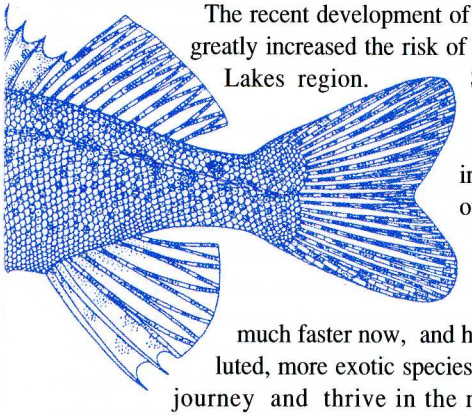
A Field Guide to Aquatic Exotic Plants and Animals

Exotic Introductions

"Exotic" species — organisms introduced into habitats where they are not native — are severe world-wide agents of habitat alteration and degradation. A major cause of biological diversity loss throughout the world, they are considered "biological pollutants."

Introducing species accidentally or intentionally, from one habitat into another, is risky business. Freed from the predators, parasites, pathogens, and competitors that have kept their numbers in check, species introduced into new habitats often overrun their new home and crowd out native species. In the presence of enough food and a favorable environment, their numbers will explode. Once established, exotics rarely can be eliminated.

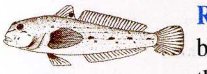
Most species introductions are the work of humans. Some introductions, such as carp and purple loosestrife, are intentional and do unexpected damage. But many exotic introductions are accidental. The species are carried in on animals, vehicles, ships, commercial goods, produce, and even clothing. Some exotic introductions are ecologically harmless and some are beneficial. But other exotic introductions are harmful to recreation and ecosystems. They have even caused the extinction of native species — especially those of confined habitats such as islands and aquatic ecosystems.



The recent development of fast ocean freighters has greatly increased the risk of new exotics in the Great Lakes region. Ships take on ballast water in Europe for stability during the ocean crossing. This water is pumped out when the ships pick up their loads in Great Lakes ports. Because the ships make the crossing so much faster now, and harbors are often less polluted, more exotic species are likely to survive the journey and thrive in the new waters.

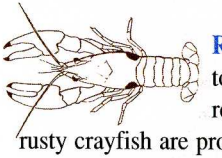
Many of the plants and animals described in this guide arrived in the Great Lakes this way. But they are now being spread throughout the continent's interior in and on boats and other recreational watercraft and equipment. **This guide is designed to help water recreationalists recognize these exotics and help stop their further spread.**

Midwest Aquatic Exotics

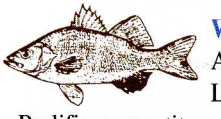


Round goby (*Neogobius melanostomus*) is a bottom-dwelling fish, native to eastern Europe, that entered the eastern Great Lakes in ballast water. They can spawn several times per year, grow to about 10 inches, are aggressive, and compete with native bottom-dwellers like sculpins and log perch. They are expected to be harmful to Great Lakes and inland fisheries.

Sea lamprey (*Petromyzon marinus*) are predaceous, eel-like fish native to the coastal regions of both sides of the Atlantic Ocean. They entered the Great Lakes through the Welland Canal about 1921. They contributed greatly to the decline of whitefish and lake trout in the Great Lakes.



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.

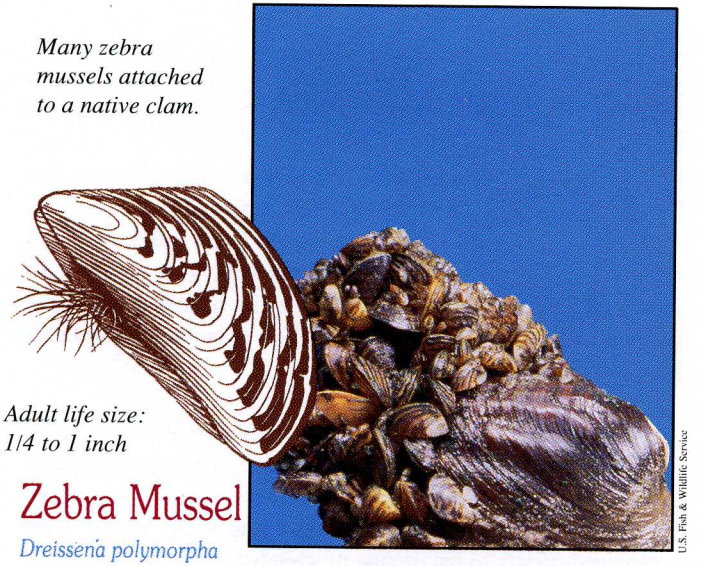


White perch (*Morone americana*) are native to Atlantic coastal regions and invaded the Great Lakes through the Erie and Welland canals. Prolific competitors of native fish species, white perch have the potential to cause declines of Great Lakes walleye populations.

