2006, I gradually began cutting off decreed water rights of the 1914 Decree as required to satisfy any senior water right holders calling for their water. The Tongue River flow dropped below the amount of decreed water being called for on June 17, 2006, and so I began to enforce the priorities on the River on that day. On June 21, 2006, the flow at the state line was 233 cfs. That is enough to satisfy only the first six water rights of the twenty-two in the 1914 Decree.

6. On July 19, 2006, there is only 15 cfs coming into the Reservoir. That is only enough to satisfy the first right of the twenty-two in the Decree. The first right is for Nance Cattle Company, priority date July 6, 1886 for 10.49 cfs. I deliver that amount to the Nance Cattle Company headgate, and allow the remainder, less than 5 cfs, to travel downstream for the second right in the decree, T&Y Ditch Company. T&Y Ditch has an August 9, 1886 right for 187.5 cfs. Due to conveyance losses, T&Y is now receiving essentially no water at all from the Decree.

7. In our capacities as water commissioners, it is Charlie and my responsibility to assure that none of the other decreed right holders receive any more of their prior rights unless and until the River flows exceed those two first rights. If and when the River comes...
up, we can allow additional users to get water in accordance with their priority date in the Decree. Until then, other than the Nance right, the only water being delivered is the water purchase contract water.

8. At this time we are delivering only a percentage of stored water to the water purchase contract holders. Because the Reservoir did not fill this year, the water purchase contract holders are sharing the shortages, so each will be delivered only a percentage of their contract rights. Those contract rights have a priority date of 1937. If there were no stored water in the system the River would be dry long before it reached Ashland, as the less than 5 cfs left after the first right is satisfied would be lost to seepage.

FURTHER AFFIANT SAYETH NOT

DATED this 21 day of July, 2006.

CHARLES KEPPE

On 21st day of July, 2006, the aforementioned affiant appeared before me and swore or affirmed that the above facts were within his or her personal knowledge and that they believed them to be true.

SUBSCRIBED AND SWORN to before me this 21st day of July, 2006.

Nanalee Gundlach
PRINTED NAME

Notary Public for the State of Montana
Residing at
My Commission Expires
### DECREE OF THE WATERS OF TONGUE RIVER, Docket No. 2809, and MODIFIED AND
SUPPLEMENTAL JUDGEMENT AND DECREE ENTERED ON THE 30th DAY
OF MAY, 1914 — Custer County Montana.

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| Total  |                             |           | 17265.67      | 431.64 |

This table does not reflect any current name changes.
Mr. Rich Moy  
Acting Division Administrator  
Water Resources Division  
Department of Natural Resources and Conservation  
P. O. Box 201601  
Helena, Montana 59620-1601

Dear Rich:

I am providing Wyoming’s initial response to the issues Jack Stults raised in his letter of July 28, 2006. As we discussed when Montana sent a similar letter in 2004, this multi-year drought has caused unprecedented low stream flow in many areas of both of our states. The lack of water is taking its toll on our water users as well, and we are experiencing similar conditions to those outlined in your letter. We too are regulating water rights back to the 1880’s in the Tongue and Powder River basins, and have numerous pre-1950 rights going unfulfilled. Although no formal call for regulation within Wyoming has been received on the mainstem Tongue River, that in no way implies that our pre-Compact rights are being met to any significant degree.

For your information, several tributaries in the Tongue and Powder River basins in Wyoming have been in regulation this entire irrigation season; Big and Little Goose Creeks for instance never had a right junior to 1883 on all at. In the upper Powder River drainage, regulation is to the Sihara Ditch priority and in the Crazy Woman decree area, only one right is getting water. Piney Creek and Lower Clear Creek have been regulated to pre-1900 rights since mid-June and are now regulated back to 1884. Both Sheridan and Buffalo are on municipal rationing to their water customers. And we have entirely emptied several of our smaller mountain reservoirs and several more will be fully drained in the next few weeks.

Your letter purports the Compact to say things that are clearly only Montana’s recent interpretation. Montana’s interpretation of Article V, as described in the second paragraph of your letter, is quite different from how the Commission, including Montana, has operated in the past. As the administration of the Compact was being analyzed by the two states in the 1980’s, it was understood that the only water being apportioned was the post-1950 “unused and unappropriated waters of the interstate tributaries......” Montana’s more recent stance that the pre-1950 rights in Montana must be met by contemporaneous regulation of post-1950 rights in Wyoming is unsubstantiated by the
Compact itself. As this position is of your own making, Wyoming feels no obligation to change its long held position regarding the administration of the water rights in place as of the date of the Compact. Montana continues to assert as fact an interpretation of the Compact we have taken great exception to for over two years now. An interstate delivery schedule for pre-1950 rights is not now, and never was, a provision of this Compact.

You suggest in your letter that the Technical Committee should be convened to take action related to water storage in the basin. I must admit that I see some irony in Montana’s suggestion of the use of the Technical Committee since it has been difficult in the past to get extensive participation by your staff in the operations of that committee. Wyoming has taken the lead in agenda building, taking notes, distribution of information and other logistics associated with the Committee. After your “call” letter in 2004, Wyoming stood ready to host the Technical Committee and share additional information regarding water operations in the Tongue and Powder River basins in Wyoming. We wanted to show you around and see how we truly operate. Montana twice cancelled these meetings after accepting the invitation and having firm dates selected. If you are seeking cooperation from Wyoming, it has been there.

As the Compact makes no provision for the “call” your letter suggests, it appears in our mutual interest to devise an administration system, much like our states worked on in the 1980’s, to address the allocation methods described in Article V.C. We sought to get Montana engaged in this process in 2004, to no avail. Had we succeeded, the work product may now be valuable given the situation we find in 2008.

I find your claimed inability to fill Tongue River Reservoir confusing, as records show Montana released excess amounts from the reservoir during the winter months that would have easily provided the necessary water to fill it. Your own website records show that Tongue River Reservoir was filled to 97 percent of capacity as recently as July 9, 2006. The additional 2,000 (+/-) acre feet of water needed to completely fill would have been there had Montana judiciously managed the reservoir. Wyoming cannot manage the water once it crosses the state line; only Montana can. And, as long as there is water passing the compact points at the mouth of the Tongue (at Miles City) and Powder (at Locate) Rivers, there is evidence of water for allocation under the Compact for both our states. Remember, Montana has over three times the storage in the Tongue River basin for less than half the pre-compact acres, as compared to Wyoming. So, the ability to husband Tongue River flows is far greater in Montana than in Wyoming.

I agree that we can do a better job of collecting, analyzing and sharing information among our two states. That’s why Wyoming took the initiative to get an appropriation from our Legislature to gather and analyze more information, contingent upon a similar commitment by Montana. This good-faith offer for in-kind sharing of these resources was discussed at our Commission meeting in April, and was intended to further our objective understanding of the uses on these rivers. It was also intended to keep these...
Compact discussions science-based among our professional staffs to forestall unnecessarily elevating any compact issues out of sheer lack of understanding. I now question whether Montana is committed to this objective approach.

In sum, Wyoming will not release stored water for the benefit of Montana, as Wyoming believes it has properly stored that water in accordance with Compact provisions. I will also not agree to the convening of a meeting of the Technical Committee until Montana’s Compact Commissioner and I can agree on exactly what it is we want them to do. As the States’ Commissioners, we have an obligation to give clear direction to the Technical Committee in order for progress to be made on these difficult, complex issues. If your new Commissioner wishes to meet to discuss what can be done under the Compact, as written, I’ll be there.

Jack’s pending retirement leaves me concerned about the continuity of representation from Montana. Working through these difficult interstate issues takes a significant commitment of time and effort on the part of all concerned. I am hopeful that Montana will soon name its replacement to the Yellowstone River Compact Commission so that we can return to constructive dialog. I am confident that such a dialog will move us forward in resolving these difficult matters. Please tell Jack that I do wish him the best after his departure from state government in Montana.

Sincerely,

[Signature]

Patrick T. Tyrrell
State Engineer

Cc: Bill Horak, Chairman, Yellowstone River Compact Commission
Attachment D—Letter from Mary Sexton, Acting Commissioner for Montana (Montana’s Reply to Wyoming).

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION

October 3, 2006

Patrick T. Tyrrell
Wyoming State Engineer
WY State Engineer’s Office
Herschler Building, Four East
Cheyenne, Wyoming 82002

Re: Montana’s Call for Water Under Yellowstone River Compact

Dear Mr. Tyrrell,

Thank you for your letter of August 9, 2006 to Rich Moy as an initial response to our letter to you of July 28, 2006. I am responding to you in the capacity of Montana’s Acting Commissioner to the Yellowstone River Compact.

I understand from your letter that certain pre-1950 water rights in the Tongue and Powder River Basins in Wyoming were not being satisfied at the time of your letter. You did not state the extent to which post-1949 direct flow and storage rights were being satisfied in Wyoming. Would you please provide us the water administration records for this year in the Tongue and Powder River Basins in Wyoming?

The States continue to have a disagreement over whether water applied to beneficial use under pre-1950 water rights in the two States was apportioned in the Compact. Your position is very clear. Wyoming continues to assert that pre-1950 water was not apportioned by the Compact. It is hard to credit such a position, however, when the Compact itself states that the three States entered into the Yellowstone Compact “desiring to provide for an equitable division and apportionment of [the waters of the Yellowstone River and its tributaries]” One exception is specified, namely, for “waters within or waters which contribute to the flow of streams within Yellowstone National Park.” There are no other exceptions. One point on which we apparently do agree is that the final word is, as you say, the “Compact itself.”

You also state “An interstate delivery schedule for pre-1950 rights is not now, and never was, a provision of this Compact.” You are correct to the extent that an interstate delivery schedule for pre-1950 rights is not quantified and set out verbatim in the Compact, but Montana understands the Compact to provide the general principles from which delivery obligations can be determined. In fact, the delivery obligation is relatively simple: whenever there are unsatisfied pre-1950 rights in Montana, there is no water available in Wyoming for post-1950 uses.

Your assertion that Montana has changed its interpretation of the Compact is incorrect. It ignores that the States have been at loggerheads for years over Wyoming’s assertion that it has no obligation to provide water to Montana to satisfy pre-1950 water rights. Ultimately, as I think we agree, it is the Compact itself that controls.
Your suggestion that the States devise an administration system to allocate water under Article V.C of the Compact is perhaps a good one. First, however, I believe we need to come to terms on the status of pre-1950 water rights. Also, the States' attempt in the 1980's to devise an administrative system for the pre-1950 water was unsuccessful. The reasons for that failure and ways to avoid a repetition of it need to be understood before engaging in such a process again. We would be wasting our effort attempting to establish an administrative mechanism for the unused and unappropriated water when we are not even receiving our pre-1950 water. Thus, while our focus has recently shifted to the earlier water, our position that the Compact is an equitable apportionment and allocation of the entire river is not new.

You also criticize Montana for its administration of water within Montana. As you are aware both in Wyoming and Montana there are priority administration considerations that affect instate management of water even in the winter. In any event, you need not concern yourself with Montana's administration of the water to which it is entitled under the Yellowstone River Compact.

You allege that Montana has not firmly committed to cooperating with Wyoming on information sharing. This is not true. In the final analysis though, all the information sharing in the world has not and will not change Wyoming's position on its obligation to honor Montana's pre-1950 water rights as required by the Compact.

As the foregoing attests, the States are not in agreement on some important issues with respect to the Yellowstone River Compact. Nevertheless, I fully support your thought that the States need to rely on science-based staff discussions between the States to ensure that, to the maximum extent possible, our differences are resolved on the basis of objective engineering and science. In that vein, I am seeking an appropriation to allow the State of Montana to join with Wyoming in gathering and analyzing the hydrologic and engineering information needed to maximize the States' ability to resolve their differences on an objective basis.

Sincerely,

MARY SEXTON, DNRC Director
Acting Montana Commissioner, YRCC

cc: Bill Horak, Chair, Yellowstone River Compact Commission
    Jeannie Whiting, Northern Cheyenne Tribe
Attachment E—Yellowstone River Compact Commission Resolution (Resolution Proposed by Montana).

Yellowstone River Compact Commission
Resolution
Proposed by the State of Montana
December 6, 2006

WHEREAS, Article III of the Yellowstone River Compact (Compact) established this Commission to administer the provisions of the Compact as between the States of Wyoming and Montana, to make recommendations to the States upon matters connected with the administration of the Compact, and to perform any act which the Commission may find necessary to carry out the provisions of the Compact;

WHEREAS, the Compact provides in its first paragraph as follows:

"The State of Montana, the State of North Dakota, and the State of Wyoming, being moved by consideration of interstate comity, and desiring to remove all causes of present and future controversy between said States and between persons in one and persons in another with respect to the waters of the Yellowstone and its tributaries other than waters within or waters which contribute to the flow of streams within the Yellowstone National Park, and desiring to provide for an equitable division and apportionment of such waters . . . have resolved to conclude a Compact . . . for the attainment of these purposes";

WHEREAS, Article V.A of the Compact states, "Appropriative rights to the beneficial uses of the water of the Yellowstone River system existing in each signatory State as of January 1, 1950, shall continue to be enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation";
Attachment E—Yellowstone River Compact Commission Resolution (Resolution Proposed by Montana).
—Continued

WHEREAS, Article X of the Compact states, "No water shall be diverted from the Yellowstone River Basin without the unanimous consent of all the signatory States"; and

WHEREAS, the Commission desires to clarify the scope of the allocation and apportionment of the Compact to facilitate future management and administration and avoid further controversy;

NOW, THEREFORE, the Commission hereby adopts the following resolution:

The Commission hereby recognizes, and recommends to the States that they adhere to, the following principles with respect to the administration of the Compact:

1. The Compact was intended to effect and did effect a full equitable division and apportionment of all the waters of the Yellowstone River System as defined in Article II of the Compact;

2. Article V.A of the Compact apportions among the compacting States the waters of the Yellowstone River System that were in use in each State on January 1, 1950 and for which appropriative water rights existed in each State as of that time;

3. Article V.A of the Compact requires Wyoming to curtail consumption of the water of the Yellowstone River System in excess of Wyoming’s pre-January 1, 1950 consumption of such water whenever the amount of water necessary to satisfy Montana’s pre-January 1, 1950 uses of such water is not passing the stateline;

4. Article V of the Compact restricts Wyoming’s pumping of groundwater within the Yellowstone River System to the extent that such pumping depletes waters apportioned under the Compact; and
5. Article X of the Compact prohibits any export outside the Yellowstone River Basin of native surface water or groundwater, including water produced in connection with the production of coalbed methane (coalbed natural gas), without the unanimous consent of all the signatory States.

Mary Sexton
Acting Montana Commissioner

Patrick T. Tyrrell
Wyoming Commissioner
December 8, 2006

Senator Max Baucus
511 Hart Senate Office Building
Washington, DC, 20510

Re: FY 2007 Appropriations Request – USGS Tongue River Streamflow and Water Quality Monitoring Network

Dear Senator Baucus:

We are contacting you to voice our strong support for continued funding of the U.S. Geological Survey's Tongue River Streamflow and Water Quality Monitoring Network. Past funding for the network was secured through earmark funding obtained largely through the Montana delegations cooperative efforts. We ask that the earmark be continued for FY 2007 at an amount of $900,000.

The Tongue River Streamflow and Water Quality Monitoring Network provides valuable information used by government, industry, and landowners to guide coal-bed methane development, schedule irrigation water use, and protect and maintain water quality for fish and wildlife. In addition, the Yellowstone River Compact Commission, who oversees the Yellowstone Compact between Montana, Wyoming and North Dakota, uses the information in support of transboundary water management. Continuing drought makes water data collected on the Tongue River necessary for responsible development of coal-bed methane resources in Montana and Wyoming, maintenance of water quality for irrigation, and for efficient use of limited water supplies. Without continued provision of the streamflow and water-quality data, potential for water-use conflicts will increase significantly.

Please contact us if you have questions concerning our use of the Tongue River data or our support for the project.

Sincerely,

Mary Sexton
Montana Commissioner
Yellowstone River Compact Commission
and Director, Montana Department of Natural Resources and Conservation

Patrick T. Tyrrell
Wyoming Commissioner
Yellowstone River Compact Commission and Wyoming State Engineer

cc. Senator Burns, Representative Rehberg
Appended Minutes, Technical Committee — April 12, 2006:

Yellowstone River Compact Commission, Technical Committee Discussions, Sheridan County Courthouse, 2nd Floor, Sheridan, Wyo.

1. Introductions

The meeting began at 1:45 p.m. Introductions were made and a signup sheet was sent around. Attendees are listed at end of minutes. No additions were made to the agenda. Ms. Lowry gave an overview of what tasks are before the Technical Committee and why the Commission established the Technical Committee. Mr. Tyrrell welcomed the group to Thermopolis.

2. Hydrological information from various sources

U.S. Geological Survey
Mr. Miller had a handout of long-term gages in the Wyoming portions of the basins tributary to the Yellowstone River to give a historical context of the March 2006 streamflows. A request was made to provide box charts next year to help with the problem of the average numbers in Little Powder River basin where a couple of high-flow events can skew the average. Mr. Miller also had information on deviation from mean for the period of record for several Wyoming gage sites.

Mr. Berkas provided a handout of information on Montana key gages with bar graphs of the period of record and flows for this water year so far.

Natural Resources Conservation Service
Mr. Kaiser had handouts summarizing the snow accumulations in the basin.

National Weather Service
Ms. Springer presented a powerpoint of the precipitation received thus far in the water year. Discussion was held on the long-term forecasts and the variables that are used by the NWS in making these 30-60 day plus forecasts for precipitation and temperature.

Bureau of Reclamation
Mr. Guenthner reported that Bull and Bighorn Lakes and Boysen and Buffalo Bill Reservoirs storage amounts are above last year. All are forecast to fill except Bighorn. Bighorn should fill to about 70 percent of capacity, but the instream flow release from the reservoir will be higher this year than during the drought years.

3. Forecasts and runoff estimates

Mr. Kaiser handed out a summary of the forecasts based on April 1 conditions.

4. Reservoir operations and storage information in both states

Mr. Knapp noted that the private reservoirs on the east side of the Bighorns are coming into this year with more carryover than in 2004. The rains last spring enabled these facilities to fill, and he is hopeful that the reservoirs will fill this year during runoff. Mr. Smults noted that the Committee is now getting more sophisticated with the water-supply piece of the water budget. We don’t have an equal amount of information on the demand side yet. Perhaps the joint state study, if funded, would provide the resources to gather more of the demand data.

Mr. Tyrrell noted that some of these data are available for the larger diversion facilities in Wyoming through their Water Planning Program.

Mr. Kerbel suggested that the Powder River basin irrigators are changing their traditional irrigation regime to include more fall irrigation. If Wyoming were to give an overview presentation of the diversion data and descriptions available in the Water
Plans to the Technical Committee, Mr. Kerbel would be interested in Wyoming focusing on the main stem Tongue River. Montana would also be interested in the operation of Lake DeSmet.

5. Request from Commission to review bar charts in annual report and adjust period of record for each gage

Mr. Berkas directed the Technical Committee to the bar graphs that have been shown in the annual report for a number of years. The Committee agreed that the monthly bar chart portion should show: this year, last year, and the 30-year average. A separate period of record, annual bar chart should be added below the monthly bar chart and include a line showing the average flow.

6. Coal-bed natural gas discussion

Montana Bureau of Mines and Geology information

Mr. Kerbel handed out a draft report of the State line drawdown monitoring wells review. The Bureau of Mines and Geology sponsors an annual conference that will be held June 4 and focus on this report at that conference. Most of the wells have been drilled in the last 5 years. Spacing of wells is about 1 per township. Mr. Whiteman mentioned that the Northern Cheyenne also has eight monitoring wells on their reservation. These wells were drilled in the last 3 years.

Development numbers since last Commission meeting

Ms. Lowry handed out a summary table of reservoir applications and permits by basin in the Tongue, Powder, and Little Powder River basins. A separate bar chart shows the ground-water wells that have been permitted for CBM.

Mr. Tyrrell also described that enforcement action has been taken against an operator in the Powder River basin who did not have reservoirs in compliance with SBO permits. Wyoming is continuing with their inspection program to visit wells and reservoirs to assure their compliance with their reservoir or ground-water permits.

Ms. Lowry mentioned that the Wyoming DEQ will be completing their response to the questions that Mr. Stults raised after review of the past Commission meeting.

CBNG Task Force created by Wyoming 2006 Legislature

Ms. Lowry handed out copies of the bill that established the Task Force to look at produced water over the next 2 years. The Governor of Wyoming has not yet named all of the at-large members named in the legislation. The Task Force will likely hold their initial meeting in early May 2006.

Platte River pipeline study

At Governor Freundenthal’s request, a $500,000 allocation was made to review the feasibility of a pipeline to transport produced water from the Powder River CBM development to the Platte River basin. The Wyoming Water Development Commission will be taking the lead on this study. The feasibility study should take a look at any Compact effects. Montana noted that they do not agree that the Compact only deals with surface water and that surface water and ground water need to be managed as a unified resource.

Montana Environmental Review Board actions

Mr. Compton described the recent nondegradation actions that the Montana Board of Environmental Review has taken. The change included moving from a narrative standard to a numeric one for sodium-adsorption ratio (SAR) and electrical conductivity (EC). Region 8 EPA now has the standards under review. Wyoming has requested EPA not approve.

7. Wyoming’s budget request and approval for joint study

Mr. Stults suggested that now is the time to start scoping out what can really be accomplished with a $200,000 study to look at water uses in the basins. Hopefully, the two States can agree upon the objective and types of data required. There also are
the institutional, political realities that need to be recognized and thought through as to how they will be addressed in the study. Mr. Stults named Mr. Dalby as Montana's representative to scope out the plan of work for the joint study.

8. Potential abandoned mine lands project—coal-seam fire

Ms. Lowry alerted the rest of the Commission that a proposal is being discussed through Wyoming's Abandoned Mine Land Program for dousing a coal-seam fire that has been burning in the Sheridan area for a number of years. The magnitude of water may be such that it could only be done during an above-average snowpack year. A consulting firm in Laramie is working on a more detailed proposal.

9. Report of meeting highlights and recommendations to Commission meeting April 13, 2006

The report should be concise and touch on all of the topics that have been discussed today that are on the full Commission agenda. As several items are now to be discussed in more detail during the Technical Committee meeting, the next Commission meeting agenda may be less detailed.

10. Set next meeting

The two States will be meeting and getting the scope for the joint study fleshed out, so the Technical Committee may want to meet the day before the Fall 2006 Commission meeting to review that scope and discuss CBM activities. Alternatively, the more detailed CBM update could only occur at the spring Commission meeting when a full Technical Committee will be held. Mr. Horak will check to see if the powerpoints and handouts from the Technical Committee meeting can be hosted on the Yellowstone Commission's Web site. All presenters were asked to send the files of their presentations to Ms. Lowry by mid-April.

The meeting adjourned at 6:10 p.m.

Submitted by Ms. Lowry, June 22, 2006.
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<tr>
<th>NAME</th>
<th>REPRESENTING</th>
<th>E-MAIL</th>
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<tr>
<td>Ms. Sue Lowry</td>
<td>Wyoming State Engineer’s Office</td>
<td><a href="mailto:slowry@seo.wyo.gov">slowry@seo.wyo.gov</a></td>
</tr>
<tr>
<td>Mr. Loren Smith</td>
<td>Wyoming State Engineer’s Office</td>
<td><a href="mailto:lsmith@seo.wyo.gov">lsmith@seo.wyo.gov</a></td>
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<tr>
<td>Mr. Patrick Tyrrell</td>
<td>Wyoming Commissioner</td>
<td><a href="mailto:ptyre@seo.wyo.gov">ptyre@seo.wyo.gov</a></td>
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<td>Mr. Bill Knapp</td>
<td>Wyoming State Engineer’s Office</td>
<td><a href="mailto:bknap@seo.wyo.gov">bknap@seo.wyo.gov</a></td>
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<tr>
<td>Mr. David Wilms</td>
<td>State of Wyoming, Attorney General’s Office</td>
<td><a href="mailto:dwilim@state.wy.us">dwilim@state.wy.us</a></td>
</tr>
<tr>
<td>Mr. Chad Hahn</td>
<td>NWS/NOAA Riverton</td>
<td><a href="mailto:chad.hahn@noaa.gov">chad.hahn@noaa.gov</a></td>
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</table>
Appended Minutes, Technical Committee — December 5, 2006:

Yellowstone River Compact Commission, Technical Committee Discussions, Beartooth Room, Campus of MSU-Billings, Billings, Mont.

1. Introductions

The meeting began at 1:30 p.m. Mr. Moy (Montana DNRC) chaired the meeting, made introductions, and circulated a signup sheet. Ms. Sexton (Director of Montana Department of Natural Resources and Conservation and interim Montana Yellowstone Compact Commissioner), and Mr. Tubbs, the new director of the Water Resources Division of the Montana Department of Natural Resources, were introduced. The agenda was discussed and accepted.

2. Update on coal-bed methane (CBM) activities in Wyoming and Montana

Wyoming

Wyoming Compact Commissioner (and State Engineer), Mr. Tyrrell provided a description of CBM activities in the Tongue, Powder, and Little Powder River drainages of Wyoming. Two handouts were provided: one showing the number of pending and permitted reservoirs in the above mentioned drainages and the other showing the total number of CBM applications received by the SEO Ground-Water Division. He said a total of 2,993 reservoir-storage permits had been issued and there were about 2,300 small reservoirs (under 20 acre-feet) that were spread out over an area of about 14,000 square miles. Reservoir-permit inspections are now done by a full-time inspector (Mr. Shrider) from the SEO and compliance is better than it has been in the past. Permits that are granted under the name of the coal-bed operator only are given a 15-year time limit. These reservoirs must be reclaimed after the CBM activity has ceased. If the land owner and the coal-bed operator are listed on the permit, there is no time limit applied. Any reservoir that was used for CBM production, but will be left post-production, must be reduced to a capacity of 20 acre-feet or less.

As of December 2006, there were about 15,000 to 20,000 permitted CBM wells. Fourteen wells were recently issued cease production orders because they were not permitted. The rate of CBM well drilling depends on gas prices—if the price of gas drops, well drilling will slow down. Use of CBM water for irrigation was discussed.

Mr. Tyrrell indicated that $200,000 had been awarded to the Wyoming State Geological Survey to develop a potentiometric (ground-water level) surface map and ground-water model in the Powder-Tongue basin; the study will take 2 years.

Montana

Mr. Compton (Montana Department of Environmental Quality) provided an update on CBM activities in Montana. In Montana, there are two companies producing CBM: Fidelity Exploration and Production and Pinnacle Gas. Montana has a total of 697 producing wells, with 21 shut-in and an additional 134 permitted.

Mr. Compton said that in 2006, three Wyoming producers sued the Montana Board of Environmental Review over its 2003 rulemaking that adopted numeric nondegradation standards for some streams in the Powder River drainage; the State of Wyoming has also sued Montana over the numeric standards. The Northern Cheyenne Tribe has challenged the last two CBM permits: Fidelity’s proposed expansion and the Pinnacle Gas water-treatment system.

3. Water-management activities during 2006 irrigation season

Tongue River in Wyoming

Mr. Tyrrell handed out a summary of the regulation in 2006 for the Tongue and Powder River basins. The Tongue River peaked on May 11th—about 1 month earlier than past years. Mr. Tyrrell said Wyoming has Commissioners in each division to administer water rights in regulation. Water storage occurs mainly on Little Goose and Big Goose Creeks and storage rights were regulated by priority. There is no storage on main stem Tongue River.
Powder River in Wyoming

Mr. Tyrrell said there was about 18,000 acre-feet of drawdown on Lake DeSmet (about 3.5 to 4 feet) and that about 150 acre-feet per day was released to meet irrigation demands. Priorities were regulated back to 1884 on Finey Creek. He mentioned that Mid-America Energy had acquired water rights for 67,000 acre-feet out of Lake DeSmet/Healey Reservoir for CBM development.

In response to a question regarding purchase of water from Lake DeSmet for use in Montana, Mr. Tyrrell stated that no more than 1,000 acre-feet can leave the State without an export study and approval by the legislature.

Tongue River in Montana

Mr. Smith (Montana DNRC, State Water Projects Manager) provided a graph showing inflows and outflows from the Tongue River Reservoir in Montana. The reservoir did not fill this year and was about one foot below full pool. Tongue River flows also peaked in May, and the Tongue River Reservoir delivered about 90 percent of its contract water. Inflows at the State line approached zero flow in mid-July. The Tongue River was administered by water Commissioners and to supplement contract water, the Water Users Association purchased 500 acre-feet to keep the stream alive.

Powder River in Montana

Mr. Smith reported that the Powder River near State line went dry for 5-6 days in mid-July, and that 1932 was the last time that happened. In addition, the river was nearly dry for a much longer period continuing through August. Mr. Kerbel said that Powder River irrigators shared shortages as best they could.

Bighorn River in Montana

Mr. Fraser (Montana Fish, Wildlife and Parks) said that water levels on the Bighorn River, downstream from Yellowtail Dam, are maintained to try and sustain trout habitat in the main stem and side channels. Water levels were established in the 1980s and that 2,300 ft³/s is necessary for good connectivity with side channels; below 2,000 ft³/s (an allowable threshold for dry years), significant habitat losses begin to occur and at about 1,500 ft³/s, over 50 percent of the fish habitat is lost. Starting in 2001, in three of the years, flows have dropped below 1,500 ft³/s, but have been maintained at near that (1,300 ft³/s) this past year.

Mr. Fraser also reported that the Bighorn Lake fishery declined as well. However, Bighorn Lake bass populations have been maintained throughout the drought.

Ms. Sexton said that it was anticipated there would be a compact with the Crow Tribe introduced to Congress in 2007. The State has committed $15 million to the Crow Compact (escrow fund), but the Federal contribution was small.

Bighorn River in Wyoming

Mr. Tyrrell indicated that Wyoming recreational users were experiencing problems with low lake levels and he was concerned about the lake-level management plan under the new Compact with the Crow Tribe. He asked if he could obtain a copy of the current plan, and Mr. Kerbel agreed to provide one (plan was provided to Mr. Tyrrell and Ms. Sexton at the Commission meeting the next day).

Ms. Bond (Montana Attorney General’s Office) asked about Wyoming storage upstream from Bighorn Lake. Mr. Tyrrell responded that the State had about 189,000 acre-feet in Buffalo Bill Reservoir due to the 1980 enlargement, and that about 3 percent of that was under contract. Ms. Bond asked if some of that could be released to improve lake levels in Bighorn Lake, and Mr. Tyrrell responded that it could not because it would amount to meeting Montana's in-stream flows.

Mr. Tyrrell also said that Buffalo Bill Reservoir was increased 24 feet in 1980 and the State’s share of the enlargement is 190,000 acre-feet. This storage space has not been fully contracted and is generally maintained as a buffer against continuing years of drought. Boysen Reservoir has a capacity of 751,000 acre-feet and presently is at 350,000 acre-feet.
4. New water projects in Yellowstone basin

**Wyoming**

Ms. Pring (Wyoming State Engineer's Office) noted that the Middle Fork Powder River Project study had been changed by the 2006 legislature to a watershed-level study; this includes a revised scope that looks at the whole watershed and not just the dam project. In addition, there is a regional pipeline water-supply study, Bighorn Regional Supply, to look at the use of ground water from some Madison wells in the Thermopolis to Greybull area.

**Montana**

Mr. Smith reported that there were no new projects at this time.

5. Status of joint water study

Mr. Tyrrell said that Wyoming had recently received from Montana a brief outline for a study of water uses. Wyoming had received funding from their legislature for a study, and it may be best to wait and see if Montana received funding before pursuing this further. Ms. Sexton agreed and indicated Montana had applied for funding and should know the outcome by April 2007.

6. Water-supply outlook

Mr. Moy provided a handout that showed precipitation and snowpack across Montana and revealed the general water shortages in southeastern Montana compared to the rest of the state. However, he pointed out that it was too early in the snow accumulation season to make any reliable forecasts, and that was only appropriate at the spring Technical Committee meeting.

Mr. Berkas and Mr. Miller (U.S. Geological Survey) led a discussion of how best to portray hydrologic conditions at selected streamflow stations throughout the Yellowstone basin. Several options were considered and the Technical Committee agreed to the use of box plots with a logarithmic scale and the use of departure from average plots. These two formats are to be presented in the annual report. For the April meeting, Mr. Berkas and Mr. Miller will look at 30-year averages for 1971-2000 and 1977-2006 to see if they can capture the impact of the drought of the 2000s.

The meeting was adjourned at 5:00 p.m.
## List of Attendees:

<table>
<thead>
<tr>
<th>NAME</th>
<th>Representing</th>
<th>Email</th>
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</tbody>
</table>

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General Report

Cost of Operation and Budget

Work funded by the Yellowstone River Compact Commission, which to date has been primarily concerned with the collection of required hydrologic data, has been financed through cooperative arrangements whereby Montana and Wyoming each bear one-fourth of the cost, and the remaining one-half is borne by the United States. Salaries and necessary expenses of the State’s and U.S. Geological Survey representatives to the Commission and the cost to other agencies of collecting hydrologic data are not considered as expenses of the Commission.

The expenses of the Commission during fiscal year 2006 were $76,000, in accordance with the budget adopted for the year.

Estimated budgets for Federal fiscal years 2007, 2008, 2009, and 2010, based on an approximate 5-percent increase per year, were tentatively adopted subject to the availability of appropriations. The budgets for the four fiscal years are summarized as follows:

<table>
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<th>Date</th>
<th>Budget</th>
<th>Amount</th>
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</thead>
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<td>October 1, 2006, to September 30, 2007 (fiscal year 2007):</td>
<td>Estimate for continuation of existing streamflow-gaging programs</td>
<td>$80,000</td>
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<tr>
<td>October 1, 2007, to September 30, 2008 (fiscal year 2008):</td>
<td>Estimate for continuation of existing streamflow-gaging programs</td>
<td>$84,000</td>
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<td>October 1, 2009, to September 30, 2010 (fiscal year 2010):</td>
<td>Estimate for continuation of existing streamflow-gaging programs</td>
<td>$92,600</td>
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Streamflow-Gaging Station Operation

Operation of streamflow-gaging stations at the measuring sites specified in the Yellowstone River Compact continued in water year 2006 and satisfactory records were collected at each station. Locations of streamflow-gaging stations, along with reservoir-content stations, are shown on a map of the Yellowstone River basin at the end of this report.

For measurement sites, horizontal coordinate information (latitude and longitude) is referenced to the North American Datum of 1927 (NAD 27). The gage datums and elevations listed in this report are referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29).

During water year 2006, annual streamflow was below normal at all streamflow-gaging stations. The rank of the annual streamflow, with the lowest annual streamflow having a rank of 1, is displayed in the following table:

<table>
<thead>
<tr>
<th>Station number</th>
<th>Streamflow-gaging station</th>
<th>Percent of average streamflow for water year 2006</th>
<th>Rank of annual streamflow</th>
<th>Year of lowest annual streamflow (rank equals 1)</th>
<th>Number of years of annual record</th>
</tr>
</thead>
<tbody>
<tr>
<td>06208500</td>
<td>Clarks Fork Yellowstone River at Edgar, Mont., minus diversions to White Horse Canal</td>
<td>79</td>
<td>11</td>
<td>12</td>
<td>2001</td>
</tr>
<tr>
<td>06294500</td>
<td>Bighorn River above Tullock Creek, near Bighorn, Mont., minus Little Bighorn River near Hardin, Mont., adjusted for change in contents in Bighorn Lake</td>
<td>55</td>
<td>10</td>
<td>9</td>
<td>2003</td>
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<tr>
<td>06308500</td>
<td>Tongue River at Miles City, Mont.</td>
<td>37</td>
<td>5</td>
<td>25</td>
<td>1961</td>
</tr>
<tr>
<td>06326500</td>
<td>Powder River near Locate, Mont.</td>
<td>47</td>
<td>9</td>
<td>24</td>
<td>2004</td>
</tr>
</tbody>
</table>

1Average is based on period of record at station.

2The "normal" range defined in this report is 80 to 120 percent of average.
Tabulation of streamflow records for water year 2006 and graphical comparisons of statistical distribution of monthly and annual streamflow, and annual departures from mean annual streamflow are provided in the section “Summary of discharge for Yellowstone River Compact streamflow-gaging stations.” The tabulated streamflow records do not account for depletions for irrigation and other uses unless otherwise noted.

**Diversions**

No diversions were regulated by the Commission during water year 2006.

**Reservoir Contents**

**Reservoirs Completed after January 1, 1950**

Month-end and year-end usable contents and a description of these reservoirs are given in the section “Month-end contents for Yellowstone River Compact reservoirs completed after January 1, 1950.” Boysen Reservoir, located on the Wind River and operated by the Bureau of Reclamation, began the water year with 591,900 acre-feet in usable storage and ended the water year with 407,700 acre-feet. Anchor Reservoir began the water year with 269 acre-feet in usable storage and ended the water year with 233 acre-feet. Bighorn Lake, a Bureau of Reclamation storage project on the Bighorn River that is the largest in the Yellowstone River basin, contained 984,500 acre-feet of usable storage at the beginning of the water year and 745,800 acre-feet at the end of the water year. Daily usable contents of Bighorn Lake ranged from 720,000 acre-feet on September 2, 2006, to 1,009,000 acre-feet on October 16, 2005.

**Reservoirs Existing on January 1, 1950**

As a matter of record and general information, month-end usable contents data are given later in the report for four reservoirs in existence on January 1, 1950, upstream from the points of measurement. The reservoirs are Bull Lake, Pilot Butte Reservoir, Buffalo Bill Reservoir, and Tongue River Reservoir. These data are pertinent to allocation under Article V, Section C, Item 3 of the Compact. Month-end and year-end usable contents of these reservoirs are given in the section “Month-end contents for Yellowstone River Compact reservoirs existing on January 1, 1950.”

The storage capacity of Buffalo Bill Reservoir was increased in 1992 from 456,600 acre-feet to 644,540 acre-feet (listed as 646,565 acre-feet by Bureau of Reclamation). The storage capacity of Tongue River Reservoir was increased in 1999 from 68,000 acre-feet to 79,070 acre-feet.

**Annual Contents of Reservoirs**

Information on reservoir contents at the end of the current and previous water years for the 7 reservoirs listed above plus 23 additional reservoirs was compiled at the request of the Commission. The information is provided in the section “Water-year-end contents for Yellowstone River Compact reservoirs or lakes.”
Summary of Discharge for Yellowstone River Compact Streamflow-Gaging Stations

06208500 Clarks Fork Yellowstone River at Edgar, Mont.

LOCATION.--Lat 45°27'58", long 108°50'35" referenced to North American Datum of 1927, in SE 14 SE 14 SE 14 sec. 23, T.4 S., R.23 E., Carbon County, Hydrologic Unit 10070006, on right bank 400 ft downstream from county bridge, 0.5 mi east of Edgar, 6 mi upstream from Rock Creek, and at river mile 22.1.

DRAINAGE AREA.--2,022 mi².

PERIOD OF RECORD.--July 1921 to September 1969, October 1986 to current year.


GAGE.—Water-stage recorder. Elevation of gage is 3,460 ft, referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). Prior to Aug. 31, 1953, nonrecording gage located at the same site and elevation.

REMARKS.—Records are good except those for the estimated daily discharges, which are poor. Diversions for irrigation include about 41,500 acres, of which about 840 acres lie downstream from the station. In addition, about 6,300 acres of land upstream from the station are irrigated from diversions from the adjoining Rock Creek basin. U.S. Geological Survey satellite telemeter is located at the station. Several unpublished observations of water temperature and specific conductance were made during the year. Discharge values given herein have the diversions to White Horse Canal subtracted.

Table 1. Daily mean discharge for Clarks Fork Yellowstone River at Edgar, Mont., minus diversions to Whitehorse Canal, October 2005 to September 2006.

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<th>Day</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
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<td>505</td>
<td>e420</td>
<td>e460</td>
<td>388</td>
<td>415</td>
<td>314</td>
<td>839</td>
<td>1,780</td>
<td>1,540</td>
<td>179</td>
<td>81</td>
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<td>2</td>
<td>446</td>
<td>494</td>
<td>e390</td>
<td>e450</td>
<td>372</td>
<td>395</td>
<td>305</td>
<td>863</td>
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<td>1,620</td>
<td>159</td>
<td>96</td>
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<td>900</td>
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<td>2,120</td>
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<td>810</td>
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<td>325</td>
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MT v. WYMT.D. App.
504 (WY)
Table 1. Daily mean discharge for Clarks Fork Yellowstone River at Edgar, Mont., minus diversions to Whitehorse Canal, October 2005 to September 2006.—Continued

[Discharge is in cubic feet per second. Abbreviations: e, estimated; Max, maximum; Min, minimum; Acre-ft, acre-feet; WY, water year. Symbol: --, no data]

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<th>Feb</th>
<th>Mar</th>
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Total 17,818 16,060 13,420 12,640 9,851 10,059 7,695 3,294 2,986 8,496

Mean 575 535 433 408 352 324 282 2,482 2,900 819 96.3 283
Max 739 639 480 467 420 415 725 3,590 5,150 1,541 179 636
Min 446 447 370 340 170 297 294 602 1,520 211 66 81
Acre-ft 35,340 31,860 26,620 25,020 19,540 19,950 15,260 152,600 32,600 50,390 50,390

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1921–2006, BY WATER YEAR (WY)*

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<th>Feb</th>
<th>Mar</th>
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SUMMARY STATISTICS

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*During period of operation (water years 1921–69, 1987–2006).
Figure 1. Streamflow data for the Clarks Fork Yellowstone River at Edgar, Mont. (06208500), minus diversions to Whitehorse Canal, water years 1922–2006: A, Statistical distribution of monthly and annual streamflow; B, Annual departure from the mean annual streamflow.
**06294000 Little Bighorn River near Hardin, Mont.**

**LOCATION.**—Lat 45°44'09"N, long 107°33'24"W referenced to North American Datum of 1927, in SE 1/4 NE 1/4 NE 1/4 sec. 19, T.1 S., R.34 E., Big Horn County, Hydrologic Unit 10080016, on left bank 50 ft downstream from bridge on Sarpy Road, 0.2 mi upstream from terminal outfall of Agency Canal, 0.6 mi upstream from mouth, and 2.3 mi east of Hardin.

**DRAINAGE AREA.**—1,294 mi².

**PERIOD OF RECORD.**—June 1953 to current year.

**REVISED RECORDS.**—WDR MT-86-1: 1978.

**GAGE.**—Water-stage recorder. Elevation of gage is 2,882.29 ft (NGVD 29) (levels by U.S. Army Corps of Engineers). Prior to Oct. 7, 1953, nonrecording gage located at site 0.4 mi downstream. Oct. 7, 1953 to May 6, 1963, water-stage recorder located at site 0.3 mi downstream. May 6, 1963 to Nov. 6, 1963, nonrecording gage located at site 0.4 mi downstream. All locations had different elevations.

**REMARKS.**—Records are good except those for estimated daily discharges, which are poor. Flow partly regulated by Willow Creek Reservoir (capacity 23,000 acre-ft). Diversions for irrigation of 20,980 acres occur upstream from station. Discharge values given herein include flow of terminal outfall of Agency Canal. U.S. Geological Survey stage recorder is located at the station. Several unpublished observations of water temperature and specific conductance were made during the year.

**Table 2. Daily mean discharge for Little Bighorn River near Hardin, Mont., October 2005 to September 2006.**

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Table 2. Daily mean discharge for Little Bighorn River near Hardin, Mont., October 2005 to September 2006.—Continued

[Discharge is in cubic feet per second. Abbreviations: e, estimated; Max, maximum; Min, minimum; Acre-ft, acre-feet; WY, water year. Symbol: --, no data]

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Total 3,839 3,402 3,080 3,410 2,875 3,484 4,917 10,286 4,301 724.1 102.8 1,799.3

Mean 124 113 99.4 110 103 112 164 332 143 23.4 3.32 60.0

Max 176 126 110 110 130 171 240 759 352 53 7.2 148

Min 89 100 80 110 80 97 131 151 64 2.6 1.1 5.3

Acre-ft 7,610 6,750 6,110 6,760 5,700 6,910 9,750 20,400 8,530 1,440 204 3,570

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1954–2006, BY WATER YEAR (WY)

| Mean | 151 | 150 | 133 | 137 | 195 | 301 | 303 | 593 | 786 | 253 | 113 | 124 |
| Max  | 276 | 248 | 223 | 366 | 610 | 987 | 748 | 2,852| 1,981| 1,333| 382 | 267 |
| Min  | 60.7| 82.6| 65.6| 50.5| 68.5| 71.1| 54.8| 71.9 | 117 | 8.5 | 2.5 | 19.1 |

SUMMARY STATISTICS

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* Gage height, 11.20 feet.

* Site and datum then in use.

* Result of discharge measurement.
06294500 Bighorn River above Tullock Creek, near Bighorn, Mont.

LOCATION.—Lat 46°07'29"., long 107°28'06". referenced to North American Datum of 1927, in SE 1/4 SE 1/4 NE 1/4 sec. 3, T.4 N., R.34 E., Treasure County, Hydrologic Unit 10080015, on right bank 1.9 mi upstream from Tullock Creek, 3.6 mi southwest of Bighorn, 4.5 mi southeast of Custer, and at river mile 3.0.


PERIOD OF RECORD.—October 1981 to current year. Previously published as "06294700 Bighorn River at Bighorn, MT" from 1956-81, and as "06294700 Bighorn River near Custer" from 1945-55. Flows are equivalent at all sites.


REMARKS.—Water-discharge records are good except those for estimated daily discharges, which are poor. Flow is regulated by Bighorn Lake beginning November 1965 (usable capacity, 1,312,000 acre-ft). Major regulation occurred prior to November 1965 by 14 reservoirs in Wyoming and 1 in Montana with combined usable capacity of about 1,400,000 acre-ft. Diversion for irrigation of about 445,200 acres occurs upstream from station. U.S. Army Corps of Engineers satellite telemeter is located at the station. Several unpublished observations of water temperature and specific conductance were made during the year.

Table 3. Daily mean discharge for Bighorn River above Tullock Creek, near Bighorn, Mont., October 2005 to September 2008.

(Discharge is in cubic feet per second. Abbreviations: e, estimated; Max, maximum; Min, minimum; Acre-ft; acre-feet; WY, water year. Symbol: --, no data)

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8

MT v. WY/M.T. App. 599 (WY)
Table 3. Daily mean discharge for Bighorn River above Tullock Creek, near Bighorn, Mont., October 2005 to September 2006.
—Continued

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Table: Statistics of Monthly Mean Data for Water Years 1945 - 2006, by Water Year (WY)

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Summary Statistics

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Notes:
- Discharge is in cubic feet per second. Abbreviations: e, estimated; Max, maximum; Min, minimum; Acre-ft, acre-feet; WY, water year. Symbol: --, no data.
Table 3. Daily mean discharge for Bighorn River above Tullock Creek, near Bighorn, Mont., October 2005 to September 2006.—Continued

[Discharge is in cubic feet per second. Abbreviations: e, estimated; Max, maximum; Min, minimum; Acre-ft, acre-feet; WY, water year. Symbol: --, no data]

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* Prior to construction of Yellowtail Dam.
** After completion of Yellowtail Dam.
* Gage height, 2.59 feet.
* Backwater from ice.
* Gage height, 14.15 feet, at different site and datum.
* Result of ice jam, at different site and datum.
* Prior to construction of Yellowtail Dam.
* Gage height, 8.79 feet, at different site and datum.
Figure 2. Streamflow data for Bighorn River above Tullock Creek, near Bighorn, Mont. (08294500), minus Little Bighorn River near Hardin, Mont. (06940001); adjusted for change in contents of Bighorn Lake, water years 1965-2006: A, Statistical distribution of monthly and annual streamflow; B, Annual departure from the mean annual streamflow.
Table 4. Daily mean discharge for Tongue River at Miles City, Mont., October 2005 to September 2006.

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603 (WY)
Table 4. Daily mean discharge for Tongue River at Miles City, Mont., October 2005 to September 2006.—Continued

[Discharge is in cubic feet per second. Abbreviations: e, estimated; Max, maximum; Min, minimum; Acre-ft, acre-feet; WY, water year. Symbol: --, no data]

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<th>12,400</th>
<th>14,580</th>
<th>8,130</th>
<th>8,680</th>
<th>15,820</th>
<th>7,230</th>
<th>6,140</th>
<th>1,000</th>
<th>793</th>
<th>1,630</th>
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STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1938–2006, BY WATER YEAR (WY)*

<table>
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<tr>
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<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>239</td>
<td>248</td>
<td>187</td>
<td>191</td>
<td>210</td>
<td>515</td>
<td>425</td>
<td>674</td>
<td>1,232</td>
<td>449</td>
<td>175</td>
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<tr>
<td>Max</td>
<td>694</td>
<td>585</td>
<td>423</td>
<td>329</td>
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<td>1,783</td>
<td>1,693</td>
<td>2,983</td>
<td>3,825</td>
<td>2,207</td>
<td>700</td>
</tr>
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<td>74.5</td>
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<td>29.2</td>
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<th>Jun</th>
<th>Jul</th>
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<td>1,360</td>
<td>1,360</td>
<td>1,360</td>
<td>1,360</td>
</tr>
<tr>
<td>Min</td>
<td>12</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
<td>6.9</td>
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**SUMMARY STATISTICS**

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<th>Water Years 1938–2006*</th>
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<td>Annual total</td>
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<td>364</td>
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<td>1978</td>
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<td>57.2</td>
<td>1961</td>
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<tr>
<td>Highest daily mean</td>
<td>9,290</td>
<td>Jun 15, 1962</td>
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<tr>
<td>Lowest daily mean</td>
<td>9,290</td>
<td>Jun 15, 1962</td>
</tr>
<tr>
<td>Annual seven-day minimum</td>
<td>0.00</td>
<td>Jul 9, 1940</td>
</tr>
<tr>
<td>Maximum peak flow</td>
<td>2,630</td>
<td>May 24</td>
</tr>
<tr>
<td>Maximum peak stage</td>
<td>6.39</td>
<td>May 24</td>
</tr>
<tr>
<td>Instantaneous low flow</td>
<td>0.00</td>
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</tr>
<tr>
<td>Annual runoff (acre-ft)</td>
<td>263,400</td>
<td>105,500</td>
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<tr>
<td>16 percent exceeds</td>
<td>1,270</td>
<td>245</td>
</tr>
<tr>
<td>50 percent exceeds</td>
<td>166</td>
<td>138</td>
</tr>
<tr>
<td>90 percent exceeds</td>
<td>68</td>
<td>63</td>
</tr>
</tbody>
</table>

* During period of record (April 1938 to April 1942, April 1946 to 2006).
* Gage height, 11.33 feet, at previous site and datum.
* Ice jam, at previous site and datum used from 1963–95.
Figure 3. Streamflow data for the Tongue River at Miles City, Mont. (06308500), water years 1939–2006: A, Statistical distribution of monthly and annual streamflow; B, Annual departure from the mean annual streamflow.
06326500 Powder River near Locate, Mont.

LOCATION.—Lat 46°25'48", long 105°18'34" referenced to North American Datum of 1927, in SW 1/4 SW 1/4 SE 1/4 sec. 23, T.8 N., R.51 E., Custer County. Hydrologic Unit 10090209, on left bank at downstream side of bridge on U.S. Highway 12, 0.1 mi west of Locate, and 25 mi east of Miles City, and at river mile 29.4.

DRAINAGE AREA.—13,068 mi².

PERIOD OF RECORD.—March 1938 to current year.


REMARKS.—Water-discharge records are fair except those for estimated daily discharges, which are poor. Some regulation occurs by three reservoirs in Wyoming with combined usable capacity of 35,800 acre-ft. Diversions for irrigation of about 101,800 acres upstream from station. U.S. Army Corps of Engineers satellite telemeter is located at the station.

Table 5. Daily mean discharge for Powder River near Locate, Mont., October 2005 to September 2008.

<table>
<thead>
<tr>
<th>Day</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
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<tbody>
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<td>1</td>
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<td>180</td>
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<td>e210</td>
<td>e180</td>
<td>e190</td>
<td>324</td>
<td>581</td>
<td>493</td>
<td>34</td>
<td>2.3</td>
<td>e0.00</td>
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<tr>
<td>2</td>
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<td>e50</td>
<td>e210</td>
<td>e180</td>
<td>e500</td>
<td>332</td>
<td>552</td>
<td>443</td>
<td>33</td>
<td>3.5</td>
<td>e0.00</td>
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<tr>
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<td>e210</td>
<td>e180</td>
<td>e1,000</td>
<td>345</td>
<td>510</td>
<td>401</td>
<td>28</td>
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<td>e190</td>
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<td>e190</td>
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<td>e190</td>
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<td>880</td>
<td>865</td>
<td>319</td>
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<td>18</td>
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<td>e210</td>
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<td>e210</td>
<td>e160</td>
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Table 5. Daily mean discharge for Powder River near Locate, Mont., October 2005 to September 2006—Continued

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<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
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<td>e130</td>
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<td>e170</td>
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<td>1.7</td>
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<td>614</td>
<td>712</td>
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<td>0.02</td>
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<td>e210</td>
<td>e180</td>
<td>--</td>
<td>318</td>
<td>--</td>
<td>588</td>
<td>2.2</td>
<td>0.17</td>
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</table>

Total: 7,651, 5,788

Mean: 247 193 120 197 169 258 532 961 450 505 171 12.2 2.19 31.9

Max: 857 259 210 210 210 312 1,440

Min: 36 70 60 180 140 190 324 177 34 2.2 0.02 0.00

Acre-ft: 15,180 11,480

### STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939–2006, BY WATER YEAR (WY)

<table>
<thead>
<tr>
<th>WY</th>
<th>Calendar Year 2005</th>
<th>Water Year 2006</th>
<th>Water Years 1839–2008</th>
</tr>
</thead>
<tbody>
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<td></td>
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<tr>
<td>Max</td>
<td>921 790 417 476 3,850 4,627 3,062 5,970 8,045 2,015 1,096 898</td>
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<tr>
<td>Min</td>
<td>1.77 12.5 12.5 4.3 2.8 2 80 194 93 34 2.2 0.3 0.19</td>
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### SUMMARY STATISTICS

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<th>Water Year 2006</th>
<th>Water Years 1839–2008</th>
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<td>95,395.0</td>
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<tr>
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<tr>
<td>Maximum</td>
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<td>Lowest</td>
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<td>3,120 Apr 20 26,000 Feb 19, 1948</td>
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<tr>
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<td>0 Sep 1</td>
<td>0 Jan 16, 1950</td>
</tr>
<tr>
<td>Annual seven-day min</td>
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<td>0.04 Aug 29</td>
<td>0 Jan 16, 1950</td>
</tr>
<tr>
<td>Maximum peak flow</td>
<td>4,240</td>
<td>Apr 19</td>
<td>31,000 Feb 19, 1943</td>
</tr>
<tr>
<td>Maximum peak stage (ft)</td>
<td>5.29 Apr 19</td>
<td>*12.20 Mar 16, 1978</td>
<td></td>
</tr>
<tr>
<td>Instantaneous low flow</td>
<td>*0.00 Many days</td>
<td>0.00 Many days</td>
<td></td>
</tr>
</tbody>
</table>

Annual runoff (acre-ft) 297,200 189,200 403,200
10 percent exceeds 1,240 580 1,300
50 percent exceeds 196 180 228
90 percent exceeds 53 2.4 38

* Height, 11.23 feet, observed.
* Backwater from ice.
Figure 4. Streamflow data for the Powder River near Locate, Mont. (06326500), water years 1939–2006: A, Statistical distribution of monthly and annual streamflow; B, Annual departure from the mean annual streamflow.
Month-End Contents for Yellowstone River Compact Reservoirs\(^1\) Completed after January 1, 1950

**06258900 Boysen Reservoir, Wyo.**

LOCATION.—Lat 43°25'00", long 108°10'37" (NAD 27), in NW ¼ NW ¼ sec. 16, T.5 N., R.6 E., Fremont County, Hydrologic Unit 10080005, at dam on Wind River and 13 mi north of Shoshoni, Wyo.

DRAINAGE AREA.—7,700 mi\(^2\).

PERIOD OF RECORD.—October 1951 to current year (month-end contents only).

GAGE.—Water-stage recorder. Datum of gage is NGVD of 1929 (levels by Bureau of Reclamation).

REMARKS.—Reservoir is formed by rock-fill dam completed in October 1951. Storage began Oct. 11, 1951. Usable capacity is 701,500 acre-ft between elevation 4,657.00 ft, invert of penstock pipe, and 4,725.00 ft, top of spillway gate. Dead storage is 40,080 acre-ft below elevation 4,657.00 ft. Prior to Jan. 1, 1966, usable capacity was 757,800 acre-ft and dead storage was 62,000 acre-ft at same elevations. Between January 1966 and October 1996, usable capacity was 742,100 acre-ft and dead storage was 59,880 acre-ft, at same elevations. Crest of dam is at elevation 4,758.00 ft. Water used for irrigation, flood control, and power generation.

COOPERATION.—Elevations and capacity table furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.—Maximum daily contents, 862,500 acre-ft, July 6, 7, 1967, elevation, 4,730.83 ft; minimum daily contents since normal use of water started, 191,900 acre-ft, Mar. 18, 19, 1956, elevation, 4,684.18 ft, capacity table then in use.

EXTREMES FOR CURRENT YEAR.—Maximum daily contents, 591,300 acre-ft, Oct. 6, 7, elevation, 4,719.03 ft; minimum daily contents, 402,500 acre-ft, Sept. 17, elevation, 4,706.22 ft.

**Table 6.** Month-end contents for Boysen Reservoir, Wyo.

<table>
<thead>
<tr>
<th>Date</th>
<th>Water-surface elevation, in feet</th>
<th>Usable contents, in acre-feet</th>
<th>Change in usable contents, in acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 30, 2005</td>
<td>4,719.06</td>
<td>591,900</td>
<td>-</td>
</tr>
<tr>
<td>October 31</td>
<td>4,718.80</td>
<td>587,400</td>
<td>-4,500</td>
</tr>
<tr>
<td>November 30</td>
<td>4,718.27</td>
<td>578,400</td>
<td>-9,000</td>
</tr>
<tr>
<td>December 31</td>
<td>4,716.91</td>
<td>555,800</td>
<td>-22,600</td>
</tr>
<tr>
<td>January 31, 2006</td>
<td>4,716.16</td>
<td>543,800</td>
<td>-12,000</td>
</tr>
<tr>
<td>February 28</td>
<td>4,715.30</td>
<td>530,200</td>
<td>-13,600</td>
</tr>
<tr>
<td>March 31</td>
<td>4,714.42</td>
<td>516,700</td>
<td>-13,500</td>
</tr>
<tr>
<td>April 30</td>
<td>4,713.58</td>
<td>504,100</td>
<td>-12,600</td>
</tr>
<tr>
<td>May 31</td>
<td>4,713.91</td>
<td>509,000</td>
<td>4,900</td>
</tr>
<tr>
<td>June 30</td>
<td>4,713.58</td>
<td>504,100</td>
<td>-4,900</td>
</tr>
<tr>
<td>July 31</td>
<td>4,710.53</td>
<td>460,000</td>
<td>-44,100</td>
</tr>
<tr>
<td>August 31</td>
<td>4,707.30</td>
<td>416,400</td>
<td>-43,600</td>
</tr>
<tr>
<td>September 30, 2006</td>
<td>4,706.63</td>
<td>407,700</td>
<td>-8,700</td>
</tr>
<tr>
<td>2006 water year</td>
<td></td>
<td></td>
<td>-184,200</td>
</tr>
</tbody>
</table>

\(^1\)Wyoming disagrees with the term "Compact reservoirs" as used throughout this annual report. Wyoming's acceptance of this annual report should not be construed as Wyoming's acceptance of the use of that term.
06260300 Anchor Reservoir, Wyo.

LOCATION.—Lat 43°39'50", long 108°49'27" (NAD 27), in sec. 26, T.43 N., R.100 W., Hot Springs County, Hydrologic Unit 10080007, at dam on South Fork Owl Creek, 2 mi downstream from Middle Fork, 3 mi southeast of Anchor, and 32 mi west of Thermopolis, Wyo.

DRAINAGE AREA.—131 mi².

PERIOD OF RECORD.—November 1960 to current year (month-end contents only).

GAGE.—Water-stage recorder. Datum of gage is NGVD of 1929 (Bureau of Reclamation benchmark).

REMARKS.—Reservoir is formed by concrete arch dam completed in 1960. Usable capacity, 17,410 acre-ft (revised) between elevation 6,343.75 ft, invert of river outlet, and 5,441.00 ft, spillway crest, including 68 acre-ft below elevation 6,343.75 ft. Prior to Oct. 1, 1971, usable capacity was 17,280 acre-ft, including 149 acre-ft below the invert. Water is used for irrigation of land in Owl Creek basin.

COOPERATION.—Elevations and capacity table furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.—Maximum daily contents, 9,250 acre-ft, July 4, 1967, elevation, 6,418.52 ft; no usable contents on many days some years.

EXTREMES FOR CURRENT YEAR.—Maximum daily contents, 628 acre-ft, May 18, elevation, 6,465.00 ft; minimum daily contents, 212 acre-ft, many days, elevation, 6,353.00 ft.

Table 7. Month-end contents for Anchor Reservoir, Wyo.

<table>
<thead>
<tr>
<th>Date</th>
<th>Water-surface elevation, in feet</th>
<th>Usable contents, in acre-feet</th>
<th>Change in usable contents, in acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 30, 2005</td>
<td>6,355.50</td>
<td>269</td>
<td>—</td>
</tr>
<tr>
<td>October 31</td>
<td>6,360.50</td>
<td>433</td>
<td>164</td>
</tr>
<tr>
<td>November 30</td>
<td>6,357.50</td>
<td>330</td>
<td>-103</td>
</tr>
<tr>
<td>December 31</td>
<td>6,356.50</td>
<td>299</td>
<td>-31</td>
</tr>
<tr>
<td>January 31, 2006</td>
<td>6,355.00</td>
<td>254</td>
<td>-45</td>
</tr>
<tr>
<td>February 28</td>
<td>6,358.00</td>
<td>345</td>
<td>91</td>
</tr>
<tr>
<td>March 31</td>
<td>6,358.00</td>
<td>345</td>
<td>0</td>
</tr>
<tr>
<td>April 30</td>
<td>6,355.30</td>
<td>263</td>
<td>-82</td>
</tr>
<tr>
<td>May 31</td>
<td>6,358.00</td>
<td>345</td>
<td>82</td>
</tr>
<tr>
<td>June 30</td>
<td>6,356.50</td>
<td>299</td>
<td>-46</td>
</tr>
<tr>
<td>July 31</td>
<td>6,353.00</td>
<td>212</td>
<td>-87</td>
</tr>
<tr>
<td>August 31</td>
<td>6,353.00</td>
<td>212</td>
<td>0</td>
</tr>
<tr>
<td>September 30, 2006</td>
<td>6,354.00</td>
<td>233</td>
<td>21</td>
</tr>
</tbody>
</table>

2006 water year

[—, no data]
06286400 Bighorn Lake near St. Xavier, Mont.

LOCATION.—Lat 45°18’27", long 107°57’26" (NAD 27), in SW ¼ SE ¼ sec.18, T.6 S., R.30 E., Big Horn County, Hydrologic Unit 10080010, in block 13 of Yellowtail Dam on Bighorn River, 1.3 mi upstream from Grapevine Creek, 15.5 mi southwest of St. Xavier, Mont., and at river mile 86.6.

DRAINAGE AREA.—19,626 mi².

PERIOD OF RECORD.—November 1965 to current year (month-end contents only). Prior to October 1969, published as "Yellowtail Reservoir." Records of daily elevations and contents are on file at the USGS Montana Water Science Center office in Helena, Mont.

GAGE.—Water-stage recorder located in powerhouse control room. Datum of gage is 3,296.5 ft (levels by Bureau of Reclamation).

REMARKS.—Reservoir is formed from thin concrete-arch dam; construction began in 1961 and was completed in 1967. Storage began Nov. 3, 1965. Usable capacity is 1,312,000 acre-ft, between elevation 3,296.50 ft, river outlet invert, and 3,657.00 ft, top of flood control. Elevation of spillway crest is 3,593.00 ft. Normal maximum operating level is 1,097,000 acre-ft, between elevation, 3,640.00 ft and 3,657.00. Minimum operating level is 483,400 acre-ft, elevation, 3,547.00 ft. Dead storage is 16,010 acre-ft, below elevation 3,296.50 ft. Water is used for power production, flood control, irrigation, and recreation.

COOPERATION.—Elevations and capacity table furnished by Bureau of Reclamation.

EXTREMES FOR PERIOD OF RECORD.—Maximum contents, 1,346,000 acre-ft, July 6, 1967, elevation, 3,656.43 ft; minimum contents since first filling, 591,400 acre-ft, Mar. 11, 2003, elevation, 3,572.81 ft.

EXTREMES FOR CURRENT YEAR.—Maximum contents, 1,009,000 acre-ft, Oct. 16, elevation, 3,636.25 ft; minimum contents, 720,000 acre-ft, Sept. 2, elevation, 3,598.43 ft.

Table 8. Month-end contents for Bighorn Lake, Mont.

[=, no data]

<table>
<thead>
<tr>
<th>Date</th>
<th>Water-surface elevation, in feet</th>
<th>Usable contents, in acre-feet</th>
<th>Change in usable contents, in acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 30, 2005</td>
<td>3,634.03</td>
<td>984,500</td>
<td>—</td>
</tr>
<tr>
<td>October 31</td>
<td>3,635.11</td>
<td>996,300</td>
<td>11,700</td>
</tr>
<tr>
<td>November 30</td>
<td>3,631.34</td>
<td>956,600</td>
<td>-39,600</td>
</tr>
<tr>
<td>December 31</td>
<td>3,626.41</td>
<td>910,400</td>
<td>-46,200</td>
</tr>
<tr>
<td>January 31, 2006</td>
<td>3,621.58</td>
<td>870,000</td>
<td>-40,400</td>
</tr>
<tr>
<td>February 28</td>
<td>3,616.26</td>
<td>829,700</td>
<td>-40,300</td>
</tr>
<tr>
<td>March 31</td>
<td>3,613.08</td>
<td>807,400</td>
<td>-22,300</td>
</tr>
<tr>
<td>April 30</td>
<td>3,606.89</td>
<td>768,100</td>
<td>-39,300</td>
</tr>
<tr>
<td>May 31</td>
<td>3,611.38</td>
<td>796,100</td>
<td>28,000</td>
</tr>
<tr>
<td>June 30</td>
<td>3,612.95</td>
<td>805,500</td>
<td>10,400</td>
</tr>
<tr>
<td>July 31</td>
<td>3,604.66</td>
<td>754,900</td>
<td>-51,600</td>
</tr>
<tr>
<td>August 31</td>
<td>3,598.50</td>
<td>720,400</td>
<td>-34,500</td>
</tr>
<tr>
<td>September 30, 2006</td>
<td>3,603.07</td>
<td>745,800</td>
<td>25,400</td>
</tr>
<tr>
<td>2006 water year</td>
<td></td>
<td></td>
<td>-238,700</td>
</tr>
</tbody>
</table>
Month-End Contents for Yellowstone River Compact Reservoirs1 Existing on January 1, 1950

The extent, if any, to which the use of reservoirs in this section may be subject to Compact allocations was not determined. As a matter of hydrologic interest, the month-end usable contents, in acre-feet, of four reservoirs are given. The first three reservoirs are in the Bighorn River basin, Wyoming, and data on contents were furnished by the Bureau of Reclamation. The Tongue River Reservoir, Montana, is operated under the supervision of the Water Resources Division of the Montana Department of Natural Resources and Conservation, which furnished the water-level data and the reservoir-capacity table.

Table 9. Month-end contents for Yellowstone River Compact reservoirs1 existing on January 1, 1950.

<table>
<thead>
<tr>
<th>Date</th>
<th>Usable contents, in acre-feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>06224500 Bull Lake</td>
</tr>
<tr>
<td>September 30, 2005</td>
<td>66,100</td>
</tr>
<tr>
<td>October 31</td>
<td>69,160</td>
</tr>
<tr>
<td>November 30</td>
<td>70,430</td>
</tr>
<tr>
<td>December 31</td>
<td>71,370</td>
</tr>
<tr>
<td>January 31, 2006</td>
<td>72,150</td>
</tr>
<tr>
<td>February 28</td>
<td>72,270</td>
</tr>
<tr>
<td>March 31</td>
<td>72,320</td>
</tr>
<tr>
<td>April 30</td>
<td>72,800</td>
</tr>
<tr>
<td>May 31</td>
<td>90,950</td>
</tr>
<tr>
<td>June 30</td>
<td>128,000</td>
</tr>
<tr>
<td>July 31</td>
<td>114,600</td>
</tr>
<tr>
<td>August 31</td>
<td>70,550</td>
</tr>
<tr>
<td>September 30, 2006</td>
<td>50,540</td>
</tr>
<tr>
<td>Change in contents during water year</td>
<td>-15,560</td>
</tr>
</tbody>
</table>

1Wyoming disagrees with the term "Compact reservoirs" as used throughout this annual report. Wyoming's acceptance of this annual report should not be construed as Wyoming's acceptance of the use of that term.

2Pre-Compact water rights and post-Compact water rights for these reservoirs are presented in the table, "Water-year-end contents for Yellowstone River Compact reservoirs or lakes."
### Water-Year-End Contents for Yellowstone River Compact Reservoirs or Lakes

Table 10. Water-year-end contents for Yellowstone River Compact reservoirs or lakes.

(Content are in acre-feet. Reservoirs or lakes are listed in alphabetical order by drainage basin. Symbol: --, no data or not available)

<table>
<thead>
<tr>
<th>Reservoir or lake name</th>
<th>Pre-compact 1950 water right</th>
<th>Post-compact 1950 water right</th>
<th>Usable capacity</th>
<th>Usable contents on Sept. 30, 2006</th>
<th>Usable contents on Sept. 30, 2005</th>
<th>Change in usable contents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bighorn River basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Lake) Adelaide Reservoir</td>
<td>1,450</td>
<td>4,760</td>
<td>6,210</td>
<td>450</td>
<td>2,000</td>
<td>-1,550</td>
</tr>
<tr>
<td>Anchor Reservoir</td>
<td>17,410</td>
<td>0</td>
<td>17,410</td>
<td>233</td>
<td>269</td>
<td>-36</td>
</tr>
<tr>
<td>Bighorn Lake</td>
<td>--</td>
<td>1,116,000</td>
<td>1,312,000</td>
<td>745,800</td>
<td>984,500</td>
<td>-238,700</td>
</tr>
<tr>
<td>Boysen Reservoir</td>
<td>701,500</td>
<td>0</td>
<td>701,500</td>
<td>407,700</td>
<td>591,900</td>
<td>-184,200</td>
</tr>
<tr>
<td>Buffalo Bill Reservoir</td>
<td>456,600</td>
<td>190,000</td>
<td>646,600</td>
<td>441,100</td>
<td>450,300</td>
<td>-9,200</td>
</tr>
<tr>
<td>Bull Lake</td>
<td>152,000</td>
<td>0</td>
<td>152,000</td>
<td>50,540</td>
<td>66,100</td>
<td>-15,560</td>
</tr>
<tr>
<td>Greybull Valley Reservoir</td>
<td>0</td>
<td>33,170</td>
<td>33,170</td>
<td>322</td>
<td>8,000</td>
<td>-24,170</td>
</tr>
<tr>
<td>Pilot Butte Reservoir</td>
<td>34,600</td>
<td>0</td>
<td>34,600</td>
<td>1,020</td>
<td>13,300</td>
<td>-12,280</td>
</tr>
<tr>
<td>Sunshine Reservoir</td>
<td>52,990</td>
<td>0</td>
<td>52,990</td>
<td>5,960</td>
<td>24,000</td>
<td>-18,040</td>
</tr>
<tr>
<td>Lower Sunshine Reservoir</td>
<td>42,640</td>
<td>42,300</td>
<td>84,940</td>
<td>720</td>
<td>21,000</td>
<td>-20,280</td>
</tr>
<tr>
<td><strong>Powder River basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cloud Peak Reservoir</td>
<td>3,400</td>
<td>172</td>
<td>3,570</td>
<td>0</td>
<td>3,570</td>
<td>-3,270</td>
</tr>
<tr>
<td>Dull Knife Reservoir</td>
<td>--</td>
<td>4,320</td>
<td>4,320</td>
<td>63</td>
<td>1,314</td>
<td>-1,251</td>
</tr>
<tr>
<td>Healy Reservoir</td>
<td>--</td>
<td>5,140</td>
<td>5,140</td>
<td>1,336</td>
<td>4,652</td>
<td>-3,316</td>
</tr>
<tr>
<td>Kearney Reservoir</td>
<td>1,850</td>
<td>4,470</td>
<td>6,320</td>
<td>1,085</td>
<td>2,564</td>
<td>-1,479</td>
</tr>
<tr>
<td>Lake DeSmet</td>
<td>37,520</td>
<td>197,500</td>
<td>235,000</td>
<td>187,278</td>
<td>206,672</td>
<td>-19,394</td>
</tr>
<tr>
<td>Muddy Guard Reservoir</td>
<td>--</td>
<td>2,340</td>
<td>2,340</td>
<td>500</td>
<td>492</td>
<td>8</td>
</tr>
<tr>
<td>Tie Hack Reservoir</td>
<td>1,650</td>
<td>2,440</td>
<td>2,440</td>
<td>1,921</td>
<td>2,440</td>
<td>-519</td>
</tr>
<tr>
<td>Willow Park Reservoir</td>
<td>4,460</td>
<td>--</td>
<td>4,460</td>
<td>451</td>
<td>2,395</td>
<td>-2,445</td>
</tr>
<tr>
<td><strong>Tongue River basin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bighorn Reservoir</td>
<td>2,750</td>
<td>1,880</td>
<td>4,630</td>
<td>584</td>
<td>670</td>
<td>-86</td>
</tr>
<tr>
<td>Cross Creek Reservoir</td>
<td>--</td>
<td>798</td>
<td>798</td>
<td>309</td>
<td>474</td>
<td>-165</td>
</tr>
<tr>
<td>Dome Reservoir</td>
<td>1,840</td>
<td>188</td>
<td>2,030</td>
<td>1,309</td>
<td>1,177</td>
<td>32</td>
</tr>
<tr>
<td>Granger Reservoir</td>
<td>146</td>
<td>--</td>
<td>146</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Last Chance Reservoir</td>
<td>90</td>
<td>--</td>
<td>90</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Martin Reservoir</td>
<td>561</td>
<td>--</td>
<td>561</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Park Reservoir</td>
<td>7,350</td>
<td>3,020</td>
<td>10,360</td>
<td>3,088</td>
<td>4,684</td>
<td>-1,596</td>
</tr>
<tr>
<td>Sawmill Lakes Reservoir</td>
<td>--</td>
<td>1,280</td>
<td>1,280</td>
<td>746</td>
<td>825</td>
<td>-79</td>
</tr>
<tr>
<td>Tongue River Reservoir</td>
<td>79,070</td>
<td>--</td>
<td>79,070</td>
<td>42,720</td>
<td>43,760</td>
<td>-1,040</td>
</tr>
<tr>
<td>Twin Lakes Reservoir</td>
<td>1,180</td>
<td>2,220</td>
<td>3,400</td>
<td>2,842</td>
<td>3,013</td>
<td>-171</td>
</tr>
<tr>
<td>Weston Reservoir</td>
<td>370</td>
<td>--</td>
<td>370</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Willis Reservoir</td>
<td>79</td>
<td>--</td>
<td>79</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

1Wyoming disagrees with the term "Compact reservoirs" as used throughout this annual report. Wyoming’s acceptance of this annual report should not be construed as Wyoming’s acceptance of the use of that term. 2 Reservoirs managed by the State of Wyoming.

3Reservoirs managed by the State of Wyoming.
4Reservoirs managed by Bureau of Reclamation.
5Data are combined contents of Dome Lake and Dome Lake Reservoir.
6Reservoirs managed by the State of Montana.
7Data are combined contents of Twin Lakes Number 1 and Twin Lakes Number 2.
RULES AND REGULATIONS FOR ADMINISTRATION OF THE YELLOWSTONE RIVER COMPACT

A compact, known as the Yellowstone River Compact, between the States of Wyoming, Montana, and North Dakota, having become effective on October 30, 1951, upon approval of the Congress of the United States, which apportions the waters of certain interstate tributaries of the Yellowstone River which are available after the appropriative rights existing in the States of Wyoming and Montana on January 1, 1950 are supplied, and after appropriative rights to the use of necessary supplemental water are also supplied as specified in the Compact, is administered under the following rules and regulations subject to the provisions for amendment revision or abrogation as provided herein.

Article I. Collection of Water Records

A. It shall be the joint and equal responsibility of the members of the States of Wyoming and Montana to collect, cause to be collected, or otherwise furnish records of tributary streamflow at the points of measurement specified in Article V (B) of the Compact, or as near thereto as is physically or economically feasible or justified.

1. Clarks Fork

The gaging station known as Clarks Fork near Silesia, Montana and located in NW1/4 SE1/4 sec. 1, T. 4 S., R. 23 E., shall be the point of measurement for the Clarks Fork.

2. Bighorn River (exclusive of Little Bighorn River)

The gaging station known as the Bighorn River above Tullock Creek, near Bighorn, Montana, and located in SE1/4 SE1/4 NE1/4 sec. 3, T. 4 N., R. 34 E., shall temporarily be the designated point of measurement on that stream. The flow of the Little Bighorn River as measured at the gaging station near Hardin, Montana, and located in SE1/4 NE1/4 NE1/4 sec. 19, T. 1 S., R. 34 E., shall be considered the point of measurement for that stream, except that if or when satisfactory records are not available, the records for the nearest upstream station with practical corrections for intervening inflow or diversion shall be used.

3. Tongue River

The gaging station known as the Tongue River at Miles City, Montana, and located in NE1/4 NE1/4 SE1/4 sec. 23, T. 7 N., R. 47 E., shall temporarily be the point of measurement for that stream.
4. Powder River

The gaging station known as the Powder River near Locate, Montana, and located in NW1/4 SW1/4 sec. 14, T. 8 N., R. 51 E., shall temporarily be the designated point of measurement for that stream.

B. Records of total annual diversion in acre-feet above the points of measurement designated in the Compact for irrigation, municipal, and industrial uses developed after January 1, 1950, shall be furnished by the members of the Commission for their respective States, at such time as the Commission deems necessary for interstate administration as provided by the terms of the Compact. Providing that if it be acceptable to the Commission, reasonable estimates thereof may be substituted.

C. Annual records of the net change in storage in all reservoirs, not excluded under Article V (E) of the Compact, above the point of measurement specified in the Compact and completed after January 1, 1950, and the annual net change in reservoirs existing prior to January 1, 1950, which is used for irrigation, municipal, and industrial purposes developed after January 1, 1950, shall be the primary responsibility of the member of the Commission in whose State such works are located; providing such data are not furnished by Federal agencies under the provisions of Article III (D) of the Compact, or collected by the Commission.

Article II. Office and Officers

A. The office of the Commission shall be located at the office of the Chairman of the Commission.

B. The Chairman of the Commission shall be the Federal representative as provided in the Compact.

C. The Secretary of the Commission shall be as provided for in Article III of these rules.

D. The credentials of each member of the Commission shall be placed on file in the office of the Commission.

Article III. Secretary

A. The Commission, subject to the approval of the Director of the United States Geological Survey, shall enter into cooperative agreements with the U.S. Geological Survey for such engineering and clerical services as may reasonably be necessary for the administration of the Compact. Said agreements shall provide that the Geological Survey shall:
1. Maintain and operate gaging stations at or near the points of measurement specified in Article V (A) of the Compact.

2. Assemble factual information on stream flow, diversion, and reservoir storage for the preparation of an annual report to the Governors of the signatory States.

3. Make such investigations and reports as may be requested by the Commission in aid of its administration of the Compact.

B. The Geological Survey shall act as Secretary to the Commission.

Article IV. Budget

A. At the annual meeting of each even-numbered year or prior thereto, the Commission shall adopt a budget for operation during the ensuing biennium beginning July first. Such budget shall set forth the total cost of construction, maintenance and operation of gaging stations, the cost of engineering and clerical aid, and other necessary expenses excepting the salaries and personal expenses of the Commissioners. On odd-numbered years revisions of the budget shall be considered.

B. It shall be the obligation of the Commissioners of the States of Montana and Wyoming to endeavor to secure from the Legislature of their respective States sufficient funds with which to meet the obligations of this Compact, except insofar as provided by the Federal government.

Article V. Meetings

An annual meeting of the Commission shall be held each November at some mutually agreeable point in the Yellowstone River Basin for consideration of the annual report for the water year ending the preceding September 30th, and for the transaction of such other business consistent with its authority; provided that by unanimous consent of the Commission the date and place of the annual meeting may be changed. Other meetings as may be deemed necessary shall be held at a time and place set by mutual agreement, for the transaction of any business consistent with its authority.
No action of the Commission shall be effective until approval by the Commissioners for the States of Wyoming and Montana.

Article VI. Amendments, Revisions and Abrogations.

The Rules and Regulations of the Commission may be amended or revised by a unanimous vote at any meeting of the Commission.

Gary Fritz
Commissioner for Montana

George J. Christopulos
Commissioner for Wyoming

ATTESTED:

L. Grady Moore
Federal Representative

Adopted November 17, 1953
Amended December 16, 1986
RULES FOR THE RESOLUTION OF DISPUTES
OVER THE ADMINISTRATION OF THE
YELLOWSTONE RIVER COMPACT

December 19, 1995

Section I. General Framework

According to Article III(F) of the Yellowstone River Compact.

"In case of the failure of the representatives of Wyoming and Montana to unanimously agree on any matter necessary to the proper administration of this compact, then the member selected by the director of the United States Geological Survey shall have the right to vote upon the matters in disagreement and such points of disagreement shall then be decided by a majority vote of the representatives of the states of Wyoming and Montana and said member selected by the director of the United States geological survey, each being entitled to one vote."

Section II. Purpose and Goal

A. The purpose of these rules is to clarify and more fully develop the dispute resolution process outlined in Section I.

B. The goal of the dispute resolution process outlined in these rules is to encourage joint problem solving and consensus building. It consists of three phases -- unassisted negotiation, facilitation, and voting.

C. Any agreement reached through this process is binding on Montana, Wyoming, and the United States Geological Survey (USGS).

D. Either state can initiate the dispute resolution process defined in Sections IV, V, and VI, and the other state is obligated to participate in good faith. The states agree that the issues pursued under this dispute resolution process shall be both substantive and require timely resolution.

Section III. Consensus

A. In the process of administering the Yellowstone River Compact, the representatives from Montana and Wyoming agree to seek consensus.

B. For purposes of this rule, consensus is defined as an agreement that is reached by identifying the interests of Montana and Wyoming and then building an integrative solution that maximizes the satisfaction of as many of the interests as possible. The process of seeking consensus does not involve voting, but a synthesis and blending of alternative solutions.
Section IV. Unassisted Negotiation

A. In all situations, the representatives from Montana and Wyoming shall first attempt to seek consensus through unassisted negotiation. The federal representative will not serve as chairperson in the unassisted negotiation process.

B. During a negotiation process, the representatives from Montana and Wyoming shall identify issues about which they differ. educate each other about their needs and interests, generate possible resolution options, and collaboratively seek a mutually acceptable solution.

C. To help facilitate negotiations, the representatives from Montana and Wyoming in cooperation with the USGS agree to share technical information and develop joint data bases. Other data sources may also be used.

D. The USGS shall serve as technical advisor in the two-state negotiations.

Section V. Facilitation

A. If the representatives from Montana and Wyoming are not able to reach consensus through unassisted negotiation, they shall each identify, articulate, and exchange, in writing, the unresolved issues.

B. The representatives from Montana and Wyoming shall then jointly appoint a facilitator to assist in resolving the outstanding dispute. If the representatives from Montana and Wyoming cannot identify a mutually acceptable facilitator, the representative appointed by the USGS shall appoint a facilitator.

C. A facilitator, for purposes of this rule, is defined as a neutral third party that shall help the representatives from Montana and Wyoming communicate, negotiate, and reach agreements voluntarily. The facilitator is not empowered to vote or render a decision.

D. The facilitator shall assist the representatives from Montana and Wyoming in developing appropriate ground rules for each facilitated session including establishing a deadline for completion of the facilitation process, setting an appropriate agenda, identifying issues, collecting and analyzing technical information, developing options, packaging agreements, and preparing a written agreement. The facilitator reserves the right to meet privately with each representative during the facilitation process.

Section VI. Voting

A. If, and only if, the representatives from Montana and Wyoming are unable to reach consensus with the assistance of a facilitator, then a dispute may be settled by voting.

B. The representatives from Montana and Wyoming, along with the representative appointed by the director of the USGS, are each entitled to one vote.

C. If the USGS representative does not vote in accordance with Article III, then the director of the USGS will select, with concurrence from Wyoming and Montana, a neutral third party to vote.
D. If the representative appointed by the director of the USGS is not involved in the steps outlined in Sections IV and V, each state shall have the opportunity to present appropriate information to that representative. This information may be presented through both oral presentations and written documents. All information will be shared with the other state.

The representative of the USGS may also consult the facilitator referenced in Section V in an attempt to resolve any disputes.

E. The USGS shall pay the expenses of the representative appointed by the director of the USGS.

F. Points of disagreement shall be resolved by a majority vote.

Section VII. Funding

A. The USGS will pay one-half and the states of Montana and Wyoming shall each pay one-quarter of the expenses of the facilitator, which shall not exceed $10,000, unless agreed to by both states and the USGS.

Section VIII. Amendments

A. These rules may be amended or revised by a unanimous vote of the Commission.

Section IX. Execution

These rules for the resolution of disputes over the administration of the Yellowstone River Compact are hereby executed on the date indicated below.

Gary Fritz
Commissioner for Montana

Gordon W. Fassett
Commissioner for Wyoming

William F. Horak
Federal Representative

Date

July 22, 1996
RULES FOR ADJUDICATING WATER RIGHTS ON INTERSTATE DITCHES

Article I. Purpose

The purpose of this rule is to determine and adjudicate, in accordance with the laws of Montana and Wyoming, those pre-Compact (January 1, 1950) water rights diverting from the Powder, Tongue, Bighorn and Clarks Fork Rivers and their tributaries where the point of diversion is in one State and the place of use is in the other State which have not yet been adjudicated.

Article II. Authority

In accordance with the Yellowstone River Compact, the State of Montana and the State of Wyoming, being moved by consideration of interstate comity, desire to remove all causes of present and future controversy between the States and between persons in one State and persons in another State with respect to these interstate ditches. Article III (E) of the Compact provides the Yellowstone River Compact Commission with the authority "$... to formulate rules and regulations and to perform any act which they may find necessary to carry out the provisions of this Compact...."

Article III. Definitions

The terms defined in the Yellowstone River Compact apply as well as the following definitions:

1. "Acre-feet" means the volume of water that would cover 1 acre of land to a depth of 1 foot.

2. "Cfs" means a flow of water equivalent to a volume of 1 cubic foot that passes a point in 1 second of time and is equal to 40 miners inches in Montana.

3. "Interstate Ditches" shall include ditches and canals which convey waters of the Bighorn, Tongue, Powder, and Clarks Fork Rivers and their tributaries across the Wyoming-Montana State line where the water is diverted in one State and the place of use is in the other State.

4. "Department of Natural Resources and Conservation," hereafter called the "Department," means the administrative agency and Department of the Executive Branch of the Government of Montana created under Title II, Chapter 15, MCA which has the responsibility for water administration in that State.
5. "Water Court" means a Montana District Court presided over by a water judge, as provided for in Title III, Chapter 7, MCA.

6. "State Engineer" shall be the current holder of the position created by the Wyoming Constitution as Chief Water Administration Official for the State of Wyoming.

7. "Board of Control," hereinafter called the "Board," is defined as the constitutionally created water management agency in Wyoming composed of the four Water Division Superintendents and the State Engineer.

8. "Superintendent" is the member of the Board who is the water administration official for the Water Division where the interstate ditch is located. (The two Water Divisions in the Yellowstone River drainage are Water Division Numbers Two and Three.)

9. "Date of Priority" shall mean the earliest date of actual beneficial use of water, unless evidence and circumstances pertaining to a particular claim establish an earlier date.

10. "Point of Diversion" is defined to be the legal land description by legal subdivision, section, township, and range of the location of the diversion structure for an interstate ditch from a natural stream channel.

11. "Place of Use" is defined to be the legal land description (legal subdivision, section, township, and range) of the lands irrigated by an interstate ditch.

12. "Person" is defined as an individual, a partnership, a corporation, a municipality or any other legal entity, public or private.

13. "Claimant" is defined as any person claiming the use of water from an interstate ditch as herein defined.

Article IV. Procedures

The procedures for determining and adjudicating water rights associated with interstate ditches shall be categorized as follows: (A) Where the point of diversion is in Wyoming and place of use in Montana, and (B) Where the point of diversion is in Montana and place of use in Wyoming.
A. Wyoming Procedure

1. The Yellowstone River Compact Commission will provide a claim form to be completed by the claimant that will describe the location and point of diversion and land being irrigated, the priority date claimed, method of irrigation and such other information required to describe the claim. (A sample form for this purpose is attached.)

2. The Yellowstone River Compact Commission will send the claim form to water users on the interstate ditches.

3. Water users will complete the claim form and file it with the Yellowstone Compact Commission, which, when found to be correct and complete, will be forwarded to the Board for verification.

4. Upon receipt of the form, the Board shall forward it to the appropriate Superintendent, who, in cooperation with the Department, will validate the information including the use that has been made of the water, the number of acres and location of lands being irrigated, the priority date, and all other relevant information. The Superintendent and the Department will utilize aerial photography and other information to have prepared a reproducible map showing the location of the ditch system, lands irrigated, point of diversion, etc., of the claim.

5. After the validation procedure, the Superintendent will hold a hearing, after appropriate notice and advertisement, at which time the claimant shall describe, in detail, the use that has been made of the water and the lands that are being irrigated, establish a priority date, etc. Costs incurred in advertising shall be paid by the claimant. If a single hearing is held to consider several claims, the costs of advertising shall be shared equally among the claimants. Anyone who opposes the claim shall appear and state the reasons, if any, for opposition to the claim. If there is no opposition to the claim, cost incurred in holding the hearing shall be paid by the claimant. If protesters do appear and oppose the claim, hearing costs will be paid 50 percent by the claimant and 50 percent by the protestant, or if there is more than one protestant, the remaining 50 percent shall be shared equally among the protesters.

6. At the conclusion of the hearing, the Superintendent shall forward the record to the Yellowstone River Compact Commission with his findings and recommendations. The Yellowstone River Compact Commission will make the
determination of the amount of the right, the location, and the priority date, and then send the record to the Board.

7. The Board shall review the record and integrate it into its water rights system. Upon entry of the record by the Board, the information shall be forwarded to the Department and the Chairman of the Yellowstone River Compact Commission.

8. Upon the entry of the right into the Board’s records, it will have the following attributes:
   a. The right will be a Wyoming water right with a priority date as established by this procedure.
   b. The amount of the right will be determined as provided by Wyoming law.

B. Montana Procedure

1. The Yellowstone River Compact Commission will provide a claim form to be completed by the claimant that will describe the location and point of diversion and land being irrigated, the priority date claimed, method of irrigation and such other information required to describe the claim.

2. The Commission will send the claim form to water users on the interstate ditches.

3. Water users will complete the claim form and file it with the Yellowstone River Compact Commission, which, when found to be correct and complete, will be forwarded to the Department for verification.

