

HOBART AND WILLIAM SMITH COLLEGES





INVASIVE SPECIES FACT SHEETS

Eastern Mosquitofish, Poeciliidae by Fishes of North Carolina Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License Western Mosquitofish, Robert McDowell, Bugwood.org CC BY-NC 3.0 US.



EASTERN MOSQUITOFISH, WESTERN MOSQUITOFISH

Gambusia holbrooki, Gambusia affinis Origin: Southern Atlantic & Gulf slope drainages, Mississippi Basin

INVASIVE RANKING, NYS

Very High

MANAGEMENT STRATEGY

Prevention

DISTRIBUTION (As of 2/2018)



www.fingerlakesinvasives.org

Mosquitofish are small, gray or brown invasive fish. They have short bodies, growing up to about 7 cm, with a flat-topped head and a mouth that is pointed upward for surface feeding. The dorsal and caudal fins are rounded. Small black dots may be present on the body and tail, as well as a small dark-colored bar below the eye. These species are very similar in appearance to each other.

HABITAT

Mosquitofish can live in a variety of freshwater habitats including rivers, springs, and marshes, although they prefers shallow, warmer waters lacking predatory fish. They may also occur in brackish water. These species can with-stand higher pollution levels and lower dissolved oxygen levels than other fish. However, they are susceptible to cold temperatures. Some populations have been known to overwinter under ice cover.

THREAT

Due to their aggressive and predatory behavior, mosquitofish can greatly disrupt food webs and negatively impact native fish populations through predation and competition. Despite their name, these fish are not particularly efficient mosquito predators, as they prefer larger prey; they may benefit mosquitos by consuming predators and competitors of the mosquitos. They may also displace native fish species that act as more efficient mosquito control agents. Mosquitofish populations may also result in algal blooms if too many grazing zooplankton are consumed.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As these species are most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body.



REFERENCE - IUCNRedlist. "Gambusia affinis." http://www.iucnredlist.org/details/166562/0. (accessed June 6, 2017). U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].





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NORTHERN SNAKEHEAD Channa argus Origin: Asia

INVASIVE RANKING, NYS High

MANAGEMENT STRATEGY Prevention



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The Northern Snakehead is a long, thin fish with a somewhat flattened head. It is brown with dark blotches, and has a single dorsal fin running along the length of the body. The anal fins are located directly behind the pectoral fins, unlike the native bowfin, whose anal fins are located much farther back on the body. They can grow larger than 80 cm.

HABITAT

Northern Snakehead lives in canals, lakes, and rivers, preferring shallow, stagnant waters with a muddy substrate and aquatic vegetation. It is tolerant of a wide range of temperatures and poorly oxygenated waters.

THREAT

This species may compete for resources with native species, including foods and habitat. Competition for aquatic insects puts native fish populations at risk, and can disrupt recreational and commercial fishing. Juvenile fish are capable of overland movement and can survive up to four days out of water.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As these species are most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body.

REFERENCE - Fuller, P.L., Benson, A.J., Nunez, G., Fusaro, A., and Neilson, M., 2017, Channa argus (Cantor, 1842): U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL, https://nas.er.usgs.gov/queries/factsheet.aspx?speciesid=2265, Revision Date: 6/12/2017, Access Date: 9/18/2017 Northern Snakehead Fish. New York State Department of Environmental Conservation. Albany, NY. Accessed [9/18/17] http://www. dec.ny.gov/animals/45470.html



ew York Department of Environmental Conservation, Bugwood.org CC BY-NC 3.0 US.

Bernard Kuhajda, Department of Biological Sciences, University of Alabama, Tuscaloosa, AL, Bugwood.org CC BY-NC 3.0 US.



ORIENTAL WEATHERFISH, DOJO, WEATHER LOACH

Misgurnus anguillicaudatus Origin: Eastern Asia

INVASIVE RANKING, NYS

Very High

MANAGEMENT STRATEGY

Physical Prevention



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The invasive Oriental Weatherfish is a bottom-feeding, insectivorous fish with an eel-like body. It is colored a marbled brown and greenish gray dorsally and pale silver ventrally. It has a small, underslung mouth with fleshy lips surrounded by six barbells. Individuals average 15 cm in length, but may grow as long as 28 cm.

HABITAT

These fish are often found in shallow, slow-moving waters with muddy or silty substrates. They can survive in oxygen-poor waters by breathing air using a modified intestine and survive long droughts by estivating in soft substrates.

THREAT

This species competes with native fish populations for aquatic insects as a food source. Macroinvertebrate abundance may be drastically reduced. This species has been associated with increased turbidity and nitrogen levels in standing water.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As this species is most commonly spread through pet trade, fishing, and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body. Once established, removing individuals with backpack electrofishing and bait nets can be effective in managing populations.

