


Center for Freshwater Studies

THE UNIVERSITY OF ALABAMA

Director Update — Spring 2011

I hope your semester has gone well. A number of exciting events have occurred relevant to the CFS on various fronts over the last months, and I have summarized some of these below. I plan to schedule a CFS meeting during the first two weeks of May to discuss a variety of research and other topics related to the CFS, including possible use of funds in the CFS overhead account. These funds are now approaching $70,000. Thanks to all who have volunteered to insert the CFS on the OSP Internal Coordination Sheet to make this possible! If you have projects you would like highlighted on the CFS website or in a future Newsletter, please send information, including photos, to me.

Events of Note

1. The CFS website (http://www.as.ua.edu/biolaqua/cfs): We are continuing to develop the CFS website – all helpful comments and suggestions are welcome. Part of the web-site includes links to descriptions of current research projects. All input from members is welcome here – we would like to highlight a number of projects. See an example highlight on p. 2 of this Newsletter.

2. National NOAA Center on UA campus: A couple of summers ago CFS faculty provided input to Vice President for Research Joe Benson for the development of a NOAA-linked Institute for Southeast Weather and Hydrology. Subsequently, Environmental Institute director Bob Pitt, David Brommer (geography) and I met with faculty from other institutions (AU, UAH, and USA) and NOAA personnel and produced several white papers. Continuing negotiations between VPR Benson and NOAA have now resulted in a developing national NOAA center on the UA campus entitled Integrated Water Resources, Science and Services (IWRSS). This will be the only NOAA center nationally that will focus on water and hydrology. IWRSS will occupy a new building on the site of the current Environmental Health and Safety building that will eventually house ~ 150-200 NOAA personnel with primary expertise in modeling, GIS, and other quantitative skills. The target date for completion of the building is 2014, although NOAA personnel will likely have a presence on campus before that date. VPR Benson provided the following update last week: “Things are still moving forward. We are in initial design for the building. The Board of Trustees approved the ground lease at the February (2011) meeting and we plan to take the design to the BOT at the June meeting”.

3. National Ecological Observatory Network (NEON). Events are moving fast on this front:

Re-cap for last 18 months:

♦ In December 2009 the Domain 8 Science and Education Coordinating Committee (DSECC) met with NEON chief scientist, Michael Keller, here on the UA campus. This 15-member committee, selected by NEON, is composed of representatives from academic, state, and federal agencies from across the domain. I serve as chair and Leslie Rissler from UA is also on the committee. At the meeting, Michael gave an overview of recent NEON activities and initiated a question/answer period with the committee members. He also queried the group for input on individuals across the nation who had expertise in specific areas relevant to the Fundamental Sentinel Unit (FSU) component of NEON that addresses organismal sampling and identification.

♦ Dr. Hank Loescher, NEON scientist, was a guest speaker here in January 2010, hosted by The Environmental Institute, The Center for Freshwater Studies, The Department of Civil, Construction, and Environmental Engineering, and The Atmospheric and Environmental Research Program. His talk was well attended by CFS members from diverse academic units. During his visit, Hank met with faculty/students informally to discuss any topics of interest to them on NEON.

♦ In April 2010, Dr. Hongyan Luo, NEON biometeorologist, and Max Brunke (NEON staff) visited the Domain 8 core (Talladega National Forest)

and one of the two relocatable sites (Choctaw National Wildlife Refuge on the Tombigbee River) to establish the specific locations of the flux towers and soil plots within these sites. She also visited the Domain 8 STREON site within the Talladega National Forest. Feedback from NEON after the meeting was that she was very favorably impressed with the Domain 8 sites and the progress made during the visits.

♦ In May/June 2010 NEON passed its final review and was approved by the National Science Board.

♦ In July 2010 NEON aquatic lead Heather Powell visited Domain 8 to begin planning for installation of NEON aquatic and STREON infrastructure and sampling at the core and two relocatable sites.

♦ In January 2011 NEON staff, including Heather Powell and Hank Loescher, returned to Alabama to meet with staff from the U.S.Forest Service and U.S. Army Corps of Engineers to begin discussions of the permitting process.

♦ Several recent NSF solicitations emphasize broad-scale research that is highly relevant to the NEON concept. One example: – "Macrosystems Biology: Research on Biological Systems at Regional to Continental Scales will support quantitative, interdisciplinary, systems-oriented research on biosphere processes and their complex interactions with climate, land use, and invasive species at regional to continental scales as well as planning and development activities to enable groups to conduct Macrosystems Biology Research." NSF Solicitation 10-555; next deadline: April 2, 2012.

RESEARCH PROJECT HIGHLIGHT

Understanding variation in the relative importance of nitrogen (N) retention mechanisms from Ridge and Valley headwaters to the Mobile Bay.
Drs. Jennifer Edmonds and Behzad Mortzavi, Department of Biological Sciences. This work is currently funded by the USGS through the Alabama Water Resource Research Institute in Auburn, AL.

Widespread nutrient enrichment within the Mobile River Basin of the southeastern US has the potential to increase the delivery of nitrogen (N) and phosphorus (P) to the Gulf Coast. The extent to which nutrient enrichment and associated anoxic conditions persist in the Mobile Bay is largely unknown; however, reducing N transport to Alabama's coastal waterways will likely ameliorate possible loss of commercial and recreational value due to hypoxic events similar to the Dead Zones widely observed in the Gulf of Mexico. Through our collaboration between researchers in Tuscaloosa and DISL, we are evaluating the patterns and controls on two important mechanisms for nitrogen retention (denitrification and plant uptake) within the Cahaba River, a key drainage system within the Mobile basin in central Alabama that receives large inputs of anthropogenic N from activity in Birmingham, AL. Our project includes both laboratory and field activities designed to assess the competition between plant uptake of N and utilization of nitrate by sediment microorganisms. In organic matter-rich sediments experiencing low oxygen conditions, microorganisms will convert nitrate to N2 (g) as they respire, permanently removing N from the ecosystem and preventing it from reaching coastal waters. Field research for this project has focused on six sites along the river starting above Birmingham in the Ridge and Valley physiographic province and ending downstream ~275 km in the Coastal Plain. Evidence from lab experiments suggests carbon limitation of sediment denitrification at all sites, with the exception of our samples taken from the shoal habitat (see photo). In contrast to the two other physiographic types, the shoals site on the Fall Line had only a small response to C additions, but responded strongly to N addition. This suggests that C limitation of denitrifying bacteria was alleviated by the presence of organic matter rich sediments associated with shoal macrophytes, something we are exploring further in 2010-11. Denitrification potentials measured at coastal sites by the Mortazavi lab as part of this same project also showed evidence of strong N limitation, but no effects of adding C, most likely due to high primary production (i.e., organic matter production) coupled with low water nitrate concentrations. Future work will relate the patterns in N retention in the Cahaba River to the larger river network and its receiving ecosystem, the Mobile Bay.

Graduate student researchers Elise Chapman, Julie Jarnigan, and Corianne Tatariw (pictured left to right) at the shoals found within the Fall Line of the Cahaba River. Shoals contain abundant *Justicia americana* plant beds, interspersed among which are the rare Spider Lily plants.