As a culminating learning experience for CEE 261 this quarter, I am requesting a proposal for a wetlands hydrology or ecohydrology research project. In this document I attempt to describe the nature of “wetlands hydrology or ecohydrology research” appropriate for a proposal, the appropriate scope of such a project, my expectations for the depth and breadth of the proposal document, and some rules and guidelines for the structure and format of the document. I also provide some guidelines for the oral presentation of your proposal.

Wetlands Hydrology and Ecohydrology Research

Your proposal should define a research project focussing on some aspect of wetlands hydrology or, more generally, of ecohydrology. I am using the term “ecohydrology” to mean the role of hydrologic processes on ecosystem structure and function. “Wetlands hydrology”, then, is a subset of ecohydrology. Because much of our time this quarter will be spent on wetlands, I am assuming that most of you will want to prepare a proposal addressing wetlands hydrology. However, I include ecohydrology in the scope of a possible proposal for those who may wish to explore a different water-dependent ecosystem.

“Wetlands” here means freshwater or inland saline wetlands, because the hydroperiod and mass and energy fluxes in coastal or estuarine brackish and saltwater wetlands are dominated by tides with an overlay of occasional flood discharges in some cases. I am willing to entertain a proposal addressing a wetland type other than a freshwater or inland saline wetland only after a preliminary discussion and only if you can convince me that the research question is truly one of hydrology. Which brings us to the second word, “hydrology”. The central question of your proposed research must focus on one or more hydrologic processes, such as precipitation, interception, stemflow, evaporation, infiltration, recharge, groundwater flow, runoff, streamflow, etc. That is, it must focus on the flow and/or storage of water in a wetland environment. I am willing to interpret this broadly. For example, you may be interested in nitrate flux and storage in a prairie pothole. As long as the focus is on aqueous transport and storage, I will be happy. I will not be happy if the focus is on microbial denitrification or nitrate sequestration in organic soils or in wetland vegetation tissue. I also do not interpret tides as a hydrologic process. If you have any questions about my definition of “hydrology”, don’t hesitate to discuss them with me.

Finally, we come to the word “research”. Perhaps the most useful way to define this elusive term is “the creation of new knowledge”. The goal of your proposed project should be knowledge or understanding of something that is not now known. This creates several challenges. First, you must demonstrate that you know what is known. Second, you must be able to show how your project will (hopefully) add to what is already known.
The issue of originality in this sense can be subtle. Determining the water balance of a particular vernal pool certainly will create new knowledge if the pool has never been studied before. However, if water balances have been determined for many other vernal pools, then the incremental knowledge of adding one more pool to the list will be small. Unless, of course, there is something different about this pool, or if you carry out your water balance in a different way that reveals an aspect of the water balance that has not been discovered before on any of those other vernal pools. For example, perhaps there have been dozens of vernal pool water balances, but no one has quantified the effects of gopher burrows on the residence time of water above the water table, and you can make the case that gopher burrows are likely to have a significant effect on residence time. That’s starting to sound like original research.

It may be worth noting that “design” is not “research”. So, designing a monitoring network or designing a compensatory replacement riparian wetland is not research per se. If you need a monitoring network to create some new knowledge about wetland hydrology, then the design of that network may be an important component of your research plan, but it cannot be the goal of the project. On the other hand, knowledge about how to design a monitoring network could very well be the target of a research proposal.

In any case, it is the purpose of the proposal to convince the reader that your research question/hypothesis will lead to new knowledge.

**Scope of the Project**

Your proposed project should be a single-investigator project requiring from 1 to 3 years for completion and no more than 2 graduate student research assistants at any time during the project. In other words, the focus should be narrow enough that one researcher, i.e., you, can provide most of the required expertise and guidance. That does not preclude the use of a consultant or two for particular expertise on, say, a measurement technique, but it means that the scope is not so broad that one person cannot design the overall project and supervise a staff of graduate students in completing it. This also does not preclude a “multidisciplinary” investigation; however, the set of “disciplines” required needs to be small enough that one person can develop the necessary expertise.