REFERENCE - Nico, L., P. Fuller, M. Neilson, J. Larson, A. Fusaro, T.H. Makled, and B. Loftus. 2017. Misgurnus anguillicaudatus. USGS Nonindigenous Aquatic Species Database, Gainesville, FL. https://nas. er.usgs.gov/queries/factsheet.aspx?SpeciesID=498 Revision Date: 1/27/2016

Wells, S. 2014. Monitoring Feral Oriental Weatherfish Infestations In New York State. American Currents. http://www.nanfa.org/ac/oriental-weatherfish- new-york.pdf



Peter van der Sluijs, CC BY-SA 3.0, via Wikimedia Commons



Round Gobies are small, brown and black blotched fish with large, frog-like heads. There is a black spot on their front dorsal fin, which is a characteristic of the species. They grow to just under 30 cm in size. Round Gobies can be distinguished from native sculpins (Cottoidae) by their fused pelvic fins, or suctorial disc, which helps them attach to surfaces in flowing water.

via Wikimedia Commons

HABITAT

Round Gobies are bottom dwellers of fresh or brackish water. They can thrive in a wide variety of habitat types, including open sand, dense macrophytes, and rocky substrates.

THREAT

Round Gobies are aggressive fish that can outcompete native species for food, shelter, and nesting sites. They also prey on eggs of many native fish species. Round Gobies bioaccumulate many contaminants, which are then passed on to larger game fish and then potentially to humans.

MANAGEMENT

Prevention and education are the best management strategies. Clean, drain, and dry all equipment prior to moving between waterbodies, and do not release live bait. Little can be done to eradicate populations once they are established.



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REFERENCE - Invasives Species Awareness Program. (2011). Round Goby. Retrieved from Ontario Invading Species Awareness Program: http://www.invadingspecies.com/invaders/fish/roundgoby/ U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/8/2017].







INVASIVE RANKING. NYS High

MANAGEMENT STRATEGY

ROUND GOBY

Neogobius melanostomus Origin: Eurasia

Prevention

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ASIAN LONG-HORNED BEETLE Anoplophora glabripennis Origin: Asia

INVASIVE RANKING, NYS High

MANAGEMENT STRATEGY

Chemical Physical Prevention



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Michael Bohne, USDA Forest Service, Bugwood.org CC BY-NC 3.0 US.



Asian longhorned beetles (ALB) are a forest pest with a wide range of host trees. Adult beetles are 2-4 cm in length, with jet black bodies and mottled white spots on the back. Their black-andwhite-banded antennae are 1.5-2.5 times longer than the body. Beetle larvae are cream-colored, cylindrical, and up to 6 cm in length. They produce frass that looks like wood-shavings, and leave a circular exit hole about 1 cm in diameter and over 2.5 cm deep.

HABITAT

These beetles live in a wide range of native hardwoods, but prefer maple trees. Larvae first burrow between the inner bark and the wood of the tree, forming a feeding gallery; as they mature, they move deeper, to the dense inner wood of the tree trunk.

THREAT

Asian longhorned beetles can severely damage the physical and vascular structure of trees, interfering with uptake of vital nutrients. Continued infestation leads to tree death in six to eight years. In the US, \$669 billion worth of urban trees are at risk to this pest, and the potential damage to forest ecosystems is currently incalculable.

MANAGEMENT

Quarantines and tree removal are the current methods of prevention and eradication. The Don't Move Firewood campaign helps prevent its spread to new locations. Annual pool surveys help monitor for new infestations. In some areas, an insecticide may be used as a preventative measure as well as a treatment, although it can be costly. Biological control methods are being researched, but are not yet available for use. Development of genetically resistant trees may be part of the long-term solution to ALB if eradication from the US is not successful.

REFERENCE - Meng, P. S., K. Hoover, M. A. Keena. "Asian Longhorned Beetle (Coleoptera: Ceram- bycidae), an Introduced Pest of Maple and Other Hardwood Trees in North America and Europe." J. Integ. Pest Mngmt. (2015) 6(1): 4:DOI: 10.1093/jipm/pmv003

US Forest Service. "Forest Health Protection." www.na.fs.fed.us. https://www.na.fs.fed.us/fhp/alb/ident_reporting/identifying.shtm. (accessed May 25, 2017).



Kenneth R. Law, USDA APHIS PPQ, Bugwood.org CC BY-NC 3.0 US.

Forest Service, Bugwood org Co.



EMERALD ASH BORER Agrilus planipennis Origin: Northern China, Korea

INVASIVE RANKING, NYS Very High

MANAGEMENT STRATEGY

Chemical Prevention



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Daniel Herms, The Ohio State University, Bugwood.org GC BY-NC 3.0 US.



