Modeling Water Decisions at different Scales

Presentation Part II

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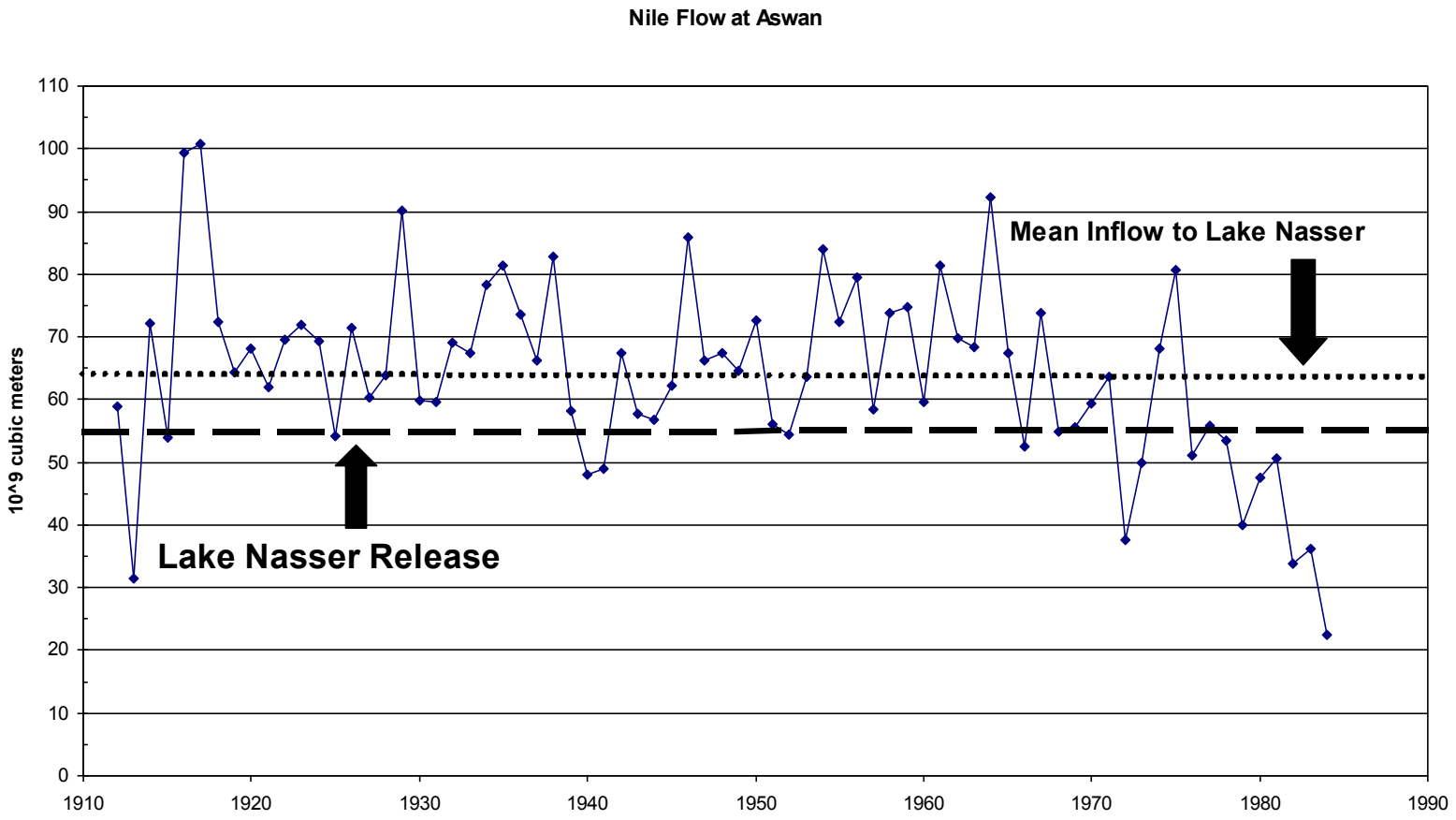
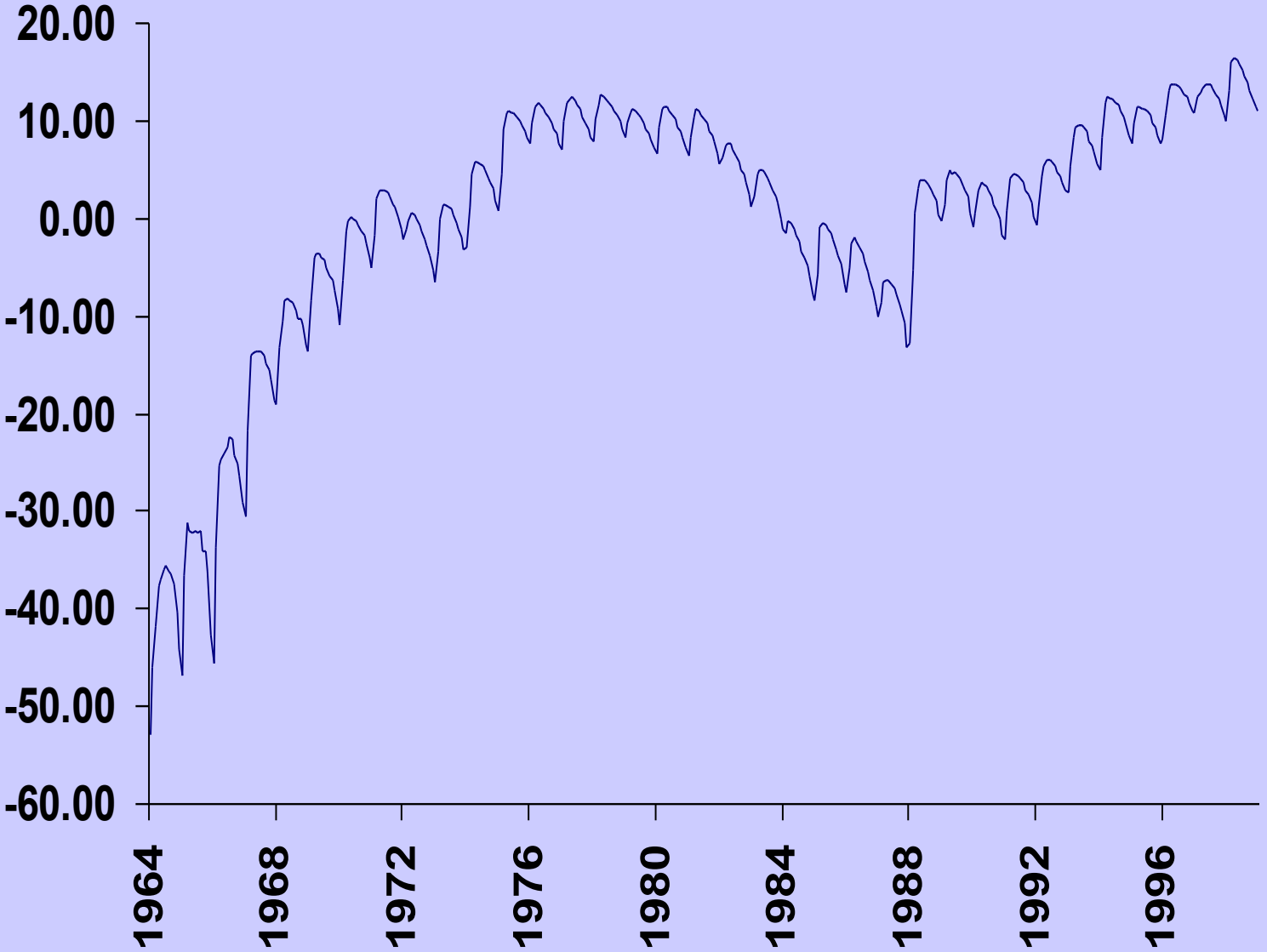
High Aswan Dam


