Aquatic Invasive Species (AIS) Action Plan:

Water Chestnut

This action plan is a living document and will be updated, as needed, to reflect the status of the species in Pennsylvania.

Natural History

Description: The water chestnut is a rooted, annual aquatic plant with submersed and floating leaves.

Taxonomy

Common name: **Water chestnut**
Family: **Trapaceae**
Species: ***Trapa natans***
ITIS Taxonomic Serial Number **27170**

ITIS-Integrated Taxonomic Information System.

Morphology: The glossy green floating leaves, 2.0 to 4.0 cm (~ 0.75 to 1.6 inches), are triangular with toothed edges and form rosettes around the end of the stem (Figure 1). The stem anchors into the mud by numerous branched roots and extends upward to the surface of the water. The plant's cord-like stems are spongy and buoyant and can reach lengths of up to approximately five meters (16 feet). Single small, white flowers with four 0.8 cm (~0.33 inch) long petals sprout in the center of the rosette. The fruit is a large nut with four sharp spines (Figure 2).

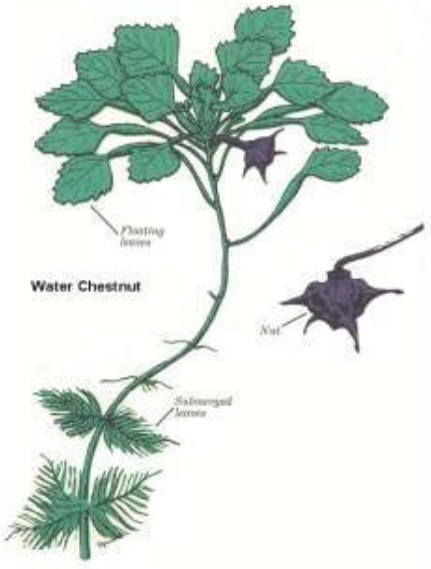

Figure 1. Diagram of a water Chestnut plant. Source: MD-DNR.

Origin: The water chestnut is native to Eurasia. It was first introduced to North America in the 1870s, where it is known to have been grown in a botanical garden at Harvard University in 1877. The plant had escaped cultivation and was found growing in the Charles River by 1879 (Ling Cao 2009).

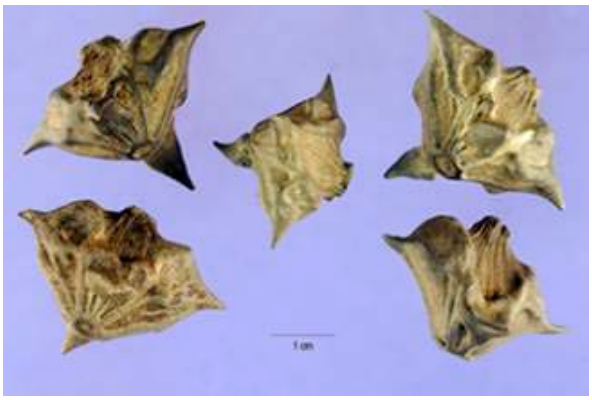

Figure 2. Water chestnut seed pods. Steve Hurst @ USDA-NRCS PLANTS Database

Figure 3. Water chestnut bed. Photo: Leslie J. Mehrhoff, University of Connecticut, Invasive Plant Atlas of New England (IPANE)

Food Preferences: Photosynthetic organism preferring nutrient rich water.

Reproductive behavior: Seeds germinate in the spring with each seed producing 10 to 15 rosettes and each rosette capable of producing up to 20 seeds. The plants start to produce hard, nut-like seeds in July with the seeds ripening in about a month. Over wintering of populations is accomplished when the mature, greenish brown seeds sink to the bottom where they can remain viable in the sediment for up to 12 years. The plant spreads either by the rosettes detaching from their stems and floating to another area, or more often by the nuts being swept by currents or waves to other parts of the lake or river (O'Neill 2006).

Notable Characteristics: Mature seeds are very hard with sharp points easily capable of piercing light footwear.

Historic Vectors: Escape from horticultural collections, sold as ornamental plant, escape from the aquarium trade, hitchhiker in ballast water

Current Pathways/Vectors: Seed dispersal by animals, human dispersal via the ornamental plant trade and escapes from ornamental ponds (Perkiomen Watershed Conservancy, personal communication), hitchhiker on recreational equipment (Eyres 2009).

Preferred Habitat: *T. natans* grows best in shallow (less than five meters deep), nutrient-rich lakes and slow-moving streams and rivers with soft muddy bottoms (Figure 3). It is generally found in waters with a pH range of 6.7 to 8.2 and alkalinity of 12 to 128 mg/L of calcium carbonate (Ling Cao 2009).

Distribution and Status

Distribution: While established in the northeastern United States since the late 1800's, *Trapa natans* continues to advance into new territory in New England and the Mid-Atlantic states. Water chestnut can now be found in Connecticut, Maryland, Massachusetts, New York, Pennsylvania, Vermont and Virginia and in the Canadian Province of Quebec in a tributary of the Richelieu River (Ling Cao 2009).