Emerald ash borer (EAB) is a wood boring beetle that feeds on and eventually kills all species of ash. Adults are about 1 cm long, with an elongated metallic green body and narrow brass colored head. Larvae are creamy white with a brown head and are flattened on top and bottom. The larvae have eight abdominal segments, with the last segment sporting two pincer-like spines. Adults emerging from trees in the spring leave a D-shaped exit hole in the bark.

HABITAT

Emerald ash borers can be found in, on, or around ash trees (*Fraxinus* spp.) in hardwood forests.

THREAT

Adult beetles feed on ash foliage, causing aesthetic damage. The larvae damage ash trees by feeding on the inner bark, which disrupts the transportation of water and nutrients, resulting in mortality. Destruction caused by the emerald ash borer is projected to cost \$10.7 billion by 2020 through urban tree removal, loss of ecosystem services and property value, and wholesale loss of ash plantations.

MANAGEMENT

Ash trees can be treated with an insecticide to prevent infestation; treatments last for three years. Planning for removal of untreated trees in urban areas will prevent costly emergency removals. It is also important to prevent the spread of established populations. When recreating and camping, only local firewood should be used. Biocontrol with the use of parasitic wasps is currently being deployed in a few states. This is a long-term management method rather than immediate control.









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Shimat Joseph, University of Georgia, Bugwood.org CC BY-NC 3.0 US



HEMLOCK WOOLLY ADELGID Adelges tsugae

Origin: Asia, Southern Japan

INVASIVE RANKING, NYS High

MANAGEMENT STRATEGY

Chemical Biocontrol Prevention



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The hemlock woolly adelgid is a small, aphid-like insect that attacks hemlock trees. They are most easily recognized by the white "woolly" masses of wax they use to protect themselves and their eggs from desiccation and predation. These ovisacs can be readily observed on the undersides of branches, at the base of the needles, from late fall to early summer. Infested trees may have gray-tinted foliage or exhibit needle loss and branch dieback.

HABITAT

The hemlock woolly adelgids feed on native eastern hemlock (*Tsuga canadensis*), and on any ornamental species of hemlock. They are found on twigs at the base of needles.

THREAT

Hemlock woolly adelgids use their long, sucking mouthparts to tap into the food storage of plant cells, which causes the tree to wall off the wound with scar tissue. After an intense infestation, the tree is unable to get sap to the end of its branches to produce new growth; once existing needles die, the tree cannot produce food. Dieback can occur in as little as two years, and mortality in 4-20 years depending on site characteristics and climate. Hemlock woolly adelgids reproduce asexually in the eastern US, so one insect can start a new infestation.

MANAGEMENT

Treatment with systemic insecticides is effective and relatively inexpensive, with treatments remaining effective for up to seven years. Limiting the movement of infested nursery stock will slow its spread. Biological controls are under development and are the best long term management option.

REFERENCE - Childs, Robert. Hemlock Woolly Adelgid Frequently Asked Questions. https://ag.umass.edu/landscape/fact-sheets/hemlock-woolly-adelgid-frequently-asked-questions.

DEC. Hemlock Woolly Adelgid http://www.dec.ny.gov/animals/7250. html. May 31, 2017.

US Forest Service. Pest Alert - Hemlock Woolly Adelgid https://www. na.fs.fed.us/spfo/pubs/pest_al/hemlock/hwa05.htm. May 25, 2017. Hemlock Woolly Adelgid, Adelges tsugae Factsheet. 2016. New York State Department of Environmental Conservation. https://www.dec. ny.gov/docs/lands_forests_pdf/hwafactsheet.pdf.



INVERTEBRATES

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Fabio Moretzsohn, Texas A&M University-Corpus Christi, Bugwood.org CC BY-NC 3.0 US.



The Asian clam is a freshwater bivalve mollusk. The outside shells are yellow-green to brown; where color chips away, white spots can be seen underneath. The inside of the shells are white to light purple. Adults are small, usually less than 4 cm in length.

HABITAT

The Asian clam is a filter feeder that removes particles from the water column. It can be found on or slightly buried in the sediment of freshwater water bodies. The species is cold intolerant and limited to warmer regions of freshwater systems.

THREAT

The Asian clam displaces already threatened native mussels, resulting in biodiversity decline, an unbalanced food chain, and increased possibility of algal blooms. The Asian clam can also cause millions of dollars in damage, clogging commercial and industrial water intake pipes.

MANAGEMENT

In closed environments such as power plants, chemical, physical, and mechanical methods can be used. In natural systems, prevention though education and stewardship is the best management strategy. As this species is most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body.