Flowering rush (*Botumus umbellatus*) is a perennial plant from Europe and Asia that was introduced in the Midwest as an ornamental plant. It grows in shallow areas of lakes as an emergent, and as a submersed form in water up to 10 feet deep. Its dense stands crowd out native species like bulrush. The emergent form has pink, umbellate-shaped flowers, and is 3 feet tall with triangular-shaped stems.

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 nusiance aquatic plant in the Midwest until Eurasian watermilfoil appeared. It was accidentally introduced along with the common carp.

Many zebra mussels attached to a native clam.



U.S. Fish & Wildlife Service

Adult life size: 1/4 to 1 inch

Zebra Mussel

Dreissena polymorpha

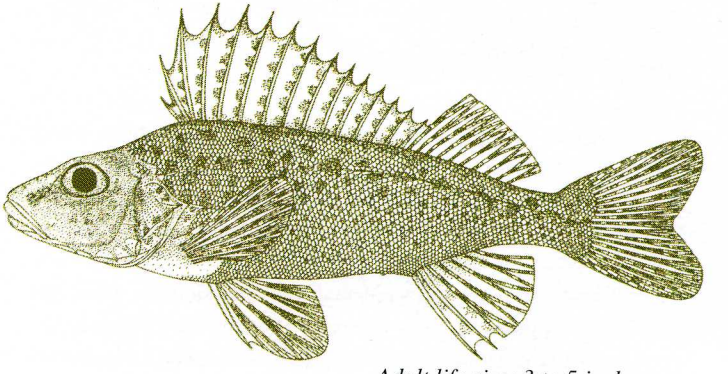
Zebra mussels and a related species, the Quagga mussel, are small, fingernail-sized mussels native to the Caspian Sea region of Asia. They were discovered in Lake St. Clair near Detroit in 1988. Tolerant of a wide range of environmental conditions, zebra mussels have now spread to parts of all the Great Lakes and the Mississippi River and are showing up in inland lakes. Zebra mussels clog water systems of power plants and water treatment facilities, as well as irrigation systems. They have severely reduced and eliminated native mussel species.

Female zebra mussels can produce as many as 1 million eggs per year. These develop into microscopic, free-living larvae (called veligers) that begin to form shells. At about three weeks, the sand grain-sized larvae start to settle and attach to any firm surface using "byssal threads". They will cover rock, metal, rubber, wood, docks, boathulls, native mussels, and even aquatic plants.

Zebra mussels filter plankton from the surrounding water. Each mussel can filter about one quart of lake water per day. However, not all of what they remove is eaten. What they don't eat is combined with mucus as "pseudofeces" and discharged onto the lake bottom where it accumulates. This material may benefit bottom feeders while reducing the plankton food chain for upper water species.

Diving ducks, the freshwater drum, and other fish eat zebra mussels, but will not significantly control them.

Likely means of spread: Microscopic larvae may be carried in livewells or bilge water. Adults can attach to boats or boating equipment that sit in the water.



Adult life size: 3 to 5 inches

Ruffe

Gymnocephalus cernuus

The ruffe is a small European member of the perch family that is native to central and eastern Europe. It was introduced to Duluth harbor, probably in tanker ballast water, around 1985, and is spreading to other rivers and bays around Lake Superior.

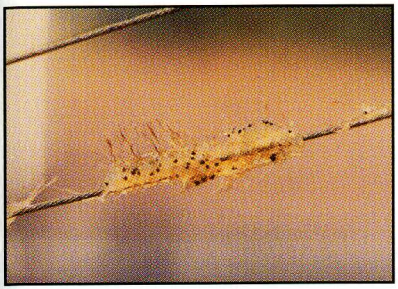
In Europe, the ruffe is a pest species in waters it has invaded. Ruffe have shown explosive population growth and have had harmful impacts on native species and functions of aquatic ecosystems.

