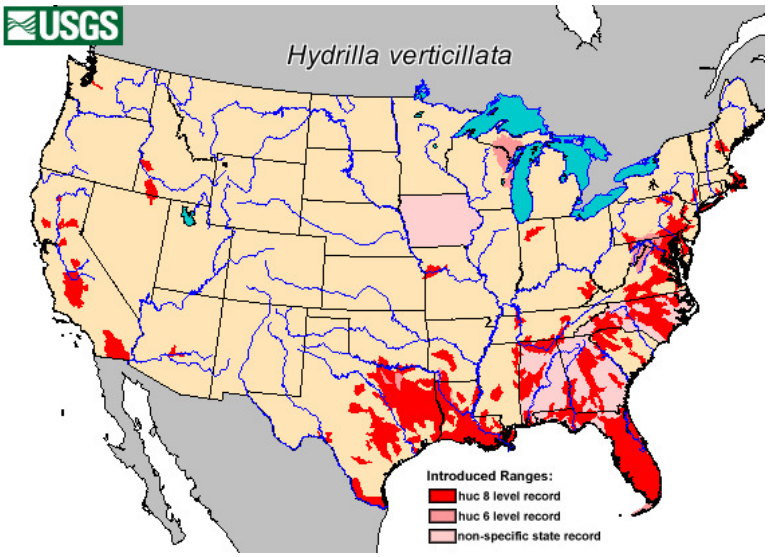
HYDRILLA

COMMON NAME: Hydrilla
Hydrilla is also known as water thyme, Florida elodea, Wasserquirl and Indian star-vine.

SCIENTIFIC NAME: *Hydrilla verticillata* (L.f.) Royle
Hydrilla's scientific name is made up of the Greek word "hydro" meaning "water" and the Latin word "verticillus" that means "the whorl of a spindle". Appropriately named, it is an aquatic plant with leaves that are whorled around the stem. Hydrilla is in the Frog's Bit family, or Hydrocharitaceae. It is the only species of the genus *Hydrilla* in the world though it resembles many of the other species in the family.

DISTRIBUTION: It is not really known where exactly hydrilla originated. Some sources give a broad native range of parts of Asia, Africa and Australia. Other sources are more specific and say that the dioecious form of hydrilla originated from the Indian subcontinent and the monoecious form originated from Korea. Currently the only continent without records of hydrilla is Antarctica.



Indiana: Hydrilla was found in Lake Manitou at Rochester, Indiana in August of 2006. This is the only known location of hydrilla in Indiana and at that time it was the only population in the Midwest.

DESCRIPTION:

Leaves: Leaves are small about 2-4 mm wide and 6-20 mm long. They are strap-like with pointed tips and have visible saw-tooth margins. The leaves are whorled around the nodes in groups of 4-8 leaves. The leaf midvein is reddish in color and usually has a row of spines on it. This gives the plant a rough texture. The leaves are usually a green color, though topped out leaves could be bleached by the sun and appear more yellowish. Hydrilla has an axillary leaf scale called a squamula intravaginalis that is found next to the stem at the base of the leaf. This distinguishes it from the other species in the Hydrocharitaceae family. One may confuse hydrilla with another exotic weed, Brazilian elodea (*Egeria densa*). Hydrilla will have a serrated leaf edge and rough teeth on the underside of the leaves where Brazilian elodea will not. There is also a native species found in Indiana, American elodea (*Elodea canadensis*), which looks somewhat like hydrilla.

Identification Characteristics of the Hydrocharataceae

Character	**Brazilian Elodea** *(Egeria densa)*	**American Elodea** *(Elodea canadensis)*	**Hydrilla (monoecious)** (*Hydrilla verticillata*	**Hydrilla (dioecious)** (*Hydrilla verticillata)*
Leaves per Whorl	4 (3-5) 	3(2) 	5(2-8) 	4-5 (2-8) 
Serrated Edges Visible	With magnification	With magnification	Distinct on older plants	Distinct
Leaf Size	Up to 4cm	Up to 1.5 cm	1-2 cm	1-2 cm
Flowers	Male only, up to 2 cm	Tiny, male and female on separate plants	Male and female on same plants, to 1 cm	Only female plants in US, to 1 cm
Tubers Present	No	No	Yes	Yes

Roots/Stem: New root sprouts are white and when growing in highly organic soil they may be become brown. They are submerged and buried in the hydro-soil. Hydrilla stems are very slender only about 1/32 of an inch wide, but they can grow to lengths of 30 feet. When the stem nears the waters surface it branches out considerably. The monoecious form of hydrilla will usually start to branch out at the sediment level rather than at the top of the water.