REFERENCE - Aquatic Invasive Animals. [November 2017.]Rhode Island Department of Environmental Management. Providence, RI. Accessed [5/8/2018]http://www.dem.ri.gov/programs/benviron/ water/quality/surfwq/pdfs/corflu.pdf

U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/8/2017].





ASIAN CLAM Corbicula fluminea Origin: Asia

INVASIVE RANKING, NYS High

MANAGEMENT STRATEGY

Chemical Mechanical Physical Prevention



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BLOODY RED SHRIMP

Hemimysis anomala Origin: Eurasia

INVASIVE RANKING, NYS High

MANAGEMENT STRATEGY Prevention



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Bloody red shrimp are small invertebrates that can grow to about 0.5-1.5 cm. Their coloring may range from ivory and translucent to red-orange and is variable in changing temperature and light conditions. This species has eight pairs of legs, which is a distinguishing trait. With magnification, a characteristic flat-ended tail with two prominent spikes can be seen. Bloody red shrimp display a distinctive swarming behavior that is unique in the Great Lakes. Swarms may cover several square meters. Individuals, typically males, will migrate from deeper waters to the upper water column at twilight and return to the profundal zone at dawn.

HABITAT

Bloody red shrimp typically live in quiet areas of brackish or freshwater lakes and reservoirs, but may also establish populations in rivers and streams. This species prefers hard or rocky substrates with water temperatures of about 10-15° C. Specimens have been collected at depths ranging from 0.5-50 m, although it generally inhabits 6-10 m depths.

THREAT

Bloody red shrimp rapidly consume a variety of zooplankton, phytoplankton, detritus, and insect larvae, putting it in direct competition with many native aquatic organisms including young fish. Zooplankton biomass and diversity may also be reduced.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As this species is most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body.







REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/9/2017]

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CHINESE MITTEN CRAB

Eriocheir sinensis Origin: Pacific coast of China and Korea

INVASIVE RANKING, NYS Moderate

MANAGEMENT STRATEGY

Prevention



HABITAT

The Chinese mitten crab may be found in estuaries, bays, and rivers with ample aquatic vegetation. Although they are born in a marine environment, these crabs migrate to and inhabit freshwater during the majority of their life cycle, between two and five years, before returning to saltwater to reproduce.

THREAT

These crabs are aggressive and may compete with native species. Burrows can destabilize streambanks and lead to erosion and habitat loss.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As these species are most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body.



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REFERENCE - Chinese Mitten Crab. New York State Department of Environmental Conservation. Albany, NY. Accessed [9/18/17] http:// www.dec.ny.gov/animals/35888.html

Benson, A. J., and P. L. Fuller, 2017, Eriocheir sinensis: U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL, https://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=182, Revision Date: 8/7/2012, Access Date: 9/18/2017



Robert T. Dillon, Jr., College of Charleston, Bugwood.org CC BY-NC 3.0 US.





The shell of the Chinese mysterysnail is up to 6 cm tall and smooth, with light to dark olive-green vertical striping and six or seven whorls.

HABITAT

This species may inhabit a slow-moving body of water with a muddy substrate.

THREAT

Chinese mysterysnails can be hosts for parasites that are harmful to humans. They can also outcompete native snail species for food and space.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As these species are most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body. If observed, they can be manually removed using hand or fishing nets. Due to the species' operculum (trap door mechanism), which seals the animal inside its shell, few chemical controls are effective; those that are effective are also likely harmful to native species. Biological controls are being investigated.



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REFERENCE - State of Indiana. "Aquatic Invasive Species: Chinese Mystery Snail." http://www.in.gov/dnr/files/CHINESE_MYSTERY_ SNAIL.pdf. (accessed June 1, 2017).

TMI. "Chinese Mystery Snail, Cipangopaludina chinensis malleatus." https://sites.google.com/a/rsu5.org/invasive/maine-invasive- species/chinese-mystery-snail-cipangopaludina-chinensis-malleatus. (accessed June 1, 2017).



CHINESE MYSTERYSNAIL Cipangopaludina chinensis Origin: Southeast Asia

INVASIVE RANKING, NYS Very High

MANAGEMENT STRATEGY Prevention Minnesota Department of Natural Resources, Bugwood.org CC BY-NC 3.0 US.

U.S. Geological Survey, U.S. Geological Survey, Bugwood.org CC BY-NC 3.0 US.





The faucet snail grows up to 12.5 mm but are generally smaller. Shells have four or five whorls and range from light brown to black. They are difficult to differentiate from other native snails, so photos and the specimen should always be submitted to an expert for identification.

HABITAT

Faucets snails are commonly found in freshwater ponds, shallow lakes, and canals. They typically inhabit the bottom substrate in fall and winter and may be found attached to aquatic macrophytes in warmer months.

