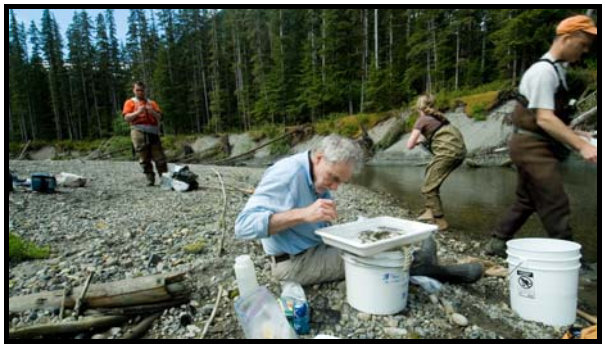
St. Croix Watershed Research Station

Highlights of 2007 -2008



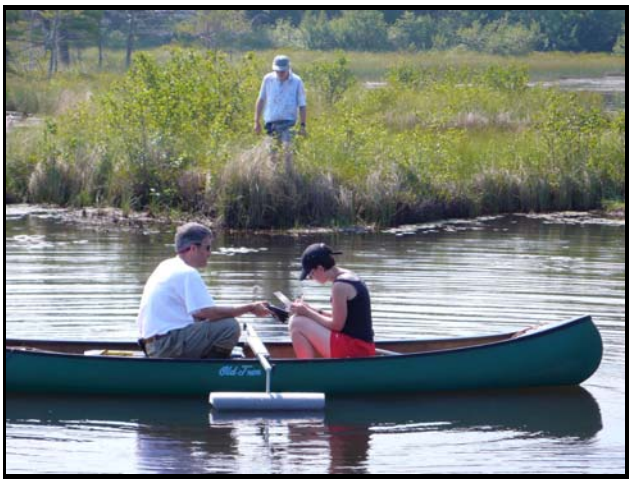
Dan Engstrom in Glacier Bay

Tracking Mercury Pollution in Southeast Alaska

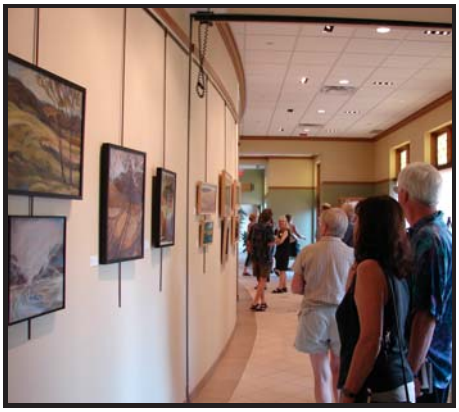
Twenty-five years ago when Station director Dan Engstrom began his long-term ecological studies at Glacier Bay, Alaska, this most spectacular of Alaskan national parks was considered remote from human impact. But with the tremendous growth in the Asian economy over the last two decades, mercury pollution from long-distance atmospheric transport has become a threat to this pristine ecosystem. Elevated levels of mercury have been recently reported in murre eggs as well as lingcod and halibut, while lake sediment cores collected from the Glacier Bay region by Engstrom and colleagues show rising mercury levels over the same period. This last summer, Dan joined a research team, headed by scientists from the University of Alaska Southeast, to begin a systematic study of mercury levels in streams and rivers draining into Glacier Bay. Funded by the National Park Service, the research team will determine levels of contamination in different parts of the park with the aim of understanding how terrestrial soils, particularly muskegs, transform the atmospheric mercury into methylmercury, the form primarily responsible for fish and wildlife contamination.

Diatoms Used to Monitor Our National Parks

The eight diverse parks that make up the Great Lakes Network of the National Park Service (GLKN) - Voyageurs, Grand Portage, Mississippi, St. Croix, Isle Royale, Pictured Rocks, Sleeping Bear, and Indiana Dunes - were each established to protect nationally significant water resources. However, the lakes and rivers in these parks are being stressed by impacts from exotic species, contaminants, outside development, recreation, and climate change. The GLKN has partnered with the Research Station to develop a novel aquatic monitoring program to detect ecological changes using diatoms preserved in sediment cores. Staff scientists Mark Edlund and Joy Ramstack, with NPS aquatic ecologist Brenda Moraska Lafrancois, have retrieved and analyzed sediment cores from 15 lakes to understand the history and timing of changes in each lake and park unit. Modern sediment samples from 70 different lakes and river segments are helping develop models for interpreting ecological change, both historical and present-day. The lakes and rivers will be resampled every 3-5 years to detect future ecological change, to identify the possible causes, and to guide the management of our parks in a future certain to bring change.