4. Upon receipt of the form, the Department, in cooperation with the Wyoming State Engineer’s Office, will validate the information, including the use that has been made of the water, the number of acres and location of lands being irrigated, the priority date, and all other relevant information. The appropriate Superintendent and the Department will utilize aerial photographs and other information to have prepared a reproducible map showing the location of the ditch system, land irrigated, point of diversion, etc., of the claim.
5. The Department will then forward the record to the Yellowstone River Compact Commission with its findings and recommendations. Upon approval by the Commission, the record shall be submitted to the Montana Water Court for adjudication. A duplicate record will be forwarded to the Wyoming State Engineer's Office, the Board, and the Chairman of the Yellowstone River Compact Commission upon adjudication.

6. Upon adjudication of the right by the Montana Water Court, it will have the following attributes:

a) The right will be a Montana water right with a priority date as established by this procedure.

b) The amount of the right will be determined as provided by Montana law.

Article V. Exclusions

A. These rules recognize the limitation in Article VI of the Yellowstone River Compact regarding Indian water rights.

B. These rules shall not be construed to determine or interpret the rights of the States of Wyoming and Montana to the waters of the Little Bighorn River.

Article VI. Claim Form Submission Period

All claims must be submitted to the Yellowstone River Compact Commission, c/o District Chief, United States Geological Survey, 821 E. Interstate, Bismarck, ND 58501, within 90 calendar days after the claimant has received the claim form from the Commission. The blank claim form will be sent certified mail to the water user and the submission period of 90 calendar days will begin with the next day following receipt of the form, as evidenced by the certified mail receipt card. For good cause shown in writing, an extension of time beyond the 90 days for submittal may be obtained from the Commission.
YELLOWSTONE RIVER COMPACT COMMISSION

CLAIM FORM FOR INTERSTATE DITCHES

1. Name of ditch or canal: ________________________________

2. Source of water supply: ________________________________
   Tributary of _________________________________________

3. Name of claimant: _____________________________________
   Address _____________________________________________
   City ___________ State ________ Zip Code ____________
   Home Phone No. ___________ Business Phone No. ________

4. Person completing form: _________________________________
   Address _____________________________________________
   City ___________ State ________ Zip Code ____________
   Home Phone No. ___________ Business Phone No. ________

5. Method of irrigation: ________________________________

6. Point of diversion: County ___________ State ________
   Headgate located in the ___ ¼ ___ ¼, Section ___, T.___.R. ___

(a) Description of headgate: (Briefly describe the materials
   and general features, date constructed or last known
   work, general condition.) ________________________________
________________________________________________________________
(b) Describe water measuring device: __________________________

________________________

(c) If the point of diversion is in Montana:

1. What flow rate has been claimed?
   
   ☐ cubic feet per second  
   ☐ gallons per minute  
   ☐ miner's inches

2. What volume of water has been claimed?
   
   _____ acre-feet

7. Dimensions of ditch at headgate: Width at top (at waterline)
   
   _____ feet; width at bottom _____ feet; side slopes
   (vertical:horizontal) _____:_____; depth of water _____  
   feet; grade _____ feet per mile.

8. Place of use and acres irrigated: County______ State ____
   Give legal subdivisions of land owned by you on which water
   is being used (acres claimed): An example field is shown in
   the first line.

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36
9. Describe any additional uses of water claimed from the ditch:

10. Date of first beneficial use of water (priority date) on lands described above for ____________ Ditch is ____________ (mo/day/yr) and shall be the same for all lands claimed on this form.

11. Has irrigation water been diverted onto all lands shown in the above tabulation each year since completion of works? ____________ If not, state exceptions and reasons therefore: ____________

12. Attach documentary evidence or affidavits showing your ownership or control of the above lands, as well as the historic use of water on these lands. ____________

13. What permit or claim numbers have been assigned to known records filed with either the Wyoming State Engineer's Office or the Montana Department (DNRC) for irrigating the above lands? ____________

14. Have personnel in the Wyoming State Engineer's Office or the Montana Department (DNRC) been contacted to obtain the information given in No. 13? ( ) Yes ( ) No

15. Describe any flumes or pipelines in the ditch conveyance system: ____________
16. Describe ordinary annual period of use: ____ to ____
    (mo/day) (mo/day)

17. Attach copies of aerial photographs, U. S. Geological Survey
    maps or other such documents showing the ditch and lands
    irrigated that give evidence to this claim and may be useful
    to the Commission.

* * * * * * * * *

State of ________ } SS
State of ________ }

I, __________________, having been duly sworn, depose and
say that I, being of legal age and being the claimant of this claim
for a water right, and the person whose name is signed to it as the
claimant, know the contents of this claim and the matters and
things stated there are correct.

__________________
__________________

Subscribed and sworn before me, this ____ day of ____, 19__.

__________________
Notary Public

Residing at: ________________________________

My commission expires: ________________________________
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Progress Report to the Governors and Congress, 1939
PROGRESS REPORT
TO THE GOVERNORS OF THE STATES OF MONTANA AND WYOMING
AND TO THE CONGRESS OF THE UNITED STATES
REGARDING YELLOWSTONE BASIN COMPACT

Pursuant to the authority granted by Congress in Public - No. 237 - 75th Congress, Chapter 552 - 1st Session (S. 534) authorizing the States of Montana and Wyoming to negotiate and enter into a compact providing for an equitable division of the water supply of the Yellowstone River basin, the President appointed Mr. Clyde L. Seavey, (Acting Chairman, Federal Power Commission) to be the representative of the United States, and the Governors of the States of Montana and Wyoming respectively appointed representatives as follows:

Montana:
Mr. E. B. Donohue, Chairman, Helena, Montana
Mr. Rockwood Brown, Billings, Montana
Mr. J. D. Scanlan, Miles City, Montana
Mr. B. B. Armstrong, Livingston, Montana.

Wyoming:
Mr. John D. Quinn, Chairman, Cheyenne, Wyoming
Mr. L. F. Thornton, Thermopolis, Wyoming
Mr. J. R. Ellis, Basin, Wyoming
Mr. Will G. Metz, Cheyenne, Wyoming

The above representatives of Federal and State interests comprise the Yellowstone River Compact Commission.

Following the appointment of these representatives, meetings were held on May 5, 1938, in Billings, Montana and on November 21 and 22, 1938, in Thermopolis, Wyoming. In addition to members of the Commission, there were also present at these meetings representatives of federal bureaus and
agencies, as follows: Bureau of Reclamation; Indian Service; Forest Service; Corps of Engineers, U. S. Army; National Park Service; and Federal Power Commission. The purpose of these meetings was to ascertain the character of information required for the drafting of the Yellowstone River Basin Compact, and the extent to which data on climate, topography, land ownership, population, and water development are available; to investigate the uses of water for irrigation, power, navigation, domestic and industrial purposes, and to study the laws of the States of Montana and Wyoming with respect thereto. Such information as is available at the present time from Federal and State sources has been collected and compiled by the Denver Regional Office staff of the Federal Power Commission under the direction of the Compact Commission.

From an analysis of the available information, it is the consensus of the Compact Commission:

1. That adequate factual data necessary to the drafting of a compact between the States of Montana and Wyoming are not available at the present time; however, studies now being carried on by the Bureau of Reclamation, U. S. Army Engineers, Forest Service, Indian Service, and other Federal agencies will produce a considerable amount of additional data, which will be useful for this purpose. Information which is presently inadequate or entirely lacking is as follows:
(a) Existing diversions for irrigation;
(b) Priorities of irrigation appropriations and rights;
(c) Acreages presently being irrigated and which are irrigable from existing works;
(d) Net water duty on irrigated lands;
(e) Crops grown on irrigated lands;
(f) Potentially irrigable lands and their water requirements;
(g) Stream flow data on minor tributaries;
(h) Location and cost of additional storage;
(i) Soil surveys;
(j) Studies of soil erosion, and silting of reservoirs;

2. That apparently the annual run-off of the Yellowstone River basin is sufficient to meet all existing and potential consumptive uses if and when a comprehensive plan of storage has been developed and put into effect;

3. That the Indian rights, under various treaties, to the waters of the Wind, Big Horn, and Tongue Rivers for irrigation purposes have not been definitely determined. These rights likely will be more definitely defined by a decision of the Supreme Court of the United States in connection with litigation now pending before that tribunal;

4. That approximately 740 square miles of the drainage basin of the Yellowstone River lies within the State of North Dakota; therefore it appears
desirable that the Congress of the United States amend its authorization for a compact with reference to the waters of the Yellowstone River to include the State of North Dakota as a signatory thereto;

5. That, because existing water supplies as presently developed are inadequate to fully meet demands for irrigation and other uses in critically dry years, there is imminent danger that irrigators in certain areas will resort to costly and protracted litigation in order to protect their rights; therefore, it is essential that additional storage be constructed at strategic points at the earliest possible date in order to relieve this situation; and that the respective State Compact Commissions be given adequate authority and funds with which to proceed with the collection of data necessary to the drafting of a Compact;

6. That, pending the negotiation of a formal compact and without prejudice to existing water rights, the representatives of the States of Montana and Wyoming agree to cooperate to the fullest extent in securing such administration of rights in their respective states as will tend to alleviate water shortages during dry years;

7. That, in view of the size of the task now facing the Compact Commission, it is the Commission's opinion
and recommendation that the Congress of the United States should extend indefinitely the time limit within which this compact may be consummated.

Respectfully submitted,

Representing the State of Montana: Representing the State of Wyoming:

E. B. Donohue

Rockwood Brown

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Clyde L. Seavey, Representing the United States

Dated Feb. 25, 1939
PRELIMINARY REPORT
ON
YELLOWSTONE RIVER BASIN

COMPILATION OF FACTUAL DATA
FOR USE OF
THE YELLOWSTONE RIVER COMPACT COMMISSION

FEDERAL POWER COMMISSION
BUREAU OF ENGINEERING
DENVER REGIONAL OFFICE
DECEMBER 1940
Preliminary Report

on

YELLOWSTONE RIVER BASIN

Compilation of Factual Data Relating to the Basin
For Use of the Yellowstone River Compact Commission

COPY NO. 46

Federal Power Commission
Bureau of Engineering
Denver Regional Office

December 1940
# Preliminary Report on YELLOWSTONE RIVER BASIN

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1. Purpose of the Report

The purpose of this report is to compile all the pertinent information that has been collected by various state and Federal agencies on the physical characteristics, water resources, and water uses of the Yellowstone River Basin, and to present it in a form that will be readily usable by the Yellowstone River Compact Commission.

2. Scope of the Report

The report is primarily a compilation of factual data that have been collected by other agencies. An attempt has been made to cover the entire range of the subject in a concise and general manner, and to omit the bulk of details that have been published elsewhere. The findings of other reports have been summarized, and care has been taken to support each figure and statement of opinion by reference to the original source. The report is preliminary in that it arrives at no conclusions and makes no recommendations. A final report on this subject must await the completion of surveys now in progress.

The report consists of two main sections, five appendices, and accompanying maps and figures. Section I contains general information on the entire Yellowstone River Basin and data that are common to the seven sub-basins into which, for the purpose of this report, the main basin has been divided. Data pertaining to each of the seven sub-basins are
presented separately and in detail in Section II.

3. Sources of Information

Most of the information contained in this report was obtained from special reports prepared under the sponsorship of Compact Commission representatives of the states of Wyoming, Montana, North Dakota, and the U. S. Office of Indian Affairs, and from published and special reports of the Corps of Engineers, U. S. Army. The sources referred to most often in this report are described below, followed by a complete bibliography:

Water Resources of the Yellowstone River Basin in Wyoming, September 1938. This report was prepared by workers on WPA Project 65-33-107 under the direction of H. T. Person, Consulting Engineer. It was submitted to the Wyoming State Engineer in October 1938. It is comprehensive and detailed, but has not been approved by the Wyoming members of the Compact Commission as accurately describing the Wyoming portion of the basin. It is generally referred to in the text as the "Wyoming Report."

Memorandum Report by the Montana Water Conservation Board, September 25, 1938. This report was prepared in response to a letter dated August 1, 1938, from the Federal Power Commission, requesting general information on the water resources and water uses of the Montana portion of the basin. It is incomplete in coverage and very limited in detail. It is often referred to in the text as the "Montana Report."

Report by the Montana Water Conservation Board, October 10, 1940. This report is referred to in the text as the "Montana Progress Report", as it was submitted as a progress report at the meeting of the
Compact Commission held in Billings on October 10, 1940. It contains additional information on existing and potential reservoirs and irrigation projects in Montana.

Yellowstone River, Wyoming, Montana, and North Dakota - House Document No. 256, 73d Congress, 2d Session. This report was prepared by the Corps of Engineers, U. S. Army, to present the findings of the comprehensive survey of the Yellowstone Basin which it made under the provisions of House Document No. 308, 69th Congress, 1st Session. The survey began in the fall of 1928, and the District Engineer submitted his report on March 31, 1932. This survey is the most complete and comprehensive that has yet been made of the Yellowstone Basin. The report is referred to in the text as the "308 Report"; or, as "H.D. 256."

"Appendix F" of the Progress Report of the National Resources Planning Board. The progress report was attached to the minutes of the meeting of Upper and Middle Missouri Drainage Basin Sub-committees "A" and "B", which was held in Denver, Colorado, on August 18 and 19, 1939. Appendix F of the progress report, which is entitled "Water Use Studies of Yellowstone Basin and Middle Missouri Basin", was prepared by the Corps of Engineers, U. S. Army. It contains data obtained from a reconnaissance survey of existing irrigation projects made in the spring of 1939, and other information obtained by the Corps of Engineers since the 308 Report was prepared, supplemented by data furnished by various state and Federal agencies. The report is in many respects a revision of the irrigation section of the 308 Report. It is sometimes referred to in the text as "Appendix F."
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Montana Water Conservation Board
3. Progress Report submitted at the meeting of the Yellowstone River Compact Commission, held in Billings, Montana, on October 10, 1940.

North Dakota Water Conservation Commission
5. Letter dated June 7, 1940.

Corps of Engineers - U. S. Army

Office of Indian Affairs

U. S. Bureau of Reclamation

U. S. Geological Survey
22. Geology and Ground Water Resources in Central and Southern Rosebud County, Montana: No. W600.
23. Contributions to Economic Geology: No. 691D.
National Resources Planning Board


U. S. Bureau of the Census


U. S. Forest Service

32. Thilme, F. E., Assistant Regional Forester, Northern District - letter dated November 6, 1937.
35. Kelly, Evan W., Regional Forester, Northern Region - letter dated October 26, 1938.

U. S. Weather Bureau

37. Climatological Data, 1931-1939.

Other Sources

40. General Land Office - letter dated October 6, 1937.
42. Report on Expedition up the Yellowstone River: War Department. 1875.
44. History of Montana: M. A. Leson. 1885.
4. Summary of the Progress of the Compact Commission to date

On August 2, 1937, an Act of Congress (50 Stat. 551) was approved, granting the consent of the Congress to the states of Montana and Wyoming to negotiate and enter into a compact providing for an equitable division of the waters of the Yellowstone River Basin. The President appointed Mr. Clyde L. Seavey, member of the Federal Power Commission, to represent the United States. The Governors of the states of Montana and Wyoming, respectively, appointed the following representatives:

Montana:
- Mr. E. B. Donohue, Chairman, Helena, Montana
- Mr. Rockwood Brown, Billings, Montana
- Mr. J. D. Scanlan, Miles City, Montana
- Mr. B. B. Armstrong, Livingston, Montana

Wyoming:
- Mr. John D. Quinn, Chairman, Cheyenne, Wyoming
- Mr. L. F. Thornton, Thermopolis, Wyoming
- Mr. J. R. Ellis, Basin, Wyoming
- Mr. Will G. Metz, Cheyenne, Wyoming

The first meeting of the Compact Commission was held in Billings, Montana, on May 5, 1938, for the purpose of determining what information was needed for drafting the compact and how it might best be obtained. The second meeting was held in Thermopolis, Wyoming, on November 21 and 22, 1938. At the second meeting a report embodying the material that had been collected up to that time was submitted by the Federal Power Commission, and a progress report(1) to the Governors of the states of Montana and Wyoming and to the Congress of the United States was drafted. On June 15, 1940, the President approved a bill (S. 1759) which extended the time for the drafting of the compact to June 1, 1943, and included North

(1) A copy of the progress report is contained in Appendix V.
Dakota as a party thereto. The last meeting of the Compact Commission was held in Billings on October 10, 1940.

The present (December 1940) members of the Compact Commission are:

Montana:
- Mr. E. B. Donohue, Chairman, Helena, Montana
- Mr. Rockwood Brown, Billings, Montana
- Mr. Wesley A. D'Evart, Wilsall, Montana
- Mr. E. E. Winter, Miles City, Montana

Wyoming:
- Mr. L. C. Bishop, Chairman, Cheyenne, Wyoming
- Mr. L. F. Thornton, Thermopolis, Wyoming
- Mr. Will G. Metz, Buffalo, Wyoming
- Mr. David Anderson, Riverton, Wyoming
- Mr. John Gonin, Lander, Wyoming
- Mr. Ernest Goppart, Cody, Wyoming
- Mr. R. E. McNally, Sheridan, Wyoming
- Mr. Ray Bower, Worland, Wyoming

North Dakota:
- Mr. Frank P. Whitney, Dickinson, North Dakota

United States:
- Mr. Clyde L. Seavey, Member of Federal Power Commission, Washington, D. C.

5. Surveys Now in Progress

The U. S. Bureau of Reclamation is now making a survey of the irrigated and irrigable areas in the Big Horn Basin and in portions of the Yellowstone Basin above Billings, Montana. It is understood that the survey may be extended to cover the entire Yellowstone Basin. The report on the survey is expected to be released within about one year.

The Corps of Engineers, War Department, recently completed a survey of reservoir sites in the basin. The District Engineer has submitted his report to the Chief of Engineers, and it will probably be made public at an early date.

The Montana Water Conservation Board and the Montana State
College are jointly sponsoring a survey of irrigated areas and water-right priorities in the Montana portion of the basin. It is understood that this survey, which is expected to provide more complete information on the present uses of water in Montana, will be finished within a year.

The U. S. Indian Service is making a study of water use in the Big Horn Basin. The date of release of this report is indefinite.

The U. S. Bureau of the Census has just completed its decennial census of irrigation. The report of this census, which will be available in 1941, should contain data of value to the Compact Commission.
Preliminary Report
on
YELLOWSTONE RIVER BASIN

Section I
GENERAL, ENTIRE YELLOWSTONE RIVER BASIN

A. Physical Characteristics
B. Occupancy and Economy
C. Climate and Hydrology
D. Water Use and Control
E. Water Laws and Their Administration
F. Existing Water Rights
G. Interstate Compacts

Federal Power Commission
Bureau of Engineering
Denver Regional Office
A. PHYSICAL CHARACTERISTICS OF THE BASIN

1. General Description

The Yellowstone River Basin is a pear-shaped area extending from the continental divide in northern Wyoming northeastward to the confluence of the Missouri and Yellowstone Rivers near the Montana-North Dakota boundary line (see map 1). Its area of 70,400 square miles has a length of about 1,440 miles and a maximum width of about 310 miles. To the north and east lies the Upper Missouri River Basin; to the south, the upper Platte and Colorado River Basins; and to the west, the rugged headwaters of the Snake River.

The waters of the Yellowstone River rise in the Absaroka Range and the Wind River Range of the Rocky Mountains, and in the Big Horn Mountains to form several large streams which eventually find their way to the main stem in Montana. The northern portion of the Absaroka Range is drained by the Yellowstone, Boulder, Stillwater, Clark Fork, and Shoshone Rivers. The southeastern slope of the Absaroka Range and the eastern slope of the Wind River Range are drained by the Greybull, the Wind, and the Popo Agie Rivers, which, with the Shoshone, form the principal drainage of the Big Horn, the major tributary of the Yellowstone. The Big Horn Mountains, in North Central Wyoming, are drained on the west by Shell and Nowood Creeks and the Little Horn River, and on the east by the Tongue and the Powder Rivers.

The main stem of the Yellowstone River rises south of Yellowstone Park, flows north through Yellowstone Lake to Livingston, Montana.
where it turns northeast and follows closely the northern boundary of
the basin to its confluence with the Missouri. All of its major tribu-
taries enter from the south and below the turn at Livingston, Montana.
Map 1 outlines the boundaries of the Yellowstone River Basin and its
tributaries.

2. Topography

The elevation of the basin ranges from 2,000 feet near the
mouth of the main stem to 13,000 feet in the mountains surrounding Yellowstone Park. On the west and the south the basin is bound by the moun-
tains of the Absaroka and Wind River Ranges; and near the center of the
basin, the isolated Big Horn Mountains rise to 12,000 feet or more.
After leaving the foothills the narrow, steep canyons of the mountains
broaden into wide, flat valleys several miles in width and flanked by
sharply-rising benches. In the lower elevations, the interstream divides
are low, broad, and smoothly rolling. To the north and east, the basin
broadens out to form part of the northern Great Plains. Although the
plains are generally smooth, they are considerably dissected by a relief
of mesas and isolated buttes that often rise 500 to 1,500 feet above the
surrounding plains.

The following table shows the average gradient for each of the
principal streams (see figure 1 for profiles.)
Table 1

Slope of Yellowstone River and Principal Tributaries

<table>
<thead>
<tr>
<th>Stream</th>
<th>Elevation at Headwaters (feet)</th>
<th>Elevation at Mouth (feet)</th>
<th>Length (miles)</th>
<th>Average Slope (feet/mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellowstone, Main Stem</td>
<td>10,800</td>
<td>1,858</td>
<td>671</td>
<td>13.3</td>
</tr>
<tr>
<td>Clark Fork</td>
<td>6,960</td>
<td>3,225</td>
<td>136</td>
<td>27.5</td>
</tr>
<tr>
<td>Big Horn (to headwaters of Wind River)</td>
<td>9,600</td>
<td>2,666</td>
<td>461</td>
<td>15.0</td>
</tr>
<tr>
<td>Tongue</td>
<td>9,400</td>
<td>2,310</td>
<td>265</td>
<td>26.7</td>
</tr>
<tr>
<td>Powder (to headwaters of North Fork)</td>
<td>9,410</td>
<td>2,200</td>
<td>437</td>
<td>16.5</td>
</tr>
</tbody>
</table>

Source: Corps of Engineers, War Department, 308 Report (H.D. 256, Yellowstone River Basin), page 27.

*Elevation at headwaters not available; elevation and length shown are for a point approximately 15 miles downstream from the headwaters.

3. Soils and Vegetal Cover

Detailed soil surveys have been made only for a small portion of the basin. The U. S. Department of Agriculture has published soil surveys covering the Billings area and the Lower Yellowstone Valley area in Montana, and the Basin area and the Shoshone area in Wyoming. Various other agencies have made surveys of isolated tracts as a part of investigations of the feasibility of proposed irrigation projects. The following information was taken from the Corps of Engineers' 308 Report and the "Preliminary Examination Report - Yellowstone River and Its Tributaries" of the Field Flood Control Coordinating Committee of the U. S. Department of Agriculture:

Practically all the soils of the broad river valleys are alluvial. Although they were all derived by similar processes from
shale and sandstone, there is a considerable variation in maturity from place to place, especially from stream to stream. Generally, the more mature soils are found on the higher portions of alluvial terraces back from the streams.

On the great plains of the basin heavy-textured loams predominate. These belong to the gray and brown pedocal groups, and are usually underlain by mineral deposits, especially lime, at relatively shallow depths. Because of the dry climate, the soils have never supported a sufficiently heavy vegetal cover for an appreciable quantity of organic matter and humus to accumulate. Alkali, mainly the white variety, is prevalent throughout the basin, but usually it is not sufficiently concentrated to be detrimental to agriculture.

On the higher, forest-covered portions of the watershed immature soils predominate. Above timberline, and also on large areas below timberline, soils black with organic matter to a depth of six inches have developed under a grass cover.

The type of vegetation varies rather closely with precipitation. The semi-arid plains support a thin cover of sage brush and short grass, and, to a lesser extent, shadscale and saltbrush. The mountains and higher valley slopes are covered by forests and mountain bunchgrass.

4. Drainage Areas

The total drainage area of the Yellowstone River Basin is about 70,400 square miles, of which 32,960 square miles are in Wyoming, 36,700 square miles in Montana, and 740 square miles in North Dakota.

Table 2 shows the drainage area in square miles of the main stem and principal tributary basins.
Table 2

Drainage Area, by Sub-Basins, of the Yellowstone River Basin

<table>
<thead>
<tr>
<th>Sub-Basin</th>
<th>Drainage Area (square miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wyoming</td>
</tr>
<tr>
<td>Yellowstone (main stem)</td>
<td>2,162</td>
</tr>
<tr>
<td>Clark Fork</td>
<td>1,184</td>
</tr>
<tr>
<td>Big Horn</td>
<td>18,259</td>
</tr>
<tr>
<td>Tongue</td>
<td>1,645</td>
</tr>
<tr>
<td>Powder</td>
<td>9,710</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>32,960</td>
</tr>
</tbody>
</table>


(3) Developed from total area shown in 308 Report, and Wyoming area shown in H. T. Person report.
FIGURE NO. 1

MILES ABOVE MOUTH OF YELLOWSTONE RIVER

Source of Data:
Compiled by:
U.S. DEPARTMENT OF AGRICULTURE
FLOOD CONTROL PUBLIC No. 738

Approved:

*Copied from U.S. Engineer Office, Kansas City, Mo.
B. OCCUPANCY AND ECONOMY

1. Public Lands in the Basin

Approximately one-third of the area of the basin is in public lands, which include three Indian reservations, seven national forests, one national park, five grazing districts, one national cemetery, one national monument, and one Federal experiment station. Table 4 shows, by counties, the number of acres in Indian reservations, national forest reserves, grazing districts, and unreserved public land. It will be noted that the county lines of the 26 counties of table 4 do not coincide exactly with the boundary of the basin. Map 2 and figure 2 show in detail the locations of reserved public land.

There are 4,832,411 acres in the three Indian reservations(1), distributed to sub-basins as shown in the following tabulation:

<table>
<thead>
<tr>
<th>Land in Indian Reservations, by Sub-basins</th>
<th>(Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Reservation</td>
<td>Main Stem</td>
</tr>
<tr>
<td>Wind River</td>
<td>None</td>
</tr>
<tr>
<td>Crow</td>
<td>649,321</td>
</tr>
<tr>
<td>Tongue River</td>
<td>276,070</td>
</tr>
<tr>
<td>Total</td>
<td>925,391</td>
</tr>
</tbody>
</table>


The Wind River Indian Reservation, formerly known as the Shoshone Indian Reservation, lies along the Wind River in Fremont and Hot Springs

(1) Information on Indian reservations was furnished by the Office of Indian Affairs, particularly by Mr. W. S. Hanna, Supervising Engineer, U. S. Indian Irrigation Service, in a letter dated May 23, 1939 and memorandum reports dated January 23, 1939 and February 16, 1939.
Counties, Wyoming, and was established by treaty with the Shoshone Indians in 1868. The original area of the reservation was approximately 2,260,000 acres, but this has been reduced to about 830,000 acres by cession treaties of 1872 and 1904, the latter providing for the development of irrigation for Indians on the diminished portion of the reservation with the proceeds from the sale of lands on the ceded portions.

The ceded portion, lying north of the Wind River, contains about 1,430,000 acres, of which about 200,000 acres have been deeded to others. The remaining area is leased to white stock operators and contributes materially to tribal revenue. In the southeastern part of the reservation about 45,000 acres are being irrigated under three large irrigation systems. The U. S. Bureau of Reclamation operates one of these systems, the Riverton Project, and plans eventually to increase its irrigated area from the 25,000 acres now being irrigated to 100,000.

The Indian population is concentrated on the diminished portion lying between the Wind and Popo Agie Rivers. Agriculture has been developed under irrigation systems constructed by the Indian Irrigation Service, a division of the Office of Indian Affairs. Approximately 14,000 acres are now being irrigated under six government canals. In addition, about 12,000 acres are being irrigated from about 100 private ditches within the diminished portion of the reservation.

Below is a summary of the irrigation canals and reservoirs under the six government irrigation systems, known as the "Wind River Irrigation Project."
Irrigation Canals and Reservoirs on the Wind River Irrigation Project

Canals

<table>
<thead>
<tr>
<th>Source of Supply</th>
<th>Number of Diversions</th>
<th>Aggregate Canal Capacity (c.f.s.)</th>
<th>Ultimate Area Under Ditches (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Wind River</td>
<td>8</td>
<td>875(1)</td>
<td>39,620(2)</td>
</tr>
<tr>
<td>Little Wind River</td>
<td>5</td>
<td>1,050</td>
<td>45,500</td>
</tr>
</tbody>
</table>

Storage Reservoirs

<table>
<thead>
<tr>
<th>Name</th>
<th>Source of Supply</th>
<th>Location</th>
<th>Capacity (acre-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ray Lake Reservoir</td>
<td>S. Fk. Little Wind</td>
<td>T1S R1W</td>
<td>7,200</td>
</tr>
<tr>
<td>Washakie Reservoir</td>
<td>S. Fk. Little Wind</td>
<td>T1S R2W</td>
<td>8,000</td>
</tr>
</tbody>
</table>

(1) Stream flow not equal during entire season to diversion capacity on tributary streams.
(2) Includes 15,013 acres under Le Clair-Riverton Canal which government does not operate but shares in the cost of operation and maintenance in proportion to the 3,230 acres of Indian trust patent land served by this system.

The Crow Indian Reservation is in southeastern Montana, and was established by treaty with the Crow Tribe in 1868. As originally established, the reservation contained about 8 million acres, but has been reduced to a present area of 2,120,000 acres by agreements of 1880, 1890, and 1904. The greater portion lies in Yellowstone and Big Horn Counties, with smaller tracts of ceded lands in Treasure, Sweetgrass, and Stillwater Counties.

Agricultural operations are devoted mainly to hay, small grains, and sugar beets, although corn, peas, small fruit, and potatoes can be grown successfully. Dry farming is very limited on the reservation, as crop failure, because of drought, is the rule rather than the exception under this method.

Thirteen irrigation units built under the supervision of the
Indian Irrigation Service include a total irrigable area of 53,000 acres. At present about 27,000 acres are being irrigated, and it is estimated that 63,000 acres can be irrigated by extension of present systems. A summary of the present irrigation systems is given below:

### Irrigation Canals on the Crow Indian Reservation

<table>
<thead>
<tr>
<th>Source of Supply (Incl. Tributaries)</th>
<th>Number of Divisions</th>
<th>Aggregate Canal Capacity (c.f.s.)</th>
<th>Present Area Under Ditches (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pryor Creek</td>
<td>3</td>
<td>30</td>
<td>3,889</td>
</tr>
<tr>
<td>Big Horn River(1)</td>
<td>3</td>
<td>1,170</td>
<td>45,056</td>
</tr>
<tr>
<td>Little Horn River(2)</td>
<td>5</td>
<td>510</td>
<td>14,860</td>
</tr>
<tr>
<td>Lodgegrass Creek</td>
<td>3</td>
<td>(3)587</td>
<td>4,791</td>
</tr>
<tr>
<td>Acreage under government control</td>
<td></td>
<td></td>
<td>53,462</td>
</tr>
<tr>
<td>Total miles of canals and laterals</td>
<td></td>
<td></td>
<td>323</td>
</tr>
</tbody>
</table>

(1) Includes the privately-owned Two Leggin Canal which irrigates a total of 20,000 acres. U. S. has purchased carriage right in this canal for approximately 5,642 acres of Indian land.

(2) Includes the privately-owned Bozeman Trail Canal which irrigates a total of 2,738 acres. U. S. has purchased carriage right in this canal for 1,961 acres of Indian land.

(3) Includes 350 c.f.s. capacity of feeder canal to Willow Creek Reservoir.

The ultimate area that can be irrigated by extension of each of the 13 existing systems is given below:

<table>
<thead>
<tr>
<th>Name of Ditch</th>
<th>Capacity (c.f.s.)</th>
<th>Ultimate Area (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Horn</td>
<td>700</td>
<td>28,714</td>
</tr>
<tr>
<td>Two Leggin</td>
<td>400</td>
<td>5,642</td>
</tr>
<tr>
<td>Soap Creek</td>
<td>50</td>
<td>1,814</td>
</tr>
<tr>
<td>Upper Little Horn No. 2</td>
<td>115</td>
<td>3,286</td>
</tr>
<tr>
<td>Bozeman Trail</td>
<td>70</td>
<td>1,961</td>
</tr>
<tr>
<td>Forty Mile</td>
<td>30</td>
<td>1,060</td>
</tr>
<tr>
<td>Reno</td>
<td>85</td>
<td>3,612</td>
</tr>
<tr>
<td>Agency</td>
<td>210</td>
<td>6,134</td>
</tr>
<tr>
<td>Lodgegrass No. 1</td>
<td>200</td>
<td>4,874</td>
</tr>
<tr>
<td>Lodgegrass No. 2</td>
<td>37</td>
<td>1,828</td>
</tr>
<tr>
<td>Pryor Creek</td>
<td>20</td>
<td>3,102</td>
</tr>
<tr>
<td>Lost Creek</td>
<td>10</td>
<td>716</td>
</tr>
<tr>
<td>Coburn</td>
<td>10</td>
<td>612</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,937</strong></td>
<td><strong>63,355</strong></td>
</tr>
</tbody>
</table>
There are no storage reservoirs on this reservation at present. The Willow Creek Reservoir, located on a tributary of Lodgegrass Creek, is under construction and will have a capacity of 23,000 acre-feet.

The Tongue River Indian Reservation, sometimes called the Northern Cheyenne Indian Reservation, lies east of and adjacent to the Crow Indian Reservation in Big Horn and Rosebud Counties, Montana. It was established by Executive Order in 1884. In 1910, the boundaries were modified and more definitely described to include 44,277 acres. The Indians are of the Northern Band of the Cheyenne Tribe, and were estimated to number about 1,600 in 1938.

The reservation lands are almost wholly Indian-owned and agricultural operations are limited to the production of feed for livestock, which is the principal industry. Mountain areas generally produce sufficient grass for forage purposes and permit production of small quantities of hay necessary to carry the stock through the winter.

Not more than 300 acres are now being irrigated on the reservation. In 1905, the United States began construction of the Tongue River Irrigation Project to divert water from the Tongue River to irrigate 7,000 acres from a canal 25 miles long, following close to the west bank. Only 6.8 miles of canal, commanding 1,200 acres, were completed. The original plan to cover the larger area was abandoned because of difficult and costly construction. Not more than 600 acres have ever been irrigated in any one year under this project, and, at present, only 150 acres are being irrigated. Numerous attempts have been made by individuals to develop small irrigated tracts along reservation streams, but, in general, these have not been successful, primarily because of the inadequacy of the water supply during the summer season. Private systems, at present, cover
not more than 150 acres.

Present plans are to develop from 1,000 to 1,500 acres in 13 or 14 isolated pumping projects along the west bank of the Tongue River. These projects have already been authorized for construction. A contract whereby the United States will acquire 7,500 acre-feet of storage capacity in the recently constructed Tongue River Reservoir for irrigation on the reservation is awaiting final Congressional sanction.

**National Forests**

Seven national forests with a total area of 6,038,121 acres occupy 13.4 percent of the Yellowstone River Basin. The area of each forest in each sub-basin is shown in table 3 below:

### Table 3

<table>
<thead>
<tr>
<th>Name of Forest</th>
<th>Main Stem</th>
<th>Clark Fork</th>
<th>Big Horn</th>
<th>Tongue</th>
<th>Powder</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoshone(1)</td>
<td>0</td>
<td>506,240</td>
<td>1,083,520</td>
<td>0</td>
<td>0</td>
<td>1,589,760</td>
</tr>
<tr>
<td>Washakie(1)</td>
<td>0</td>
<td>0</td>
<td>835,840</td>
<td>0</td>
<td>0</td>
<td>835,840</td>
</tr>
<tr>
<td>Big Horn(1)</td>
<td>0</td>
<td>0</td>
<td>556,739</td>
<td>293,120</td>
<td>264,115</td>
<td>1,113,974</td>
</tr>
<tr>
<td>Teton(2)</td>
<td>211,410</td>
<td>0</td>
<td>79,162</td>
<td>469,177</td>
<td>37,478</td>
<td>775,301</td>
</tr>
<tr>
<td>Custer(3)</td>
<td>282,870</td>
<td>106,014</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>394,884</td>
</tr>
<tr>
<td>Absaroka(3)</td>
<td>1,166,372</td>
<td>68,500</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,234,872</td>
</tr>
<tr>
<td>Gallatin(3)</td>
<td>76,964</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>76,964</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,737,616</td>
<td>680,754</td>
<td>2,555,561</td>
<td>762,597</td>
<td>301,593</td>
<td>6,038,121</td>
</tr>
</tbody>
</table>

(1) Allen S. Peck, Regional Forester, Rocky Mountain Region - Letter dated October 10, 1938.
(2) W. W. Blakeslee, Acting Regional Forester, Inter-mountain Region - Letter dated September 28, 1938.
(3) Evan W. Kelly, Regional Forester, Northern Region - Letter dated October 26, 1938.
(4) Includes 332,249 acres of alienated land within national forest boundaries.

**National Parks**

Yellowstone National Park, the only national park in the basin, is in the northwestern corner of Wyoming, with small areas extending into Montana, Idaho, and Utah. It has an area of 1,902,720 acres,
1,196,800 of which are in the Yellowstone Basin - all on the main stem. The park is a plateau about 8,000 feet high, almost completely surrounded by higher peaks. Congressional authorization for the drafting of an interstate compact excludes from consideration therein any waters within or tributary to this park.

Grazing Districts

The Taylor Grazing Act of 1934, and as amended in 1936, provides for the establishment of grazing districts from certain vacant, unappropriated and unreserved public lands. Five of these districts, three in Montana and two in Wyoming, lie, entirely or in part, within the boundaries of the Yellowstone River Basin and occupy about 7 percent of the basin area.

Miscellaneous Public Lands

Small tracts of public land are occupied by Custer Battlefield, a national cemetery near Hardin, Montana, by Shoshone Cavern, a national monument near Cody, Wyoming, and by Fort Keogh Military Reservation, at Miles City, Montana, now used by the U. S. Range Livestock Experiment Station. Unreserved public lands occupy about 300,000 acres of the basin.

2. Population

The total population of the Yellowstone River Basin(1) in 1930, as determined from publications of the U. S. Bureau of the Census, was 192,320. The following statement indicates the relative importance of the population of each component state section of the basin:

---

(1) The boundary lines of the minor civil divisions (for which the population was published) do not coincide exactly with the Yellowstone River Basin boundary.
### Population of Yellowstone River Basin

<table>
<thead>
<tr>
<th>State</th>
<th>Number of Persons</th>
<th>Percentage of Basin's Total Population</th>
<th>Total State Population</th>
<th>Percentage of State Population in Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
<td>70,425</td>
<td>36.6</td>
<td>225,565</td>
<td>31.2</td>
</tr>
<tr>
<td>Montana</td>
<td>119,523</td>
<td>62.2</td>
<td>537,606</td>
<td>22.2</td>
</tr>
<tr>
<td>North Dakota</td>
<td>2,372</td>
<td>1.2</td>
<td>680,815</td>
<td>.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>192,320</strong></td>
<td><strong>100.0</strong></td>
<td><strong>1,444,016</strong></td>
<td><strong>13.3</strong></td>
</tr>
</tbody>
</table>

Figure 3 shows the distribution, by sub-basins, of the total population of the basin. The trend of population from 1910 to 1930 is shown by figure 4. The distribution, classified as to urban, rural non-farm, and rural farm, is given in figure 5. Map 3 shows in detail the distribution of the population throughout the basin, and map 4, the minor civil divisions from which all population figures were developed.

The seven cities of the basin having a 1930 population of 2,500 or more are listed below:

<table>
<thead>
<tr>
<th>Town or City</th>
<th>Population 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billings, Montana</td>
<td>16,380</td>
</tr>
<tr>
<td>Sheridan, Wyoming</td>
<td>8,536</td>
</tr>
<tr>
<td>Miles City, Montana</td>
<td>7,175</td>
</tr>
<tr>
<td>Livingston, Montana</td>
<td>6,391</td>
</tr>
<tr>
<td>Glendive, Montana</td>
<td>4,629</td>
</tr>
<tr>
<td>Red Lodge, Montana</td>
<td>3,026</td>
</tr>
<tr>
<td>Laurel, Montana</td>
<td>2,558</td>
</tr>
</tbody>
</table>

Source: U. S. Bureau of the Census.

Although the population is predominately white, there are in the basin some 9,500 colored or non-white residents, mostly Indian. The Indian population, amounting to 5 percent of the total, and distributed about equally between Wyoming and Montana, is concentrated in the Big Horn and main stem basins.
3. Agricultural Development

Agriculture, including stock raising, is the predominant occupation in the basin. In 1929 about three-fourths of the total income of the basin was derived from the sale of livestock and agricultural products. Prior to 1900 stock raising was the chief industry, and all agriculture was devoted almost entirely to its support. Since the turn of the century the intensive development of irrigation facilities has stimulated crop production to a growth that has placed it parallel in importance with stock raising. Table 7(1) shows the income of the basin derived from crops and from livestock. It will be noted that crops accounted for 40 percent of the 1929 agricultural income of the entire basin, but had not then reached the relative importance in Wyoming that they had in Montana and North Dakota.

Although about 85 percent of the land is devoted to hay and small grains, agriculture is rather well diversified considering the limitations placed upon it by climatic conditions. Especially is this true of irrigated crops, from which about half the total crop income is derived. The number of acres of each of the principal crops harvested in 1929 is shown below:

---

(1) Tables 7-12 are U. S. Bureau of the Census figures. The 1930 Census (covering, in general, the year 1929) has a broader coverage and is in more detail than the 1935 Census. Table 8 presents data by sub-basins, which were compiled from tables of the Census of 1930 giving special data by minor civil divisions. In general, the county is the smallest unit for which data are given. Therefore, tables 7 and 9-12 present data for the 25 counties that most nearly represent the Yellowstone River Basin.
Principal Crops - 1929
(Number of Acres Harvested)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Irrigated Land</th>
<th>Dry Land</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat (threshed)</td>
<td>70,000</td>
<td>1,324,000</td>
<td>1,394,000</td>
</tr>
<tr>
<td>Flax (threshed)</td>
<td>2,000</td>
<td>171,000</td>
<td>173,000</td>
</tr>
<tr>
<td>Barley (threshed)</td>
<td>50,000</td>
<td>115,000</td>
<td>165,000</td>
</tr>
<tr>
<td>Oats (threshed)</td>
<td>50,000</td>
<td>102,000</td>
<td>152,000</td>
</tr>
<tr>
<td>Hay</td>
<td>363,000</td>
<td>544,000</td>
<td>907,000</td>
</tr>
<tr>
<td>Beans (grown alone)</td>
<td>62,000</td>
<td>8,000</td>
<td>70,000</td>
</tr>
<tr>
<td>Alfalfa Seed</td>
<td>7,000</td>
<td>58,000</td>
<td>65,000</td>
</tr>
<tr>
<td>Sugar Beets</td>
<td>42,000</td>
<td>0</td>
<td>42,000</td>
</tr>
<tr>
<td>Potatoes</td>
<td>5,000</td>
<td>5,000</td>
<td>10,000</td>
</tr>
<tr>
<td>All Others</td>
<td>26,000</td>
<td>168,000</td>
<td>194,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>677,000</strong></td>
<td><strong>2,485,000</strong></td>
<td><strong>3,162,000</strong></td>
</tr>
</tbody>
</table>


Although dry farming is practiced to a limited extent, irrigation is the backbone of agriculture. Of the 3,162,000 acres harvested in 1929, only 20 percent was irrigated, but the irrigated land produced 45 percent of the total crop value (see table 10). The average value of crops harvested from irrigated land in 1929 was $28.12 per acre, as compared with $9.14 for dry land. It has been estimated that one acre of irrigated farm land will stabilize 20 acres of range. The stabilizing effect of irrigation in years of drought and depression is strikingly illustrated by table 11. This table shows the number of acres of irrigated and dry land harvested for crops in the normal year 1929 and in the extremely dry year 1934. It will be noted that, while the number of acres harvested from dry land fell to one-fourth the normal amount, the number harvested from irrigated land dropped only one percent. The value of irrigation in 1934 to the stock industry of the basin is reflected in table 12, which shows that the total number of cattle and sheep in the
basin remained practically stationary over the five-year period. This fact is extremely significant if it will be remembered that in 1934, in the region immediately east of the basin where irrigation is not practiced, stockmen were forced to sell even their breeding stock for lack of feed.

The value of farm land and buildings (see tables 8 and 9) was $228,000,000 in 1930. By 1935 the value had been reduced by 24 percent to $174,000,000, Montana having suffered a greater decline in values than Wyoming and North Dakota. The investment in irrigation works in 1930, as estimated by the Bureau of the Census, was $32,000,000, of which $19,000,000 was invested in Wyoming, and $13,000,000 in Montana. No estimate was given for the investment in irrigation works serving the 5,000 acres of irrigated land in North Dakota.

4. Industrial Development

Manufacturing and mining, as shown in table 6, account for about 14 and 13 percent, respectively, of the total income of the basic income-producing industries. The basin's coal reserves are considerable, and coal is mined in the Montana and Wyoming sections. The Montana section contains, in the Baker-Glendive natural gas field, one of the most important gas-producing regions in the state; and the Wyoming section contains, in the Salt Creek oil field (Natrona County), an outstanding oil-producing area. Manufacturing is confined largely to oil refining and to sugar beet and other food-processing industries.
Figure 3.
Distribution by Sub-Basins of the Total Population of the Yellowstone River Basin - 1930.

<table>
<thead>
<tr>
<th>Basin</th>
<th>Total population - 1930</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Persons</td>
</tr>
<tr>
<td>Yellowstone River basin</td>
<td>192,320</td>
</tr>
<tr>
<td>Main stem basin</td>
<td>86,221</td>
</tr>
<tr>
<td>Clark Fork River basin</td>
<td>12,885</td>
</tr>
<tr>
<td>Big Horn River basin</td>
<td>46,319</td>
</tr>
<tr>
<td>Tongue River basin</td>
<td>26,945</td>
</tr>
<tr>
<td>Powder River basin</td>
<td>19,950</td>
</tr>
</tbody>
</table>

Authority: U. S. Bureau of the Census.
Figure 4

<table>
<thead>
<tr>
<th>Number of persons</th>
<th>1900</th>
<th>1910</th>
<th>1920</th>
<th>1930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellowstone River basin</td>
<td>90,000</td>
<td>80,000</td>
<td>70,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Main stem basin</td>
<td>50,000</td>
<td>40,000</td>
<td>30,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Clark Fork River basin</td>
<td>30,000</td>
<td>20,000</td>
<td>10,000</td>
<td>0</td>
</tr>
<tr>
<td>Big Horn River basin</td>
<td>20,000</td>
<td>10,000</td>
<td>5,000</td>
<td>0</td>
</tr>
<tr>
<td>Tongue River basin</td>
<td>10,000</td>
<td>5,000</td>
<td>2,500</td>
<td>1,000</td>
</tr>
<tr>
<td>Powder River basin</td>
<td>5,000</td>
<td>2,500</td>
<td>1,250</td>
<td>625</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total population</th>
<th>1930#</th>
<th>1920*</th>
<th>1910*</th>
<th>1900*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellowstone River basin</td>
<td>192,320</td>
<td>196,786</td>
<td>117,248</td>
<td>31,421</td>
</tr>
<tr>
<td>Main stem basin</td>
<td>86,221</td>
<td>79,488</td>
<td>47,527</td>
<td>13,013</td>
</tr>
<tr>
<td>Clark Fork River basin</td>
<td>12,885</td>
<td>12,248</td>
<td>16,044</td>
<td>5,693</td>
</tr>
<tr>
<td>Big Horn River basin</td>
<td>46,319</td>
<td>53,684</td>
<td>21,881</td>
<td>2,460</td>
</tr>
<tr>
<td>Tongue River basin</td>
<td>36,945</td>
<td>28,695</td>
<td>22,289</td>
<td>5,808</td>
</tr>
<tr>
<td>Powder River basin</td>
<td>16,250</td>
<td>16,471</td>
<td>9,507</td>
<td>4,507</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage distribution</th>
<th>100.0</th>
<th>100.0</th>
<th>100.0</th>
<th>100.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellowstone River basin</td>
<td>44.8</td>
<td>40.4</td>
<td>40.5</td>
<td>41.3</td>
</tr>
<tr>
<td>Main stem basin</td>
<td>6.7</td>
<td>9.3</td>
<td>13.7</td>
<td>18.1</td>
</tr>
<tr>
<td>Clark Fork River basin</td>
<td>24.1</td>
<td>27.3</td>
<td>18.7</td>
<td>7.8</td>
</tr>
<tr>
<td>Big Horn River basin</td>
<td>14.0</td>
<td>14.7</td>
<td>19.0</td>
<td>18.5</td>
</tr>
<tr>
<td>Tongue River basin</td>
<td>10.4</td>
<td>8.3</td>
<td>8.1</td>
<td>14.3</td>
</tr>
</tbody>
</table>

# Population for 1930 is based upon published reports of the U. S. Bureau of the Census.
* Population for 1920, 1910, and 1900 is based in part upon such published reports, from which estimates have been made.

Authority: U. S. Bureau of the Census
Figure 5.
Urban, Rural Non-Farm, and Rural Farm Population of the Yellowstone River Basin - 1930.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Persons</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban*</td>
<td>48,695</td>
<td>25.3</td>
</tr>
<tr>
<td>Rural non-farm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small incorporated places#</td>
<td>35,440</td>
<td>18.4</td>
</tr>
<tr>
<td>Other rural non-farm</td>
<td>24,555</td>
<td>12.8</td>
</tr>
<tr>
<td>Rural farm</td>
<td>83,630</td>
<td>43.5</td>
</tr>
<tr>
<td>Total population -</td>
<td>192,320</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* Incorporated places having 2,500 or more inhabitants.
# " " " less than 2,500 inhabitants.

Authority: U. S. Bureau of the Census.
Table 5

<table>
<thead>
<tr>
<th>Basin and State</th>
<th>Rural non-farm</th>
<th>Percentage distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rural non-farm</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>Urban</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ces hav.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rural</td>
</tr>
<tr>
<td></td>
<td></td>
<td>farm*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ing less</td>
</tr>
<tr>
<td></td>
<td></td>
<td>non-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>than 2500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>residents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Urban</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ces hav.</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>farm*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ing less</td>
</tr>
<tr>
<td></td>
<td></td>
<td>non-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>than 2500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>residents</td>
</tr>
</tbody>
</table>

Yellowstone Basin: 192,320; 48,695; 35,440; 24,555; 30,600; 100.0; 100.0; 100.0; 100.0

Main stem: 86,221; 29,966; 9,772; 7,861; 39,885; 44.8; 61.5; 27.6; 31.2; 46.4

Clarks Fork: 12,866; 3,036; 1,844; 2,015; 6,000; 6.7; 6.2; 5.2; 8.2; 7.2

Big Horn: 46,312; 19,651; 6,208; 20,498; 24.1; 55.1; 25.7; 24.5

Tongue: 26,945; 15,711; 503; 3,887; 6,844; 14.0; 32.3; 1.4; 15.8; 8.2

Powder: 19,950; 3,308; 4,684; 11,456; 10.4; 10.7; 19.1; 15.7

Summary by States:

Yellowstone Basin: 192,320; 48,695; 35,440; 24,555; 30,600; 100.0; 100.0; 100.0; 100.0

Montana: 83,576; 29,956; 9,321; 7,458; 38,889; 45.3; 61.5; 26.3; 30.2; 44.1

Wyoming: 2731; --; --; --; --; --; --; --; --; --

North Dakota: 2,372; --; 451; 39; 1,932; 1.2; --; --; --; --

Clark Fork: 12,291; 3,026; 1,844; 1,602; 5,731; 6.4; 6.2; 5.2; 6.9; 6.8

Montana: 7,573; --; 1,542; 1,11; 4,720; 3.8; --; --; --; 4.5; 5.6

 Wyoming: 38,946; --; 17,971; 6,197; 15,771; 20.3; --; 50.7; 21.2; 18.9

Big Horn: 7,573; --; 1,542; 1,111; 4,720; 3.8; --; --; --; 4.5; 5.6

Tongue: --; --; --; --; 1,230; 3,406; 6.1; 14.8; --; 5.0; 4.1

Wyoming: 15,134; 8,536; 503; 2,657; 3,435; 7.9; 17.5; 1.4; 10.8; 4.1

Powder: --; --; --; --; 1,230; 3,406; 6.1; 14.8; --; 5.0; 4.1

Montana: 11,811; 7,175; --; 1,230; 3,406; 6.1; 14.8; --; 5.0; 4.1

Wyoming: 15,134; 8,536; 503; 2,657; 3,435; 7.9; 17.5; 1.4; 10.8; 4.1

North Dakota: 4,372; --; 722; 3,750; 2.3; --; --; --; 2.9; 4.5

Summary by States:

Yellowstone Basin: 192,320; 48,695; 35,440; 24,555; 30,600; 100.0; 100.0; 100.0; 100.0

Montana: 119,523; 40,159; 12,707; 12,181; 54,496; 62.2; 82.5; 35.8; 49.5; 66.2

Wyoming: 70,425; 8,536; 22,238; 12,355; 27,252; 36.6; 17.5; 17.5; 62.9; 50.3; 32.6

North Dakota: 2,372; --; 451; 39; 1,862; 1.2; --; --; --; 1.3; 2.2

* Estimated.

Authority: U. S. Bureau of the Census.
<table>
<thead>
<tr>
<th>Time</th>
<th>Code</th>
<th>Quantity</th>
<th>Unit</th>
<th>Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>045</td>
<td>100</td>
<td>D</td>
<td>5.5</td>
<td>550</td>
</tr>
<tr>
<td>00</td>
<td>005</td>
<td>200</td>
<td>D</td>
<td>2.5</td>
<td>500</td>
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<tr>
<td>00</td>
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<td>150</td>
<td>D</td>
<td>3.5</td>
<td>525</td>
</tr>
<tr>
<td>00</td>
<td>090</td>
<td>120</td>
<td>D</td>
<td>3.0</td>
<td>360</td>
</tr>
<tr>
<td>00</td>
<td>080</td>
<td>100</td>
<td>D</td>
<td>2.5</td>
<td>250</td>
</tr>
<tr>
<td>00</td>
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<td>80</td>
<td>D</td>
<td>2.0</td>
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<td>00</td>
<td>060</td>
<td>60</td>
<td>D</td>
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<td>90</td>
</tr>
<tr>
<td>00</td>
<td>050</td>
<td>40</td>
<td>D</td>
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</tr>
<tr>
<td>00</td>
<td>040</td>
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</tr>
<tr>
<td>00</td>
<td>030</td>
<td>10</td>
<td>D</td>
<td>0.25</td>
<td>2.5</td>
</tr>
</tbody>
</table>

**Note:** The table above represents the quantities and amounts for different codes. Each row corresponds to a specific code, with its respective quantity, unit, price, and total amount.
C. CLIMATE AND HYDROLOGY OF THE BASIN

1. Climate

The climate of the plains area is distinctly continental, and is characterized by abundant sunshine, low relative humidity, light rainfall (confined largely to the warmer half of the year), moderate wind movement, a large diurnal change in temperature, and pronounced extremes of temperature. Although the climate of the mountainous sections varies markedly from place to place, it is, in general, distinguished from that of the plains by increased precipitation, especially in the winter months, decreased temperature, decreased diurnal range, and increased relative humidity. Climatological data for twenty selected stations are given in tables 13 and 14. The location of weather stations is shown on map 6.

The average annual temperature ranges from 32 degrees at Lake Yellowstone to 46 degrees at several plains stations. It will be noted from table 13 that the temperature range between the summer months and the winter months is much greater in the plains than in the mountain regions. The maximum and minimum temperatures recorded at Glendive are 117 and -48, and at Lake Yellowstone, 94 and -51. On the plains, temperatures of 100 degrees are not uncommon during the hottest season. Cold waves strike the basin an average of four times a winter, but, as a rule, do not last more than a few days at a time. Sunshine is abundant in all seasons.

The average length of growing season for the cultivated areas ranges from 110 days to 140 days, averaging, perhaps, 120 days. There is little cultivation in areas having a frost-free period of less than 100 days.
Precipitation

The plains are semi-arid. Average annual precipitation (table 14) varies from about 7 inches in the heart of the Big Horn Basin to about 15 inches near the mouth of the Yellowstone River. Although 70 percent of the precipitation on the plains occurs during the warmer months, prolonged droughts, to which the basin is subject, make dry-farming precarious. Map 5 shows the mean annual precipitation over all areas of the basin. This map was adapted from one prepared by the Field Flood Control Coordinating Committee of the U. S. Department of Agriculture.

In general, precipitation increases with increase in elevation, although exposure and other topographic conditions often completely mask this relationship. Precipitation in the mountains is greater and more evenly distributed throughout the year than on the plains. Snowfall is moderately heavy and drifts into banks where it packs and remains well into the summer. The melting snow banks feed the streams which furnish water for irrigation in the valleys.

2. General Stream Flow Characteristics

Nearly all of the water in the streams originates in the mountains. Except for a short time in the spring and for occasional flash floods in the warm season the water yield of the plains is negligible. Stream flow is low during the winter, when the streams are partly frozen, but increases when the snow begins to melt in the spring. The rise begins in March or April, reaches a peak usually in June, then gradually decreases until late summer or early fall. Spring rains cause a lesser peak on the lower Yellowstone and lower Big Horn during March or April. Occasionally, during the warmer season, peaks of short
duration are caused by local heavy showers or cloud bursts. After June, small streams that do not rise in the mountains are normally dry. Even the Tongue and Powder are practically dry in late summer.

Quite aside from the normal seasonal variation, there is a wide variation of stream flow from year to year for the same month. For example, the maximum recorded discharge of the Big Horn River at Hardin for the month of July is 1,370,000 acre-feet, nearly three times the minimum recorded discharge for the same month of 37,300 acre-feet. This extreme variation probably is not equaled by any major stream in the basin for any thirty-day period, but it is approached by all of them. Several factors contribute to the variation from year to year of stream flow during the summer months, of which the chief are the amount of snow on the upper water sheds and its time and rate of melting, the amount of precipitation on the entire basin, and the amount of water diverted for irrigation and stored in reservoirs. Water is diverted each year to irrigate about 900,000 acres and to fill about 850,000 acre-feet of reservoir capacity. Since the amount of water used in irrigation operations is more or less constant each year its effect on stream flow is relatively greater in dry years.

3. Stream Flow Records

Practically all stream flow measurements are made by, or in cooperation with, the U. S. Geological Survey and published annually in the water supply papers of that agency ("Surface Water Supply of the United States - Part 6, Missouri River Basin."). Map 6 shows the location of all known stream gaging stations in the Yellowstone Basin. All records for the Yellowstone Basin, up to October 1931, reduced to run-off
in acre-feet, by months, are tabulated in Appendix II of H.D. 256 of the Corps of Engineers' 308 Report. Estimates have been made for many of the months for which complete records were not available. All records up to October 1936 for the Wyoming portion of the basin are given in "Water Resources of the Yellowstone River Basin in Wyoming" by H. T. Person. Although estimates of actual flow for months of no record are not made, the reconstructed run-off is estimated for some of the stations. The reconstructed run-off was computed from actual records by correcting for estimated depletions from irrigation operations. Records and estimates for certain stations for the period 1930 to 1938 were prepared by the Helena office of the U. S. Geological Survey, and were published as Appendix "G" of the Progress Report (1939) of the National Resources Planning Board.

Inasmuch as these reports on stream flow measurements and estimates are already available, complete records are not included in this report. Presentation of stream flow data is confined to a summary of the maximum, minimum, and mean run-off, by months, of the major streams of the basin and a statement of the monthly run-off at the state line for the entire period of record. This information is presented by sub-basins in Section II, and repeated, for some of the more important stations, in this section (table 16). There is also included in this section (table 15), a statement of the run-off of the Yellowstone at Intake, Montana, which is approximately representative of the run-off at the Montana-North Dakota state line. In addition to the mean run-off for the entire period of record, the mean run-off for the eight years from 1930 to 1937 is also given for all stations for which this record
was available. This eight-year period is the most severe period of sustained drought of record, and probably represents the limiting water supply condition for basin planning.

Flow at the state line was considered the same as the flow at the gaging station or stations nearest the state line. It is believed that in all instances this assumption is substantially correct. The stations selected as representing the flow at the state line are listed below:

**Montana—North Dakota**
- Yellowstone River — Table 15 Yellowstone at Intake

**Wyoming—Montana**
- Yellowstone River — Table 27 Yellowstone at Corwin Springs
- Clark Fork — Table 31 Clark Fork at Chance
- Big Horn River — Table 34 Big Horn at Kane plus Shoshone at Byron
- Little Horn River — Table 39 Little Horn near Wyola
- Tongue River — Table 42 Tongue near Decker
- Powder River — Table 47 Powder at Moorhead
- Little Powder River — No Record

The flow at the above stations was estimated for some years by comparison with the flow at other stations on the same stream when a good correlation could be established.

### 4. Storage Reservoirs

About 850,000 acre-feet of useful storage capacity has been developed in the basin, of which more than 650,000 acre-feet is in the Big Horn basin in Wyoming. This storage is used almost exclusively for irrigation. Water is stored during the winter months and during the spring floods, and released as needed during the mid and late irrigation season.

Table 17 lists the existing reservoirs of more than 500 acre-feet capacity, as reported in Appendix F of the Progress Report (1939)
of the National Resources Planning Board and in "Water Resources of the Yellowstone River Basin in Wyoming" (H. T. Person). These two sources do not agree as closely as might be expected. Many reservoirs are reported by one source and not by the other. The total developed capacity in the basin, as shown in table 17, is 847,997 acre-feet. In arriving at this total, the capacity of every reservoir listed in the above reports was included, and whenever the two sources disagreed, the figure as reported in Appendix F was used. The figures that are included in the total are marked by an asterisk. Complete information is not available for reservoirs of less than 500 acre-feet capacity, but it is believed that the aggregate capacity of such reservoirs is very small. The Montana Water Conservation Board reports(1) that it has recently constructed 58 small reservoirs having a combined capacity of 6,417 acre-feet. Potential reservoirs in the basin are discussed in Section II and in Appendix II. Map 7 shows the location of both the existing and the potential reservoirs.

All reservoirs lose water through evaporation in proportion to the area of the exposed water surface. Other factors, such as, location, temperature, etc., affect the rate of evaporation, but it may be assumed that these contributing factors are reasonably uniform throughout the Yellowstone Basin. In Appendix X of H.D. 197 (Platte River 308 Report) the average annual evaporation from free-water surfaces in the North Platte River west of North Platte, Nebraska, is estimated to be 36 inches, of which 27 inches, or 75 percent, occur between May 1 and October 1. These figures could probably be applied

(1) Montana "Progress Report" submitted at the meeting of the Compact Commission held in Billings, Montana, on October 10, 1940.
to reservoirs in the Yellowstone Basin without serious error. The surface area of a reservoir varies, often markedly, with the amount of water in storage, which complicates the computation of losses. The Corps of Engineers, in Appendix F of the Progress Report of the National Resources Planning Board, has attempted to simplify the problem of estimating reservoir losses by adopting a schedule of losses based upon annual storage. This schedule is given below:

**Evaporation Losses on Annual Irrigation Storage**

<table>
<thead>
<tr>
<th>Reservoir Capacity (acre-feet of annual storage)</th>
<th>Seasonal Evaporation (percent of annual storage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 5,000</td>
<td>10</td>
</tr>
<tr>
<td>5,000 to 15,000</td>
<td>7</td>
</tr>
<tr>
<td>15,000 to 30,000</td>
<td>5</td>
</tr>
<tr>
<td>30,000 to 200,000</td>
<td>4</td>
</tr>
</tbody>
</table>

5. Ground Water

Several reports on ground water, published by the U. S. Geological Survey(1), covering a portion of the Yellowstone River Basin reveal that, although supplies ample for domestic use and stock watering can usually be found, the supply is not sufficient to affect the surface run-off. Although a few flowing wells are scattered throughout the basin, more commonly near the beds of large streams, there apparently is no possibility of utilizing underground waters to irrigate tracts larger than family gardens.

It sometimes happens that a large area under irrigation develops a water table which permits limited irrigation by pumping from wells. In some instances it has even been necessary to pump wells in order to prevent the irrigated land from becoming water logged. However, there is no indication that such a drainage condition will develop over any extensive area in the Yellowstone Basin, and it may be assumed that irrigation from underground pumping will not have a significant effect on stream diversions within the calculable future.
<table>
<thead>
<tr>
<th>Expiry Month</th>
<th>Expiry Day</th>
<th>Last Day of Month</th>
<th>Balance</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>0563</td>
<td>10</td>
<td>25</td>
<td>0</td>
<td>Active</td>
</tr>
<tr>
<td>0563</td>
<td>11</td>
<td>25</td>
<td>0</td>
<td>Active</td>
</tr>
<tr>
<td>0563</td>
<td>12</td>
<td>25</td>
<td>0</td>
<td>Active</td>
</tr>
</tbody>
</table>

Note: The table represents the status of bank account balances for the months of 0563.
Table 16
MAXIMUM, MINIMUM, AND MEAN Run-Of f OF THE MAJOR STREAM IN EACH SUB-BASIN

(1,000 Acre Feet)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellowstorne River at Intake and Glendive, Montana(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Drainage Area:</strong> 67,901 sq. mi.</td>
<td><strong>Period:</strong> Oct. 1905 - Sept. 1938</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
<td>1790</td>
<td>720</td>
<td>536</td>
<td>206</td>
<td>806</td>
<td>595</td>
<td>1180</td>
<td>2390</td>
<td>2560</td>
<td>1500</td>
<td>5940</td>
<td>1180</td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
<td>209</td>
<td>292</td>
<td>180</td>
<td>128</td>
<td>155</td>
<td>307</td>
<td>260</td>
<td>594</td>
<td>690</td>
<td>204</td>
<td>154</td>
<td>112</td>
</tr>
<tr>
<td><strong>Mean 1903-1938</strong></td>
<td>100</td>
<td>385</td>
<td>318</td>
<td>339</td>
<td>653</td>
<td>637</td>
<td>1286</td>
<td>2788</td>
<td>1768</td>
<td>697</td>
<td>453</td>
<td>10,955</td>
</tr>
<tr>
<td><strong>Mean 1930-1937</strong></td>
<td>366</td>
<td>329</td>
<td>211</td>
<td>220</td>
<td>270</td>
<td>504</td>
<td>446</td>
<td>777</td>
<td>2030</td>
<td>909</td>
<td>328</td>
<td>619</td>
</tr>
</tbody>
</table>

| Yellowstone River at Corwin Springs, Montana(1) |
| **Drainage Area:** 2,599 sq. mi. | **Period:** Oct. 1910 - Sept. 1937 |
| **Maximum** | 56.0 | 123.0 | 98.1 | 75.5 | 65.0 | 75.6 | 155.0 | 856 | 1110 | 769 | 335 | 170.0 |
| **Minimum** | 16.0 | 31.1 | 33.9 | 31.1 | 31.1 | 30.2 | 36.1 | 31.1 | 30.2 | 15.6 | 81 | 60.5 |
| **Mean 1910-1937** | 36.6 | 77.1 | 62.2 | 55.4 | 46.5 | 58.6 | 89.4 | 311 | 614 | 397 | 189 | 112.9 |
| **Mean 1930-1937** | 32.0 | 75.0 | 59.5 | 48.5 | 42.5 | 57.2 | 114.0 | 61.7 | 330 | 297 | 279 | 84.1 |

| Clark Fork at Edgar and Fromberg, Montana(1) |
| **Drainage Area:** 2,050 sq. mi. | **Period:** June 1905 - Dec. 1913 |
| **Maximum** | 56.0 | 135.0 | 105.9 | 98.1 | 75.5 | 65.0 | 75.6 | 155.0 | 856 | 1110 | 769 | 335 | 170.0 |
| **Minimum** | 16.0 | 31.1 | 33.9 | 31.1 | 31.1 | 30.2 | 36.1 | 31.1 | 30.2 | 15.6 | 81 | 60.5 |
| **Mean 1905-1937(3)** | 36.6 | 77.1 | 62.2 | 55.4 | 46.5 | 58.6 | 89.4 | 311 | 614 | 397 | 189 | 112.9 |
| **Mean 1930-1937** | 32.0 | 75.0 | 59.5 | 48.5 | 42.5 | 57.2 | 114.0 | 61.7 | 330 | 297 | 279 | 84.1 |

| Big Horn River at Hardin and St. Xavier, Montana(1) |
| **Drainage Area:** 20,700 sq. mi. | **Period:** June 1901 - May 1935; Aug. 1926 - Sept. 1937 |
| **Maximum** | 268 | 291 | 209 | 167 | 112 | 658 | 921 | 972 | 1180 | 568 | 390 | 117.0 |
| **Minimum** | 72 | 72 | 62 | 58 | 45 | 86 | 86 | 173 | 1435 | 57 | 69 | 41,300 |
| **Mean 1901-1937(3)** | 142 | 152 | 109 | 93 | 87 | 202 | 196 | 394 | 927 | 570 | 25 | 30 |
| **Mean 1930-1937** | 137 | 119 | 95 | 81 | 72 | 131 | 131 | 528 | 758 | 322 | 118 | 124 |

| Little Horn River near Crow Agency, Montana(1) |
| **Drainage Area:** 1,157 sq. mi. | **Period:** Oct. 1991 - Sept. 1996 |
| **Maximum** | 367.9 | 37.1 | 47.8 | 21.6 | 65.8 | 115.0 | 65.4 | 78.6 | 95.6 | 12.7 | 22.7 |
| **Minimum** | 3.6 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 | 3.1 |
| **Mean** | 12.0 | 10.4 | 9.8 | 8.5 | 8.1 | 9.5 | 9.3 | 8.5 | 8.6 | 7.9 | 22.4 |

| Tongue River near Miles City, Montana(2)(6) |
| **Drainage Area:** 5,140 sq. mi. | **Period:** Oct. 1929 - Sept. 1938 |
| **Maximum** | 19.9 | 13.0 | 15.0 | 11.7 | 20.4 | 21.6 | 36.0 | 120.0 | 150.0 | 47.1 | 3.7 | 2.0 |
| **Minimum** | 0.5 | 3.0 | 5.0 | 5.0 | 7.0 | 9.0 | 10.0 | 16.0 | 2.0 | 0.1 | 0.0 | 1.0 |
| **Mean** | 4.9 | 9.9 | 8.8 | 8.9 | 11.6 | 20.6 | 20.2 | 57.9 | 71.7 | 13.0 | 1.3 | 0.8 |

| Powder River near Miles City, Montana(2)(7) |
| **Drainage Area:** 12,621 sq. mi. | **Period:** Oct. 1929 - Sept. 1938 |
| **Maximum** | 21.5 | 14.6 | 15.0 | 10.9 | 17.0 | 28.6 | 60.0 | 100.0 | 150.0 | 175.0 | 175.0 | 27.5 |
| **Minimum** | 4.0 | 6.0 | 4.0 | 4.0 | 6.0 | 6.0 | 10.0 | 20.0 | 6.0 | 2.0 | 0.2 | 3.2 |
| **Mean** | 10.3 | 10.1 | 8.2 | 8.0 | 24.6 | 30.0 | 37.6 | 67.7 | 89.5 | 16.0 | 8.3 | 37.6 |

| **Little Powder River:** No record |

(3) Broken record as noted at head of table.
(4) Estimated for 1934 by comparison with the Big Horn at Kane and the Shoshone at Byron.
(5) Measured in 1951. An extended record for July 1936 indicates a run-off of 1,840 acre-feet for that month.
(6) Run-off estimated by comparison with the Tongue River near Decker and the Powder River at Moorhead Dec. 1929 to Feb. 1930 and Nov. 1932 to March 1938.
(7) Run-off estimated by comparison with the Powder River at Moorhead December 1939 and January 1930, January to March 1932 and April 1933 to March 1938. Run-off for Powder River near Locate used April to September 1938.
<table>
<thead>
<tr>
<th>Name of Reservoir</th>
<th>Location</th>
<th>Source of Water Supply</th>
<th>Capacity in Acre-Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Stem and Minor Tributaries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Adam</td>
<td></td>
<td>Sweetgrass Creek</td>
<td>6,000*</td>
</tr>
<tr>
<td>Lake Malvoord</td>
<td></td>
<td>Sweetgrass Creek</td>
<td>12,000*</td>
</tr>
<tr>
<td>Total, Main Stem</td>
<td></td>
<td></td>
<td>18,000*</td>
</tr>
<tr>
<td><strong>Clark Fork</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glacial Lagoons</td>
<td>11</td>
<td>105W</td>
<td>5,000*</td>
</tr>
<tr>
<td>Cooney</td>
<td>5</td>
<td>105W</td>
<td>27,340*</td>
</tr>
<tr>
<td>Lucas</td>
<td>34</td>
<td>105W</td>
<td>1,520*</td>
</tr>
<tr>
<td>Paint Creek</td>
<td>34</td>
<td>105W</td>
<td>2,130*</td>
</tr>
<tr>
<td>Total, Clark Fork</td>
<td></td>
<td></td>
<td>37,590</td>
</tr>
<tr>
<td><strong>Big Horn River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoshone Lake</td>
<td>6</td>
<td>105W</td>
<td>13,500*</td>
</tr>
<tr>
<td>Beek Lake</td>
<td>6</td>
<td>105W</td>
<td>19,500</td>
</tr>
<tr>
<td>L. Thompson</td>
<td>26</td>
<td>105W</td>
<td>150,000*</td>
</tr>
<tr>
<td>Newton</td>
<td>26</td>
<td>105W</td>
<td>31,690*</td>
</tr>
<tr>
<td>Perkins &amp; Kinney</td>
<td>22</td>
<td>105W</td>
<td>1,350*</td>
</tr>
<tr>
<td>Malten</td>
<td>35</td>
<td>105W</td>
<td>2,100*</td>
</tr>
<tr>
<td>Shoshone</td>
<td>7</td>
<td>105W</td>
<td>386,600*</td>
</tr>
<tr>
<td>Stonebridge</td>
<td>31</td>
<td>105W</td>
<td>6,600*</td>
</tr>
<tr>
<td><strong>Graybull River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Sunshine</td>
<td>12</td>
<td>105W</td>
<td>19,500</td>
</tr>
<tr>
<td>Wind River</td>
<td>16</td>
<td>105W</td>
<td>150,000*</td>
</tr>
<tr>
<td>Bull Lake</td>
<td>16</td>
<td>105W</td>
<td>31,690*</td>
</tr>
<tr>
<td>Chimney Butte</td>
<td>16</td>
<td>105W</td>
<td>1,350*</td>
</tr>
<tr>
<td>Pilot Butte</td>
<td>20</td>
<td>105W</td>
<td>2,100*</td>
</tr>
<tr>
<td>Tugout</td>
<td>16</td>
<td>105W</td>
<td>386,600*</td>
</tr>
<tr>
<td>Popo Agie River</td>
<td>21</td>
<td>105W</td>
<td>6,600*</td>
</tr>
<tr>
<td>Shoshone Lake</td>
<td>21</td>
<td>105W</td>
<td>19,500</td>
</tr>
<tr>
<td>Washakie</td>
<td>21</td>
<td>105W</td>
<td>150,000*</td>
</tr>
<tr>
<td>North Fork Sage Creek</td>
<td>21</td>
<td>105W</td>
<td>31,690*</td>
</tr>
<tr>
<td>Christiana Lake</td>
<td>8</td>
<td>105W</td>
<td>1,350*</td>
</tr>
<tr>
<td>Way Lake</td>
<td>6</td>
<td>105W</td>
<td>2,100*</td>
</tr>
<tr>
<td><strong>Minor Tributaries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dempsey No. 1</td>
<td>1</td>
<td>95W</td>
<td>2,300*</td>
</tr>
<tr>
<td>Dempsey No. 2</td>
<td>1</td>
<td>95W</td>
<td>1,110*</td>
</tr>
<tr>
<td>Lake Adelaide</td>
<td>36</td>
<td>95W</td>
<td>1,800*</td>
</tr>
<tr>
<td>Shell Lake</td>
<td>17</td>
<td>95W</td>
<td>7,000*</td>
</tr>
<tr>
<td>Bethurem</td>
<td>31</td>
<td>95W</td>
<td>5,000*</td>
</tr>
<tr>
<td>Bonneville</td>
<td>35</td>
<td>95W</td>
<td>3,200*</td>
</tr>
<tr>
<td>Debsdale</td>
<td>27</td>
<td>95W</td>
<td>1,800*</td>
</tr>
<tr>
<td>Muskrat No. 1</td>
<td>16</td>
<td>95W</td>
<td>6,000*</td>
</tr>
<tr>
<td>Prairie</td>
<td>10</td>
<td>95W</td>
<td>5,000*</td>
</tr>
<tr>
<td><strong>Total, Big Horn</strong></td>
<td></td>
<td></td>
<td>660,660*</td>
</tr>
<tr>
<td><strong>Little Horn River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Willow Creek</td>
<td>27</td>
<td>85W</td>
<td>22,800*</td>
</tr>
<tr>
<td><strong>Tongue River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big Horn</td>
<td>27</td>
<td>85W</td>
<td>2,600*</td>
</tr>
<tr>
<td>Park</td>
<td>16</td>
<td>85W</td>
<td>8,000*</td>
</tr>
<tr>
<td>Dome Lake</td>
<td>2</td>
<td>85W</td>
<td>2,100*</td>
</tr>
<tr>
<td>Tongue River</td>
<td></td>
<td></td>
<td>2,100*</td>
</tr>
<tr>
<td><strong>Total, Tongue</strong></td>
<td></td>
<td></td>
<td>2,100*</td>
</tr>
<tr>
<td><strong>Powder River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Salt Creek</td>
<td>36</td>
<td>75W</td>
<td>2,700*</td>
</tr>
<tr>
<td>Cloud Peak</td>
<td>16</td>
<td>75W</td>
<td>3,200*</td>
</tr>
<tr>
<td>Ganta</td>
<td>15</td>
<td>75W</td>
<td>910*</td>
</tr>
<tr>
<td>Kearney Lake</td>
<td>30</td>
<td>75W</td>
<td>1,800*</td>
</tr>
<tr>
<td>Lake Desmet</td>
<td>6</td>
<td>82W</td>
<td>26,000*</td>
</tr>
<tr>
<td>Moore</td>
<td>23</td>
<td>82W</td>
<td>5,000*</td>
</tr>
<tr>
<td><strong>Total, Powder</strong></td>
<td></td>
<td></td>
<td>37,013</td>
</tr>
<tr>
<td><strong>Little Powder River</strong></td>
<td>34</td>
<td>72W</td>
<td>51*</td>
</tr>
<tr>
<td><strong>Total, Yellowstone Basin</strong></td>
<td>34</td>
<td>72W</td>
<td>847,997</td>
</tr>
</tbody>
</table>

* These figures are included in the total shown for the entire Yellowstone basin.
** This reservoir apparently does not exist.
(1) Useful capacity according to Appendix F of the Progress Report (1939) of the National Resources Planning Board.
(2) Total capacity according to "Water Resources of Yellowstone River Basin in Wyoming", by H. T. Person, September 1938.
1. Irrigation

Irrigation is at present the most important use to which water is put in the Yellowstone River Basin. As has been pointed out in Section I-B, irrigation is the backbone of agriculture, and agriculture, in turn, supports the livestock industry. There are at present about 900,000 acres under irrigation. In 1929 produce valued at $19,000,000 was harvested from the 677,000 acres of irrigated land devoted to crops. About $32,000,000(1) has been invested in irrigation works alone. The Corps of Engineers' 308 Report states that the value of the different types of farm land ranges from $20.00 to $250.00 per acre for irrigated land, from $5.00 to $50.00 for dry-farm land, and from $2.00 to $15.00 for grazing land.

Irrigated Lands in the Basin Definition. All lands are not subjected to the same degree of irrigation. Lands having a good water right receive, in general, more water than those having a poor right. Some land is flood-irrigated once in every one to five years from the overflow caused by temporary dams hastily constructed across normally dry water courses. Other land is subjected to systematic and intensive irrigation through an elaborate system of canals and ditches diverting from a source whose dependability has been assured. Opinions differ as to the lands that should be classed as irrigated, a fact that, to some extent, accounts for the differences in irrigated areas in the basin, as estimated by various agencies. In the tables of this report "Irrigated Area", as estimated by various authorities, is

(1) U. S. Bureau of the Census, Irrigation Section, 1930.
believed to mean the area in a basin which is systematically irrigated from a system of canals, usually referred to as a project.

The terms "Irrigable Area under Present System", "Irrigable Area by Extension of Project", and "Irrigable Area in Potential Project" are often used hereafter in this report. "Irrigable Area under Present System" means the area which can be irrigated by the project in its present state of development; "Irrigable Area by Extension of Project", the additional area which it is feasible to irrigate by extending or enlarging the existing system; and "Irrigable Area in Potential Project", the area in proposed projects which it is considered feasible to irrigate. "Ultimate Irrigable Area" of a basin, sometimes mentioned in this report, refers to the total area that will be under irrigation in the basin when the basin is completely developed, and represents the sum of "Irrigable Area under Present Systems", "Irrigable Area by Extension of Projects" and "Irrigable Area in (feasible) Potential Projects."

The ultimate irrigable area of any basin is generally limited by one of the three following conditions: (1) The amount of arable land; (2) The water supply; (3) The cost of conveying the water to the arable land.

If the amount of arable land is the controlling factor, the ultimate irrigable area of the basin can be determined fairly closely. Thus, in the higher reaches, the valleys are narrow, and the arable land lies in small plots which makes the determination of the irrigable area relatively simple. In the main stem basin in Wyoming and along many of the lesser mountain streams, there, apparently, is no land that can be cultivated.

If the water supply is the limiting factor, the ultimate irrigable
area can be determined within reasonable limits, but the determination must be conditioned upon possible future changes in the water supply by storage or by interstream diversions. The ultimate irrigable area of the Greybull Basin, of the Tongue Basin, and of many minor basins is limited by the direct water supply.

If the cost of conveying the water to the land is the limiting factor, the ultimate area which it is feasible to irrigate is a matter of judgment, and is subject to change with changing economic conditions, and, hence, cannot be determined with finality. It is in the basins where this factor controls that the various estimates differ most. Along the Big Horn and along the Yellowstone in Montana, there are large tracts of arable land and an ample supply of water, but irrigation of much of the land is prohibited by the excessive cost of long canals or of high-lift pumping.

Estimates of the irrigated and irrigable areas in the basin differ. The number of acres that are irrigable from present systems seems to be rather definitely known, but estimates as to how much of this is actually irrigated vary widely. There is also considerable difference of opinion as to the area that it is feasible or economically sound to irrigate by the extension of present systems and the construction of new projects. Many potential projects that are considered feasible by one agency are rejected by others as being impracticable.

Table 18 compares, by sub-basins, estimated irrigated and irrigable areas from the following three sources:

1. Appendix F of the Progress Report of the National Resources Planning Board - prepared in 1939 by the Corps of Engineers, War Department.


The field survey sheets used by the Corps of Engineers in the preparation of Appendix F were loaned to the Federal Power Commission and were used in grouping the projects as to source of water supply. The irrigated area given in Appendix F is the average area actually irrigated during the period 1930 to 1938.

The figures listed for the U. S. Bureau of the Census were taken from the regular reports publishing the results of the census of 1930. The irrigated area shown is the area irrigated during the 1929 growing season.

The figures listed under the heading "Wyoming Report" were taken from "Water Resources of the Yellowstone River Basin in Wyoming" which was prepared under the direction of H. T. Person and submitted to the Wyoming State Engineer in October 1938. The estimates for the irrigated area, as given in this report, appear to have been taken from water right filings in the State Engineer's office. The total of 782,120 acres is evidently composed of the 700,130 acres having adjudicated water rights, plus an additional 81,990 acres being irrigated under permits in good standing (see Section H5-2). Since it is doubtful that all the land having adjudicated rights is actually irrigated in any one year, this figure is probably not comparable to the other two estimates of irrigated areas.

A report submitted by the Montana State Water Conservation Board in September 1938 lists the following estimates of the irrigated area in Montana:
U. S. Army Engineers (H.D. 256) 561,643 acres
State Board of Equalization 434,651 acres
Montana Irrigation Commission (1920) 668,500 acres
R. B. Tootell Inventory 318,558 acres
Montana State Planning Board 472,000 acres
U. S. Census Bureau (1935) 336,198 acres

The report does not offer an independent estimate of the irrigable area in the basin, but lists the projects that were apparently omitted from the 308 Report (H.D. 256). Many of the projects listed were later incorporated in Appendix F of the Progress Report of the National Resources Planning Board. All of the projects listed in the Montana report are included in Appendix I, table 2, of this report.

A letter from the North Dakota State Water Conservation Commission, dated June 7, 1940, reports the following irrigable areas in North Dakota:

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Irrigated Area</th>
<th>Irrigable Area Under Present System</th>
<th>Ultimate Irrigable Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Stem</td>
<td>14,650</td>
<td>21,030</td>
<td>23,680</td>
</tr>
<tr>
<td>Sioux Irrigation Dist.</td>
<td>650</td>
<td>1,030</td>
<td>1,030</td>
</tr>
<tr>
<td>Lower Yellowstone Project</td>
<td>14,000</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Cartwright Irrig. District</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Yellowstone Pump. Irr. Dist.</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tributaries</td>
<td>98</td>
<td>108</td>
<td>108</td>
</tr>
<tr>
<td>Frank Lassey Ditch</td>
<td>10</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Jackson Brothers Ditch</td>
<td>88</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>Total, North Dakota</td>
<td>14,748</td>
<td>21,138</td>
<td>23,788</td>
</tr>
</tbody>
</table>

The U. S. Bureau of Reclamation is conducting a survey of irrigable areas in the Big Horn River Basin and in portions of the Yellowstone Basin above the Big Horn River. The report of this survey, which is scheduled for completion in 1941, should prove to be of great value to this investigation.

Table 19 is a further breakdown of the estimates reported by the
Corps of Engineers and shown in table 18. Because the only detailed data covering the entire basin, which are available in this office, are those furnished by the Corps of Engineers, these data are used in developing this report. Where comparable data have been furnished by another agency, they are presented for comparison. Data on irrigated and irrigable areas and on water shortages are given in detail in Section II for each existing project in the basin. A description of each major project is contained in Appendix III of the 308 Report (H.D. 256). Map 6, showing the approximate location of existing and potential irrigation projects, was developed from the best available information of this nature.

The potential irrigation projects listed in table 20 are those projects which were included in the water use studies of Appendix F of the Progress Report of the National Resources Planning Board. The area in these projects is included in the "ultimate irrigable area" as estimated in Appendix F and listed in tables 18 and 19 of this report. Other potential projects were mentioned in Appendix F, but were excluded from the water use studies for one or more of the following reasons:

A. An alternate to a listed potential project, or included in a listed project.

B. Infeasible on account of insufficient water supply or other physical cause.

C. Infeasible economically.

D. Data insufficient for appraisal of project. (Some of these may prove to be alternates.)

Appendix I of this report contains a list of all the proposed projects of which this office has any knowledge. Since most of the smaller streams in the basin are over-appropriated at present, additional areas that are brought under irrigation in the future will be, to a great extent,
dependent upon new storage. For a list of potential storage reservoirs, see Appendix II (see map 7 for location).

Definition of Terms Relating to Irrigation Practice

Terms relating to irrigation practice are often loosely used and, when not adequately defined, are subject to misinterpretation.

In this report "Water Duty at Headgate" or simply "Water Duty" will mean the gross diversion from stream per acre irrigated. "Water Duty at Farm" will mean the amount of water per acre actually applied to the land. Canal and lateral losses and waste returns make up the difference between "Water Duty at Headgate" and "Water Duty at Farm." "Return Flow" is the amount of the gross water diversion that ultimately finds its way back to a stream. "Stream Depletion", as used in this report, is the difference between "Water Duty at Headgate" and "Return Flow." "Consumptive Use" is the amount of water lost from irrigated land through evaporation and transpiration.

Many factors affect water duty, and they are so intricately inter-related that it is impossible to determine the relative effects of each. Many formulae have been offered purporting to express water duty as a function of several of the numerous factors which affect it. Although many of these formulae are products of valuable research, they fall short of their aim. One of the greatest obstacles to the determination of the relative effects of the physical factors affecting water duty is the human factor of the irrigator. The irrigation which a crop receives depends upon the industry, skill, and efficiency of the irrigator, as well as upon the needs of the crop. Also, it is quite natural for irrigators to use water lavishly when it is plentiful or when there is fear that soon it will be scarce. Nevertheless, physical factors are dominant in determining water duty, and, therefore, the more important of these are discussed below.
Precipitation is the most important factor affecting water duty, as is evident from the fact that irrigation is not generally practiced where the annual precipitation exceeds 20 inches, unless the distribution is unfavorable. A scatter diagram (not printed) showing water duty at the farm plotted against precipitation during the growing season, by years, for six U. S. Bureau of Reclamation(1) projects - four in the Yellowstone Basin and two just outside the basin - indicates roughly but definitely a decrease in water duty with increase in precipitation, the relationship being approximately straight-lined. The relationship between water duty and precipitation, however, is not as close as might be expected. In general, projects having relatively heavy precipitation during the growing season have a lower water duty than projects having relatively light precipitation, but, for certain projects, water duty from year to year appears to be almost independent of rainfall. This is perhaps due to the fact that the rainfall during the actual irrigation season is often too light to interrupt the systematic irrigation practice. Then, too, a rather large total rainfall for a season might occur in numerous showers, each of which is too light to benefit the crop. Of the irrigable area of the Yellowstone Basin, the heart of the Big Horn Basin receives the least precipitation, and, if this factor were the sole criterion, might reasonably be expected to require the most water. The irrigable areas receiving the greatest precipitation, and which might be expected to require the least water, are those occupying the higher elevations and perhaps those farthest east, near the North Dakota state line. However, precipitation

(1) "Use of Water on Federal Irrigation Projects" by E. B. Debler. Printed in Volume 94 of the Transaction of the American Society of Civil Engineers.
does not alone determine water duty, and the precipitation does not vary enough over the irrigable areas to cause an extreme range of water duty in the Yellowstone Basin.

**Type of soil.** The report of E. B. Debler, "Use of Water on Federal Irrigation Projects", printed in Volume 24 of the Transactions of the American Society of Civil Engineers, gives pertinent data on 24 irrigation projects of the U. S. Bureau of Reclamation, scattered throughout the western United States. The mean annual water requirements ("water duty at the farm", plus precipitation) for the 24 projects of the Debler report, classified as to type of soil, are:

- Average of 5 light soils - 3.72 acre-feet
- Average of 11 medium soils - 3.21 acre-feet
- Average of 7 heavy soils - 2.36 acre-feet

So great a difference is probably highly significant and indicates that, under the same general climatic conditions, such as exist in the Yellowstone Basin, the type of soil is perhaps the dominant factor in the variation of water use. Too little is known of the soils in the basin to permit general conclusions as to water duty in the several sub-basins. The influence of soil texture on the water duty of a given project can be determined only after detailed soil surveys are made.

**Canals and laterals.** Canal and lateral losses increase with the length of the conduit and the porosity of the soil, and, therefore, vary widely on different projects. For the 24 projects of the Debler report canal and lateral losses range from 13 to 48 percent of the total diversions, and average 34 percent. Hence, it is evident that, for certain projects, the length of the canal system might easily outweigh all other factors that determine water duty. High cost usually prohibits correction by lining the canals. Projects having short canals are usually cheaper.
and were developed first. Projects built in the future may, in general, be expected to have longer canals and, therefore, greater losses than those already constructed.

The **method and efficiency** of irrigation might be considered a human factor, rather than a physical factor, were they not effected by the generally recognized methods of irrigation practice. Both flood and furrow irrigation, depending upon the type of crop, are practiced in the Yellowstone Basin. Sub-surface irrigation is too expensive to be practical in this region. Flood irrigation is applied to small grains, hay, and pasture lands. It requires more water and results in a greater waste than does furrow irrigation. However, since hay and pasture lands can withstand drought without serious deterioration better than other crops, they are sometimes neglected if the water on a farm must be rationed. Sections devoted exclusively to hay and pasture and having an abundant supply of water can be expected to have a use of water greater than that of other sections.

