CAREER: Land use, geologic and climatic controls on stream processes in northern New England using airborne laser swath mapping

PI: Noah P. Snyder, Boston College Department of Geology & Geophysics

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RESEARCH

Key questions

- How are physical processes (transport of water and sediment downstream) in three Maine rivers responding to changes in climate and land use?
  - ⇨ Deglaciation (~13,000 years)
  - ⇨ Deforestation/reforestation (~200 years)
- How are changes in physical processes affecting riverine habitat quality?
  - ⇨ Are channels narrowing? How often does bed substrate move?
  - ⇨ Are these changes related to declines in Atlantic salmon population?
- Can we predict the effects of future changes, such as stream restoration efforts?

Figure 1. Students making measurements of bed particle size, Narraguagus River, Maine (August 2005).

New methodology: airborne laser swath mapping

- High-resolution mapping technology that is revolutionizing the study of landscapes by allowing for collection of unprecedented topographic surveys.

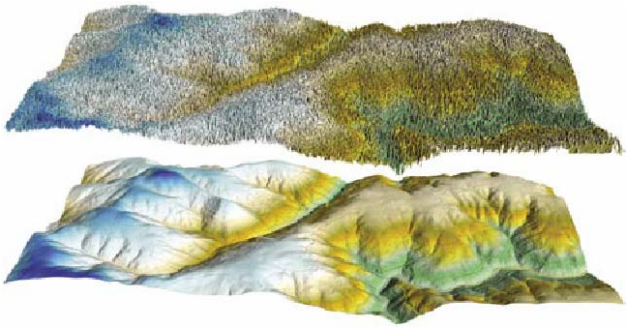

Figure 2. Unfiltered and filtered digital elevation models of Caspar Creek, northern California, source: National Center for Airborne Laser Mapping (http://www.ncalm.org/). These images are created by first flying an airplane over the study area, and collecting elevation data using laser returns. Second, this vast set of spatial data is processed into a grid of bare earth and treetop elevations. One of the goals of my research is to develop new methods for the study of physical processes in rivers using ALSM digital data, and use these tools to understand landscape history and future, and provide information to land managers.

EDUCATION

Five-year project annual cycles

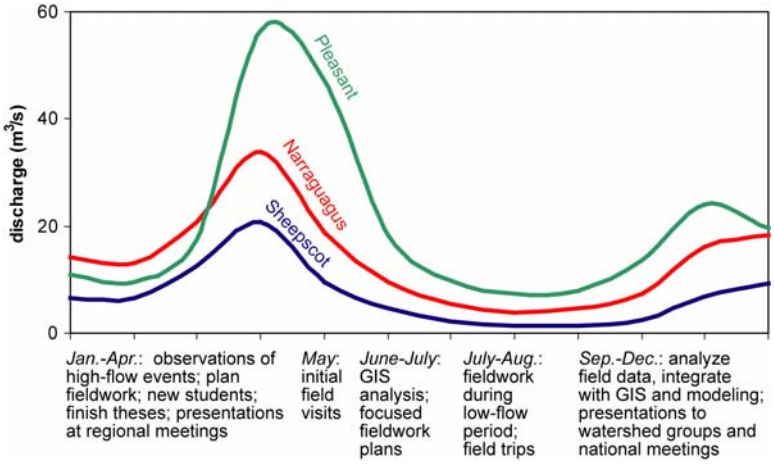

Figure 3. Planned project annual cycle compared to monthly average stream flow in the study-area rivers. Research will be conducted by teams of graduate and undergraduate students centered around each of the three study-area watersheds. Each student will have a role within the team that evolves, as his or her skills grow, to eventual production of thesis research projects. Multi-year student involvement will ensure strong professor-student, graduate-undergraduate, and undergraduate-undergraduate mentoring.

OUTREACH

- Student teams will share results and methods with land managers and watershed restoration non-profit groups to underscore the importance of using science in making land-use decisions.
- High school students in northern New England will learn about watershed science and collegiate research opportunities during hands-on demonstrations at field sites, led by project BC students.