



*Aquatic Plants
& Algae*

of

New Hampshire's
Lakes and Ponds

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and
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New Hampshire Department of Environmental Services

Aquatic Plants and Algae of New Hampshire's Lakes and Ponds

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Aquatic Plants and Algae of New Hampshire's Lakes and Ponds

First Edition

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A Note About This Publication

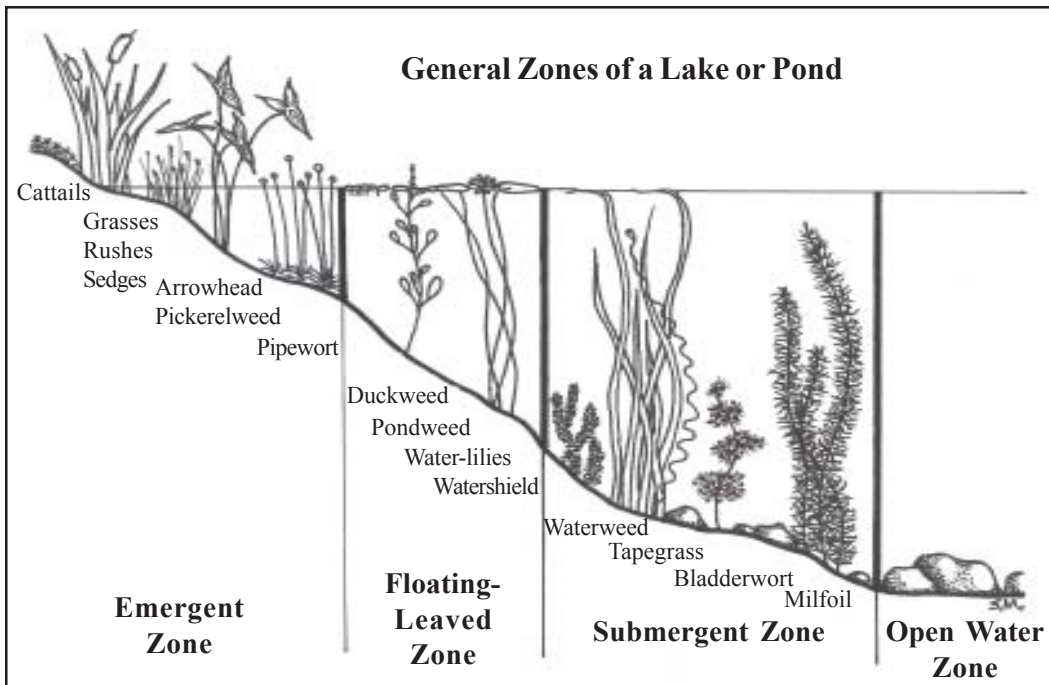
This is a reference field guide for common New Hampshire aquatic plants and algae and does not encompass all the plants and algae species found in the state. This publication is intended to give its reader a generalized summary of the plants and their ecology, and aid in the identification and understanding of the most frequently seen species.

Introduction

New Hampshire's lakes and ponds are rich with aquatic plant life; the State's diverse array of plants forms unique communities in each of our waterbodies. This publication encapsulates those species that are most commonly encountered, but this book cannot possibly cover all the species represented throughout our waterbodies. Our goal of this first edition is to further pique the curiosity of the many Weed Watchers and plant enthusiasts throughout the state.

Our years of experience working closely with lakes and ponds have taught us that plants are either the joy or the bane for many individuals. Some people enjoy exploring the plant zones for fish, hatching insects, wiggling tadpoles, red water mites, and crayfish; others view the ring of plants around their lake as a frustration, to avoid while they swim or which impedes boat lanes to the deeper waters. The purpose of this book is to introduce aquatic plants in a colorful and meaningful manner. The authors have included color photographs and line drawings to aid in plant identification, as well as information on plant locations, habitats, animals that use these plants, and interesting lore associated with them.

Plants tend to fall within spatial zones in a waterbody and are thus classified according to their growth habit and location. Three plant zones can generally be identified: the emergent zone, the floating-leaved zone, and the submergent zone. The following diagram illustrates these three zones of plant growth that start near the water's edge, and lead to the deeper, open water areas of the waterbody.



The emergent zone is commonly found nearest to shore. The plants in this zone are rooted in the substrate, and they are usually erect and standing up out of the water. The most notable species in this zone are cattails, pickerelweed, grasses, rushes, and sedges. This zone can generally extend into water depths of one to two feet.

The floating-leaved zone is generally the next zone that is encountered as you move out into a waterbody. Here, we have grouped both free-floating plants, and rooted plants with floating broad leaves. This zone generally begins in water depths ranging from two to ten feet. This zone contains plants such as yellow and white water-lilies, floating-heart, duckweeds, and watershield.

The submergent zone can begin in a water depth as little as one foot and extend to a depth where adequate sunlight can reach the bottom. These plants are either rooted or free-floating, and are wholly submersed (underwater), though some free-floating species can drift to the surface forming mats. Water-milfoils, bladderworts, coontails and waterweeds fall within this category. Flowering parts of these plants may extend above the water surface, but there are no floating leaves.

Though the plants can be grouped within these three distinct categories, the plants do not follow strict boundaries, nor do they form mutually distinct bands within waterbodies. The plants mix and intermingle, varying in depth ranges depending on species, and some have varying stages that oscillate between limp and submergent to erect and emergent depending on water level fluctuation.

Generally, lakes that are more nutrient rich tend to have more abundant plant communities. Lakes can be classified into three trophic, or enrichment, classifications, based on numerous parameters (oxygen content, nutrient content, temperature, chemistry, and plant growth). Oligotrophic lakes are generally deeper basins with sandier or rockier substrates, low nutrients, high clarity, salmonid fish population, and tend to have fewer aquatic plants. On the other end of the spectrum, eutrophic lakes tend to have shallower basins with highly organic or silty bottoms, elevated nutrients, low clarity, warmwater fish populations, and abundant plant growth surrounding most of the shoreline, and shallower open water areas. Mesotrophic lakes tend to have more moderate characteristics between the oligotrophic and eutrophic categories. Again, there are spectrums of diversity and variability that make each waterbody unique.

Some waterbodies have very abundant plant growth despite the trophic condition, which may be a result of an invasive aquatic plant infestation in the nearshore areas. Exotic aquatic plants (also called 'invasive') are typically those species that are not part of the native plant assemblages in our region. Many of these plants tend to grow quickly and dominate the shallows of waterbodies in very short timeframes, altering the structure of native plant communities and the aquatic ecology, recreational values, and aesthetics. There are currently over sixty (60) waterbodies in New Hampshire that are infested with various species of exotic aquatic plants. These plants that fall within this category are highlighted within the pages of this book.

We have also included exotic aquatic plants of concern that are not yet in New Hampshire as a distinct chapter. It is important to be familiar with these species, as it will aid in the early detection of these new species if they do come into New Hampshire. This will allow for a more rapid response to contain or eradicate any pioneering populations of new exotics.

At the end of the publication is a section on both macroscopic (larger) and microscopic (smaller) algae. Algae play a very large role in our lake and pond systems. In most waterbodies, particularly the smaller systems, algae and plants coexist in a delicate balance. Generally, waterbodies that have more plants in them will have fewer nutrients available for algal uptake and growth. These waterbodies may have higher clarities due to the lower algal populations and more stable shorelines as a result of plant growth. Conversely, waterbodies with few plants may have excess nutrients available to drive algal growth, thus the waters may be less clear and more algae-laden. Algae are, however, important in all aquatic systems, as they provide oxygen, are an important food source for many aquatic organisms, and leave a history in our lake sediments, as will be discussed later in this book. We have grouped the macroalgae first, followed by general discussions for several classes of algae. The cyanobacteria (i.e., blue-green algae), are broken-out in more detail, as these can oftentimes be toxin producers, as will be discussed accordingly.

The waterbody you live on or visit will have its own unique assemblage of plants and algae. We encourage you to use this book to explore New Hampshire's waterbodies and identify the plant communities you encounter. Biologists with the Department of Environmental Services has visited and sampled most of the nearly 1,000 waterbodies larger than ten (10) acres throughout New Hampshire. Chances are that a fairly current plant map and algal community assessment exist for the waterbody you are interested in exploring. This information will provide a baseline list of plants and algae observed on the respective date of our survey. For more information on a waterbody of interest, or to ask questions about aquatic plant communities, please contact the Limnology Center at the Department of Environmental Services.

The next time you are out on a lake or pond, take some time to explore the plant populations. You will undoubtedly be transfixed by the variations in structure and natural beauty of these communities, as well as by the abundance of aquatic life you will observe skirting the roots and leaves of the plants found within the them.

Amy Smagula and Jody Connor
N.H. Department of Environmental Services

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Arrow arum (*Peltandra virginica*)



Alternate Names: Tuckahoe and poison arum

Habitat: Shallow waters of swamps, pond and lake margins, and river edges.

Description: Large arrow-shaped leaves and a vertically curled, green, nontraditional flower; it is easily identified in the fall by its cluster of greenish-brown berries. This plant stands up to 2 feet in height. Annual or perennial.

Identification Tips: The leaves of this plant have one dominant central vein from which other smaller veins originate. The smaller veins are parallel to one another. This is a key difference from that of arrowhead, which has veins radiating out from one central point.

Plant Facts: The smut beetle commonly feeds on the **emergent** leaves. Because of the plant's chemical defenses, other insect feeders are uncommon. Wood ducks and muskrats often eat the berries that are produced in the fall. Irritating crystals are found in all parts of most arums. They burn and irritate if eaten and will create small wounds in the mouth. This is the only species of arrow arum in New Hampshire.



Arrowhead (*Sagittaria* spp.)

Alternate Names: Duck potato, wapato, swamp potato and tule.

Habitat: Pond or lake edges, marshes and slow moving streams.

Description: Leaf shape is variable within and between species. Leaves can be broadly or narrowly arrow-shaped, lance-shaped, or tape-like. Plants have white flowers with three petals. Grows 1-1.5 feet high. Annual or perennial.

Identification Tips: The leaf veins of arrowhead all originate from the point where the stem connects to the leaf, and radiate outward from that point. Leaf venation is one way of distinguishing arrowhead from arrow arum. Another distinguishing factor is that roots in *Sagittaria* species are **septate**, while those of arrow arum are not.

Plant Facts: Arrowhead produces **tubers** associated with the roots that are often eaten by beavers, muskrats and ducks. The starchy tubers are nourishing for humans as well. Native Americans used them for food, tea, and **poultices** for wounds. There are several species of *Sagittaria* in New Hampshire; *S. latifolia* and *S. graminea* are the most common.



Blue Flag (*Iris versicolor*)



Alternate Names: Blue iris, fleur-de-lis, flag lily, and snake liver.

Habitat: Wetlands, and lake, pond and river edges.

Description: Bluish-purple flower on stems approximately 3 feet tall. Leaves long and narrow, sword-like. Perennial.

Identification Tips: Bluish-purple flower with distinctive yellow and white center. Leaves can be confused with those of cattail and emergent bur-reed on occasion, but leaves of iris overlap in a two-rank fashion.

Plant Facts: This plant has a deep tuberous root system, and is therefore a very important wetland and bank/shoreline stabilizer. This iris is toxic to humans and wildlife. Blue flag iris is pollinated by insects. This plant is the official flower of Tennessee. Blue flag iris is a native of New Hampshire, whereas the aquatic yellow iris is an introduced invasive species.



Bur-reed (*Sparganium spp.*)

Alternate Names: Ox-tongue and bur-flag.

Habitat: Shallow water and margins of lakes, ponds, and rivers.

Description: Plant can be easily identified by its spiky burr-like fruit found on a stalk between its long leaves. Plants can be 2-3 feet tall along the shallows of waterbodies. It can also be found submerged in up to 4 feet of water, forming ribbon-like leaves. Perennial.

Identification Tips: This plant is easily confused with wild-celery if the leaves are tape-like, or with young cattail if leaves are emergent. For the floating form, when closely inspected the bur-reed has a ridge or **keel** down the back of the long leaf. When erect and emergent, leaves are shorter in height than those of cattail, with a distinct keel or almost triangular cross section. When in fruit, burr-like seed head is distinctive.

Plant Facts: Bur-reed provides habitat for many insects (flies, long-horned leaf beetles, and caterpillars such as the red sedge borer and the cattail borer) and food for migrating birds. This plant is also food for mammals such as the muskrat and white-tailed deer. Humans can also eat the plant **tubers** as a potato-like starch substitute.



Buttonbush (*Cephalanthus occidentalis*)



Alternate Names: Pond dogwood, crane-willow, globe-flower, and knuckle-brush.

Habitat: Along the shoreline margins of ponds, lakes, swamps, and streams.

Description: This bush is easily identifiable by its densely clustered white ball-shaped flowers and opposite or whorled shiny, green, leathery leaves (often with red stalks). Shrub.

Plant Facts: Butterfly and moth species are often found feeding on the sweet nectar of the tubular flowers (bloom in July and August) because of their long curled mouthparts. Caterpillar pupas are often found on buttonbush because of the food association with larvae and adults.

Native Americans and early pioneers used the roots and bark of buttonbush for medicinal purposes. However, the plant does contain **glycosides**, which makes the foliage poisonous to livestock.



