What’s lurking in our waters?

Rising numbers of aquatic invasive species jeopardize aquatic habitats

You can help!

Preventing the spread of aquatic invasive species (AIS) is a responsibility that must be shared across the board in order to stem the flow of exotic species and to keep those that have already established residence from further spreading in our valued water bodies. As the numbers of invasive species grow, so does the impact on lakes, streams and wetlands and the native species who live in those habitats. The impacts on humans vary from a nuisance status to potentially life-threatening status, and most certainly present a significant economic impact in terms of spoiled lakes and the dollars needed to keep the invaders in check. Because the problem continues to grow and requires the cooperation of all individuals, GLIFWC is providing this supplement in an effort to inform people of the problem and what they personally can do to help stem the tide of aquatic invasive species. For further information on AIS, please visit GLIFWC’s website at www.glifwc.org.

Cover photo credits: top left, Leslie Mehrhoff, University of Connecticut; top right, Charlie Otto Rasmussen, GLIFWC; bottom left, Miles Falck, GLIFWC; bottom right, Doug Jensen, MN Sea Grant.
Aquatic Invasive Species

What is the problem?

Plants, animals and other organisms that find their way into new areas where they do not occur naturally are considered introduced, exotic or non-native. Not all exotic introductions cause long-term problems. Many exotic species are valued for their agricultural and aesthetic qualities, while others persist with little or no ecological impact. Occasionally when an exotic organism is introduced into an area where it did not previously exist, it is able to flourish and quickly dominate its new surroundings. The term invasive is used to describe such species. This insert will focus on aquatic invasive species (AIS), organisms that infest and disrupt aquatic ecosystems and adjacent wetlands.

When an organism is introduced into a new area, it often leaves its natural enemies behind. Non-native organisms are prone to become invasive when their populations are no longer controlled by predation, disease or competition. As the population grows, the invasive species uses more water and habitat resources for fish, waterfowl and other native species. Zebra mussels, quagga mussels and spiny waterflea feed on food resources that would otherwise be available for the fry of native fish. The round goby, ruffe and tubenose goby eat substantial quantities of native fish eggs, limiting their reproductive success, and displace native prey species that native fish depend on. The common result of these and other impacts caused by AIS is a reduction in the diversity and abundance of native species.

The impacts of AIS are not isolated to the ecological health of our waters. The economic impacts of AIS are substantial. Sea lamprey contributed substantially to the crash of the Great Lakes commercial fishery in the mid 50’s. As these fisheries rebound after years of expensive lamprey control efforts, new threats posed by more recent invaders continue to threaten sport and commercial fishing industries. Intake pipes of water and power utilities around the Great Lakes are routinely clogged by zebra mussels and must be cleaned on a regular basis. These costs are passed on to consumers. A 1999 study by Cornell University tallied $138 billion in annual expenses in the United States due to exotic species on land and water. This equals 1% of the GDP. Exotic species related to agriculture add an additional $18 billion annually in the United States. These costs are passed on to consumers. Non-native fish species such as round goby and tubenose gobies, if not controlled, can limit access to upper Great Lakes ports.

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Great Lakes Exotic species list

The list of Great Lakes exotic species on page three could continue for several more pages if run in total. Obviously, the list of non-native species in the Great Lakes is frighteningly long and growing. The list itself serves as an exclamation mark to the urgency of claims that prevention and control need to be effective now.

The list was published on the NOAA website (glerl.noaa.gov/erb/Programs/invasive/) as an analysis of the 162 exotic species documented in the Great Lakes. NOAA notes that this number of documented exotic species is best thought of as a minimum number. Identification of new non-native species relies on the ability to find, identify and verify them. Ship ballast has long been one of the most common pathways for exotic species to enter the Great Lakes. Other avenues include canals connecting the lakes to inland waters, and deliberate release, such as stocking, accidental release, such as dumping bait buckets or aquariums. It is thought that one of the Great Lakes first invaders, the sea lamprey, traversed the canals from the Atlantic Ocean and entered the Great Lakes in the 1830’s.
A partial list of exotic species in the Great Lakes

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For a complete list: www.glen.inoaa.noa.gov/Programs/invasive/
Surveys to monitor zebra mussels in Lake Metonga

Scientists blame zebra mussels for toxic algae blooming in area lakes

By Jeff Alexander, Muskegon Chronicle Staff Writer

Muskegon, Mich.—For years, scientists have pondered the worst-case scenario that could result from zebra mussels infesting the Great Lakes and scores of inland waters. That picture is becoming increasingly, and alarmingly, clear.

A potent group of toxic compounds has been discovered in a common algae species found in Muskegon Lake and the poisons may be present in other Michigan lakes. Scientists have found that these compounds can cause vomiting, diarrhea, fever, rashes, throat irritation and, in extreme cases, liver damage and cancer.