THREAT

The faucet snail can outcompete native species. The species is a host for parasites that can kill waterfowl when the snail is ingested. They may also be a source of biofouling as they can clog water intake pipes and accumulate in swimming areas.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As this species is most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body.



FAUCET SNAIL

Bithynia tentaculata Origin: Europe

INVASIVE RANKING. NYS

High

MANAGEMENT STRATEGY

Prevention

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REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].







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FISHHOOK

WATERFLEA,

SPINY WATERFLEA Cercopagis pengoi &

Bythotrephes longimanus

Origin: Eurasia

INVASIVE RANKING, NYS

Very High

MANAGEMENT STRATEGY

Prevention

DISTRIBUTION





Fishhook and spiny waterfleas are tiny crustaceans less than 1.25 cm in length, with long, sharp, barbed tails. The tail of spiny waterflea is straight, while the fishhook waterflea has an angled tail-spine with a distinguishing "fishhook" like loop at the end of the tail.

HABITAT

These species inhabit freshwater and brackish lakes. The fishhook and spiny water fleas prefer cooler temperatures over warmer areas of a lake.

THREAT

Fishhook and spiny waterfleas are predators of small zooplankton, such as *Daphnia*. This results in direct competition between the waterfleas and small planktivorous fishes. Few predators can eat them due to the long, spiny tails, which can result in exponential waterflea population growth. The waterfleas also contribute to biofouling issues, as their tails collect on fishing equipment and lines.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As these species are most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body.



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REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].







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NEW ZEALAND

MUD SNAIL

Potamopyrgus antipodarum

Origin: New Zealand &

nearby islands.

INVASIVE RANKING. NYS

High

MANAGEMENT STRATEGY

Prevention

Michal Maňas CC-BY-4.0 via Wikimedia Commons



The New Zealand mud snail has an elongated shell with seven or eight whorls that coil to the right. Shell colors range from dark gray or brown to light brown. Some variants within the species in the Great Lakes region exhibit a keel or ridge in the middle of each whorl. The snail is usually 4-6 mm in length within the Great Lakes region.

HABITAT

This species can live in fresh and brackish water; where it may be found on and around macrophytes, often in littoral zones of lakes or slow streams with muddy substrates. It can also live in high flow environments, where it burrows into the sediment.

THREAT

Abundant populations of introduced New Zealand mud snail may outcompete other grazing invertebrates and inhibit colonization by other macroinvertebrates. It has yet to colonize streams in the Great Lakes basin, but these are areas where the snail is expected to have significant impact. These snails alter nutrient (nitrogen and carbon) flows, and consume large amounts of the food available to filter feeders.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As this species is most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body.



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REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].







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Quagga mussels are filter-feeding, freshwater, bivalve mollusks. Their appearance is variable, but shells usually have dark concentric rings that fade toward the hinge. Shells can grow to about 4 cm and are rounded, with a slightly bowed bottom that causes the mussel to tip over if set on its flattest surface.

HABITAT

Quagga mussels inhabit freshwater at varying depths depending on temperature, where they are sheltered from wave attack. They can live on a wide variety of soft and hard surfaces.

THREAT

Quagga mussels can outcompete and crowd out native species. As filter feeders, they remove particles from the water, which affects water quality and the food chain of aquatic ecosystems. They also cover many surfaces and can be a nuisance to humans due to their sharp shells.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As these species are most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body. Not much can be done once established. Manual removal may be performed on small, accessible populations. In closed systems, such as water treatment plants, other control methods can be used, including chemical, thermal, electrical, and biological controls.



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QUAGGA MUSSEL Dreissena rostriformis bugensis Origin: Eurasia

INVASIVE RANKING, NYS

Very High

MANAGEMENT STRATEGY

Chemical Mechanical Physical Biocontrol Prevention



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REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].

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is History Survey, Bugwood

RED SWAMP

CRAYFISH

Procambarus clarkii

Origin: Southern Mississippi River drainage to Illinois and

Gulf Coast plain from Florida panhandle to Mexico

INVASIVE RANKING, NYS

Not Applicable

MANAGEMENT STRATEGY

Prevention

Chris Taylor, Illinois Histroty Survey, Bugwood.org CC BY-NC 3.0 US.



Red swamp crayfish have a dark red body with bright red raised spots. Head and claws are elongated. The body ranges from 5.5-12 cm in length.

HABITAT

This species may inhabit a variety of permanent freshwater habitats including lakes, ponds, streams, canals, seasonally flooded swamps and marshes, and ditches with mud or sand bottoms and organic debris for shelter. Red swamp crayfish are tolerant of a range of salinity, pH, oxygen, temperature,

and pollution levels.

