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## CHAPTER 5

# AQUATIC PLANT IDENTIFICATION AND MANAGEMENT

One of the most important steps in aquatic plant management is the correct identification of plant species. A taxonomic key or plant outline can be very helpful to aquatic pesticide applicators.

The following discussion includes some of the common nuisance aquatic plants and algae found in Michigan, their identification and suggested strategies for successful management. Some non-weedy plant species commonly found in aquatic areas are included.

### Algae

Algae are generally classified as being either *planktonic*, *filamentous (attached)* or *erect*. All types of algae obtain energy from sunlight. Algae are simple plants without true roots, leaves or flowers. They reproduce by cell division, plant fragmentation or spores.

**Planktonic algae** are individual algae cells that are suspended in the water or form a film on the surface. Planktonic algae are responsible for low water clarity and can also cause allergic and/or toxic reactions in sensitive people. The most common group of nuisance planktonic algae is the blue-green algae. These species may turn the water a deep blue-green color. The blue-green algae can form green or dark green surface scum. They may accumulate on the downwind sides of lakes, forming unsightly gelatinous masses on shorelines.

The blue-green algae are also noted for creating taste and odor problems in drinking water supplies where they accumulate. Some species are toxic and have been responsible for livestock illness and death. Natural die-off may cause summer-kill of fish due to oxygen depletion.

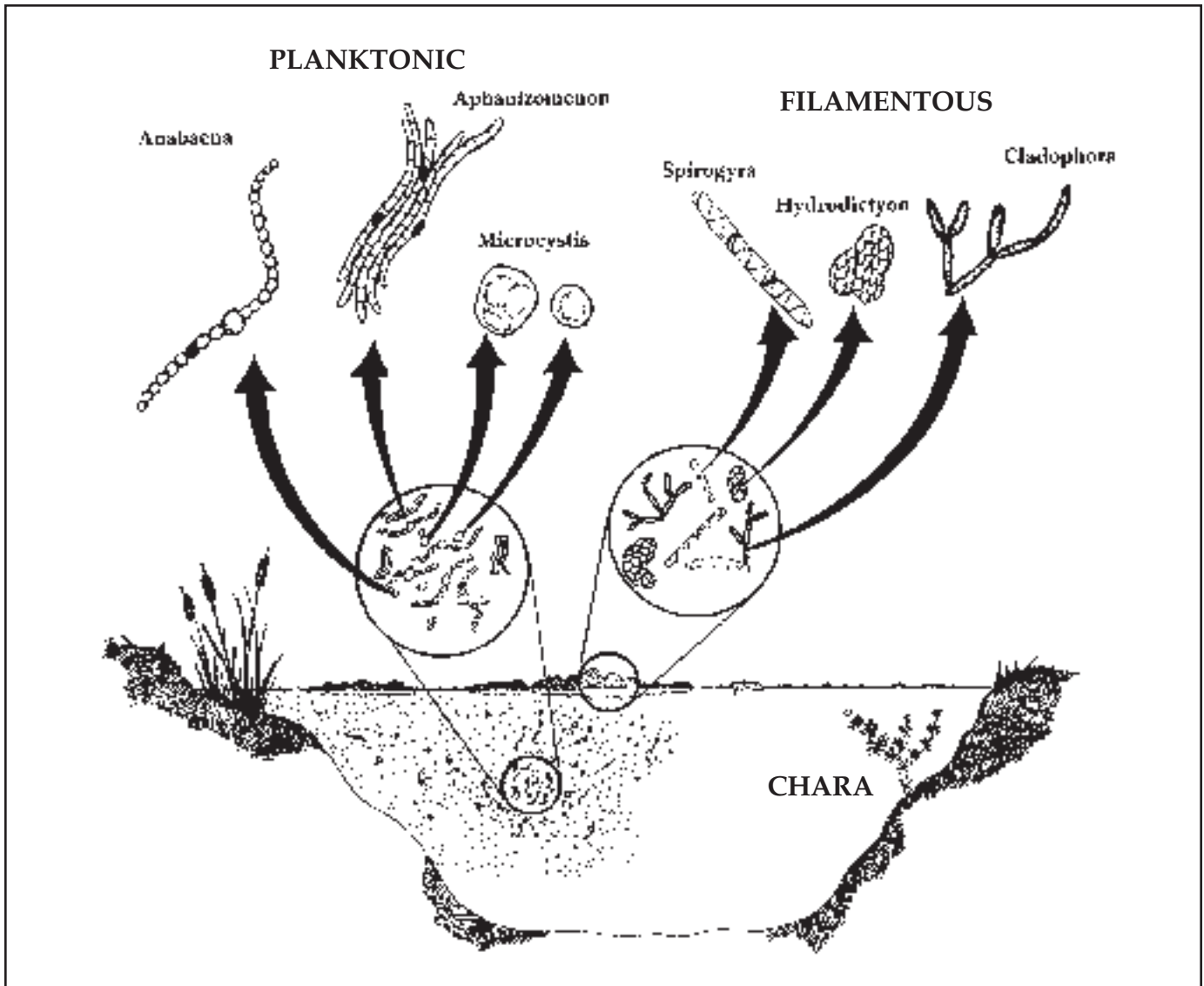
Many of the lakes and reservoirs plagued by nuisance planktonic algae are also characterized by fertile hydrosols. Reducing the planktonic

algae may then enhance production of rooted macrophytes by improving light penetration to the fertile hydrosols. Therefore, anyone planning control strategies for planktonic algae should consider the potential for increased production of rooted macrophytes. This possibility should not necessarily be thought of as something negative — macrophytes can be useful and are easier to manage, if necessary.

Several **filamentous algae** genera have become significant nuisances in northern lakes. Filamentous algae can be split into two groups depending on growth habit: attached and planktonic (free-floating). Both types can be persistent and difficult to manage. The attached algae are found on docks, seawalls, boats and other hard surfaces. The texture varies from slimy to coarse, resembling wet cotton or hair.

Filamentous algae often become a nuisance on hydrosols where nuisance rooted macrophytes have been indiscriminately removed. They also become a significant nuisance in the presence of macrophytes when the concentration of nutrients in the water column is high. Reducing nutrient loading may help to control nuisance filamentous algae if they are not growing in close association with nutrient-rich sediment.

