Thunder Lake

Oneida County, Wisconsin

Aquatic Invasive Species Monitoring and Water Quality Monitoring Reports

Monitoring conducted on behalf of the Thunder Lake District

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Thunder Lake: Aquatic Invasive Species Monitoring Report

Field Date:	August
WBIC:	1618100
Previous AIS Findings:	Chinese Mystery Snails, Banded Mystery Snails
New AIS Findings:	No new AIS found.
Field Crew:	Aubrey Nycz, AIS Lead Program Assistant, and Madeline Hetland, AIS Project Assistant - Oneida County Land and Water Conservation and Dean Keckeisen, Volunteer, Thunder Lake District

On June 29, 2022, Aubrey and Madeline visited Thunder Lake to conduct an AIS survey and collect water clarity data. They were assisted by Dean Keckeisen, volunteer from Thunder Lake, and Dean graciously provided his motor boat for the monitoring activities.

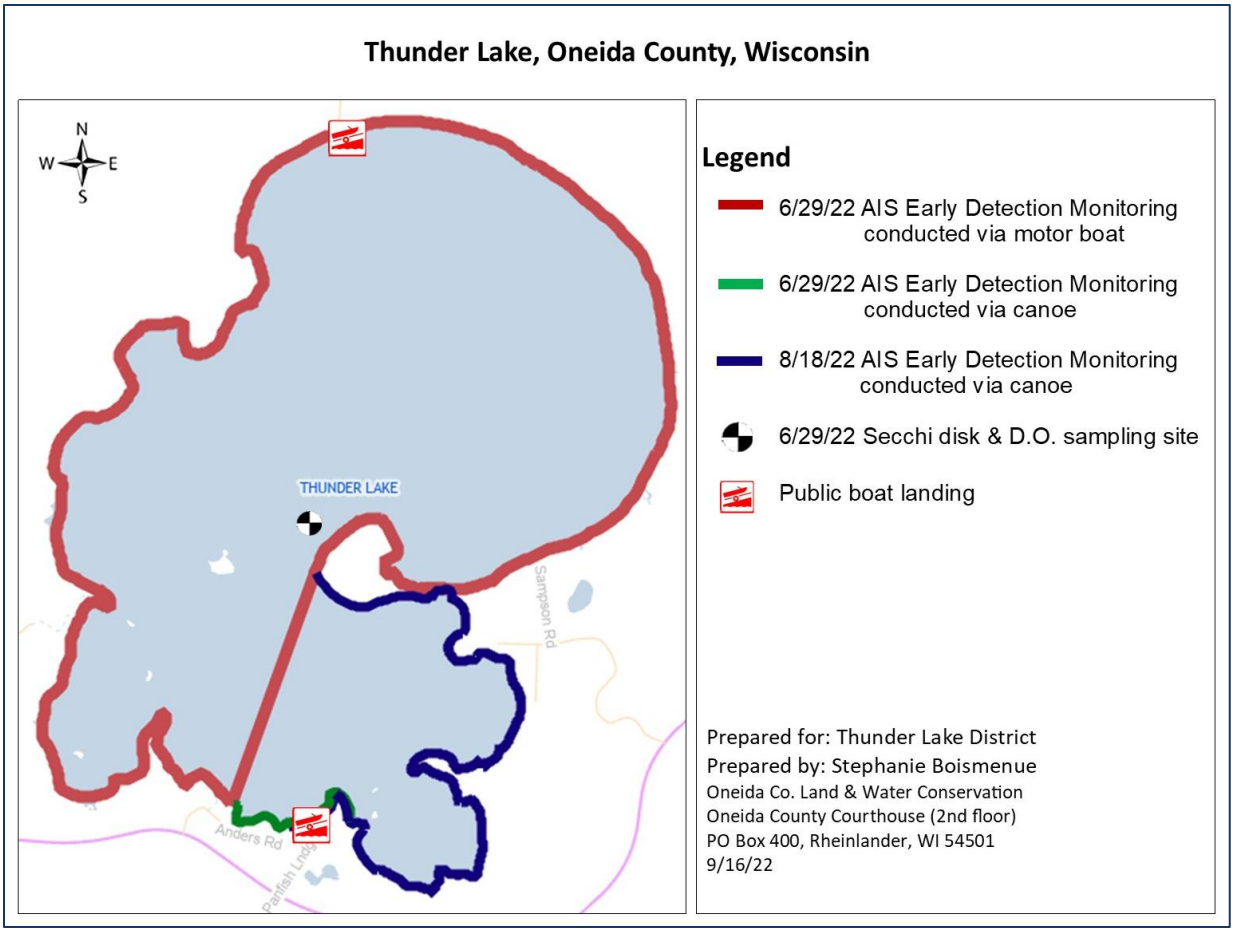
For the AIS monitoring component, the team conducted a visual meander survey around the shoreline. The Team had anticipated monitoring the entire shoreline that day, but the two bays in the south east end of the lake were not navigable in a motor boat due to shallow water (1 foot depth) and dense aquatic vegetation (*Map 1*). Therefore, it was determined that that section of the lake would need to be monitored via canoe. Upon completing monitoring activities in Dean's boat, Aubrey and Madeline determined that, given the time of day and size of the bays to be monitored via canoe, that they would need to return to Thunder Lake another day to finish monitoring that section of the lake in the canoe.