Nile Flow at Aswan
10^9 cubic meters
110
100
90
80
70
60
50
40
30
20
10
0
1910
1920
1930
1940
1950
1960
1970
1980
1990
Mean Inflow to Lake Nasser
Lake Nasser Release

Lake Nasser levels (monthly)



B/C ANALYSIS -Benefits

Estimate Benefits of HAD

Annual Increase in GNP (1960 prices)	L.E. million/year
Extension of cultivated area by 1,200,000 feddans and conversion of 850,000 feddan From basin to perennial irrigation	63.0
Increasing Rice cultivation to 1,000,000 feddans	56.0
Flood Protection	10.0
Improved Navigation	5.00
Hydropower Electric Energy Generation	100.0
Increase of taxes on Old lands and New taxes	9.0
Savings on barrage maintenance	2.5
Revenue from Dams electrification	10.5
Total Annual Benefit	256.0

B/C ANALYSIS- COSTS

Table 4 Estimate Capital Costs of HAD

Project Element	**Total Capital Cost L.E. Million (1960)**
Total undiscounted Cost incurred to 1970	560
Cost of reclamation of 550,000 feddans	220
Cost of 3 water barriers for Degradation	10
Total Capital Costs	790

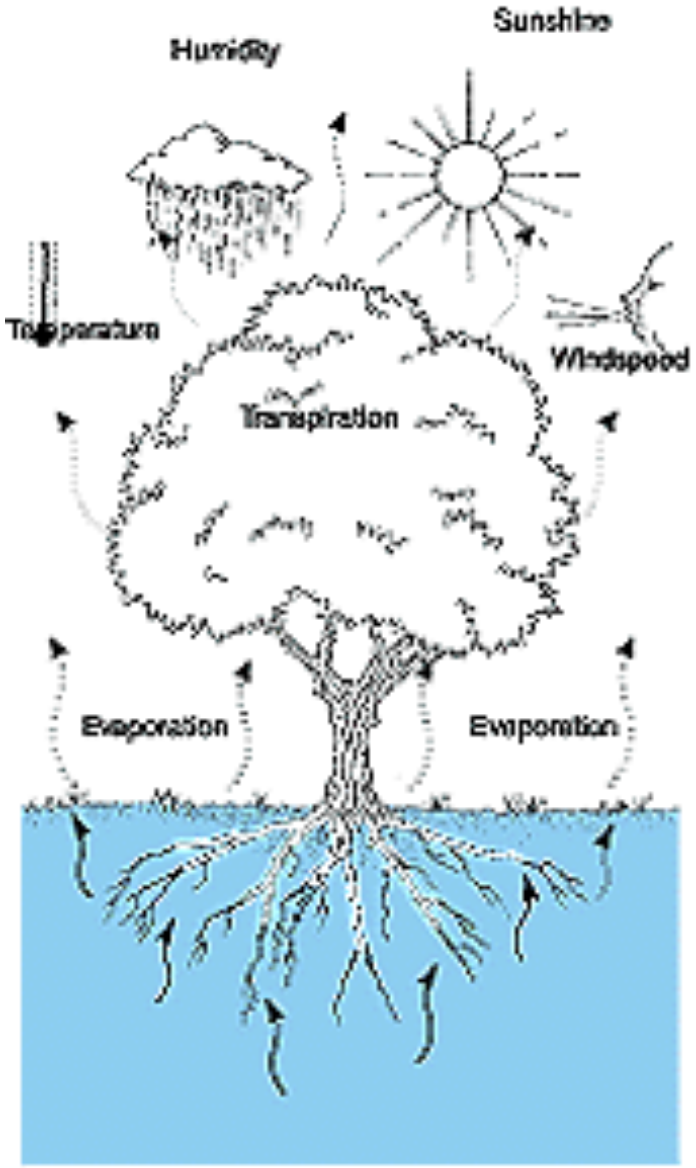
Table 5 Annual Operating Cost of HAD Project

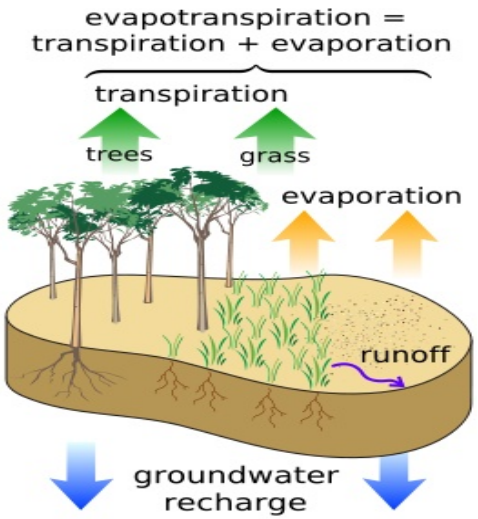
Project Element	**Annual Cost L.E. Million (1960)**
Cost of artifical fertilizer to replace natural from flood sediment	(a)20 (b)40
Maintenance of Power Station & transmission lines	5
Maintenance of HAD	3
Total Annual Additional Costss	(a)28 (b)48