THREAT

The red swamp crayfish can dramatically alter habitats through burrowing activity, and is a strong competitor to native crayfish species. Juveniles feed upon and can significantly reduce local macroinvertebrate populations. Abandoned burrows can result in collapsed banks along the water's edge.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As these species are most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body. The red swamp crayfish is also spread through dumping of bait buckets and releases due to pet trade.



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REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [9/14/2017]. HOBART AND WILLIAM SMITH COLLEGES





INVERTEBRATES

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Jeff Gunderson



Rusty crayfish grow to about 10 cm in length and are dark brown with rust-colored spots on both sides of the carapace. It has relatively large, robust claws that are gray-green to red-brown with black bands on the tips. The moveable claw is smooth and S-shaped, forming an oval gap when the claws are closed.

HABITAT

Rusty crayfish live in waterbodies and waterways with clear, well-oxygenated water and rocks, logs, and debris for shelter. This species prefers cobbly bottom sediment but will tolerate a variety of substrates, including silt, clay, sand, and gravel substrates.

THREAT

Rusty crayfish are aggressive and reproduce quickly, which allows them to outcompete and displace native crayfish species. This can also negatively impact the structure and biodiversity of the aquatic community.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As this species is most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body.



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REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].







INVASIVE RANKING, NYS IHR High Rust com

MANAGEMENT STRATEGY

Cantopical Survey, Bushooring, Cr. Bushooring,

RUSTY CRAYFISH

Orconectes rusticus Origin: Ohio River Basin

Prevention

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ZEBRA MUSSEL Dressina polymorpha Origin: Eurasia

INVASIVE RANKING, NYS Very High

MANAGEMENT STRATEGY

Chemical Mechanical Physical Biocontrol Prevention

(As of 2/2018)



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Zebra mussels are filter-feeding, freshwater, bivalve mollusks that attach to most surfaces in aquatic environments. Zebra mussels are small, up to 3 cm long, and D-shaped with light and dark yellow to brown alternating stripes. This species is similar in appearance to the quagga mussel (*Dreissena rostriformis bugensis*), but they can be distinguished by the presence of a flattened underside. When placed on a flat surface, zebra mussels will remain upright.

HABITAT

Zebra mussels inhabit freshwater lakes, rivers, reservoirs, streams, and ponds up to depths of widely varying depths. They attach to any stable substrate including sand, silt, cobbles, macrophytes, concrete, and metal. They do not tolerate salinity or low dissolved oxygen.

THREAT

Zebra mussels can outcompete and displace native species. Although they have some predators, they breed faster than they can be consumed. As filter feeders, they remove particles from the water, affecting the clarity, content, and ultimately the food chain of aquatic ecosystems. They can also attach to and cover many surfaces, which can cause slippery and sharp conditions, and clog intakes or other pipes.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As this species is most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body. Zebra mussels are very difficult to control once established. In closed systems such as water treatment plants, chemical, thermal, electrical, and biological controls may be used.



REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].





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Black and pale swallowwort (*Vincetoxicum nigrum and V. rossicum*) are invasive, herbaceous, perennial vines. Leaves are shiny, dark green, and narrowly oval or heart-shaped, with smooth edges and sharply pointed tips. The leaves are oppositely arranged. Swallowwort stems grow in a spiral pattern and are covered in tiny hairs. Swallowworts closely resemble the related common milkweed (*Asclepias syriaca*).

Swallowwort flowers are five petaled and clustered at the base of leaf stems. Pale swallowwort blooms from May through mid-July; its small flowers have petals twice as long as they are wide, ranging from pink to dark burgundy in color. Black swallowwort blooms in June and July; its flowers are small and dark purple in color, with petals covered in fine hairs and about as wide as they are long.

HABITAT

Both swallowwort species are shade tolerant, but grow more aggressively when exposed to open areas of sunlight. They occur along roadsides, in gardens, old fields and pastures, forests, limestone rich environments with thin soil, and along the edges of low lying marshy areas. They can tolerate only brief periods of flooding.

THREAT

Swallowworts can form dense populations that outcompete native species, and are a serious threat to monarch butterflies (*Danaus plexippus*). They crowd out milkweed patches where monarchs lay their eggs and their larvae feed and monarchs mistakenly lay eggs on swallowworts. As monarch caterpillars cannot survive on swallowwort, this further reduces monarch populations.

MANAGEMENT

These plants can be physically removed by thoroughly digging up root masses prior to seed dispersal. They may also be treated with herbicides once flowering has begun. Spread of swallowworts can be reduced if mowed consistently every year before seed pods are mature, although this will not affect rhizome growth.



