

Aquatic
Nuisance
Species
Handbook

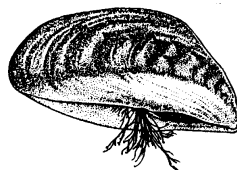
for
government
officials

AQUATIC NUISANCE SPECIES HANDBOOK

for Government Officials

CONTENTS

Introduction/Purpose	iii
Sources of Aquatic Nuisance Species	
Ballast Water	1
Aquaculture	1
Water Diversions	1
Aquaria	1
Aquatic Nuisance Species	2
Identification	
Eurasian Watermilfoil	2
Round Goby	2
Ruffe	2
Purple Loosestrife	2
Sea Lamprey	3
Spiny Water Flea	3
Zebra Mussel	3
Distribution of Nuisance Species	4
Other Nuisance Species	5
Impacts	
Economic Impacts	6
Ecological Impacts	6
Guidelines for Control	7
Permits	9
Monitoring	9
Instructions for Boaters	10
Relevant Laws & Statutes	10
Resource Materials	12



Introduction

◆ The purpose of this handbook is to inform public officials and other interested parties of the prevention and control of unintentionally introduced aquatic nuisance species in our marinas, lakes, parks, and other areas throughout Michigan. Some of these species that can be harmful to the environment include the zebra mussel, eurasian milfoil, purple loosestrife, round goby, and ruffe.

Aquatic Nuisance Species

An aquatic nuisance species (ANS) is defined as a waterborne, non-native organism that threatens the diversity or abundance of native species, the ecological stability of impacted waters, or threatens a commercial, agricultural, aquacultural or recreational activity.

These species have the potential to cause significant ecological problems because they have been introduced into a habitat in which there are no natural controls, such as pathogens, parasites, and predators. Lack of natural controls in a new habitat may allow a species to grow at or near its potential, exponential growth rate. If such species become established, they may disrupt species relationships in the new habitat. As a nuisance species proliferates, other species' relationships change in the habitat. The introduced species may prey upon, outcompete, or cause disease in a native species.



Photo credit: Ladd Johnson

The introduction of harmful nonindigenous aquatic species, also known as exotics, into the Great Lakes region causes ecological, economic, societal and public health impacts that threaten the value of the region's water resources.

The Great Lakes have been subject to invasions of ANS since the settlement of the region by Europeans. Since the 1800s, at least 140 nonindigenous aquatic organisms have been introduced in the Great Lakes ecosystem. Approximately 10 percent of these species cause the greatest harm.

Local communities dependent upon water from the Great Lakes basin, or tourism as a major portion of their economy, can be greatly impacted by the introduction of ANS. Additionally, the quality of life of the citizens of these communities can be impacted by the introduction of these organisms.

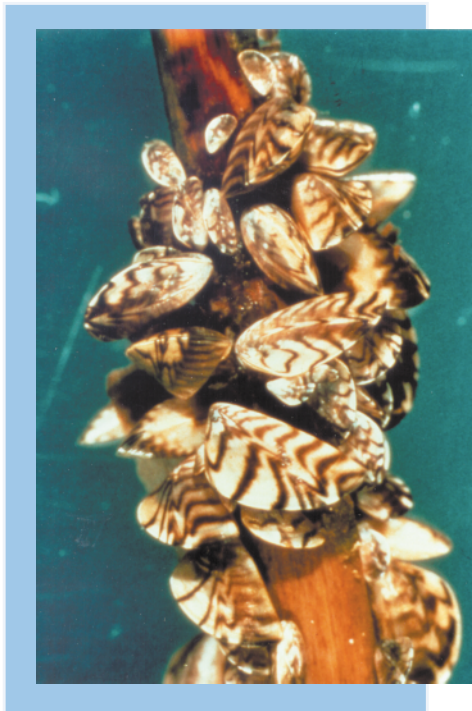


Photo Credit: S. Van Mechelen

Sources of Aquatic Nuisance Species

Ballast Water: Discharge by ships is the most significant source of unintentional introductions of ANS to coastal and estuarine waters of the United States and around the world. Ship hull exteriors, seawater pipe systems, ballast water, sewage holding tanks and treatment plants, anchors and chains play a role in the inadvertent export and import of live organisms. Several projects have been undertaken to explore various methods of treatment of ballast water (i.e., heat, filtration, biocides, etc.) in an effort to prevent the transportation of ANS into waters of the Great Lakes.

Aquaculture: The private and state propagation and production and harvest of plants or animals for commercial or recreational purposes provides a potential source of ANS introductions to the waters of the Great Lakes region. Programs to insure the proper facility inspection, species inspection and water quality control monitoring of these facilities are necessary.

Water Diversion: ANS are unintentionally transported when water is exchanged from one location to another. Agricultural irrigation is one example which can disperse ANS into connecting rivers, lakes and wetlands.

Aquaria: The importation of tropical fish, both freshwater and saltwater, and those cultivated in warmer areas such as Florida put water bodies at risk of invasion. These species are intentionally or accidentally released into the Great Lakes in areas where there are no natural predators to maintain a balance in the ecosystem. Some states do regulate the importation of some species based on their potential danger.

Aquatic Nuisance Species

Eurasian Watermilfoil

Eurasian watermilfoil (*Myriophyllum spicatum*), a nonindigenous aquatic plant,

reached the midwestern states between the 1950s and 1980s. In nutrient rich lakes, watermilfoil can form thick underwater stands of tangled stems and vast mats of vegetation at the water's surface. In shallow areas, the plant can interfere with water recreation such as boating, fishing and swimming. The plant's floating canopy can also crowd out dominant native water plants

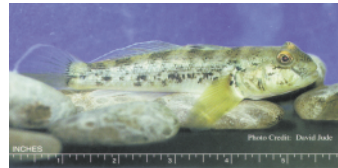


Photo Credit: David Jude

Round Goby

The round goby (*Neogobius melanostomus*) is an abundant species with origins in the Black and Caspian Seas. They are small fish that feed chiefly on bivalves, amphipod crustaceans, small fish and fish eggs. It is believed this fish was introduced into the Great Lakes from discharged ballast water. Consumption studies of fish suggest round gobies might have a detrimental impact on native species through competition for food and predation on eggs and young fish.

Ruffe

The ruffe (*Gymnocephalus cernuus*) is a small perch-like Eurasian fish. It was apparently introduced to the Great Lakes in the St. Louis River near Duluth, Minnesota, from a ballast discharge. In Europe, the ruffe feeds on whitefish eggs and competes with other more desirable fish. The spiny dorsal fins of the ruffe discourage predation by other fish. In Lake Superior, the species of fish that is most affected by the ruffe is the yellow perch. Populations of perch have declined up to 75 percent in water bodies where ruffe have become established.



Photo Credit: Gary Cholwek

Purple Loosestrife



Purple loosestrife (*Lythrum salicaria*) is a perennial wetland plant native to Europe and Asia. It was introduced into the United States in the early 1800s and continues to spread. The plant is impacting Michigan wetland ecosystems by changing the structure, function and productivity of the wetlands. The plant forms dense monoculture stands, sometimes hundreds of acres in size, that displace native vegetation and threaten the biotic integrity of wetland ecosystems. The loss of plant species richness and diversity has eliminated natural foods and cover essential to many wetland wildlife species.

of the Great Lakes Region

Sea Lamprey

The [sea lamprey](#) (*Petromyzon marinus*) has been a serious problem in the Great Lakes for more than 50 years. After more than 30 years of trying to eradicate lamprey, the parasitic invader is

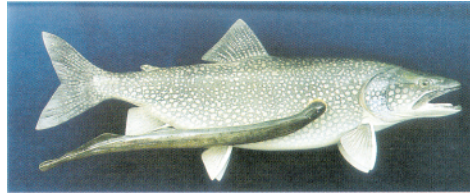


Photo Credit: Office of Great Lakes Fishery Commission

making a comeback at the expense of the lake trout fishery in northern Lakes Michigan and Huron. An adult lamprey can kill up to 40 pounds

of fish in just 12 to 20 months. A lamprey attaches itself to a fish with a sucking disk, pierces its scales and skin, and sucks out body fluids, often killing the fish.