Flowers: The flowers are imperfect (meaning there are separate male and female flowers) but the plant can be monoecious (flowers of both sexes on one plant) or dioecious (flowers of one sex being produced per plant). The female flower is white with three petals that alternate with

three whitish sepals. The male flower has petals and sepals similar to the female flower, but the color could be white, reddish, or brown.

Fruits/Seeds: Hydrilla produce two different hibernacula to cover its buds. One is called a tuber, which forms terminally on rhizomes. They can be 5-10 mm long and are off white to yellow colored. Hydrilla also produces a turions which are compact dormant buds in the leaf axil. They are 5-8 mm long, dark green in color, and they appear to be spiny. The turion will break off and settle to the bottom of the water to start a new plant. The tubers are able to over winter and re-sprout as new plants as well. Seeds are also produced.

LIFE CYCLE BIOLOGY: Hydrilla is a submersed, herbaceous, perennial aquatic plant. It is capable of living in many different freshwater habitats. It will grow in springs, lakes, marshes, ditches, rivers, or anywhere there is a few inches of water. Hydrilla can tolerate low nutrient and high nutrient conditions as well as a salinity of up to 7%. Another adaptation hydrilla possesses, that enable it to out compete native plants, is the ability to grow in low light conditions. It is able to grow at deeper depths and can begin to photosynthesize earlier in the morning than most other aquatic plants. In the beginning stages of life hydrilla elongates at a rate of one inch per day. This continues until the plant comes close to the top of the water, here it begins to branch out. It produces a large mat of vegetation at the waters surface intercepting the light before it can reach other plants.

Hydrilla can reproduce in four different ways, fragmentation, tubers, turions, and seed. Fragmented pieces of hydrilla that contain at least one node are capable of sprouting into a new plant. The tubers of hydrilla are formed on the rhizomes and each one can produce 6,000 new tubers. When out of water a tuber can remain viable for several days, it can even lie dormant for over 4 years in undisturbed soil before sprouting a new plant. Turions are formed in the leaf axils of the plant. They are broken off and once settled in the sediment they can sprout into a new plant. Uncharacteristic of most plants, seed production in hydrilla is of least importance for reproduction. It seems that seed production is mostly used for long distance dispersal by means of ingestion by birds. The monoecious form of hydrilla puts more energy into tuber and turion production than does the dioecious form. It is important to know which form you have when deciding on the best management technique.

The main adaptations that give hydrilla an advantage over other native plants are: it can grow at low light intensities, it is better at absorbing carbon dioxide from the water, it is able to store nutrients for later use, it can tolerate a wide range of water quality conditions, and it can propagate in four different ways.

PATHWAYS/HISTORY: Under the name Indian star-vine, hydrilla was imported into Florida as an aquarium plant in the 1950's. A farmer living near Tampa acquired the plant but was not impressed with it and discarded it into a canal behind his business. A few months later the farmer noticed that the hydrilla grew very well and decided to market it. By the 1960's severe problems caused by hydrilla were being reported. In 1990 hydrilla could be found in 187 lakes and rivers in Florida. Because there are two different strains of hydrilla found in the United States, the monoecious strain and the dioecious strain, it is believed that there was a separate introduction outside of Florida. The dioecious form is mainly found in the southern states and California and the monoecious form is found north of South Carolina. Hydrilla was brought to national attention in 1980 when it was discovered in the Potomac River in Washington D.C.

This plant has been reported from 28 states with the most severe occurrences being found in the Gulf and South Atlantic States.