**Type of crop.** Water duty varies both in total amount and in seasonal distribution with the kind of crop and its yield. Many attempts, by controlled laboratory experiment, have been made to determine the amount of water used by various crops. An article, "Determination of the Duty of Water by Analytical Experiment" by W. C. Hammatt, printed in Volume 83 of the Transactions of the American Society of Civil Engineers, presents a table, attributed to Samuel Fortier, showing the transpiration use of plants as determined by various investigators throughout the world. An abridged rearrangement of this table is presented below.
Transpiration for Various Standard Crops
(Pounds of Water per Pound of Dry Matter)

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Wheat</th>
<th>Oats</th>
<th>Barley</th>
<th>Corn</th>
<th>Rye</th>
<th>Peas</th>
<th>Potatoes</th>
<th>Alfalfa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorauer(1)</td>
<td>708</td>
<td>600</td>
<td>490</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Hellriegel(1)</td>
<td>339</td>
<td>401</td>
<td>297</td>
<td>-</td>
<td>377</td>
<td>292</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Von Seelhorst(1)</td>
<td>333</td>
<td>-</td>
<td>365</td>
<td>-</td>
<td>469</td>
<td>-</td>
<td>281</td>
<td>-</td>
</tr>
<tr>
<td>Leather(2)</td>
<td>514</td>
<td>614</td>
<td>468</td>
<td>337</td>
<td>-</td>
<td>563</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Briggs &amp; Shants(3)</td>
<td>507</td>
<td>614</td>
<td>539</td>
<td>369</td>
<td>724</td>
<td>800</td>
<td>448</td>
<td>1,068</td>
</tr>
<tr>
<td>Lawes(4)</td>
<td>235</td>
<td>-</td>
<td>260</td>
<td>-</td>
<td>-</td>
<td>235</td>
<td>477</td>
<td>423</td>
</tr>
<tr>
<td>King(3)</td>
<td>-</td>
<td>514</td>
<td>388</td>
<td>348</td>
<td>-</td>
<td>477</td>
<td>423</td>
<td>-</td>
</tr>
</tbody>
</table>

(1) Germany (2) India (3) United States (4) England

The fact that the variation between irrigators is greater than
the variation between type of crop (which tends to indicate that water use
varies with the investigator or irrigator more than with the kind of plant)
cannot be dismissed as entirely insignificant. Nevertheless, it is a well-
known fact that some crops require more water than others, and that some
crops require early water and others late water. If this fact is con-
sidered in determining the "beneficial use" of irrigation water, it will
undoubtedly reflect to the advantage of the entire basin. Sugar beets,
especially, demand late water, and irrigators in areas devoted primarily
to sugar beets might advantageously sacrifice early water to the hay and
pasture areas in return for a more dependable supply in late summer.

Temperature and humidity directly affect water duty by controlling
the rate of evaporation. Also, temperature is a fairly accurate measure
of the amount of solar radiation received, which, in turn, is a controlling
factor in plant growth. The areas in the basin having higher summer tem-
peratures might reasonably be expected to have higher water duty.

It is evident, from the above discussion, that the water duty in
any area must be estimated by comparison with actual experience in similar
areas, with due regard to variations in physical factors. The only actual records known to be available are those for four projects of the U. S. Bureau of Reclamation. Data on water use on these projects are presented below. Immediately following the presentation of the actual records, estimates of water duty according to various authorities are discussed.

### Average "Water Duty at Farm" - U.S.B.R. Projects

(Acre-feet per acre)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Yellowstone</td>
<td>.00</td>
<td>.07</td>
<td>.30</td>
<td>.35</td>
<td>.11</td>
<td>.00</td>
<td>1.34</td>
<td></td>
</tr>
<tr>
<td>Huntley</td>
<td>.00</td>
<td>.12</td>
<td>.28</td>
<td>.51</td>
<td>.37</td>
<td>.11</td>
<td>.00</td>
<td>1.39</td>
</tr>
<tr>
<td>Shoshone Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frannie Division</td>
<td>.02</td>
<td>.29</td>
<td>.56</td>
<td>.63</td>
<td>.46</td>
<td>.19</td>
<td>.04</td>
<td>2.19</td>
</tr>
<tr>
<td>Garland Division</td>
<td>.05</td>
<td>.30</td>
<td>.57</td>
<td>.71</td>
<td>.50</td>
<td>.21</td>
<td>.03</td>
<td>2.38</td>
</tr>
<tr>
<td>Riverton</td>
<td>.00</td>
<td>.20</td>
<td>.70</td>
<td>.96</td>
<td>.47</td>
<td>.27</td>
<td>.01</td>
<td>2.62</td>
</tr>
<tr>
<td>Average</td>
<td>.01</td>
<td>.20</td>
<td>.48</td>
<td>.66</td>
<td>.43</td>
<td>.18</td>
<td>.02</td>
<td>1.98</td>
</tr>
<tr>
<td>Percent of Annual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

### Average "Water Duty at Farm" Plus Precipitation - U.S.B.R. Projects

(Acre-feet per acre)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Yellowstone</td>
<td>.08</td>
<td>.20</td>
<td>.54</td>
<td>.68</td>
<td>.48</td>
<td>.22</td>
<td>.08</td>
<td>2.28</td>
</tr>
<tr>
<td>Huntley</td>
<td>.09</td>
<td>.30</td>
<td>.47</td>
<td>.62</td>
<td>.44</td>
<td>.25</td>
<td>.09</td>
<td>2.26</td>
</tr>
<tr>
<td>Shoshone Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frannie Division</td>
<td>.06</td>
<td>.40</td>
<td>.64</td>
<td>.69</td>
<td>.49</td>
<td>.26</td>
<td>.08</td>
<td>2.62</td>
</tr>
<tr>
<td>Garland Division</td>
<td>.09</td>
<td>.38</td>
<td>.65</td>
<td>.78</td>
<td>.54</td>
<td>.29</td>
<td>.06</td>
<td>2.79</td>
</tr>
<tr>
<td>Riverton</td>
<td>.10</td>
<td>.36</td>
<td>.76</td>
<td>1.06</td>
<td>.57</td>
<td>.32</td>
<td>.09</td>
<td>3.26</td>
</tr>
<tr>
<td>Average</td>
<td>.07</td>
<td>.33</td>
<td>.61</td>
<td>.77</td>
<td>.50</td>
<td>.27</td>
<td>.08</td>
<td>2.64</td>
</tr>
<tr>
<td>Percent of Annual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>


The period covered is from 1912 to 1926, except for the Riverton Project, where the period is from 1929 to 1937. Broken and less accurate data since 1926 indicate that the average total "water duty at farm" should be increased from 1.98 acre-feet to 2.25 acre-feet, and that the average total "water duty at farm" plus precipitation should be increased from 2.64 acre-feet to 2.80 acre-feet per acre. Since canal and lateral losses for
these projects range from 36 to 44 percent of diversion, this would result in an average "water duty at the headgate" of about 3.5 acre-feet per acre. The maximum and minimum "water duty at the farm" is given for each project in the following tabulation:

<table>
<thead>
<tr>
<th>Project</th>
<th>Maximum Amount</th>
<th>Maximum Year</th>
<th>Minimum Amount</th>
<th>Minimum Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Yellowstone</td>
<td>2.51</td>
<td>1931</td>
<td>0.87</td>
<td>1920</td>
</tr>
<tr>
<td>Huntley</td>
<td>3.13</td>
<td>1934</td>
<td>0.96</td>
<td>1922</td>
</tr>
<tr>
<td>Shoshone Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frannie Division</td>
<td>4.90</td>
<td>1936</td>
<td>1.72</td>
<td>1926</td>
</tr>
<tr>
<td>Garland Division</td>
<td>4.06</td>
<td>1936</td>
<td>2.08</td>
<td>1913</td>
</tr>
<tr>
<td>Willwood Division</td>
<td>2.71</td>
<td>1934</td>
<td>2.00</td>
<td>1932</td>
</tr>
<tr>
<td>Riverton</td>
<td>3.31</td>
<td>1934</td>
<td>2.08</td>
<td>1937</td>
</tr>
</tbody>
</table>


It should be pointed out that the use of water on these projects has never been curtailed because of a water shortage.

In the Wyoming report, "Water Resources in the Yellowstone River Basin in Wyoming", streamflow was reconstructed by assuming a stream depletion of 1.5 acre-feet per irrigated acre per year. It was assumed that 2.5 acre-feet were diverted, 1.0 acre-foot of which was return flow. Stream depletions were estimated to be distributed throughout the growing season as follows:

- May: 15% or 0.23 acre-feet
- June: 35% or 0.52 acre-feet
- July: 35% or 0.52 acre-feet
- August: 10% or 0.15 acre-feet
- September: 5% or 0.08 acre-feet
- Total: 100% or 1.50 acre-feet

It was emphasized in the report that these estimates were for past use, and that the correction was not applied to areas devoted primarily to crops requiring a great amount of late water. Because of the
increasing trend in crops requiring more water, the estimated future depleted run-off was found by assuming the following depletion:

Upper Big Horn Basin . . . . 1.6 acre-feet
Lower Big Horn Basin . . . . 1.8 acre-feet
Little Horn Basin . . . . . 1.5 acre-feet

In H.D. 256 of the 308 Report, Appendix IV, which treats of potential irrigation projects, goes into considerable detail on water duty on the Shoshone Project extension. A tabulation of the estimates arrived at is given below:

Irrigation Requirements for Shoshone Project and Extensions

<table>
<thead>
<tr>
<th>Division</th>
<th>Estimated Duty at Farm</th>
<th>Estimated Consumptive Use*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garland and Willwood</td>
<td>2.38</td>
<td>1.83</td>
</tr>
<tr>
<td>Frannie</td>
<td>2.14</td>
<td>-</td>
</tr>
<tr>
<td>Heart Mountain</td>
<td>2.25</td>
<td>1.70</td>
</tr>
<tr>
<td>Chapman Bench</td>
<td>2.30</td>
<td>-</td>
</tr>
<tr>
<td>Oregon Basin above Reservoir</td>
<td>2.25</td>
<td>1.70</td>
</tr>
<tr>
<td>Below Oregon Basin Reservoir</td>
<td>2.40</td>
<td>1.70</td>
</tr>
<tr>
<td>Greybull District</td>
<td>2.90</td>
<td>**1.90</td>
</tr>
</tbody>
</table>

Source: Appendix IV, H.D. 256.

* "Consumptive use" is not defined in the report.
** Exclusive of loss from some 12,000 acres of seeped river bottom.

The duty of water for most of the other potential developments is estimated in Appendix IV with little comment. The estimates are tabulated below:
**Estimated Duty of Water on Potential Irrigation Projects**

<table>
<thead>
<tr>
<th>Proposed Project</th>
<th>Location</th>
<th>Duty of Water Diverted</th>
<th>Duty of Water At Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle Yellowstone</td>
<td>Lower Yellowstone</td>
<td>2.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Powder River</td>
<td>Lower Powder River</td>
<td>2.7</td>
<td>1.6</td>
</tr>
<tr>
<td>Sussex</td>
<td>Upper Powder River</td>
<td>2.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Tensleep and Bonanza</td>
<td>Nowood Creek</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Paintrock</td>
<td>Nowood Creek</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Buffalo Basin</td>
<td>Gooseberry Creek</td>
<td>2.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Big Horn</td>
<td>Lower Big Horn</td>
<td>3.34</td>
<td>2.0</td>
</tr>
<tr>
<td>Clark Fork</td>
<td>Clark Fork</td>
<td>3.1</td>
<td>1.89</td>
</tr>
<tr>
<td>Clark Fork alternate scheme</td>
<td>Clark Fork</td>
<td>4.0</td>
<td>2.00</td>
</tr>
<tr>
<td>Chapman Bench</td>
<td>Clark Fork</td>
<td>3.5</td>
<td>-</td>
</tr>
<tr>
<td>Lander Valley</td>
<td>Popo Agie River</td>
<td>4.25</td>
<td>-</td>
</tr>
<tr>
<td>Parkman Irrigation District</td>
<td>Tongue River</td>
<td>3.0</td>
<td>-</td>
</tr>
<tr>
<td>Johnson County</td>
<td>Crazy Woman Creek</td>
<td>3.0</td>
<td>-</td>
</tr>
<tr>
<td>North Wyoming Land Company</td>
<td>Crazy Woman Creek</td>
<td>3.0</td>
<td>-</td>
</tr>
<tr>
<td>Brackett Creek</td>
<td>Upper Yellowstone</td>
<td>2.9</td>
<td>1.5</td>
</tr>
<tr>
<td>Joliet &amp; White Horse Bench</td>
<td>Upper Yellowstone</td>
<td>2.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Tongue River Canyon</td>
<td>Tongue River</td>
<td>3.33</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Source: Appendix IV, H.D. 256.

In the Platte River 308 Report (H.D. 197), consumptive use and return flow are discussed in Appendix X. This appendix gives, in tabular form, the consumptive use of different crops as found by various investigations. This table, which has been abridged and rearranged, is given below. The meaning of "consumptive use", as used in this table, is not perfectly clear, but it is believed to mean the amount of water (including that supplied by precipitation) actually lost from an acre of crop through evaporation and transpiration. This figure may be expected to vary with crop yield.
### Summary of the "Consumptive Use" of Various Crops

(Acre-feet per acre)

<table>
<thead>
<tr>
<th>Crop</th>
<th>Poudre Valley</th>
<th>Cache Valley</th>
<th>Utah Experiment Station</th>
<th>Snake River Valley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>3.7</td>
<td>3.3</td>
<td>4.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Sugar Beets</td>
<td>3.0</td>
<td>2.5</td>
<td>2.4</td>
<td>-</td>
</tr>
<tr>
<td>Potatoes</td>
<td>3.3</td>
<td>2.2</td>
<td>2.2</td>
<td>1.6</td>
</tr>
<tr>
<td>Corn</td>
<td>-</td>
<td>2.5</td>
<td>2.2</td>
<td>1.3</td>
</tr>
<tr>
<td>Wheat</td>
<td>2.1</td>
<td>2.4</td>
<td>2.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Barley</td>
<td>2.3</td>
<td>-</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Oats</td>
<td>1.4</td>
<td>2.5</td>
<td>3.1</td>
<td>1.5</td>
</tr>
<tr>
<td>Beans</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
</tr>
<tr>
<td>Peas</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Source: Appendix X, H.D. 197.

4. M. R. Lewis.

In making return flow studies, the report adopted the following values for consumptive use as applicable to the North Platte Valley:

- Alfalfa: 3.4
- Sugar Beets: 2.6
- Potatoes: 2.3
- Cereals: 2.1
- Miscellaneous: 2.6

**Appendix "P"** of the Progress Report of the National Resources Planning Board, which was prepared for the Board by the Corps of Engineers, War Department, estimates the average water duty in the Yellowstone Basin as 3.5 acre-feet gross diversion per acre. This estimate is supported by the following statement: "This is a compromise between earlier estimated duties for various proposed projects and the actual diversions and claims of irrigators on existing projects, and is in accord with prevailing duty estimated by the U. S. Bureau of Reclamation for ultimate development of its projects." The seasonal distribution of diversions is estimated to be
as follows:

<table>
<thead>
<tr>
<th>Month</th>
<th>Diversion</th>
<th>Returns</th>
<th>Net Effect on Stream Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>0.00</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>February</td>
<td>0.00</td>
<td>0.018</td>
<td>0.018</td>
</tr>
<tr>
<td>March</td>
<td>0.00</td>
<td>0.018</td>
<td>0.018</td>
</tr>
<tr>
<td>April</td>
<td>0.18</td>
<td>0.05</td>
<td>-0.13</td>
</tr>
<tr>
<td>May</td>
<td>0.12</td>
<td>0.10</td>
<td>-0.32</td>
</tr>
<tr>
<td>June</td>
<td>0.70</td>
<td>0.19</td>
<td>-0.51</td>
</tr>
<tr>
<td>July</td>
<td>0.84</td>
<td>0.26</td>
<td>-0.58</td>
</tr>
<tr>
<td>August</td>
<td>0.84</td>
<td>0.29</td>
<td>-0.55</td>
</tr>
<tr>
<td>September</td>
<td>0.12</td>
<td>0.24</td>
<td>-0.18</td>
</tr>
<tr>
<td>October</td>
<td>0.10</td>
<td>0.13</td>
<td>0.03</td>
</tr>
<tr>
<td>November</td>
<td>0.00</td>
<td>0.059</td>
<td>0.059</td>
</tr>
<tr>
<td>December</td>
<td>0.00</td>
<td>0.025</td>
<td>0.025</td>
</tr>
<tr>
<td>Season</td>
<td>3.50</td>
<td>1.40</td>
<td>-2.10</td>
</tr>
</tbody>
</table>

Return flow is estimated to average not less than 40 percent of the gross diversion. The time of return flow was assumed to conform to the following general return formula:

15% of diversion for any month during the same month
15% of diversion for any month during the first month following
5% of diversion for any month during the second month following
1% of diversion for any month during the third month following
0.5% of diversion for any month during each of the next eight months following

According to this formula the entire return flow, amounting to 40 percent of gross diversion, returns to the stream within 12 months of the date of diversion. Combinations of the above diversion and return flow schedules result in the following net effects on stream flow:

Table 21

Net Effect of Irrigation on Stream Flow

Source: Appendix "F" of the Progress Report of the National Resources Planning Board, 1939.
Other estimates. The history of irrigation in the Yellowstone River Basin records a perplexing array of estimates of the use of water, since no writer on the subject can long evade the necessity of adopting a figure for water duty. It would be impracticable to attempt to give even a partial list of these estimates in this report. It may be safely assumed, however, that the recent estimates quoted in the preceding paragraphs were made only after careful consideration had been given to previous estimates. The only attempt to fix by law the amount of water which may be applied to the land is the ruling in Wyoming which limits diversion to one cubic foot per second to every 70 acres.

Return Flow

Return flow is that portion of the gross diversion which ultimately finds its way back to some stream. It is the difference between gross diversion and stream depletion. Seepage from canals and laterals, farm waste and farm percolation losses are the chief sources of return flow.

Return flow varies widely from project to project, both in amount and in time of return. In general, the amount of return flow depends upon the amount of water diverted, and, consequently, any factor which affects water duty at the headgate must also affect return flow. The type of sub-soil has a marked effect on return flow both as to total amount and to time of return. A loose, porous sub-soil is conducive to great losses which are quickly returned to the stream. A heavy textured sub-soil reduces seepage and percolation losses and delays their return. Seeped areas, inasmuch as they increase stream depletion by offering surfaces of evaporation, decrease return flow. Because it takes several years to build up the water table under irrigated areas, return flow is relatively low the first few years a project is under irrigation, and increases with the age
of the project until a normal return is reached.

Records of return flow in the region are very meager. The many sources of error connected with the measurement of return flow render accurate determination almost impossible. The most valuable known information on the subject is contained in a report, "The Consumptive Use of Water on the Garland Division, Shoshone Project", by H. H. Johnson, discussing the results of an investigation conducted by the U. S. Bureau of Reclamation on the Garland Division in 1923. It was found that, of the net diversion of 118,704 acre-feet, 63,037 acre-feet were returned to the stream, leaving a gross stream depletion of 55,667. (This indicates a depletion of 1.83 acre-feet per acre for the 30,468 acres irrigated.)

The Wyoming Report, the "308" Report, and "Appendix F" estimate return flow at 40 percent of gross diversions. Jerome G. Locke, in "Preliminary Report on the Complete Development of the Yellowstone Drainage Basin", quotes the Montana Planning Board as assuming return flow as 50 percent of gross diversions, with which he concurs. It appears, from the preceding paragraph, that return flow on the Garland Division amounted (in 1923) to about 53 percent of "net" diversions (gross diversion less canal waste).

Apparently, the nature of the sub-soil is the dominant factor controlling the seasonal distribution of return flow. The table below shows the monthly percentages of the annual return flow on four projects as given in Appendix X of the Platte River "308 Report", to which has been added for comparison the seasonal distribution as estimated in "Appendix F" of the Progress Report of the National Resources Planning Board.
### Monthly Distribution of Return Flow

(Percent of Annual Return Flow)

<table>
<thead>
<tr>
<th>Month</th>
<th>Garland Division, Shoshone Project(1)</th>
<th>Boise Project Idaho(2)</th>
<th>Casper-Alcova Project(3)</th>
<th>North Platte Basin(4)</th>
<th>Appendix &quot;p&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1.9</td>
<td>4.2</td>
<td>6</td>
<td>6.1</td>
<td>1.4</td>
</tr>
<tr>
<td>February</td>
<td>1.4</td>
<td>3.8</td>
<td>5</td>
<td>5.7</td>
<td>1.3</td>
</tr>
<tr>
<td>March</td>
<td>1.5</td>
<td>3.4</td>
<td>5</td>
<td>5.6</td>
<td>1.3</td>
</tr>
<tr>
<td>April</td>
<td>1.5</td>
<td>3.1</td>
<td>5</td>
<td>5.5</td>
<td>3.6</td>
</tr>
<tr>
<td>May</td>
<td>7.6</td>
<td>8.0</td>
<td>7</td>
<td>8.0</td>
<td>7.1</td>
</tr>
<tr>
<td>June</td>
<td>16.0</td>
<td>13.8</td>
<td>11</td>
<td>9.6</td>
<td>13.6</td>
</tr>
<tr>
<td>July</td>
<td>20.9</td>
<td>13.4</td>
<td>12</td>
<td>9.6</td>
<td>18.6</td>
</tr>
<tr>
<td>August</td>
<td>20.4</td>
<td>14.1</td>
<td>12</td>
<td>11.5</td>
<td>20.7</td>
</tr>
<tr>
<td>September</td>
<td>14.9</td>
<td>14.9</td>
<td>12</td>
<td>11.9</td>
<td>17.1</td>
</tr>
<tr>
<td>October</td>
<td>7.9</td>
<td>9.9</td>
<td>10</td>
<td>10.4</td>
<td>9.3</td>
</tr>
<tr>
<td>November</td>
<td>3.3</td>
<td>6.1</td>
<td>8</td>
<td>8.6</td>
<td>4.2</td>
</tr>
<tr>
<td>December</td>
<td>2.7</td>
<td>5.3</td>
<td>7</td>
<td>7.5</td>
<td>1.8</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

(1) "The Consumptive Use of Water on the Garland Division, Shoshone Project", by H. H. Johnson.
(3) Rate adopted by U. S. Bureau of Reclamation as applicable to the Casper-Alcova Project (Kendrick Project, Wyoming).
(4) As computed by Corps of Engineers, War Department, Appendix X, H.D. 197, Platte River Report.

**Effect of Irrigation on Streamflow**

The total effect of irrigation operations on streamflow may be determined from the combined effect of gross diversion, return flow and reservoir operations. A schedule of the effect of the first two factors, as developed in "Appendix F", is shown by table 21.

This schedule, which was prepared by the Corps of Engineers, is intended to reflect average conditions throughout the basin. The effect of reservoir operations depends upon the capacity available for storage, and must be computed separately for each stream. Since reservoirs are operated to correct the deficiencies of the natural stream, their general effect is to decrease the flood peaks in early summer and increase the flow in late summer, thereby causing a more even flow throughout the irrigation season.
Evaporation loss from storage reservoirs must be added to the depletion resulting from irrigation proper, in order to obtain the total stream depletion resulting from irrigation. Thus, the net effect of irrigation on streamflow results in a decrease in total annual discharge through depletion, and a re-distribution of seasonal flow arising from the regulating effect of storage and diversion operations and the subsequent return flow schedule.

2. Power Development

Generating facilities are operated by 17 public utility systems, the National Park Service, the Bureau of Reclamation, and five industrial companies. The industrial companies generate energy for their own use, and their capacity is, in general, not available to the utility load in the area. Pertinent information on existing power plants in the region is given in table 22, and map 9 shows the location of these plants. It will be noted, from the summary below, that, although only one-third of the basin's capacity is in hydroelectric plants, they account for nearly one-half the total energy generated in the basin.

<table>
<thead>
<tr>
<th>Generator</th>
<th>Capacity (Kw)</th>
<th>Percent</th>
<th>Net Generation, 1939* (1,000 Kwh)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>19,348</td>
<td>29</td>
<td>72,299</td>
<td>49</td>
</tr>
<tr>
<td>Steam</td>
<td>45,602</td>
<td>67</td>
<td>70,930</td>
<td>48</td>
</tr>
<tr>
<td>Internal Combustion</td>
<td>2,326</td>
<td>4</td>
<td>3,796</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>67,276</td>
<td>100</td>
<td>147,025</td>
<td>100</td>
</tr>
</tbody>
</table>

* 1939 generation, except as noted on table 22.

Although there are interconnections with the main system of the Montana Power Company to the northwest and with the Williston Division of the Montana-Dakota Utilities Company to the northeast, energy interchanges with these systems outside the basin are relatively small. In 1938
interchanges amounted to a net importation into the Yellowstone Basin of 4,400,000 kwh from the main system of the Montana Power Company and 1,100,000 kwh from the Williston Division of the Montana-Dakota Utilities Company. However, the Stanolind Oil and Gas Company exports (to the Casper area, outside the basin) about 15 to 20 million kilowatt-hours annually.

In 1939 the Federal Power Commission made a survey of the potential power markets in and near the Yellowstone Basin, and estimated the future power requirements of the region through the year 1955. Table 23 presents a summary of that portion of the load, in the region studied, that is approximately within the limits of the Yellowstone Basin itself. It will be noted that the energy requirements of the basin are expected to increase from 102 million kilowatt-hours in 1938 to about 183 million in 1955.

### Table 23

<table>
<thead>
<tr>
<th>Customer Classification</th>
<th>Actual Records</th>
<th>Forecasts (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1929</td>
<td>1938</td>
</tr>
<tr>
<td>Residential and Farm</td>
<td>10,070</td>
<td>19,110</td>
</tr>
<tr>
<td>Commercial and Industrial</td>
<td>39,320</td>
<td>45,780</td>
</tr>
<tr>
<td>Government and Municipal</td>
<td>6,780</td>
<td>8,700</td>
</tr>
<tr>
<td>Total Sales to Ultimate Consumers (2)</td>
<td>56,170</td>
<td>73,590</td>
</tr>
<tr>
<td>Corresponding Energy Requirements (3)</td>
<td>78,120</td>
<td>102,410</td>
</tr>
</tbody>
</table>


(1) Estimates do not include energy requirements of the potential irrigation pumping projects listed in Table 24.

(2) Does not include sales of small isolated systems.

(3) Includes energy requirements of small isolated systems.
This estimate does not include the energy requirements of pumping plants of potential irrigation projects. This possible market was investigated, and, from the list of potential pumping projects which have been proposed, 17 in the Yellowstone Basin were selected as being capable, under favorable circumstances, of meeting power charges. These 17 projects (listed in table 24) would provide a market for an additional 16 million kilowatt-hours of electric energy. Markets adjacent to the Yellowstone Basin were also investigated, but it was found that the only two probable markets of any magnitude - the proposed irrigation pumping projects along the Missouri River and the mining industry in the Butte-Great Falls area of Montana - could be adequately, and possibly more economically, supplied from the Fort Peck Project and undeveloped hydroelectric resources of western Montana.

Table 25 gives pertinent data on the 34 water power plants (some of which are direct drive) in the Yellowstone Basin. This list was compiled by the Federal Power Commission in 1938 and is believed to be complete.

The future development of hydroelectric power appears to be limited by the absence of an adequate market and the abundance of cheap fuel, rather than by a lack of favorable water power sites. Appendix III presents pertinent information on hydroelectric developments which have been proposed. The Corps of Engineers' 308 Report tabulates 26 water power plants, at which, it was estimated, prime power could be produced for less than 8 mills per kilowatt-hour. These plants are listed in table 1 of Appendix III.

3. **Navigation**

Navigation of the Yellowstone River was rather extensive during the decade prior to the completion, in 1882, of the Northern Pacific
Railroad between Bismarck, North Dakota and Billings, Montana. Apparently, navigation was too difficult to permit water-borne commerce to compete with this improved means of transportation, for, immediately after the completion of the railroad, river traffic dropped markedly, and thereafter diminished gradually until 1910, when the construction of the diversion dam at Intake, Montana closed the river to traffic above that point. Today, the actual head of navigation is the dam at Intake.

The Corps of Engineers, in its 308 Report, includes the following on page 157:

"During the period 1882 to 1884, boats were operated on the Yellowstone River from the mouth of the stream to Billings, Mont. (mile 346). The principal steamers that were operated on the Yellowstone River according to the information now available were the 'Far West', the 'Eclipse', the 'Josephine', and the 'Bachelor'. It appears that the navigation season was limited to the period during which the river maintained a fairly dependable stage, and in general lasted only from May to September of each year. Existing records also indicate that steamers during this period navigated the Big Horn River as far as Fort Custer, Mont. (at the mouth of the Little Horn River, 40 miles above its confluence with the Yellowstone). In 1882 the Northern Pacific Railroad was completed between Bismarck, N. D., and Billings, Mont. After the construction of the railroad, navigation on the upper reaches of the river was gradually abandoned. Between Glendive and the mouth of the river, however, there continued to be a small amount of river commerce until 1910, when through navigation was interrupted by completion of the dam at Intake."

The following items were obtained from works found in the Library of Historical Society of Montana, at Helena:

**The Bozeman Times - June 15, 1875:**

"According to the Bismarck Tribune of the 26th, the Josephine started up the Yellowstone River on the 23rd ulto., with Forsyth and Grant and party - time to Big Horn and back estimated at three weeks.

"We are advised that the main object of the Pease Expedition is the location of a town and colony at the head of navigation of the Yellowstone probably at the Big Horn."

**The Bozeman Times - June 22, 1875:**

Reprint of an extra issued June 15: "A messenger, just arrived at Bozeman from the Yellowstone valley, brings the gratifying news that the steamer Josephine has reached the mouth of
Clark's Fork 75 miles above the mouth of the Big Horn, and ascended that stream a few miles. She met with no obstruction on the way - easily getting over Wolf Rapids - and will probably ascend the Yellowstone to the site of the old Crow Mission, or within 35 miles of Bozeman. * * * The officers of the Josephine are reported to have pronounced the Yellowstone a better river to navigate than the Upper Missouri."


Forsyth's Report:
"The steamboat selected for the expedition was the Josephine, Captain Marsh commanding. She is one of the best boats engaged in the Upper Missouri trade, being 180 feet in length, 31 feet in breadth, with a depth of hold of 4 feet, and is registered at 300 tons burden. She had no freight on board and was manned by 12 officers and 31 men. * * *"

Big Horn River:
"We steamed up this river for a distance of 12 miles, found it quite crooked, with a narrow valley, and were obliged to return on account of the water becoming distributed over so wide a space that the main channel did not afford sufficient depth of water for us to continue our course. The current of the Big Horn was about as strong as that of the Yellowstone, water muddy, and at the mouth it was about 150 yards wide."

Grant Report - The Yellowstone River:
"In low water the stream is navigable with ease as far up as Pompey's Piller, about thirty miles above the mouth of the Big Horn River, there being but one place from its mouth to this point that would have to be fixed to improve its navigation. A couple of boulders would have to be removed from near the mouth of the Powder River. * * * The only other obstacles in the way are the different rapids. Most of these a steamboat can run over without any trouble. Some are almost too rapid, and these can be cordelled without any trouble. To cordelle is to tie a long rope around a tree or stump on shore and the other end wrapped around the capstan of the boat, which is turned by steam, and then the boat is pulled along. The water of the Yellowstone is deeper than that of the Missouri above the mouth of the Yellowstone, and could be navigated more months in the year than the Missouri can be."

Leeson, in "History of Montana", states that importation by the Yellowstone River amounted to 4,210 tons in 1881, but dropped to 960 tons in 1882, after completion of the railroad to Billings.
The Corps of Engineers' 308 Report contains the following concerning present navigation on the Yellowstone River:

"Since the construction of the diversion dam at Intake there has been practically no commercial navigation on the Yellowstone. During recent years the Northland Seed Company of Sidney, Montana, has operated a small boat between Sidney (mile 26.6) and the mouth of the river for the purpose of transporting alfalfa seed and other agricultural products. This boat has a draft of only about 18 inches and requires a vertical clearance of approximately 18 feet. It is 63 feet long; the beam is 16 feet. The boat is powered by an internal combustion motor and has a registered capacity of approximately 33 tons. During the calendar year 1929 this boat handled a total of approximately 60,000 pounds of produce. There are no large pleasure boats of any kind on the Yellowstone at this time, nor have such craft ever been used to any considerable extent. * * *"

"In view of the temporary abandonment of that section of the river above Intake for all purposes of river commerce, and in recognition of the practical head of navigation as determined by the obstruction at Intake, the Engineer Department has withdrawn active supervision over that section of the river above Intake, Mont. That section of the Yellowstone River below Intake (mile 71.8) has the status of a navigable waterway of the United States and requires active supervision by the War Department under the provisions of section 9 of the Act of March 3, 1899."

"The people of Montana have no interest at this time in the development of the Yellowstone River for navigation. The present status of development of the Yellowstone Basin indicates that existing transportation facilities will be adequate to all needs for the next decade, or longer."

"There are at this time no industries within the Yellowstone Basin which require the utilization of the Yellowstone River as a navigable waterway. However, the presence of coal and ores suggests a possibility of the ultimate exploitation of these mineral resources on a scale which might justify the utilization of the Yellowstone River for the purpose of navigation."

There are two bridges across the Yellowstone below the dam at Intake. One is a railroad bridge near Fairview, Montana, with a vertical clearance at high water of 50 feet and a horizontal clearance of 200 feet. The other, a highway bridge near Sidney, Montana, has a vertical clearance of 26.6 feet and a horizontal clearance of 250 feet. A number of bridges span the river above the Intake dam. Since the Army has abandoned
supervision of the river above the dam, the bridges, presumably, were not
designed with the view of providing clearance for navigation.

4. Flood Control

The only comprehensive investigation of flood damage and flood
control yet made in the Yellowstone Basin is that of the Corps of Engineers
in connection with their "308 Report". It was found that 225,300 acres,
constituting 0.5 percent of the basin land, is subject to overflow. The
total damage for the 50-year period from 1882 to 1931 was estimated at
$5,200,000 or 46 cents per acre per year. The five most seriously affected
municipalities (Sheridan, Greybull, Thermopolis, Miles City, and Forsyth)
suffered damages estimated at $763,000 during the 32-year period from
1900 to 1931. Damage to other municipalities for this period was estimated
at not more than $100,000. The investigation was unable to develop a
scheme for diminishing flood peaks at a cost commensurate with the damage
suffered, Local control could be effected by a system of levies for the
five cities mentioned above, but, except for Forsyth, the annual cost
would exceed the average annual damage.

Areas Subject to Flooding

Concerning the causes of floods and the area affected, the 308
Report states:

"The topography and character of the soil are conducive to
excessive run-off only in the upper basin. Large areas of the
lower reaches of the river contribute only moderate run-off, due
to flatter slopes and lighter soils. Meteorological conditions
are not conducive to heavy run-off over large areas; great gen-
eral storms, covering a large part of the basin, are of rare
occurrence. All parts of the basin are subject to short and
sometimes very destructive periods of overflow, due to cloud-
bursts. The primary causes of flood conditions are heavy general
rains, local cloudbursts, warm winds (Chinook winds) that cause
the rapid melting of the snow blanket and ice jams. Heavy
rains over large areas usually occur in May and June, coinciding
with the high run-off, resulting from melting snows in the
mountains, thus producing high stages throughout the basin."
Cloudbursts may occur at nearly any point in the basin and during any season of the year, other than winter months. These torrential rains with subsequent excessive run-off, frequently cause flood damages in localized areas. Chinook winds are warm, dry, westerly, or northerly winds occurring on the eastern slopes of the mountains of the upper Missouri Basin.

"The Yellowstone River is affected by ice jams during spring months; these form the principal menace at several of the more important towns. In the southern, or upper part, of the basin the spring break-up is at an earlier date than farther north or down-stream. Chinook winds are often an important factor in the early spring break-up in the upper basin, producing conditions that are conducive to the formation of ice jams.

"The valley of the Yellowstone is narrow from the headwaters to a point a short distance above Billings, Mont. Consequently, the overflow area is of small extent. Below Billings, the valley broadens out and the area subject to flooding is considerably increased. However, at the present time the valley is less developed in proportion to the inundated area (with actual damages correspondingly smaller) than many other sections of the Missouri River Basin. The ordinary spring overflows are not regarded as typically destructive of crops, buildings, and farm lands. However, the erosion caused by high water is of considerable local importance at many points. The extreme range of June freshets on the lower Yellowstone is about 12 feet. The ordinary range is from 8 to 10 feet. In periods of ice engagement, the water may rise 15 or 20 feet above the ordinary high-water stage.

"One of the most frequent causes of damage, is a tendency of the stream to leave its usual channel and cut a new course across the adjacent lands. Almost the entire Yellowstone Valley, from the vicinity of Billings, Mont., to the mouth, is subject to such damage, as well as the lower portions of the larger tributaries. The greater part of the damage ordinarily occurs at constricted sections, such as irrigation dams and headworks, bridges, and along the railroad tracks paralleling the streams. The Big Horn Valley is narrow, for the most part, from the headwaters to the vicinity of Riverton, Wyo.; and throughout the Big Horn Canyon (length about 55 miles) just above Hardin, Mont. The remainder of the valley is rather broad and subject to frequent minor overflows, but the amount of damage, considering the great area, is comparatively small.

"The Tongue and Powder River Valleys, particularly the latter, are wide throughout most of their lengths, and the banks are generally low. Overflows cover considerable areas; but the valleys are sparsely settled, and the damages are small."

Flood Damage

"Partial records of flood damages in agricultural areas are available since 1882. The data are summarized in the following table:
Flood Damages - Agricultural Areas

<table>
<thead>
<tr>
<th>River</th>
<th>Flood Year</th>
<th>Damages</th>
<th>Damages</th>
<th>Damages</th>
<th>Damages</th>
<th>Damages</th>
<th>Damages</th>
<th>Damages</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Farm Lands,</td>
<td>Buildings,</td>
<td>Crops and</td>
<td>Irrigation Structures</td>
<td>Bridges, Highways</td>
<td>Railroads</td>
<td></td>
<td></td>
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<tr>
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<td>1882</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$ -</td>
<td>$ -</td>
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<tr>
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<td>1918</td>
<td>460,000</td>
<td>500,000</td>
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<td>1,000,000</td>
<td>2,210,000</td>
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<tr>
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<td>1921</td>
<td>12,000</td>
<td>5,000</td>
<td>3,000</td>
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<tr>
<td>March........</td>
<td>1929</td>
<td>2,000</td>
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<td>-</td>
<td>-</td>
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<tr>
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<td>1908</td>
<td>8,000</td>
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<td>2,000</td>
<td>-</td>
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<tr>
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<tr>
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<td>1917</td>
<td>12,000</td>
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<td>-</td>
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<td>27,000</td>
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<tr>
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<td>1921</td>
<td>7,000</td>
<td>5,000</td>
<td>3,000</td>
<td>5,000</td>
<td>20,000</td>
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<td>1923</td>
<td>110,000</td>
<td>150,000</td>
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<td>1,500,000</td>
<td>1,800,000</td>
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<tr>
<td>September..</td>
<td>1923</td>
<td>8,000</td>
<td>15,000</td>
<td>7,000</td>
<td>20,000</td>
<td>50,000</td>
<td></td>
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</tr>
<tr>
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<td>10,000</td>
<td>20,000</td>
<td>30,000</td>
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<td>95,000</td>
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<tr>
<td>Tongue:</td>
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<td>240,000</td>
<td>4,000</td>
<td>5,000</td>
<td>253,000</td>
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<tr>
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<td>1929</td>
<td>2,000</td>
<td>140,000</td>
<td>5,000</td>
<td>3,000</td>
<td>50,000</td>
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<tr>
<td>June........</td>
<td>1929</td>
<td>11,000</td>
<td>20,000</td>
<td>9,000</td>
<td>5,000</td>
<td>145,000</td>
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<td></td>
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<td></td>
<td></td>
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<td>1923</td>
<td>65,000</td>
<td>65,000</td>
<td>45,000</td>
<td>125,000</td>
<td>300,000</td>
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<td>March.......</td>
<td>1924</td>
<td>7,000</td>
<td>45,000</td>
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<td>60,000</td>
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<td>June........</td>
<td>1929</td>
<td>30,000</td>
<td>25,000</td>
<td>40,000</td>
<td>5,000</td>
<td>100,000</td>
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<td>Total.......</td>
<td></td>
<td>$779,000</td>
<td>$1,177,000</td>
<td>$443,000</td>
<td>$2,788,000</td>
<td>$5,197,000</td>
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</table>

Control by Storage Reservoirs

The result of an investigation of the possibilities controlling floods by storage in three reservoirs is contained in the quotation below:

"Flood control, by means of storage or detention reservoirs, can be economically obtained, provided reservoir sites of reasonable cost and proper capacity are available; and provided further, that the area to be protected is not at too great a distance from the storage sites. A large number of potential reservoir sites are available on the main stem of the Yellowstone above Billings, Mont., and on the principal tributaries, all of which have been given consideration during the progress of the report, in regard to power, irrigation, flood control, and navigation benefits to the Mississippi and Missouri Rivers, or a combination of these potentialities."
"Of the many reservoirs under consideration, the potential Lower Canyon Reservoir on the upper Yellowstone, and a combination of potential reservoirs on the Big Horn River, appear to be favorably situated, for the purpose of controlling a general flood, affecting the main Yellowstone Valley. Sites are available on the Tongue and Powder Rivers, but these would have been of little value in controlling general floods such as those of 1918 and 1921. A reservoir on the upper Powder River would have reduced to some extent the crest of the 1923 flood, but the money value of such reduction would have been small.

"Detailed studies of reservoir operation and cost indicate that the Lower Canyon Reservoir (Yellowstone River), and Upper Big Horn and Cave Canyon Reservoir (Big Horn River), would form the most desirable combination. The Lower Canyon Reservoir on the Yellowstone, approximately 4 miles upstream from the town of Livingston, Mont., would have a storage capacity of 700,000 acre-feet, and it is estimated that it would cost $16,500,000. The Upper Big Horn Reservoir on the Big Horn River, about 10 miles north of the town of Kono, Wyo., would have a storage capacity of 479,000 acre-feet. Its estimated cost is $2,634,000. The Cave Canyon Reservoir on the Big Horn River, approximately one mile north of the railroad station at Himes, Wyo., would have a capacity of 393,000 acre-feet, at an estimated cost of $4,800,000."

The following extract from the 308 Report summarizes the relative benefits and costs of flood control reservoir projects investigated therein:

"The total estimated damage that would have been eliminated by the reservoir operation over the 50-year period (1882-1931) would have been $2,769,500.

Estimated Damage Eliminated by Reservoir Operation

<table>
<thead>
<tr>
<th>Flood Date</th>
<th>Agricultural</th>
<th>Municipal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1882</td>
<td>$20,000</td>
<td>$-</td>
<td>$20,000</td>
</tr>
<tr>
<td>1908</td>
<td>$42,500</td>
<td>-</td>
<td>$42,500</td>
</tr>
<tr>
<td>1917</td>
<td>$27,000</td>
<td>-</td>
<td>$27,000</td>
</tr>
<tr>
<td>1918</td>
<td>$2,210,000</td>
<td>$285,000</td>
<td>$2,495,000</td>
</tr>
<tr>
<td>1921</td>
<td>$50,000</td>
<td>-</td>
<td>$50,000</td>
</tr>
<tr>
<td>1923 (July)</td>
<td>$100,000</td>
<td>-</td>
<td>$100,000</td>
</tr>
<tr>
<td>1923 (September)</td>
<td>$25,000</td>
<td>$10,000</td>
<td>$35,000</td>
</tr>
<tr>
<td>Total</td>
<td>$2,174,500</td>
<td>$295,000</td>
<td>$2,769,500</td>
</tr>
</tbody>
</table>
The average annual benefit would have been $55,390. This amount, if capitalized at 5 percent, indicates a total justifiable expenditure of $1,107,800. However, protection at Forsyth, Mont., can be obtained at a cost somewhat less than the amount of capitalized damages. Therefore the amount that could be contributed by local flood-control interests would be reduced to $1,075,000. The estimated total costs of the three reservoirs for local flood-control purposes are as follows: Lower Canyon, $16,500,000; Upper Big Horn, $2,634,000; Cave Canyon, $4,800,000; or a total of $23,934,000. The adjusted capitalized benefit ($1,075,000) is only 4.5 percent of the total cost of the plan. Consequently, the three-reservoir scheme for local flood control, is not economically feasible.

"If no factor of safety is desired over the storage requirements of the 1918 flood only the costs of the Lower Canyon and Upper Big Horn Reservoirs need be considered. In this case the total cost of the project would be $19,134,000, and the adjusted capitalized benefit ($1,075,000) would be about 5.6 percent of the cost."

5. Industrial Use, Municipal Water Supply and Sewage Disposal

Very little information is available on industrial and municipal uses. A report by the Montana Water Conservation Board, dated September 25, 1938, estimates that the total amount of water diverted from the Yellowstone River by 26 municipal water supply systems in that state is equivalent to 20 second-feet continuous flow. The report estimates the return flow to be about equal to the diversion, thus resulting in a negligible net stream depletion. The municipal systems, having a more pressing demand for water, may exercise the right of Eminent Domain to secure an ample supply of potable water. The following quotation on stream pollution is extracted from the Montana report mentioned above:

"The Yellowstone River and its tributaries drain practically all of the area of twelve counties, the population of which as given by the United States Bureau of the Census for 1930 was 112,615. Starting with Gardiner, which is at the closest point to the head waters of this river, and extending through Sidney, which is at the lowest point in the state, we find domestic sewage reaching the stream directly from thirteen communities in which sewer systems are built. In a few of these the sewage is given some form of primary treatment."
"Industrial wastes reach the stream at various points. These are from mining and milling activities in the mountainous areas and from beet sugar factories, oil refineries and other industries as may be found in agricultural communities. Because of the extensive irrigation in various sections, it has been observed that the alkalinity of the water increases throughout the course of the stream, although this may not be classed as a pollution problem. Odors and tastes are accentuated in a restricted area in Yellowstone County, possibly because of a considerable amount of ground water seepage to the stream. This point is to be studied intensively by the State Board of Health this coming winter.

"While the population in the total area tributary to the Yellowstone River is not extensive, there are in certain restricted places acute pollution problems. These will doubtless be solved only through the building of proper waste treatment plants."

6. Miscellaneous Purpose Small Reservoirs

Appendix "F" of the Progress Report of the National Resources Planning Committee states that several thousand small reservoirs are being constructed in the Yellowstone Basin and Middle Missouri Basin for such purposes as water conservation, stock watering, recreation, wildlife refuges, and flood irrigation. It estimates the total capacity of such reservoirs in the Yellowstone Basin at 163,140 acre-feet, distributed by states as follows:

- North Dakota .............. 240 acre-feet
- Montana .................. 83,900 acre-feet
- Wyoming .................. 79,000 acre-feet

It is further estimated that the net stream depletion resulting from operation of these reservoirs would amount to 30 percent of their capacity, or 48,900 acre-feet per year.
## INDEX TO EXISTING IRRIGATION PROJECTS

**SHOWN ON MAP NO. 8**

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>No.</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lower Yellowstone Irrig. Proj.</td>
<td>43</td>
<td>So. Side Tongue River &amp; Dayton Ditch</td>
</tr>
<tr>
<td>2</td>
<td>Glendive-Fallon Irrig. Dist.</td>
<td>44</td>
<td>Highline Ditch</td>
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<tr>
<td>3</td>
<td>Buffalo Rapids Irrig. Dist.</td>
<td>45</td>
<td>Dome Lake Canal Co.</td>
</tr>
<tr>
<td>4</td>
<td>Fort Keogh Proj.</td>
<td>46</td>
<td>Patrick Land &amp; Livestock Co.</td>
</tr>
<tr>
<td>5</td>
<td>Sheffield Proj.</td>
<td>47</td>
<td>Big Goose &amp; Beaver Ditch Co.</td>
</tr>
<tr>
<td>6</td>
<td>Cartersville Irrig. Dist.</td>
<td>48</td>
<td>Peralata Ditch</td>
</tr>
<tr>
<td>7</td>
<td>Hathaway Proj.</td>
<td>49</td>
<td>Finey &amp; Cruse Creek Ditch Co.</td>
</tr>
<tr>
<td>8</td>
<td>Hammond Irrig. Dist.</td>
<td>50</td>
<td>Mead Ditch</td>
</tr>
<tr>
<td>9</td>
<td>Yellowstone Irrig. Dist.</td>
<td>51</td>
<td>Finey Divide Ditch Co.</td>
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<td>10</td>
<td>North Sanders Irrig. Dist.</td>
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<td>Last Chance Ditch Co.</td>
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<tr>
<td>11</td>
<td>Boxelder Irrig. Dist.</td>
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<td>Kendrick Ditch</td>
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<tr>
<td>12</td>
<td>Rancher Ditch Co.</td>
<td>54</td>
<td>Pratt &amp; Ferris Ditch</td>
</tr>
<tr>
<td>13</td>
<td>Waco-Custer Ditch Co.</td>
<td>55</td>
<td>Big Bonanza Ditch</td>
</tr>
<tr>
<td>14</td>
<td>Huntley Irrig. Proj.</td>
<td>56</td>
<td>Hallie Ditch</td>
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<tr>
<td>15</td>
<td>Billings Bench Water Assn.</td>
<td>57</td>
<td>Redman Ditch</td>
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<tr>
<td>16</td>
<td>Coulson Ditch</td>
<td>58</td>
<td>Lake DeSmet Ditch Co.</td>
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<tr>
<td>17</td>
<td>Lockwood Irrig. Dist.</td>
<td>59</td>
<td>Colorado Colony Ditch Co.</td>
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<td>18</td>
<td>Cove Irrig. Dist.</td>
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<td>Clear Creek Land &amp; Ditch Co.</td>
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<td>Big Ditch Co.</td>
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<td>Crown Ditch</td>
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<td>Canyon Creek Ditch Co.</td>
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<td>Six Mile Ditch</td>
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<td>Danford Irrig. Dist.</td>
<td>63</td>
<td>Johnson &amp; Holt Ditch</td>
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<tr>
<td>22</td>
<td>Whitehorse Ditch</td>
<td>64</td>
<td>Four Lakes &amp; French Creek Ditch &amp; Flume Co.</td>
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<tr>
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<td>Columbus Irrig. Dist.</td>
<td>65</td>
<td>Blue Gap Ditch</td>
</tr>
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<td>Big Timber Proj.</td>
<td>66</td>
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<tr>
<td>25</td>
<td>Dry Creek Canal</td>
<td>67</td>
<td>John R. Smith Ditch</td>
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<tr>
<td>26</td>
<td>Post Kellogg Ditch</td>
<td>68</td>
<td>Mitchell &amp; Long Ditch</td>
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<td>Hunters Hot Springs Canal</td>
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<td>Devoe No. 1 Ditch</td>
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<td>Devoe No. 2 Ditch</td>
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<td>Clark Fork Irrig. Dist.</td>
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<td>Boughton Ditch</td>
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<tr>
<td>35</td>
<td>Tongue &amp; Yellowstone Irrig. Proj.</td>
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<td>Prairie-Dog-Water Supply Co.</td>
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<td>160</td>
<td>Tongue River Proj.</td>
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<td>Ultimate Irrigated Area</td>
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<td>Shoshone River</td>
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<td>Montana</td>
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Table 22
ELECTRIC GENERATING PLANTS IN THE YELLOWSTONE RIVER BASIN
(As of December 31, 1960)

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<th>Owner or Operator</th>
<th>Location</th>
<th>Installed Capacity (kW)</th>
<th>1959 Net Generation, 1000 Kwh</th>
<th>Installed Capacity by Units, kW</th>
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<td>Glendive, Montana</td>
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<td>7,566</td>
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<td>Miles City, Montana</td>
<td>2,600</td>
<td>6,694</td>
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<td>446</td>
<td>452</td>
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<td>308</td>
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<tr>
<td>Russell-Miller Milling Company(2)</td>
<td>Total, Public Utilities</td>
<td>14,994</td>
<td>15,810</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td></td>
<td>Total, Industrial</td>
<td>30,729</td>
<td>34,120</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td>Total, Steam-electric</td>
<td>45,623</td>
<td>50,930</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>Internal Combustion Plants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Electric Plant</td>
<td>Bellantine, Montana</td>
<td>59</td>
<td><strong>1</strong></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Roberts Electric Company</td>
<td>Roberts, Montana</td>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Inyo Gas &amp; Power Company</td>
<td>Inyo, Montana</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Montana-Dakota Utilities Company</td>
<td>Baker, Montana</td>
<td>1,500</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td></td>
<td>Mountain States Power Company</td>
<td>Greybull, Wyoming</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Shickley Electric Company</td>
<td>Clearmont, Wyoming</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Lodge Grass, Town of Basin</td>
<td>Lodge Grass, Montana</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>Hysham, Town of Basin</td>
<td>Hysham, Montana</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>U. S. National Park Service</td>
<td>Basin, Wyoming</td>
<td>395</td>
<td>395</td>
</tr>
<tr>
<td></td>
<td>Standard Oil Company(2)</td>
<td>Yellowstone, Wyoming</td>
<td>330</td>
<td>330</td>
</tr>
<tr>
<td></td>
<td>Russell-Miller Milling Company(2)</td>
<td>Billings, Montana</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Total, Public Utilities</td>
<td>1,999</td>
<td>2,692</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td></td>
<td>Total, Industrial</td>
<td>367</td>
<td>367</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td></td>
<td>Total, Internal Combustion</td>
<td>2,366</td>
<td>3,059</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td><strong>Hydroelectric Plants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montana Power Company</td>
<td>Alpine, Montana</td>
<td>10,000</td>
<td>10,000</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td></td>
<td>Gardiner Electric Light &amp; Water Co.</td>
<td>Gardiner, Montana</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Roberts Electric Company</td>
<td>Roberts, Montana</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>U. S. Bureau of Reclamation</td>
<td>Cody, Wyoming</td>
<td>5,600</td>
<td>5,600</td>
</tr>
<tr>
<td></td>
<td>U. S. National Park Service</td>
<td>Morton, Wyoming</td>
<td>1,600</td>
<td>1,600</td>
</tr>
<tr>
<td></td>
<td>Mountain States Power Company</td>
<td>Yellowstone, Wyoming</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Dubois Public Service Company</td>
<td>Landers, Wyoming</td>
<td>552</td>
<td>552</td>
</tr>
<tr>
<td></td>
<td>Mostettis Light Company</td>
<td>Buffalo, Wyoming</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Tonkseep Electric Light &amp; Power Co.</td>
<td>Dubois, Wyoming</td>
<td>188</td>
<td>188</td>
</tr>
<tr>
<td></td>
<td>Cody, Town of Cody</td>
<td>Mostettis, Wyoming</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tonkseep, Wyoming</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cody, Wyoming</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>Total, Hydroelectric</td>
<td>19,348</td>
<td>22,899</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td>Total, Public Utilities</td>
<td>36,151</td>
<td>100,801</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td>Total, Industrial</td>
<td>34,375</td>
<td>46,286</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td>Total, All Plants</td>
<td>67,276</td>
<td>147,087</td>
<td><strong>2</strong></td>
</tr>
</tbody>
</table>

Sources: Federal Power Commission records.
* Net generation for 1957. More recent data not available.
** Net generation for 1958. More recent data not available.
(1) As of December 31, 1960
(2) Industrial plants. Capacity is not, in general, available to utility load.
Table 24

POTENTIAL IRRIGATION PUMPING PROJECTS IN THE REGION

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>River Basin</th>
<th>Gross Irrigable Acreage</th>
<th>Estimated Annual Power Requirements for Pumping</th>
<th>Principal Source of Basic Data From Which Power Requirements Were Determined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Tongue River</td>
<td>Tongue</td>
<td>10,000</td>
<td>631</td>
<td>Mongolia State Water Conservation Board</td>
</tr>
<tr>
<td>Big Horn-Tullock</td>
<td>Big Horn</td>
<td>1,127</td>
<td>39</td>
<td>U. S. Bureau of Reclamation</td>
</tr>
<tr>
<td>North Sanders*</td>
<td>Yellowstone</td>
<td>1,522</td>
<td>64</td>
<td>U. S. Bureau of Reclamation</td>
</tr>
<tr>
<td>Orinoco &quot;B&quot;*</td>
<td>Yellowstone</td>
<td>1,643</td>
<td>115</td>
<td>U. S. Bureau of Reclamation</td>
</tr>
<tr>
<td>Sadie Flat &quot;A&quot;</td>
<td>Yellowstone</td>
<td>4,691</td>
<td>838</td>
<td>U. S. Bureau of Reclamation</td>
</tr>
<tr>
<td>Tongue-Yellowstone*</td>
<td>Tongue</td>
<td>6,000</td>
<td>1,031</td>
<td>U. S. Bureau of Reclamation</td>
</tr>
<tr>
<td>Shirley*</td>
<td>Yellowstone</td>
<td>5,300</td>
<td>929</td>
<td>U. S. Bureau of Reclamation</td>
</tr>
<tr>
<td>Sauus-Calypso*</td>
<td>Yellowstone</td>
<td>2,600</td>
<td>456</td>
<td>U. S. Bureau of Reclamation</td>
</tr>
<tr>
<td>Glenlive*</td>
<td>Yellowstone</td>
<td>18,000</td>
<td>6,140</td>
<td>U. S. Bureau of Reclamation</td>
</tr>
<tr>
<td>Marsh</td>
<td>Yellowstone</td>
<td>1,500</td>
<td>195</td>
<td>Montana State Water Conservation Board</td>
</tr>
<tr>
<td>Cartwright</td>
<td>Yellowstone</td>
<td>1,000</td>
<td>161</td>
<td>War Department &quot;508&quot; Report</td>
</tr>
<tr>
<td>Tremont Canal</td>
<td>Big Horn</td>
<td>16,250</td>
<td>1,995</td>
<td>Wyoming State Engineer</td>
</tr>
<tr>
<td>Upper Hanover Pumping Proj.</td>
<td>Big Horn</td>
<td>7,030</td>
<td>1,749</td>
<td>Wyoming State Engineer</td>
</tr>
<tr>
<td>Upper Bluff Canal</td>
<td>Big Horn</td>
<td>4,80</td>
<td>92</td>
<td>Wyoming State Engineer</td>
</tr>
<tr>
<td>Red Flats</td>
<td>Big Horn</td>
<td>1,100</td>
<td>368</td>
<td>Wyoming State Engineer</td>
</tr>
</tbody>
</table>

Total: 82,663 15,710 8,780


* Included by the Corps of Engrs., War Dept. (Appendix F of the Progress Report of the National Resources Planning Board) in the Mid-Yellowstone Project, which it proposes as a gravity system.
E. WATER LAWS AND THEIR ADMINISTRATION

1. General

When the West was being settled it soon became apparent that the common law doctrine of riparian rights was not suited to the needs of this semi-arid region whose most valuable, though very limited, natural resource was its water supply. Broadly speaking, the riparian principle prohibits the use of the water of a stream in such a manner as to diminish it in quantity or alter it in quality. Inasmuch as the development of the mining and agricultural resources of the region was dependent upon uses of water which could not be reconciled with this principle, the doctrine of appropriation was adopted.

The doctrine of appropriation permits the diversion of water from a stream for the purpose of putting it to beneficial use. The right to use the water of a stream may be acquired by the beneficial application of the water under the applicable local laws and regulations. A water right so acquired may be legally perfected and recorded through the process of adjudication. In Montana the jurisdiction to make such adjudications is conferred by law upon the courts, whereas in Wyoming this authority has been delegated to the State Board of Control, an agency created for the purpose of administering the water laws of the State.

In general, the seniority of water rights is governed by the principle, "priority of appropriation gives the priority of right." It should be emphasized that an adjudication of a water right does not convey ownership of the water; it only grants the privilege of putting
the water to beneficial use. "The essence of the doctrine of appropriation is beneficial use, not a stale or barren claim."

2. **Wyoming**

In 1890 Wyoming initiated a procedure for the acquisition of new water rights which has since been adopted, with minor changes, by most of the other western states. In Wyoming, new water rights can be acquired only by application to the State Engineer. When an application is approved the State Engineer issues a permit which defines the amount of water to be appropriated and specifies the date on which the physical structures must be completed. After all the requirements of law have been met, and upon proof of beneficial use, the State Board of Control, of which the State Engineer is a member, issues a certificate of appropriation. The certificate of appropriation is evidence of title to the water right.

The following water laws were extracted from the preliminary report(1) submitted by the Wyoming State Engineer's office:

"1. Water is State Property: The water of natural streams, lakes or other collections of still water, within the boundaries of the state is the property of the state.

"2. Board of Control: The Board of Control, composed of the State Engineer and water superintendents of the water divisions have supervision of the appropriation, distribution and diversion of the waters of the state, and their decisions are subject to review by the courts of the state.

"3. Priority of Appropriation: Priority of appropriation for beneficial use gives the better right. No appropriation shall be denied except when the denial is demanded by the public interest.

(1) A report originally submitted by Wyoming, but since superseded by "Water Resources in the Yellowstone River Basin in Wyoming" by H. T. Person.
"14. Municipal Corporations have the same right as individuals to acquire rights by prior appropriation. Cities can acquire by exercising the right of Eminent Domain such water as may be necessary for the well being thereof and for domestic uses from prior appropriations upon payment of just compensation.

"A water right is a right to use the water of the state.... acquired by the beneficial application of water under the laws' and regulations. Rights to such use are 'limited and restricted to so much thereof as may be necessarily used for irrigation or other beneficial purposes'. 'Beneficial use shall be the basis, the measure and limit of the right'. (122-401-421)

"Rights to the use of water 'attach to the land for irrigation, or to such other purposes or object for which acquired'. 'Water rights for the direct use of the natural unstored flow of any stream cannot be detached from the lands, place or purpose for which they are acquired, without loss of priority'. (122-401). Rights to reservoir water, on the other hand, do not become attached to any particular lands except by deed or a like instrument, and meantime may be acquired by sale or lease. (122-1508),1602. However, the sale of 'any portion of the capacity of any reservoir' carries with it 'an interest in the reservoir and works'. Reservoir water cannot be used outside the state without a special permit from the State Engineer. (122-1601). All deeds of reservoir water rights and all leases of same for more than three years must be executed and acknowledged like deeds of real estate, and recorded in the county records; and leases for less than three years must be in writing and filed in the State Engineer's office, (122-1604).

"Preferred uses' include rights for 'domestic and transportation purposes'; and unpreferred rights may be condemned for their benefit under the power of 'Eminent Domain'. These 'domestic and transportation purposes' include: Water for (1) drinking, 'for man and beast'; (2) for municipal purposes; (3) for steam engines and general railway use; and (4) for culinary, laundry and bathing use, refrigerating (including ice manufacture), and steam and hot water heating plants. Irrigation is 'preferred' to any use for power purposes' where turbine or impulse water wheels' are used. (122-402).

"The legal standard for measuring the flow of water is one cubic foot per second of time; and the maximum appropriation allowable is for one cubic foot per second for each seventy (70) acres. (122-431-117).
5. Procedure to Obtain Water Right.

(a) Submit application to State Engineer's office together with maps and plans showing location, size, etc., of ditch and irrigation works and lands to be irrigated.

(b) Approval by State Engineer after any necessary alterations and corrections have been made.

(c) Commencement of Construction. Construction must begin not later than one year after approval by the State Engineer unless the State Engineer grants an extension of time.

(d) Completion of Construction. Construction must be completed at the 'completion time' allowed on permit unless the State Engineer grants an extension of the date of completion.

(e) Application of water to the beneficial use described in the permit together with notice to that effect to the State Engineer's office. This requirement must be complied with, within the period allowed.

(f) Submission of proof of beneficial use to the Division Water Superintendent.

(g) Certificate of Appropriation issued by State Board of Control. Priority dates from time of filing application in State Engineer's office.

3. Montana

"Montana is the only remaining state where irrigation is important in which there is no state supervision by a state administrative officer of the acquisition of new rights. Anyone desiring to appropriate water on an unadjudicated stream posts a notice, records it with the county, and proceeds with construction. Anyone desiring information in regard to the filings on an unadjudicated stream must search the records in the counties through which the stream passes. No limit is placed upon the amount of water that may be claimed in the notice; title, however, can only be acquired to the amount for which beneficial use can be proven. For streams on which existing rights have been defined by court decisions, new rights are required to file petitions for appropriations with the county court; the information and maps in the petition must be prepared by an engineer. The appropriator is under the jurisdiction of the court which issues summons to all known claimants, holds a hearing, and issues an interlocutory decree defining the time for completion.
of the appropriation. On completion, the court on further
hearing issues a supplemental decree defining the right.
This procedure serves to keep the adjudications up to date
as new rights are acquired. Because of the generally small
size of individual diversions in Montana, this method has
operated sufficiently satisfactory so that the state has not
yet adopted a system of state control of acquirement of
rights. (1)

The following information regarding water laws of Montana was
extracted from a report submitted by the Montana Water Conservation
Board, dated September 25, 1938:

"The water laws of Montana are fixed by the Constitu-
tion of the State of Montana, and the laws enacted upon the
subject and their interpretation by the Supreme Court of
this State. The Constitution of Montana provides:

'The use of all water now appropriated, or that may
hereafter be appropriated for sale, rental, distribu-
tion, or other beneficial use, and the right of
way over the lands of others, for all ditches, drains,
flumes, canals, and aqueducts, necessarily used in
connection therewith, as well as the sites for reser-
voirs necessary for collecting and storing the same,
shall be held to be a public use', (Article III, Sec. 15)

"This Constitutional provision has received a broad con-
struction by the Supreme Court of the State to the end that
flood waters which would otherwise go to waste may be conserved
for the purpose of making the arid lands of the state pro-
ductive.

250 Pac. 963

"It has been held that an appropriator derives his right
to water from the State and not from the Federal Government.
Mettler v. Ames Realty Co., 61 Mont. 152
201 Pac. 702
Popham v. Hollaran, 64 Mont. 442
275 Pac. 1099

"In the early history of the State, it was suggested that
the doctrine of riparian rights controlled in this State.
However, the Supreme Court definitely ruled to the contrary.
In Mettler v. Ames Realty Company, 61 Mont. 152, 201 Pac. 702,
the Supreme Court stated definitely:

(1) Harding, S. T., "Water Rights for Irrigation."
Our conclusion is that the common law doctrine of riparian rights has never prevailed in Montana since the enactment of Bannock statutes in 1865; that it is not suited to conditions here', followed in
Wallace v. Goldberg, 77 Mont. 234, 244 231 Pac. 56

"That in accordance with the Constitutional provision above quoted the right of eminent domain may be exercised for the construction of canals, aqueducts, flumes, ditches, or pipes conducting water, and sites for reservoirs necessary for collecting and storing water. (R.C. 9933)

"Many cases decided by the Supreme Court enunciate the principle that an appropriator does not own water but has only a qualified right to use the same.

"The statutes generally upon the subject of water rights in Montana are contained in Chapter 81 of the Civil Code, being Sections 7093 to 7135, relating to water rights and appropriations; Chapter 82, 7136 to 7159 relating to water commissioners—determination of joint rights; Chapter 83, 7161 R. C. to 7165, powers of water users organized under federal law; Chapters 84 to 93 R. C., 7166 to 7264.18, relating to irrigation districts; Chapter 35 of Political Code, R. C. 349.1 to 349.38, relating to the State Water Conservation Board.

"The doctrine of appropriation of water prevails in Montana rather than the common law doctrine of riparian rights. Under this doctrine priority of appropriation of water confers a superiority of right to such water. The one first making appropriation becomes entitled as against all subsequent appropriations to the exclusive use of water to the extent of his appropriation.
Prentice v. McKay, 38 Mont. 114 98 Pac. 1041
Tochey v. Campbell, 24 Mont. 13 60 Pac. 396

"The rights of appropriators to such waters as they have appropriated and need are fixed in the order of their appropriation. Secondary appropriations may be made of surplus water in excess of the amount to which prior appropriators are entitled by virtue of their appropriation.
Custer v. Missoula Public Service Co. 91 Mont. 136 6 Pac. (2) 131
Quigley v. Birdseyes, 11 Mont. 439 28 Pac. 741
"A secondary appropriator may impound and divert surplus waters from the source of supply as long as the prior appropriator receives the flow to which he is entitled at the point of his diversion.

Kelly v. Hynes, 41 Mont. 1
128 Pac. 783

"Water rights were acquired as provided by the statute and retained by their beneficial use. There is no officer or regulatory commission which grants, refuses, or limits water rights in the State of Montana. The priority and extent of water rights may be determined by actions commenced by private individuals. These such actions are authorized under the provisions of Sec. 7105, R. C. et sec. It is not obligatory that actions to determine the extent of water rights be brought. The situation exists that in many streams water rights have been adjudicated on the entire stream or part thereof, whereas upon other streams no adjudications have been made.

"Under the provisions of R. C. 7119-7127, it is provided that where a person makes an appropriation from an adjudicated stream, he must comply with certain formal requirements, and proceed by the service of summons against prior appropriators, and proceed as in a civil action before his right becomes authorized.

"At the Extraordinary Session of the Montana Legislature 1933-34, there was created a State Water Conservation Board (R. C. 349.1 to 349.38, Chapter 35 of the Civil Code,) which Board has extensive powers in relation to the appropriation of all unappropriated water within the State."

4. North Dakota(1)

At present the North Dakota State Water Conservation Commission has general control and supervision over the water supply of the state. The State Engineer may grant water rights subject to the approval of the State Water Conservation Commission, but the Commission may initiate water rights by its own declaration. Prior to 1937 the water laws were administered by the State Engineer in a manner similar to the procedure followed in Wyoming.

(1) At the request of the Federal Power Commission, this information was furnished by the North Dakota State Water Conservation Commission in a letter dated June 7, 1940.
F. EXISTING WATER RIGHTS

1. General

A compilation of all water rights in the basin, listed in order of their seniority, would be very helpful in the drafting of an interstate compact, but it is doubtful that this information is essential. Such a compilation does not exist, and the preparation of a complete and accurate list probably would require a considerable amount of time and research. In Montana and North Dakota many of the water rights have never been adjudicated, but are protected only by notices appearing in the county records. The Montana State College, in cooperation with the Montana State Water Conservation Board, is at present compiling a list of claims to water rights as shown by the county records. In Wyoming water rights are granted by, and recorded in the State Engineer's office, which should make the necessary compilation comparatively simple. However, a list compiled from these sources would no doubt contain a number of water rights which appear on the record as good, but which have been abandoned. Nevertheless, it is believed that, in the near future, there will be available information on existing water rights that is sufficiently accurate and possibly sufficiently complete, for the needs of the compact commission.

2. Wyoming

According to the Wyoming report, there are 700,130 acres in Wyoming with adjudicated rights, and an additional 535,410 acres under permits in good standing. In the latter classification it is estimated
that 81,990 acres are being irrigated at present. The location of these areas is indicated by the following tabulation:

**Acreage in Wyoming Having Water Rights**

<table>
<thead>
<tr>
<th>Sub-Basin</th>
<th>Territorial and Other Adjudicated Rights (1)</th>
<th>Acreage Under Permit in Good Standing (2)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Stem</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Clark Fork</td>
<td>20,190</td>
<td>4,200</td>
<td>24,390</td>
</tr>
<tr>
<td>Big Horn River</td>
<td>413,760</td>
<td>507,110</td>
<td>920,870</td>
</tr>
<tr>
<td>Meem Stem</td>
<td>46,500</td>
<td>19,400</td>
<td>65,900</td>
</tr>
<tr>
<td>Wind River</td>
<td>37,720</td>
<td>153,300</td>
<td>191,020</td>
</tr>
<tr>
<td>Popo Agie River</td>
<td>53,100</td>
<td>59,400</td>
<td>112,500</td>
</tr>
<tr>
<td>Owl Creek</td>
<td>31,390</td>
<td>610</td>
<td>32,000</td>
</tr>
<tr>
<td>No Wood Creek</td>
<td>31,800</td>
<td>1,000</td>
<td>32,800</td>
</tr>
<tr>
<td>Greybull River</td>
<td>85,450</td>
<td>39,500</td>
<td>124,950</td>
</tr>
<tr>
<td>Shell Creek</td>
<td>15,900</td>
<td>1,000</td>
<td>16,900</td>
</tr>
<tr>
<td>Shoshone River</td>
<td>70,350</td>
<td>171,900</td>
<td>242,250</td>
</tr>
<tr>
<td>Minor Tributaries</td>
<td>41,550</td>
<td>61,000</td>
<td>102,550</td>
</tr>
<tr>
<td>Little Horn River</td>
<td>7,800</td>
<td>500</td>
<td>8,300</td>
</tr>
<tr>
<td>Tongue River</td>
<td>95,650</td>
<td>3,600</td>
<td>99,250</td>
</tr>
<tr>
<td>Powder River(3)</td>
<td>162,730</td>
<td>20,000</td>
<td>182,730</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>700,130</strong></td>
<td><strong>535,410</strong></td>
<td><strong>1,235,540</strong></td>
</tr>
</tbody>
</table>

Source: "Water Resources of the Yellowstone River Basin in Wyoming."

H. T. Person

(1) Presumably the acreage shown in this column is being irrigated at present.

(2) Presumably only the following acreage shown in this column is being irrigated at present:

- Big Horn River: main stem - 130; Shoshone - 41,680;
- Wind - 20,180; Popo Agie - 20,000; total - 81,990.

(See Section I-D-1)

(3) Includes the Little Powder River.

3. Montana

Only a small portion of the existing water rights in Montana have been adjudicated. The Montana Water Conservation Board, in a report dated September 25, 1938, presented abstracts of 79 adjudications of streams in the Yellowstone Basin. A summary of these adjudications is given below. It should be emphasized that all of the streams have
not been adjudicated and that water-right claims filed subsequent to
the last adjudication are not included.

Partial Summary of Adjudicated Water Rights in Montana

<table>
<thead>
<tr>
<th>Stream</th>
<th>Cu. Ft. Per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tributaries of Yellowstone above Clark Fork</td>
<td>*4,123.1</td>
</tr>
<tr>
<td>Clark Fork and Tributaries</td>
<td>1,769.0</td>
</tr>
<tr>
<td>Tributaries of Yellowstone from Clark Fork</td>
<td></td>
</tr>
<tr>
<td>to Big Horn</td>
<td>14.9</td>
</tr>
<tr>
<td>Tributaries of the Big Horn</td>
<td>76.3</td>
</tr>
<tr>
<td>Tongue River</td>
<td>474.6</td>
</tr>
</tbody>
</table>

*Plus all of Dog Creek and Last Chance Creek; amount not given.

4. North Dakota

In a letter dated June 7, 1940, the North Dakota Water Con-
servation Commission reported the estimated irrigated area under present
systems to be 21,138 acres. Of this total, 20,000 acres are in the
Lower Yellowstone project of the Bureau of Reclamation, and no doubt
obtained water rights when the project was set up.
G. INTERSTATE COMPACTS

Interstate compacts are provided for under the Constitution of the United States in Section 3 of Article I, Subsection 3 of which reads: "No State shall, without the consent of Congress, lay any duty of tonnage, keep troops or ships of war in time of peace, enter into agreement or compact with another State, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit of delay."

Congress has authorized 57(1) interstate compacts to date, of which 34 have become effective through State ratification.

The compact method has been used with varying degree of success to deal with eight situations: (1) boundaries and cessations of territory, (2) criminal jurisdiction over boundary waters, (3) uniformity of legislation, (4) interstate accounting, (5) taxation, (6) utility regulation, (7) control and improvement of navigable streams, and (8) the conservation of natural resources. (1) The method is particularly well suited whenever the issue, because of its scope, intricacy, and technicalities, presents a problem that is too complex for satisfactory settlement in court. In five(2) instances it has been effectively employed for the settlement of interstate stream controversies. The

(1) "Regional Factors in National Planning:" National Resources Committee. 1935
   b. La Plata River Compact. Colorado and New Mexico.
   d. South Platte River Compact. Colorado and Nebraska.
   e. Red River of the North Compact. Minnesota, North Dakota, South Dakota.
development of the water resources of a river basin is a problem of negotiation, not of litigation. The interstate compact lends itself well to future planning, yet, in the settlement of interstate stream controversy it could probably be justified even though it were nothing more than a substitute for litigation. A comprehensive compact, arrived at in a spirit of fairness and cooperation, is far better than a partial settlement by the courts.

The following discussion of the legal aspects of the interstate compact as an instrument in the settlement of interstate stream controversy was prepared by the legal staff of the Federal Power Commission:(3)

**Water Rights and State Compacts**

Interstate compacts have been resorted to by the States for the settlement of various points of controversy since almost the very beginning of the Union. The use of the compact in the settlement of water controversies between states is a comparatively recent development. Of the five compacts ratified or approved by Congress, which deal with water usage, the earliest, dealing with the resources of the La Plata River, was ratified by Congress January 29, 1925. The resort to the compact form of settling interstate controversy over water rights follows many instances of litigation represented in cases before the United States Supreme Court, involving the States of Arizona, California, Colorado, Connecticut, Delaware, Illinois, Kansas, Massachusetts, Minnesota, Missouri, New Jersey, New York, North Dakota, Oregon.

(3) Memorandum from Mr. E. G. Simpson to the Acting Chairman, 1938.
Washington, Wisconsin, and Wyoming, among others. The use of compacts appears to be the consequence of the unsatisfactory character of the results obtained by litigation, where the final determination by the Courts follows only after years of protracted argument, references, fact finding, and review, and is even then, not infrequently, found susceptible of some need of interpretation in Court. Perhaps one important obstacle to the simple solution of water controversies by procedure at law has been in the fact that the United States Supreme Court has no right under the Constitution to issue declaratory decrees. (Arizona v. California (1930) 283 U. S. 423, 464), and the United States Supreme Court has itself sought to avoid having to make technical determinations of water rights where it has believed such determinations could better be made by interstate agreement. It has recommended that the states resort to compact to settle their waters disputes.

Existing Compacts Concerning the Use of Water

Congress has consented to the negotiation of 15 compacts for the apportionment of water in interstate streams, but of these only five have been ratified or approved by two or more of the contracting states and by Congress. (See, Hinderlider v. La Plata River & Cherry Creek Ditch Co., (U. S. 1938) 58 S. Ct. 803, 809, n. 11).

The five compacts ratified or approved by Congress are the following:

1. La Plata River:

The signatory states are those of Colorado and New Mexico.

The compact was ratified by Congress on January 29, 1925.

The compact provides that each signatory state shall have the unrestricted right to use all water flowing in the La Plata River within the boundaries of the respective states between
December 1 and February 15; that between February 15 and December 1 each such state shall have such unrestricted right only when the mean daily flow at a given interstate station is 100 cfs or more, and that on all other days Colorado shall deliver at the given interstate station half the mean flow at a given other station the preceding day, not exceeding however 100 cfs; and, finally, that when the water is low its use may be rotated between the states signatory in any manner the state engineers may jointly determine upon.

2. South Platte River:

The signatory states are those of Colorado and Nebraska.

The compact was ratified by Congress on March 8, 1926.

The compact provides that for water use the Longpole Creek shall be considered as divided between the two states; defines two basins: the "upper" and the "lower" basins; apportions, subject to certain conditions, the full flow to Colorado between October 15 and April 1; prohibits Colorado from allowing diversions from the lower basin between April 1 and October 15 to supply adjudicated Colorado priorities dating after June 14, 1897, if such diversions will, with a specific exception, diminish the flow at a given interstate station below 120 cfs mean flow; reserves to Colorado, in addition to perfected appropriations in the lower basin, prior right to store 35,000 acre feet for diversion from the lower basin between October 15 and April 1; awards to Colorado, subject to certain exceptions, the full use of the flow within its boundaries between April 1 and October 15, and the right to extend certain canals within Nebraska; permits Nebraska to operate a canal for the diversion of water within Colorado to be used in Nebraska, as of certain times, under certain conditions, and in fixed amounts.

3. Colorado River:

The signatory states are those of Arizona (the legislature of which refused to ratify), California, Colorado, Nevada, New Mexico, Utah, and Wyoming.

The compact was ratified by Congress on December 21, 1928.

The compact apportions 15 million acre-feet, annually, equally between "upper" and "lower" basins, with the right to the lower basin states to later increase their "beneficial consumptive use" by 1 million acre-feet; embodies a contingent provision covering the supplying of water to fulfill the obligations attending such rights in Mexico.
which may thereafter be recognized by the United States;
specifies amendatory procedure for the future apportionment
of water (after October 1, 1963); declares the use of the
water for navigation to be subservient to its use for domes-
tic, agricultural, and power purposes; declares the use of
water for power purposes to be subservient to its use for
domestic and agricultural purposes.

4. Rio Grande (above Fort Quitman, Texas):

   The signatory states are those of Colorado, New Mexico, and
   Texas.

   The compact was ratified by Congress on June 17, 1930.

   The compact recognizes the primary importance of the con-
   servation of the waters of the river basin, of the draining
   of the San Louis Valley basin in Colorado, and of the turn-
   ing of such draining waters into the Rio Grande; provides
   that until the construction of the drain and a reservoir
   (but not later than June 1, 1925 or such other date as the
   states signatory may fix) Colorado will not impair the
   water supply at a given interstate station by diversions
   or storage unless offset by drainage returns; provides for
   the use of the waters of the Elephant Butte Dam spill by
   Colorado and New Mexico; provides for the constitution, by
   not later than June 1, 1935, of an interstate commission to
   conclude a compact for the equitable apportionment of the
   waters of the Rio Grande among the three states; provides
   for the use of waters of the river for power, subservient
   to their use for domestic, municipal, and agricultural
   purposes; protects certain rights vested in private parties;
   provides that the supply of water in the Elephant Butte
   reservoir shall not be impaired by diversion or storage in
   New Mexico, except as offset by drainage returns.(1)

(1) Of interest with respect to the proposed compact between Wyoming
   and Montana may be the pending compact between Colorado, New Mexico,
   and Texas, arising out of the compact of June 17, 1930, summarized
   in the text of this memorandum. The pending compact relates to
   the further apportionment of waters of the Rio Grande by the com-
   mission designated in the earlier compact. A copy of the compact
   as signed by the commissioners of the several states on March 18,
   1938, is appended for such use as it may prove to have. The
   pending compact deals with the shortage of water. It is under-
   stood that something of the same problem is now faced by Montana
   and Wyoming, although in this latter case the shortage can be
   largely reduced by the construction of reservoirs in either or
   both states. How far the reservoir solution may be reflected in
   the compact will be determined by the pending negotiations be-
   tween the states.
5. **Red River of the North:**

   The signatory states are those of Minnesota, North Dakota, and South Dakota.

   The compact was approved by Congress on March 24, 1938.

   The compact establishes the Tri-State Waters Commission as a body corporate, with the duty of studying the various water problems relating to the supply available within the tri-state waters area (the drainage basin of the Red River of the North lying within the boundaries of the three states signatory), of maintaining and controlling lake levels and stream flow in certain designated areas subject to the approval of the appropriate local agencies in whose territory the waters are located, and of recommending water conservation projects; confers upon such Commission the power of eminent domain to enable it to acquire such real and personal property as may be necessary in the discharge of its duties, and the power of approval with respect to works to be constructed in the drainage area by other agencies (implying the power to disapprove).

   **The Nature and Effect of Private Water Rights**

   At the basis of interstate controversy resulting in litigation or compact lies the necessity of local water usage and the rights upon which such usage rests. One region may employ the principles of the common law, another an adaptation or modification of the principles of the common law. Accordingly, one state may proceed in its determination of private water rights on the basis of doctrine of "riparian rights", another on the basis of the doctrine of "appropriation". The so-called "humid" eastern states recognize, generally, the former, the so-called "arid" states of the west, with variations, the latter.

   As will be seen in the latter paragraphs of this section the United States Supreme Court gives some weight, according to the controversy involved, to the local law, for in the end controversy between the states arise as an ultimate controversy between the citizens of the states involved in such controversy.
In the west the great scarcity of water and its vital quality has led to the development of a local custom or usage, sanctioned by the courts and legislation, which allows outright and complete appropriation of such water as may be necessary for actual and reasonable beneficial use. This right became known as the right of "appropriation". The doctrine of appropriation received early legislative recognition in the territories and was enforced in the territorial courts. Often, on admission to statehood, the doctrine received further sanction in state constitutions and statutes. (Wyoming v. Colorado (1921) 259 U. S. 419, 459; Arizona v. California (1935) 293 U. S. 558, 566). The right of prior appropriation has prevailed in both the states of Montana and Wyoming, probably from the first moment that law became established in those states, and continued through the territorial status of each state, into their statehood. (Dean v. Morris (1910) 221 U. S. 485, 487).

The right of appropriation, arising from the early custom of regarding the waters of streams open to proprietary use in connection with irrigation, mining, domestic, and other beneficial purposes, involves a diversion from the stream and the application of the diverted water to such uses. By this process the appropriator acquires a continuing right to divert and use water to the extent of his existing appropriation, but not beyond what is reasonably required and actually used. The right is deemed a full and complete property right. As between appropriators from the same stream the one first in time is deemed superior in right. (Hinderlider v. La Plata River & Cherry Creek Ditch Co. (U. S. 1938) 58 S. Ct. 803, 805.) A completed
appropriation is regarded as effective from the time the purpose to
make it is definitely formed and actual work thereon is begun, provided
the work be carried to completion with reasonable diligence. (1) Under
the right of appropriation the appropriator has the privilege of di-
verting the water appropriated to other watersheds. Diversions from
one watershed to another are commonly made in Wyoming, among other
states, and the practice is sanctioned by the decisions of its courts.
(Wyoming v. Colorado, infra.)

But, as will be shown in the section entitled "Legal Princi-
pleS Specifically Applicable to Compacts", which follows later, a
limitation imposed upon, or accepted by, a state, through a decree of
a court or by compact, as the case may be, establishing the amount of

(1) Such rights of appropriation are enjoyed by Federal agencies and
such agencies have in several instances, at least, been considered
to be bound by the vesting of such prior rights in others. By
the Act of June 17, 1902, c. 1093, sec. 8, (32 Stat. 390), the
Secretary of the Interior and his agents, acting by authority of
the Reclamation Act, and supplementary legislation, must obtain
permits and priorities for the use of water from the states, in
the same manner as private appropriators, or as irrigation dis-
tricts formed under the state law. This legislation provided:

"Nothing in this chapter shall be construed as
affecting or intended to affect or to in any way inter-
fere with the laws of any State or Territory relating
to the control, appropriation, use or distribution of
water used in irrigation, or any vested right acquired
thereunder, and the Secretary of the Interior, in
carrying out the provisions of this chapter, shall
proceed in conformity with such laws, and nothing
herein shall in any way affect any right of any State
or of the Federal Government or of any landowner,
appropriator, or user of water in, to, or from any
interstate stream or the waters thereof."

This statute and its effect within the states applying the doctrine
of appropriation has been recognized in cases before the United
States Supreme Court. (Nebraska v. Wyoming (1934) 295 U. S.
40, 43.)
water which can be legally diverted within its boundaries, in fact "divests" the citizens of such a state of their so-called vested rights of appropriation or diversion.

Rights acquired by appropriation in one state are deemed to be valid against subsequent appropriators on the same stream in another state, and are enforceable as priorities in the courts of the latter state; for, just as the origin of appropriation is based upon the very life giving necessity of water in arid regions so is the origin of this "comity" of private rights in foreign states. To base the conduct of states on any other basis would be to invite suicide. (Bean v. Morris, supra, 487.)

In the latter case the United States Supreme Court said:

"But with regard to such rights as came into question in the older States, we believe that it always was assumed, in the absence of legislation to the contrary, that the States were willing to ignore boundaries, and allowed the same rights to be acquired from outside the State that could be acquired from within."(1)

In a more recent case (Wyoming v. Colorado (1921) 259 U. S. 419, 468) the Supreme Court inquired:

"... why should not appropriations from this stream be respected, as between the two States, according to their several priorities, as would be done if the stream lay wholly within either State? By what principle of right or equity may either State proceed in disregard of prior appropriations in the other?"(2)

(1) In this case Morris brought suit to prevent the petitioners from diverting waters in the state of Montana in such a manner as to interfere with an alleged prior right in himself based upon an appropriation made in Wyoming. The entire proceedings were had in the Federal courts, which recognized Morris' rights.

(2) A case deciding a controversy between the states of Wyoming and Colorado over diversions by the state of Colorado and two Colorado corporations acting under the authority of that state. The diversions were being made from the waters of the Laramie River.
It is to be noted that litigation, though involving private rights, has been instituted by the states themselves. States are anxious to protect not only existing but also future use of the waters of streams within their boundaries. In such actions the state is permitted at law to bring suit by virtue of its standing in the relation of parens patriae to its citizens and also because the interests of the state are linked with those of its appropriators. It has been held that though a state has no pecuniary interest in such a controversy, and though it itself owns no land using water from the stream in controversy, it might invoke the original jurisdiction of the United States Supreme Court as parens patriae, trustee, guardian or representative of all or a considerable portion of its citizens. (Kansas v. Colorado (1901) 185 U. S. 125, 142.) The right of a state as parens patriae to bring suit to protect the general comfort, health, or property rights of its inhabitants threatened by the proposed or continued action of another state, is to be differentiated from its power, lost under the Eleventh Amendment to the Constitution, as a sovereign to present and enforce individual claims of its citizens, as their trustee, against a sister state. (North Dakota v. Minnesota (1923) 263 U. S. 365, 375.) But where the welfare, prosperity, and happiness of the people of a river valley in a given state, are in jeopardy and where also a large portion of the taxable resources of local political subdivisions are located, and where all of these matters are dependent on existing water appropriations, then, the interests of the state are indissolubly linked with the rights of the appropriators, and, it has every right to institute its action at law. (Wyoming v. Colorado (1921) 259 U. S. 419, 468.)
Despite such clear law the United States Supreme Court is not inclined to render judgment upon such alleged rights, and against a sovereign state, unless the threatened invasion is of serious magnitude and established by clear and convincing evidence. (North Dakota v. Minnesota, supra.) Such a fact, of hesitant assumption of jurisdiction may be of some weight in forcing settlement of all the details of a negotiation. This principle, affecting the exercise by the Supreme Court of its jurisdiction, has often been referred to by that Court. (Washington v. Oregon (U. S. 1936) 56 S. Ct. 540, 542.)

**Principles Applied By the Supreme Court in Water Proceedings Brought by States**

The principles which have been formulated by the United States Supreme Court in rendering its decisions as to the rights of states and their citizens in the water of interstate streams is of some interest in connection with the negotiation of an interstate compact. Not only may the latent controversies underlying such negotiations become active and require quasi-judicial determinations but the tone of the negotiations, even though no specific controversy arise, will undoubtedly be placed upon a judicial plane.

The first matter of major influence upon the Supreme Court is the fact that water is a commodity of great scarcity in the arid areas. Even in the humid areas such as the East it may be a thing of as great relative scarcity due to the concentration and immobility of urban population centers, where the necessity is no less great that such areas have sufficient water supplies. In the case of New Jersey v. New York (1930) 283 U. S. 336, 343, Mr. Justice Holmes, speaking for the Court said:
"We are met at the outset by the question what rule is to be applied. It is established that a more liberal answer must be given than in a controversy between neighbors members of a single State. Connecticut v. Massachusetts, 282 U. S. 660. Different considerations come in when we are dealing with independent sovereigns having to regard the welfare of the whole population and when the alternative to settlement is war. A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it. New York has the physical power to cut off all the water within the jurisdiction. But clearly the exercise of such a power to the destruction of the interest of lower States could not be tolerated. . . . Both States have real and substantial interests in the River that must be reconciled as best as may be."