The planktonic-type filamentous algae may form mats on the sediments, continually increasing in size and layers. As new layers grow on top of old layers, the algae mat becomes increasingly dense and the lower layers become shaded and die. Gases are produced as the dead algae decompose. As these gases combine with those normally released from bottom sediments, they are trapped below the algae mat. These gases can actually buoy the mats upward to the water's surface. These surface mats of algae are unsightly, trap debris, and are commonly referred to as "pond scum."



Algae habitats.

The **erect algae** (*Chara and Nitella*) resemble vascular plants. Erect algae grow from the sediment. Although they do not have roots, they do have hold-fast structures that anchor them to the bottom. Erect algae are considered valuable in maintaining water quality. They cover the sediments and absorb nutrients that are released. This aids in preventing the establishment of the other nuisance algae groups and other undesirable plant species.

Control of the various algae groups can be achieved by several similar techniques, though application rates and methods will vary. One approach is to broadcast an algaecide over the entire water and algae surface. Large mats of algae should be broken up with a boat propeller or high-pressure stream of water to maximize the treatment effectiveness. Directly spraying the floating mats and attached filaments will give the best results.

Control of erect algae is not usually recommended. In cases where control is desired, a granular algaecide is recommended because the pellets sink to the bottom and maintain contact with the algae. Chara can be difficult to control, particularly in hard water. Two or more treatments with contact herbicides may be necessary, and best results are obtained when the plants are young and uncalcified.

Take care when using copper-based algaecides. Certain doses (even very low doses) of copper are toxic to fish and aquatic organisms, especially to cold-water fish in soft water. Few lakes in Michigan have soft water (less than 50 ppm calcium carbonate).

### Aquatic Flowering Plants

Aquatic plants can be described according to their growth habits as follows:

**Submersed plants.** Plants grow completely below the water surface and depend on the surrounding water for support of the plant body.

**Emersed or emergent plants.** Plants are rooted in the sediments, extend above the water surface and are self-supporting.

**Free-floating plants.** Plants are not attached to the sediments and float on the water surface or just below it. Most have roots that extend into the water for nutrient uptake.

**Rooted floating plants.** Plants are attached to the sediment and have leaves that float on the water surface. These plants may or may not be self supporting.

A great percentage of aquatic weed control measures implemented in Michigan are for the control of **exotic species** — plants native to other regions, countries or continents.

Many aquatic exotic plant species are capable of **displacing** (choking out — outcompeting) native and beneficial plants. Some exotic plants — Eurasian watermilfoil and curly-leaf pondweed in particular — form dense mats of near-surface vegetation and cover expansive areas. These mats are nearly impenetrable by watercraft. They not only make fishing, boating and swimming difficult, but may also adversely affect the chemistry of underlying waters, degrading fishery and fish-food organism habitats.

In contrast, many of our native aquatic plants exhibit a more open growth habit with patchy distribution. This type of plant “architecture” is more favorable for other aquatic organism needs. See pages 149-152 for identification of aquatic plants commonly found in Michigan.

Some plants that have been native to the southern United States are moving northward

in distribution and becoming nuisances. These include the rooted macrophytes fanwort (*Cabomba caroliniana* A. Gray), southern naiad (*Najas guadalupensis*) and the filamentous *Pithophora* spp. algae. Our region’s native plants usually keep themselves in check and do not grow to nuisance proportions.

Native plants fulfill necessary and beneficial roles in the aquatic ecosystem. They serve as food, habitat or shelter for other aquatic organisms. They serve as stabilizing features for the substrate, and they filter storm and runoff water as it moves through the aquatic area. Identifying both native and exotic plants allows you to anticipate the changes in aquatic environments due to exotic plant invasion or your management practices.

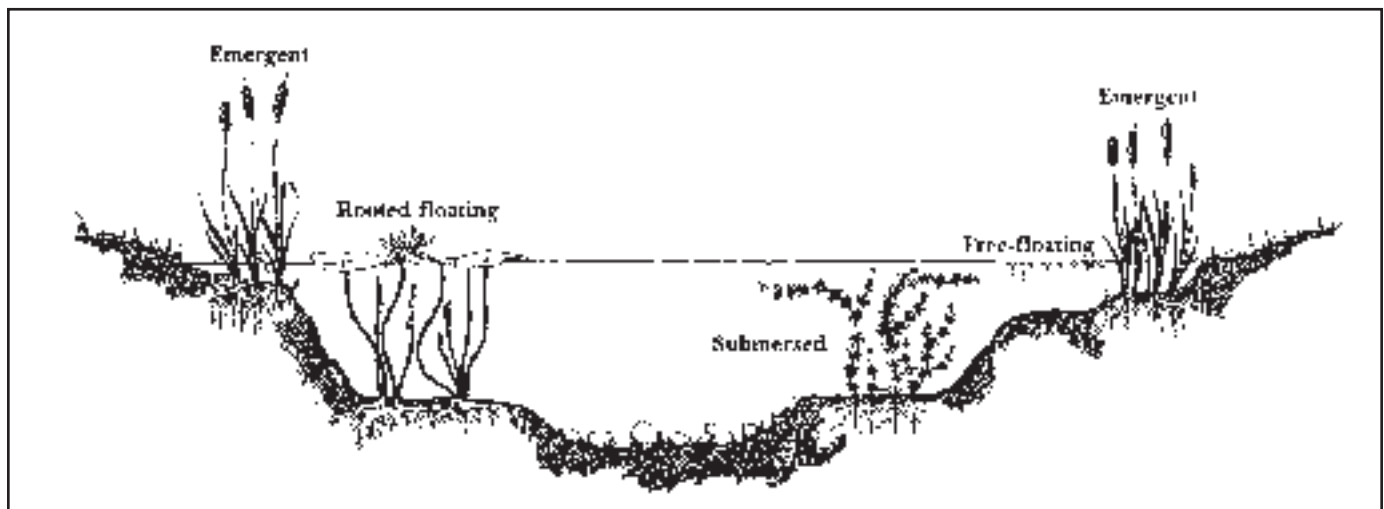
As an aquatic pest manager, strive to promote the continued existence of beneficial plants and minimize the production of weed species.