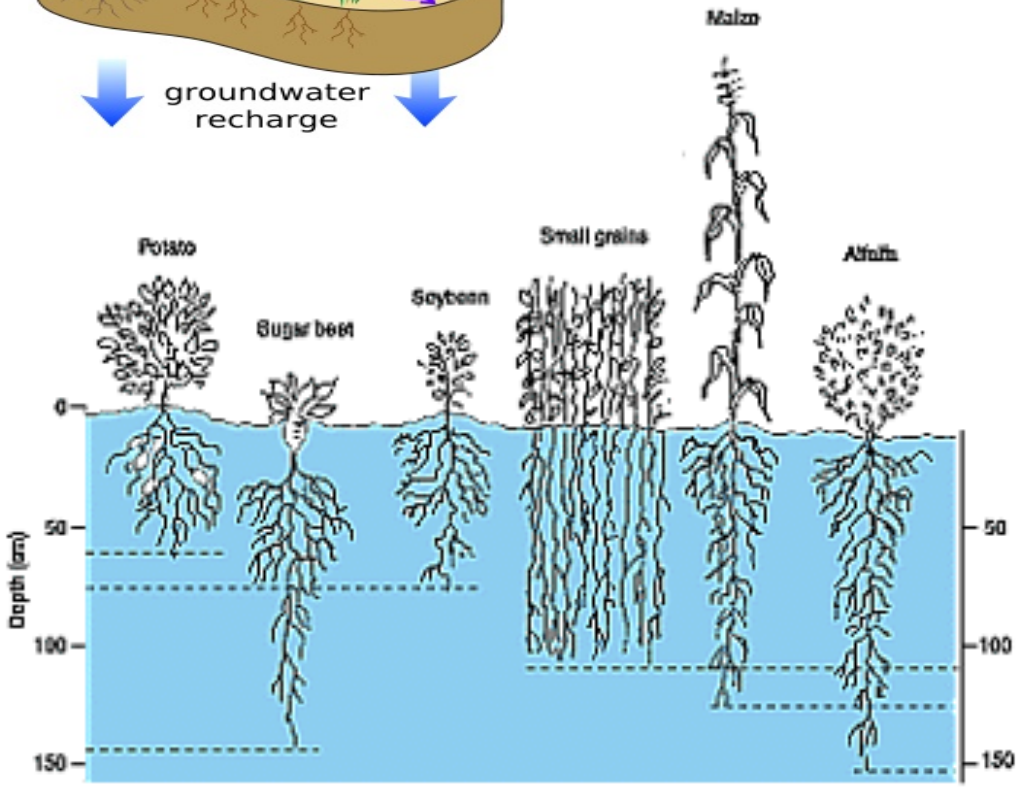
B/C Analysis of HAD

	PV Net Benefits			IRR	Benefit/Cost Ratio			Yrs to EVEN
	6%	10%	15%		6%	10%	15%	
Govt. Undisc	NA	NA	NA	NA	NA	NA	NA	=2.5
Govt. Disc	1867	816	279	21.8	10.74	5.88	9.24	~4
Shibl –F-20	1359	456	92	18.9	8.12	3.32	1.7	14/16/19
Shibl-F40	1117	389	64	16.7	6.86	2.31	1.46	15/17/20

