The Teachers Take With Them A Web of Learning (Day 7 … and beyond)

August 12, 2010

Blogger's Note: It's been a few weeks since the teachers completed "2010's Lake Ontario Exploration Workshop." Now, we're following up with them, both on what they presented to each other right before the week-long training wound down and what they plan to do moving forward with all their newly-learned notions of Lake Ontario and its tributaries.

After a week of Lake Ontario learning - from seining on the Niagara River near Buffalo to experiencing the sand dunes of Black Pond Wildlife Management Area all the way up the eastern lakeshore past Oswego - the teachers on this Centers for Ocean Sciences Education Excellence (COSEE) Great Lakes tour are leaving, soon to return to their respective classrooms with a wealth of hands-on knowledge. "This group of educators and the dedicated scientists and researchers made every

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By Event:

- 2010 Lake Ontario Exploration Workshop
- Shipboard and Shoreline Science on Lake Michigan
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- Lake Huron Exploration Workshop
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moment of planning well worth the effort," said New York Sea Grant Coastal Education Specialist ***Helen Domske***, leader of the exploration workshop.

On the final morning of this journey, the teachers gathered to discuss what they plan to do once they get back into their classrooms. They also shared some "wow" moments and were presented certificates of completion for a job well done. Each of the participants also received a pewter sturgeon pin that they can wear as a token of their time spent learning about Lake Ontario.

The first group to present included ***Eric Bauerlein***, ***Kristin Sheehan***, ***Sandy Cunningham*** and ***Scott Krebbeks***, who are all middle school teachers. They are proposing to have their classes connect with each other to share facts, information and questions among their students. Using tools such as posters, a blog and shared presentations, their unit will focus on the physical characteristics of Lake Ontario, as well as the native and invasive species of the lake and human impacts that alter the environment. Students will be given a problem that they personally can have an impact on. That personal connection to an issue and communication with students from other schools should lead to some rewarding activities in the upcoming school year.

"I want to give my students a better understanding of the Great Lakes based on my experiences and learning," said Bauerlein, "from invasive species and how they are being managed to understanding the food chain in the Great Lakes and how humans have impacted it." He plans to use this information to supplement the water unit in his classroom.

Others in this group further the idea of how beneficial the Lake Ontario tour has been. "I have a better idea of all of the facts that impact the Great Lakes watershed - ecologically, politically, economically and geologically," said Krebbeks. "And, I'll incorporate the real-life examples I experienced on this workshop in my science curriculum." For Cunningham, it's concepts like invasives in the Great Lakes and water quality in the Niagara River and Lake Ontario that have her most inspired. "I am planning on changing several activities that I already use - drop in the bucket, bioaccumulation, the energy pyramid - to be Great Lakes specific."

The next group of teachers - ***Sandie Cecelski***, ***Eunice Reinhold*** and ***Claire Faulring*** - will have their students look at water quality, agriculture, responsible stewardship, point and non-point pollution and other environmental problems related to the watershed. Each teacher will use local streams or ponds as living classrooms to teach their students important concepts that they learned about during the

By Date:

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- July 2010
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workshop. And they will utilize classroom experiments to add experiential learning to environmental issues.

“I have taken these wonderful, sweet inland seas for granted,” said Reinhold. “But, I now feel renewed from what I learned - about the ecology and geology of the Great Lakes - and I want to share this enthusiasm with my students.” Cecelski added, “My participation in this COSEE Great Lakes workshop has expanded and enriched my entire teaching methodology related to aquatic science.” Mirroring her group member’s comments, Faulring, a teacher in Erie County’s Springville, NY said, “I have gained a greater appreciation for what is in my backyard.”

Teachers ***Chris Cybulski***, ***Dave Uglow***, ***Judy Gluchowski*** and ***Paulette Morein*** provided a variety of activities that their students will be involved in. From salt maps of the Great Lakes, outlines made in sidewalk chalk, dissection of fish, reading *Paddle to the Sea*, Scribble maps of local areas, using the Nab the Aquatic Invader! Web site, or a virtual pond dip, these educators will involve their students in a myriad of classroom projects to increase their knowledge of and stewardship for Lake Ontario.

“I was amazed to find out how badly polluted Lake Eire was in the 1960s,” said Cybulski. “It was also good to know that we’ve since done something about it, by reducing phosphorus levels, introducing municipal sewage systems and cutting down on industrial pollution.” In related news, a new NOAA-funded study led by ***Christopher Gobler***, an associate professor at Stony Brook University, in collaboration with New York Sea Grant’s ***James Ammerman*** and ***Chuck O’Neill***, will focus on how phosphorus pollution drives toxic blooms of blue-green algae in the Great Lakes (click here for more details).

For Morien, a teacher in Dunkirk, NY, which is bordered on the north by Lake Erie, all this lake learning has her energized, too. “I currently have no lessons on the Great Lakes, but I plan on developing a unit of study for my classroom.” A few of the “big ideas” she will incorporate: lessons on identifying and naming the Great Lakes, their size, volume and depth as well as native and invasive species and what students can do to “preserve the splendor of the Great Lakes.”

For many of the teachers, the experience has been an ideal refresher course. “During this week-long immersion in Great Lakes information, I’ve been surprised to find that my knowledge was out of date,” said Gluchowski. “I learned how clean-up efforts have made dramatic improvements in Lake Ontario and invasive species have added huge new challenges.” Gluchowski, an enrichment specialist at a Rochester, NY elementary school, has been working on connecting lessons on Lake

Ontario to an existing fifth grade unit.

"In the fall, students begin their study of science with a unit on 'The Living Environment,' a New York State standard. During this unit, students study a pond or stream ecosystem on the school campus. But, because of this week-long workshop, I'm working on building on that unit so that the students view our school's wetlands as part of Lake Ontario's watershed and, therefore, a larger ecosystem. My aim is that the students walk away with a better understanding of ecosystems, an interest in science, and perhaps even begin to feel the importance of stewardship for the Lake ecosystem."

John Pennella, ***Kit Marshall***, ***Kim Furguson*** and ***Ed Stevens*** highlighted activities that will be used with high school students around the Lake Ontario watershed. Focusing on taxonomy, stream indicators and water quality, their students will use a hypothesis driven approach to learning about Lake Ontario and its ecosystems. They will also utilize mapping activities to add a local relevance to their classroom efforts.

Some of the essential questions of these teachers will address with their students include: How do we determine the impact of humans on the local ecosystem? And how will this affect your use of environmental resources? "Overall, I found the activities on this trip to be engaging, informative and worthwhile to take back to my students so that they might realize the importance of and take responsibility for the health of the Great Lakes in the future," said Marshall, a teacher in Oswego.

Before disbanding, many of the teachers shared their favorite moments from the trip. These included the interactions with researchers, the visits to Fort Niagara, the sand dunes, the Salmon River Hatchery or the Rice Creek Field Station. Many commented on the new information they learned, either during a presentations or from each other along the way. They'll take all this with them and will use it in their respective classrooms. "They shared the spirit and dedication of other educators," said Domske. "These teachers were inspired by each other's enthusiasm and zest for learning and they've made connections that will last for years to come."

In closing, I [***Paul C. Focazio***, NYSG's Web Content Manager] leave you with some "thank you" messages that our trip leader, Helen Domske, wanted me to relay …

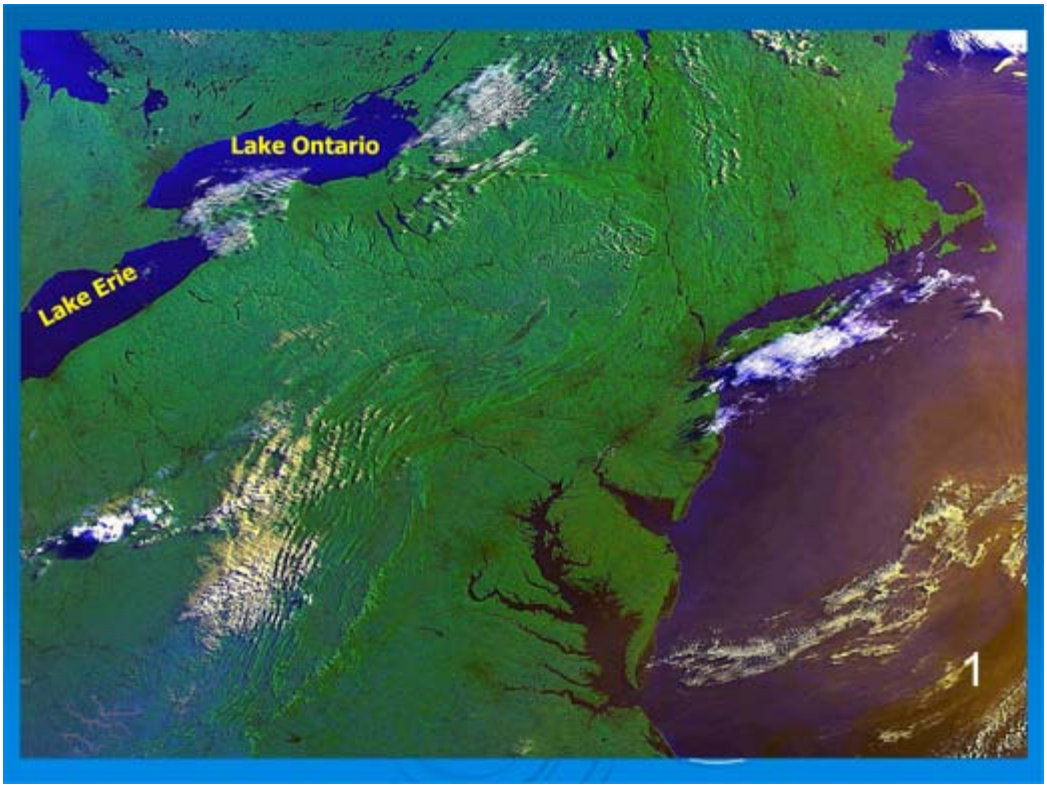
"This trip was a *huge* success and I owe much gratitude to Paul Focazio, who put together this excellent blog that will be used by the teachers in the future. I also thank him for driving the other van along the shores of Lake Ontario. Special thanks go to ***Mary Penney***, ***Dave White***,