The Team did observed two previously identified AIS, the Chinese mystery snail and banded mystery snail, and luckily they did not find any new AIS. A complete report of the June 29, 2022 monitoring activities can be found on page 4 of this report.

On September 18, 2022, Aubrey and Madeline, returned to Thunder Lake and competed the AIS meander survey in the south east section of the lake. They did not find any new AIS and the lake is healthy and thriving.

Aubrey reported "these bays were covered with watershield, white water lilies, bullhead pond lilies, and soft stemmed bulrush, which made navigation challenging. The areas we were able to access were in deeper water, so we were unable to see the bottom substrate. From what we could see though, these parts of the lake seemed to be in the same condition as the rest of the lake – healthy growth of native plants, dark water, and muck substrate."

Figure 1. Map of Thunder Lake showing areas monitored for AIS and water quality



Thunder Lake

Oneida County, Wisconsin

June 29, 2022
Aquatic Invasive Species Monitoring and Water Quality Monitoring Report

Conducted on behalf of the Thunder Lake District

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Thunder Lake Aquatic Invasive Species Monitoring and Water Clarity Monitoring Report

Field Date:	June 29, 2022
WBIC:	1618100
Previous AIS Findings:	Chinese Mystery Snails, Banded Mystery Snails
New AIS Findings:	No new AIS found.
Field Crew:	Aubrey Nycz, AIS Lead Program Assistant, and Madeline Hetland, AIS Project Assistant - Oneida County Land and Water Conservation and Dean Keckeisen, Volunteer, Thunder Lake District

On June 29, 2022, Aubrey Nycz and Madeline Hetland visited Thunder Lake, located in the Town of Three Lakes, Oneida County, to conduct an AIS survey and collect water clarity data. The survey began by meeting Thunder Lake volunteer, Dean Keckeisen, at the Thunder Lake boat landing. Dean offered his assistance by driving us around the lake in his motor boat, instead of using the county canoe. Having assistance from a member on the Thunder Lake District with a motor boat on a large waterbody was very much appreciated.

Thunder Lake is a 1794-acre drainage lake with a maximum depth of 10.5 feet (Figure 1.). There are two public boat landings on Thunder Lake located off of Rice Lake Road and County Hwy A. The substrate is 60% sand, 15% gravel, 5% rock, and 20% muck. Along with reporting the depth and substrate, the Wisconsin Department of Natural Resources (DNR) reports that the lake has panfish, largemouth bass, northern pike, and walleye. In 2013, the invasive Banded Mystery Snail and Chinese Mystery Snail were discovered in Thunder Lake and verified by the DNR (Figure 2).