Cattail (*Typha* spp.)

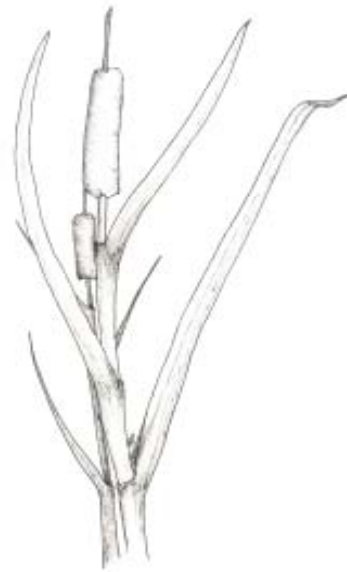
Common Names: Flag, cat-o-nine-tails, marsh beetle, candlewick, and Cossack asparagus.

Habitat: Marshes, swamps, pond and lake margins, and in other moist areas.

Description: Leaves long and narrow, twisting, reaching up to 5 feet in length. Flower is dark brown and hot dog or cigar-like. Perennial.

Identification Tips: Look for the hot dog-like flower head. Two species are common in New Hampshire: *Typha angustifolia* and *Typha latifolia*. *Typha angustifolia* has an **inflorescence** that is generally separated into two parts (between male and female flowers). *Typha latifolia* generally has a continuous or contiguous inflorescence (shown in image below).

Plant Facts: This plant is quick to colonize wet sites. Cattails can outcompete other plants by forming dense growth that causes over-shading, and by **allelopathic** secretions. However, cattails provide benefits, such as water purification and nutrient and metal uptake from the water.



Cattails support a complex community of animals. This plant provides food for insects and shelter to boring insects, as well as shelter for fish, birds, and aquatic mammals such as muskrats. Cattail uses are universal; portions of the plant are edible year-round. The plant was used by the Native Americans for down-like fill in their blankets and pillows, and portions of the plant were used in **poultices**.



Grasses (*Poaceae* family)



Alternate Name: Too many to list.

Habitat: Shallows and shoreline areas of waterbodies.

Description: Grasses are identifiable by their swollen **nodes** and hollow stems. Grasses may have a distinct flower or reduced flowers depending on the species. Perennial and/or annual.

Identification Tips: Individual species identification is by inspection of the often inconspicuous flowers, which requires use of a magnifying glass or hand lens.

Plant Facts: The grass family is large, but only a few genera are common in aquatic systems. Some of the common genera around lakes include *Zizania* (wild rice), *Elymus* (wild-rye), *Phragmites* (common reed), *Poa* (bluegrass), *Glyceria* (manna grass), *Calamagrostis* (bluejoint), and *Panicum* (panic grass), to name a few. Keys dedicated exclusively to grass species are good sources of information if further differentiation is needed.



Zizania aquatica



Grasses are a primary food source for many grazers. Their dense root mats creates stability in soils and creates habitat for burrowing rodents and nesting birds.

Colored photos courtesy of Don Cameron, ME DEC

Grasses (*Poaceae* family)-cont. Common reed (*Phragmites australis*), Exotic

Habitat: Fresh and brackish water margins, ditches, and marsh/wetland areas. Also common to waste/fill areas, river banks, and gravel bars.

Description: This plant is 3 to 15 feet tall with broad leaf blades. Inflorescence is a tuft of long silky hairs on top of the stalk. Rhizomes thick and strong. Perennial.

Identification Tips: The common characteristic is the large brown seed head at the tip of the stem.

Plant Facts: *Phragmites australis* is a native reed that has been present in wetlands for millennia, but a non-native European species has crossbred with *P. australis* and has formed an invasive plant. Specific information identifying the native or the introduced types of common reed can be found online at the Cornell University website at <http://invasiveplants.net/phragmites/morphology.htm>.

This exotic plant has little to offer to birds and mammals besides cover (i.e., no food value).

Phragmites often outcompetes other native wetland plants, thus limiting the plant diversity and food source value of the wetland. The only animal that feeds on this to any extent is the muskrat.

In Europe, this reed has been utilized for centuries in roof thatching. A good reed thatched roof will last 80 years, which is considerably longer than the average shingled roof.



*This Photo courtesy of Jason E. Smith
Hanover Engineering Associates, Inc.*



Emergents

Hedge-hyssop (*Gratiola aurea*)



Alternate Name: Golden hedge-hyssop.

Habitat: Wetlands, and lake and pond margins in gravelly substrates.

Description: Leaves opposite, slightly succulent on stem reaching 4-6 inches in height. Flower yellow, tubular in shape, originating from leaf axils. Perennial.

Identification Tips: Submersed form is more common. It is difficult to identify without flower, but opposite leaves and short stature of plant are distinctive. Its slightly succulent character also helps with identification. Plants generally only flower when emergent.

Plant Facts: These plants are used in herbal medicines for their parasitic dispelling qualities and their ability to aid in the treatment of jaundice.



Horsetail (*Equisetum* spp.)

Alternate Names: Mares-tail, bottle-brush, and horse-pipe.

Habitat: Wetlands, lake and pond margins.

Description: Hollow bamboo-like stem with cone-like flower heads on top. Joints of stem are ringed with black hair-like bands of leaves. Perennial.

Identification Tips: The singular stem with a cone-like head is unique among wetland and aquatic plants. A secondary portion of the plant resembles a small spruce-like tree. This is its sexually reproducing portion, and the cone-like portion is asexually reproducing.

Plant Facts: These are toxic plants to both humans and livestock. The cone-like heads were used as an abrasive pad for cleaning (like steel wool pads). This genus is actually an ancient group of ferns.



Photos courtesy of Jason E. Smith, Hanover Engineering Associates, Inc.

Jewelweed (*Impatiens capensis*)



Alternate Names: Touch-me-nots, snapweed, and celandine.

Habitat: Shady areas along lake and pond margins, and other moist areas.

Description: Hollow, succulent stems reaching up to 4 feet tall. Leaves toothed and oval. Flowers bright orange or yellow. Their oblong seed pouches are found in late summer and “explode” and curl to expel the seeds, which can be propelled up to 7 feet away. Annual.

Identification Tips: Easily identifiable by their many orange or yellow flowers during the summer.

Plant Facts: The sap from this plant has been clinically proven to relieve skin rashes. Ground-up jewelweed can be immediately applied to the affected part of the body. This plant neutralizes the oily urushiol produced by poison ivy and poison oak.



Lobelia (*Lobelia dortmanna*, *Lobelia cardinalis*)

Alternate Names: Cardinal flower, red lobelia (*Lobelia cardinalis*), water lobelia (*Lobelia dortmanna*).

Habitat: *Lobelia dortmanna* is found in shallow regions of acidic lakes and ponds. *Lobelia cardinalis* is found along lake, pond, or river edges.

Description: *Lobelia dortmanna* has tubular basal leaves and light violet flowers that hang down in bells; *L. cardinalis* has alternate leaves along the entire stem, and bright crimson flowers. Perennial.

Identification Tips: *Lobelia dortmanna* can easily be mistaken from a distance for pipewort with a dragon or damsel fly suspended from it. Pipewort has a white button-like seed head at the tip of the stem. The way to distinguish between the basal leaves of the two species is by looking for a tubular leaf with rounded tip for *L. dortmanna*.

Lobelia cardinalis has vivid red flowers during the summer months.



L. dortmanna

L. cardinalis



L. dortmanna



L. cardinalis

Meadow-sweet and Steeple-bush (*Spiraea spp*)



Spiraea tomentosa- Steeple-bush



Spiraea latifolia- Meadow-sweet

Habitat: Shorelines, marshes, and moist soils.

Description: Shrubby/woody plants with serrated leaves alternate along stem. Flowers ranging from pink to white.

Identification Tips: For steeple-bush (*S. tomentosa*), flowers in spikes, pinkish in color, leaves somewhat hairy. For meadow-sweet (*S. latifolia*), flowers in clusters, ranging from pink to white. Shrub.

Plant Facts: The pinker plants of this genus are often confused with purple loosestrife, particularly those with the spike of flowers in steeple-bush. To differentiate, *Spiraea* has alternate leaves whereas purple loosestrife has opposite or whorled leaves. The stems of *Spiraea* species tend to be round in cross-section, whereas the stems of purple loosestrife are square in cross-section.

Pickerelweed (*Pontedaria cordata*)

Alternate Name: Tuckahoe

Habitat: Margins of lakes and ponds, streams and marshes.

Description: Basal heart-shaped leaves, and 3-inch, bluish-purple flower spike on separate stalk. Grows 1-2 feet tall. Perennial.

Identification Tips: This plant can be distinguished from its close look-a-likes, arrow arum and arrowhead, by its light bluish-purple flower spike from June through August. Bases of the leaves are more rounded, whereas arrowhead and arrow arum leaves are more pointed.

Plant Facts: Pickerelweed is an important food source for surface feeding waterfowl like ducks and migrating geese. The leaves and seeds are edible and nutritious. The young uncurled leaves may be used in salads or as cooked greens. The seeds may be eaten off the plant or may be dried, roasted, or ground into a type of flour.



Pipewort (*Eriocaulon aquaticum*)



Alternate Name: Water button.

Habitat: Shallow clear waters of lakes and ponds.

Description: Basal spiky leaves with white septate roots. Flower head on long talks (6-36 in. tall), button-like, white. Perennial.

Identification Tips: This plant can easily be confused with quillwort and water lobelia when not in flower. When in flower, the key distinction is the white button-like seed head of pipewort when compared to the purplish nodding flower of the water lobelia.

When not in flower, the key distinction from quillwort is that pipewort has septate roots.

Plant Facts: This species has long been associated with good water quality.



Pipewort in flower



Pipewort basal leaves on lake sediments (photo courtesy of Don Cameron, ME DEC)

Pitcher Plant (*Sarracenia purpurea*)

Alternate Names: Indian dipper, side-saddle flower, and whippoorwill-boots.

Habitat: Bogs, wetlands, and other wet-acidic soils.

Description: The leaves with purple streaks are formed into a tube or pitcher shape. A single purple flower and stalk originates from the center of this modified cluster of leaves. Carnivorous Perennial.

Identification Tips: The tube-shaped leaves make this plant one of the most easily distinguishable plants found in bog habitats.

Plant Facts: The main function of the tube-shaped leaves is to capture insects. There are hairs within the tube that point downward so that once an insect falls into the leaf it cannot climb back out. There are also digestive juices at the bottom of the leaf, which break down the insect so that the plant can absorb the nutrients.



Purple Loosestrife (*Lythrum salicaria*), Exotic



Alternate Names: Spiked loosestrife and black blood, among many others.

Habitat: Pond, river, and lake margins, wetlands, and along roadways (wet/poorly drained soils).

Description: Leaves opposite or whorled along a square stem. Spike of purple, magenta, or dark pink flowers from July through August. Annual or perennial.

Plant Facts: This plant outcompetes other wetland or margin plants, which are beneficial food sources for wildlife and insects. It reproduces by producing millions of seeds per plant and quickly takes over the landscape when introduced. It also spreads by rhizome.

This plant was once sold commercially as a garden ornamental, but has been prohibited since 1999 in New Hampshire. Nursery cultivars were first thought to be sterile, but the plant crossed with native loosestrife and other purple loosestrife plants, and quickly spread.

The leaves have been reported to be useful in treating gastric disorders and skin wounds. The twigs may be chewed to treat bleeding gums.



Rushes (*Juncus* spp.)

Habitat: All regions of the United States and in many different habitats, but primarily marshes and lake and pond margins.

Description: Rushes are derived from rhizomes and are identifiable by their generally round stems and lack of nodes (which grasses have) or edges (which sedges have). Species of rushes may have a distinct flower or reduced flowers which are generally at or near the tips of the stems, appearing brown to tan in color, and tuft-like. Perennial.

Identification Tips: Individual species identification is by inspection of the often inconspicuous flowers and seeds, which requires use of a magnifying glass. Generally 2-4 feet in height with alternative leaves and brown wooly tufts of seeds.

Most species are found in moist soils, but some of the common genera in and around lakes include *J. effusus* (soft rush), *J. militaris*, and *J. pelocarpus*. Keys dedicated to rush species are good sources of information if further differentiation is needed.

Plant Facts: Good for shoreline stabilization due to extensive rhizomes. Used for shelter making and as a food source by birds and other wildlife.



Juncus canadensis



Juncus pelocarpus



Juncus militaris

Colored photographs courtesy of Don Cameron, ME DEC

Rushes (*Juncus spp.*)
Soft rush (*Juncus effusus*)



Alternate Names: Soft-stem bulrush.

Habitat: Lake, pond, and river margins and wetlands.

Description: This plant closely resembles other rushes such as spike rush. Perennial.

Identification Tips: Look for a soft round stem with brown tufts of seeds at the top of the plant.

Plant Facts: These plants have thick rhizomes well anchored to the sediment, which in turn lend to the stability of the shoreline. These plants are important in attenuating sediment that enters the lake. These plants also provide an important food source for waterfowl.



Sedges (Cyperaceae family)

Alternate Names: Many, depending on genus.

Habitat: Primarily wetlands, and lake and pond edges, but also forests and dry upland areas.

Description: Sedges are easily distinguishable by their triangular stems and flower spikes.