Spiny Water Flea

The [spiny water flea](#) (*Bythotrephes cederstroemi*) is also believed to have entered the waters of the Great Lakes from discharged ballast water. Although its average length is rarely more than one



centimeter, this large predacious zooplankton can have a profound effect on a lake's plankton. The spiny water flea sometimes competes directly with young fish for food. Because this organism can reproduce many times faster than fish, it could monopolize the food supply at times, to the eventual detriment of the fish. Although *Bythotrephes* can also fall prey to fish, its spine seems to frustrate most small fish, which experience great difficulty swallowing the animal.

Zebra Mussel

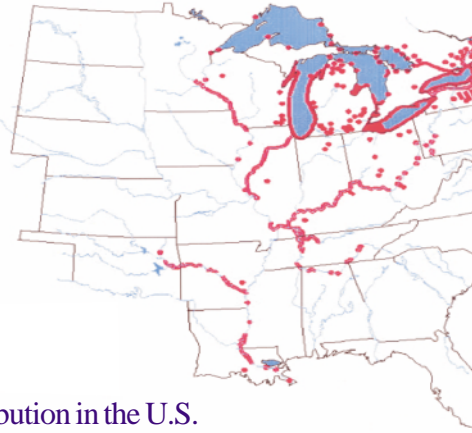


In the spring of 1988, the [zebra mussel](#) (*Dreissena polymorpha*) was discovered in Lake St. Clair. Scientists believe the zebra mussel was transported to North America in the ballast water of a transatlantic freighter that previously visited a port in Eastern Europe where this mollusk is common. Zebra mussels have now spread to all five Great Lakes, many inland lakes, and are also found in the Mississippi, Tennessee, Hudson, and Ohio River basins.

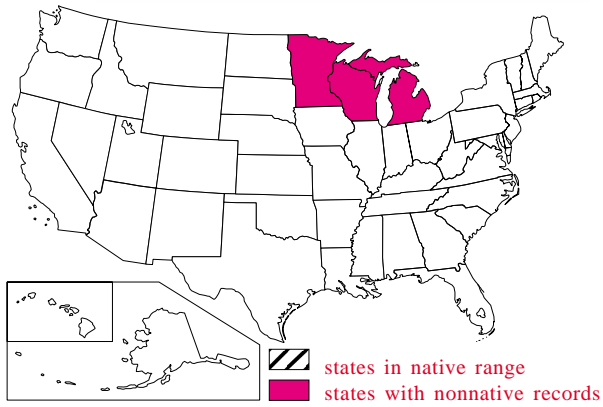
Zebra mussels readily attach to most hard submerged surfaces, including boats, rocky shoals, water intake pipes, navigational buoys, docks, piers, and indigenous species such as clams. They affix themselves to shells of their own species and are able to form dense layered colonies of over one million per square meter.

Distribution of Nuisance Species

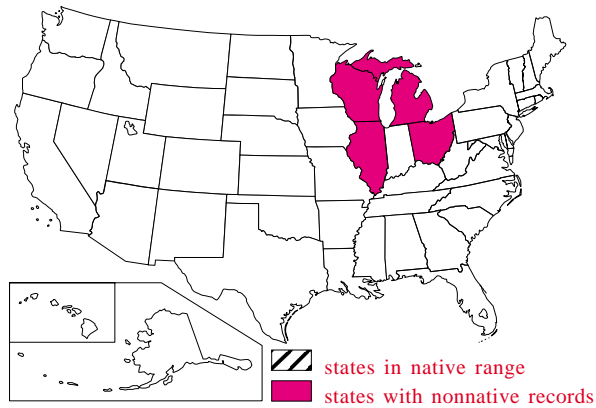
Zebra Mussel Distribution in U.S.



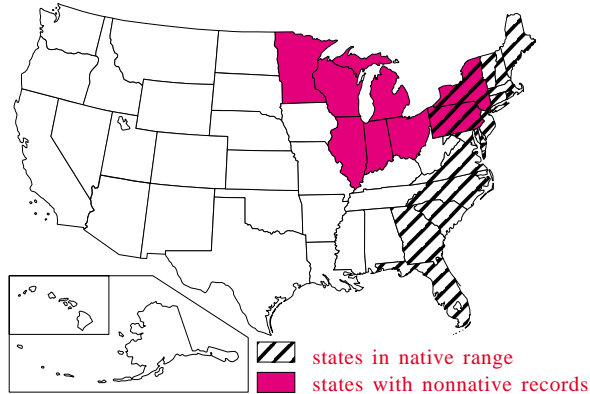
Ruffe Distribution in the U.S.



Round Goby Distribution in U.S.



Sea Lamprey Distribution in U.S.



Other Nuisance Species

Numerous other ANS inhabit the waters of the Great Lakes basin without as much notice as those previously mentioned. All nuisance species compete with, and contribute to reduced numbers of native species. Nuisance plant species such as the flowering rush (*Butomus umbellatus*) and curly-leaf pond weed (*Potamogeton crispus*) tend to crowd out native species. In addition, masses of dead plants accumulate on the floors of water bodies where they have been introduced, impairing water quality and wildlife habitat. Others create competition for food and habitat.

Alewife (*Alosa pseudoharengus*) are native to the Atlantic coast. They compete with lake herring, whitefish, chubs, and perch for plankton and other small organisms. Due to lamprey damage to large predator fish in the Great Lakes, alewife populations have exploded.



Photo Credit: Virgil Beck



Common carp (*Cyprinus carpio*) are domesticated ancestors of a wild form native to the Caspian Sea region and East Asia. Carp degrade shallow lakes by causing excessive turbidity which can lead to declines in waterfowl, aquatic plants, and important native fish species.

Rusty crayfish (*Orconectes rusticus*) are native to streams in the Ohio, Kentucky, and Tennessee region. Spread by anglers who use them as bait, rusty crayfish are prolific and can severely reduce lake and stream vegetation, depriving native fish and their prey of cover and food. They also reduce native crayfish populations.



White perch (*Morone americana*) are native to Atlantic coastal regions and invaded the Great Lakes through the Erie and Welland canals. Prolific competitors of native fish species, white perch are believed to have potential to cause declines of Great Lakes walleye populations.

Curly-leaf pondweed (*Potamogeton crispus*) is an exotic plant that forms surface mats that interfere with aquatic recreation. The plant usually drops to the lake bottom by early July. Curly-leaf pondweed was the most severe nuisance aquatic plant in the Midwest until Eurasian watermilfoil appeared. It was accidentally introduced along with the common carp. It has been here so long, that most people are not aware it is an exotic.



Impacts

Economic Impacts

The waters of the Great Lakes basin provide valuable economic benefits, including drinking water, commercial and sport fisheries, and other forms of recreation. Some species that have been imported to the Great Lakes provide economic benefits, such as those supporting the aquaculture business and the sport fishing industry. However, several ANS introduced inadvertently have caused severe economic impacts.

The sea lamprey, which kills fish by attaching to its prey and feeding on body fluids, devastated populations of whitefish and lake trout, top predators in the 1940s and 1950s, thus permitting populations of commercially less valuable fish to proliferate.

Another ANS, the zebra mussel, moves into the intake pipes of hundreds of facilities that use raw water from the Great Lakes, resulting in extensive monitoring and control costs. The U.S. Fish and Wildlife Service estimates the potential economic impact at \$5 billion over the next ten years to U.S. and Canadian factories, water suppliers, power plants, ships and fisheries within the Great Lakes region. For example, the Consumers Energy Company currently spends nearly \$1 million annually to control the zebra mussel.

Ecological Impacts

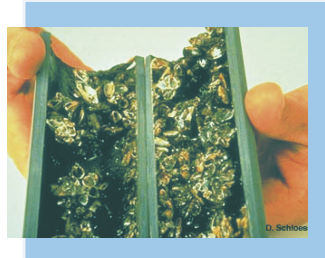


Photo Credit: Don Schloesser

The introduction of nonindigenous aquatic species into an established ecosystem can alter or disrupt existing relationships and ecological processes. Without natural predators, some nonindigenous aquatic species out-compete and even displace native populations.

Alewife populations increased rapidly in the Great Lakes during the 1940s and 1950s because of the suitability of the habitat and the fact that predators were not sufficiently abundant to suppress their growth. Consequently, periodic die-offs fouled recreational beaches and blocked municipal and industrial water intakes. While the alewife out-competed and suppressed whitefish, yellow perch, emerald shiners and rainbow smelt, it subsequently became a prey fish for stocked trout and salmon. The alewife has permanently altered the ecosystem.

