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You Ain't From Around Here: Exotic Invasive of the Quarter: Hydrilla (*Hydrilla verticillata*)
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Like most of you, I have been thoroughly enjoying the warm spring weather. I'm excited about the arrival of summer and heading down the New River in my kayak. I'm not so excited about the exotic invasive that put a damper on our boating trips last summer. To be spiteful, I decided to give this plant the honor of being the Exotic Species of the Quarter. Let me introduce to you: hydrilla (also known as Florida elodea, water thyme, wasserquirl, Indian star-vine, and the perfect aquatic weed).

Upon completion of my research, I am both fascinated and horrified to find out what we are up against!

Native to Africa, hydrilla is now found on every continent except Antarctica and South America. The species tends to be more widespread in tropical areas, but also does well in temperate areas. Hydrilla was introduced to the Eastern U.S. in the early 1950's by an aquarium dealer who dumped 6 bundles of the plants into a canal near Tampa, FL. In 1960, the first naturalized hydrilla plants were found in Florida (in Miami and the Crystal River). In 1979, it was listed on the federal noxious weed list. Today hydrilla is found in still or slow moving fresh waters in all the Gulf Coast states, as far north as Maryland and Delaware, in the western states of California, Washington, and Arizona, and is considered to be the most problematic aquatic weed in the U.S. Virginia's hydrilla population ranges from Lake Gaston (on the North Carolina border) to the Potomac. Hydrilla has covered over 2000 acres of Lake Gaston since its introduction in 1989.

Hydrilla can be either monocious (a single plant has both male and female flowers) or dioceous (a single plant has either male or female flowers). The hydrilla population in Florida is dioceous female, while the hydrilla population in Virginia is monocious, (with the exception of Lake Gaston, which has both types).

Hydrilla has adaptations which make it a fierce competitor, capable of displacing native species. First, the stems elongate quickly (up to 1" per day) until they reach the water's surface, where they branch prolifically. The branching allows maximum sunlight absorption and shades out competitors below. Half of the standing crop occurs in the top 1.5' of water. Hydrilla is well-adapted to low light levels, so it can start photosynthesizing earlier and continue to do so much later each day than other plants, and it can survive in deeper water. In the Crystal River, hydrilla was found growing 49 feet below the surface!



**A hydrilla infestation. Photo by:
David J. Moorhead, Univeristy of Georgia**

Second, hydrilla can grow under a wide range of water chemistry. Although the plants grow well in nutrient rich sites, they are 90% water, so they can grow vegetative material in nutrient poor sites as well. Hydrilla grows in water with up to 7% of the salinity of seawater, a wide range of pH levels (however, it prefers a neutral pH), and even in high levels of raw sewage (adding to its charm).

Third, hydrilla has a number of reproduction methods (four to be exact!): fragments, tubers, turions and seeds. Fragments with as few as three leaves can sprout a new plant – so even small pieces on boats, buckets and draglines can start new populations. I certainly can't say I haven't moved a fragment or two on my boat. Tubers are small potato-like formations on the end of underground roots, which can form new plants. They are usually white or yellow. Tubers are formed in the fall and can withstand ice cover, drying out, ingestion by waterfowl, regurgitation, and herbicide applications. They also can remain viable in the soil for several years. Turions are compact buds produced along the stems in the leaf axils (the point where the leaf is attached to the stem). For every 9' of vegetation, up to 6000 new turions can form. They can break free from the stem and settle on the bottom, forming new plants. Turions are 0.25" long, and a shiny dark-green. Seed production is of minimal importance and seedlings are rarely seen. Research has yet to determine if the seeds can survive in the gut of birds. If so, this could be a source of long distance dissemination.

In addition to replacing native vegetation, hydrilla causes a host of other problems. It reduces flow in drainage and irrigation canals, and in areas used for utility cooling (up to 90%). Hydrilla clogs intake pumps, and interferes with boating, waterskiing and swimming. A large infestation of hydrilla can alter dissolved oxygen and pH, which can have a negative impact on fish populations.



A boat engine choked with hydrilla. Photo by: Wilfredo Robles, Mississippi State University.

