Great Lakes Center Newsletter

Fall 2016

RESEARCHING THE GREAT LAKES AND THEIR TRIBUTARIES SINCE 1966

Sunset on Lake Superior.

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Sampling one of the largest lakes in the world, Lake Superior

by Knut Mehler

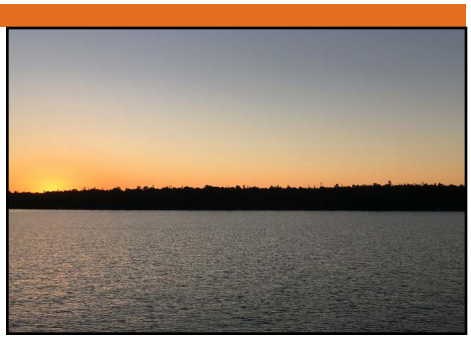
Every year researchers from around the Great Lakes go aboard the U.S. EPA research vessel *Lake Guardian* to monitor the Great Lakes. The vessel is used to collect samples of air, water, sediment, plankton, and other aquatic life. Information from these samples are used by scientists to assess the physical, chemical, and biological conditions of the Great Lakes. Their work has created baseline and long-term data sets which are used by managers and policymakers to support decision-making that help to protect the Great Lakes.

For the first half of September this year, Lyuba, Brianne and I had the chance to be part of the cruise to sample the largest freshwater lake in the U.S., Lake Superior. This lake is also the largest lake in the world by surface area, stretching 350 miles from east to west and 160 miles from north to south, and holds an impressive 3 quadrillion gallons of water.

The 180' R/V *Lake Guardian* is the largest research and monitoring ship on the Great Lakes, a home to 14 permanent crew members and up to 28 scientists.

The Lake Superior Binational Program Partnership identified monitoring of the lower-trophic food web and energy transfer as

one of their priorities for the 2016 Cooperative Science and Monitoring Initiative (CSMI). The goal of the CSMI, which started in 2002, is to bring scientists from different research facilities together to monitor nutrients, contaminants, water chemistry, zooplankton, phytoplankton, and benthic invertebrates. In response to this priority, an intensive assessment of the lower food web in the nearshore and offshore zones of Lake Superior is being conducted to supplement long-term annual monitoring programs.



We saw a number of stunning sunrises and sunsets.

Besides the crew, there were 10 scientists on board split into two teams: SUNY Buffalo State and U.S. EPA GLNPO and Development-Mid-Continent Ecology Division Laboratory from Duluth, Minnesota. Together we sampled for water chemistry, phytoplankton, zooplankton, *Mysis* (opposum shrimp), sediment and benthic invertebrates. Results will provide lakewide estimates of the status and condition of Lake Superior's lower food web, and be compared with similar CSMI surveys conducted in 2005-2006 and 2011 to provide a baseline of ecosystem changes observed over the past decade in the nearshore and offshore zones of the lake. These data are critical to understanding the mechanisms and estimating the benthic-pelagic flux of energy and nutrients in the Lake.

The northern lights we saw this summer.

The Buffalo State team focused on benthic invertebrates, organisms without a backbone which live on or in the sediments and include worms, midges, small clams, and amphipods. Benthic invertebrates are an essential part of the food web in the Great Lakes, and their presence or absence can tell scientists a lot about the water and sediment quality in the Great Lakes as some of them are tolerant to pollution and some are not. Sediment samples are taken with a PONAR grab sampler that is lowered down to the lake bottom. The sample is then washed through a sieve and organisms larger than 250 µm are preserved for later analysis. Special attention will be given to a keystone benthic invertebrate, *Diporeia* spp., which is an important organism in the Great Lakes food web. Once very common across the Great Lakes, its population declined at an alarming rate in 4 of the 5 Great Lakes; it remains abundant in Lake Superior. Therefore, scientists are interested in understanding the population decline, still one of the greatest mysteries in the Great Lakes.