Conditions will vary from site to site, even on the same lake. Management tactics may not be effective under all treatment conditions. Be familiar with the techniques and products you are using and how they may react with and change the conditions and plant diversity at the treatment site.

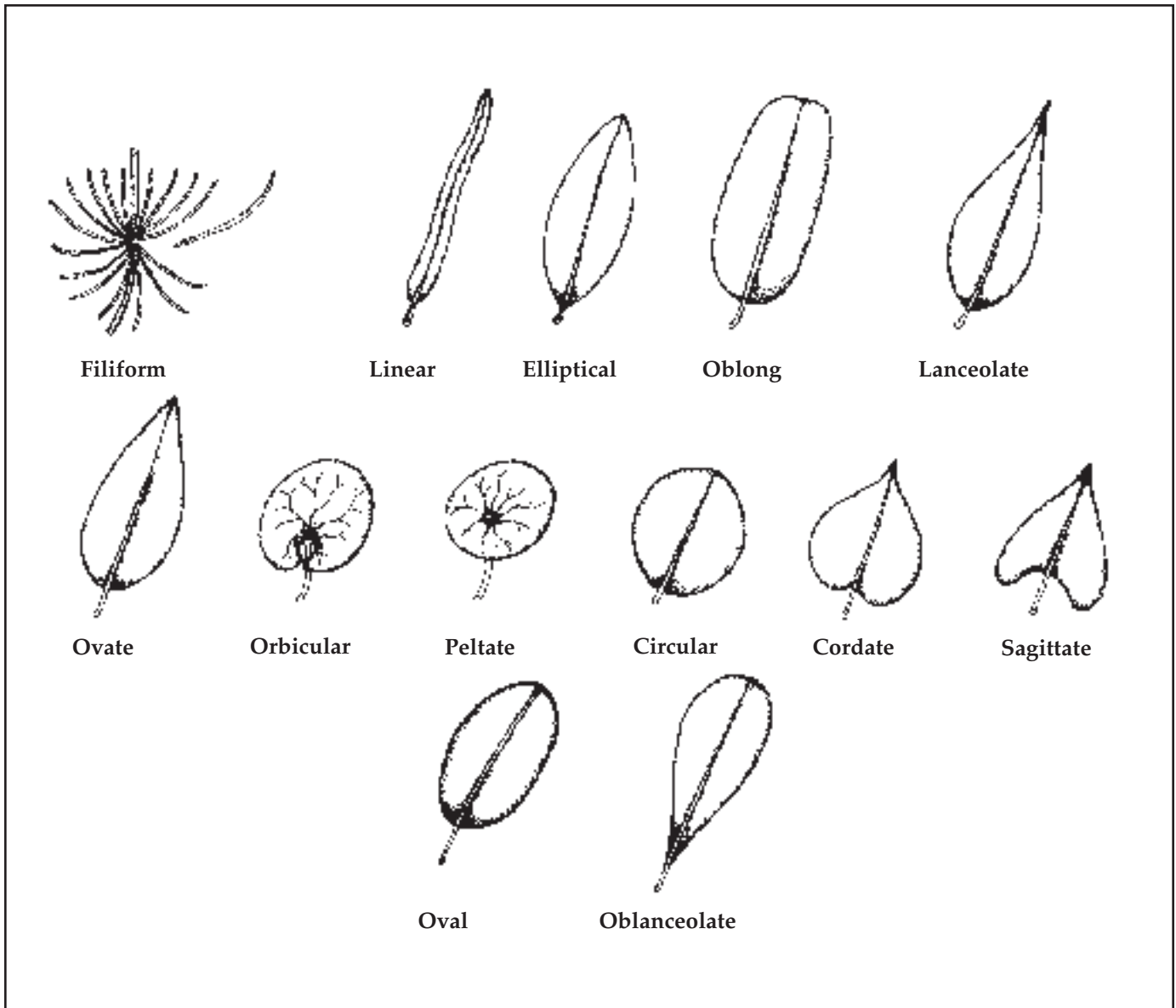
## Submersed Plants

### Watermilfoils

The watermilfoil species are members of the genus *Myriophyllum*. This group is composed of plants that grow submerged, grow at the surface and may have small flower stalks that extend above the water surface. Most watermilfoils are **native** plants requiring minimal management because they are rarely present in nuisance proportions. The watermilfoils reproduce mainly by **fragmentation** (plant pieces break off the parent



Four groups of aquatic flowering plants.



Leaf forms useful in identifying aquatic plants.

plant, develop new roots and become reestablished) and **stolons** (lateral stems). Reproduction by seed is rare for watermilfoils in Michigan.

The major watermilfoil of concern in the United States is the exotic Eurasian watermilfoil (*M. spicatum*). Eurasian watermilfoil was introduced to the United States in the 1940s. This species is opportunistic — Eurasian watermilfoil is adaptable to many growing conditions and quickly moves into areas that have been disturbed or changed. Because of this adaptability and their rapid growth rate, they can become established more quickly than other species. They easily grow to nuisance proportions in shallow and relatively deep water. Eurasian watermilfoil is of limited value to wildlife or fisheries because of its undesirably dense growth habit. Eurasian watermilfoil frequently displaces (chokes out) native plants.

Eurasian watermilfoil is susceptible to some systemic herbicides. Certain systemic aquatic herbicides can be used as **selective herbicides** to selectively remove Eurasian watermilfoil. Selective herbicides are effective only against certain species and are able to control unwanted plants (target plants) without serious injury to desirable species. Because Eurasian watermilfoil grows faster than most native species, the consistent use of **contact herbicides** (kills only tissue the herbicide touches, allowing regrowth from the roots) favors the continued reestablishment of this plant. Harvesting is **not** recommended for managing Eurasian watermilfoil because this results in its spread by fragmentation. Long-term harvesting, like the consistent use of contact herbicides, encourages Eurasian watermilfoil's displacement of native or more desirable plant species.



