

Water Chestnut

Trapa natans

Family: Trapaceae

Other common names: Bull nut, water-caltrop

Identification:

- Floating leaves are triangular with toothed edges and form a rosette on the water surface
- Submergent leaves are feathery, and whorled around the stem
- White flowers form in the axils of floating leaves
- Fruit are nut-like and woody with four distinctive sharp spines



Native to temperate regions of Europe and Asia, water chestnut (not related to the edible plant) was first recorded in North America in the mid to late 1800s. Today this aggressive annual plant has become a serious nuisance in lakes, ponds, slow moving streams and rivers in the northeastern United States (Connecticut, Delaware, Maryland, Massachusetts, New Hampshire, Pennsylvania, Vermont, Virginia, and Washington D.C.). It has also been found in the South and Richelieu Rivers in the province of Quebec.

A true annual, water chestnut reproduces only by overwintering seeds. Seed production however is so significant that one acre of water chestnut can produce enough seeds to cover 100 acres the following year. Large, nearly impenetrable floating mats of water chestnut can cover entire bays within a lake. These mats restrict sunlight penetration into the water, limit submergent plant growth, reduce oxygen levels in the water and increase the potential for fish kills. Water chestnut also provides only marginal habitat value for waterfowl and fish. Recreational activities such as boating and fishing are often made impossible. The sharp spiny seeds of water chestnut are also major water hazards and can restrict the recreational use of beaches.

Millions of dollars are spent on water chestnut control programs annually. To help control its distribution, the sale of all species of water chestnut are banned from most of the United States.



L. J. Mehrhoff, University of Connecticut

Purple Loosestrife

Lythrum salicaria

Family: Lythraceae

Other common names: Morden Pink, Fire candle

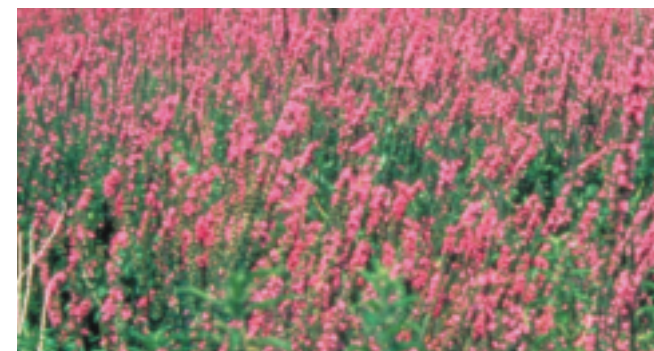
Identification:

- Leaves are downy, with smooth edges, arranged oppositely in pairs which alternate down the stalk at 90 degree angles or arranged in whorls of three
- Stalks are square, five or six-sided, woody (2+ m)
- Flowers are tall spikes (10-30 cm) with numerous individual pink-purple flowers with 5-6 petals
- On mature plants, perennial rootstocks are extensive and can send out up to 30 to 50 shoots



Purple loosestrife is one of the most well known invasive species associated with ornamental gardens. A beautiful but aggressive invader, it arrived in eastern North America in the early 1800s. Plants were brought by settlers for flower gardens, and seeds were also present in the soil in the ballast holds of European ships. Since it was introduced, purple loosestrife has spread westward and can be found across much of Canada and the United States. This emergent perennial can rapidly degrade wetlands and diminish their value for wildlife and fish habitat. More than 190,000 hectares of wetlands, marshes and riparian meadows are affected in North America each year, with an economic impact of millions of dollars.

Purple loosestrife also invades drier sites and can encroach on agricultural crop and pasture land. Depending on the size of infestation, several effective control options are available. Mechanical techniques (e.g. digging, cutting flower tops etc.) can control small stands of purple loosestrife. In larger stands, biological control utilizing the purple loosestrife leaf-eating *Galerucella* beetles is the preferred option. Numerous jurisdictions have successfully utilized these insects to restore native plant diversity within wetland habitats. Consult your local state or provincial resource agency to obtain more information about possible control options.