One severe biological impact since the introduction of the zebra mussel into the Great Lakes is the near extinction of native clams in Lake St. Clair and in the western basin of Lake Erie. Zebra mussels attach and build colonies on the clams, eventually leading to their death.

Organisms invading the Great Lakes can also threaten public health through the introduction of disease, concentration of pollutants, contamination of drinking water, and other harmful human health effects.

Guidelines for Control

The following disinfection/prevention procedures are recommended for fish and aquatic surveys, equipment, fish rearing ponds, and fish transport units. The need for disinfecting can be reduced by scheduling visits to non-infested waters before surveys of ANS infested water.



Small equipment such as small nets, measure boards, buckets, raingear, waders, and anchors

- Dry completely and keep dry for 3 days
- If needed sooner than 3 days, soak in solution of 1 part chlorine bleach to 10 parts water (ex: 1 gallon bleach to 10 gallons of water) for a minimum of 30 minutes, or rinse with hot water $\geq 110^{\circ}\text{F}$, or freeze at 0°F for minimum of 24 hours

Large equipment such as trap nets, gill nets, fyke nets, and holding crates

- Inspect all nets carefully. Degree of infestation will depend on how long the nets have been in water. Look carefully for signs of adult zebra mussels attached to netting, especially if nets have been in water more than 1 night.
- Stretch outdoors until dry, pack and bring inside for 3 days if no mussels found. (Rain or dew outside could keep mussels alive)
- Label each net with the ending day of the quarantine to avoid any confusion as to their future availability.

Use previous bleach method if nets are needed before completion of quarantine process. Soak in solution for minimum of 30 minutes.

Rearing ponds

Uninfested ponds:

- To prevent contamination by boat, designate one boat for use in fertilizing and setting nets in uncontaminated ponds.
- When harvesting fish, draw transport water from the rearing pond, not water body.
- After stocking fish into an infested water, disinfect any equipment that came in contact with the water.

Infested ponds:

- Whenever possible, stock fish from contaminated ponds into uncontaminated waters. Otherwise use the transport disinfection recipes below.
- Research has shown that rotenone will kill all ages of zebra mussels at concentrations less than those normally used to treat our ponds. Therefore, if the source of contamination to a pond can be eliminated, the pond can be “disinfected” by the fall rotenone treatment.
- Primary factors limiting the zebra mussel are moisture and temperature. Their maximum out of water survival time in ideal conditions is about 10 days for adults and 3 days for newly settled juveniles. Juveniles and veligers are the most common forms found on boats and equipment.

Guidelines for Control (cont.)

Fish Transport Units

The following are solutions that will kill zebra mussel veligers in water used to transport live fish:

1. For Brood and other adult fish, and trout and muskellunge greater than 150mm:

Treat with 100 mg of 40% formalin per liter of rearing water for minimum of 2hrs
 $100 \text{ mL of } 40\% \text{ formalin/L} = 378.5 \text{ mL}/100 \text{ gal.}$

2. For hybrid striped bass (only):

Treat with 20,000 mg NaCl per liter for minimum of 2hrs during transport
 $20,000 \text{ mg NaCl/L} = 2\% = 7.57 \text{ kg}/100\text{gal.} = 16.7\text{lb.}/100\text{gal.}$

3. For fingerlings walleye, saugeye, largemouth bass, hybrid striped bass and channel catfish:

Treat first with 750 mg KCl per liter of rearing water. Add 20 mL of 40% formalin per liter during transport for minimum of 2 hours
 $750 \text{ mg KCl/L} = 2,839 \text{ mg}/\text{gal.} = 284 \text{ g}/100\text{gal.} = 1 \text{ gal. stock solution } 100\text{gal.}$
 $20 \text{ mL of } 40\% \text{ formalin/L} = 75.7 \text{ mL}/\text{gal.} = 7.57 \text{ L } 100\text{gal.}$

Preparation of KCl stock solution from water softener KCl: Softener salt is 99% KCl and about 0.7% NaCl. It comes in 40lb. bags, which is enough to treat 6,400 gal. of pond water. To make up a stock solution in advance for future use, dissolve one 40lb. bag in 64 gallons of water. (This is about 1/4 as concentrated as a saturated solution of KCl at 68F.) Use 1 gal. of stock solution /100 gal. of pond water.

KCl Source:

Water Softner KCl from Dublin Pump, Dublin OH, costs \$8.95/40lb. or \$0.50/kg
Reagent grade KCl from Fischer Scientific (Cat. #P217-10) costs \$17.29/kg.

The use of infested water for irrigation and other water from diversions pose a threat of unintentional introductions of ANS to new water bodies. Projects investigating the effectiveness of filtration of these waters are currently being conducted. In combination with other water treatment, filtration can be a highly effective tool in preventing the spread of undesirable organisms.

Chlorine and ultraviolet light have been used by municipal water treatment plants to eliminate harmful and disease-causing organisms from drinking water and wastewater. The practicality of other, effective and environmentally friendly biocides is presently being tested in an effort to prevent the spread of ANS to uninfested waters.

A successfully established ANS in the Great Lakes ecosystem should be regarded as impossible to eradicate. Overall cost effectiveness dictates that the emphasis is placed on preventing new introductions and limiting the spread of established populations rather than attempting after-the-fact control of organisms. Attaining these goals will be realized by implementing a comprehensive program incorporating information and education, impact assessment, monitoring, research, regulation and policy.

The Michigan Department of Environmental Quality should be consulted for recommendations and permits prior to any attempt at control or eradication of a "pest." Do-it-yourself control treatments often make matters worse and can harm native species. Harmful exotic species and the control of their spread are international issues with potential impacts that span economic, social, health and ecological concerns.

Permits

The Environmental Protection Agency (EPA) requires that each state have standards for water quality and issue permits for discharge in the form of National Pollutant Discharge Elimination System (NPDES). Under Act No. 451 of the Public Act of 1994 of Michigan Compiled Laws, the Michigan Surface Water Quality Division (SWQD) has the authority to issue permits and regulate surface water.

In addition to the standards NPDES permit, Part 4 of Water Quality Standards (Rule 57) under Clean Water Act allows the SWQD to issue permits for toxic substances such as Calgon, Nalco, and Betz Clam which control the spread of zebra mussel from discharge facilities. Under Rule 57, it states that harmful levels of these chemicals may not be released in surface water that will cause injury to aquatic species or other consumers.

Detoxification of the treated effluent is required using bentonite clay unless the final effluent limit has been met. No more than 6 applications of less than 12 hours per discharge are permitted. Follow-up monitoring using a toxicity test is required to determine adequate detoxification using the EPA/600/4-90/027F "Methods for Measuring the Acute Toxicology of Effluents to Freshwater and Marine Organisms."

Monitoring

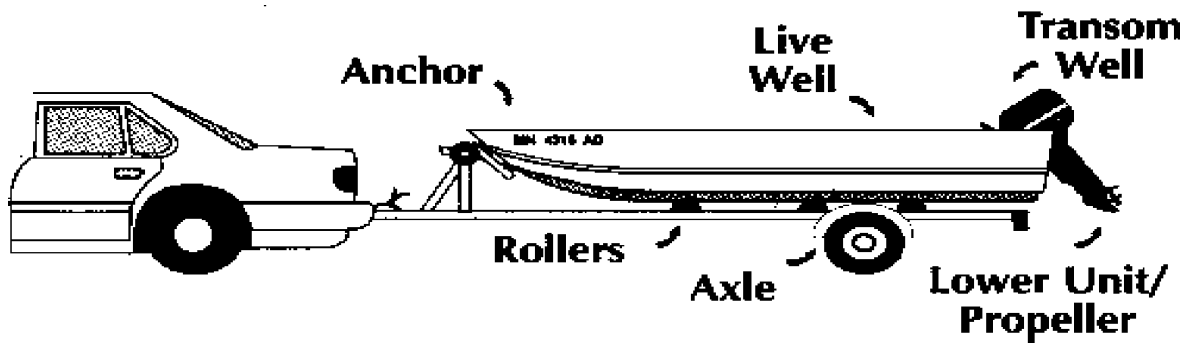
At the state level, the Department of Natural Resources (DNR) has four Great Lakes Research Stations which are involved in monitoring Great Lakes fish stocks. The major thrusts of the studies are to measure changes due to harmful invaders and other external sources. The stations help measure the progress of sea lamprey control by monitoring lake trout wounding rates and recovery of lake trout stocks. They are monitoring fish stocks in the Saginaw Bay to assess the effects of zebra mussels, white perch and the reintroduction of walleye.