The time constraint of 1 to 3 years precludes a long-term study. It does not preclude, however, an initial phase of an anticipated multi-phase study, or a feasibility study for a longer-term study.

The constraint of no more than 2 student research assistants at any one time means that your project should not require a massive amount of “labor” to complete. For example, you should not require a field crew of more than 3 persons (2 students plus you). There shouldn’t be so many components of your proposed project that you and 2 research assistants can’t reasonably be expected to complete the work during the duration of the project.

A note on collaboration: You are welcome, and indeed encouraged, to explore your ideas with your colleagues (and with me, of course). However, your proposal should be your own work. Having a classmate read and review your proposal both editorially and
substantively seems a good idea to me, and I encourage it. If a colleague provides you with an important data set, concept, or idea, that is fine, but you should acknowledge this source as you would acknowledge a published source, e.g., “(Colleague’s name, pers. comm.)”. Good ideas don’t just appear fully formed. They need development and critical review. The best way to do that is often through discussion. Don’t be bashful about discussing your ideas in public. The work becomes your own when you articulate your knowledge and ideas in the proposal document and make decisions about what is important and how the work should be organized and implemented. Academic honesty requires that you acknowledge explicit sources of information; it should not be a disincentive to collaborative thinking or the sharing of ideas.

It is not impossible to imagine that you and a colleague might develop two research proposals that are somehow connected or related, e.g., two different studies at the same site. That also is fine. However, your proposed projects should be independent. That is, one should not depend on the other for successful completion of the project. You should prepare separate, stand-alone, proposals, using your own words. If you wish to include the same previously-published graphic, e.g., a map, that is fine. It might even be possible that you would develop some information relevant to both proposals jointly, e.g., background site information, and an exact copy of that information could then be appropriately included in both proposals. However, the substance of the proposals should be developed individually. If you have any questions about collaboration, please ask.

**Depth and Breadth of the Proposal**

The text of the proposal document should not exceed 20 pages, and the total document (text plus figures, tables, reference list, etc.) should not exceed 30 pages. This will probably require you to think carefully about what to include and what not to include in the proposal. I want to leave that up to you. However, here are a few things to consider:

1) You need to demonstrate that you know and understand the existing literature relevant to your proposed research project. This doesn’t mean that you must cite every paper or report that has been written relevant to your topic. Nor does it mean that you must present all of the background data, analysis, and results from the existing literature. Your job is to **summarize** the state of knowledge relevant to your research problem. It is to lay out the key points from previous work. The summary should dictate what you cite; not the other way around. If a number of investigators have reached the same conclusion, cite only one or two of them and say “and others”.

2) In presenting and discussing your proposed research, specificity is good. The two key questions are “How?” and “Why?” The more concrete you can be about what you are going to do, with what tools, in what order, the better. So, “We are going to monitor the water table elevation” is not a very useful sentence. How are you going to monitor the water table? With wells or piezometers? How many? Where located? How constructed? How often?

Please note that this does not mean that you need to be able to answer every “how?” and “why?” question at the time of writing the proposal. It may be that you can’t say how you are going to monitor the water table until you know more about the depth to the water table or the direction of the gradient. Explain how you are going to do the
first step, and then how you are going to decide how to do the next step. What options are available and what will determine which option you choose?

You also do not need to have developed fully all the expertise you need to carry out the proposed research. You need to have the expertise to design the project, but you don’t need to have all of the expertise to implement every step in the research. You need to be confident that you can carry out every step in the research, but you don’t need to know all the details. So, if you need to measure vadose zone moisture content, and time-domain reflectometry is a well-tested method to determine vadose zone moisture content under the conditions at your site, then you can propose to use the methodology without discussing all of the details of the methodology.

3) I do not expect you to prepare a cost budget for your proposed research. While any “real” proposal would require such a budget, that is beyond our scope here. I am interested in the intellectual content of your proposed research project. You are constrained by time (1-3 years for the project), so I expect you to think about the time required to complete the proposed work, but you do not need to think about the cost. The one hedge to this I will include is that your project shouldn’t have huge foreseeable costs. To illustrate by example, your project shouldn’t require that you purchase 1000 hectares of salt ponds in South San Francisco Bay, or that you build a new laboratory building on the Stanford campus.

