2013 Lake Ontario Ecosystem Forum

State University of New York (SUNY) at Oswego
Campus Center Building, Room 132
Oswego, NY 13126

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SUMMARY

Welcome
Jen Baker, New York State (NYS) Department of Environmental Conservation, and
Mary Vanouse, Director of Community Development, City of Oswego

Jen Baker welcomed participants to the forum and explained that the forum was sponsored by the U.S. Environmental Protection Agency (EPA), NYS Department of Environmental Conservation (DEC) and New York Sea Grant to provide the opportunity for participants to learn about the Lakewide Action and Management Plan (LAMP) and Lake Ontario research being conducted under the Great Lakes Restoration Initiative (GLRI). The forum was not intended to focus on water levels or related regulations.

Mary Vanouse welcomed the participants to Oswego on behalf of the mayor. She noted that U.S. and Canadian management efforts have improved the shoreline and beautiful waters of Lake Ontario. The forum will focus on the Lake Ontario LAMP as well as future restoration efforts. The waterfront has improved immensely, and the goal is to restore the lake to its former pristine glory.

Lake Ontario Lakewide Action and Management Plan (LAMP)
Don Zelazny, NYS Department of Environmental Conservation

Don Zelazny explained that he is frequently asked how the lake is doing, and he has struggled with how to answer that question for years because there is no simple answer. There are many changes over time, including new threats that must be addressed. To accomplish this, the LAMP was implemented.

Lake Ontario is the 14th largest lake in the world and contains the largest watershed relative to the surface area of the lake of all of the Great Lakes. It is a freshwater inland sea. It receives 83 percent of its water from Lake Erie via the Niagara River, which creates a shoreline plume throughout most of the year. The center of the lake is nutrient-poor, whereas the nearshore zone is nutrient rich, with the overabundance of nutrients causing algal blooms. This complex dichotomy makes it difficult to create management plans to improve the system. Because it is the furthest downstream Great Lake, it is particularly susceptible to upstream nutrients, contaminants and invasive species from the four Upper Great Lakes. Approximately 10 million people live in the Lake Ontario watershed, with 2 to 3 million of those people living in the state of New York. The west end of the lake near Toronto, Ontario, is seeing tremendous population growth, creating additional problems that must be addressed. Three binational agreements manage different aspects of the lake. The Boundary Waters Treaty addresses water levels and flows, the International Convention for Great Lakes Fisheries manages sustainable fish populations, and the Great Lakes Water Quality Agreement (GLWQA) addresses water and ecosystem quality. EPA and Environment Canada are the lead agencies for the GLWQA, and the LAMP derives its authority from the GLWQA, which in turn has a standing of law under the Clean Water Act (CWA).

The purpose of the Lake Ontario LAMP is to protect, restore and maintain the Lake Ontario ecosystem and its watershed. Three broad goals also were established. First, the Lake Ontario ecosystem services should be maintained and, as necessary, restored or enhanced to support self-reproducing and diverse biological communities. Second, the presence of contaminants will not limit human uses of fish, wildlife and waters of the Lake Ontario basin nor cause adverse health effects in plants and animals. Third, people will conduct activities with responsible stewardship for the Lake Ontario basin. The LAMP is a management plan that is designed to implement existing programs and policies on a collaborative, binational basis rather than advocate for new policies. The LAMP is managed by four federal, state and provincial government agencies. Additional agencies participate on workgroups and technical advisory committees. These agencies rely heavily on nongovernmental organizations, research universities, local groups and the general public. The GLWQA includes a Cooperative Science and Monitoring Initiative, which focuses available funding and resources on one Great Lake annually within a 5-year cycle. Lake Ontario's intensive monitoring year under the initiative is 2013, with efforts to understand the nutrient inputs, nutrient cycling and foodweb dynamics in the lake so that the best restoration actions are taken.