In the future, additional monitoring will be required for suspected pathways of ANS. Boaters, fishermen, bait shops, aquaculture facilities, water treatment plants, sub-irrigation and tile drain projects, and intentional introductions by citizens will come under greater scrutiny.

The Michigan Sea Grant College program has an Aquatic Nuisance Office that publishes a map on zebra mussel sightings in Michigan water and produces a database of lakes monitored each year. Citizens, agency personnel, and Sea Grant staff report zebra mussel and other aquatic nuisance species to the office which compiles the data and forwards it through the zebra mussel network. This network includes ANS contacts throughout the Great Lakes Basin including many fishery commissions, service, municipal and industrial water users, industry associations, citizen associations and many other organizations.

In addition, the office coordinates a pilot program for citizen monitoring of zebra mussels in Michigan's inland lakes. Lake sampling kits include a "how to" video to allow citizen volunteers to send their water samples to labs for microscopic analysis to determine whether zebra mussels have spawned in their lake.

How you can stop the spread of exotics:



- ✓ **Remove** any visible plants and animals from your boat, trailer, truck and other boating equipment (anchors, centerboards, rollers, axles, propellers, etc.) **before** leaving **any** water body.
- ✓ **Drain** water from the motor, livewell, bilge and transom wells at the ramp or access **before** leaving **any** water body.
- ✓ **Empty** your bait bucket on land before leaving any water body. Never release live bait into a water body, or release aquatic animals from one water body into another.
- ✓ **Wash/dry** your boat and other boating equipment to kill harmful exotic animal species that were not visible at the boat launch. Before transporting to another water body, use one cap of liquid laundry detergent in bilge compartments and livewells:

rinse your boat and boating equipment that normally get wet with **hot** (at least 40° C or 104° F) tap water; or **spray** your boat and trailer with high-pressure water at a carwash; or **dry** your boat and equipment for at least 3 days; if boat is docked at the lake, increase drying time to 10 days. (If boat is needed right away, rinse with hot water instead of tap water. It requires a temperature of 110° F to kill veligers and 140° F to kill adults. Flush outboard with hot water.)

flush most outboards using mufflers, which can be purchased at any marine store. When necessary, use a tank to flush the motor. Hook it up to a cold or hot water tap depending on the length of time before the outboard is going to be used again.

For more information:

Call the Michigan Department of Natural Resources (DNR), Fisheries Division, at 517-373-1280, or the Michigan Department of Environmental Quality, Office of the Great Lakes, at 517-335-4056.

Relevant Laws and Statutes

[Purple Loosestrife Law: 1995 PA 182](#)

This Act regulates the sale and distribution of nursery stock, plants, and plant products. It prohibits the sale or distribution of purple loosestrife *Lythrum salicaria* throughout the state of Michigan. The director of the department of agriculture may approve cultivars that have been developed and recognized to be sterile. Cultivars of *Lythrum virgatum* such as rose queen and mordon gleam may be sold at retail.

[Sport Fishing Law: 1929 PA 165](#)

The Sport Fishing Law requires a license from the DNR for taking or possessing minnows, wigglers or crayfish for other than personal use. It prohibits the import and export to the State of these species without a license, and prohibits all import of minnows and wigglers that are not native to Michigan. It also prohibits the import of live game fish or eggs except with a permit and prohibits planting fish, fish fry, or spawn without a permit. Violation of the law is a misdemeanor and carries a 90-day jail term, \$500 fine, or both, as a maximum penalty.

[Game Fish in Private Waters: 1957 PA 196](#)

The Game Fish in Private Waters law controls the import of game fish for private use, requiring a license from the DNR. It prohibits the import of "...any other species of fish when the importation of such species would endanger the public fishery resources of this State." The restrictions are defined by rules, promulgated by the DNR Fisheries Division. Violation of this law is also a misdemeanor, and carries a 90-day jail term, \$100 fine or both as a maximum penalty.

[State Launch Site Special Use Permit](#)

The DNR requires permits for use of state access sites for fishing and boating tournaments according to rules under the enabling legislation for the Department, 1921 PA 17. The current rules do not contemplate potential cross-contamination of public waters with exotic species, so the restrictions are limited in purpose to public safety and protection of property. Follow the above recommended precautions when moving a boat from lake to lake.

Resource Materials

General Brochure/Fact Sheet

A Field Guide to Aquatic Exotic Plants and Animals, Minnesota Department of Natural Resources, Exotic Species Program, 500 Lafayette Rd., St. Paul, MN 55155-4025, phone: 612-296-2835, fax: 612-296-1811, email: debbie.hunt@dnr.state.mn.us, pp 12, 1992, describes 11 common exotics in the Great Lakes region and instructions on how to prevent their spread. Single copies free.

Biological Invasions; How Aquatic Nuisance Species are Entering North American Waters, the Harm They Cause and What Can Be Done to Solve the Problem, Great Lakes Panel on Aquatic Nuisance Species, c/o Great Lakes Commission, The Argus II Building, 400 Fourth St., Ann Arbor, MI 48103-4816, phone: 313-665-9135, fax: 313-665-4370, email: glc@great-lakes.net, pp 8, 1997, an overview of the ANS problem in North America with a distribution map. One copy free; additional copies \$1.

Exotic Species and Freshwater Boater Survey: What do Boaters Know and Do They Care?, Minnesota Sea Grant Exotic Species Information Center, University of Minnesota - Duluth, 2305 East Fifth St., Duluth, MN 55812-1445, phone: 218-726-8712, fax: 218-726-6556, email: djensen@mes.umn.edu, pp2, 1997, fact sheet based on boater survey results. Free.

Exotics: Don't Let Them Ride With You!, Minnesota Sea Grant Exotic Species Information Center, University of Minnesota - Duluth, 2305 East Fifth St., Duluth, MN 55812-1445, phone: 218-726-8712, fax: 218-726-6556, email: djensen@mes.umn.edu, pp2, 1992, sheet designed to be carried in tackle boxes for identification of ANS and instructions to prevent their spread. Free.

Is Your Boat a Nuisance Carrier?, Connecticut Sea Grant College Program, University of Connecticut, 1084 Shennecossett Rd., Groton, CT 06340-6097, phone: 860-405-9127, fax: 860-405-9109, email: nbalcom@aol.com, pp 2, 1992, card warning boaters about their potential for spreading ANS. Free.

Nonindigenous Aquatic Nuisance Species State Management Plan: A Strategy to Confront Their Spread in Michigan, Michigan Department of Environmental Quality, Office of the Great Lakes, P.O. Box 30473, Lansing, MI 48909-7973, phone: 517-335-4056, fax: 157-335-4053, email: coscarem@state.mi.us, pp 42, January, 1996, management plan to prevent the introduction and control the spread of ANS in Michigan. Single copies free.

State Agency Noxious Weed Management Plans, Washington State Department of Fish and Wildlife, Fishery Management, 600 Capitol Way N., Olympia, WA 98501-1091, phone: 360-902-2821, fax: 360-902-2158, pp 48, 1996, management plan to control the growth and prevent the spread of noxious weeds in the State of Washington. Free

What's Next: The Prediction and Management of Exotic Species in the Great Lakes, Great Lakes Fishery Commission, 2100 Commonwealth Blvd., Suite 209, Ann Arbor, MI 48105, phone: 313-662-3209, fax: 313-741-2010, email: mgaden@great-lakes.net, pp 22, 1993, report of a 1992 workshop on the future of predicting new introductions and managing existing populations of ANS in the Great Lakes. Free.

General Audio-Visual

Aquatic Exotics, Minnesota Department of Natural Resources, Exotic Species Program, 500 Lafayette Rd., St. Paul, MN 55155-4025, phone: 612-296-2835, fax: 612-296-1811, email: debbie.hunt@dnr.state.mn.us, 22 minutes, 1996, video providing a brief summary of what exotic species are, how they spread, and why they can harm ecosystems. \$10 or by loan.

