Waterwheel Plant
Aldrovanda vesiculosa

Figure 1. Waterwheel (Aldrovanda vesiculosa). Photo by Shaun Winterton, CA Department of Food and Agriculture, Bugwood.org

Description

Waterwheel plant (*Aldrovanda vesiculosa)* is a free-floating submerged aquatic carnivorous plant recently introduced to North America. Rootless stems grow across the water from 2.5 to 8 inches (6 to 20 cm) in length, with whorls of 4-9 small leaves one inch (2.3 cm) in diameter. Each of its leaves features a pair of two oval lobes 0.15 to 0.28 inches (4-7mm) in length, that snap shut in about one-tenth of a second upon stimulation of any of the 20 sensitive hairs located on the inner surface of each lobe. Charles Darwin described waterwheel as "a miniature, aquatic *Dionaea* [Venus fly-trap]." Indeed, modern molecular studies have shown that waterwheel and the Venus fly-trap are closely related.

Waterwheel is the only extant species of the genus *Aldrovanda*, although there is fossil evidence of others in this genus. The species as a whole possesses little genetic variation. In its native range, waterwheel is declining and endangered. It is a valued species among carnivorous plant enthusiasts.

Habitat

Waterwheel grows naturally in pools, lakes, wetlands and river deltas, in areas with standing freshwater. It prefers shallow waters, with depths less than 1 meter; it is also susceptible to desiccation, so it requires a steady permanent water level throughout its growing season, from mid-spring to mid-fall. It naturally occurs in waters that are low in nutrients; its disappearance in much of its natural habitat appears to be related to impact from agricultural runoff.

Figure 2. Waterwheel population at Meadowbrook Pond, Ft. A.P. Hill, Caroline County, VA. Photo by Fort A.P. Hill Environmental and Natural Resources Division.

Distribution

Waterwheel had a wide, sparse distribution across parts of Europe, Africa, Asia, and Australia. Populations in its natural range are rapidly declining, prompting recognition as an endangered species in these places.

It was first discovered in Virginia in 2013 at Fort A.P. Hill Military Reservation in Caroline County, where it appears to have escaped from nearby cultivation to establish in a large, old impoundment on the base. It has since been discovered in several other streams and ponds at the Fort. Unverified reports tell of occurrences of waterwheel in other Virginia counties. Other naturalized populations in North America are reported in New Jersey and New York. Waterwheel is listed on the New Jersey Invasive Species Strike Team's Do Not Plant List (New Jersey Invasive Species Strike Team 2014).

Threats

At the Fort A.P. Hill sites, waterwheel has formed dense mats of vegetation just below the water surface, blocking light to other submerged plants. Under optimal conditions, it is capable of extremely rapid growth. It may also be carried to new habitat by waterfowl.

Figure 3. Turions, or reproductive buds, of waterwheel under ice in early spring, Ft. A.P. Hill, Caroline County, VA. Photo by Fort A.P. Hill Environmental and Natural Resources Division.

Waterwheel can reproduce vegetatively from fragments, but it can also reproduce through turions, which are compact vegetative buds. Turions survive cold winters by sinking to the bottom of the pond, lake, or stream. Waterwheel flowers infrequently and rarely results in fruit.

Control

Mechanical, chemical, and biological control methods are commonly used for aquatic species like waterwheel. Each has positive and negative impacts on the habitat. The land manager's challenge is to choose the method with the least negative implications for the situation. Waterwheel is only recently emerging as an invasive species. The recommendations in this section are based on techniques used for submerged aquatic vegetation such as hydrilla.

Chemical. No studies have been published on use of herbicide to control waterwheel. Herbicides with no impacts to fish and wildlife include triclopyr and flumiozazin (South Carolina Aquatic Plant Program 2014).

Biological. Grass carp (*Ctenopharygodon idella*) is a voracious herbivore frequently used for aquatic plant management. Tilapia has also been used with some success (South Carolina Aquatic Plant Program 2014).

Mechanical. This method is not recommended for the particularly rare habitats in which waterwheel is currently found. Harvesters require deep water free of obstructions.

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