Identification Tip: One easy way to remember how to identify sedges is the phrase “Sedges have edges,” which refers to the triangular feel of the stem when it is rolled between the fingers.

The sedge family is very large and includes a number of genera; including beak-rush (*Rhynchospora*), spike rush (*Eleocharis*), and bulrush (*Scirpus*). Some of the other common genera in the sedge family include cotton grass (*Eriophorum*), three-way sedge (*Dulichium*), and umbrella-sedge (*Cyperus*). Keys dedicated to sedge species are good sources of information if further differentiation is needed.

Spike rush and three-way sedge are commonly found along lake and pond edges, and will be discussed in more detail in the next two pages.

Plant Facts: Many insects feed on sedges, including moths, caterpillars and dragonflies. Waterfowl such as surface-feeding ducks and wood ducks feed on the seeds while hiding in the plants’ cover. Sedge seed and associated insects are a major food source for ruffed grouse chicks.



Wool grass- *Scirpus cyperinus* (photo courtesy of Don Cameron, ME DEC)

Sedge meadows provided grazing for livestock up until the early twentieth century, especially for the pioneer farmers. Now sedge meadows are mowed and used for garden mulch.

Spike Rush (*Eleocharis* spp.)



Habitat: Lake, pond, and river margins, and wetlands.

Description: Hollow stems associated with a brown seed head. The plants stand approximately 2 feet in height. Some species are erect and emergent, while others are more grass-like and submergent. Annual or perennial.

Identification Tips: The emergent species are easily identifiable by spiked seed heads at the top of the plant. They are often eaten by birds and may not be present. The submersed species of this plant often form large areas of "grassy" (not in a botanical sense) bottom growth, with stems reaching lengths of 1-2 feet.

Plant Facts: This plant provides stability for the water margins and protects the shore from wave action. Spike rushes can form large stands of grass-like underwater growth with no fruiting bodies. Fish species and snail species abound in areas with this type of cover.



Eleocharis acicularis



Eleocharis obtusa



Eleocharis robbinsii

Colored photos courtesy of Don Cameron, ME DEC

Three Way Sedge (*Dulichium arundinaceum*)

Alternate Name: Pond sedge, wild bamboo.

Habitat: Lake and pond margins.

Description: This plant has a round, hollow, jointed stem that has yellowish/brownish seed heads. Leaves are more abundant at the top of the plant while the bottom portion is a bare stem. Perennial.

Identification Tips: When looking down upon the plant, the leaves are lined up and appear to radiate from three angles away from the main stem.

Plant Facts: This plant is an important food source for wildlife. It is also important for bank and substrate stabilization due to its extensive rhizomes.



Smartweeds (*Polygonum* spp.)



Alternate Names: Willow weed, sickle weed, and water persicaria.

Habitat: Emergent or on the shorelines of lakes, ponds, and marshes. Occasionally found in deeper water up to 3-4 feet.

Description: These plants have swollen stem joints and alternate leaves. Leaves are long, linear, and pointed at the tip. Flowers are pink or white and spike-like. Annual or perennial.

Identification Tips: The plants are easily mistaken for other species with somewhat similar leaves, like pondweeds. Leaves are smooth, and plants are often trailing. Flowers are needed for identification.

Plant Facts: These plants have a peppery taste (from mild to strong) and are often cooked with other greens for flavor. They are a common additive to tea. One species was commonly used to make yellow dye.



St. John's Wort and Marsh St. John's Wort (*Hypericum* and *Triadenum* spp.)

Habitat: Emergent and shoreline plants found along any waterbody or wetland.

Description: Leaves opposite with smooth margin, leaves with translucent dots. Bluish upper leaf surface, and reddish stem and underside leaf surface. Flowers in clusters in axils of leaves or tip of stem ranging from pink in *Triadenum* to yellow in *Hypericum*. Perennial.

Identification Tips: Look for leaves that have a reddish underside, but bluish above and have no stem connecting them to main stem. This plant is approximately 1 foot tall. Glandular "dots" on leaves are distinctive. Leaves are rounded at tips.

Plant Facts: Marsh St. John's-wort is a well-known herbal remedy for repairing nerve damage and reducing pain and inflammation. Its oil is applied to inflammations, sprains, bruises and varicose veins.

St. John's wort is also used to treat circulation problems, bronchitis and gout. It is also taken as a mood-lifter.



Sundew (*Drosera rotundifolia* & *D. intermedia*)

Drosera interm



Drosera rotundifolia



Alternate Names: Rosa solis and dew plant.

Habitat: Open, unshaded bogs and wet acidic soils. Generally, bare acidic soils and amongst sphagnum mosses.

Description: Radiating rosette of leaves covered in tiny red hairs that excrete a sticky sap. This is a small plant that is found close to the ground. The leaves are approximately 1.5 inches or less in length. The flower does not grow to more than 4-6 inches high.

Drosera rotundifolia has robust round leaves, while the *D. intermedia* has narrower spatula shaped leaves. Both have white flowers present in mid summer. Perennial.

Identification Tips: This is a relatively unique plant that can be easily identified by the tiny, sticky red hairs on the leaves with `drops` or clear sap on the ends.

Plant Facts: Sundew is a carnivorous plant that attracts insects by its glistening, sticky sweet secretions. Once an insect comes to investigate the attractive substance, it becomes stuck to the leaf.

Within a minute, the plant entraps the insect by slowly rolling the leaf around it (a passive growth mechanism triggered by the insect). The sundew then digests the insect by secreting a digestive enzyme through its specialized hairs. Most states legally protect this plant. When in a boggy area, step carefully ... you could be trodding on a sundew!

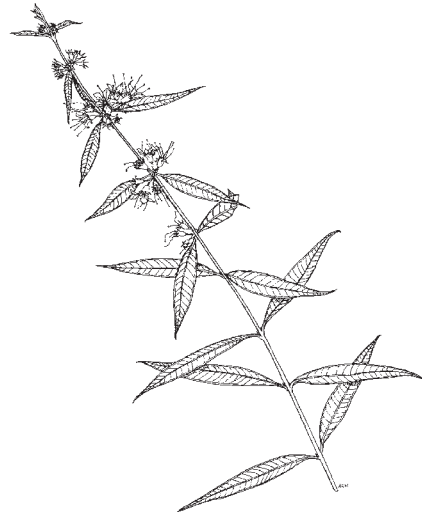
Swamp Loosestrife (*Decodon verticillatus*)

Alternate Names: Water-willow and grass poly.

Habitat: Swamps, lake and pond margins.

Description: Leaves are either paired or in whorls of 3 along a ridged woody stem that ranges from 3 to 9 feet long. Lower stems are spongy and buttressed. This arching plant has lavender, bell-shaped flowers in axillary clusters along the stem. Perennial.

Identification Tips: This loosestrife should not be confused with its invasive relative, purple loosestrife. Key characteristics in their differentiation are the axillary clusters of magenta purple flowers on swamp loosestrife (rather than the corn-on-the-cob spikes of magenta flowers of the purple loosestrife). This species also lacks the square stem of purple loosestrife.



Plant Fact: This is a good indicator of soft, unstable soils, so tread carefully in these areas!



Purple loosestrife

Swamp loosestrife



Photo courtesy C. Barre Hellquist, Mass College of Liberal Arts



Photo courtesy Jason E. Smith, Hanover Engineering Associates, Inc.

Sweet Flag (*Acorus americanus*)



Alternate Names: Sweet sedge, myrtle grass, and sweet cane.

Habitat: Swamps, lake and pond margins.

Description: Long sword-like leaves that resemble those of the irises. The seed head juts diagonally from the leaf, and is sausage-shaped and covered with small, yellowish-green flowers. Perennial.

Identification Tips: The leaves are similar to those of the irises, but can easily be distinguished when the two plants are in flower. The sausage-shaped flower head is not easily confused with cattail because the flower head on the cattail is smooth and brown versus the sweet flag, which is rough and covered in small flowers. Also note that the cattail inflorescence is at the top of the stalk while the sweet flag inflorescence is angled at about 45 degrees from the main stem.



Acorus americanus (Photo courtesy of Don Cameron, ME DEC)

Plant Facts: This plant has an aromatic scent which in itself is distinguishable. It is related to the Arum family and has some medicinal values. The rhizomes are considered to possess anti-spasmodic properties. They have also been used to treat epilepsy, dysentery, intermittent fevers, and kidney and liver problems.

Water Arum (*Calla palustris*)

Alternate Names: Bog-arum, swamp robin, water dragon, and marsh calla.

Habitat: Shallow water of swamps, ponds, and bog edges.

Description: Leaves broad and heart-shaped. White clasping flower with a golden, club-shaped center. Perennial.

Identification Tips: These flowers are very different from that of pickerelweed, but when the flowers are not present, the leaves appear very similar. Water arum is generally found in acidic conditions like those of bogs or sphagnum mosses.

Plant Facts: Like all arums, this plant has irritating crystals that can cause lacerations in the mucus membranes if consumed.

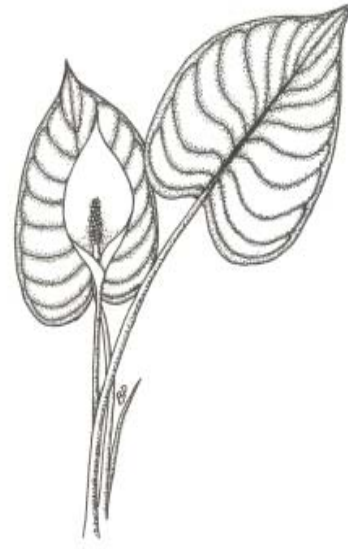


Photo courtesy of C. Barre Hellquist, MCLA

Floating Plants

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Duckweeds (*Lemna spp. & Spirodela spp.*)



Alternate Names: Duck meat and duck meal.

Habitat: Surfaces of some lakes, ponds, and other waterbodies, most often in stagnant waters of wetland areas.

Description: These plants have no true leaves or stems and have only a flat, green plant body called a **thallus**. They are extremely small, only about 1/16 of an inch in diameter for *Lemna* and about 1/8 of an inch in diameter for *Spirodela*. *Spirodela* is usually larger with more and obvious trailing roots. The plants rarely flower.

Identification Tips: Duckweeds blanket the water surface in colonies. There may be one or more roots hanging into the water, but the plant is free-floating. The leaves of this plant are elliptically shaped and flat.

Plant Facts: Thick mats of duckweed can shade pond bottoms and affect **photosynthesis** of submerged plants. These plants reproduce by **asexual budding**. Many people think that dense growths of duckweeds resemble an algae bloom.

Both aquatic and terrestrial insects feed and lay eggs on the thallus of the plant. The name duckweed comes from the fact that many waterfowl feed on this plant.

Floating Heart (*Nymphoides cordata*)

Alternate Names: Little floating heart and banana plant.

Habitat: Lakes, ponds, and slow moving rivers or streams.

Description: Leaves are small, approximately 1-1.5 inches across, and heart-shaped. The leaves may be reddish to purplish in color. Flowers are white. Perennial.

Identification Tips: The leaves are often confused with those of the yellow water-lily but are only about the size of a 50 cent piece, and the shape resembles a heart, with the same soft v-shape of the yellow water-lily. Floating heart has a small white flower that can be found in mid-summer; yellow water-lily has a large yellow flower that blooms most of the summer.

Plant Facts: The flowers are a good food source for many insects and waterfowl.



Image above shows floating heart cluster surrounded by the larger leaves of white water-lily.

Water Chestnut (*Trapa natans*), Exotic



Alternate Name: Bull nut

Habitat: Floating in lakes, ponds, and in slow moving river systems.

Description: Triangular toothed leaves in **rosettes** found floating on the surface of a waterbody. Feathery leaves are submersed on a stem. Fruit is single-seeded and called a **caltrop**. The fruits have four horns that are sharp with several barbs protruding off of them. The small hidden flowers have white petals and are found underneath the **rosettes** of leaves. Invasive to New Hampshire. Annual.

Identification Tips: Distinctive rosette of leaves. Triangular shaped toothed leaves.

Plant Facts: In this region, this decorative plant may have originated from a water garden in Harvard University. When a flood spread the plants beyond the garden, its invasive nature was discovered when it entered local waterways. Water chestnut is currently found only in the Nashua River in NH, but it is spreading throughout MA and VT.

The distinctive seed is often called 'devil's hat' or 'devil's sled.'

Watermeal (*Wolffia* spp.)

Habitat: Lakes, ponds, and other stagnant waterbodies.

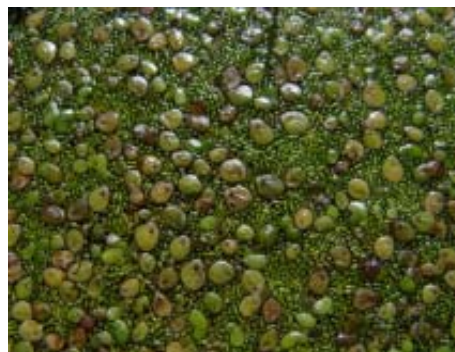
Description: This is a very small plant in the duckweed family which has the distinction of being the world's smallest flowering plant. This tiny plant lacks roots and floats on the surface.

Watermeal is classified as a flowering plant, but hardly ever flowers because of **asexual budding**.

Watermeal has a tendency to grow better in **alkaline** waters and is often found among other species of duckweeds.