Eurasian Watermilfoil (*Myriophyllum spicatum*)

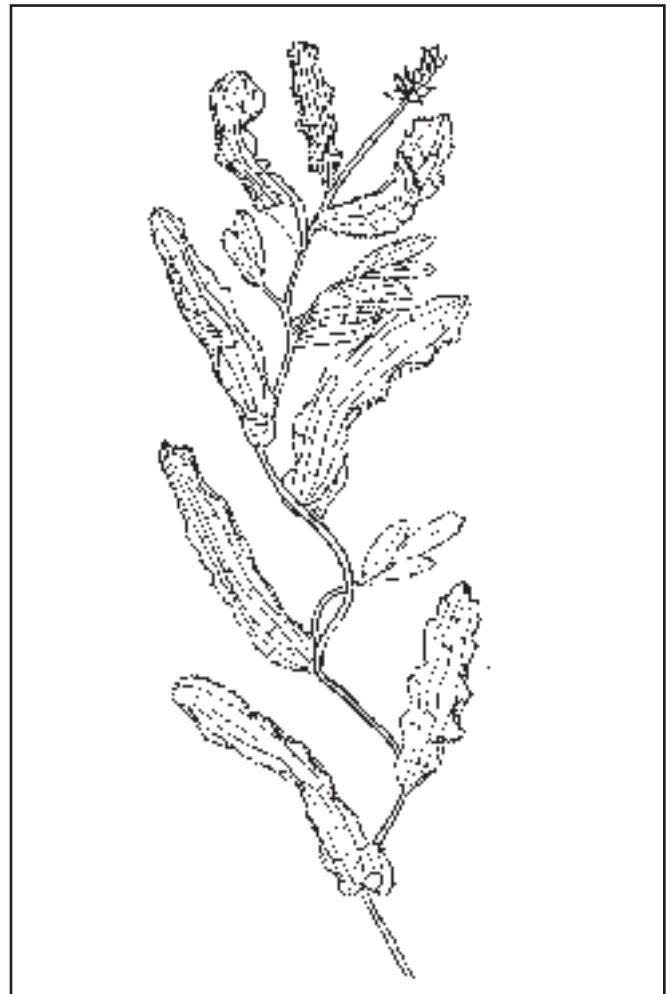
### Pondweeds

The pondweeds are a very diverse group of aquatic plants. Identification of pondweed species can be difficult because structural differences among species are often small. Also, environmental factors often influence the growth form of a species, and hybridization between species is common. The growth form of a species may be related to current velocity, depth, clarity, temperature of water, time of year, nutrients, bottom type, etc.

Most pondweeds are beneficial native species that provide excellent habitat and food for fish, aquatic invertebrates and migrating waterfowl. One species, curly-leaf pondweed (*Potamogeton crispus*), is an exception. Like Eurasian watermilfoil, this species is an exotic. It was brought to North America in the mid-19th century. Curly-leaf pondweed has since spread throughout the continent and become a pest in many locations.

Curly-leaf pondweed gets its name from its wavy leaf margins. This species can grow up to 6 feet and may spread by re-rooting of plant fragments. Curly-leaf pondweed emerges early in the spring. It flowers and sets seed in the late spring and early summer. In Michigan dieback occurs, typically by the first week of July. After curly-leaf pondweed dieback occurs, it usually remains

unnoticed until the following spring although it has been known to reappear due to regrowth of juvenile plants in late summer to early fall. Apparently these small plants are capable of overwintering below ice cover.



Curly-Leaf Pondweed (*Potamogeton crispus*)

Curly-leaf pondweed reproduces primarily by rhizomes and dormant leaf structures called turions. These turions can lie dormant in the substrate for several years, sprouting only when conditions are right. These dormant structures are not affected by herbicides.

Curly-leaf pondweed can be a serious nuisance during the early part of the summer when recreational activities are at a peak. Early control of this species is recommended so that the plant is not allowed to grow to large proportions and cause problems when dieback occurs in July. If large amounts of plant material die and decompose when water temperatures are high, the potential for oxygen stress (radically decreased dissolved oxygen [D.O.] levels) on the water body and its aquatic organisms is great. Many organisms can suffocate when the D.O. levels drop.



**Broad-Leaved Pondweeds:** (A) Richardson Pondweed (*Potamogeton richardsonii*) and (B) Floating-Leaf Pondweed (*Potamogeton natans*)



**Narrow-Leaved Pondweeds:** (A) Leafy Pondweed (*Potamogeton foliosus*) and (B) Flat-Stemmed Pondweed (*Potamogeton zosteriformis*)

The other pondweeds can be classified as either narrow-leaved pondweeds, which have thread or ribbon-like leaves, or broad-leaved pondweeds, which have leaves usually wider than 1 cm (about a half inch). Members of these two general classifications can be used for food, cover, and shelter by wildlife and fish. Pondweeds are among the most important waterfowl foods in the United States.

Pest species of pondweeds can be controlled in a variety of ways. Applying certain herbicides early in the season can selectively remove curly-leaf pondweed without affecting either group of beneficial pondweeds which sprout later in the season. Both application timing and herbicide formulation allow certain herbicides to be used as selective controls of unwanted plants while avoiding serious injury to desirable plants.

The broad-leaved pondweeds are hardier than curly- or thin-leaved pondweeds and may require a combination of herbicides for control. Always consult the product label for mixing instructions and limitations. Most pondweeds can be mechanically harvested.

### Naiads

The naiads (*Najas* spp.) are sometimes desirable and at other times considered a serious nuisance. They are desirable when found as low-growing lake bottom covers and are valuable to wildlife and fish. Naiads often grow in thick clumps, and they can be short, lake bottom dwellers or grow to heights that will reach the surface. When they grow to the surface and create impenetrable masses of vegetation, they become a nuisance.



**Southern Naiad (*Najas guadalupensis*)**

The naiads differ from other aquatic pest species in that they are **annuals** (complete their life cycle in one year) that overwinter as seed. Most other submersed aquatic species overwinter in a vegetative condition or produce special overwintering structures. The naiads are adapted to fluctuating water levels, possibly because of the seeds' hardiness. As a result, naiads often become serious nuisances in shallow areas managed by repeated drawdowns.

Naiads can reproduce from fragments as well as by seeds. If control is necessary, harvesting is not usually an effective option because these plants grow low to the ground and fragment easily.