Stop the Invasion, Minnesota Sea Grant Exotic Species Information Center, University of Minnesota - Duluth, 2305 East Fifth St., Duluth, MN 55812-1445, phone: 218-726-8712, fax: 218-726-6556, email: djensen@mes.umn.edu, 25 minutes, 1993, video of the environmental and economic damage caused by ANS and the steps being taken to address the problem. \$10.

Strangers in Our Waterways, Oregon State University, Extension and Experiment Station Communications, Publications Orders, 422 Kerr Administration, Corvallis, OR 97331-2119, phone: 541-737-2513, fax: 541-737-0817, puborder@cmail.orst.edu, 28 minutes, 1995, video tape, in VHS format, that explores the impact of non-native species on aquatic ecosystems and reviews research being conducted to help reduce or prevent their negative impacts. \$30.

General Sign/Poster

Exotic Species Advisory, Wisconsin Department of Natural Resources, 101 S. Webster St., Madison, WI 53707, phone: 608-266-9270, fax: 608-267-2800, email: martir@dnr.state.wi.us, 18" x 24", 1995, sign notifying the public that an infested water body contains Eurasian watermilfoil, zebra mussels, ruffe or spiny water flea and providing instructions on how to prevent their spread. Also available as an 8 1/2" x 11" handout. Free.

Exotic Species Advisory Sign, Aquatic Exotics, Minnesota Department of Natural Resources, Exotic Species Program, 500 Lafayette Rd., St. Paul, MN 55155-4025, phone: 612-296-2835, fax: 612-296-1811, email: debbie.hunt@dnr.state.mn.us, 18" x 24", 1993, sign intended for posting at infested waters warning boaters that ANS are present. Free for water access owners.

Stop Sign for Water Accesses, Minnesota Department of Natural Resources, Exotic Species Program, 500 Lafayette Rd., St. Paul, MN 55155-4025, phone: 612-296-2835, fax: 612-296-1811, email: debbie.hunt@dnr.state.mn.us, 18" x 24", 1995, sign intended for posting at exits of public and private water accesses. It reads, "Please stop and remove all aquatic plants and drain water from boat and trailer." Free to water access owners.

General Catalogue/Database

Great Lakes Sea Grant Network Exotic Species Graphics Library Catalogue, Michigan Sea Grant College Program, University of Michigan, 4116 I.S.T. Building, 2200 Bonisteel Blvd., Ann Arbor, MI 48109-2099, phone: 313-764-1118, fax: 313-647-0768, email: belatham@engin.umich.edu, 1993, graphics library containing color slides and line illustrations of a wide variety of ANS. Catalogue available. Loan or purchase available.

General Newsletter/Periodical

ANS Digest, Freshwater Foundation, 2500 Shadywood Road, Navarre, MN 55331, phone: 612-471-9773, fax: 612-471-7685,

email: nhalker@freshwater.org, pp 8-12, published quarterly, newsletter providing current information on monitoring and controlling the spread of ANS.

Nuisance Notes, U.S. Fish and Wildlife Service, Region 6, 315 Houston St., Suite E, Manhattan, KS 66502, phone: 913-539-3474, ext. 20, fax: 913-539-8567, email: Linda_Drees@fws.gov, pp 2, published bi-annually, periodic newsletter of the Western Zebra Mussel Task Force. Free.

Seiche, Minnesota Sea Grant Exotic Species Information Center, University of Minnesota - Duluth, 2305 East Fifth St., Duluth, MN 55812-1445, phone: 218-726-8712, fax: 218-726-6556, email: djensen@mes.umn.edu, pp 12, published quarterly, newsletter with articles about Lake Superior and Minnesota's inland waters. Free.

The HELM, Illinois-Indiana Sea Grant Program, University of Illinois, 65 Mumford Hall, 1301 W. Gregory Dr., Urbana, IL 61801, phone: 217-333-9448, fax: 217-333-2614, email: r-goettel@uiuc.edu, pp 8, published biannually, newsletter that includes frequent articles on ANS in Illinois and Indiana waters. Free.

Twine Line, Ohio Sea Grant College Program, The Ohio State University, 1314 Kinnear Road, Columbus, OH 43212-1194, phone: 614-292-8949, fax: 614-292-4364, email: baniki.1@osu.edu, pp 8, published bimonthly, covers Lake Erie as a recreational and economic resource and includes research findings and agency activities. \$4.50 for six issues.

Eurasian Watermilfoil Brochure/Fact Sheet

A Summary of Eurasian Watermilfoil Control Technologies, Vermont Department of Environmental Conservation, Water Quality Division, 103 South Main St., Building 10-North, Waterbury, VT 05671-0408, phone: 802-241-3777, fax: 802-241-3287, email: mikeH@waterq.anr.state.vt.us, pp 16, 1996, a summary of mechanical, chemical, biological habitat manipulation and physical management technologies for Eurasian watermilfoil. Free.

Fighting Eurasian Watermilfoil in Wisconsin, Wisconsin Department of Natural Resources, 101 S. Webster St., Madison, WI 53707, phone: 608-266-9270, fax: 608-267-2800, email: martir@dnr.state.wi.us, pp 4, 1994, reprint of an article from the spring 1994 issue of *Aquatics* reviewing efforts in the state of Wisconsin to control the spread of Eurasian watermilfoil. Free.

How to Identify and Search for Eurasian Watermilfoil, Vermont Department of Environmental Conservation, Water Quality Division, 103 South Main St., Building 10-North, Waterbury, VT 05671-0408, phone: 802-241-3777, fax: 802-241-3287, email: mikeH@waterq.anr.state.vt.us, pp 8, 1996, fact sheet providing general information on Eurasian watermilfoil, the problems it causes and how to identify and prevent its spread. Includes instructions on how to search for and distinguish it from beneficial native aquatic plants. Free.

Milfoil: An Aggressive Water Weed, Washington State Department of Ecology, Olympia, WA 98501-1091, phone: 206-459-6000, pp 8, 1990, brochure describing Eurasian watermilfoil, the threat it poses to water bodies and what the public can do to control its growth, prevent its spread and minimize its impacts. Free.

Eurasian Watermilfoil Report

A Report from the Milfoil Study Committee on the Use of Aquatic Herbicides to Control Eurasian Watermilfoil in Vermont, Vermont Department of Environmental Conservation, Water Quality Division, 103 South Main St., Building 10-North, Waterbury, VT 05671-0408, phone: 802-241-3777, fax: 802-241-3287, email: mikeH@waterq.anr.state.vt.us, pp 41, 1993, report discussing the potential for using aquatic herbicides to control Eurasian watermilfoil in Vermont's lakes. Free.

Eurasian Watermilfoil in Wisconsin: A Report to the Legislature, Wisconsin Department of Natural Resources, 101 S. Webster St., Madison, WI 53707, phone: 608-266-9270, fax: 608-267-2800, email: martir@dnr.state.wi.us, pp 19, 1992, report to the Wisconsin legislature summarizing the location and spread of Eurasian watermilfoil in the state and providing a plan to prevent its spread. Free.

Eurasian Watermilfoil Chemical Treatment Plan: A Report to the General Assembly, Vermont Department of Environmental Conservation, Water Quality Division, 103 South Main St., Building 10-North, Waterbury, VT 05671-0408, phone: 802-241-3777, fax: 802-241-3287, email: mikeH@waterq.anr.state.vt.us, pp 15, 1996, an in-depth look at the use of chemicals to control Eurasian watermilfoil in Vermont, with an emphasis on three Vermont lakes. Free.

Eurasian Watermilfoil Audio-Visual

Eurasian Watermilfoil...A Threat to Our Lakes, Vermont Department of Environmental Conservation, Water Quality Division, 103 South Main St., Building 10-North, Waterbury, VT 05671-0408, phone: 802-241-3777, fax: 802-241-3287, email: mikeH@waterq.anr.state.vt.us, 20 minutes, 1995, slide show with script discussing Eurasian watermilfoil in Vermont, the threat it poses to lakes and what can be done to control it and prevent its spread. Appropriate for grade levels 7-12 and beyond. Available by loan.

Eurasian Watermilfoil Sign/Poster

Eurasian Watermilfoil Poster, Minnesota Department of Natural Resources, Exotic Species Program, 500 Lafayette Rd., St. Paul, MN 55155-4025, phone: 612-296-2835, fax: 612-296-1811, email: debbie.hunt@dnr.state.mn.us, 17" x 23", Undated, poster encouraging boaters to remove all aquatic vegetation from their boats to avoid spreading Eurasian watermilfoil. 50 cents.