A participant asked whether Mr. Zelazny thought that current legislation was adequate for the task of restoring Lake Ontario and whether there were dedicated funding sources for Lake Ontario restoration. Mr. Zelazny responded that the legislative authority for the LAMP and GLWQA is found within the CWA; there are many elements and commitments that the U.S. and Canadian governments have made that require additional authorities as well. For example, invasive species are not fully covered under the CWA but are addressed via other laws, regulations and agencies. Mr. Zelazny thought that there were enough authorities established, but the challenge is to use the available authorities to accomplish needed actions. Currently, funding is at its highest for the Great Lakes; President Obama's focus on the Great Lakes has resulted in a 5-year, $1.2-billion program (the GLRI). Most of the studies being presented at this forum are a result of this funding.

Quality of Lake Ontario Beaches
Kelly St.-Clair, NYS Department of Health

Kelly St.-Clair explained that the NYS Department of Health is responsible for public beach regulation via the NYS Sanitary Code, which outlines water quality requirements. The NYS Department of Health also is responsible for drowning and injury prevention; the state of New York has the lowest drowning rate in the United States, even with more than 1,600 regulated public beaches. Beach water quality is monitored via bacterial indicator standards, and when beaches exceed these standards, they are closed or placed under an advisory while the bacterial source is investigated. The Sanitary Code also calls for investigations into possible sources of pollution. Four categories of bacteria are included in the standards, and EPA considers *Escherichia coli* and *Enterococci* to be the most reliable, and therefore recommended, indicators to assess water quality for the risk of gastrointestinal illness. Bacterial indicators are assessed using a typical dose-response curve that correlates bacterial indicators with likelihood of swimming-associated illness. It is a cost-effective method to determine whether a pollution source has infiltrated a beach.

The federal Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000 requires bacterial indicator monitoring of Great Lakes and coastal beaches, with EPA designated as the responsible agency. Under the BEACH Act, 342 beaches in the state of New York must be monitored, including 23 Lake Ontario beaches and 17 Lake Erie beaches. As part of the BEACH Act, the state of New York collects the monitoring and beach action information from participating local jurisdictions; data trends during the previous 5 years have remained fairly consistent. A "day under a beach action" is defined as a day when the beach is closed or under advisory. Preemptive protocols result in beach closures when environmental conditions associated with increased

bacterial indicator concentrations exceed guidelines (e.g., rainfall, water clarity, algae density). Most New York beaches are open for swimming a vast majority of the time. The Great Lakes beaches have greater closure rates compared to marine beaches, possibly because marine beaches are less subject to urban stormwater, contain sand buffer areas and experience tidal flushing.

These data have been used to apply for additional funding and increased investigative work. Monitoring and notification are protective of public health, but the pollution sources affecting the beaches should be identified and the sources eliminated to protect public health and improve water quality. When regional EPA staff was able to secure additional BEACH Act funds for the state of New York, some additional funds were provided to appropriate jurisdictions to identify pollution sources at the highest risk beaches. Enhanced sanitary surveys were implemented at 14 beaches, including two on Lake Ontario. Additional funds were secured through the GLRI to perform enhanced monitoring and sanitary survey work on nine Lake Ontario beaches, 13 Lake Erie beaches and 16 St. Lawrence River beaches. This funding has allowed more in-depth investigations with the ultimate goal of identifying and reporting pollution sources. Point sources include sewage, combined system overflows, failing septic systems and concentrated animal feeding operations; nonpoint sources include birds, agriculture and algae. The NYS Department of Public Health and Health Research Inc., a nonprofit research organization, also obtained grants to develop a website for beach water quality information, which should "go live" prior to the 2014 beach season. Grant money also is being used to implement rapid test methods, including EPA-approved qPCR, that decrease turnaround time from 24 hours to 2 to 3 hours.

Because beaches are a valuable resource, it is important to preserve them. Measures to improve water quality include: proper sanitary sewer hookups; proper design, installation and maintenance of septic system; proper disposal of animal waste; reduced application of phosphorus; and implementation of rain collection and other storm water runoff mitigation practices.

A participant noted that the "percent days under beach action" appeared to have decreased after 2009 and wondered whether the cause was known. Ms. St.-Clair said that she has not been able to examine the larger data set that may connect the causes.

A participant cited a sunscreen effectiveness survey that indicated that most sunscreens are ineffective and wondered whether there was a way to address pollution from ineffective products, particularly for Sylvan and Verona Beaches. Ms. Saint-Clair said that she could discuss this with her colleagues.