Randy Westbrooks, U.S. Geological Survey

Other Invaders

Goldfish (*Carrasius auratus*)

Tolerant of a wide range of habitat conditions and temperature ranges, goldfish are a standard addition to aquariums and water gardens throughout North America. Unfortunately, due to intentional releases from aquariums or accidental escapes from water gardens, goldfish have become established in several areas within the Great Lakes basin. Goldfish feed heavily on aquatic plants and threaten native fish populations through competition for food and degradation of habitats.

Grass carp (*Ctenopharyngodon idella*)

Native to eastern Asia, grass carp were imported to North America in the 1960's. Feeding heavily on aquatic vegetation, and tolerant of a wide range of temperatures and habitat conditions, grass carp have been widely released for aquatic plant control throughout North America (45 U.S. states, and the province of Alberta). Growing to one metre in length and 50 kg in weight, grass carp feed on and uproot large areas of vegetation increasing water turbidity and reducing water quality.

These environmental concerns caused Alberta and many U.S. states to only allow the release of sterile (triploid) grass carp in natural waters. Despite this precaution, breeding populations have become established in the United States. Water gardeners should take care not to use this fish in their ponds and note that the release of non-native fish is illegal in most jurisdictions. In Ontario, it is now illegal to sell or buy live grass carp. Grass carp can be distinguished by the unique crosshatched appearance of its scales.



USDA, APHIS-Oxford, North Carolina Archives

Mosquito fish

(*Gambusia holbrooki*)

Ranked as one of the world's most invasive species, mosquito fish have been widely introduced to waters in the United States. Despite their name, mosquito fish do not provide any greater control of mosquitoes than native fish species. Once established these fish compete for food and habitat with native species.



U.S. Geological Society

Oriental Mystery Snail (*Cipangopaludina chinensis*)

Native to Asia, this large snail (6 cm) is commonly sold in live food markets and aquarium retail outlets throughout North America. It was first discovered in the Great Lakes basin in the mid-1940s and has since been found in abundance in numerous inland lakes. The environmental impacts of this snail are still unknown. It is also commonly called the Chinese mystery snail or the Japanese trapdoor snail.

Help Prevent the Spread!*

Before building your water garden or starting your aquarium:

- Become familiar with invasive species of regional and national concern and the laws that may restrict their use. Contact your local resource agency for a list.
- Become familiar with the identification and scientific name (i.e. genus and species) of the species you plan to purchase. Common names can be interchanged for invasive and non-invasive species.
- Consider using only native plants.
- Select water garden sites that are far away from natural waterways and isolated from any potential flooding situations.

When buying aquatic plants, fish or invertebrates:

- Never collect plants or fish from the wild. (In many jurisdictions this practice is illegal).
- Choose a reputable nursery or aquarium retailer.
- Ensure your plant purchases are free of hitchhikers (i.e. undesired plants, invertebrates or fish in the water or soil). Rinse plants in a light-coloured bucket with tap water until clean and free of soil.
- Remove hitchhikers by dipping the plant repeatedly in a 10% chlorine solution. After 30 seconds, rinse the plant with tap water. This method will not harm emergent plants such as arrowhead (*Sagittaria spp.*), but is not recommended for submergent plants such as wild celery (*Vallisneria americana*).

When disposing of unwanted aquatic plants, invertebrates and fish:

- Never release aquatic plants, invertebrates or fish into natural waterways (it is illegal in all jurisdictions).
- Immediately dispose of invasive species in your water garden if they are located where they could spread into nearby waterways.
- Dispose of unwanted plants by drying them completely or freezing and discarding in the household garbage. Avoid compost disposal because many seeds can withstand drying and freezing.
- Return fish that outgrow tanks to local aquarium stores or give them to school groups or humane societies. In Ontario, contact the Fish Rescue Program to find a home for unwanted fish at 1-800-563-7711.

* Adapted with permission from Illinois-Indiana Sea Grant College Program at the University of Illinois and Purdue University.