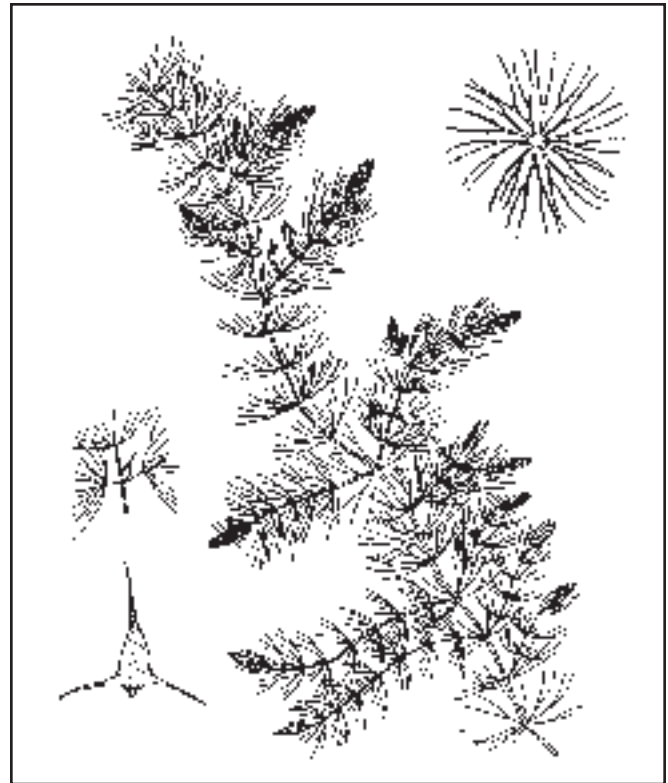
### Other Submersed Native Plant Species

Most other native submersed aquatic plant species require little management. It is important to consider these non-pest plants in the overall lake management goals and recognize that some plants provide desirable features. Therefore, plan for areas that may serve as plant preserves.

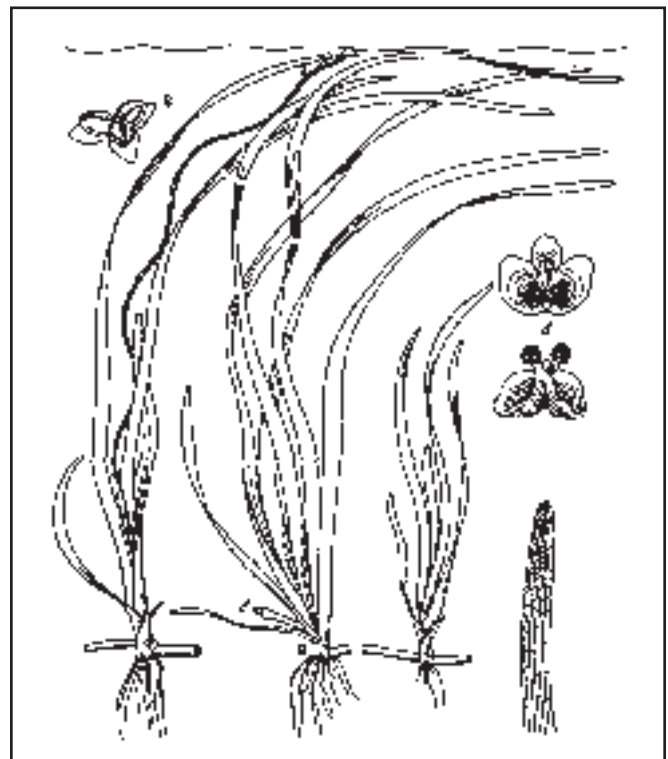
Species diversity should be maintained by protecting the most desirable species from exotic plant invasions. Certain groups of plants benefit the lake by forming unobtrusive and valuable bottom covers that prevent wind-induced currents from suspending bottom sediments in the water body. It is also vital to recognize the food, shelter and habitat value that many plants provide for fish, waterfowl and other aquatic organisms. If a group of plants becomes a nuisance, they must be managed cautiously and with consideration for their many positive qualities.

**Coontail** (*Ceratophyllum demersum*), found in relatively quiet and deep water, is usually less than 3 feet long. It has clusters of finely forked leaves that appear bushy (like a raccoon's tail) at or near the ends of the stems. Leaves have small teeth along one side and are sometimes stiff with a coating of lime. Coontail harbors significant amounts of food for fish and waterfowl because its many fine branches are available for colonization by small aquatic animals. Coontail breaks into fragments easily and spreads in this manner. Harvesting may be effective in the short run, but, because of fragmentation, it is usually not recommended. Winter drawdowns may also increase coontail populations.

**Wild celery or tape (eel) grass** (*Valisneria americana*) is a hardy plant with long, limp, ribbon-like leaves all arising from the base of the plant. In summer, plants may have small pods on the ends of long stalks that originate at their base. The



Coontail (*Ceratophyllum demersum*)

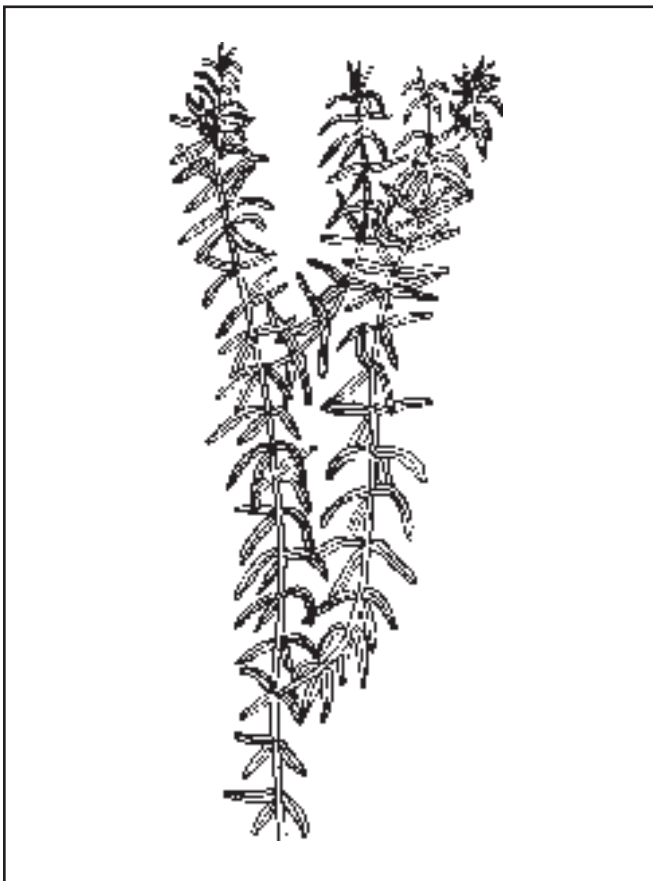


Eelgrass (*Valisneria americana*)

leaves and underground tubers of wild celery are preferred food for waterfowl such as mallards, canvasbacks and goldeneyes. Because it is an excellent wildlife food, people plant it to attract waterfowl. Excessive growth during July and

August in shallow water may present a problem. Try hand pulling, raking or screening the bottom if you must control or thin problem areas. Herbicide treatments are not recommended in areas where fish may be trapped — herbicide application rates required for control may harm the fish.