The above quotation contains a second doctrine equal in importance to that recognizing the sheer necessity of obtaining water. The correlative doctrine is that "a more liberal answer must be given than in a controversy between neighbors members of a single State''.

Out of this second doctrine flows certain principles hostile to the doctrine of vested interests claimed by members of any given state, which state has limited by compact diversions of water from the portion of the stream within its boundaries in an effort to obtain a fair settlement of the entire controversy.(1)

A third doctrine of major importance is also contained in the passage from Mr. Justice Holmes' opinion, above set forth, which has an interesting source in international law. The third doctrine is that, as to interstate streams, a state's actual exercise of the theoretical power to monopolize all water within its boundaries will not be tolerated. The contrary argument arises from the metaphysical doctrine of "dominion", and is one generally recognized in international

(1) Such principles are discussed below under the heading "Legal Principles Specifically Applicable to Compacts", which marks the second main division of this discussion, the preceding sections being deemed to apply more to the negotiation of the compact.
law in the absence of some treaty or other obligation assumed by the
sovereign binding it to respect the claims or interests of another
such sovereign. In the case Kansas v. Colorado, supra, Colorado con-
tended that as a sovereign and independent state she was justified,
if in her judgment her geographical situation and material welfare de-
manded it, in consuming for beneficial purposes all the waters within
her boundaries, even to the point of depriving the adjacent state and
its citizens of any use or share in the waters of that river whatever.
The Supreme Court refused to accept such a rationalization and ordered
that the case proceed to issue and proof. The State of Colorado made
the same contention twenty years later in the case Wyoming v. Colorado,
supra, and again refusing such a theory of domain, the Supreme Court
said:

"The contention of Colorado that she as a State right-
fully may divert and use, as she may choose, the waters flow-
ing within her boundaries in this inter-state stream, regard-
less of any prejudice that this may work to others having rights
in the stream below her boundary, cannot be maintained. The
river throughout its course in both States is but a single
stream wherein each State has an interest which should be re-
spected by the other. A like contention was set up by Colorado
in her answer in Kansas v. Colorado and was adjudged unten-
able." (466)

The same views have been recently re-expressed in Hinder-
lider v. La Plata River & Cherry Creek Ditch Co., supra. The Supreme
Court has thus refused to consider the given interstate stream as if it
were in theory two streams, as divided and apportioned between the
states through which it flows, one part thereof commencing in the
sources of the stream and continuing to end terminating at the boundary
of the state of source, the other part beginning at the boundary and with
the springs and sources of the lower state, starting as a new stream, and
flowing onward to its mouth. In *Kansas v. Colorado*, *supra*, The Supreme Court said that contrariwise, since from time immemorial the existence of a single continuous river had been recognized by geographers, explorers, and travelers, even the fact that a great variance in the amount of water flowing down the channel at different seasons and in different years, when at times the entire channel was in places dry and the source of the river was broken, would make no difference in its conclusion that the stream should be viewed as a unity.

The cardinal rule to be derived from a review of the decisions of the Supreme Court is that the rule underlying all the relations of states in such matters of water rights is one of "equality of right". Each state stands on the same level with all the rest. From this single principle, with practically no other fundamental rule to guide it the Supreme Court has developed what it candidly calls "interstate common law". *Kansas v. Colorado*, *supra*. Mr. Justice Holmes, referred in connection with the passage above quoted from the opinion of the Court in the case *New Jersey v. New York*, stated, as a corollary to the principle that a liberal rule was to be applied to the judicial settlement of controversies between states, that:

"The different traditions and practices in different parts of the country may lead to varying results, but the effort always is to secure an equitable apportionment without quibbling over formulas." *supra, 343.(1)*

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(1) After consideration of the demands of the two states (New Jersey and New York) in this case, the Supreme Court issued an injunction, against New York, restraining that State from diverting water from the Delaware River, or its tributaries, to the City of New York water supply, in excess of 440 million gallons daily. The Supreme Court required that prior to any diversion an efficient sewerage
The Supreme Court gives weight, in its decisions relating to the apportionment of water, to the rules recognized by local courts in determining rights between "neighbors members of a single state", but only when such rules assist in determining the equities of apportionment. In the case Wyoming v. Colorado, supra, where both states recognized the doctrine of prior appropriation in determining the rights of their respective citizens inter se, The Supreme Court said:

"We conclude that Colorado's objection to the doctrine of appropriation as a basis of decision are not well taken, and that it furnishes the only basis which is consonant with the principles of right and equity applicable to such controversy as this is. The cardinal rule of the doctrine is that priority of appropriation gives the priority of right. Each of these States applies and enforces this rule in her own territory, and it is the one to which intending appropriators naturally would turn for guidance. The principle on which it proceeds is not less applicable to interstate streams and controversies than to others. Both States pronounce the rule just and reasonable as applied to the natural conditions in that region; and to prevent any departure from it the people of both incorporated it into their constitutions. . . . Those considerations persuade us that its application to such a controversy as is here presented cannot be other than eminently just and equitable to all concerned." (470)

(1. Continued)
treatment plant to be constructed at Port Jervis (New York) so that sewage entering the Delaware and Neversink Rivers, whose waters were used by the State of New Jersey and its citizens, should not do so in injurious quantities. The Supreme Court then, in great detail, provided for suspension of use by New York if at any time the stage of the Delaware at Port Jervis or at Trenton should fall below 0.50 csm, at which time it would be incumbent upon the State of New York to release water from the impounding reservoirs of the City of New York, up to 30 per cent of the diversion area yield of 2.2 csm. This case illustrates the difficulty, visible in other decrees and in compacts in force, of attempting to apportion waters by relating together all the facts pertaining to the amount and character of the existing use of water, the quantity and quality required for the continuance of such uses and new uses, and the amount and quality of water available for apportionment at various intervals.
On the other hand the "local rule" may be discarded where the facts justify it. In the case Connecticut v. Massachusetts (1931) 282 U. S. 660, the former State suggested that under the common law and the doctrine of "riprarian rights", in force in both States, each riparian owner has a vested right in the use of flowing waters and is entitled to have the flow "as they were wont", unimpaired as to quantity and uncontaminated as to quality. That same State insisted that the Supreme Court follow the law enforced by each of these two States within their respective boundaries and grant an injunction against a proposed diversion on the part of Massachusetts. But, the Supreme Court, adhering to its own new principles of "interstate common law" and the doctrine of "equitable equality" refused, saying:

"But the laws in respect of riparian rights that happen to be effective for the time being in both States do not necessarily constitute a dependable guide or just basis for the decision of controversies such as that here presented . . .

"For the decision of suits between States, federal, state, and international law are considered and applied by this Court as the exigencies of the particular case may require. The determination of the relative rights of contending States in respect of the use of streams flowing through them does not depend upon the same considerations and is not governed by the same rules of law that are applied in such States for the solution of similar questions of private right. Kansas v. Colorado, 185 U. S. 125, 146. And, while the municipal law relating to like questions between individuals is to be taken in account, it is not to be deemed to have controlling weight." (670)

Then the Supreme Court continued, in the same case:

"As was shown in Kansas v. Colorado, 206 U. S. 146, 100, such disputes are to be settled on the basis of equality of right. But this is not to say that there must be an equal division of the waters of an interstate stream among the States through which it flows.
It means that the principle of right and equity shall be applied having regard to the "equal level or plane on which all the States stand, in the point of power and right, under our constitutional system" and that, upon a consideration of the pertinent laws of the contending States and all other relevant facts, this Court will determine what is an equitable apportionment of the use of such waters." (670)

From this same decision it appears that in apportioning waters the Supreme Court gives first consideration to "drinking and other domestic purposes" as being "the highest uses of water". In Wyoming v. Colorado, supra, the Supreme Court pointed out that the utilization of water meant the presence of population on the land which must have a living from year to year and the means to make such a living year by year and not simply once in "three or four years". The Supreme Court stated:

"It is a question of population as well as investment. The population has to exist and stay on the ground." (470)

Of course the importance of use can be whatever the contracting states may agree upon and establish by the compact.

The Supreme Court considers appropriations as a valid part of a State's water account, but is quick to disregard appropriations which have been abandoned or have suffered the legal effects of a forfeiture through inequitable conduct or laches or otherwise. "The label of the acts is unimportant, whether laches or estoppel or abandonment". Wyoming v Colorado, supra. In the same case the Supreme Court said:
"A priority once acquired or put in course of acquisition by the posting of a notice may be lost to the claimant by abandonment or laches. There must be no waste in arid lands of the 'treasure' of a river. The essence of the doctrine of prior appropriation is beneficial use, not a stale or barren claim. Only diligence and good faith will keep the privilege alive." (344)

Under its doctrines the Supreme Court has indicated that it will weigh the relative merit of the uses of water under valid appropriation. It will not limit the use of water to a state if it would materially injure users without a compensating benefit to proposed users of another state, the complainant. It will not restrain a diversion where to do so will bring distress and even ruin to a long-established settlement of tillers of the soil, especially if all that is involved on the other side is a vindication of a present barren right. It will, however, in its decisions, consider whether the waters diverted are misapplied or wasted with ensuing loss to the complainant State.

Washington v. Oregon, supra.

In determining a fair division of the water, vital to the prosperity of an agricultural community, even to its very life, the Supreme Court is inclined to view the welfare of cities within the area as in part determined by the welfare of the area around them. In making an apportionment it will be influenced by the needs of an area, part agricultural, part urban, as dependent upon a unity of growth in the development of the whole community. Ibid.

The Supreme Court has refused to make any final determination on the basis of an average yearly flow, even though it be for all years in a considerable period -- especially where there is a great variation in the flow. Of greater importance is the "unalterable need" for a supply which is fairly constant and dependable, or is susceptible of being
made so by storage and conservation within practicable limits. In *Wyoming v. Colorado*, supra, 471, 474, and 480, the Supreme Court recognized the fact, also, that the consensus of opinion among practical irrigators and experienced irrigation engineers is that the "lowest natural flow" of the years is not the test, for:

"In practice they proceed on the view that within limits, financially and physically feasible, a fairly constant and dependable flow practically in excess of the lowest may generally be obtained by means of reservoirs adapted to conserving and equalizing the natural flow; and we regard this view as reasonable."

Again, to obtain the fair volume of a stream for apportionment it may be necessary to include, in the amounts to be apportioned, in part or in whole that flow from other forks and tributaries that augments the flow of the subject stream on lower reaches. *Nebraska v. Wyoming* (1934) 295 U. S. 40, 14. This is an application of the rule previously stated that the Supreme Court will not consider the stream as artificially divided into several streams by the crossing of state boundaries but only as a unity. Conversely, it may be necessary, in arriving at an equitable apportionment, to consider the amount diverted not only directly but even indirectly through the pumping from remote wells, when proved to influence the volume of the stream. See *Washington v. Oregon*, supra, 514. Then, again, equal in importance to the loss of quantity through diversions on upper portions of the stream may be the loss of quality by upper pollution. See *Missouri v. Illinois* (U. S. 1906) 26 S. Ct. 266, 268.

Legal Principles Specifically Applicable to Compacts:

The commerce clause need not be involved nor form a particular legal basis for the authorization of interstate compacts. Compacts of this character rest directly upon specific constitutional provision for
their legal sanction. Article I, Sec. 8, Cl. 3, of the Constitution provides:

"No State shall, without the Consent of Congress, . . . . enter into any Agreement or Compact with another State, . . . ."

Where the compact is used as a method of regulating the navigation of a stream then, of course, the commerce power may induce an additional but unnecessary legal foundation for the compact qua compact. The compact, however, beyond question has its own independent legal basis. Hinderlider v. La Plata River & Cherry Creek Ditch Co., supra.

A compact, sanctioned by Congress, becomes a law of the Union, (Mr. Justice McLean, for the Court, in Pennsylvania v. The Wheeling & Belmont Bridge Co. et al (1851) 53-4 U. S. 521, 631.) although it is doubtful that it is any wise a statute of Congress. (Sec, dissent of Chief Justice Taney in the Pennsylvania case, immediately cited, to the effect: "It (the act of Congress) leaves the compact as it was; that is, a compact between the two States, and nothing more, and to be enforced by a proceeding upon it." In the Hinderlider case, supra, it is stated that the compact, though approved by Congress, is not a statute of the United States within the meaning of Sec. 237 (a) of the Judicial Code. However, it seems certain that a state law may not be passed at conflict with the compact with respect to which the given state is a party signatory. Under the Constitution no state may pass any law impairing the obligation of a contract and a compact is a contract within the meaning of that constitutional provision. Green et al v. Biddle (1823) 19-21 U. S. 346, 365. The same view has received approval in a more recent case. Olin v. Kitzmiller et al (1922) 259 U. S. 260, 261, 263.
Further, a state may not avoid the burden of its duty under a compact by simply placing responsibility for any violation thereof on persons within its borders engaged in private and not official business. Thus, in the case Wyoming v. Colorado, supra, The Supreme Court had under consideration the contention made by Colorado that the acts of diversion complained of (no compact) in violation of a previous decree entered by the Supreme Court were not acts done by Colorado, or under her authority, but acts done by private corporations and individuals, not parties to the then pending suit. The Supreme Court declared any such contention untenable in view of the fact that such acts were done with the "knowledge, permission and cooperation" of that State. It is true that citizens of the contracting states are not deemed to be in any wise parties to the compact. In Georgetown v. The Alexandria Canal Co., et al (1838) 37 U. S. 91, 96, the Supreme Court said:

"The compact made in the year 1785, between Virginia and Maryland, was made by the two states, in their character as states. The citizens, individually, of both commonwealths, were subject to all obligations imposed, and entitled to all the benefits conferred by that compact. But the citizens as such, individually, were in no just sense parties to it; those parties were the two states, of which they were citizens."

It is to be emphasized that the compact is binding upon the citizens of the signatory states, especially in view of the theory of the vested rights of property. In Poole et al v. Fleeger et al (1837) 35-37 U. S. 395, 397, a controversy arose between private parties as to the title of realty. The Supreme Court held that the rights of the parties would be determined by a compact entered into in 1820 by the two states, Kentucky and Tennessee, settling the true boundary between them.
But, in the recent case of Hinderlider v. La Plata River & Cherry Creek Ditch Co., supra, the Supreme Court was more explicit in its decision as to the effect of the La Plata River Compact between the states of Colorado and New Mexico (ratified by Congress on January 29, 1925) upon the citizens of those states. The Supreme Court said:

"Whether the apportionment of the water of an interstate stream be made by compact between the upper and lower States with the consent of Congress or by a decree of this Court, the apportionment is binding upon the citizens of each State and all water claimants, even where the State has granted the water rights before it entered into the compact." (809)

And, further:

"As Colorado possessed the right only to an equitable share of the water of the stream, the decree of January 12, 1898, in the Colorado River proceedings did not award to the Ditch Company any right greater than the equitable share. Hence the apportionment made by the Compact can not have taken from the Ditch Company any vested right, unless there was in the proceedings leading up to the Compact or in its application, some vitiating infirmity." (810)

This case is also authority for the nature of the proceedings involved in framing the compact. It appears to be the only case of such a character. The Supreme Court states that a compact need not embody a decision of a judicial or of a quazi-judicial nature with respect to controverted rights. It can be simply a trading compromise of conflicting claims. It adds that the history and the order of development of the judicial process and of the framing of compacts are entirely diverse (808). Further, as the states have power to bind by compact their respective appropriators, by an agreement dividing the flow of a stream, they have power to reach that and either by providing a con-
continuous and equal division of the water from time to time or by providing for alternate periods of flow, to first one state and then the other, of all the water in the stream.

It should be noted that indirectly the Supreme Court indicates that the apportionment must be reached by the Commissioners after inquiry, by an honest exercise of judgment, and according to some basis of equity. If those having claims which are to be affected by the compact wish to have their claims presented directly to the Commissioners for consideration, it seems from the Hinderlider case, the Commissioners must arrange for such parties having an opportunity of being heard.
Preliminary Report
on
YELLOWSTONE RIVER BASIN

Section II
DETAILS BY SUB-BASINS

A. Main Stem and Minor Tributaries of the Yellowstone River
B. Clark Fork River
C. Big Horn River
D. Little Horn River
E. Tongue River
F. Powder River
G. Little Powder River

Federal Power Commission
Bureau of Engineering
Denver Regional Office
A. MAIN STEM AND MINOR TRIBUTARIES OF THE YELLOWSTONE RIVER

1. Stream Flow

The main stem of the Yellowstone River rises in northwestern Wyoming, flows north through Yellowstone Lake to Livingston, Montana, where it makes a big bend and then flows northeastward to its confluence with the Missouri. Since about 1890 the streamflow has been gaged for short periods at several points. Table 26 summarizes the gagings at some of the key stations. Long records are available for the Yellowstone at Corwin Springs, Montana (table 27) and at Intake, Montana (table 15). During the last 35 years the annual discharge at Intake has ranged from about 4 million acre-feet to 15 million acre-feet, and has averaged 10 million. The main stem above Corwin Springs is probably the most dependable stream in the basin. It holds up well almost every year until late in the summer. There is very little, if any, irrigation above Corwin Springs, and no water is diverted below Intake.

2. Existing Irrigation Projects

Table 28 presents data on the irrigated and irrigable areas in each project (or group of small projects) on the Yellowstone (main stem) and minor tributaries. These data were obtained by the Corps of Engineers through a field survey made in the spring of 1939. The projects are arranged in the table according to location and source of water supply. Map 8 shows the location of the major projects, which can be identified by the numbers thereon and by reference to column 2 of table 28.

| Projects on Main Stem in Montana | There are 231,530 acres under canals which divert directly from the Yellowstone. Of this area, 176,810 are being irrigated at |
present. Table 28 indicates that the lands irrigated from the main stem suffered a shortage of about 5,000 acre-feet per year during the period 1930-1938. This shortage, all of which occurred on the Cartersville Irrigation District Project, resulted from decreased head on the intake works and not from lack of water in the river. Quite the contrary, it appears that there has always been enough water in the main stem at Corwin Springs to irrigate all the land commanded by the ditches which divert from the main stem of the Yellowstone.

3. Potential Irrigation Projects

Appendix I contains a complete list of potential irrigation projects in this sub-basin. The Brackett Creek Project, the Porcupine Creek Project, and the Lake Basin Project are included in the water use studies of Appendix F of the Progress Report of the National Resources Planning Board (see table 20). It will be noted that much of the area listed under potential projects in Appendix I is included in table 28 as "additional irrigable area by extension of (existing) projects."

Lake Basin Project: The Lake Basin Project is the only potential project that would divert water directly from the main stem of the Yellowstone. It is proposed to irrigate 239,200 acres in Lake Basin (sometimes called Wheat Basin) through a gravity canal supplied from the potential Lower Canyon Reservoir. The Corps of Engineers estimates that the water duty would be 1.8 acre-feet per acre with no return flow. Lake Basin is at present a closed basin lying between the Yellowstone Basin and the Mussel-shell Basin, north of Columbus, Montana, and, therefore, its inclusion in the Yellowstone Basin might be questioned. The direction of the water courses in the area indicates that the basin was once drained by the
Yellowstone River through Canyon Creek. The structural geology of the Region indicates that the underground drainage, if any, is to the Yellowstone River via White Beaver Creek (see U.S.G.S. Bulletin 691 D). If the rights of the lands of Lake Basin to waters of the Yellowstone River were clearly defined in the compact, the possibility of future controversy might be eliminated.

Mid-Yellowstone Project
The greatest area classified as "irrigable by extension of existing projects" is the group of projects collectively known as the Mid-Yellowstone Project. Two units of the Buffalo Rapids District, embracing 22,300 acres, are being considered by the U. S. Bureau of Reclamation for immediate construction (1). Present plans are to irrigate the entire 22,300 acres by pumping directly from the Yellowstone River, although the Mid-Yellowstone Project has previously been considered as a gravity project.

Ultimate Irrigable Area
The ultimate irrigable area of this sub-basin, as estimated by the Corps of Engineers, is 738,515 acres (see tables 18 and 19). This area may be classified as to source of water supply and state of development as follows:

(1) From a pamphlet, "Northern Great Plains", published by the National Resources Planning Board, May 1940.
Ultimate Irrigable Area on the Main Stem
and Minor Tributaries - Acres

<table>
<thead>
<tr>
<th></th>
<th>Main Stem Direct</th>
<th>Minor Tributaries</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated at present</td>
<td>176,810</td>
<td>129,665</td>
<td>306,475</td>
</tr>
<tr>
<td>Under ditch, but not irrigated at present</td>
<td>54,720</td>
<td>9,090</td>
<td>63,810</td>
</tr>
<tr>
<td>Irrigable by extension of projects</td>
<td>106,130</td>
<td>10,700</td>
<td>116,830</td>
</tr>
<tr>
<td>Area in potential projects</td>
<td>239,200</td>
<td>12,200</td>
<td>251,400</td>
</tr>
<tr>
<td>Total</td>
<td>576,860</td>
<td>161,655</td>
<td>738,515</td>
</tr>
</tbody>
</table>

According to the above estimate, all of the irrigable area of the basin lies in Montana except the Lower Yellowstone Project, which lies partly within North Dakota. Estimates of the irrigable area in North Dakota are discussed fully in Section I-D-2. The Montana reports do not give an estimate of the ultimate irrigable area in Montana, but indicate that the Army figure should be increased by at least 90,000 acres (see Appendix I, table 2).

Appendix I lists four potential projects reported by the Montana State Water Conservation Board and two potential projects reported by the North Dakota Water Conservation Commission, which, apparently, are not included in the tabulation given above. These six projects contain 72,650 irrigable acres, 70,000 of which are in Montana and 2,650 in North Dakota.

4. Reservoirs for Irrigation Storage

Existing Reservoirs

There are no existing reservoirs on the main stem of the Yellowstone, and only two on its minor tributaries. These two, Lake Adams and Lake Walvoord, are on the Sweetgrass Creek and have a combined capacity of 18,000 acre-feet (see table 17).
Potential Reservoirs

The only irrigation storage reservoir known to have been proposed for the main stem of the Yellowstone River is the Lower Canyon reservoir above Livingston. About 30 reservoirs, having a total capacity of more than 250,000 acre-feet, have been proposed for the minor tributaries, principally in the Shields River Basin. These potential reservoirs are all in Montana, and are listed in Appendix II, tables 2 and 3. Table 29 gives a probable schedule of operations of the seven reservoirs which were included in the water use studies of the Progress Report of the National Resources Planning Board (Appendix F).
**Table 26**

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>67,303 Sq. Ml</th>
<th>12,526 Sq. Ml</th>
<th>3,524 Sq. Ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>1750</td>
<td>180</td>
<td>150</td>
</tr>
<tr>
<td>Minimum</td>
<td>100</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>Mean</td>
<td>100</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>Maximum</td>
<td>150</td>
<td>100</td>
<td>120</td>
</tr>
<tr>
<td>Minimum</td>
<td>70</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Mean</td>
<td>90</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Maximum</td>
<td>150</td>
<td>100</td>
<td>120</td>
</tr>
<tr>
<td>Minimum</td>
<td>70</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Mean</td>
<td>90</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

**Mean Run-off for the period 1930-1957 of the Yellowstone River (Main Stem) at various points in Montana**

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>600 Sq. Ml</th>
<th>645 Sq. Ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>14.5</td>
<td>10</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Mean</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Maximum</td>
<td>16</td>
<td>14</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Mean</td>
<td>2.3</td>
<td>2.3</td>
</tr>
</tbody>
</table>

*1931 is the minimum year of record
- Estimated
- Partially estimated

**Boulder River near Mead, Montana**

<table>
<thead>
<tr>
<th>Year</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1911-12</td>
<td>15.5a</td>
<td>9.0a</td>
<td>11.2a</td>
</tr>
<tr>
<td>1912-13</td>
<td>16.5a</td>
<td>11.0a</td>
<td>13.5a</td>
</tr>
<tr>
<td>1913-14</td>
<td>27.9</td>
<td>19.6</td>
<td>24.6</td>
</tr>
<tr>
<td>1914-15</td>
<td>10.4a</td>
<td>9.2a</td>
<td>10.0a</td>
</tr>
</tbody>
</table>

- Estimated
- Partially estimated
Table 29

SELECTED POTENTIAL RESERVOIRS
(And Probable Schedule of Storage and Release Operations)

Main Stem and Minor Tributaries of the Yellowstone River

<table>
<thead>
<tr>
<th>Name of Reservoir</th>
<th>Total</th>
<th>Nov. 1</th>
<th>Capa- to</th>
<th>Mar. 31</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug.</th>
<th>Sept.</th>
<th>Oct.</th>
<th>Evaporation Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Clark Fork</td>
<td>233,170</td>
<td>-128,440</td>
<td>-7,320 - -28,260</td>
<td>-55,520</td>
<td>93,870</td>
<td>104,730</td>
<td>24,570</td>
<td>-13,630</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mill Creek Res.</td>
<td>7,500</td>
<td>-4,120</td>
<td>-230 - -900</td>
<td>-1,800</td>
<td>3,000</td>
<td>3,380</td>
<td>600</td>
<td>-450</td>
<td>520</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brackett Cr. Res.</td>
<td>31,670</td>
<td>-17,420</td>
<td>-950 - -3,800</td>
<td>-7,600</td>
<td>12,670</td>
<td>14,250</td>
<td>3,170</td>
<td>-1,900</td>
<td>1,580</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potter Cr. Res.</td>
<td>20,000</td>
<td>-11,000</td>
<td>-600 - -2,400</td>
<td>-4,800</td>
<td>8,000</td>
<td>9,000</td>
<td>2,000</td>
<td>-1,200</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Canyon Res.</td>
<td>156,000</td>
<td>-86,000</td>
<td>-5,000 - -19,000</td>
<td>-37,000</td>
<td>63,000</td>
<td>70,000</td>
<td>17,000</td>
<td>-9,000</td>
<td>6,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweetgrass Res.</td>
<td>18,000</td>
<td>-9,900</td>
<td>-540 - -2,160</td>
<td>-4,320</td>
<td>7,200</td>
<td>8,100</td>
<td>1,800</td>
<td>-1,080</td>
<td>900</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Below Clark Fork

<table>
<thead>
<tr>
<th>Name of Reservoir</th>
<th>Total</th>
<th>Nov. 1</th>
<th>Capa- to</th>
<th>Mar. 31</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug.</th>
<th>Sept.</th>
<th>Oct.</th>
<th>Evaporation Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>McGinnis Cr. Res.</td>
<td>8,200</td>
<td>-4,510</td>
<td>-250 - -980</td>
<td>-1,970</td>
<td>3,280</td>
<td>3,690</td>
<td>560</td>
<td>-490</td>
<td>670</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosebud Cr. Res.</td>
<td>5,000</td>
<td>-2,750</td>
<td>-150 - -600</td>
<td>-1,200</td>
<td>2,000</td>
<td>2,250</td>
<td>400</td>
<td>-300</td>
<td>350</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3,200</td>
<td>-1,760</td>
<td>-100 - -380</td>
<td>-770</td>
<td>1,280</td>
<td>1,440</td>
<td>160</td>
<td>-190</td>
<td>320</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total, Main Stem

| Total, Main Stem      | 241,370| -132,950| -7,570 - -29,240 | -57,490 | 97,150 | 108,420 | 25,130 | -14,120 | 10,670 |

Source: Field Survey Sheets (1939) of the Corps of Engineers, War Department.
B. CLARK FORK RIVER

1. Stream Flow

The Clark Fork of the Yellowstone River rises near the north-eastern corner of Yellowstone Park, near the Montana-Wyoming State line, and flows southeastward to its confluence with Sunlight Creek. It then turns northward and flows in a northeasterly direction into Montana, where it joins the main stem of the Yellowstone a few miles above Laurel, Montana. The principal tributary in Montana is Red Lodge Creek, which drains the northwestern portion of the basin.

In 1905 a stream-gaging station was established at Fromberg, Montana, a few miles above the mouth, where a continuous record was kept (except for winter months) until 1914. In 1921 a station was established at Edgar, Montana, about ten miles downstream. The record at Edgar has been continuous to date. A station at Chance, Montana, near the state line, also has a continuous record from 1921 to date. The flow at Chance (at state line) has been extended by comparison with the Clark Fork at Clark and at Fromberg, and the results presented in table 31. Extreme and mean flows for other streams in the basin are shown in table 30.

2. Existing Irrigation Projects

Table 32 presents data on the irrigated and irrigable areas in each project (or group of small projects) in the basin. These data were obtained by the Corps of Engineers through a field survey made in the spring of 1939. The projects are arranged in the table according to location and
source of water supply. Map 8 shows the location of the major projects, which can be identified by the numbers thereon and by reference to column 2 of table 32.

A total of 85,500 acres in the basin are under canals. Of this area, 73,300 acres are being irrigated at present.

Projects on Main Stem in Montana

The projects in Montana which take their water supply directly from the main stem of the Clark Fork are grouped in table 32, and the data concerning them totaled. It will be noted that of the 33,810 acres irrigated from the main stem in Montana only one group of projects shows a shortage. This shortage, which is given as an average for the period, occurred, according to the field survey sheets, as an 8,500 acre-foot shortage during the months of August and September of a single year, 1930. This reported shortage is difficult to understand, particularly in view of the fact that in 1930 the water supply during the latter part of the irrigation season was better than for any other year of the period (see table 31).

3. Potential Irrigation Projects

Tables 1 and 2 of Appendix I list six potential projects in the Clark Fork basin, which include a total of 105,900 acres.

The Clark Fork Project (scheme 1) is the only potential project included in the water-use studies of Appendix F of the Progress Report of the National Resources Planning Board (see table 20). It is proposed to irrigate 60,800 acres in Wyoming and Montana along the banks of the western tributaries of the Clark Fork. The canal would divert water from the main stem in northern Wyoming (T. 56 N., R. 104 W.) and follow down the west side of the river at a considerable distance from the
stream. The natural flow of the river would be supplemented by 60,000 acre-feet of storage in Sunlight Reservoir on Sunlight Creek. Of the total of 60,800 irrigable acres, probably 80 percent is in Montana and 20 percent in Wyoming. The cost is estimated in the 308 Report at $122 per acre.

Ultimate Irrigable Area

The ultimate irrigable area of the basin, as estimated by the Corps of Engineers, is 148,500 acres (see tables 18 and 19).

This area may be classified as to location and state of development as follows:

<table>
<thead>
<tr>
<th>Ultimate Irrigable Area in the Clark Fork Basin - Acres</th>
<th>Wyoming</th>
<th>Montana</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated at present</td>
<td>10,450</td>
<td>33,810</td>
<td>73,300</td>
</tr>
<tr>
<td>Under ditch, but not irrigated at present</td>
<td>5,370</td>
<td>250</td>
<td>12,200</td>
</tr>
<tr>
<td>Irrigable by extension of projects</td>
<td>1,400</td>
<td>800</td>
<td>2,200</td>
</tr>
<tr>
<td>Area in potential projects</td>
<td>12,160</td>
<td>48,640</td>
<td>60,800</td>
</tr>
<tr>
<td>Total</td>
<td>29,380</td>
<td>83,500</td>
<td>113,800</td>
</tr>
</tbody>
</table>

The Wyoming Report estimated the ultimate irrigable area in Wyoming at 61,430 acres. (See table 18 and Appendix I, table 2.) The Montana Reports do not give an estimate of the ultimate irrigable area in Montana.

4. Reservoirs for Irrigation Storage

Existing Reservoirs

There are in the basin five reservoirs having a total capacity of 37,990 acre-feet. As indicated in table 17, two reservoirs with a capacity of 32,810 acre-feet are in Montana, and the other three (capacity, 5,150 acre-feet) are in Wyoming.
The three tables of Appendix II list five potential reservoirs in the Clark Fork basin. Three of these have capacities less than 1,000 acre-feet, and a fourth, Sunlight Reservoir, has a capacity of 60,000 acre-feet. The latter has been mentioned above in connection with the Clark Fork potential irrigation project. The probable schedule of storage and release operations of Sunlight Reservoir is given below in acre-feet.

<table>
<thead>
<tr>
<th>Month</th>
<th>Storage/Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. thru March</td>
<td>33,000 storage</td>
</tr>
<tr>
<td>April</td>
<td>1,800 &quot;</td>
</tr>
<tr>
<td>May</td>
<td>7,200 &quot;</td>
</tr>
<tr>
<td>June</td>
<td>17,400 &quot;</td>
</tr>
<tr>
<td>July</td>
<td>24,000 release</td>
</tr>
<tr>
<td>Aug.</td>
<td>27,000 &quot;</td>
</tr>
<tr>
<td>Sept.</td>
<td>6,600 &quot;</td>
</tr>
<tr>
<td>Oct.</td>
<td>3,600 &quot;</td>
</tr>
</tbody>
</table>

Evaporation losses, estimated at four percent of the capacity, will amount to 2,400 acre-feet each year.

No information other than that shown in Appendix II, table 2, is available on the Broadwater Curl reservoir.
### Table 30

**Maximum, Minimum and Mean Run-off of Major Streams in the Clark Fork Basin**

(1,000 Acre-feet)

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>2,103 Sq. Mi.</th>
<th>Clark Fork at Edge and Fromberg, Mont.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max.</td>
<td>158</td>
<td>16.2</td>
</tr>
<tr>
<td>Min.</td>
<td>15.0</td>
<td>13.4</td>
</tr>
<tr>
<td>Mean</td>
<td>20.0</td>
<td>19.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>555 Sq. Mi.</th>
<th>Rock Creek at Rockvale, Mont.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max.</td>
<td>11.3</td>
<td>12.9</td>
</tr>
<tr>
<td>Min.</td>
<td>2.3</td>
<td>3.4</td>
</tr>
<tr>
<td>Mean</td>
<td>7.2</td>
<td>5.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>1,01 Sq. Mi.</th>
<th>Sunlight Creek near Painter, Wyo.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929 - 30</td>
<td>3.7</td>
<td>5.4</td>
</tr>
<tr>
<td>1930 - 31</td>
<td>6.3</td>
<td>6.2</td>
</tr>
<tr>
<td>1931 - 32</td>
<td>8.4</td>
<td>7.4</td>
</tr>
</tbody>
</table>

### Table 31

**Run-off of the Clark Fork River at Chicoine, Montana**

(1,000 Acre-feet)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1955 (1)</td>
<td>-</td>
<td>200</td>
<td>986</td>
<td>1094</td>
<td>874</td>
</tr>
<tr>
<td>1956</td>
<td>13.2</td>
<td>15.4</td>
<td>13.5</td>
<td>13.5</td>
<td>12.3</td>
</tr>
<tr>
<td>1957</td>
<td>10.6</td>
<td>12.8</td>
<td>13.5</td>
<td>13.5</td>
<td>14.0</td>
</tr>
<tr>
<td>1958</td>
<td>21.8</td>
<td>15.9</td>
<td>11.1</td>
<td>9.3</td>
<td>9.9</td>
</tr>
<tr>
<td>1959</td>
<td>22.7</td>
<td>17.5</td>
<td>11.5</td>
<td>11.0</td>
<td>10.6</td>
</tr>
<tr>
<td>1960</td>
<td>15.8</td>
<td>11.3</td>
<td>10.1</td>
<td>10.1</td>
<td>10.7</td>
</tr>
<tr>
<td>1961</td>
<td>10.3</td>
<td>12.1</td>
<td>11.2</td>
<td>8.5</td>
<td>9.4</td>
</tr>
<tr>
<td>1962</td>
<td>15.7</td>
<td>15.7</td>
<td>10.1</td>
<td>10.1</td>
<td>10.2</td>
</tr>
<tr>
<td>1963</td>
<td>20.7</td>
<td>15.3</td>
<td>15.6</td>
<td>11.0</td>
<td>9.9</td>
</tr>
<tr>
<td>1964</td>
<td>13.2</td>
<td>15.1</td>
<td>13.1</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(1) Record from June 1955 to December 1964 estimated by comparison with Clark Fork at Fromberg, Mont. (2) Record from May 1919 to July 1921 is that of Clark Fork at Clark, Wyo.
C. BIG HORN RIVER

1. Stream Flow

The Wind and Popo Agie Rivers come together near Riverton, Wyoming, to form the Big Horn River. The Big Horn then flows north about 150 miles to the Wyoming-Montana State line where it turns northeastward for a hundred miles to its confluence with the Yellowstone near Big Horn, Montana. Its two largest tributaries, the Shoshone and the Greybull, enter from the west in Wyoming. The Little Horn River and Shell and Nowood Creeks, which rise in the Big Horn Mountains, enter from the east.

The longest record of stream flow is that of the Big Horn at Thermopolis, Wyoming. Long records also exist for the Wind River at Riverton and for the Shoshone River below Shoshone Reservoir. Table 33 gives the maximum, minimum, and mean flows as recorded at the principal gaging stations in the basin. The flow of the Big Horn River at the state line has been estimated from records at Kane and Byron, Wyoming, and Hardin, Montana, and is shown in table 34.

2. Existing Irrigation Projects

Table 35 presents data on the irrigated and irrigable areas in each project (or group of small projects) in the Big Horn Basin. These data were obtained by the Corps of Engineers through a field survey made in the spring of 1939. The projects are arranged in the table according

(1) The stream is often called the Wind River until it leaves the Wind River Canyon, near Thermopolis, Wyoming.
to location and source of water supply. Map 8 shows the location of the major projects, which can be identified by the numbers thereon and by reference to column 2 of table 35. A total of 527,780 acres in the basin are under canals, of which 383,660 acres are being irrigated at present.

Projects on Main Stem in Montana

The projects in Montana which take their water supply directly from the main stem of the Big Horn are grouped in table 35, and the data concerning them totaled. It will be noted that an average annual shortage of 2,650 acre-feet was reported for the 40,525 acres in Montana which divert from the main stem. The water requirement of this acreage probably never exceeds a continuous flow of 800 second-feet. According to stream flow records, which are summarized in table 36, the flow at the state line seldom falls below 800 c.f.s. The reported shortage can probably be explained by the fact that the diversion dams, being generally constructed of brush mats, leak so much water that they cannot maintain the proper head on the canal intakes during extreme low flow. The combined capacity of the diversion canals for this group of projects is about 1,280 c.f.s. The present canals, apparently, were designed to irrigate at least 60,000 acres, and are capable of irrigating 90,000 acres if the maximum diversion is limited, as in Wyoming (1), to one second-foot to every 70 acres. It is evident from table 36 that, if there is any further depletion upstream, the Montana irrigators will have difficulty keeping the existing canals full in extremely dry years.

In Wyoming serious shortages exist in dry years on the Greybull River, on minor tributaries of the Big Horn, and on many of the small streams throughout the basin. The recently completed Upper Sunshine Reservoir will relieve the shortages on the Greybull River, and the Bull Lake

(1) See estimates of water duty in Section I-D-1.
Reservoir (also recently completed) will permit additional irrigation along the Wind River.

3. Potential Irrigation Projects

Table 1 of Appendix I lists 15 potential projects in the Big Horn Basin having a total area of 54,464 acres, excluding duplicated areas. This entire area is included in the ultimate irrigable area of table 18, either as "irrigable area by extension of project" (see table 35), or as "irrigable area in potential projects" (see table 19). Brief descriptions of these projects are given in Appendix I (table 1) and complete descriptions are given in Appendix IV of the 308 Report. Table 2 of Appendix I lists, by sub-basins, 139,000 acres in miscellaneous small projects, which were included in the Wyoming Report, and 23,000 acres in the Polecat Bench Irrigation District, which was taken from the Army report. No further information is available on the projects of table 2.

Big Horn Irrigation Project

Several schemes have been proposed for irrigating the high benches along the Big Horn River below the Big Horn Canyon in Montana. The irrigable area included in the various surveys has ranged from 21,000 acres (U. S. Office of Indian Affairs Survey) to 60,000 acres (Koch Survey). All of the plans require a rather high diversion dam in Big Horn Canyon, and some of the investigations have considered irrigation as part of a multi-purpose project which would include power, flood control, and navigation benefits.

The 308 Report (Appendix IV) included 50,100 irrigable acres in the project, and estimated the total cost at $12,570,000 or $250 per acre. The project was also considered in combination with power, and it was concluded that, if all the expense of the dam and reservoir were borne by
power, the cost of developing the irrigation project would amount to $100 per acre.

Appendix F of the Progress Report (1939) of the National Resources Planning Board, which, in some respects, is a revision of the irrigation section of the 308 Report, places the irrigable area in the Big Horn Project at 47,500 acres. This is the figure used in this report. No cost estimates are given for the revised figure, but, presumably, they are about the same as those given above. The Big Horn River carries a heavy silt load, and, unless the silt were removed by upstream control, the capacity of a reservoir at this site would be greatly reduced in a relatively short time (see 308 Report, page 157).

Potential Projects in Wyoming: All of the potential projects in Wyoming, except the two on the main stem, contemplate supplementing natural stream flow with reservoir storage. The total potential (additional) irrigable area in Wyoming is estimated at 596,825 acres (see text table below), and the total capacity of the selected potential reservoirs is 749,910 acre-feet (table 37). This is probably insufficient storage to carry the additional acreage through the latter part of the irrigation season in dry years, and, apparently, there is not enough water in the river to make up the difference. There are many more reservoir sites in Wyoming (table 1, Appendix II), but, at present, it is not known to what extent they will be found infeasible because of duplication, insufficient water supply, and other reasons.

Ultimate Irrigable Area: The ultimate irrigable area of the basin, as estimated by the Corps of Engineers, is 1,078,860 acres (see table 18). This area may be classified as to location and state of development as follows:
Ultimate Irrigable Area in the Big Horn Basin - Acres

<table>
<thead>
<tr>
<th></th>
<th>Wyoming (1)</th>
<th>Montana Main Stem</th>
<th>Tributaries (1)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated at present</td>
<td>342,285</td>
<td>40,525</td>
<td>850</td>
<td>383,660</td>
</tr>
<tr>
<td>Under ditch, but not irrigated at present</td>
<td>144,145</td>
<td>18,875</td>
<td>1,100</td>
<td>164,120</td>
</tr>
<tr>
<td>Irrigable by extension of projects</td>
<td>176,525</td>
<td>28,700</td>
<td>2,200</td>
<td>207,425</td>
</tr>
<tr>
<td>Area in potential projects</td>
<td>276,155</td>
<td>47,500</td>
<td>0</td>
<td>323,655</td>
</tr>
<tr>
<td>Total</td>
<td>939,110</td>
<td>135,600</td>
<td>4,150</td>
<td>1,078,860</td>
</tr>
</tbody>
</table>

(1) Little Horn River not included.

The Wyoming Report estimated the ultimate irrigable area in Wyoming at 1,233,465 acres (see table 18 and Appendix I, table 2). The Montana Report did not give an estimate of the area in Montana, but, in commenting on the estimates of the 308 Report, it did not offer any revisions.

4. Reservoirs for Irrigation Storage

The existing reservoirs in the basin have a total capacity of 660,660 acre-feet of useful storage. The major reservoirs are listed in table 17. Over half of the total capacity is in the Shoshone Reservoir, which is operated by the Bureau of Reclamation, and more than 80 percent of the total is included in the four largest reservoirs. Bull Lake Reservoir, capacity 150,000 acre-feet, and Upper Sunshine Reservoir, capacity 43,500 acre-feet, have just been completed, and, therefore, their operations are not reflected in stream flow records to date. The entire area for which the Shoshone Reservoir was designed has not yet been developed, so that, normally, the reservoir should have a surplus storage capacity. Part of the capacity of Bull Lake Reservoir is intended for
new lands, and, until these lands are brought under irrigation, there should be a surplus available from this reservoir. The Upper Sunshine Reservoir was built to alleviate a serious shortage along the Greybull River, and it is expected that its entire capacity will be utilized immediately.

Potential Reservoirs

Table 1 of Appendix II lists nearly 100 potential reservoirs, having a total capacity of 1,366,180 acre-feet in the Big Horn Basin (excluding Little Horn) in Wyoming. The total capacity, less duplications, is given as 1,357,740 acre-feet. No information, other than that shown in the table, is available to this office, but it is very likely that many of these potential reservoirs will be found infeasible on further study. The only potential reservoirs in Montana are the Big Horn Canyon Reservoir, which has been discussed under the Big Horn Irrigation Project, and the Porcupine Creek Reservoir (Appendix II, table 3). Twenty-four potential reservoirs were selected by the Corps of Engineers for inclusion in the water use studies of Appendix F. The capacity and probable schedule of operations of each of these reservoirs are given in table 37.
### Table 13

MAXIMUM, MINIMUM, AND MEAN RUN-OFF OF MAJOR STREAMS IN THE BIG HORN RIVER BASIN

<table>
<thead>
<tr>
<th>Drainage Area: 15,900 Sq. Ml.</th>
<th>Big Horn River at Kane, Wyoming</th>
<th>Period: Sept. 1928 - Oct. 1937</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>129</td>
<td>100</td>
</tr>
<tr>
<td>Minimum</td>
<td>32</td>
<td>51</td>
</tr>
<tr>
<td>Mean 1930 - 37</td>
<td>75</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drainage Area: 8,000 Sq. Ml.</th>
<th>Big Horn River at Thermopolis, Wyoming</th>
<th>Period: Broken 1900-1906; Oct. 1910-Sept. 1937</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>160</td>
<td>99</td>
</tr>
<tr>
<td>Minimum</td>
<td>40</td>
<td>15</td>
</tr>
<tr>
<td>Mean 1930 - 37</td>
<td>36</td>
<td>21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drainage Area: 2,520 Sq. Ml.</th>
<th>Wind River at Riverton, Wyoming</th>
<th>Period: Broken 1906 - 1911; Oct. 1911-Sept. 1917</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>73</td>
<td>40</td>
</tr>
<tr>
<td>Minimum</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Mean 1930 - 37</td>
<td>30</td>
<td>21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drainage Area: 1,655 Sq. Ml.</th>
<th>Popo Agie River below Arapaho, Wyoming</th>
<th>Period: Broken 1906 - 1918</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>38</td>
<td>29</td>
</tr>
<tr>
<td>Minimum</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Mean 1930 - 37</td>
<td>21</td>
<td>10*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drainage Area: 1,774 Sq. Ml.</th>
<th>Nowood Creek at Bonanza, Wyoming</th>
<th>Period: Broken 1910 - 1928</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>166.2</td>
<td>23.5</td>
</tr>
<tr>
<td>Minimum</td>
<td>8.7</td>
<td>8.6</td>
</tr>
<tr>
<td>Mean 1930 - 37</td>
<td>17.1</td>
<td>11.0 10*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>36.5</td>
<td>11.9</td>
</tr>
<tr>
<td>Minimum</td>
<td>6.1</td>
<td>5.5</td>
</tr>
<tr>
<td>Mean 1930 - 37</td>
<td>13.0</td>
<td>8.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>7.0</td>
<td>5.8</td>
</tr>
<tr>
<td>Minimum</td>
<td>3.5</td>
<td>3.1</td>
</tr>
<tr>
<td>Mean 1930 - 37</td>
<td>5.0</td>
<td>4.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>57.8</td>
<td>55.1</td>
</tr>
<tr>
<td>Minimum</td>
<td>6.9</td>
<td>6.7</td>
</tr>
<tr>
<td>Mean 1930 - 37</td>
<td>33.8</td>
<td>21.4</td>
</tr>
</tbody>
</table>
### Table 24

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>123</td>
<td>145</td>
<td>167</td>
<td>189</td>
<td>210</td>
<td>232</td>
<td>254</td>
<td>276</td>
<td>298</td>
<td>320</td>
<td>342</td>
<td>364</td>
</tr>
<tr>
<td>1967</td>
<td>386</td>
<td>408</td>
<td>430</td>
<td>452</td>
<td>474</td>
<td>496</td>
<td>518</td>
<td>540</td>
<td>562</td>
<td>584</td>
<td>606</td>
<td>628</td>
</tr>
<tr>
<td>1968</td>
<td>650</td>
<td>672</td>
<td>694</td>
<td>716</td>
<td>738</td>
<td>760</td>
<td>782</td>
<td>804</td>
<td>826</td>
<td>848</td>
<td>870</td>
<td>892</td>
</tr>
</tbody>
</table>

*Note: Data represents estimated snowfall at the 30-year average of Montana-Moming State Line.*
Table 36
BIG HORN RIVER AT MONTANA-WYOMING STATE LINE

Low Flows During Irrigation Season

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of days with flow less than:</th>
<th></th>
<th></th>
<th></th>
<th>Monthly Mean Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1200 c.f.s.</td>
<td>1000 c.f.s.</td>
<td>800 c.f.s.</td>
<td>600 c.f.s.</td>
<td></td>
</tr>
<tr>
<td>July</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5700 c.f.s.</td>
</tr>
<tr>
<td>1931(1)</td>
<td>19</td>
<td>17</td>
<td>12</td>
<td>8</td>
<td>1350 c.f.s.</td>
</tr>
<tr>
<td>1932</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7470 c.f.s.</td>
</tr>
<tr>
<td>1933</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3700 c.f.s.</td>
</tr>
<tr>
<td>1934</td>
<td>23</td>
<td>18</td>
<td>14</td>
<td>3</td>
<td>1290 c.f.s.</td>
</tr>
<tr>
<td>1935</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7520 c.f.s.</td>
</tr>
<tr>
<td>1936</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3670 c.f.s.</td>
</tr>
<tr>
<td>1937</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9180 c.f.s.</td>
</tr>
<tr>
<td>1938</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7630 c.f.s.</td>
</tr>
<tr>
<td>August</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7730 c.f.s.</td>
</tr>
<tr>
<td>1931(1)</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>1990 c.f.s.</td>
</tr>
<tr>
<td>1932(1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1840 c.f.s.</td>
</tr>
<tr>
<td>1933(1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3470 c.f.s.</td>
</tr>
<tr>
<td>1934</td>
<td>22</td>
<td>18</td>
<td>4</td>
<td>0</td>
<td>1080 c.f.s.</td>
</tr>
<tr>
<td>1935</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1560 c.f.s.</td>
</tr>
<tr>
<td>1936</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3020 c.f.s.</td>
</tr>
<tr>
<td>1937</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1380 c.f.s.</td>
</tr>
<tr>
<td>1938</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1930 c.f.s.</td>
</tr>
<tr>
<td>September</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2940 c.f.s.</td>
</tr>
<tr>
<td>1931</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>0</td>
<td>990 c.f.s.</td>
</tr>
<tr>
<td>1932</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3530 c.f.s.</td>
</tr>
<tr>
<td>1933</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1700 c.f.s.</td>
</tr>
<tr>
<td>1934</td>
<td>23</td>
<td>21</td>
<td>3</td>
<td>0</td>
<td>980 c.f.s.</td>
</tr>
<tr>
<td>1935</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1380 c.f.s.</td>
</tr>
<tr>
<td>1936</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1330 c.f.s.</td>
</tr>
<tr>
<td>1937</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1800 c.f.s.</td>
</tr>
<tr>
<td>1938</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2640 c.f.s.</td>
</tr>
</tbody>
</table>


* 1930-1934, flow of Big Horn at Kane plus flow of Shoshone at Byron. 1935-1938, flow of Big Horn at St. Xavier.

(1) Stream flow records include the following special or unusual releases from Shoshone Reservoir (Source: Letter from U. S. Bureau of Reclamation dated September 27, 1940):

1931. From 7/24 to 7/25  125 c.f.s.
      From 7/26 to 8/1   50 c.f.s.
1932. From 8/5 to 8/28  1000 c.f.s.
1933. From 8/5 to 8/28  2500 c.f.s.
D. LITTLE HORN RIVER

1. Stream Flow

The Little Horn River is a tributary of the Big Horn River, but it is treated separately in this report because it crosses the Montana-Wyoming state line. It is a small stream, rising in the Big Horn mountains in northern Wyoming, and flowing northward across Montana to its confluence with the Big Horn near Hardin. Several of its tributaries also rise in Wyoming and parallel the main stem until they reach Montana where they converge and join the main stem. The main stem is about 125 miles long, and by far the greater portion is in Montana. Its major tributary, Lodgegrass Creek, lies almost entirely within Montana.

In 1905 a gaging station was established near Crow Agency, Montana, not far from the mouth. The station was discontinued after two years, but it was re-established in 1912 and has been operated, with minor interruptions, to date. The average annual discharge of the river at this point is about 225,000 acre-feet. A gage was established at Wyola, Montana, in 1912, and a continuous record kept until 1924 when the station was abandoned. This gage probably represents fairly accurately the total discharge at the state line of all the tributary streams of the Little Horn that rise in Wyoming. For this reason, the entire record (by months) of this station has been given in table 39. Table 38 gives the maximum, minimum, and mean monthly discharges of the Little Horn River, near Crow Agency, and of Lodgegrass Creek, near Lodge Grass, Montana.
2. Existing Irrigation Projects

By far the greater portion of the land irrigated by the Little Horn is in Montana, although estimates of the area under irrigation in Wyoming vary widely. Table 40 presents data on the irrigated and irrigable areas in each project (or group of small projects) in the basin. These data were obtained by the Corps of Engineers through a field survey made in the spring of 1939. The projects are arranged in the table according to location and source of water supply. Map 8 shows the location of the major projects, which can be identified by the numbers thereon and by reference to column 2 of table 40. According to Corps of Engineers' survey, there are 20,990 acres under canals, of which 13,780 acres are being irrigated at present. This survey reports about 1,600 acres in Wyoming under canal, all of which are being irrigated. The Wyoming Report estimates this figure at 7,800 acres (see table 18). Most of the land in Montana is irrigated from systems under the control of the U. S. Indian Irrigation Service (see Section I-B-1).

Projects on Main Stem in Montana

The projects in Montana that take their water supply directly from the main stem of the Little Horn are grouped in table 40, and the data concerning them totaled. An average annual shortage of 6,120 acre-feet was reported for the 8,410 acres irrigated. Shortages occurred all along the stream during the late season of each year from 1930 to 1938. Evidence of this shortage is apparent in the stream-gaging records of the station near Crow Agency, which show that frequently there is less than 50 second-feet in the river during August and September, and that occasionally the stream is practically dry.
3. Potential Irrigation Projects

The only potential projects in the Little Horn Basin are the Parkman Irrigation District project and the group of miscellaneous small projects having a total area of 7,000 acres which were included in the Wyoming Report. Data on these projects are presented in tables 1 and 2 of Appendix I. The Parkman Irrigation District project is described in Appendix IV of the Corps of Engineers 308 Report, but no further information on the miscellaneous small projects is available. Under the Parkman Irrigation District project, it is proposed to divert water from the upper Tongue River to West Pool Creek, a tributary of the Little Horn, to supplement the water supply for lands now under irrigation and to irrigate 5,470 acres of new land. The water would be applied to the land from the existing distribution system. It is estimated that new project features would cost $200,000.

Ultimate Irrigable Area

The ultimate irrigable area in the basin, as estimated by the Corps of Engineers, is 42,460 acres (see table 16). This area may be classified as to location and state of development as follows:

<table>
<thead>
<tr>
<th>Ultimate Irrigable Area in the Little Horn Basin - Acres</th>
<th>Wyoming</th>
<th>Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main Stem</td>
<td>Tributaries</td>
</tr>
<tr>
<td>Irrigated at present</td>
<td>1,600</td>
<td>8,410</td>
</tr>
<tr>
<td>Under ditch, but not irrigated at present</td>
<td>0</td>
<td>6,330</td>
</tr>
<tr>
<td>Irrigable by extension of projects</td>
<td>2,030</td>
<td>9,320</td>
</tr>
<tr>
<td>Area in potential projects</td>
<td>5,470</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>9,100</td>
<td>24,060</td>
</tr>
</tbody>
</table>
The Wyoming Report estimated the ultimate irrigable area in Wyoming at 14,800 acres (see table 18 and Appendix I, table 2). The Montana Report did not give an estimate of the area in Montana, but, in commenting on the estimates of the 308 Report, did not offer any revision. The Indian Irrigation Service estimates that the ultimate area that can be irrigated by the extension of systems under its control is about 27,000 acres. This area is listed by systems in Section I-B-1.

4. Reservoir for Irrigation Storage

The only reservoir in the Little Horn Basin is the Willow Creek reservoir on Willow Creek (Montana), which was completed recently. Its operations (capacity 22,800 acre-feet) are not reflected in the stream flow records to date. The only known potential reservoir is the Twin Creek Reservoir listed in table 1 of Appendix II. This potential reservoir, which would have a capacity of 1,000 acre-feet, is not included in the water use studies of Appendix F of the Progress Report (1939) of the National Resources Planning Board.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>6.5%</td>
<td>6.7%</td>
<td>6.9%</td>
<td>7.1%</td>
<td>7.3%</td>
<td>7.5%</td>
<td>7.7%</td>
</tr>
</tbody>
</table>

**Note:**
- Table shows yearly sales percentage from 1970 to 1977.
- Data is presented as a percentage increase from the previous year.

**Explanation:**
- The sales percentage increased steadily from 1970 to 1977, indicating growth in the company's revenue over the years.
Table 10

EXISTING IRRIGATION PROJECTS

Little Horn River Basin

<table>
<thead>
<tr>
<th>Project Name and Location</th>
<th>Project No.</th>
<th>1930 - 1938 Average Acres (Acre-Feet)</th>
<th>Average Annual Shortage</th>
<th>Irrigated Area Under System of Project</th>
<th>Irrigable Area by Extension of Project</th>
<th>Ultimate Irrigable Area in Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jones Ditch</td>
<td>85</td>
<td>1,600</td>
<td>1,480</td>
<td>1,600</td>
<td>2,030</td>
<td>3,630</td>
</tr>
<tr>
<td>Misc. (Little Horn River)**</td>
<td>30</td>
<td>800</td>
<td>740</td>
<td>800</td>
<td>900</td>
<td>1,700</td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Stem</td>
<td></td>
<td>12,180</td>
<td>10,300</td>
<td>19,390</td>
<td>13,970</td>
<td>33,360</td>
</tr>
<tr>
<td>Misc. (Little Horn River)**</td>
<td>83</td>
<td>8,410</td>
<td>6,120</td>
<td>14,740</td>
<td>9,320</td>
<td>24,060</td>
</tr>
<tr>
<td>Crow Indian Project</td>
<td>Pt. 83</td>
<td>2,760</td>
<td>2,530</td>
<td>5,680</td>
<td>6,300</td>
<td>11,980</td>
</tr>
<tr>
<td>Crow Indian Project</td>
<td>Pt. 83</td>
<td>4,660</td>
<td>2,760</td>
<td>8,000</td>
<td>1,750</td>
<td>9,750</td>
</tr>
<tr>
<td>Misc. (Little Horn River)</td>
<td></td>
<td>100</td>
<td>800</td>
<td>160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tributaries</td>
<td></td>
<td>3,770</td>
<td>4,180</td>
<td>4,650</td>
<td>4,650</td>
<td>9,300</td>
</tr>
<tr>
<td>Lodge Grass 1 &amp; 2</td>
<td>Pt. 83</td>
<td>3,050</td>
<td>3,980</td>
<td>3,050</td>
<td>3,650</td>
<td>6,700</td>
</tr>
<tr>
<td>Stevens Ditch</td>
<td>84</td>
<td>500</td>
<td>140</td>
<td>1,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Misc. (Lodge Grass Creek)</td>
<td></td>
<td>220</td>
<td>60</td>
<td>600</td>
<td>1,000</td>
<td>1,600</td>
</tr>
<tr>
<td>Total, Little Horn River Basin</td>
<td></td>
<td>13,780</td>
<td>11,780</td>
<td>20,990</td>
<td>16,000</td>
<td>36,990</td>
</tr>
</tbody>
</table>

Source: Appendix F - Progress Report of the National Resources Planning Board.

* Numbers are those assigned by Corps of Engineers in 308 Report. See Map 8.

** An arbitrary distribution between states of a single grouping by the Corps of Engineers.
E. TONGUE RIVER

1. Stream Flow

The Tongue River rises in the northeastern portion of the Big Horn Mountains in Wyoming in a number of small streams that flow through gently rolling country before they unite, just south of the Montana-Wyoming boundary line, to form a single stream. From the state line the stream flows northeastward through Montana for 125 miles to Miles City, where it empties into the main stem of the Yellowstone. Throughout the lower area in Wyoming irrigation water is diverted from the tributary streams, many of which are almost completely depleted.

Stream gage readings above the diversions have been inadequate, which renders it impossible to estimate with confidence the natural or undepleted stream flow. In 1928 a gaging station was established at Decker, Montana, two miles north of the Wyoming line, and was operated until September 1938. The entire record, by months, for this station is reproduced in table 42. Short or broken records exist for several other gaging points in the basin. Table 41 presents the maximum, minimum, and mean monthly run-off at three of these stations.

2. Existing Irrigation Projects

Table 43 presents data on the irrigated and irrigable areas in each project (or group of small projects) in the basin. These data were obtained by the Corps of Engineers through a field survey made in the spring of 1939. The projects are arranged in the table according to location and source of water supply. Map 8 shows the location of the major
projects, which can be identified by the numbers thereon and by reference to column 2 of table 43. Appendix III of the Corps of Engineers 308 Report contains a brief description of each existing project. According to the 1939 survey, a total of 57,605 acres are under canals, of which 53,305 acres are being irrigated at present. Of the area under canals, about 75 percent is in Wyoming and 25 percent in Montana.

<table>
<thead>
<tr>
<th>Projects on Main Stem in Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>It will be noted from table 43 that all of the existing projects in Montana take their water supply directly from the main stem of the Tongue River. This table also indicates that the 13,840 acres being irrigated in Montana suffered an average annual shortage of 10,450 acre-feet during the period 1930-1938. According to the field survey sheets from which the table was prepared, shortages occurred during July, August, and September of every year, and were particularly severe in 1934. From table 44, it is evident that there is frequently less than fifty second-feet in the river at the state line. From July 18 to September 3, 1934, there was never more than ten second-feet in the river at this point. The combined capacity of the diversion canals in Montana is about 300 cubic feet per second, and the gage at Miles City shows that the canals divert the entire stream during most of the irrigation season.</td>
</tr>
</tbody>
</table>

3. Potential Irrigation Projects

Appendix F of the Progress Report (1939) of the National Resources Planning Board includes only two potential projects in the basin: (1) the Tongue River Water Users' Association project of 19,000 acres, and (2) a group of small projects on Pumpkin Creek aggregating 3,200 acres. Both of these projects are in Montana. The area in the Tongue River Water Users' project is limited by the capacity of the Tongue River Reservoir.
The Wyoming Report estimates the potential irrigable area in Wyoming to be 24,500 acres under the classification "miscellaneous (potential) projects and extensions of present projects." These projects are all listed in tables 1 and 2 of Appendix I. The Parkman Irrigation District project, which diverts water from the Tongue River, has been discussed in Section II-D (Little Horn River).

During the months of September and October 1934, the Montana Water Conservation Board made a plane table survey of the Tongue River Valley, beginning at the site of the Tongue River Dam and extending continuously down the river to the Northern Pacific Railway bridge at Miles City. The irrigated and irrigable lands were classified as follows:

A. Good soil and easy to irrigate.
B. Good soil but needing special preparation for irrigation.
C. Poor soil, or too rough to irrigate easily.

The results of the survey were reported by Mr. Fred E. Buck in a memorandum to the Montana Water Conservation Board dated March 19, 1935. The totals shown in the memorandum are tabulated below:

<table>
<thead>
<tr>
<th>Land Class</th>
<th>Acres</th>
<th>Irrigated</th>
<th>Acres</th>
<th>Irrigable</th>
<th>Total Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4,966</td>
<td>4,544</td>
<td></td>
<td></td>
<td>9,510</td>
</tr>
<tr>
<td>B</td>
<td>3,132</td>
<td>11,729</td>
<td></td>
<td></td>
<td>14,861</td>
</tr>
<tr>
<td>C</td>
<td>519</td>
<td>6,148</td>
<td></td>
<td>5,893</td>
<td>6,667</td>
</tr>
<tr>
<td>Brush</td>
<td></td>
<td></td>
<td>5,893</td>
<td></td>
<td>5,893</td>
</tr>
<tr>
<td>Total</td>
<td>8,617</td>
<td>28,314</td>
<td></td>
<td>36,931</td>
<td></td>
</tr>
</tbody>
</table>

Of this total area, it was estimated that the portion indicated below could best be irrigated by pumping:

<table>
<thead>
<tr>
<th>Class</th>
<th>No. of Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3,546</td>
</tr>
<tr>
<td>B</td>
<td>6,059</td>
</tr>
<tr>
<td>C</td>
<td>2,563</td>
</tr>
<tr>
<td>Brush</td>
<td>1,706</td>
</tr>
<tr>
<td>Total</td>
<td>13,874</td>
</tr>
</tbody>
</table>
The 19,000 acres listed under the Tongue River Water Users' Association project may have been selected by the Army Engineers from the details of this survey.

It is evident from the stream flow records that additional irrigation in this basin must depend upon new storage capacity. The Tongue River Reservoir has recently been built near Decker to permit more extensive irrigation in Montana. Contracts are being made for storage space in the reservoir, including one for 7,500 acre-feet with the Federal government for the use of the Indians on the Tongue River Reservation.

The ultimate irrigable area of the basin, as estimated by the Corps of Engineers, is 86,155 acres (see table 18). This area may be classified as to location and state of development as follows:

<table>
<thead>
<tr>
<th>Ultimate Irrigable Area in the Tongue Basin - Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Irrigated at present</td>
</tr>
<tr>
<td>Under ditch, but not irrigated at present</td>
</tr>
<tr>
<td>Irrigable by extension of projects</td>
</tr>
<tr>
<td>Area in potential projects</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

The Wyoming Report estimated the ultimate irrigable area in Wyoming at 125,650 acres (see table 18 and Appendix I, table 2). The Montana Reports do not give an estimate of the ultimate irrigable area in Montana, but indicate that the Army estimate should be increased by 1,000 acres (see Appendix I, table 2). The Indian Service has authorized construction of several pumping projects to irrigate from 1,000 to 1,500 acres, and is
reserving 7,500 acre-feet of storage capacity in the Tongue River Reservoir (see Section I-B-1).

4. Reservoirs for Irrigation Storage

Existing Reservoirs
As shown in table 17, there are four existing reservoirs in the basin having a combined capacity of 73,020. Big Horn, Dome Lake, and Park reservoirs are all in Wyoming and have a total capacity of 13,020 acre-feet. The Tongue River Reservoir, which is in Montana, has a capacity of 60,000 acre-feet.

Potential Reservoirs
Table 1 of Appendix II lists eight potential reservoirs in Wyoming having an aggregate capacity of 103,446 acre-feet. Pumpkin Creek Reservoir, with a capacity of 6,800 acre-feet, is listed in table 3 of Appendix II. Two additional reservoirs on Pumpkin Creek are listed in table 2 of Appendix II. Four potential reservoirs were selected by the Corps of Engineers for inclusion in the water use studies of Appendix F. The capacity and probable schedule of operations of each of these reservoirs is given in table 45. The Tongue River Reservoir was included in the table because its operations are not yet reflected in stream flow measurements.
<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>6.2</td>
<td>7.9</td>
<td>10.2</td>
<td>12.7</td>
<td>14.6</td>
<td>16.8</td>
<td>19.2</td>
<td>19.8</td>
<td>18.6</td>
<td>16.8</td>
<td>14.4</td>
<td>10.5</td>
</tr>
<tr>
<td>Min</td>
<td>1.8</td>
<td>3.6</td>
<td>5.5</td>
<td>6.9</td>
<td>8.9</td>
<td>11.4</td>
<td>13.5</td>
<td>14.4</td>
<td>12.4</td>
<td>10.3</td>
<td>7.1</td>
<td>4.7</td>
</tr>
<tr>
<td>Max</td>
<td>11.7</td>
<td>15.6</td>
<td>19.4</td>
<td>20.4</td>
<td>21.9</td>
<td>22.4</td>
<td>22.2</td>
<td>20.5</td>
<td>18.9</td>
<td>16.4</td>
<td>13.7</td>
<td>10.5</td>
</tr>
</tbody>
</table>

### Precipitation

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1.6</td>
<td>3.2</td>
<td>4.8</td>
<td>6.2</td>
<td>7.9</td>
<td>8.2</td>
<td>7.3</td>
<td>8.1</td>
<td>7.5</td>
<td>6.5</td>
<td>5.4</td>
<td>3.6</td>
</tr>
<tr>
<td>Min</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Max</td>
<td>3.6</td>
<td>5.8</td>
<td>8.3</td>
<td>10.3</td>
<td>12.1</td>
<td>12.4</td>
<td>11.2</td>
<td>12.1</td>
<td>10.9</td>
<td>9.3</td>
<td>7.6</td>
<td>4.7</td>
</tr>
</tbody>
</table>

### Temperature and Precipitation

<table>
<thead>
<tr>
<th>Period</th>
<th>Jan-Apr 79</th>
<th>May-Aug 79</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>8.6</td>
<td>15.9</td>
</tr>
<tr>
<td>Min</td>
<td>3.6</td>
<td>10.8</td>
</tr>
<tr>
<td>Max</td>
<td>13.7</td>
<td>20.8</td>
</tr>
</tbody>
</table>

### Snowfall

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.0</td>
<td>0.1</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Min</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>Sample text from the document</td>
<td>Table 1: Extension Information Report</td>
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<tr>
<td>Project Name</td>
<td>Description of project data</td>
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<td></td>
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</tr>
<tr>
<td>Dates</td>
<td>Project duration and timeline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Costs</td>
<td>Estimated and actual costs</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Team Members</td>
<td>List of contributors and stakeholders</td>
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</tr>
<tr>
<td>Notes</td>
<td>Any relevant notes or additional information</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The provided text is a template for a table of information. Actual data would need to be filled in based on the specifics of the project.
### Table 44

**TONGUE RIVER AT MONTANA-WYOMING STATE LINE**

Low Flows During Irrigation Season

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of days with flow less than</th>
<th>Monthly Mean Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200 c.f.s.</td>
<td>150 c.f.s.</td>
</tr>
<tr>
<td>July</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>31</td>
<td>26</td>
</tr>
<tr>
<td>1931</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1932</td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td>1933</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>1934</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1935</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>1936</td>
<td>28</td>
<td>27</td>
</tr>
<tr>
<td>1937</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1938</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>August</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1931</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1932</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1933</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>1934</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1935</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1936</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1937</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>1938</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td>September</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>1931</td>
<td>29</td>
<td>22</td>
</tr>
<tr>
<td>1932</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>1933</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>1934</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>1935</td>
<td>30</td>
<td>30</td>
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<tr>
<td>1936</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>1937</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>1938</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>


(1) Tongue River near Decker, Montana.
Table 45

SELECTED POTENTIAL RESERVOIRS
(And Probable Schedule of Storage and Release Operations)

Tongue River Basin
(Acre-Feet)

<table>
<thead>
<tr>
<th>Name of Reservoir</th>
<th>Total</th>
<th>Nov. 1</th>
<th>Mar. 31</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug.</th>
<th>Sept.</th>
<th>Oct.</th>
<th>Evaporation Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rockwood Res.</td>
<td>21,750</td>
<td>-11,960</td>
<td>-650</td>
<td>-2,610</td>
<td>-5,220</td>
<td>8,700</td>
<td>9,790</td>
<td>2,170</td>
<td>-1,310</td>
<td>1,090</td>
<td></td>
</tr>
<tr>
<td>North Fork Res.</td>
<td>28,000</td>
<td>-15,400</td>
<td>-840</td>
<td>-3,360</td>
<td>-6,720</td>
<td>11,200</td>
<td>12,600</td>
<td>2,800</td>
<td>-1,680</td>
<td>1,400</td>
<td></td>
</tr>
<tr>
<td>South Fork Res.</td>
<td>25,000</td>
<td>-13,750</td>
<td>-750</td>
<td>-3,000</td>
<td>-6,000</td>
<td>10,000</td>
<td>11,250</td>
<td>2,500</td>
<td>-1,500</td>
<td>1,250</td>
<td></td>
</tr>
<tr>
<td>Total, Wyoming</td>
<td>74,750</td>
<td>-41,110</td>
<td>-2,240</td>
<td>-8,970</td>
<td>-17,940</td>
<td>29,900</td>
<td>33,640</td>
<td>7,470</td>
<td>-4,490</td>
<td>3,740</td>
<td></td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tongue River Res.*</td>
<td>60,000</td>
<td>-33,000</td>
<td>-1,800</td>
<td>-7,200</td>
<td>-14,400</td>
<td>24,000</td>
<td>27,000</td>
<td>6,600</td>
<td>-3,600</td>
<td>2,400</td>
<td></td>
</tr>
<tr>
<td>Pumpkin Cr. Res.</td>
<td>6,800</td>
<td>-3,740</td>
<td>-204</td>
<td>-818</td>
<td>-1,632</td>
<td>2,720</td>
<td>3,060</td>
<td>540</td>
<td>-408</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td>Total, Montana</td>
<td>66,800</td>
<td>-36,740</td>
<td>-2,004</td>
<td>-8,015</td>
<td>-16,032</td>
<td>26,720</td>
<td>30,060</td>
<td>7,140</td>
<td>-4,008</td>
<td>2,880</td>
<td></td>
</tr>
<tr>
<td>Total, Tongue Basin</td>
<td>141,550</td>
<td>-77,850</td>
<td>-4,244</td>
<td>-15,986</td>
<td>-33,972</td>
<td>56,620</td>
<td>63,700</td>
<td>14,610</td>
<td>-8,498</td>
<td>6,620</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Survey Sheets (1939) of the Corps of Engineers, War Department.

*Project recently constructed. Included here because reservoir operations are not reflected in stream flow records to date.
1. **Stream Flow**

The Powder River rises on the eastern slope of the Big Horn Mountains in Wyoming and flows northeastward across the state line into Montana. A few miles below Powderville, Montana, the river turns north-northwestward and continues in that general direction to its confluence with the Yellowstone River, near Terry. The air-line distance from the headwaters to the mouth is about 250 miles. The Wyoming portion of the basin is divided naturally into three sub-basins, the Clear Creek Basin, the Crazy Woman Creek Basin, and the Upper Powder River Basin. Irrigation is rather extensive in all of these three sub-basins. In its lower reaches the Powder River follows a winding course through a valley varying in width from one-half to three miles, and flanked by rolling benches 100 to 500 feet high. Irrigation along the lower reaches is at present almost negligible, as is indicated by the fact that less than 400 acres in Montana are irrigated from the Powder River.

In 1915 a stream gage was established on the main stem below Arvada, Wyoming. In 1919 it was moved 20 miles upstream to Arvada, and has been operated, with minor interruptions, to date. The total record of these two gages is the longest period of record in the Powder River Basin. The annual discharge of the stream at Arvada has ranged from 165,000 to 840,000 acre-feet, averaging 440,000 acre-feet. The gage at Moorhead, Montana, which was established in 1915, is probably a better representation of the flow at the state line. The entire record of this gage is given in table 47. It will be noted from this record that the flow at the state line
is extremely low during the late irrigation season. A number of gages have been operated from time to time in the tributary basins, but the gaging are inadequate to permit accurate stream flow reconstruction. Extreme and mean discharges at several points are shown in Table L6.

2. Existing Irrigation Projects

Practically all the irrigated land in the Powder River Basin is in Wyoming. Table L8 presents data on the irrigated and irrigable areas in each project or group of small projects. These data were obtained by the Corps of Engineers through a field survey made in the spring of 1939. The projects are arranged in the table according to location and source of water supply. Map 8 shows the location of the major projects, which can be identified by the numbers thereon and by references to column 2 of Table L8. Appendix III of the 308 Report contains a brief description of each existing project. According to the 1939 survey, a total of 75,480 acres are under canals, of which 63,785 acres are being irrigated at present. As indicated in Table L8, shortages are general throughout the basin, amounting to an average of 47,000 acre-feet annually during the period 1930 to 1938. Shortages occurred during every month of every year of this period, but were most severe in 1934.

Projects on Main Stem in Montana

| Projects on Main Stem in Montana | Only 380 acres in the Powder River Basin in Montana are irrigated at present. This area is in small tracts along the river, in Custer and Prairie Counties, and is irrigated from the main stem by pumping. The capacity of the pumps is given as seven cubic feet per second. Although the average annual shortage during the period 1930 to 1938 is reported at 60 acre-feet, from the record at Moorhead, it appears that the flow at that point seldom falls below the combined pump capacity |
of seven cubic feet per second.

3. Potential Irrigation Projects

Table 1 of Appendix I lists five potential projects in the Powder River Basin. The Sussex project is considered a duplication of the Red Fork project, and there is insufficient water for both the Johnson County project and the Northern Wyoming Land Company project, which leaves three potential projects in the basin, with a combined area of 41,325 acres. These three projects are included in the water-use studies of Appendix F of the Progress Report of the National Resources Planning Board, and are listed in table 20. Table 2 of Appendix I lists 18,000 acres in potential miscellaneous small projects in Wyoming. Table 2 also shows six potential projects having an area of 14,600 acres that were reported by the Montana Water Conservation Board. No further information is available on the projects in table 2. Inspection of stream flow records in the basin and of existing shortages as reported in table 48 indicates that additional irrigation in the Powder River Basin must depend upon new storage capacity.

<table>
<thead>
<tr>
<th>Ultimate Irrigable Area</th>
<th>Wyoming(1)</th>
<th>Montana Main Stem</th>
<th>Tributaries(1)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated at present</td>
<td>63,405</td>
<td>380</td>
<td>0</td>
<td>63,785</td>
</tr>
<tr>
<td>Under ditch, but not</td>
<td>11,695</td>
<td>0</td>
<td>0</td>
<td>11,695</td>
</tr>
<tr>
<td>irrigated at present</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigable by extension</td>
<td>5,900</td>
<td>0</td>
<td>0</td>
<td>5,900</td>
</tr>
<tr>
<td>or projects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area in potential</td>
<td>28,675</td>
<td>12,650</td>
<td>0</td>
<td>41,325</td>
</tr>
<tr>
<td>projects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>109,675</td>
<td>13,030</td>
<td>0</td>
<td>122,705</td>
</tr>
</tbody>
</table>

(1) Little Powder River not included.
The Wyoming Report estimated the ultimate irrigable area in Wyoming at 216,500 acres (see table 18 and Appendix I, table 2). The Montana Reports do not give an estimate of the ultimate irrigable area in Montana, but indicate that the Army figure should be increased by 14,600 acres (see Appendix I, table 2).

4. Reservoirs for Irrigation Storage

<p>| Existing Reservoirs | The existing reservoirs in the basin have a total capacity of 35,013 acre-feet. The major reservoirs, all of which are in Wyoming, are listed in table 17. About three-fourths of the total existing storage capacity is the Lake DeSmet Reservoir in Clear Creek Basin. |
| Potential Reservoirs | More than 30 sites for potential reservoirs have been investigated in the Powder River Basin. The combined capacity of the 34 potential reservoirs listed for Wyoming in table 1 of Appendix II is 255,270 acre-feet. The capacity of the potential Moorhead Reservoir in Montana is 46,000, which makes a total of 301,270 acre-feet for the entire basin. The Montana Water Conservation Board reports (Appendix II, table 2) three small potential reservoirs in Montana, but detailed data on the projects are lacking. Only seven reservoirs, having a combined capacity of 115,430 acre-feet, were included in the water-use studies of Appendix F of the Progress Report of the National Resources Planning Board. The estimated storage and release schedule of each of these seven reservoirs is given in table 49. |</p>
<table>
<thead>
<tr>
<th>Week</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.5</td>
<td>10.8</td>
<td>10.6</td>
<td>10.9</td>
<td>11.2</td>
</tr>
<tr>
<td>2</td>
<td>10.3</td>
<td>10.7</td>
<td>10.5</td>
<td>10.8</td>
<td>11.2</td>
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<td>10.4</td>
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<td>11.1</td>
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<td>4</td>
<td>10.2</td>
<td>10.5</td>
<td>10.6</td>
<td>10.8</td>
<td>11.1</td>
</tr>
</tbody>
</table>

**Note:** Week 1 is from 6/5 to 6/9, Week 2 is from 6/12 to 6/16, etc.
### Power Distribution Panel

#### Existing / Installation

<table>
<thead>
<tr>
<th>Code</th>
<th>Panel Code</th>
<th>Panel Name</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>E001</td>
<td>Panel A</td>
<td>10 units</td>
<td>10</td>
</tr>
<tr>
<td>E002</td>
<td>Panel B</td>
<td>5 units</td>
<td>5</td>
</tr>
<tr>
<td>E003</td>
<td>Panel C</td>
<td>20 units</td>
<td>20</td>
</tr>
</tbody>
</table>

#### New / Proposed

<table>
<thead>
<tr>
<th>Code</th>
<th>Panel Code</th>
<th>Panel Name</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>P001</td>
<td>Panel D</td>
<td>3 units</td>
<td>3</td>
</tr>
<tr>
<td>P002</td>
<td>Panel E</td>
<td>15 units</td>
<td>15</td>
</tr>
<tr>
<td>P003</td>
<td>Panel F</td>
<td>10 units</td>
<td>10</td>
</tr>
</tbody>
</table>

#### Notes

- Panel A is currently in use and requires replacement.
- Panel B has a capacity issue and needs upgrading.
- Panel C is fully utilized and may require additional space.

---

**Project Name and Location**

- **Project Name:** Power Distribution Upgrade
- **Location:** Central Power Station

---

**Contact Information**

- **Name:** John Doe
- **Email:** john.doe@powerstation.com
- **Phone:** 123-456-7890

---

**Additional Notes**

- New panels will be installed in the next quarter.
- Existing panels will be decommissioned after the upgrade.

---

**Appendix**

- Detailed wiring diagrams for each panel.
- Material list for upcoming installations.

---

**Appendix 2**

- Maintenance schedule for power distribution systems.
- Safety guidelines for installation personnel.
### Table 19

**SELECTED POTENTIAL RESERVOIRS**

(And Probable Schedule of Storage and Release Operations)

**Powder River Basin**

(Acre-Feet)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Fork Res.</td>
<td>30,000</td>
<td>-16,500</td>
<td>-900</td>
<td>3,800</td>
<td>-7,200</td>
<td>12,000</td>
<td>13,500</td>
<td>3,000</td>
<td>-1,800</td>
<td>1,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elk Lake Res.</td>
<td>1,500</td>
<td>-820</td>
<td>50</td>
<td>180</td>
<td>360</td>
<td>600</td>
<td>680</td>
<td>70</td>
<td>90</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clear Cr. Nos. 1&amp;2</td>
<td>16,600</td>
<td>-9,130</td>
<td>500</td>
<td>2,000</td>
<td>4,000</td>
<td>6,640</td>
<td>7,470</td>
<td>1,660</td>
<td>970</td>
<td>830</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Henry Res.</td>
<td>12,000</td>
<td>-6,600</td>
<td>360</td>
<td>1,440</td>
<td>2,880</td>
<td>4,800</td>
<td>5,400</td>
<td>980</td>
<td>720</td>
<td>840</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piney Res.</td>
<td>5,250</td>
<td>-2,890</td>
<td>160</td>
<td>630</td>
<td>1,280</td>
<td>2,100</td>
<td>2,360</td>
<td>420</td>
<td>310</td>
<td>370</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cloud Peak Res. (Encl)</td>
<td>4,080</td>
<td>-2,250</td>
<td>120</td>
<td>490</td>
<td>980</td>
<td>1,630</td>
<td>1,840</td>
<td>330</td>
<td>240</td>
<td>280</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total, Wyoming</strong></td>
<td>69,430</td>
<td>-33,190</td>
<td>-2,090</td>
<td>8,340</td>
<td>-16,680</td>
<td>27,770</td>
<td>31,250</td>
<td>6,440</td>
<td>-4,130</td>
<td>3,970</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Moorhead Res.</td>
<td>46,000</td>
<td>-25,300</td>
<td>-1,380</td>
<td>5,520</td>
<td>-11,040</td>
<td>18,400</td>
<td>20,700</td>
<td>5,060</td>
<td>-2,760</td>
<td>1,840</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total, Powder Basin</strong></td>
<td>115,430</td>
<td>-63,490</td>
<td>-3,470</td>
<td>-13,860</td>
<td>-27,720</td>
<td>46,170</td>
<td>51,950</td>
<td>11,500</td>
<td>-6,890</td>
<td>5,810</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Survey Sheets (1939) of the Corps of Engineers, War Department.
G. LITTLE POWDER RIVER

The Little Powder River is in no sense a major stream of the Yellowstone Basin, but, because its drainage area is divided about equally between Wyoming and Montana, it is treated separately in this report. The stream rises in the northern part of Campbell County, Wyoming, and flows north across a portion of Powder River County, Montana, to its confluence with the Powder River. The air-line distance from its head, near Gillette, Wyoming, to its mouth near Broadus, Montana, is about 75 miles.

The stream's entire drainage area lies within the plains in an area of low water yield. No gaging station is known to have been established on the Little Powder River or any of its tributaries. Appreciable flow of the stream is, no doubt, confined to periods immediately following heavy rains.

There is little developed storage capacity in the basin, and irrigation, if practiced at all, must necessarily be haphazard. According to Appendix F of the Progress Report of the National Resources Planning Board, there is no irrigation in the basin, but the Wyoming Report gives the irrigated area in Wyoming as 6,230 acres (see table 18). The only potential irrigation project reported in Appendix F is the Cottonwood project, having an irrigable area of 2,300 acres. The Wyoming Report shows the irrigable area of the Cottonwood project as 3,200 acres, and estimates that an additional 4,300 acres in Wyoming may be irrigated from miscellaneous small ditches.

The only reservoir in the basin at present is the Rawhide reservoir with a capacity of 51\(\frac{1}{4}\) acre-feet. Two potential reservoirs, the
Cottonwood and the Lonetree, are listed in table 1 of Appendix II. The former has been included in the water use studies of Appendix F in connection with the potential Cottonwood irrigation project.
Preliminary Report

on

YELLOWSTONE RIVER BASIN

APPENDICES

I - Potential Irrigation Projects in the Yellowstone River Basin
II - Potential Reservoirs in the Yellowstone River Basin
III - Potential Power Sites in the Yellowstone River Basin
IV - Congressional Authorization
V - Progress Report of the Compact Commission

Federal Power Commission
Bureau of Engineering
Denver Regional Office
APPENDIX I
POTENTIAL IRRIGATION PROJECTS IN THE YELLOWSTONE RIVER BASIN

The principal source of information on potential irrigation projects is the 308 Report of the Corps of Engineers, War Department. Table 1, which was taken directly from the 308 Report, lists every project described by the Corps of Engineers regardless of its physical or economic desirability. Only projects footnoted either (a) or (b) are included in the "Ultimate irrigable area" as given in the main sections of this report. A brief description of each project is contained in Table 1. Further information on these projects is given in considerable detail in Appendix IV of the 308 Report.

Table 2 lists the potential irrigation projects not given in the 308 Report but which were mentioned in the following sources:

1. Appendix F of the Progress Report (1939) of the National Resources Planning Board.


5. A "Progress report" prepared by the Montana Water Conservation Board and submitted by Mr. W. E. Donohue at the meeting of the Compact Commission held in Billings, Montana, on October 10, 1940.
An effort was made to avoid duplicating, in Table 2, areas listed in Table 1, but because of the absence of detailed information in the above five sources the effort may not have been entirely successful.

Appendix F was prepared in 1939 by the Corps of Engineers, War Department. It is, to a certain extent, a revision of part of the material of the 308 Report. A few additional potential projects are considered, and some of the projects of the 308 Report are excluded from further study, apparently because of lack of merit. (Appendix F, however, makes no comment on the feasibility of the various projects.)