“Don’t want to scare people, but the levels of microcystins we found are significant,” said Gary Fahnenstiel, director of the National Oceanic and Atmospheric Administration’s (NOAA) Lake Michigan Field Station in Muskegon.

Fahnenstiel, one of the world’s leading experts on algae, said people should avoid swimming, wading, windsurfing, canoeing or water-skiing in areas of lakes with blue-green algal blooms. Dogs also should avoid those waters.

Zebras mussels in Lake Metonga in northeast Wisconsin indicate that populations of the exotic species continue to expand.

“High reproduction and survival in 2003 resulted in a substantial increase in adult densities of ZM,” said Michael Preul, Sokaogon Chippewa Community fisheries biologist. “The project leader for the long-term study, Preul said that juvenile zebra mussels were much smaller in 2004 than in 2003, a reasonable result of cool summer temperatures or a decline in the forage base.”

Zebras mussels were identified in Lake Metonga in July of 2001. In spring 2002, the Sokaogon Chippewa Community initiated a long-term study in partnership with the Lake Metonga Association, U.S. Fish and Wildlife Service and Wisconsin Department of Natural Resources. The study was designed to address possible ecological impacts to Lake Metonga and the potential spread of zebra mussels downstream to the Wolf River.

“This cooperation documents the importance of Lake Metonga and seriousness of the zebra mussel threat in the region,” Preul said.

The study includes chemical, physical, and biological surveys. Biological surveys include adult and juvenile zebra mussel surveys and surveys of other biological communities most likely to be impacted by zebra mussels, including phytoplankton, zooplankton (microscopic plants and animals) and fish.

Zebra mussels look like small clams with a yellowish or brown “D” shaped shell, usually with dark and light colored stripes. They can reach two inches in length and generally live 2-3 years. Zebra mussels are native to the Caspian Sea region of Asia. They were discovered in Lake St. Clair near Detroit in 1988 and are currently are found in all of the Great Lakes, many rivers and some inland lakes.

Zebra mussels were first found in Wisconsin waters of Lake Michigan at Racine Harbor in 1991.

Study results indicate that zebra mussels have been reproducing in Lake Metonga for a number of years. They are found in suitable habitat throughout the lake but have not been found on samplers in Outlet and Swamp Creeks downstream of Lake Metonga. Adult zebra mussel densities are low throughout most of the lake. Densities average seven per square meter, however there are a few hotspots.

“We collected an alarming 1000 zebra mussels from one fish crib and found adult densities on a rocky point approaching 400 per square meter,” said Preul.

Lake Metonga contains habitat similar to other lakes that have high zebra mussel densities. There is suitable substrate, ample food, and sufficient calcium levels for growth and reproduction. Water temperature, pH, salinity and dissolved oxygen levels are within tolerable ranges. Zebra mussels have been found in Lake Metonga in depths of up to 30 feet on cobble, boulders, sticks and logs, native mussels, crayfish, and man-made substrates such as docks, boats and marinas. Furthermore, they have been found on submerged aquatic plants. It’s not uncommon to find aquatic plants with attached zebra mussels washed up on shore. A combination of quality habitat and prolific reproduction (one mature female can produce up to 200,000 eggs per year) may lead to high densities in Lake Metonga. Adult densities in some areas of the Great Lakes average 3,000 per square meter with highs of 70,000 per square meter.

Zebra mussels are filter feeders. Each adult zebra mussel can filter one quart of water per day. Nearly all particulate matter, including phytoplankton and some small zooplankton, are removed. These microscopic plants and animals form the base of the food chain. Biologists speculate that reduction of phytoplankton and zooplankton may have impacts on fish species such as perch, walleye, and other species that feed on plankton during part of their development.

Other potential impacts are a reduction in native mussel abundance and an increase in water clarity, which could increase aquatic plant coverage. Zebra mussels don’t pose a health risk to divers or swimmers, but their sharp shells can make walking on them hazardous. Zebra mussels are transported to lakes primarily by boat traffic. Boaters should be alert that they might be spreading either the larval form—known as veligers—or adults if they transport water or aquatic plants from one lake to another. There are thousands of lakes within a couple hours driving distance of Lake Metonga that contain suitable habitat for zebra mussels.

“Lake Metonga also contains the exotic plant Eurasian watermilfoil that can be colonized by zebra mussels,” Preul said. “By not removing this plant from boats, two exotic species could be spread to other lakes at the same time.”

The study continues in 2005. Results will be used to help manage the Lake Metonga ecosystem and may be used to help predict the impacts of zebra mussels on other inland lakes.

For further information contact Michael Preul at (715) 478-7621.