Identification Tips: Unlike its relative, duckweed, this plant completely lacks roots. The plant must be inspected closely to detect this difference. Watermeal may also resemble an algae bloom, but can be distinguished by simply touching the water's surface to see if tiny plants are stuck to your fingers (watermeal) or if the water has a slimy film (algae). It is commonly found growing along with duckweed.

Plant Facts: A species of *Wolffia* has been cultured in South Asian countries for human consumption because it is a high source of protein. Waterfowl, especially ducks, eat this native plant species. Watermeal is often cultured for animal feed.



Colored photographs courtesy of Don Cameron, ME DEC

Watershield (*Brasenia schreberi*)



Alternate Names: Dollar tag and water target.

Habitat: Lakes, ponds, and slow-moving rivers or streams.

Description: Leaves oval, stem attaching to center point on the underside of leaf. Underside of leaf dark pink. The leaves are approximately 4 inches in diameter. Flower dark pink to purple, emergent and visible next to leaves in July. Perennial.

Identification Tips: A common characteristic of watershield is a jelly-like coating found on the underside of the leaf and on the stem that protects it from **herbivores**. This plant resembles the leaves of the water-lily as well as those of floating heart. The key difference is that the watershield's stem is attached on the bottom center of the leaf and has flowers that are dark pink in color. Both white water-lily and floating heart have white flowers.



Plant Facts: Watershield is a favorite resting place for insects. Clusters of floating plants like watershield and the water-lilies are good hiding places for fish such as bass.

White Water-Lily (*Nymphaea odorata*)

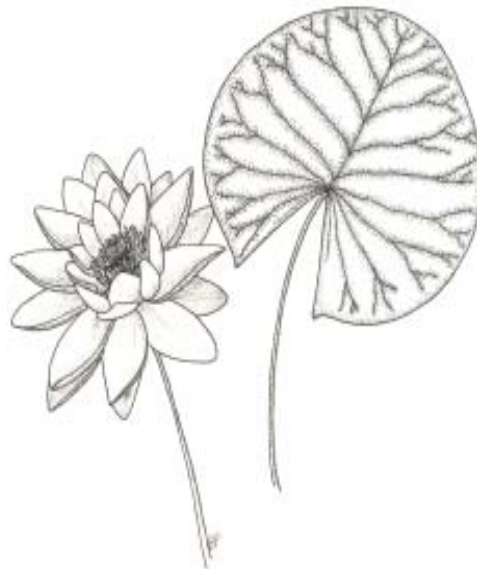
Habitat: Lakes, ponds, and slow moving rivers.

Description: The white, sweet smelling flower is easily identified in the summer months. The floating leaves are round, have a sharp V-notch on one side, and can reach up to 12 inches across. The stem is round in cross section, and is attached to the middle of the leaf underside. Flowers are large, 4 inches in diameter. Perennial.

Identification Tips: This plant can be distinguished from the yellow water-lily and floating heart by the sharp v-notch near the stem attachment, and the more rounded shape of the leaf. Both the yellow water-lily and floating-heart have a much softer rounded v-notch that is more heart-shaped. Yellow water-lily leaves are much more oval than the white water-lily, which has a circular leaf; floating heart leaves are no more than a few inches in length.

Plant Facts: The white water-lily flower is a favorite of honeybees. The plant also has the same relationship with the water-lily leaf beetle as the yellow water-lily (page 42).

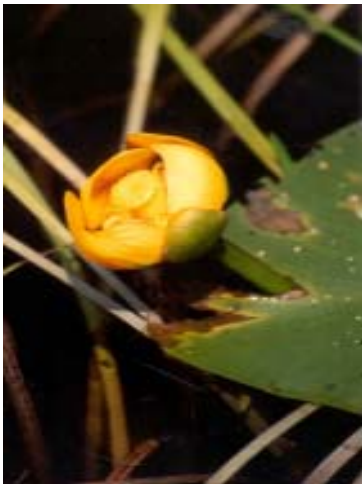
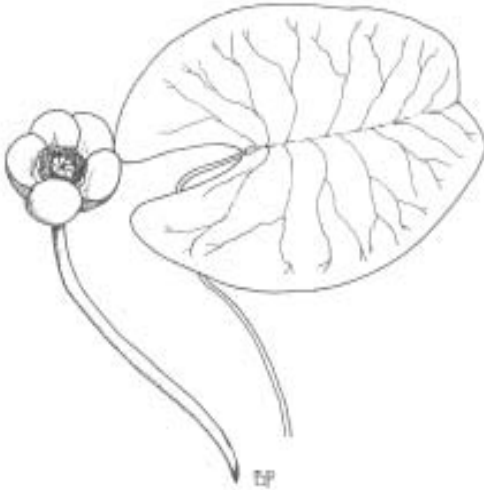
White water-lily flowers have a long history of religious and symbolic significance. Egyptians used the flowers in funeral services. The white flower is also a symbol of purity, virtue, and innocence because it arises from slime and mud.



Above image courtesy of Kaley Connor



Yellow Water-Lily (*Nuphar variegata*)



Above image courtesy of Kaley Connor



Alternate Names: Spatterdock and cow-lily.

Habitat: Ponds, lakes, and very slow-moving streams or rivers.

Description: Yellow water-lily is easily identified by its **emergent** yellow flower and giant floating erect leaves which can be as long as 12 to 15 inches. The leaves are large with lobed ends where the stem is attached. The stem of the leaf is triangular in shape. The yellow flower petals appear cupped around the inner flower parts and do not open completely like white water-lilies Perennial.

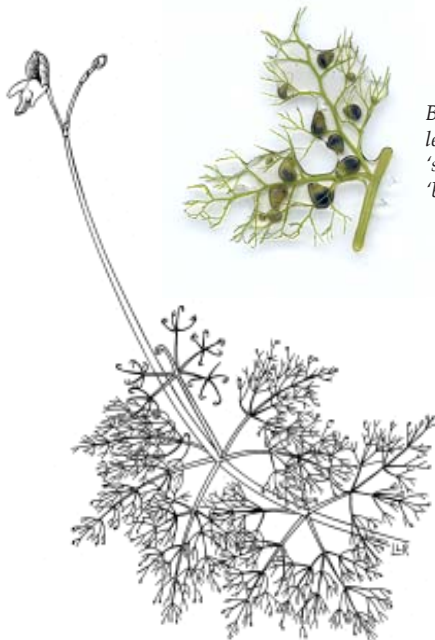
Identification Tips: Yellow water-lily is often confused with floating heart and the white water-lily. As noted on the previous page, floating-heart is much smaller in leaf length, and white-lilies have a much more rounded leaf with a sharp v-notch.

Plant Facts: Yellow water-lily leaves provide habitat for insects. The water-lily leaf beetle relies on the leaf of water-lilies for food; it chews paths through the leaves, which quickly forms holes. Research conducted on this beetle shows that it may increase the rate of nutrient recycling in the lake or pond.

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Bladderwort (*Utricularia* spp.)



Bladderwort leaf showing 'stomachs' or 'bladders'



Bladderwort bud



Alternate Names: Hooded water-milfoil and pop-weed.

Habitat: Lakes, ponds, rivers, and streams.

Description: This plant is easily distinguished by its small bladders found on branched leaves. There are approximately 10 species found in New Hampshire. Flowers range from pink to yellow, white, and green; flowers are emergent. Bladderwort is free-floating and rootless, though it may give the appearance of being rooted. Perennial.

Identification Tips: Bladderwort may resemble the milfoils, but there are two key distinguishing features. One is the bladders on the leaves for which the plant is named. The other is that milfoils have feather-like leaves that have one central leaf stem with nearly opposite unbranched leaflets. The leaflets of bladderwort are more of a branching-forking configuration, as shown in the image at the top left.

Plant Facts: This **carnivorous** plant has trigger hairs on each bladder that open a trap-door and suck in water along with the organism that triggered the reaction. These organisms can range from insect larvae to tiny zooplankton. Once inside the bladders, the organism is digested by enzymes found there. Special cells then take the digested material from the bladders and move it to the stem.

Brazilian Elodea (*Egeria densa*), Exotic

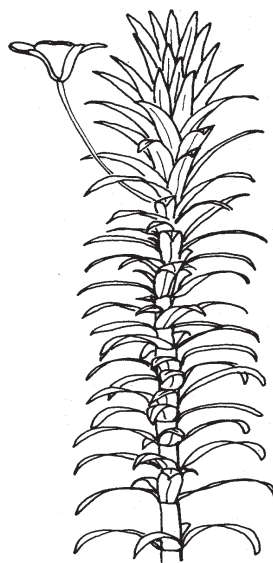
Alternate Names: Anacharis, waterweed.

Habitat: Lakes, ponds, rivers, and streams.

Description: Leaves are usually in whorls of 4, but this is not a consistent or reliable means of species level identification. The stems of the plant can surpass 6 feet. Leaves have slightly serrate margins that are visible with a hand lens or a dissecting microscope. Perennial.

Identification Tips: Brazilian elodea is often confused with the native waterweed (page 69) or its more invasive relative hydrilla (page 75). It can be distinguished from hydrilla by its rich green color, robust size, and smaller teeth on the leaf margins. It can be distinguished from native waterweed by its minute teeth that are sometimes only visible through a microscope. The flowers are white with three spreading petals and bright yellow centers (**anthers**).

Plant Facts: Brazilian elodea is often used in the classroom to study cell structure in plants. It is also a good oxygenator, so it is favorable for home aquariums. Brazilian elodea is an invasive plant that was introduced from South America and has colonized one waterbody in New Hampshire (Nutts Pond in Manchester). The sale of this plant was made illegal in New Hampshire in 1998 to prevent its further introduction and spread in the state.



Coontail (*Ceratophyllum* spp.)

Alternate Name: Hornwort.

Habitat: Lakes, ponds, and slow moving rivers and streams.

Description: This submerged plant is free-floating with no roots, though it often lies across the bottom, giving the appearance of being rooted. The whorled leaves often cause the plant to be confused with water-milfoil. The purplish-greenish flowers are found where the leaf attaches to the stem and stay entirely submerged. The leaf whorls are highly forked. There are two species found in New Hampshire; *Ceratophyllum demersum*, and *C. echinatum*. Perennial.

Identification Tips: This plant has a plastic-like feel upon inspection, and leaves tend to be thickly clustered at the tips of stems. The leaves are completely whorled around the stem and forked; milfoil leaves are distinctly feather-like.

Plant Facts: Coontail provides habitat for worms, snails, crustaceans, and insect larvae, but interestingly inhibits the growth of blue-green algae on its stems by a sulfur-based **allelopathic** response.

Waterfowl and muskrats often feed on the plant, although they may be eating the plant primarily for its many animal residents.



Fanwort (*Cabomba caroliniana*), Exotic

Habitat: Lakes, ponds, rivers, and streams.

Description: Leaves are in opposite pairs on the stem, finely dissected and fan-shaped. Small floating leaves form before flowering. The white flowers are emergent. Perennial.

Identification Tips: This plant has two opposite leaves that have a distinct stem from which leaflets fan outward. Fanwort roots are silvery in color. The main stem ranges from 1 to 12 feet in height.

Plant Facts: This is a southern species that has adapted to our winter conditions. It is found in over 6 waterbodies in southeastern New Hampshire. Fanwort is listed as a prohibited species for sale in New Hampshire.



Mermaid-weed (*Proserpinaca palustris*)

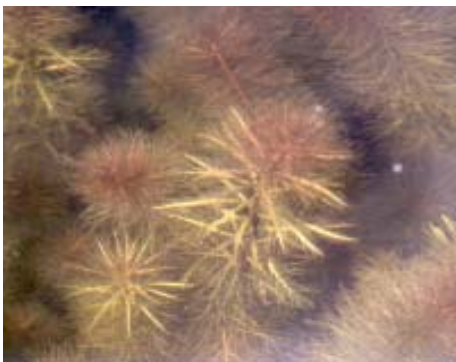


Habitat: Found in lakes and ponds.

Description: The emergent leaves are serrated with nutlets in the **axils**. The submerged leaves are dissected and feather-like. Perennial.

Identification Tips: This plant is a cousin of water-milfoil, and is often confused for the invasive water-milfoil species. The water-milfoils do not have full-bodied leaves on the upper portion of the stem as this species does. Mermaid-weed has feather-like fully submerged leaves, but they are thick and plastic-like and are more alternate than opposite. Stems are weak. The plant can be amphibious (growing in the water or just outside of the water in moist soils).

Plant Facts: Another species in this genus, *P. pectinata*, is endangered in New Hampshire.



Above two colored photos courtesy of Don Cameron, ME DEC



Water-Milfoils: *Myriophyllum* spp.

There are six species of native water-milfoils in New Hampshire, most of which have very similar habitats and characteristics. Native milfoil species tend to grow in small clumps or patches, and rarely grow to dominate the shallows of a waterbody. There are also two species of non-native (exotic) water-milfoil that tend to be more invasive in their nature, and more robust in size than the native water-milfoils.

Water-milfoils, as a group, are difficult to identify to the species level when not in fruit or flower, but there are some notable distinctions between species. To be certain of species level identification in the absence of fruit or flower, genetic analysis of the plant specimen is often necessary.

Alternate Names: Most water-milfoils do not have common or alternate names, but those that do are listed in the following pages with each species' description.