For More Information

If you would like more information about aquatic invasive species, their impacts, regulations to prevent their spread, or methods and permits for their control,

contact:

INVADING SPECIES HOTLINE

1-800-563-7711 (In Ontario)

or **705-748-6324**

Email: invading_species@ofah.org

Website: www.invadingspecies.com

You may also contact:

"Cette publication est également disponible en français."

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European Frogbit Line Drawing: Andrea Bauman,
Ontario Federation of Anglers and Hunters

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Aquatic Invasive Species



A GUIDE FOR WATER GARDENERS AND AQUARIUM OWNERS



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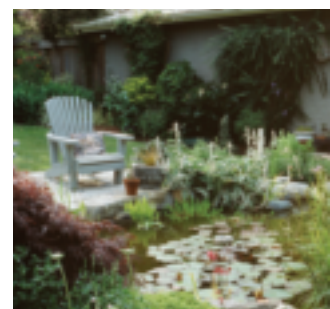
Water gardeners and aquarium owners... be aware of invasive plants and animals!

Today, aquarium and water garden hobbyists can select from literally thousands of exotic species and varieties of aquatic plants, invertebrates (snails), and fish readily available at local nurseries, pet stores, aquarium outlets or via mail order or the Internet. Originating from other regions of the world, exotic species can add beauty and variety to a home aquarium or water garden.

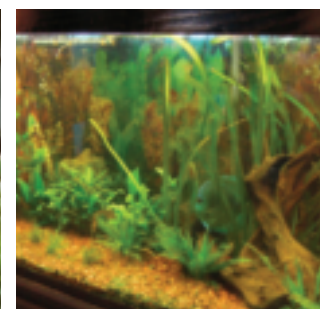
Unfortunately a small percentage of these aquatic exotic species are "invasive" and can become established and spread in our lakes, rivers and wetlands with devastating impacts on native flora and fauna. Accidental and intentional releases or escapes of aquatic invasive plants and animals are becoming an increasingly widespread problem in North America.

Adaptable to a wide range of environmental conditions, and in the absence of natural predators or controls, invasive species can spread aggressively and outcompete native species. Some invasive plants can form dense floating mats that restrict boating, fishing and swimming. When these large mats decompose in the fall, they can reduce the oxygen content in the water and degrade water quality for fish and other aquatic organisms. Invasive fish used in private ponds and gardens can degrade or destroy aquatic habitat affecting native fish spawning and nursery habitats. Invasive species can also have significant economic costs, with millions of dollars spent every year by federal, state, provincial and municipal agencies, industries and citizens for management and restoration initiatives.

The fish, plants and invertebrates identified in this field guide are popular aquarium or water garden species, which are invasive and pose a significant environmental threat if released in the wild. Water garden and aquarium enthusiasts are encouraged to use the information in this guide to assist in planning and maintaining their aquarium or water garden to prevent the release or accidental escape of these invasive species to our natural waters.



Burt Klassen

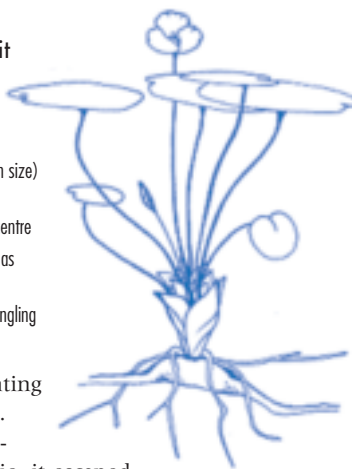


OFAH

European Frog-bit

Hydrocharis morsus-ranae
Family: Hydrocharitaceae
Other common names: Frog-bit

- Identification:**
- Single white flower (1.5 cm) with 3 petals and a yellow centre
 - Smooth, heart-shaped floating leaves (2-3 cm in size) with spongy purplish-red undersides
 - Cluster (rosette) of many leaves at the plant's centre
 - Stolons or runners at the plant's centre, as well as turions, produce new plants
 - Roots are long (10-20 cm), unbranched and dangling (do not anchor the plant to the bottom)



European frog-bit is a free-floating aquatic plant native to Europe. Introduced in 1932 to an ornamental pond in Ottawa, Ontario, it escaped into the Rideau Canal a year later and subsequently spread throughout numerous tributaries and isolated wetlands within the St. Lawrence River, Lake Champlain, Lake St. Clair, Lake Ontario and Lake Erie drainage basins and the northeastern United States. It has also been reported in inland lakes in Washington, New York and Michigan.