Using the motor boat, the AIS survey consisted of a visual meander search around most of the lake's perimeter, searching both sides of the boat, and moving in and out between various water depths. Polarized sunglasses were used to aide in looking at the bottom substrate. We looked both in the water and along the shoreline and made notes of the plants and animals we observed in the process (see Table 1). Survey conditions were very good with mostly sunny skies and not a lot of wind, which made it easy to see into the water.

AIS Monitoring Results - No new AIS were found during this survey. Information about the Chines Mystery Snail and the Banded Mystery Snail can be found in the *AIS Quick Guide* in **Appendix A.** The targeted AIS that we searched for are regulated under the Invasive Species Rule (WI Chapter NR40) and includes**:** Asian clams, banded mystery snails, Chinese mystery snails, Faucet Snails, New Zealand mudsnail, quagga mussels, zebra mussels, rusty crayfish, spiny waterfleas, Eurasian watermilfoil, curly leaf pondweed, flowering rush, non-native phragmites, purple loosestrife, yellow iris, and variegated reed manna grass (Glyceria Maxima 'Variegated'), red swamp crayfish, Japanese knotweed, Japanese hops, European frog-bit, yellow floating heart, water chestnut, Brazilian waterweed, Hydrilla, fanwort, parrot feather, water, hyacinth, water lettuce, and rock snot.

Water quality monitoring – To observe the water clarity and quality on Thunder Lake, we used a depth finder and maps indicating where data had been collected in the past to locate the deep hole. After locating the deep hole, we used a Secchi disk to measure water clarity and a dissolved oxygen meter to measure water quality. Oxygen is needed for a healthy fish population, and also for plants to respire at night. The measurements from the dissolved oxygen meter can tell us if the organisms in the lake are under stress. The dissolved oxygen measurements on Thunder Lake were at healthy levels, and the water is well oxygenated. These measurements can be found in Table 1 and Table 2. The Secchi disk reading was at **5 feet** out of a maximum depth of 10.5 feet.

Native Plants – Thunder Lake has a healthy amount of native plants growing throughout the lake! At first glance, shoreline grasses or plants growing tight to the shoreline around a lake may seem like a nuisance. The truth is though, that native plants play an important role in all waterbodies. When allowed to take root, native plants will provide a food source to aquatic animals, provide fish and wildlife habitat, improve water quality, stabilize the shoreline and the waterbody's bottom, and prevent erosion and the accumulation of sediment along the edge of a waterbody. When there are native plants along the edge of a waterbody, they can help filter trash, fertilizers, and other large amounts of runoff. Furthermore, aquatic vegetation can attract desirable wildlife, such as deer and pollinators, while also deterring undesirable animals, such as geese.

It was great to see a thriving native plant population on Thunder Lake. Listed below are some of the common plants that were identified during our monitoring efforts.

Blue Flag Iris *(Iris versicolor)*

Description: A semi-aquatic to emergent perennial. Flowers are deep blue to purple, 6 parted, 6-8 cm wide. Sepals may have greenish-yellow markings at the base surrounded by a white zone. Leaves are narrow, sword-like; arranged in flattened, fan-like clusters. Flowers stalks (20-80 cm high) are taller than the leaves.

Status: Native

Photo Credit: Wisconsin Department of Natural Resources

Broad-leaved Cattail *(Typha latifolia)*

Description: An emergent plant. Leaves are sword-like (10-23 mm wide, 1 – 3 m tall). The flower resembles a hotdog on a stick. The pollen that this plant contains is shed in clusters of four grains. Broadleaf cattail will often cross with narrow-leaf cattail to form the hybrid, Typha x glauca.

Status: Native

Photo Credit: www.nwplants.com

Bullhead Pond Lily (Nuphar variegate)

Description: An aquatic plant with heart shaped leaves up to 40cm long, floating on surface. Has a cup-shaped yellow flower, often with dark patches at the base of each petal. Leaves originate from a thick, spongy rhizome, which can be uprooted.