The other team, U.S. EPA-Duluth, was interested in off-shore benthos and zooplankton, small animals which live in the water column and drift along with the current. Here, *Mysis* are of particular interest for the scientists. They can be found in deep, cold oligotrophic lakes like Lake Superior and are the main food source for many fish species in the lake. They migrate toward the surface during the night to feed on other zooplankton. When day breaks they migrate back to the dark lake bottom to avoid predators. Scientists used plankton nets from different depths to collect those small animals. After retrieving the samples, mysids were preserved for stable isotope analysis, a process that allows scientists to obtain information on the animals' food sources. In addition to mysids, zooplankton samples were collected and will be taken to the laboratory in Duluth to determine species composition, community structure, and biomass.

The EPA's remote underwater glider. (Credit: Tom Hollenhorst)

Ecologist Tom Hollenhorst, also from the U.S. EPA-Duluth, used a remote underwater glider for monitoring the water quality in Lake Superior. Shaped like a torpedo, it collects huge amounts of data including

conductivity, temperature, depth, dissolved oxygen, and turbidity from different depths. This high-technology device is powered by lithium batteries and can be programmed like an auto-pilot on an airplane. Because it is very efficient, it can operate for months on its own over great distances. In fact, one Slocum glider made a 7,400 km journey through the ocean, being at sea for 221 days. The EPA's glider was launched from the Lake Guardian on the southern shore of Lake Superior and will make its way back to Duluth on its own.

In addition to biological data, water samples were taken at each station using the on-board Rosette sampler. Anne Cotter from U.S. EPA-Duluth processed the samples using a filtering apparatus. Anne and her team are interested in the amount of nutrients in the water samples, especially nitrogen and phosphorus, as both can cause excessive algae growth. Further, Anne was looking for the concentration of chlorophyll in the water - the green pigments in cyanobacteria, algae and plants. Chlorophyll is an important proxy of how productive an ecosystem is and scientists can use this information to draw conclusions about the trophic status of a water body. For example, a high concentration of chlorophyll is indicative of eutrophication which can harm other aquatic species such as fish.

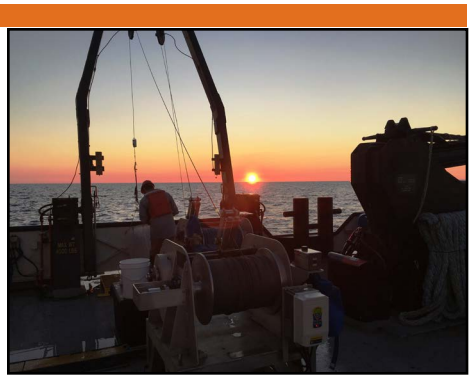
Since the *Lake Guardian* operates 24 hours per day, both teams work in 12-hour shifts. Although the days (or nights) on board can be very long there is always time to relax in the lounge or on deck to enjoy the beautiful scenery, including the northern lights. •

Knut Mehler is assisting taking water samples with the rosette, which collects water at various depths using its twelve bottle. (Credit: Anne Cotter)

Water samples are filtered in the lab for chlorophyll, nutrient, and suspended solids. (Credit: Anne Cotter)

Great Lakes Summer Survey

by Susan Daniel



Jim Watkins (Cornell) collecting zooplankton.

Researchers completed another successful Great Lakes summer survey aboard the EPA's *R/V Lake Guardian*. The ship left Milwaukee, Wisconsin on August 1st, and sampled Lakes Michigan, Huron, Erie, Ontario, and Superior during a month long survey. This year marks the fourth consecutive year the Great Lakes Center has participated in this scientific cruise.

Scientific crews from both Cornell University and SUNY Buffalo State, including Susan Daniel and Keith Pawlowski (graduate student), collected benthic macroinvertebrates, zooplankton, and chlorophyll as part of the U.S. EPA-funded grant Great Lakes Long-Term Biological Monitoring. In total, 204 samples from 68 stations were collected using a PONAR grab sampler.

Susan Daniel collecting sediment cores.

Researchers also collected benthic meiofauna from 37 permanent stations throughout the lakes, in collaboration with Marissa Hajduk at Texas A&M University Galveston. Marissa Hajduk was an Undergraduate Research and Mentoring Program (URM) student who worked with Lyubov Burlakova and Alexander Karatayev before graduating from Buffalo State in 2010. Other side projects included the collection of multiple sediment cores from six stations to study the effect of *Dreissena* on organic content and the subsequent effect on benthic communities.