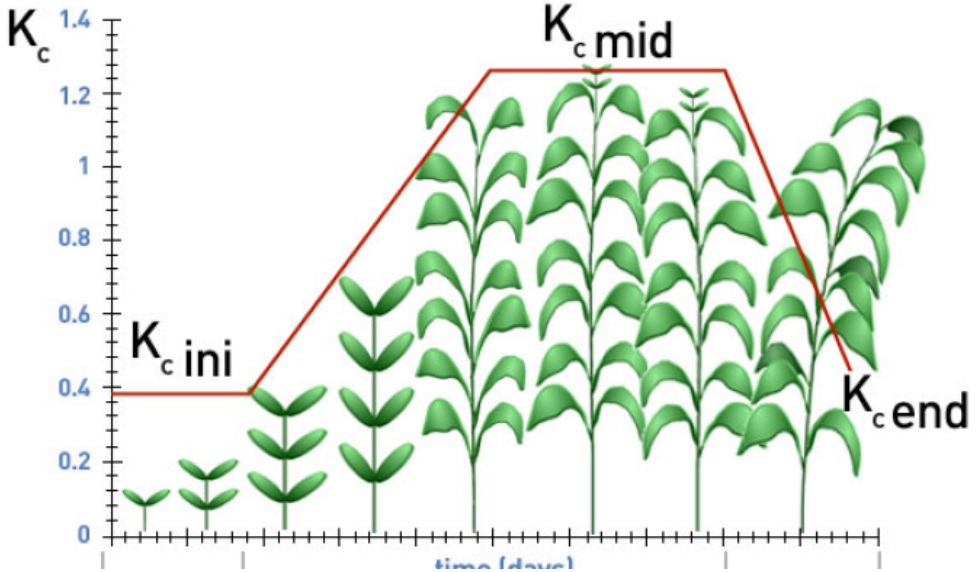
Crop Water Demand

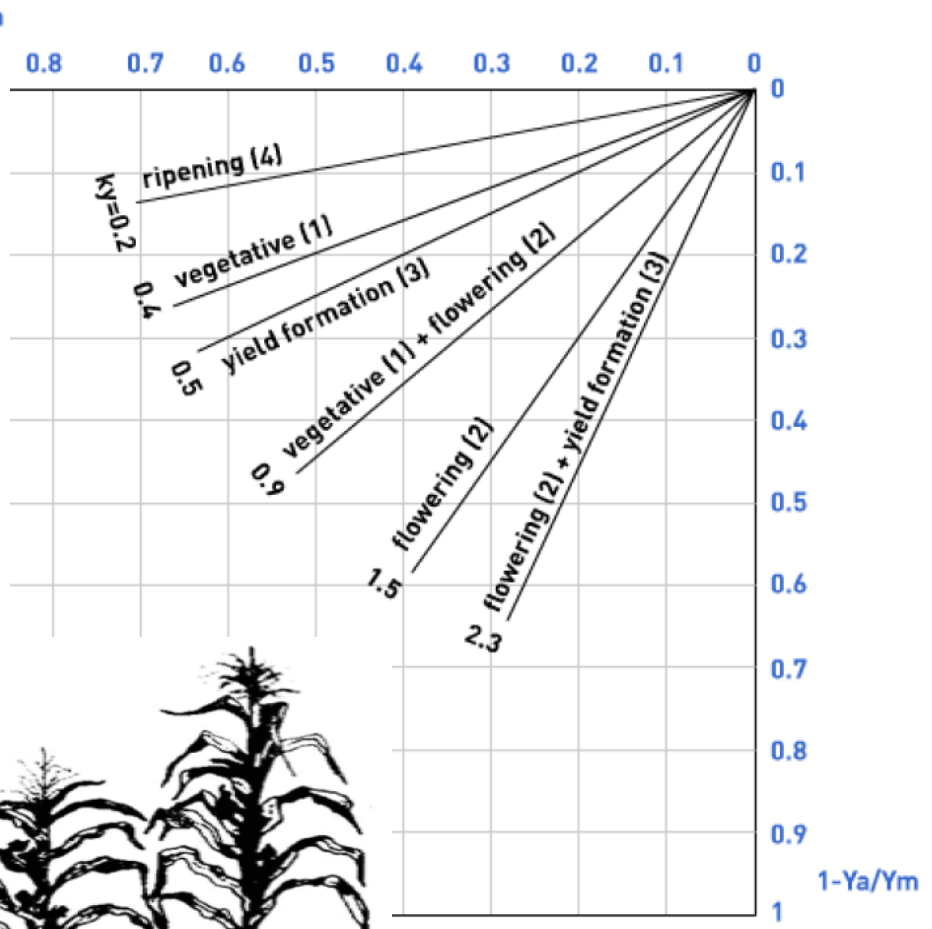




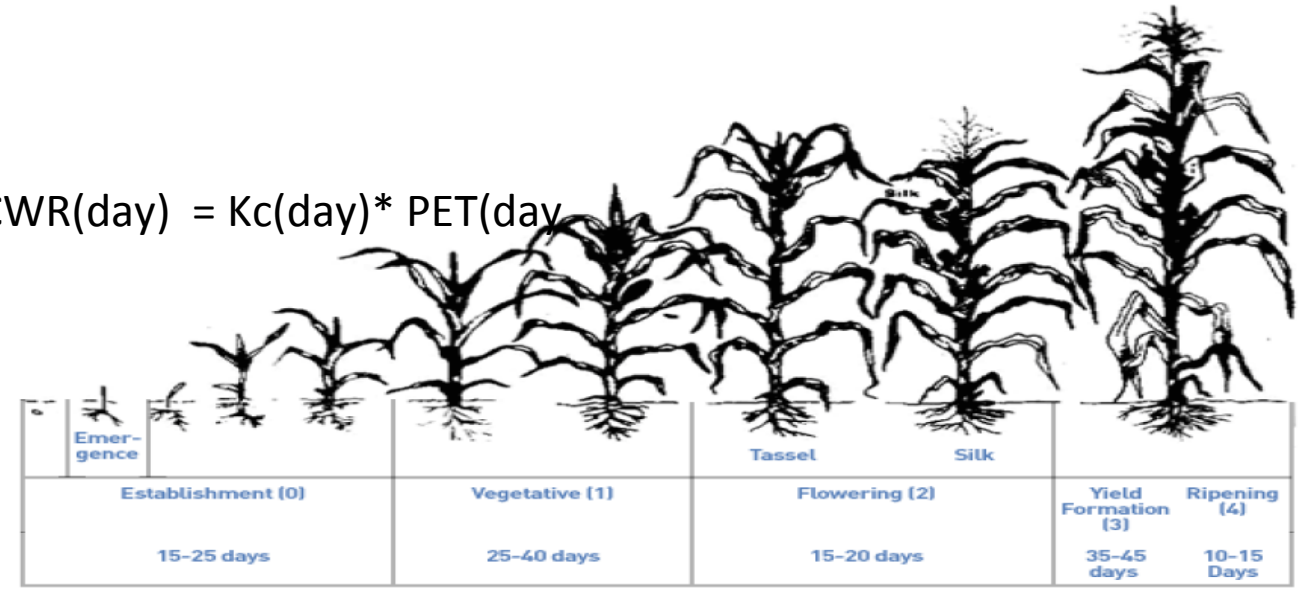


Modeling Crop Water Requirement & Stress



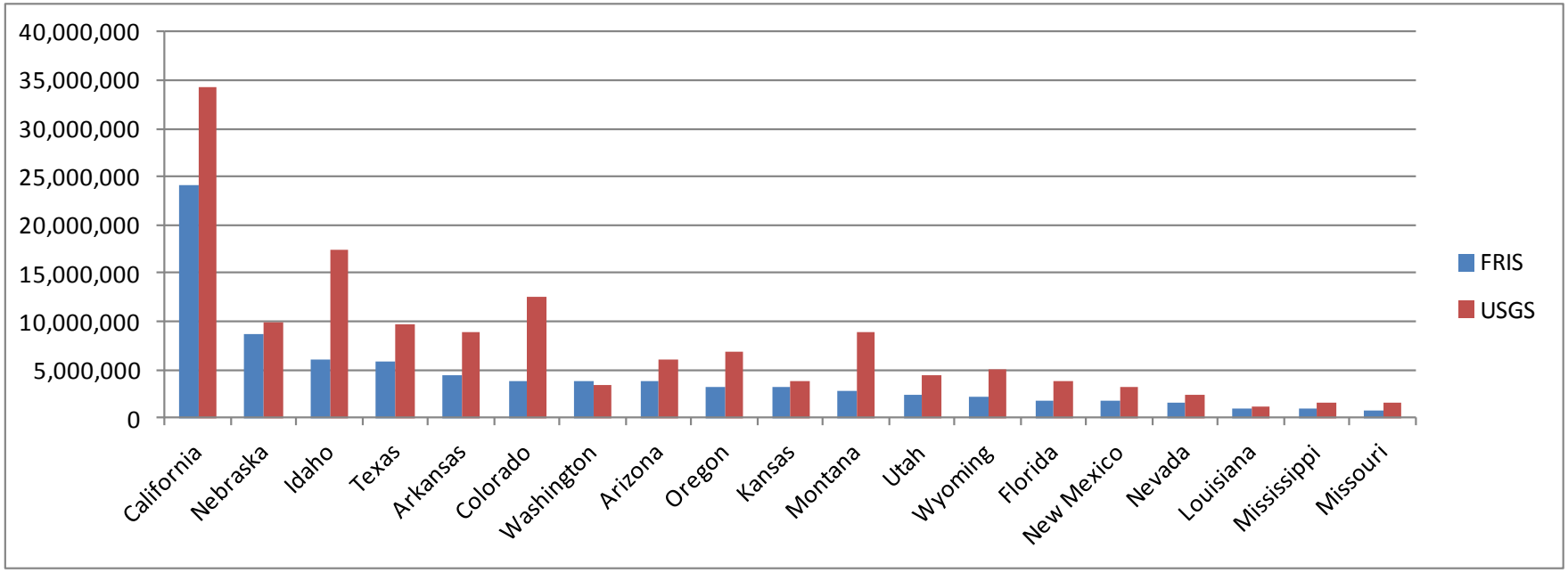