Status: Native

Photo Credit: Jomegat's Weblog

Clasping-leaf pondweed *(Potamogeton richardsonii)*

Description: A submerged aquatic plant. Leaves are wavy and smooth with pointed tips. Leaves clasp (partially wrap around) the stem.

Status: Native

Photo Credit: Paul Skawinski

Coontail *(Ceratophyllum demersum)*

Description: An aquatic plant that is heavily branched and light green to brown in color. This plant grows to be 2 m tall, has whorled leaves that branch once or twice, and is bushy at the tip.

Status: Native

Photo Credit: illinoiswildflowers.info

Floating Bur-reed *(Sparganium fluctuans)*

Description: An emergent plant. Stem is usually submerged can can be up to 5 feet long. Leaves are flat, spear-like, and can grow 40 inches long. Flowers are small and are in globular clusters.

Status: Native

Photo Credit: science.halleyhosting.com

Large Leaf Pondweed *(Potamogeton amplifolius)*

Description: A submerged aquatic plant. Submergent leaves are very broad (4-7 cm wide and 8-20 cm long), arched and slightly folded. Floating leaves are 2-23cm long, with a petiole longer than the leaf blade.

Status: Native

Photo Credit: Paul Skawinski

Pickerel Weed *(Pontederia cordata)*

Description: An aquatic plant with thin, bright green leaves. Emergent leaves tend to be arrow shaped with 6 parted, blue flowers.

Status: Native

Photo Credit: asapaquatics.com

Slender Naiad *(Najas flexilis)*

Description: A submersed plant. Stems grow from a thin rootstalk and are finely branching. Leaves are 1 - 4 cm long, slender, taper to a point, and have very finely toothed edges.

Status: Native

Photo Credit: IUCNredlist.org

Softstem Bulrush (*Schoenoplectus tabernaemontani)*

Description: A sedge that is tall, rounded, wider at the base, and gradually tapers upward. IT produces hanging clusters of spikelets at the top of the plant.

Status: Native

Photo Credit: ernstseed.com

Variable Leaf Pondweed (*Potamogeton gramineus)*

Description: Submergent leaves with 3-7 veins and floating leaves with 11-19 veins. Leaves may be smal and clustered, large and singular, or both leaf forms may occur on the same plant. Can be found growing at various water depths.

Status: Native

Photo Credit: outdooralabama.com

Water Shield *(Brasenia schreberi)*

Description: An aquatic plant with stems up to 2 meters long, small floating leaves, and reddish purple flowers that have 6-8 petals. Stems and underside of leaf are usually covered in a clear, slimy coating.

Status: Native

Photo Credit: Shannon Sharp

White Water Lily *(Nymphaea odorata)*

Description: An aquatic plant that has large, round leaves that can grow to be 12 inches in diameter. White water lilies also have large, white flowers with many petals.

