

# Connecticut's Aquatic and Wetland Invasive Plant Identification Guide

2<sup>nd</sup> Edition

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## Introduction to Aquatic Plants

Aquatic plants are essential components of healthy ecosystems in lakes and ponds. They cleanse water and provide habitat for rich communities of aquatic organisms. Because invasive species are not native, they have few natural enemies. Their dramatic growth rates can clog water intakes, decrease recreational opportunities, reduce local real estate values, and alter native ecosystems (Connecticut Aquatic Nuisance Species Working Group, 2006, Fishman et al. 1998). Recent vegetation surveys of 201 lakes and ponds by the Connecticut Agricultural Experiment Station Invasive Aquatic Plant Program (CAES IAPP) found one or more invasive plants in over two-thirds of the water bodies (CAES IAPP, 2012).

Approximately three-quarters of the invasive aquatic plant species in southern New England were introduced as cultivated plants (Les and Mehrhoff, 1999). These introductions come from recreational boating (Couch and Nelson, 1985), dumping of aquariums, water gardening, and plant fragments mixed with live bait used by fishermen. Spread of invasive plants from one lake to another also occurs naturally by wildlife and downstream flow. Once established, eradication of invasive aquatic plants is extremely difficult. Preventing introductions by inspections, public education, early detection, and rapid response is critically important.

This guide is intended to provide information on the identification and distribution of the 22 aquatic plants listed as invasive or potentially invasive (Table 1) by the Connecticut General Statute (Sec. 22a-381d). The sale of these plants, with the exception of common water-hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes*), is also banned by State Statute and their transport is limited to activities associated with control and education. Fines of up to one hundred dollars can be imposed for each violation.

## How to Use This Guide

Identifying Connecticut's freshwater aquatic plants is challenging. CAES IAPP surveys have found over 100 native species and 14 invasive species (Figure 1). These do not include many of the wetland plants in this guide because our surveys are limited to lakes and ponds. We use many references when plant identification is questionable including; Crow and Hellquist (2000) and Fassett (1957), other recognized experts and molecular identification using DNA sequencing. Some of the potentially invasive plants discussed here have never been documented in Connecticut and may be unfamiliar to readers. Certain invasive aquatic plants can be easily confused with native or other invasive plants so care must be taken to ensure accuracy. The places where plants are found are often related to their means of dispersal (Table 1) and sometimes this gives a clue to their identification.

Table 1. Invasive and potentially invasive aquatic plants listed in the Connecticut General Statutes (Sec. 22a-381d).

#	SCIENTIFIC NAME	COMMON NAME	DISPERSAL
1	<i>Butomus umbellatus</i>	Flowering rush	Water Gardening
2	<i>Cabomba caroliniana</i>	Fanwort	Aquariums, Boats/Trailers, Bait
3	<i>Callitriche stagnalis</i>	Pond water-starwort	Water Gardening
4	<i>Egeria densa</i>	Brazilian water-weed, Anacharis, Egeria	Aquariums, Boats/Trailers, Bait
5	<i>Eichhornia crassipes</i> *	Common water hyacinth	Water Gardening
6	<i>Hydrilla verticillata</i>	Hydrilla	Aquariums, Boats/Trailers, Bait
7	<i>Iris pseudacorus</i>	Yellow iris, Yellow flag iris	Nursery Stock, Water Gardening
8	<i>Lythrum salicaria</i>	Purple loosestrife	Nursery Stock, Water Gardening
9	<i>Marsilea quadrifolia</i>	European watercress, Water shamrock	Water Gardening, Boats/Trailers
10	<i>Myosotis scorpioides</i>	Forget-me-not, Water scorpion-grass	Water Gardening
11	<i>Myriophyllum aquaticum</i>	Parrotfeather	Aquariums, Boats/Trailers
12	<i>Myriophyllum heterophyllum</i>	Variable-leaf watermilfoil	Aquariums, Boats/Trailers
13	<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	Aquariums, Boats/Trailers, Bait
14	<i>Najas minor</i>	Brittle water-nymph, Minor naiad	Boats/Trailers
15	<i>Nelumbo lutea</i>	American water lotus	Water Gardening
16	<i>Nymphoides peltata</i>	Yellow floating heart	Water Gardening
17	<i>Pistia stratiotes</i> *	Water lettuce, Tropical duckweed	Water Gardening
18	<i>Potamogeton crispus</i>	Curly leaf pondweed, Crispy-leaved pondweed	Boats/Trailers
19	<i>Rorippa microphylla</i>	Onerow yellowcress	Water Gardening
20	<i>Rorippa nasturtium-aquaticum</i>	Watercress	Water Gardening
21	<i>Salvinia molesta</i>	Giant salvinia	Water Gardening
22	<i>Trapa natans</i>	Water chestnut	Water Gardening, Boats/Trailers

\* plants that are not banned

This guide has three main parts. First, each plant has a summary page containing pictures, a list of key features, and a map of where the plant has been found by either CAES IAPP or the Invasive Plant Atlas of New England (IPANE, 2012). Other sources may have found some of the plants elsewhere, and the maps are not meant to suggest the plants are limited to the locations shown. Second, there is a series of comparative pictures that help differentiate the invasive species from similar native plants. Third, there is a plant identification key that provides a step-by-step method for narrowing plants to their species. This key also includes native plants that are commonly mistaken for invasive species.

## What to do if You Find a Plant Discussed in This Guide

Before taking action, it is important that the plant be positively identified and the location of the plant is noted. Latitude and longitude coordinates taken with a global positioning system (GPS) are best. Plant samples requiring further identification need to be mailed or taken to the CAES IAPP, 123 Huntington Street, New Haven, CT 06511, or another qualified entity such as the Connecticut Department of Energy and Environmental Protection (DEEP). You can call CAES IAPP at (203) 974-8512 with questions.

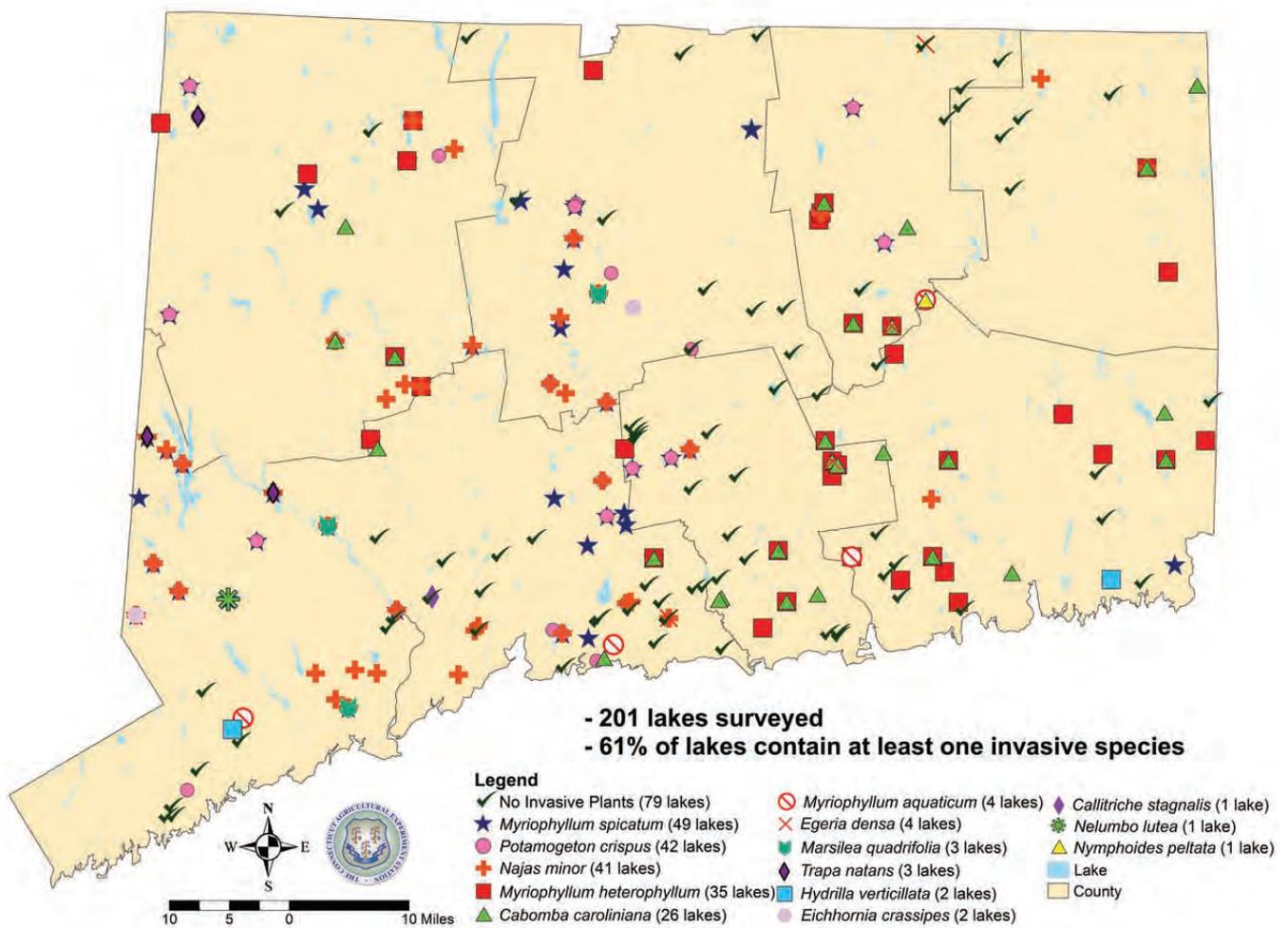


Figure 1: Locations of invasive aquatic plants found by CAES IAPP surveys from 2004-2012.

### Additional Resources for Plant Identification

CAES IAPP web page, aquatic plant survey requests, online herbarium, and reprints of this guide