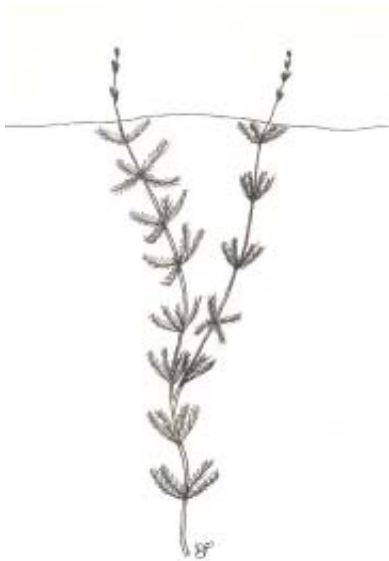
Habitat: Shallow margins of lakes and ponds, and slow-moving rivers and streams and their backwaters.

Description: Feather-like leaves whorled or alternate around main stem, with one exception (*M. tenellum*). Stem height for some species can reach over 5 feet (particularly for the exotic species), but are generally 1 to 1.5 feet in length. Variable water-milfoil and Eurasian water-milfoils can easily grow to fifteen foot lengths.

Plant Facts: Native water-milfoils are important food sources to wildlife and aquatic insects, and serve as habitat for fish and other aquatic life. Typically, native water-milfoils like *M. humile*, *M. alterniflorum*, and *M. farwellii* are present in small clusters of stems, which are scattered around the shoreline and mixed with assemblages of other native plants.

Variable water-milfoil and Eurasian water-milfoil begin as smaller clusters of stems as well, but each season expand their footprint in a waterbody, and quickly come to dominate the shallow portions of waterbodies, where sunlight penetrates the bottom. Rather than mixing and intermingling with native plant communities, they dominate and eventually crowd out natives, forming a monoculture of exotic water-milfoil growth.

Alternate Flowered Milfoil (*Myriophyllum alterniflorum*)



Identification Tips: The leaves of this species tend to be smaller than the other native milfoils, and cup slightly upwards in whorls along the main stem. Leaves are less than one inch in length. Stem and leaves are reddish in color. Flowers are on an emergent stalk.



Native Water-Milfoil: *Myriophyllum farwellii*



Identification Tips: Feather-like leaves are both alternate and whorled on different portions of the stem. Fruit is ridged and in axils of submersed leaves, but this species rarely fruits. This milfoil species does not produce an emergent flower spike.



When comparing plants based on vegetative growth only, this native water-milfoil species is often confused for variable water-milfoil due to its robust growth and its bright green color.

M. farwellii images are courtesy of Don Cameron, ME DEC

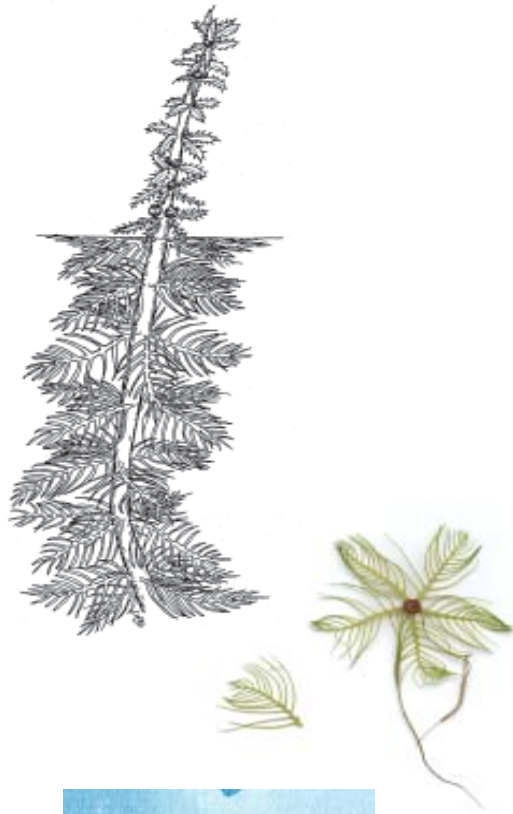
Variable Water-Milfoil (*Myriophyllum heterophyllum*), Exotic

Identification Tips: Stem is stiff and thick; if broken in half a 'wheel-spoke' is observed inside the stem. The leaves are in whorls of 4 to 6 and can grow up to 2 inches long. Leaves on upper stem are whorled, and may be whorled or alternate on lower stem. Variable water-milfoil can grow to 15 feet in length. In July, flowers emerge from the water and are in a spike up to 6 inches tall with distinctive oval-shaped, toothed **bracts**. Can also form a succulent amphibious form when water levels recede.

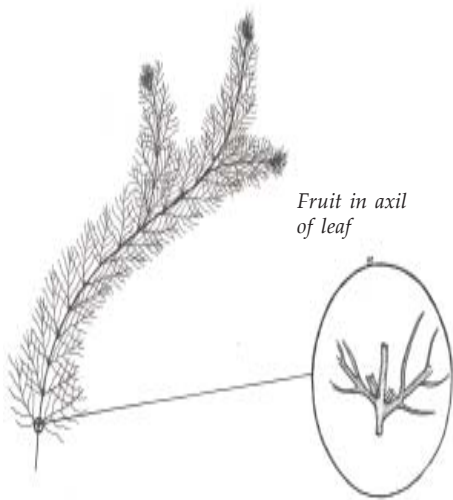
This plant is more robust than the other water-milfoil species. It has a very thick and heavy stem. It can only be positively identified with the flower present or by DNA analyses.

Plant Facts: Fragments of variable milfoil are made by passing boats, wave action, and auto-fragmentation. These fragments may float freely and spread for one to two weeks as they generate roots. Once roots make contact with sediment, the fragment attaches; the roots spread laterally and expand the footprint of the colony. With one fragment an entire colony can arise. Colonies can out-compete native plants, reducing biodiversity.

Data from a University of New Hampshire study suggest that variable water-milfoil can grow an inch per day.



Native Water-Milfoil (*Myriophyllum humile*)



Identification Tips: This is one of the more common native species in New Hampshire. Stems and leaves tend to be brownish/red-dish in color, and the fruits are in the axils of the leaves (see diagram). Leaves are alternate along the main stem.

This water-milfoil species tends to be smaller than other native water-milfoils in nature, and reaches only about 1 to 1.5 feet in height.



Native Water-Milfoil (*Myriophyllum sibiricum*)

Identification Tips: Leaves whorled around main stem but opposite at top of stem. Flowers born on emergent spikes. Bracts are small. Leaves with 11 or fewer leaflet pairs. Favors slightly more alkaline conditions.

This plant can sometimes be confused with Eurasian milfoil, due to the flower spike and the leaf arrangement on the stem. Eurasian milfoil, however, generally has 12 or more pairs of leaflets on one leaf.



Colored photos courtesy of Don Cameron,
ME DEC

Eurasian Water-Milfoil (*Myriophyllum spicatum*), Exotic



Identification Tips: Eurasian water-milfoil leaves are in whorls of 4 and grow up to 1.5 inches in length. The feathery, stiff leaf has one central vein with 12 or more pairs of smaller leaflets. The leaves are concentrated near the upper portion of the plant, so this species has a tendency to shade out bottom growth. The plants can grow one to sixteen feet in length. The flowers, are green, emergent and fairly inconspicuous; they are approximately 2 inches tall. Perennial.

Eurasian milfoil leaves appear clipped on the end. The leaf whorls are separated by a distance of approximately 1 inch along the stem. The stem is thinner than that of variable milfoil.

Plant Facts: Few species of invertebrates and vertebrates feed on this plant, although a burrowing weevil (*Eurychiopsis*) has been known to graze some portions of Eurasian milfoil stems. The weevil burrows into the plant, cutting the veins that carry food and nutrients through the plant, thus killing it. Unfortunately, the weevil is not effective in controlling variable milfoil.

Native Water-Milfoil (*Myriophyllum tenellum*)

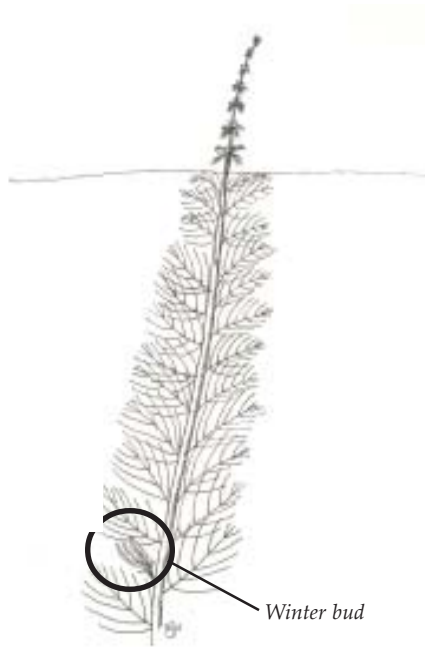
Alternate name: Leafless milfoil

Identification Tips: This unique milfoil has no feather-like leaves like other milfoil species. Leaves of this species are scale-like. Stems are brownish to dark greenish, short, and close to bottom in shallows. *M. tenellum* is generally found in nearshore areas of acidic waters.



Colored photos courtes of Don Cameron,
ME DEC

Northern Water-Milfoil (*Myriophyllum verticillatum*)



Identification Tips: Leaves whorled, with leaves at top of stem opposite. Fruits on emergent stalk that may make this species resemble an exotic milfoil to the unfamiliar eye. The **bracts** are generally used to identify species.

Yellowish-brownish colored leaves tend to be robust (slightly larger) in size. Plants can grow 4 to 5 feet in height.

The presence of a winter bud, as shown in line drawing, is a distinctive characteristic used for identification.

This plant is occasionally confused with variable milfoil.



Photo courtesy Don Cameron, Maine DEP

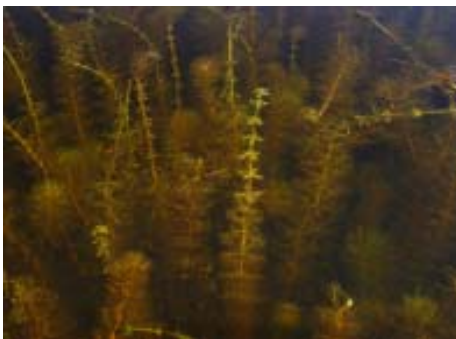


Photo courtesy Don Cameron, Maine DEP



Photo courtesy C. Barre Hellquist, Mass College of Liberal Arts

Pondweeds (*Potamogeton spp.*)

Pondweeds are a very large and important group of aquatic plants. They are among the most commonly found species in waterbodies across the state, with generally at least one species represented in each waterbody. In New Hampshire we have 25 different species of pondweeds documented (according to Dr. C. Barre Hellquist, MA College of Liberal Arts).

In the next few pages of this book, we will cover some of the broader categories of pondweeds, and detail some specifics of representative species within those categories.

Alternate Names: Many, based on species.

Habitat: Lakes, ponds, and streams, generally in water ranging from 1.5 to 8 feet deep.

Identification Tips: Surfictionally, the oval floating leaves of some pondweeds can be confused with those of watershield. The parallel leaf veins of the pondweed are a good identifier as to the genus of the plant, as are the stems that join the leaf at one edge. (Watershield stems are attached in the center of the underside of the leaf).

Keying pondweeds can be difficult, thus for the purposes of this key, we generalize the basic characteristics of the more common pondweed species. Typically, the size of the leaves, the presence of a **stipule**, and the nature of the stipule are good factors to consider when looking at pondweeds. The seeds, and their shape and size are also very important in pondweed identification, but we do not go into detail on this as magnification is generally needed to see the details of the seeds. Nevertheless, such detail may be required for a precise identification, and for that, more detailed taxonomic keys are recommended.

Plant Facts: Pondweeds provide important structure in underwater communities, creating habitat for fish, aquatic insects, amphibians, and other aquatic life. In addition to providing shelter, the seeds of pondweeds are eaten by many forms of aquatic life. Waterfowl rely on the seeds and root **tubers** of the plants for food. Sago pondweed, though rare in New Hampshire, is of particular importance to waterfowl because of its prolific seed and tuber production.



P.

P. epiphydrous



P. natans



Large-Leaved Pondweeds (*Potamogeton amplifolius*, *P. epihydrus*, *P. natans*)



Potamogeton amplifolius



Potamogeton epihydrus



Potamogeton epihydrus

Potamogeton amplifolius- Commonly known as big-leaved pondweed or bassweed. This pondweed has large, curly underwater leaves that appear to fold in on themselves and arch. This pondweed grows in deeper water, commonly between 4-8 feet deep. The floating leaves are large, though not always present.

Potamogeton epihydrus- The submersed leaves are ribbon-like, appearing 2-ranked (feather frond-like). Floating leaves blunt or rounded at tip, and are 1-2 inches long.

Potamogeton natans- This is a very common pondweed. Large oval floating leaves are softly heart-shaped at base. Where petiole of leaf attaches to leaf there is a distinct color change in this species. Submersed leaves are generally modified to be long and needle-like or ribbon-like.



Potamogeton natans

All photos on this page are courtesy of
C. Barre Hellquist, Mass College of Liberal Arts

Small Floating-Leaved Pondweeds (*Potamogeton bicupulatus*, *P. spirillus*, *P. vaseyi*)

Potamogeton bicupulatus- Very fine submersed leaves, with some floating leaves that are 7-veined and approximately 1/2 inch in length.