REFERENCE - April 2014. Black And Pale Swallow-worts. Invasive Species Control. Michigan Natural Features Inventory. https://mnfi.anr.msu.edu/ invasive-species/Swallow-wortBCP.pdf





BLACK SWALLOWWORT,

of Illinois

PALE SWALLOWWORT

Vincetoxicum rossicum Origin: Europe

INVASIVE RANKING, NYS

Very High

MANAGEMENT STRATEGY

Chemical Physical Prevention



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PLANTS

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BRAZILIAN WATERWEED Egeria densa Origin: South America

INVASIVE RANKING, NYS High

MANAGEMENT STRATEGY

Chemical Physical Biocontrol Prevention



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Brazilian waterweed is a submerged aquatic plant with bright green stems and leaves and a very leafy appearance. Leaves are linear, up to 2.5 cm long and ½ cm wide with finely toothed margins, and grow in whorls of four to eight leaves. Stems are cylindrical and grow until they reach the water surface, where they can form dense mats. White, three-petaled flowers grow just above the water surface to 2 cm in diameter. Only male plants are found in the U.S.; these reproduce via stolons and fragmentation.

HABITAT

Brazilian waterweed inhabits slow-flowing freshwaters. This species is tolerant of a wide range of temperatures and light levels, and can occur as deep as 7 m.

THREAT

Dense populations of Brazilian waterweed can disrupt water flow, trap sediment, and alter water quality, as well as reduce the abundance and diversity of native vegetation. Severe infestations may impair recreational uses of a water body including boating, fishing, and swimming.

MANAGEMENT

Prevention is the best management practice to ensure that this species remains unintroduced. Education of the public about practices such as clean, drain, and dry, as well as timely reporting of sightings, can keep this invasive at bay. Brazilian waterweed may be physically removed only if extreme care is taken to remove fragments from the water. Chemical control can reduce infestations, although it is not species-specific and may damage other beneficial aquatic plants in the area. Triploid Grass Carp (*Cteonpharyngodon idella*) may also be used to control Brazilian waterweed infestations. However, the stocking of Grass Carp requires a permit.

REFERENCE - Egeria densa USGS Nonindigenous Aquatic Species Database, Gainesville, FL, and NOAA Great Lakes Aquatic Nonindigenous Species Information System, Ann Arbor, MI.

https://nas.er.usgs.gov/queries/greatlakes/FactSheet.aspx?SpeciesID=10& Potential=Y&Type=2&HUCNumber Revision Date: 1/28/2015







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USDA PLANTS Database, USDA NRCS PLANTS, Database, Bugwood.org



Brittle waternymph is an annual submersed aquatic plant, that is compact but bushy in appearance with thin, branching stems that can grow up to 1.5 m in length. Stems and roots can fragment easily. The leaves are oppositly arranged, stiff, curled, and pointed, with visible spines along the margins. The seeds, which grow along the stem, are slightly recurved, purplish in color, and have tiny, rectangular pits arranged in longitudinal rows. Care must be taken when identifying this species, as it is similar in appearance to native waternymph species.

HABITAT

Brittle waternymph inhabits still or slow-moving waterbodies. This species is capable of growing in depths up to 4 m, and is more tolerant of turbidity and high-nutrient conditions than native species of the same genus.

THREAT

Brittle waternymph can form dense stands in shallow water that inhibit the growth of native aquatic macrophytes. This can also result in unfavorable habitat for fish and waterfowl. Dense infestations will also hinder swimming, fishing, boating, and other forms of recreation.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As this species is most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body. Small infestations may be removed manually or mechanically to reduce biomass. However, since this plant spreads very easily, it is crucial to avoid fragmentation during removal. Herbicides can be effective in controlling larger infestations.







BRITTLE WATERNYMPH, **BRITTLE NAIAD**

University of Georgia, Bugwood, as C.

. Wallace

Rebekah D

Najas minor Origin: Eurasia & Northern Africa.

INVASIVE RANKING, NYS

Moderate

MANAGEMENT STRATEGY

Chemical Mechanical Physical Prevention



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REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].

PLANTS

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Phragmites australis ssp. australis Origin: Europe & Middle East

INVASIVE RANKING, NYS Very High

MANAGEMENT STRATEGY

Chemical Physical Prevention



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Common reed is a tall, herbaceous, perennial plant that grows 1-6 m tall from rhizomes or stolons (horizontal stems). The stems are hollow and ribbed. Leaves are linear, flat, drooping, smooth, and blue-green in color. The flowers grow in an oblong panicle inflorescence and progress from purple to straw-colored when mature. The non-native subspecies can be distinguished from the native using leaf color (blue-green vs yellow-green), persistent leaf sheaths, and rougher texture on the stem. Common reed mostly reproduces clonally through rhizomes but will also grow from viable seeds.