CWR(day) = Kc(day)* PET(day

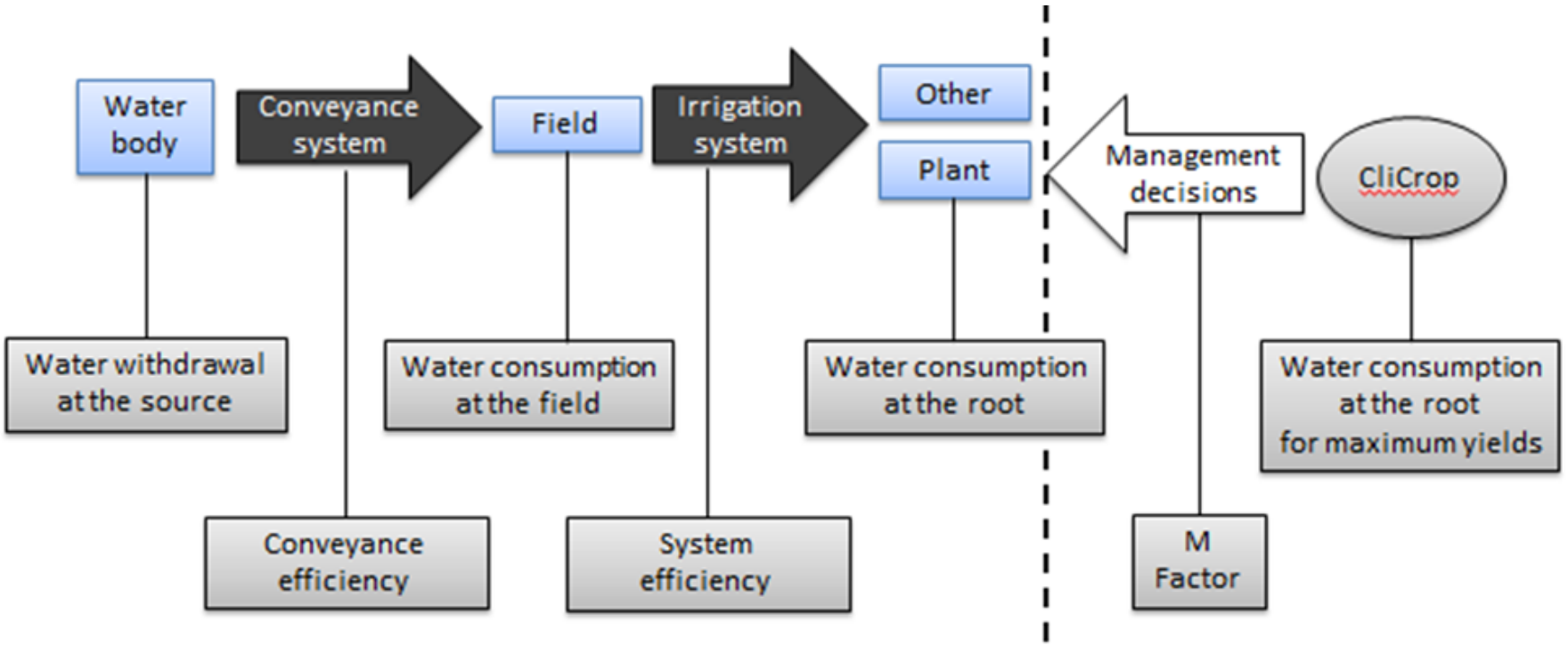


US IRRIGATION WATER

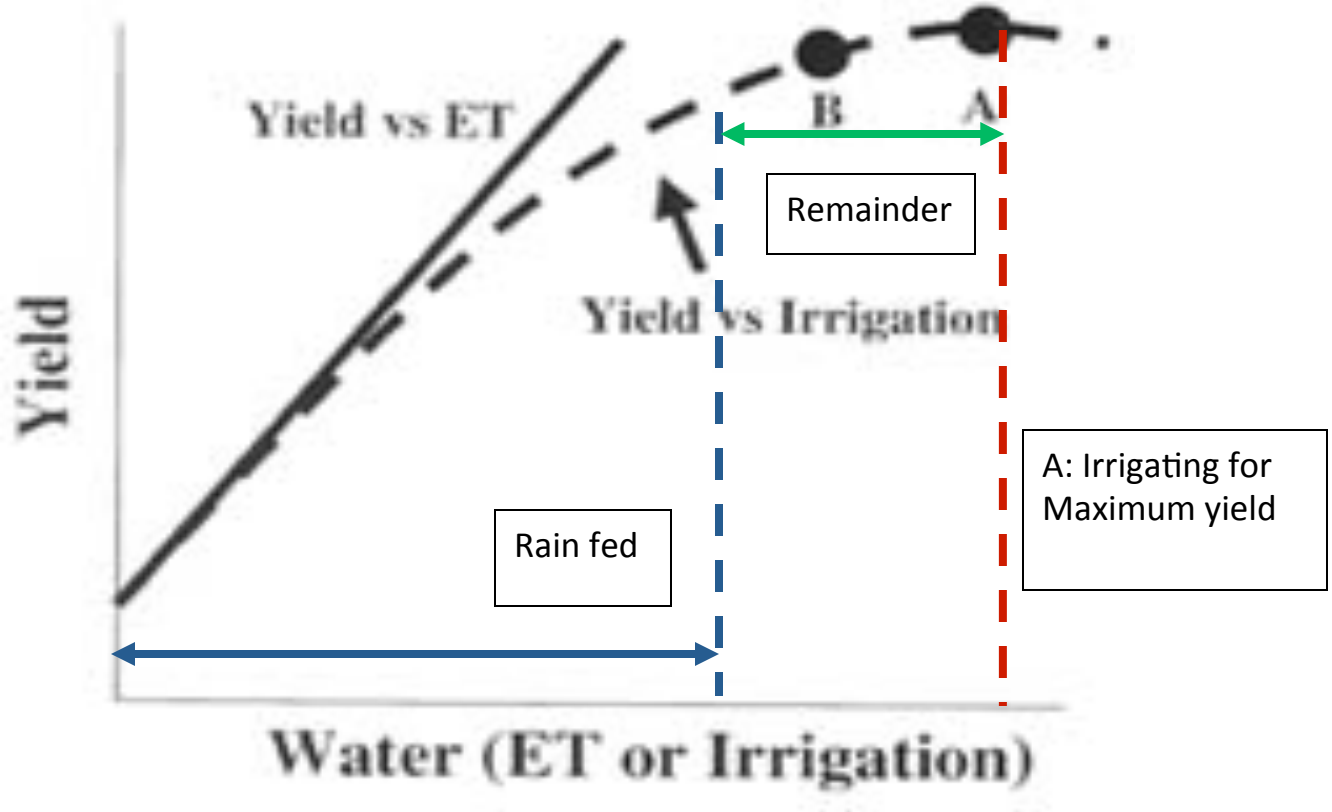
- 19 States that represent 96% of Irrigation Water Use (Acre-ft)