Ellen George and ***Sharon Mullen*** for their assistance with planning the program. To the researchers and scientists including, ***Dr. Joe Atkinson***, ***Dr. Randy Snyder***, ***Dr. Chris Pennuto***, ***Dr. Bill Edwards***, ***Dr. Lucina Hernandez***, ***Chuck O'Neill*** of New York Sea Grant, ***Mike Goehle***, ***Denise Clay*** of USFWS, geologist ***Susan Diachun*** of NYS Parks, the biologists at the Aquarium of Niagara, ***Peter Robson*** at the BUBL, ***Fran Verdoliva*** of NYSDEC, and ***Rene Rickard*** of the Tuscarora Nation sharing their time and expertise with this group of educators. You touched our lives, expanded our knowledge and made us understand our role as stewards of Lake Ontario. This week has been a real highlight in my 32 years of teacher training and I am proud to be a part of COSEE Great Lakes and New York Sea Grant. Both entities believe in educating those who teach the next generation of Great Lakes citizens!"

post by paul, from 2010 Lake Ontario Exploration Workshop — Comments (0)

Mapping out, and Learning from, Great Lakes History (Day 6)

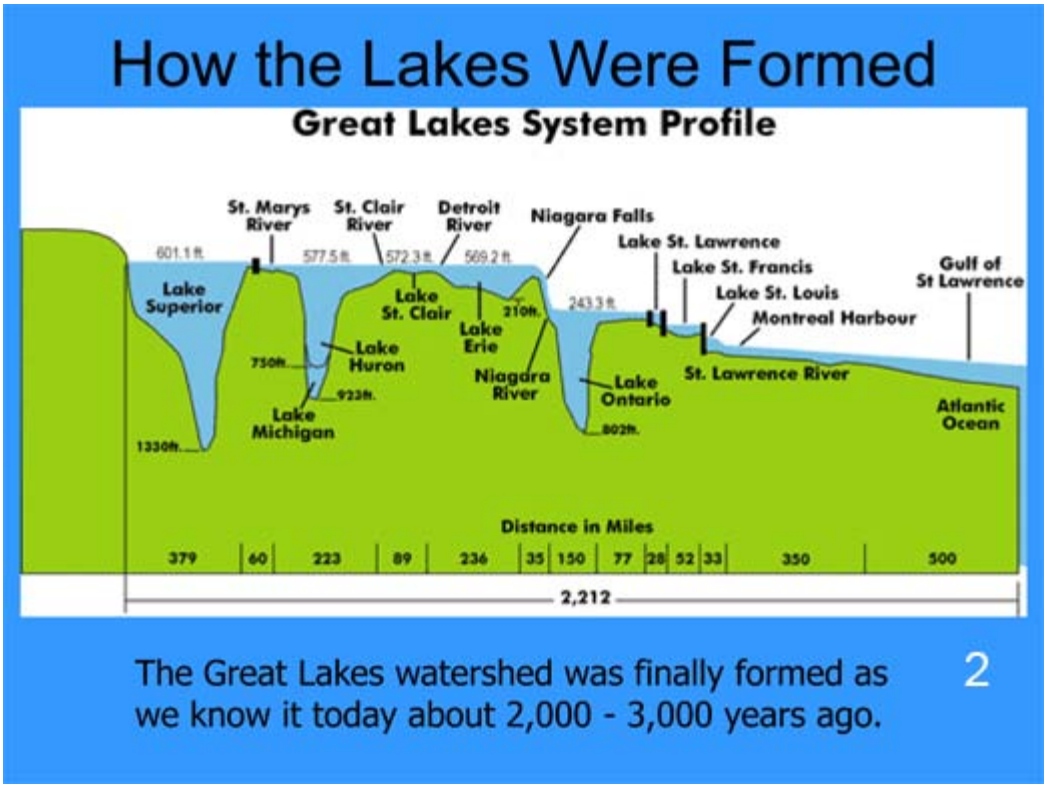
July 30, 2010



The morning began with an overview lecture on the Great Lakes and Lake Ontario (1) , presented by New York Sea Grant's (NYSG) ***Helen Domske***. The presentations, which will be made available for use by the teachers in their classrooms, focused on the geology [see illustration in (2)], history and environmental issues of the Great Lakes system,

along with an in-depth look at some of the important issues related to Lake Ontario. These include the *Cladophora* algae problems, issues with increased fishing pressure of the double-crested cormorant, Type-E botulism outbreaks, and changes in the fish community of the Lake caused by the introduction of invasive species. Throughout the week, the educators have learned about some of these issues, so it was a good review of some of their new-found knowledge.

"Did you know that a total of 86% of inflows to Lake Ontario comes from the upper Great Lakes and Lake Erie via the Niagara River?" asked Domske at one point during the lecture. "So, you can see how water quality in Lake Ontario is affected by upstream sources and inputs from local industry, urban development, agriculture and landfills." As discussed in "Day 3" of our blog (July 27, 2010), this is what has led to identifying various **Areas of Concern** (AOCs) in Lake Ontario and throughout the rest of the Great Lakes system (3). Lake Ontario is certainly not stagnant or a complete sink to what enters its system, though. With a retention time of about six years, about 93% of the water in Lake Ontario flows out to the St. Lawrence River, with the remaining 7% leaving via evaporation.



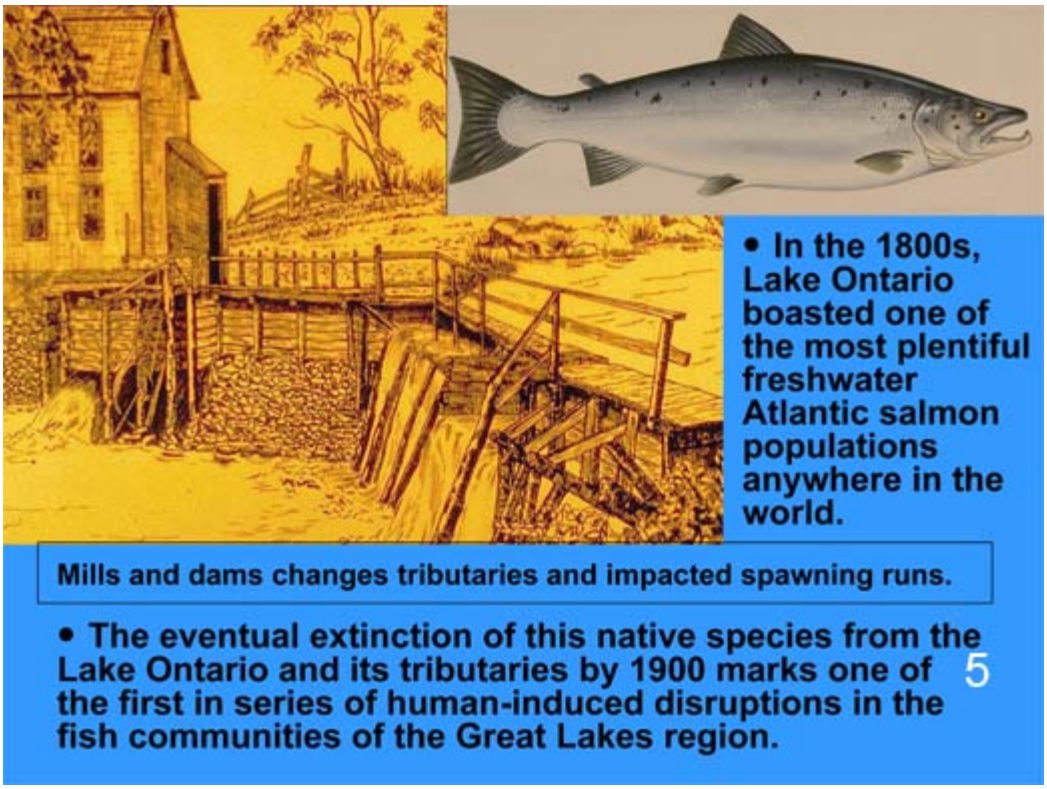
A number of native species in Lake Ontario (4) (5) - whitefish, lake trout, lake herring, Atlantic salmon - have seen population fluctuations over the last century, mostly due to changes in the food web. For example, spring abundance of diatoms, a microscopic algae that is an important food source for zooplankton and opossum shrimp (*Mysis*), has declined in the Eastern Basin of Lake Ontario since the establishment of zebra and quagga mussels. Any decline in diatoms would affect zooplankton and *Mysis*, which then impacts forage fish like lake herring and its competitor since at least the 1950s, the invasive alewife. With their food source at risk, lake herring and other native species certainly struggle more to thrive in the presence of pervasive species like the alewife. (See a NYSG Coastlines article spotlighting Sea Grant-funded research on *Mysis* and alewife to get a better sense of impacts on the Great Lakes food chain, click here.)

