

# Physical Hydrology for Ecosystems

## Final Project and Some Ideas

As part of BEE 3710, you will do a term project either individually or in pairs. This has consistently been an interesting part of the class. In fact, one year we focused on a problem watershed in Tompkins County, with different groups of students looking at specific aspects of the issues, and the City Planners claim the findings from this class were more useful, valid, and creative than an expensive consultant they had hired to do the same things.

This year the choice of topic is completely up to you. The only requirement is that it relate to hydrology or water resources in some obvious way and that it have some sort of analysis or calculation. You may turn-in your project in whatever form is most appropriate, e.g., report, website, movie, etc. If you are planning something extra unusual, e.g., papier-mâché, please run it by me first.

Here are some ideas or questions that I have been thinking about may never find time to explore. Feel free to use these as inspiration. Use as much or as little of an idea as you would like. Creativity is a plus.

### Long-term trends

- **Has potential evapotranspiration changed over the last 100 years?**
- **Has actual evapotranspiration changed of the past 100 years?**
- **Has the frequency (return period) of floods and droughts changed over the past 100+ years?**
- **Have stream sediment patterns changed over the past 50 years?**

### Experiments and measurements

- **Pan evaporation in different settings:** Measure pan evaporation under a variety of situation, on snow, on ice, on Beebee Lake, in the open, with/without wind, in buried pans, pans of different materials, etc. and compare results and, if time allows, put in the context of current pan evaporation theories (several papers have been published on this, believe it or not). You could do something similar with house plants instead.
- **How much road salt washes into the streams with the spring melt?** There have been several papers showing that summer stream chloride levels are steadily increasing the snow regions of the Eastern US but a big unknown is how much washes-off in the spring.

### Other analyses:

- **How much of our annual snow load ends up at the boundaries between open areas and forests/hedge-rows?**
- **Does winter snowfall correlate with summer baseflow?**

- **Are there hydrological explanations for ecological observations** (e.g., changes in spring blooming or fall leaf-fall)
- **Are the identifiable correlations between land use patterns or changes and hydrology?**
- **Is there any correlation between rainfall, streamflow, ET patterns and climate indices like El Niño?**
- **Comparative hydrology**, i.e., compare some hydrologic feature between two or more watersheds that differ in some identifiable way, e.g., calculate ET for watersheds at different latitudes or stream flashiness for urban vs. rural watersheds or baseflows among watersheds with different drainage densities.
- **Model a processes or watershed and compare your simulations against measurements or use your model to test a hypothesis**, e.g., late summer soil conditions drier in the last half of the 20<sup>th</sup> century relative to the first half.

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**Data Mining:** There are several easily accessible long-term data sources:

USGS: stream discharge, some water quality, some groundwater

NOAA: weather stuff (e.g., [gis.ncdc.noaa.gov/map/viewer](http://gis.ncdc.noaa.gov/map/viewer))

Long Term Ecological Research (LTER) network: (<http://www.lternet.edu/>): Stream discharge, precipitation, water chemistry, etc.

Cornell's eCommons: e.g., A Fall Creek dataset - <http://ecommons.cornell.edu/handle/1813/8148>