Toxic algae blooming in area lakes

Scientists blame zebra mussels

Fahnenstiel said, because they were taken from algae scum floating on the lake. But (See Toxic algae blooming, page 10)
Researchers find sale of invasives continue to thwart prevention measures

By Kristine Maki, Lac Courte Oreilles Plant Ecologist

Plants and animals have long been moved by humans beyond ranges achieved through natural means. Most often this causes no problems, but when invasive plants or animals are moved to new areas, either by accident or intentionally, problems occur to native plants and animals. Today’s interest in water gardening and lake and shoreline restorations increases the risk that aquatic invasive plants are moved throughout the country.

In a study sponsored by Minnesota Sea Grant and the Minnesota Department of Natural Resources, researchers at the University of Minnesota surveyed aquatic plant vendors to determine unintentional shipment of invasive plants, intentional sale of illegal plants, and any unintentional shipment of other organisms. The researchers, Susan Galatowitch and the author, placed 40 orders for aquatic plants, totaling 123 taxa and 681 individual plants, from 34 vendors across the United States.

Several noxious weeds and Minnesota prohibited exotic species were ordered to determine whether current regulations are effective in stopping the sale of these species.

Upon the arrival of plant purchases, the contents were examined for unintentional receipts of plants and other organisms, receipt of federal noxious weeds and Minnesota prohibited exotic species.

Many more organisms were received than what the researchers ordered! Upon close examination of the orders, additional plants, animals, fungi, and algae were discovered in 93 percent of the orders. Ten percent of the orders included plants considered to be invasive: hydrilla (Hydrilla verticillata), giant salvinia (Salvinia molesta), purple loosestrife (Lythrum salicaria), and curly leaf pondweed (Potamogeton crispus). These four plants are causing problems all around the country and are some of the worst weeds in the world.

Noxious weed laws are written to slow the spread of invasive species. Minnesota prohibited exotic species and Federal noxious weeds, in part to determine if communication between sellers and regulators was working well enough to stop the sale of prohibited species. Of the 14 attempts made at ordering prohibited species or noxious weeds, the researchers received the outlawed species 13 times (93%).

If improper disposal of aquarium or water garden plants occur, or lake or shoreline restorations occur with plants that have organisms attached to them, the possibility of an invasive plant being introduced to an area is great.

Sales in the aquatic gardening industry are now reaching approximately $1 billion/year. If one assumes there are approximately one million individual purchases, and 10% of these include an unintentional invasive, there would be 100,000 opportunities annually for an invasive aquatic plant to be introduced to an environment where it could naturalize.

In addition, plants are being sold that have been found to be highly invasive and are banned from certain areas.

Riparian land owners, water gardeners, resource mangers, and policy makers need to be aware of the risks associated with the sale and use of aquatic plants and be prepared to properly clean and dispose of plants, be knowledgeable on the best plants to use, and watch for new populations that may be related to introductions from this pathway.

For more information, contact Kristine Maki, Lac Courte Oreilles plant ecologist, (715) 634-0102.

Zebra mussels promote green algae which fouls commercial fishing gear

By Mark Ebener, CORA Biologist

Sault Ste. Marie, Mich.—Beginning in about 1997 Chippewa Ottawa Resource Authority (CORA) commercial fisherman began reporting that their fishing gear set in northern Lake Huron near Cedarville, Michigan to capture whitefish for June, July, and part of August. Their ability to catch fish has declined dramatically.

The same situation began developing in Lake Michigan in 2003-2004. In June 2003 fishermen from the Naubinway areas of northern Lake Michigan reported that the same green slime nearly wiped out their commercial trappings.

In 2004 in Green Bay, Lake Michigan the slime was terrible and basically stopped the commercial fishery from catching whitefish for June, July, and part of August.

The slime has been identified as the filamentous green algae Chladophora.

Biologists have always been able to successfully fish survey gear at Drummond Island where the slime did not appear to be abundant. Now, the slime problem has rendered 40-foot tall trap nets inoperable and ruined boxes of gillnets.

Researchers from Environment Canada will be sampling more of the slime to identify what is occurring and why.

For more information, contact Mark Ebener; Chladophora photo: Chester County Water Resources Authority. http://arwin.wcupa.edu:10080/ponds/Aquatic%20Plants.htm#metaphyton

Chladophora is the green algae most people see attached to rocks in a body of water that seems to dance with the waves and currents.

Biologists believe that zebra and quagga mussel’s excretions have provided nutrients for expanded growth of Chladophora. At the same time, zebra and quagga mussel’s excretions have increased water clarity of the Great Lakes, except Superior, making it possible for Chladophora to grow at greater depths in the lakes. Thus, Chladophora is now more abundant because it has more nutrients available to it and can occupy a greater area of the lakes. It appears that Chladophora dies over winter and then floats around in big mats in the water column, where it fouls commercial fishing gear after a storm or even a strong wind.