<http://www.ct.gov/caes/IAPP>

The Invasive Plant Atlas of New England

<http://nbii-nin.ciesin.columbia.edu/ipane/>

Invasive Plants of the Eastern United States: Identification and Control

<http://www.invasive.org/eastern/>

State of Washington Department of Ecology Non-native Freshwater Plants

<http://www.ecy.wa.gov/programs/wq/plants/weeds/exotic.html>

University of Florida, Center for Aquatic and Invasive Plants

<http://plants.ifas.ufl.edu/>

USDA National Invasive Species Information Center

<http://www.invasivespeciesinfo.gov/>

## Definitions of Plant Terms

**Alternate:** leaves not directly across from each other on the stem

**Dissected:** leaf divided into many narrow segments; appear feathery, branched or forked

**Entire:** leaf not divided and margins not toothed

**Forked:** leaf divided into two or more equal segments

**Lanceolate:** lance-shaped, long, wider in the middle foliage

**Leaflet:** one of many leaf-like structures that make up a leaf

**Margin:** the edge or border of a leaf

**Opposite:** leaves are directly across from each other on the stem

**Petiole:** leaf stalk; stem-like structure that attaches a leaf to the stem

**Pinnately compound:** leaf containing many leaflets

**Rhizome:** underground stem often sending out roots and shoots from its nodes

**Rosette:** a dense cluster of leaves that are all at a single height, like petals of a rose

**Stolon:** above ground stem often sending out roots and shoots at nodes, also termed “runner”

**Spike:** unbranched continuation of the stem where flowers are located, usually located above the water

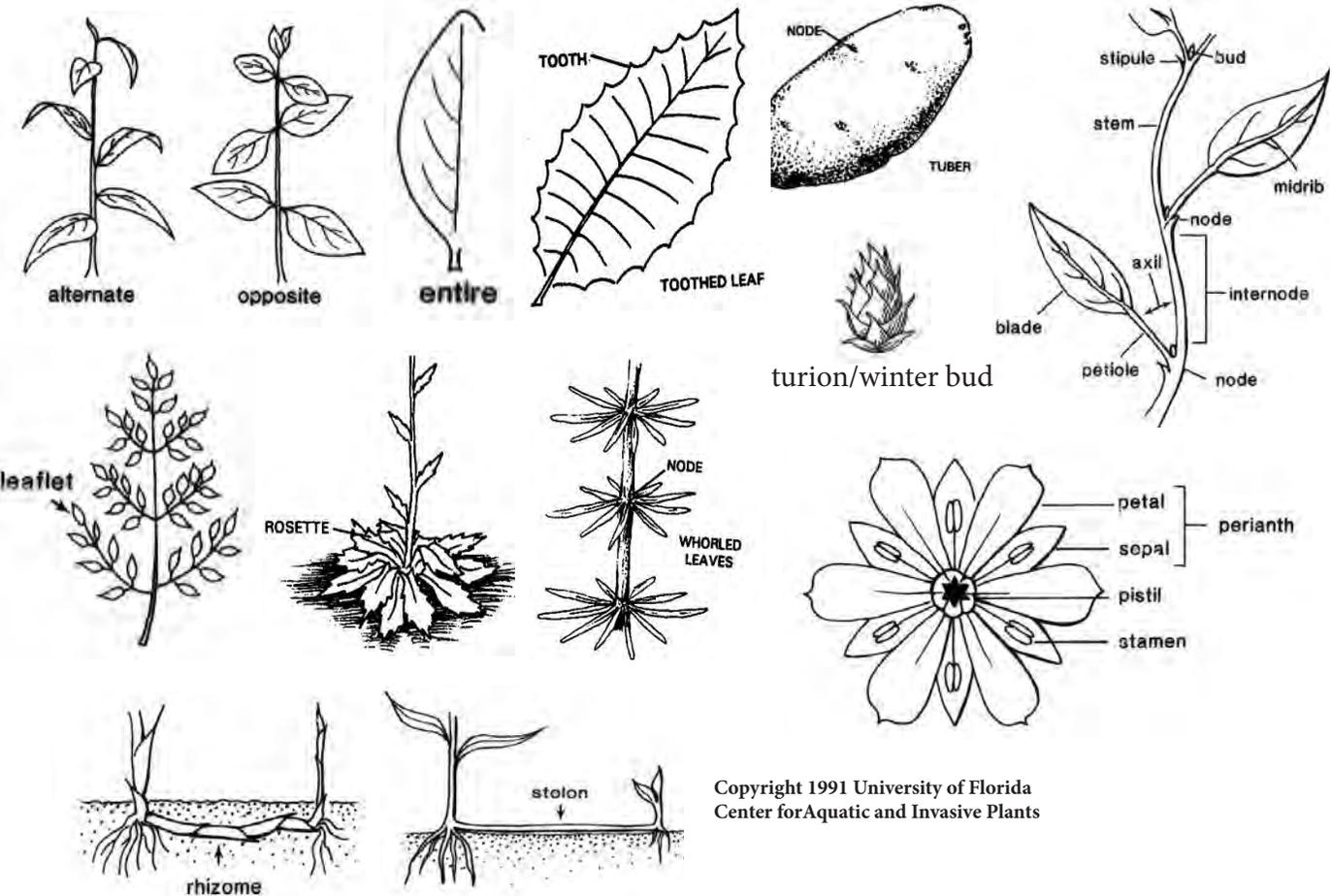
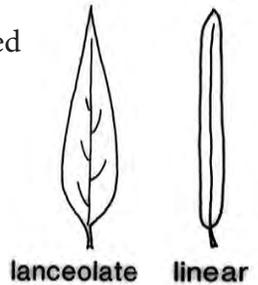
**Tooth:** points or lobes along a leaf margin

**Tuber:** modified, underground stem for starch storage and a form of vegetative reproduction

**Turion:** a modified leaf bud on a stem or shoot, a form of vegetative reproduction

**Whorled:** three or more leaves at the same node, forming a ring-like arrangement

**Winter bud:** a modified leaf bud that survives the winter and facilitates vegetative reproduction



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# *Butomus umbellatus*

## Common name:

Flowering rush

## Origin:

East Asia

## Key features:

**Stems:** Can be found along shorelines and into water 9 feet (3 m) deep

**Leaves:** Long, narrow, sword shaped leaves up to 3 feet (1 m) tall that originate at base. Leaves are fleshy with twisted ends, grass-like, cross section of leaves are triangular

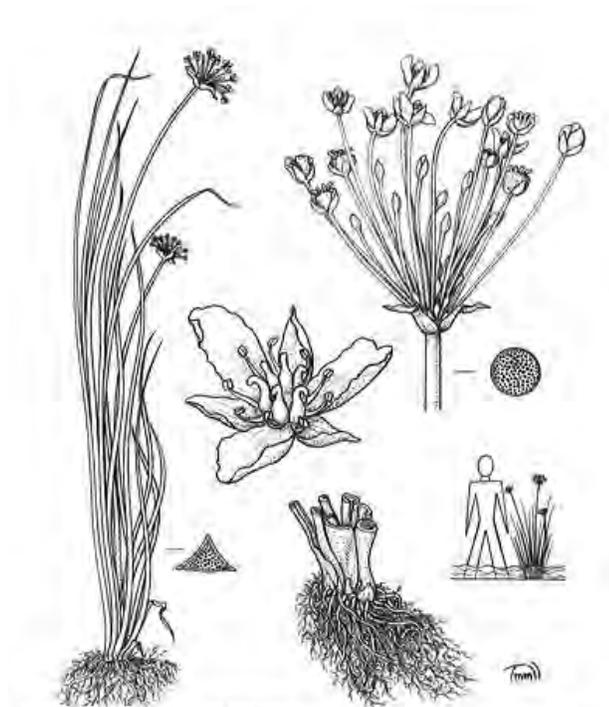
**Flowers:** Inflorescence contains pink to white flowers 0.8-1.2 inches (2-3 cm) across with 3 petals and 3 sepals on a stalk that can be 3 feet (1 m) tall

**Fruits/Seeds:** Fruit is a follicle

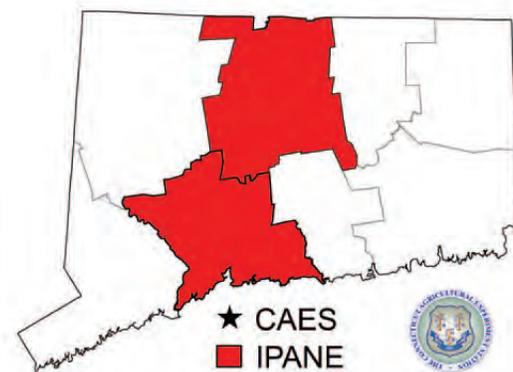
**Reproduction:** Seeds and rhizomes

## Easily confused species:

Bur-reeds: *Sparganium* spp.



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# *Cabomba caroliniana*

## Common names:

Fanwort

Carolina fanwort

## Origin:

Southeast United States

South America

## Key features:

Plants are submersed

**Stems:** Can be 6 feet (2 m) long

**Leaves:** Dissected, opposite leaves 0.8-2 inches (2-5 cm) are fan-like and made up of forked leaflets attached to the stem by a petiole. Floating leaves 0.2-0.8 inches (6-20 mm) wide are oblong and produced on flower shoots

**Flowers:** Small, solitary flowers are usually white to pinkish

**Fruits/Seeds:** Flask shaped

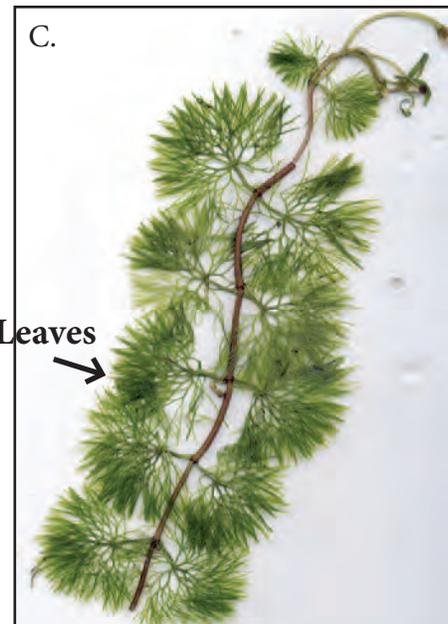
**Reproduction:** Seed and fragmentation

## Easily confused species:

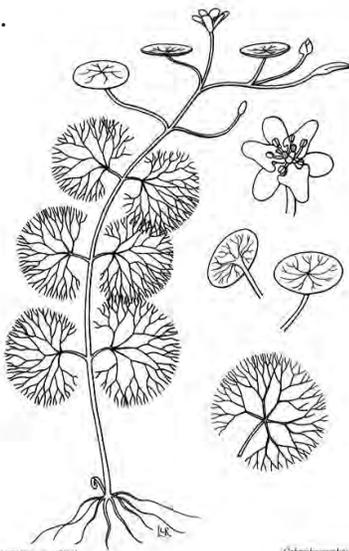
Watermilfoils: *Myriophyllum* spp.

White water crowfoot: *Ranunculus longirostris*

Water marigold: *Megalodonta beckii*



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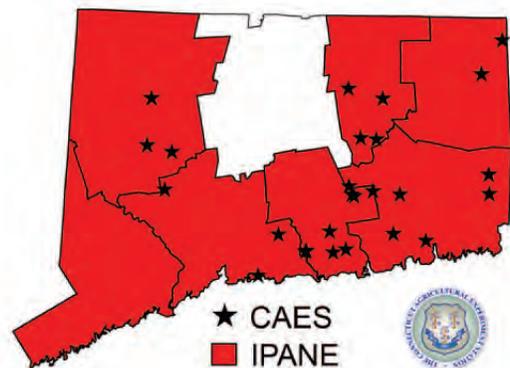
B.



A. Copyright 1991 Univ. of Florida, Center for Aquatic and Invasive Plants

B. Copyright 2002 Univ. of Florida, Photo by A. Murray

C. Photo by A. Smagula



# *Callitriche stagnalis*

**Common name:**

Pond water-starwort

**Origin:**

Europe and North Africa

**Key features:**

Plants are submersed with floating rosettes

**Stems:** 4-12 inches (10-30 cm) long

**Leaves:** Floating leaves are opposite and oval or spoon shaped 0.8 × 0.1-0.3 inches (2 cm × 3-8 mm), submerged leaves are narrower and tend to be smaller

**Flowers:** Small with 2 small bracts at their base, flowers are close to each other at leaf bases for self pollination

**Fruits/Seeds:** Round 0.06-0.08 inches (1.5-2 mm) thick forming 4 mericarps that have thin winged margins

**Reproduction:** Cloning and seeds

**Easily confused species:**

Other *Callitriche* spp. (can only distinguish them by their fruit)



Photo by CAES IAPP

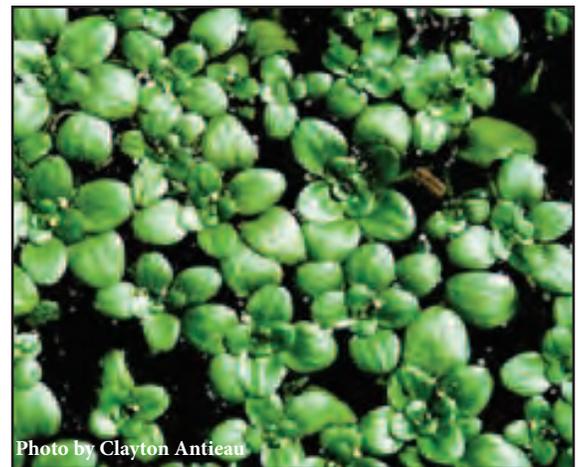
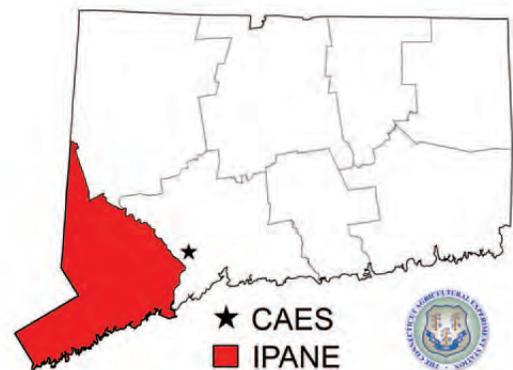


Photo by Clayton Antieau



Photo by Leslie J. Mehrhoff



# *Egeria densa*

## Common names:

Brazilian waterweed  
Brazilian elodea  
South American waterweed

## Origin:

South America

## Key features:

Plants are submersed

**Stems:** Plant stems green, soft and typically 1-2 ft (0.3-0.6 m) long

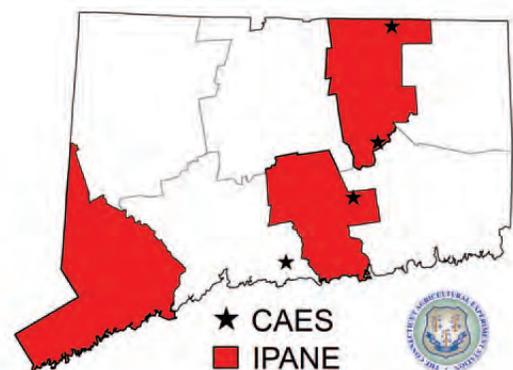
**Leaves:** Leaves entire 0.4-1.2 inches (1-3 cm) long by 0.2 in (5 mm) wide, leaves toothed (need magnification), leaves are whorled with typically 4 leaves per whorl

**Flowers:** Small white flowers with three petals, only staminate (male) flowers found in the US

**Reproduction:** Fragmentation

## Easily confused species:

Waterweeds (Native): *Elodea nuttallii* and *E. canadensis*  
Hydrilla: *Hydrilla verticillata*



# *Eichhornia crassipes*

## Common names:

Common water-hyacinth

Floating water-hyacinth

## Origin:

Brazil

## Key Features:

**Stems:** Free floating plant

**Leaves:** Leaves are oval 1.6-4.7 inches (4-12 cm), thick, waxy and form a rosette, petioles are inflated which helps with floatation