The Changing Lake Ontario Foodweb
Lars Rudstam, Cornell University

Lars Rudstam displayed a diagram of the Lake Ontario offshore foodweb, which now includes several invasive species. His research focuses on *Diporeia* and *Mysis*, two genera of small crustaceans, as well as predatory water fleas and quagga mussels, both of which are invasive species. Lars noted that invasive species restructure the foodweb. His project involves mostly offshore sampling from ships operated by New York State, EPA, the Province of Ontario and the Canadian federal government and is a true binational collaboration. The group collects water at different depths, which allows the researchers to examine the depth structure of organisms. Surveys have illustrated the changes that have occurred in Lake Ontario during the last few decades, with phosphorus being the limiting nutrient in the lake. Water clarity has increased during this time because of the decrease in phosphorus. Zooplankton biomass in the upper waters has decreased and this decrease could affect the fish population. The decline in 2005 was associated with invasive predatory water fleas. But the decline of zooplankton in the upper water is compensated to some degree by increases in the deeper waters of Lake

Ontario. The increasing clarity (transparency) at the surface of Lake Ontario is associated with more deep algae and zooplankton. A deep chlorophyll layer in the lake has increased algae and productivity in deeper water compared to the past. Approximately 80 percent of zooplankton are living in deeper water, which has caused alewives, an invasive species of prey fish, to migrate to deeper waters as well. The biomass of *Mysis* is higher than the biomass of fish in certain layers, and *Diporeia*, once a major food source throughout Lake Ontario, has nearly disappeared. The state of Lake Ontario is investigated in more detail by the collaborators every 5 years, and 2013 is one such year.

In terms of Lake Ontario's nearshore environment, changes have occurred as a result of invasive mussels, which in turn have created thick algae mats. Total phosphorus generally is higher nearshore and at embayments and rivers compared to Lake Ontario offshore waters. Offshore nutrient loading in Lake Ontario is influenced by Niagara River inflows, carrying water from Lake Erie. Nearshore algal blooms result from local nutrient input.

A participant commented that he examines several types of chlorophyll to determine which algae groups are present. Lars noted that this is an approach used in 2013 to separate different algal groups. The participant added that there also is a decrease in number of diatoms in Lake Michigan and Lake Huron. Comparing the Great Lakes and the mechanisms occurring in each could be beneficial for understanding the causes of ecosystem change in Lake Ontario.

Restoration of Native Fish Species
Jim Johnson, U.S. Geological Survey (USGS)

Jim Johnson explained that several important fish species native to Lake Ontario are at low levels of historic abundance. The objective of his project is to restore the native fish community at two different trophic levels, which has never has been attempted on a lake the size of Lake Ontario. The late Dr. Dwight Webster, professor of fishery science at Cornell, stated in 1982 that in the 1800s "Lake Ontario and certain lesser lakes tributary to the St. Lawrence River represented the most striking worldwide example of freshwater colonization by the Atlantic salmon." This quote puts into perspective the global importance of salmon. Lake Ontario is believed to have the largest freshwater Atlantic salmon population in the world.

The objectives specific to restoring Atlantic salmon populations to New York waters are to: (1) increase natural reproduction in the Salmon River system, (2) increase returns of mature salmon to Beaverdam Brook, and (3) increase the recreational catches in the Salmon River system. Fishermen have volunteered to help stock the Salmon River. So far, 175,000 fall fingerlings and 30,000 yearlings have been stocked. The goal is to collect and spawn returning adult salmon that are adapted to the Lake Ontario environment. Fingerlings and yearlings are externally marked so that the researchers can identify their fish without killing them. The first successful natural reproduction of salmon in Salmon River in more than a century occurred in 2009, and the researchers have documented successful natural reproduction in four of the previous five years. The Saint Regis Mohawk Tribe also has an interest in stocking the St. Regis River with Atlantic salmon.