Eurasian Watermilfoil Card/Decal

Eurasian Watermilfoil Identification Card, Minnesota Department of Natural Resources, Exotic Species Program, 500 Lafayette Rd., St. Paul, MN 55155-4025, phone: 612-296-2835, fax: 612-296-1811, email: debbie.hunt@dnr.state.mn.us, wallet-size card, 1994, card with general information on Eurasian watermilfoil, a photo of it, instructions on how to identify and distinguish it from native watermilfoil, and ways to avoid its spread. The card can be customized for different jurisdictions. Free.

Purple Loosestrife Brochure/ Fact Sheet

Field Identification of Galerucella Beetles: Biological Control Agents of Purple Loosestrife, University of Guelph, Biological Control Laboratory, Department of Environmental Biology, Guelph, Ontario N1G 2W1, phone: 1-800-563-7711 in Ontario or 519-824-4120, extension 8591, fax: 519-837-0442, email: dmackenz@uoguelph.ca, pp2, 1994, fact sheet providing information on the field identification of two biological control agents for purple loosestrife. Free.

Laboratory Rearing of Galerucella Beetles: Biological Control Agents of Purple Loosestrife, University of Guelph, Biological Control Laboratory, Department of Environmental Biology, Guelph, Ontario N1G 2W1, phone: 1-800-563-7711 in Ontario or 519-824-4120, extension 8591, fax: 519-837-0442, email: dmackenz@uoguelph.ca, pp2, 1994, fact sheet providing information on the laboratory rearing of two biological control agents of the purple loosestrife. Free.

Project purple: Guidelines for Purple Loosestrife Control, Ontario Federation of Anglers and Hunters, P.O. Box 2800, Peterborough, Ontario K9J 8L5, phone: 1-800-563-7711 in Ontario or 705-748-6324, fax: 705-748-9577, email: fish_wild@oncomdis.on.ca, pp 4, 1995, fact sheet providing drawings of purple loosestrife, instructions for identifying it and directions for controlling its spread. Free.

Purple Loosestrife Fact Sheet, Ontario Federation of Anglers and Hunters, P.O. Box 2800, Peterborough, Ontario K9J 8L5, phone: 1-800-563-7711 in Ontario or 705-748-6324, fax: 705-748-9577, email: fish_wild@oncomdis.on.ca, pp 2, 1993, fact sheet providing general information on purple loosestrife including line drawings of the plant and instructions on how to identify it. Free.

Purple Loosestrife: What You Should Know, What You Can Do, Ontario Federation of Anglers and Hunters, P.O. Box 2800, Peterborough, Ontario K9J 8L5, phone: 1-800-563-7711 in Ontario or 705-748-6324, fax: 705-748-9577, email: fish_wild@oncomdis.on.ca, pp 16, 1996, brochure providing comprehensive information on purple loosestrife, including how to identify it, its impacts, control methods, cultivars and alternative plantings. Free.

Purple Loosestrife; An Attractive but Serious Threat to Wisconsin's Wetlands and Waterways, Wisconsin Department of Natural Resources, 101 S. Webster St., Madison, WI 53707, phone: 608-266-9270, fax: 608-267-2800, email: martir@dnr.state.wi.us, pp 12, 1995, full-color brochure providing general information about purple loosestrife, the threat it poses to wetlands and water bodies, its distribution in Wisconsin, and the steps that should be taken to control its spread. Free.

Purple Loosestrife; The Beautiful Killer, Manitoba Purple Loosestrife Project, c/o Ducks Unlimited, Oak Hammock Marsh, P.O. Box 1160, Stonewall, Manitoba R0C 2Z0, phone: 204-467-3269, fax: 204-467-9028, email: c_lindgren@ducks.ca, pp 6, 1990, brochure providing general information on purple loosestrife, the problems it causes, ways to control it and alternative plantings. Free.

The Grand River Watershed Management Plan: A New Initiative in the Fight Against Purple Loosestrife, University of Guelph, Biological Control Laboratory, Department of Environmental Biology, Guelph, Ontario N1G 2W1, phone: 1-800-563-7711 in Ontario or 519-824-4120, extension 8591, fax: 519-837-0442, email: dmackenz@uoguelph.ca, pp2, 1996, fact sheet providing information on the development of a biological control plan for purple loosestrife in the Grand River Watershed. Free.

Purple Loosestrife Report

A Universal Manual for Purple Loosestrife Control (Second Edition), Ontario Federation of Anglers and Hunters, P.O. Box 2800, Peterborough, Ontario K9J 8L5, phone: 1-800-563-7711 in Ontario or 705-748-6324, fax: 705-748-9577, email: fish_wild@oncomdis.on.ca, pp 80, 1993, manual outlining approaches for managing the spread and control of purple loosestrife. \$16 Canadian.

Life History and Taxonomic Status of Purple Loosestrife in Minnesota: Implications for Management and Regulation of this Exotic Plant (Special Publication 146), Minnesota Department of Natural Resources, Exotic Species Program, 500 Lafayette Rd., St. Paul, MN 55155-4025, phone: 612-296-2835, fax: 612-296-1811, email: debbie.hunt@dnr.state.mn.us, pp15, 1992, a summary of research findings that affect management of purple loosestrife. Topics such as seed bank dynamics and cultivar reproduction are covered. Free.

Minnesota Purple Loosestrife Program: History, Findings and Management Recommendations (Special Publication 145), Minnesota Department of Natural Resources, Exotic Species Program, 500 Lafayette Rd., St. Paul, MN 55155-4025, phone: 612-296-2835, fax: 612-296-1811, email: debbie.hunt@dnr.state.mn.us, pp 27, 1994, review of purple loosestrife management through the use of herbicides and biological control. Free.

Purple Loosestrife Audio-Visual

Project Purple: How to Stop Purple Loosestrife from Destroying Your Wetlands!, Ontario Federation of Anglers and Hunters, P.O. Box 2800, Peterborough, Ontario K9J 8L5, phone: 1-800-563-7711 in Ontario or 705-748-6324, fax: 705-748-9577, email: fish_wild@oncomdis.on.ca, 14 minutes, 1993, video providing information on purple loosestrife, its invasive behavior, techniques for identifying it and methods for controlling its spread. \$14 Canadian or by loan.

Purple Loosestrife Video, Manitoba Purple Loosestrife Project, c/o Ducks Unlimited, Oak Hammock Marsh, P.O. Box 1160, Stonewall, Manitoba R0C 2Z0, phone: 204-467-3269, fax: 204-467-9028, email: c_lindgren@ducks.ca, 30 minutes, 1997, video describing the problems caused by purple loosestrife, ways to control it, and alternative plantings. Contact source. Restoring the Balance: Biological Control of Purple Loosestrife, University Resource Center, 7-8 BTP, Ithaca, NY 14850, phone: 607-255-2090, fax: 607-255-9946, email: dist_cent@cce.cornell.edu, 25 minutes, 1997, video describing the ecological impacts of purple loosestrife and reviewing its biological control and management through use of the galerucella beetle. \$24.95.

Purple Loosestrife Sign/Poster

Beautiful Killer; Purple Loosestrife (Lythrum), Manitoba Purple Loosestrife Project, c/o Ducks Unlimited, Oak Hammock Marsh, P.O. Box 1160, Stonewall, Manitoba R0C 2Z0, phone: 204-467-3269, fax: 204-467-9028, email: c_lindgren@ducks.ca, 2 ft. x 3 ft., 1995, poster explaining why purple loosestrife is a problem and presenting options for controlling it. Free.

Round Goby Brochure/Fact Sheet

Gobies in the Great Lakes, Ontario Ministry of Natural Resources, Natural Resources Information Centre, Box 7000, 300 Water St., Peterborough, Ontario K9J 8M5, phone: 1-800-563-7711 in Ontario or 705-755-1950; for requests in French 705-755-1674, fax: 705-755-1201, email: dextraal@epo.gov.on.ca, pp 2, 1996, fact sheet providing general information on the goby, where they can be found in the Great Lakes, what impacts they may have and what boaters and anglers can do to prevent their spread. Free.