The potential projects carried in the basin totals of the main section of this report (projects footnoted (a) and (b) in Tables 1 and 2) are those selected for consideration by Appendix F. The other projects were omitted in order to avoid the possibility of duplication, and not because they are considered to be lacking in merit.
### Appendix I

**Table 1**

**Potential Irrigation Projects in the Yellowstone River Basin**

*(As Listed in the Corps of Engineers 308 Report)*

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Source of Water Supply</th>
<th>Irrigable Acreage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Yellowstone project improvement</td>
<td>Yellowstone River</td>
<td>10,871(^a)</td>
<td>On west side of Yellowstone River, below Intake, Mont., being built by Bureau of Reclamation; construction began 1905. Direct diversion from Yellowstone River at Intake; no storage. Potential development limited to 871 acres now in suspended status on account of incomplete drainage system. Completion dependent on policies of Bureau of Reclamation.</td>
</tr>
<tr>
<td>Huntley project improvement</td>
<td>Yellowstone River</td>
<td>(c)(^a)</td>
<td>On south side of Yellowstone River, between Huntley and Bull Mountain, Mont., built by Bureau of Reclamation; construction began in 1905. Direct diversion from Yellowstone River, about 2 miles above Huntley; no storage. Potential development limited to land now in suspended status on account of incomplete drainage.</td>
</tr>
<tr>
<td>Brackett Creek: Scheme No. 1)</td>
<td>Brackett Creek</td>
<td>(9,791(^b)</td>
<td>On both sides of Brackett Creek, west of Clyde Park, Mont. Involves storage in Brackett Creek Reservoir; 2 schemes of development proposed: Scheme No. 1 - Area, 9,791 acres; reservoir capacity, 31,668 acre-feet; North Canal, 10.5 miles long, initial capacity, 142.5 second-feet; South Canal, 24 miles long, initial capacity, 87.4 second-feet; estimated cost $1,199,100, or $121.45 per acre.</td>
</tr>
<tr>
<td>Scheme No. 2)</td>
<td>Creek</td>
<td>(5,550</td>
<td>Scheme No. 2 - Area, 5,550 acres; reservoir capacity, 14,229 acre-feet; North Canal, 13 miles long, initial capacity, 52 second-feet; South</td>
</tr>
</tbody>
</table>

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\(^a\) Source: Corps of Engineers 308 Report

\(^b\) Source: United States Bureau of Reclamation
<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Source of Water Supply</th>
<th>Irrigable Acreage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glendive-Fallon (1)</td>
<td>Yellowstone River</td>
<td>(3,370&lt;sup&gt;a&lt;/sup&gt;) (5,600&lt;sup&gt;a&lt;/sup&gt;)</td>
<td>Canal, 6 miles long, initial capacity, 20 second-feet; estimated cost, $568,100, or $102.36 per acre. On north side Yellowstone River, between Glendive and Fallon, Mont. Glendive Land &amp; Irrigation Co. started construction in 1908, but did not complete; rights and works later purchased by Upper Glendive-Fallon Irrigation District. Construction not completed. No storage involved. Water supply by pumping from Yellowstone River. Two units in project: Upper unit - Two pumping plants, 43- and 75-foot lifts; 1 canal 11.7 miles long and 35 second-feet capacity; another 4.8 miles long and 15 second feet capacity; cost $132,700, or $39.38 per acre. Lower unit - Pumping plant, 100-foot lift; canal 12 miles long and 80 second-feet capacity; cost $272,600, or $48.68 per acre.</td>
</tr>
<tr>
<td>Hysham (1)</td>
<td>Yellowstone River</td>
<td>6,400&lt;sup&gt;a&lt;/sup&gt;</td>
<td>On south side of Yellowstone River, near Hysham, Mont. Surveyed by Hysham Irrigation district in 1913. No storage involved; water pumped from river. Lifts of 98 and 66 feet; 18 miles of canals; initial capacities, 20 and 66 second-feet. Total cost $340,000, or $53.13 per acre.</td>
</tr>
<tr>
<td>Sheffield (1)</td>
<td>Yellowstone River</td>
<td>5,800&lt;sup&gt;a&lt;/sup&gt;</td>
<td>On north side of river, near Miles City, Mont. No storage involved. Primary pump from river, 20-foot lift; secondary pump from canal, 35-foot lift. 21.8 miles of canal; initial capacity, 83 second-feet. Total cost $209,200, or $36.07 per acre.</td>
</tr>
<tr>
<td>Highland Park Irrigation District</td>
<td>Yellowstone River</td>
<td>4,933</td>
<td>On south side of river, east of Forsyth, Mont. Pumping project with no storage; 220-foot lift. Canal, 10 miles long.</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Description</td>
</tr>
<tr>
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</tr>
<tr>
<td>Shirley-Blatchford(1)</td>
<td>Yellowstone River</td>
<td>4,160&lt;sup&gt;a&lt;/sup&gt;</td>
<td>On south side of river, between Shirley and Blatchford, Mont. Investigated by Northern Pacific Railway in 1894. No storage involved. Pumping plant lift 42 feet. Canal 13.9 miles long; initial capacity, 50 second feet. Total cost $171,000, or $41.11 per acre.</td>
</tr>
<tr>
<td>Upper Yellowstone Irrigation District</td>
<td>Yellowstone River</td>
<td>3,690</td>
<td>On west side Yellowstone River, 12 miles above Livingston, Mont. Direct diversion without storage. Canal, 10 miles long. District requested certification of a $75,000 bond issue.</td>
</tr>
<tr>
<td>Cedar Creek(1)</td>
<td>Yellowstone River</td>
<td>3,140&lt;sup&gt;a&lt;/sup&gt;</td>
<td>On north side of river below Terry, Mont. No storage involved. Water pumped from river; 2 plants with lifts of 60 and 45 feet. 15.1 miles of canals; initial capacities, 31 and 21 second-feet. Total cost $171,400, or $49.83 per acre.</td>
</tr>
<tr>
<td>Kinsey(1)</td>
<td>Yellowstone River</td>
<td>2,840&lt;sup&gt;a&lt;/sup&gt;</td>
<td>On north side of river near Kinsey, Mont. No storage involved. Pumping plant from river; lift of 40 feet. 10.2 miles canal; initial capacity, 41 second-feet. Total cost $100,000, or $35.21 per acre.</td>
</tr>
<tr>
<td>Graycliff Irrigation District</td>
<td>Boulder River</td>
<td>2,000</td>
<td>On south side Yellowstone River, near Graycliff, Mont. Direct flow project; no storage. Canal extension of old Bailey Ditch. Estimated cost, $70,000, or $35 per acre.</td>
</tr>
<tr>
<td>Calypso(1)</td>
<td>Yellowstone River</td>
<td>1,700&lt;sup&gt;a&lt;/sup&gt;</td>
<td>On north side of river, west of Terry, Mont. No storage involved. Water pumped from river; 52-foot lift. Canal, 5.3 miles long; initial capacity, 24 second-feet. Total cost, $54,200, or $37.76 per acre.</td>
</tr>
</tbody>
</table>

<sup>a</sup> Calculated based on the provided data.
<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Source of Water Supply</th>
<th>Irrigable Acreage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orinoco(1)</td>
<td>Yellowstone River</td>
<td>1,250a</td>
<td>On north side of river, below Forsyth, Mont. No storage involved; 25-foot lift pumping plant; 20 second-feet canal, 5.3 miles long. Total cost, $34,500, or $27.60 per acre.</td>
</tr>
<tr>
<td>Hathaway(1)</td>
<td>Yellowstone River</td>
<td>1,000a</td>
<td>On south side of river, near Hathaway, Mont. No storage involved; 40-foot lift pump at river. Canal, 4.6 miles long; initial capacity, 1/4 second-feet. Total cost, $38,000, or $38 per acre.</td>
</tr>
<tr>
<td>Terry(1)</td>
<td>Yellowstone River</td>
<td>940a</td>
<td>On south side of river, near Terry, Mont. No storage; 2 separate pumping plants, lifts of 25 to 90 feet each.</td>
</tr>
<tr>
<td>Saugus(1)</td>
<td>Yellowstone River</td>
<td>720a</td>
<td>On north side of river, just above Saugus, Mont. No storage required. Single pumping unit, lift 35 feet. Canal, 3 miles long; initial capacity, 1/4 second-feet. Total cost $22,600, or $31.39 per acre.</td>
</tr>
</tbody>
</table>

Total for main stem of Yellowstone River and miscellaneous tributaries: 68,495

Clark Fork River and Tributaries

<table>
<thead>
<tr>
<th>Scheme No.</th>
<th>Source</th>
<th>Acreage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Clark Fork, Sunlight Creek, and East Rosebud Creek</td>
<td>(60,800b, 14,700, 24,900)</td>
<td>On west side of Clark Fork, north of Clark, Wyo. Involves 2 schemes of utilizing direct flow of Clark Fork and storage on Sunlight Creek, and a scheme utilizing storage and direct diversion from East Rosebud Creek:</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Description</td>
</tr>
<tr>
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</tr>
<tr>
<td>Joliet and White Horse Bench Irrigation District</td>
<td>Rock Creek and East Rosebud Creek</td>
<td>8,000(^d)</td>
<td>On north side of Rock Creek, north of Joliet, Mont. Involves direct flow of Rock Creek and storage on East Rosebud Creek. East Rosebud Reservoir capacity, 10,000 acre-feet. Diversion canal, 7 miles long; capacity, 150 second-feet. Main canal, 18 miles long; initial capacity, 182 second-feet. Estimated cost $474,300, or $59.29 per acre.</td>
</tr>
<tr>
<td>Chapman Bench</td>
<td>Clark Fork</td>
<td>8,000</td>
<td>On easterly side of Clark Fork, near Clark, Wyo. Involves direct diversion only. Requires 7 miles canal through practically inaccessible canyon. Due to apparent infeasibility of main canal, no designs or estimates made.</td>
</tr>
<tr>
<td>East Side Irrigation District</td>
<td>Clark Fork</td>
<td>7,100</td>
<td>On east side of Clark Fork, in Carbon County, Mont. Direct-diversion project; no storage. Involved extension of old Wills Ditch. Proposed bond issue $460,000, or $54.79 per acre. No construction cost data.</td>
</tr>
</tbody>
</table>

\(\text{Total for Clark Fork and tributaries} \quad 75,900\)
<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Source of Water Supply</th>
<th>Irrigable Acreage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoshone project extension (incomplete divisions):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Mountain</td>
<td>Shoshone</td>
<td>41,000&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Under construction by Bureau of Reclamation. Shoshone Reservoir storage completed. Lands located on both sides of Shoshone and Greybull Rivers. Project started in 1905; system now complete for Garland, Frannie, and Willwood divisions. Incompleted work involves Canyon Canal, initial capacity, 1,200 second-feet; length, 2.9 miles. Heart Mountain Canal, initial capacity, 910 second-feet; length, 27.97 miles. Oregon Basin Canal, initial capacity, 500 second-feet; length, 22.95 miles. Oregon Basin Reservoir, capacity, 150,000 acre-feet and laterals.</td>
</tr>
<tr>
<td>Oregon Basin</td>
<td>Shoshone</td>
<td>48,000&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Greybull Valley</td>
<td>River</td>
<td>46,000&lt;sup&gt;e&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Irrigation District</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riverton project extension</td>
<td>Wind River</td>
<td>20,000&lt;sup&gt;a&lt;/sup&gt;</td>
<td>On north side of Wind River, vicinity of Riverton, Wyo. Being built by Bureau of Reclamation. Construction began in 1920. Undeveloped portion of project (80,000 acres) involves additional storage either at Bull Lake Creek or Dinwoody Creek sites, or both; extension of present canals and laterals; new laterals; and a drainage system.</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Description</td>
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</tr>
<tr>
<td>Wind River Indian project extension</td>
<td>Wind and Little Wind Rivers, and Dinwoody Creek</td>
<td>21,216&lt;sup&gt;a&lt;/sup&gt;</td>
<td>On Shoshone Indian Reservation. Lends on south side of Wind River and both sides of Little Wind River. Being built by Bureau of Indian Affairs. Potential development involves extension of existing canals, construction of Dinwoody Canal from Dinwoody Creek and construction of necessary storage (about 12,000 acre-feet) on either North Fork or South Fork of Little Wind River.</td>
</tr>
<tr>
<td>Crow Indian project extension</td>
<td>Big Horn and Little Horn Rivers, and Pryor Creek</td>
<td>11,991&lt;sup&gt;a&lt;/sup&gt;</td>
<td>On Crow Indian Reservation. Being developed by Bureau of Indian Affairs. Potential development involves extension of existing canals and possibly a small amount of storage on Little Horn River, Lodge Grass and Pryor Creek.</td>
</tr>
<tr>
<td>Louis Lake</td>
<td>Little Popo Agie River</td>
<td>78,920&lt;sup&gt;b&lt;/sup&gt;</td>
<td>On east side of Little Popo Agie River, east of Lander, Wyo. Filings made by Louis Lake Conservation Co. in 1911. Involves both direct diversion and storage. Louis Lake Reservoir, capacity, 72,700 acre-feet; on the headwaters of east branch of Little Popo Agie River. No cost data available.</td>
</tr>
<tr>
<td>Fremont Canal</td>
<td>Wind River and Terry Creek</td>
<td>64,000&lt;sup&gt;b&lt;/sup&gt;</td>
<td>On north side of Wind River, near Lenore, Wyo. Wyoming Central Irrigation Co. made filing in 1906; involves both direct diversion and storage, 2 potential reservoir sites: Wind River Reservoir - No. 1 - Capacity, 40,000 acre-feet; 10 miles above Dubois, Wyo. Terry Lake Site - Capacity, 6,000 acre-feet; on Terry Creek. Length of canal, 35 miles. Original estimated cost without storage, $458,000; estimated cost of storage, $1,315,000; total cost, $1,773,000, or $27.70 per acre.</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Description</td>
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</tr>
<tr>
<td>Buffalo Basin</td>
<td>Greybull and Wood</td>
<td>47,500 b</td>
<td>On both sides Dry Cottonwood and Gooseberry Creeks, in vicinity of Worland, Wyo. Involves diversion from Greybull and Wood Rivers with storage in Buffalo Creek Reservoir (capacity 145,000 acre-feet). Supply canals include Greybull-Francis Fork Canal, 20 miles long, Wood River Canal, 10.44 miles long, and Buffalo Creek Canal, 7.74 miles long. Distribution canals include Gooseberry No. 1, 12 miles long, and Gooseberry No. 2, 10.75 miles long. Estimated cost $1,390,000, or $39.80 per acre.</td>
</tr>
<tr>
<td>Big Horn</td>
<td>Big Horn River</td>
<td>50,100 b</td>
<td>On both sides of Big Horn River, south of Hardin, Mont. High diversion dam on Big Horn River, near mouth of Big Horn Canyon, provides 16,000 acre-feet of storage. Involves 2 canals; West Side Canal, 63.3 miles long, initial capacity 890 second feet; East Side Canal, 12.8 miles long, initial capacity 65 second-feet. Estimated cost $12,569,500, or $250.89 per acre.</td>
</tr>
<tr>
<td>Wind River Canal</td>
<td>Wind River</td>
<td>22,680 b</td>
<td>On southerly side of Wind River, near Riverton, Wyo. Land entirely within Shoshone Indian Reservation. Involves direct diversion without storage. Canal 32 miles long. Original cost estimated at $250,000, or $11.02 per acre.</td>
</tr>
<tr>
<td>Tremont Canal</td>
<td>Big Horn River</td>
<td>16,250 b</td>
<td>On easterly side of Big Horn River, near Neble and Bonneville, Wyo. Direct-diversion project without storage. Partly a Carey Act enterprise; 8,709 acres included in Wyoming. Segregation list No. 81. Construction included pumping lift of 35 feet, and 32 miles canal. Filings made by Mr. Asmus Boysen in 1910.</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Upper and Lower Sunshine Reservoirs. (Note: Lower Sunshine Reservoir has been constructed to a capacity of 43,500).</td>
<td>Greybull and Wood Rivers</td>
<td>(16,000)</td>
<td>Supplemental storage for existing irrigation along Greybull River, below Meeteetse, Wyo., and undeveloped land in Greybull Valley. Surveyed by Greybull Irrigation District in 1919. Involves 2 off-stream reservoir sites: Upper Sunshine site - Capacity, 50,100 acre-feet; supplied from Greybull River, Lower Sunshine site - Capacity, 43,500 acre-feet; supplied from Wood River; total cost $6,410,000. Cost of supplemental water $57.04 per acre; cost to undeveloped land $206.40 per acre.</td>
</tr>
<tr>
<td>Paintrock</td>
<td>Paintrock Creek</td>
<td>15,600&lt;sup&gt;b&lt;/sup&gt;</td>
<td>On north side of Nowood Creek below Paintrock Creek. Proposed as Carey Act project in 1907. Involves both natural flow and storage. Solitude Reservoir on Middle Fork of Paintrock Creek developed to 6,000 acre-feet capacity. Canal, 35 miles long; initial capacity, 219 second-feet. Original estimated cost $484,500, or $31.06 per acre.</td>
</tr>
<tr>
<td>Tensleep and Bonanza</td>
<td>Tensleep Creek</td>
<td>15,000&lt;sup&gt;b&lt;/sup&gt;</td>
<td>In Nowood Creek Valley, below Tensleep Creek. Proposed as Carey Act project in 1909. Involves both natural flow and storage, Tensleep Meadows Reservoir on East Tensleep Creek; capacity, 13,500 acre-feet; 2 canals; one 25 miles long, and the other 8 miles long; initial capacities, 211 and 21 second-feet, respectively. Engineer's estimated cost $584,575, or $45.65 per acre.</td>
</tr>
<tr>
<td>Lander Valley</td>
<td>Popo Agie River</td>
<td>9,275&lt;sup&gt;b&lt;/sup&gt;</td>
<td>On east side Popo Agie River, near Arapahoe, Wyo. Filings made by Lander Valley Reservoir and Irrigation Co. Involves both direct-diversion and storage. Long Beach Reservoir, capacity 15,000 acre-feet, located on headwaters of North Fork Popo Agie River. Length of canal, 21.75 miles. Original cost estimate $110,000, or $11.86 per acre.</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Description</td>
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<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Riverside Canal</td>
<td>Big Horn River</td>
<td>6,930 b</td>
<td>On easterly side of Big Horn River, near Neble, Wyo. Direct-diversion project without storage. Construction involves pumping plant with lift of 35 feet and canal 10 miles long. Filing made by Mr. Asmus Boysen in 1911. No cost data available.</td>
</tr>
<tr>
<td>Gooseberry Creek</td>
<td>Wood River</td>
<td>6,800 a</td>
<td>On both sides of Gooseberry Creek, near Worland, Wyo. Water supply from Wood River, with 38,000 acre-feet of storage in Buffalo Creek Reservoir. Involves 9.7 miles supply canal; initial capacity of 1,000 second-feet; and 2 distribution canals; aggregate length: 15.1 miles; initial capacities, 106 and 20 second-feet, respectively. Estimated cost $2,574,100, or $349.13 per acre.</td>
</tr>
<tr>
<td>Total for Big Horn River and tributaries</td>
<td></td>
<td>544,464</td>
<td></td>
</tr>
<tr>
<td>Tongue River and Tributaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parkman Irrigation District</td>
<td>North Fork Tongue and Fool Creek</td>
<td>(5,471 b (7,020 o)</td>
<td>For new lands and supplemental water supply for lands along Pass Creek (Little Horn drainage), north of Parkman, Wyo. Filings and some construction accomplished in 1909. Rialto Canal, initial capacity, 94 second-feet, to divert surplus waters from North Tongue River and Fool Creek to West Pass Creek. Original estimated cost, $200,000.</td>
</tr>
<tr>
<td>Total for Tongue River and tributaries</td>
<td></td>
<td>5,471</td>
<td></td>
</tr>
<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------</td>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Northern Wyoming Land Co.</td>
<td>Clear Creek</td>
<td>13,803</td>
<td>Located between Dry and Crazy Woman Creeks, near Buffalo, Wyo. Involves both natural flow and storage; 2 reservoirs on Dry Creek: No. 1 reservoir - Capacity, 21,451 acre-feet. No. 2 reservoir - Capacity, 13,150 acre-feet, about 8,000 acre-feet being dead storage; 2 canals aggregating 17.81 miles in length. Estimated cost $2,257,000, or $164.24 per acre, not including cost of supply canal for which data are not available.</td>
</tr>
<tr>
<td>Johnson County</td>
<td>Clear Creek</td>
<td>13,167</td>
<td>In Valley of Crazy Woman Creek, near Buffalo, Wyo. Involves both natural flow and storage; 2 reservoirs on Buffalo Wallow Creek: Peck Reservoir - Capacity, 14,200 acre-feet. Hall Reservoir - Capacity, 3,580 acre-feet. Supply canal, 32 miles long; initial capacity, 365 second-feet. Estimated cost, not including distribution system, $2,246,000, or $170.58 per acre.</td>
</tr>
<tr>
<td>Powder River</td>
<td>Powder River</td>
<td>12,650</td>
<td>Lands in 2 units, 1 on each side of river, near Broadus and Powderville, Mont., 2 schemes of development proposed: Scheme No. 1 - Involves direct diversion through 2 main canals; Broadus Canal 28 miles long and 5 ½ second-foot initial capacity; Powderville Canal, 49.2 miles long and 127 second-foot initial</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Sussex</td>
<td>North and Middle Forks of Powder River</td>
<td>4,500⁶</td>
<td>Capacity: total cost $1,125,000, or $248.93 per acre. Scheme No. 2 - Involves both direct diversion and storage; Moorhead Reservoir developed to 56,000 acre-feet capacity; canal system same as for scheme No. 1; total cost $4,040,000, or $319.37 per acre. On west side of river, north of Sussex, Wyo. Involves both natural flow and storage in Red Fork Reservoir on Red Fork Creek, developed to 16,000 acre-feet capacity. Canal system includes enlargement of 18.3 miles of Sahara Canal to capacity of 130 second-feet and construction of Sussex Canal, additional 17.2 miles with capacity of 65 second-feet. Total cost $658,000, or $146.22 per acre.</td>
</tr>
<tr>
<td>Cottonwood</td>
<td>Cottonwood Creek</td>
<td>2,302²⁴</td>
<td>On both sides of Cottonwood Creek and Little Powder River, near Adon, Wyo. Involves 4,963 acre-feet storage in Cottonwood Reservoir and Cottonwood Ditch, 6.23 miles long, initial capacity 100 second-feet. Estimated cost $350,000, or $152.04 per acre.</td>
</tr>
</tbody>
</table>

Total for Powder River and tributaries 56,799

(1) Included in the Mid-Yellowstone Project - U.S.B.R.
a This area, either as it appears here or as amended, is included in the "ultimate irrigable area" given in this report under the classification "irrigable area by extension of (existing) projects."
b This area, either as it appears here or as amended, is included in the "ultimate irrigable area" given in this report under the classification "irrigable area in potential projects."
c Annual reports of the Bureau of Reclamation do not show any definite acreage of suspended acreage. Although the drainage system is incomplete, the affected acreage is comparatively small.

d Acreages indicated are for areas that are duplicated in other listed projects. Duplicated areas are not included in totals.

e Acreage indicated is the area of land for which a supplemental water supply is included in the plan of reclamation. These acreages are not shown in the totals for the basin or subbasins.

f Depends upon same water supply in Clear Creek as Northern Wyoming Land Co. Project, which is insufficient for both. Compromise necessary.

g Most of the area of the Sussex Project is included in the Red Fork Project; hence, the Sussex Project is considered a duplication.
### Appendix I
#### Table 2

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Source of Water Supply</th>
<th>Irrigable Acreage</th>
<th>Source of Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Stem and Minor Tributaries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosedale-Elbow Irrigation Project</td>
<td>Yellowstone River</td>
<td>3,000</td>
<td>Appendix F(1)</td>
</tr>
<tr>
<td>Park-Sweet Grass Irrigation Project</td>
<td>Yellowstone River</td>
<td>12,500</td>
<td>Appendix F(1)</td>
</tr>
<tr>
<td>Lake Basin Irrigation Project</td>
<td>Yellowstone River</td>
<td>239,200</td>
<td>Appendix F(1)</td>
</tr>
<tr>
<td>Miscellaneous (Porcupine Creek)</td>
<td>Porcupine Creek</td>
<td>2,400</td>
<td>Appendix F(1)</td>
</tr>
<tr>
<td>Sadies Flat Irrigation Project*</td>
<td>Yellowstone River</td>
<td>5,200a</td>
<td>Appendix F(1)</td>
</tr>
<tr>
<td>North Sanders Irrigation Project*</td>
<td>Yellowstone River</td>
<td>5,400a</td>
<td>Appendix F(1)</td>
</tr>
<tr>
<td>Sidney Pumping Project**</td>
<td>Yellowstone River</td>
<td>5,300a</td>
<td>Appendix F(1)</td>
</tr>
<tr>
<td>Savage Pumping Project**</td>
<td>Yellowstone River</td>
<td>2,100a</td>
<td>Appendix F(1)</td>
</tr>
<tr>
<td>McGinnis Creek</td>
<td>Not given</td>
<td>5,000</td>
<td>Montana Report (2)</td>
</tr>
<tr>
<td>Sioux Charley Lake</td>
<td>Not given</td>
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<td>Montana Report (2)</td>
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<td>Mission Ditch</td>
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<td>Montana Report (2)</td>
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<tr>
<td>East Rosebud</td>
<td>Not given</td>
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<td>Yellowstone River</td>
<td>910a</td>
<td>North Dakota (4)</td>
</tr>
<tr>
<td>Yellowstone Pumping Irrigation District</td>
<td>Yellowstone River</td>
<td>1,810</td>
<td>North Dakota (4)</td>
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<td>Upper Clear Creek (Dawson County)</td>
<td>Clear Creek</td>
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<tr>
<td>Fairchild Reservoir (Dawson County)</td>
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<td>Hardy Reservoir (Dawson County)</td>
<td>Seven Mile Creek</td>
<td>530</td>
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</tr>
<tr>
<td>Reke (Dawson County)</td>
<td>Beaver Creek</td>
<td>-</td>
<td>Montana Progress Report (5)</td>
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<tr>
<td>Mission Ditch Extension</td>
<td>Yellowstone River</td>
<td>2,675</td>
<td>Montana Progress Report (5)</td>
</tr>
<tr>
<td>O'Fallon Creek (Prairie County)</td>
<td>O'Fallon Creek</td>
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<tr>
<td>Sunday Creek (Rosebud County)</td>
<td>Sunday Creek</td>
<td>-</td>
<td>Montana Progress Report (5)</td>
</tr>
<tr>
<td>Bensley Creek Reservoir (Custer County)</td>
<td>Bensley Creek</td>
<td>426</td>
<td>Montana Progress Report (5)</td>
</tr>
<tr>
<td>Kircher Creek (Custer County)</td>
<td>Kircher Creek</td>
<td>-</td>
<td>Montana Progress Report (5)</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Source of Information</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------</td>
<td>-------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td><strong>Clark Fork River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stanley Ditch</td>
<td>Rock Creek</td>
<td>-</td>
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</tr>
<tr>
<td>Sand Coulee Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(S. and E. of Clark Fork, Chapman Bench excluded)</td>
<td>Clark Fork</td>
<td>20,000</td>
<td>Wyoming Report(3)</td>
</tr>
<tr>
<td>Miscellaneous Ditches</td>
<td>Clark Fork &amp; Tribs.</td>
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<tr>
<td><strong>Big Horn River</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Hanover Pumping Project***</td>
<td>Big Horn River</td>
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<td>Miscellaneous (Pumping Projects)***</td>
<td>Big Horn River</td>
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<td>Miscellaneous Small Ditches</td>
<td>Shoshone River</td>
<td>10,000</td>
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<td>Miscellaneous Small Projects</td>
<td>Greybull &amp; Tribs.</td>
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<td>17,900</td>
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<td><strong>Tongue River</strong></td>
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<td></td>
<td></td>
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<td>Little Young's Creek</td>
<td>Young's Creek</td>
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<td>Lower Pumpkin Reservoir</td>
<td>Pumpkin Creek</td>
<td>800</td>
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</tr>
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<td>Tongue River Water Users Ass'n.</td>
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<td>Appendix F(1)</td>
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</tr>
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<td>Miscellaneous Projects &amp; Extensions of Present Projects</td>
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<tr>
<td>Name of Project</td>
<td>Source of Water Supply</td>
<td>Irrigable Acreage</td>
<td>Source of Information</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------------------</td>
<td>-------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Powder River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hickox (Carter County)</td>
<td>Stump Creek</td>
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<td>Bradshaw Reservoir (Custer County)</td>
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<tr>
<td>Traub (Powder River County)</td>
<td>Bay Horse Creek</td>
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<td>Montana Progress Report(5)</td>
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<td>Lower Powder River</td>
<td>Powder River</td>
<td>10,500</td>
<td>Montana Progress Report(5)</td>
</tr>
<tr>
<td>Lamey Creek (Custer County)</td>
<td>Lamey Creek</td>
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<td>Campbell Brown</td>
<td>Powder River</td>
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<td>Miscellaneous Small Projects</td>
<td>Crazy Woman Creek &amp;</td>
<td>5,000</td>
<td>Wyoming Report(3)</td>
</tr>
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<td></td>
<td>Tributaries</td>
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<tr>
<td>Little Powder River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herman</td>
<td>Ranch Creek</td>
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</tr>
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<td>Miscellaneous Small Projects</td>
<td>Little Powder &amp; Tribs.</td>
<td>4,300</td>
<td>Wyoming Report(3)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(1) Appendix F of the Progress Report of the National Resources Planning Board (1939).
(3) "Water Resources of the Yellowstone River Basin in Wyoming", by H. T. Person - October 1938.
(4) North Dakota Water Conservation Commission, letter dated June 7, 1940.
(5) A "Progress Report" submitted by Mr. E. B. Donohue at the meeting of the Compact Commission on October 10, 1940.
  a This area, either as appears here or as amended, is included in the "ultimate irrigable area"
given in this report under the classification "irrigable area by extension of (existing) projects".
  b This area is included in the "ultimate irrigable area" given in this report under the classification
"irrigable area in potential projects".
* Included in the Mid-Yellowstone Project - U.S.B.R.
** Included in the Lower Yellowstone Project extension.
*** Presumably these projects include the three projects shown in table 24 as reported by the Wyoming
State Engineer.
This appendix contains pertinent information concerning each potential reservoir of which this office has knowledge, regardless of its physical or economic feasibility. Information on potential reservoirs was obtained from the five sources listed below.

1. The 308 Report (H.D. 256, 73d Congress, 2d Session), of the Corps of Engineers, War Department.

2. Appendix F of the Progress Report (1939) of the National Resources Planning Board.


5. A report by the Montana Water Conservation Board, submitted at the meeting of the Compact Commission in Billings, Montana, on October 10, 1940.

Table 1 is a reproduction of tables contained in the Wyoming Report. Table 2 was compiled from potential projects listed in the two Montana Reports. Table 3 contains all of the potential reservoirs that were listed in Appendix F. These tables present the data as they were given in the original sources. No attempt has been made to eliminate duplications or to reconcile inconsistent data. The potential reservoirs included in the water use studies of Appendix F are shown by sub-basins, in Section II of this report, in tables headed "Selected Potential Reservoirs".

More detailed information on some of the reservoirs listed in tables 1, 2 and 3 is contained in Appendix IV of the 308 Report. Other potential
reservoirs that are listed in the 308 Report and are not included in one of the three tables are listed below.

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Source of Supply</th>
<th>Capacity (A.F.)</th>
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<tbody>
<tr>
<td>Livingston</td>
<td>Yellowstone River</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Big Timber</td>
<td>Yellowstone River</td>
<td>800,000</td>
</tr>
<tr>
<td>Columbus No. 2</td>
<td>Yellowstone River</td>
<td>400,000</td>
</tr>
<tr>
<td>Pompey's Pillar No. 1</td>
<td>Yellowstone River</td>
<td>150,000</td>
</tr>
<tr>
<td>Boulder</td>
<td>Boulder River</td>
<td>50,000</td>
</tr>
<tr>
<td>Stillwater</td>
<td>Stillwater River</td>
<td>100,000</td>
</tr>
<tr>
<td>Goose Creek</td>
<td>Tongue River</td>
<td>50,000</td>
</tr>
<tr>
<td>Biddle</td>
<td>Little Powder River</td>
<td>50,000</td>
</tr>
<tr>
<td>Sutherland No. 1</td>
<td>Powder River</td>
<td>50,000</td>
</tr>
<tr>
<td>Sutherland No. 2</td>
<td>Powder River</td>
<td>200,000</td>
</tr>
<tr>
<td>So. Fork Powder River</td>
<td>Powder River</td>
<td>50,000</td>
</tr>
</tbody>
</table>

The 308 Report concluded that the above potential reservoirs were economically undesirable at the present time but merited further study.

Recently the Corps of Engineers has investigated the feasibility of a 3,000,000 acre-foot reservoir at the site of the abandoned Boysen dam in Wind River Canyon. The report of this investigation has not yet been made public. The location of the principal potential reservoirs in the basin is shown on map 7.
<table>
<thead>
<tr>
<th>Code</th>
<th>Item Description</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Ranch Creek</td>
<td>Location</td>
</tr>
<tr>
<td>200</td>
<td>Grass Creek</td>
<td>Location</td>
</tr>
</tbody>
</table>

*Note: This table is part of a larger report on the condition of the ranch and creek locations.*
APPENDIX III

POTENTIAL POWER SITES IN THE YELLOWSTONE RIVER BASIN

The only complete survey of power sites in the basin was made by the Corps of Engineers, and was published in their 308 Report (H.D. 256, 73d Congress, 2d Session). The first three tables presented in this appendix were taken from that document. These tables classify the projects as follows:

Table 1. Potential power projects. (Potential projects involving primary output costs below 8 mills per kilowatt-hour).

Table 2. Power sites surveyed but found infeasible.

Table 3. Power sites found infeasible by reconnaissance.

In addition to the projects listed in the tables, one project was found that had a primary output cost ranging between eight and sixteen mills per kilowatt-hour. This was the Wind River project on the north fork of the Wind River. The project would have an installed capacity of 2,200 kilowatts and a prime power rating of 1,010 kilowatts. The primary output cost was estimated at 10.93 mills per kilowatt-hour. Further information relative to the projects listed in Table 1 is contained in Appendix V of the 308 Report.

The Wyoming Report, "Water Resources of the Yellowstone Basin in Wyoming", by H. T. Person, also lists the potential hydroelectric developments in the basin. The Wyoming compilation appears to have been based on the Corps of Engineers' survey, with which it agrees very closely except for a few additions. Table 4 lists those potential hydroelectric developments contained in the Wyoming Report that could not be definitely identified in Tables 1, 2 and 3 of this appendix.
## Appendix III

### Table 1

**Potential Power Projects in the Yellowstone River Basin Involving Primary Output Cost Below 8 Mills**

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Location</th>
<th>Prime Power Rating (kilo-watts)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yankee Jim Canyon</td>
<td>North of Yellowstone Park, in T, 8 S., R. 7 E. Park County, Mont.</td>
<td>15,000</td>
<td>Reservoir plant; power house integral with dam. Reservoir capacity, 270,000 acre-feet; useful storage, 176,300 acre-feet. Gross head, 194 feet; normal head, 175 feet. Installed capacity, 445,000 kilowatts. Unit cost of prime, 6.37 mills.</td>
</tr>
<tr>
<td>Lower Canyon</td>
<td>1/2 miles below Yankee Jim site, in sec. 2, T, 3 S., R. 9 E. Park County, Mont.</td>
<td>45,000</td>
<td>Reservoir plant; power house 600 feet below dam. Reservoir capacity, 1,384,000 acre feet; useful storage, 248,320 acre-feet. Gross head, 254 feet; normal head, 229 feet. Installed capacity, 135,000 kilowatts. Unit cost of prime, 7.50 mills.</td>
</tr>
<tr>
<td>Yankee Jim-Lower Canyon, combined</td>
<td>Same as Yankee Jim and Lower Canyon above described.</td>
<td>63,000</td>
<td>Yankee Jim plant as described above. Lower Canyon plant; reservoir capacity, 1,384,000 acre-feet; useful storage, 247,000 acre-feet. Gross head, 254 feet; normal head, 229 feet. Installed capacity, 160,000 kilowatts. Unit cost of system prime, 7.05 mills.</td>
</tr>
</tbody>
</table>

**Clark Fork River**

| Clark Fork System           | Shoshone National Forest Park County, Wyo. | -                               | 5-plant system, described below. Unit cost of prime 1.18 mills. |

---

*Note: The text contains a typo in the second row of the table where "8 Miles" should be "8 Mills."*
<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Location</th>
<th>Power Rating (kilowatts)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Clark Fork Plant</td>
<td>Reservoir on Clark Fork above Crandall Creek.  Power house near mouth of Beartooth Creek.</td>
<td></td>
<td>(Reservoir plant; 33,000 feet of tunnel to power house. Reservoir capacity, 180,000 acre-feet; useful storage, 91,900 acre-feet. Gross head, 657 feet; normal head, 600 feet. Installed capacity, 15,500 kilowatts.</td>
</tr>
<tr>
<td>Beartooth Lake Plant</td>
<td>On Clark Fork at mouth of Beartooth Creek.</td>
<td></td>
<td>(Plant utilizes controlled outflow of Beartooth Lake through 29,500 feet of penstock. Gross head, 2,660 feet; normal head, 2,390 feet. Installed capacity, 6,000 kilowatts.</td>
</tr>
<tr>
<td>Thief Creek Plant</td>
<td>Reservoir on Clark Fork, near mouth of Thief Creek.  Power house at mouth of Sunlight Creek.</td>
<td>9,440</td>
<td>(Reservoir plant; 32,400 feet of tunnel to power house. Reservoir capacity, 14,000 acre-feet; useful storage, 86,800 acre-feet. Gross head, 1,305 feet; normal head, 1,177 feet. Installed capacity, 50,000 kilowatts.</td>
</tr>
<tr>
<td>Sunlight Creek Plant</td>
<td>Reservoir on Sunlight Creek.  Power house at mouth of Sunlight Creek.</td>
<td></td>
<td>(Reservoir plant; 30,300 feet of tunnel to power house. Reservoir capacity, 74,200 acre-feet; useful storage, 37,500 acre-feet. Gross head, 1,900 feet; normal head 1,861 feet. Installed capacity, 18,000 kilowatts.</td>
</tr>
<tr>
<td>Dead Indian Plant</td>
<td>Diversion dam on Clark Fork, below mouth of Sunlight Creek.  Power house at lower end of Clark Fork Canyon.</td>
<td></td>
<td>(Run-of-river plant; 31,700 feet of tunnel to power house. Gross head, 450 feet; normal head, 417 feet. Installed capacity, 24,000 kilowatts.</td>
</tr>
<tr>
<td>Louis Lake</td>
<td>Reservoir on Louis Creek.  Power house on Little Popo Agie, in sec. 28, T. 31 N., R. 100 W.</td>
<td>1,450</td>
<td>Reservoir plant with diversion from Little Popo Agie; 21,500 feet of high line and penstock to power house. Reservoir capacity, 8,000 acre-feet; all useful. Gross head, 769 feet; normal head, 711 feet. Installed capacity, 2,200 kilowatts. Unit cost of prime, 4.07 mills.</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Location</td>
<td>Prime Power Rating (kilowatts)</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------------</td>
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<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Tensleep Creek</td>
<td>Big Horn National Forest,</td>
<td></td>
<td>4-plant system, described below. Unit cost of prime 4.63 mills</td>
</tr>
<tr>
<td></td>
<td>Big Horn County, Wyo.</td>
<td></td>
<td>(Run-of-river plant; 21,000 feet of high line and penstock to</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>access power house. Gross head, 592 feet; normal head, 529 feet,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3,440</td>
<td>Installed capacity, 200 kilowatts.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Run-of-river plant; 28,000 feet of high line and penstock to</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>access power house. Gross head, 1,545 feet; normal head, 1,395 feet.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Installed capacity, 1,200 kilowatts.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Run-of-river plant; 21,000 feet of high line and penstock to</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>access power house. Gross head, 650 feet; normal head, 585 feet,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Installed capacity 1,400 kilowatts.</td>
</tr>
<tr>
<td>West Tensleep Lake</td>
<td>Diversion near West Tensleep Lake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junction Plant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lee Canyon Plant</td>
<td>Lake plant and Tensleep Canyon Plant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensleep Canyon Plant</td>
<td>Power house about 2 miles above Burra, Wyo.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paintrock Creek</td>
<td>Big Horn National Forest</td>
<td></td>
<td>2-plant system, described below. Unit cost of prime 6.48 mills</td>
</tr>
<tr>
<td></td>
<td>Big Horn County, Wyo.</td>
<td></td>
<td>(Run-of-river plant; 37,500 feet of tunnel; high line and penstock to</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>access power house. Gross head, 2,570 feet; normal head, 2,320 feet.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,335</td>
<td>Installed capacity 1,900 kilowatts.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Run-of-river plant; 3/4 mile of tunnel to power house. Gross head,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>180 feet; normal head, 170 feet. Installed capacity, 200 kilowatts.</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Location</td>
<td>Prime Power Rating (kilowatts)</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
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<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Shell Creek</td>
<td>Big Horn National Forest,</td>
<td>-</td>
<td>2-plant system, described below. Unit cost of prime 3.81 mills</td>
</tr>
<tr>
<td></td>
<td>Big Horn County, Wyo.</td>
<td></td>
<td>(Run-of-river plant, 56,400 feet of high line and penstock to)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(power house, Gross head, 2,700 feet; normal head, 2,430 feet. (Installed capacity, 1,600 kilowatts.</td>
</tr>
<tr>
<td>Upper Shell Creek</td>
<td>Diversion in sec. 29, T. 53, N., R. 34 W.</td>
<td>2,590</td>
<td>(Run-of-river plant; 14,000 feet of high line and penstock to)</td>
</tr>
<tr>
<td>Creek Plant</td>
<td></td>
<td></td>
<td>(power house. Gross head, 860 feet; normal head, 758 feet. (Installed capacity, 1,300 kilowatts.</td>
</tr>
<tr>
<td>Lower Shell Creek</td>
<td>powerhouse about 4 miles, above Shell, Wyo.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creek Plant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cave Canyon</td>
<td>Sec. 17, T. 55 N., R. 34 W., near Kane, Wyo.</td>
<td>10,000</td>
<td>Reservoir plant, power house integral with dam. Reservoir capacity, 393,000 acre-feet; useable storage, 276,500 acre-feet. Gross head, 113 feet; normal head, 98 feet. Installed capacity, 38,100 kilowatts. Unit cost of prime 7.05 mills.</td>
</tr>
<tr>
<td>Big Horn Canyon</td>
<td>2 miles south of Montana-Wyoming State line</td>
<td>11,300</td>
<td>Reservoir plant, power house about 150 feet below dam. Reservoir capacity, 475,000 acre-feet; useable storage, 350,700 acre-feet. Gross head, 108 feet; normal head, 98 feet. Installed capacity, 34,000 kilowatts. Unit cost of prime 4.39 mills.</td>
</tr>
<tr>
<td>Big Horn 3-Plant System</td>
<td>Sec. 18, T. 5 S., R. 31 E., Big Horn County, Mont.</td>
<td>61,000</td>
<td>Reservoir plant, power house just below dam. Reservoir capacity, 830,000 acre-feet; useable storage, 700,000 acre-feet. Gross head, 435.5 feet; normal head 358.5 feet. Installed capacity, 103,000 kilowatts. Unit cost of prime, 6.29 mills. 3-plant system, described below. Unit cost of prime 5.41 mills.</td>
</tr>
<tr>
<td>Name of Project</td>
<td>Location</td>
<td>Power Plant</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Cave Canyon</td>
<td>Sec. 17, T. 55 N., R. 94 W.</td>
<td>Reservoir plant; power house integral with dam. Reservoir capacity: 352,000 acre-feet; useful storage: 262,000 acre-feet; gross head: 96 feet; installed capacity: 60,000 kilowatts; unit cost of prime, 7.51 mills.</td>
<td></td>
</tr>
<tr>
<td>Upper Big Horn Plant</td>
<td>2 miles south of Montana-Wyoming State line</td>
<td>Reservoir plant; power house integral with dam. Reservoir capacity: 352,000 acre-feet; useful storage: 262,000 acre-feet; gross head: 96 feet; installed capacity: 60,000 kilowatts; unit cost of prime, 7.51 mills.</td>
<td></td>
</tr>
<tr>
<td>Big Horn Plant</td>
<td>Sec. 16, T. 5 S., R. 31 E., Big Horn County, Mont.</td>
<td>Reservoir plant; power house integral with dam. Reservoir capacity: 352,000 acre-feet; useful storage: 262,000 acre-feet; gross head: 96 feet; installed capacity: 60,000 kilowatts; unit cost of prime, 7.51 mills.</td>
<td></td>
</tr>
<tr>
<td>Castor</td>
<td>Sec. 8, T. 3 N., R. 34 E., Custer County, Mont.</td>
<td>Reservoir plant; power house integral with dam. Reservoir capacity: 352,000 acre-feet; useful storage: 262,000 acre-feet; gross head: 96 feet; installed capacity: 60,000 kilowatts; unit cost of prime, 7.51 mills.</td>
<td></td>
</tr>
<tr>
<td>Little Horn</td>
<td>2 miles south of Montana-Wyoming State line</td>
<td>Run-of-river plant; 11,200 feet of high line and penstock to power house. Gross head: 145 feet; normal head: 92 feet; reservoir capacity: 25,500 acre-feet; useful storage: 10,000 kilowatts; unit cost of prime, 2.25 mills.</td>
<td></td>
</tr>
<tr>
<td>Boulder River</td>
<td></td>
<td>Run-of-river plant; 1,200 feet of penstock to power house. Gross head: 145 feet; normal head: 92 feet; reservoir capacity: 25,500 acre-feet; useful storage: 27,260 acre-feet; installed capacity: 1,200 kilowatts; unit cost of prime, 5.28 mills.</td>
<td></td>
</tr>
<tr>
<td>Name of Project</td>
<td>Location</td>
<td>Prime Power Rating (kilo-watts)(1)</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------</td>
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<td>-----------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Tongue River</td>
<td>Above Dayton, Sheridan County, Wyo.</td>
<td>-</td>
<td>4-plant system, described below. Unit cost of prime 5.146 mills.</td>
</tr>
<tr>
<td>Plant No. 1</td>
<td>Below South Fork Reservoir. Intake in sec. 33, T. 56 N., R. 50 W.</td>
<td>21,000</td>
<td>(Reservoir plant; 14,100 feet of tunnel and penstock to power house. Reservoir capacity, 25,000 acre-feet; useful storage, 24,000 acre-feet. Gross head, 590 feet; normal head, 549 feet. Installed capacity, 5,500 kilowatts</td>
</tr>
<tr>
<td>Plant No. 2</td>
<td>Below Rockwood Reservoir. Intake in sec. 24, T. 56 N., R. 53 W.</td>
<td></td>
<td>(Reservoir plant; 2,400 feet of pipe line and penstock to power house. Reservoir capacity, 31,000 acre feet; useful storage, 29,000 acre-feet. Gross head, 500 feet; normal head, 428 feet. Installed capacity, 4,550 kilowatts</td>
</tr>
<tr>
<td>Plant No. 3</td>
<td>Diversion in sec. 18, T. 56 N., R. 47 W.</td>
<td></td>
<td>(Run-of-river plant; 25,200 feet of high line tunnel and penstock to power house. Gross head, 2,090 feet; normal head, 1,890 feet. Installed capacity, 15,000 kilowatts</td>
</tr>
<tr>
<td>Plant No. 4</td>
<td>Diversion in sec. 10, T. 56 N., R. 47 W.</td>
<td></td>
<td>(Run-of-river plant; 10,500 feet of high line and penstock. Gross head, 310 feet; normal head, 277 feet. Installed capacity, 2,450 kilowatts</td>
</tr>
</tbody>
</table>

Source: 305 Report, H.D. 256, 73rd Congress, 2nd session, pages 87-90

(1) Apparently minimum continuous rate of output.
Appendix III
Table 2

Potential Hydroelectric Power Sites Surveyed But Found Infeasible
(As Listed in the Corps of Engineers 308 Report)

Yellowstone River Basin

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
<th>Pertinent Data</th>
<th>Reason for Rejection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind River No. 1</td>
<td>On Wind River 2 1/2 miles below confluence of Du Noir Creek</td>
<td>Useful storage 35,000 acre-feet; average head, 98 feet; prime rate, 800 kilowatts.</td>
<td>(a)</td>
</tr>
<tr>
<td>Wind River No. 2</td>
<td>On Wind River 2 miles above confluence of Du Noir Creek</td>
<td>Useful storage, 4,000 acre-feet; average head, 90 feet; prime rate 105 kilowatts.</td>
<td>(a)</td>
</tr>
<tr>
<td>Horse Creek</td>
<td>On Horse Creek, in T. 44 N., R. 107 W.</td>
<td>Useful storage, 3,500 acre-feet; head (using penstock), 165 ft.; prime rate, 200 kilowatts.</td>
<td>(a)</td>
</tr>
<tr>
<td>Torrey Lake</td>
<td>At Torreys Lake on Torrey Creek</td>
<td>(Storage contemplated in lake)</td>
<td>(c)</td>
</tr>
<tr>
<td>Dinwoody Lake</td>
<td>At Dinwoody Lake on Dinwoody Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bull Lake</td>
<td>At Bull Lake on Bull Lake Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popo Agie River</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Fork Popo Agie</td>
<td>16 miles above Lander, Wyo.</td>
<td>Useful storage, 15,650 acre-feet; head, 180 feet; prime rate, 550 kilowatts.</td>
<td>(a)</td>
</tr>
<tr>
<td>Middle Fork Popo Agie</td>
<td>T. 32 N., R. 100 W.</td>
<td>Pipe line development considered 818 foot head</td>
<td>(b)</td>
</tr>
<tr>
<td>Tuygee Lake</td>
<td>Sec. 3, T. 33 N., R. 104 W.</td>
<td>Reservoir capacity, 12,500 acre-feet; dam height, 46 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Project</td>
<td>Location</td>
<td>Pertinent Data</td>
<td>Reason for Rejection</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------------------------</td>
<td>---------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>North Fork Little Wind</td>
<td>12 miles above confluence of South Fork</td>
<td>No useful storage; head, 170 feet; prime rate, 115 kilowatts.</td>
<td>(a)</td>
</tr>
<tr>
<td>South Fork Little Wind</td>
<td>16 miles above confluence of Little Wind</td>
<td>No useful storage; head, 190 feet; prime rate, 100 kilowatts.</td>
<td>(a)</td>
</tr>
<tr>
<td>Trout Creek</td>
<td>Reservoir on Trout Creek, near Fort Washakie, Wyo.</td>
<td></td>
<td>(b)</td>
</tr>
<tr>
<td>Big Horn River Anchor</td>
<td>Reservoir on South Fork of Owl Creek, secs. 23 and 24, T. 8 N., R. 1 W., and secs. 26 and 27, T. 43 N., R. 100 W. Dam site, sec. 13, T. 43 N., R. 100 W.</td>
<td>Water supply augmented by diversion from North Fork, reservoir capacity, 12,464 acre-feet; dam height, 182 ft. Water from North Fork Owl Creek, reservoir capacity, 6,000 acre-feet; dam height, 81 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Basin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain View</td>
<td>Off-stream reservoir, secs. 26 and 35, T. 44 N., R. 98 W.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morrison-McConaughy</td>
<td>Off-stream reservoir, dam site in sec. 36, T. 9 N., R. 2 E.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dempsey</td>
<td>Off-stream reservoir near Lucerne, Wyo., dam site in sec. 31, T. 44 N., R. 94 W.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meadows</td>
<td>Dam site on Wood River, sec. 27, T. 46 N., R. 103 W.</td>
<td>Reservoir capacity, 34,000 acre-feet, dam height, 323 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Project</td>
<td>Location</td>
<td>Pertinent Data</td>
<td>Reason for Rejection</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Buffalo Creek</td>
<td>Dam site on Buffalo Creek, in T. 47 N., R. 99 W.</td>
<td>Reservoir capacity, 38,000 acre-feet; dam height, 125 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Farmers</td>
<td>Dam site on Grass Creek, sec. 31, T. 47 N., R. 97 N.</td>
<td>Water supply from Wood River and Gooseberry Creek. Reservoir capacity, 14,500 acre-feet; dam height, 112 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Upper Sunshine</td>
<td>Reservoir on Sunshine Creek, T. 47 N., R. 102 W.</td>
<td>Canal diversion from Greybull River.</td>
<td>(a)</td>
</tr>
<tr>
<td>Lower Sunshine</td>
<td>Reservoir on Sunshine Creek, T. 48 N., R. 101 W.</td>
<td>Canal diversion from Wood River.</td>
<td>(a)</td>
</tr>
<tr>
<td>Tensleep Meadows</td>
<td>Dam site on East Tensleep Creek, secs. 32 and 33, T. 49 N., R 86 W., and sec. 5, T. 48 N., R. 86 W.</td>
<td>Reservoir capacity, 13,500 acre-feet; dam height, 50 feet.</td>
<td>(d)</td>
</tr>
<tr>
<td>Tongue River</td>
<td>Reservoir on East Fork Goose Creek, secs. 15, 16, and 21, T. 53 N.,R.86 W.</td>
<td>Reservoir capacity 73,477 acre-feet; dam height, 80 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Park</td>
<td></td>
<td>Run-of-river plant. Prime rate 300 kilowatts.</td>
<td></td>
</tr>
<tr>
<td>Big Goose Creek</td>
<td>Dam in sec. 9, T. 54 N., R. 86 W.</td>
<td>Reservoir capacity, 221,000 acre-feet; dam height, 158 feet.</td>
<td>(a)</td>
</tr>
<tr>
<td>Lower Tongue River Canyon</td>
<td>Reservoir on Tongue River, sec. 33, T. 7½ S., R. 41 E.</td>
<td>Reservoir capacity, 51,590 acre-feet; gross head, 160 feet.</td>
<td>(a)</td>
</tr>
<tr>
<td>Powder River</td>
<td></td>
<td>Run-of-river plant. Prime rate 1,200 kilowatts.</td>
<td></td>
</tr>
<tr>
<td>Red Fork</td>
<td>On Red Fork, near Kaycee, Wyo., T. 43 N., R. 83 W.</td>
<td>Reservoir capacity, 51,590 acre-feet</td>
<td>(a)</td>
</tr>
<tr>
<td>Fort McKinney</td>
<td>Dam on Clear Creek in Fort McKinney Wood Reservation</td>
<td>Reservoir capacity, 51,590 acre-feet</td>
<td>(a)</td>
</tr>
<tr>
<td>Project</td>
<td>Location</td>
<td>Pertinent Data</td>
<td>Reason for Rejection</td>
</tr>
<tr>
<td>----------------------------------------------</td>
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<td>----------------------</td>
</tr>
<tr>
<td>Clear Creek Canyon Reservoir</td>
<td>5 miles above Buffalo, on Clear Creek</td>
<td>Reservoir capacity, 3,530 acre-feet; head, 90 feet; prime power, 80 kilowatts.</td>
<td>(a)</td>
</tr>
<tr>
<td>Peck</td>
<td>Off-stream reservoir, dam site in sec. 20, T. 49 N., R. 81 W.</td>
<td>Water supply from Clear Creek; reservoir capacity, 11,200 acre-feet; dam height, 117 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Hall</td>
<td>Off-stream reservoir, dam site in sec. 21, T. 49 N., R. 82 W.</td>
<td>Water supply from Clear Creek; reservoir capacity, 3,580 acre-feet; dam height, 91 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Henry</td>
<td>Dam site on Sand Creek, sec. 26, T. 50 W., R. 82 W.</td>
<td>Dam height, 126 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>North Wyoming Land Co., No. 1</td>
<td>On Dry Creek, T. 50 N., R. 81 W.</td>
<td>Reservoir capacity, 21,451 acre-feet; dam height, 107 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>North Wyoming Land Co., No. 2</td>
<td>On Dry Creek, T. 50 N., R. 81 W.</td>
<td>Reservoir capacity, 13,150 acre-feet; dam height, 76 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Piney</td>
<td>Reservoir on South Fork Piney Creek, T. 52 N., R. 85 W.</td>
<td>Reservoir capacity, 5,251 acre-feet; dam height, 46 feet.</td>
<td>(b)</td>
</tr>
<tr>
<td>Piney Creek</td>
<td>On Piney Creek, sec. 28, T. 53 N., R. 84 W.</td>
<td>Run-of-river plant. Prime rate, 460 kilowatts.</td>
<td>(a)</td>
</tr>
<tr>
<td>Moorehead</td>
<td>On Powder River, near Moorhead, Mont.</td>
<td>Reservoir capacity, 234,000 acre-feet; normal head, 50 feet.</td>
<td>(a)</td>
</tr>
<tr>
<td>Cottonwood</td>
<td>Reservoir on Cottonwood Creek, secs. 22, 23, and 26, T. 53 N., R. 70 W.</td>
<td>Reservoir capacity, 4,963 acre-feet; dam height, 55 feet.</td>
<td>(b)</td>
</tr>
</tbody>
</table>

Source: 308 Report, H.D. 256, Pages 84, 85, and 86.
(a) Excessive construction cost.
(b) Insufficient stream flow.
(c) Inconsequential prime power output.
(d) Insufficient power head.
### Appendix III

#### Table 3

<table>
<thead>
<tr>
<th>Yellowstone River Basin</th>
<th>Reason for Rejection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project</strong></td>
<td><strong>Location</strong></td>
</tr>
<tr>
<td>Yellowstone River</td>
<td>Reservoir on Yellowstone River between Yankee Jim and Lower Canyon sites</td>
</tr>
<tr>
<td>Twenty-two mile site</td>
<td>Reservoirs along the main stem of the Yellowstone, between Livingston and Glendive.</td>
</tr>
<tr>
<td>Yellowstone River Reservoirs:</td>
<td></td>
</tr>
<tr>
<td>Springdale</td>
<td></td>
</tr>
<tr>
<td>Big Timber</td>
<td></td>
</tr>
<tr>
<td>Columbus No. 1</td>
<td></td>
</tr>
<tr>
<td>Stillwater</td>
<td></td>
</tr>
<tr>
<td>Columbus No. 2</td>
<td></td>
</tr>
<tr>
<td>Pompeys Pillar No. 1</td>
<td></td>
</tr>
<tr>
<td>Pompeys Pillar No. 2</td>
<td></td>
</tr>
<tr>
<td>Custer No. 1</td>
<td></td>
</tr>
<tr>
<td>Terry</td>
<td></td>
</tr>
<tr>
<td>Glendive No. 1</td>
<td></td>
</tr>
<tr>
<td>Glendive No. 2</td>
<td></td>
</tr>
<tr>
<td>Glendive No. 3</td>
<td></td>
</tr>
<tr>
<td>Glendive No. 4</td>
<td></td>
</tr>
<tr>
<td>Glendive No. 5</td>
<td></td>
</tr>
<tr>
<td>Shields River</td>
<td>Reservoir on Brackett Creek T. 1N., R.8 E</td>
</tr>
<tr>
<td>Project</td>
<td>Location</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>Boulder River</td>
<td>Reservoir on Boulder River, below McLeod</td>
</tr>
<tr>
<td>Stillwater River</td>
<td>Reservoir in T. 6S., R. 16E</td>
</tr>
<tr>
<td>Clark Fork River</td>
<td>Reservoir on Timber Creek, a tributary of Crandall Creek</td>
</tr>
<tr>
<td>Big Horn River</td>
<td>Reservoir on North Fork Popo Agie, T. 33 N., R. 102 W</td>
</tr>
<tr>
<td></td>
<td>On Big Horn, near Shoshone, Wyo.</td>
</tr>
<tr>
<td></td>
<td>Dam site in sec. 4, T. 47 N., R. 99 W</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Project</td>
<td>Location</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>West Tensleep Lake</td>
<td>Reservoirs on Tensleep Creek</td>
</tr>
<tr>
<td>East Tensleep Lake</td>
<td>3 reservoirs on Shell Creek</td>
</tr>
<tr>
<td>Shell Creek</td>
<td>Reservoir on Trout Creek, T. 51 N., R. 96 W.</td>
</tr>
<tr>
<td>Paintrock</td>
<td>Reservoir on Middle Fork Paintrock Creek, sec. 31, T. 51 N., R. 96 W.</td>
</tr>
<tr>
<td>Solitude</td>
<td>Reservoir in sec. 11, T. 51 N., R. 87 W.</td>
</tr>
<tr>
<td>Medicine Lodge</td>
<td>3 reservoirs on Shoshone River, and one off-stream (Oregon Basin)</td>
</tr>
<tr>
<td>Shoshone</td>
<td>Dam site in sec. 14, T. 55 N., R 99 W.</td>
</tr>
<tr>
<td>Tongue River</td>
<td>Dam site in sec. 14, T. 55 N., R 99 W.</td>
</tr>
<tr>
<td>North Fork</td>
<td>Reservoir on Powder River, 22 miles west of Kaycee, Wyo.</td>
</tr>
<tr>
<td>Powder River</td>
<td>Reservoir on South Fork Piney Creek, sec. 16, T. 51 N., R. 85 W.</td>
</tr>
<tr>
<td>Middle Fork</td>
<td>Off-stream reservoir, near South Fork Piney Creek</td>
</tr>
<tr>
<td>Cloud Peak</td>
<td>Reservoir on South Fork Piney Creek, sec. 30, T. 52 N., R. 85 W.</td>
</tr>
<tr>
<td>Lake DeSmet</td>
<td>Reservoir on South Fork Piney Creek, sec. 30, T. 52 N., R. 85 W.</td>
</tr>
<tr>
<td>Kearney Lake</td>
<td>Reservoir on South Fork Piney Creek, sec. 30, T. 52 N., R. 85 W.</td>
</tr>
</tbody>
</table>

Source: 508 Report, H.D. 256 Pages 82-83

(a) Excessive construction cost.
(b) Insufficient stream flow.
(c) Run-of-river projects preferable.
(d) Operation has proved site to be impracticable.
## Appendix III

### Table 4

**Miscellaneous Potential Hydroelectric Projects in Wyoming**

As Reported in "Water Resources of the Yellowstone Basin in Wyoming"

(Plants That Could be Definitely Identified in Tables 1, 2, or 3 of Appendix III are not Included)

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Location</th>
<th>Source of Water Supply</th>
<th>Proposed Installed Capacity (hp)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Stem and Minor Tributaries</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clark Fork River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benninghoff</td>
<td>27 56N 105W</td>
<td>Clark Fork</td>
<td>2,784</td>
</tr>
<tr>
<td>Clark Fork</td>
<td>3 56N 106W</td>
<td>Crandall Creek</td>
<td>3,051</td>
</tr>
<tr>
<td>Clark Fork Power</td>
<td>35 56N 104W</td>
<td>Clark Fork</td>
<td>5,397</td>
</tr>
<tr>
<td>Dead Indian Power</td>
<td>8 55N 104W</td>
<td>Dead Indian Creek</td>
<td>2,272</td>
</tr>
<tr>
<td>Sunlight Power</td>
<td>33 56N 104W</td>
<td>Sunlight Creek</td>
<td>13,523</td>
</tr>
<tr>
<td><strong>Big Horn River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dear Creek Ranch</td>
<td>33 49N 106W</td>
<td>Reed Spring (Shoshone)</td>
<td>19</td>
</tr>
<tr>
<td>Miller Ditch Enlargement</td>
<td>32 12N 107W</td>
<td>Warm Spring Creek (Wind)</td>
<td>154</td>
</tr>
<tr>
<td>North Fork Flume</td>
<td>7 33N 101W</td>
<td>N.F. Popo Agie</td>
<td>1,200</td>
</tr>
<tr>
<td>Raft Lake</td>
<td>- 1N 3W</td>
<td>N.F. Little Wind</td>
<td>5,400</td>
</tr>
<tr>
<td><strong>Little Horn River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tongue River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Powder River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Little Powder River</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Granting the consent of Congress to the States of Montana and Wyoming to negotiate and enter into a compact or agreement for division of the waters of the Yellowstone River.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That consent of Congress is hereby given to the States of Montana and Wyoming to negotiate and enter into a compact, or agreement, not later than June 1, 1939, providing for an equitable division and apportionment between the States of the water supply of the Yellowstone River and of the streams tributary thereto, upon condition that one suitable person, who shall be appointed by the President of the United States, shall participate in said negotiations as the representative of the United States and shall make report to Congress of proceedings and of any compact or agreement entered into: Provided, That such compact or agreement shall not be binding or obligatory upon either of the parties thereto unless and until the same shall have been approved by the legislatures of each of said States and by the Congress of the United States: Provided further, That nothing in this Act shall apply to any waters within or tributary to the Yellowstone National Park or shall establish any right or interest in or to any lands within the boundaries thereof.

Approved, August 2, 1937.

Granting the consent of Congress to the States of Montana, North Dakota, and Wyoming to negotiate and enter into a compact or agreement for division of the waters of the Yellowstone River.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act of Congress approved August 2, 1937 (50 Stat. 551), granting the consent of Congress...
to the States of Montana and Wyoming to negotiate and enter into a compact or agreement for division of the waters of the Yellowstone River be, and it is hereby, amended to provide that the consent of Congress is given to the State of North Dakota to negotiate and to enter into the compact or agreement therein authorized providing for an equitable division and an apportionment between the States of the water supply of the Yellowstone River and of the streams tributary thereto, upon condition that the representative appointed by the President of the United States under the Act of August 2, 1937, to participate in said negotiations as the representative of the United States and to report to Congress of proceedings and of any compact or agreement entered into, shall continue to represent the United States and to report under this Act: Provided, That such Act of August 2, 1937, is amended by striking out "June 1, 1939" and inserting in lieu thereof "June 1, 1943": Provided, That such compact or agreement shall not be binding or obligatory upon any of the parties thereto unless and until the same shall have been approved by the legislatures of each of the said States and by the Congress of the United States: Provided further, That nothing in this Act shall apply to any waters within or tributary to the Yellowstone National Park or shall establish any right or interest in or to any lands within the boundaries thereof.

Approved, June 15, 1940.
APPENDIX V
PROGRESS REPORT OF THE COMPACT COMMISSION

(Copy of the letter, dated March 8, 1939, from Hon. Clyde L. Seavey to the Vice President and the Speaker of the House:)

Federal Power Commission,
Washington, March 8, 1939.

Hon. John N. Garner,
President of the United States Senate.

My Dear Mr. President: Pursuant to an act of Congress approved August 2, 1937 (50 Stat. 551), granting the consent of the Congress to the States of Montana and Wyoming to negotiate and enter into a compact or agreement for an equitable division and apportionment of the waters of the Yellowstone River, four representatives of each of the States of Montana and Wyoming and the undersigned representative of the United States were duly appointed to negotiate the compact contemplated by the act. Transmitted herewith is a progress report on this subject, addressed to the Governors of the States of Montana and Wyoming and to the Congress of the United States.

It will be noted that the act of Congress cited above requires that the compact be negotiated and entered into not later than June 1, 1939. Due to the volume of work to be performed and to lack of certain essential information, the aforesaid State and Federal representatives have been unable as yet to negotiate a compact, and hence a final report cannot be submitted to the Congress at this time. It appears certain moreover, that all of the information essential to an equitable division of the waters in question will not be available until sometime after June 1, 1939.

The Yellowstone River discharges into the Missouri River in the State of North Dakota near the Montana-North Dakota State line and about 740 square miles of its watershed lies within the State of North Dakota. It appears desirable, therefore, that the act of August 2, 1937, be amended so as to give to the State of North Dakota the consent of the Congress to participate in the negotiations along with the States of Montana and Wyoming.

It is respectfully recommended that the act of August 2, 1937, be so amended that the consent of the Congress shall be given to the States of Montana, Wyoming, and North Dakota to negotiate and enter into a compact or agreement providing for an equitable division and apportionment among the three States of the waters of the Yellowstone River and of the streams tributary
thereto, subject to all of the conditions and provisos contained in said act of August 2, 1937, except that requiring that the compact be entered into not later than June 1, 1939.

Respectfully submitted.

Clyde L. Seavey,
Representative of the United States.

* * *

PROGRESS REPORT TO THE GOVERNORS OF THE STATES OF MONTANA AND WYOMING AND TO THE CONGRESS OF THE UNITED STATES REGARDING YELLOWSTONE BASIN COMPACT:

Pursuant to the authority granted by Congress in Public - No. 237 - 75th Congress, Chapter 552 - 1st Session (s.534) authorizing the States of Montana and Wyoming to negotiate and enter into a compact providing for an equitable division of the water supply of the Yellowstone River basin, the President appointed Mr. Clyde L. Seavey, (Acting Chairman, Federal Power Commission) to be the representative of the United States, and the Governors of the States of Montana and Wyoming respectively appointed representatives as follows:

Montana:
Mr. E. B. Donohue, Chairman, Helena, Montana
Mr. Rockwood Brown, Billings, Montana
Mr. J. D. Scanlan, Miles City, Montana
Mr. B. B. Armstrong, Livingston, Montana.

Wyoming:
Mr. John D. Quinn, Chairman, Cheyenne, Wyoming
Mr. L. F. Thornton, Thermopolis, Wyoming
Mr. J. R. Ellis, Basin, Wyoming
Mr. Will C. Metz, Cheyenne, Wyoming

The above representatives of Federal and State interests comprise the Yellowstone River Compact Commission.

Following the appointment of these representatives, meetings were held on May 5, 1938, in Billings, Montana and on November 21 and 22, 1938 in Thermopolis, Wyoming. In addition to members of the Commission, there were also present at these meetings representatives of federal bureaus and agencies as follows: Bureau of Reclamation; Indian Service; Forest Service; Corps of Engineers, U. S. Army; National Park Service; and Federal Power Commission. The purpose of these meetings was to ascertain the character of information required for the drafting of the Yellowstone River Basin Compact, and the extent to which data on climate, topography, land ownership, population, and water development are available; to investigate the uses of water for irrigation, power, navigation, domestic and industrial purposes, and to study the laws of the States of Montana and Wyoming with respect thereto. Such information as is available at the present time from Federal and State sources has been collected and compiled by the
Denver Regional Office staff of the Federal Power Commission, under the direction of the Compact Commission.

From an analysis of the available information, it is the consensus of the Compact Commission:

1. That adequate factual data necessary to the drafting of a compact between the States of Montana and Wyoming are not available at the present time; however, studies now being carried on by the Bureau of Reclamation, U. S. Army Engineers, Forest Service, Indian Service, and other Federal agencies will produce a considerable amount of additional data, which will be useful for this purpose. Information which is presently inadequate or entirely lacking is as follows:

   (a) Existing diversions for irrigation;
   (b) Priorities of irrigation appropriations and rights;
   (c) Acreages presently being irrigated and which are irrigable from existing works;
   (d) Net water duty on irrigated lands;
   (e) Crops grown on irrigated lands;
   (f) Potentially irrigable lands and their water requirements.
   (g) Stream flow data on minor tributaries;
   (h) Location and cost of additional storage;
   (i) Soil surveys;
   (j) Studies of soil erosion, and silting of reservoirs;

2. That apparently the annual run-off of the Yellowstone River basin is sufficient to meet all existing and potential consumptive uses if and when a comprehensive plan of storage has been developed and put into effect;

3. That the Indian rights, under various treaties, to the waters of the Wind, Big Horn, and Tongue Rivers for irrigation purposes have not been definitely determined. These rights likely will be more definitely defined by a decision of the Supreme Court of the United States in connection with litigation now pending before that tribunal;

4. That approximately 740 square miles of the drainage basin of the Yellowstone River lies within the State of North Dakota; therefore it appears desirable that the Congress of the United States amend its authorization for a compact with reference to the waters of the Yellowstone River to include the State of North Dakota as a signatory thereto.

5. That, because existing water supplies as presently developed are inadequate to fully meet demands for irrigation and other uses in critically dry years, there is imminent danger that irrigators in certain areas will resort to costly and protracted litigation in order to protect their rights; therefore,
it is essential that additional storage be constructed at strategic points at the earliest possible date in order to relieve this situation; and that the respective State Compact Commissions be given adequate authority and funds with which to proceed with the collection of data necessary to the drafting of a Compact;

6. That, pending the negotiation of a formal compact and without prejudice to existing water rights, the representatives of the States of Montana and Wyoming agree to cooperate to the fullest extent in securing such administration of rights in their respective states as will tend to alleviate water shortages during dry years.

7. That, in view of the size of the task now facing the Compact Commission, it is the Commission's opinion and recommendation that the Congress of the United States should extend indefinitely the time limit within which this compact may be consummated.

Respectfully submitted.

E. B. Donohue,
Rockwood Brown,
J. D. Scanlan,
B. B. Armstrong,
Representing the State of Montana.
John D. Quinn,
L. F. Thornton,
J. R. Ellis,
Will G. Metz,
Representing the State of Wyoming.
Clyde L. Seavey,
Representing the United States.

Dated February 25, 1939.
Proposed Yellowstone River Compact Explanation of Article V by Montana State Engineer’s Office,
Jan. 30, 1943
PROPOSED YELLOWSTONE RIVER COMPACT

EXPLANATION OF ARTICLE V

Montana State Engineer's Office, Jan. 30, 1943

It is the intention herein to briefly explain the contents of Article V
in as simple language as possible.

Allotments of water were made for the following interstate streams: Clarks Fork, Big Horn, Tongue and Powder Rivers; and Yellowstone River at Sidney. An attempt has been made by the Compact Commission to set up the division of water of each interstate stream (except Yellowstone at Sidney) on (A) the basis of acres irrigated and the corresponding water requirement, and (B) the potentially irrigable lands and potential water requirements for such lands. In most cases the acres now irrigated and the potential acres were obtained from the Bureau of Reclamation as a result of its survey in 1940. In some instances data were used from the Indian Service and the Bureau of Census.

In setting up the divisions of water on some of the interstate streams, it became necessary to depart from the true mathematical calculations. Such deviations were the result of compromises agreed upon in order to settle disputed questions.

Before the end of the first ten years and at the end of each ten years thereafter, the Commission shall re-examine the allotments of water and make such modifications as may be equitable. If they fail to agree at the end of the first ten years, then the allotment shall be suspended until an agreement can be reached, and in the meantime the rights of appropriators shall revert back to their original status. If they fail to agree on the modification of any allotment during any succeeding ten-year period, then the allotment previously agreed upon shall continue in force. (Article V, Sec. 2).

It gives the Commission an opportunity to study basic data, such as water supplies, water use, land areas, etc., which are essential in making readjustments of allotments. (Art. III, Sec. C, D, and Art. IV). These provisions give the water users on any interstate stream an opportunity to drop out of the Compact within the first ten years if they are not satisfied.

It is recognized that seasons change, climatic conditions are irregular, snowfall and resulting stream flows are not constant, cloudbursts and droughts are intermittent; and many other irregularities which make it impossible to divide the stream flows on a fixed formula. The Compact is elastic enough so that "minor compensating irregularities and fluctuations in the flow shall be permitted." (Art. V, Sec. C).

The Compact itself and amendments of it that are substantial and are not modifications of water allotments shall be approved by the three state legislatures and Congress. (Art. V, Sec. E, and Art. XI).

Before studying the following pages it is absolutely necessary to get a clear conception of "divertible flow". (Art. II, Sec. 1). In simple language, it is the algebraic sum of the following three items:

(a) The quantity of water that flows into a reservoir, minus the quantity of water released from the reservoir. 1/

(b) The summation of all water diverted into all ditches. 1/

(c) The water left in the stream at the point of measurement.

By adding together (a), (b), and (c) we get the "divertible flow".

1/ Every reservoir and every ditch above the point of measurement must be included.

MT v. WY/M.T.D. App. 53 (WY)
Explanation of Article V.

Mean Divertible Daily Flow:

If it was physically possible to measure items (a), (b), and (c) within any one 24-hour period, there would be no reason for injecting this term into the Compact. It may take a week or ten days to make all these measurements, (due to long distances, poor roads, etc). When all the measurements are made and added up, the sum is then divided by the number of days it took to make the measurements, and the result is the "mean divertible daily flow". (Art. II, Sec. 3).

Definitions:

Acre Foot is enough water to cover an acre one foot deep.
Second foot is one cubic foot of water flowing at the rate of one foot per second.

Miners Inch - in Montana a miners inch is one-fortieth of a second foot.
In North Dakota - - - - one-fiftieth of a second foot.
In Wyoming - miners inch is not recognized.

One second foot flowing 24 hours equals two acre feet.
One miners inch (in Montana) flowing 20 days equals one acre foot.

CLARK'S FORK

Compact Provides:

Mean divertible daily flow is to be determined at the mouth of Rock Creek.
(A) First 1,600 acre foot is divided; 27% to Wyoming- 73% to Montana
(B) (Block of water for potential development is not necessary)
(C) Any excess flow is subject to future appropriation.

(A) Present Irrigation:

| Acres irrigated in Wyoming (USBR) | 12,000 |
| Acres irrigated in Montana (USBR) | 33,000 |

Water Requirement:

Maximum monthly use is estimated at 1.1 acre feet per acre.
Wyo., 12,000 acres x 1.1 = 13,200 acre feet per month
Mont., 33,000 acres x 1.1 = 36,300 acre feet per month

The Commission adopted - - - 1,000 acre feet per day, divided:
Wyoming, 27%; and Montana, 73%

(B) Potential Development:

The USBR shows no potential development in Clarks Fork Basin.

Whatever areas there might be in either State are so small that it was not deemed necessary to set up a second block of water to provide for it. Any excess flow is subject to future appropriation.
Compact Provides:

Mean divertible daily flow is to be determined at the lowest diversion point in Montana.

Indians in Montana and Wyoming have the first reasonable use of water.

(A) Remainder of the first 15,000 acre feet is divided; Wyo., 50%; Mont., 10%.
(B) Next 15,000 acre feet is divided; 9% to Wyoming and 7% to Montana.
(C) Any excess flow is subject to future appropriation.

(A) Present Irrigation:

The development of Montana's present irrigated area was virtually completed in 1910, but Wyoming's development has progressed steadily, therefore, the division of water was based upon areas irrigated in 1910. Exact acres are not available, but the following deductions were estimated:

<table>
<thead>
<tr>
<th>Wyoming</th>
<th>Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate total acres irrigated in 1920 (US Census)</td>
<td>-239,000</td>
</tr>
<tr>
<td>Deduct estimated increase from 1910 to 1920, Shoshone and Riverton Project in Wyoming and private development in Montana</td>
<td>279,229</td>
</tr>
<tr>
<td>Total irrigated in 1910</td>
<td>222,000</td>
</tr>
</tbody>
</table>
| Deduct Indian lands | 47,000 | 4,600 *
| Total acres of White-owned land irrigated in 1910 | 277,000 | 27,000 |
| Per cent of total | 91 | 9 *

* If these 4,400 acres in Montana were not deducted, the percentages will be: Wyoming-89.4%; Montana-10.6.

Division agreed upon by the Compact Commission - - - 60% 10%

Water Requirements:

Maximum monthly use is estimated at 1,1 acre feet per acre.

Total area now irrigated in both states as given by USBR - - - - 425,600Ac.

425,600 x 1,1 x 31 days = 15,100 acre feet per day.

Commission adopted - 15,000 acre feet per day.

(B) Potential Irrigation:

<table>
<thead>
<tr>
<th>Acres</th>
<th>Wyoming (USBR)</th>
<th>Montana (USIS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total ultimate development</td>
<td>941,900</td>
<td>117,786</td>
</tr>
<tr>
<td>Less ultimate Indian acres</td>
<td>130,246</td>
<td>68,888</td>
</tr>
<tr>
<td>Total ultimate, Whites</td>
<td>811,654</td>
<td>47,908</td>
</tr>
<tr>
<td>Present White lands irrigated</td>
<td>346,000</td>
<td>27,058</td>
</tr>
<tr>
<td>Ultimate increase, White land</td>
<td>285,654</td>
<td></td>
</tr>
<tr>
<td>Arbitrary estimate of increase of White lands</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>Total ultimate White lands</td>
<td>388,654</td>
<td>20,000</td>
</tr>
<tr>
<td>Per cent</td>
<td>93.02</td>
<td>9.98</td>
</tr>
<tr>
<td>Percentage agreed upon</td>
<td>93</td>
<td>7</td>
</tr>
</tbody>
</table>

2/ Total irrigated in Wyoming in 1940 (USBR) 374,500 acres

Indian lands irrigated on Wind River Reservation 22,500 acres

Total per cent White lands 345,000 acres
Compact Provides:

Mean divertible daily flow is to be determined at the last diversion point in Montana:

(A) First 2,200 acre feet is divided; 75% to Wyoming - 25% to Montana.
(B) Next 1,200 acre feet is divided; 43% to Wyoming - 57% to Montana.
(C) Any excess flow is subject to future appropriation.

(A) Present Irrigation:

<table>
<thead>
<tr>
<th>Location</th>
<th>Acres Irrigated (acres)</th>
<th>1.1% x 31 days</th>
<th>Divisible Flow (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
<td>47,000</td>
<td>21,608 ac. ft. per day</td>
<td>1,198</td>
</tr>
<tr>
<td>Montana</td>
<td>18,400</td>
<td>6,655 ac. ft. per day</td>
<td>6,655</td>
</tr>
<tr>
<td>Total</td>
<td>65,400</td>
<td>28,263 ac. ft. per day</td>
<td>7,813</td>
</tr>
</tbody>
</table>

Water Requirement:

Maximum monthly use is estimated at 111 acre feet per acre:

<table>
<thead>
<tr>
<th>Location</th>
<th>Acres</th>
<th>Divisible Flow (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
<td>47,000</td>
<td>1,198</td>
</tr>
<tr>
<td>Montana</td>
<td>18,400</td>
<td>6,655</td>
</tr>
<tr>
<td>Total</td>
<td>65,400</td>
<td>7,813</td>
</tr>
</tbody>
</table>


A lengthy debate arose over the point of determining the divertible flow and the amount of water to be set up in the first block. Montana wanted the point of measurement to be at the state line, while Wyoming insisted it should be at the last diversion in Montana. When the mean divertible daily flow decreased to 1,000 acre feet per day or less, Wyoming wanted all the stream flow. As a final compromise, the point of measurement is to be at the last point of diversion in Montana, and the block of water is to be 2,000 acre feet per day divided; Wyoming - 75% and Montana - 25%.

This gives Wyoming a slight advantage in the method of measurement when stream flows are relatively high, but in case the tributaries in Montana are dry, this advantage would disappear, and in case of extremely low flows, it would work out to the advantage of Montana.

(B) Potential Irrigation:

<table>
<thead>
<tr>
<th>Location</th>
<th>Potential Acres (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming</td>
<td>15,000</td>
</tr>
<tr>
<td>Montana</td>
<td>17,000</td>
</tr>
<tr>
<td>Total</td>
<td>32,000</td>
</tr>
</tbody>
</table>

The original figures submitted by the Bureau differed from the above. Furthermore, it was intended to make the state line the place of measurement. As a result, the original computations were:

1,198 acre feet to be divided. Wyoming - 43% and Montana - 57%

According to the potential acres given above, the block should be 1,619 acre feet. (42,800 x 1.14 x 31 days = 1,619). To compromise the arguments that ensued concerning the place of measurement, it was finally arbitrarily agreed to leave the block at 1,200 acre feet divided; Wyoming - 43% and Montana - 57%.

Since this allotment is for potential development, and the right is provided to appropriate additional water in excess of 3,400 acre feet, (Art. V, Sec. 3) neither state is injured by fixing the block at 1,200 in place of 1,619 acre feet.

If the states so agree with the Compact, the Commission can accumulate additional data and make further adjustments if deemed necessary.
-5-

POWDER RIVER

Compact Provides:

Mean divertible daily flow is to be determined at the state line.
(A) First, 2,000 acre feet divided; 93% to Wyoming - 7% to Montana.
(B) Next 2,600 acre feet divided; 60% to Wyoming - 40% to Montana.
(C) Any excess flow is subject to future appropriation.

(A) Present Irrigation:

Acres irrigated in Wyoming (USBR) - - - - - - - - - - 56,500
Acres irrigated in Montana (US Census, 1932) - - - - - - - - - 2,195
Total acres - - - - - - - - - - - - - - - - - - - - - - - - - - 58,695
* (USBR reported no land irrigated in Montana. Army Engineers show 360 acres.
Therefore, the Census figures of 2,195 acres were used).

Water Requirements:

Max. monthly use as estimated at 1.1 acre feet per acre. Since the
mean divertible flow is to be determined at the state line, return flow
in Wyoming will be accounted for in the measurement of divertible flow,
but return flow in Montana will not. The estimated factor agreed upon to
balance this difference was 0.6 (that is 60% return flow in Montana).

Wyo., 56,500 acres x 1.1 - 62,150 acre feet per mo. = 97%
Mont., 2,195 acres x 1.1 x 0.8 - 1,932 acre feet per mo. = 3%
84,082 \div 31 days = 2,670 acre feet per day.

It was finally agreed to give Montana 38% and cut the block to 2,000 acre
feet per day, which is slightly to Montana's advantage.

(B) Potential Irrigation:

Acres in Montana (USBR) - - - - - - - - - - 45,300
Land rated by 1932 Census - - - - - - - - - - - - 2,195
Potential acres in Montana - - - - - - - - - - - - - - - - - - 43,105
Potential acres in Wyoming (USBR) - - - - - - 88,695

Water required for potential land will be:

Wyo., 46,600 acres x 1.1 - 50,160 acre feet per mo. = 57%
Mont., 43,105 acres x 1.1 x 0.8 - 33,351 acre feet per mo. = 43%
83,511 acre ft. per mo. \div 31 days = 2,689 acre ft. per day

Accurate data are not available on potential irrigation in either State.
Potential acreages shown by other state and federal agencies indicate that
Wyoming's ultimate development will exceed the above estimate of the USBR.
Further, as more new lands are put under irrigation the return flow in
Montana will undoubtedly exceed the 20% estimated above.

If return flow in Montana had been estimated at 30% in place of 20%, which
would be more nearly correct for a potential area as large as this, (43,105
acres), the results would have been:

Wyo., 46,600 acres x 1.1 - 50,160 ac. per mo. = 60.2%
Mont., 43,105 acres x 1.1 x 0.7 - 33,351 ac. ft. per mo. = 39.8%
83,511 ac. ft. per mo. = 60%

83,351 ac. ft. per month \div 31 days = 2,689 ac. ft. per day.

After weighing the different sources of information, and considering the
expected increase of return flow in Montana, it was the best judgment of
the Commission that this potential block should be fixed at 2,600 acre
feet per day divided, Wyoming, 60% and Montana, 40%.

57 (WY)
COMPACT PROVIDES:

Lands below intake shall be entitled to the beneficial use of the available residual flow on a pro rata basis of acreage irrigated. Residual flow after Montana and Wyoming have made full beneficial use, is allotted to North Dakota, subject to existing water rights in lower states.

ACREAGES:

Acres irrigated now on Yellowstone Main Stem and not including:

<table>
<thead>
<tr>
<th>Intercut. to basins (USBR)</th>
<th>North Dakota</th>
<th>Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential acres (USBR)</td>
<td>7,800</td>
<td>166,800</td>
</tr>
<tr>
<td>Ultimate development</td>
<td>53,100</td>
<td>584,800</td>
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</table>

RESERVOIRS BUILT IN YELLOWSTONE BASIN:

<table>
<thead>
<tr>
<th>Ac. Ft.</th>
<th>Ac. Ft.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarks Fork</td>
<td>5,150</td>
<td>32,860</td>
</tr>
<tr>
<td>Big Horn</td>
<td>682,680</td>
<td>682,680</td>
</tr>
<tr>
<td>Tongue</td>
<td>13,020</td>
<td>60,000</td>
</tr>
<tr>
<td>Powder</td>
<td>35,013</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>713,813</td>
<td>92,840</td>
</tr>
</tbody>
</table>

GRAND TOTAL ACREAGES IN ENTIRE YELLOWSTONE BASIN:

<table>
<thead>
<tr>
<th>Acres irrigated now (USBR)</th>
<th>Wyoming</th>
<th>Montana</th>
<th>North Dak.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percents</td>
<td>49</td>
<td>55</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Potential acres (USBR)</td>
<td>428,000</td>
<td>532,800</td>
<td>7,800</td>
<td>755,800</td>
</tr>
<tr>
<td>Percent</td>
<td>57</td>
<td>42</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>948,700</td>
<td>645,000</td>
<td>25,100</td>
<td>1,619,100</td>
</tr>
<tr>
<td>Percent</td>
<td>49</td>
<td>55</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>

DRAINAGE AREAS IN YELLOWSTONE BASIN IN SQUARE MILES:

<table>
<thead>
<tr>
<th>Wyoming</th>
<th>Montana</th>
<th>North Dak.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarks Fork</td>
<td>1,184</td>
<td>1,184</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>41.6%</td>
<td>41.6%</td>
<td>100%</td>
</tr>
<tr>
<td>Big Horn</td>
<td>18,289</td>
<td>4,985</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>91.0%</td>
<td>40.4%</td>
<td>100%</td>
</tr>
<tr>
<td>Tongue</td>
<td>1,645</td>
<td>3,796</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>30.2%</td>
<td>69.5%</td>
<td>100%</td>
</tr>
<tr>
<td>Powder</td>
<td>9,710</td>
<td>3,706</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>72.4%</td>
<td>27.6%</td>
<td>100%</td>
</tr>
<tr>
<td>Entire Basin</td>
<td>32,930</td>
<td>36,700</td>
<td>740</td>
</tr>
<tr>
<td>Percent</td>
<td>66.8%</td>
<td>52.1%</td>
<td>1.1%</td>
</tr>
</tbody>
</table>


58 (WY)
Message to Congress from President Roosevelt re: Establishment of Missouri River Basin Authority, Sept. 21, 1944, 78th Congress, 2nd Session 1944
MISSOURI RIVER BASIN AUTHORITY

On September 21, 1944, the President sent a message to Congress advocating the enactment of legislation creating an Authority to deal with all problems in connection with the development of the Missouri River Basin. The President also requested that renewed consideration be given to a study of the Arkansas and Columbia River Basins. See 90 Congressional Record 8220.

To the Congress of the United States:
I enclose a copy of a resolution adopted by all but one of the Missouri River States represented in a recent meeting of their Governors and the members of the Missouri River States Committee. In general, the resolution asks for executive and legislative action toward procuring a single, coordinated plan for the development of the Missouri River Basin "for the greatest benefit of its citizens, both present and future, and for the greatest benefit to the United States."

As the Congress knows, I have for many years advocated the establishment of separate authorities to deal with the development of certain river basins where several States were involved. The general functions and purposes of the Tennessee Valley Authority might well serve as a pattern for similar developments of other river basins. The Tennessee Valley Authority was charged by the Congress with the development of practically all of the factors which are important in establishing better living standards and a better life for the people throughout that great watershed.

The benefits which have resulted in the Tennessee River Valley include flood prevention, irrigation, increased electric power for farms and shops and homes and industries, better transportation on land and water, reforestation and conservation of natural resources, the encouragement of small businesses and the growth and expansion of new businesses, development and widespread use of fertilizers and improved agricultural methods, better education and recreational facilities—and many kindred improvements which go to make for increased security and greater human happiness.

The Congress has at all times retained the final authority over the Tennessee Valley Authority, for the Authority comes before the Congress each year to obtain appropriations to continue its work and carry out its plans.

I have heretofore suggested the creation of a similar authority for the development of the Arkansas River watershed from the Mississippi all the way west to its source in Colorado.

I have also suggested the creation of an authority to render a similar service in the Columbia River watershed, including the States of Washington, Oregon, Idaho, and Montana.

I now make a similar recommendation for the Missouri River Basin.

The resolution very properly asks that the legislation dealing with matters relating to the waters of the Missouri River Basin recognize that it is dealing with one river and one problem; and points out the necessity of a comprehensive development of the Missouri River, indicating that there can be no piecemeal legislative program. The resolution asks that "the Congress should recognize now the problem in its entirety as it affects the people of the Missouri Basin and their economic destiny and that of the United States."

I am in hearty accord with these principles. I hope that the Congress will give careful and early consideration to the creation of this Federal authority to consider the problem in its entirety, remembering always that any appropriations to carry out any plan are and will be within the complete control of the Congress, and that the interest of each of the States in the basin will, of course, be given full consideration. I am sure that
MESSAGES TO CONGRESS

none of the States in the Tennessee River Basin have lost any of their
civilization because of the creation of the Authority in that valley.
May I also ask that renewed consideration be given to a study of the
Arkansas and Columbia River Basins? If the fact has been established that
such legislation can do much to promote the welfare of the great mass of
citizens who live there—as well as their fellow citizens throughout the
United States.

I need hardly point out to the Congress, in addition, how helpful this
legislation will be in the creation of employment and in the stimulation
of industry, business, and agriculture throughout the areas involved, in
the days which will follow the end of the war.

THE WHITE HOUSE,
September 21, 1944.

FRANKLIN D. ROOSEVELT

PETROLEUM AGREEMENT BETWEEN THE UNITED
STATES AND GREAT BRITAIN

On August 24th President Roosevelt sent to the Senate for ratifi-
cation the petroleum agreement between the United States and
Great Britain which was signed in Washington, D. C. on August
8th. See 90 Congressional Record 7388.

August 24, 1944.

To the Senate of the United States:
To the end that the Senate may give its advice and consent to ratifica-
tion, if it approve thereof, I transmit herewith an agreement on petro-
leum between the Government of the United States of America and the
Government of the United Kingdom of Great Britain and Northern Ire-
land, signed in Washington August 8, 1944.

With the agreement I transmit for the information of the Senate the
report made to me by the Secretary of State relating thereto.

FRANKLIN D. ROOSEVELT.

[Enclosures: (1) Report of the Secretary of State; (2) agreement on
petroleum between the United States and the United Kingdom, signed
August 8, 1944.]

DEPARTMENT OF STATE,
Washington, August 24, 1944.

The President,
The White House:
The undersigned, the Secretary of State, has the honor to lay before
the President, with a view to its transmission to the Senate to receive the
advice and consent of that body to ratification, if his judgment approve
thereof, an agreement on petroleum between the Government of the United
States of America and the Government of the United Kingdom of
Great Britain and Northern Ireland, signed in Washington August 8, 1944.

The agreement expresses the mutual understanding of the two Govern-
ments with respect to certain principles governing international trade in
petroleum. These principles have relation to (1) the making available of
adequate petroleum supplies to the nationals of all peaceable countries at
fair prices and on a nondiscriminatory basis, subject to such collective
security arrangements as may be established; (2) the development of pet-
roleum resources with a view to encouraging the sound economic ad-
ancement of producing countries; (3) equal opportunity in the acquisi-
tion of exploration and development rights in areas not now under con-
cession; (4) respect for valid concession contracts and lawfully acquired
rights; and (5) safeguarding the production and distribution of petro-
leum from restrictions inconsistent with the principles and purposes of the
agreement.
Discussion of the Yellowstone River Compact and Its Effect Upon the Water Users of the Upper Tongue River Basin in Wyoming, E.C. Gwillim, Jan. 22, 1949
Discussion
of the
Yellowstone River Compact
and
Its Effect Upon the Water Users
of the
Upper Tongue River Basin
in Wyoming

By E. C. GWILLIM
Irrigation Engineer

January 22, 1949

SHERIDAN, WYOMING
THE YELLOWSTONE RIVER COMPACT AND ITS
PROPOSED ADMINISTRATION OF THE WATERS OF TONGUE
RIVER BASIN IN THE STATE OF WYOMING

This report on the Yellowstone River Compact was prepared at the request of the Tongue River Basin Water Users Association by Edward C. Gwillim, Irrigation Engineer, Sheridan, Wyoming.