**Elodea** or **waterweed** (*Elodea canadensis*) is rarely a nuisance. Elodea provides cover for bluegills and perch and supports insects valuable as fish food. It has slender stems up to 7 to 9 feet long with three leaves in clusters around the stems. It grows completely below the water surface. Leaves are bunched in whorls of three toward the ends of the stems where new growth occurs. Older leaves usually senesce (decline, fade) and break off the lower stems. Elodea grows best in soft sediments and cool water. Elodea may rapidly colonize an area and then decline in abundance within 5 to 7 years. If necessary, it can be managed with certain aquatic herbicides or harvested. If you're treating it with chemicals, wait until the plants have matured (early or midsummer). Try physical removal to control problem areas. Hand pulling, raking, dragging or screening the bottom are effective control methods if broken pieces are removed from the water to prevent new plants from regenerating from fragments.



**Elodea** (*Elodea canadensis*)

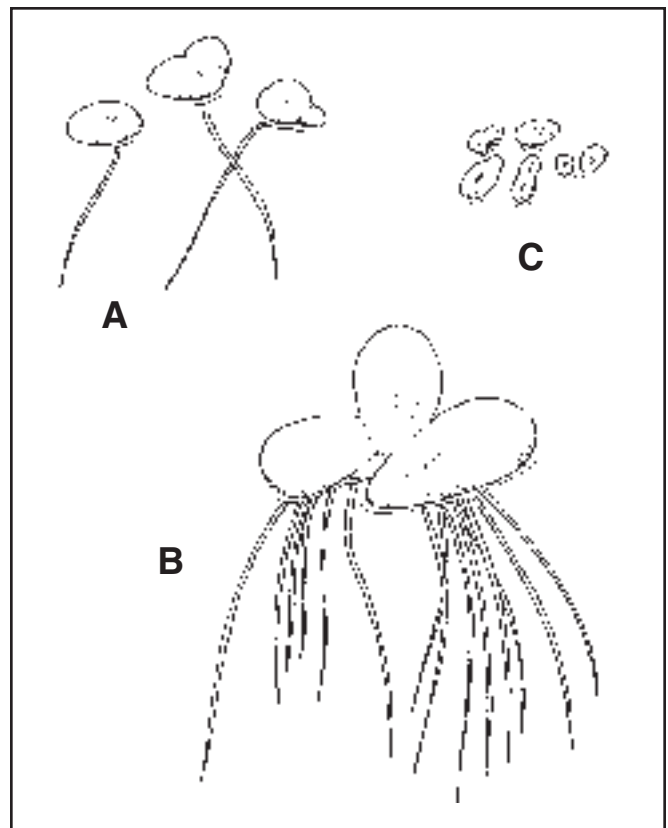
Elodea is similar in appearance to another plant called **hydrilla** (*Hydrilla verticillata*). Hydrilla is not native to North America and is a serious nuisance in lakes of the southern United States. It is distinguished from elodea by having five leaves in each whorl and a ridge of micro-fine spines on the midrib on the lower side of the leaf. It is not currently thought to be in Michigan, but if it is found or suspected, notify the MDNR immediately.

## Free-Floating Plants

### Duckweed and Watermeal

It is difficult to maintain control of **duckweed** and **watermeal** (*Lemna* spp., *Wolffia* spp., *Spirodela* spp.). Duckweed is a tiny, green, floating, oval plant often mistaken for algae. Roots may or may not extend from the underside. Duckweed reproduces by division and is common in quiet water such as ponds and backwaters.

Watermeal is the smallest of flowering plants, granular in size and usually very abundant when present. These tiny, floating, green plants do not have roots extending from the underside and are often mistaken for seeds. Because duckweed and watermeal are floating plants, both obtain their nutrients directly from the water, not a substrate.

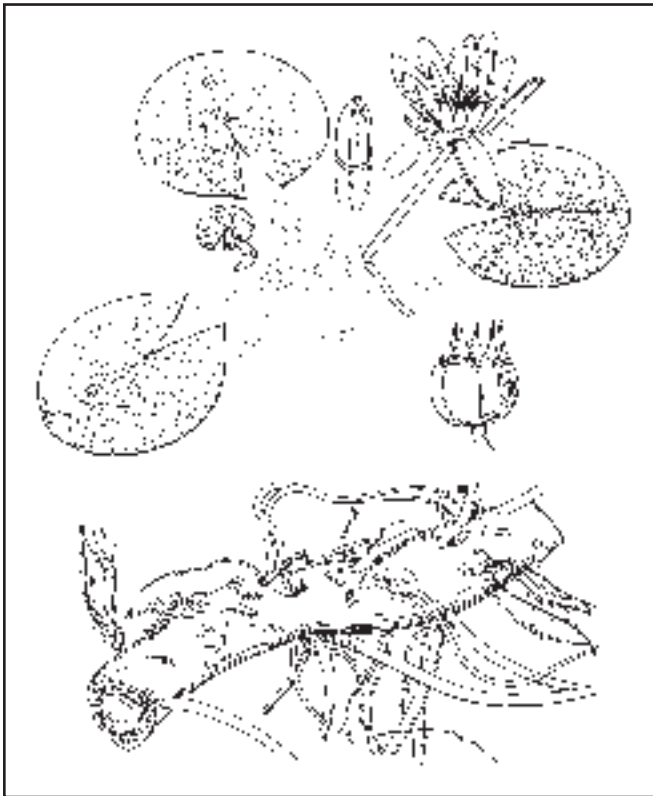


(A) Common Duckweed (*Lemna* spp.), (B) Giant Duckweed (*Spirodela* spp.), and (C) Watermeal (*Wolffia* spp.)