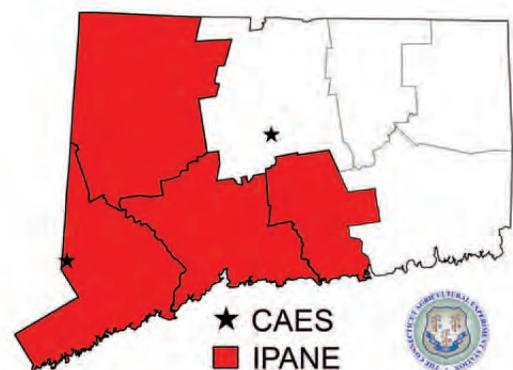
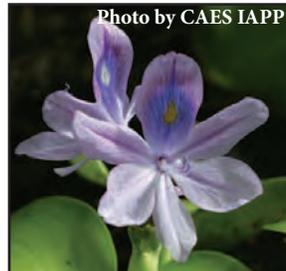
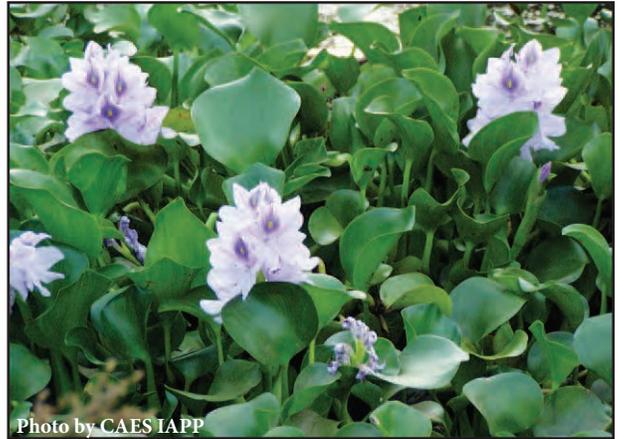
**Flowers:** Flowers are light purple with one petal having a darker blotch with a yellow center 2.0-2.8 inches (5-7 cm)

**Fruits/Seeds:** Fruit is a capsule with ribbed seeds

**Reproduction:** Seeds and stolons

## Easily confused species:

None



# Hydrilla verticillata

## Common name:

Hydrilla

## Origin:

Asia

## Key features:

Plants are submersed

**Stems:** Slender, branched and up to 25 feet (7.5 m) long

**Leaves:** Whorled leaves approx. 0.7 inches (1.5 cm) long, whorls often have 5 leaves (range 4-8); leaf margins are visibly toothed

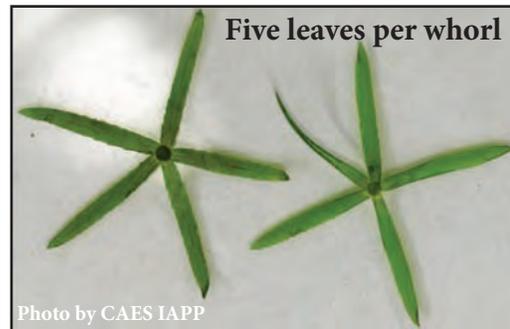
**Flowers:** Female flowers have three translucent petals that have reddish streaks, male flowers have three petals and can be white to red in color

**Fruits/Seeds:** Small tubers (key feature) can be found in the sediment, turions form along the stem

**Reproduction:** Fragmentation, turions, tubers and seeds



Photo by CAES IAPP



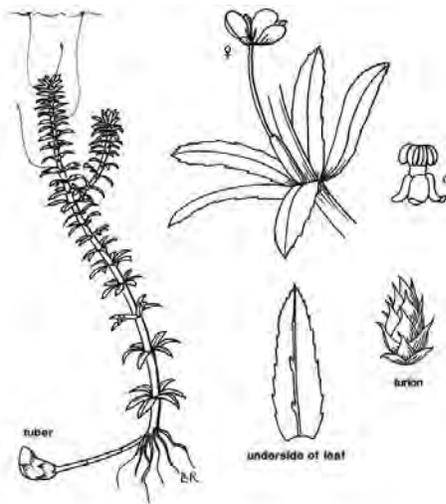
Five leaves per whorl

Photo by CAES IAPP

## Easily confused species:

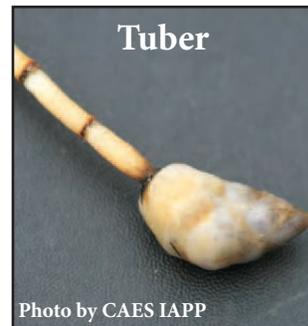
Waterweeds (Native): *Elodea nuttallii* and *Elodea canadensis*

Brazilian waterweed: *Egeria densa*



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*Hydrilla verticillata*  
Hydrilla



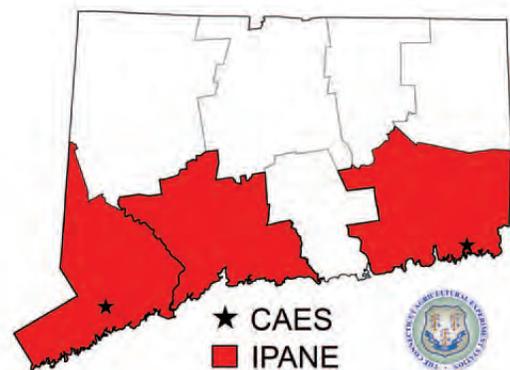
Tuber

Photo by CAES IAPP



Turions

Photo by CAES IAPP



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# *Iris pseudacorus*

## Common names:

Yellow iris  
Yellow flag

## Origin:

Europe  
Western Asia  
Northwest Africa

## Key features:

**Leaves:** Sword shaped leaves are flattened with a raised mid rib and rise out of the soil, the tips of the leaves are pointed and arch over

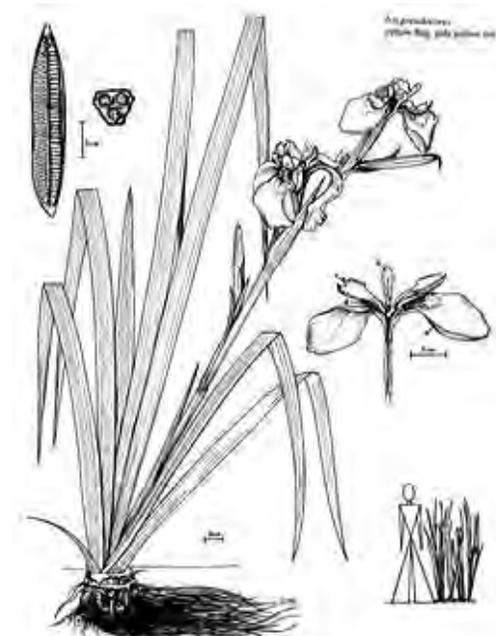
**Flowers:** Flowers are on peduncles 3-4 feet (1-1.3 m) tall. Several light to dark yellow flowers are on each stem with 3 small erect petals and 3 large downward sepals

**Fruits/Seeds:** Fruit is a capsule, seeds are brown

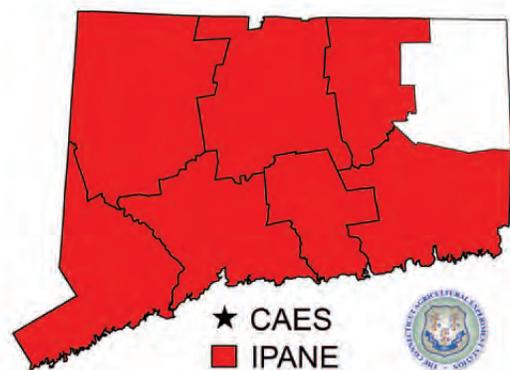
**Reproduction:** Seeds and rhizomes

## Easily confused species:

Northern blue flag iris: *Iris versicolor*



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# *Lythrum salicaria*

## Common name:

Purple loosestrife

## Origin:

Europe

## Key features:

**Stems:** Plants have herbaceous stems and can grow 1.5-5 feet (0.5-1.5 m) tall

**Leaves:** Opposite, or in whorls of 3, 1-4 inches (3-10 cm) long, linear, or lanceolate in shape, leaves can be smooth or hairy

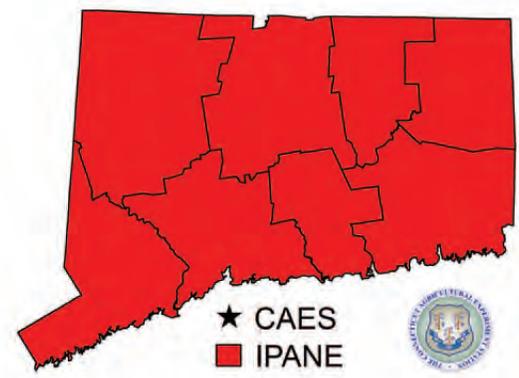
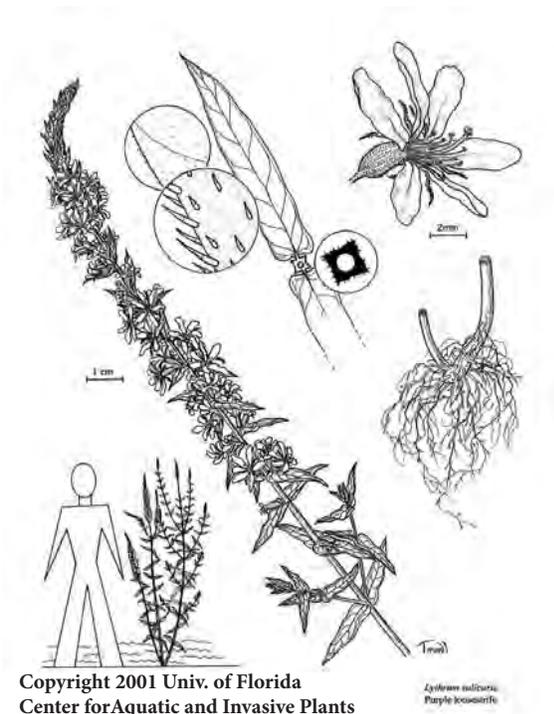
**Flowers:** Large, pink-purple flowers clustered on long terminal spikes 4-16 inches (10-40 cm) long, floral tube is twice as long as it is wide and typically has 6 petals

**Fruits/Seeds:** Fruit is a two cavity capsule with numerous reddish-brown seeds

**Reproduction:** Seed

## Easily confused species:

Winged loosestrife: *Lythrum alatum*



# *Marsilea quadrifolia*

## Common names:

European waterclover  
Water shamrock

## Origin:

Europe

## Key features:

Floating leaf plant

**Stems:** Smooth petioles 2-12 inches (5-30 cm)

**Leaves:** Comprised of 4 fan-shaped leaflets (similar to a four-leaf clover)

**Fruits/Seeds:** 2 or 3 dark brown sporocarps 0.2 inches × 0.2 inches (4-5.5 mm × 3-4 mm)

**Reproduction:** Cloning and sporocarps

## Easily confused species:

None

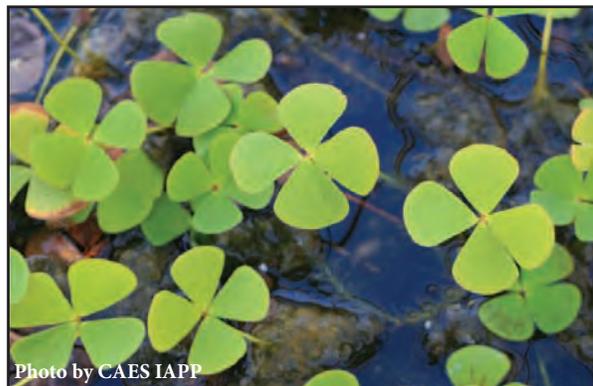


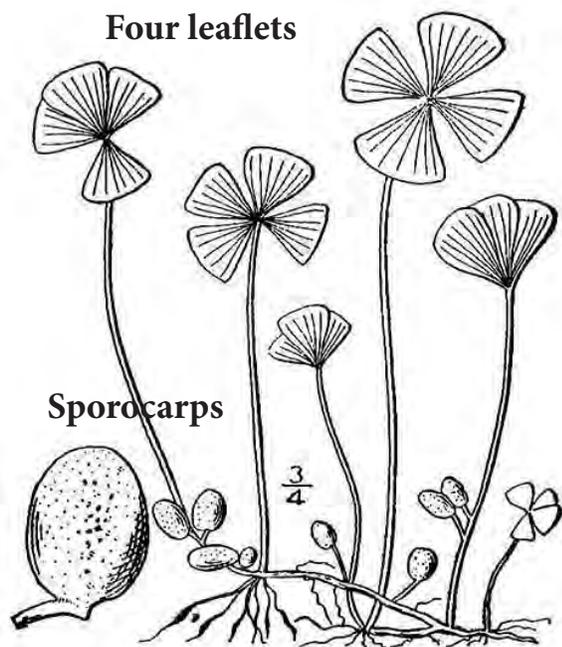
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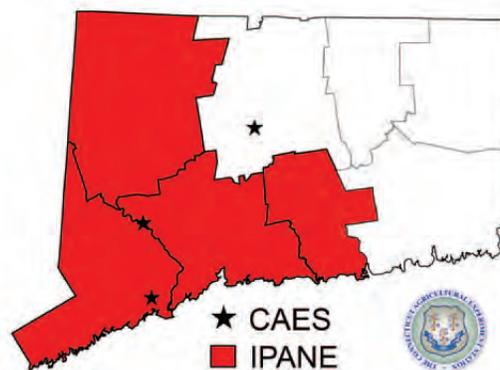
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Photo by CAES IAPP