Status: Native

Photo Credit: Stephanie Boismenue

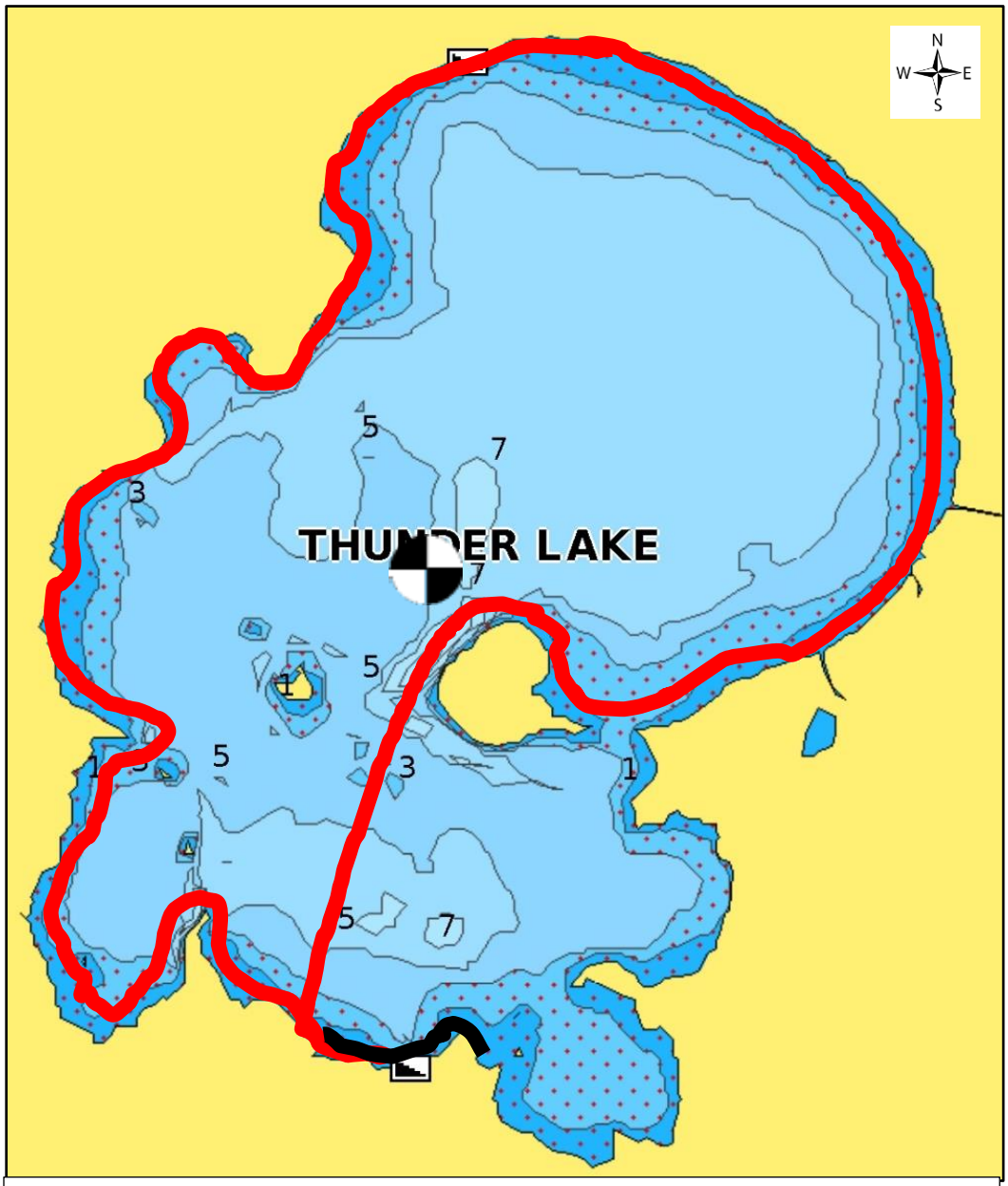
Wild Celery *(Vallisneria americana)*

Description: An aquatic plant with ribbon-like leaves that are dark-green. This plant grows below the water surface and then blankets the surface. This plant produces small, whitish-yellow flowers.

Status: Native

Photo Credit: Jacqueline Donnelly

Figure 1. Map of Thunder Lake, Oneida County, WI



Map Key

Boat Landings

Location of dissolved oxygen and Secchi disk reading
Latitude: 45.787341, Longitude: -89.219707

Areas monitored for AIS by motor boat

Areas monitored for AIS by canoe

Figure 2. Photo of the two verified AIS in Thunder Lake.