All of these data will be added to the U.S. EPA benthic database that contains annual data starting in 1997. These samples, and previous data, will shed light on current environmental status of the Great Lakes and provide a baseline for any future changes in water quality. There is one year left in the current grant cycle, so expect to see our researchers out on this cruise again next year. Overall, employees from GLC enjoyed a month of hard work and wonderful discussions with personnel from eight scientific institutions. •

More sights around the Great Lakes (thanks, Susie!)

Clear skies and clear water reflecting all that blue sky, with no land in sight.

Calm morning with interesting cloud formation. This one looks like land.

Every sunset is different, like this one, with some dramatic dark clouds.

Early detection protocol for invasive species in Western New York

by Andrea Locke, WNY PRISM coordinator

Research plots set-up to assist with determining effective management strategies for WNY PRISM Early Detection Priority plant *Brachypodium sylvaticum* (Slender False Brome). (Credit: WNY PRISM)

Invasive species pose a significant threat to our environment and economy, as well as to human health. Once well established, they can be very expensive and time consuming to manage. For these reasons, prevention has long been held as the gold standard for invasive species management. By preventing the initial establishment of invasive species, impacts on our environmental, economy and health can be minimized while also avoiding the long term costs of management. However, prevention efforts are unable to stop all invasive species from being introduced or becoming established within a region. Early detection is the next step of defense against invasive species. Successful early detection programs allow for potential threats to be identified in time for effective, efficient and environmentally sound decisions to be made (assessment) and actions to be taken (rapid response). The earlier an infestation is found, the more successful management efforts will be.

WNY PRISM Invasive Species Management Crew surveying for invasive species. (Photo credit: WNY PRISM)

Last fall, WNY PRISM developed an early detection monitoring program, beginning with the creation of an early detection priority species list. This list provided the basis for WNY PRISM to identify sites to conduct monitoring in 2016, and has now led to the further development of a regional early detection protocol.

WNY PRISM is pleased to announce the release of the Regional Early Detection Protocol for Invasive Species. Developed in cooperation with WNY PRISM's Working Groups, Steering Committee and additional Partners, this protocol provides a framework for professionals and citizen scientists to report sightings of new and emerging invasive species as they enter our region. An early detection species is defined as a species which is known from three or fewer locations within the eight county region of WNY PRISM.

The WNY PRISM Regional Early Detection Protocol for Invasive Species can be found on our website. It includes a step-by-step process for proper identification, documentation, and reporting for new invasive species. As the rollout of this protocol continues through the fall, you will find additional information on early detection priorities and advice on proper identification and reporting. Early Detection Priorities are available online. Species already present, common or well-established within WNY may continue to be reported to iMapInvasives to assist resource managers in the development of effective landscape scale management strategies.

In 2016, the WNY PRISM Invasive Species Management Crew visited 12 sites for early detection monitoring. Sites included 5 species present on the WNY Early Detection Priority List. For the majority of these sites, previous removal efforts have shown to be successful and species were not observed. If no recurrences of the

invasive species have been detected after 5 years of site monitoring, the sites will be considered eradicated and removed from monitoring. For those sites that continue to have the target invasive species present, efforts to achieve eradication will continue.

With the release of the new early detection protocol, WNY PRISM aims to engage the greater WNY community in efforts to find infestations of new invasive species earlier in their establishment, which in turn will ensure greater success through removal efforts. We look forward to working with you! •

GLES summer internships

by Chad Schuster and Mary Pokorski, GLES M.S. students

Mary Pokorski (above) and Chad Schuster (below) conducting SVAP studies in Tonawanda Creek.