Structure and Format of the Document

To facilitate my review of your proposal and the opportunity to provide you with feedback, I request that you adhere to the following rules/guidelines with respect to the document itself:

1) Include a cover page showing, at the minimum, the title of your project, your name, and the date.

2) Include your name and the page number in the header or footer of all pages after the cover page.

3) Format your document with at least 1” margins on all four sides of the text (excluding header and footer) and use 1-1/2 or double-space line spacing. This provides me with room for commenting if necessary.

4) Use a common font, and a font size no smaller than 12-point.

5) You may use color, but color shouldn’t be essential to understanding, since I will retain a black & white photocopy.

6) All figures and tables should be numbered or lettered and should be referenced in the text using those numbers or letters. Figures and tables may be integrated into the text, or included at the end of the document as a group. If integrated into the text, they should not appear prior to their first reference in the text. If included as a group at the end, they should be ordered in the order in which they are referenced in the text. All figures and tables should be referenced in the text!
7) Figures, tables, or graphics do not need to be in digital format, i.e., you don’t need to scan them in and incorporate them as a digital graphic into a word processor file. You may submit a clean copy from the original source, appropriately documented.

8) You must submit a hardcopy version of your proposal, which I will take as the archival version of the document. The hardcopy may be printed double-sided (to save paper). It should not be printed on the reverse side of previously used paper (as a way of recycling).

9) Please staple your document. Do not bind it in any other way or submit it in a notebook.

10) You may submit, in addition to the hardcopy, a MS Word file of the text of your proposal. This will facilitate my feedback using the Comment utility available in Word. Probably the easiest way to do this is via an e-mail attachment. However, I can also cope with a standard floppy disk or a 100-MB Zip Disk. Remember that I use Macintosh computers. This means that most everything translates well from the PC world, with only a couple of exceptions: equation fonts are different on the two platforms, and graphics formats are not always perfectly compatible. Since I will have hardcopy, this should present no significant problems.

11) Please cite sources in the text using the author and year of publication, e.g., “(Billabong, et al., 1986)” or “Billabong, et al. (1986)”. Following the text should then be a reference list showing all referenced citations in bibliographic format.

12) Please include a photocopy of the one bibliographic reference you consider most important in understanding the thrust of your proposed research. (It can be stapled separately and paper-clipped to your proposal document.) While I am an avid reader of the hydrology literature, I haven’t read everything, and having a key reference available as I review your proposal will assure you that I have some background material.

13) An abstract is not required.

**Oral Presentation**

Because oral presentations are extremely important in the research community, as well as in professional engineering practice, and because oral presentations require a very different type of communication design than written documents, I am requesting that you present your proposal orally during one of the regularly scheduled exam times (Friday, 7 June, 12:15-3:15, or Tuesday, 11 June, 12:15-3:15). We will decide as a class when to schedule the presentations. The goal of this presentation is to summarize the proposal in an efficient, effective oral presentation.

Given this goal, your presentation should respond to the following specifications:
Content: Your presentation should focus on the key points of your proposal, which will include: What is the research question (what knowledge are you seeking)? Why is it important? How are you going to answer your question (acquire the knowledge)?

Format: Each presentation will be allotted 15 minutes, including 5 minutes for questions. You may structure your presentation in any way that you think will be effective.

I assume that you will find the use of visual aids helpful. To that end, we will have available one overhead projector, one computer/video projector, and one screen, i.e., the equipment in the classroom. It is also possible to arrange for the use of a 35mm slide projector. Available through Jill Nomura in M-13 are transparencies and color transparency pens. If you are interested in using computer-generated and projected slides, please consult with me well ahead of the time of the presentation so that software and hardware can be properly configured. If you are unfamiliar with the best way to prepare presentation materials, Jill or I will be glad to assist you.

Please provide either one (1) paper copy or a suitable digital document, e.g., PowerPoint, Word, or pdf file, of all visual aids at least 24 hours prior to the presentation. We will make handouts for everyone in the class.