Adhered to the filamentous algae or living in the huge mats of Chladophora are also other organisms such as diatoms, protozoans, nematodes, water bear, copepods, mites, and volvox.

Researchers from Environment Canada will be sampling more of the slime this year to try and understand what is occurring and why.
Parrot feather gets its name from its feather-like leaves. It has been introduced worldwide for use in indoor and outdoor aquaria. However, it has escaped cultivation and spread via plant fragments and intentional plantings. Infestations can alter aquatic ecosystems by shading out the algae in the water column.

Curlyleaf pondweed is an underwater plant that usually grows in lake water about three to ten feet deep. It has wavy leaves with fine-toothed edges and grows well in cold temperatures, even under ice. Because it begins early, it shades out native plants, forming dense mats that make it difficult to boat or swim through. During the mid-summer die-back, it releases nutrients, which can cause algal blooms and other problems.

Purple loosestrife is a perennial plant native to Europe. It arrived in eastern North America in the early 1800’s via plants brought by settlers and seeds carried within livestock and the ballast holds of ships. In North America, purple loosestrife quickly spread westward displacing native wetland plant communities. It’s current distribution covers much of the United States and Canada.

Eurasian watermilfoil is an underwater plant that grows rapidly and can reach up to 20 feet long. Originally from Europe and Asia, the prolific milfoil now dominates many midwestern waters, its dense stands choking out native plants and damaging fish habitat.

Zebra mussels look like small clams with “D” shaped shells, usually with light and dark stripes. Although they can be up to two inches long, most are under an inch. They usually grow in clusters and are found in shallow, algae-rich water. They attach themselves to boat hulls, and their tiny larvae can live for weeks in water left onboard.

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Fanwort is a beautiful looking aquarium plant with fan-shaped underwater leaves. Native to the southeastern United States, it is considered to be very weedy even where it is native. Fanwort grows very densely where it has been introduced, and because it has tightly-spaced leaves, it has a tubular appearance in the water. Fanwort is a serious aquatic weed as far north as upstate New York and Michigan (out of its native range). Fanwort can reproduce from small fragments.

Water chestnut can grow in any freshwater setting, although it prefers nutrient-rich lakes and rivers. Water chestnut can form dense floating mats, severely limiting light—a critical element of aquatic ecosystems. It can also reduce oxygen levels, which may increase the potential for fish kills. It competes with native vegetation.

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Hydrilla has become a severe problem in several areas of the United States. Hydrilla clogs drainage and irrigation canals, prevents boating access for fishing and other water recreation, impedes commercial navigation, shades out beneficial native plants, degrades water quality, and restricts water movement.

(Fishhook waterfleas are small predacious aquatic ecosystems and fishing by fouling gear. Spiny lake Ontario in 1982 and have invaded some inland lakes. First in 1998, the fishhook waterfleas have invaded and the Finger Lakes of New York in masses on fishing lines and the first eylet of rods, damaging the landing a fish.

Bighead (left) and silver carp are invasive fish spreading to lakes, rivers and streams in several areas of North America, particularly the Mississippi River and the Great Lakes regions. Because they feed on plankton, these fish compete for food directly with native ecosystems, including mussels, all larval fishes and some adult fishes. They are both Asian carp brought to North America in the 1970s to remove algae from aquaculture ponds. The silver carp is know for its flying leaps out of the water.

(AIS information reprinted from: Sea Grant’s WATCH cards, Wisconsin DNR Wildcards, www.invasivespecies.org; Wisconsin DNR AIS website; URL: ecy.wa.gov/program/wq/plants/weeds)
Determine if the water body you intend to fish or rice in is reported to have aquatic invasive species. This can be done by watching for Exotic Species Advisory warning signs posted at boat landings, using the internet to access maps at GLIFWC’s web site www.glifwc.org, and examining maps at tribal registration stations that highlight known Aquatic Invasive Species (AIS) in tribal walleye and wild rice harvest lakes. Note: Some lakes may be infested with invasive species but have yet to be reported or have a warning sign installed. As a precaution, please take the preventative steps listed below and protect ceded territory waters for future generations.

Inspect and remove aquatic plants, animals, and mud from your boat, trailer and equipment.

**Curlyleaf pondweed**

Curlyleaf pondweed begins to grow rapidly with the warming water temperatures of early spring, forming large, dense patches which can clog waterways. By mid-summer the pondweed canopy begins to die back, and the resulting high oxygen demand caused by this decaying vegetation can adversely affect fish populations. Curlyleaf pondweed has been found in many popular fishing lakes throughout Minnesota, including Mille Lacs Lake. Curlyleaf pondweed has also been found in popular Wisconsin fishing waters, including Pelican Lake, Lake Minocqua, Tomahawk Lake Chain, Kentuck, Little Saint Germaine, and Lake Wissota among others.