Water chestnut has occurred repeatedly in tributaries of the Chesapeake Bay, where plants were first discovered in the 1920s. Pennsylvania has reported populations in the Lower Susquehanna, areas around Philadelphia, and in isolated lakes and ponds in Montgomery and Bucks Counties (Figure 4). Most recently, a population was reported in the Upper Delaware River (MD SeaGrant

2007, Perkiomen Watershed Conservancy, personal communication).

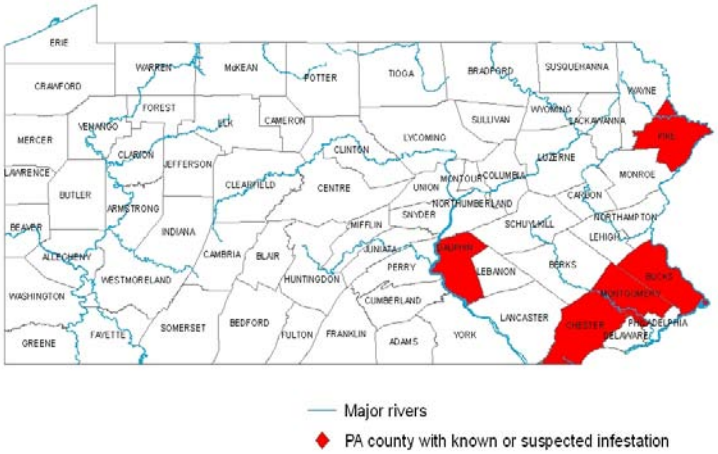

Figure 4. Pennsylvania distribution of water chestnut (*Trapa natans)* (April, 2011)

Pennsylvania Legal Status: Currently not regulated in 58 Pa. Code §71.6 and §73.1.

Threats

Water chestnut out-competes native plants for sunlight and is a fierce competitor in shallow waters with soft, muddy bottoms. This aggressive species is a prolific reproducer. One acre of water chestnut can produce enough seeds to cover 100 acres the following year (MD Sea Grant). Uncontrolled, it creates nearly impenetrable mats across wide areas of water, thus limiting the passage of light into the water, a critical element of a well-functioning aquatic ecosystem. At die off, it reduces oxygen levels, which may increase the potential for fish kills. *T. natans* is of little value to wildlife (O'Neill 2006).

Water chestnut infestations create havoc for boating and recreational areas. The dense mats make navigation difficult, while the spiked seeds, capable of puncturing shoe leather, are a danger to bathers and beach users. When the plant occupies a site, most recreational activities such as swimming, fishing from the shoreline, and the use of small boats are eliminated or severely impeded. (Ling Cao 2009, MD DNR 2010)

Management

Management Goals: *T. natans* still has limited distribution in Pennsylvania. Thus, the primary goal is to locate all extant populations of the plant in order to contain and eradicate those infestations.

Containment and Prevention Actions:

- Coordinate with PA State government agencies, watershed associations, and volunteer groups to locate infestations.
- Initiate a public education effort to acquaint the populace with the threat of and measures to prevent the spread of water chestnut.
- Advocate inclusion of water chestnut on the invasive species lists in 58 Pa. Code §71.6 and §73.1.
- Encourage incident reporting of aquatic invasive species within Pennsylvania.

Online reporting can now be conducted at the following PFBC web site: http://www.fish.state.pa.us/promo/form/ais_reporting.htm

- Keep informed with research concerning the use of biological controls.
- Monitor water chestnut infected waters and inventory nearby or suspected waters.
- Monitor infected waters that have been exposed to eradication procedures for a minimum of 15 years.

Rapid Response Options:

- Eradicate water chestnut infestations before seed release in early summer. Each infestation will need to be assessed for hand, mechanical, and/or chemical eradication procedures.

References

Eyres, W. 2009. Water Chestnut (*Trapa natans L.*) Infestation in the Susquehanna River Watershed: Population Assessment, Control, and Effects, Occasional Paper No. 44, Biological Field Station, Oneonta, NY, SUNY at Oneonta.

Ling, C. 2009. *Trapa natans*. USGS Nonindigenous Aquatic Species Database, Gainesville, FL. (http://nas.er.usgs.gov/queries/FactSheet.aspx ?Species ID=263, April 26, 2010).

Maryland Sea Grant. 2007. Invasive Species in the Chesapeake Watershed, Water Chestnut (*Trapa natans L.)* (http://www.mdsg.umd.edu/issues/restoration/non-natives/workshop/water_chestnut.html

O'Neill, C.R., Jr. 2006. Water Chestnut (*Trapa natans*) in the Northeast. New York Sea Grant, Invasive Species Factsheet Series: 06-1. New York Sea Grant, SUNY College at Brockport. (http://www.seagrant.sunysb.edu/ais/pdfs/WaterChestnutFactsheet.pdf.