Overall, much has changed with Lake Ontario fisheries over the years, as the teachers saw in a presentation timeline:

- Early-late 1800s: canal system, lamprey enter, watershed changes: deforestation, damming, siltation, unregulated salmon fishing, alewives introduced, salmon collapse and extirpated.
- 1920s and 1930s: lamprey predation, highly-prized fish populations collapse, increased harvest on alternative fish species, introduction of smelt and double crested cormorant, smelt and alewife dominate offshore, alewife die-offs, human population growth, industry, nutrient

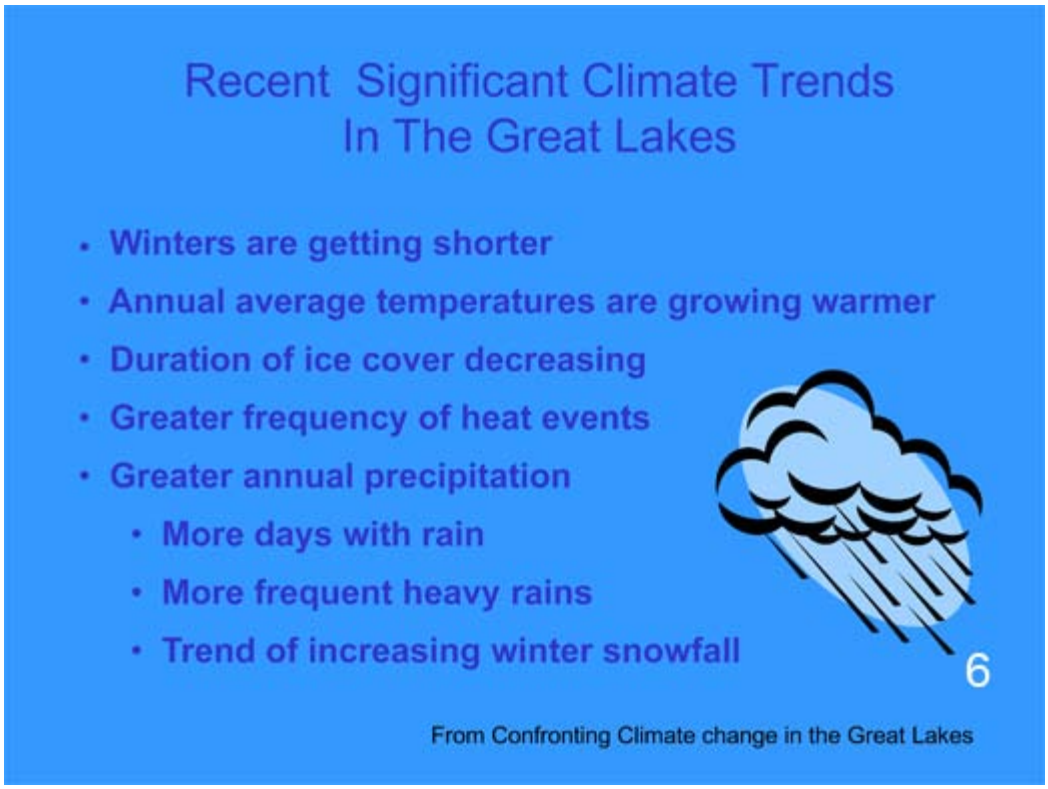
inputs.

- 1950s and 1960s: population collapses of many native species, severe decline of lake trout/burbot, St. Lawrence Seaway, TFM (a chemical carefully applied to streams infested with aquatic invasives such as sea lamprey ton control their populations), massive alewife die-offs, contaminant loading, hydroelectric power use, successful stocking, lamprey control, concern for nutrient loading, cormorants decline.
- 1970s and 1980s: beginning/expansion of stocking efforts, sportfishery generating revenue, alewives and smelt under some control, ballast species introductions, nutrient/toxic abatement, signs of successful lake rehabilitation.
- 1990s and early 2000s: stocking rates/sportfisheries peak & decline, more ballast invasions with negative impacts on fish/ecosystems, cormorant populations explode, alewife/smelt decline, signs of successful lake trout reproduction, fisheries sustainability?



In addition to discussing how recent climate trends have influenced the Great Lakes (6), the teachers detailed some of effects human impacts have had on fish communities in Lake Ontario, the Lake “in their backyard.”

- A shift from dominant species that are large and long-lived (i.e. lake trout, Atlantic salmon, lake sturgeon) to smaller, short-lived fish species.
- A shift in populations with relatively stable populations (numbers and age) to unstable populations fluctuate considerably (numbers/ages).
- A shift from populations with diverse habitat preferences and diverse physical characteristics to populations that thrive only in narrow range of habitats.
- A shift in abundance of highly-prized, commercial fish species for human food to species to fish species that are of little or no commercial value.



Before breaking for lunch, the teachers took part in an interactive three-hour workshop on geospatial mapping that was presented by Cornell University geographer ***Susan Hoskins***, and NYSG educator, ***Nordica Holochuck*** [pictured (7) r-l, along with NYSG's ***Mary Penney*** and ***Dave White***]. This workshop was similar to one the pair presented in New York City, but this version focused on Lake Ontario and its sand dune ecosystem. The teachers learned about topographic maps and how to read the map symbols, colors and patterns. They were also shown how to use aerial maps and were asked to complete an exercise that used their newly-learned information to determine information on the sand dune area and changes that have taken place over time. Educators then presented their findings to each other.

During an early afternoon break, the teachers got back into groups they formed earlier in the week (8) and worked on lesson plan materials presented on Friday, July 30, the final day of the workshop. Discussions centered not only on what the teachers learned during their week-long Lake Ontario training, but also how they might implement some of the concepts into their classroom curricula.

In the afternoon, the educators headed to SUNY Oswego's **Rice Creek Field Station** for a presentation by ***Dr. Lucina Hernandez*** (9), who originally worked on ecosystem issues in Mexico. Dr. Hernandez told the group about some of the research being conducted by students and faculty of the college who utilize the different ecosystems of the station to study the plants and animals found within this beautiful location. Afterwards, a few of the educators shared their week-long experiences so far with a reporter from *The Salmon River News* (see news article, pdf). They later joined the other teachers for a walk through the trails, where they observed native and invasive species that are found on the grounds of the field station.

The station property is made up of a 26-acre Rice Creek pond (10) surrounded by 300 acres of land in several stages of succession from open field to mature forest. It includes a small nature center where the educators were able to see preserved specimens of many of the birds they have encountered during the workshop. While its primary function is to provide facilities for field-oriented courses in natural science taught at SUNY Oswego, the field station is also available for public education and recreation.

On the way to the next location, NYSG Program Leader Dave White gave an historic and cultural overview of the **Oswego Harbor** (11) from a beautiful overlook on the harbor (12). While looking out at the lighthouse, U.S. Coast Guard Station and marina, the educators learned about the important role that the Oswego Harbor has played to shape the history and economy of the area.

The last stop of the afternoon was the **H. Lee White Marine Museum** (13), where the group learned about the history of the area, the importance of shipping and its economic contribution to the growth of Oswego. The educators had the chance to tour the facility and explore a World War II ship that has been added to the museum's display. During this time, some of the teachers local to the Oswego area reflected on their experiences along Lake Ontario with a reporter from the *Palladium Times* (14). Overall, the museum experience helped to round out the week and provide the teachers with some historical and cultural perspective on Lake Ontario.

post by paul, from 2010 Lake Ontario Exploration Workshop — Comments (0)

Feet off the Sand Dunes, Fishin' the Salmon River (Day 5)

July 29, 2010

As part of the largest collection of freshwater sand dunes in the Great Lakes, the **Eastern Lake Ontario Dunes and Wetlands Area** (ELODWA) is globally significant [see map, (2) below; and download a full map of the area here - pdf]. Locally, they are the only sand dunes situated on the New York side of Lake Ontario and are the second highest dunes found in northeastern United States (the first being in Cape Cod, Massachusetts). The ELODWA spans approximately 17 miles with nearly 10 of those miles in private ownership and 6 miles available for public access. Sand dunes are important because they act as a buffer for inland wetlands and upland areas, providing them protection from the Lake Ontario's storm energy. However, the dunes are also fragile and are not tolerant to vehicular and foot traffic. Traffic across the dunes can kill plants, leaving areas devoid of vegetation. Those areas are susceptible to wind scouring, adjacent vegetation becoming undercut and resulting depressions which are known as dune blowouts.

During this part of the tour, educators experienced **Black Pond Wildlife Management Area** (WMA), which is owned and managed by the New York State Department of Environmental Conservation (NYSDEC). This property boasts an Americans with Disability Act (ADA)-compliant trail and raised dune walkover that brought the educators to the shore of Lake Ontario after meandering through the 500+ acres (1).

Along the way ***Mary Penney***, Eastern Lake Ontario Dune and Salmon River Stewardship and Habitat Program Coordinator for New York Sea Grant, discussed topics such as invasive species like purple loosestrife and European frog-bit [both pictured in (5); frog-bit floating on the water, loosestrife as a plant in the middle of the pond], dune blowouts and dune succession and plant communities (3) (4). One way the invasive loosestrife is being dealt with is through biological control. “It takes a long time to come up with a biological agent that will eat the invasive but won’t go after other species,” Penney cautions. Research began in 1985 and today the plant is managed well with a number of insects that feed on it. Several species each of leaf beetles and weevils use purple loosestrife as their natural food source and they can do significant damage to the plant.

While on the beaches at Black Pond WMA, the teachers did not see a great deal of the pervasive green algae *Cladophora* washing ashore (9). NYSG's ***Helen Domske*** explained that this is because *Cladophora* is an attached algae, meaning that it requires a substrate to cling to. This is a challenge on a sandy, less rocky beach. What was washing ashore in large quantities, though, were the shells of quagga and zebra mussels (7) (8) Domske taught the teachers how to tell the two apart by looking for the flattened portion of the zebra mussel shell that is lacking from the more oval-shaped quagga mussel shell.

Throughout their time at this WMA, the educators learned about the importance of practicing environmentally-responsible stewardship, especially when recreating in fragile and unique ecosystems - like staying out of areas with posted signs and behind the snow fencing (6) that protects the dunes. As part of this effort, Penney has been developing Eastern Lake Ontario Dune and Wetlands Traveling Trunk

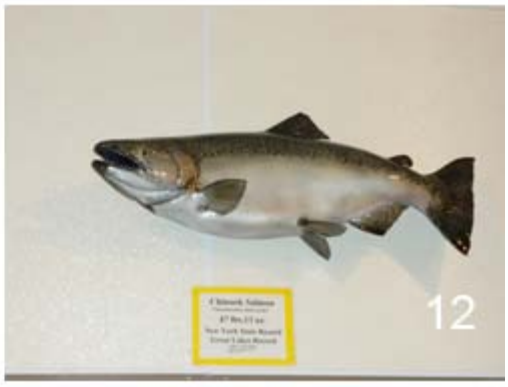
and a series of fact sheets, funded by New York State Department of State Division of Coastal Resources, that will be released this summer.

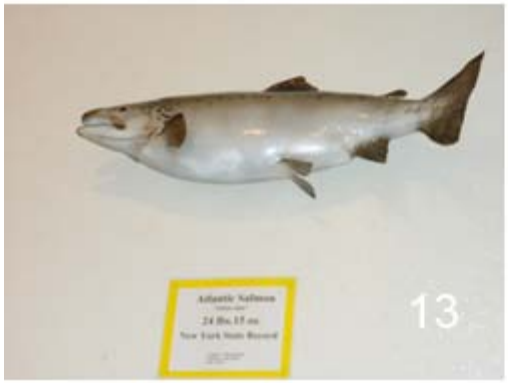
For more resources on this topic, check out NYSG's NYSG's Great Lakes Sand Dunes and Wetlands Web site.