**Eurasian watermilfoil**

Eurasian watermilfoil often reproduces by fragmentation, with 4-8 inch pieces breaking off, rooting and forming new plants. This trait enables the plant to be easily transferred from lake to lake by outboard motors and trailers. Dense stands of Eurasian watermilfoil can alter predator-prey relationships, leading to increases in forage fish and decreases in larger fish (i.e. walleye and musky). Researchers have found that during daytime feeding periods, 3-4 times as many fish feed in areas with native plant communities as in the milfoil patches. Furthermore, when milfoil dies in the fall it decays, reducing oxygen levels otherwise available for fish. Eurasian watermilfoil has been found throughout the Twin Cities area and has spread northward in Minnesota to many lakes including Mille Lacs Lake.

Eurasian watermilfoil has also been found in popular Wisconsin fishing waters including the Chippewa Flowage, Round Lake and Little Round Lake (Sawyer County), Lake Metonga, Rainbow Flowage, Lake Minocqua, Minong Flowage, Eagle Chain and others.

**Drain**

Drain all water from your motor, live well, bilge, transom wells, etc.

Spiny water fleas and zebra mussels can accidently be transferred from lake to lake through water left in motors, livewells, bilges, and transom wells. The spiny water flea reproduces rapidly and competes with young perch and other small fish for food.

**Spiny waterfleas**

Spiny waterfleas have spread from Lake Superior to inland ceded territory waters including:
- St. Louis River, Island Lake Reservoir & Fish Lake Flowage in Minnesota,
- Gile Flowage in Wisconsin,
- Lake Gogebic and Michigamme Lake in Michigan.

**Zebra mussels**

Zebra mussels have spread throughout the Great Lakes and up the Mississippi River system to the Twin Cities. Zebra mussels are now found in over 43 inland lakes in Wisconsin and 200 waterways in Michigan, posing a serious threat to inland ceded territory waters. In recent years zebra mussels have spread to two 1842 ceded territory waters:
- Second Lake (Fortune Pond) near Crystal Falls, Michigan, and
- Lake Metonga near Crandon, Wisconsin.

Zebra mussels have been found to clog the intakes of water systems, damage boat motors, and injure people with their sharp shells. Zebra mussels can also spread from lake to lake by attaching themselves to aquatic vegetation.

**Disposing of unwanted bait in the trash away from water.**

Never release live bait into a water body, or transfer aquatic animals or water from one water body to another. Dispose of unwanted bait in the trash away from water. (Photo © State of Minnesota, Department of Natural Resources)

Wisconsin laws prohibit launching a boat or placing a trailer or boating equipment in navigable waters if it has aquatic plants or zebra mussels attached.

**Rustic crayfish**

Rustic crayfish were brought into Wisconsin for bait in the 1960s and are now found in over 100 lakes and streams in northern Wisconsin. They have also spread throughout 1854 ceded territory waters in Minnesota. As rustic crayfish spread, they uproot vegetation, depriving native fish of cover and food, making waters murky, and eating fish eggs.

(See Help prevent the spread of AIS, page 10)
What is GLIFWC doing to prevent the spread of AIS?

By Sue Erickson, Staff Writer

Public education
GLIFWC believes that having an informed public is the first step in stemming the tide of AIS. This involves raising public awareness of the problem, helping people identify AIS and letting them know how their actions can help prevent further spread of invasive aquatic plants and animals.

In order to better inform the public, GLIFWC has included information in Mazina'igan, GLIFWC’s quarterly newspaper, which has featured one aquatic or terrestrial invasive species each month since last year. GLIFWC has also acquired and produced several brochures on various invasive species.

Several educational displays developed by GLIFWC feature AIS and are taken to various conferences, sport shows and fairs as part of the public outreach program. The displays educate and illustrate how to prevent the spread of AIS. Information, including AIS brochures and identification cards for several species, are distributed at informational booths.

Materials available through the GLIFWC Public Information Office (pio@glifwc.org) include the following informative brochures produced by GLIFWC or other agencies:

- Plants Out of Place (GLIFWC)
- Purple Loosestrife: What You Should Know, What You Can Do (OFAH)
- Help Stop Aquatic Hitchhikers (MN DNR)
- The Facts on Eurasian Water Milfoil (WI DNR/UW-Extension)
- Zebra Mussel Boater’s Guide (WI DNR/SeaGrant)

GLIFWC also has individual species identification cards for numerous AIS as well as terrestrial invasives that were published by the Wisconsin Department of Natural Resources or Sea Grant.

Additional species-specific information including photos, life history, ecological impacts, control methods, and educational resources are available at GLIFWC’s web site (www.glifwc.org—click on “invasive species”).