IRRIGATION SYSTEM

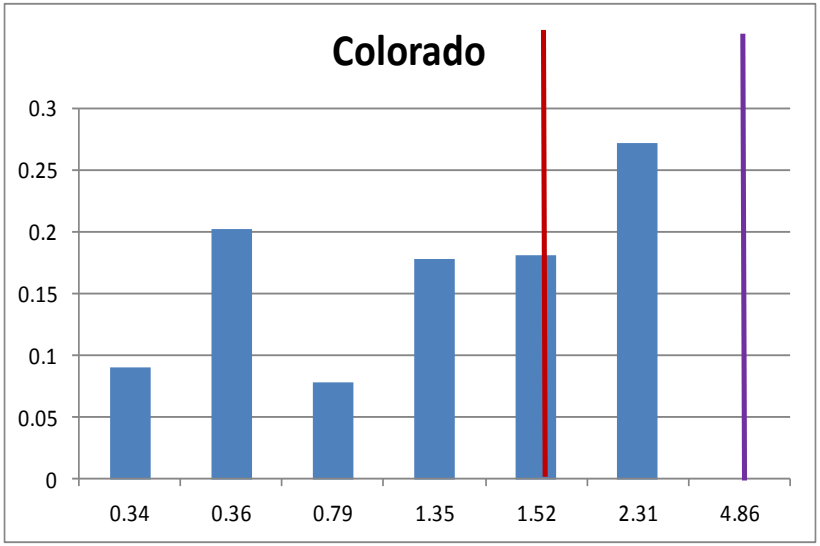


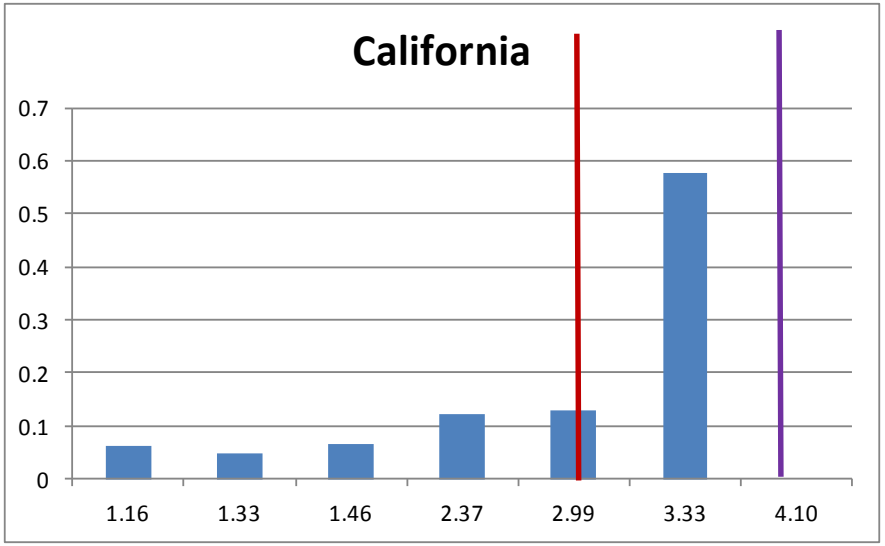
CliCrop Results



CliCrop Result = Water needed to obtain maximum yield – Rain fed

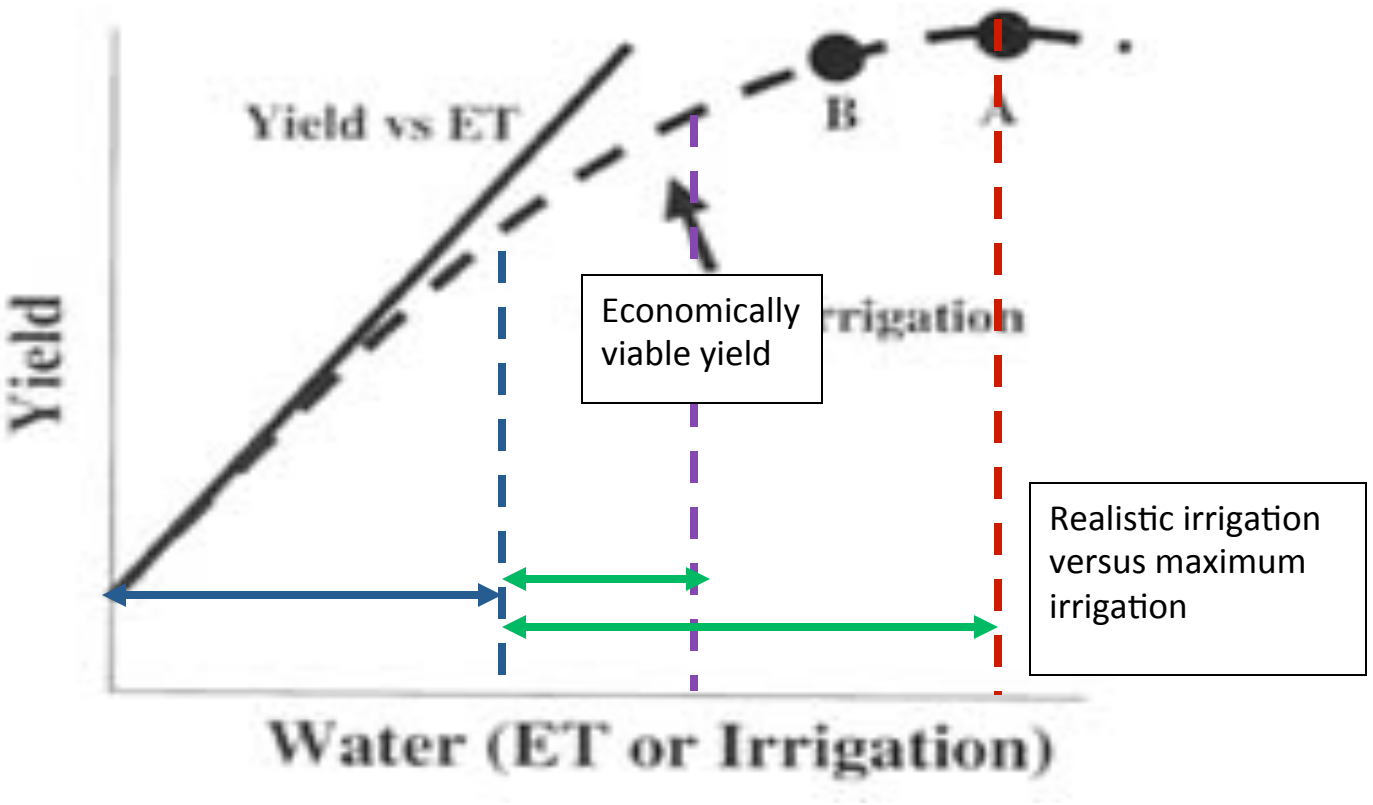
Which Numbers



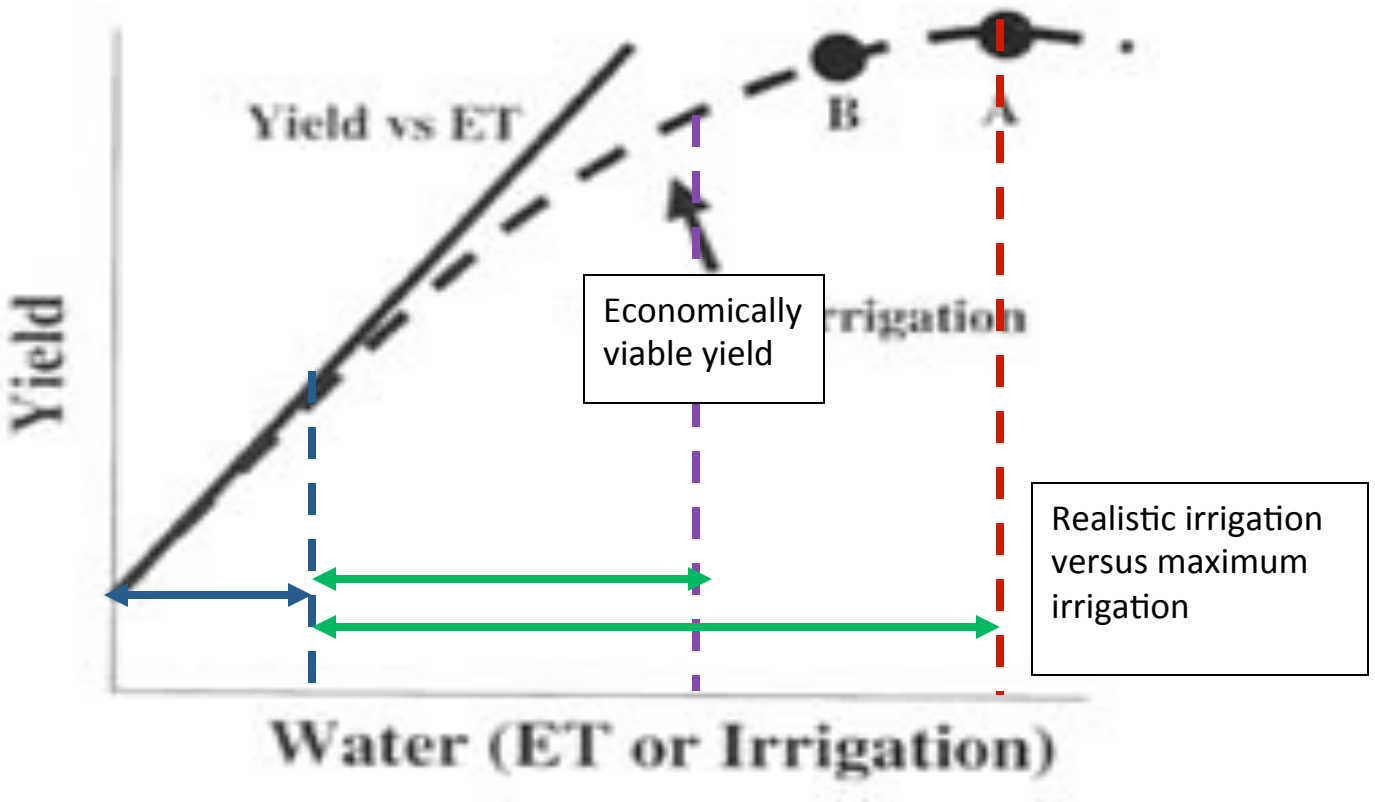


Distribution of percent irrigation withdrawn in acre-ft/acre
Red = FRIS average irrigation withdrawn; 1.55 ft in CO; 2.93 ft in CA