Britton, N.L., and A. Brown. 1913



# *Myosotis scorpioides*

## Common names:

Forget-me-not  
Yellow eye forget-me-not  
Water scorpion-grass

## Origin:

Europe  
Western Asia

## Key features:

Plants grow 8-24 inches (20-60 cm) in height

**Stems:** Stems are angled, often creeping

**Leaves:** Lower leaves are tapered to the base while the upper leaves are more oblong, leaves are alternate, with short hairs

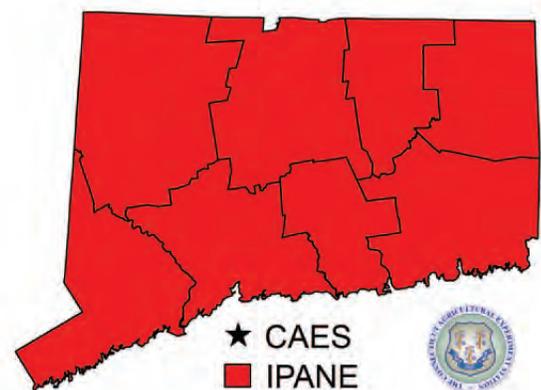
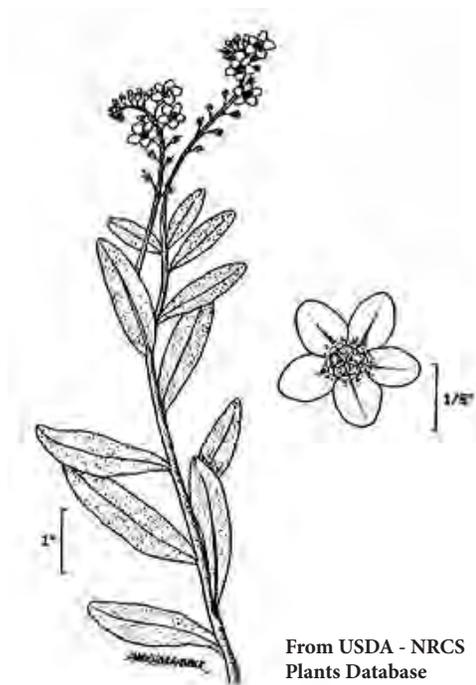
**Flowers:** Flowers are flat and are typically blue with a yellow center, 0.2-0.4 inches (6-9 mm) wide, along a simple inflorescence with a common axis

**Fruits/Seeds:** Seeds are contained in a nutlet that is angled and keeled on the inner side

Reproduction: Seeds

## Easily confused species:

Bay forget-me-not: *Myosotis laxa*



# *Myriophyllum aquaticum*

## Common names:

Parrotfeather  
Brazilian watermilfoil

## Origin:

Amazon River basin

## Key features:

Plants occur mostly above the water's surface

**Stems:** Thick green stems

**Leaves:** Leaves are a blue-green color and have a feathery appearance, leaves are whorled, dissected with rounded tips

**Flowers:** Flowers have white sepals and no petals (only females found in the US)

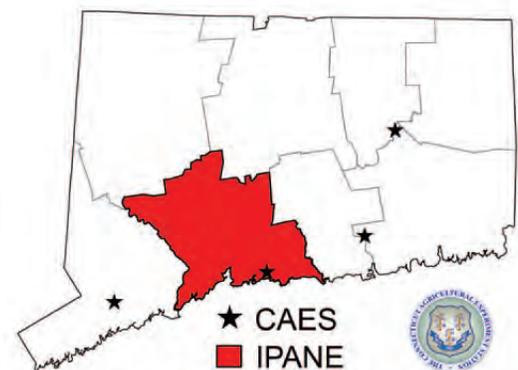
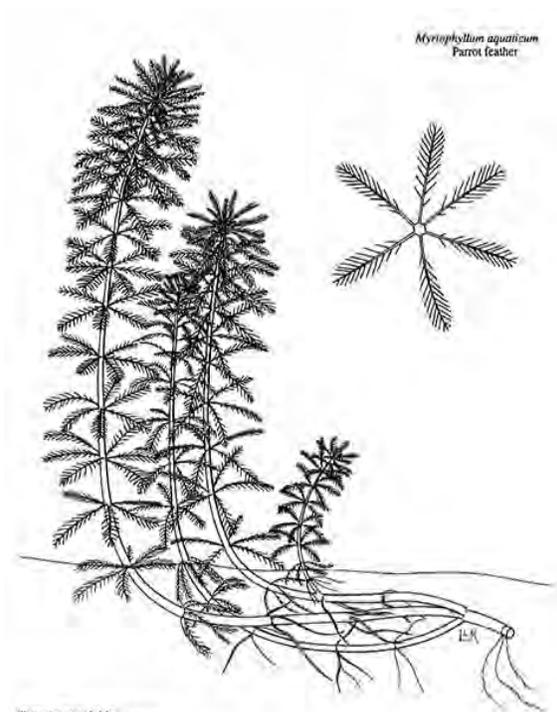
**Fruits/Seeds:** 0.06-0.08 inches (1.5-2 mm) long

**Reproduction:** Fragmentation

## Easily confused species:

Eurasian watermilfoil: *Myriophyllum spicatum*

Variable-leaf watermilfoil: *Myriophyllum heterophyllum*



# *Myriophyllum heterophyllum*

## Common names:

Variable-leaf watermilfoil  
Variable watermilfoil  
Two-leaf watermilfoil

## Origin:

Southern United States

## Key features:

Plants are submersed

**Stems:** Dark brown stems extend to the water's surface and spread to form large mats

**Leaves:** Triangular with  $\leq 11$  pairs of leaflets. Leaves are dissected and whorled (4-6 leaves/whorl) resulting in a feathery appearance with leaf whorls  $< 1$  inch apart giving it a ropy appearance

**Flowers:** Inflorescence spike 2-14 inches (5-35 cm) long extend beyond the water's surface with flowers in whorls of four with reddish petals

**Fruits/Seeds:** Fruits are almost round, with a rough surface

**Reproduction:** Fragmentation and seeds

## Easily confused species:

Eurasian watermilfoil: *Myriophyllum spicatum*

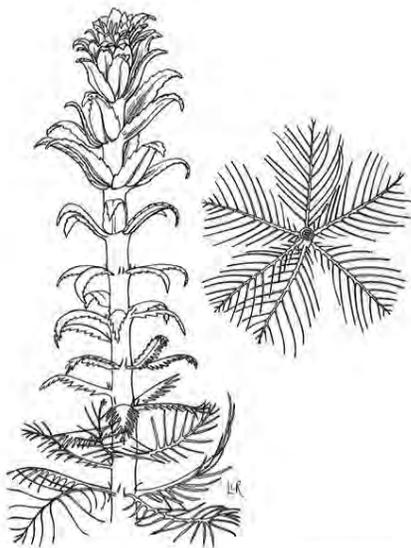
Low watermilfoil: *Myriophyllum humile*



Photo by CAES IAPP



Photo by CAES IAPP



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Florida Invasive and Aquatic Plants

*Myriophyllum heterophyllum*  
Variable-leaf milfoil

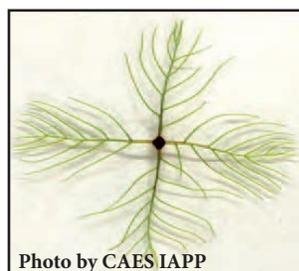
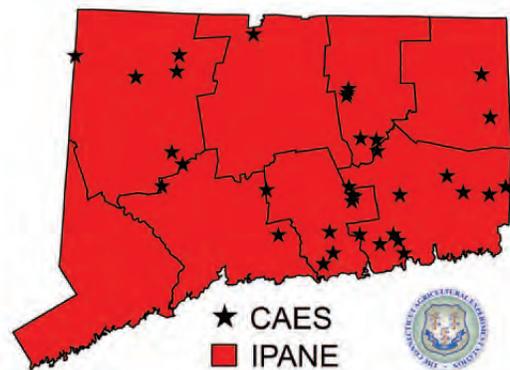


Photo by CAES IAPP



Leaves collapse out of water

Photo by CAES IAPP



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# *Myriophyllum spicatum*

## Common name:

Eurasian watermilfoil

## Origin:

Europe and Asia

## Key features:

Plants are submersed

**Stems:** Stem diameter below the inflorescence is greater with reddish stem tips

**Leaves:** Leaves are rectangular with  $\geq 12$  pairs of leaflets per leaf and are dissected giving a feathery appearance, arranged in a whorl, whorls are 1 inch (2.5 cm) apart

**Flowers:** Small pinkish male flowers that occur on reddish spikes, female flowers lack petals and sepals and have 4 lobed pistil

**Fruits/Seeds:** Fruit are round 0.08-0.12 inches (2-3 mm) and contain 4 seeds

**Reproduction:** Fragmentation and seeds

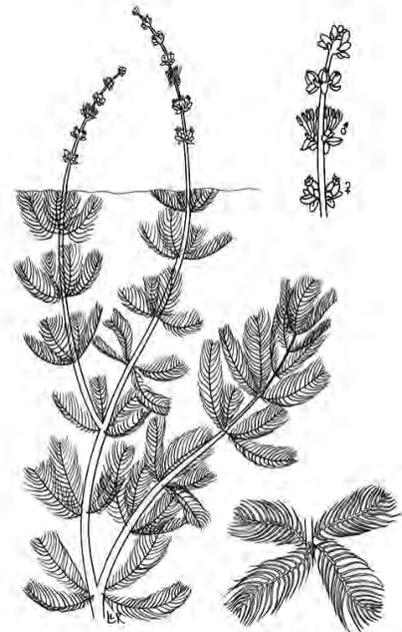
## Easily confused species:

Variable-leaf watermilfoil: *Myriophyllum heterophyllum*

Low watermilfoil: *Myriophyllum humile*

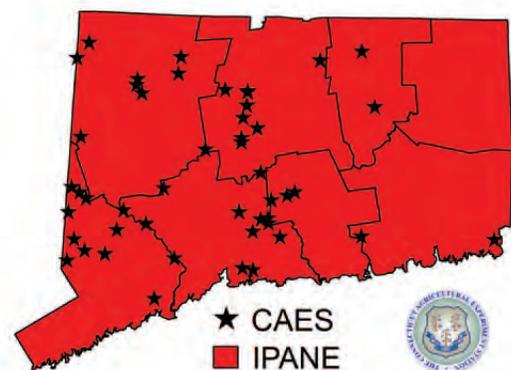
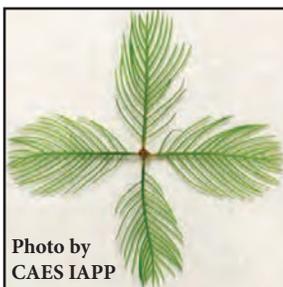
Northern watermilfoil: *Myriophyllum sibiricum*

Whorled watermilfoil: *Myriophyllum verticillatum*



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*Myriophyllum spicatum*  
Eurasian watermilfoil



# *Najas minor*

## Common names:

Minor naiad  
Brittle waternymph  
Spiny leaf naiad  
Eutrophic waternymph

## Origin:

Europe

## Key features:

Plants are submersed

**Stems:** Branched stems can grow up to 4-8 inches (10-20 cm) long

**Leaves:** Opposite and lance shaped on branched stems with easily visible toothed leaf edges and leaves appear curled under, basal lobes of leaf are also serrated, 0.01-0.02 inches (0.3-0.5 mm)

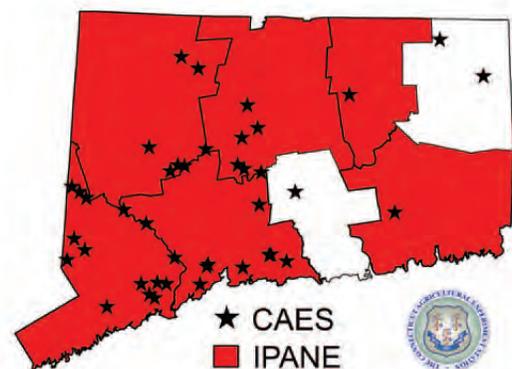
**Flowers:** Monoecious (male and female flowers on same plant)

**Fruits/Seeds:** Fruits are purple-tinged and seeds measure 0.03-0.06 inches (1.5-3 mm)

**Reproduction:** Seeds and fragmentation

## Easily confused species:

Other naiads (native): *Najas* spp.