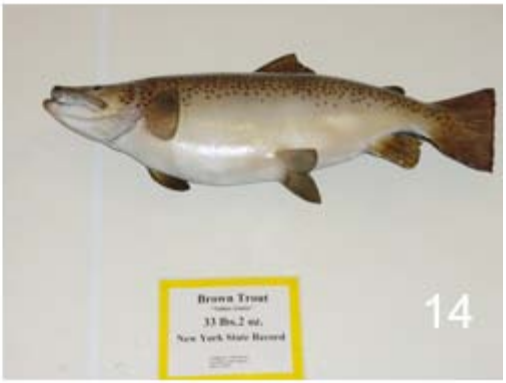
The **Salmon River Fish Hatchery** was built in 1980 and currently

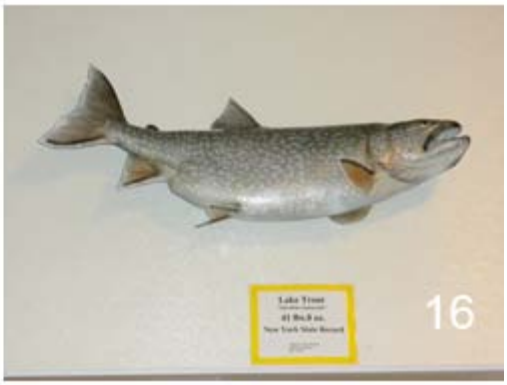
produces trout and salmon for stocking into Lake Ontario and Lake Erie. It is the largest of the 12 NYSDEC fish hatcheries and each year produces close to 2 million fingerlings (young fish 3-5 inches long) and close to 1 million yearlings (fish one year old or over) [see chart, (17), displayed by NYSG's Mary Penney].

The hatchery supplies fish for more than 100 public waters, including Lake Ontario. Annually, the hatchery stocks 3.5 million trout [including brown (14), rainbow (15) and lake (16)] and salmon [including Coho (11), Chinook (12) and Atlantic (13)] and nine million walleye fry.









An educational program and facility tour was arranged for the educators. During this portion of the day, ***Fran Verdoliva***, Salmon River Special Program Coordinator for NYSDEC provided an overview of the history of the Salmon River and Lake Ontario fisheries as well as a history and challenges of the Pacific (Chinook and Coho) salmon stocking program. Egg processing procedures were highlighted in a movie. Although this is not the busy time at the hatchery (Pacific salmon spawning season is around Columbus Day), we were lucky enough to see some adult brown trout in the fish ladder (18).

Pacific salmon are not native to the Great Lakes, but have become naturalized, successfully spawning in the Salmon River and other tributaries. According to NYSG-funded research five to 10 million Chinook salmon were naturally reproduced in the Salmon River in 2005. The finding comes from a NYSG-funded project carried out by SUNY College of Environmental Science and Forestry graduate student ***Dustin Everitt*** (for more, see related article in NYSG's *Coastlines*, pdf). Research is underway to better understand the survival of hatchery and wild produced Chinook salmon.

The final stop of the day was the majestic **Salmon River Falls Unique Area** (19) (20), owned and managed by NYSDEC. Prior to purchase from Niagara Mohawk in 1993, the Salmon River Falls Unique Area was closed to the public. Under current ownership the property has short distance trails that vary in difficulty such as the ADA-compliant Falls Trail, the strenuous Gorge Trail, and the moderate but often slippery Riverbed Trail.

The gorge of the Salmon River Falls provides unique habitat for plant communities and wildlife. Bald eagles and osprey use the gorge walls for protection from severe weather.

The Salmon River Falls historically was the natural barrier for migrating Atlantic salmon. After the dams and reservoirs were constructed that changed. The flows experienced in the mainstream of the Salmon River bypass the Salmon River Falls and are pipelined from the upper reservoir to the lower reservoir (situated downstream). From headwaters in the Tug Hill to mouth in Port Ontario, the Salmon River is approximately 44 miles and experiences a drop of 1,500 feet in elevation.

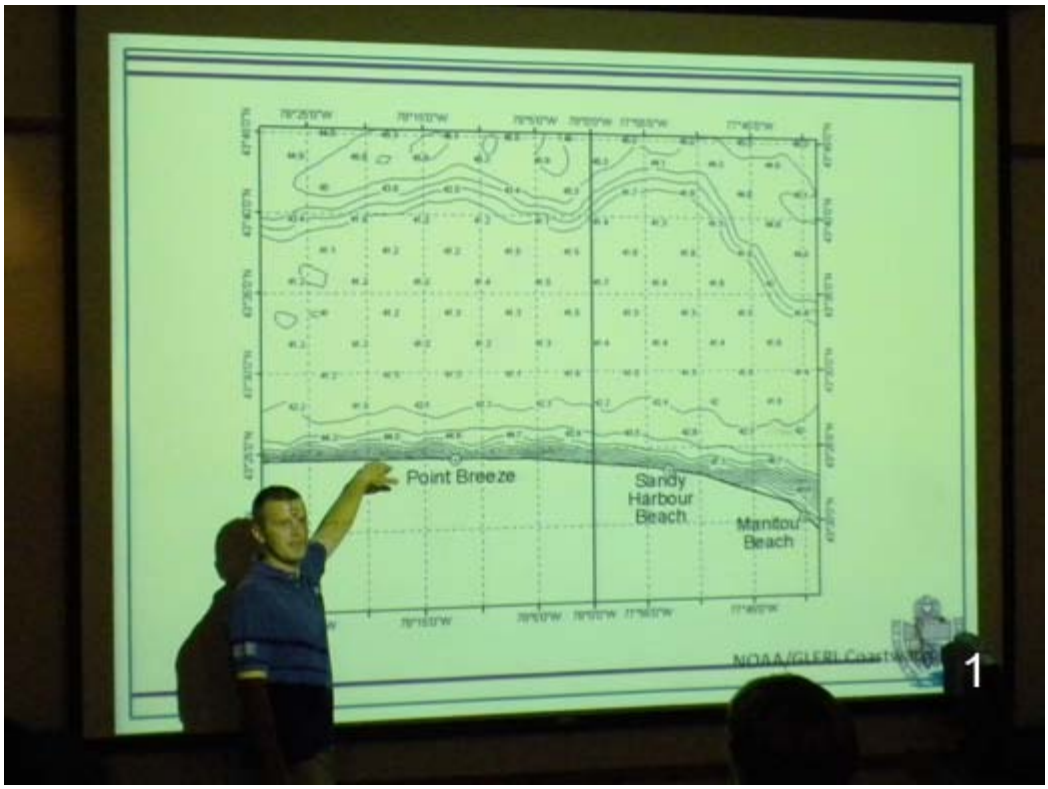
After dinner and the informative, exciting day exploring the Lake Ontario sand dunes and the Salmon River Hatchery, the group headed back to SUNY Oswego. There, the group shared 15 lessons from the **Greatest of the Great Lakes**, a COSEE Great Lakes curriculum CD product that was created a few years ago (For more information, check out NYSG's related news item). Not only were the educators able to describe the classroom activity, some people suggested adaptations that

made it a better activity in classrooms. ***Howard Walter***, the COSEE Great Lakes evaluator, ended the evening by explaining about the challenges and different ecosystems. He was impressed by the thorough nature of the demonstrations.

post by paul, from 2010 Lake Ontario Exploration Workshop — Comments (0)

From the BUBL to Invasive Species Trouble (Day 4)

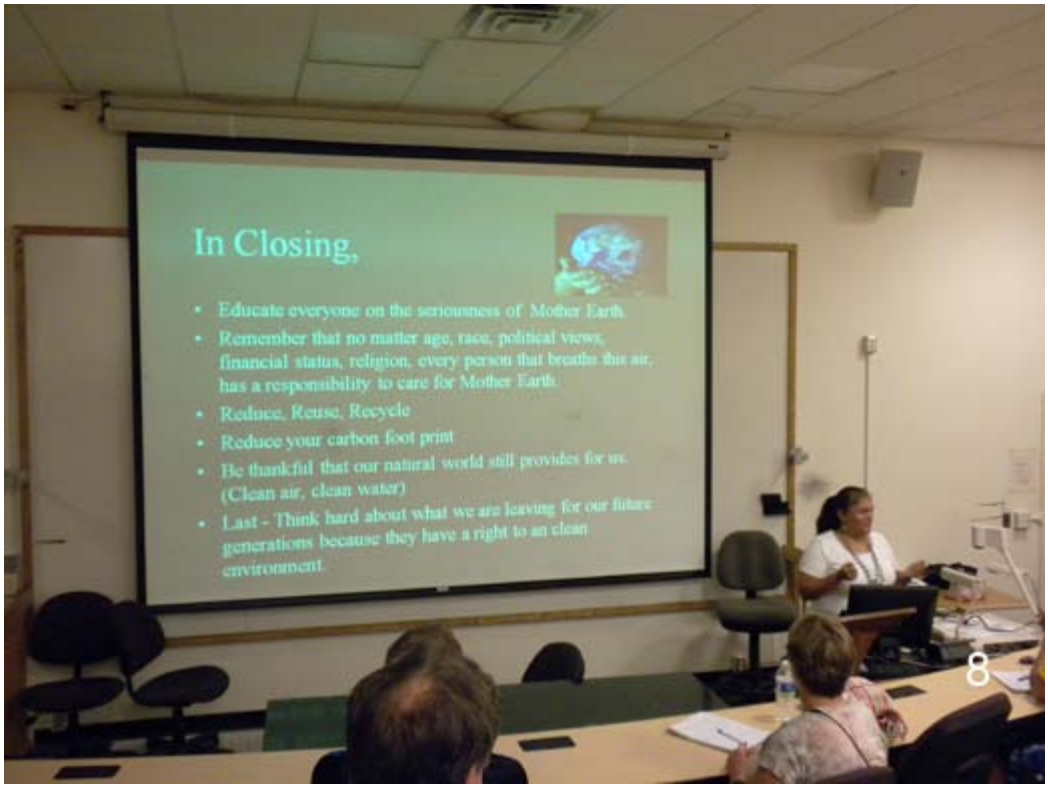
July 28, 2010



The day started with a visit to Niagara University and the biology laboratory of ***Dr. Bill Edwards*** [pictured in (1) above]. “We’re interested in learning how tributaries influence nearshore areas of the lakeshore,” Edwards said of his current research. He’s working with, among others, University at Buffalo’s ***Joe Atkinson***, SUNY College at Buffalo’s ***Chris Pennuto***, SUNY Brockport’s ***Joe Makarewicz*** and SUNY College of Environmental Science and Forestry’s ***Greg Boyer*** on this Lake Ontario Nearshore Nutrient Transport Study (LONNS). Investigators on the LONNS project have been assessing the hypothesis that nutrients are being trapped in the nearshore region, limiting offshore productivity and impacting the nearshore through benthic algae blooms and beach closures.