Mark Edlund and Joy Ramstack,
Apostle Islands National Lakeshore

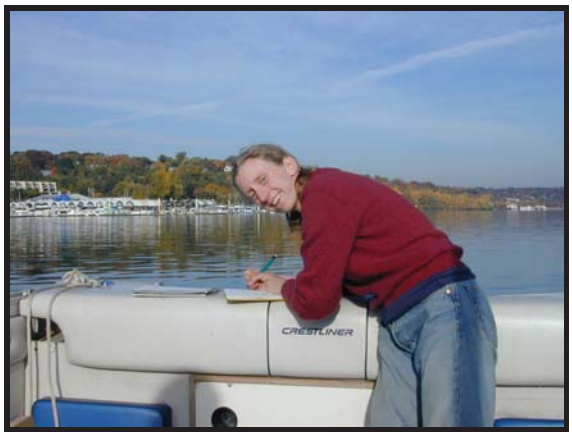


Stillwater Public Library gallery

Pine Needles Artists Featured in Stillwater Exhibition

Since the Artist at Pine Needles residency began in 2001, eleven visual artists and two writers have taken part. In August, 2007, works from all 13 artists were included in a gallery show at the Stillwater Public Library. Over 40 examples of residency-inspired art, including paintings, woodcut prints, photographs, multimedia collages, and sculptures were exhibited in the new gallery space of the recently renovated historic Carnegie Library. In summer of 2007, the residency program welcomed three participants to the James Taylor Dunn Pine Needles lodge. Graphic artist Mark Odegard crafted journals of writings, drawings, paintings, and collages. Scientific illustrator and painter Vera Ming Wong began drawing and painting examples of St. Croix River mussels. Graphic artist and painter Kim Gordon rounded out the 2007 season, painting views of the river and its many variations from the banks of the Pine Needles property.

A Journey to the Sea: Silica Cycling in the St. Croix



Laura Triplett on the St. Croix River

Recent research on the St. Croix River has shown that humans are significantly altering the global silica cycle. Silica, a product of rock weathering, is an essential nutrient for terrestrial plants and aquatic organisms such as diatoms and sponges. Doctoral student Laura Triplett and scientists from the Research Station and the Metropolitan Council measured the amount of silica flowing into and out of Lake St. Croix, and used sediment cores to measure how much silica has been sequestered in the lake through time. With these data, they calculated that before Euro-American settlement in the 1800s, Lake St. Croix trapped around 2% of its annual silica inflow, while it now traps around 10%. The increased silica trapping is a consequence of increased phosphorus concentrations, which encourage diatoms to grow and remove more silica from the water. On the scale of the entire Mississippi River, which is eutrophic (nutrient rich) and has many reservoirs and dams to trap silica, there has been a significant decline in silica reaching the Gulf of Mexico. There, lower silica concentrations means fewer marine diatoms, which negatively impacts some desirable fish species. Anthropogenic silica depletion has also been invoked to explain fishery declines in the Black Sea and the Mediterranean Sea. This Lake St. Croix study is one of the first to isolate and quantify the role of eutrophication in that global phenomenon.

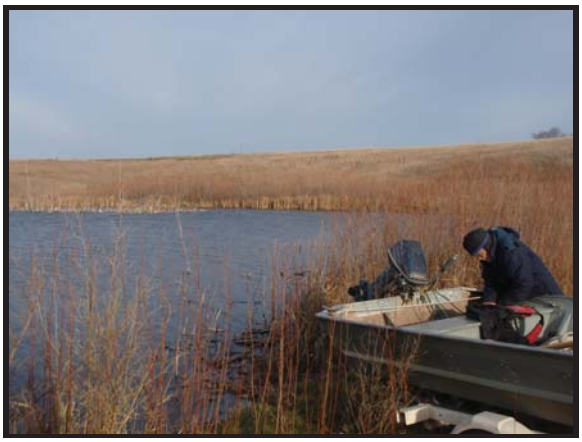
TOP: The Willow River, photo by Adam Lange; RIGHT: Delft, The Netherlands

Watershed Modeling at Home and Abroad

The Technical Assistance Program for Watersheds - TAPwaters - is an ongoing project devoted to the use of computer models to answer management and research questions in the St. Croix basin. Project manager Jim Almendinger and graduate student Marylee Murphy are nearing completion of a model of the Willow River, a tributary near Hudson, Wisconsin. The Research Station is internationally known for inferring *past* environmental conditions from lake-sediment cores and is also deeply involved in monitoring *present-day* conditions in the basin. Now, with watershed modeling, it's added a new tool to help predict the *future* consequences of today's management decisions. In July of 2007, Almendinger attended an international modeling workshop in Delft, The Netherlands, where he shared his experiences in modeling the Willow and learned about modeling applications in watersheds around the world. Importantly, Almendinger met with the development team who wrote the model code to explain needed corrections and improvements to the program. Incorporation of these suggestions into a new version of the model will greatly increase the ease and accuracy of model application all over the world, but especially in the heavily farmed, glaciated landscape of the Upper Midwest.

Erosion Reduction by Conservation Grasslands

Research Station staff have begun a new project titled "Demonstrating Benefits of Conservation Grasslands on Water Quality." Conservation grasslands are agricultural lands, planted in grass or other perennial cover as part of state and federal programs to minimize crop overproduction, to create wildlife habitat, and to reduce soil erosion and nutrient loss that otherwise would pollute lakes and streams. The research aims to quantify whether there is a critical amount or placement of grassland needed to produce a measurable reduction in erosion. Because lakes tend to trap most of the sediment that enters them, the rate of lake-sediment accumulation is a measure of erosion in the contributing watershed. Lakes in western and southern Minnesota have been selected according to the amount of conservation grasslands in their watersheds. Sediment cores from these lakes will be analyzed for accumulation rates of both sediment and phosphorus to see if these rates correlate with changes in land use. Funding for this project is provided by the Legislative and Citizen Commission on Minnesota Resources (LCCMR).



Little Turtle Lake in Grant County, MN