Ciscoes (including deepwater bloater and shallow water lake herring) have been chosen for rehabilitation to diversify prey fish, reduce thiaminase, and improve salmon and trout reproduction. These native fish, which are adapted to the Lake Ontario environment, also increase the stability of the prey fish community, fill an "empty" niche, and help restore historical foodweb structure and function. Recently hatched salmonid fry showed low survival rates caused by consumption of alewives, which contain high amounts of thiaminase that interfere with successful salmon reproduction. Restoring the diverse native prey base, including bloaters and lake herring, will alleviate this problem. Bloaters have become extinct in Lake Ontario but still exist in the upper Great Lakes, so a

source of eggs still is available. Because bloaters spawn in January and February at a depth of 400 feet, there are unique challenges for collecting eggs from wild fish in spawning condition. Fortunately, a small fleet of commercial fishermen still net bloaters in Lake Michigan, and U.S. Fish and Wildlife staff were able to accompany these fishermen and collect eggs. The collected eggs were transferred to special hatcheries in Ontario and New York; approximately 20,000 of these fish will be stocked in Lake Ontario in 2013. Lake herring are present in the eastern basin of Lake Ontario but are absent from the western end of the lake where they historically have been present. Approximately 10,000 lake herring were stocked into the Irondequoit Bay in December 2012, with more plans for stocking in 2013. Research on spawning success and early survival continues at Cornell University and The Nature Conservancy.

A participant asked whether acid rain levels affect spawning. Dr. Johnson replied that acid rain cannot be discounted but in a system as large as Lake Ontario, it is not as great of a threat. Acid rain has more effect on Adirondack-type lakes. Although salmon spawn in shallow waters, which might be affected more by acid rain, other species' reproduction is not affected. Thiaminase has been identified as the problem with the low success rates in Atlantic salmon.

A participant asked about the temperature control boundaries established for bloaters at the hatcheries. Dr. Johnson responded that the hatcheries keep the water as cold as possible, but this delays the hatch, which in turn affects feeding. Temperature is very important to success.

A participant asked how the alewives arrived in Lake Ontario, and Dr. Johnson explained that they appeared approximately 100 years ago when the Welland and Erie Canals were opened.

Contaminants in Great Lakes Fish, With a Focus on Lake Ontario

Jim Pagano, SUNY Oswego Environmental Research Center

Jim Pagano explained that the Great Lakes Fish Monitoring Program (GLFMP) is an EPA program administered by the Great Lakes National Program Office (GLNPO) that was established in the 1970s as part of the GLWQA. It involves partnerships with Great Lakes states, federal agencies and tribes and monitors contaminant trends in the open waters of the Great Lakes using fish as indicators. The program also assesses the overall effects of toxins on fish and fish-consuming wildlife. Data generated by the program are used by other agencies, nongovernmental organizations, Great Lakes states and tribes, and other researchers. Samples collected under the program are taken from two sites in each Great Lake, alternating between the two sites every other year. The program monitors for legacy contaminants from the 1950s and 1960s emerging contaminants, including polybrominated diphenyl ethers (PBDEs).

Polychlorinated biphenyl (PCB) levels in the top predator fish of the Great Lakes, lake trout, have declined since the 1970s. PCBs are a useful indicator for a broader suite of persistent toxic substances, and overall PCB concentrations are declining the fastest in Lake Michigan, followed by Lakes Huron and Ontario. There was no statistically significant PCB concentration trend in Lakes Superior and Erie between 1999 and 2009. One GLRI action plan goal is a long-term cumulative percentage decline in average concentrations of PCBs in Great Lakes fish. As of 2009, the average Great Lakes whole fish total PCB concentrations have decreased by 44.3 percent relative to 2000, which surpasses the 2010–2013 annual goals. Contaminants from legacy industrial activity in the Great Lakes are declining at different rates. Total mercury concentrations in lake trout in Lakes Ontario and Michigan are decreasing, whereas these levels are increasing in Lake Erie; Lakes Huron and Superior show no trend as a result of a lack of good data. Mercury levels are critical because of human health threats. There is a

correlation between lake surface area and mercury concentration in lake trout, indicating possible atmospheric loading. Levels of PBDEs, which were banned in 2004, have leveled off in Lake Ontario and are decreasing in the other Great Lakes. It is important to continue surveillance of chemicals because they are bioaccumulative and affect the environment. The program also compares levels of polychlorinated dioxins and furans, which are byproducts of combustion among the Great Lakes and Finger Lakes.