After Edwards' lecture on Lake Ontario's thermal bar, nearshore currents and water movement in the Lake, our group of educators had the opportunity for some experiential learning. Some of the teachers spent time testing water samples for nitrate (2), dissolved oxygen [(3), left), salinity [(3), right], pH, conductivity and other parameters, while others observed Lake Ontario plankton under a microscope (4) (5). ***Eunice Reinhold*** and ***Scott Krebbeks***, teachers in, respectively, Hamburg and Conesus, NY, excitedly identified copepods, blood worms, and even a juvenile quagga mussels in the sample they checked out.

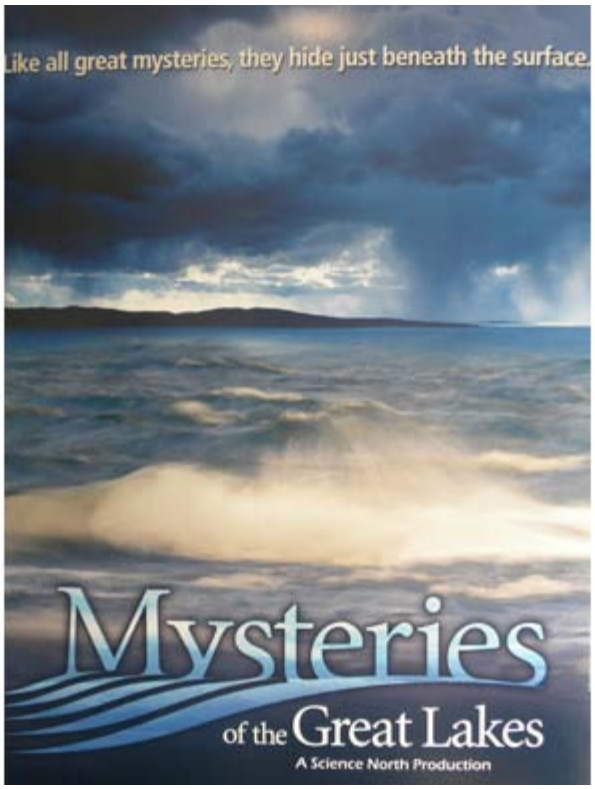
Some of the teachers also familiarized themselves with maps of the Great Lakes (6). Consisting of Lakes Superior, Michigan, Huron, Erie, and Ontario, they form the largest group of freshwater lakes on Earth by total surface and volume. Lake Ontario, the 14th largest lake in the world, is the smallest of them in surface area. It ranks fourth among the Great Lakes in maximum depth, but its average depth is second only to Lake Superior.



After the work in the laboratory, the group had the chance to learn about the Tuscarora Nation from ***Rene Rickard***, a member of the Haudenosaunee Environmental Task Force (7). After a welcome in her native language, Rene shared information about the environmental ethic of her people. Using artifacts such as native corn and beans, beaded moccasins and woven baskets, she shared historic messages and future concerns about the Great Lakes.

As Rene explained, she and her fellow members of the Tuscarora Nation continually give thanks for Mother Earth, the water, plants, animals, trees, birds, winds, stars, and other natural elements. Of the water, she said, “We give thanks to all the waters of the world. Water is life. We know its power in many forms - waterfalls, rain, mists, streams, rivers, and oceans.”

Rene has contributed to other COSEE Great Lakes workshops and her presentations have also been very well received by participants. The educators were impressed with her passion for the environment as she shared the words of thanks that are spoken by the “People of the Longhouse” concerning water, animals, fish and the moon and stars. At the close of Rene’s discussion (8), one teacher asked, “How can you be so thankful for all the elements with all the hardships you face today?” Rene replied, “Our teachings show us we can’t fault people and we need to appreciate what we have.”



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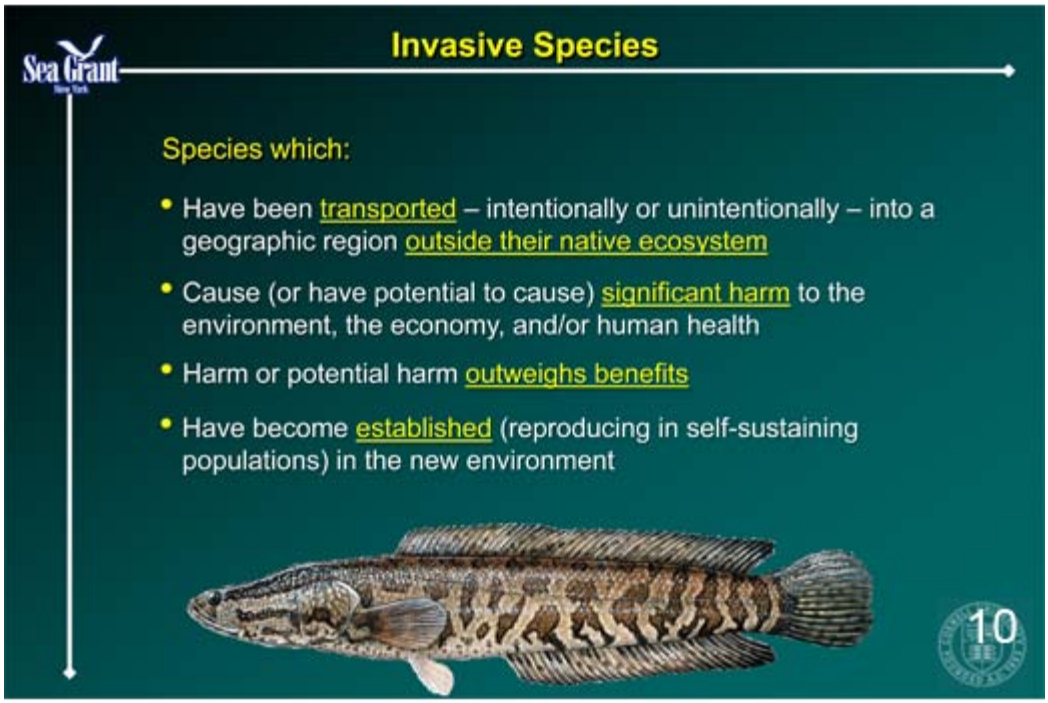
The journey continued east to Rochester, where educators got to experience the **Bathysphere Underwater Biological Laboratory** (BUBL), located at the **Rochester Museum of Science**. BUBL is part of Monroe BOCES and helps students learn about Lake Ontario through a simulated journey below the lake to work at a functional laboratory scenario. Using math, science and technology visiting students learn about the biology, chemistry and shipwrecks of Lake Ontario.

Peter Robson, the technology education educator at BUBL, regaled the group with facts about Lake Ontario and provided a tour of one of the two laboratories that visiting students utilize.

The educators also had the opportunity to view the “Mysteries of the Great Lakes” at the Museum’s IMAX theater (9). The movie focuses on efforts underway to restore lake sturgeon, the largest fish found in the Great Lakes. These prehistoric-looking fish can actually live over 100 years! For more on the movie, check out the Science North Production’s Web site



Chuck O'Neill, the Interim Associate Director of New York Sea Grant, met our group for dinner and afterwards provided us with a lecture on invasive species (10). O'Neill is renowned for his work with the Invasive Species Clearinghouse and the Partnerships for Invasive Species Management (PRISM) in New York (14). His presentation covered the characteristics of invasive species, their ecological and economic impacts and information on some of the notorious plant and animal

species found throughout the state. Some quick facts he provided include:

- As of 2005, about 5,000 non-indigenous species had established free-living populations in the U.S.
- There are over 185 aquatic invasive species (AIS) in the Great Lakes basin
- In New York State, there are approximately 400 aquatic and terrestrial invasive species
- 15% of all invasive species have caused severe harm to agriculture, industry, human health, and the environment
- invasive species are second only to habitat loss as a prime cause of decreased biodiversity.

At the close of his discussion, O'Neill provided the teachers with some resources on invasives (15). "I was impressed with his talk," said teacher Scott Krebbeks. "Particularly, I was pleased to see that there are things that me and my students can do to help." ***Kristin Sheehan***, a teacher from Pulaski, NY, added, "I have a much clearer and greater depth of knowledge on invasive species now. I can't wait to share my ideas with my students in the form of new lessons and activities."

"I didn't realize the impact that invasive species have in the region," said ***Chris Cybulski***, a teacher from Angola, NY. "I was surprised to see that zebra mussels have cost us $1.5-2 billion from 1989 to 2009." Since colonization of the Great Lakes, these benthic filter feeders have covered the undersides of docks, boats, and anchors. They have also spread into streams and rivers nationwide. In some areas they completely cover the substrate, sometimes covering other freshwater mussels. They can grow so densely that they block pipelines, clogging water intakes of municipal water supplies and hydroelectric companies. Zebra mussels thrive because they out-compete with indigenous clams and mussels for both food and habitat.

Prior to the talk, teachers viewed specimens of some of these invasives, including the fishhook waterflea (*Cercopagis pengoi*) (11), bloody red shrimp (*Hemimysis anomala*) (12), and zebra & quagga mussels (*Dreissena* spp.) [(13), quagga mussels].

SUNY Brockport's ***Joe Makarewicz*** has investigated the fishhook waterflea for New York Sea Grant (see related article, pdf).