European frog-bit invades calcium-rich water in wetlands and the backwaters and quiet bays of lakes, often growing on its own or in association with purple loosestrife (another invasive plant) or cattails. It forms dense, impenetrable mats of floating vegetation, preventing sunlight from penetrating the water's surface and reaching the submerged native aquatic plants below. In the fall, dense mats of European frog-bit break apart and decompose, falling to the bottom of the lake. The decomposition of this plant matter can deplete dissolved oxygen levels in the water body negatively affecting fish and other aquatic organisms.

Reproducing both vegetatively and sexually, new populations of European frog-bit can be easily established from a single plant fragment or seed spread by recreational watercraft, watercurrents and waterfowl.

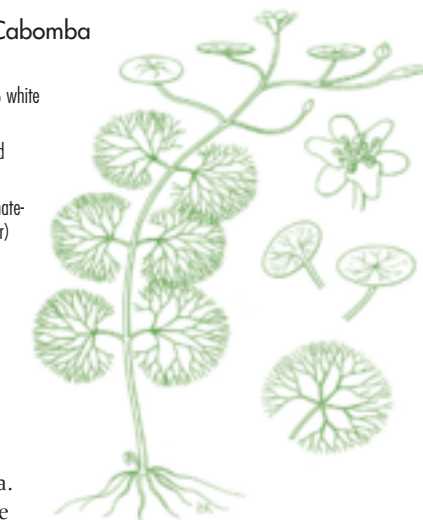


D.A. Sutherland, NHIC Archives

Fanwort

Cabomba caroliniana
Family: Cabombaceae
Other common names: Cabomba

- Identification:**
- Floating yellow centered flower with 6 white petals (1.3 cm in diameter)
 - Submergent fan-shaped leaves arranged oppositely
 - Floating narrow leaves arranged alternately (1.3cm long and 0.8cm in diameter)



Fanwort's vibrant submergent foliage and hardy nature have made it a popular aquarium plant around the world. This popularity has facilitated its invasion in Australia, Asia, and India. Although its native range encompasses the subtropical and southern temperate climates of southeastern North America and South America, fanwort can withstand temperatures below 0°C and has thus invaded the province of Ontario, and the northern United States including the New England states, Michigan and Washington.

Once established, fanwort is an extremely persistent and competitive nuisance plant, forming dense stands that can crowd out other native plants, clog drainage canals, and restrict recreational uses such as swimming and boating.

Fanwort grows in a variety of habitats including lakes, small rivers, streams and ditches. It prefers acidic waters with a pH of between 4 and 6, which may facilitate its invasion into lakes on the Canadian Shield. Although fanwort does not appear to produce viable seed in northern climates, populations can become established from a single stem fragment by vegetative reproduction and can be spread by recreational watercraft.



D.A. Sutherland, NHIC Archives

Common Reed

Phragmites australis
Family: Poaceae
Other common names: Phragmites, Giant reed, yellow cane

- Identification:**
- Grows up to 4 m in height
 - Stiff wide leaves arranged oppositely
 - Hollow stem
 - Clusters of tiny flowers, feathery and drooping, colour purplish (July – October)
 - Fruit ranging from white to gray to brown