DISPERSAL/SPREAD: Once established hydrilla can easily spread to new areas. Fragments of the plant are able to root and develop into a new plant. These plant fragments are transported to new waters via boats and fishing equipment. Hydrilla's tubers and turions allow it to persist in an area. They can live dormant in the ground and can even resist a drought. Waterfowl are a vector of transport for hydrilla as well. Some waterfowl feed on the plant and may regurgitate the tubers into other bodies of water. It has been found that these tubers are still able to sprout. Birds can also spread seeds. Finally, hydrilla can be spread unintentionally through the horticulture industry when tubers are present in potted plants or fragments could hitchhike with wild harvested plants.

RISKS/IMPACTS: Hydrilla is sometimes called an invisible menace because most of the time you don't know it is there until it has filled the water. It will shade out native aquatic plants until they are eliminated. This forms a monoculture, which will reduce biodiversity and alter the ecosystem. Hydrilla does not only pose a threat to other plants but to animals as well. When hydrilla becomes over abundant, fish population imbalances are likely. The dense mats of hydrilla will alter the waters chemistry by raising pH, cause wide oxygen fluctuations, and increase water temperature.

Hydrilla is an economic drain. Millions of dollars are lost due to reduced recreational opportunities as hydrilla mats interfere with boating, swimming, fishing, etc. In flowing waters hydrilla will greatly reduce flow and can cause flooding. For operations that require water intake, hydrilla can pose a problem by clogging the intake pipes. Waterfront property values drop in areas infested with hydrilla. Millions of dollars are annually spent trying to control this aquatic pest.

MANAGEMENT/PREVENTION: Control of aquatic weeds is difficult and eradication sometimes can be an unrealistic goal. Before any type of management technique can be implemented there needs to be a positive identification of the plant. Some native plants look similar to hydrilla so it is important to have proper identification.

While there are many methods available to control aquatic plants, the method most suitable for complete and fast elimination is chemical control. Aquatic herbicides containing the active ingredients endothall, fluridone, diquat, or chelated copper are all labeled for use on hydrilla.

For states that have major infestations of this pest plant, they have looked to hydrilla's native range for any insects that could be used as a biological control. Four hydrilla-attacking insects have been released. *Bagous affinis,* a hydrilla tuber-attacking weevil and *Hydrellia pakistanae,* a leaf-mining fly both were released in 1987. *Hydrellia balciunasi* is another leaf mining fly that was released in 1989. *Bagous hydrillae*, a stem-mining weevil, was released in 1991. Many different states have released one or a combination of the four insects. It is still too early to know what long-term impacts these insects will have on hydrilla. One Indiana company is helping to develop a biological control method for hydrilla. SePro Inc. of Carmel, Indiana is a cooperator in a project with U.S. Army Engineer Research and Development Center Environmental Laboratory to grow an endemic fungal pathogen that attacks hydrilla.

The appearance of hydrilla in Lake Manitou was very alarming due to the large leap from previously known infested areas and the abundance of natural lakes in the area that are now at risk should the plant not be contained and eradicated. Chemical control began soon after the plant was found and plans are to continue until the plant has been eradicated. Access restrictions were imposed at Lake Manitou immediately after the discovery to reduce the risk of hydrilla being spread by recreational activities. Periodic access restrictions will continue during periods when there is a risk of the plant being moved by boats and trailers.

Hydrilla has been listed by the U.S. government as a Federal Noxious Weed. With this designation, it is illegal to import or sell the plant in the United States. However, it is possible that internet sales still occur.

Like all invasive species, the key to preventing their spread is knowledge! You can also help by practicing a few good techniques to stop the spread of hydrilla and other aquatic invasive plants.

- ✓ Rinse any mud and/or debris from equipment and wading gear and drain any water from boats before leaving a launch area.

- ✓ Remove all plant fragments from the boat, propeller, and boat trailer. The transportation of plant material on boats, trailers, and in livewells is the main introduction route to new lakes and rivers.

- ✓ Do not release aquarium or water garden plants into the wild, rather seal them in a plastic bag and dispose in the trash.

- ✓ Consider using plants native to Indiana in aquariums and water gardens.

- ✓ If you detect this plant in a lake, pond, or stream, immediately contact the Indiana Department of Natural Resources, Division of Fish and Wildlife.
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