In addition, GLIFWC has collected field data and compiled existing data from several cooperating agencies and organizations to develop a regional database for invasive species throughout Wisconsin, Minnesota and Michigan. This data can be accessed via GLIFWC’s Internet Map site (see related story on page 11). The information and maps are updated annually (www.glifwc.org—click on “maps”).

Monitoring and inventory

Key to understanding and confronting the problems of AIS is knowing where they are and in what quantity. Gathering this information is a time-consuming and labor-intensive process because there are so many waterbodies to survey. GLIFWC is improving its monitoring process by collecting field data and compiling existing data from other agencies.

Since 1986 GLIFWC has worked with the U.S. Fish & Wildlife Service’s (USFWS) Zebra Mussel Control Program. Each spring GLIFWC sets lamprey traps in a number of rivers that are tributaries of Lake Superior for mark and recapture population studies. The lamprey are trapped, marked and released. Those that are trapped in the recapture effort are destroyed. Data recorded are provided to the USFWS in order to calculate sea lamprey population estimates.

GLIFWC has also assisted the USFWS with annual surveys for zebra mussels in the upper St. Croix River. In 2003 GLIFWC staff surveyed fourteen St. Croix headwater lakes for zebra mussels. While no zebra mussels were found, they did identify rusty crayfish and purple loosestrife in some of the lakes and found curlyleaf pondweed in one lake where it was not previously documented. Staff also noted the presence of the Georgia mystery snail and the Chinese mystery snail in some lakes. The Georgia mystery snail is from the Southeastern United States but is making its way north. The Chinese mystery snail is a large snail imported for use in aquariums. The ecological impacts of these snails are not yet fully understood.

In 2004, GLIFWC staff initiated monitoring efforts on 36 lakes within the ceded territories to inventory aquatic invasive species on waters that contribute

Control and prevention efforts
GLIFWC has been treating purple loosestrife within the Bad River—Chequamegon Bay watershed since 1988. Purple loosestrife threatens the integrity of wetland habitats by out-competing native vegetation. Diverse wetland plant communities can quickly be displaced by dense stands of purple loosestrife.

GLIFWC staff have used a variety of methods to control loosestrife, including hand pulling, chemical control and biological control through the introduction of Galerucella beetles. The latter method, which has proven effective, involves raising the beetles and distributing them in loosestrife-infested wetlands.

GLIFWC biological and enforcement staff who use boats in various ceded territory waters have all attended the WDNR’s Clean Boats, Clean Waters enforcement satellite offices located on member reservations. In addition, each GLIFWC boat now has a log book providing recent information on regional AIS distribution, identification information, reporting forms, and a checklist that is filled out after properly inspecting and cleaning boats.

Coordination with other agencies and organizations

Because aquatic invasive plants disperse widely across the landscape and administrative boundaries, it is advantageous to work cooperatively towards management and control objectives. In addition, the number of new invasives being introduced into regional waters continues to exceed control activities and is too much for any one agency to manage alone. The vastness of the problem requires effective networking among all concerned and coordination so that information can be shared and labor is not duplicated.

GLIFWC continues to work with a variety of agencies and organizations, including state and federal agencies as well as private organizations, lake associations and concerned individuals. The regular sharing of data, educational resources and management strategies with other agencies and organizations promotes regional cooperation and reduces duplication of effort and expenses. Examples include:

- Coordinate monitoring efforts
- Provide brochures
- Provide educational displays
- Compile and provide regional distribution data
- Network via professional conferences
- Maintain AIS information on website

In early spring, 10-12 adult Galerucella beetles are placed on potted loosestrife plants to feed and lay their eggs. By mid-summer, approximately 1000 new adults will emerge from each pot for release at loosestrife infested wetlands. (Photo by Miles Falck)
Help prevent the spread of AIS

(Continued from page 8)

**Smelt**

Smelt have been found in 21 northern Wisconsin lakes. They pose the greatest risk to walleye in smaller, deep, clear lakes lacking a diverse fishery. The impact of smelt on walleye populations can be seen in Sparkling Lake (Vilas County, WI) where they were first discovered in 1981.

Historically this lake had good natural reproduction, but as smelt numbers increased, fishery surveys started showing that young walleye weren’t surviving into the fall of their first year. This problem continued with fall fisheries surveys documenting no significant natural reproduction since 1988. It is believed that smelt compete directly with juvenile walleye for food, limiting walleye recruitment.