Purple = USGS average irrigation withdrawn; 4.86 ft in CO; 4.03 ft in CA

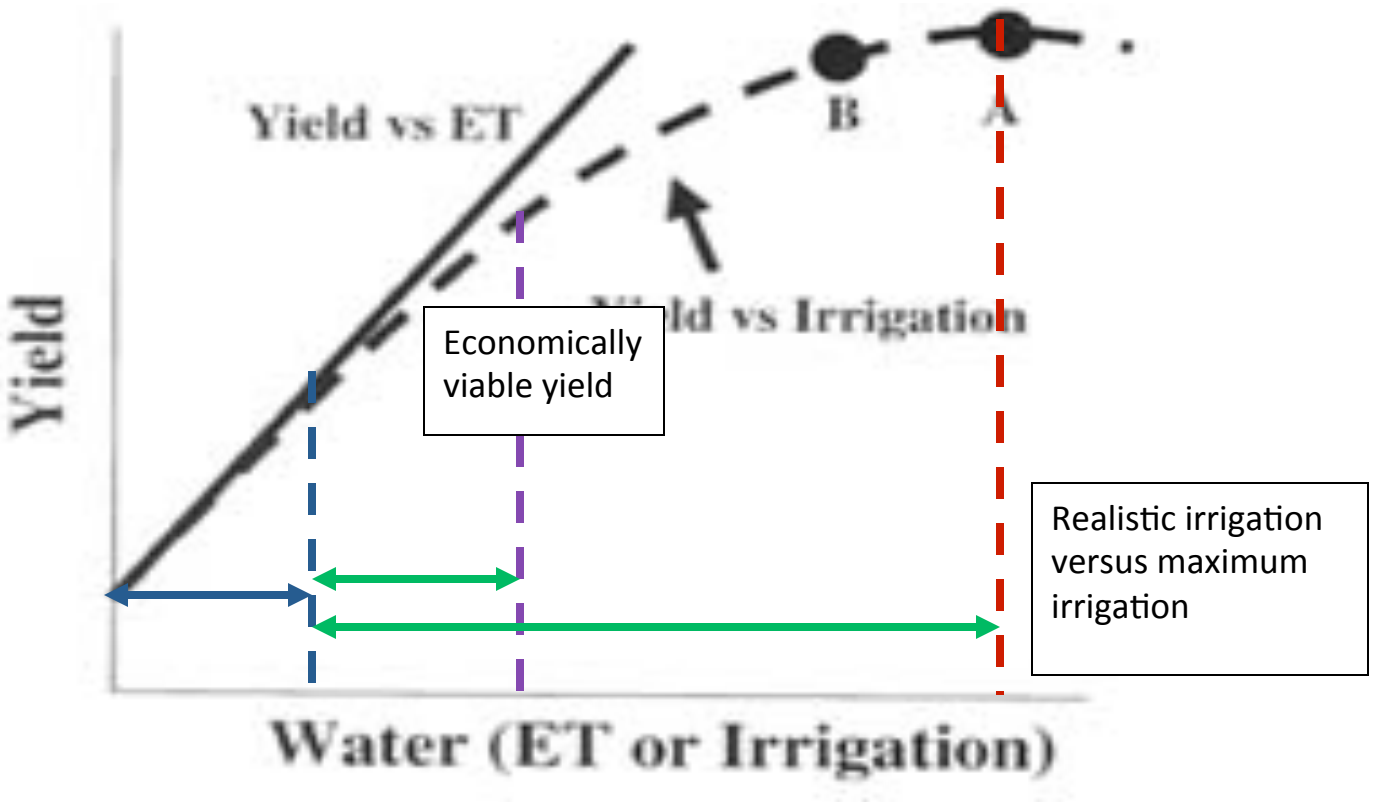
Economic consideration



Adding in climate



Climate and Economics



Average M-Factor USA

Forage	0.695
Pasture	0.579
Cotton	0.695
Grain	0.902
Ground Nuts	0.466
Maize	1.304
Pluses	1.390
Rice	0.664
Sorghum	0.570
Soybean	1.311
Sugarbeets	1.335
Wheat	0.562
Vegetable	1.669
Other	1.837
Potatoes	1.334
Berries	1.837
Orchard	0.824