# *Nelumbo lutea*

**Common name:**

American water lotus

**Origin:**

Southeastern United States, Mexico, Honduras, and the West Indies

**Key features:**

Plants are on or above the water

**Stems:** Stiff stalk attaches to the center of the leaf

**Leaves:** Large, bluish-green, circular leaves with no “slit” like water lilies

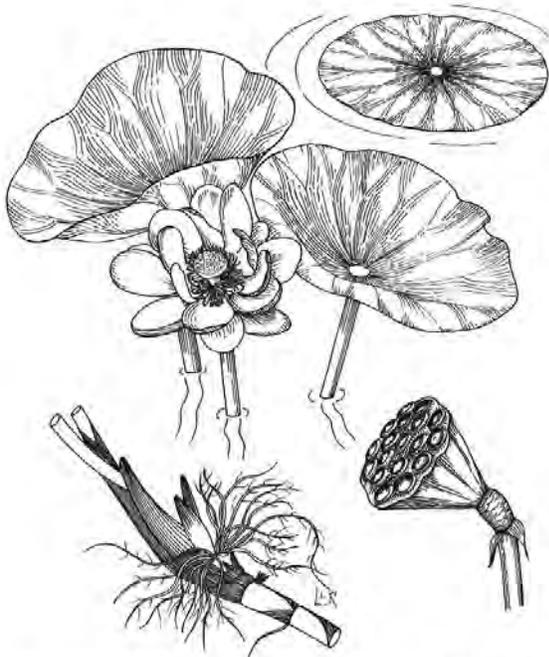
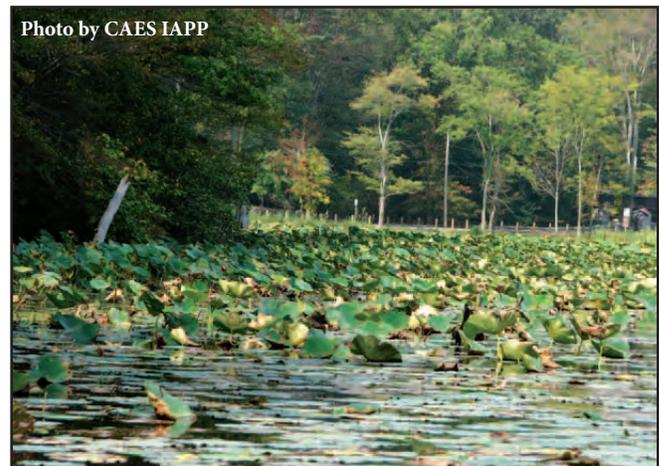
**Flowers:** White to yellowish flowers measure up to 8 inches (20 cm) wide

**Fruits/Seeds:** Seeds are nut-like and contained in a structure that resembles the top of a watering can

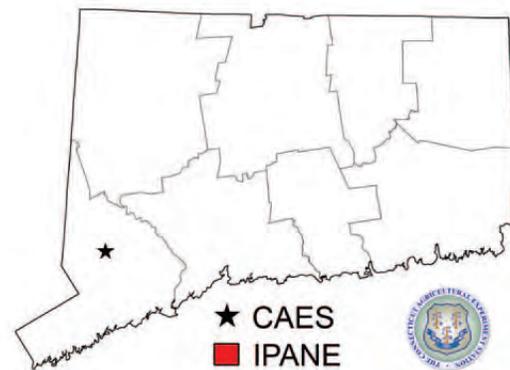
**Reproduction:** Seed

**Easily confused species:**

None



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# *Nymphoides peltata*

**Common name:**  
Yellow floating heart

**Origin:**  
Europe, Japan, China, and India

**Key features:**  
Floating leaf plant

**Stems:** Branching stems spread over water's surface

**Leaves:** Floating leaves are round and heart-shaped at base, paired at each node

**Flowers:** Flowers are bright yellow on long peduncles with 5 fringed petals

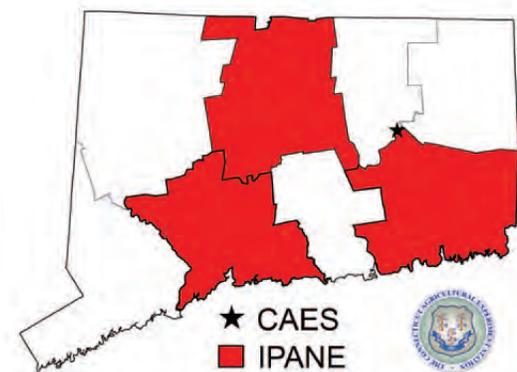
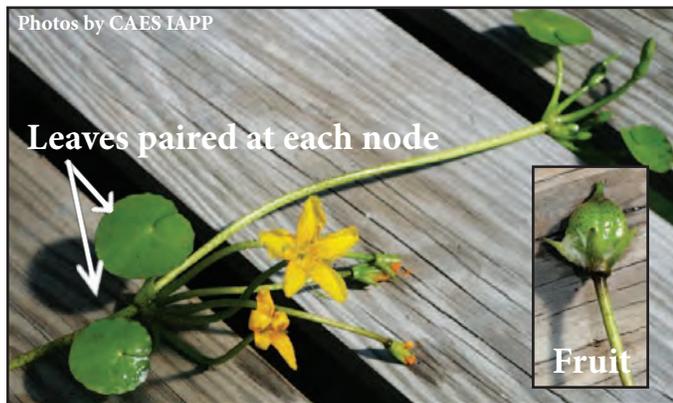
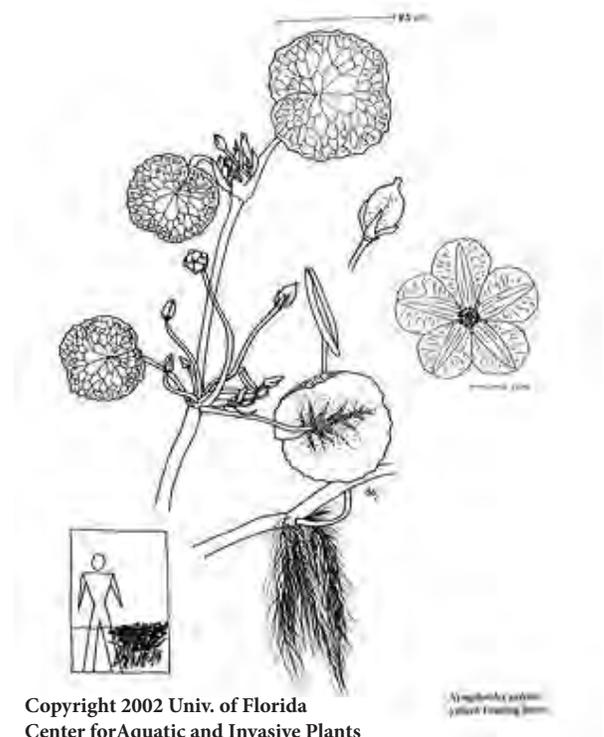
**Fruits/Seeds:** Seeds are flat and oval and are in capsules

**Reproduction:** Seeds and rhizomes

**Easily confused species:**

Little floating heart: *Nymphoides cordata*

Yellow water lily: *Nuphar variegata*



# *Pistia stratiotes*

## Common names:

Water lettuce  
Tropical duckweed

## Origin:

Nativity unknown, but possibly South America, Africa, Southeastern US

## Key features:

Free floating plant that resembles a head of lettuce

**Stems:** Roots are long and feathery

**Leaves:** Leaves are fleshy and covered with dense white hairs and have parallel venation

**Flowers:** Several male flowers form a whorl around a spike with one female flower below them

**Fruits/Seeds:** Fruit are light green berries that produce 0.04 inch (1 mm) brown seeds

**Reproduction:** Seeds and stolons

## Easily confused with:

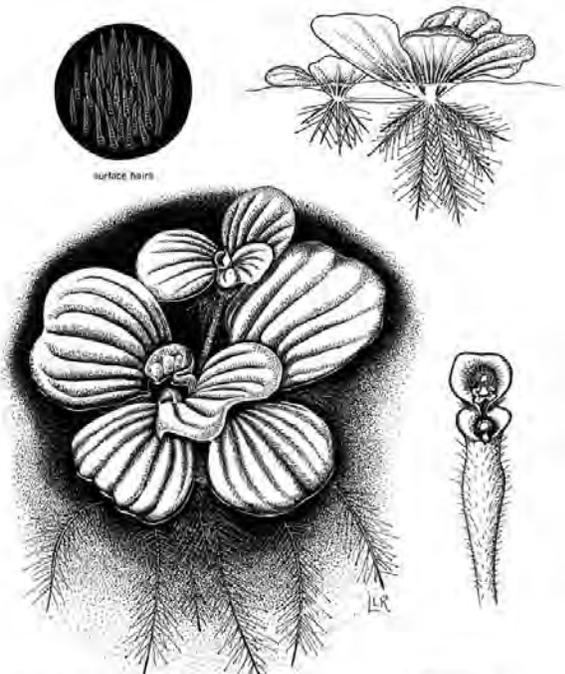
None



Photo by Leslie J. Mehrhoff

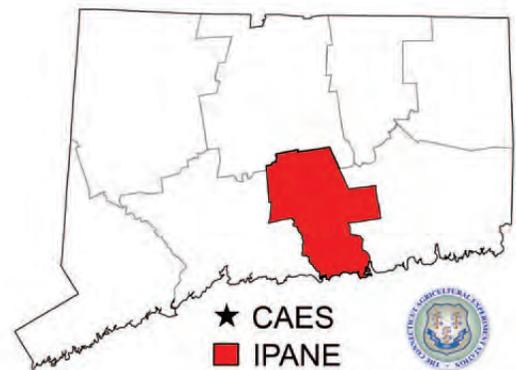


Photo by Leslie J. Mehrhoff



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*Pistia stratiotes*  
Water lettuce



# *Potamogeton crispus*

## Common names:

Curly leaf pondweed  
Crispy-leaved pondweed  
Crisped pondweed

## Origin:

Asia, Africa, and Europe

## Key features:

Plants are submersed

**Stems:** Stems are flattened, can form dense stands in water up to 15 feet (5 m) deep

**Leaves:** Alternate leaves 0.3-1 inches (3-8 cm) wide with wavy edges (similar to lasagna) with a prominent mid-vein

**Flowers:** Brown and inconspicuous

**Fruits/Seeds:** Fruit is oval 0.1 inches (3 mm) long

**Reproduction:** Turions (right) and seeds

## Easily confused species:

None



Photo by CAES IAPP

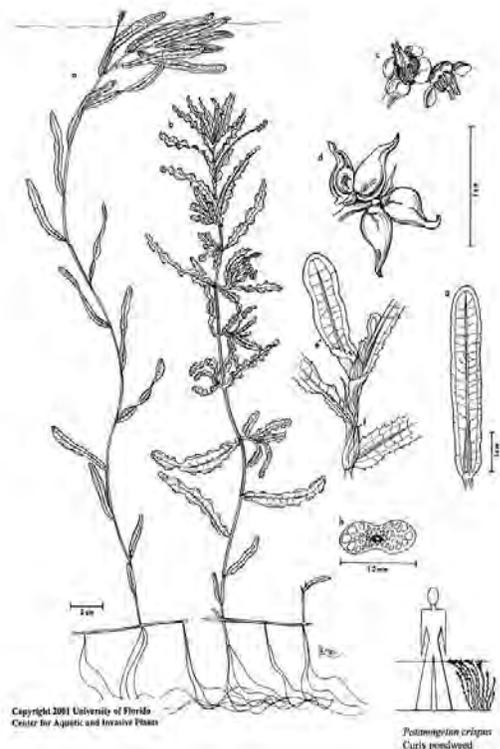


Turion

Photo by CAES IAPP

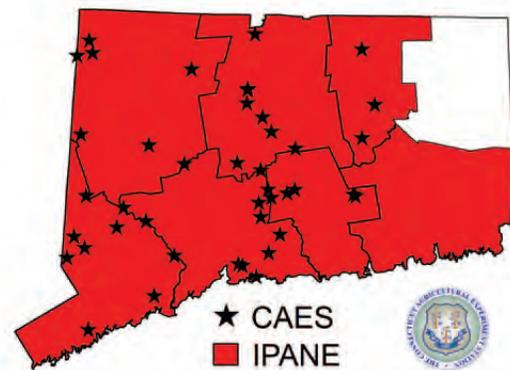


Photo by Leslie J. Mehrhoff



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*Potamogeton crispus*  
Curly pondweed