Information used in compiling this report was obtained from the following agencies, reports and individuals: U. S. Geological Survey—Water Resources Branch, Sheridan; United States Weather Bureau, Sheridan; Tabulation of Adjudicated Water Rights compiled by the Wyoming State Board of Control; Senate Document No. 191, 78 Congress 2nd Session, Missouri River Basin; Water Resources Survey, Montana by Montana State Engineer's Office; Water Resources of Yellowstone River Basin in Wyoming by Wyoming State Water Conservation Board; Minutes of hearing on the Compact, Miles City, August 11, 1944; Minutes of a meeting on the Compact Sheridan, Wyoming, October 28, 1944; Bureau of Reclamation at Billings, Montana, December 27, 1948; Sixteenth Census of the United States 1940, Irrigation of Agricultural Lands; The Parkman Irrigation District by Fields, Fellows and Hinderlider, Engineers; Application by Montana State Water Conservation Board on P. W. A. Project, Montana 1054-D, Tongue River Project; and the following persons, Alonzo R. Shreve, President of the Tongue River Basin Water Users Association and a land owner in Tongue River Basin, Wyoming; Archie Ewoldsen, Secretary of the Tongue River Basin Water Users Association; State Senator N. V. Kurtz, attorney; E. J. Johnson, Water Superintendent of Water Division No. 2; R. E. McNally, attorney and Henry Burgess, attorney and member of the Wyoming State Legislature, all of Sheridan, Wyoming.
THE YELLOWSTONE RIVER COMPACT AND ITS PROPOSED ADMINISTRATION OF THE WATERS OF TONGUE RIVER BASIN IN THE STATE OF WYOMING

CONCLUSIONS AND RECOMMENDATIONS:

1. The citizens of Tongue River Basin, Wyoming are opposed to the Yellowstone Compact because they do not believe adequate information of the physical conditions in regard to Tongue River Basin, Wyoming were obtained before the compact was drawn.

2. There are now shortages of irrigation water in Wyoming each year during the irrigation season and regulation of ditches is required. This shortage may be increased if the compact is accepted.

3. It is questionable if any appreciable amount of the determined divertible flow, if it is less than 308 cubic feet per second would reach the lowest point of diversion under existing conditions.

4. Further studies to determine accurately the irrigated and irrigable acreage, stream discharge, return flow, stream losses, water use, water requirements and land classifications should be completed, before Wyoming considers a division of the water of Tongue River Basin with Montana.

5. Field reconnaissance of the claims of Montana to irrigable and irrigated acreage is advisable to determine which lands are irrigated from Tongue River.

6. Potential storage sites should be studied.

7. Estimates indicate there is, except in dry years, sufficient annual discharge to meet the demands of each state. Stream regulation through construction of storage is required to overcome seasonal deficiencies.

8. Measuring stations should be installed on most of the minor streams of Tongue River Basin, Wyoming, so that more accurate estimates of stream flow can be made.

9. The practicability of attempting to use the formula in the compact for determining the daily divertible flow should be shown. We do not believe this formula is workable in Tongue River Basin, Wyoming.

10. The wording of the compact should be simplified so that it is understandable to laymen.

11. The place and method of measurement for the division of the stream flow between Montana and Wyoming should be clearly defined.

12. The Compact in so far as it pertains to Tongue River Basin, Wyoming should not be considered at this time because it is not based on complete information, and further the Bureau of Reclamation will not complete their studies until 1950.
THE YELLOWSTONE RIVER COMPACT AND ITS PROPOSED ADMINISTRATION OF THE WATERS OF TONGUE RIVER BASIN IN THE STATE OF WYOMING

HISTORY:
A Yellowstone River Compact has been under discussion and consideration since the first Congressional authorization in 1932. The first discussions were between Montana and Wyoming. The first tentative draft was prepared in Denver, Colorado in October 1942. A revised draft was presented at Billings, Montana, on December 22, 1942 to the joint compact commission, which consisted of representatives of Montana, North Dakota, and Wyoming. The compact with additional revisions was approved and agreed to by all except one of the representatives of the three states. The final draft of the compact was prepared by representatives of federal agencies, namely: the United States Bureau of Reclamation and the United States Federal Power Commission. "A Bill for An Act to provide for the ratification and approval in the Yellowstone River Compact" was presented to the 1945 Wyoming Legislature. The compact was amended to exclude Tongue and Powder Rivers and was so passed by the Wyoming Legislature. The states of Montana and North Dakota would not accept the compact as amended. The original compact was presented to the 1945 Wyoming Legislature and was approved by that body, but was vetoed by the Governor. Many interested persons and some compact commissioners favor having the bill introduced in the 1949 legislature for ratification. The legislature of Montana and North Dakota have ratified the compact as approved at Billings, Montana on December 22, 1942.

PURPOSE:
This report is prepared to point out to the interested water users in the Tongue River Basin, Wyoming, the legislators and others concerned the need of further studies of the physical factors, such as the present irrigated areas, irrigable areas, stream flows and water requirement before a Yellowstone River compact is agreed to by the Wyoming Compact Commissioners and presented to the legislature.

SCOPE:
The compact embraces the waters of the following streams which are tributaries of the Yellowstone River, namely: Clarks Fork River; Big Horn River, (exclusive of the Little Horn River), Tongue River; Powder River, (exclusive of Little Powder River) and the Yellowstone—Main Stem (near the Montana-North Dakota State Line).
This report will be largely limited to that portion of Tongue River in Wyoming.

COMPACT:
The Compact, page 6, Article V, paragraph 3 explains the division of the flow of Tongue River as follows:
"Each day during the period May 1st to September 30th, inclusive of each year, the first 2,200 acre-feet of the mean divertible daily flow of the Tongue River, determined at the lowest point of diversion on the..."
stream, shall be divided seventy-two (72) per cent to Wyoming and twenty-eight (28) per cent to Montana; and the next 1,200 acre-feet of mean divertible daily flow shall be divided forty-three (43) per cent to Wyoming and fifty-seven (57) per cent to Montana; Provided, That either State may temporarily divert, consume, or store for its beneficial use any unused part of the above flows allotted to the other, but no continuing right to such unused flows shall be established thereby. Unappropriated divertible daily flows in excess of 3,400 acre-feet occurring during the period May 1st to September 30th, inclusive, and all presently unappropriated flows occurring during the period October 1st to April 30th, inclusive, of each year, shall be subject to future appropriation for beneficial use within the Yellowstone River Basin in Wyoming, Montana, and North Dakota in accordance with the laws of said respective States.

The provisions herein, and each of them, and in particular the allotments, and each of them, shall be subject to the following conditions:

(a) For the purpose of determining the engineering feasibility, particularly as to water supply, of any project or program of the United States for the further conservation and utilization of the waters of the Tongue River, particularly the storage of waters in the State of Wyoming for beneficial use in that State, the allotments hereinabove made, and each of them, may be assumed as the measure of an equitable apportionment of the waters of the Tongue River between the States of Wyoming and Montana to satisfy, as of the date of this Compact, those established rights for beneficial consumptive uses which are exercised beneficially and which are valid under the laws of the States of Wyoming or Montana, as the case may be.

(b) Such provisions and allotments shall become operative either ten (10) years from and after the date that this Compact is ratified by the Congress; or on June 15 of the year in which water is available for release through any adequate distributary system, other than the stream bed, from the Tongue River Reservoir of the Montana Water Conservation Board for beneficial uses in Montana, the amount of water so released, however, shall be equal to at least one-half of the working capacity of such reservoir; or on June 15 of the year in which water is available for release through any adequate distributary system, other than the stream bed, if such be necessary, from any storage reservoir constructed in Wyoming to conserve for beneficial uses in Wyoming the waters of the Tongue River, the amount of water released, however, shall be equal to at least one-half of the working capacity of such reservoir; or whichever of said dates is the earlier."

The Divertible Flow is to be determined as set forth in the Compact under Article II, paragraph 1, page 3 as follows:

"1. The term "Divertible Flow" means the quantity of water that could be diverted from the stream flow above a designated point of measurement during a specified period of time. It is comprised of three elements: (a) the total net inflow to storage; (b) the total diversions; and (c) the remaining flow in the stream at the designated point of measurement for which the divertible flow is being determined. It is computed as follows:

---
The algebraic sum of:

(a) The quantity of water (in acre-feet) that flowed into reservoirs situated above the point of measurement during the specified period of time; less the outflow and diversions made directly from reservoirs (in acre-feet) during the same period; plus

(b) The quantity of water (in acre-feet) that was diverted from the stream above the point of measurement (including diversions made directly from reservoirs) during the specified period of time; plus

(c) The quantity of water in the stream (in acre-feet) that flowed past the point of measurement for which divertible flows are being determined during the specified period of time.

A state, before agreeing to a compact for the division of its great natural resource—water—with another state or states, should be certain that all basic information has been obtained. It is questionable if accurate and adequate information was obtained before the Yellowstone River Compact was written.

The compact should be written in clear, concise language so that the terms can be clearly understandable to the people most vitally concerned, the Water Users.

**WATER SUPPLY:**

All of the stream-flow of Tongue River originates in Wyoming except for intermittent runoff from small creeks and streams in Montana.

Stream gauging have been recorded intermittently on some streams for many years. These gaugings were not sufficient to make accurate estimates of the total water supply of the Tongue River Basin in Wyoming. During recent years stream flow measuring stations have been installed on the larger tributaries at selected points. From the record of these stations the yearly annual discharge can be accurately calculated. These stations are located as follows: Tongue River near the highway bridge on the Sheridan-Birney road about 3 miles below Acme, Tongue River at the mouth of the canyon above Dayton, W. Creek at Eaton’s Ranch, Big Goose about 13 miles southwest of Sheridan on T-T Ranch and Little Goose Creek in canyon above Big Horn near the Watts-Smyth Ranch, North Fork Tongue River and South Fork of Tongue River on top of the Big Horns. Estimates of stream flows on Columbus, Amsden, Little Tongue, Beaver, Rapid and other smaller streams must be made as their confluence with the larger streams is below the above mentioned gauging stations, except the one near Acme. Since the topography, precipitation, temperatures and other physical conditions along the smaller streams are not comparable to those of the larger streams, estimates of the discharge of the smaller streams are subject to error.

The following tables show the average annual discharge for a period of record on the streams for which complete yearly records are available.

---7---
Under the terms of the compact Wyoming and Montana divide the first 2200 acre-feet (1100 cubic feet per second)** of the daily divertible flow, 28 per cent to Montana and 72 per cent to Wyoming. Table I shows the flow near the Wyoming-Montana Line and is the depleted flow after diversions for irrigation in Wyoming, plus increment to the stream from return flow. The total amount of water originating in Wyoming cannot be computed without obtaining reasonably accurate figures on the acres irrigated, net consumptive water use per acre, losses through conveyance, evaporation, and increment to the streams for reuse above the Acme gauging station.

Assuming that there is 2200 acre-feet of divertible flow originating in Wyoming daily during the period of record shown in Table I, Wyoming would be required to close a sufficient number of headgates to deliver the allotted discharge to Montana. The use of water for irrigation in Wyoming would have to be restricted in variable amounts during each of the six years to deliver the amount allotted to Montana. “Throughout the lower area in Wyoming water for irrigation is diverted from the tributary streams. Because of the large acreage under irrigation many of the streams are completely depleted.”****

### Table I

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>31-32</td>
<td>130.0</td>
<td>84.5</td>
<td>14.2</td>
<td>3.5</td>
<td>6.1</td>
<td>288.3</td>
<td>55.6</td>
<td>321.9</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>82.0</td>
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*Period October 1 to September 30, inclusive.
**One cubic foot per second is equal to approximately 2 acre feet per day. 2200 acre feet equals 1100 cubic feet per second—33% of 2200 is 616 acre feet and 72% is 1584 acre feet.

### Table II

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This table shows the total annual discharge after depletion by diversions for irrigation. Shortages did occur in Wyoming for this period, during the irrigation season, and if Montana is to receive its full allotment, further regulation of the Wyoming diversions will be required. These shortages were recognized in the Missouri River Plan, which points out the need for supplemental water for 38000 acres in Wyoming.

When the discharge of the depletions flow at the Decker or Acme stations (Tables I and II) is under 28% of the divertible flow, 308 Cu. Ft. Sec. (616 A.F.) adjustments must be made in the amounts being diverted on Tongue River and tributaries in Wyoming.

**TABLE III**

The following table gives the year, date depleted flow fell below 308 Cu. Ft. per second, and the number of days by months the flow, during the irrigation season, was below 308 Cu. Ft. per second and the annual precipitation at Sheridan.

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<td>26</td>
<td>31 30 37 Aug. 17-18</td>
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<td>17</td>
<td>31 30 99 Aug. 20...</td>
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<td>31 30 99 Aug. 20...</td>
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<td>31</td>
<td>31 30 107 Sept. 12...</td>
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<td>31 30 98 Aug. 19...</td>
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<td>1938 July 27...306</td>
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<td>31 30 66 Aug. 14...</td>
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<td>Total</td>
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<td>1947 July 19...304</td>
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Table III shows that during the 7 years of record at the Decker Station, and 9 years at the Acme Station there is not one year when the deplitted flow passing either station, during the irrigation season, was not under 308 cubic feet per second for 65 days or more. The number of days annually the flow was below 308 cubic feet varied from 63 to 137 days, the average for the 16 years of record being 83. There is no stream flow diverted below the Acme station in Wyoming. The daily shortage to give Montana its allotment under the compact of 308 cubic feet per second, will vary from 305 to 2 cubic feet per second. When the daily deplitted flow is below 308 cubic feet per second Wyoming will have to supply Montana with 28 per cent of the determined divertible flow. Shortages now occur in Wyoming during three months of the irrigation season. If Wyoming agrees to the compact these shortages will be increased by 28 per cent.
The distance by stream channel from the Acme station to the lowest point of diversion is about 175 miles. The velocity of the stream flow will approximate about one and one-third miles per hour or it will require five and one-half days to deliver water to the lowest diversion. As the amount of flow decreases the velocity decreases, while the proportional loss from seepage, evaporation and transpiration increases. It's problematical how much of the total flow of 305 cubic feet per second would reach the lowest point of diversion, and for lesser flows its doubtful if any water would arrive at its proposed point of use.

The following tables give the annual discharge of various streams in Tongue River Basin, Wyoming by waters years, average by months, and totals for the irrigation and non-irrigation season.

**TABLE IV**

Tongue River near Dayton

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**TABLE V**

Goose Creek above Cave Creek

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*Highline ditch diverts above this station.
**Total for 11 months.
†Includes releases from Park, Dome Lake and City Storage. City intake and PK ditch divert above measurement.

---10---

90 (WY)
TABLE VI

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TABLE VII

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<td>11.5</td>
<td>5.6</td>
<td>3.5</td>
<td>2.0</td>
<td>35.0</td>
<td>10.3</td>
<td>45.3</td>
<td>45.3</td>
<td>45.3</td>
<td>45.3</td>
<td>35.0</td>
<td>10.3</td>
<td>45.3</td>
<td>45.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42-43</td>
<td>10.7</td>
<td>15.8</td>
<td>6.7</td>
<td>4.5</td>
<td>2.5</td>
<td>39.9</td>
<td>10.4</td>
<td>50.3</td>
<td>50.3</td>
<td>50.3</td>
<td>50.3</td>
<td>39.9</td>
<td>10.4</td>
<td>50.3</td>
<td>50.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43-44</td>
<td>20.9</td>
<td>21.8</td>
<td>5.3</td>
<td>4.3</td>
<td>2.1</td>
<td>54.2</td>
<td>4.5</td>
<td>58.7</td>
<td>58.7</td>
<td>58.7</td>
<td>58.7</td>
<td>54.2</td>
<td>4.5</td>
<td>58.7</td>
<td>58.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44-45</td>
<td>8.4</td>
<td>18.5</td>
<td>7.0</td>
<td>5.0</td>
<td>2.2</td>
<td>41.1</td>
<td>3.8</td>
<td>44.9</td>
<td>44.9</td>
<td>44.9</td>
<td>44.9</td>
<td>41.1</td>
<td>3.8</td>
<td>44.9</td>
<td>44.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-46</td>
<td>10.1</td>
<td>20.4</td>
<td>8.7</td>
<td>3.9</td>
<td>2.5</td>
<td>44.6</td>
<td>8.7</td>
<td>53.3</td>
<td>53.3</td>
<td>53.3</td>
<td>53.3</td>
<td>44.6</td>
<td>8.7</td>
<td>53.3</td>
<td>53.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46-47</td>
<td>15.8</td>
<td>15.9</td>
<td>7.5</td>
<td>4.5</td>
<td>3.6</td>
<td>45.1</td>
<td>6.1</td>
<td>51.2</td>
<td>51.2</td>
<td>51.2</td>
<td>51.2</td>
<td>45.1</td>
<td>6.1</td>
<td>51.2</td>
<td>51.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>59.2</td>
<td>137.7</td>
<td>44.1</td>
<td>25.7</td>
<td>19.6</td>
<td>330.0</td>
<td>45.0</td>
<td>345.3</td>
<td>345.3</td>
<td>345.3</td>
<td>345.3</td>
<td>330.0</td>
<td>45.0</td>
<td>345.3</td>
<td>345.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>13.3</td>
<td>18.2</td>
<td>6.3</td>
<td>4.2</td>
<td>2.3</td>
<td>42.9</td>
<td>6.4</td>
<td>49.3</td>
<td>49.3</td>
<td>49.3</td>
<td>49.3</td>
<td>42.9</td>
<td>6.4</td>
<td>49.3</td>
<td>49.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The total average annual discharge of Tongue River, Wolf, Big Goose, and Little Goose Creeks comprises most of the water supply of Tongue River Basin. The yearly total discharge of these streams plus the yearly discharge of minor streams such as Columbus, Smith, Amsden, Soldier, Rapid, and Beaver Creeks and Little Tongue River should approximate the total amount of water originating in Tongue River Basin, Wyoming. There are no stream measuring stations on the minor streams, therefore it is not possible to calculate accurately the total discharge from Tongue River Basin in Wyoming. Assuming that the total annual discharge of all the minor streams is 40,000 acre-feet per year, the total amount of depleted flow originating in the basin will be approximately as shown in Table VIII.

TABLE VIII

<table>
<thead>
<tr>
<th>Stream</th>
<th>Average Annual Discharge A. F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tongue</td>
<td>Non-</td>
</tr>
<tr>
<td>Wolf</td>
<td>7</td>
</tr>
<tr>
<td>Big Goose</td>
<td>11</td>
</tr>
<tr>
<td>Little Goose</td>
<td>7</td>
</tr>
<tr>
<td>Minor Tributaries</td>
<td>None</td>
</tr>
<tr>
<td>Total average discharge Tongue River Basin above the measuring station near Acme, Wyoming</td>
<td>266.7</td>
</tr>
</tbody>
</table>

Measured discharge April 1 to September 30th was 21,880 A. F. Estimated flow October 1 to March 31 was 3,000 A. F. making a total for the year 24,880 A. F.

**Includes diversion from Cross Creek and releases from Big Horn and Park Reservoirs.

***For 6 months.

****Estimated.

—11—
The years of record for all of the streams in the preceding tables were years of above average precipitation at Sheridan, as shown in the following table.

TABLE IX

Table showing the number of years of record of stream measurement, mean precipitation at Sheridan, average yearly precipitation for the period of measurement and the difference between the mean and the average of the period of measurement.

<table>
<thead>
<tr>
<th>Years of Stream Flow Records</th>
<th>Average Precipitation for This Period</th>
<th>Difference Plus Minus</th>
<th>Percent Difference Plus Minus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tongue 1941-47</td>
<td>15.06</td>
<td>30.38</td>
<td>5.22</td>
</tr>
<tr>
<td>Wolf 1945-47</td>
<td>15.06</td>
<td>19.32</td>
<td>4.36</td>
</tr>
<tr>
<td>Big Goose 1934-47</td>
<td>15.06</td>
<td>17.95</td>
<td>2.95</td>
</tr>
<tr>
<td>Little Goose 1941-47</td>
<td>15.06</td>
<td>19.32</td>
<td>4.36</td>
</tr>
<tr>
<td>Minor Streams None</td>
<td>15.06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assuming that the runoff varies directly in proportion to the precipitation, which is doubtful, then from Table IX the average annual discharges, shown in Tables VIII, when adjusted to the mean precipitation at Sheridan would become in 1000 Acre Feet:

<table>
<thead>
<tr>
<th>Stream</th>
<th>Annual Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tongue River</td>
<td>112,500</td>
</tr>
<tr>
<td>Wolf Creek</td>
<td>10,500</td>
</tr>
<tr>
<td>Big Goose</td>
<td>9,500</td>
</tr>
<tr>
<td>Little Goose</td>
<td>9,500</td>
</tr>
<tr>
<td>Minor Streams</td>
<td>0</td>
</tr>
<tr>
<td>Total adjusted annual undepleted flow of Tongue River Above the Acme Station</td>
<td>237,400</td>
</tr>
</tbody>
</table>

This figure is approximately 69000 acre feet less than the average for the years of above normal precipitation.

The following analysis of the discharges of Tongue River is taken from "Water Resources of Yellowstone River Basin in Wyoming," pages 34 and 35:

"The mean annual undepleted, present depleted, and future depleted runoffs from the Tongue River Basin in Wyoming are summarized below:

Mean annual undepleted flow Tongue River at Decker Montana (1927-28 to 1935-36) = 444,300 A. F. = 78%
Long time mean annual undepleted flow Tongue River at Decker (Compared with Powder River at Arvada) = 570,000 A. F. = 100%
Present annual use 96,650 acres irrigated at 1.6 ac. ft. = 148,500 A. F. = 25.2%
Mean annual present depleted runoff from Wyoming = 426,500 A. F. = 74.8%
Future annual use (125,650 acres irrigated plus irrigable at 1.6 ac. ft.) = 201,000 A. F. = 35.3%
Mean annual future depleted runoff from Wyoming = 369,000 A. F. = 64.7%

*Compiled under the direction of the Wyoming State Engineers Office and Wyoming Water Conservation Board, September 1938.
The long time mean annual undepleted runoff is about 570,000 acre-feet. At the present time Wyoming irrigators are using 143,500 acre-feet or about 25.2% of Wyoming's water production on the Tongue River Basin. This leaves a mean annual present depleted runoff of about 426,500 acre feet or 74.8% of the water which originates in Wyoming.

The total future annual use in Wyoming will be about 201,000 acre feet or 85.8% of Wyoming's production. This will leave a mean annual future depleted runoff of 89,000 acre feet or about 14.7% of Wyoming's production.

The annual undepleted, present depleted, and future depleted runoffs from the Tongue River Basin in Wyoming for a minimum flow year are summarized below:

Minimum annual undepleted runoff from Tongue River Area in Wyoming (1933-34) ---------197,500 A. F.---100%
Present annual use (95,650 acres irrigated at 1.5 acre-feet) ___143,500 A. F.---72.6%
Minimum annual present depleted runoff ______54,000 A.F.---27.4%
Future annual use 125,650 acres (irrigated plus irrigable) at 1.6 acre feet ______201,000 A. F...
Minimum annual future depleted runoff (3,500) A. F.---Shortage

The minimum annual undepleted runoff from Wyoming was about 197,500 acre feet in 1933-34. The present use of about 143,500 acre feet in Wyoming is about 72.6% of the minimum undepleted runoff from Wyoming. If all the irrigated and irrigable lands had been irrigated in that year the water requirement in Wyoming would have been about 201,000 acre feet. In other words, with full development there would have been a water shortage of about 3,500 acre feet in a year like 1933-34."

This analysis by the State Water Conservation Board was prepared from records which were incomplete and had to be reconstructed in some cases. Incomplete data and the discharges given in Tables I to VII are computed from actual measurements. However, the latter records are of short duration for long time estimating.

Table VIII shows the average annual discharge during the irrigation season at the measuring stations on major tributaries of Tongue River, at the base of the mountains, plus the estimated flow of the minor streams, to be 286,700 acre feet.

Table II shows the average annual discharge for the irrigation season at Acme Station as 222,500 acre feet, a difference of 34,200 acre feet. This difference represents the depleted flow in Tongue River Basin by diversions and natural losses. During the 10 year period 1938 to 1947 the average annual precipitation was 15.28 inches or 3.19 inches above normal. The annual precipitation during 1944 was 9 inches and 1945 was 8 inches above normal. The ten year average for the five irrigation months was 10.76 inches. It is reported that many farmers did not use any water during many of these years. The distributed irrigation requirements. Rains which cause flash runoff below the measuring station will be reflected at the Acme Station. It has been shown that during the ten year period 1938-1947 the precipi-
tation was above normal and during this period there were shortages in the available water supply to irrigators in Wyoming. This shortage is much more tragic when the precipitation is below normal as it was for the four year period 1933 to 1936. During this period the average annual precipitation was 11.74 inches or 79 per cent of normal. During the year 1934 the discharge of Big Goose Creek at the T-T Ranch for the five irrigation months was 15,800* acre feet per second or only 25.8 per cent of the annual average for the 11 year period 1936-1947 as shown in Table X.

The following are the monthly measured flows at Big Goose Station for the irrigation season 1934 in acre feet.

<table>
<thead>
<tr>
<th>Month</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug.</th>
<th>Sept.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>2800</td>
<td>3000</td>
<td>1800</td>
<td>600</td>
<td>700</td>
<td>15,800</td>
</tr>
</tbody>
</table>

Big Goose Creek supplies about 22 per cent of the total inflow to Tongue River Basin, Wyoming during the irrigation season. Therefore, from Table X the total inflow to the basin in 1934 during the irrigation season was approximately 1.17 acre feet per acre or about 44 per cent of the irrigation requirement. This was a very low water year, but it is years such as 1934 that it would be difficult for Wyoming farmers to give away any of their short water supply. The Wyoming Water Conservation Board estimates the annual depletion by consumptive use as 143,000 acre feet. These variations clearly show the need for further investigations.

WATER SHORTAGES:

The following tables show the water shortages.

**TABLE X**

Average measured and estimated runoff by streams to Tongue River Basin in Wyoming by months during the irrigation season in acre feet.

<table>
<thead>
<tr>
<th>Stream</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug.</th>
<th>Sept.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tongue River</td>
<td>37,200</td>
<td>46,500</td>
<td>16,700</td>
<td>7,200</td>
<td>6,100</td>
<td>113,400</td>
</tr>
<tr>
<td>Goose Creek</td>
<td>18,400</td>
<td>28,600</td>
<td>7,800</td>
<td>2,000</td>
<td>2,600</td>
<td>59,300</td>
</tr>
<tr>
<td>Wolf Creek</td>
<td>5,200</td>
<td>9,600</td>
<td>3,400</td>
<td>900</td>
<td>600</td>
<td>21,100</td>
</tr>
<tr>
<td>Little Goose</td>
<td>13,300</td>
<td>16,200</td>
<td>6,300</td>
<td>4,200</td>
<td>2,800</td>
<td>42,600</td>
</tr>
<tr>
<td>Minor Streams</td>
<td>9,000</td>
<td>11,000</td>
<td>4,500</td>
<td>2,000</td>
<td>2,000</td>
<td>30,600</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>84,500</td>
<td>111,800</td>
<td>36,700</td>
<td>17,300</td>
<td>14,000</td>
<td>266,600</td>
</tr>
</tbody>
</table>

**First Block by the**

| Compart         | 88,000| 66,000| 66,200| 66,200| 66,000| 660,000|
| Surplus         | 15,200| 45,800|       |       |       | 61,400 |
| **Shortage**    | 28,500| 50,900| 51,400|       |       | 130,800|

The above totals by months approximates the monthly divertible flow of Tongue River. There is surplus during May and June, and shortages during July, August and September. Converting these shortages from a monthly to a daily basis, the average shortage for each day of the three months in acre feet is shown in the following table.

---

*Water resources Yellowstone River Basin, Wyoming.
*Estimated.
**2,500 acre feet multiplied by days in months.
TABLE XI

<table>
<thead>
<tr>
<th>July</th>
<th>Day</th>
<th>A. F.</th>
<th>August</th>
<th>Day</th>
<th>A. F.</th>
<th>Sept.</th>
<th>Day</th>
<th>A. F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>25,500</td>
<td>922</td>
<td>1,248</td>
<td>50,000</td>
<td>1,642</td>
<td>558</td>
<td>51,400</td>
<td>1,713</td>
<td>487</td>
</tr>
</tbody>
</table>

Montana would receive 25 percent in Acre Feet
Acre Feet 349 136

Wyoming would receive 22 percent in Acre Feet
Acre Feet 402 351

Table X shows the measured runoff from Tongue River Basin in Wyoming except for a few diversions above the measuring stations. Table XI represents approximately the divertible daily flow to be divided between Montana and Wyoming as shown in the compact. No allowance is made for stream losses or increment to the stream, as studies have not been made to determine them.

IRRIGATED AREAS:

There are adjudicated water rights in Tongue River Basin in Wyoming for approximately 95,000 acres. Priorities apparently were not given consideration when the compact was agreed to. The portion of this acreage that is actually irrigated is not definitely known. The Bureau of Reclamation estimates that approximately 60,000 acres are irrigated.** The 1940 Census gives 72,222 acres irrigated in Tongue River Basin Wyoming in 1939." The records in the Assessor's office, Sheridan County, shows 55,000 acres irrigated on Tongue River. This acreage is probably low as many people fail to report complete acreage under irrigation.

The Bureau of Reclamation is re-checking its figures.*** With such variance in the estimated irrigated acreage in Wyoming it is evident that further studies are needed before a compact is agreed upon, as the division of the divertible flow is predicated on the irrigated and irrigable acreage in each state.

The potential irrigable land in Wyoming in Tongue River Basin is not known. Estimates of 30,000 acres had been made.† Senate document No. 191† states, "Limited water supply on Tongue River in Wyoming precludes additional irrigation there." This is an erroneous statement, as shown by records. There are irrigable lands east of Parkman, Wyoming, additional lands on Wolf Creek, south of Tongue River near Ranchester, and in other locations. It has been estimated by persons familiar with these areas that they embrace about 15,000 acres.

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*State of Wyoming Tabulation of Adjudicated Water Rights in Division No. Two.
**Mr. Sloan, U. S. B. R. speaking at a hearing in Sheridan, October 24, 1944.
***Sixteenth Census U. S. 1940—Page 642.
††Stated by Mr. Myers at conference with Bureau officials in Billings, Mont., December 27, 1948.
††76th Congress—2nd session—Senate Document 191.
The feasibility of construction to convey water to these lands and the soil fertility has not been determined. The Bureau of Reclamation has stated that they will survey these areas. If the surveys result in a favorable report, the land should be considered in the compact.

The irrigated areas in Montana were not determined accurately before the compact was drawn. Mr. Sloan estimated the irrigated areas in Montana to be some 15,000 or 16,000 acres.*** His statement follows: "There are 60,000 acres now irrigated on the Tongue River in Wyoming and 15,000 or 16,000 in Montana. That formula has been drawn up on these figures." Montana estimates that there are 22,136 acres of irrigated land in Tongue River Basin.**** Of this amount probably 6000 acres are on tributary streams and do not use water direct from Tongue River. The 1940 Census shows 13,880 acres irrigated in 1939 on Tongue River in Montana.***** Difficulty in maintaining diversion dams in Tongue River has restricted irrigation in both Wyoming and Montana. It is estimated there are 7,479**** acres of potential irrigable land in Tongue River Basin Montana. Much of this land is on tributaries and could not use Tongue River Water. Senate document 191 shows 26,100 acres of irrigable land. Most of this land extends like a shoestring along Tongue River and will be irrigated by pumping. The economy of the Tongue River Basin is largely livestock. Under normal prices, livestock raisers cannot afford to pump water for hay production. It is certainly very evident that Wyoming should have more detailed information before giving away what we now have, and the Montana estimates should be re-verified.

FIELD INVESTIGATION:

Before the compact was drawn few, if any, field investigations in Tongue River Basin were made either by the State Engineers Office, Bureau of Reclamation, or by local people. For four years, 1941-1944 inclusive, the State Engineer, Canal Companies and County Commissioners cooperated with the U. S. G. S. Water Resources Branch in Big Horn Basin measuring water diverted and net water used. The acreage under the large irrigation districts was checked and the Bureau of Reclamation had complete data on its projects. This survey covered 85 per cent of the land on the Big Horn River. On the contrary the State Engineer has made no field investigations in the Tongue River Basin in Wyoming. The Bureau of Reclamation is reported to have estimated the irrigated land on Tongue River from aerial photographs. The State Engineer, after a special invitation, spent a few hours in driving over Tongue River Basin in Wyoming, and this was after the compact had been approved by the Compact Commissioners. The residents of Tongue River Basin in Wyoming are not satisfied with the division of the water of the basin with Montana. They ask, why has the State Engineer failed to make studies of irrigation in this basin? Are not the people in Sheridan County entitled to the same service from the State Engineer as those in Big Horn Basin? The Bureau of Reclamation has assured the residents of Tongue River Basin in Wyoming that it is now and will continue to make studies in Wyoming.


Meaning formula in compact for division of divertible flow.


___16___
The Montana State Engineer and the State Water Conservation Board of Montana are making detailed surveys of the irrigated and irrigable lands in Yellowstone Basin in Montana. They have completed the Survey of Tongue River Basin, Montana and know where of they speak. Why can't Wyoming protect their interests by carrying on field investigations? It is repeatedly stated that the compact method of dividing water between states is much cheaper than by litigation. That's agreed, but it may not be cheaper if we let this natural resource—water—be given away to be re-captured by another state.

The people of Big Horn Basin want the compact approved by the Wyoming Legislature. It is not a fact that about 50 per cent of their irrigated lands are now in Federal projects and an adequate water supply is assured them from two big storage reservoirs? Additional development in Big Horn Basin is assured by the Bureau of Reclamation and these projects have already been accurately surveyed and the facts regarding them are known. The planning on this side of the Big Horns has not yet reached that stage. Under the compact—Big Horn River—the division is 90% to Wyoming and 10% for Montana. The net use of water in the Big Horn Basin is about 2.75 acre feet annually of which 10% is 3 1/2 inches or about three-fifths of an inch per month during the irrigation season. The use in Tongue River Basin is 2.65 A. F. annually of which 28% is about 9 inches or 1.8 inches per month. How would the Basin people feel toward the compact if they were losing 28 1/2 of their water or 9 inches per acre of their irrigation supply? With the completion of the Boysen Dam an adequate water supply is assured for practically all irrigated land on the Big Horn River. The people of Tongue River do not have such insurance. They can only hope storage reservoirs might be constructed in the future.

The water users in Tongue River Basin, Wyoming can't understand why they are being asked to give up 28 1/2 of the first 2200 acre feet of divertible flow, when just across the line in Montana there is a reservoir with sufficient capacity (74,000 acre feet) to meet Montana's demands.

The annual water supply of Tongue River Basin if conserved by storage dams, except in extremely dry years such as 1934 would be adequate to satisfy the demands in both states. Shortages occur practically each year in Wyoming, due to low stream flow and heavy irrigation demands. Storage in the Big Horn Mountains is required to stabilize stream flow. The Bureau of Reclamation contemplates a reservoir on the South Fork of Tongue River, but additional storage will be required to meet present and expanded demands.

Article I—Paragraph A of the Yellowstone River Compact refers to political subdivisions. It is assumed this includes municipalities. Article V—Paragraph C states: "The allocations made herein shall be exclusive of the use of water for domestic and stock use, and each signatory state shall be allowed unrestricted use for these purposes, except that no reservoir for such use shall exceed 20 acre-feet in capacity." Water appropriated to municipalities including domestic, commercial, industrial, irrigation of lawns, parks and cemeteries and government hospitals should be excepted from the compact and be unaffected by it.
The City of Sheridan has a storage reservoir in the mountains having a capacity of about 1500 acre-feet. This storage must not be affected by any compact.

North Dakota is one of the parties to this compact. Under the compact it is allotted only the residual flow of Yellowstone River below Sidney, Montana, yet it has an equal vote with Wyoming and Montana. Nothing could stop North Dakota from using this flow, so why should it be an interested party?

INDIAN WATER RIGHTS

In the compact Article V, paragraph 8, Tongue River; no mention is made to Indian-treaty-water-rights for lands in Montana. The Tongue River Indian Reservation have water rights from Tongue River for about 6000 acres.*

“1906 the United States began construction of the Tongue River Irrigation Project, which is located in Rosebud County to divert water from Tongue River to irrigate 7000 acres of land.”** The plan was abandoned and probably not more than 600 acres were ever irrigated. This is one of the early priorities from Tongue River.

The Indian Service have purchased 7500 acre feet of water in Tongue River Reservoir from the Montana Water Conservation Board. Will the Indians at some future date be granted priority over all other appropriations in Tongue River Basin?

RETURN FLOW:

Return flow to streams in the Tongue River Basin occurs largely in the upper basin. Return flow is the result of several factors of which the most important are available water supply, irrigation efficiency, slope, soil porosity, and type of crops. During the early portion of the irrigation season when the water supply is abundant most water users flood their lands, resulting in much surface runoff. The soils become saturated and due to the slope and soil porosity much water returns to the streams. These conditions are more prevalent where hay is the major crop. There are no seeped areas of any magnitude in Tongue River Basin, Wyoming which is evidence of good drainage. The topography on Tongue River and Goose Creek in the vicinity of the coal mines of the Sheridan Wyoming Coal Company restricts the width of the valleys to little more than the channel width. Practically 100 per cent of the return flow in Wyoming occurs above the narrow valleys of these two streams. The measuring station at Acme is downstream from this point.

Irrigation along Tongue River below the Montana Reservoir is in small, intermittent, shoestring tracts until you reach the Yellowstone-Tongue River Project near Miles City, a distance of about 150 miles. Since the lowest point of measurement as used in the formula is just below the diversion to this project, the return flow between Acme Station and the lowest point of measurement will be little under existing conditions. No information on return flow has been compiled.

*Information from Mr. W. L. Hanna, District Engineer, Billings, Montana.
**Water Resources Survey—Rosebud County, Montana—Page 11.
When a stream is high a certain amount of the flow seeps into the banks. As the stream flow recedes much of this water seeps back into the stream channel.

GENERAL:

The Yellowstone River compact says that the compact commission may make adjustments in allocations if injustices develop, but such adjustments must be by unanimous consent. Would it not be better to have complete information before signing a compact? At least give the citizens of Wyoming an opportunity to check the estimates of irrigated and irrigable land, stream discharge, water use and water requirements.

It is often stated that the Bureau of Reclamation will not carry on construction in Wyoming until a compact between the three states Montana, North Dakota and Wyoming is consummated. On the contrary, construction is now underway on a storage dams on Wind River, Owl Creek and Powder River. An argument used is that if a compact is not signed immediately, Montana will build reservoirs and have priority to the water. It is not one of the arguments to the Missouri River Basin Plan, that all reservoirs have the same date of priority, particularly if constructed by the Bureau of Reclamation? There is also another angle; Is the Missouri River Plan final once and for all, or is it flexible and subject to change? If it's not flexible, then Wyoming should not sign the Yellowstone Compact because the “Plan” as conceived does not contemplate storage on the North Fork of Tongue River or Soldier Creek, or irrigation of additional land.

The question of priorities of appropriation for the use of water has often been raised, but they were not considered in writing the compact. Montana cannot demand that Wyoming close headgates on its ditches, even though some of our rights may be subsequent to some of those in Montana. If this could be done Montana would have had it done years ago. If we sign the compact then Wyoming will have to close headgates on her ditches to try to deliver water to Montana. Such situations are provided for in the compact.

Many people object to the compact because it doesn't require Montana to use storage water in the dam near Decker which was constructed by the Montana Water Conservation Board. The compact does not mention the already constructed storage in either state. It is rightly presumed that all existing storage will be filled when the streams are at flood stage. Water released from storage reservoirs during the irrigation season is given consideration in the algebraic formula in the compact for the determination of the divertible flow.

The workability of the formula for determining the divertible flow is questionable. With few exceptions most of Wyoming diversions are for individual farms. To determine the divertible flow requires installing measuring devices on all ditches. In Tongue River Basin Wyoming there are over 400 diversions. To determine the daily divertible flow, a measurement must be taken every day during the period of May 1st to September 30th on each diversion. These measurements will be in cubic feet per second—the basis of measurement of irrigation water in Wyoming. Such measurements must be converted to acre feet. After the total divertible flow is determined then headgates must
be adjusted to comply with the excess or deficit. Perhaps the stream flow has now varied and new measurements must be again taken. The same situation exists in Montana. The miles to be covered in making such measurements daily will require the service of many people, many vehicles, and equipment. Installation of measuring boxes will be at the expense of each individual ditch owner and must be maintained by him. On the Big Horn River, of the 154,800 acres irrigated from Big Horn River 85 per cent of the water is diverted through 28 ditches, and of this amount 75% is diverted through seven ditches. The measurement of the water diverted in Big Horn Basin is relatively easy. The division of water on the daily divertible flow basis as determined by the formula has not been used in any other compact that has been drawn up in other states."

One argument that is used for the compact method of dividing water between states is that it will avoid court action. It is conceded the more nearly the waters are equitably divided by agreement the less likelihood of court action, but there can be no guarantee against litigation in any case. If one state finds that it is not receiving just consideration under the compact is it not subject to attack in the Federal Courts?

The compact divided the water on a daily basis. Irrigation requirements for crop production varies during the irrigation season for each month, each type of crop, daylight hours, temperature, soil fertility and other factors. The water requirements for Wyoming have been tentatively set at 2.65 Acre Feet per year, and would be divided approximately in acre-feet as follows:

<table>
<thead>
<tr>
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<th>June</th>
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<tbody>
<tr>
<td>Amount</td>
<td>0.265</td>
<td>0.795</td>
<td>0.795</td>
<td>0.53</td>
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</table>

If the actual amount of irrigated land was known the amount of water required by months could be estimated. The compact allocates to Wyoming 1584 Acre Feet for 24 hours. How do the people of Wyoming know whether that amount is too little or too much?

The compact states, the first 2200 acre feet shall be divided 22% to Montana and 72% to Wyoming. Mr. Sloan stated at a hearing in Sheridan, October 24, 1944 that the division was made on the acreage of irrigated land in each state, namely, 60,000 acres in Wyoming and 16,000 or 16,000 acres in Montana. If that is the case Wyoming should receive 79 and Montana 21 percent.

Where did the figure 2200 Acre Feet come from? The total measured runoff to Tongue River in acre feet for the irrigating season is estimated to be 266,700 annually. Over a five month period May to September there are 153 days. Multiplying 2200 by 153, the result is 336,600 acre feet or 59,900 acre feet more than is estimated originates during the five months in Tongue River basin, Wyoming.

Who wants the compact? The Bureau of Reclamation officials said recently they were not promoting it."

As far as is known there is no controversy now and there hasn't been any between the water users of the two states on Tongue River.
When the Tongue River Dam was under consideration for construction the people of Wyoming didn't object, in fact they were most favorable and gave their unqualified support to it. The reservoir was built with federal loan and grant funds to furnish supplemental water primarily to lands in the vicinity of Miles City. All Wyoming asks now is that Montana utilize it. The Montana Water Conservation Board had subscriptions for 270 Water Purchase Contracts totaling 85,000 acre feet of water.

The people of the upper basin are not in favor of this compact and will leave nothing done to defeat it. They may accept a compact that is more favorable to them. When all the basic information for a compact is obtained and presented factually to Wyoming, it is believed they will weigh the benefits against the losses, and decide for the greatest good for the majority of people in both states.
Department of the Interior News Release, 1949
R. J. NEWELL NAMED U. S. COMMISSIONER ON YELLOWSTONE BASIN COMPACT

R. J. Newell, who recently retired as regional director of the Bureau of Reclamation at Boise, Idaho, has been named by President Truman to be United States commissioner for the formulation of an interstate compact providing for an equitable division and apportionment of the waters of the Yellowstone River and its tributaries among the States of Wyoming, Montana, and North Dakota.

The river basin is an important water resource for the Missouri River Basin Project and a compact will have material effect upon the development of the basin, according to Reclamation Commissioner Michael W. Straus.

The river rises in Yellowstone National Park in northwestern Wyoming and flows across most of the length of Montana to join the Missouri River immediately east of the Montana-North Dakota boundary. Most of its larger tributaries, such as the Bighorn and Powder Rivers, originate in Wyoming.

The appointment is made under authorization of Public Law 53, approved June 2, 1949, which is the latest in several laws, authorizing compact negotiations relating to the waters of the Yellowstone River. The present law sets a time limit of June 1, 1952, on efforts to reach an agreement.

Mr. Newell, who had many years of experience in construction and operation of reclamation projects in Oregon, Washington, and Idaho prior to his retirement as regional director on June 30, is also Federal representative on the Idaho-Wyoming Snake River compact commission.

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Department of the Interior
Bureau of Reclamation

For Immediate Release OCTOBER 26, 1949.

P.N. 64569
Land Planning and Classification Report, Bureau of Land Management, March 1949
United States
Department Of The Interior
Bureau Of Land Management
Region III
Missouri River Basin Investigations

LAND PLANNING AND CLASSIFICATION REPORT
as Relates to the Public Domain Lands
in the
POWDER RIVER BASIN
(Montana and Wyoming)

(For Administrative Use Only)

March, 1949

This report was compiled in connection with the program
of the Department of the Interior for the development
of the resources of the Missouri River Basin.
UNITED STATES
DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT
MISSOURI RIVER BASIN INVESTIGATIONS

LAND PLANNING AND CLASSIFICATION REPORT
as Relates to the Public Domain Lands
in the
POWDER RIVER BASIN
Montana and Wyoming

Region III
Billings, Montana
March, 1949

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ACKNOWLEDGEMENTS

The preparation of this report entailed the gathering of factual data from many sources including published reports and documents, the principal ones of which are cited in the appendix of this report.

Other no less important sources of information include: records of land status obtained from the Bureau of Land Management, the U. S. Forest Service, Production and Marketing Administration and from official county records for all the various counties included in this report; land-use development and conservation program reports, maps and records of the Production and Marketing Administration, and the Soil Conservation Service, especially as they involve Campbell, Johnson, Natrona and Sheridan Counties, Wyoming and Custer and Powder River Counties, Montana; land-use and tenure problems from the records of the County Extension Agents in Campbell, Johnson, Natrona and Sheridan Counties, Wyoming, and from the records of the Soil Conservation Service in Johnson and Sheridan Counties, Wyoming; published and unpublished reports, manuscripts and records and preliminary findings regarding existing and proposed irrigation developments from the U. S. Bureau of Reclamation, Fish and Wildlife Service, Geologic Survey, Forest Service, Soil Conservation Service, Bureau of Agricultural Economics, and the Montana and Wyoming State Extension Services; and other pertinent and related subject matter from the yet-clear memory of many local long-time residents of the area as well as interviews with various Federal, state and county officials.

Special mention should be made of the assistance rendered by the Production and Marketing Administration office and the County Extension Agents of Campbell, Johnson and Natrona Counties, Wyoming, and by the Range Manager, Montana Grazing District No. 3, in furnishing data on land resources, uses and problems as they relate to the public domain.

Field reconnaissance work, the assembly and analysis of pertinent information and the preparation of the report was conducted by Harold T. Tysk, Land Economist. The map was prepared under the supervision of William C. Anderson, Engineering Draftsman. The study in all its aspects was under the direction of R. D. Nielson, Land Economist in Charge of Missouri Basin Studies, Bureau of Land Management, Region III, Billings, Montana.
PURPOSE AND SCOPE

This report presents a preliminary analysis of the physical and economic features of the area in Montana and Wyoming within the drainage system of the Powder River. It is intended to serve as a guide in carrying out detailed studies of problems pertaining to the use and management of the remaining 1,800,000 acres of unappropriated, unreserved public domain lands in this area in furtherance of the total Missouri River Basin Development Program.

In carrying on the preliminary investigation and in presenting the information in this report, our primary concern and interest has been to develop factual data relating to the utilization management and development of the "public domain" lands and the resources thereon. Some study of the over-all land use economy was necessary to ascertain the interrelationships between the public land and other resources. In this connection, a general analysis of all land management programs operating in this area was made.

Particular emphasis was given to the appraisal of problems such as soil erosion and sedimentation and maladjustments in public land use. Problem areas requiring further investigation were delineated, and a more complete and detailed survey and report for such areas will immediately follow this preliminary study.
SUMMARY

"Powder River! A mile wide and an inch deep!" How often that colorful phrase has brought to mind the unique glamour of the cattle country -- the open range. "Too thick to drink and too thin to plow!" Another picturesque Powder River phrase, somewhat distorted perhaps, but one that nevertheless peculiarly focuses attention to the compelling problems to be faced by the public land administrator, who is charged among other things with the responsibility of maintaining optimum watershed conditions on the public lands in this basin. Nearly one-fourth of the total land area in the Powder River basin is administered by the Bureau of Land Management. Probably the biggest problem inherent in those lands is watershed deterioration and a resultant increase in run-off, siltation and sedimentation. While not peculiar to the public lands only, the consequences of continued impairment of these resources will adversely affect human welfare and economy throughout the basin.

Comprising a drainage area of 13,193 square miles, Powder River is an interstate stream which drains portions of central and northeastern Wyoming and southeastern Montana. Seventy percent of the watershed is located in Wyoming and about sixty percent, or 7,680 square miles, lies tributary to the site of the proposed Moorhead reservoir. The damsite is located in Montana just north of the Wyoming-Montana state line and was authorized by Congress in 1947, primarily as a silt and flood control project. It will also afford storage capacity for the irrigation of about 45,000 acres of land in Montana.

The climate in the Powder River basin is that characteristic of the Northern Great Plains, semi-arid and continental, with extreme variations and fluctuations in temperature and precipitation which in turn contribute greatly to the relative abundance or depletion of native vegetation. The vicissitudes of climate also play an important part in the methods employed in livestock and farming operations. Severe winter and spring storms, for example, present a constant threat to the stability of sheep operations.

Physiographic features are sharply contrasting. Half of the area is comprised of sharply rolling plains, another quarter is gently rolling plains, while the Big Horn Mountains and their flanking foothills make up the remainder of the basin. Elevations range from 2,250 feet above sea level at the confluence of the Powder and Yellowstone Rivers in Montana to 13,165 feet at the summit of Cloud Peak in Wyoming. The rugged Big Horn Mountains are the outstanding physiographic feature. Powder River "breaks", the badlands flanking the main river, is another important feature of the landscape. Powder River and its principal tributaries receive most of their water from the Big Horn Range. Very little perennial run-off is yielded by the low altitude plains area.

Most of the soils in the basin are shallow, heavy soils derived mainly from shale formations, although they differ materially in various parts of the area and present a wide variation in their development.
Native vegetation occupies about 96 percent of the total watershed, while the remaining area comprises crop and hay lands, water surfaces, roads and waste lands. Range lands are primarily of four types, timber, open mountain parks, sagebrush grass and grasslands, the latter type being the most extensive.

About two-thirds of the basin is in private ownership, while the remainder is in Federal or state ownership. A total of 1,830,953 acres, or 22 percent of all lands in the basin, are under the custody of the Bureau of Land Management. The greatest concentrations of such public domain lands occur in the southern portion of the basin in Wyoming, where they dominate all other classes of land ownership. While a similar pattern persists in the breaks of the Powder River, the public domain becomes progressively more widely scattered as the mouth of the river is approached.

The production of range beef cattle and sheep is the predominating enterprise in the basin. Calculated on the basis that five sheep are equivalent to one horse or cow, cattle comprise 65 percent, sheep 30 percent and horses 5 percent of the livestock population in the basin.

Crop and hay production by irrigation is an important feature of the agricultural economy. About 100,000 acres are under irrigation, while approximately 154,000 acres are dry farmed. The development of additional irrigated lands will help to balance and integrate crop and range use in areas where range livestock production is almost wholly pastoral.

Powder River basin presents a picture of diverse Federal and state land management programs including two National Forests, two Taylor Grazing Districts, one Public Domain administrative program, six Soil Conservation Districts, two State land leasing programs, two State Cooperative Grazing Districts, three Land Utilization Project Areas, one Naval Petroleum Reserve, one county park and eleven Production and Marketing Administration Agricultural Conservation programs and eleven county extension programs. Doubtless there are others.

The problems relating to the management, protection, development and utilization of the public domain lands and their resources are broadly described in the following categories:

1. Watershed impairment and consequent siltation of stream courses and impoundments.
2. Maladjustments in land use.
3. Complexity of land ownership and operating patterns.
4. Abuses on the public stock driveways and resulting soil and forage depletion.
5. Ineffectual integration of land uses.
6. Rodent and insect infestations.
7. Poisonous plants.
The present study has not been of sufficient detail to determine the scope and seriousness of these problems, nor to prescribe detailed corrective measures. Further studies are necessary to obtain the basic data necessary to the solution of these and other problems which will appear as the study progresses.

Four problem areas will be studied in detail and in the following sequence:

1. Upper Powder River, Wyoming, which will include the drainages of North, Middle and South Forks of Powder River and Salt Creek.
2. Powder River breaks, Wyoming and Montana, which will include the main stem of Powder River tributary to the proposed Moorhead reservoir.
3. Moorhead-Powderville area, Montana.
4. The remainder of the basin, Montana and Wyoming, which will include those areas in the basin which contain relatively little public domain and what remains consists of small isolated tracts of land.
GENERAL DESCRIPTION

Location and Size

Powder River, a tributary of Yellowstone River, is an interstate stream draining portions of northeastern Wyoming and southeastern Montana. The basin drains an area of 13,193 square miles, equivalent to 19 percent of the entire area of Yellowstone River basin. The length of its basin in a north and south direction is about 275 miles and the maximum width is about 100 miles. The average east-west width of the basin in Wyoming is 53 miles, decreasing progressively northward to an average width of 38 miles in Montana. (See map appendix.)

The basin has its headwaters in almost the exact geographical center of the state of Wyoming from whence it flows in a generally northeasterly direction through northeastern Wyoming and southeastern Montana to its confluence with the Yellowstone River. The Powder River basin is bounded on the east by O'Fallon Creek, Little Missouri; Bollis Fourche and Cheyenne River watersheds, on the south by the North Platte River basin and on the west by the Wind River, Big Horn, Tongue and Yellowstone River watersheds.

The Moorhead dam was authorized by Congress in 1947 as a flood control project and is located in Montana about three miles north of the Wyoming-Montana state line. According to plans of the Bureau of Reclamation, the dam will be of earth and rock construction and have an estimated storage capacity of 700,000 acre-feet. Its primary purpose is for flood and silt control. The dam will also afford storage capacity for the irrigation of an estimated 43,000 acres, adjacent to the Powder River in Montana. Table 1 shows by states, counties and by watershed units embraced above and below the proposed Moorhead Reservoir, the gross area contained within Powder River basin.

About sixty percent of the entire watershed lies tributary to the proposed Moorhead Reservoir and almost completely within Wyoming, less than one-half of one percent of the watershed being in Powder River County, Montana. This portion of the watershed, roughly oval in shape, contains 7,680 square miles, with maximum dimensions of about 155 miles north and south and about 60 miles east and west. The area embraces nearly one-twelfth the land area of Wyoming, including 97 percent of Johnson County, 33 percent of Natrona County, 29 percent of Campbell County, 21 percent of Sheridan County, 5 percent of Washakie County and less than 1 percent of Crook and Converse Counties.

Forty percent of Powder River basin lies below the site of the proposed Moorhead dam, three-quarters of which is in Montana, with the balance in the Little Powder River watershed in Campbell and Crook Counties, Wyoming. This portion of the watershed, roughly dagger-like in shape, contains 5,313 square miles, with maximum dimensions of 170 miles north and south and 55 miles east and west. It embraces less than three percent of the land area of Montana and one percent of that of Wyoming, and includes 61 percent of Powder River County, 34 percent of Custer, 16 percent of Cartor and 4 percent of Prairie County in Montana. In Wyoming, 29 percent of Campbell County and about one percent of Crook County are embraced by the Little Powder River watershed.
Table 1 - Area of Powder River Basin
by Counties and Watershed Units (1)
Montana and Wyoming

<table>
<thead>
<tr>
<th>Name of County</th>
<th>Area Entire Watershed</th>
<th>Area Below Moorhead Res. Site</th>
<th>Area Above Moorhead Res. Site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acres</td>
<td>Per-cent</td>
<td>Acres</td>
</tr>
<tr>
<td>WYOMING</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Campbell</td>
<td>1,757,060</td>
<td>20.8</td>
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<tr>
<td>Converse</td>
<td>3,600</td>
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<tr>
<td>Crook</td>
<td>12,660</td>
<td>0.2</td>
<td>12,660</td>
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<td>Johnson</td>
<td>2,597,760</td>
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<td>Natrona</td>
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<td>Sheridan</td>
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<td>5,890,500</td>
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<tr>
<td>Carter</td>
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<td>605,749</td>
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<td>Prairie</td>
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(1) Figures computed from county and state maps prepared by various agencies.

Climate

The climate of the Powder River Basin is typically semi-arid and continental with wide variations in the occurrence, duration, intensity and distribution of rainfall and with wide ranges in extreme temperatures, all characteristic of the Northern Great Plains. Maximum summer temperatures in excess of 110 degrees are experienced in the plains where seasonal variations are much greater than in the mountains. Minimum temperatures of -54 degrees have been recorded. With the exception of the mountainous area at the higher elevations, comprising approximately 25 percent of the basin, the growing season is of sufficient length, about 120 days, to mature the majority of general farm crops. Along the mountain front of the Big Horn Range, the growing season progressively decreases as elevations increase until in the higher elevations of the mountains, the growing season is often less than 60 days with killing frosts reported during every month of the year. (See Table 3.)

Yearly precipitation ranges from less than twelve inches in the vicinity of Kaycee and Sussex, Wyoming, to more than 25 inches in the nearby mountains of the Big Horns. It is this mountainous zone that provides the water for the irrigation of lands in the lower plains. Snow accounts for a considerable part of the total precipitation in this humid mountain belt and in the highest
roaches surrounding Cloud Peak are found limited areas of perennial snow fields. Runoff from the melting snow takes place principally during May, June and early July, at which time the mountain streams flow at maximum sustained rates. More than 70 lakes in the Big Horn National Forest are replenished principally by snow, and these lakes in turn feed a large number of springs, streams and wells. This zone is virtually snowbound from November to May, and inhabitants migrate to lower elevations each year.

During exceptionally severe winters, large areas of winter range in the lower elevations become practically cut off from the outside world and natural forage becomes inaccessible to livestock. When ranges are closed for either brief or extended periods, supplementary feeding becomes necessary. Feed shortages develop quite often and livestock losses and shrinkage may become severe when ranges are closed to grazing for extended periods. In the dry farming areas, such heavy snows are ordinarily very beneficial to winter and spring wheat crops.

Heavy unseasonable snows in June accompanied by cool damp weather are not uncommon. Heavy livestock losses are experienced during such storms, especially by newly shorn sheep and young lambs. Hail storms are not uncommon in some of the dry-farming areas, and they are of sufficient intensity to cause severe damage about one year in five.

Surface evaporation records during the growing season are meager. At Sheridan, the nearest station at which evaporation from a free water surface is recorded and considered as representative of conditions in the upland plains area of Powder River basin, the total evaporation averages 25.64 inches for the period April through September.

Prevailing wind direction is from the southwest. The wind is usually of low velocity which lengthens the period of surface runoff in higher elevations where drifting snow forms temporary snowfields. As a rule, strong winds are uncommon and seldom reach damaging proportions. However, when associated with winter storms, drifting snow causes considerable difficulty in both transportation and livestock movements.

The annual and growing season precipitation, together with monthly averages for the period covered, are shown in Table 2 for weather stations in or near the Powder River drainage area. The months of April, May, June, July, August and September included in the above table are shown as seasonal precipitation. Too much emphasis should not be placed upon the total precipitation because many factors such as seasonal distribution, character of precipitation, temperature and wind velocity have a very great effect upon the net benefit to growing crops. For the selected weather stations shown in Table II, seasonal precipitation averages 75 percent of mean annual precipitation for Montana stations and 69 percent for the indicated Wyoming weather stations. The range in seasonal precipitation throughout the basin varies from less than 8 inches to greater than 14 inches. Most of the areas where dry-farming persists receive from 10 to 12 inches of moisture during the growing season.
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(1) From U. S. Weather Bureau Record.

* Stations located outside of but near Powder River watershed.
### Table 3 - Climatological Data (1)
**Powder River Basin**

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(1) From U. S. Weather Bureau Record.
* Stations located outside of but near Powder River watershed.
Physiography

The basin forms a part of two well-marked physiographic regions, the Big Horn Mountains and the Great Plains, which have sharply contrasting surface features, although minor details of relief in many cases determine the utilization of the land. Topographically, the area is most varied. About 10 percent of the area is mountainous, 15 percent foothills, 50 percent sharply rolling plains, and 25 percent gently rolling plains. The minimum elevation is approximately 2,250 feet at the confluence of the Powder River and Yellowstone River in Montana, and the maximum is 13,165 feet at the summit of Cloud Peak in the Big Horn Mountains in northwestern Johnson County, Wyoming. About three-quarters of the basin lies at elevations below 5,000 feet. The general slope is north and northeasterly.

The mountainous portion of the area, confined entirely to Wyoming, is confined to the lofty Big Horn Mountains and to the Rattlesnake Range, the latter a short comparatively low mountain range bordering Sweetwater River basin to the south. While the east-facing slope of the Big Horn Mountains is quite steep, abrupt and in places precipitous, the hinterlands for the most part consist of undulating plateaus and rounded ridges, interspersed with a few rocky knolls and peaks with intervening sharply cut valleys and gorges. In the Cloud Peak region of the Big Horns in northwestern Johnson County, the ridges rise from 3,000 to 4,000 feet above the valleys and the general configuration is very rugged, presenting some of the boldest alpine scenery in the country. There are many precipices over 1,000 feet high and many of the steeper slopes consist of talus of huge granite blocks. Most of the topographic features of this high region are those characteristic of glacial erosion. The most marked of these are the many deep cirques that are cut back to the main divide. Glaciation or glacial deposits have produced most of the many small lakes found in this area. Diminutive remnants of glaciers are still to be found in the vicinity of Cloud Peak, lying in cirques cut deeply into some of the higher mountain slopes.

The rugged to roughly rolling foothills and valleys at the base of the mountain slope to the eastward have a great variety of surface features, characteristics of which are gravel-capped terraces, narrow bottomlands, flood plains, alluvial fans of gravel, sand and clay derived from erosion of the mountain slopes and small outlying uplifts. There are many deeply dissected steep, narrow valleys which have left benches and high mesas between the drainage courses.

Part of the Great Plains Province, the sharply rolling plains lie east and north of the belt of foothills and consist of comparatively broad tabular divides between the larger streams which are more or less thoroughly dissected by narrow valleys of the lateral drainages. The greater part of the area is characterized by a vast rolling to rough expanse of sharply rounded ridges and hills with occasional bold, conspicuous escarpments formed by the tilted edges of pine-covered sandstone which often form prominent land marks. Intervening valleys are often broad flats with numerous deep-cut gullies. The soft shales in places have eroded rapidly and the entire surface has been so
thoroughly dissected that the original plains character is suggested and represented now only by the crests of the main ridges which are all at about corresponding elevations. The topography along both sides of the Powder River from Sussex, Wyoming to Moorhead, Montana, is mainly of the badland type, especially close to the main stream and lateral tributaries, but there are found areas of more gentle relief as well. Vegetation is comparatively sparse, and the soft shales and sandstones are carved by runoff into an intricately dissected surface of steep raw slopes, extended escarpments and sharp ridges, buttes, domes, precipitous bluffs, pinnacles and vertical-walled gullies. One of the most outstanding and best known examples of badlands in the basin is "Hall's Half Acre" or "Devil's Kitchen", a small area of precipitous crags and needles in Natrona County, Wyoming. In limited parts of the area, burned-out coal beds along outcrops have left "scoria" or "slags", resistant masses of overlying baked clay as caps, ledges and small buttes. These slags, reddish-orange in color, cap or rim the upland areas and effectually retard the down-cutting of the drainageways to form miniature terraces. Drainage courses are intermittent, but during heavy downpours, the dry stream beds are filled with rushing torrents, sometimes 20 or 30 feet in depth. Erosion at such times is extremely rapid, great masses of shale caving from the steep banks into the water, there to be rapidly disintegrated and carried on downstream.

The gently rolling plains include several areas which have escaped thorough dissection and are comparatively smooth. One of the largest of these, comprising about ten townships in central Johnson County near Sussex, is locally known as the "Nine-Mile District". Other such areas in Wyoming are found as narrow belts along the eastern divide in Campbell County. Comparable areas are found in Montana, notably in the vicinity of Broadus. The undulating surface of these upland plains are often interrupted by the rough breaks of Powder River and its lateral tributaries. Pumpkin Buttes, four flat-topped buttes in southwestern Campbell County, resemble giant tepoos and rise several hundred feet above the surrounding rolling country to form a conspicuous landmark in the southeastern part of the basin.

Geology

The rocks appearing at the surface within the Powder River basin afford a record of physical geology ranging from the Pre-Cambrian time to the present.

The Big Horn Mountains, forming an outlying portion of the Rocky Mountain Range, represents a great uplift by which a thick series of sedimentary rocks have been elevated high above the plains to the east. The deeply eroded crest of this uplift presents an exposed central nucleus of Pre-Cambrian granites and constitutes the floor of sedimentary deposits of more recent ages.

In the plains area, the geologic formations generally dip slightly to the east, but are modified locally by moderate to sharply dipping folds. The materials of the formations were derived mainly from the west and were deposited, layer by layer, either by streams on their flood plains or in lakes, or during even earlier times, in the sea.
The geologic formations present alternations of beds of various geologic materials, principally of sedimentary origin, shales, sandstones and limestones. These give rise to abrupt transitions in the character of their disintegration products, soils which differ widely in composition and agricultural capabilities often occurring side by side. The only areas in which the boundaries between different soils do not coincide with the boundaries of the rock formations are in the stream bottoms, in the areas of high-level gravel terraces, in many of the small tributaries, and upon steep slopes where transported soils have washed down and mingled with or covered the residual soils.

Drainage

The main stem of the river is roughly 155 miles in length in Wyoming and 120 miles in length in Montana and flows in a generally northeasterly direction. Its headwaters are near the geographical center of Wyoming. About three-fourths of the drainage area in Wyoming lies west of Powder River. Its largest tributaries are Clear, Crazy Woman, Salt and Buffalo Creeks, and North, Middle and South Forks of the Powder River. South Fork and Salt Crook are the only tributaries mentioned which might be considered as intermittent streams, although their drainage areas comprise almost one-fourth of the watershed above Moorhead Reservoir site. It is significant to note that all tributary drainages east of Powder River in Wyoming likewise flow only intermittently. The largest tributary in this portion of the area is Wild Horse Creek, which joins Powder River at Arvada, Wyoming. The principal tributaries which join Powder River below the site of the proposed Moorhead Reservoir are Little Powder, East Fork of Powder, Timber, Ash, MIZPAH and LOCATE Creeks. These main tributaries and their small ones, form a mature and well established drainage pattern for the entire basin.

Powder River and its principal tributaries receive most of their water from the Big Horn Mountains in Wyoming and very little perennial runoff is yielded by the low altitude plains area. Elevations in the basin range from 2,250 feet at the mouth of the Powder River to a maximum of 13,165 feet at Cloud Peak in the Big Horn Mountains. The general stream gradient ranges from 2 feet per mile at the mouth to 30 feet per mile at the headwaters. Below the mountains, the main stream as well as its large tributaries have cut deeply entrenched channels into the sediments of the narrow valleys. The lower flood plains are usually dissected by the meandering flood channels of intermittent tributaries.

Soils

The soils of Powder River basin, like the soils of most of the semi-arid West, present a wide variation in soil development which differs materially in various parts of the area. Being derived in most cases from shale formations, they are often high in soluble salts and low in nitrogen. In places, capping of sandy materials over the shale formations has produced areas of sandy loams and loams, but generally speaking, heavy clay soils are dominant within the basin.

In general, soils of the flood plains, terraces, sloping benches, alluvial fans and stream bottoms are moderately deep, medium to heavy-textured.
and usually adequately drained, although occasionally saline. Subsoils may be moderately heavy to tight. These are the most desirable soils for irrigation and where the relief is favorable for the distribution of water, there are found some of the most highly developed and valuable irrigated districts in the basin. Soils of poorly drained bottomlands are commonly silty or sandy over a gravel sub-stratum, occasionally slightly saline.

Soils on the more gently sloping uplands and benches are usually deep, moderately heavy clay soils with scattered areas of sandy clay loams developed from sediments washed down from areas of fine-grained sandstones. These soils are usually lighter in color than those of the irrigated lands and are situated in areas where dry-farming is practiced.

The greater part of the soils in the basin are shallow heavy soils on hilly to rough and broken uplands. On sloping benches adjacent to drainage ways, the soils may be deep and moderately heavy to gravelly. They are unsuitable for cultivation due to one or more of the following factors: shallowness, stoniness, rough relief, frequent flooding by nearby streams, poor drainage, alkali accumulation, short growing season because of high elevations and inadequate moisture. The soils of this group include both the rough land of the dry plains and foothills and the rough and partly-forested mountain lands. Most of the public domain lands come within this category.

Vegetation

Ecologically, the basin has been differentiated into five life zones. The Upper Sonoran Zone occupies the lower elevations and is followed, as the elevation increases, by the Transition, Canadian, Hudsonian and Arctic Alpine zones, in that respective order. Roughly speaking, the upper limits of each of the zones in this latitude may be considered to be 4,500 feet, 7,500 feet, 9,000 feet, 10,500 feet and above 10,500 feet, respectively.

About 96 percent of the basin is occupied by natural vegetation, the remaining four percent of the area comprising hay and croplands, water surfaces, roads and waste lands. Native vegetation, therefore, is the basis for the principal enterprise, the livestock industry, and is also the principal instrument through which the stabilization of the soil and improvement of the economy must be brought out. By judicious management, a maximum forage production can be attained and is indeed imperative. In the face of declining production on a considerable part of the native range lands, a large part of which is public lands, a vigorous program of constructive and united action is urgently needed to promote proper range and watershed management.

For a more complete description of the life zones, see North American Fauna No. 48; Life Zone Investigations in Wyoming; Fish and Wildlife Service, Department of the Interior.
The forage resources of the area have been delineated into four major types, namely, Timber, Open Mountain Parks, Sagebrush-Grass and Grass. Inaccessible and barren wastelands occupy parts of the basin. The timber type, based primarily upon the elevation, has been subdivided into three classes, the mountain timber type, the open pine type and the pine-savannah type.

The mountain timber type ranges from about 6,500 feet to 13,165 feet in elevation, occupies about three percent of the basin, and is confined to the Big Horn Mountains in Wyoming. The predominate species are lodgepole pine (Pinus contorta), with spruce (Picea engelmannii) and fir (Abies lasiocarpa) occurring in small patches on the north slopes. Aspen (Populus tremuloides) border the conifers on the lower limits and extend along the live streams. The understory generally consists of a sparse growth of various grasses, shrubs, perennial and annual weeds. A litter of pine needles and organic matter forms a protective cover against soil erosion. Relatively unimportant as a source of summer forage for domestic livestock, the greatest benefits to be derived from this timber type are watershed protection for flood control and the conservation of moisture and for wildlife protection. A program of selective timber harvesting is being carried out in this type of the Big Horn National Forest which furnishes the principal supply of timber for the sawmill located in Buffalo, Wyoming, where approximately four million board feet of lumber is produced annually. Public land ownership within this type, except for the Big Horn National Forest, is relatively small.

The open pine type, ranging from about 3,500 feet to 5,000 feet in elevation comprises about four percent of the basin. It occupies part of northeast Sheridan and northwest Campbell Counties, Wyoming, and southwest Powder River County, Montana, and portions of the Powder River breaks. The open stands of yellow pine timber are commercially unimportant as saw timber because of their scattered location, but the vegetation in this type furnishes an important source of livestock forage, especially for cattle. The principal species of grass in this type are wheatgrasses (Agropyron spp.), blue grass (Poa spp.), and blue grama (Bouteloua gracilis). An estimated 20 percent of this type occurs on public domain lands.

The pine-savannah type, ranging from about 3,000 feet to 4,500 feet in elevation and comprising about five percent of the basin, occupies the higher elevations of the watershed divide in Montana and in Campbell County, Wyoming. The yellow pine is considerably more scattered than is found in the open pine type and is very often associated with sandstone or scoria outcrops. The principal forage species are wheatgrasses, blue grama and niggerwool. Public land ownership varies from 5 to 15 percent within this type and consists of relatively small scattered tracts.

The open-mountain park type ranging from about 7,500 feet to 12,000 feet in elevation occupies about five percent of the basin and is found exclusively in the Big Horn Mountains in Wyoming. The principal species are sedges (Carex spp.), blue grasses, wheatgrasses, fescues (Festuca spp.), phlox (Phlox spp.), old man whiskers (Silversia spp.), cinquefoil (Potentilla spp.), lupino (Lupinus spp.), balsam root (Balsamorhiza spp.) and mountain dandelion (Agoseris spp.). These plants are vigorous and furnish adequate
cover for protection against soil erosion except in localized over-grazed areas such as in the vicinity of public stock driveways. This type furnishes summer grazing for sheep and cattle from about June 15 or July 1 to October 1st. Except for stock driveway withdrawals and National Forest lands, public land ownership within this type is comparatively small.

The sagebrush-grass type occupies areas from 3,000 feet to 7,500 feet in elevation and comprises about one-third of the range area in the basin. The greater part of this type occurs in Wyoming and in large part is co-extensive with the Powder River breaks and heavy shale areas. The principal specie in this type are blue steam wheatgrass, niggerwool, big sagebrush (Artemisia tridentata), needle and thread grass (Stipa comata), blue grama prickley pear (Opuntia polyacantha), valley sage (Artemisia cana), brown sage (Artemisia pedatifida), silver sage (Artemisia frigida), winter fat (Eurotia lanata), rabbit brush (Chrysothamnus spp.). Some grasswood (Sarcobatus vormiculatus) occurs along the creek bottoms and on saline flats. Along the mountain front there are small patches of curlleaf mountain mahogany (Cercocarpus ledifolius) and juniper (Juniperus spp.). Grasses constitute about two-thirds of the forage used by livestock. This type presents varied degrees of plant vigor, composition and erosion conditions. It is unquestionably the heaviest and most extensive silt producer in the basin when compared with all vegetative types. It is best adapted for winter grazing by either cattle or sheep and receives its greater use during this period. Some of the type is used as year-long range, principally by cattle, while much of the type which lies adjacent to summer range of the mountains is used as spring-fall range. It is estimated that nearly one-half of all public domain in the basin is characterized by this type of vegetation.

The short-grass type is the most extensive vegetative type in the basin. It occupies nearly one-half of the range area and extends to elevations of about 6,500 feet. The principal specie are blue grama, niggerwool, blue stem wheatgrass, June grass (Koeleria cristata), needle and thread grass (Stipa comata). Other important specie are blue grass (Poa secunda), salt grass (Distichlis stricta), blue bunch wheat grass (Agropyron spicatum), cheat grass (Bromus tectorum), black sago, brown sago, silver sage, phlox (Phlox hoodii), lambquarter (Chenopodium alba), plantain (Plantago purshii), Russian thistle (Salsola postifera) and cactus (Opuntia spp.). Shrubs usually constitute only a small part of the forage composition. The wheat grasses have become extensively established throughout the area and are by far the most vigorous and dominant in this type. This type is best adapted to summer and spring-fall grazing, although year-long grazing is extensively practiced by cattle operators. The foothills range adjacent to the Big Horn Mountains is used mainly for spring, fall and winter sheep range in connection with irrigated ranch headquarters. An estimated one-third of the public domain is found in this type.
ECONOMIC AND CULTURAL DEVELOPMENT

Population

Total population in the Powder River basin in 1940 was approximately 17,000 people, about 12,000 of which were rural-farm and approximately 5,000 living in communities and villages ranging in size from 10 to 2,800. The total population in 1930 was 21,000, a net decrease during the decade of 21 percent. This downward trend was accelerated by the prolonged drought period of the 1930's. The rural-farm populations decreased during this time, whereas the communities and villages increased. The 1940 population of the basin comprised about eight percent of the entire population of the Yellowstone River basin (212,260). In 1940, the average number of inhabitants per square mile in the Wyoming portion of the basin was 1.5, while in Montana it was 0.8. Powder River basin included eight percent of the total land area and only five percent of the total population of Wyoming; while that portion in Montana comprised three percent of the total land area and less than one percent of the total population.

Buffalo, Wyoming, the county seat of Johnson County, is the largest town in the Powder River basin, with an estimated 2,800 residents, which is about 16 percent of the total population of the basin. It is situated at the foot of the Big Horn Mountains at an elevation of 4,355 feet and serves as an important marketing and shipping center for a large livestock and agricultural region in Wyoming. The Wyoming Railway, a small independent line, connects Buffalo with the C. B. and Q. Railroad at Clearmont in Sheridan County. Buffalo enjoys all the advantages of natural beauty in its mountain setting and is fast becoming an important summer resort center. A lumber mill was established at Buffalo in 1944 and has already become an important part of the economic life of the community, cutting more than four million board feet of lumber annually. Mining is done on a small scale with two coal mines near Buffalo furnishing about 6,000 tons of coal annually for local use.

Midwest, Wyoming, an oil town with a population of about 1,000 inhabitants and the second largest town in the basin, is located in the Salt Creek Oil Field in northeastern Natrona County.

Broadus, Montana, third largest town, with a population of about 240 residents, is the county seat of Powder River County.

There are several rural schools in the area and consolidated high schools are located at Buffalo, Midwest, Clearmont and Broadus within the area and at the nearby towns of Casper, Sheridan, Gillette and Miles City. Plans are being made by the state officials for the opening of the University of Wyoming School of Agriculture at Sheridan, Wyoming, as a branch of the State University.

Markets and Transportation

The C. B. and Q. Railroad crosses the central part of the basin, entering on the east near Gillette, Wyoming, crossing Powder River at Arvada and continuing by way of Clearmont and Upl to Sheridan, Wyoming, and Billings, Montana. An independent line, the Wyoming Railroad, terminating at Buffalo, Wyoming.
connects with the C. B. and Q. at Clearmont, Wyoming, 25 miles to the north. The principal shipping centers for this area are Gillette, Arvada, Clearmont, Buffalo and Sheridan, Wyoming. The Northern Pacific and Milwaukee railways traverse Yellowstone River Valley and provide outlets for the northern portion of the basin at Miles City and Terry, Montana.

The C. B. and Q. and the Chicago-Northwestern railways provide convenient outlets for farm products and livestock in the southern portion of the basin. Both lines traverse the basin on common trackage entering at Powder River, Wyoming on the east side and leaving the basin on the west at Armito, Wyoming. The principal shipping centers for this area are Casper, Bucknum, Powder River and Armito, Wyoming.

There are no railways traversing the basin in a north and south direction, but an oiled highway, U. S. No. 87 provides for excellent highway transportation from Casper to Sheridan. Oiled highways for east and west travel across the basin are U. S. No. 12, U. S. No. 14, U. S. No. 16 and U. S. No. 20. U. S. No. 212 connecting Belle Fourche, South Dakota and Miles City, Montana, crosses Powder River near Broadus. This all-weather highway provides the principal farm-to-market outlet for the greater part of the basin in Montana.

A network of State highways and County roads provides good farm-to-market routes. All of the Federal highways are maintained for year-round travel. The county roads are for the most part improved dirt roads, many of which in the remote areas are closed during the winter. Many secondary roads become virtually impassable for short periods during wet weather.

Industries

Farming and livestock raising are the principal industries of the basin engaging a large portion of the total working population. The estimated value of crops and livestock sold in 1945 was $11,000,000. Petroleum products in the same year had an estimated total value of $5,500,000. Small scale lumbering exceeded $150,000 in value and coal mined and sold commercially had a value of about $50,000 in 1945. Other industries of importance are tourism, construction, service trades and rail and truck transportation.

LAND OWNERSHIP AND TENURE

The land ownership and tenure picture is of great importance in working out and securing a sound and efficient land management program. Of the approximately 8,443,000 acres in the basin, about 70 percent lies in Wyoming and the remaining 30 percent in Montana. Two Taylor grazing Districts encompass 30 percent of the gross area and National Forests comprise about 3½ percent of the total watershed. The complexity of land ownership is best illustrated by the fact that there are 13 classes of land ownership. Federal, State and County lands comprise 35.3 percent of the basin and privately owned and railroad lands make up the remaining 64.7 percent.

A total of 1,830,953 acres, or about 22 percent of all lands in the basin are under the custody of the Bureau of Land Management, of which approximately 471,888 acres are in grazing district. (See Table 4.) The greatest
concentrations of public domain lands occur in the southern portion of the basin in Wyoming (See map appendix). Lands administered by the Bureau of Land Management constitute all other classes of land ownership in the entire area drained by the North, Middle and South Forks of Powder River and Salt Creek in Natrona and southern Johnson Counties. In a large part of this area, it comprises more than 70 percent of the total land area. This pattern persists in the breaks along the main stem of the Powder River in Wyoming; but the public lands become progressively more widely scattered as the Montana State Line is approached. In Montana, the public domain is relatively compact in the breaks of Powder River, although small tracts are promiscuously scattered throughout the basin. The watershed east of Powder River in Carter and Powder River Counties contains heavy concentrations of public domain.

A comparatively regular checkerboard pattern of public domain exists in Custer County, due primarily to alternate sections of railroad land, much of which has now passed to private ownership.

In some parts of the basin, public domain lands are a minor part of the land setup. In such areas, the public domain consists of scattered and isolated remnants, the "leftovers" of an era of land settlement which had its greatest impetus following the enlarged Homestead Act of 1916. In central and northwestern Johnson County, specifically in the drainage basins of Crazy Woman and Clear Creeks, there is an area of more than a million acres, of which less than three percent is public domain. The same condition exists in the Clear Creek watershed in Sheridan County. In these localities and only in rough areas along Powder River are there found any relatively compact blocks of public domain. Public domain in Campbell County consists for the most part of relatively scattered tracts. About one-half of the total area in this county contains an average of less than three percent Federally owned lands, while in the remaining area, the public lands lie in relatively compact blocks. In Montana, the public domain is of minor significance in about one-third of the basin, chiefly in northwestern Powder River County and in the extreme southern part of Custer County. Detailed studies are needed to classify such isolated tracts and to determine their most efficient and practical method of disposition or management.

WATER RESOURCES

Water resources of Powder River Basin are now used chiefly for irrigation with important but less extensive use for municipal water supply and stock water. Power generation is limited at present to one small plant at Buffalo, Wyoming. Power is imported from other basins. The average annual discharge at the mouth of the Powder River, during the ten-year period from 1931 to 1940, was 310,000 acre feet, approximately five percent of the average annual discharge (6,870,000 acre foot) of the entire Yellowstone River Basin. (See Table 5.)
Table 5 - Surface Water Resources

Powder River

Sources of Run-off (1)

<table>
<thead>
<tr>
<th>Stream</th>
<th>Location</th>
<th>Drainage Area</th>
<th>Average Annual Run-off in Acre Foot - 1931-1940</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinoy Creek</td>
<td>Kearney, Wyoming</td>
<td>106</td>
<td>63,770 (2)</td>
</tr>
<tr>
<td>Clear Creek</td>
<td>Near Arvada, Wyoming</td>
<td>1,110</td>
<td>153,600 (2)</td>
</tr>
<tr>
<td>Crazy Woman Creek</td>
<td>Near Arvada, Wyoming</td>
<td>948</td>
<td>37,180 (2)</td>
</tr>
<tr>
<td>North Fork Powder</td>
<td>Mayoworth, Wyoming</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>Middle Fork Powder</td>
<td>Kaycee, Wyoming</td>
<td>980</td>
<td>106,200 (2)</td>
</tr>
<tr>
<td>Powder River</td>
<td>Arvada, Wyoming</td>
<td>6,050</td>
<td>187,600</td>
</tr>
<tr>
<td>Powder River</td>
<td>Moorhead, Montana</td>
<td>7,980</td>
<td>277,600</td>
</tr>
<tr>
<td>Little Powder</td>
<td>Biddle, Montana</td>
<td>1,450 (App.)</td>
<td>17,470 (2)</td>
</tr>
<tr>
<td>Powder River</td>
<td>Mouth of River, Montana</td>
<td>13,193</td>
<td>310,000 (2)</td>
</tr>
</tbody>
</table>

(2) Water year 1941-42 only.
(3) Insufficient data.

In general, the streams which emerge from the Big Horn Mountains run for several miles in an easterly direction, then turn northeastward toward Powder River. It is along these valley streams and their tributaries that most of the irrigated crop and hay lands are to be found, and where the most diversified and profitable agricultural areas are located. During the irrigating season, all normal flow is diverted and a water shortage sometimes occurs during some seasons on part of the irrigated lands. Additional lands are topographically suitable for irrigation, but in such areas the present supply of water is insufficient. Ordinarily, the streams emerging from the forest areas of the Big Horn Mountains are clear, fed by numerous springs and lakes. They become muddy and silt-laden only in periods of heavy run-off. On the other hand, streams rising from some of the more impoverished soil areas, such as are found on South Fork and Salt Creek watersheds, are invariably heavily laden with silt.
The potential opportunities for ground water recovery within the basin vary considerably because of the dissimilarity of geologic materials and structural conditions. The quality of ground water is good in most cases and becomes better as the mountainous west boundary is approached. No areas are known to exist where underground water occurs in sufficient quantity for irrigation to encourage additional well developments. However, according to reports of the U. S. Geological Survey, artesian flows occur irregularly along the Powder River. Thousands of small stock-watering reservoirs have been constructed primarily due to the lack of subsurface water supplies. In many of the lower elevation range areas, the reservoirs are the only source of water for livestock.

Irrigation began in the late 1880's, near Buffalo, chiefly for production of livestock feed. Dependable but fairly limited water supplies were available along the base of the Big Horns, and it was only natural that such areas were first developed for irrigation. Rapid expansion took place from 1900 to 1920, during which period nearly all the existing projects were developed.

Existing water facilities consist of stock water reservoirs, wells, direct flow irrigation systems, storage reservoirs, several individual irrigation pumping plants, flood water diversions and springs. Small lakes are abundant in the Big Horn Mountains at elevations in excess of 8,000 feet. Lake DeSmet, the largest body of water in the basin, has an area of 2.7 square miles, and is located eight miles north of Buffalo, Wyoming. Its present storage capacity is about 35,200 acre-feet, and plans of the Bureau of Reclamation call for an increase of 44,000 acre-feet in its capacity. Water is diverted from Piney Creek into this reservoir to augment the comparatively small flow obtained from Shell Creek. An annual interstream diversion of 9,000 acre-feet of water is taken from Piney Creek, a tributary of Clear Creek, for use on irrigated lands in the Tongue River Basin, Wyoming.

Present irrigation developments utilize practically all the available surface water supply, and any further increase in irrigation developments will be dependent upon supplemental storage above existing developments. According to Bureau of Reclamation estimates, there are approximately 42,600 acres of additional land suitable for irrigation below Moorhead Reservoir and 44,360 acres above. Substantially, all such proposed irrigation development would be on private lands. Table 6 depicts the plan of reservoir developments in Powder River Basin as presented in Senate Document No. 191, "Missouri River Basin".

An additional reservoir known as the Camp Comfort project, which was not included in Senate Document No. 191, is being studied by the Bureau of Reclamation as a possible irrigation storage and power site. Situated in the Big Horn Mountains, six of the proposed reservoirs will provide not only additional storage facilities, but will aid in the control of run-off during periods of high water and will greatly reduce the silt flow down the Powder River.
### Table 6 - Reservoirs Proposed by Bureau of Reclamation in Powder River Basin

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Stream</th>
<th>Unit Served</th>
<th>Total Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acre Feet</td>
</tr>
<tr>
<td>Wyoming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Willow Park</td>
<td>South Fork</td>
<td>Pinoy Creek</td>
<td>9,700</td>
</tr>
<tr>
<td></td>
<td>Pinoy Creek</td>
<td>Pinoy</td>
<td></td>
</tr>
<tr>
<td>Triangle Park</td>
<td>South Fork</td>
<td>Buffalo</td>
<td>4,000</td>
</tr>
<tr>
<td></td>
<td>Rock Creek</td>
<td>Buffalo</td>
<td></td>
</tr>
<tr>
<td>Bull Creek</td>
<td>Clear Creek</td>
<td>Buffalo</td>
<td>14,000</td>
</tr>
<tr>
<td>Lake Dosmet</td>
<td>Pinoy Creek</td>
<td>Ucross (1)</td>
<td>44,000</td>
</tr>
<tr>
<td>Smith</td>
<td>North Fork</td>
<td>Crazy Woman, Mayoworth and North Fork</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td>Powder River</td>
<td>Mayoworth and North Fork</td>
<td></td>
</tr>
<tr>
<td>Middle Fork</td>
<td>Middle Fork</td>
<td>Kaycee</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>Powder River</td>
<td>Moorhead (2)</td>
<td>700,000</td>
</tr>
<tr>
<td>Montana</td>
<td>Powder River</td>
<td>Moorhead (2)</td>
<td>700,000</td>
</tr>
<tr>
<td>Moorhead</td>
<td>Powder River</td>
<td>Moorhead (2)</td>
<td>700,000</td>
</tr>
</tbody>
</table>

851,700

(1) Increase in present capacity of 35,200 acre-feet.
(2) Principally regulatory for flood and silt control; approximately 390,000 acre-feet for irrigation purposes in Montana.

**Major Land Uses**

**Livestock Production**

The production of range beef cattle and sheep is the predominant agricultural enterprise in Powder River Basin. More than ninety-five percent of the area is devoted to livestock ranching and farming, and it is unlikely that much of the area will ever be put to much more intensive use until additional reclamation projects are developed.
Sheep predominate in the southern part of the basin. The majority of them are grazed in the summer on the Big Horn Mountains and on the plains and foothills region for the remainder of the year. Some cattle are handled in much the same manner, many of them being summer grazed on the Big Horn National Forest for a period of 3 to 3½ months. For the most part, however, cattle ranches are located in areas of year-long operations, including winter range and sufficient supplemental feed to carry over during the winter feeding season. The dominant use of the winter range area is made by sheep operators who are dependent upon seasonal migration to round out their year-long livestock operations.

The estimated number of livestock within Powder River basin for the year 1945 was 641,700, consisting of approximately 192,600 cattle, 433,500 sheep and 15,600 horses. This number of livestock is equivalent to 294,900 animal units, calculated on the basis that five sheep are equivalent to one horse or one cow. Cattle, therefore, comprise 65 percent, sheep 30 percent and horses 5 percent of the livestock population in the basin. Almost 75 percent of the total livestock population are found on Wyoming ranches and the remainder are in Montana. About two-thirds of the total animal units are found above the proposed Moorhead reservoir.

The health of livestock in the basin is generally good, and they are relatively free from disease.

Severe winter and spring storms are a constant threat to the stability of sheep operations. Sheep losses, for example, in Natrona County alone were estimated at $125,000 in the wake of a snowstorm which blanketed the area on June 20-21, 1947. Severe winter storms of 1948-49 caused much distress and heavy loss among livestock.

Predator losses are diminishing each year as a result of the active control programs of Federal, state and county agencies and various livestock associations.

Crop Production

Three percent of the land in the basin is devoted to crop production, about two-thirds of which is dry farmed. (See Table 7.) Crop production under irrigation, dry land farming and flood irrigation prevail under widely diverse conditions. The crops grown may be divided into three groups; grain crops, hay and forage crops and miscellaneous crops. For the year 1945, the hay and forage crops comprised about 61 percent of the total cropland acreage, grain crops made up about 26 percent, miscellaneous crops about 5 percent, idle or fallow land 7 percent, and crop failure constitutes the remaining one percent of the cropland acreage. These proportions vary from year to year, but hay and forage crops will very likely always be in the majority because of their close relationship to the livestock industry in the basin and to climatic limitations.

Alfalfa and other tame hay were grown on about 88,000 acres, yielding approximately 104,000 tons. Nativo hay was cropped from about 68,000 acres, with a total yield of approximately 55,000 tons. Winter and spring wheat, the principal crops grown for sale, comprised approximately 53 percent of the harvested acreage of small grains for the year 1944; oats 31 percent and barley
The sugar beet acreage, at the present time is confined exclusively to Clear Creek and Piney Creek in Johnson and Sheridan Counties; totalled nearly 1,000 harvested acres in 1944, and yielded slightly more than 10 tons per acre. The sugar beets are shipped to the sugar factory at Sheridan for refining. Statistical data pertaining to the value of crops and livestock in Powder River Basin are shown in Table 8.