Hydrilla does have some benefits. Duck habitat is improved by hydrilla and a moderate cover (20-40%) can be beneficial to large mouth bass. Also, for reasons not fully understood, large populations of submerged aquatic plants can increase water transparency. However, these don't outweigh the problems it causes.

How to identify hydrilla:

The appearance of hydrilla can vary considerably, and can often be confused with other native species. Generally hydrilla is rooted to the bottom, but can survive in a free-floating state.

Stems: erect, quite long in deep waters, profuse branching near the surface;

Leaves: small, strap-like and pointed, 0.08 – 0.2" wide, 0.2 – 0.8" long, in whorls of 3-8, 11-39 sharp teeth per leaf, can have spines or glands underneath, midrib often red;

Seeds: smooth, brown, 0.08 – 0.12” long, not prolific, rarely seen;

Female flowers: three whitish sepals (outer petals of the flower) and three translucent petals, 0.4 – 2” long, 0.2 – 0.3” wide, clustered towards tip of stem, float on the surface and form an inverted bell surrounding an air bubble (to keep the stigmas dry to ensure pollination);

Male flowers: three whitish red or brown sepals, up to 0.1” long and 0.8” wide, three stamens in the leaf axils, three whitish or reddish linear petals about 0.8” long; flowers are released to float to the surface as they reach maturity (as an air filled bud), where they explosively scatter pollen on the surface about 4” around flower, water can become greenish-white with pollen.



**Potato-like tubers (left) and young plants (right). Photos by:
USDA ARS Archive USDA Agricultural Research Station,
Leslie J. Mehrhoff, University of Connecticut.**

How to Control Hydrilla

In recreational waters, the goal is generally to improve the environment by selectively controlling hydrilla in sensitive areas. Because hydrilla resembles some native species, it's a good idea to have a natural resource professional make an accurate identification before beginning any control measures.

Mechanical: A simple way to help prevent spreading hydrilla is to carefully check all equipment (boats, buckets, fishing lines, etc.) before moving it from one water body to another.

Chemical: A number of herbicides have been found to be effective for controlling hydrilla. Only use herbicides labeled for aquatic use. These should be applied early in the growing season. Treatment of large areas can result in a temporary decrease in dissolved oxygen as the dead plant material decays, which can result in a fish kill. For this reason, it may be best to treat only 1/3 to 1/2 of an area at one time.

Herbicides with excellent results include fluridone (name brand Sonar and Avast!), hydrothol (Hydrothol 191 and Hydrothol Granular), aquathol (Aquathol K and Aquathol Super K). Also, diquat (Reward, Weedtrine-D and Eliminator) has been shown to give excellent results when combined with copper sulfate, copper complex or copper carbonate (Komeen, Nautique, Captain, Clearigate, Cutrine Plus, Cutrine Ultra and K-Tea). For more information, please see the Virginia Tech Pest Control Manual at <http://www.ext.vt.edu/pubs/pmg/hf7.pdf>, (aquatic weeds begin on page 29) or at VFELP website www.cnr.vt.edu/forestupdate, or call 540/231-6391 for a hard copy.

Biological: A lot of research on biological controls is underway. There are numerous insects that feed on hydrilla, but none have been released for public use. One biological control that is approved is the sterile grass carp. The grass carp is an herbivore, so it will feed on all aquatic vegetation in the water body – not just on hydrilla. Landowners need a permit to possess these fish, as they could cause serious environmental threats if they escape and establish a breeding population. Virginia landowners can obtain a permit from the Department of Game and Inland Fisheries by calling 804/367-8629 or visiting <http://www.dgif.state.va.us/forms/PERM/PERM-001.pdf>. A link to the form is also available at the VFLEP website. To obtain a permit, you must also submit a map of the area, percent of area covered, primary use of pond, means of grass carp containment and a \$10 fee. A list of approved grass carp suppliers is also available from the DGIF and the VFLEP websites.

Controlling and preventing the spread of a species so determined to reproduce and out-compete everything is a tough job. I guess I'll just have to make peace with swimming through beds of hydrilla (I'm shivering with disgust at the thought). Go-go hydrilla!

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For many more hydrilla photos, visit www.bugwood.org