Potamogeton spirillus- This pondweed is commonly referred to as snail-seed pondweed. It is generally found in acid to neutral waters and may have floating leaves present. Submersed leaves are limp, pointed at tips. Floating leaves are rounded at the tip. The fruits are in the axils of the leaves. The stipules are partially fused to the petioles.

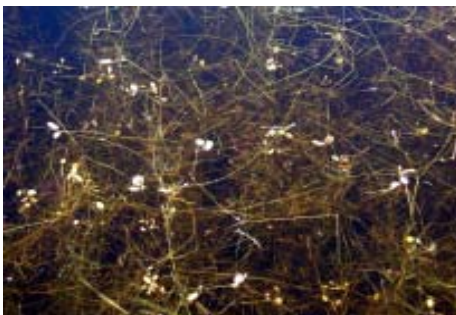
Potamogeton vaseyi- Stipules are not fused. Submersed leaves are narrow and thread-like, and pointed at tip. Floating leaves are small, less than 1/2 inch long. This pondweed commonly forms winter buds.



Potamogeton bicupulatus



Potamogeton spirillus



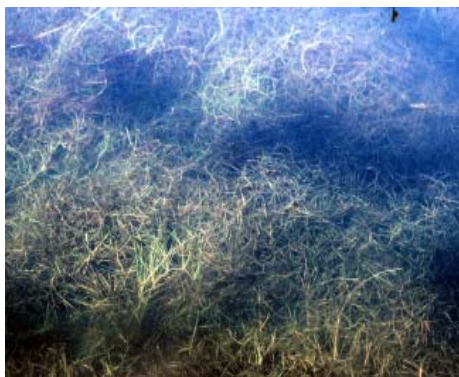
Potamogeton vaseyi



Potamogeton spirillus

All photos on this page are courtesy of
C. Barre Hellquist, Mass College of Liberal Arts

Pondweeds Lacking Floating Leaves (*Potamogeton pusillus*, *P. foliosus*, *P. obtusifolius*)



Potamogeton pusillus

Potamogeton pusillus- This species has three subspecies, two of which are found in more acidic waters similar to those found throughout NH. This species has numerous **lacunae** on either side of the leaf midrib (tissues with air cells). The submerged leaves are very narrow and thread-like with one to three veins. This pondweed has a grassy-like growth.



Potamogeton foliosus

Potamogeton foliosus- Submersed leaves are 3-veined. The flower stalks are short and in the axils of the leaves, and generally curved backwards on the stem. This species generally forms winter buds.



Potamogeton obtusifolius

Potamogeton obtusifolius- This pondweed has large flowers and fruits. The plant is generally reddish brown in color, and the long narrow leaves have blunt tips.

All photos on this page are courtesy of
C. Barre Hellquist, Mass College of Liberal Arts

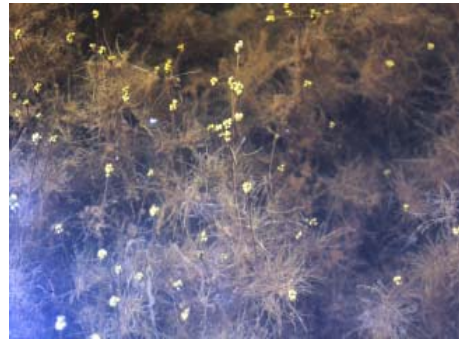
Pondweeds Lacking Floating Leaves (*Potamogeton praelongus*, *P. confervoides*, *P. robbinsii*, *P. perfoliatus*)

Potamogeton praelongus- This pondweed has a distinctive ‘hooded’ tip to the leaf that, when flattened, splits at the tip. The base of the leaf loosely clasps the stem. Leaves are 4-8 inches long.



Potamogeton praelongus

Potamogeton confervoides- Leaves are thread-like. Plant is grassy looking in appearance. This one is very tolerant of acid waters.



Potamogeton confervoides

Potamogeton robbinsii- This pondweed has stiff leaves that are two-ranked, appearing like a feather-frond. No floating leaves, generally submersed, and growing 1-1.5 feet in height.



Potamogeton robbinsii



Potamogeton perfoliatus

All photos on this page are courtesy of
C. Barre Hellquist, Mass College of Liberal Arts

Curly-leaf Pondweed (*Potamogeton crispus*), Exotic



Colored photos courtesy of Karen Hahnel, ME DEP

Habitat: Lakes, ponds, and back-water areas of rivers and streams.

Description: Plant has 1/4 inch wide, 4 inch long curly-edged leaves with teeth present on the margins. It has a thick, hard, fruiting body on the top of the plant. Perennial.

Identification Tips: This plant could be confused with *Potamogeton perfoliatus*, a native pondweed, because the leaves are also curly. The difference is the presence of teeth on the margins of the leaves of curly-leaf pondweed. Hard, almost woody **turions**.

Plant Facts: The plant is photosynthetically active underneath clear ice, giving it a competitive advantage over other plants.

This plant is listed as prohibited for sale in New Hampshire. It has been found in three waterbodies in New Hampshire.

Quillwort (*Isoetes spp.*)

Habitat: Lake, pond, and river bottoms.

Description: This low growing plant has spiky, somewhat succulent leaves with thick nodule-like bases which contain spores. The leaves form small rosettes on the sediments in the littoral zone of waterbodies. Perennial.

There are several species of quillwort in New Hampshire, and they are very difficult to identify to species level unless the fruiting bodies (megaspores) are present in the nodule-like bases.

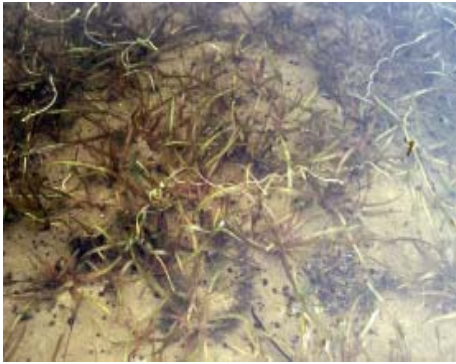
Identification Tips: This plant looks very similar to the basal leaves of pipewort. An easy way to distinguish these plants from one another is found in the roots. Pipewort has septate (striped) roots, whereas quillwort has no stripes on the roots.

Plant Facts: This plant provides stability to organic mucky bottoms.



Photos courtesy of Don Cameron, ME DEP

Tape-grass (*Vallisneria americana*)



Alternate Name: Water-celery.

Habitat: Lakes, ponds, and in slow moving streams and rivers.

Description: The leaves are long, **basal** and somewhat broad and ribbon-like with a distinct cellular band along the midrib. Perennial.

Identification Tips: This plant is often confused with the submerged leaves of bur-reed. Tape-grass leaves have heavy air-filled, vertically veined centers (**lacunae**) and lightly veined edges. Unlike bur-reed, this plant has no **keel** or rib on the back of the leaf. A flower forms on a long curly stem that can accommodate fluctuating water levels to keep the flower on the water's surface (as shown in image below).

Plant Fact: Tape-grass is often consumed by ducks and other waterfowl.

Water Crowfoot (*Ranunculus* spp.)

Alternate Names: Crowfoot, aquatic buttercup

Habitat: Ponds, lakes, and slow moving rivers.

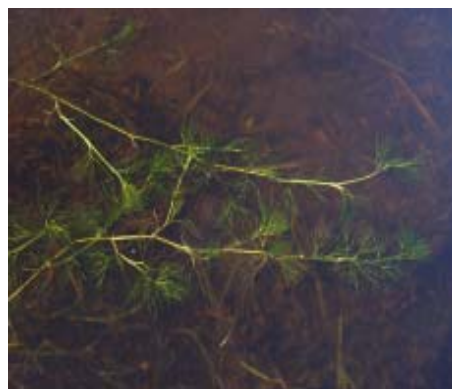
Description: Plant can have branching, dissected, fan-like leaves or lobed leaves arranged alternately along the stem. Leaf **petioles** sheath the main stem. Flowers yellow or white. Annual or perennial depending on species.

Identification Tips: Dissected leaves of water crowfoot appear similar to fanwort, but do not have the stems associated with each “fan,” and the leaves are not directly opposite. Water crowfoot may also resemble water marigold (see page 66), but it does not have the upper emergent leaves. Both water marigold and water crowfoot have yellow flowers, but the flower of water marigold is more robust.

There are many species of water crowfoot in New Hampshire. Some species are more often found in alkaline waters, while other species are found in more acidic conditions.



Top two images are *Ranunculus flabellaris*. Bottom two images are *R. aquatilis*. Photos courtesy of Don Cameron, ME



Water-Marigold (*Megalodonta beckii*)



Habitat: Lakes, ponds, rivers, and streams.

Description: Leaves are very dissected and appear whorled around the main stem. Water-marigold has characteristic emergent leaves that are strongly toothed. Stems are weak. Flowers in heads, yellowish in color, and emergent. Perennial.

Identification Tips: This plant is commonly confused with the exotic water-milfoils and fanwort, but the leaves are attached directly to the stem. Fanwort has stalked leaves. Water-marigold leaves do not have the classic feather-like shaped leaves of the water-milfoils.

Plant Facts: Water-marigold is usually found in lakes and ponds that are nutrient rich and that have a relatively **neutral** pH.

Not observed in fruit in New Hampshire.



Water-marigold flower. Photo courtesy of Don Cameron, ME DEC.

Water Naiad (*Najas flexilis* and *N. gracillima*)

Alternate Name: Water nymph

Habitat: Lake and pond bottoms.

Description: There are two species that are relatively common in freshwaters in New Hampshire; *N. flexilis* and *N. gracillima*.

The leaves of both species can either appear whorled or nearly opposite along stem. Leaves have varying degrees of serration on margin. *N. flexilis* generally has serrated leaves and a spiny midrib on the lower side of the leaf. *N. gracillima* generally has small spines on the leaf, and no serration on the midrib. *N. gracillima* also has slightly lobed leaf bases. Annual.

Identification Tips: Plant has tufts of leaves originating off the central stem.

Plant Facts: This plant provides habitat for fish and food for wildlife, as well as stability to bottom sediments.



Photos on this page are courtesy of Don Cameron, ME DEC.

Najas flexilis

Water Naiad (*Najas minor*), Exotic



Habitat: Alkaline lakes, ponds, rivers, and streams.

Description: The flowers are inconspicuous and are found in the leaf axils. Teeth can be seen with the unaided eye. This plant is very brittle and fragments easily (one mode of reproduction). The other mode of reproduction is by seeds that are generated from the flowers found in the axil of the plant. These seeds are oblong in shape and are deposited in the sediment when the plant dies in the fall.

Identification Tips: This plant is distinguishable from native water naiad by its thicker and broader leaves with serrated edges.

Plant Facts: *Najas minor* is generally found in **eutrophic** or **alkaline** waters.

In New Hampshire it is currently found in the Connecticut River and two small ponds in Portsmouth.



Photos courtesy of Ann Bove, VT DEC

Waterweed (*Elodea canadensis*, *E. nuttallii*)



Alternate Name: Native *Elodea*, Canadian waterweed (for *E. canadensis*).

Habitat: Lakes, ponds, rivers, and streams.

Description: This plant has a robust appearance with leaves in whorls of 3. The leaf margins are smooth. Native waterweed doesn't reach more than 2 feet in length. Flowers with 3 petals, green or white. Perennial.

Identification Tips: This plant is commonly mistaken for its invasive relative, Brazilian elodea and hydrilla. It can be distinguished by its smooth leaf margins.

There are two common species of waterweed in New Hampshire, *E. canadensis* and *E. nuttallii*. *Elodea canadensis* tends to have slightly broader leaves with blunt tips, whereas *E. nuttallii* tends to have thinner, more needle-like leaves that are pointed at the tips.

Plant Facts: This plant is a common aquarium plant used in classrooms for fish habitat and the study of plant cell structure. This native plant can be sold legally in pet shops, although its relatives, Brazilian elodea and hydrilla, cannot.

E. nuttallii can be found in alkaline to acidic environments, and *E. canadensis* can be found in alkaline or neutral systems.

Illegal Invasive Plants Not Yet in New Hampshire

Emergent Plants	
Flowering Rush (<i>Butomus umbellatus</i>), Exotic ...	72
Floating Plants	
Frog-bit (<i>Hydrocharis morsus-ranae</i>), Exotic	73
Yellow Floating-heart (<i>Nymphoides peltata</i>), Exotic	74
Submerged Plants	
Hydrilla (<i>Hydrilla verticillata</i>), Exotic	75
Parrot Feather (<i>Myriophyllum aquaticum</i>), Exotic	76

Flowering-Rush (*Butomus umbellatus*), Exotic



Habitat: Lake and pond margins and marshes.

Description: If completely emergent, the leaves of flowering rush are stiff and sword-like. If submerged, leaves are long, limp and ribbon-like. The flowers are solitary or in **umbels**. Perennial.

Identification Tips: This plant is taller than most other rushes (4 to 5 feet) and has pink flowers. Rhizome is made up of leaf-bases.

Plant Facts: This plant originates from Europe and has been spreading across the northern U.S. and Canada since the early 1970s. It is currently found in Vermont (most commonly along Lake Champlain), Maine, Massachusetts, and Connecticut. This plant is illegal to sell in New Hampshire.