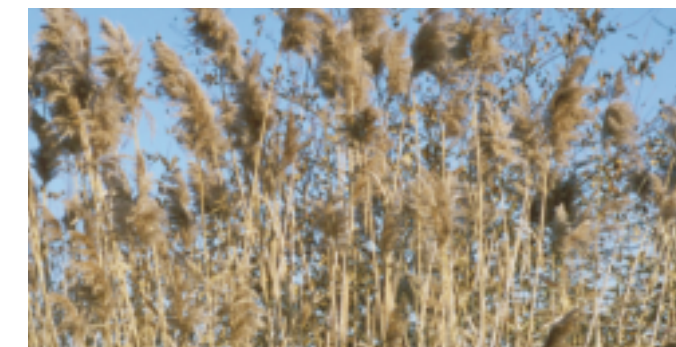


Common reed, a towering perennial grass reaching heights of up to 4 metres, is often observed growing alongside highways in drainage ditches or adjacent wetlands. It appears to have been present in North America for at least 3000 years, although it wasn't until the 19th and 20th centuries that it began to aggressively spread replacing formerly diverse mixed wetland plant communities with almost complete monocultures.

Human disturbances such as dredging, water level alterations and warmer climatic temperatures may have facilitated common reed's spread, however scientists have now largely attributed these recent invasions to the introduction of more aggressive European genotypes (strains).

The recent expansion of common reed into many Great Lakes wetlands is an environmental concern. Spreading by rhizomes (underground stems), common reed can quickly form vast unbroken stands, reducing the wetland's habitat value for wildlife and in particular nesting waterfowl. Common reed can affect nutrient cycling within the wetland by storing nutrients in both live and dead stems (dead stems can take 3-4 years to decompose). Common reed is not an important food source for wildlife, although waterfowl and muskrat occasionally eat its seeds and rhizomes respectively.

Common reed is often sold as an ornamental grass and has been used in the past for shoreline stabilization and naturalization projects.



James H. Miller, USDA Forest Service

Hydrilla

Hydrilla verticillata
Family: Hydrocharitaceae
Other common names: Florida elodea, water thyme, Indian star-vine

- Identification:**
- Rooted submergent perennial plant growing up to depths of 30 metres
 - Heavily branched erect stems with whorls of 3-8 leaves that join directly to the stem
 - Leaf undersides have one or more spikes, leaf edges are toothed
 - Flowers are small and white and reach the water's surface
 - Yellow tubers (2-3 cm) at the end of underground stems



Often called the "perfect aquatic weed", hydrilla is one of the most serious invasive plant pests in North America. Native to Asia and central Africa, this submergent perennial plant was first introduced to Florida in the late 1950s.

Extremely adaptive and able to survive in a variety of environmental conditions and climates (tropical and temperate), hydrilla has spread throughout Florida's public waters and to more than 14 American states including northern states such as Connecticut and Washington. Hydrilla has not yet been found in Canada, although accidental introductions could occur from the aquarium and water garden trades.

A vigorous colonizer, hydrilla aggressively displaces native aquatic plants to the detriment of native fish populations. Dense infestations of hydrilla can affect water quality, restrict water flow and cause flooding. Recreational activities such as boating and swimming within hydrilla infestations often become impossible. Most known control measures for hydrilla are ineffective.



Vic Ramey, University of Florida

Flowering Rush

Butomus umbellatus
Family: Butomaceae

- Identification:**
- Single flowering stem reaches heights over 1 metre
 - Large cluster of white to pink flowers
 - Long narrow fleshy leaves



K. Kohout, Wisconsin State Museum

Flowering rush is a showy perennial plant native to Europe and temperate Asia. An emergent plant, its wide umbrella of pink-white flowers has ensured its popularity among water garden enthusiasts for over a century. Flowering rush was first observed in North America in 1897 growing along the St. Lawrence River in Quebec. Since then, its popularity in the water garden trade and great reproductive potential (seed and root bulbets) have resulted in its spread throughout wetlands, and along the shorelines of rivers, lakes and ponds in the St. Lawrence River, eastern and southwestern Ontario and Michigan. Sporadic occurrences have also been recorded in the provinces of Manitoba, Nova Scotia, Alberta, British Columbia and the states of North and South Dakota, Minnesota, Montana, Idaho and Ohio. The environmental impacts of flowering rush are still relatively unknown, although several scientists have described the plant as aggressive and capable of displacing native wetland plants.