Duckweed and watermeal are noted for their rapid reproduction. When they become a nuisance, harvesting is not a feasible option because they pass through the belting. Effective herbicide control depends upon chemical contact with as many of the plants as possible. This includes those washed up along shorelines or trapped in back-water areas. The minute size of these plants makes it very easy for water to wash the herbicides off. Addition of a sticker (adjuvant) is recommended by most manufacturers to aid in maintaining herbicide contact with emergent plants.

## Rooted Floating Plants

Waterlilies or lily pads (*Nymphaea* spp., *Nuphar* spp.) are valued for fish cover and for their showy flowers, and they are often best left alone. Lily pads' flower color may be white, yellow or pink depending on the species or hybrid. Leaves range from 6 to 16 inches in diameter and may be heart-shaped or round with a **cleft** (a cut about halfway to the midvein of the leaf). Lily pads are common in shallow water and prefer muck or silt bottoms. Water lilies spread horizontally from thick, fleshy rhizomes. The white water lily is able to tolerate a wide range of water pH.



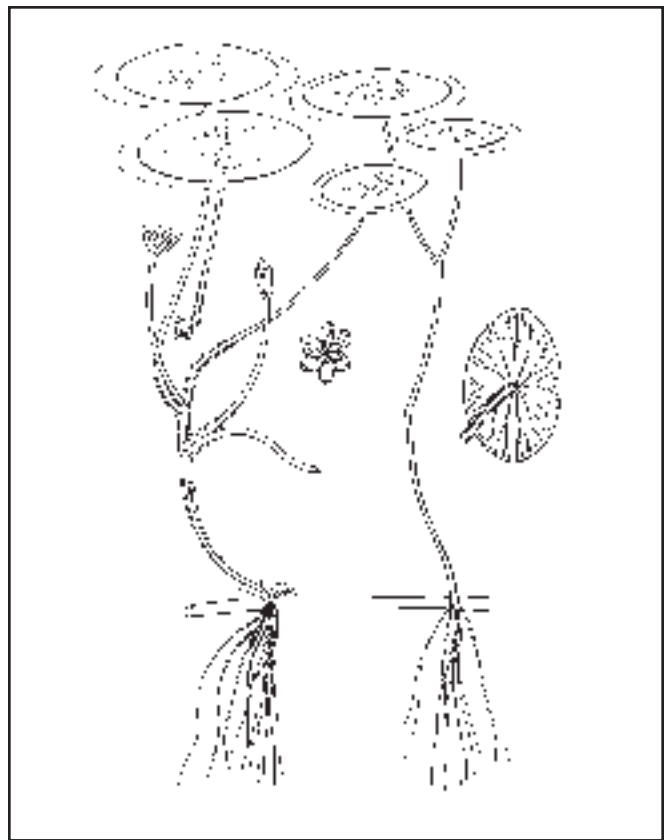
Waterlily (*Nymphaea* spp.)

Waterlilies may be intentionally planted for their beauty and their contribution to fish habitat. Some species are quite prolific and can create a

nuisance problem. If management treatments are needed, use the same strategy as for cattails. (See below.) Always consult the herbicide label for specific use, timing and rates. Because of the tough nature of the lily pad leaf and the **petiole** (the stalk of the leaf), it may take some time for the plant material to decompose.

**Watershield** plants (*Brasenia schreberi*) look similar to lily pads. They are found in shallow, acid waters throughout the eastern United States. Watershields have oval to elliptical leaves with smooth, unlobed edges. The petiole is attached to the middle of the leaf. The leaves may be 2 to 5 inches long. A slimy, gelatinous coating covers the underside of leaf and stem, particularly on mature plants. A dull, reddish purple flower is produced in early summer.

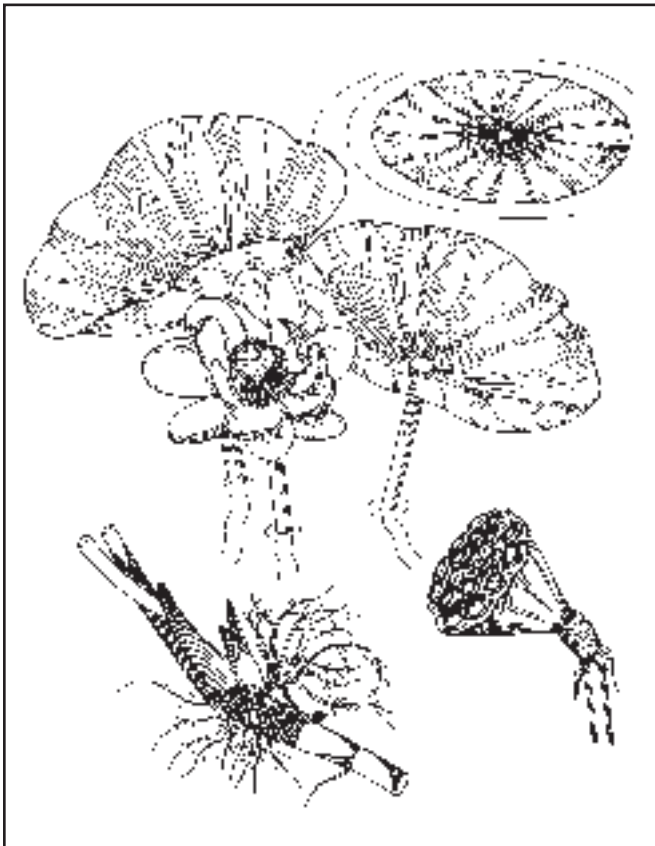
If watershield becomes a nuisance and a liquid herbicide treatment is made, take care not to wash the chemical off the leaf surfaces. Treat early in the season before the gelatinous coating develops.



