



St. Croix Watershed Research Station

Highlights of 2008 -2009



Kim Gordon
Artist at Pine Needles, 2007

Centennial Funding for the St. Croix

The St. Croix National Scenic Riverway has been awarded funding through the National Park Service's Centennial Challenge. The Riverway is receiving \$200,000, matched by the Twin Cities Metropolitan Council and Minnesota Pollution Control Agency, to develop a watershed model that will help achieve nutrient reduction goals for the St. Croix River. The model will be developed at the Research Station under the direction of Senior Scientist Jim Almendinger. The Soil and Water Assessment Tool, or SWAT, will identify the sources of nutrient loads, the management practices that will best reduce these loads, and the locations where those practices would be most effective. It can be used by communities, watershed or county conservation districts, or landowners to help achieve water quality goals for the St. Croix. The Centennial Initiative is a 10-year program to reinvigorate America's national parks and prepare them for a second century. The Centennial will be celebrated in 2016.

Great Lakes Research

Station scientist Mark Edlund was recently awarded a new project from the Great Lakes Fishery Trust, studying changes in the Great Lakes. An unprecedented ecological collapse, most notably in populations of a bottom-dwelling freshwater shrimp called *Diporeia*, has resulted in a decline in the health of whitefish, yellow perch and cisco fisheries. The loss of *Diporeia* coincides with the introduction of exotic species including the zebra and quagga mussel; theories are that the competition for food between the mussels and *Diporeia* is driving the changes. To test this hypothesis, the project will analyze sediment cores from Lake Michigan to determine the quantity and quality of the algal food resources for *Diporeia*, particularly diatoms, and how changes in food resources are linked to population dynamics of zebra/quagga mussels and *Diporeia*. To corroborate the results of sediment analyses, scientists will examine stomach contents of Lake Michigan *Diporeia* using preserved, historical collections taken from over 40 sites between 1981-2005. The new two-year project, titled "Habitat or Food? The Demise of the Benthic Food Web in Lake Michigan," will begin in January 2009 and is a collaboration between the research station and The University of Michigan.



Zebra mussels are driving changes in the Great Lakes



Meadowlark photo courtesy of Carol Henderson

Restoring Habitat "For the Birds"

Populations and nesting habitats of many grassland-nesting songbirds such as eastern meadowlark, bobolink and Henslow sparrow have declined significantly. A new project, directed by Senior Scientist, Shawn Schottler, in cooperation with Great River Greening and Standing Cedars Community Land Conservancy, is restoring old fields to prairie habitat, to create and evaluate improved grassland habitat complexes. Through November 2008, three plantings of native species have been completed at Standing Cedars, south of Osceola, Wisconsin. Distinct seed mixes will create areas of differing "structures"—short to medium height prairie; tall, dense forb-rich prairie; and short grass-dominated prairie. The importance of high plant diversity in prairie reconstructions is known; this project will demonstrate that structural diversity is equally important. Creating prairie with distinct differences (e.g. tall vs. short) is likely key in improving grassland songbird habitat. Locally-grown seed has been harvested in preparation for plantings in later 2008 and 2009, to create new structures "for the birds."

Complex Ecosystem Changes on the Mongolian Grasslands

Research station scientists Mark Edlund and Jim Almendinger, University of Minnesota graduate student Avery Cook Shinneman, and an international team of researchers have been working to understand the long-term impacts of both climate change and human land-use on aquatic ecosystems in western Mongolia. Using diatom assemblages and chemical data from lake sediment cores, they showed that past periods of warmer climate are associated with higher rates of evaporation and increased salinity in the Mongolian lakes. Traditional herders in western Mongolia rely heavily on natural freshwater resources, and there are concerns about the increased salinization of these resources with continued global warming. In addition, the team discovered shifts in the lake's ecosystems over the last 10-15 years that are unique from any seen in the more than 2000 years recorded in the lake sediment cores. The lakes in the region have become highly eutrophic (nutrient-enriched), and this eutrophication appears to have occurred only recently, a combined impact of the warming temperatures and rapid increases in the number of livestock grazing in the region since Mongolia's 1991 transition to a free-market economy. With lakes becoming warmer, more saline, and more eutrophic, aquatic habitats, as well as the natural resource benefits for the people of the region, are increasingly threatened.



20th Annual St. Croix River Research Rendezvous

October 21, 2008 marked the 20th annual St. Croix River Research Rendezvous—the annual conference which began in 1989. This single-day event, held each October at Warner Nature Center, is a highly-focused gathering of scientific, policy and management experts on the St. Croix River and its watershed. Each year, researchers present the latest results from ongoing studies of environmental issues facing the St. Croix region. Over these 20 years, 304 oral presentations and 62 posters have been presented by representatives from 21 different colleges and universities; 3 high schools; 3 museums; and 22 county, state and federal agencies. More presentations have focused on mussel populations in the river than any other, although the issues of water quality, nutrients, and sediments have also been a major focus. The 20th annual St. Croix River Research Rendezvous marks the beginning the 20th anniversary of the establishment of the research station in May, 1989.

Photo courtesy of Stillwater Courier

Climate Effects on Mercury Production

For the past eight years the research station, with other agency partners, has studied mercury cycling in a wetland in the Marcell Experimental Forest near Grand Rapids, Minnesota. The original research questions behind the project were concerned with the effects of atmospheric sulfate deposition on methylmercury production in boreal wetlands. Methylmercury is a very toxic form of mercury which bioaccumulates in game-fish, fish-eating wildlife, and humans. Over the last four years northern Minnesota has experienced moderate to severe summer droughts, which have impacted our original research and led to new lines of inquiry regarding the role that climate plays in methylmercury production. In February 2007 the Intergovernmental Panel on Climate Change released its latest report and predicted warmer temperatures and altered precipitation patterns for mid-latitude regions such as Minnesota. Our research indicates that these new climatic patterns may increase methylmercury production in wetlands and lead to reversals of declining methylmercury contamination seen in some northern fisheries.



Allison Baczynski and Jill Coleman Wasik change the water chemistry of experimental plots at the Marcell Experimental Forest