Gobies: Cyberfish of the '90s, Michigan Sea Grant College Program, University of Michigan, 4116 I.S.T. Building, 2200 Bonisteel Blvd., Ann Arbor, MI 48109-2099, phone: 313-764-1118, fax: 313-647-0768, email: belatham@engin.umich.edu, pp 4, 1996, fact sheet discussing the impact of the round goby on native benthic fish, such as sculpins and darters. Describes the characteristics and habitat of the round and tubenose goby. Free.

Round Gobies Invade North America, Illinois-Indiana Sea Grant Program, University of Illinois, 65 Mumford Hall, 1301 W. Gregory Dr., Urbana, IL 61801, phone: 217-333-9448, fax: 217-333-2614, email: r-goettel@uiuc.edu, pp 2, 1995, fact sheet describing the biology of the round goby and how to identify it. Free.

Round Goby Sign/Poster

Have You Caught this Fish?, Illinois Natural History Survey, Lake Michigan Biological Station, 400 17th St., Zion, IL 60099, phone: 847-872-8676, fax: 847-872-8679, email: jmarsden@uiuc.edu, 11" x 11", 1996, sign describing the round goby and requesting reported sightings in Illinois. \$2.00.

Round Goby Card/Decal

Round Goby WATCH, Minnesota Sea Grant Exotic Species Information Center, University of Minnesota - Duluth, 2305 East Fifth St., Duluth, MN 55812-1445, phone: 218-726-8712, fax: 218-726-6556, email: djensen@mes.umn.edu, wallet-size card, 1992, card with a photo of a round goby, instructions on how to identify and prevent its spread, and phone numbers for reporting it. Has been customized for use in other jurisdictions; contact your local resources agency or Sea Grant office. Free.

Ruffe Brochure/Fact Sheet

Ruffe (Gymnocephalus cernuus): A New Threat to Fisheries, Minnesota Sea Grant Exotic Species Information Center, University of Minnesota - Duluth, 2305 East Fifth St., Duluth, MN 55812-1445, phone: 218-726-8712, fax: 218-726-6556, email: djensen@mes.umn.edu, pp 4, 1996, brochure describing the biology, ecology, control methods and impacts of the ruffe in the Great Lakes. Free.

Ruffe - A New Threat to Our Fisheries, Minnesota Sea Grant Exotic Species Information Center, University of Minnesota - Duluth, 2305 East Fifth St., Duluth, MN 55812-1445, phone: 218-726-8712, fax: 218-726-6556, email: djensen@mes.umn.edu, pp 4, 1997, fact sheet summarizing the history and habitat of the ruffe and what should be done if one is caught. Free.

Ruffe Sign/Poster

Ruffe Distribution, Ontario Ministry of Natural Resources, Natural Resources Information Centre, Box 7000, 300 Water St., Peterborough, Ontario K9J 8M5, phone: 1-800-563-7711 in Ontario or 705-755-1950; for requests in French 705-755-1674, fax: 705-755-1201, email: dextraal@epo.gov.on.ca, 8 ½" x 11", 1995; updated annually, map showing the geographic distribution of the ruffe in Ontario. Free.

Ruffe Card/Decal

Ruffe WATCH, Minnesota Sea Grant Exotic Species Information Center, University of Minnesota - Duluth, 2305 East Fifth St., Duluth, MN 55812-1445, phone: 218-726-8712, fax: 218-726-6556, email: djensen@mes.umn.edu, wallet-size card, 1995, card with a photo of a ruffe, instructions on how to identify and prevent its spread, and phone numbers for reporting them. They have been customized for use in other jurisdictions; contact your local resources agency or Sea Grant office. Free.

Spiny Water Flea Brochure/Fact Sheet

Spiny Tailed Bythotrephes in the Great Lakes, Michigan Sea Grant College Program, University of Michigan, 4116 I.S.T. Building, 2200 Bonisteel Blvd., Ann Arbor, MI 48109-2099, phone: 313-764-1118, fax: 313-647-0768, email: belatham@engin.umich.edu, pp 2, 1990, fact sheet explaining the unique body structure and unusual reproductive cycle of the spiny water flea. MICHU-SG-90-700. Free.

The Spiny Water Flea, Bythotrephes cederstroemi: Another Unwelcome Newcomer to the Great Lakes, Ohio Sea Grant College Program, The Ohio State University, 1314 Kinnear Road, Columbus, OH 43212-1194, phone: 614-292-8949, fax: 614-292-4364, email: baniki.1@osu.edu, pp 2, 1997, fact sheet providing general information on the spiny water flea, including where it came from, what it eats and its potential impact on the Great Lakes. Free.

Zebra Mussel Brochure/Fact Sheet

Boaters: Take Action Against Zebra Mussels, Ohio Sea Grant College Program, The Ohio State University, 1314 Kinnear Road, Columbus, OH 43212-1194, phone: 614-292-8949, fax: 614-292-4364, email: baniki.1@osu.edu, pp 2, 1996, fact sheet providing information on the zebra mussel and steps that boaters can take to prevent spreading them. Free.

Control Zebra Mussels in Residential Water Systems, New York Sea Grant, Zebra Mussel Information Clearinghouse, Morgan III, State University College, Brockport, NY 14420-2928, phone: 1-800-285-2285 or 716-395-2516, fax: 716-395-2729, email: zmussel@cce.cornell.edu, pp 10, 1996, fact sheet explaining control measures for home owners who use water taken from zebra mussel infested waters. One copy free, 40 cents for multiple copies.

Don't Pick Up Hitchhikers! Stop the Zebra Mussel!, New York Sea Grant, Zebra Mussel Information Clearinghouse, Morgan III, State University College, Brockport, NY 14420-2928, phone: 1-800-285-2285 or 716-395-2516, fax: 716-395-2729, email: zmussel@cce.cornell.edu, pp 6, 1994, brochure providing information for boaters on controlling the spread of zebra mussels. 10 copies free; contact source for bulk quantities.

Safe Use of Zebra Mussel in Classroom and Laboratories, Michigan and Ohio Sea Grant College Programs, University of Michigan, 4116 I.S.T. Building, 2200 Bonisteel Blvd., Ann Arbor, MI 48109-2099, phone: 313-764-1118, fax: 313-647-0768, pp 2, 1993, fact sheet summarizing the zebra mussel's means of transport and life cycle and providing procedures for transporting and using them safely in the classroom and laboratory to prevent their spread to uninfested waters. Free.

Slow the Spread of Zebra Mussels and Protect Your Boat and Motor, Too, Ohio Sea Grant College Program, The Ohio State University, 1314 Kinnear Road, Columbus, OH 43212-1194, phone: 614-292-8949, fax: 614-292-4364, email: baniki.1@osu.edu, pp 2, 1994, fact sheet targeting boaters, OHSU-FS-054. Free.

The Zebra Mussel (Dreissena polymorpha): An Unwelcome North American Invader, New York Sea Grant, Zebra Mussel Information Clearinghouse, Morgan III, State University College, Brockport, NY 14420-2928, phone: 1-800-285-2285 or 716-395-2516, fax: 716-395-2729, email: zmussel@cce.cornell.edu, pp 12, 1991, fact sheet providing general information on the zebra mussel, including its origin, biology, impacts and potential control methods. Single copies free; additional copies 40 cents.

Zebra Mussel Alert and Guide to Boaters, Illinois Department of Natural Resources, 9511 Harrison St., Des Plaines, IL 60016, phone: 847-294-4134, fax: 847-294-4128, pp 6, 1991, brochure providing general information on the zebra mussel, its presence in Illinois waters, the damage it can cause, and how to prevent its spread and minimize its impacts on boating equipment. Free.

Zebra Mussel Boater's Guide, Wisconsin Department of Natural Resources, 101 S. Webster St., Madison, WI 53707, phone: 608-266-9270, fax: 608-267-2800, email: martir@dnr.state.wi.us, pp 6, 1995, brochure describing the zebra mussel, the threat it poses to inland waters, and the steps boaters can take to prevent its spread and mitigate its impact. Free.

Zebra mussel Control Products for Shoreline Property Owners, Ontario Federation of Anglers and Hunters, P.O. Box 2800, Peterborough, Ontario K9J8L5, phone: 1-800-563-7711 in Ontario or 705-748-6324, fax: 705-748-9577, email: fish_wild@oncomdis.on.ca, 1 page, 1996, brochure for small-volume water users listing filters available in Ontario to help prevent infestation by zebra mussels. Free.