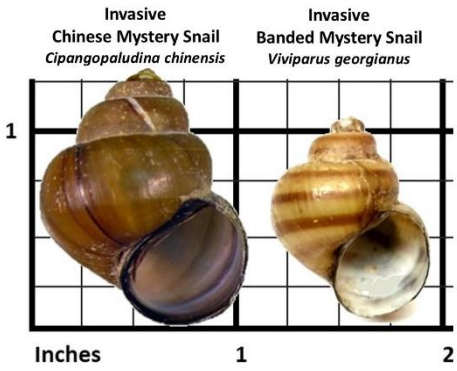
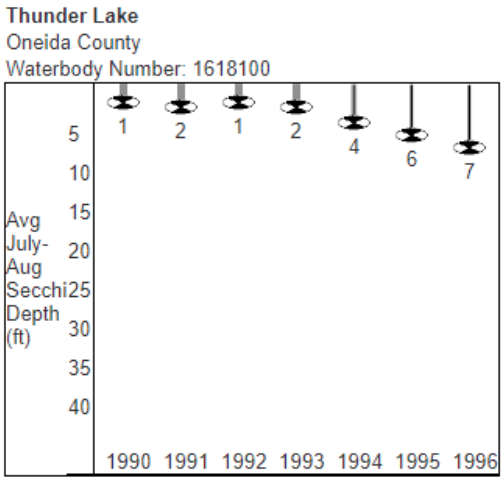


Table 1. June 29, 2022 dissolved oxygen levels and temperatures at the deep hole taken on.

Depth (Feet)	Dissolved Oxygen Levels (mg/L)	Percent of Dissolved Oxygen	Temperature (°F)
1	8.98	103.1%	68
2	8.98	103.2%	68
3	8.99	102.8%	67.6
4	8.92	101.9%	67.4
5	8.84	100.9%	67.4
6	8.5	97.4%	67.2
7	8.44	95.9%	67.0
8	8.36	94.9%	66.8

Table 2. Historical Secchi Graph that shows the average summer Secchi readings by year.



Past secchi averages in feet (July and August only).

Year	Secchi Mean	Secchi Min	Secchi Max	Secchi Count
1990	1.4	1.25	1.5	5
1991	2	1.5	2.5	5
1992	1.42	1.25	1.5	3
1993	2	1.5	2.5	4
1994	4	2.75	5.25	4
1995	5.5	5	6	2
1996	7.25	5.25	8.5	3

Source: https://dnrx.wisconsin.gov/swims/public/reporting.do?type=11&action=post&format=html&stationNo=443275
Resources: https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=1618100&page=facts

Appendix A

Golden Sands Resource Conservation & Development Council, Inc.

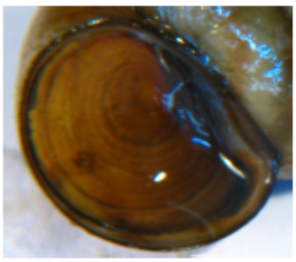
Aquatic Invasive Species Quick Guide

Banded Mystery Snail (*Viviparus georgianus* Lea)

Description: The banded mystery snail is a member of the family Viviparidae. Snails in this family give birth to live young, complete with shells. The shell is up to 1.5 inches tall, and 1-1.5 inches wide. Horizontal brown bands on the shell are visible from outside or inside the shell. A sturdy operculum is able to seal off the shell when the snail feels threatened. A typical life span is 3 years for males and 4 years for females. Mass die-offs of mature banded mystery snails are common in early spring after reproduction. Banded mystery snails occupy silt, marl, muck, and sand substrates.

The banded mystery snail is usually about an inch tall and has distinct horizontal bands.

North American Distribution: Southeastern U.S., lower Mississippi River, the Great Lakes states, northeastern U.S., and Quebec.



Banded mystery snails have a tough plate called an operculum covering the shell opening.

Dispersal Vectors: Banded mystery snails are native to the southeastern U.S. They were first documented in the Great Lakes basin in 1867 when 200 banded mystery snails were intentionally released by a civilian into the Hudson River drainage. Introductions have probably also occurred via the aquarium trade.

Ecological Impacts: Primarily grazes on diatoms, green algae, and fish eggs, but it is also capable of filter-feeding. First- and second-year individuals may be consumed by turtles, fish, and crayfish. Banded mystery snails have been documented at densities as high as 864 individuals per square meter. This species probably competes for food and resources with native snail species, but no serious negative impacts have been documented in its introduced range. It has been identified as an intermediate host to multiple trematode parasites, which have been involved in waterfowl die-offs in the Upper Mississippi River area.