Above two photos courtesy of Ann Bove, VT DEC

Frog-bit (*Hydrocharis morsus-ranae*), Exotic

Habitat: Floating freely in lakes and ponds, or rooted in shallow-water marshes and wetlands.

Description: Floating (unrooted) plant with kidney-shaped leaves that resemble a floating water-lily leaf; roots are clearly visible below leaves, unlike water-lilies. The flowers have three white petals with a yellow center. This plant can form dense floating colonies. Perennial.

Identification Tips: This plant is often confused with water hyacinth, though water hyacinth has a purplish/blue flower and a thick bulbous portion to the leaf stems. Leaves of frog-bit are thick and fleshy.

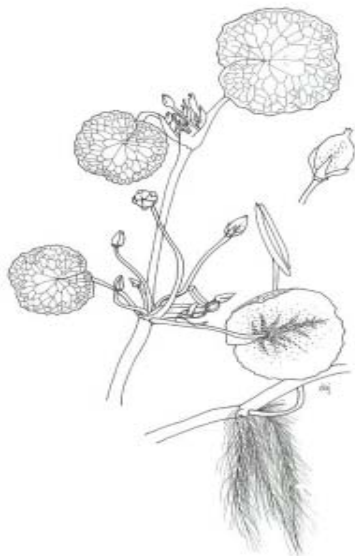
Plant Fact: Frog-bit is native to the southern portion of the United States and can be found in Lake Champlain, in Vermont.

This plant is illegal to sell in New Hampshire.



This photo is courtesy of Ann Bove, VT DEC

Yellow Floating-heart (*Nymphoides peltata*), Exotic



Habitat: Lakes, ponds, rivers, and streams near coastal regions.

Description: This species is larger than the native white floating-heart (page 37), and is approximately 3 to 5 inches in length. Yellow floating-heart has a yellow flower. It does not produce 'banana like clusters' like the native *Nymphoides*. Perennial.

Identification Tips: This plant has leathery leaves and yellow flowers, versus the delicate leaves and white flowers of native floating heart.

Plant Fact: This plant originated in eastern Asia and is invasive to the entire United States. It currently can be found in Lake Champlain, in Vermont. Illegal to sell in New Hampshire.



Photo courtesy of Ann Bove, VT DEC



Photo courtesy of Ann Bove, VT DEC



Hydrilla (*Hydrilla verticillata*), Exotic

Alternate Name: Anacharis.

Habitat: Lakes, ponds, rivers, and streams.

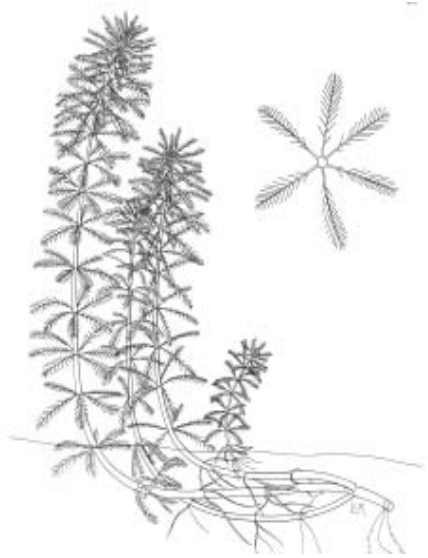
Description: Hydrilla has narrow leaves whorled around the main stem. Leaves are conspicuously toothed along the margins of the leaves, and may also be toothed along the rib on the underside of the leaf. The leaves are in whorls of four to six, and are approximately one-third to two-thirds inches long. The stem can grow to 20 feet or more. A small white flower emerges in July, often detaching from the plant and drifting. Perennial.

Identification Tips: This plant is often confused with Brazilian elodea but can be differentiated by its rough texture and larger teeth on its leaf margins. The presence of **tubers** on hydrilla can also be a good distinction between the plants. If the plants are removed carefully from the sediments, the tubers may still be connected to the hydrilla plants, as shown in the picture to the right.

Plant Facts: Native to Africa. This is the most invasive submergent plant in the United States, and can even outcompete invasive water-milfoil species by canoping over the surface. It has been observed to grow up to a half-inch per day in optimum conditions. It will only be outcompeted by floating invasive species like water hyacinth. It can currently be found in the northeast in Maine, Massachusetts, Connecticut, and Pennsylvania.



Parrot Feather (*Myriophyllum aquaticum*), Exotic



Habitat: Lakes, rivers, and ponds.

Description: Parrot feather is another water-milfoil species. It is distinguishable from the other water-milfoils in that the densest portion of the plant is emergent, whereas the other milfoils have their densest leaves underwater. This plant can grow right up to the shoreline and in deeper waters. Perennial.

Plant Fact: Parrot feather is native to South America. This plant is believed to have originally been released from an aquarium. It once was found in a water garden in Bradford, New Hampshire, but was eliminated before it entered a nearby lake. It does infest some waterbodies in nearby Massachusetts.

Parrot feather is illegal to sell in New Hampshire.



Southern Invasive Aquatic Plants

Please note that these plants listed here are more characteristic of invasive species in warmer climates, particularly the southern United States. It is unlikely that these plants will overwinter in New Hampshire; however, exotic aquatic plants are adaptive, so we list these here for your information. These are all common plants in home water gardens, so they may be somewhat familiar.

Giant Salvinia (<i>Salvinia molesta</i>), Exotic	78
Water Hyacinth (<i>Eichhornia crassipes</i>), Exotic	79
Water Lettuce (<i>Pistia stratiotes</i>), Exotic	80

Giant Salvinia (*Salvinia molesta*), Exotic

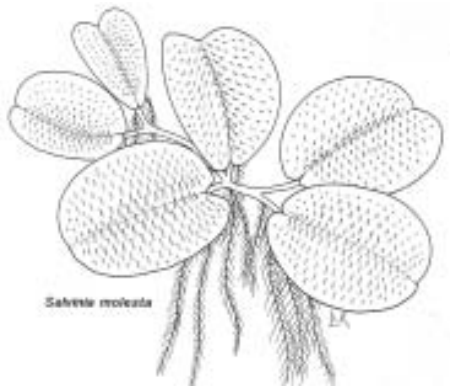


Photo courtesy C. Barre Hellquist, Mass College of Liberal Arts

Habitat: Free-floating aquatic fern found in dense mats on lakes, ponds, and rivers.

Description: The leaves have a central midrib and are light to medium green. The upper surface of the leaf has long brownish hairs. Annual.

Identification Tips: Giant salvinia may be confused with water lettuce, but giant salvinia does not have linear ribbing throughout its leaf structure and is considerably smaller, contradictory to its name. Giant salvinia also has round bumps present on the upper surface of its leaves.

Plant Facts: Giant salvinia is considered extremely invasive and is found in many southern states. Scientists speculate that it will not survive the northern winter season, and therefore will not become a problem in NH and other northern states.

Water Hyacinth (*Eichhornia crassipes*), Exotic

Habitat: This free-floating plant is found in lakes, ponds, and rivers.

Description: The leaves are raised above the surface and have a bulbous midsection to the stem. The flowers are light violet in color with one upper petal that is darker purple with a yellow center. The roots are dark purple to blackish in color. Perennial or annual.

Identification Tips: Water hyacinth may be confused with frog-bit if the flowers are not present. However, water hyacinth has a bulbous base which extends to the beginning of the leaf, a trait absent in frog-bit.

Plant Facts: This plant is extremely invasive and is mostly found along the coastal regions of the southern portion of the United States. This distribution is believed to be due to milder winter conditions along coastal margins.

Water hyacinth is widely distributed in the aquarium and ornamental trade.

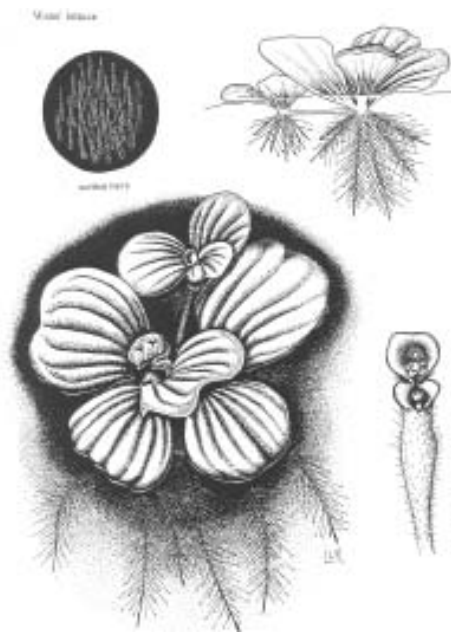


Photo courtesy of Jason E. Smith,
Hanover Engineering Associates, Inc.



Photo courtesy C. Barre Hellquist,
Mass College of Liberal Arts

Water Lettuce (*Pistia stratiotes*), Exotic



Habitat: Free-floating plant is found on lakes, ponds, and rivers.

Description: Densely-packed leaves that are grayish to light green in color; arranged in rosettes that float on the water surface.

Identification Tips: May resemble giant salvinia in the water, but this plant has linear ridges throughout the leaves.

Plant Facts: This plant is intolerant to freezing temperatures and will not likely survive a New Hampshire winter.

Water lettuce is widely distributed in the aquarium and ornamental trade.



Photos courtesy of C. Barre Hellquist, Mass College of Liberal Arts

Algae

Macroalgae

Muskgrass (<i>Chara spp.</i>)	82
<i>Nitella spp.</i>	83

Microalgae

Cyanobacteria: The Bluegreen Algae

<i>Anabaena</i>	84
<i>Aphanizomenon</i>	85
<i>Gleotrichia</i>	85
<i>Microcystis</i>	86
<i>Oscillatoria</i>	86

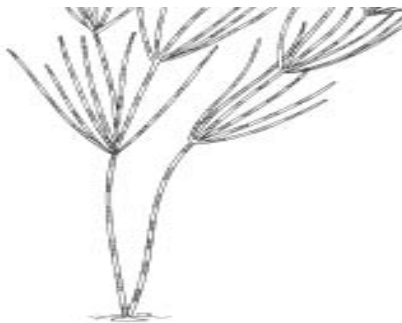
Bacillariophyceae: The Diatoms 87

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Muskgrass (*Chara spp.*)



Colored photographs courtesy of Don Cameron,
ME DEC.

Alternate Names: Brittlewort and candelabra plant.

Habitat: Bottom growth in lakes, ponds, and rivers.

Description: This macroalgae grows in dense mats and mimics the structures of vascular aquatic plants. The alga feels rough to the touch due to calcium deposits on their surface. *Chara* also emits a musty, garlic-like odor. This alga has whorls of 6 to 8 branchlets that radiate off the "stem" (since this is not a vascular plant it does not have a true stem). Each alga consists of about 3 to 4 "giant" cells that are approximately 3 to 4 inches long. *Chara* sometimes forms mats along the bottom of waterbodies.

Identification Tips: *Chara* can be distinguished from *Nitella* by its skunky odor and rough feeling.

Plant Facts: This plant serves as the host of many other algae by supporting them on its surface. Muskgrass serves as food for many invertebrates like the hydra and small crustaceans. Salamanders and newts lay eggs in the beds of *Chara* and waterweed, and the small jelly-like eggs may be attached singly to a plant.

Nitella (*Nitella* spp.)

Alternate Name: Stonewort

Habitat: Lakes and ponds.

Description: This alga is similar to muskgrass, but tends to form in deeper waters. *Nitella* has whorls of 6 to 8 branchlets off the main stem, and may have forks branching off those branchlets. May form dense mats on the bottom of waterbodies.

Identification Tips: It can be distinguished from muskgrass by its lack of both a garlic-like odor and calcium deposits. This alga also has branches at the ends of its branchlets, where muskgrass has straight branchlets.

Plant Facts: This plant serves as food for many herbivores.



Photos courtesy of Don Cameron, Maine DEP

Microalgae

The Bluegreen Algae (*Cyanobacteria*)

Anabaena spp.



Habitat: This organism is found throughout the water column and can make the water appear blue-greenish in color when in bloom.

Description: *Anabaena* is a filamentous cyanobacterium that is capable of fixing nitrogen from the atmosphere. It is commonly found throughout New Hampshire's waterbodies during the summer months and can bloom excessively during late summer.

Cyanobacteria Facts:

Cyanobacteria can have toxins associated with them, including neuro- and hepatotoxins, that can be harmful to humans and animals when present in high concentrations.

If you suspect a severe algae bloom of any type contact the NH Department of Environmental Services Limnology Center (contact information is located in the beginning pages of this publication). Biologists can perform a microscopic analysis of a sample to provide an organism identification. High cyanobacteria cell counts may necessitate the posting of swimming advisories or water use restrictions.

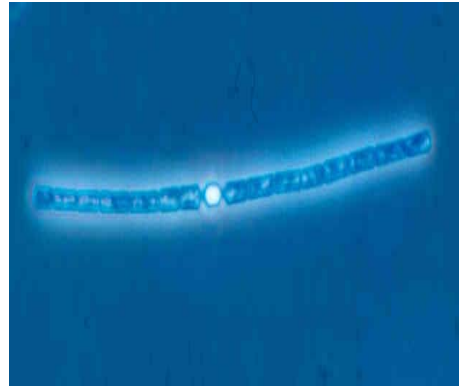
Aphanizomenon

Habitat: *Aphanizomenon* is generally found in more nutrient enriched waters, and may form dense blue-green or brilliant green surface scums.