Another aspect of the GLFMP is surveillance, and the program has acquired advanced instrumentation from $6.5 million in funding that allows close examination of chemicals in the environment. The initial list of potential contaminants included 22,000 chemicals from the Howard and Muir list that could be bioaccumulative; of these, 600 were considered to have the potential to be persistent, bioaccumulative and toxic. The final prioritized list includes 51 compounds. Data from the advanced instrumentation indicate that lake trout display numerous chemical compounds, indicating a wide variety of contaminants contained within the fish. Synthetic musk compounds, used in personal care products, enter the lakes via wastewater discharge and atmospheric deposition. Levels of two of these musk compounds are highest in lake trout from Lake Ontario. Perfluorooctane sulfonate (PFOS), which was used as surface-active agent in fire-fighting foams, coating additives and cleaning products, was phased out in 2002; none of the Great Lakes show any apparent trends in whole fish PFOS concentrations.

A participant asked about the SUNY Oswego Environmental Research Center. Jim explained that the scientists at the center focus on academic research and rarely make presentations in public forums such as this one. A participant asked how many students were associated with the center. Jim responded that hundreds of students had passed through the center over the years, most of who move on to attend graduate school.

A participant asked about the toxicity levels associated with the musks. Mr. Pagano replied that some have the potential to mimic estrogens, which can cause reproductive problems, but they are not toxic.

A participant asked about Brownfields sites (e.g., chemical plants on the Niagara River). Mr. Pagano explained that many of the sites were remediated.

A participant asked about dioxins formed during trash burning. Mr. Pagano responded that industrial burning in incinerators is completed under controlled conditions under high heat, so dioxin levels are relatively low. Personal trash burning in burn barrels creates far more dioxins/furans.

A participant asked whether the dioxins in Lake Ontario have been carried downstream from other sources. Mr. Pagano explained that there are transport pathways, but most of the dioxins are a result of the amount of the people and industry surrounding Lake Ontario.

Lake Ontario Coastal Wetlands: Restoration and Invasive Species Management
Mat Levine, The Nature Conservancy

Mat Levine explained that the Eastern Lake Ontario Dune and Wetland Complex comprises 16,000 acres along 17 miles of shoreline in Oswego and Jefferson Counties, making it the largest inland dune system in the eastern Great Lakes. It consists of high-quality freshwater marshes, swamps, fens and aquatic beds; the dunes impound the wetlands. Healthy coastlines and wetlands help to provide a healthy economy and quality of life for the state of New York. Fish spawning, breeding marsh bird and wildlife habitats have resulted in 5,000 acres of wildlife management areas, two Nature Conservancy preserves, and two state parks that are open to the public. The Central Western New York Nature Conservancy was awarded two GLRI grants totaling more than $700,000 for 3

years. The funded projects included wetland restoration, invasive species prevention and control, and improvement of natural flows.

To restore wetland habitat for native fish and breeding marsh birds in cattail wetlands, two miles of channels to the interior of a cattail marsh and four acres of open water potholes were created; the new habitat has been monitored for three years to determine effectiveness. The area historically was open water with some grasses but as it transformed into a cattail marsh, plant diversity decreased. Ducks Unlimited and the NYSDEC partnered in the two-week excavation effort. The researchers chose to monitor three species to determine the effectiveness of the excavation: muskrats, black tern (a state endangered species) and northern pike. There are signs of muskrats, as measured via den density, and the numbers of black terns are steady, although the birds do not use the artificial nesting platforms that were built as part of the project. Northern pike were found in the channels immediately following excavation and have been present each year. Vegetation also is being monitored, and invasive plant species have not increased. A mix of vegetation species is returning, but it is too early to interpret the results.

The invasive species prevention and control portion of the project has been divided into two subcomponents: (1) early detection and rapid response; and (2) control of established invasives. To accomplish the first subcomponent, 56 miles of water bodies near eastern Lake Ontario were searched each year between 2011 and 2013, and more than 120 bags of water chestnut were pulled. This was managed by hand, and resulted in the annual removal of virtually all water chestnut discovered in the project area. To accomplish the second subcomponent, 8,000 *Galerucella* beetles were released to biologically control purple loosestrife plants, more than 40 acres of glossy buckthorn were treated, and three stands of *Phragmites* were cut and treated in the Deer Creek Marsh Wildlife Management Area.