Control Options: Manual removal of banded mystery snails is possible, but probably impractical in most situations.

Several chemical pesticides have been used to control snails in aquaculture ponds, but the banded mystery snail's thick operculum makes it less susceptible to these chemicals. Since most native snails do not have an operculum to seal off their shell, these native species are much more susceptible to pesticides.

An effective biological control agent is not known at this time.

A mass die-off of mature banded mystery snails.

Additional Information:

Eckblad, J.W. and M.H. Shealy, Jr. 1972. Predation on largemouth bass embryos by the pond snail *Viviparus georgianus*. Transactions of the American Fisheries Society. 101 (4): 734-738.

Kipp, R.M., A.J. Benson, J. Larson, and A. Fusaro. 2013. *Viviparus georgianus*. USGS Nonindigenous Aquatic Species Database, Gainesville, FL. http://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=1047 Revision Date: 3/12/2013

Photo credit: Paul Skawinski

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Developed by Golden Sands Resource Conservation & Development (RC&D) Council, Inc. as part of an aquatic invasive species (AIS) education program, supported by an AIS grant from the Wisconsin Department of Natural Resources. BMS-1-14

Aquatic Invasive Species Quick Guide

Chinese Mystery Snail (*Cipangopaludina chinensis* Reeve)

Golden Sands Resource Conservation & Development Council, Inc.

Description: Chinese mystery snails are often large, up to nearly 3 inches tall. Shells are typically dark brown, and may have some dark vertical ridges near the opening. The lowermost whorl of the shell is usually much wider than the rest of the shell. At the opening of the shell, a thick, hardened plate called an operculum is able to seal the shell against predators or harmful chemicals in the water. Chinese mystery snails are capable of grazing algae from surfaces and filter-feeding on suspended algae particles.

North American Distribution: Scattered across North America, but they are most abundant in the eastern and central United States.

The Chinese mystery snail can be nearly 3 inches tall.

Chinese mystery snails have a tough plate called an operculum covering the shell opening.

Dispersal Vectors: Native to eastern Asia, Chinese mystery snails were first imported to the U.S. in the late 1800s as a food item in oriental markets. It is believed that some people may have "seeded" these snails into local waterways for later harvest. Chinese mystery snails are also introduced to water gardens for the purpose of clarifying the water and grazing algae from hard surfaces. At any time during summer and fall, each female may contain dozens of small snails at different stages of development. She occasionally gives birth to small batches of live young, complete with shells.

Ecological Impacts: Chinese mystery snails likely compete for food and resources with native snails and other grazers or filter-feeders. Some research studies suggest that impacts to native species may be insignificant. Chinese mystery snails serve as a secondary host for a trematode parasite that has been killing large numbers of waterfowl in the Midwestern U.S. Some larger animals like turtles or muskrats may occasionally feed on Chinese mystery snails.

Control Options: Manual removal of Chinese mystery snails remains the only effective method of control. Of course, the effect on the population depends on the number removed and the total population size. These snails prefer mucky, organic sediments, so manual removal is likely to be a difficult option in many areas.

Chemical control efforts tend to be unsuccessful and have unintended consequences to native snails and/or other animals. Chinese mystery snails can seal up their shells with their operculum, protecting them from unfavorable conditions like chemical pesticides. Most North American snails do not have this ability and would be harmed.

Juvenile Chinese mystery snails, just minutes old.

Additional Information:

Dillon, R. T. Jr., M. Ashton, M. Kohl, W. Reeves, T. Smith, T. Stewart & B. Watson 2013. *The freshwater gastropods of North America*. http://www.fwgna.org.

Global Invasive Species Database. *Bellamya chinensis*. http://www.issg.org/database/species/ecology.asp?si=1812&fr=1&sts=sss&lang=EN

Photo credit: Paul Skawinski

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