Description: *Aphanizomenon* is a filamentous cyanobacterium that can either be present as a single filament or as a rafted colony. Rafted colonies can be visible to the unaided eye.

Cyanobacteria Facts:

Aphanizomenon is a documented neurotoxin producer (nerve toxin) that can be harmful to humans and animals. Interestingly, this cyanobacterium, as well as others, are recommended as a dietary supplement and anti-oxidant.

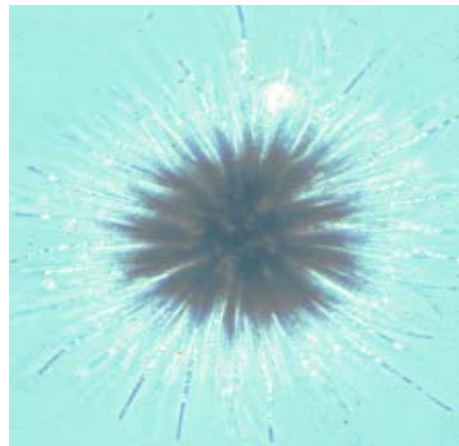


Gleotrichia

Habitat: *Gleotrichia* is found in lakes and ponds with varying nutrient concentrations.

Description: This colonial cyanobacterium is visible to the naked eye in the water column, and often appears as small fuzzy white dots when abundant.

Cyanobacteria Facts: *Gleotrichia* has rarely been known as a toxin producer, but a recent study on Lake Sunapee showed that this cyanobacterium may have the ability to produce microcystin. Locations with blooms have been documented in nutrient rich waters of eutrophic waterbodies, but also in oligotrophic waterbodies like Lake Sunapee in New Hampshire. Its sheer presence in a waterbody is not necessarily an indication of poor water quality.



Microcystis



Habitat: Can be present in most freshwater systems.

Description: *Microcystis* is toxic in larger concentrations (blooms) which occur in the later months of summer when the waterbody is excessively warm with high amounts of nutrients. This alga may be seen in large masses if their concentration is elevated.

When the plant cells die, the toxin microcystin is released into the water. This poses a hazard to humans and animals that consume the water because this compound is highly toxic to liver cells of most organisms. Consistent water testing is needed to determine if toxins are present.

Oscillatoria



Habitat: This cyanobacterium forms clumps of greenish blobs at the water's surface, or it could be sparsely distributed throughout the water column. It may also form a thin layer over the bottom sediments. This cyanobacterium can grow under many conditions and is tolerant of high levels of pollution.

Description: *Oscillatoria* is a cylindrical unbranched filamentous cyanobacterium. When it blooms it forms small, bright green clumps that resemble 'sweater fuzz' floating in the water column.

Cyanobacterial Facts:

Oscillatoria cells can regulate their buoyancy in the water column, allowing them to occupy different depths, and even cover the lake bottom sediments. *Oscillatoria* can produce toxins that cause skin rashes.

The Diatoms (*Bacillariophyceae*)

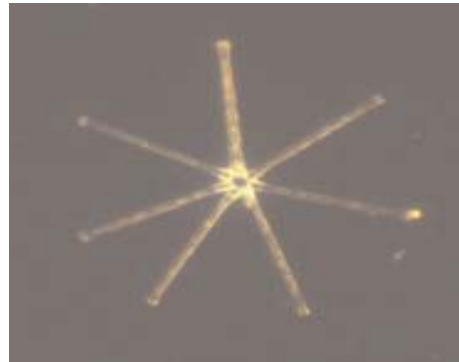
Habitat: Most lakes, ponds, and rivers in New Hampshire. Also found in soil and moss.

Description: Diatoms have silica (glass-like) 'shells' or **frustules** that vary in shape, size, and design, like those shown in the images on this page.

Algae Facts: Diatoms are used in **paleolimnology** to determine water quality conditions throughout the lake's history. Some species relate to the pH of a waterbody, while other species reflect the nutrient content of the lake. Changing conditions of lakes over time bring with them changes in algal community composition, including changes within the diatom group. Because the glass-like shells of diatoms persist in the sediments of waterbodies and can be aged with carbon dating, scientists can use them to recreate a picture of what the algal community in the lake looked like hundreds of years ago.

Diatoms generally peak in our waterbodies in the spring (known as the Spring Diatom Index), when silica is generally in higher supply after the winter months).

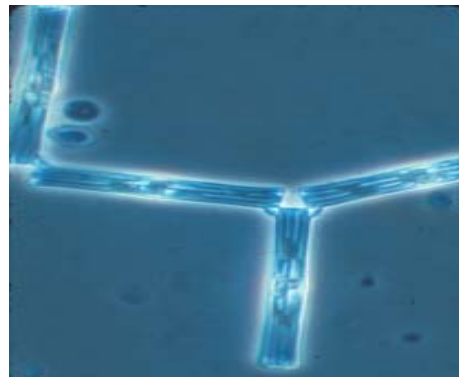
Diatoms produce relatively high amounts of oxygen when they photosynthesize..



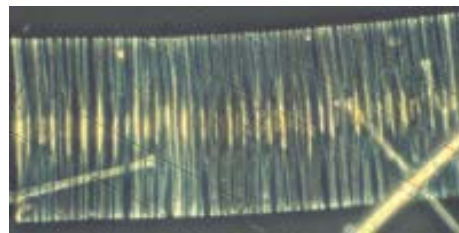
Asterionella



Navicula



Tabellaria



Fragillaria

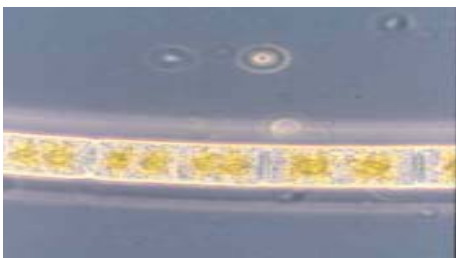
The Green Algae (*Chlorophyceae*)



Closterium



Pediastrum



Zygnema



Gleocystis

Habitat: This large group of fresh-water algae is found in 'clouds' underneath the water surface, or sparsely throughout the water column as individual cells or colonies. Green algae can also be found in terrestrial substrates, puddles, or tree bark.

Description: This large group of fresh water algae is composed of approximately 350 genera and 2,650 species.

Algae Facts: Green algae, along with other algae, provide the basis of the aquatic food chain. These microorganisms are consumed by **zooplankton**, which in turn are fed on by larger organisms. This chain extends to the larger fish in the ecosystem and eventually to humans and other terrestrial animals.



Spirogyra



Spirogyra, Mougeotia, and Zygnema forming cloud-like growths over lake bottom

The Golden Brown Algae (*Chrysophyceae*)

Habitat: Most lakes, ponds, and rivers. Also found in moist soils and moss. Common in slightly acidic waters. A very common group of algae in New Hampshire's waterbodies.

Description: These algae are characterized by a goldish-brown or reddish color. Some species have scales and spines, some are colonial, and some are single cells.

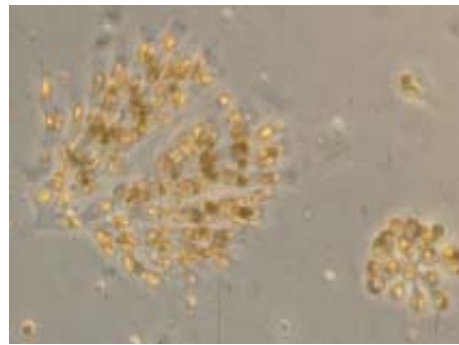
Algae Facts: When present in high numbers, some species of golden brown algae can impart taste and odor problems to water, including scents like geranium, fish, cucumber, grass, and violets.

These algae can survive unfavorable conditions by forming **endocysts**.

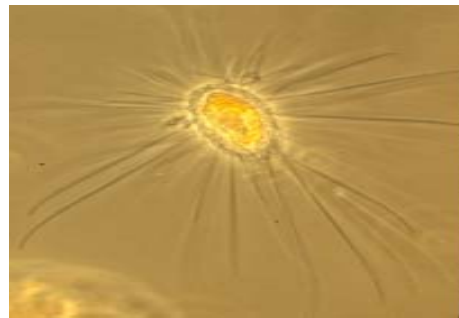
These algae are photosynthetic, but can also develop structures to catch small organisms for food.



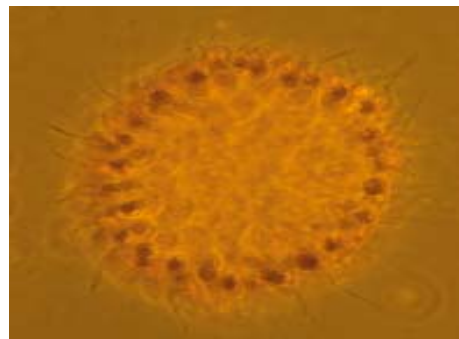
Chrysosphaerella



Dinobryon



Mallomonas



Uroglenopsis

(The Dinoflagellates) *Pyrrophyceae*



Ceratium



Peridinium

Habitat: Nutrient rich lakes, ponds, and rivers. Also found in sand and snow.

Description: These algae are generally larger in size and have two flagella that help propel them in a spiraling motion through the water column.

Algae Facts: Due to their large size, these algae are not often grazed upon in the water column by small filter-feeding organisms. Rather, they are eaten by large zooplankton and fish.

Dinoflagellates can produce toxins and are responsible for red tides in the ocean.

There are approximately 550 genera and 4,000 species within this family of algae.

Glossary

Acidic: Water classified at a pH of less than 7, but more often below a pH of 6.

Alkaline: Water that is high in calcium carbonate concentration. This water is also found at a pH of greater than 7.

Allelopathic: Toxic secretions produced by the plant as a defense mechanism.

Annual: A plant that lives for a year, completes its lifecycle, then dies back.

Anther: The pollen-bearing portion of the stamen.

Asexual Budding: Production of a clone from the original cell.

Axil: The angle between an organ and the axis origin, for example between the leaf and the stem.

Basal Leaves: Leaves found at the base of the stem.

Biodiversity: Having immense diversity of an ecosystem.

Brackish: Fresh water that is being effected by salt water and therefore has a slight salt content.

Bract: A modified leaf that can be found under an inflorescence, as in water-milfoils.

Caltrop: The woody horned seed of water chestnut.

Calyx: The outer whorl or protective leaves of a flower.

Carnivorous: Consumer of animals.

Emergent: Extending above the water line.

Eutrophic: Water high in nutrients like phosphorus and nitrogen.

Floating: Category of plants that are generally found drifting on the surface of the water; generally not connected to the sediments by roots.

Frustule: The silica case of a diatom.

Genus: A classification category or level of plants.

Glycosides: Toxic sugar production as a defense mechanism.

Herbivore: An organism that consumes vegetation exclusively.

Inflorescence: a grouping of flowering bodies of a plant.

Invasive: Refers to species' harmful impacts on an environment; usually characterized by aggressive growth that leads to the species dominating an area.

Keel: A central ridge.

Lacunae: Large cells in plants that are filled with air; air chambers.

Macrophyte: A higher plant.

Mesotrophic: A lake classification category that is intermediate to oligotrophic and eutrophic.

Node: The level of the stem where one or more leaves are protruded.

Neutral: Referring to pH 7; neither acidic or alkaline.

Oblong: Longer than broad, with parallel sides.

Oligotrophic: Referring to a lake classification; generally low nutrients, few plants and algae, high oxygen throughout water column; top rating.

Perennial: Living for 2 or more years, dying back to the roots at the end of the growing season, then re-growing in the spring from the roots.

Petiole: Leaf stalk.

Paleolimnology: A study of the history of a lake through the evaluation of lake sediments and related fossils.

Photosynthesis: The process in which chlorophyll containing plants utilize sunlight, water and carbon dioxide and convert it to sugar, starches, water and oxygen. This process is the fundamental basis of all life on earth.

Pinnate: Compound, with leaves arranged on two sides of the axis.

Pistil: The seed-bearing organ of the flower that consists of the ovary, style, and stigma.

Poultices: Heated, soft mass applied to a sore portion of the body.

Precipitate: The separation of a substance from solution or suspension by chemical or physical change.

Rhizome: Any prostrate of subterranean stem.

Rosette: A cluster of leaves originating from one central location.

Sepal: The leafy portion of the calyx.

Septate: Divided into parts, as in the roots of pipewort, where the roots have thin white lines perpendicular to the length of the root.

Species: A grouping of related plants or animals.

Stipule: Extensions or attachments of a leaf base that are characteristic of some species, particularly the pondweeds.

Submergent: Plants that have most of their vegetative growth underwater.

Stagnant: Still water; not flowing.

Stamen: Pollen-bearing organ of the flower.

Stigma: The portion of the pistil that receives the pollen.

Style: The tapered portion of the pistil.

Symbiotic: Two different organisms living together in a way that benefits one or both of them.

Terrestrial: Living on land.

Thallus: A vegetative body.

Tuber: A thick, short subterranean stem, sometimes an extension from the root.

Umbels: Cluster of flowers with stems of equal length that originate from the main stem.

Zooplankton: Microscopic invertebrates (animals) found throughout the water column.

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