To improve natural flows, the final aspect of the project, three culverts were installed on Hollis Tract Road by the Town of Sandy Creek. Installation of this road caused premature conversion of wetland to woody habitat, so these culverts will improve the hydrologic connection of the fen, reduce the woody succession and improve the habitat for the state endangered bog buckmoth.

A participant asked whether additional funding would be available for other areas. Mr. Levine responded that The Nature Conservancy is a primary partner in a similar excavation project in Braddock Bay near Rochester.

A participant noted that black tern populations across North America have declined and asked whether anyone was studying the reason for this decline. Mr. Levine did not know of any specific studies.

A participant wondered how feasible it was to protect against invasive species in a popular kayaking area. Are there efforts to ban the use of private kayaks and instead provide local rentals? Mr. Levine agreed that it is a high-use recreation area. Signs that educate people about invasive species and how to control them are present, but he did not think further enforcement would be implemented.

***The Lake Ontario Fishery and the New Research Vessel* Kaho**
Brian Lantry, USGS

Brian Lantry explained that the Lake Ontario Biological Station is located on the southeastern shore in Oswego; it is part of the Great Lakes Science Center in Ann Arbor, Michigan, which performs research on all facets of Great Lakes ecosystems. The mission of the Lake Ontario Biological Station is to determine the status of Lake Ontario fish stocks as affected by natural processes, management actions and invasive species. Researchers at the station perform research on natural, manmade and invasive species impacts that affect important fish stocks

and the ecosystem in general. This information then is presented in a manner that managers and decision makers can use to make informed decisions. The station's specialty is deep-water research, particularly because of the new 70-foot, all-aluminum research vessel that recently replaced the 50-year-old steel vessel. The new vessel has the specialized ability to deploy bottom trawls off the stern, gill nets over the side, scientific hydroacoustics out of through-hull tubes in the center of the boat, and water quality monitoring gear off either side of the boat. The station comprises a small but efficient staff to perform the research, with the focus on prey fish population assessments, restoration of native lake trout and the status of invasive species. Lake Ontario has more invasive species than the other Great Lakes.

The researchers collect several types of data, including numbers and biomass of all species caught; length, weight, sex, maturity and diet; tissues samples; and aging structures. Tissue samples are used to examine genetics, health and tissue composition; using stable isotope tracers, long-term diet history and origin can be investigated. Aging structures are used to determine vital rates such as survival and recruitment. The researchers use a bathythermograph that provides water temperature information at 1 meter depth intervals and measures the light available for photosynthesis and the amount of chlorophyll present from phytoplankton. A Ponar dredge is used to obtain bottom samples that include bugs and zebra and quagga mussels.

The collected data were used to create a time trend of abundance of alewives in Lake Ontario, which shows a sharp decline in the mid-1990s associated with the arrival of zebra mussels and sewage control measures that helped to decrease nutrients. This information was used by managers to balance predator/prey ratios through stocking programs. The researchers also examine the intensity of damage caused by sea lampreys, a marine invader. Lake trout restoration in Lake Ontario began in the 1950s, but the trout did not live beyond four years because of sea lampreys. Lake Ontario has the best sea lamprey control program of all of the Great Lakes. Native deepwater sculpin, which have recovered from a local extinction caused by alewives, reappeared in Lake Ontario in 1996 and are increasing in number. Zebra and quagga mussels have been implicated in dramatic whole-system changes in the Great Lakes, highlighting the importance of research regarding invasive species impacts on native species. These mussels have affected the clarity of the lake, which in turn drives fish species into deeper waters. These waters are colder, and fish growth is connected to temperature. Invasive fishhook fleas, which are voracious zooplankton predators, also have affected native small fish species that compete with them for zooplankton. Invasive round gobies have become a dominant part of the nearshore, bottom-dwelling fish community, displacing native species. GLRI 2013 sampling in Lake Ontario will be the most intensive ever undertaken in the lake and will help to describe how energy and nutrient flows and production levels have changed.