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# *Rorippa microphylla*

## **Common name:**

Onerow yellowcress

## **Origin:**

North Africa, Europe, and the Middle East

## **Key features:**

**Stems:** Grows flatly across the ground and roots at nodes, forming large mats, can be fully to partially submerged

**Leaves:** Pinnate leaves with 3-9 segments and the terminal leaf is the largest

**Flowers:** White petals with 4 part perianth

**Fruits/Seeds:** Fruit is a long and slender silique, up to 1 inch (25 mm) long, with seeds in one row on each side

**Reproduction:** Seed

## **Easily confused species:**

Watercress: *Rorippa nasturtium-aquaticum*

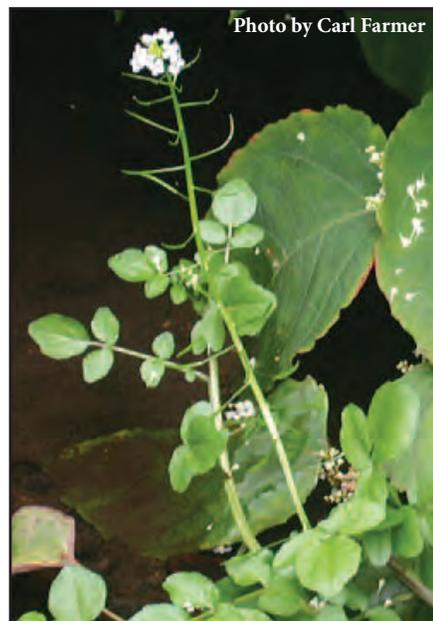


Photo by Carl Farmer



Photo by S. Waterkers

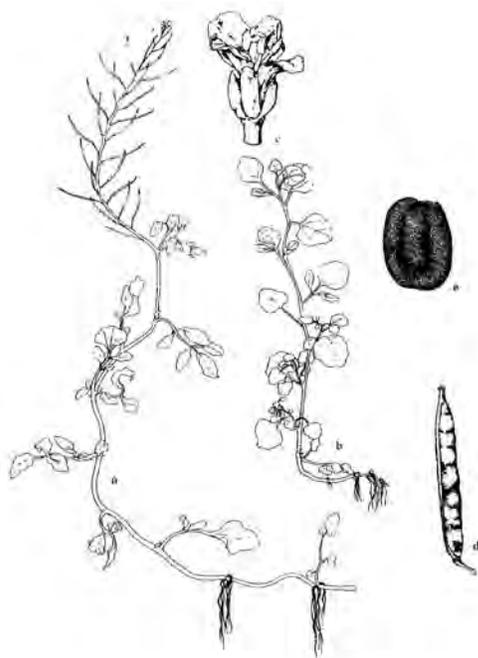
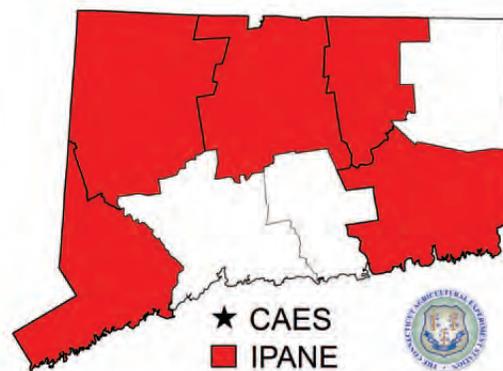


Fig. 129. *Nasturtium microphyllum*: a. habit, flowering and fruiting; b. habit, vegetative; c. flower; d. fruit seed (CGAW).  
Crow and Hellquist, 2000

155



# *Rorippa nasturtium-aquaticum*

## **Common name:**

Watercress

## **Origin:**

North Africa, Europe, and the Middle East

## **Key features:**

**Stems:** Hollow stems can grow flat on mud or be fully or partially submersed

**Leaves:** Leaves are pinnately compound have 3-9 segments and vary in shape, the terminal leaf is the largest in each segment

**Flowers:** Small white and green flowers; four white petals with four long and 2 short stamens

**Fruits/Seeds:** Fruit is pod-like silique, 0.4-0.6 in. (10-15 mm) long, with seeds in two rows per side

**Reproduction:** Fragmentation and seed

## **Easily confused species:**

Onerow yellowcress: *Rorippa microphylla*



Photo by Jerry Drown

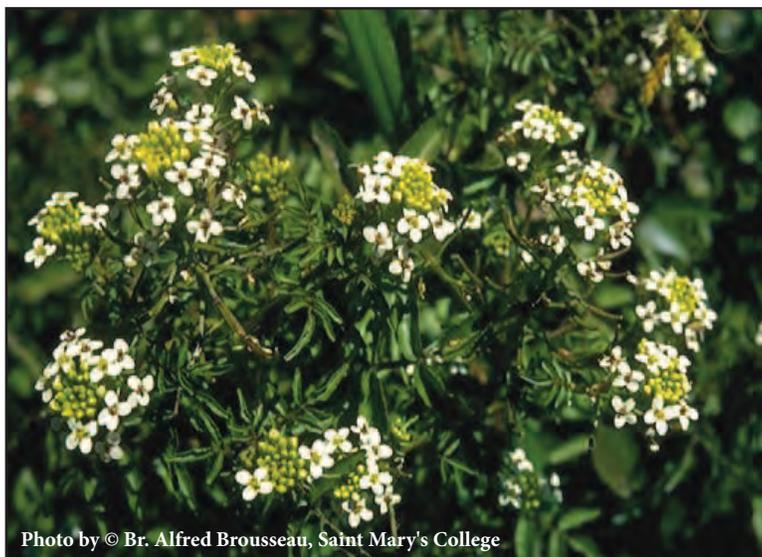
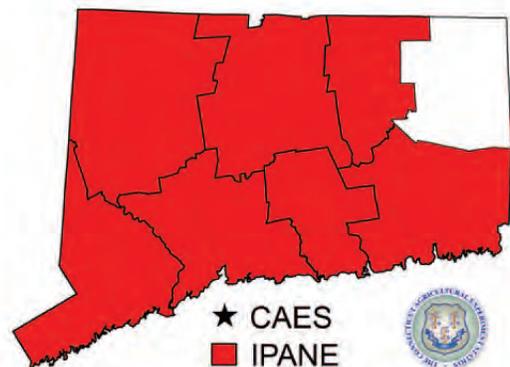


Photo by © Br. Alfred Brousseau, Saint Mary's College



# Salvinia molesta

## Common names:

Giant salvinia  
Water fern  
Salvinia  
Kariba weed  
Aquarium watermoss

## Origin:

Brazil

## Key features:

Free floating plant with no roots

**Stems:** Horizontal stems float below the surface

**Leaves:** Submersed leaves are brown and feather-like; surface leaves are folded at midrib and covered with many water repellent hairs that are split in the middle but rejoin at the tips; leaves become tightly packed into long chains as the plant grows

**Fruits/Seeds:** Egg shaped sporocarps

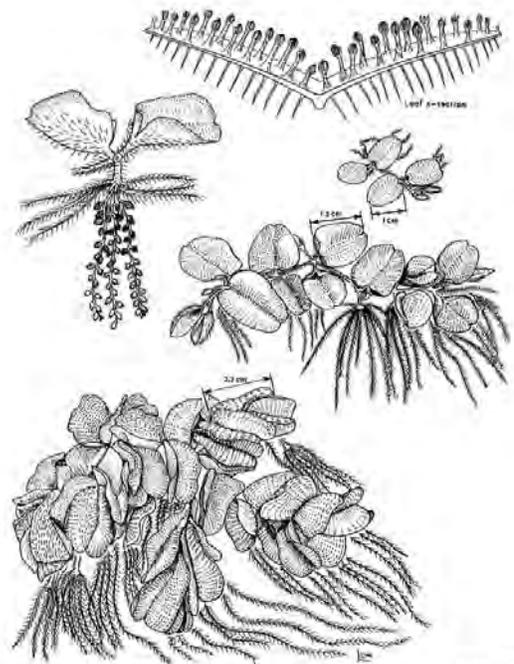
**Reproduction:** Fragmentation

## Easily confused species:

None

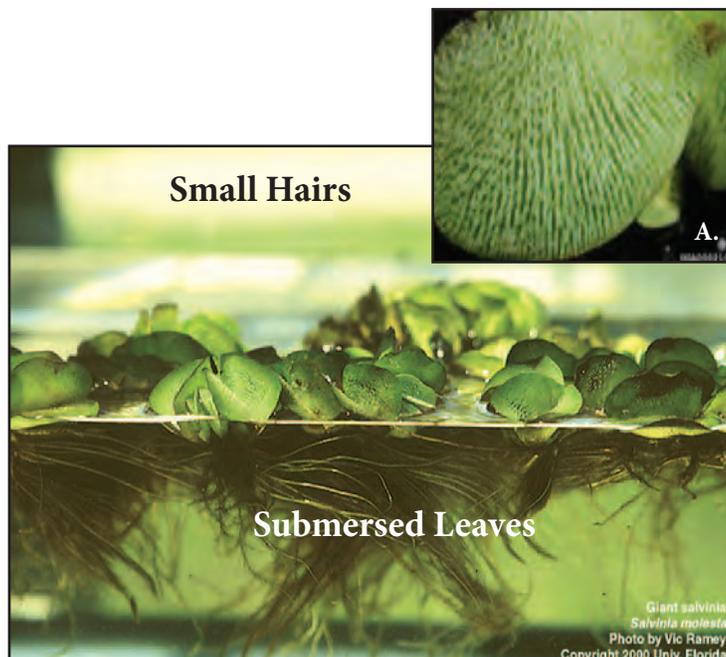


Photo by CAES IAPP



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*Salvinia molesta*  
*Clusia salvinia*

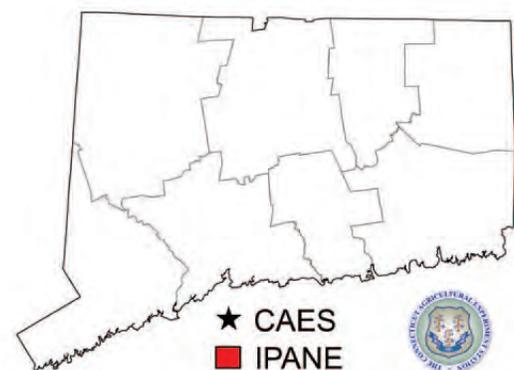


Small Hairs

Submersed Leaves

Giant salvinia  
*Salvinia molesta*  
Photo by Vic Ramey  
Copyright 2000 Univ. Florida

Photo credit A: Mic Julien, Commonwealth Scientific And Industrial Research Org., Bugwood.org



# *Trapa natans*

## Common names:

Water chestnut  
European water chestnut

## Origin:

Asia and Europe

## Key features:

Plants are rooted to substrate and float

**Stems:** Stem is submersed, flaccid and can be up to 15 feet (5 m) long

**Leaves:** Leaves 0.8-0.16 inches (2-4 cm) long are triangular and toothed along the front edge with inflated petioles, leaves float in a rosette pattern