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<th>Gallons of Water</th>
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<td>6 1/4</td>
</tr>
<tr>
<td>100</td>
<td>12 2/3</td>
</tr>
</tbody>
</table>
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- **If hot water is not available, spray equipment with high-pressure water.**
- This step is particularly important to take after boats have been used in ceded territory waters known to possess: **spiny waterfleas** (St. Louis River, Island Lake Reservoir, and Fish Lake Flowage in Minnesota, Gile Flowage in Wisconsin, and Lake Gogebic and Michigamme Lake in Michigan), **zebra mussels** (Second Lake (Fortune Pond) in Michigan, and Lake Metonga in Wisconsin), or **heterosporis parasites** (Vilas County lakes, including Lac Vieux Desert, Big Arbor Vitae, Scattering River, Eagle, Carpenter, Cranberry, Catfish, and Yellow Birch lakes or Oneida County lakes, Dam, Sand and Columbus).

**DRY Equipment.** If possible, allow five (5) days of drying time before entering new waters.

(Continued from page 4)

The Bear Lake sample was taken in an area with no scum on the water—the blue-green algae looked more like pollen in the water. Although few people are out on area lakes now, Fahnenstiel said it would be wise to look for blooms in any lake with a blue-green algal bloom: “I would boat in it but I wouldn’t swim in it,” he said.

A Michigan State University study published earlier this year concluded that blue-green algal blooms could occur in any lake where zebra mussels are present. More than 100 Michigan lakes are infested with zebra mussels, according to state data.

“Virtually all lakes infested with zebra mussels will have blue-green algal blooms,” said Alan Steinman, director of GVSU’s Annis Water Resources Institute. “If you have hard-to-treat equipment that cannot be exposed to hot water you can: dip equipment into vinegar for 20 minutes to kill harmful aquatic species; or use a 1% table salt solution for 24 hours to replace the vinegar dip. This table provides correct mixtures for the 1% salt solution in water:

- Wash your boat and equipment with hot water; or
- d) ip equipment into vinegar for 20 minutes to kill harmful aquatic species; or
- Use a 1% table salt solution for 24 hours to replace the vinegar dip. This table provides correct mixtures for the 1% salt solution in water:

- **Microcystin contamination has never been documented in area lakes until now because no one ever tested for the toxins. Although blue-green algae has been a problem in other parts of the world for more than a century, it has only emerged as an issue in the United States in recent years, according to several scientists. “There could be lakes out there, such as Spring Lake, that could be very high (for microcysts). We just haven’t sampled them,” Fahnenstiel said.**

- **Spring Lake, one of West Michigan’s most popular and intensely studied lakes, is notorious for massive blue-green algal blooms. Scientists from Grand Valley State University (GVSU) have thoroughly studied those blooms and phosphorous pollution in Spring Lake, but did not test for toxic microcysts in the algae, said Alan Steinman, director of GVSU’s Annis Water Resources Institute. He said the test is difficult and costly to perform. “I’ve always been told that blue-green algae is not a harmful thing,” said John Nash, chairman of the Spring Lake Lake Board. When informed that some blue-green algae contains toxins, Nash said, “That concerns me.”**

- **Rediske said he has seen people swim, water ski and ride tubes in blue-green algal blooms on Spring Lake. “People seem to go out in Spring Lake in all conditions. This is something that really needs to be looked at,” Rediske said.**

- **Microcystin contamination has been a problem for more than 100 years in other countries. There have been numerous cases of people, dogs and livestock becoming ill after drinking or wading in water laced with microcysts. In Brazil, more than 60 kidney patients died after drinking water laced with microcysts passed through their dialysis machines. People have become ill and some dogs have died recently in Vermont after falling into blue-green algae on picturesque Lake Champlain. Soldiers in Great Britain were sickened after canoeing through a blue-green algal bloom, and a Wisconsin boy died last year after falling into an agricultural pond contaminated with microcysts, Fahnenstiel said.**

- **The problem is a relatively new one in the Great Lakes region. That’s because zebra mussels are increasing the number of lakes experiencing blue-green algal blooms.**

(Reprinted with permission from the Muskegon Chronicle, Sunday, October 17, 2004 edition.)
One of the most important aspects of managing any invasive species is to determine its distribution and abundance. This information can be used to prioritize management, justify funding requests, target educational outreach, and to direct and evaluate control efforts.

Realizing the importance of this data, many federal, state, and tribal agencies, as well as universities and non-government organizations collect and compile this important information. Unfortunately, not all of this data is accessible in one place, and it varies in quality and completeness.

GLIFWC has compiled much of this data and made it available in a common format that can be accessed over the Internet. The goal of this project is to provide tools that enable regional coordination of invasive species management. Data contributors include:

- Great Lakes Indian Fish & Wildlife Commission
- Lac Courte Oreilles Natural Resource Department
- Michigan Department of Natural Resources
- Minnesota Department of Natural Resources
- National Park Service
- Sea Grant
- The Nature Conservancy
- U.S. Forest Service
- U.S. Geological Survey
- Wisconsin Department of Natural Resources

GLIFWC’s Map Viewer (click on “maps” at www.glifwc.org) provides access to known AIS locations in an interactive online mapping environment. Users can zoom-in on the area of interest and display only the information they need. Customized maps can be printed for developing grant applications, educational materials, presentations, or field use.