A participant asked whether the round goby was responsible for the return of larger and increased numbers of Chinook salmon. Dr. Lantry responded that round gobies are not often found in the stomach of Chinook salmon; they generally are eaten by bottom feeders such as bass, perch, and brown and lake trout.

A participant asked whether the researchers sample fish caught via ice fishing. Dr. Lantry explained that they did not because their presence is in open waters and not in embayments where ice fishing occurs.

In response to a question about sturgeon, Dr. Lantry explained that this is a tributary or near-shore fish, and his experience is in deepwater.

A participant asked about class tours of the research vessel, and Dr. Lantry responded that class tours are available. He invited anyone who wanted to tour the vessel in the future to do so.

In response to a comment about omega-3 fatty acids in Great Lakes versus marine fish, Dr. Lantry stated that herring, bloaters and lake trout all are rich in fatty acids.

In response to a question about commercial fisheries, Dr. Lantry explained that commercial fishing is thriving on the north shore of Lake Ontario and at Stony Point for nonregulated fish. The cost-benefit analysis leans toward sport fishing, however. The participant asked about commercial fishing on the Canadian side of the lake, and Dr. Lantry responded that whitefish and bullhead are commercially fished in Canada. In response to a question about blue pike, Dr. Lantry noted that blue pike used to be a commercial fish.

A participant asked for Dr. Lantry's assessment of the round goby situation. He explained that it is difficult to control certain invasive species.

Question and Answer Session

Ms. Jennifer Baker opened the floor to those who had questions for the session speakers.

How does general, societal use of herbicides and pesticides impact Lake Ontario? Mr. Levin responded that data are not available to directly show how they are affecting water quality, but they are always of concern. The state of New York has stricter herbicide laws than the federal government. Mr. Zelazny added that many legacy contaminants are pesticides and herbicides that have been banned. Now, other forms of pesticides and herbicides that may not have gone through the federal agency process are being found. The risks, particularly cumulative effects, are not known. The breakdown of these products also is of concern. A new section of the GLWQA addresses the examination of chemicals of emerging concern.

How can herbicides and pesticides that are used near a water source be addressed? Mr. Zelazny responded that state permits are required for each individual application in the state of New York, and the conditions in each permit minimize the chemicals to the greatest degree possible. A participant noted that small yard applications do not have the same restrictions.

Are pharmaceuticals an issue for the Great Lakes or if it was localized to ground water? Mr. Zelazny replied that ground water is an issue for the Great Lakes, and there is a correlation between ground water and surface water quality in the Great Lakes. Ground water quality is getting a new focus in the GLWQA, and a grant was issued to the USGS to examine aquifers in the Great Lakes Basin and determine the water quality. His department is working with USGS to perform a targeted assessment of key, sensitive aquifers, such as New York's Tug Hill Aquifer.

Under the GLWQA's 2012 renewal, the focus of the LAMPs changed to be action based. Lake Ontario has a unique challenge being at the end of the Great Lakes system, and two governments must agree on the chemicals of concern. How will the Lake Ontario LAMP become more action oriented as it moves forward with its next steps? What is the role of the Lake Ontario LAMP in helping to prioritize chemicals of the greatest concern? Mr. Zelazny replied that no one has the answer to this currently. There has been discussion about how the Lake Ontario LAMP will implement all of the provisions of the GLWQA. In the past, some persistent, bioaccumulative and toxic chemicals have been controlled via banning, and the LAMP does not have the authority to do this. Some issues must be dealt with on a national level, because LAMP cannot create policy. The Lake Ontario LAMP is taking restoration and management actions to address changes in the foodweb, and it would like public input regarding other areas and actions on which it should focus or collaborate. Also, what can the Lake Ontario LAMP do to help municipal and community groups to take smaller actions? The process involves a two-way conversation. A participant added that it is necessary to take into account human interactions with nature, and

limnologists are needed to accomplish this in a lake system. Because funding and jobs have not been available, the number of limnologists has decreased significantly. The participant thought that approximately 300 limnologists are needed for the Great Lakes. Mr. Zelazny said that he wished that there were more limnologists. The goal of the LAMP is to protect and restore the biological, chemical and physical health of the lake ecosystem, and limnologists play a key role in this.

Ms. Baker thanked the participants for their interest and adjourned the forum at 8:55 p.m.