**Flowers:** Flowers are located in the center of the rosette and have four white petals

**Fruits/Seeds:** Fruit is hard and has four sharp spines

**Reproduction:** Seeds and fragmentation

## Easily confused species:

None



Photo by Leslie J. Mehrhoff

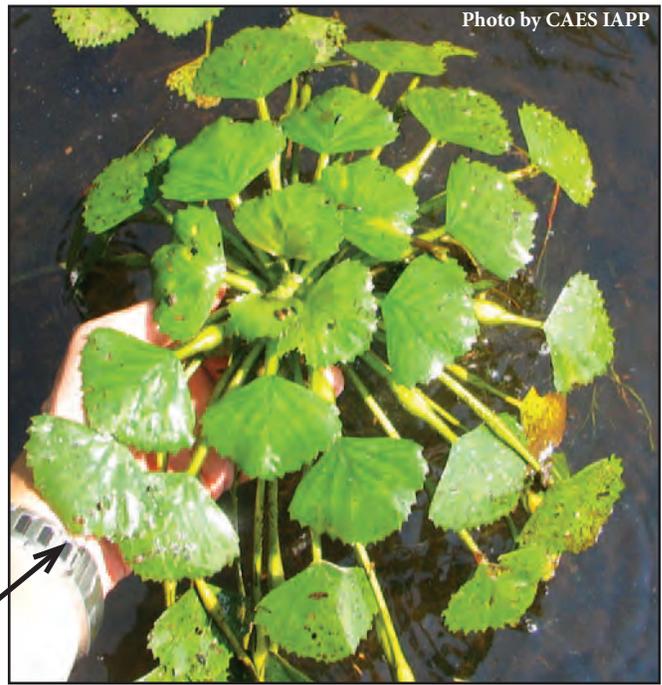


Photo by CAES IAPP



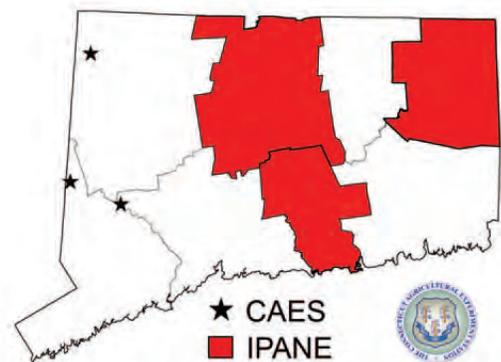
Photo by CAES IAPP

← **Fruit**

**Rosette** →



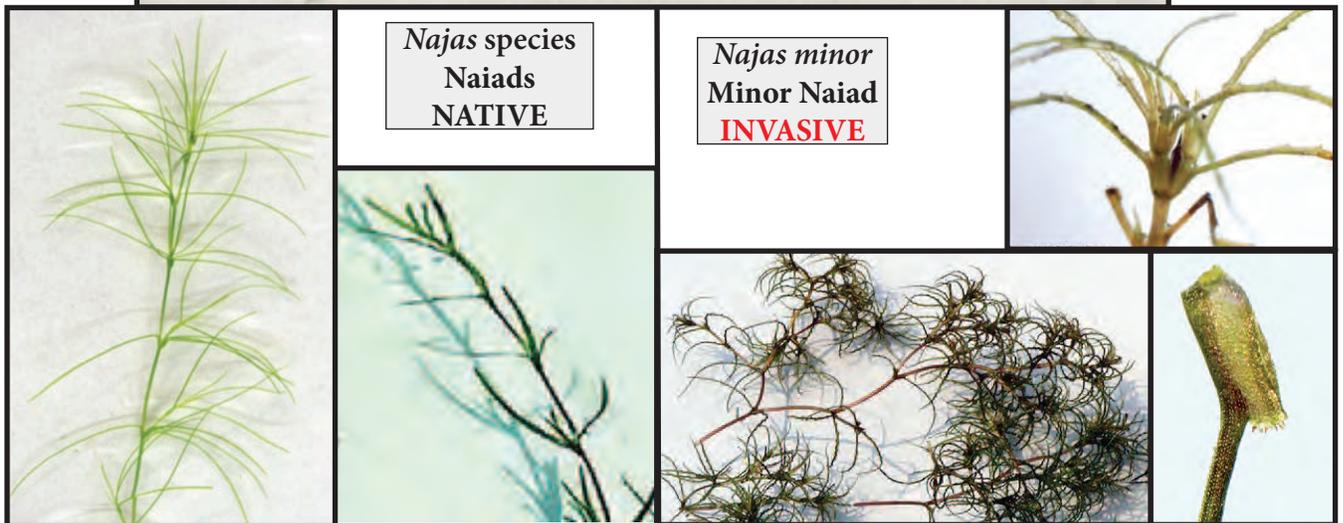
Photo by Leslie J. Mehrhoff



# Commonly Confused Aquatic Plants

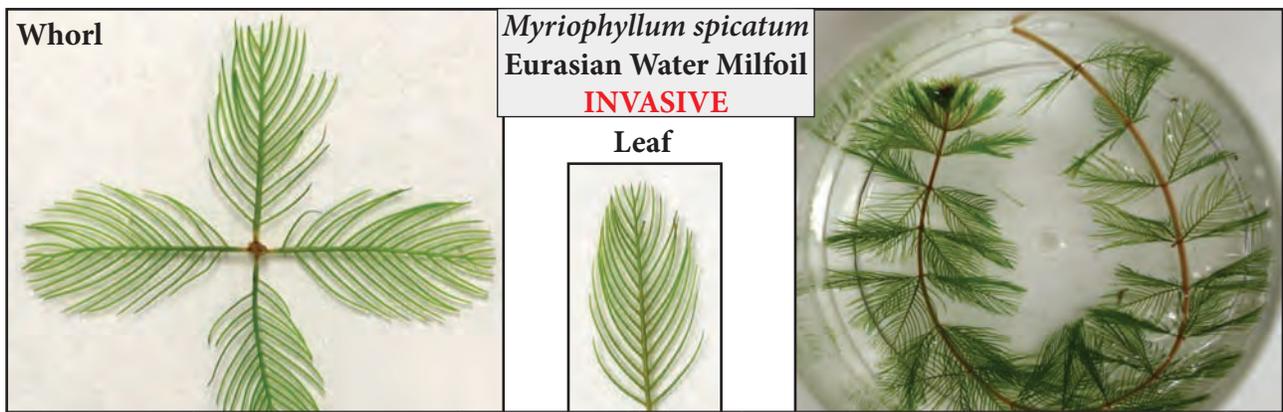
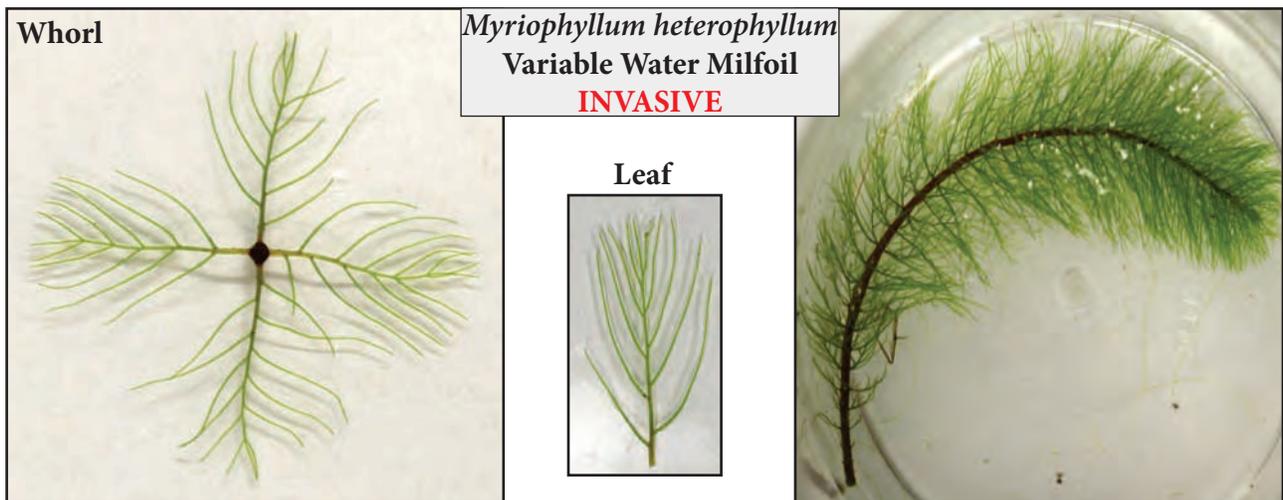
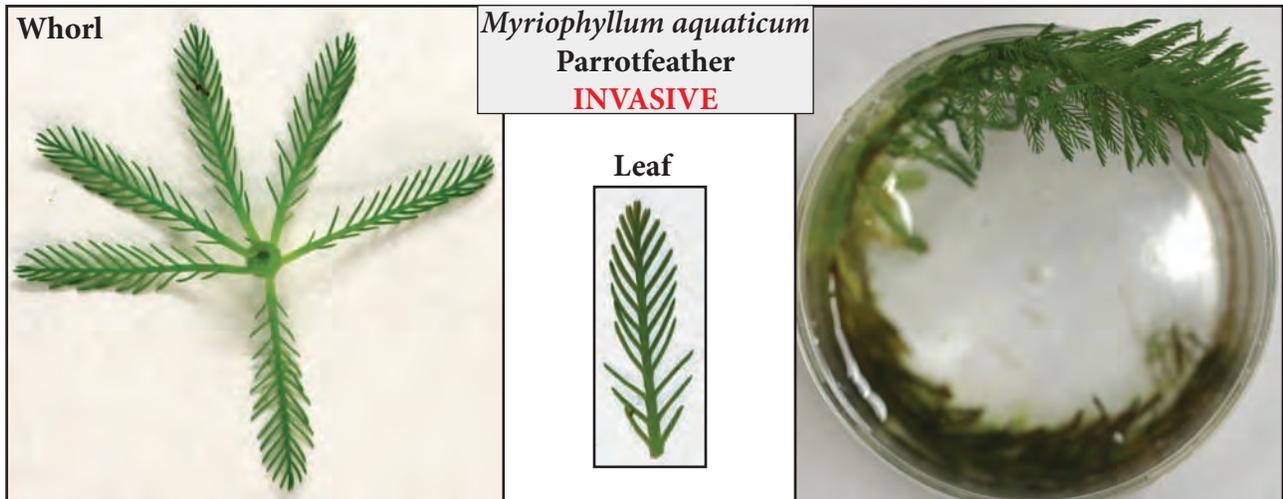
## Submersed plants with non-dissected leaves

(all photos CAES IAPP)



## Submersed plants with feathery dissected leaves

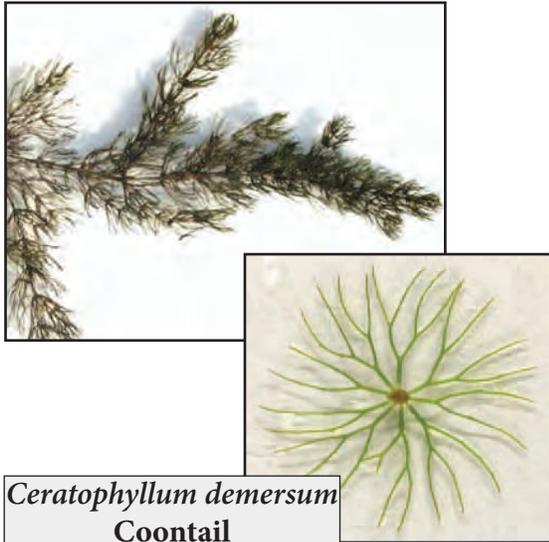
(all photos CAES IAPP)



NOTE: *Myriophyllum sibiricum*, Northern Watermilfoil, is a threatened native species that is easily confused with *M. spicatum*. *M. sibiricum*'s distinguishing features include; less than 12 leaflet pairs per leaf, winter buds, and stem tips that are usually green instead of red.

## Submersed plants with forked and branched dissected leaves

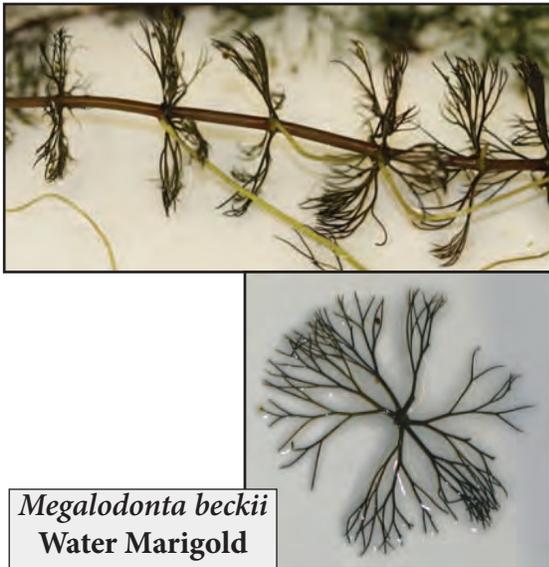
(all photos CAES IAPP except where noted)



*Ceratophyllum demersum*  
Coontail  
NATIVE



*Utricularia* species  
Bladderwort  
NATIVE



*Megalodonta beckii*  
Water Marigold  
NATIVE

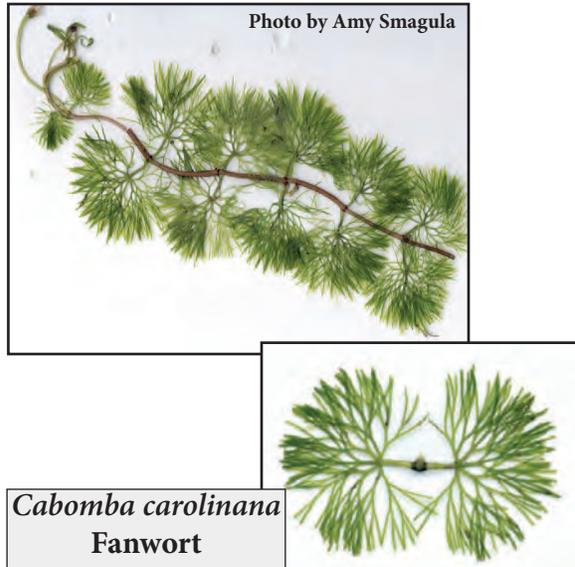


Photo by Amy Smagula

*Cabomba caroliniana*  
Fanwort  
**INVASIVE**



*Ranunculus* species  
Water-crowfoot  
NATIVE

# Key to Invasive or Potentially Invasive Aquatic Plants of Connecticut

*Key also includes commonly confused native species*

## Floating-Leaf Plants (field characteristics)

1. Plants free-floating on water's surface, not rooted to the substrate\*
  2. Leaves folded along midrib, surface covered with hairs..... *Salvinia molesta* (Giant Salvinia)
  2. Leaves not folded, surface smooth
    3. Petioles inflated; oval leaves in a rosette; light purple flowers .....  
..... *Eichhornia crassipes* (Water Hyacinth)
    3. Petioles not inflated; broad, fleshy leaves in a rosette, covered with dense white hairs.....  
..... *Pistia stratiotes* (Water Lettuce)
1. Plants rooted in substrate
  4. Leaves forming a rosette; leaves triangular, toothed; petioles inflated; spiny fruit.....  
..... *Trapa natans* (Water Chestnut)
  4. Leaves not forming rosette
    5. Leaves compound, cut into several leaflets
      6. Leaves comprised of four leaflets, like a four-leaf clover.....  
.....*Marsilea quadrifolia* (European Waterclover)
      6. Leaves pinnately compound with 3-9 leaflets, terminal leaflet is largest; hollow stems floating; small white and green flowers in clusters
        7. Pod-like fruit 0.4-0.6 inches (10-15 mm) long, 2 rows of seeds per side.....  
.....*Rorippa nasturtium-aquaticum* (Watercress)
        7. Pod-like fruit 0.7-1 inches (17-26 mm) long, 1 row of seeds per side.....  
..... *Rorippa microphylla* (Onerow Yellowcress)
    5. Leaves entire or lobed
      8. Leaves entire (no slit), circular, bluish green, on stiff stalk above water.....  
..... *Nelumbo lutea* (Water Lotus)
      8. Leaves lobed, heart shaped
        9. Yellow flowers
          10. Flowers with five, fringed petals.....*Nymphoides peltata* (Yellow Floating Heart)
          10. Flowers ball shaped, petiole flattened.....  
.....*Nuphar variegata* (Yellow Water Lily) (native)
        9. White flowers with five, fringed petals; roots close to the floating leaves, near the surface of the water..... *Nymphoides cordata* (Little Floating Heart) (native)

\*Plants such as yellow and little floating heart and water chestnut can become free-floating when dislodged from sediment or detached from a rooted plant.