Watershield (*Brasenia schreberi*)

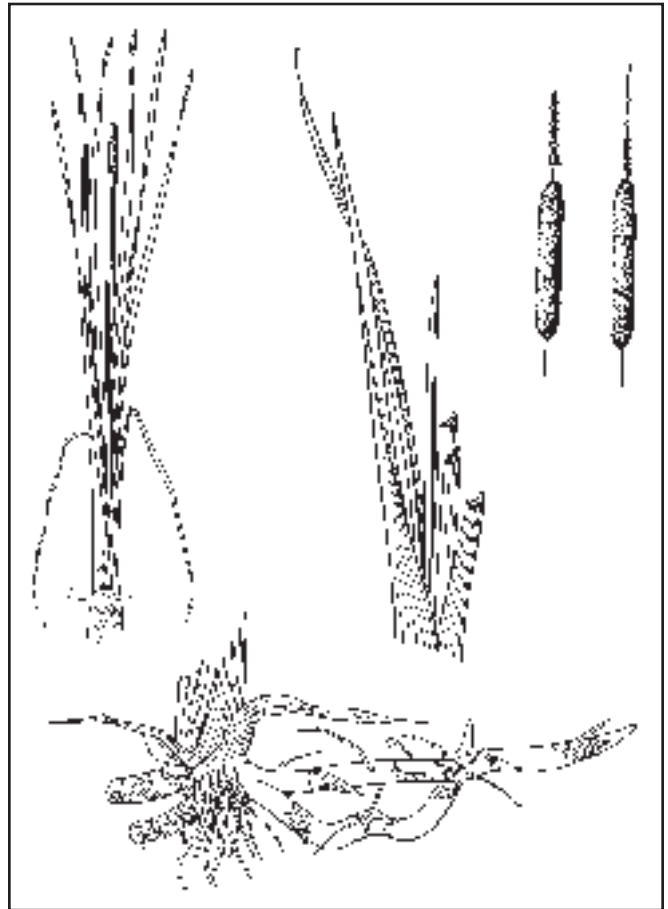
**American lotus** (*Nelumbo lutea*) grows in shallow areas of lakes and in slow-moving water. Plants have large, circular leaves up to 2 feet in diameter that extend above the water surface. The stem is attached in the center of the leaf, which is frequently cup-shaped. The seeds of this plant are a valuable food for waterfowl; the

starchy rhizomes are also edible. Lotus plants provide shade and cover for fish. The seed pods are sometimes sold commercially for flower arrangements. This plant does not normally constitute a nuisance.



American Lotus (*Neumbo lutea*)

temic herbicide before or after seedheads form. Consult the pesticide label for recommended timing and rates of systemic herbicides.



Cattail (*Typha* spp.)

## Emergent Plants

**Cattails** (*Typha* sp.) are highly regarded wetland plants that provide food and shelter for many species of wildlife and fish. Cattails have long, slender, grass-like stalks up to 10 feet tall. Cattails inhabit wet lowlands and water to 4 feet deep.

Cutting mechanically or by hand during the growing season gives temporary relief but requires repeated treatment throughout the season. Cutting off cattails at ice level during the winter sometimes reduces their stands the following year. Effective herbicide management options for cattails require either applying certain contact herbicides before seedheads form or using a sys-

**Purple loosestrife** (*Lythrum salicaria*) is an exotic, invasive species that outcompetes beneficial shoreline and wetland vegetation. It is very prolific (up to 300,000 seeds per plant) and has an extensive root system. People have aided its spread by using it as an ornamental plant. The purple flower spike is quite attractive.


The plant is of little value to wildlife and should be controlled as soon as infestations are discovered to prevent beneficial vegetation from being choked out. Treatment with a contact herbicide before flowering can be effective. Treatment with a systemic herbicide is best. Perform systemic herbicide treatments before seed formation to reduce seed dispersal and enhance long-term control.

**See pages 149-152 for photographs of aquatic plants commonly found in Michigan.**

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## Chapter 5 – Aquatic Plant Identification and Management Review Questions

Write the answers to the following questions, and then check your answers with those in the back of this manual.

1. Which statement concerning algae is incorrect?
  - a. Algae are classified as being either planktonic, filamentous or erect.
  - b. Algae reproduce by cell division, plant fragmentation or spores.
  - c. All algae obtain energy from sunlight.
  - d. Algae are simple plants with true roots.
  
2. What organism is commonly referred to as “pond scum”?
  
  
  
  
  
  
  
  
  
  
3. Eurasian watermilfoil and curly-leaf pondweed are examples of \_\_\_\_\_ plant species that can form dense mats of near-surface vegetation over expansive areas and adversely affect water chemistry and degrade fisheries.
  
  
  
  
  
  
  
  
  
  
4. What necessary and beneficial roles do native plants fulfill in their aquatic ecosystem?
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5. Which is not a characteristic of the watermilfoil species?
  - a. Most are exotic plants requiring management.
  - b. They are members of the genus *Myriophyllum*.
  - c. They reproduce mainly by fragmentation and rhizomes.
  - d. The major watermilfoil of concern in the United States is the Eurasian watermilfoil.
  
  
  
  
  
  
  
  
  
  
6. Name the plant shown below.  

  
  
  
  
  
  
  
  
  
  
7. \_\_\_\_\_ are dormant leaf structures that are not affected by herbicides and are used primarily for reproduction in the curly-leaf pondweed.
  
  
  
  
  
  
  
  
  
  
8. If large amounts of plant material die and decompose when water temperatures are high, the potential for oxygen stress on the water body and its aquatic organisms is great.  
True or False?
  
  
  
  
  
  
  
  
  
  
9. Naiads differ from many other aquatic pest species in that they are \_\_\_\_\_ and overwinter as \_\_\_\_\_.

10. Which is not a characteristic of coontail?
- It has clusters of finely forked leaves that appear bushy at or near the end of the stem.
  - It is a hardy plant with long, limp, ribbon-like leaves arising from the base of the plant.
  - It harbors significant amounts of food for fish and waterfowl in its branches.
  - Because of fragmentation, harvesting of coontail is not recommended.

11. To control wild celery or tape grass, try hand pulling, raking or screening the bottom, but not herbicide treatments. True or False?

12. Name the aquatic organism shown below.



13. What free-floating, tiny, green, oval plant reproduces by division and is common in quiet water?
14. Which statement about rooted floating plants is not true?
- They do not normally constitute a nuisance.
  - Waterlilies are valued as fish cover and for their showy flowers.
  - It is best to treat watershield chemically after its gelatinous coating develops.
  - The seeds of the American lotus are a valuable food for waterfowl, and their rhizomes are also edible.