In addition, the data for each location can be queried, viewed and printed using a suite of interactive tools. The information provided includes information source, date of documentation, contact person, estimates of abundance, acreage, and accuracy of location.

The left panel of the web site is used to control the visibility of the various layers, display map legends, and provide access to help files for using the site. The toolbar located directly above the map is used to zoom in or out, display data, run queries, and print maps.

The site continues to evolve as data are updated and new applications are added. One promising new technology is the use of “open GIS.” GLIFWC is currently incorporating this into the web site so that users will have the added benefit of displaying topographic maps, aerial and satellite imagery, and digital elevation models.

This data is not housed on GLIFWC servers, nor is it maintained by GLIFWC staff. Instead it is stored on servers at USGS, NASA, and Terraserver and is provided as an “open GIS” map service that can be accessed by other map viewers.

Similarly, GLIFWC intends to make some of its data available in an open GIS format in the future so that other web sites can make use of the data for similar applications. The advantage is that no one organization has to compile and store the various databases, yet they can be effectively combined over the Internet and made available to those who need access in one seamless package. This method will avoid duplication of efforts while facilitating coordination among agencies, organizations, and individuals that utilize the data.
**Funding**

Much of GLIFWC’s work on aquatic invasive species education and outreach as well as prevention and control efforts is a result of funding from cooperating agencies. GLIFWC is grateful for the opportunities provided through funds from the following cooperators:

**Bureau of Indian Affairs (BIA)—Noxious Weed Program**

Annual funding from the BIA’s Noxious Weed Program provides a foundation for GLIFWC to develop new partnerships and bring additional resources to bear on noxious weed management within the treaty ceded territories.

**Natural Resources Conservation Service (NRCS)—Environmental Qualities Incentive Program (EQIP)**

Funding from the NRCS EQIP program has provided resources to control purple loosestrife on private lands within the Bad River-Chequamegon Bay watershed. Due to the prolific nature of purple loosestrife, its ability to disperse long distances, and the diversity of public and private land owners involved, effective long-term control requires a coordinated and cooperative effort among landowners.

Use of NRCS EQIP funds has increased the effectiveness of GLIFWC’s watershed control strategy by providing funds to work cooperatively with The Nature Conservancy and private landowners to control purple loosestrife on privately-owned lands. EQIP funds have also been used to develop educational materials (*Plants Out of Place* and *Target: Leafy Spurge* brochures) to raise awareness about the ecological impact of exotic plants and to prevent new introductions within the ceded territories.

**Environmental Protection Agency (EPA)—Great Lakes National Program Office (GLNPO)**

GLNPO has provided funding to: 1) evaluate the effectiveness of purple loosestrife controls within the Bad River watershed, and 2) prioritize and guide management efforts for other invasive non-native plants in the ceded territories.

**Administration for Native Americans (ANA)**

Funding from ANA has enabled GLIFWC to build its capacity to inventory and track the distribution and abundance of AIS in the treaty ceded territories and implement educational outreach activities.

**Wisconsin’s Comprehensive Management Plan**

In cooperation with the Wisconsin DNR and the UW–Extension, GLIFWC contributed to Wisconsin’s Comprehensive Management Plan To Prevent Further Introductions and Control Existing Populations of Aquatic Invasive Species. As a signatory to this management plan, GLIFWC is eligible for funding from the US Fish & Wildlife Service to implement activities identified in the management plan. GLIFWC has been using these funds to inventory waters for AIS, implement educational outreach and manage purple loosestrife.

**Cooperating agencies and organizations**

Because invasive species disperse widely across the landscape and administrative boundaries, it is advantageous to work cooperatively towards management and control objectives. In addition, the number of new exotics being introduced into local ecosystems continues to outpace control activities and is too much for any one agency to manage alone. GLIFWC routinely shares information and coordinates management activities with several cooperating agencies and organizations.

- Great Lakes Indian Fish & Wildlife Commission member tribes
- Invasive Plant Association of Wisconsin
- Local schools & volunteers
- Michigan Department of Natural Resources
- Minnesota Department of Agriculture
- Minnesota Department of Natural Resources
- Northern Great Lakes Visitor Center
- Northwoods Weed Initiative
- Private landowners
- Sea Grant
- The Nature Conservancy
- USDA–Natural Resources Conservation Service
- USDA–Forest Service
- UW–Extension
- Wisconsin Wetlands Association
- Wisconsin Department of Natural Resources

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