In a currently-funded New York Sea Grant (NYSG) research project, a team led by Cornell University's ***Lars G. Rudstam*** is investigating such aspects of the bloody-red shrimp as diet, feeding rates, habitat preferences, growth rates, temperature and light preferences. The information from these studies will be used to help predict the likelihood that *Hemimysis* will contribute to food web disruption in the Great Lakes and provide valuable information useful for effective management of this new invader.

For more on zebra and quagga mussels, as well as a host of other invasive critters, check out NYSG's Aquatic Invasive Species site. In addition to information on numerous species, there are links to Web sites of the National Aquatic Nuisance Species Clearinghouse and other Sea Grant, federal, state, local and non-governmental organization invasive species programs.

post by paul, from 2010 Lake Ontario Exploration Workshop — Comments (0)

Electroshocking Fish: In-Seine? No. Safe, Educational? Yes. (Day 3)

July 27, 2010

Olcott, or **Olcott Beach** (pictured in (1) above] as the locals in this lakeside Niagara County hamlet refer to it, is home to the deepest harbor (2) on Lake Ontario west of Rochester. On this day, another sign should be posted, though. One reading, “no fish were harmed during the making of this demonstration.” We’re here with U.S. Fish and Wildlife Service (USFWS) biologists ***Mike Goehle*** and ***Denise Clay*** for a truly interactive fish biology lesson. The pair use equipment aboard their small metal boat (4) (5) to electroshock some fish swimming in **Eighteen Mile Creek**. The fish – which are temporarily stunned so they can be captured for monitoring – were placed in a cooler, identified for our group of teachers (3), and then all safely released back into the Creek.

Eighteen Mile Creek is one of around 40 **Areas of Concern** (AOC) in the Great Lakes (click here for related resources). Nearly a decade after the revised 1978 Great Lakes Water Quality Agreement was signed by

Canada and the United States to “restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem,” the two nations agreed that the worst areas would be given priority attention. Subsequently, 43 such areas were designated as Areas of Concern because they contained contaminated sediment, inadequately treated wastewater, nonpoint source pollution, inland contaminated sites or degraded habitat to a greater degree than the rest of the Great Lakes. Twenty-six of these are solely in the United States, 10 are solely in Canada, and five are binational waterways. Some of the other AOCs in the Lake Ontario region include the Niagara River, St. Lawrence River, and the Rochester Embayment; the Oswego River is one of three AOCs delisted over the years, meaning it is no longer of concern.

Some of the specimens caught during the experiment included: bowfin (6) (9), largemouth bass (7) (10) and pumpkinseed sunfish (8). Adult

largemouth bass average 1-2 pounds and 10-15 inches, but can grow to over 20 inches and nearly 10 pounds. They prefer rocky or gravel bottoms, feed on insects, crayfish and small fishes, and spawn in late spring. Pumpkinseeds, which prefer shallow water with some weed cover, reach a maximum length of about 16 inches, although sizes of 6-8 inches are more typical. As for the bowfin, it, along with gar and sturgeon, are among the few freshwater fish still in existence that were contemporaries of the dinosaurs. When the oxygen level is low (as often happens in still waters), the bowfin can rise to the surface and gulp air into its swim bladder, which is lined with blood vessels and can serve as a lung.

The invasive round goby (11) was first discovered in the St. Clair River, the channel connecting Lake Huron and Lake St. Clair, in 1990. The species, which displaces native fish and can spawn multiple times a year, comes from the same area of the world as the zebra mussel (around the Black and Caspian Seas). Presumably, they arrived the same way as the zebra mussels, too: in ballast water discharged by transoceanic vessels.

The white sucker (12) is a very common bottom-feeding freshwater fish that will eat almost anything it can, but most commonly small invertebrates and plant matter. Larger predatory fish species such as walleye, trout, bass, northern pike, catfish, and muskellunge prey on the white sucker. This species is usually not fished for food, though some consider it good to eat. It is most often used as bait; the young are sold as sucker minnows.

Following the demonstration, Goehle used some water sampling equipment - a plankton net (13) and hydrolab (15) to, respectively, collect plankton and larval fish [examined by teachers in a plastic container, (14)] and run some standard tests (pH, turbidity, water temperature, and dissolved oxygen).

Some plant specimen were collected from the Creek as well, including the native *Vallisneria*, or water celery (16) and two very similar species - the invasive Eurasian milfoil and the native coontail, as displayed by New York Sea Grant's (NYSG) **Helen Domske** (17).

In a two-year NYSG-funded study that wrapped up late last year, University at Buffalo investigator ***Joe Atkinson*** [pictured in green, (18)] and his team created a web-based tool that allows scientists and managers to plot a resource shed for Lake Ontario or Lake Erie at any location of interest. After undergoing testing off-and-on for about a year, Atkinson said, “This tool will be able to plot resource sheds not only for the long-term average hydrodynamic conditions originally proposed but also for a set of historic conditions, for years since about 2000.” His team’s findings were published earlier this year in an *Environmental Science and Technology* journal article. “Our goal was to develop the concept of resource sheds to help users better understand the large scale physical processes that are the forcing factors that underlie many important Great Lakes issues, such as hypoxic [low dissolved oxygen] zones, contamination spread, population declines and disease outbreaks.”

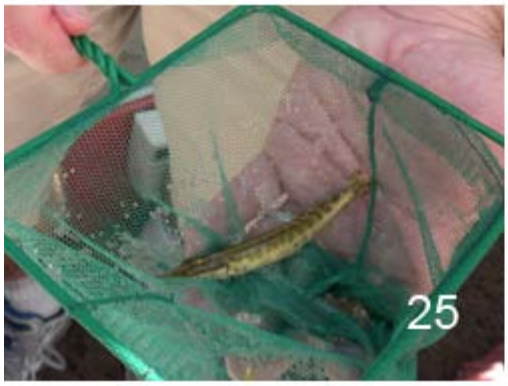
Buffalo State College Biologist ***Dr. Randy Snyder*** is the project leader for a two-year NYSG project designed to improve understanding and accurate forecasting of the condition and growth of alewives (19), an important component of the Great Lakes food web. “They are a great forage fish for Lake Ontario’s salmon population,” he said, “but unfortunately, that’s based on both an invasive (alewife) and an introduced, stocked species (Pacific salmon).”

Snyder is evaluating how lake temperature, ration size and prey composition influence alewife growth and condition. Given the dramatic changes occurring in the Great Lakes food webs, development of accurate measures of alewife condition and growth will improve fisheries managers’ ability to optimize salmonine stocking rates, forecast how changes in food webs or abiotic factors will affect alewife populations, and better predict the impact of alewives on their prey populations.

After Snyder's talk, the teachers were introduced to graduate students [including ***Kevin Cudney***, in white, (20)] working with SUNY College at Buffalo Biologist Dr. ***Christopher M. Pennuto***. Pennuto is the project leader for a two-year NYSG project on the round goby that was completed late last year. The exotic goby has had a significant impact in the Great Lakes and is expanding its range. There is concern over its ecological impact to tributary streams and how readily the goby will expand upstream. "Our assessment of round goby swimming performance should enable us to collaborate with engineers in developing fish passage designs," says Pennuto.

Snyder [in the green t-shirt (22) rejoined the teachers for some seining on the Niagara River (21). Seine nets are usually long flat, weighted nets that hang vertically in the water and are used to encircle, and safely collect, fish for study.

Some of the specimen collected during the activity included: quagga and zebra mussels [in, respectively, the left and right hands (23)], juvenile rock bass (24), juvenile gar (25), red horse sucker (26), smallmouth bass (27), and white sucker (28). "Seining in the Niagara River was a great experience," said ***Erik Bauerlein***, a teacher from Hamburg, NY. "We netted a gar, which I didn't know existed in the Great Lakes. It was equally interesting to electroshocking, when we observed other species of fish I was also unfamilar with, including the bowfin."



The teachers returned to the Buffalo State College Field Station once the fish were properly identified and either released back into the River or collected in coolers for further study. At the field station, the teachers were greeted by Bill Wippert, a photographer for the ***Buffalo News***. Wippert snapped several photos, including ones while the teachers were cleaning off the gear and examining their fish-laden cooler (29). For more, see the *Buffalo News* article.

post by paul, from 2010 Lake Ontario Exploration Workshop — Comments (0)

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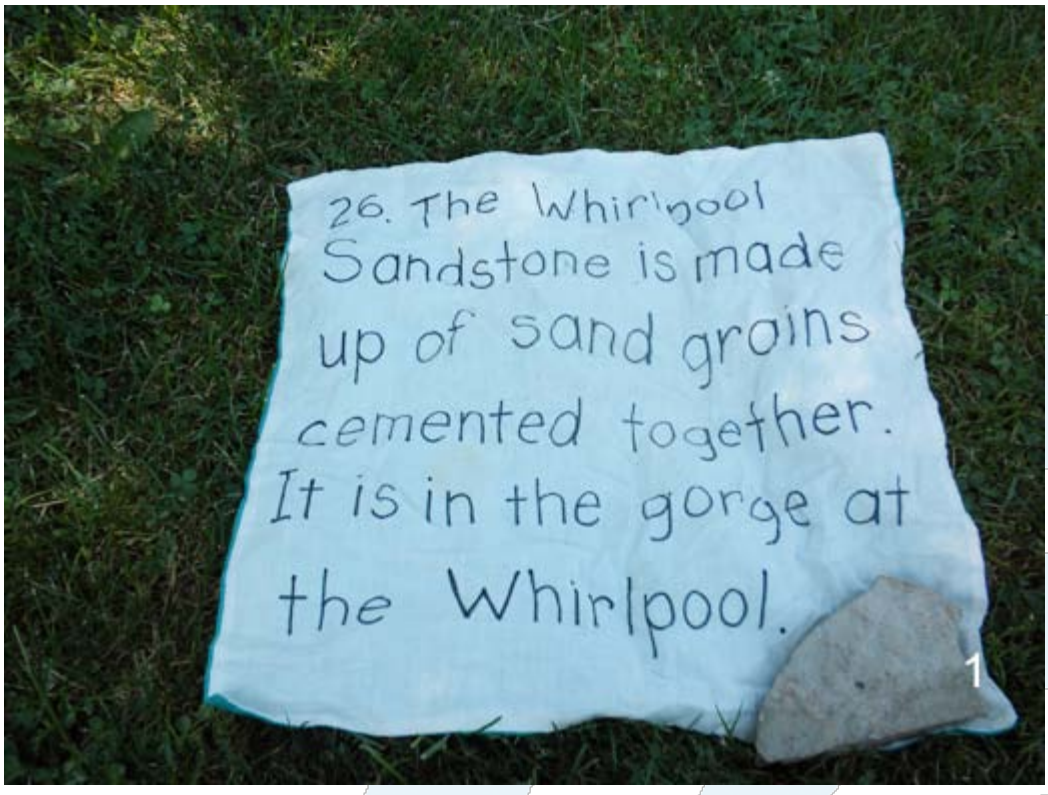
advancing ocean sciences education