Yellow Floating Heart

Nymphoides peltata
Family: Gentianaceae

Other common names: Floating heart

- Identification:**
- Bright, yellow flowers approx. 3-4 cm in diameter
 - Two to five flowers from each flower stalk. Five petals per flower with a distinctive fringe along the edges of the petals
 - Heart-shaped floating leaves with slightly wavy margins and purplish undersides



M. Malchoff, Sea Grant Lake Champlain

Yellow floating heart is a perennial floating water lily-like plant that can carpet the surface of lakes and wetlands with its heart shaped floating leaves. Native to Eurasia and the Mediterranean, its attractive bright yellow flowers have made it popular among ornamental water gardeners in North America since the late 1800s.

Yellow floating heart grows in dense mats, in slow moving rivers, lakes, reservoirs and ponds. These mats can shade and reduce the growth of other native aquatic plants, reduce oxygen levels in the water and interfere with recreational water uses. Able to reproduce by seeds, stolons and stem fragments, populations of yellow floating heart have been reported in the province of Ontario and at least 15 U.S. states including Vermont, New York and Washington.

Yellow Iris

Iris pseudacorus
Family: Iridaceae
Other common names: Yellow Flag

- Identification:**
- Grows up to 0.9-1.2m in height
 - Broad, lance-shaped leaves are stiff and erect (0.5-1 m long and 1-3cm wide)
 - Flowers (7-9 cm wide) bloom from April to June and range in colour from white to cream to yellow
 - Fruit capsule is 6-angled and is 4-8cm in size and contains approx. 120 seeds
 - Rhizomes are pink-fleshed, and 1-4 cm in diameter



Robert H. Malenbrock, USDA-NRCS Plants Database

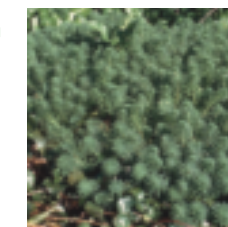
The attractive flowers of the herbaceous perennial yellow iris have made it a standard addition to ornamental gardens for more than a century. Native to Europe, Africa and Asia, it escaped from North American gardens and can now be found within the shallow edges (up to 25cm in depth) of freshwater lakes, ponds, rivers, streams and wetlands in Canada (Newfoundland to British Columbia) and all of the continental United States with the exception of a few western states. The spread of this species may have also been facilitated by its use in sewage treatment cells and for erosion control. Once established, yellow iris can also spread through rhizomes and the downstream dispersal of its seeds. Growing up to 1.2m in height, with long sword-shaped leaves, yellow iris forms dense populations which can displace native plants. When not in flower, it is extremely difficult to distinguish from native irises such as blue flag. Yellow iris is still widely sold in nurseries throughout North America.

Parrotfeather

Myriophyllum aquaticum
Family: Haloragaceae

Other common names: Brazilian water-milfoil

- Identification:**
- Small, white flowers located in the axils of emergent leaves
 - Unbranched emergent stems (25+ cm long) with whorls of finely dissected leaves
 - Submergent leaves are reddish, feather-like and present usually only in winter



Alison Fox, University of Florida

Parrotfeather, a native perennial of South America, is sporadically distributed throughout much of the United States. A popular aquarium and water garden species, it is likely that its wide distribution is the result of escapes or discards from aquaria or ornamental pools. Its popularity as an ornamental is largely due to its bright green foliage that grows above the watersurface. When introduced into natural systems parrotfeather can form dense stands that can dominate the flora of shallow lakes and streams. Although parrotfeather is native to tropical climates, this adaptable perennial plant could become a nuisance in colder climates of the northern United States and Canada in the future. Aquarium owners are urged to take particular care when disposing of this plant.