HABITAT

Common reed grows on shorelines, wetlands, ditches, and disturbed sites. It can tolerate saline habitats and a wide range of environmental conditions.

THREAT

Common reed forms dense monocultures, displaces native species, and degrades wetland habitat. It also alters habitat structure and hydrology. The leaves and stems are of poor nutritional value to wildlife. Dense stands impede shoreline access and can block important signage, as well as pose a fire hazard during its dormant season.

MANAGEMENT

Prescribed burning following herbicide treatment can help manage common reed populations. Mechanical control can slow the spread but will not eradicate established stands. Soil disruption should be kept to a minimum since it encourages re-sprouting. Cut material should be raked, bagged, and disposed of to prevent seed dispersal. Large stands are best managed using herbicides.

REFERENCE - Sturtevant, R., A. Fusaro, W. Conard, and S. lott, 2017, Phragmites australis australis (Cav.) Trin. ex Steud.: U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, FL

NOAA Great Lakes Aquatic Nonindigenous Species Information System, Ann Arbor, MI, https://nas.er.usgs.gov/queries/greatlakes/ FactSheet.aspx?SpeciesID=2937, Revision Date: 6/3/2016, Access Date: 9/15/2017



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Curly-leaved pondweed is a submerged perennial aquatic plant that can grow to about 5 m long. It has rigid, reddish-green, oblong leaves with finely toothed, wavy margins and blunt tips, which grow in an alternate arrangement. This species produces very small greenish-red flowers on a spike above the water surface. It also reproduces using overwintering buds, called turions.

HABITAT

Curly-leaved pondweed grows in a wide variety of environments, including shallow, deep, still, flowing, slightly brackish, or freshwater water up to a depth of about 6 m.

THREAT

This species is one of the first to grow in the spring and can grow quickly, allowing curly-leaved pondweed to outcompete native plants for light and space thereby reducing the biodiversity and value of aquatic habitat. Curly-leaved pondweed's senescence during midsummer can cause a critical loss of dissolved oxygen. The decomposition process can result in increased levels of phosphorous, which can lead to algal blooms. Dense infestations will also inhibit boating, fishing, swimming, and other recreational activities.

MANAGEMENT

The best management strategy is prevention through education and stewardship. As this species is most commonly spread through fishing and boating equipment, it is important to use precautions such as cleaning, draining, and drying your boat and other aquatic equipment before moving to another water body. This plant may be removed manually, provided all fragments and stem parts are also removed. Herbicides have been effective in controlling infestations.







CURLY-LEAVED PONDWEED

of Illinois, Bugwoor

Potamogeton crispus Origin: Europe, Africa, and Australia

INVASIVE RANKING, NYS

High

MANAGEMENT STRATEGY

Chemical Mechanical Physical Prevention



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REFERENCE - U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].

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EURASIAN WATERMILFOIL Myriophyllum spicatum Origin: Eurasia

INVASIVE RANKING, NYS Very High

MANAGEMENT STRATEGY

Chemical Mechanical Physical Biocontrol Prevention

DISTRIBUTION (As of 2/2018)



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Eurasian watermilfoil is an invasive submerged aquatic plant that can be easily mistaken for several native plants. Each leaf is blunt-tipped and finely divided into at least 12 pairs of leaflets, arranged in whorls of four on brown or green stems. The plant can grow up to 6 m in length. Tiny pink flowers may occur on emergent spikes in mid-June and again in late July. Although each plant can produce 100 seeds in a season, it reproduces more successfully via fragmentation.

HABITAT

This invasive can be found to depths of 10 m in lakes, ponds, and quieter sections of rivers and streams. It can grow in fresh or brackish water, across a wide range of temperatures, and thrives in disturbed areas with nutrient loading, intense plant management, and/or abundant motorboat use.

THREAT

Eurasian watermilfoil can spread very easily through fragmentation. This species forms dense mats that outcompete and displace native species, degrade habitat, and inhibit recreational activities.

MANAGEMENT

Education about practices such as clean, drain, and dry, as well as timely reporting of sightings is an important management practice to reduce the spread of this species and prevent new infestations. Once Eurasian watermilfoil is established, it is very hard to control. Mechanical control can enhance the spread of an infestation by creating and transporting plant fragments. If extreme care is taken to prevent or remove fragments, small infestations may be mechanically or manually removed. Many herbicides can control milfoil populations. Biocontrol insects or the triploid Grass Carp (*Ctenpharyngodon idella*) may also be options for control.



REFERENCE - https://nas.er.usgs.gov/queries/greatlakes/FactSheet. aspx?SpeciesID=237

U.S. Geological Survey. [2017]. Nonindigenous Aquatic Species Database. Gainesville, Florida. Accessed [6/7/2017].