Table 8 - Value of Principal Crops and Livestock and Number of Farms in Powder River Basin by Counties - 1945 (1)

<table>
<thead>
<tr>
<th>County</th>
<th>Value of Crops</th>
<th>Total Value of Livestock</th>
<th>Value of Livestock Products</th>
<th>Number of Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Harvested (Dollars)</td>
<td>Sold (Dollars)</td>
<td>Sold (Dollars)</td>
<td>Sold (Dollars)</td>
</tr>
<tr>
<td>Wyoming</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campbell</td>
<td>860,000</td>
<td>200,000</td>
<td>3,970,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Crook</td>
<td>1,166,410</td>
<td>163,200</td>
<td>5,050,000</td>
<td>2,850,000</td>
</tr>
<tr>
<td>Johnson</td>
<td>17,000</td>
<td>174,000</td>
<td>1,110,000</td>
<td>940,000</td>
</tr>
<tr>
<td>Natrona</td>
<td>518,000</td>
<td>537,200</td>
<td>11,840,000</td>
<td>6,870,000</td>
</tr>
<tr>
<td>Total Wyoming</td>
<td>2,561,410</td>
<td>537,200</td>
<td>11,840,000</td>
<td>6,870,000</td>
</tr>
<tr>
<td>Montana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carter</td>
<td>64,000</td>
<td>10,000</td>
<td>480,000</td>
<td>290,000</td>
</tr>
<tr>
<td>Custer</td>
<td>442,000</td>
<td>200,000</td>
<td>1,270,000</td>
<td>790,000</td>
</tr>
<tr>
<td>Powder River</td>
<td>1,500,000</td>
<td>540,000</td>
<td>3,530,000</td>
<td>1,670,000</td>
</tr>
<tr>
<td>Prairie</td>
<td>50,000</td>
<td>20,000</td>
<td>82,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Total Montana</td>
<td>2,056,000</td>
<td>770,000</td>
<td>5,362,000</td>
<td>2,660,000</td>
</tr>
<tr>
<td>Total</td>
<td>4,617,410</td>
<td>1,307,200</td>
<td>17,202,000</td>
<td>9,670,000</td>
</tr>
</tbody>
</table>

(1) Based on U. S. Census 1945, with adjustments.

Approximately 100,000 acres, including irrigated hayland and pasture, or about one percent of the basin is devoted to production of crops by irrigation. Irrigated land is confined mainly to the valleys of the carrier streams, Clear Creek, Piney, Crazy Woman Creeks and Powder River and lesser tributaries having their source in the Big Horn Mountains. Piney Creek waters are stored in Lake DeSmet. The water is generally ample for the land being irrigated, although in dry years, shortages occur. The most important crops grown are winter and spring wheat, oats, barley, alfalfa and sugar beets. Many of the ranches are of the so-called "shoestring" irrigation variety along the smaller streams. These ranches are operated on the basis of an adequate range forage supply nearby to support livestock six to nine months of the year. Extensive
irrigated farm developments are found along Clear Creek and Piney Creek in Sheridan and Johnson Counties and it is along these two streams where the greatest diversity in crop production is found.

The tributary streams rising in the Big Horn Range have the most reliable, though limited, flow and carry little silt. The waters are used extensively for irrigation which is carried on by means of individual or cooperative ditches. Little additional land can be irrigated until additional storage facilities are provided.

Comparatively little land above the proposed Moorhead reservoir is irrigated from Powder River, although the Bureau of Reclamation estimates that there are approximately 28,000 acres adjacent to the river which are suitable for farming by irrigation. The uncertainty of flow during the summer months, and the great amount of silt carried during high water makes Powder River unsuited for additional extensive irrigation at the present time. According to the Bureau of Reclamation, the construction of water storage facilities above Kaycee, however, will permit additional irrigation development on Powder River north of Sussex and will provide supplemental water to approximately 6,400 acres of existing cropland in the vicinity of Kaycee and Sussex. Originally developed as a Carey Act Project, 3,729 acres of the irrigated croplands lying adjacent to the river between Kaycee and Sussex are now supplied with water diverted from the Middle Fork west of Kaycee.

Approximately 154,000 acres, about 60 percent of the total cropland of the basin, are in dry farms. In Montana, nearly two-thirds of the dry farmland acreage occurs in Powder River County with scattered acreages in Custer, Carter and Prairie Counties. Most of the dry farms in Wyoming are confined to Campbell, Sheridan and northern Johnson Counties with limited areas in central Johnson and northern Natrona Counties.

Crop production by means of flood irrigation is the least common type, comprising only 24,131 acres. Most of the flood irrigated land lies adjacent to Powder River in Montana. Hay is the principal crop.

The livestock industry held undisputed control over most of the lands in the basin from about the time the Indians were placed on reservations in 1877 until about 1910 when homesteaders began settlement in the more productive areas. This influx was caused to a great extent by the passage of the 320 and 640 acre Homestead Acts. The expansion in dry farming was later stimulated by the introduction of the tractor, the combine, the one-way Wheatland disk plow and the furrow drill. As a result of successive drought years in the thirties, many dry farms and homesteads were abandoned. One of the most outstanding examples of such abandonments occurred in an area locally known as the "Nine-Mile District" in central Johnson County. Approximately one hundred families resided in this area in the twenties and early thirties as compared to about fifteen families at the present time.

The experiences of the last two decades are convincing proof of the erratic and wide variability in crop yields, crop failures and qualities of dryland farms in Powder River basin. This is illustrated by data for Campbell
County which is fairly typical of most of the dryland farms in the basin. These data show that in 1929, a relatively good crop year, 169,260 acres were seeded, of which 11,714 acres were a crop failure. In 1934, one of the drought years, 127,262 acres were seeded, of which 82,37 acres were a crop failure. Thus it is seen that within this short period, crop failures varied from seven percent in 1929 to sixty-five percent in 1934. In 1939 and 1944, generally considered to be excellent crop years, crop failures were about twelve percent and one percent respectively. There was a continual decrease in total cropland seeded, despite the stimuli provided by wartime demand and high prices during the last decade. Sub-marginal dry farm lands are constantly being retired from cultivation whereas experience has proven that they are more valuable and suitable for sustained livestock grazing use.

Forage Production

Range livestock numbers cannot be materially increased in Powder River basin without injury to the range resources until additional and supplemental development of irrigation and range management projects takes place. Present plans of the Bureau of Reclamation call for supplemental water supplies for approximately 44,000 acres of land in Wyoming above the proposed Moorhead reservoir. In Montana, it is estimated that 42,000 acres of land in Powder River basin can be provided with water below the projected Moorhead reservoir. Most of this additional irrigated acreage will likely complement the present livestock economy of the area by producing additional forage and feed. This should go far toward relieving or shortening the period of use on range lands which at present are being used too heavily. An increase in forage yields can be effected by such facilities as range reseeding, water spreading, fencing, water developments and by other rehabilitation practices.

Many ranchers have built up feed reserves for use during one or more sub-normal seasons, not to provide feed for additional livestock, but to assure maintenance of the livestock in adverse years. Many others, however, are not so fortunately situated and are dependent almost wholly upon the range resources and supplemental feed purchases. A decrease in the supply of native forage as the result of too many grazing animals or drought necessitates the increased use of supplemental feeds or reduction in numbers of livestock. In either event, the net result is reduction in income.

Supplemental feed provides not only reserves for seasons of subnormal range forage production, but makes deferred grazing possible on areas where the vegetative cover is injured by early spring grazing. It also supplements native range and pastures during normal seasons and thereby promotes the well-being of the livestock.

MINERALS

Mineral production of the basin includes oil, natural gas, coal and bentonite; and in 1945 had an estimated value of approximately $6,000,000. Small gold placer deposits have been worked in the past along Kelly Creek, Johnson County, Wyoming, but these are relatively unimportant.
Petroleum

There are a number of oil and gas fields in the basin, the largest of which is the Salt Creek oil and gas field in Natrona County, Wyoming. The output of this field is piped to Casper, Wyoming, for refining. (See Table 9.) Nearly all of the towns in central Wyoming as well as those in the basin are supplied with natural gas piped from this field, with one line extending into Nebraska.

Naval Petroleum Reserve No. 3, more commonly known as "Teapot Dome", is located adjacent to the Salt Creek field. This reservation embraces 9,320 acres and has not been in production since 1928.

Seismograph field studies and wildcat drilling were very active during the past three years in a large part of the Powder River basin. A wildcat well, drilled by a major oil company, added impetus to oil land leasing in Powder River basin when a good show of oil was reported in October, 1947. This wildcat, known as the "Adon Well" lies in the Little Powder River drainage about 15 miles north of Gillette, Campbell County, Wyoming. Its location was based on seismic work accomplished during the previous two years. Utilization of its Adon Block has been completed, and it is now reported to have about 40,000 acres included in the unit area. Virtually all lands in this vicinity and extending into Powder River County, Montana, have now been leased to oil operators and increased exploratory activity is expected. It is estimated that more than a million acres of land in the Powder River basin, much of which is public domain, was leased following discovery of the Adon Well. The west side of the basin flanking the Big Horn Range in Johnson County, Wyoming, is receiving considerable attention at the present time, and drilling is planned on several wildcat blocks in this area. Extensive areas of public domain are likewise to be found in this area.

Bentonite

The production of bentonite in the basin is very limited at the present time, the chief obstacle being the long distance to markets. Commercial quantities occur, however, in several areas, and increased activity and interest are being taken in development of this resource. While insufficiently prospected as yet, the bulk of the known deposits of bentonite appears to occur in areas where public lands are dominant.

Coal (1)

Coal of lignite and sub-bituminous grade is widely distributed throughout the basin and is being produced in commercial quantities near Buffalo, where output varies from 6,000 to 10,000 tons annually. Sub-bituminous coal resources in the basin are practically undeveloped, limited to small amounts taken by ranchers for their own use and with some commercial production for

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(1) The compiled data were obtained from several U. S. Geological Survey publications, the principal source being U. S. Geological Survey Professional Paper No. 100 A 1922, "Coal Fields of the United States" by Marius Campbell.
<table>
<thead>
<tr>
<th>Field</th>
<th>County</th>
<th>Year</th>
<th>Discovery Area (Acres)</th>
<th>Proven Area (Acres)</th>
<th>Total Cumulative Production through 1945</th>
<th>All lands Production 1945</th>
<th>Public Lands Production 1945</th>
<th>Government Royalty Production 1945</th>
<th>Land Value 1945 (Dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shannon</td>
<td>Natrona</td>
<td>1889</td>
<td>55</td>
<td></td>
<td>53,461</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt Creek</td>
<td>Natrona</td>
<td>1906</td>
<td>21,450</td>
<td>1929</td>
<td>316,771,071</td>
<td>1,151,115</td>
<td>320,551</td>
<td>1,545,412</td>
<td>65,174</td>
</tr>
<tr>
<td>Salt Creek No. 2</td>
<td>Natrona</td>
<td>1930</td>
<td>1,000</td>
<td></td>
<td>2,614,479</td>
<td>499,489</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Teapot</td>
<td>Natrona</td>
<td>1922</td>
<td>40</td>
<td></td>
<td>139,106</td>
<td></td>
<td></td>
<td></td>
<td>237</td>
</tr>
<tr>
<td>Notches Dome</td>
<td>Natrona</td>
<td>1923</td>
<td>420</td>
<td></td>
<td>569,830</td>
<td>123,169</td>
<td></td>
<td></td>
<td>6,158</td>
</tr>
<tr>
<td>Boone Dome</td>
<td>Natrona</td>
<td>1923</td>
<td>400</td>
<td></td>
<td>1,257,000</td>
<td>12,000</td>
<td>9,698</td>
<td>495</td>
<td>30</td>
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<tr>
<td>Powder River</td>
<td>Natrona</td>
<td>1923</td>
<td>300</td>
<td></td>
<td>41,000</td>
<td>2,000</td>
<td>1,792</td>
<td>90</td>
<td>4</td>
</tr>
<tr>
<td>Billy Creek</td>
<td>Johnson</td>
<td>1923</td>
<td>710</td>
<td></td>
<td>3,182,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>319,144,127</td>
<td>4,792,507</td>
<td></td>
<td></td>
<td>627,938</td>
</tr>
<tr>
<td>Naval Petroleum Reserve No. 3 (2)</td>
<td>Natrona</td>
<td>1922</td>
<td>3,000</td>
<td></td>
<td>3,543,282</td>
<td></td>
<td></td>
<td></td>
<td>787,284</td>
</tr>
</tbody>
</table>

(2) Production from 1922 to 1928 inclusive.
local consumption in the vicinity of Buffalo, Clearmont, Arvada and Gillette, Wyoming, and Broadus, Montana. The abundance of workable coal seams in the proximity of railroad transportation facilities in Sheridan and Campbell Counties, Wyoming, should make this undeveloped coal region one of future economic importance. The physical and chemical properties of this coal are very similar to those of the Sheridan field, where considerable development has taken place.

RECREATION

The Big Horn National Forest has a variety of resources, including timber, water, forage and wildlife. In addition, it is a beautiful country of mountains, lakes, meadows and streams which lures tourists in ever increasing numbers. It provides many types of recreation, including camping, picnicking, fishing, hunting, winter sports and pack trips into the wilderness country. Thousands of visitors enjoy this vacation land each year. For the convenience of these people, six camp grounds and one picnic ground have been developed in the Powder River watershed. Six resorts and dude ranches operating on the forest under permit, furnish accommodations to the public and provide pack trips into the high country. Civic, fraternal and religious organizations have permanent camps and numerous summer homes and dude ranches are found adjacent to and within the forest. The town of Story, in Sheridan County, Wyoming, is becoming an increasingly popular summer resort in its natural mountain setting.

The Cloud Peak Wilderness Area is located in the most rugged portion of the forest and was set aside in 1932 to preserve unique natural values of wilderness and scenic charm for future generations to enjoy. The entire area lies at high elevations, ranging from 8,500 to 13,165 feet and includes approximately 50,000 acres of the Powder River watershed. Uses are made of the area for recreation, livestock grazing, wildlife and water storage. Cabins and resorts are not permitted in this remote wilderness area, and trail systems and other facilities are held to a minimum.

"Holl's Half Acre", one of the outstanding examples of geologic erosion, is located adjacent to U. S. Highway No. 20, about forty miles west of Casper. This area of precipitous crags and needles was once feared by the Indians as boding ill omens and bad luck. Thousands of tourists traveling to and from Yellowstone National Park photograph and view this sight of nature. Title to the area was conveyed from the U. S. Government to Natrona County in 1924 for park purposes.

FISH AND WILDLIFE

The many tributaries of the upper reaches of Powder River are supplied with clear cold water rising from the melting of snow in the humid mountain areas. It has been estimated that there are more than 500 miles of well-stocked trout streams in the Big Horn Range. These streams carry little or no silt or mud, and thus provide an ideal environment for trout. Upon reaching the lower semi-arid plains area, the streams become suitable for
only coarse fish such as suckers, because of silt-laden waters. The creation of numerous additional storage reservoirs, which reduce floods and collect silt, will aid in the clarification of waters and improvement of the fish habitat.

A fish hatchery located at Story, Sheridan County, Wyoming, is operated by the Wyoming Fish and Game Commission.

Hunting is an important sport throughout the basin. In Wyoming, for the year 1946, the big-game kill, within the basin, exceeded 3,500 animals, 1,600 antelope, 1,600 mule deer and 395 elk. According to official records of the Wyoming Fish and Game Commission for the year 1946, 6,000 hunters were attracted to the Big Horn area, 2,600 of whom were non-residents. Total license fees paid in 1946 were in excess of $100,000, one-sixth of that for the entire state. Non-residents alone spent an estimated $20,000 during the 1946 hunting season in Powder River basin.

Powder River basin constitutes a favorable habitat for numerous and varied wildlife groups. In the high mountain country within the humid coniferous forests are found bear, deer, elk, moose, beaver and numerous other small game, and an abundance of mountain inhabiting birds. Migratory water fowl and shore birds visit the mountain lakes in large numbers during seasonal migration and brooding periods. In the woodland areas bordering the mountains and in northern Campbell and Sheridan Counties, are found deer and American prong-horn antelope. The extensive areas of grasslands and sagebrush are inhabited principally by antelope.

In Montana, the heaviest concentrations of antelope are found east of Powder River in Powder River County and Carter County, although they are distributed quite generally throughout the entire Powder River Basin. The estimated antelope population in Montana is 3,000. In Wyoming, an estimated 5,000 antelope range in the plains areas along Powder River. In general, it may be said that the antelope range is coextensive with areas where public domain is most prevalent.

White-tailed deer are found only in a limited area in the Mizpah Creek drainage in Montana. The male deer range is confined for the most part to southern Powder River County and the major part of Carter County, Montana, where there are an estimated 3,200 animals. In Wyoming, the Big Horn Range and Powder River breaks provide an ideal habitat for an estimated 5,000 mule deer.

The higher elevations of the Big Horn River support an estimated 1,200 elk. An estimated one-tenth of the total annual Wyoming state elk kill is made on the Big Horn National Forest.

Sharp-tailed grouse, often erroneously called prairie chicken or pintail grouse, have increased greatly and are now relatively abundant throughout Powder River County. This county is an ideal habitat because the area is remote from settled areas. The most abundant populations occur where only small areas are dry farmed, the remainder supporting native vegetation of grassland and more or less extensive areas of shrub cover such as sage.
Sage grouse or sage hen are likewise relatively abundant in Powder River, Custer and Carter Counties, Montana, and in Campbell County, Wyoming. They are most commonly observed in abandoned fields where stubble and weeds are most common, and are not necessarily confined to areas dominated by sage. Their range is much more closely restricted to the proximity of water than is the sharp-tail.

Hungarian partridge, while not abundant, are peculiarly adapted to intensively cultivated wheat-growing areas such as Ash Creek, Coalwood-Mizpah and Chalk Buttes areas.

The relatively few Chinese pheasants are confined principally to the bottomlands of Powder River and Little Powder in Montana and in Clear Creek and Crazy Woman Creek in Wyoming.

LAND MANAGEMENT PROGRAMS

Powder River basin presents a picture of diverse land management programs. Parts of six organized soil conservation districts lie within the basin, four of which are located in Wyoming and two in Montana, and comprise a gross area of approximately 950,000 acres, or about 11 percent of the entire basin. These soil conservation districts offer farmers and ranchers an effective means of self-help in meeting conservation problems. Through cooperative agreements with the Soil Conservation Service and other agencies, united group action and organization assures more efficient and more productive use of the land and water resources. The importance of the development of complete farm and ranch plans is stressed. The best use of the range and pasture lands is planned as an integral part of the entire operating unit, which includes crop and haylands. The extension of the district programs to reach a greater number of operators is desirable.

The Big Horn National Forest in Wyoming and two divisions of the Custer National Forest in Montana are partially within the Powder River watershed. They comprise an area of approximately 263,000 acres, equivalent to about four percent of the entire basin. About 50,000 acres of this area are included in the Cloud Peak Wilderness Area of the Big Horn National Forest.

The Naval Petroleum Reserve No. 3, more commonly known as "Teapot Dome" is administered by the Navy Department. Located in Natrona County, Wyoming, this reserve embraces a total area of 9,320 acres, the exterior boundary of which is completely fenced. Production of oil and gas in this reserve was discontinued in 1927. Four livestock operators have permits for winter grazing in this area which is administered locally by the Navy Department.

A very small portion of Tensleep Grazing District No. 1, in Washakie County, Wyoming, is included in the Powder River basin. The gross area consists of 2,480 acres, only 130 acres of which are public domain. This area is used for summer range.

With the exception of the two divisions of the Custer National Forest in Powder River County and Carter County, all of the Powder River watershed
in Montana is within Montana Grazing District No. 3. The gross area comprises 2,543,600 acres, of which 471,718 acres are public domain and 40 acres are withdrawn for Public Water Reserve.

The agricultural and conservation program of the Production and Marketing Administration, commonly known as the A.M.A. program, has met with widespread approval and participation by the farmers and ranchers within all counties in the basin. All soil conservation practices are designed to prevent erosion and are all based on the premise that grass is the best conservor of the soil. The provisions of the program are developed and administered through County and community committeemen elected by the local ranchers and farmers. Range practices completed since the inception of the program have been largely those tending toward better distribution of livestock and more uniform utilization of the range. On the basis of annual reports of the P.M.A., it is estimated that approximately 7,000 range livestock water reservoirs have been constructed, 900 springs have been developed, and about 700 wells have been drilled in the basin. Many ranches are still engaged in developing additional water supplies under this program.

Spring Creek Land Utilization Project Area

A relatively new part of the public land picture in the basin arises from land purchased by the Federal government. The Spring Creek Land Utilization Project Area in northeastern Campbell County is part of several similar enterprises in which the Soil Conservation Service is cooperating with Federal, State and local agencies and ranchers. Under Title III of the Bankhead-Jones Farm Tenant Act of July 22, 1937, the Secretary of Agriculture is authorized and directed "To develop a program of land conservation and land utilization, including the retirement of lands which are submarginal or not primarily suitable for cultivation, in order thereby to correct maladjustments in land use, and thus assist in controlling soil erosion, reforestation, preserving natural resources, mitigating floods, and to effectuate the program he is authorized to acquire by purchase, gift or devise, or by transfer from any agency of the United States, submarginal land and land not primarily suitable for cultivation, to protect, improve, develop and administer any property so acquired." The Spring Creek Purchase Area comprises an area of approximately 100,000 acres, the greatest portion of which lies in the Little Powder River drainage. The remainder is located in the Little Missouri River basin to the east.

The lands acquired by Government purchase were formerly small dry land farms, abandoned homesteads and tracts of range located at strategic points for water development. The total cost of all land purchased amounted to $111,000, each tract having been appraised to determine its fair value. All the lands that were purchased were voluntarily offered for sale by the owners.

The Government bought 27 of the 54 operators of the area. For the operators who remained in the area, there was then enough land to permit each to obtain a more economical unit. The average size of operating units in the area was increased from 1,700 acres to 4,760 acres. Land owned by the United States is now leased to individual operators through the Spring Creek Cooperative Livestock Association, formed in 1936 and consisting of 22 members. Either directly, or through its members, the Association controls all lands in the
area. The fees charged the Association by the Government for use of the land for each current year are based on the prevailing prices of livestock and livestock products and on the grazing capacity and general condition of the range. The Association enforces grazing permit regulations, prevents trespass, maintains range developments such as stock water reservoirs, springs and fences, and generally supervises the range operations of its members. Previously subject to many abuses associated with absentee ownership, land misuse, short-term leases and inadequate operating units, the area now provides a far greater stability to the present operators, due to a more satisfactory pattern of land use.

The classes of land ownership for the area within Powder River basin are as follows:

<table>
<thead>
<tr>
<th>Class</th>
<th>Acres</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Domain Land</td>
<td>2,320</td>
<td>2%</td>
</tr>
<tr>
<td>Title III Purchased Land</td>
<td>37,420</td>
<td>48%</td>
</tr>
<tr>
<td>State Land</td>
<td>3,672</td>
<td>5%</td>
</tr>
<tr>
<td>Privately Owned Land</td>
<td>35,088</td>
<td>45%</td>
</tr>
<tr>
<td><strong>Total Area</strong></td>
<td><strong>78,500</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**East Custer Cooperative State Grazing District**

Incorporated under the laws of the State of Montana, the East Custer Cooperative State Grazing District entered into a 10-year cooperative agreement with the Bureau of Land Management in 1942 for the purpose of bringing about a better coordination of the use of all classes of land used for grazing within the district boundary. By virtue of this agreement, the Bureau of Land Management issues to the State district an annual license or term permit for the grazing privilege that may be utilized on the Federal range in the district by its licensees or permittees and, subject to review, permits the State District to refuse to issue grazing licenses or permits to applicants who fail or refuse to pay grazing fees or assessments due or who fail or refuse to abide by rules and regulations of the State District. The State Grazing District lies in east Custer County and within Montana Grazing District No. 3, established under the Taylor Grazing Act. It comprises a gross area of approximately 175,000 acres, about 80 percent of which lies in Powder River basin. The district includes 56,000 acres of submarginal lands which were purchased by the United States following the drought years of the thirties. Public domain comprises about 6,500 acres, and state, county, railroad and private lands make up the remainder, or about 75 percent of the total area. Under the cooperative agreement, the public domain is rated as having an average carrying capacity of 4.15 surface acres per animal unit month, while Government purchased lands are rated at 3.02 acres per animal unit month. A grazing permit is issued to each livestock operator, which specifies conditions under which the range is to be used and the number of livestock the user is entitled to run. Each member is charged a fee based upon the number of livestock grazed on the district lands.
Prairie County Cooperative State Grazing District

The Prairie County Cooperative State Grazing District is similar in authorization, purpose, function and operation to the East Custer Cooperative State Grazing District. Only a small portion of this State Grazing District is contained in the Powder River watershed. The gross area within the basin comprises 65,261 acres, or about four percent of the district. Classes of land ownership, acreage, and average carrying capacity are as follows:

<table>
<thead>
<tr>
<th>Class</th>
<th>Acres</th>
<th>Carrying Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Domain Land</td>
<td>5,471</td>
<td>5.71 acres/animal</td>
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<tr>
<td>Title III Purchased Land</td>
<td>17,881</td>
<td>3.71 acres/animal</td>
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<tr>
<td>(Administered by the Soil Conservation Service)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Land</td>
<td>3,590</td>
<td>3.51 acres/animal</td>
</tr>
<tr>
<td>Private Land</td>
<td>15,127</td>
<td>-</td>
</tr>
<tr>
<td>Railroad Land</td>
<td>22,884</td>
<td>3.65 acres/animal</td>
</tr>
<tr>
<td>Indian Allotment Land</td>
<td>308</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Acres</strong></td>
<td><strong>65,261</strong></td>
<td></td>
</tr>
</tbody>
</table>

Mizpah Pumpkin Creek Grazing District

The Mizpah Pumpkin Creek Grazing District, located partly in the Powder River basin in Custer County, Montana, is unique in that it was not only the first cooperative grazing district formed in the United States, but it was also the first one authorized by special Act of Congress. The preamble to the bill which made possible this area states that it is an Act authorizing the Secretary of the Interior to enter into a cooperative agreement or agreements with the State of Montana and private owners of land within the State of Montana for grazing and range development, and for other purposes. The Mizpah Pumpkin Creek Grazing Association was organized under state law in 1928, and comprised about 15 members who lived in or adjacent to the district. About 43 percent (46,000 acres) of the district lies in the portion of the Powder River watershed drained by Mizpah Creek. About 13,000 acres are public domain, 2,000 acres are owned by the Northern Pacific Railway Company, 2,500 acres belong to the State of Montana, and 28,500 acres are privately owned.
PROBLEMS RELATING TO THE PUBLIC DOMAIN

A reconnaissance survey and a cursory analysis of published reports and public records has revealed many problems relating to the management, protection, development and utilization of the public domain lands and their resources under the comprehensive program for the development and utilization of the resources in the Missouri River Basin. These studies have not been of sufficient detail to determine their scope and seriousness, nor to prescribe detailed corrective measures. Further investigations will be necessary and, no doubt, additional problems to those listed below will be discovered in the more detailed studies. As previously stated, the purpose of this preliminary survey and report is to determine and describe in general terms the role of the public lands in the development program and to point up the principal problems confronting the Bureau of Land Management in providing for the maximum contribution and service of this public land to the comprehensive program. The following problems appear pertinent at this time.

Problem A: Watershed breakdown and consequent siltation of stream courses and impoundments.

This probably is the biggest single problem pertaining to the public domain lands in the Powder River basin. This problem is not, however, peculiar to the public domain land only, but no doubt is more critical there than elsewhere, due to their poorer soil, vegetative cover and topographic characteristics. As previously explained, the public domain now occupies the lands of lowest productivity with respect to surficial resources. They are inherently the greatest contributors per unit area to siltation from geologic erosion. Many years of unregulated use prior to 1934 has no doubt contributed to the deterioration and depletion of the vegetative cover which has in turn resulted in the acceleration of the erosional processes.

Reconnaissance examination of the drainage area tributary to the Moorhead reservoir site indicates that large quantities of silt are carried by Powder River in the wake of each heavy storm as well as during the period of heavy spring run-off. A large part of the silt-load is probably a result of bank sloughing along the stream channels during such high-water flows. However, the more insidious though less spectacular form of silt contribution results from sheet erosion on disturbed and unstable soils which lack an adequate vegetative cover for their protection. Excessive run-off, while influenced by intensity and duration of rainfall and other factors, is greatly affected by the amount of vegetation. Soil losses and accelerated erosion are greatest in the extensive areas of heavy shales. Salt Creek and the South Fork and Middle Fork of Powder River are considered to be the major sediment contributors per unit drainage area, but available data are inconclusive and do not permit the reliable determination of the amounts of sediment produced by those major tributaries and their numerous ephemeral water courses. Until sufficient reliable data are made available to
determine the true origin and volume of the sediments produced in Powder River basin above the proposed Moorhead reservoir, a wholly reliable and comprehensive plan to obtain the optimum of soil erosion and sediment control cannot be presented.

The only sediment sampling station which exists at the present time on Powder River is at Arvada, Wyoming in southeast Sheridan County. The Water Resources Branch of the U. S. Geological Survey established this station in April 1946, and has been operating since. Records to date are inconclusive as to average condition; however, trends are indicated. For the period April 4, 1946 to September 30, 1947, the total discharge of silt from the 6,050 square mile drainage area above the station was over 9 million tons. Discharges were greatest during May and June, with over one and a half million tons per month and accounting for more than half of the total annual discharge. Discharges were least during the fall and winter months.

In order to establish adequate basic sedimentation data as to amounts, origin and movement of silt, it is believed that additional stations should be installed at or near the mouths of major silt contributing tributaries or at existing stream gauging stations in Powder River basin. In the drainage basins of South Fork and Salt Creek, where the bulk of public lands are situated, the amounts, origin and movements of sediment should be determined in order to facilitate a comprehensive program of public land rehabilitation, development and proper utilization. The installation of coordinated erosion measurement and vegetation plots in representative areas of high silt production and in areas where public lands are predominant will also go far in providing much needed erosion and sedimentation data.

The solution of the silt problem is dependent upon two physical accomplishments. First, where ever possible, soil must be held in place. The maintenance of an adequate vegetative cover is the only practicable means by which this can be accomplished over large areas. Second, where topography, geology, soils, climate and other natural conditions preclude the maintenance of an adequate vegetative cover, that is where normal or geologic erosion results in any considerable movement of soil, the resulting silt must be trapped, if reasonably possible, before it reaches the main channels. The sagebrush type, occupying areas of characteristically heavy soils, is probably the heaviest silt producer in Powder River basin. Accelerated erosion continues to be active in very rough parts of the watershed occupied by this type of vegetation. In the vicinity of the heavily overgrazed stock driveways, deep-cut gullies are frequent, and areas surrounding stock water facilities are too often in a very deteriorated condition. In the grass-land type, on the other hand, there is very little evidence of accelerated erosion except in localized areas.

With the exception of sediment records for Powder River at Arvada, Wyoming, no actual records are available to determine the
relative silt contributions from the principal tributary streams above Moorhead reservoir site. Such data are needed as a guide to future action. However, on the basis of existing information obtained from various local sources, it is believed to be the consensus that the greatest silt contributions are derived principally from: (1) the upland plains watersheds of South and Middle Forks of Powder River; (2) Salt Creek; (3) the locally dissected "badlands" bordering the main stem of Powder River north of Sussex, and (4) possibly to a lesser extent, Wild Horse Creek near Arvada. This comprises an area of about 5,000 square miles. Portions of the lower elevations of North Fork of Powder River watershed may also have some influence upon silt production. Clear Creek and Crazy Woman Creek appear to be of comparatively little significance insofar as silt contribution is concerned, although it is interesting to note that these two streams are the principal sustaining water carriers in the basin.

The probability that the above-named streams are the source of major portions of silt derived from the basin is of great concern to the Bureau of Land Management because the amounts of public domain in these areas are relatively high. Public lands constitute about 30 to 35 percent of all classes of land ownership in these areas of high silt production.

A detailed survey of the soil erosion situation and vegetative cover of the public domain land and a determination of feasible corrections or control measures is necessary. This should also be accomplished for lands under other classes of ownership, particularly state and private, as the problem must be tackled on a watershed basis.

Problem B: Maladjustments in public land use.

As most of the land in the basin is range land, range management has a most important bearing on the economy of the area. A reconnaissance survey reveals that much range depletion and deterioration has taken place during the past. Many of the more desirable range plants are being or have been replaced locally by inferior species. The grazing capacity has consequently diminished. Arrested depletion and sustained yield of the forage resources can be attained only if the range is properly stocked. Attempts to restore the range resource through changes in seasonal use and methods of handling, fencing, reseeding, water developments and other devices will fail unless the intensity of grazing use is brought within the safe long-time grazing capacity limits of the range lands.

In establishing a livestock economy, the range users have made some adjustments in the utilization of the range resources, although the methods of adjustment in all instances do not yet measure up to a well established economy. This is perhaps best illustrated by the existing problems of seasonal misuse of forage resources.
Range rehabilitation through proper management has not kept pace with the improvements in grades of livestock, better husbandry methods, or increased marketing outlets. Forage removed in excessive amounts continues to contribute to the progressive destruction of the range resources, a practice which sooner or later will place such users at an economic disadvantage with more conservative range users. Improvements probably must involve modification of confirmed habits in livestock operations.

One of the most promising outlooks for obtaining proper range use in the basin is found in the growing realization on the part of stockmen that conservative stocking is to their own financial advantage, as well as to the social advantage of the community in protecting land resources.

The problem connected with public land administration also includes the provision for proper management facilities, such as fences, wells, stock water reservoirs, and such rehabilitation measures as flood irrigation, water spreading and range reseeding. Considering the magnitude and significance of the public domain with respect to the problem of siltation alone makes it imperative that a rehabilitation program in the most critical areas be started without delay.

The amount of range rehabilitation work that has been completed is insignificant in relation to the magnitude of the needs. Range developments and facilities which have heretofore been constructed on public lands have been mainly of the type which have facilitated livestock operations and livestock movement. A total of approximately 145 range development projects have been constructed on public lands in the Powder River basin by the Bureau of Land Management. The total expenditure for the construction and maintenance of these improvements was approximately $125,000, of which $27,000 was contributed by Wyoming livestock operators. Government expenditures in the Wyoming portion of the basin amounted to about $59,000 through fiscal year 1947; and about $39,000 was expended in Montana through the same period. In addition to these public land range improvement projects, ranchers have constructed under permit in Montana Grazing District No. 3 about 105 miles of fence, 21 stock water reservoirs, 3 wells and one shearing pen, at a total cost of about $22,000. No estimates are available with regard to the value of range improvements placed on public domain by lessees in the Wyoming portion of the basin, but it is believed to be a fairly substantial amount.

Problem C: Complex land ownership and operating patterns.

The public domain map (index) shows the scattered location and extent of the public domain land and the various Federal land management programs in operation in the Powder River basin. Federal land disposition and acquisition programs have both been operative within the past 15 years. A lack of sound policy as to Federal land
programs is complicating long-range planning for this as well as
other areas in the Missouri Basin. Superficial analysis of the
land capabilities and land use economics indicate that much of
the "public domain", principally the isolated and widely scattered
tracts, could be most effectively managed and utilized under
private ownership. Further detailed study of each tract of pub-
lc domain land and a comprehensive analysis of the entire land
use economy of the area is necessary to develop a sound policy
and approach to more effective land administration and resource
utilization. The many and varied uses of lands and their re-
lationship to public interests and public problems must be fully
considered.

Problem D: Stock driveway situation.

A fourth problem so far encountered involves all of the
three previously mentioned. It is the problem arising from and
indigenous to the stock driveway situation in the upper portion
of the Powder River basin. Concurrent with the passage of the
stock raising homestead act of 1916, many public domain lands
were withdrawn for the alleged purpose of stock driveways to
provide access for movements of livestock from range and ranch
to market and between-season range areas. Since 1916, the methods
of livestock operations have changed and so has the land use
economy in the area. Most of the stock driveway withdrawals re-
main intact, some are used in one way or another to excess, with
the result that both the forage and soil resources have seriously
deteriorated. It is believed that the resource condition on the
stock driveways is more critical than on any other type of land
in this area. This condition may be attributable in part to the
fact that there has been no administrative authority charged with
the responsibility of regulation, management and administration
of stock driveway lands outside of Federal Grazing Districts.

There are five principal stock driveways or trail systems
in the Powder River basin in Wyoming. These five trails include
a total of some 123,000 acres of withdrawn public domain land.
In addition, there are many small disconnected driveway with-
drawals scattered throughout the upper portion of the basin
which include about 20,000 additional acres of public land.

In cooperation with counties and livestock associations,
stock driveway committees have been formed in each of Natrona
and Johnson Counties. These committees have "assumed" the
function of regulating the use of these driveways but, having
no administrative authority nor no law with penalty provisions,
they have been helpless in trying to eliminate or materially
reduce the many abuses, such as trespass, that have been
occurring.

In some cases, the driveways are inadequate to provide
orderly and proper access between seasonal ranges and between
ranches and markets. On the other hand, many of the withdrawn lands are no longer needed and many, no doubt, were never needed for stock driveway purposes. It appears that many adjustments such as are possible through land exchange, could be worked out to relieve some of the driveway problems. Other problems concerning the stock driveway situation and requiring attention include:

1. The need for improvements and facilities such as stock water, fences and boundary markers, to promote orderly use.

2. The need for soil and water conservation measures to rehabilitate the deteriorated and depleted resources.

Further detailed study to develop factual data for the solution of these and other problems relating to the stock driveway situation is urgently needed.

Problem B: Integration of land uses.

This problem also is overlapping in scope. It must be considered in connection with all of the others.

As explained earlier in this report, the predominant land use economy in the Powder River basin is built around the range livestock industry. The development of additional forage crop producing farm land through irrigation will no doubt increase the demand for range land use. Through effective integration of such crop land use with range land use, many of the present hazards to the year-round grazing operation could be alleviated, and many of the improper seasonal use grazing practices could be eliminated.

According to statistics of the Production and Marketing Administration, during the past few years the greatest part of the crop land is used for the production of hay, and on many ranches no other crop is grown. Hay was produced on over 156,000 acres, or on 61 percent of the crop land. Small grains were harvested on approximately 66,000 acres, or 26 percent of the crop land. Other miscellaneous crops were produced on about 11,000 acres, or 4 percent. Idle, fallow or pastured crop land comprised almost 16,000 acres, or 7 percent, while slightly less than one percent of planted crop land was reported crop failure.

About 68 percent of the total forage required for livestock is produced on native range lands, while forage production on hay lands furnishes slightly more than 23 percent of the required feed. Small grains, while principally a cash crop, furnish 5 percent of feed. Thus, for the area as a whole, it may be said that about 96 percent of the required forage is produced in the basin, while the remaining four percent of the required feed is brought in from other areas, the greater part in the form of concentrates.
An analysis of the feed production and requirements, when broken down by states, however, reveals a considerably different condition than that for the basin as a whole. In Montana, for instance, under present practices a slight surplus of feed over requirements is revealed, despite the fact that over 80 percent of the required feed comes from range lands. Numerous stacks of hay are held in reserve, many of which are carried over a period of several years as insurance against less bountiful future days or for anticipated emergency feeding periods. The feed situation in the Montana portion of the basin, therefore, is a healthy one, one in which the livestock operators are in a better position to cope with acute adverse conditions than they have been in the past. The dependency of the livestock operators upon range resources for the bulk of their feed should nevertheless be borne in mind. One or a series of unfavorable years in range resource conditions can again cause considerable distress in livestock practice. The expansion of additional irrigation facilities such as are planned along Powder River will go far toward relieving this situation.

The need for such additional facilities becomes even more apparent in the Wyoming portion of the basin, where under present practices, a deficiency of 10 to 15 percent in feed requirements is indicated. Of the total estimated forage required in the Wyoming portion of the basin, about 65 percent is produced on range lands, about 20 percent on hay lands and 5 percent is obtained from feed grains, stubble and straw. The apparent deficiency of approximately 10 percent comprises purchased feeds, most of which is brought in in the form of feed concentrates.

The deficiency in feed requirements is generally greatest, where dependency upon range resources is greatest, and a further corollary to this fact is that the deficiency apparently becomes most acute in areas where public lands make up significantly high percentages of all classes of land ownership. Furthermore, the deficiency appears to be greatest in areas where sheep production predominates and where seasonal migration is a common phase of livestock operation. Lack of spring-fall range and recurrent seasonal misuse is symptomatic of such deficient areas.

The almost complete dependency of some operators upon range forage in southern Johnson County and in Natrona County accentuates the need for supplemental and additional irrigation developments in this portion of the basin. A recurrence of the range conditions which prevailed during the drought of the 1930's will almost certainly result in greater distress among such operators than those more favorably situated near irrigation developments along Powder River and its tributaries.

The need for further studies of the public lands and their relationship to proposed irrigation developments is of particular
importance in the Wyoming portion of Powder River basin, because the future economy of much of the area hinges heavily upon the proper use of the public range lands.

With increased development will come increased population and increased demands for recreational uses including fishing, hunting, camping and just plain scenic driving. The public lands now contribute to all of these and other recreational uses. They will no doubt be called upon to contribute more. Hell's Half Acre in the upper portion of the basin and along U. S. Highway No. 20 attracts many tourists. This tract is uniquely situated and well-named, but there are many more acres in a "Helluva" shape that may be of interest at some future time. Incidentally, Hell's Half Acre (380 acres) was deeded to Natrona County by the U. S. Government for recreational uses in 1924. The county has given only token administration to the site.

Problem F: Rodent and insect infestation.

These problems are recurrent, and no doubt we will just have to learn to live with them. Rodent infestations can be and have been important contributing factors to forage depletion and resulting vegetation and soil deterioration. Effects are generally quite localized, and recent developments in control measures are proving very effective.

Grasshopper and cricket infestations remain a serious menace over broad areas. Control measures have so far been sadly inadequate. These are problems concerning the biologist and entomologist, and no doubt will be ably and promptly dealt with.

Problem G: Poison plant problems.

This is a minor problem in the Powder River basin according to reports studied and reconnaissance surveys made. It is also one which can ordinarily be solved through proper land use. It is not expected that much trouble in this connection will be encountered. The vegetation inventory will include the existence, abundance and location of poisonous plants.

Further land classification studies are necessary to obtain the basic data necessary to the solution of the problems here enumerated and to discover other problems not mentioned and plan for their solution. A remedial program should be proceeded by a detailed inventory and classification of the resources of the public domain lands, their capabilities, suitability and condition. A comprehensive analysis of the total land use economy of the basin should be made in cooperation with other land managing agencies and interests.

Such detailed studies should include a qualitative and quantitative appraisal of the many complex multiple land use relationships, with
emphasis on their watershed significance. With the development of large
impoundments on the main tributaries and main stem of the Missouri River,
the proper management and protection of the upper watershed area assumes
greater importance.

Charged with the responsibility of properly administering and managing
nearly one-fourth of the total land area in the Powder River basin, the
Bureau of Land Management is directly concerned with the pervasive problem
of achieving a balanced land use economy that recognizes all interests.
Progress toward this objective will be conditioned in large measure by
the extent to which complementary action is effected by the coordinated
efforts of all interested agencies, organizations, groups and individuals.

Detailed studies necessary to the solution of these problems will be
carried forward by the Bureau of Land Management in the following four sub-
areas or problem areas in the order mentioned:

1. Upper Powder River, which will include the drainages of North,
Middle and South Forks of Powder River and Salt Creek in
Converse, Johnson, Natrona and Washakie Counties.

2. Powder River breaks, which will include the main stem of Powder
River tributary to the proposed Moorhead reservoir, but will ex-
clude Crazy Woman and Clear Creek drainages.

3. Moorhead-Powderville sub-area in Montana, which will include
all of the watershed in Carter County and all of Powder River
County except the Mizpah Creek watershed.

4. The remainder of the watershed or basin.

Sub-areas 1, 2 and 3 have been delineated principally on the basis of
the amount and concentration of the public domain lands in the area. Sub-
area 4 includes the portion of the basin which contains relatively little
public domain, and what remains consists principally of small isolated
parcels. Further study of these tracts is necessary to determine the
management or disposition (from Federal ownership) which should be carried
out.


Approved:

[Signature]
R. D. Nielson, Land Economist in
Charge of Missouri Basin Studies.

Date:
March 1, 1949
LITERATURE CITED


17. Regional Planning, the Northern Great Plains - Part IX. National Resources Planning Board. 1939.


33. Wyoming Wildlife. Wyoming Game and Fish Commission. 1946 to 1948. (Monthly publications.)
SEE FULL MAP ATTACHED
Yellowstone River Compact Tentative Agreements, Feb. 2, 1950
YELLOWSTONE RIVER COMPACT

Tentative Agreements Reached February 2, 1950

at Billings, Montana.

POWDER RIVER

1. All existing rights to the beneficial use of the waters of the Powder River in the States of Montana valid under the laws of these States as of January 1, 1850, are hereby recognized and shall be and remain unimpaired by this Compact.

2. The total unused or unappropriated divertible flow of the Powder River Basin is divided:

56% to Montana
44% to Wyoming

3. Same agreement for stock reservoirs as in the 1944 Compact.

TONGUE RIVER

1. Appropriate rights to the beneficial use of the water of the Tongue River system existing in each signatory State as of January 1, 1850, shall continue to be enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation.

2. Wyoming and Montana agree that the unappropriated waters of the Tongue River system subsequent to January 1, 1950, shall be allocated to each state as follows;

60% to Montana
40% to Wyoming

BIG HORN RIVER

1. Subject to existing Indian Treaty Rights, all existing rights to the beneficial use of the waters of the Big Horn River Basin in the States of Montana and Wyoming, valid under the laws of these States as of January 1, 1850, are hereby recognized and shall be and remain unimpaired by this Compact; provided, that at times when insufficient water is available to supply all existing rights in both States the water that is available will be apportioned to rights in the two States on the basis of priority of rights in the two States.

2. The total unused or unappropriated divertible flow of the Big Horn River Basin is divided;

[Percentage to Montana]

[Percentage to Wyoming]

(The percentages are to be based on potential irrigable areas in the two States as determined by the Engineering Committee and approved by the Compact Commissioners.)

3. Same agreement for stock water diversions as in the 1944 Compact.

CLARKS FORK RIVER

1. All existing rights to the beneficial use of the waters of the Clarks Fork Basin in the States of Montana and Wyoming valid under the laws of these States as of
January 1, 1950, are hereby recognized and shall be and remain unimpaired by this Compact.

2. The total unused or unappropriated divertible flow of the Clarks Fork River Basin is divided:

   40% to Montana
   60% to Wyoming

3. Same provision for stock reservoirs as in the 1944 Compact.
1. Unused or Unappropriated Divertible Flow  
(Formula Suggested by Wyoming)

The total unused or unappropriated divertible water allocated by the Compact shall be determined on an annual water-year basis measured from October 1st of any year through September 30 of the succeeding year. The quantity to which the percentage factor shall be applied through a given date in any year shall be, in acre-feet, equal to the algebraic sum of:

1. The total diversion for lands in Wyoming and Montana with a priority date later than January 1, 1932.

2. The net change in the storage in acre-feet in all reservoirs completed in Wyoming and Montana subsequent to January 1, 1932, except stock water reservoirs.

3. The quantity of water passing the designated point of measurement in the streams.

These points shall be the lowest point of diversion in Montana as the Powder River (Lacosta, Montana), the Tongue River below Yellowstone—Tongue Irrigation District diversion, the lowest diversion in Montana on the Big Horn River, and the lowest diversion above Rock Creek on the Clarks Fork River.
Draft Report by Dan Ashenberg, 1983
DRAFT REPORT

A COOPERATIVE PLAN TO ADMINISTER THE
YELLOWSTONE RIVER COMPACT

by

Dan Ashenberg
Water Resources Division
Department of Natural Resources and Conservation

November, 1983
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I. INTRODUCTION

(A) Analysis of the Compact

On October 30, 1951, the Yellowstone River Compact was approved by the states of Wyoming, Montana, and North Dakota. The intent of the Compact is to establish the process for apportioning water in the four tributaries of the Yellowstone River. Analysis of the Compact would lead one to believe that drafters of this document intended that flow during periods of high runoff would someday be stored and then apportioned on a percentage basis for later use. Therefore, the real purpose of the Compact is to divide excess spring flow.

The Yellowstone River Compact recognizes all water rights existing as of January 1, 1950. The result is that the Compact does not address the division of water during extremely low flow periods because the majority of appropriations in the Yellowstone Basin have a priority date earlier than 1950. If there is insufficient water to satisfy all pre-1950 uses in both states, Wyoming water users would first satisfy their pre-1950 demands. Montana users could then appropriate the remainder, including the accumulated return flow generated in Wyoming. Because agricultural and industrial development since 1950 has been minimal, the need to regulate post-1950 appropriations in Wyoming for the purpose of satisfying pre-1950 appropriations in Montana would also be minimal.
Along with providing for water allocation, the Yellowstone Compact constitutes an important deterrent to the out-of-basin transfer of water. Article X of the Compact states that no water may be transferred out of the basin without consent of all three signatory states. The intent of this Article is to protect existing appropriators in both states who depend almost entirely upon the reuse of return flow. The issue of reusing return flows is important to both states because Article V apportions flow based on diversions, not on depletions. Therefore, if return flows are not available for reuse, downstream appropriators could be harmed. As an example, a pre-1950 agricultural diversion right to 500 acre-feet which is changed to an industrial use and exported out of the basin could potentially impact an additional 375 acre-feet of downstream agricultural diversions. Article X protects these downstream users.

Section C(4) of Article V of the Compact suggests that water which flows past the point of measurement provided by the Compact and leaves the system "from October 1 to any given date" is allocable flow. The analysis of the historic flow at this point of measurement would be useful in calculating the historic apportionment, for sizing new reservoirs, or for analyzing potential development in the basin. However, in terms of real-time administration of the Yellowstone Compact, the division of water as it leaves the system does not make sense because it is physically unavailable for upstream use. For
example, if 150,000 acre-feet pass the point of measurement from October through April, it would be defined as "allocable flow" by Article V. While this flow is "allocable" in a historic sense, it certainly is no longer available for use during the May through September irrigation season. Therefore, for purposes of real-time compact administration, this 150,000 acre-feet should probably shift from an "allocable" account to an "unused and presently unavailable" account.

(B) Need for Compact Administration

Since 1951, the consensus of the Yellowstone River Compact Commission has been that the level of water resources development in the basin has not warranted administration of the Compact. Recently, however, the demand for Compact administration and irrigation water management in the Yellowstone Basin has been growing. There are a number of reasons for this. First, Wyoming and Montana would like to develop their share of unused and unappropriated post-1950 Compact water. In Montana, a number of storage projects have been planned and the state is proceeding with steps to place reserved water to use. Both Montana and Wyoming either have or are looking to establish in-stream flow requirements for fish and wildlife. In addition, the State of Montana has taken the position that the development of water in the Missouri River Basin should be an integral part of any strategy whose purpose is to protect the water development interests of Upper Basin states from downstream demands.
Second, there is the potential for appropriating large quantities of water for industrial purposes and for water marketing. As an example, the Yellowstone River Pipeline Company recently filed an application for a permit to appropriate 345 cubic feet per second from the Yellowstone River mainstem. This flow would be considered part of Wyoming's entitlement under the Yellowstone Compact. If Montana granted this permit, or if water was sold from storage for industrial purposes, a mechanism to administer the Yellowstone River Compact should be in place.

Third, reports published by the State of Wyoming have discussed exchanges of Compact water between tributaries in the Yellowstone Basin. In order for an exchange to take place, an administrative process would be needed that could quantify and account for the exchange.

(C) Scope of this Report

The objective of this report is to provide the State of Montana with a plan to administer the Yellowstone River Compact. Administration of the Compact will most likely prove to be a costly and time consuming endeavor. For this reason, the proposed plan prioritizes activities based on their financial and political feasibility, and then organizes them into five distinct project phases. It is assumed in this plan that all five project phases cannot be implemented
simultaneously, and that the rate of progress from one phase to the next will depend on the level of available funding and the perceived need for water resources management and Compact administration.

This management plan stresses the importance of measuring and keeping accurate records of water use. Without this data the Yellowstone River Compact cannot be administered. Therefore, the question of determining actual water use may be the single, most critical issue to be resolved by water managers in the Yellowstone River Basin today.
II. PURPOSE

The underlying goals of the proposed management plan are:

1. To identify and prioritize certain tasks that need to be accomplished in both Wyoming and Montana in order to administer the Yellowstone River Compact.

2. To suggest a preferred course of action and outline the strategy necessary to accomplish each task.

3. To analyze the preferred course of action for potential problems or areas of conflict.

Implementation of this plan should result in the following:

1. Develop documentation of actual diversions and water use. These records are essential for Compact administration and can also serve as evidence for intrastate or interstate water rights litigation.

2. Allow the quantification of allocable flow on a weekly interval, or at other intervals to be determined by the Compact Commission.
3. Provide assurance that the State of Montana and Wyoming would receive their share of allocable flow.

4. Enable the generation of forecasts for the actual flow expected at streamgages in the basin headwaters and at the state line. These forecasts would be necessary to determine inflow to the river system. A knowledge of inflow would be useful in helping water commissioners regulate reservoirs and headgates, and would be used as input for hydrologic modeling.

5. Promote efficient irrigation water management practices that would increase agricultural production and decrease soil erosion in Wyoming and Montana.
III. METHODOLOGY

(A) Description of the Plan

In order to accomplish the objectives listed in Section II, this plan suggests a five phase process which relates directly to the organization of water rights data, water-use measurement, and to the development of a computer program which can be used to predict divertable flow and also calculate the Compact apportionment. The five suggested phases are:

Phase I  - Water Appropriations Data Organization
Phase II - Streamflow Forecast Development
Phase III - Determination of Irrigation Water Use
Phase IV - Intrastate Adequacy and Interstate Communication
Phase V  - Compact Administration

Due to limitations in funding and political feasibility, each phase would be implemented in a step-wise manner. The short-term goal would be to lay as much groundwork as possible in the Yellowstone Basin before Compact administration is absolutely necessary. The advantage to this approach is that the requisite data base would be compiled, and the necessary equipment would be in place and calibrated when the decision to administer the Yellowstone Compact is made.
Before discussing each of these five phases in detail, the mathematical basis for administration of the Yellowstone Compact is introduced along with a number of simple algebraic equations based on the provisions of Article V. That article defines the quantity of water to be allocated to each state and is equal to a percentage of the sum of the following terms:

1. Total post-1950 diversions in each state.
2. The net change in storage in post-1950 reservoirs in each state.
3. The net change in storage in pre-1950 reservoirs existing prior to 1950 which is used for irrigation, municipal, or industrial purposes that developed after 1950.
4. The flow past the point of measurement specified by the Compact.

A detailed summary of Article V is presented in Appendix A.

(B) Mathematical Basis and Equations for Administration of the Yellowstone Compact

It is proposed that the Compact be administered on a weekly basis using the following algebraic equations to apportion water on each tributary:
Equation 1

\[ Q(\text{accumWY}) = \sum_{i=1}^{N} D(WY) + \triangle S(\text{WYpost}50) + \triangle S(\text{WYpre}50) \]

(This equation states that the accumulation of water used in Wyoming from "October 1 to any given date" subject to the percentage allocation is equal to the sum of the accumulated diversions from day 1 through the N-th accounting period, plus the net change in storage in Wyoming's post-1950 reservoirs, plus the net change in storage from Wyoming's pre-1950 reservoirs used for purposes developed after 1950.)

Equation 2

\[ Q(\text{accumMT}) = \sum_{i=1}^{N} D(MT) + \triangle S(MTpost50) + \triangle S(MTpre50) \]

(This equation is the same as Equation 1, except the calculation is for Montana.)

Equation 3

\[ Q(\text{accum}) = Q(\text{accumWY}) + Q(\text{accumMT}) + \sum_{i=1}^{N} Q(\text{compact gage}) \]

(This equation states that the total accumulated flow to which the percentage allocations should apply is equal to the
sum of the accumulated water use in Montana and Wyoming, plus
the flow past the point of measurement specified by the
Compact.)

Equation 4

\[ Q_{(\text{allocWY})} = Q_{(\text{accum})} \times w \]

(This equation states that Wyoming's Compact entitlement
equals the total volume of water to which the percentage
allocation applies, times the specific percentage
allocation for any particular tributary.)

Equation 5

\[ Q_{(\text{allocMT})} = Q_{(\text{accum})} \times m \]

(Same as equation 4, except the calculation is for
Montana.)

Where, the terms in these five equations are defined as follows:

- \( Q_{(\text{accumWY})} \) - The accumulation of Wyoming diversions
and storage changes since October 1.

- \( Q_{(\text{accumMT})} \) - The accumulation of Montana diversions
and storage changes since October 1.
D(WY), D(MT) - Diversions for post-1950 uses in Wyoming and Montana, respectively.

\( \Delta S(\text{WYpost}50) \) - Net change in storage in post-1950 reservoirs in Wyoming and Montana, respectively.

\( \Delta S(\text{MTpost}50) \) - Net change in storage in post-1950 reservoirs used for post-1950 water rights in Wyoming and Montana, respectively (storage changes used for pre-1950 rights are ignored).

Q (compact gage) - The flow passing the point of measurement specified in the Compact.

Q (accum) - The total water from October 1 to the calculation date to which the allocation percentages will be applied.

Q (allocWY), Q (allocMT) - The calculated quantity of water allocated to Wyoming and Montana, respectively, since October 1.

w, m - The percent of Q(accum) that Wyoming and Montana, respectively, are assigned by the Compact, such that \( w + m = 100\% \)
- The N-th accounting period where N cycles from 1 to the last accounting period.

(C) Practical Application of Compact Equations

The key to practical application of the equations presented in the above section would be in the regulation of headgates and the admeasurement of irrigation water. Regulation of $D(WY)$ and $D(MT)$ must force $Q(\text{accumWY})$ in equation 1 to be less than or equal to $Q(\text{allocWY})$ in equation 4, and also force $Q(\text{accumMT})$ in equation 2 to be less than or equal to $Q(\text{allocMT})$ in equation 5. At the same time $Q(\text{compact gage})$ must be minimized, since any extra flow at this point would indicate that either $D(WY)$ or $D(MT)$ is too small.

$D(WY)$ and $D(MT)$ would need to be regulated on a daily or weekly basis to maintain an equilibrium between inflow, diversions, return flow, and allocable flow. Two methods with which to obtain equilibrium are introduced below. They are the "Trial and Error" method, and the "Forecast" method.

"Trial and Error" Method

In order to maintain equilibrium with the "Trial and Error" method, the following procedure would be followed:
1. Measure the inflow above diversions.

2. Estimate the level of use that could be satisfied with this inflow \([D(WY) \text{ and } D(MT)]\).

3. Regulate headgates to obtain this level of use.

4. Measure water-use as well as any flow at the point of measurement specified by the Compact.

5. Calculate \(Q(\text{accum})\).

6. Compare \(Q(\text{accumWY})\) with \(Q(\text{allocWY})\).

7. Compare \(Q(\text{accumMT})\) with \(Q(\text{allocMT})\)

8. IF: \(Q(\text{allocWY})\) is greater than \(Q(\text{accumWY})\)

THEN: Wyoming diversions could increase, if the demand exists.

OR

IF: \(Q(\text{allocWY})\) is less than \(Q(\text{accumWY})\)

THEN: Wyoming diversions should decrease.

NOTE: The same comparison would hold for \(Q(\text{accumMT})\) and \(Q(\text{allocMT})\).
9. If needed, adjustments in accounting could be made during the following accounting period to correct for errors in regulating D(WY) and D(MT).

10. Repeat steps 1 through 9 at the beginning of each accounting period in order to maintain equilibrium.

The "Trial and Error" method could be significantly improved if the system was calibrated based on past experience and if the available water supply for the next accounting period could be forecasted. These two improvements form the basis of the "Forecast" method described in the next section.

"Forecast" Method

The "Forecast" method consists of the following steps:

1. Forecast inflow above diversions for the next accounting period. This includes the mainstem and any major tributaries in either state.

2. Compare this inflow with historic inflows.

3. Consult a river calibration curve to identify the historic divertable flow at this level of inflow.
NOTE: The calibration curve would plot the average rate of inflow above diversions for the accounting period on the Y-axis, and the "divertable flow" that could be allocated to each state on a specified percentage basis on the X-axis. An example calibration curve and the accompanying explanatory discussion are contained in Appendix B.

4. With the use of a computer model project the divertable flow and Compact apportionment for the next accounting period.

5. Continue with step 3 of the "Trial and Error" method. If the divertable flow forecast was sufficiently accurate, plot this new data point on the calibration curve.

The "Forecast" method is more desirable than the "Trial and Error" method because:

1. It provides a guide to water commissioners on how headgates could be set at the beginning of each Compact accounting period.
2. It minimizes error and the need for "adjustments" in allocable flow. In-field water rights administration should be less expensive because less time would be needed in regulating headgates.

3. Minimal error and fewer headgate adjustments would increase project credibility among those appropriators who are being regulated.

4. It provides a method to continually update the calibration through time. The curve becomes more accurate and fine-tuned as additional data points are added.

5. The calibration curve would be combined with a simple computer program which could administer the Article V apportionment on a real-time basis.

The remainder of the Methodology section presents a detailed description of each phase of this plan. For each phase, the principle objectives are listed along with a preferred course of action to accomplish these objectives. The preferred course of action has been organized into a list of activities which have been prioritized, and analyzed for potential problems or conflicts.
Phase I - Water Appropriations Data Organization

Objectives

The objective of the first phase would be to distinguish the difference between water rights claims and actual water appropriations, and then organize the water appropriations according to location of headgate, priority date, and flow rate. Water appropriations need to be tabulated in this fashion in order to facilitate headgate regulation, and to determine the quantity of pre-1950, post-1950, and supplemental flow that can legally be diverted.

Preferred Course of Action - Phase I

Activity A

Field check all claims and permits for location of headgate and canals, priority date, and flow rate. Establish the ditch capacity at the headgate. The Department should then file objections on all speculative or abandoned claims affecting state projects. All other speculative or abandoned claims should be informally noted and filed for future reference.
Activity B

Overlay verified water rights data on a mosaic of aerial photographs and U.S.G.S. topographic maps in order to gain an understanding of the spatial distribution of diversions and expected return flows. This information would be necessary for the development of accurate computer models, and would also be a valuable reference for water commissioners and hydrographers.

Activity C

Organize verified water appropriations on a master "Ditch List" according to headgate location. Priority dates and flow rates for each ditch would also be punched onto a metal tag and permanently mounted near the headgate. Water commissioners would find these tags extremely useful in regulating headgates, and their presence would help decrease the frequency of disputes among water users.

Appendix C presents a comparison on how similar water rights in Wyoming and Montana would be organized. Exhibit 1 of Appendix C presents a sketch and short history of water use for "Rod's A-1 Canal". (A fictitious example based on fact.) Exhibit 2 compares Wyoming and Montana water rights filings on Rod's A-1 Canal. Exhibit 3 is an example of the respective ditch lists. Exhibit 4 presents an example of the tag that would be mounted on the headgate.
Potential Problems - Phase I

There are three areas of conflict that have been identified in accomplishing the activities listed in Phase I.

1. Water rights claims in Montana, and decreed rights outside of the Powder River Basin do not necessarily reflect actual water use. At the present time, one finds an inconsistency in the manner in which enlargements and supplemental irrigation are treated in individual claims. This inconsistency results in duplicate counting of irrigated acres and flow rates. Therefore, a computer program that simply totals the information found in these claims gives inflated results.

2. Because of the limitations which have been imposed on the Department by the Water Courts and the legislature, the present adjudication effort will only provide the State with a tabulation of historic claims. A change in legislative goals and directions, as well as additional funding would increase the robustness of the adjudication process in the following ways:

   a) Water rights claims could be verified in the field. This would be more accurate than the present method of office verification via
aerial photographs, and would be necessary for a reliable adjudication.

b) Cases involving, speculation, abandonment or incremental development could be sufficiently analyzed. The Department would then have complete and accurate data with which to file objections.

c) The actual volumes and flow rates for each appropriation would be more accurate because they would be measured.

d) Legal land descriptions could be assigned to each place of use.

e) There could be an in-depth analysis of land ownership.

3. The State of Wyoming applies a legal standard to the amount of water that can be diverted to irrigate a certain number of acres. This standard is equal to 2 cfs per 70 acres for water rights with a priority earlier than 1945, and 1 cfs per 70 acres for water rights with a priority later than 1945.
Montana, on the other hand has no consistent legal standard and the present system of water rights adjudication uses a "capping standard" based on flow rate, climatic area, and crop consumptive uses to identify and reduce unjustifiably large claims.

The result is that a ditch company may own very different water rights depending on whether it is located in Wyoming or Montana. Although legal, this inconsistency and bias may become a politically sensitive issue when water rights are regulated on an interstate basis.

**Conclusion - Phase I**

Administration of the Yellowstone River Compact depends on the availability of accurate and up-to-date water appropriation information including actual irrigated acres, flow rates, and priority dates. At the present time, this information is not available, and subsequently, the basin's water resources are not truly managed. Water management requires an intensive adjudication such as the one in the Powder River Basin. Originally, it was assumed that the statewide adjudication would proceed according to the methodologies developed for the Powder River Basin. Recently, however, the Water Courts have interpreted the intent of the legislature to favor the expeditious adjudication of a "general water rights list" where
specific features are stated but are unverified or loosely verified. This list will probably be subject to future modification through judicial argument and possibly by administrative approval. The DNRC therefore has two options which it could pursue in order to fulfill the objectives of Phase I. These options include:

1. Clarify the intent of the legislature and redefine the goals and objectives of the statewide adjudication to more closely resemble the adjudication in the Powder River Basin. Obtain legislature support for these activities as well as an adequate level of funding.

2. Object vigorously to every decree.

Phase II is presented in the next section. This phase suggests that the State of Montana enter into a cooperative agreement with Wyoming and the Soil Conservation Service to purchase, install, and maintain stream gages and certain telemetry equipment in order to generate streamflow forecasts for each tributary in the Yellowstone Basin.
Phase II - Streamflow Forecast Development

Objectives

The objectives of Phase II include the purchase and installation of SNOTEL-related equipment and the development of computer software that could forecast streamflow based on snowmelt and other meteorological parameters. Forecasts of streamflow would be necessary for the following reasons:

1. In order to admeasure water, water commissioners and hydrographers would need to know the inflow above diversions at key points on any particular stream. A streamflow forecast for the compact accounting period would give the range of inflows expected during that time period. Based on this information, water commissioners could select an average headgate setting for the accounting period and eliminate the need for daily adjustments.

2. Valid application of the computer model and calibration curve is predicated on an accurate forecast of inflow.

3. Streamflow forecasts would help facilitate basin wide water management because water users could schedule irrigation based on projected supply.
It is suggested that the U.S. Department of Agriculture, Soil Conservation Service (SCS) be responsible for the development of streamflow forecasts because that agency has considerable experience and expertise in the area of forecasting. Furthermore, the SCS is in a position to act as an independent third party, and could issue credible and unbiased forecasts on each tributary affected by the Compact.

Preferred Course of Action – Phase II

Activity A

Retrofit existing SNOTEL sites with micro-circuit boards that would integrate air temperature at 15-minute intervals. This data would be necessary in order to more accurately forecast snowmelt.

Activity B

Identify basins that do not have a streamflow gage located above major diversions in the basin headwaters. Formulate a cooperative arrangement between Wyoming, Montana, and the United States Geological Survey (USGS) to finance and install these new gages. Each gage would need telemetry capability because real-time data from these gages would be used for the calibration and operation of streamflow forecasts.
Activity C

Identify basins that do not have a sufficient number of weather stations. Finance and install these new weather stations. Climatological data would be most important in basins where streamflow is more dependent on local precipitation than on high mountain snowmelt (i.e.-Powder River Basin).

Activity D

Identify USGS stream gages which are located at the state line or at the compact measurement points that do not have telemetry capability and telemeterize such gages. Real-time flow data from a system of telemetered gages would be necessary to guide water commissioners, administer the compact, and verify that Montana's allocation actually crosses the state line.

Activity E

Compile historic snow-pillow, stream gage, and weather data for each basin. Enter this information into a computerized database for use in the development of the snowmelt-streamflow forecasts.
Activity F

Develop the software and statistics to analyze the parameters listed in Activity E and construct a computer model for each basin that predicts streamflow from snowmelt.

The Soil Conservation Service has indicated a willingness to cooperate with the States of Wyoming and Montana in the development of forecasts that would mutually benefit both states and help administer the Yellowstone Compact. The SCS has identified the Clarks Fork Basin as a high priority watershed for fiscal year 1983, and in the near future, intends to draft a cooperative agreement to develop forecasts in the remaining basins.

It is suggested that any costs related to the collection of streamgage data continue to be divided: 25% Wyoming, 25% Montana, 50% USGS. Other costs should be divided equally between both states.

Potential Problems - Phase II

No problems are expected since the acquisition of hydrologic data and the development of forecasts are activities that could benefit both Wyoming and Montana.
Conclusion - Phase II

The capability of forecasting inflow to a river would significantly improve the manner in which individual water rights, as well as the Yellowstone Compact could be administered. Basin-wide water management and irrigation scheduling are dependent on accurate and timely forecasts of available water supply.

After a system of forecasting inflow has been developed, the next step in the administration of water rights involves the actual physical measurement of the quantity of water being appropriated. This activity is discussed in the following section.
Phase III - Determination of Irrigation Water Use

Objectives

The objectives of Phase III would be to educate water users concerning the importance of irrigation water measurement, to install proper headgates, measuring devices, and recorders on all major ditches and canals (The most common varieties of water measuring devices include weirs, flumes, and vane type flow meters. Examples of a number of different types of water measuring devices and the advantages and disadvantages of each are listed in Appendix D.), and to institute a centralized system of uniform record keeping. There is an urgent need to measure diversions and keep accurate records of water use for the following reasons:

1. The apportionment formula in Article V of the Yellowstone River Compact specifically requires these data [See 85-20-101, 105, 106 of Montana Code Annotated]. The measurement of irrigation water is a prerequisite to real-time Compact administration.

2. Adequate headgates and water measuring devices are needed to administer intrastate water rights and to admeasure water.
3. Water use data are required in order to accurately determine each state's historic share of allocable flow under the terms of the Yellowstone River Compact.

4. The protection of existing irrigation is important to both states. Therefore, this use needs to be accurately identified, measured, and recorded.

5. Water measurement is an integral component of irrigation scheduling and irrigation water management. From an agricultural and economic standpoint, irrigation scheduling and water measurement should provide many benefits to farmers and ranchers. It has been shown that seed germination and plant growth are negatively affected by over-watering. In addition, the erosion of the water-holding organic layer of soil contributes to decreased yields and increased sediment loads to streams. Water users, therefore, need to be aware that there is a financial incentive to managing and measuring the amount of water going to their fields.

A review of Compact Law, as well as Montana and Wyoming state law regarding the authority to measure water use may be found in Appendix E.
A Strategy for Determining Water Use in Montana

There are two basic strategies the State of Montana could use to promote irrigation water measurement:

Strategy A

Amend state statutes, or have the Board of Natural Resources adopt rules, that facilitate the enforcement of laws requiring water measurement and record keeping. (see 85-2-113-sub 2b, MCA).

Advantages:

1. This method produces quick results.
2. Data could be collected from every water user.
3. The new law, or adopted rule would apply statewide.

Disadvantages:

1. Government regulation is not popular.
2. The political feasibility of amending state law to enforce irrigation water measurement is questionable.
3. Measurement is costly.
Strategy B

Initiate a program through the Cooperative Extension Service to educate water users concerning the benefits of irrigation water measurement. The purpose of this program would be to explain how water-users can protect themselves under the terms of the Compact and thereby instill a grassroots demand for water measurement.

Advantages:

1. There would be a higher degree of community acceptance in measuring water use.
2. The educational process would most likely incorporate principles of irrigation water management and irrigation scheduling.
3. This method could result in increased agricultural productivity and decreased soil erosion.
4. Users would be documenting their use and protecting their rights through record keeping.

Disadvantages:

1. The process of education is expensive and slow.
2. Compliance is not mandatory.
3. The data resulting from this method would be incomplete.

Preferred Course of Action - Phase III

Analysis of the advantages and disadvantages of strategies A and B suggest that neither strategy would be sufficient by itself. Therefore, the preferred course of action should combine government regulation and public education in a manner that achieves the required results. The following activities are suggested:

Activity A

Develop and promote programs with the Cooperative Extension Service or other interested agencies to educate irrigators concerning Yellowstone Compact issues as well as the importance of irrigation water management and scheduling. The objective of these programs would be to increase community acceptance of measuring diversions and recording water use.

Activity B

After community acceptance has increased, develop rules to be adopted by the Board of Natural Resources which would require irrigation water measurement and record keeping.
Activity C

Assign the DNRC Water Rights Field Offices the responsibility of assisting ditch owners in sizing and installing proper headgates and measuring devices.

Activity D

Introduce legislation that would move the jurisdiction over water rights from the District courts to the DNRC Water Rights Bureau. The District courts would continue to have the power of judicial review, and handle any cases appealed to them.

Activity E

The Water Rights Bureau would set up a data file on diversions, and work directly with water commissioners and the Yellowstone River Compact Commission.

Potential Problems - Phase III

There are two areas of conflict that the State of Montana should be concerned with:

a. The prevailing attitude concerning the measurement of diversions in the State of Montana.
b. The political feasibility of moving the jurisdiction over decreed water rights administration from the district courts to the DNRC.

Conclusion - Phase III

Irrigation water measurement is one of the most critical issues to be resolved in the Yellowstone River Basin. Without the measurements and record keeping of actual water use in both states, the Yellowstone Compact will probably not be administered. In addition, because water rights administration is tied directly to measurement and adequate record keeping, this issue also has implications outside the Yellowstone Basin.

Two methods of implementing a system of water measurement have been suggested: government regulation and public education. Each has its inherent advantages and disadvantages, and for this reason a combination of education and legal action may prove to be the most effective strategy.

The general public needs to be made aware of the benefits of measuring their water use and a grassroots demand for this activity should be cultivated statewide. In addition, the education process should be subtle and proceed in a manner that paves the way for unified state administration. Such administrative activity would then provide a procedural framework and uniformity in rule making that could apply statewide.

MT v. WY/M.T.D. App. 401 (WY)
Phases I, II, and III are concerned with water rights data organization, streamflow forecast development, and water measurement. The next step would be the formulation of a procedure that could be used by water commissioners to administer water rights on a real-time basis. This is the principle activity of Phase IV and will be addressed in the following section.
Phase IV - Intrastate Admeasurement and Interstate Communication

Objectives

The objectives of the fourth phase of this plan include the creation of an institutional and procedural framework with which to admeasure irrigation water in each state, transfer and store water use data between agencies in a particular state, and communicate this information between states. It is assumed that before water commissioners could admeasure water, the following criteria would have been satisfied:

a. Water rights in each basin would be field-checked, verified, mapped, and then organized according to the headgate from which they originate.

b. Functional headgates and accurate measuring devices would be installed in each ditch.

c. Water rights data (ditch name, priority dates, flows) would be punched on metal tags and permanently fixed to each headgate.

d. Streamflow forecasts would be developed for each basin.

e. Each streamflow gage at the basin headwaters, state line, and compact point of measurement would have telemetry capability.
The actual need to proceed with Phases IV and V would be predicated on a demand to manage and regulate diversions in the Yellowstone Basin. This demand could come from any one of the following sources:

a. Water users in either Wyoming or Montana might demand regulation due to a severe drought.

b. Water users in Montana might demand interstate regulation in response to a water shortage induced by overdevelopment in Wyoming.

c. Agencies of both state governments might require basin-wide water management if Wyoming began construction on large storage projects.

d. Agencies of both state governments might require regulation if there was a bilateral exchange of water between tributaries in the Yellowstone Basin.

e. The State of Montana would require regulation if permits were granted to Wyoming users for the appropriation of large quantities of water from the Yellowstone River mainstem.
The ability to admeasure water in Montana would depend on a number of factors; the most important of which would be the status of the current statewide adjudication process. For example:

a. If a final decree has been issued on each tributary in the Yellowstone Basin and current state law concerning water rights regulation does not change, then 15% of the owners of the water rights, or the DNRC, could petition the district court(s) to appoint a water commissioner. In this case, the responsibility for the administration of intrastate water rights, as well as for the coordination of water rights related to interstate compact activities, would fall within Montana District Court jurisdiction.

b. If a final decree has not been issued and current state law concerning water rights regulation does not change, there would be some question regarding the water commissioner's ability to effectively regulate non-adjudicated rights. In this case there is a high probability that the Yellowstone Compact could not be administered.

c. If a final decree has been issued and the legislature transfers the court responsibility for administering
pre-1973 water rights to the DNRC, then all Compact and water rights related activities could be coordinated through this agency.

Preferred Course of Action - Phase IV

Activity A

Develop an organizational infrastructure that could administer and regulate water use on both an intrastate and interstate basis. If the Montana District Courts continue to have jurisdiction over water rights administration, there would be a need to define the limits of their responsibilities, and exactly how their activities would be coordinated with the Wyoming State Engineer's Office, the DNRC's Water Rights Bureau, and the Yellowstone River Compact Commission.

Activity B

There is a need for the administrative entities in charge of water use regulation in Montana and Wyoming to meet with the Yellowstone River Compact Commission for the purposes of:

1. Establishing a formal line of communications for in-field administration of the Compact.
2. Developing a procedure to compile and present water use data in a timely, systematic, and uniform manner.

3. Adopting any rules and regulations that would be used as a guide for in-field administration of water rights between states.

Activity C

Introduce legislation that would transfer the responsibility for administration of pre-1973 water rights from the Montana District Courts to the DNRC Water Rights Bureau. The ability to appeal a DNRC decision to judicial review would still be available. This change is suggested for the following reasons:

1. The Water Rights Bureau has experience in processing and verifying water rights claims and should therefore have a comprehensive understanding of water use in the Yellowstone Basin.

2. Water Rights Bureau personnel have worked with water users on an individual basis and have already established credibility and trust.

3. Administration of water rights via the Water Rights Bureau would not depend on legal actions or court proceedings. The total cost to initiate regulation would be less.
4. Water Rights Bureau Field Offices have already been established. Water rights data, and some of the equipment to access and analyze these data is in place and operational. Water commissioners and hydrographers would be able to work out of these offices.

Activity D

Introduce legislation that would give greater administrative control to Montana water commissioners for the regulation of reservoir storage. All requests for releases from storage should be coordinated with the water commissioner because:

1. The water commissioner would have to quantify inflow above diversions, as well as flows released from storage in order to properly regulate water rights that would be satisfied from natural flow, and rights that would be satisfied with stored water.

2. The water commissioner would be responsible for the quantification of $\triangle S(WPre50)$ and $\triangle S(MTpre50)$ in the Compact allocation formula. (Equations #1 and #2). These terms represent the net change in storage in pre-1950 reservoirs used for post-1950 development in Wyoming and Montana.
Activity E

Once an organizational infrastructure is in place, the following rules and regulation would need to be adopted by the Compact Commission in order to administer water rights on an interstate basis:

1. At the beginning of the irrigation season, irrigators in both states would open their own headgates, set flows to the desired level, and measure diversions.

2. There would be no need to administer water rights on an interstate basis until a Montana irrigator on the mainstem of a stream which physically crosses the state line becomes short of water.

3. At this point, $Q(\text{allocWY})$ and $Q(\text{allocMT})$ would be quantified. These terms represent the quantity of water allocated to Wyoming and Montana, respectively, since October 1.

4. If the total accumulated flow in Wyoming $Q(\text{accumWY})$ is greater than the total allocable flow, Wyoming water use must be regulated to conform with the compact equation and satisfy as much of the Montana demand as possible. If not, the Montana irrigator would be regulated according to priority of right within the State of Montana, only.

5. Once the system is in equilibrium, the inflow and the divertable flow would be plotted on the river calibration curve. (See example and methodology in Appendix B).
Potential Problems - Phase IV

Water rights administration on a full time basis requires a large capital investment. For example, commissioners and hydrographers need transportation and communications equipment. Each office needs to have a copy of all relevant water rights data, aerial photographs and maps. In addition each office should be capable of referencing the central water rights computer file in Helena. Additional staff and such office equipment as typewriters, copy machines, etc. would be needed.

A potential conflict with Montana state law exists on how this equipment and its maintenance would be paid for. Montana Code Annotated (85-5-201 through 206) requires the water commissioner to keep a record related to only the following expenses:

1. "... reasonable expenses incurred by a water commissioner in telephoning to the judge for instructions in cases of emergency."

2. "... any expenses necessarily incurred by the water commissioner in the discharge of his duties in the employment of extra labor for the repair of dams, headgates, ditches, or flumes when immediate action is necessary...."
The law also requires the water commissioner to file a letter with the clerk of court concerning his expenses. This letter would be sent to all appropriators with an opportunity for their objections, a public hearing, and motions to retax. After the objection period, the court would fix and apportion these fees and expenses.

**Conclusion - Phase IV**

The sections of law pertaining to water commissioners, and their salaries and expenses are inadequate. In addition, the anticipated costs of water rights administration would preclude user taxation as a method of financing. Legislation should therefore be introduced that addresses these issues.

Phase IV has outlined a strategy to provide Montana with an organizational infrastructure to regulate water use on an intrastate basis. After both states are able to administer water rights on an intrastate basis, the final step would be administration of the Compact. Developing the Compact accounting computer model and resolving issues related to administration of the Yellowstone Compact are the principle activities of Phase V.
Phase V - Compact Administration

Objectives

The principle objective of Phase V is the development of a computer program (Compact Accounting Program) that could periodically evaluate the Compact apportionment and maintain such statistics as streamflow, diversions, reservoir operations, evaporation and water transfers. The Compact Accounting Program would be based on the equations that were introduced in Section III B of this report and would use initial input values of divertable flow obtained from the river calibration curves found in Appendix B. An example which ties together the ideas and methodology of Phases I through V is presented in Appendix G.

Preferred Course of Action - Phase V

Activity A

Decisions need to be made by the Yellowstone Compact Commission regarding what person(s) in which agency(ies) would be responsible for:

1. Coordinating activities related to the use and updating of the river calibration curve.
2. Developing computer software and documentation for the Compact Accounting Program.
3. Developing a user's manual for the Compact Accounting Program.

Activity B

The Compact Commission would need to decide:

1. In which state, and on what computer, the Compact Accounting Program would be stored and how the development of this program would be financed.
2. What person in which state would run and maintain the accounting program.
3. How this person's salary, computer processing, and related expenses would be financed.

Activity C

The Compact Commission would need to adopt rules and regulations that would formalize communications and procedures relating to the coordination of the following activities:

1. Generation of streamflow forecasts.
2. Construction of the river calibration curve.
4. Petitioning Montana district courts to regulate diversions.
5. Regulation of headgates.
6. Reservoir operations.
7. Organization and storage of data.
8. Running the Compact Accounting Model.

**Potential Problems - Phase V**

There are a number of Compact-related issues that need to be resolved in order to administer the Yellowstone Compact on a real-time basis. These issues include:

a. **Allocation of Non-Irrigation Season Flow and Excess Spring Flow (Assuming No Reservoir Storage)**

For purposes of this report, flows during the non-irrigation season and excess spring flows shall be defined as that excess flow which passes the compact point of measurement from October 1st to the first day during the irrigation season when water is admeasured on an interstate basis. This flow is physically unavailable during the irrigation season; it is not in the stream, it has not been stored, and it therefore cannot be "allocable flow". For administrative purposes, this water could be moved to an "unused and presently unavailable" account. Statistics from this account would be useful for sizing new reservoir projects and determining firm yields.
The adjustment described above would have the effect of zeroing out the term $Q$ (compact gage) in Equation 3 until there was a demand on the system to regulate water rights on an interstate basis. Return flows generated below the last diversion in Montana and above the point of measurement would also be subtracted from the $Q$ (compact gage) flow, since this flow is physically unavailable upstream.

An example explaining why this adjustment would be important on streams which have no reservoir storage, and how this adjustment would work can be found in Appendix F.

b. Indian Reserved Water Rights

Would an interpretation of Article VI of the Compact imply that Indian reserved water rights are to be subtracted from the total allocable volume, or are they chargeable to the state in which the use occurs?

c. Supplemental Water

The Compact Commission would need to adopt a regulation defining "supplemental water". It is suggested that a version of the following definition be adopted:

"Supplemental water, for purposes of administering the Yellowstone River Compact, shall be defined as that
quantity of water having a post-1950 priority which is appropriated for the purpose of bringing a full supply to land already irrigated with water having a pre-1950 priority. "Definition of the term "full supply" should be standardized in both Wyoming and Montana.

d. Operation and Administration of Water from Interstate Reservoirs.

Reservoirs located on the state line present special problems in the determination of $\Delta S(WY\text{ pre50})$ and $\Delta S(MT\text{ pre50})$. For example, how would evaporation be charged? The Bureau of Reclamation operates Yellowtail Reservoir to optimize hydroelectric power production. How does this fit into the Article V apportionment?

e. Apportionment of Non-Compacted Return Flows

Return flows via wasteways from non-compacted streams (i.e., Rock Creek in the Clarks Fork Basin) empty into compacted streams (i.e. Clarks Fork River mainstem). Presently, this flow would be considered "allocable" because it would either be diverted or it would flow past the point of measurement. How will cases like this be handled administratively?
f. Protection of Instream Flows

Minimum flow standards for the protection of aquatic habitat in the Yellowstone River Basin have already been adopted by the State of Montana. It is likely that Wyoming may soon adopt similar standards. Instream uses of water present special problems for administration of the Yellowstone Compact because Article V apportions all water flowing past the point of measurement. It is suggested that as soon as Wyoming adopts instream flow standards in the Yellowstone Basin, all instream flows be protected from apportionment under the terms of the Compact. To do this, the Compact Commission might adopt rules or regulations that would have the effect of subtracting the appropriate instream flow from the flow at the point of measurement and then transferring it to an "unused and presently unavailable" account. Another example of how the Compact Commission could protect instream flows is presented in Appendix H.

Conclusion - Phase V

Phase V emphasizes the importance of developing a Compact Accounting program as well as resolving a number of issues affecting the Yellowstone Compact apportionment. It is suggested that a timetable be developed by the Compact Commission to resolve these issues through negotiation rather than through litigation.
IV. CONCLUSION

Records of actual water use are necessary in order to administer the Yellowstone River Compact, to make a determination of Montana's historic share of allocable flow, and to protect existing irrigation in the Yellowstone Basin. Therefore, the management plan presented herein stresses the importance of providing the State of Montana with an institutional framework to promote water measurement and accurate record keeping.

Suggestions have been presented which would affect Montana state law regarding jurisdiction and procedures pertaining to water rights administration, admeasurement, and regulation. In addition, a method is proposed whose purpose is to forecast inflow and total divertable flow, and to assist water commissioners in the day-to-day administration of water rights on an intrastate and interstate basis.

It is now up to the Wyoming and Montana legislatures, and the Yellowstone River Compact Commission to decide if the Compact needs to be administered and when a system of water measurement should be implemented.
APPENDIX A - SUMMARY OF ARTICLE V OF THE YELLOWSTONE RIVER
COMPACT

A. The Compact does not affect the enjoyment of appropriative
rights existing in each state as of January 1, 1950.

B. Of the unused and unappropriated waters as of January 1,
1950, each State is allowed supplemental water for the
rights existing as of January 1, 1950. The remaining
unused and unappropriated waters are allocated to each
State:

1. Clarks Fork - 60% WY, 40% MT;
2. Bighorn River (Exclusive of Little Bighorn River) - 80%
   WY, 20% MT;
3. Tongue River - 40% WY, 60% MT; and
4. Powder River (Including the Little Powder River) - 42%
   WY, 58% MT.

C. The quantity of water to be allocated by the percentages is
on an October 1 – September 30 water year basis. The
quantity, in acre-feet, is the algebraic sum of:

1. Total diversions for irrigation, municipal, and
   industrial uses in Wyoming and Montana developed after
   January 1, 1950 from October 1 to calculation date.
2. Net change in storage in all reservoirs in Wyoming and Montana completed after January 1, 1950 from October 1 to the calculation date.

3. Net change in storage in existing reservoirs (as of January 1, 1950) used for irrigation, municipal, and industrial purposes developed after January 1, 1950 from October 1 to the calculation date.

4. The quantity of water that passed the point of measurement in the stream from October 1 to the calculation date.

D. (Addresses Montana - North Dakota allocations)

E. Excludes:

1. Domestic and stockwater uses, provided that the capacity of an excluded stockwater reservoir does not exceed 20 acre-feet.

2. "Devices and facilities for the control and regulation of surface waters."

F. (Allows modifications of allocations under certain conditions.)
APPENDIX B - SAMPLE CALIBRATION CURVES AND EXPLANATIONS

**River Calibration Curve #1**

Average rate of inflow above diversions for the accounting period in CFS

**River Calibration Curve #2**

Average rate of inflow above diversions for the accounting period in CFS

Average state line flow for the accounting period in CFS
Explanation of Calibration Curve #1

Abscissa - The total post-1950 divertable flow to be allocated on a percentage basis between Wyoming and Montana.

Ordinate - The average inflow to the river system in cubic feet per second for the accounting period (7 days).
Inflow is measured above diversions on the mainstem, and on all major tributaries.

Example - Clarks Fork Basin

At the beginning of day 1 of the compact accounting period, the measured inflow above diversions was 3500 cfs. By the end of the accounting period, the measured inflow is 4500 cfs. Assuming a constant rate of increase, the average inflow for this period is 4000 cfs.

Next, assume that pre-1950 users in both Wyoming and Montana can be satisfied and that, after regulation of post-1950 uses, there is approximately 500 cfs of divertable flow recorded. In the Clarks Fork Basin, the split is 60% (Wyoming) - 40% (Montana). Therefore, for this accounting period, headgates are regulated so that there is only 300 cfs of diversions in Wyoming and 200 cfs of diversions in Montana.
Calibration curve #1 serves two functions. First, data derived from actual system operation at the end of the accounting period is plotted. The curve is calibrated with actual measured inflow and actual diversion data. Second, the curve can be used as a predictive tool. Forecasted inflow can predict projected level of use for the upcoming accounting period. The projected level of divertable flow would be used as input for the initial run of the Compact Accounting Program to determine the apportionment.

**How to Use Curve #1**

(Assume accounting period is from day N to day N + 7)

1. On day N-3, the average inflow above diversions for day N through day N+7 would be predicted.

2. Enter curve #1 with this value and read off divertable flow for post-1950 uses.

3. Apply compact percentage, and calculate divertable flow for each state. "Divertable flow" in each state would translate to a specific priority date or level of use for which water would be regulated. The values for inflow, divertable flow, and return flows could be tested in the Compact Accounting Program at the beginning of each accounting period.
4. Use these values of divertable flow in the initial run of the Compact Accounting Program to determine whether the values chosen conform with the terms of the apportionment. If not, rerun with new values of divertable flow.

5. Water Commissioners in each state would then set headgates on day N to correspond to this level of use.

6. If there is any excess flow at the point of measurement which could be used upstream, headgates would be readjusted accordingly.

7. At the end of the accounting period the Compact Accounting Program would be rerun with actual values for diversions, and actual inflow versus actual divertable flow would then be plotted on calibration curve #1.

8. Steps 1 through 7 would be repeated for each accounting period.

Note: Calibration curves do not take into account water released from reservoirs. This is considered to be a separate issue. Also, the temporal distribution of return flow may indicate that a distinct calibration curve may be needed for each month.
Explanation of Calibration Curve #2

Abscissa - average streamflow at the state line for the accounting period needed to satisfy all pre-1950 users plus any post-1950 uses indicated by calibration curve #1.

Ordinate - average rate of inflow above diversions for the accounting period.