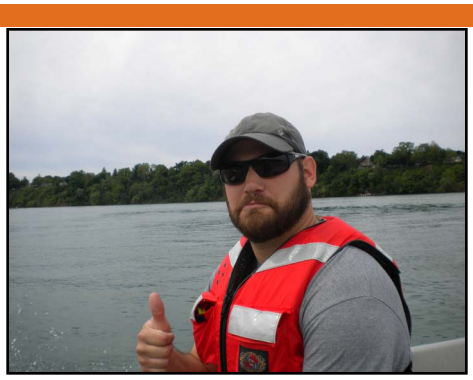
This past summer, two GLES M.S. students completed their required internships with Buffalo Niagara Riverkeeper. Chad Schuster and Mary Pokorski, both second year graduate students, worked on teams collecting field data for Riverkeeper's "Healthy Niagara" project. This project aims to create a comprehensive watershed management plan for the Niagara River watershed. Chad and Mary were part of the Stream Visual Assessment Protocol teams, or SVAP for short.

The Stream Visual Assessment Protocol is a qualitative method of determining the physical, chemical, and biological conditions of a stream using field observations and additional measurements. Chad and Mary went into the field every week with members of Riverkeeper to various tributaries of the Upper and Lower Tonawanda sub-watersheds, where they walked up-stream along designated segments and stopped to record data at every 200-foot long reach. Along these segments, the teams recorded GPS coordinates, width, and depth measurements, and rated a number of stream elements (i.e., canopy cover, in-stream fish cover and aquatic habitat, bank and channel conditions, water appearance, nutrient enrichment, riparian zone, pools, riffles, and manure presence) on a 0-10 scale. Water quality measurements were also taken using a YSI meter and water samples were taken to measure conductivity, pH, temperature, turbidity, and nitrate and phosphate concentrations. The data collected by Mary, Chad, and their field team members were used to calculate scores for overall health and condition of the observed tributaries. The work conducted during their internship is important to the Healthy Niagara project as it provides baseline data and current conditions within the watershed that Riverkeeper can incorporate into their management plan when determining which tributaries may need remediation or restoration.

Chad and Mary were able to apply skills they learned in courses that Buffalo State offered. In their Business Communications class last semester, they both underwent a mock interview for this internship prior to their actual interviews with Riverkeeper. Both students are taking away valuable field experience in stream ecology, knowledge, and new connections with Buffalo Niagara Riverkeeper that will benefit them when they graduate and begin their search for jobs related to the Great Lakes. They have also been able to apply their knowledge and skills gained from this internship in their current classes. Overall, both students agree that Riverkeeper was a great organization to intern for, and appreciate this opportunity through Buffalo State. •

Good luck!

by Kit Hastings



Josh Fisher

Brianne Tulumello

This fall, two of our employees have decided to move on to the next step in their journey.

Joshua Fisher, field and lab research technician at the Field Station, took a job as a biologist with the DEC at the Lower Hudson Valley office in New Paltz, NY. For the past three and a half years, Mark Clapsadl and I have worked with Josh down at the Field Station. The Field Station can be a quiet place during the winter months and hectic in the summer. Josh has been in charge of our boats, taking them out in the field to do research for the Emerald Shiner project and so many others, and keeping them running smoothly. It was usually Josh who went out with me to do my biweekly monitoring for the Lake Erie Lower Trophic Level Assessment.

Besides all the hours in the field that Josh put in, he was active in our labs as well. Josh became our larval fish identification expert and worked on a key to larval fish in the Niagara River. He trained three students in larval fish ID.

Josh also created three posters for display at the Field Station showing the gulls, waterfowl, and freshwater fish of the Niagara River. At the Field Station, we see thousands of birds migrating right past our facility, which sits along an important flyway for migratory birds. It is always fascinating to see all of the diving ducks that overwinter here.

I know Mark and I will both miss not only his professional merits but also all of the conversations about gardening and growing mushrooms. He was a pleasure to work with and will be missed. Good luck and best wishes!

Brianne Tulumello, research technician, has been at Buffalo State about as long as I've been here (8 years), first as a URM student and research assistant working on the LENONS project, and now as a technician working primarily on the CSMI project and supervising student workers in one of our labs on campus. In November, Brianne will be leaving us to pursue her passion of farming. She'll be working on a farm in Oneonta, NY and studying agriculture and forestry science at Hartwick. I'm so excited for her to follow her dream. Good luck, Brianne! •

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