Exploring Niagara, Falls and All (Day 2)

July 26, 2010

"I want you to unwrap what's before you, examine it, and pass it along" were the instructions given by ***Susan Diachun*** [pictured in (5) below], a geologist at **Fort Niagara State Park** in Youngstown, to our group, which is seated outside in the round (4). Each of us has a different rock that is representative of the greater Niagara region, along with a brief description on the inside of the cloth wrapping. Mine (1) read, "The Whirlpool Sandstone is made up of sand grains cemented together. It is in the [Niagara] gorge at the Whirlpool." Whirlpool sandstone is the oldest near shore sedimentary rock in the **Niagara Gorge**, formed from sediments during the Silurian Period over 400 million years ago.



As we continued this "wrap and pass" game, Susan gave us some history on how the area came to be. Near the end of the last Ice Age, around 12,300 years ago, the **Niagara River** (which, today, flows north from **Lake Erie** to **Lake Ontario**) began to flow over a large cliff

Search

By Event:

- 2010 Lake Ontario Exploration Workshop
- Shipboard and Shoreline Science on Lake Michigan
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- Shipboard and Shoreline Science on Lake Superior
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- Lake Huron Exploration Workshop
- Lake Superior Exploration Workshop
- Shipboard and Shoreline Science on Lake Erie
- Tropical Marine Ecology 2010 Workshop
- Tropical Marine Ecology 2009 Workshop
- Tropical Marine Ecology 2008 Workshop
- Tropical Marine Ecology 2007 Workshop
- Tropical Marine Ecology 2006 Workshop

known as the **Niagara Escarpment**. Located at the northern end of the Gorge, it is here that **Niagara Falls** first formed. Over thousands of years, the Falls carved through the underlying rock and, as they receded, the Falls formed the 7.1 mile Gorge that we see today - a combination of layers including erosion-resistant limestone and Lockport dolostone (3) (6), as well as shale and fine sandstones (2). Niagara Falls straddles the international border between the Canadian province of Ontario and the U.S. state of New York.

By Date:

- August 2010
- July 2010
- June 2010
- August 2009
- July 2009
- August 2008
- July 2008
- August 2007
- September 2006
- August 2006
- July 2006
- June 2006

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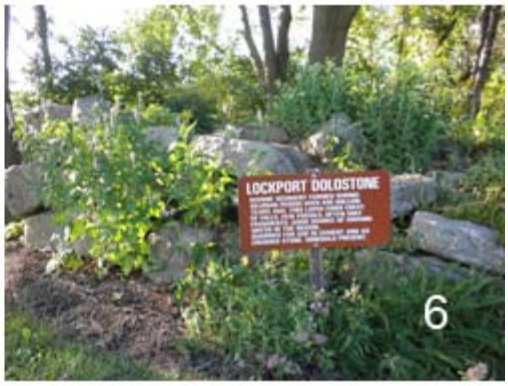

Susan's overview on the region, and the game, too, soon wound down, and the floor was open for questions and comments. ***Scott Krebbeks***, a middle school teacher in Conesus, NY, said, "I had no idea that the geology of Lake Ontario was so diverse, particularly the unusual rocks left behind as the glaciers retreated." ***Kim Ferguson***, a high school teacher in Buffalo, considered the activity "a quick and fun way to learn about the variety of rock types that make up this portion of the Great Lakes region." Several other teachers, including ***Paulette Morein*** from Dunkirk and ***Erik Bauerlein*** from Hamburg, said they found the informative exercise, or at least the method in which it was presented, a good example of what they would like to do in their respective classrooms.

Following Susan's activity, our group walked down to the Niagara River, where we found some ***Cladophora*** (7), a common filamentous algae, in the nearshore area.

While the sight of *Cladophora* may not be pleasant to visitors of the shoreline, it is not harmful to humans. However, it is believed to create, as NYSG's ***Helen Domske*** described to the teachers (8), anoxic conditions (an extreme form of hypoxia or "low oxygen") ideal for botulism, a neurotoxin that has affected a number of fish and bird species in the Great Lakes, including, respectively, round gobies and loons. ***Eunice Reinhold***, a teacher in Hamburg, said, "I was surprised to learn how botulism can disrupt a food chain and cause havoc in an ecosystem." For example, botulism is potent enough when present in Lakes Ontario and Erie to make round gobies sick. Eating just two gobies affected by the toxin can, and often does, kill a loon. For more on botulism, see **Sea Grant's "Botulism in Lakes Erie and Ontario" Web site** (click here).


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Following our visit to Fort Niagara State Park, we made our way over to the **Aquarium of Niagara** (9), where the group was treated to a lively discussion by Helen (once an Aquarium employee before coming to Sea Grant about 18 years ago) on aquatic species commonly found in the northeast. These included hermit crabs (10), the American Lobster (11), and crabs (14). The teachers then explored the touch tank themselves (12), also discovering sea stars, blue mussels, horseshoe crabs, clams, and sea urchins. "I loved the touch tank," said ***Kristin Sheehan***, a teacher in Pulaski. "It just solidifies the idea that the best kinds of learning are hands-on." Experiences like Kristin's were duly noted by ***Buffalo News*** reporter Richard Baldwin [pictured in (13), with Helen], who was working on a story about this year's Lake Ontario Exploration Workshop. Baldwin arrived just as group finished a one-on-one session with Opus, a 22 year old female Humboldt Penguin (15). Humboldt, or Peruvian, Penguins are medium-sized South American penguins, breeding in coastal Peru and Chile and growing to 26-28 inches long and weighing around 8-13 pounds. During the meet-and-greet, the teachers were able to pet Opus' small, stiff overlapping feathers, which help to keep her body temperature between 100-102 degrees Fahrenheit. She often flapped her sturdy wings as a means to keep herself cool.


10


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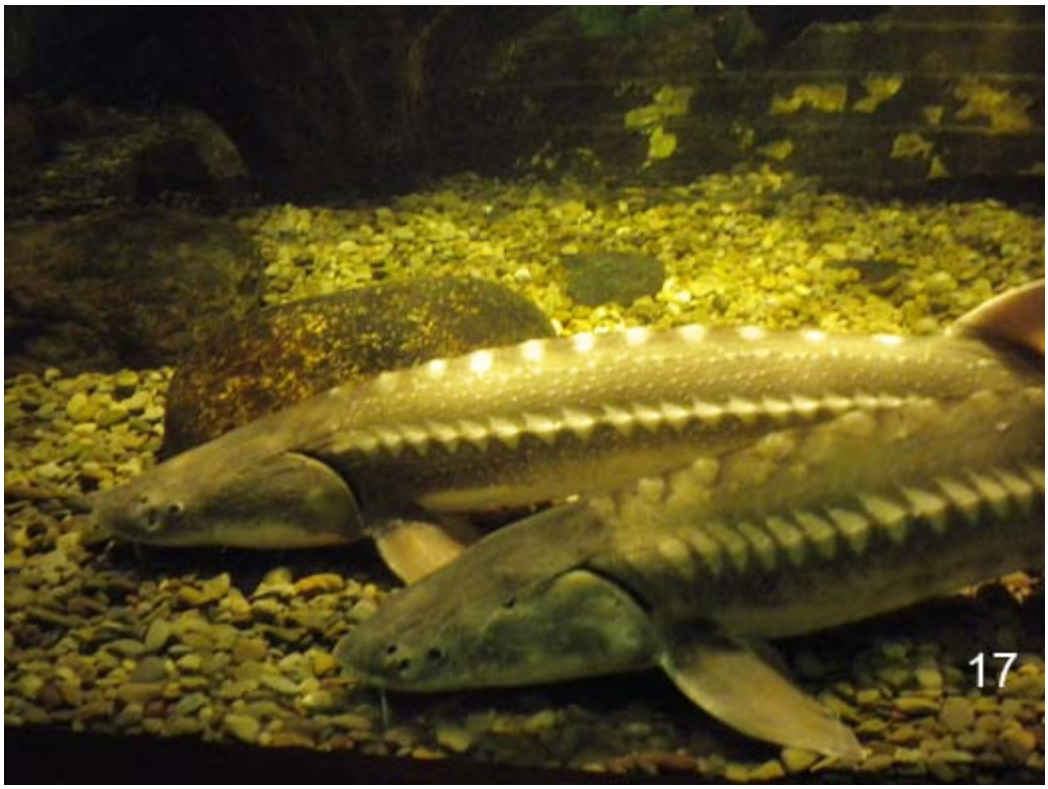
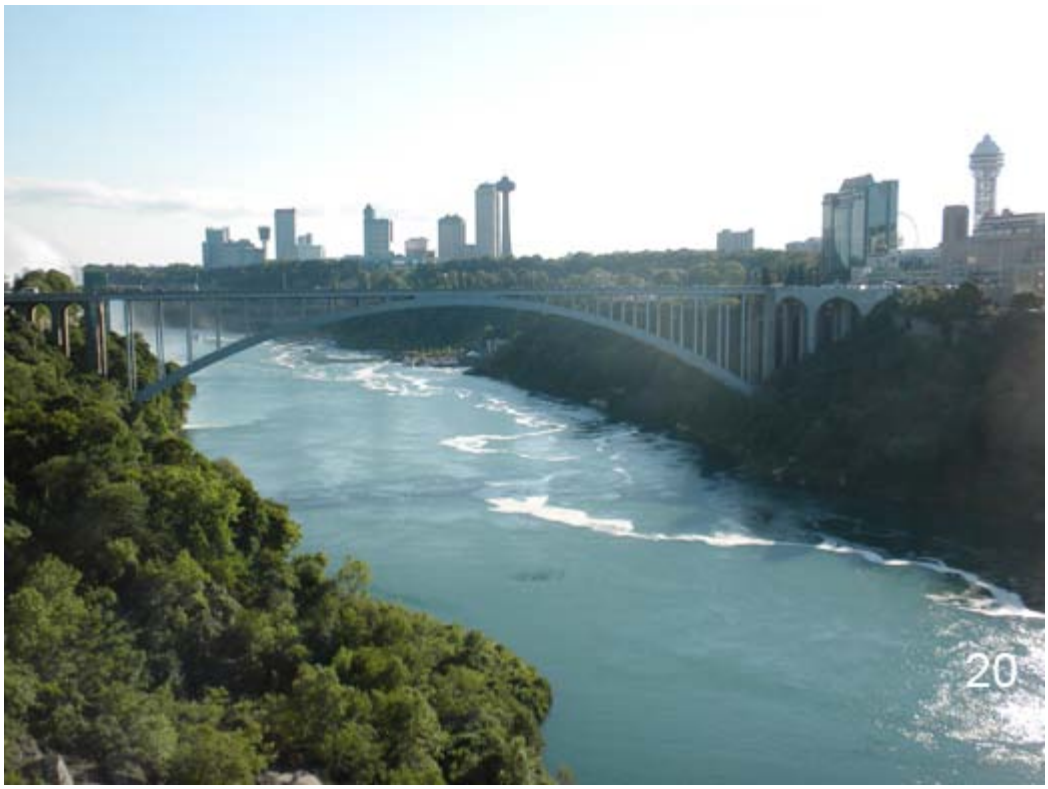
Public exhibits at the Aquarium included some “fish of the Great Lakes” tanks, which featured, among other species, carp (16), lake sturgeon (17), brown bullhead, white perch, rock bass, walleye and both small and large mouth bass.