In the St. Louis River near Duluth, populations of yellow perch, emerald shiners, and other forage fish caught in survey trawls have declined dramatically as numbers of ruffe have increased.

The ruffe's ability to displace other species in newly invaded areas is due to: (1) its high reproductive rate, (2) its feeding efficiency across a wide range of environmental conditions, and (3) characteristics that may discourage would-be predators such as walleye and pike.

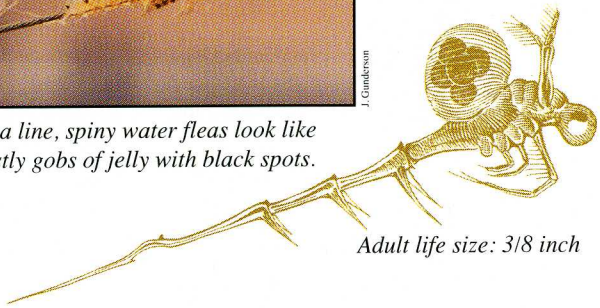
Ruffe grow rapidly and can reproduce in their first year. In the St. Louis River, females can lay between 45,000 and 90,000 eggs a year. Ruffe are primarily bottom feeders, preferring dark environments where they can hide from predators. Ruffe rarely grow bigger than 5 inches, although the sharp spines on their gill covers, dorsal and anal fins make them difficult for larger fish to eat.

Likely means of spread: Ruffe could be accidentally transported in livewells, bilge water, bait buckets, and in the ballast water of Great Lakes freighters.



J. Gunderson

On a line, spiny water fleas look like bristly gobs of jelly with black spots.



Adult life size: 3/8 inch

Spiny Water Flea

Bythotrephes cederstroemi

The spiny water flea, or "B.C.", is not an insect at all, but a tiny (less than half an inch long) crustacean with a long, sharp, barbed tail spine. A native of Great Britain and northern Europe east to the Caspian Sea, the animal was first found in Lake Huron in 1984 — probably imported in the ballast water of a trans-oceanic freighter. Since then, populations have exploded and the animal can now be found throughout the Great Lakes and in some inland lakes.

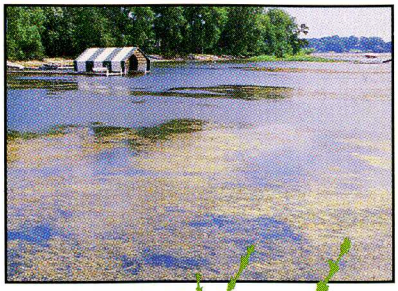
The effects spiny water fleas will have on the ecosystems of the Great Lakes region are unclear. The animals may compete directly with young perch and other small fish for food, such as *Daphnia* zooplankton. They also may provide a food source for larger fish.

Spiny water fleas also reproduce rapidly. During warm summer conditions each female can produce up to 10 offspring every two weeks. As temperatures drop in the fall, eggs are produced that can lie dormant all winter.

While the impacts of the spiny water flea seem to be minimal in some areas of the Great Lakes, it is not known if this exotic will have larger impacts on inland lake ecosystems.

Likely means of spread: Spiny water flea eggs and adults may wind up unseen in bilge water, bait buckets, and livewells. Also, fishing lines and downriggers will often be coated with both eggs and adults.

Eurasian watermilfoil typically has 12 to 21 pairs of leaflets. The native northern watermilfoil, with which it is often confused, usually has 5 to 9 pairs.



DNR Photo

Leaflet is 1/2 life size

Mature plant

Eurasian watermilfoil

Myriophyllum spicatum

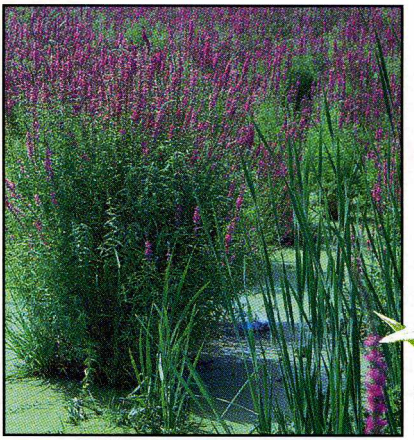
Eurasian watermilfoil was accidently introduced to North America from Europe. Spread westward into inland lakes primarily by boats and also by waterbirds, it reached midwestern states between the 1950s and 1980s.