## Submersed Plants (field characteristics)

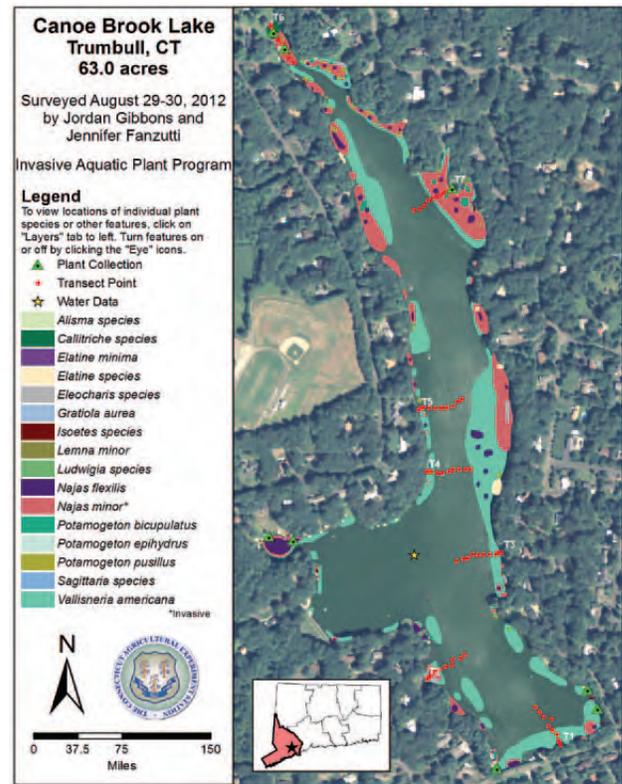
1. Leaves entire, sometimes toothed
  2. Leaves alternate, with wavy edges (lasagna-like); turions may be present; prominent leaf mid vein..... *Potamogeton crispus* (**Curly Leaf Pondweed**)
2. Leaves whorled, opposite, or clustered
  3. Leaf bases wider than the leaf blade, appearing opposite, whorled or clustered
    4. Toothed leaf edges visible without magnification..... *Najas minor* (**Minor Naiad**)
    4. Magnification needed to see toothed edges..... *Najas* species (**Other Naiads**) (native)
  3. Leaf base not distinct from rest of leaf blade, leaves strictly whorled
    5. Whorls of 3 leaves; leaf margins not toothed..... *Elodea* species (**Waterweeds**) (native)
    5. Whorls of 4 or more leaves; leaf margins toothed (magnification sometimes needed)
      6. Leaves 4 per whorl (rarely up to 6 leaves/whorl), 0.5-1.5 inches (1.2-4 cm) long, toothed leaf margins (need magnification)..... *Egeria densa* (**Brazilian Waterweed**)
      6. Leaves 5 per whorl (rarely 2-6 leaves/whorl), 0.2-0.7 inches (0.6-1.7 cm) long, toothed leaf margins; mid-vein may be toothed; tubers present; may have turions..... *Hydrilla verticillata* (**Hydrilla**)
1. Leaves dissected
  7. Leaves feathery in appearance (pinnate)
    8. Leaves concentrated above the water; thin, rounded-tipped, blue-green leaves..... *Myriophyllum aquaticum* (**Parrotfeather**)
    8. Leaves concentrated below the water, except for emergent flower spikes
      9. Leaf whorls less than 1 inch (2.5 cm) apart, giving the plant a ropy look; triangular shaped leaves, with less than or equal to 11 pairs of leaflets; thick spike with entire to toothed leaves..... *Myriophyllum heterophyllum* (**Variable Watermilfoil**)
      9. Leaf whorls 1 inch (2.5 cm) apart; rectangular shaped leaves, with greater than or equal to 12 pairs of leaflets; thin spike with leaves smaller than flowers..... *Myriophyllum spicatum* (**Eurasian Watermilfoil**)
      9. Leaves rounded in whorls with less than 12 pairs of leaflets; winter buds ..... *Myriophyllum sibiricum* (**Northern Watermilfoil**) (native, threatened)
  7. Leaves forked
    10. Leaves with numerous small bladders, not rooted..... *Utricularia* species (**Bladderworts**) (native)
    10. Leaves lacking bladders
      11. Leaves alternate; petioles sheathing stem; flowers usually solitary..... *Ranunculus* species (**Water-crowfoot**) (native)
      11. Leaves opposite or whorled
        12. Leaves whorled; leaf divisions fork in pairs, forking a total of 1-4 times, leaves often toothed; no roots or flower spike..... *Ceratophyllum* species (**Hornworts**) (native)
        12. Leaves opposite, fan-shaped; leaf divisions fork into either 2 or 3 segments
          13. Leaves attached to the stem with petioles; small floating leaves; flowers white..... *Cabomba caroliniana* (**Fanwort**)
          13. Leaves not attached to the stem by a petiole, leaves opposite but appearing whorled; emersed leaves on spike entire to toothed; flowers yellow..... *Megalodonta beckii* (**Water Marigold**) (native, threatened)

# Managing Nuisance Aquatic Vegetation in Connecticut

(all photos CAES IAPP)

## Invasive Aquatic Plant Control

Aquatic vegetation proliferates in water with proper sunlight, water chemistry, sediment and freedom from antagonistic organisms. Managing invasive aquatic plants usually requires a multifaceted approach. It is important to accurately identify the invasive and native plant species present. This can be accomplished through an aquatic plant survey (right). Sometimes nuisance plants, such as lily pads, are native. Although they may need to be managed, their removal could result in replacement with more problematic invasive species. In addition, certain native plants may be highly beneficial or rare and warrant protection. Combinations of management techniques that change from year to year are usually most effective. This discussion of invasive aquatic plant control is intended to be introductory in nature. The Aquatic Ecosystem Restoration Foundation (2009) has an online guidebook ([http://www.aquatics.org/aerf\\_handbook.pdf](http://www.aquatics.org/aerf_handbook.pdf)) that details the subjects discussed below.



## Nutrient reduction

Because nuisance aquatic vegetation is stimulated by nutrients, especially phosphorus and nitrogen, reducing the amount of these elements reaching a water body is an important part of any management program. Public education on preventing septic tank failures (right) and use of fertilizers is important. The utilization of soil tests to determine nutrient needs helps assure fertilizer is used at the proper rates and at the right time. Recent legislation in Connecticut has banned phosphorus from fertilizers used on established lawns unless substantiated by a soil test. CAES tests soil for citizens ([www.ct.gov/caes](http://www.ct.gov/caes)). Unfertilized vegetated buffer zones along shorelines are effective in limiting the movement of fertilizer to ponds and lakes. The misapplication of fertilizer to pavement is of concern because storm drains often discharge into lakes and ponds.



## Water Level Drawdown

Lowering the water level of a lake or pond can expose unwanted vegetation to lethal drying and freezing conditions. Where water level drawdown is feasible, this is a cost effective aquatic plant management technique. Non-target plants and other aquatic organisms can be negatively impacted. Usually drawdowns are performed in the winter when recreational use is minimal. Warm winters, snow cover and groundwater seepage can prevent necessary freezing and drying. Minor naiad (*Najas minor*) seems tolerant to drawdown probably because it regrows from seeds each year.



Care needs to be taken to properly assess the refill time. If the body of water is not filled by spring problem vegetation can expand into areas where plant growth is normally limited by light penetration. A side benefit of winter drawdown is docks and other shoreline structures are protected. CAES IAPP has been monitoring the effects of the annual drawdowns on Candlewood Lake (above) since 2007 and found rapid regrowth of Eurasian watermilfoil (*Myriophyllum spicatum*) one year after drawdown (CAES IAPP, 2012). Drawdowns may require permits from local, state or federal agencies.

## Herbicides

Managing invasive aquatic plants with herbicides is sometimes necessary. An aquatic herbicide must meet strict requirements of the United States Environmental Protection Agency and then be registered in the state where it is used. In Connecticut, aquatic herbicides may not be applied without obtaining a permit from the Connecticut Department of Energy and Environmental Protection (CT DEEP). Choosing the best herbicide requires proper plant identification, a sense for the non-target species you want to protect, the time of year you want to treat and potential water use limitations



(i.e. drinking, swimming, irrigation etc.). There are two general types of herbicides, contact and systemic. Contact herbicides are usually quick acting but have little effect on roots and reproductive propagules such as seeds, turions and tubers. Regrowth, therefore, can be expected. Systemic herbicides are slower acting but have the capability of controlling the root system. Longer term control is possible but elimination of an invasive species is unlikely. Herbicides are available in liquid or granular forms (above). CT DEEP (2012) offers an online guide ([http://www.ct.gov/dep/lib/dep/pesticide\\_certification/supervisor/aweeds.pdf](http://www.ct.gov/dep/lib/dep/pesticide_certification/supervisor/aweeds.pdf)) to the latest approved aquatic herbicides.

## Sediment Removal

Shallow areas of lakes and ponds with fertile sediment will promote plant growth. Removal of the sediment is a long term solution. Sediment removal is performed through various types of dredging and permits from local, State and Federal agencies are usually necessary. Dredging is performed by either wet or dry techniques. Wet dredging does not require lowering the water level and has the advantage of minimal disruption to recreational use. Dry dredging (right) involves lowering the water level, drying the sediment and using excavation equipment to facilitate removal. This method is efficient and sometimes the material can be sold to recoup some of the costs. The downside of dry dredging is its negative effects on the aquatic ecosystem and the inability to use the water body for long periods (often many years).



## Biological Controls

Introducing an organism that feeds specifically on an invasive aquatic plant can provide targeted long-term control. Unfortunately, virtually no reliable target specific biocontrols are available for invasive aquatic plants in the northeastern USA. A biocontrol being tested for Eurasian watermilfoil is the milfoil weevil (*Euhrychiopsis lecontei*). Although the larvae and adults feed on Eurasian watermilfoil and they are native to most lakes with the plant, neither the natural or introduced populations are currently considered a reliable control. As more research is performed this assessment may change. The most common biocontrol in Connecticut is an herbivorous fish called grass carp (*Ctenopharyngodon idella*). This fish was originally cultivated in China for food but its propensity to eat vegetation brought it to Europe and the USA for aquatic weed control. Concerns over grass carp developing breeding populations have caused it to become regulated in many states including Connecticut. Prior to liberation (right), a state permit must be obtained, the fish must be documented to be sterile (triploid) and inlets and outlets must be screened to prevent the fish from escaping. Grass carp are usually considered more suitable for smaller water bodies and are introduced at various rates depending on the amount of vegetated acres, the plants being controlled and other factors. The fish take a year or two to obtain sufficient size to reduce vegetation and after about five years restocking is often necessary. Unfortunately grass carp may prefer native plant species and unforeseen damage to the aquatic ecosystem can occur. In addition, as plants are consumed and passed through the fish's digestive system nutrients are released into the water that may cause algal blooms. Because grass carp are sensitive to copper based algaecides, treating the algae can be challenging.





## Harvesting

Probably the simplest means for ridding an area of invasive aquatic plants is removing them by hand pulling or cutting (above, left). Hand pulling is particularly effective in small areas and can reap tremendous benefits if used to remove new infestations. Sometimes SCUBA divers are employed. Unfortunately, many areas are too large for hand pulling to be practical and mechanical cutters (above, right), rakes or suction harvesters are needed. If the root systems are not removed rapid regrowth can occur. Several lakes in Connecticut have dedicated weed harvesting boats that operate each year. To prevent new introductions, commercial weed harvesters need to be thoroughly cleaned before moving from one water body to another.

## Benthic Barriers

Benthic barriers are blanket-like materials that are spread over unwanted aquatic vegetation to prevent light from reaching the plants. They are particularly well suited to small areas but occasionally are used for larger areas. Although most benthic barriers are installed in the spring and removed in the fall, they can be installed for as little as several weeks and then moved. More research is needed to document the level of control when this procedure is utilized. If benthic barriers are left in place for more than one growing season sediment settles on the surface and plants can take root (right).



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