United States Water Withdrawals 2005

EPA's Proposed Section 316(b) Regulations on US Power Plants

The United States (US) Environmental Protection Agency (EPA) is considering a Clean Water Act Section 316(b) Phase II regulation that could require a substantial number, if not all, of US thermoelectric power plants with once through cooling systems to retrofit to closed-loop cooling via cooling towers. These mandatory retrofits represent a substantial initial capital investment, lost generation during a closed-loop conversion forced outage, and ongoing losses of electricity required to operate with cooling towers.

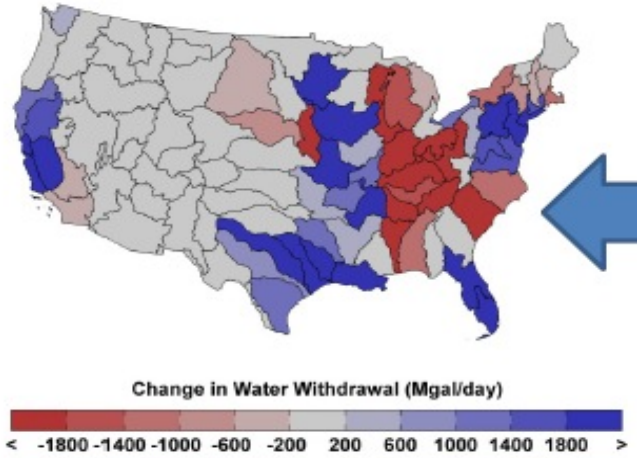
Projecting Future Thermal Cooling Water

USREP

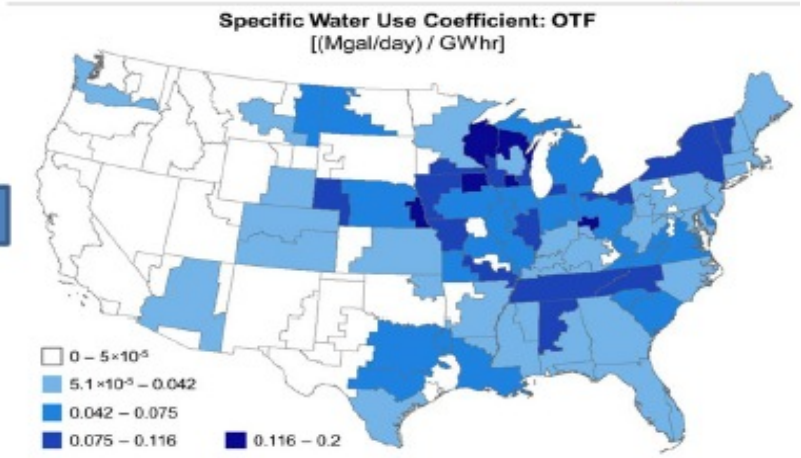
Energy Supply/ Demand

Figure 2: Regions used in ReEDS

ReEDS

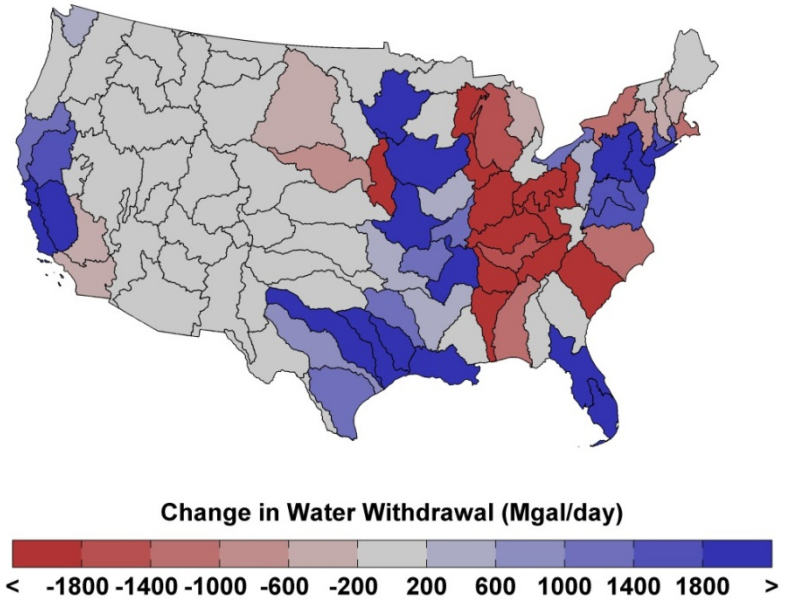


WRS

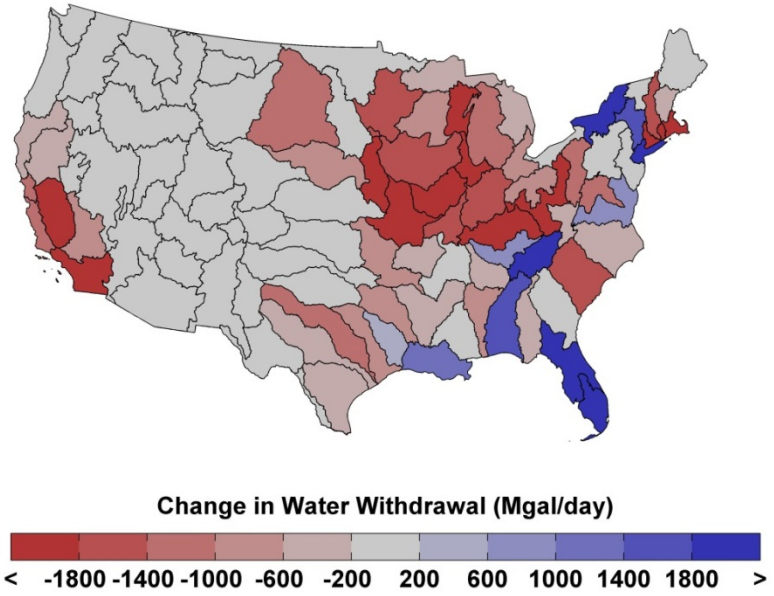


WiCTS

Impact of Emission Policy on Water Withdrawals for Electricity Generation



Unconstrained



Level 1 Stabilization