In nutrient-rich lakes it 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 important native water plants.

A key factor in the plant's success is its ability to reproduce through stem fragmentation and runners. A single segment of stem and leaves can take root and form a new colony. Fragments clinging to boats and trailers can spread the plant from lake to lake. The mechanical clearing of aquatic plants for beaches, docks, and landings creates thousands of new stem fragments. Removing native vegetation creates perfect habitat for invading Eurasian watermilfoil.

Eurasian watermilfoil has difficulty becoming established in lakes with well established populations of native plants. In some lakes the plant appears to coexist with native flora and has little impact on fish and other aquatic animals.

Likely means of spread: Milfoil may become entangled in boat propellers, or may attach to keels and rudders of sailboats. Stems can become lodged among any watercraft apparatus or sports equipment that moves through the water, especially boat trailers.



Jay Rendall

Purple loosestrife

Lythrum salicaria

Adult heigh
2 to 7 feet

Purple loosestrife is a wetland plant from Europe and Asia. It was introduced into the east coast of North America in the 1800s. First spreading along roads, canals, and drainage ditches, then later distributed as an ornamental, this exotic plant is in 40 states and all Canadian border provinces.

Purple loosestrife invades marshes and lakeshores, replacing cattails and other wetland plants. The plant can form dense, impenetrable stands which are unsuitable as cover, food, or nesting sites for a wide range of native wetland animals including ducks, geese, rails, bitterns, muskrats, frogs, toads, and turtles. Many rare and endangered wetland plants and animals are also at risk.

Purple loosestrife thrives on disturbed, moist soils, often invading after some type of construction activity. Eradicating an established stand is difficult because of an enormous number of seeds in the soil. One adult plant can disperse 2 million seeds annually. The plant is able to resprout from roots and broken stems that fall to the ground or into the water.

A major reason for purple loosestrife's expansion is a lack of effective predators in North America. Several European insects that only attack purple loosestrife are being tested as a possible long-term biological control of purple loosestrife in North America.

Likely means of spread: Seeds escape from gardens and nurseries into wetlands, lakes, and rivers. Once in aquatic systems seeds are easily spread by moving water and wetland animals.

Illustrations by: Don Luce, Jim Mcevoy, Donna Francis and M. Baradlai.

CHECKLIST

Clean boats, clean waters...

If you are a water recreationist — boater, angler, water-skier, scuba-diver, sailor, or canoeist — there are some important things you can do to prevent the transport of harmful exotic species from one lake or river to another. In some states and provinces it is illegal to transport harmful exotic species.

✓ **Inspect** your boat, trailer, and boating equipment (anchors, centerboards, rollers, axles) and **remove** any plants and animals that are visible *before* leaving any waterbody.

✓ **Drain** water from the motor, livewell, bilge, and transom wells while on land *before* leaving any waterbody.

✓ **Empty** your bait bucket on land *before* leaving the waterbody. Never release live bait into a waterbody, or release aquatic animals from one waterbody into another.

✓ **Wash/dry** your boat, tackle, downriggers, trailer, and other boating equipment to kill harmful species that were not visible at the boat launch. This can be done on your way home or once you have returned home. Some aquatic nuisance species can survive more than 2 weeks out of water, so it is important to:

- **rinse** your boat and 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; or
- **dry** your boat and equipment for at least 5 days, before transporting to another waterbody.

✓ **Learn** what these organisms look like (at least those you can see). If you suspect a new infestation of an exotic plant or animal, report it to your natural resource agency.

✓ **Consult** your natural resource agency for recommendations and permits before you try to control or eradicate an exotic "pest." Remember, exotic "pest" species thrive on disturbance. Do-it-yourself control treatments often make matters worse and can harm native species.

For more information...

If you would like more information about aquatic exotic species, the problems they cause, regulations to prevent their spread, or methods and permits for their control, contact your state department of natural resources, university sea grant program, or:

U. S. Fish and Wildlife Service
La Crosse Fishery Resource Office
555 Lester Avenue
Onalaska, WI 54650
(608) 783-8434

Ashland Fishery Resource Office
2800 Lakeshore Drive East
Ashland, WI 54806
(715) 682-6185

Alpena Fishery Resource Office
Federal Building, 145 Water Street
Alpena, MI 49707
(517) 356-5102

You may also contact:

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