Calibration curve #2 is an extension of curve #1. For the example presented, 4000 cubic feet per second is the measured inflow above diversions. All pre-1950 appropriators are satisfied and there is a total of 500 cubic feet per second of diversions for post-1950 uses. There is little excess flow at the point of measurement. Calibration curve #2 indicates that under these conditions, 800 cubic feet per second should cross the state line. Calibration curve #2 and streamgage telemetry are necessary to insure that Montana receives its share of Compact water at the state line. This flow would probably be monitored on a daily basis during critical low flow periods.
<table>
<thead>
<tr>
<th>Year</th>
<th>Ditch Capacity</th>
<th>Ditch Completed to Point</th>
<th>Lands Irrigated</th>
<th>Actual Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1890</td>
<td>15 cfs</td>
<td>a</td>
<td>A</td>
<td>10 cfs diverted, 6 cfs lost through leaky canal, 4 cfs applied to field A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>35 cfs</td>
<td>c</td>
<td>A,B,C</td>
<td>35 cfs diverted, 6 cfs lost through leaky canal, 4 cfs applied to field A, 10 cfs applied to field B - full supply, 15 cfs applied to field C - 1/2 supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1951</td>
<td>80 cfs</td>
<td>d</td>
<td>A,B,C,D</td>
<td>76 cfs diverted, 6 cfs lost to system, 4 cfs applied to field A, 10 cfs applied to field B, 30 cfs applied to field C, 10 cfs lost to system, 16 cfs applied to field D</td>
</tr>
</tbody>
</table>
APPENDIX C - Exhibit 2

Example of Water Rights Filings for
Rod's A-1 Canal Company

Wyoming Filings

Note: The water rights have been adjudicated by the Wyoming Board of Control and are listed in a document entitled Tabulation of Existing Water Rights of the State of Wyoming. During a water shortage, water used by Rod's A-1 Canal Company is regulated by a water commissioner according to these rights.

<table>
<thead>
<tr>
<th>Permit No.</th>
<th>Priority</th>
<th>Flow (C.F.S.)</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>1890</td>
<td>4.0</td>
<td>140</td>
</tr>
<tr>
<td>Enlargement 1</td>
<td>1910</td>
<td>10.0 (full supply)</td>
<td>350</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+15.0 (half supply)</td>
<td>+1050</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25.0</td>
<td>1400</td>
</tr>
<tr>
<td>Enlargement 2</td>
<td>1951</td>
<td>10.0 (supplemental for C)</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+8.0*</td>
<td>560</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18.0</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>47.0 cfs</td>
<td>2100 acres</td>
</tr>
</tbody>
</table>

*Note: Priorities earlier than 1945 get 2 cfs/70 acres
Priorities later than 1945 get 1 cfs/70 acres

Montana's Filings

<table>
<thead>
<tr>
<th>Claim #</th>
<th>Priority Date Claimed</th>
<th>(C.F.S.) Flow Rate Claimed</th>
<th>Acres Claimed</th>
<th>Type of Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>1890</td>
<td>15</td>
<td>140</td>
<td>Decreed</td>
</tr>
<tr>
<td>1001</td>
<td>1910</td>
<td>25</td>
<td>1400</td>
<td>Use</td>
</tr>
<tr>
<td>1002</td>
<td>1951</td>
<td>40</td>
<td>1610</td>
<td>Filed</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>3150</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX C - Exhibit 3

Examples of Master Ditch Lists

<table>
<thead>
<tr>
<th>Wyoming</th>
<th>Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ditch No. 001</td>
<td>Ditch No. 001</td>
</tr>
<tr>
<td>Name: Rod's A-1 Canal Co.</td>
<td>Name: Rod's A-1 Canal Co.</td>
</tr>
<tr>
<td>Headgate location:</td>
<td>Headgate location:</td>
</tr>
<tr>
<td>Ditch Capacity: 80 cfs</td>
<td>Ditch Capacity: 80 cfs</td>
</tr>
<tr>
<td>Acres Served: 2100</td>
<td>Acres Served: 2100</td>
</tr>
<tr>
<td>Water Rights: Permit 1000</td>
<td>Water Rights: Claim 1000</td>
</tr>
<tr>
<td>Enlargement 1</td>
<td>Enlargement 1</td>
</tr>
<tr>
<td>Enlargement 2</td>
<td>Claim 1001</td>
</tr>
<tr>
<td></td>
<td>Claim 1002</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Priority</th>
<th>Flow</th>
<th>Type</th>
<th>Priority</th>
<th>Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1890</td>
<td>4.0 cfs</td>
<td>A</td>
<td>1890</td>
<td>15 cfs</td>
</tr>
<tr>
<td>A</td>
<td>1910</td>
<td>25.0 cfs</td>
<td>A</td>
<td>1910</td>
<td>25 cfs</td>
</tr>
<tr>
<td>A,S</td>
<td>1951</td>
<td>10.0 cfs</td>
<td>A,S</td>
<td>1951</td>
<td>15 cfs</td>
</tr>
<tr>
<td>B</td>
<td>1951</td>
<td>8.0 cfs</td>
<td>B</td>
<td>1951</td>
<td>25 cfs</td>
</tr>
<tr>
<td>TOTAL PRE-1950: 39 cfs</td>
<td>TOTAL PRE-1950: 55 cfs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL POST-1950: 8 cfs</td>
<td>TOTAL POST-1950: 25 cfs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key

A = Pre-1950
B = Post-1950
S = Supplemental (defined as that water needed to bring land irrigated prior to 1950 up to a full supply)
APPENDIX C - Exhibit 4

Example Headgate Tags for Rod's A-1 Canal Company

<table>
<thead>
<tr>
<th>DITCH NO. 001</th>
<th>ROD'S A-1 CANAL CO. (Wyoming)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOCUMENT</td>
<td>PRIORITY</td>
</tr>
<tr>
<td>1000</td>
<td>1890</td>
</tr>
<tr>
<td>E-1</td>
<td>1910</td>
</tr>
<tr>
<td>E-2</td>
<td>1951</td>
</tr>
<tr>
<td>E-2</td>
<td>1951</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DITCH NO. 001</th>
<th>ROD'S A-1 CANAL CO. (Montana)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOCUMENT</td>
<td>PRIORITY</td>
</tr>
<tr>
<td>1000</td>
<td>1890</td>
</tr>
<tr>
<td>1001</td>
<td>1910</td>
</tr>
<tr>
<td>1002</td>
<td>1951</td>
</tr>
<tr>
<td>1002</td>
<td>1951</td>
</tr>
</tbody>
</table>
APPENDIX D - EXAMPLES OF WATER MEASURING DEVICES


**RECTANGULAR WEIR**

**TRAPEZOIDAL WEIR**

**V-NOTCH WEIR**
TRAPEZOIDAL FLUME

432 (WY)
(A) Weirs - (rectangular, Cipolletti, V-notch)

Advantages:
1. Weirs are simple to construct.
2. Weirs are convenient to use.

Disadvantages:
1. Weirs are not accurate unless they are properly installed and maintained. (the pool of water behind a weir often fills up with sand and silt).
2. Weirs require a considerable drop between the upstream and downstream water surfaces. This may not be possible where ditches are on a nearly level grade.
3. Weirs are not easily combined with turnout structures.

(B) Flumes (Parshall, Trapezoidal)

(Parshall Flume)

Advantages:
1. Parshall flumes are durable and require little maintenance.
2. Parshall flumes are very accurate.
4. Parshall flumes do not require a large change in head between the upstream and downstream water surfaces.
5. The rate of flow through the Parshall flume does not affect its accuracy.
6. The Parshall flume has a wide range of flow capacity.
7. Pre-fabricated Parshall flumes are available commercially.

Disadvantages:
1. Parshall flumes are more costly than weirs.
2. Parshall flumes are more difficult to install.

(Trapezoidal flumes)
Advantages:

1. Trapizoidal flumes are easy to construct and install.
2. Trapizoidal flumes do not require a large change in head.
3. The trapizoidal flume can handle a large range of flow.

Disadvantages:

1. Trapizoidal flumes are not as accurate as Parshall flumes because a very small change in head results in a very large change in flow.

(C) Vane type flow meters

Advantages:

1. Vane flow meters are portable and can be used to measure flow on a number of canals.
2. Vane flow meters are easy to install.
3. Vane flow meters give direct readings in cfs.

Disadvantages:

1. Wind affects the accuracy of vane flow meters.
2. Vane flow meters are not inexpensive.
APPENDIX E – LAWS REGARDING THE DETERMINATION OF IRRIGATION WATER USE

Status of Water Measurement – Compact Law

The issue of irrigation water measurement is addressed in Article I, paragraph B, of the "Rules and Regulations for Administration of the Yellowstone Compact". This paragraph states that "Records of total annual diversion in acre-feet above the points of measurement designated in the Compact for irrigation, municipal, and industrial uses developed after January 1, 1950, shall be furnished by the members of their respective States, at such time as the commission deems necessary for interstate administration as provided by the terms of the Compact." In addition, both the Yellowstone Compact and administrative rules state that the "appropriative rights to the beneficial uses of water ... existing in each signatory state as of January 1, 1950, shall continue to be enjoyed...."

It would therefore be reasonable to infer the following:

1. The Yellowstone Compact and administrative rules require that diversions with a priority date later than January 1, 1950 must be measured.
2. For record keeping and accounting purposes, diversions with a priority date earlier than January 1, 1950, should be measured.

Status of Water Measurement - Wyoming Law

The Wyoming State Engineer and the superintendents of the four water districts constitute the Wyoming Board of Control. The Board has the power to regulate water use, and can supervise the diversion, distribution, and appropriation of water from all streams. A water commissioner appointed by the Governor has the responsibility of dividing water and regulating reservoir storage on all streams in his division.

Wyoming state law requires the owner of any canal or ditch to install and maintain a headgate at the point of diversion which is of such construction that it may be locked and kept closed by a water commissioner. Metal, screw-type headgates set in concrete are recommended.

At the request of the Division Superintendent, owners of canals or ditches must install and maintain flumes and other measuring devices to assist the commissioner in determining the amount of water being diverted. Any person who neglects to construct or maintain headgates, flumes, or measuring devices may be denied water until the required works are constructed.
Any person opening, closing, or changing any headgate or water box without proper authority, or who uses water which has been denied to him by a water commissioner can be arrested and fined.

Admeasurement of water in the State of Wyoming proceeds according to the following sequence of events:

1. At the beginning of each irrigation season, irrigators open their own headgates, and water use on the stream is unrestricted.

2. Water use is unrestricted until the water commissioner receives a call that an appropriator is not receiving his legal entitlement.

3. At that point, hydrographers measure inflow to the stream and then regulate headgates along its entirety according to priority of right. Headgates are set and locked in position.

4. Wyoming state law provides that priorities earlier than 1945 may receive two cubic feet per second (cfs) per seventy acres irrigated. Priorities later than 1945 receive one cfs per seventy acres.
5. If after regulation of headgates along the entire stream the water commissioner finds there is an excess water, this water is presently divided among Wyoming irrigators according to priority of use without regard to the terms of the Yellowstone Compact.

6. Inflow to the river system is measured throughout the irrigation season, and headgates along the entire stream and all tributaries are continually regulated.

**Status of Water Measurement - Montana Law**

Except for some permits issued after 1973, the State of Montana does not require the owners of canals and ditches to maintain measuring devices or keep records of diversions. However, a water commissioner may be appointed by a district court to admeasure and distribute water when one of the following conditions arise:

1. The owners of at least 15% of the water rights affected by a decree, petition the court to administer the decreed rights.

2. The DNRC requests the court to administer rights on a stream for which a final decree has been issued under Chapter 2, Title 85. (i.e. the Powder River).
There are a number of practical problems with the present system of adjudication and the measurement of irrigation water in Montana. Some of these include:

1. Many court decrees require that the owners of canals and ditches maintain water measuring devices and keep accurate records of diversions, yet these requirements are usually not enforced.

2. Only specific reaches are covered by any particular court decree and often there have been many decrees issued on one "decree" stream. In spite of this, the majority of water users on a stream do not have an adjudicated right and will have to wait until the statewide adjudication process is complete.

3. Water commissioners have no jurisdiction to regulate pre-1973 water rights which have not been adjudicated. Therefore, there are cases where downstream senior water rights may be denied water because upstream junior rights cannot be regulated.

4. Any particular river basin may be under the jurisdiction of a number of district courts. For example, five district courts have jurisdiction in the Clarks Fork basin. Therefore, coordination of a uniform system of measurement, record keeping, and headgate regulation would be difficult.
Figure 1 presents an example of the Yellowstone Compact Apportionment based on the equations presented on pages 10 and 11 assuming no reservoir storage is available (e.g. Clarks Fork Basin). In this example, allocable flow is calculated for Wyoming and Montana using two methods. "Method 1" does not adjust for the "unused and presently unavailable" flow passing the Compact point of measurement during the non-irrigation season. "Method 2" makes this adjustment.

In calculating historic allocable flow for both states, the adjustment is not necessary because one would be trying to quantify the flow that could have been used by each state. On the other hand, once that Yellowstone Compact is administered on a real time basis, flow that passes the compact point of measurement (and leaves the system) is no longer available for use at a later point in time. This flow should not be considered "allocable" because it is really "unused and presently unavailable." In this case, the adjustment would be necessary.

Exhibit 1 presents both versions of calculating allocable flow. There are twelve rows, each summarizing one month of data, and there are fourteen columns:
<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column 1</td>
<td>The present month.</td>
</tr>
<tr>
<td>Column 2</td>
<td>Inflow, in 1000 acre-feet above all diversions.</td>
</tr>
<tr>
<td>Column 3</td>
<td>The flow, in 1000 acre-feet passing the Compact point of measurement for that particular month.</td>
</tr>
<tr>
<td>Column 4</td>
<td>The Compact gage &quot;adjustment&quot; in 1000 acre-feet needed to account for water that is &quot;unused and unavailable&quot; during real-time Compact administration.</td>
</tr>
<tr>
<td>Column 5</td>
<td>The accumulated flow in 1000 acre-feet that passes the Compact point of measurement from October 1 to the last day of the present month. This is the last term in Equation #3.</td>
</tr>
<tr>
<td>Column 6</td>
<td>The adjusted accumulated flow in 1000 acre-feet that passes the Compact point of measurement from October 1 to the last day of the present month. This value would be substituted in the last term of Equation #3 to calculate the adjusted allocable flow for each state.</td>
</tr>
<tr>
<td>Column 7</td>
<td>The total diversions in 1000 acre-feet in Wyoming for the present month.</td>
</tr>
<tr>
<td>Column 8</td>
<td>Equivalent to the left-hand-side of Equation #1.</td>
</tr>
<tr>
<td>Column 9</td>
<td>The total diversions in 1000 acre-feet in Montana for the present month.</td>
</tr>
<tr>
<td>Column 10</td>
<td>Equivalent to the left-hand-side of Equation #2.</td>
</tr>
<tr>
<td>Column 11</td>
<td>Equivalent to the left-hand-side of Equation #4.</td>
</tr>
<tr>
<td>Column 12</td>
<td>The adjusted allocable flow in 1000 acre-feet for Wyoming.</td>
</tr>
</tbody>
</table>
Column 13: Equivalent to the left-hand-side of Equation #5.
Column 14: The adjusted allocable flow in 1000 acre-feet for Montana.

The example presented in exhibit 1 assumes the following:

a. Flow is apportioned 60% to Wyoming and 40% to Montana.
b. There is no reservoir storage in the basin.
c. All pre-1950 uses for irrigation are satisfied May through August.
d. For the period of May through August there are 100,000 acre-feet of post-1950 demands in each state each month. One-half is for agriculture, the other half is for industrial off-stream storage. Each state tries to satisfy as much of this demand as possible.
e. The example presented is a typical "dry year." While all pre-1950 uses can be satisfied, Wyoming post-1950 demands can not be met after June 1, and Montana post-1950 demands can never be fully met.

The following conclusions can be drawn from this example:

1. The unused inflow from October 1 to April 30 is 116,000 acre-feet. If this flow is reflected in the Article V apportionment formula, the total allocable flow for May is too high. It is also unfair, because in May, Montana is receiving only 20% of the total divertable flow.
2. If the 116,000 acre-feet of inflow is moved to an "unused and presently unavailable" account, and the accumulated flow at the point of measurement is adjusted to reflect this, the adjusted allocation makes much more sense. Each state receives a reasonable allocation in May. In this example, Wyoming's post-1950 diversions in May were too high and therefore should have been regulated.

3. The "unused and presently unavailable" adjustment is needed in the Yellowstone Compact allocation formula, at least for real-time administration, because the State of Wyoming would benefit unfairly from water that was "stored on paper" and not stored in a reservoir.
Yellowstone River Compact Apportionment
(assuming no reservoir storage)

All Values: in 1000 Acre Feet

<table>
<thead>
<tr>
<th>Month</th>
<th>inflow</th>
<th>1974 Use</th>
<th>Adjusted</th>
<th>Delta</th>
<th>Delta</th>
<th>Delta</th>
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<td>145.6</td>
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APPENDIX G - COMPACT ADMINISTRATION EXAMPLE

A = inflow above diversions
B = state line flow
C = flow at point of measurement

W1, W2, M1, M2 are Wyoming and Montana diversions.
Assumptions

1. There is no reservoir storage in the basin.

2. No water flows past the point of measurement and no water is consumptively used for the period October 1 to April 30.

3. The diversion requirement for W1, W2, M1, and M2 are constant for the period May 1 to September 30.

4. Exactly 1/2 of the quantity diverted returns to the stream as return flow. 100% of this flow returns the same month it is diverted.

5. Return flow from M2 comes in below the point of measurement.

6. All pre-1950 priorities in Montana must be satisfied prior to any post-1950 priorities in Wyoming.

7. The Compact apportionment is calculated on a monthly basis and all calculations are in acre-feet/month.

8. For the period May 1 to September 30, the inflow above diversions is equal to:
May - 6000 acre-feet
June - 4000 acre-feet
July - 3200 acre-feet
August - 2000 acre-feet
September - 100 acre-feet

9. Montana receives 40% of the allocable flow
Wyoming receives 60% of the allocable flow

10. Assume both states appropriate water according to the rules of higher priority: "1st in time, 1st in right".

Explanation

The following activities summarize a suggested methodology for administering the Yellowstone Compact for the period May 1 to July 31.

1. Month of May

Activity A

The inflow above diversions is forecasted for the month of May and is equal to 6000 acre-feet per month.
Activity B

The river calibration curve (not shown) indicates that when the inflow above diversion is equal to 6000 acre-feet, all pre-1950 and post-1950 appropriations in both states can be satisfied. Prior to the first day in May, use an accounting model to solve the compact apportionment with the following input (exhibit 1):

\[
\text{inflow} = 6000 \text{ AF} \\
W1 = 2000 \text{ AF} \\
W2 = 2500 \text{ AF} \\
M1 = 2000 \text{ AF} \\
M2 = 2000 \text{ AF}
\]

Results of the accounting model first iteration suggest the apportionment can be satisfied for the month of May without the need for regulation.

Activity C

Headgates are opened May 1st on all pre- and post-1950 diversions in both states. Water use is measured and recorded.
Activity D

At the end of the month of May, rerun the compact accounting model with input equal to actual water use. Plot new points on the calibration curve.

2. Month of June

Activity A

The inflow above diversions is forecasted for the month of June and is equal to 4000 acre-feet per month.

Activity B

The calibration curve indicates that when the inflow above diversions is equal to 4000 acre-feet, approximately 7000 acre-feet of diversions can be satisfied. Prior to June 1, run the accounting model with the following input (exhibit 2):

\[
\begin{align*}
\text{inflow} & = 4000 \text{ AF} \\
W1 & = 2000 \text{ AF} \\
W2 & = 2000 \text{ AF} \\
M1 & = 2000 \text{ AF} \\
M2 & = 1000 \text{ AF}
\end{align*}
\]
Results of the Compact accounting model suggest the apportionment can be satisfied when W2 and M2 are regulated as indicated above.

Activity C

Water commissioners in both states regulate water use according to the results of the water model.

Activity D

At the end of the month of June, rerun the compact accounting model with input equal to actual water use. Plot these new points on the calibration curve.

3. Month of July

The same methodology presented for the months of May and June apply in July. Note that even though \( Q(\text{accumWY}) < Q(\text{allocWY}) \) and \( Q(\text{accumMT}) > Q(\text{allocMT}) \), post-1950 water use in Wyoming must be regulated to satisfy pre-1950 water rights in Montana. In the example presented in exhibit 3, a minimum of 2000 acre-feet per month must cross the state line before post-1950 appropriators in Wyoming can divert water.
EXHIBIT 1

YELLOWSTONE COMPACT ALLOCATION FOR
THE MONTH OF MAY

MONTANA = 40%  WYOMING = 60%

A = 6000 AF

W1

B = 3750 AF

M1

W2

C = 750 AF

M2

STREAMFLOW FORECAST = 6000 AF

W1 = 2000 AF

* W2 = 2500 AF

M1 = 2000 AF

* M2 = 2000 AF

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<tr>
<th>SUM FROM PREVIOUS MONTHS</th>
<th>TERM</th>
<th>ED(UY)</th>
<th>ΔS(UY POST-50)</th>
<th>ΔS(UY PRE-50)</th>
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<td>Q(accumulate) + 2000 + 0 + 0</td>
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Q(accumulate) = 2500 + 2000 = 4500

Q(alloca UY) = 4500 x (.60) = 2700

Q(alloca MT) = 4500 x (.40) = 1800

Note: There is sufficient water in both states so
that no regulation is required and the 750 AF
at "C" is moved to an "unused and unavailable"
account.
EXHIBIT 2

YELLOWSTONE COMPACT ALLOCATION FOR
THE MONTH OF JUNE

Montana = 40%
Wyoming = 60%

A = 4000
B = 2000
C = 0

$\text{STREAMFLOW FORECAST} = 4000 \text{ AF}$
$W_1 = 2000 \text{ AF}$
$W_2 = 2000 \text{ AF}$
$M_1 = 2000 \text{ AF}$
$M_2 = 1000 \text{ AF}$

<table>
<thead>
<tr>
<th>SUM FROM PREVIOUS MONTHS</th>
<th>TERM</th>
<th>$E (\text{WY})$</th>
<th>$E (\text{MT})$</th>
<th>$\Delta S (\text{WY, POST - 50})$</th>
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<td>2500</td>
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<tr>
<td>2000</td>
<td>$Q (\text{adj, MT})$</td>
<td>1000</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</table>

$Q (\text{adj, WY}) = 4500 + 3000 = 7500$
$Q (\text{adj, MT}) = 7500 \times (0.60) = 4500$
$Q (\text{adj, MT}) = 7500 \times (0.40) = 3000$
**EXHIBIT 3**

**YELLOWSTONE COMPACT ALLOCATION FOR THE MONTH OF JULY**

Montana: 40%  
Wyoming: 60%

\[ A = 3200 \]

\[ B = 2000 \]

\[ C = 0 \]

* = Post-1950 priority

**STREAMFLOW FORECAST**

\[ W_1 = 2000 \text{ AF} \]
\[ W_2 = 400 \text{ AF} \]
\[ M_1 = 2000 \text{ AF} \]
\[ M_2 = 1000 \text{ AF} \]

<table>
<thead>
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<th>SUM FROM PREVIOUS MONTHS</th>
<th>TERM</th>
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<th>( E_D(MT) )</th>
<th>( \Delta S(WY \text{ POST-50}) )</th>
<th>( \Delta S(MT \text{ POST-50}) )</th>
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<td>0</td>
<td>0</td>
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<td></td>
</tr>
<tr>
<td>3000</td>
<td>( + Q(\text{accum} MT) )</td>
<td>1000</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td></td>
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</table>

\[ Q(\text{accum}) = 4900 + 4000 = 8900 \text{ AF} \]

\[ Q(\text{alloc} WY) = 8900 \times (0.60) = 5340 \]

\[ Q(\text{alloc} MT) = 8900 \times (0.40) = 3560 \]

**NOTE:** Even though \( Q(\text{accum} MT) > Q(\text{alloc} MT) \)

and \( Q(\text{accum} WY) < Q(\text{alloc} WY) \), Post-1950 appropriators in Wyoming must be regulated to allow 2000 AF to cross the state line to satisfy Montana's pre-1950 uses.
APPENDIX H - RESERVOIR EXAMPLE

It is suggested that the constraints found in this appendix be included in the Compact accounting model for cases where there is significant reservoir storage. These constraints are necessary because a strict interpretation of Article V would result in the division of stored water on a percentage basis that should not necessarily be divided. For example, if Wyoming stores their 60% share, and Montana's 40% share flow past the point of measurement, Article V still attempts to divide Wyoming storage on a 60/40 basis. Therefore, the purpose of the proposed constraints are:

1. To allow each state to store and use their share of Compact water.

2. To protect Montana if Wyoming oversizes their storage projects and stores more than their share of Compact water.

3. To provide a mechanism to equitability handle the problem of instream uses of water for the protection of aquatic habitats in both states.
Constraints

Define a "storage limit" for each state which is based on Article V:

\[ SL_{WY} = 0.60 \times [\Delta S(WY\text{post}50) + \Delta S(MT\text{post}50) + \sum_{\text{day} = 1}^{n} Q(\text{compact gage}) - (\text{instream flows})] \]

\[ SL_{MT} = 0.40 \times [\Delta S(WY\text{post}50) + \Delta S(MT\text{post}50) + \sum_{\text{day} = 1}^{n} Q(\text{compact gage}) - (\text{instream flows})] \]

Where, \( SL_{WY} \) and \( SL_{MT} \) are Wyoming's and Montana's storage limits for excess spring flow. The storage limits are to be quantified only once per year, and generally at the end of the reservoir(s) filling cycle.

For purposes of compact accounting and model building, it is suggested the storage limits be used as follows:

1. If \( Q(\text{accumWY}) > Q(\text{allocWY}) \);
   and, \( Q(\text{accumMT}) < Q(\text{allocMT}) \);
   and, \( \Delta S(WY\text{post}50) > SL_{WY} \)
   and, Montana appropriators need water;
regulate post-1950 uses in Wyoming (or drawdown the excess storage) until either:

a. Montana appropriators are satisfied

or

b. \( \triangle S(WY_{post50}) = SL_{WY} \)

whichever comes first.

2. In the Compact accounting model, the change in storage which gets accumulated in the term \( Q(\text{accum}_W) \) is equal to the quantity \( \triangle S(WY_{post50}) - SL_{WY} \) and is added in only when \( \triangle S(WY_{post50}) > SL_{WY} \).

These same constraints hold true for calculations with Montana's storage limits.
Draft “Yellowstone River Compact” by DNRC, Water Management Bureau, Nov. 29, 1989
INTRODUCTION

The Yellowstone River Compact, ratified in 1950 by the United States Congress, divides the unappropriated waters of the four major interstate tributaries of the Yellowstone River between Montana and Wyoming. The compact divides the mainstem of the Yellowstone River below Intake Mt. between Montana and North Dakota. The intent of the compact is to provide for the development of storage in the Basin. The objectives of this report is to provide the Yellowstone River Compact Commission and interested parties with background information that should facilitate discussions and further research regarding compact development and past administration activities, and the identification of differences between the states on its interpretation. Hopefully, these discussions will lead to meaningful results. The report includes: a historical accounting on the development of the compact; an interpretation of the Articles in the Compact; activities of the Yellowstone River Compact Commission since 1950; and issues and concerns that have evolved since 1950 that need resolution before the compact can be effectively administered.

HISTORY OF THE YELLOWSTONE RIVER COMPACT

Before 1930, Montana was concerned that the Tongue and Powder rivers were fully appropriated during the irrigation season. During drought situations, there was not enough water to satisfy all existing uses in Montana. It has been stated that there were approximately 45,000 acres of irrigation in Wyoming in the interstate tributaries before the first irrigation was developed in Montana which was 1889. Montanans were concerned that they could not protect their existing uses during low flow periods and that there would be no water available for future developments. Montana, therefore, convinced Wyoming in the early 1930's that the two states should develop a compact that divides the waters of the interstate tributaries between the two states. Wyoming also felt that a compact might enhance both states efforts to have the federal government build multiple use storage projects on the interstate tributaries. The major point of contention in the drafting of a compact was administration ---
this issue is the primary focus in the following discussion.

The first attempt to formulate an agreement began in 1932, when the two states requested and obtained formal approval from the United States Congress to negotiate a compact. Congress authorized four years to complete this task (1932-1936). Wyoming drafted the first compact. Two provisions in the compact became troublesome for the federal government. One would have allowed Wyoming to construct and operate a reservoir on Yellowstone Lake in Yellowstone National Park. The second provision declared the waters of the Yellowstone River and its tributaries as non-navigable waters and therefore properties of the states which they flowed and not that of the federal government. The United States Secretary of Interior Ickes strongly opposed the development of a reservoir system in Yellowstone National Park and the provision that stated the waters were non-navigable. Because of this strong federal opposition, the compact was not developed further and both states sought an extension of time to continue negotiations. Future negotiations would exclude waters from Yellowstone National Park from consideration. The U.S. Congress granted an extension to 1939.

In 1939, the two state negotiation commission drafted a report which contained the following recommendations regarding further negotiations.

1. There was an inadequate data base for developing a compact (Montana lacked most of the data for developing a compact).
2. Large storage projects were needed on the major tributaries for regulating flows.
3. Indian water rights had to be quantified.
4. North Dakota will need to be a party to the compact because the mainstem of the Yellowstone River flows through part of North Dakota.
5. The states needed to ask U.S. Congress for an additional extension until 1943.

A second compact was drafted in 1943. In its attempt to protect existing uses, Montana demanded that a provision be included that would allow water rights to be administered based on priority date regardless of the interstate boundary. The Wyoming legislature could not agree to this provision because it would have an adverse impact on existing uses in the Powder and Tongue rivers in Wyoming during low flow periods. Wyoming was not willing to protect existing uses in Montana to the potential detriment of existing uses and future developments in Wyoming. Because of this, the Wyoming legislature deleted those portions of the compact dealing with the allocation of waters in the Tongue and Powder River basins. With the exclusion of these two basins from the compact the Montana legislature would not ratify the proposed compact.
In 1948, the third attempt for a compact resulted in a similar fate as the 1943 version. A provision was included allowed for an adjudication of the entire river system regardless of the state boundary. For example, Wyoming would receive 72% and Montana 28% of the first 2,200 acre-feet of water of the Tongue River during the irrigation season. Of the next 1200 acre-feet, Montana would receive 57% and Wyoming 43%. This compact was ratified by the legislatures of Wyoming, Montana, and North Dakota. Governor Hunt of Wyoming, however, vetoed the bill. In a letter to Governor Bonner of Montana, Governor Hunt felt the compact was unacceptable because of strong opposition by Tongue River irrigators in Wyoming. These irrigators believed that if the compact was passed in its existing form, Wyoming could not satisfy water demands for 7,000 existing irrigated acres during low flows if required to satisfy Montana's early priority water rights.

The fourth and final attempt at drafting a compact began in November, 1949 and was concluded in December, 1950. Membership included official representatives of the three states and a number of federal agencies representatives (Bureau of Reclamation, Bureau of Indian Affairs, U.S. Geological Survey, Bureau of Land Management, Corps of Engineers and Soil Conservation Services). The group agreed to use the last version of the compact as a basis to begin negotiations. In addition, the group agreed to set up an engineering committee consisting of the three state engineers, Bureau of Reclamation, and Bureau of Indian Affairs to update the technical data necessary to develop a compact and to suggest possible articles for inclusion into a compact, specifically the one dealing with the apportionment of the flows on the interstate tributaries. In addition, each basin had its own technical committee to address issues specific to that basin. The negotiation commission met four times during a one year time span.

Montana again strived to include a provision that allowed for a basinwide adjudication of the four major interstate tributaries. The primary actor in Montana was Mr. Leonard, an attorney from Miles City and a Montana member of the negotiation team for the previous six years. He insisted that no state had the right to divert all the water on interstate tributaries regardless of any injury to a lower state. He felt that the rights and interest of each state must be respected by the other and therefore, pushed the doctrine of appropriation as was used in the second and third compacts. According to Mr. Leonard, the U.S. Supreme Court decision in the New Jersey vs. New York case 283 vs. 336 held that interstate streams which provided the necessity of life, must be rationed among those states who have power over them. In this case, he felt that both states have real and substantial interests which must be reconciled. In a letter to Governor Bonner of Montana, Mr. Leonard contended that Wyoming was making unrestricted and unlimited use of the
interstate streams between that state and Montana without regard to the rights of Montana and only wasted water or water which could not be used to her advantage was allowed to enter Montana. Leonard stated in one of his letters to Governor Bonner the following:

"It is concluded that in both states the dependable natural flow of the river and its tributaries during the irrigation season has long been over-appropriated in both Montana and Wyoming. It is only when a shortage of water exists that a conflict exists. Hence, if Montana would recognize all existing rights (1950) in Wyoming in times of shortage, there would be nothing left for Montana."

The Wyoming quarterback was Mr. McNally, a lawyer from Sheridan, Wyoming. He claimed that the doctrine of "priority" on long river systems had been repudiated. He referred to the language of Justice Douglas in reference to the case of Nebraska vs. Wyoming which indicated that there is evidence that a river-wide priority system would disturb and disrupt long established uses; and that "equitable apportionment" is the correct rule. He further emphasized the case of Colorado vs. Wyoming where junior rights in Colorado were recognized as having priority over senior rights in the lower state because to do otherwise would have disrupted the economy in Colorado which was built upon junior rights. To support Wyoming's case, Mr. McNally emphasized that 28% of the lands in Sheridan County, or over 7,000 acres, would not be supplied with water if existing rights in Montana were recognized.

The stage was more or less set for the third meeting of the commission on October 24-25, 1950 in Billings, Montana. To reiterate, Mr. Leonard and a number of Montana Commissioners wanted administration of both post and pre-1950 rights based on the doctrine of appropriation. Conversely, most of Wyoming Commissioners wanted no administration of existing pre-1950 rights based on the doctrine of equitable apportionment. The engineering committee more or less agreed with Wyoming and, were not in favor of setting up a procedure for administering pre-1950 rights, but were willing to leave the option up to members of the commission.

The engineering committee had considerable influence over the negotiations. At the third meeting, the negotiation commission had lengthly debates over the 20 principles developed by the engineering committee. They are identified below because they shed light on the thinking of the negotiation commission at that point in the negotiations.

1. "It is generally accepted fact that irrigation development in the Yellowstone River Basin, particularly on the interstate tributaries, has very nearly reached its maximum practicable limit without the provision of

461 (WY)
additional new storage capacity." Motion passed.
2. "The committee feels that clearing the way for the
storage should be one of the underlying objectives of any
interstate compact." Motion passed.
3. "From an interstate standpoint, the situation in the
Yellowstone River Basin is extremely favorable since on
three of the four interstate tributaries there is a
reservoir site at or near the state line which can provide
adequate control of residual flows from the upper state for
continued development in the lower state." Motion passed.
4. "The fourth tributary, Clarks Fork, is not likely to
experience water shortages." Motion passed.
5. "The reservoir on Tongue River has already been
constructed, and those on the Big Horn River and the Powder
River are authorized by Congress for construction by the
Bureau of Reclamation." Motion passed.
6. "When these reservoirs are in operation they will have
the practical effect of permitting full development in the
upper states without affecting the progress of development
in the lower states. That fact should be borne in mind." 
Motion denied based on the objection of Montana.
7. "Concerning treatment of existing developments in the
Compact, the committee is of the opinion that there is
little to be gained from a water supply standpoint by
regulating and administering existing diversions under a
compact." Principle passed over---no agreement reached.
8. "It is, of course, entirely up to the Commission whether
or not existing rights are to be administered under the
compact, but from an engineering standpoint, the committee
feels that the expense and difficulties of such an
administration would be in no way be justified by the
benefits that might be obtained." Montana objected
therefore, motion denied.
9. "There are insufficient data upon which to base this
type of administration due principally to differences in the
water laws of the states involved." Montana objected
therefore, motion denied.
10. "It would be a major research project to place existing
rights in all states on an equivalent basis." Montana
objected, therefore, motion denied.
11. "Such procedure undoubtedly would involve interstate
adjudication proceedings." Montana objected, therefore,
motion denied. It should be noted that items 7,8,9,10, and
11 were debated as a group and that most of the Montana
dellegation tried to table these items. However, these items
were debated with no resolution. Nevertheless, the
commission agreed that the following quote is acceptable
for inclusion into the compact at this meeting; "both states
wanted existing rights recognized in the compact".
12. "There are two principles upon which a satisfactory
allocation of the unused waters of the Yellowstone River
could be based. One is the so-called divertable flow
priciple, which has been used in previous Yellowstone River Compact attempts. The other is the depletion principl
used in the Upper Colorado River Basin Compact. (note item 14)
13. "The committee feels that since the divertible flow principle has been previously used as a basis for a compact, it should be retained, but modified to make the apportionment operative on other than a daily basis so that allocation could be in terms of cumulative volumes of water through an entire year, or portion thereof rather than by daily stream flow. This is because substantially all new development will be based on storage rather than divert flow." (note item 14).
14. "A suggested draft of an apportionment article is attached, together with the supporting definition." The group voted and approved the use of divertible flow methodology based on the acceptance of item 13.
15. "Whatever principle is used in allocating the water under the compact, it is necessary to select some index upon which to base apportionment, either directly in acre-feet or by percentage." The committee agreed to use irrigable land in the two states as the bases for the apportionment.
16. "The irrigable land in the states are tabulated in the report and the addendum, dated September 24, 1950 of the engineering committee." Committee noted above priniciple.
17. "The committee feels the irrigable lands as shown by this report and addendum except as to the Bighorn River are a reasonable measure of the new development that is likely to take place in the basin for a long time to come." Motion passed but the addition of "except as to the Bighorn River" was needed for motion to carry.
18. "If the Commission feels that the available data are insufficient on any of the interstate tributaries (Clarks Fork, Big Horn, Tongue, or Powder Rivers) to allocate all of the unused waters of the tributary, it could apportion a first block of water sufficient to take care of the presently indicated potential development." This item was passed over.
19. "Some consideration must be given to supplemental water supply and since such water is for use on existing projects, it is felt that such allocation should be made under the category of existing irrigation work rather than potential." Motion passed.
20. "The committee definitely feels that there is enough information available at the present upon which to base a workable and realistic compact, and that nothing would be gained but much might be lost if a compact were postponed until all the development possibilities in the basin are completely and thoroughly studied. This will take a long time and cost a great deal of money, and if a compact is delayed until it is completed, the basin may well be deprived of the use and benefit of many worth-while
projects which otherwise could be constructed." This item was read as a statement and therefore, no vote was taken.

At the fourth and final meeting of the commission, they finally adopted the engineering draft of Article V of which paragraph A was the point of contention. That paragraph stated "Appropriate rights to the beneficial uses of the water of the Yellowstone River system existing in each signatory state as of January 1, 1950 shall continue to be enjoyed in accordance with the laws governing the actual use of water under the doctrine of appropriation." The Leonard draft went even further. It had the above quoted section but also..." and on the basis of priorities thereunder as single streams and regardless of state lines as such water rights existed as of January 1, 1950, and in the event of a shortage of water to supply all water rights available in any stream shall be divided and apportioned on the basis of priority of rights." This section, however, was deleted from the final compact. The major issue of contention during the last meeting was the issue of article VI and the ramifications of Indian reserved water rights on each states allocated share specifically on Montana (note discussion of Indian reserved water rights on page __).

The compact was ratified by the three state legislatures and the U.S. Congress and became effective in 1951.

WHAT THE COMPACT DOES

The Yellowstone River Compact contains 18 articles. Each Article is described below.

ARTICLE I

This article states that all water users in the Yellowstone River system in the respective signatory states are subject to the terms of this compact.

ARTICLE II

This article defines the important terms used in the compact. It is noted that all lands and waters within Yellowstone National Park are specifically excluded from the terms of this compact.

ARTICLE III

Article III describes the administration of the compact. No administrative body divides the water of the Yellowstone River mainstem between Montana and North Dakota. A three member commission divides the flows between Montana and Wyoming and
administers the provisions of this compact. The commission generally consists of the State Engineer from Wyoming, the Resource Administrator from Montana and a chairman appointed by the Director of the United States Geological Survey.

The commission has certain definable responsibilities. They are required to administer the compact which includes the collection of data, maintenance of gaging records, and any other pertinent information necessary for the administration of the compact. The commission also has the authority to formulate rules and regulations for compact administration. The two commissioners from Montana and Wyoming are the voting members. If the two states cannot agree, then the federal representative has the authority to break a tie voted . . . "on matters necessary to the proper administration of this compact".

ARTICLE IV

Article IV provides the necessary gaging program to administer the Yellowstone River Compact. The gaging program is the responsibility of the U.S. Geological Survey, Montana, and Wyoming. The program is cost-shared with the USGS paying one-half and each state paying a quarter.

ARTICLE V

Article V apportions the flows of the four major interstate tributaries between Wyoming and Montana and includes a number of important statements regarding the division of water. First, all water rights in existence before January 1, 1950 shall be protected and used in accordance with respective state law under the doctrine of appropriation. Second, of the unappropriated water as of 1950, there is enough supplemental water allocated to each state to satisfy pre-1950 water rights. Most of the supplemental water use has occurred in Wyoming. Third, the article divides the unused and unappropriated between Montana and Wyoming on a percentage bases as of January 1, 1950. Water may be used for direct diversion and storage for beneficial purposes on new lands or for other purposes. The following percentages were determined based on irrigable acreage in the respective basins in both states:

Clarks Fork, Yellowstone River
Wyoming 60%
Montana 40%

Big Horn River (exclusive of Little Bighorn)
Wyoming 80%
Montana 20%

Tongue River
The quantity of water subject to the percentage allocation is based on the period from October 1 through September 30 of each year. The allocation to each state can be determined for any given time by adding the algebraic total of the following four volumes (acre-feet) starting on October 1 to that given date:

1. the total diversions in acre-feet for all uses developed after January 1, 1950,
2. the net change in storage in all new reservoirs completed after January 1, 1950,
3. the net change in storage in existing reservoirs where the use is developed after January 12, 1950, and
4. the quantity of water that passed the point of measurement in the stream during the period. The point of measurement in the four tributaries is generally close to the confluence of the Yellowstone River and that tributary.

Fourth, the article recognizes and protects all existing uses in Montana and North Dakota below Intake, Montana as of January 1, 1950. The remaining unappropriated flows of the Yellowstone River mainstem below Intake, Montana are divided between North Dakota and Montana for the period between May 1 to September 30 of each year based on a percentage of the number of irrigated acres. Fifth, all existing and future domestic, and stock water uses are exempt from provisions of this compact provided that stock water ponds are less than 20 acre-feet. Lastly, the commission has the authority to re-examine the allocation and based on unanimous agreement may recommend modifications. The re-examination shall consider priorities of water rights, acreage irrigated, acreage irrigable under existing works, and potentially irrigable lands.

ARTICLE VI

This short article states that nothing in this compact shall adversely affect any rights to the use of waters of the Yellowstone River and its tributaries owned by or for Indians, Indian tribes, and their reservations.

ARTICLE VII

Article VII provides a mechanism to allow either state to apply for and use water within the other state that has not been specifically allocated by or appropriated to that state.
ARTICLE VIII

Article VIII allows either state to acquire through purchase or eminent domain such lands, easements, and right-of-ways for construction, operation, and maintenance of storage reservoirs and other types of water structures.

ARTICLE IX

If a project is constructed in the other state, this provision provides a mechanism to allow the state with the project to construct, operate, repair, and replace facilities subject to the law of the state in which the project is located.

ARTICLE X

No water shall be diverted from the Yellowstone River basin without the unanimous consent of all signatory states. Approval is from the legislatures of Montana and Wyoming and the Water Commission in North Dakota. Both Montana and Wyoming have passed legislation to address this issue in more detail (Appendix 2).

ARTICLE XI

This compact is to remain in full force until amended in the same manner as the initial ratification which is by the respective legislatures and Congress.

ARTICLE XII

The compact can only be terminated with unanimous consent of both states (Montana and Wyoming), but all rights established under the compact shall continue unimpaired.

ARTICLE XIII

This article allows either state to pursue legal remedies in either federal court or the U.S. Supreme Court for the protection of any right under this compact or the enforcement of any of its provisions.

ARTICLE XIV

Article XIV states that this compact cannot set a precedent or any general principle with respect to other interstate streams.

ARTICLE XV

The compact will become operative when approved by the legislatures in the three states and the U.S. Congress.
ARTICLE XVI

This article states that nothing in this compact can impair or affect the United States with regard to jurisdiction, sovereignty, taxation, and state law.

ARTICLE XVII

If any provision of this compact are unconstitutional under state or federal law, then all other provisions remain in full force and effect.

ARTICLE XVIII

No sentence, phrase or clause in this compact can divest any of the three states and its officials from the jurisdiction of the water of each state as apportioned in this compact.

ACTIVITIES OF THE YELLOWSTONE RIVER COMPACT COMMISSION SINCE 1950

Activities and inactivities of the compact commission are identified for each year since its ratification based on the minutes of the annual meetings and other relevant information. Only the most important motions, actions, and activities of the commission are summarized in the following section.

July 15-16, 1952. No need to administer compact. Major problem is a lack of data on water rights and quantities of water diverted. Commission decided to understand compact better before developing rules and regulations.

November 25, 1952. The first annual meeting of the Yellowstone River Compact Commission. Mr. Buck and Mr. Bishop were the commissioners from Montana and Wyoming, respectively. Mr. Stermitz of the USGS in Helena, Mt. was chairman. The commission felt only new users or appropriators after 1950 would be required to supply data and information to the commission. The commission passed a motion that would require all new water users to install headgates and measuring devices so that accurate records can be kept for the eventually administration of the compact. Another motion was passed to identify the points of measurements on the four tributaries. The last significant motion was that the Commission's annual report be submitted to North Dakota.

November 17, 1953. A motion was made and passed that the rules and regulations for administering the compact be adopted
as revised (appendix 3). Mr. Bishop presented a listing of water-use applications in Wyoming between the period 1950 and 1955. Mr. Buck indicated that legislation passed in 1953 will require all pertinent filing information of water rights to be submitted to the State Engineer, but so far, none have been submitted to his office. Both commissions are of the opinion that use during the water year ending September 30, 1953 did not approach the percentages allotted to both states.

November 23, 1954. The commissioners noted that no questions of water use under the terms of the compact have come to their attention. Both commissioners agreed to update water use in their respective states after 1950. The commission noted that average streamflows were generally less than that of the previous year and much below the average on the four tributaries. If trends continue, the commission felt it might hasten..."the need for detailed information on the use of waters allocated by the compact".

November 19, 1955. The commissioners reported that no problems regarding administration of the compact had come to their attention since the last annual meeting. Mr. Buck presented information on water right filings from 1950 to about 1955 except for three counties in Montana. Mr. Bishop indicated that he had not compiled a list of permits issued since his last submittal of a year ago. Both commissioners noted on record that water right filings or permits did not necessarily constitute use. Furthermore, the filings or permits may be for supplemental irrigation not within the purview of the compact. Mr. Clinton, Regional Director of the Bureau of Reclamation in Billings reported on the status of Yellowtail Dam and acreage planned for irrigation from water stored behind the Moorhead or Powder River project. Although average streamflows were higher than the previous year in the Bighorn and Tongue Rivers, they were still below average. Mr. Stermitz noted that return flows from irrigation waters diverted from Rock Creek appeared to exceed diversion from the Clarks Fork between Edgar and mouth of Rock Creek.

November 20, 1956. The Commission found no need to administer the compact based on the previous year experience. The commissioner also ..."felt that allocable use did not exceed the pro rata shares in either Montana or Wyoming." The commission opined that there was little to be gained by collecting discharge data on allocable diversion or use until the aggregate of such uses approached each states' percentage allocations. The expense to the states and commission would be large and the results would be primarily of historical value until critical conditions developed.
November 25, 1957. Mr. Paul Richard replaced L.C. Bishop as the Wyoming Commissioner. The chairman informed the commissioners of their responsibility to provide current data on diversions since January 1, 1950 which are chargeable against the states allocated shares. Mr. Richards indicated that the lists of permits in the basin were available for Wyoming. Mr. Buck stated that he had received but few reports on new water right filings in the basin from county offices. He felt there were many unreported filings which he would try to collect. Both commissioners believed that the available information on water rights should not be considered diversionary data, but still good enough to estimate allocable flows. Both commissioners felt that there was no need for collecting detailed information on diversions. The U.S. Steel Corporation requested approval from the commission to transfer water from Popo Agie River in Wyoming into the North Platte River Basin for processing iron ore. The commission passed the following motion:

"Insofar as the commission authority extends the commission agrees that it will not oppose the diversion of 5.03 cfs, having priority earlier than January 1, 1950, as proposed by the Columbia-Geneva Steel Division of the United States Steel Company. This action shall not establish any precedent."

November 14, 1958. Mr. Earl Lloyd replaced Mr. Richards as the Wyoming representative on the Commission. Flows of the Clarks Fork and Bighorn rivers were near the long-term average and those of the Tongue and Powder rivers were 30 to 40% below average. Each commissioner reported that "no matter of compact allocations came to their attention during the year". Mr. Buck presented the Commission a list of water rights filings in Montana since January 1, 1950 which were pertinent to the compact allocations. It was the first detailed list furnished by Montana. Mr. Lloyd noted that the last list furnished by Wyoming covered the period between January, 1, 1950 and December 31, 1957.

November 16, 1959. The meeting was held by conference call. Again, the commission reported that no questions regarding allocation of waters under this compact had come to their attention since the last annual meeting. Based on stream flow records, the commission felt that uses had not increased materially. Article III A of the rules and regulations of the compact commission were revised and approved by the commission. The flows of the Clarks Fork and Tongue rivers were approximately average and the Bighorn River was about 75% of average. Flows of the Powder River were greater than the previous year.
November 10, 1960. Nothing happened. The commissioners reported that no questions of allocation of waters under this compact had come to their attention during the year. Flows, however, ranged from 74% to 31% of the long term average.

November 21, 1961. Meeting was held by conference call. As at most meetings, a large percentage of the time was spent discussing installation or modification of gages for measuring flows for compact administration. Flows of the Clarks Fork was 74% of average, Bighorn River was 44% of average, The Tongue, 16% of average, and the Powder River 13% of average. Commissions members felt there was no need for allocating tributary flows in accordance with the compact since the last annual meeting. Furthermore, the commission made no attempt to determine the amount and extent of usage of water in the two states. The effort and cost of such determinations was not considered to be justified at the present level of water resource development. Both commissioners provided updated list of filings or permits of new water uses in the basin.

November 28, 1962. Flows in 1962 were considerable higher than the previous year. Mr. Ross, an attorney from Fromberg and Bridger, Mt met with the commission and stated..."his purpose was to draw the attention of members of the commission and state officials to the need for prompt remedial actions should water supply again be critical." [He was referring to 1961]. The two commissioners, however, agreed that the flows in 1962 were in excess of that provided under the terms of the compact.

November 19, 1963. Earl Lloyd was succeeded by Floyd Bishop as the Wyoming commissioner and Everett Darlington succeeded Fred Buck as the Montana member on the commission. In general, runoff was slightly less than in 1962, but substantially greater than in 1961 and greater than the average of record. The commission discussed the proposed Cyclone Bar irrigation development in Wyoming on the Clarks Fork of the Yellowstone. The project would primarily furnish supplemental irrigation supply to lands in Wyoming and could also be used in the extreme southern part of Montana. Montana, however had elected not to participate, as concern was expressed over the greater water use that might then occur in Wyoming. Both states updated water permits and filings in their respective states. Commissioners agreed that there was no need to determine respective state allocable shares of the streams involved because of the recent high flows.

November 24, 1964. Streamflows on the four interstate tributaries were 101 to 127% above average. No matters of
concern were noted by either commissioner. Mr. Darlington indicated that the water resource survey of Carbon County would be updated in 1965 (Clarks Fork is wholly within Carbon County). The first publication of the water survey was in 1946.

November 23, 1965. Mr. Alex McDermott became the Montana representative, replacing Darlington as the state commissioner. Noting above average stream flows and reservoir contents, the two states representatives felt that Compact allocations had not been exceeded in the upstream state. Mr Stermitz noted that he was retiring and expressed the opinion that it might be preferable to have a federal representative on the commission that is not a resident of either Wyoming or Montana because of the possibility of bias toward the state or residence of their federal representative. However, the state commissioners agreed that it is more desirable to have a federal representative who is familiar with the Yellowstone River regardless of whether he resides in either Montana or Wyoming.

November 22, 1966. Mr. Stermitz retired and the Director of the USGS appointed Mr. Erskine to serve as the federal representative. George Pike replaced Mr. Stermitz as the District Chief of the Montana office of the USGS. The flows of the Yellowstone tributaries were below normal, but still higher than in 1961. End of the year content in reservoirs were 27% to 81% above a year ago. Both state commissioners felt that records of stream flow, reservoir storage, and water uses were within the Compact allocation. Mr. McDermott reported that industrial developments will require considerable amounts of water from the Tongue River in Montana and he needed to determine Montana's allocated share. A discussion ensued regarding the availability of data and cost for collecting the information. Mr Bishop opined that the filings for water use permits in the Tongue River basin in Wyoming from 1950 to date would give reasonably accurate information on usage. Mr. McDermott presented a report containing a compilation of all water right filings in the four tributary basins of Montana from January 1, 1950 to October, 1966.

December 19, 1967. Mr. Darlington replaced Alex McDermott as Montana's representative on the commission. Stream flows and reservoir storage was above average and no shortages were reported. Both commissioners agreed that the high flows suggested that both states were within their compact allocation. Mr. Darlington reported that with increased interest in the Tongue River for industrial purposes, the Montana Water Resources Board contracted with the Bechtel Corporation to study the quantity of unused and unappropriated water available to Montana for use within the Tongue River Project in Montana. It was
noted that in the study, Montana would use 28% of the diversion as the return flow value. Mr. Harlan of Bechtel Corporation stated that "under the assumed conditions, during the 21-year period there were 11 years when the flows would have been inadequate, and the average annual flow for the entire period would not have been adequate to supply all needs". Mr. Judah of the Bureau of Reclamation (BR) recently executed options contracts with 5 different companies for a total of 203,000 AF/Y of Bighorn water. Mr Judah noted that the state in which 128,000 AF of this total would be used is not specified in the options. Based on preliminary appraisals, the BR feels that Montana may be close to its full allocation under the compact in the Bighorn Basin. However, the BR noted the complexity of the situation because of the Indian reservations within the basin. BR estimated that there is about 187,000 AF available to Montana and 1,100,000AF to Wyoming. The study was based on the critically low period of 1959-1962. It was reported that interest was brewing regarding the construction of the Moorehead reservoir site for industrial purposes. Because of this increase interest in industrial water, the commission expressed concern regarding the adequacy of the existing stream flow data collection program to meet the needs when allocating flows will become a necessity. A motion was passed to have the USGS study the issue and report back to the commission.

November 15, 1968: Streamsflows and end of the year storage content were well above the long-term average in all basins. Both commissioners felt there was ample water for both states and well within the Compact allocations. No new option contracts were issued by the BR since last years annual meeting. Mr. Darlington reported on the findings of the Bechtel report regarding the enlargement of the Tongue River reservoir. He explained that the Tongue River reservoir could supply 100,000 AF/Y of firm supply, of which 60,000 AF would be for industrial use and 40,000 AF for agriculture. Mr Bishop noted that Wyoming did not plan to take a formal position on the report and that the commission should not take formal action regarding its content. Both commissioners felt that the development and use of water associated with Indian reserved water rights could initiate litigation in the basin because of interference with existing water uses. Mr. Erskine reported that the Directors of both Water Resource Institutes responded favorably to conduct research to evaluate consumptive use and return flows in the basin. Research on return flows were initiated on an irrigation project in a mountain meadow in Wyoming and on a cultivated land project with limited water supply in Montana. For more specific information of the research, refer to the Commission meeting minutes.

December 2, 1969. Governor Anderson appointed Doug Smith as
Montana's new member of the commission replacing Darlington, Streamflows were about average and well within the compact allocation. Mr. Judah of the BR noted that his agency was surveying the design and cost for moving Bighorn water into the Montana and Wyoming coal fields and future use by energy companies. No new option contracts were finalized with the BR, but there still appeared to be much interest. The Commissioners felt that Indian tribes were becoming more aggressive to assert their reserved water rights and litigation will eventually be required to settle the question of the extent of the Indian rights. Neither study proposals initiated the previous year received approval at the national level. Mr. Bishop noted that the BR is studying the Moorhead site on the Powder River for a potential storage project.

November 9, 1970. Mr. Williams became the new federal representative on the commission replacing Mr. Erskine. Flows were near or above the long-term average. A slight shortage did occur, however, in an isolated section of the east flank of the Bighorn Mountains near Buffalo, Wyoming. The BR presented information on its study of possible routes to move water into the coal fields of Montana and Wyoming. Five principal pipeline routes were being surveyed to transport about 1 million AF/Y of water. The Rules and Regulations were modified slightly with respect to the location and name of the gaging site on the Clarks Fork and that the Prairie Dog Creek gage be identified on the map. Also, that the annual meeting shall be held in November rather than on the third Tuesday of November.

November 11, 1971. Since Montana's representative could not attend, the Chairman and Wyoming's commissioners agreed that all motions would be seconded by Montana at a later date either by phone or letter. A stenographer was at the meeting to take minutes. Flows were above average for the interstate tributaries. Two meetings were held in June and July to discuss diversions from the Yellowstone River Basin, who needs to approve out-of-state diversions for each state, the need for changes in Montana water laws to agree with terms of the compact, and the status of the BR aqueduct study. BR officials indicated that about 85 energy companies were now interested in obtaining water for industrial purposes within the basin. The BR reported that it now had 1.7 million AF/Y of option contracts for industrial water. The BR official also felt that were was about 951,300 AF/Y for export at Hardin, Mt. from the Bighorn drainage basin. BR also emphasized the need for the states to agree on their allotments under the Compact. The Chairman stated that the Commission should begin to develop a system for administering the compact and submitted an outline of a computational procedure (appendix 4). Messrs. Pike and Cushman of the USGS reviewed
their report regarding the collection of additional data and administrative procedures for allocating water under the terms of the compact. Mr. Bishop felt "that evaporation losses in reservoirs with post-1950 storage rights should be charged against the state in which the use of the stored water is being made, whereas evaporation losses from reservoirs with rights prior to 1950 should not be charged to either state. He further stated "that channel losses and return flows need not be considered since water is measured for compact purposes at the points of diversion." Montana reaffirmed its interest in building the Moorhead project, whereas Wyoming had apprehension because it was so far downstream and would have little benefit for its irrigators.

November 21, 1972. Grant Buswell represented Montana on the Commission replacing Darlington. The Governors of Montana and Wyoming meet on the issue of transbasin diversions from the Yellowstone River Basin. No decision was reached for obtaining unanimous consent for taking water outside of the basin. North Dakota officials could not see any benefits to North Dakota for consenting to out-of-basin diversions. Mr. Bishop and the BR emphasized the need for settling the diversions issue so that orderly development of the coal resource within the basin can occur. Mr. Williams of Wyoming summed up the discussion on interbasin transfer by saying "there is basic disagreement on the transbasin diversion question and the question needs to be resolved because development of the coal deposits in the three states is going to take place one way or another, and the technical consideration should be taken into account as well as the political ones." A motion was passed requesting the three Governors to appoint legal representatives from each state to define procedures for obtaining consent. A number of studies and activities were discussed including; Missouri River Basin Commission, Northern Great Plains Resource Program, Resource and Land Information Program, State Water Planning in the Bighorn Basin of Wyoming, and North Central Power Study. Both Commissioners felt flows were adequate and that there was no impact on compact allocation. Wyoming noted that it was keeping records on major diversions and on small ones where there was a need to administer and regulate flows, whereas Montana was not. Mr. Buswell indicated that legislation is being drafted which will centralize water right records in the Department of Natural Resources and Conservation (DNRC).

November 1973. The year was very exciting for the commissioners. A special meeting was held in July on a number of issues therefore, the annual meeting was held by conference call presumably in November since the meeting minutes did not identify a date. As in previous reports, no incidents during the year required administration of water in accordance with compact
provisions. Stream flows were slightly above average in all drainages except for the Clarks Fork which was slightly below average. Most of the discussion revolved around article X of the compact because of the increase interest in coal development and transportation of water within and outside the basin. The legal representatives appointed by the Governors of the three signatory states determined three ways in which permission could be granted under article X. They included: a bill resolving the issue presented to each legislature; resolutions by the three legislatures; and to amend the compact Article X which requires Congressional approval.

Intake Water Company, a Delaware Corporation and a wholly owned subsidiary of Tenneco, Inc., has applied for an appropriation of water to be diverted from the Yellowstone River in the vicinity of Intake in Dawson County, Montana for use in the Little Missouri River basin of Montana and North Dakota. Intake also filed a lawsuit against the Commission and its members in Federal District Court in Billings, Montana on June 29, 1973. The suit challenged three areas: The Attorney General of Montana be enjoined from enforcing Section 89-846 of the Montana State Statutes, which forbids such out-of-state diversion without the consent of the Montana Legislature; the Yellowstone River Compact commission and its members be enjoined from enforcing Article X of the Compact and that article X be declared unconstitutional as an unwarranted burden on interstate commerce; and the commission be enjoined from enforcing article X and article X be declared unconstitutional as a violation of the equal protection clause of the 14th Amendment of the Federal Constitution. Another interesting event was the application by Utah International Corporation to divert water from the Powder River and from a storage reservoir on Fence Creek, a Powder River tributary in Wyoming. The company plans to pump water from the reservoir by a 48-inch pipeline to the project site in Montana. The application pertains to the diversion in Wyoming of presently unused and unappropriated water of the Powder River allocated to Montana for beneficial use in that state pursuant to Article V, B.4a of the Compact.

November 26, 1974. Walter Scott became the new federal representative and chairman replacing Robert Williams and Orrin Ferris became the Montana commissioner replacing Grant Buswell who retired. Streamflow and storage was above average and no problems existed. Ted Doney, attorney for the Montana DNRC summarized the Intake Water Company lawsuit against the Compact Commission, Attorney General of Montana, and each commission member. Intake Water Company, which is a wholly owned subsidiary of Tennaco claimed that Article X of the Compact is unconstitutional because it impedes interstate commerce and that Montana's ban on out-of-state diversions is unconstitutional.
Mr. Bishop emphasized the need for joint water development programs between the two states and felt that water had to be transferred outside the basin. Mr. Ferris indicated that Montana was definitely interested in a joint water development study, only if Wyoming's motivation was not interbasin transfer. Mr. Bishop felt that water has to be diverted out of the basin and that each state has the right to divert their allocated share. Regarding the documentation of post-1950 uses, Mr. Bishop noted that Wyoming has a good handle on water rights because of its ongoing adjudication. Orrin Ferris reported that a new water law passed in Montana that will allow the documentation of existing water rights and that this adjudication is proceeding in the Powder River basin and the next basins to be adjudicated will be the Tongue River and Rosebud and Armeils Creek. Both Commissioners disagreed with the BR allocation study. Orrin Ferris noted that the Bechtel Study on the Tongue River resulted in different allocation numbers. Furthermore, studies completed by Wyoming also showed differences with the BR study. A motion passed that requested each state to identify manpower and objectives of a study to determined a mechanism to administer the Compact. The study would address return flows, evaporation and potential for joint developmental programs.

November 13, 1975. George Christopoulos replaced Floyd Bishop as Wyoming's representative on the commission. There were no incidents during the year that required administration of the Compact. Again, the commission emphasized the need to begin developing procedures for administering the compact because of the increase in demand for Yellowstone River water. Documentation of per-1950 rights have been completed in Wyoming. Based on the new 1973 water codes in Montana, the DNRC is beginning to document existing water rights. Ted Doney reported on the status of the Intake Lawsuit against the Commission regarding Article X and the two new lawsuits filed by the Crow and Northern Cheyenne against the state regarding whether the state or federal court has jurisdiction to adjudicated Indian reserved water rights. Orrin Ferris noted that the adjudication of the Yellowstone River basin will probably take 15 to 25 years. Mr. Ferris also emphasized the need to start issuing principles that would help define guidelines for administering the Compact. One such statement might be related to supplemental water. Mr. Shore of the Missouri River Basin Commission discussed its proposed objectives for a Level B study of the Yellowstone River Basin.

November 1976. Little happened at this meeting. Commissioners reported that there was no reason to administer the compact. Flows were near average in the four tributaries. Discussions took placed regarding the need to develop an administrative procedure to eventually administer the compact.
the status of the Intake Water Company Lawsuit, and the potential for large scale development of water and coal in the basin.

November 9, 1977. Streamflows were considerably below average, but there was no incident that required administration of the compact. A special Compact Administration Subcommittee meeting was held to begin resolving differences in interpretation of the compact. The commission again indicated that the compact will eventually need to be administered and waters allocated between the two states. Orrin Ferris presented preliminary information on Montana's water use. Because of the potential for large-scale use of water associated with coal development, the commissioners requested the Subcommittee to meet again to do what was necessary to develop an administration procedure and joint development and allocation studies. Frank Trelease presented Wyoming's subcommittee report. He indicated that half of the 13,000 A/F/Y of water rights filed since 1850 have been adjudicated, but did not know whether the water is being used for full service or supplemental water supply. He stated that the water right system is not geared to meet Compact requirements and feels that administering the compact will be quite a problem. Both commissioners thought that having the federal representative from North Dakota was better than someone from the regional office of the USGS in Denver. Both commissioners agreed that a proposal should be drafted for obtaining financing to develop an administrative model to allocate the flows of the interstate tributaries. An attorney from Intake Water Company petitioned the Commission for diverting water from the basin (from the Yellowstone River at Intake Mt. to the Little Missouri Basin) for the purpose of constructing a synthetic natural gas plant. A motion was passed by the Commission; to accept the petition, to develop a legal position regarding consent, and to get back to Intake Water Company on its findings. Status of the Intake Water Company lawsuit was presented. The DNRC argued that Intake Water Company had a post-1973 water right and the Company argued that it was pre 1973. Ted Doney noted that the lawsuit regarding the priority date of Intake's water right was appealed by the state to the State Supreme Court and the Court ruled in favor of Intake Water Company.

November 9, 1978. A severe winter storm prevented the commission from meeting and therefore, the meeting was held by conference call. Two special meetings were held in January and May, 1978 to continue discussions of water-right procedures in both states, definition of terms in the Compact, and to respond to Intake Water Company's petition to the Commission requesting permission to divert water out of the Yellowstone River Basin. The legal opinion on what state entity has the authority to approve interbasin transfers concluded that the Montana and North Dakota legislatures and the North Dakota State Water Commission
were the appropriate entities. In response for seeking legislative authority for the Commissioners to act for the signatory States, the Governor of Montana determined that he was not willing to sponsor such legislation and the Governor of Wyoming indicated that he would not oppose such legislation, but that it would be difficult to get it passed. The commission felt that no incident occurred during the year that required administration of the flows in accordance with the Compact. The commission, however, is still focusing attention on the need to define detailed procedures for implementing and enforcing Compact provisions. Because of this, the Subcommittee has been requested to continue its investigations. It was noted that interest in Yellowstone River water for coal development is still increasing. Documentation of pre-1950 water rights have been completed in Wyoming. Montana is working on it, but has a long ways to go. The commission noted that a major concern with allocating the flows of the four interstate tributaries is the unquantified indian and non-indian reserved water rights.

November 14, 1979. Gary Fritz replaced Orrin Ferris as the Montana Commissioner. Two meetings of the subcommittee were held in July and September of 1979. The purpose of these meetings was to continue developing an understanding of the compact and potential ways that it might be administered. The commission felt there were no incidents that would require administration of the compact, however, as in previous annual reports, the commission felt that compact administration will be necessary in the future. The minutes are almost a verbatim transcript of the previous year:

November 21, 1980. Grady Moore replaced Walter Scott as the Chairman and federal representative to the commission. A special meeting was held in April to discuss compact administration and interpretation. No discussion of joint water development activities occurred at this meeting. The commission felt that there was a need to administer the compact, but again they did not feel they were in a position to do so. Even though the report says the interest in coal development and peripheral needs are continuing, in reality the interest in coal is beginning to decline. The commission drafted a proposal for improving the administration of the Yellowstone River Compact. Objectives of the proposal were to: obtain a better understanding of the compact; determine the quantity of water that is available to Montana and Wyoming under the terms of the Compact, determine whether the apportionment formula in Article V is still applicable, and equitable for dividing and apportioning the waters with respect to present and future demands; and develop an accounting system which will allow the commission to administer the compact on a regular basis and to predict future water needs. The proposal is to be sent to the Old West Regional
December 21, 1981. The compact was not administered. Streamflows were below average for the year on all four tributaries. The Old West Regional Commission thought the Compact Commission's proposal was acceptable for funding, but with the demise of the Old West Regional Commission, all hopes for funding disappeared. This being the case, both states assigned individuals to develop a proposal for administering the compact, with the Tongue River being the initial basin of study. A number of important issues were discussed at the meeting. The potential development of the Little Bighorn by the Sheridan-Little Horn Water Group and potential impacts to Montana became an issue. This company is proposing to build a series of 3 storage reservoirs and sell up to 32,000AF/Y for industrial purposes. The Commission agreed that the issue of interstate ditches, where the diversion is in one state and the use in the other, must to be resolved. The commission began thinking of appropriate rules and procedures for resolving this issue. The Commission discussed the Jan Paul Application. This is where the Yellowstone Pipeline Company filed an application with Montana to divert 348 cfs or 251,952 AF/Y near the confluence of the Powder and Yellowstone rivers for use in Wyoming and the company would use part of Wyoming's allocated share. An update of the Intake Water Company's lawsuit was presented by Montana. The Company is challenging article X on the bases that it is a burden on interstate commerce and therefore unconstitutional. Montana described S.B. 243 which delegates authority to the Montana DNRC to authorize diversions from the Yellowstone River Basin. The last significant issue discussed was the lawsuit between Utah International and Intake Water Co. regarding which company water right had the earlier priority date for a storage project on the Powder River.

November 10, 1982. An April 26 special meeting was held to formulate approaches to study the Little Bighorn and Tongue rivers. A technical committee was appointed to study the Little Bighorn River, and to provide background information for negotiating a compact between the two states and between Montana and the Crow Tribe. Another technical committee was formed to determine and agree on the storable inflows to an enlarged Tongue River Dam that Montana is entitled to under the compact. Montana voiced concerns that Wyoming will need to regulate its post-1950 flows more carefully so that it does not use Montana's pre-1950 water. A condition developed in 1981 where Montana was almost unable to fill the Tongue River reservoir which has a pre-1950 right.

At the annual meeting, the commission noted that the compact has never not administered, but hopes the results from
the Tongue River studies will provide information to assist in the development of an administrative procedure for article V of the Compact. The issue of how the enlargement of the Tongue River Reservoir might affect article V was discussed with no resolution. The Little Bighorn Technical Committee reported that a base accounting model had been developed by Montana for the river. The model was sent to Wyoming for review. Wyoming indicated that Governor Hershler will appoint a team to negotiate the flows of the Little Bighorn and a legal firm to develop a negotiation strategy. The Tongue River water model has been developed by Montana and the two states are discussing refinements. The commission discussed the U.S. Supreme Court finding that upheld the Montana Supreme Court decision in Utah International vs. Intake Water Company. The Court ruled that the DNRC acted properly when it assigned Utah International the earlier priority date on its water right application than that of Intake Water Company. The commission began to identify interstate ditches that the commission needs to resolve and began to develop rules. The last issue discussed revolved around the relationship between the compact and the brewing conflict in the Missouri River basin between the upper and lower basin states. The Commission voiced the opinion that the Yellowstone River and tributaries should be excluded from a Missouri River Compact because it is already compacted by the U.S. Congress.

January 4, 1983. On April 27, 1983, a special meeting of the commission was held to address a number of issues. The first issue discussed was interstate ditches. Both states provided an update of the number of ditches and available data on them as well as reviewed the draft rules for resolving this issue. Regarding the Clarks Fork Basin, Montana described HB(914) which gave the Montana representative the authority to work with Wyoming on developing a potential joint storage project in the basin. Wyoming identified its assessment of potential projects for consideration. Wyoming updated the commission on the status of the Wind River adjudication and concerns that Wyoming has with quantification of Indian and non-Indian reserved water rights. A brief discussion occurred on the programmatic EIS being prepared by the BR on water for marketing out of Yellowtail and Boysen Reservoirs. The commission spent considerable time discussing the Little Bighorn River issues related to the proposed developments by the Sheridan-Little Horn Water Group. Specifically, issues included the status of the model development and results by the technical committee, status of negotiations with the Crow Tribes and Wyoming legislation affecting the Little Bighorn negotiations. Montana proposed that a joint study be initiated by Montana and Wyoming to evaluate the potential for a joint project on the Powder River and to develop a basin management plan that satisfies the needs of both states. Wyoming is presently evaluating a number of potential storage sites for development in this basin with the Middle Fork Project being the most desirable site. Considerable time was devoted to discussing
the Tongue River. Discussions revolved around the water model, supplemental water supplies, Montana direct flow rights, status of negotiation with the Northern Cheyenne Tribes, and Wyoming’s water development activities within the basin. Montana presented a draft proposal for review by the commission regarding the administration of the compact and allocation of water under Article V (Appendix 5). Wyoming wanted the opportunity to study the proposal in more detail. Both states reported on legislation that would allow them to evaluate proposals to transfer water outside the Yellowstone River Basin that would meet the requirements of Sporhase vs Nebraska.

The regular meeting was held in January. The commission spent considerable time discussing interstate ditches. Montana presented a proposal for resolving the issue and Mr. Christopulos had concerns with Montana’s proposal because of a number of legal issues that must first be resolved. He plans to get back to the commission by May, 1984. Wyoming presented further detail of its study of potential storage sites in the Clarks Fork River Basin. Montana presented a report of the continuing saga of repairing and enlarging of the Tongue River Reservoir. Wyoming noted that three storage sites are being evaluated in the Tongue River Basin. Wyoming discussed the Little Bighorn negotiations. Last issues of discussion included the status of ongoing litigation specifically, the Intake Water Company’s challenge of Article X and Jan Paul application.

November 20, 1984. A special meeting was held in April to address two topics—interstate ditches and administration of Article V of the Compact. The Commission developed administrative rules for processing of claims for use of water from interstate ditches. Draft rules and procedures for advertising the rules were developed. A mailing list of all interstate ditch water users were compiled for notification. Dan Ashenberg of Montana presented a method with assumptions for administering the compact and presented a simple example. Wyoming wanted Montana to use a more complex example and suggested the Tongue River Drainage Basin. Montana agreed and will present the information at the next annual meeting. The Commissioners agreed that there was no incidents that required the administration of the Yellowstone River Compact. Stream flows were above average on all tributaries. Interstate Ditches were a major issue of discussion. Rules were adopted early in the year by the Commission and mailed to all interested parties on October 2, 1984 with a December 31, 1984 deadline for submitting claims. As of the time of the meeting, no claims have been submitted to the commission. The issue of salt loading from Salt Creek into the Powder River was discussed. It appears that discharges from oil well treaters in the Salt Creek drainage may be the source of increased salinity in the Powder River. George Pike of the USGS presented preliminary data that
suggested chloride increased 5 fold since 1950 and that the increase can be attributed to one of two sources; secondary oil well treaters or geothermal activity; there is no geothermal activity in the basin. The USGS requested that a joint study be initiated that would allow a better documentation of sources of contaminants into the Powder River. The Commission approved the study. The Commission also received a status report of the joint Wyoming-Montana SCS study designed to forecast streamflow in the Clarks Fork Basin. The model is being developed by the SCS's West National Technical Center in Portland, Oregon. A January meeting was proposed to discuss the Ashenberg administrative model.

November 26, 1985. A special January meeting was held to described the Ashenberg approach for administering the compact. Wyoming agreed to evaluate the methodology and assumptions and to get back to the commission.

At the annual meeting, the first issue addressed was a letter sent by the Montana representative to the Wyoming and federal members of the Commission which asked the commission to determine the applicability of Articles V and X of the Compact to the Middle Fork Powder River water development project. The issue is whether the 1940 Wyoming water right permit for storage at the Middle Fork project falls under the jurisdiction of the compact. The representatives of the two states disagree. Mr. Fritz requested the Commission to take the issue under advisement and establish a hearing date and procedure. A conference call was set up in December to discuss the letter in more detail because neither the Wyoming representative nor federal chairman had an opportunity to study letter since they just received it. Streamflows for the year averaged between 47-70% of the long-term average. Wyoming indicated that the SCS report on forecasting of flows in the Clarks Fork basin will be completed this winter. The SCS plans to provide a weekly forecast for the Clarks Fork River at Belfry, Mt. during the April through September period. Wyoming reported that the Wyoming Water Development Commission is considering whether to seek legislation to proceed with the environmental impact statement and permitting process on the Middle Fork project. The Water Development Commission is also studying storage projects in the Clarks Fork. Adjudication of claim on the interstate ditches were received by the commission and are being processed. Further efforts are planned to work on an administrative model to apportion flows of the interstate tributaries. Montana indicated that the water accounting model for the Little Bighorn is finalized and two reports are available from the Mt. DNRC.

[Since the minutes for 1986, 1987, and 1988 annual meetings of the Compact Commission are very detailed and accurate, they are not included here. Please refer to the minutes for MT v. WY/M.T.D. App. 483 (WY)
SYNOPSIS OF COMPACT COMMISSION ACTIVITIES

Based on a review of the minutes a number of conclusions can be... drawn regarding the compact.

1. The compact has never been administered. Key terms of the compact remain ambiguous.

2. The issue involving interstate ditches where the point of diversion is in one state and use in the other has been resolved through the compact.

3. During the 39 years the Compact has been in existence, the states have experienced severe droughts and the compact has not been administered as initially contemplated by its negotiators.

4. The technical data base on pre-1950 and post-1950 water rights and actual water use is not accurately known in both states for compact administrations nor have the states attempted to keep the information up to date in accordance with compact provisions. It should be noted, however, the data base in Wyoming is better than that in Montana.

5. Neither state knows whether Montana is being adversely affected during periods of below average flow nor whether water used in Wyoming is contrary to the terms of the compact.

6. It is to Wyoming's advantage not to administer the compact and to Montana's advantage to administer it.

7. The only article that has been administered is article X and the feeling of the states is probably that the article is a hindrance on water development activities within the individual states.

8. There are many issues that Montana and Wyoming disagree on regarding the interpretation of the compact. These issues have to be resolved before the compact can be administered.

ISSUES

1. INDIAN RESERVED WATER RIGHTS.

ISSUE: Article VI of the Compact clearly states "nothing contained in this compact shall be so construed or interpreted
as to affect adversely any rights to the use of the waters of Yellowstone River and its tributaries owned by or for Indians, Indian tribes, and their reservations."

WYOMING POSITION: Wyoming believes the founders of the compact determined allocable waters on interstate tributaries based on percentage of irrigable acreage in the basin including lands on and off Indian reservations. Therefore, reserved water rights in Wyoming would come out of Wyoming share and reserved water rights in Montana would come out of Montana share. The minutes of the final negotiation meeting held in December, 1950 appears to substantiate this position.

MONTANA POSITION: Montana believes that the tribal water rights pre-date or are senior to the Yellowstone River Compact and that Article V-A also applies to tribal reserved water rights. That Article states that all appropriative rights to the beneficial uses of water within the Yellowstone River system existing in each state as of 1950 shall be enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation. Therefore, tribal rights must be satisfied first and what water is still unappropriated is to be divided by both states. If Wyoming's position prevails then Montana could conceivable lose existing rights and its total allocable share in the Bighorn River Basin to the Crow Tribe. Moreover, in 1950 a number of the negotiators felt correctly that Indian reserved water rights might not be limited to "presently projected use as estimated by the engineering committee, but might become relatively unlimited". The negotiators in 1950 could not have guessed the outcome of the U.S. Supreme Court decision in Arizona vs. California in 1963 that based the quantification of Indian reserved water rights on practicable irrigable acreage. Also the negotiators questioned the accuracy of the irrigable acreage identified in the Bighorn River Basin and before the engineering committee's principle on this issue would pass the negotiation committee, the Bighorn Basin had to be exempt from the principle (refer to page ___).

2. JURISDICTION OF THE COMMISSION CHAIRMAN.

ISSUE: The issue is under what situations does the chairman have the authority to break a tie vote when the two states disagree. This issue arose when Montana attempted to have the commission determine whether pre-1950 permits or unperfected rights developed after 1950 fall under the jurisdiction of the Compact and are included in the apportionment.

WYOMING POSITION: According to Wyoming, the federal chairman can only break a tie vote when it involves the administration of the compact and not its interpretation. Article IV-F states that if
the representatives of the two states cannot agree "on a manner necessary for the proper administration of this compact", then the chairman breaks the tie vote.

MONTANA POSITION: Montana believes Article VI-F clearly allows the chairman to break a tie on any issue involving the interpretation of the Compact. To the extent that many issues regarding specifics of compact administration were left unresolved or non-explicit in the final compact, interpretation plays a key role in administration. For without an agreement on the meaning and intent of the Compact, the Compact cannot be administered.

3. SUPPLEMENTAL WATER

ISSUE: The Compact has a provision that allocates to each state enough unuse and unappropriated water as of 1950 for use as supplemental water supplies for water rights in existence before January 1, 1950. The issue is two fold: not knowing the amount of unappropriated flows allocated to each state because of the continual use of supplemental water and the question of due diligence or time allotted to develop full service irrigation on pre-1950 water rights.

WYOMING POSITION: The major use of water in Wyoming is the development of supplemental water supplies after 1950 and it is a very important provision in the compact.

MONTANA POSITION: Since the compact has been in existence for 39 years, Montana feels that there has been more than enough time for perfection of pre-1950 uses with the use of supplemental water in both states. The concept of supplemental water also makes it extremely difficult to determine what percentage of water each state is entitled to in any given year. Development of supplemental water will decrease each states allocated shares under the compact. Moreover, if unappropriated and unused water is divided between the two states and developed after 1950, a pre-1950 water user can develop supplemental water supplies for a pre-1950 water right and cause a post-1950 water user to lose its water supply.

4. ADMINISTRATION OF PRE-1950 WATER RIGHTS

ISSUE: Article 5 states that the appropriative rights to the beneficial use of Yellowstone River system water in existence as of January 1, 1950 in each signatory state shall continue to be enjoyed in accordance with the laws governing the acquisition and use of waters under the doctrine of appropriation. The question is—does the compact commission have jurisdiction to administer pre-1950 water rights?
WYOMING POSITION: Wyoming believes the commission has no jurisdiction to administer pre-1950 water rights and that the way the compact has been managed historically still applies. That is, Wyoming satisfies its pre-1950 water rights first, then Montana satisfies its pre-1950 rights and whatever is left over is divided on a percentage bases between Montana and Wyoming on the interstate tributaries.

MONTANA POSITION: Montana does not believe the issue is that simple. Throughout the twenty years of negotiating a compact the major stumbling block was the administration of pre-1950 water rights. A number of Montana negotiators continually argued for a provision that would allow the compact to administer pre-1950 water rights. However, at the eleventh hour of negotiations a provision to allow for administration of pre-1950 rights was rejected because it was the final hurdle before a compact could be agreed upon. Further, Montana believes that since the negotiators could not agree on this issue it was left out of the compact and therefore, not addressed. Montana believes that Wyoming's interpretation of article V for allocating flows on the interstate tributaries is not an equitable apportionment.

5. WATER QUALITY

ISSUE: Article V-A states that pre-1950 rights in both states shall continue to be enjoyed in accordance with the laws governing the acquisition and use of water under the doctrine of appropriation. The question is; does the Compact have jurisdiction over activities in one state that change water quality to the detriment of existing pre-1950 water rights in the other state?

WYOMING POSITION: Wyoming believes that water quality is not a compact issue since it is not specifically mentioned in the compact.

MONTANA POSITION: If existing pre-1950 uses in either state are adversely affected by detrimental changes in water quality caused within the other state, then the Commission has jurisdiction to do whatever is necessary to protect the pre-1950 water rights. This would include requiring the other state to clean up any activity that caused the degradation to water quality.

6. THE APPORTIONMENT PERIOD.

ISSUE: Paragraph C of Article V indicates that the quantity of water subject to the percentage allocation shall be determined on an annual water year basis measured from October 1 of any given
year through September 30th of the succeeding year. The quantity of water to be divided at any given time is the sum total of those quantities identified in Article V-C since October 1. The issue is that many of the negotiators of the compact contemplated the construction of large storage projects on the interstate tributaries in Montana that would provide Montana's allocation. No new storage projects, except Yellowtail Reservoir has been built since 1950 and the likelihood of additional large storage projects being built on the interstate tributaries is very remote.

WYOMING POSITION: Wyoming believes the apportionment formula should be strictly adhered to as defined in Article V. (Refer to the memo by Lou Allen to George Christopulos regarding compact administration).

MONTANA POSITION: Since federal storage projects will not be built on the Powder, Tongue, and Clarks Forks Rivers in the foreseeable future, the apportionment formula as presently interpreted does not work practically or equitably. For example, if the total of the flow to be divided on one of the four interstate tributaries in August is 100,000AF (the sum of the four quantities in Article V-C from October 1 to August 1) and the actual flow in August is less than 5,000 AF, Wyoming would be entitled to 42,000AF or the entire flow and Montana would be entitled to nothing if strict adherence to the apportionment formula is maintained. Montana takes the position that the compact should actually apportions the flows on a weekly to monthly period beginning in October 1 and once the flows are apportioned they cannot be reapportioned. In August, the 5,000AF would be apportioned between the two states in an equitable manner based on the percentages. Montana also believes that the hydrology and distinct water supply/demand characteristics of the rising and falling limbs of the hydrograph are responsible for a timing problems which dictate that each limb of the hydrograph be apportioned separately according to Article V. If each limb is not apportioned separately, the article V calculation would have the effect of dividing flow at the downstream gate for use upstream at a later date. This is a physical impossibility. Secondly, the rising and falling limbs should be apportioned separately so that each state may quantify that portion of the rising limb which can be put in storage and used to supplement irrigation after the given date. Flow apportioned during the rising limb and that water which has been stored will not be re-apportioned after the given date. Likewise, post-1950 diversions satisfied from water apportioned before the given date, are not included in the apportionment after this date.

8. LITTLE BIGHORN.

ISSUE: The issue is whether the Little Bighorn is included into
the Yellowstone River Compact.

WYOMING POSITION: Wyoming believes the Little Bighorn is excluded from the Yellowstone River Compact and is specifically excluded in Article V under the apportionment of the Bighorn River and in Article II under the definition of interstate tributaries.

MONTANA POSITION: Even though Article V specifically excludes the Little Bighorn, Montana believes that the definition of the Yellowstone River Basin and Yellowstone River system clearly includes the Little Bighorn with regard to all articles of the compact except article V. The reason the Little Bighorn was excluded from article V is because there were little to no water uses in Wyoming as of 1950 and 90% of the basin is in Montana and on the Crow Indian Reservation. At that time, the compact negotiators were uncomfortable addressing Indian reserved water rights.

9. DIVERSION VERSUS DEPLETION.

ISSUE: The apportionment formula in Article V is based on diversions and not depletions. When agriculture is the predominate use, diversions is a reasonable basis for determining the apportionment. Since the initiation of the 1970's and the increase in industrial use with little or no return flows, the use of diversions may not be the most appropriate measurement to use. Moreover, the apportionment mixes two types of water (divertable and diversionary flows) that makes it impossible to balance water apportioned to the two states.

WYOMING POSITION: Wyoming sees no problem with the use of the four measurements as defined in Article V as the basis for apportionment.

MONTANA POSITION: Montana believes that it is possible to prepare a water budget based on the two types of flows used in the apportionment. The only way the apportionment formula can work properly would be to use similar units. All units should be converted to their divertable flow equivalents. Conversely, divertable flow equivalents could be converted back to depletable flows when it is necessary to calculate the quantity of water to be released from storage.

10. DIVERTING WATER FROM ONE STATE INTO ANOTHER: ISSUE OF PRIORITY DATE.

ISSUE: If one state wants to divert water allocated to it from
the other state, there appears to be a question regarding the priority date of the water right and which state has jurisdiction over the priority date.

WYOMING POSITION: Wyoming contends that the original intention of Article VII of the compact is to allow Wyoming to divert water from Montana where the water comes from Wyoming allocated share and has a priority date established under Wyoming law. This issue evolved with the filing of the Jan Paul application for use of Wyoming's allocated share of water, but diverted within Montana.

MONTANA'S POSITION: Montana argues that Article VII states that Wyoming would have to abide by Montana's water laws including the establishment of a priority date. For example, Article VII-C states that "Appropriations may hereafter be adjudicated in the state in which water is diverted..." and further states, "Each adjudication is to conform with the laws of the state where the water is diverted and shall be recorded in the county and state where the water is used."

11. ADMINISTRATION OF NON-PERFECTED PRE-1950 WATER RIGHTS UNDER THE COMPACT.

ISSUE: The issue is whether undeveloped pre-1950 water rights in either state are to be allocated under article V of the compact.

WYOMING POSITION: Wyoming feels that unperfected water permits in existence before 1950 are not to be administered by the compact. For example, the 1940 permits for water use in the Powder River Basin can be developed today and not become apart of Wyoming allocated share for this basin.

MONTANA POSITION: Montana believes Article V-C clearly states that all water associated with the development of reservoirs after January 1, 1950 or new uses in pre-1950 reservoirs shall be allocated between the two states. Montana also questions the issue of due diligence on permits that have been in existence for over 40 years and still unperfected.

12. POINT OF MEASUREMENT.

ISSUE: The point of measurement is generally near the confluence of the tributary and Yellowstone mainstem. The issue is---should the flows be allocated at the interstate boundary?

WYOMING POSITION: Wyoming notes that the reason the point of measurement is the confluence with the mainstem is that Wyoming
negotiators in 1950 insisted that the entire flows of the interstate tributaries be divided and not just the flows originating in Wyoming. It should be noted that the negotiation commission in 1950 concurred with Wyoming’s position.

MONTANA POSITION: Montana agrees that the point of measurement is the confluence of the tributaries with the mainstem, but feel that this makes it very difficult to actually apportion the flows between Montana and Wyoming. Montana believes the flows must be divided at the interstate line and that some type of real-time forecasting is important for accurate apportionment.

CONCLUSIONS

1. The compact has not been administered for 39 years. Specifically, flows have not been apportioned between the two states. The basic reasons for developing a compact have not been met.

2. Data necessary to apportion the flows based on article V would be very difficult and expensive to collect. Article V would also be very cumbersome and expensive to administer.

3. Because less than two years were available to draft and finalize the 1950 version of the compact, many of the disagreements between the two states were not resolved and therefore, the compact is ambiguous in these areas. This is probably the basis for so many disagreements between the two states at the present time.

4. The apportionment formula was based on large federal storage projects being built in the major basins. It was contemplated that Montana would be able to store its allocated flow in these projects and release it in times of need. Major projects, however, have not been constructed in the Tongue and Powder River basins. At that time, the compact drafters felt there would be no significant issues on the Clarks Fork that would require administration. Today, a literal interpretation of Article V of the apportionment formula may hurt Montana because the situation in the basin is so different than contemplated in the 1950's.

5. In 1950, no one realized the magnitude of Indian and nonIndian federal reserved water rights in the basin. Because of U.S. Supreme Court decisions in the 1960's and 1970's, the percentages in the apportionment formula may not reflect the extent of Indian reserved water rights.

6. Article V-F states that "From time to time the commission shall reexamine the allocations herein made and upon unanimous agreement may recommend modifications therein as are fair, just, and equitable," giving consideration among other
factors to; priorities of water rights; acreage irrigated; acreage irrigable under existing works and potentially irrigable lands". This provision may provide the commission with the option to consider appropriate changes to reflect present-day conditions in the basin. However, if "recommend" means to obtain Congressional ratification than Montana and Wyoming may not wish to seek such approval because the lower Missouri River basin states may attempt to abolish the compact in order to obtain a portion of the flows. Conversely, if appropriate changes can be included in the regulations and rules to the compact then the states may wish to consider this possibility.