Zebra Mussel Distribution Along Michigan's Great Lakes Coastline, Michigan Sea Grant College Program, University of Michigan, 4116 I.S.T. Building, 2200 Bonisteel Blvd., Ann Arbor, MI 48109-2099, phone: 313-764-1118, fax: 313-647-0768, email: belatham@engin.umich.edu, 1 page, 1995, map and accompanying table provide a record of the zebra mussel's rapid infestation of Great Lakes waters between 1988 and 1994. Free.

Zebra Mussel Distribution in the Inland Waters of Michigan, Michigan Sea Grant College Program, University of Michigan, 4116 I.S.T. Building, 2200 Bonisteel Blvd., Ann Arbor, MI 48109-2099, phone: 313-764-1118, fax: 313-647-0768, email: belatham@engin.umich.edu, pp 2, updated annually, map and accompanying table display zebra mussel-infested waters in Michigan. It provides an alphabetical listing and the date of zebra mussel discoveries in various locations. Free.

Zebra Mussel Migration to Inland Lakes and Reservoirs: A Guide for Lake Managers, Ohio Sea Grant College Program, The Ohio State University, 1314 Kinnear Road, Columbus, OH 43212-1194, phone: 614-292-8949, fax: 614-292-4364, email: baniki.1@osu.edu, pp 4, 1993, outlines optimum habitat requirements, economic impacts, ecological effects, and prevention and remediation strategies for zebra mussels in inland lakes, OHSU-FS-058. Free.

Zebra Mussels in North America: The Invasion and Its Implications, Ohio Sea Grant College Program, The Ohio State University, 1314 Kinnear Road, Columbus, OH 43212-1194, phone: 614-292-8949, fax: 614-292-4364, email: baniki.1@osu.edu, pp 4, 1997, fact sheet providing general information on the zebra mussel, its spread into North American waters, the problems they cause and potential control strategies. Free.

Zebra Mussel Report

The Zebra Mussel: Impacts and Control, New York Sea Grant, Zebra Mussel Information Clearinghouse, Morgan III, State University College, Brockport, NY 14420-2928, phone: 1-800-285-2285 or 716-395-2516, fax: 716-395-2729, email: zmusssel@cce.cornell.edu, pp 62, 1996, information bulletin explaining the introduction, dispersal, environmental tolerances, life history, infrastructure impacts, monitoring procedures, and control measures for use in large scale water use infrastructures. \$12.75.

The Zebra Mussel: U.S. Utility Implications, Electric Power Research Institute, Distribution Center, 207 Coggins Dr., Pleasant Hill, CA 94523, phone: 510-934-4212, fax: 510-944-0510, email: ic@epri.net.epri.com, pp 88, 1990, report discussing potential impacts of the zebra mussel on the U.S. utility industry and potential control and mitigation strategies (Order Number: GS-6995). Contact source for costs.

Zebra mussel Conference for Inland Water Users: Control and Prevention for Municipalities and Industries, Illinois-Indiana Sea Grant Program, University of Illinois, 65 Mumford Hall, 1301 W. Gregory Dr., Urbana, IL 61801, phone: 217-333-9448, fax: 217-333-2614, email: r-goettel@uiuc.edu, pp 33, 1996, report providing abstracts from a June, 1996, conference on alternative zebra mussel control strategies. \$1.00.

Zebra Mussel Information Needs Survey for Municipal and Industrial Water Users, Illinois-Indiana Sea Grant Program, University of Illinois, 65 Mumford Hall, 1301 W. Gregory Dr., Urbana, IL 61801, phone: 217-333-9448, fax: 217-333-2614, email: r-goettel@uiuc.edu, pp 8, 1992, survey of 29 southern Lake Michigan municipal and industrial water users providing findings on what types of zebra mussel information was most needed and in what form the information could be best delivered. Free.

Zebra mussel Monitoring and Control Guide, Electric Power Research Institute, Distribution Center, 207 Coggins Dr., Pleasant Hill, CA 94523, phone: 510-934-4212, fax: 510-944-0510, email: ic@epri.net.epri.com, pp 724, 1992, comprehensive guide for utilities and businesses on how to implement site-specific monitoring and control programs to prevent or mitigate zebra mussel infestations (Order Number TR-101782). \$500.

Zebra Mussel Audio-Visual

“Zebra Mussels” Television Documentary, New York Sea Grant Communications, 115 Nassau Hall, SUNY at Stony Brook, Stony Brook, NY 11794-5001, phone: 516-632-9124, fax: 516-632-6917, email: shamill@ccmail.sunysb.edu, 30 minutes, 1993, video featuring biology and impact, control measures, interviews with politicians, and the history of the zebra mussel in American waters. \$12 or by loan for free from the Zebra Mussel Information Clearinghouse.

Detecting Zebra Mussels: A Monitoring Program for Citizens, Michigan Sea Grant College Program, University of Michigan, 4116 I.S.T. Building, 2200 Bonisteel Blvd., Ann Arbor, MI 48109-2099, phone: 313-764-1118, fax: 313-647-0768, email: belatham@engin.umich.edu, 1996, video and notebook designed to accompany the lake sampling kit for use in the Sea Grant Zebra Mussel Veliger Monitoring Program. \$10.

The Spread of Zebra Mussels to Inland Lakes-Implications and Actions, Michigan Sea Grant College Program, University of Michigan, 4116 I.S.T. Building, 2200 Bonisteel Blvd., Ann Arbor, MI 48109-2099, phone: 313-764-1118, fax: 313-647-0768, email: belatham@engin.umich.edu, 66 slides and 10-page script; approximate duration 30-40 minutes, 1994, slide show with taped narration providing general information on the zebra mussel, its spread to inland waters, the problems it causes, the steps being taken to control its spread and minimize its impacts and the ways the public can help, MICHU-SG-94-706. \$10.

Ballast Water Brochure/Fact Sheet

Ballast Water - A Source of Invasion, U.S. Coast Guard, Marine Safety Detachment, 180 Andrews St., Massena, NY 13662-0728, phone: 315-764-3284, fax: 315-764-3283, pp 6, 1994, brochure summarizing U.S. ballast water management regulations effective May 1993 for vessels entering the Great Lakes. Free.

Exotic Species and the Shipping Industry: The Great Lakes, St. Lawrence System at Risk, Great Lakes Fishery Commission, 2100 Commonwealth Blvd., Suite 209, Ann Arbor, MI 48105, phone: 313-662-3209, fax: 313-741-2010, email: mgaden@great-lakes.net, pp 74, 1990, report summarizing the impact of the Great Lakes Shipping industry and introductions of nonindigenous aquatic nuisance species. Free.

Acknowledgements

Writers

Department of Environmental Quality
Mark Coscarelli, Office of Great Lakes
Emily Bankard, Office of Great Lakes

Contributors

Martha Waszak, Office of Great Lakes
Amy Hilt, MI Department of Natural Resources:
Fisheries Division
Sylvia Heaton, Surface Water Quality Division

Editor

Emily Bankard, Office of Great Lakes

Layout and Graphic Design

Emily Bankard, Office of Great Lakes

Cover Design

Stephen Bolt

Cover Photograph

Carol S. Allaire

Web sites of interest

<http://www.ansc.purdue.edu/sgnis/>
<http://131.212.107.2/seagr/areas/exotic.html>
<http://nas.er.usgs.gov/zebra.mussel/>
<http://nas.nfrcg.gov/nas/control.htm>
<http://www.entryway.com/seagrant/>
<http://www.georgianbay.ca/gbafoundation/zebra/>
<http://great-lakes.net/envt/exotic/zebra.html>



July, 1999



Prepared by the Office of Great Lakes
Michigan Department of Environmental Quality
John Engler, Governor; Russell J. Harding, Director



<http://www.deq.state.mi.us>

Thanks to the U.S. Fish and Wildlife Service, U.S. Army Corp of Engineers, and the Minnesota Sea Grant

The Michigan Department of Environmental Quality (MDEQ) will not discriminate against any individual or group on the basis of race, sex, religion, age, national origin, color, marital status, disability or political beliefs. Questions or concerns should be directed to the MDEQ Office of Personnel Services, P.O. Box 30473, Lansing, MI 48909.

Printed by authority of Department of Environmental Quality
Total number of copies printed: 3,000; Total Cost: \$3,852.36; Cost per copy: \$1.28

 Michigan Department of Environmental Quality