We couldn't leave the Aquarium without taking a walking bridge over to sights way above the Niagara River (20) and, not far off, the Niagara Falls. As Helen explained at one of the displays along the way (18), Niagara Falls continue to be renowned both for its beauty and as a valuable source of hydroelectric power, although managing the balance between recreational, commercial, and industrial uses has been a challenge for the stewards of the Falls since the 1800's. The Falls is a large draw for tourists, many of whom get up-close through a Maid of the Mist boat tour (19). While not exceptionally high, Niagara Falls is very wide. More than 6 million cubic feet of water falls over the crest line every minute in high flow, and almost 4 million cubic feet on average. It is the most powerful waterfall in North America.



post by paul, from 2010 Lake Ontario Exploration Workshop — Comments (0)

Real-Time Lake Learning Gets Google-d (Day 1)

July 25, 2010

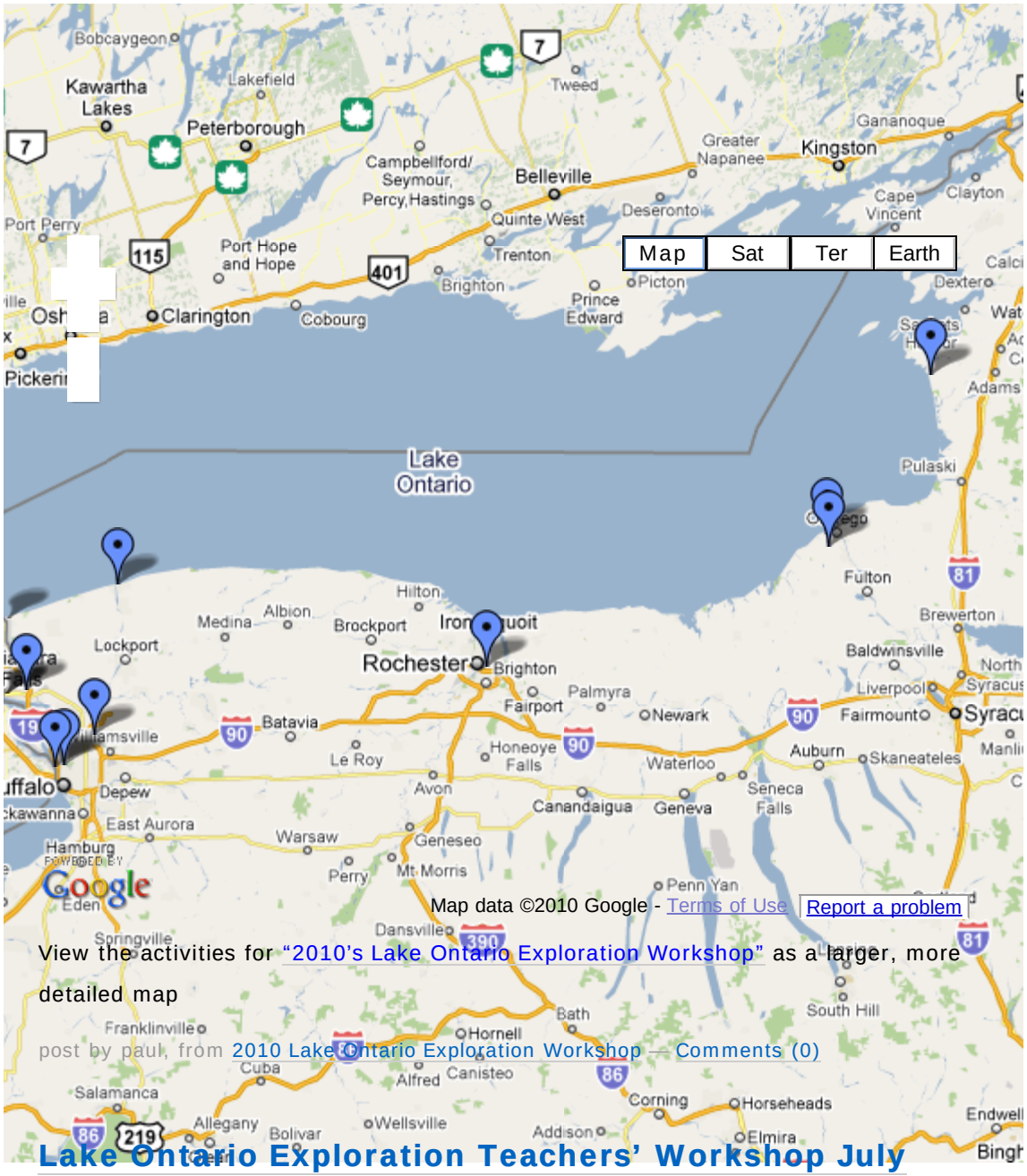
Early this afternoon, fifteen 4th -10th grade teachers and other educators from around the Great Lakes basin arrived at the **University of Buffalo** in New York to take part in **2010's Lake Ontario Exploration Workshop**. The week-long event is presented by **New York Sea Grant (NYSG)** and the **Centers for Ocean Sciences Education Excellence (COSEE) Great Lakes** and sponsored by the **National Science Foundation (NSF)** and the **National Oceanic and Atmospheric Administration (NOAA)**.

Teachers came from as nearby as Buffalo and other areas in Erie County (Hamburg, Grand Island, Angola, Springville and Williamsville) to as far as North East Pennsylvania and Carolina Beach, North Carolina, the latter through an exchange program where a teacher from the marine environment comes to learn about the freshwater Great Lakes and vice versa. Others arrived from Rochester and the Oswego area, as well as Conesus (in NY's Livingston County, north of Dansville) and Dunkirk (in Chautauqua County, bordered on the north by Lake Erie).

In just the first few hours of the workshop, the teachers were sharing how much they were already learning, one saying, “I am astounded at how little I actually know about the awesome features Mother Nature created just outside my backyard. It’s incredible the impact that glaciers have had in what we’re witnessing today in this area.” This teacher is reflecting on a geology lesson on the Great Lakes, which I’ll cover tomorrow.

This is the second time in as many years that I (NYSG’s Science Writer and Web Content Manager, ***Paul C. Focazio***) have had the opportunity to shadow a group of teachers and educators as they discover all they have yet to learn (and take stock in what they currently know) about Lake Ontario and the vast Great Lakes system. My first experience was aboard the U.S. Environmental Protection Agency’s 180-foot *R/V Peter L. Wise Lake Guardian* in July 2008 for some “Shipboard and Shoreline Science on Lake Ontario” (see COSEE blog entries and NYSG’s event follow-up resources). Through this week, though, I’ll make a number of stops along the lakeshore with this new group of teachers (and our leader, NYSG’s Coastal Education Specialist ***Helen Domske***) instead by foot (and, for those more distant excursions, by van, of course).

As you’ll see in the clickable Google Map below, the members of our group have quite an extensive itinerary laid out before them - from stops in the Buffalo region (including **Fort Niagara State Park**, the **Aquarium of Niagara** and, even around Niagara Falls) to stops in Rochester (like its **Museum of Science**) and Oswego (such as its



View the activities for "2010's Lake Ontario Exploration Workshop" as a larger, more detailed map

post by paul, from 2010 Lake Ontario Exploration Workshop — Comments (0)

Lake Ontario Exploration Teachers' Workshop July 25-30, 2010

July 19, 2010

From July 25-30, 2010, the **Centers for Ocean Sciences Education Excellence (COSEE) Great Lakes** will host 15 selected educators to learn from lake scientists at research sites on the **Niagara River** and in **Rochester**, **Oswego** and other locations along New York's **Lake Ontario** shoreline.

New York Sea Grant (NYSG) has invited 4th through 10th grade teachers and non-formal educators from the Great Lakes region to take part in this **National Science Foundation** and **National Oceanic and Atmospheric Adminstration (NOAA)**-sponsored event. NYSG Coastal Education Specialist ***Helen Domske*** leads this week-long experiential

workshop.

We'll be blogging daily starting on Sunday, July 25th. For more information, contact Helen Domske at hmd4@cornell.edu.

post by paul, from 2010 Lake Ontario Exploration Workshop — Comments (0)

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