St. Croix Watershed Research Station

Highlights of 2006

Floodplain Wetlands of the St. Croix River

Mark Edlund and Joy Ramstack have been busy collecting sediment cores from floodplain wetlands along the St. Croix River, as part of a National Park Service-funded research project to determine the ecological history of these systems. The St. Croix wetlands serve as critical nesting, nursery, and diversity hotspots for plants and animals and have a long history of cultural and natural resource significance. These areas, historically the site of Native American wild rice processing encampments, were altered during the era of log drives and were also affected by water level changes caused by dam construction. Wetlands on the Riverway, presently used for wildllife watching, waterfowl hunting, wild rice harvesting, and bank and small boat fishing, face current threats including drainage and filling, land-use changes, and artificial regulation of stream flow.

The goal of this project is to reconstruct the environmental history of these systems using biological and geochemical markers found in sediment cores. The results of this study will guide management decisions on the Riverway by providing information on the timing and magnitude of ecological change in the wetlands, as well as an understanding of wetland conditions prior to European settlement in the St. Croix watershed.

Jill Coleman Wasik in the bog

Marcell Project Expands Focus

The ongoing mercury cycling project at the Marcell Experimental Forest (part of the Chippewa National Forest north of Grand Rapids, MN) entered its fifth season this year. The first four years of the project focused on how sulfate, a major consituent of acid rain, affects mercury cycling in bogs and wetlands. Of particular interest is the microbial production of the neurotoxin, methyl-mercury, which is responsible for fish consumption advisories in Minnesota and worldwide.

This past field season, researchers Jill Coleman Wasik and Dan Engstrom added a new dimension to the study: measuring the effects of seasonal drought on mercury cycling within an experimental wetland. Somewhat serendipitously, 2006 has been one of the warmest and driest years on record in the Grand Rapids area. In fact, the wetland hasn't experienced such low water levels since March, 1977. Project researchers expect that the drought will have significant effects on mercury cycling and methylmercury production as the peat is reflooded by fall rains and winter snowmelt. Scientists from the Minnesota Pollution Control Agency and the University of Toronto are cooperating in the research.

Pine Needles Hosts Three Artists

The Artist at Pine Needles program celebrated its fifth year with an expanded residency of three artists during the summer of 2006. Twin Cities photographers Linda Gammell and Stephanie Torbert and painter Rebecca Silus were in residence at the James Taylor Dunn-Pine Needles cabin during the summer months. Each artist spent time at the research station, learning from staff and visiting scientists how visual art can link with scientific research and inquiry; for example, both Gammell and Torbert explored the use of microsopes in photography. A piece of art from each participant will soon be on view at the research station.

Mongolia Results Show Surprising Insights

Scientists Jim Almendinger and Mark Edlund have been analyzing samples and data collected over the last two years during field expeditions to the inland lakes of Western Mongolia. The two scientists, along with graduate students and collaborators from the University of Minnesota, Royal Belgian Institute of Natural Science, and St. Olaf College, are part of a hydro-biological survey team funded by the National Science Foundation. The team is seeking to catalog and describe the aquatic biodiversity of this little-known region and has spent this year away from mountains and plains of Mongolia, focusing on work in the laboratory.

In addition to determining the unique water chemisty of the lakes, streams, and springs in this semi-arid region, work is in progress to identify and catalog the algae, insects, and small crustaceans that make their homes in these unusual habitats. Team members hope that research will lead to discovery of new species, an increased understanding of the ecology of these organisms, and the development of biological indicators that will help researchers assess and maintain the health of these ecosystems.

St. Olaf College professor Charles Umbanhower (r) and student

International Lakes Meeting Draws Scientists

The research station and the Science Museum of Minnesota, with the University of Minnesota, co-sponsored the 10th International Paleolimnology Symposium in Duluth, June 25-29. Station director Dan Engstrom, conference co-chair with Emi Ito of the University, welcomed 213 registrants representing 23 countries, who met for the first time in the U.S. The theme of the meeting was Past Ecosystem Processes and Human-Environment Interactions; several members of the station scientific staff and graduate students presented papers or posters at this significant scientific assembly.

The Answer is in the Lakes: Using Lakes to Determine Sources of Suspended Sediment in Rivers

Shawn Schottler and Dan Engstrom have taken a roundabout way to answer a perplexing environmental problem. Determining the relative importance of field erosion versus streambank erosion as contributors to the huge suspended sediment loads in the Minnesota River is a simple question, but measuring each of these erosion sources directly is nearly impossible on a watershed scale. Shawn and Dan have modified a sediment fingerprinting method that utilizes atmospherically deposited radioisotope tracers to separate field erosion from streambank erosion. This new method uses lakes, surrounded by agricultural fields with no river/stream inputs, as reference systems to record the integrated fingerprint of field erosion only. By looking at sediment cores from multiple lakes throughout the watershed, they have been able to define a robust fingerprint from fields.

This fingerprint is then compared to the sediments in Lake Pepin, which receives greater than 80% of its sediment inputs from the Minnesota River and acts as the final integrator of streambank and field erosion for the entire watershed. Understanding the sources to riverine suspended sediment is critical to shaping best-management-practices and effectively allocating resource dollars. Sediment loads to surface waters in agricultural watersheds have increased 10 fold and more since European settlement and pose a severe water quality threat to these lakes and rivers.

top: (l) agricultural field, (r) streambank erosion
bottom: Shawn Schottler analyzing data in the gamma spectrometry lab