

PGOLID Plant Surveys

Part 1: Comparison of 2003 to 2010-2011

Part 2: Plant Guide

Overall Conclusions

The Pelican Group of Lakes Improvement District (PGOLID) hired a contractor to conduct a survey in 2003 to determine the plant diversity in Pelican, Little Pelican, Bass and Fish Lakes. During this survey, the invasive plant, Curly-leaf pondweed was found for the first time. The Curly-leaf pondweed treatment program began in 2005 and has greatly reduced the density of the invasive plant in the lakes.

In 2010-2011, a follow up survey was conducted by a different contractor. The standard methods used for these surveys (point-intercept method) is different than the 2003 survey, which makes it hard to directly compare them.

Overall, the plant density was higher in the 2003 survey than the 2010-2011 survey. This could be due to the fact that two different survey methods were used. Either some plants were missed at the survey points in 2010-2011, some rare plants were found in 2003, or plant diversity has decreased over time. The latter is the least likely explanation, as the PGOLID native plant populations appear to be healthy and sustaining.

Wild Rice was found in Pelican and Fish Lakes in the 2010-2011 survey. It is an excellent food source for wildlife and waterfowl. This plant is protected by the state, and a license is necessary to harvest wild rice. Wild rice destruction and removal is against the law.

Pelican Lake

The plant diversity was higher in 2003 than 2010-2011; however, the most abundant plant was the same. Chara is common in lakes with good clarity, and is a beneficial plant for the lake.

	Pelican Lake					
Date Data taken	5/20/2003	8/14/2003	*4/28/2011	*8/10/2011	5/10/2010	8/3/2010
Number of Aquatic Plants found	13	21	10	8	10	10
Most Abundant Plant	Chara	Chara	Clasping Leaf Pondweed	Chara	Chara	Chara

*Data from the western bay of Pelican Lake

Little Pelican Lake

The plant diversity was higher in 2003 than 2010; however, the most abundant plant was curly-leaf pondweed in 2003. Due to the curly-leaf pondweed treatment program, it is no longer the most abundant plant in 2010. Coontail is a common native plant that is found in healthy shallow lakes. Little Pelican Lake has a healthy native plant population, which is good for shallow lake habitat and fishing.

	Little Pelican Lake			
Date Data taken	5/20/2003	7/23/2003	4/10/2010	8/10/2010
Number of Aquatic Plants found	15	19	10	10
Most Abundant Plant	Curly Leaf Pondweed	Flatstem Pondweed	Coontail	Coontail

Bass Lake

Overall, the plant diversity was only slightly higher in 2003 than 2010. The most abundant plant changed; however, there doesn't actually appear to be much change between surveys. In the early season surveys, Bulrush was most abundant 2010, and third most abundant in 2003. An increase in Bulrush from 2003 to 2010 would be good for the lake, as Bulrush is an excellent water filterer. In the late season surveys, Chara was the most abundant plant in 2003, and the second most abundant plant in 2010.

	Bass Lake			
Date Data taken	5/20/2003	7/23/2003	4/28/2010	8/10/2010
Number of Aquatic Plants found	4	10	7	9
Most Abundant Plant	Chara	Chara	Bulrush	Coontail

Fish Lake

The plant diversity in Fish Lake was higher in 2010 than 2003. The most abundant plant, Chara, was the same for all surveys except the late season 2010 survey. In the late season 2010 survey, however, Chara was the second most abundant plant. Chara is common in lakes with good clarity, and is a beneficial plant for the lake.

	Fish Lake			
Date Data taken	5/20/2003	7/23/2003	4/28/2010	8/10/2010
Number of Aquatic Plants found	3	7	13	12
Most Abundant Plant	Chara	Chara	Chara	Coontail

Common Aquatic Plants and Algae in Minnesota Lakes

Compiled by Moriya Rufer, Information from the MN Department of Natural Resources

Aquatic plants, also called hydrophytic plants or hydrophytes, are plants that have adapted to living in or on aquatic environments. Because living on or under the water surface requires numerous special adaptations, aquatic plants can only grow in water or permanently saturated soil. Aquatic plants act as a habitat to fish.

The MN DNR should always be contacted before herbicides or algaecides are applied in reference to permits and directions, and generally, aquatic plants should not be removed without knowing what they are.

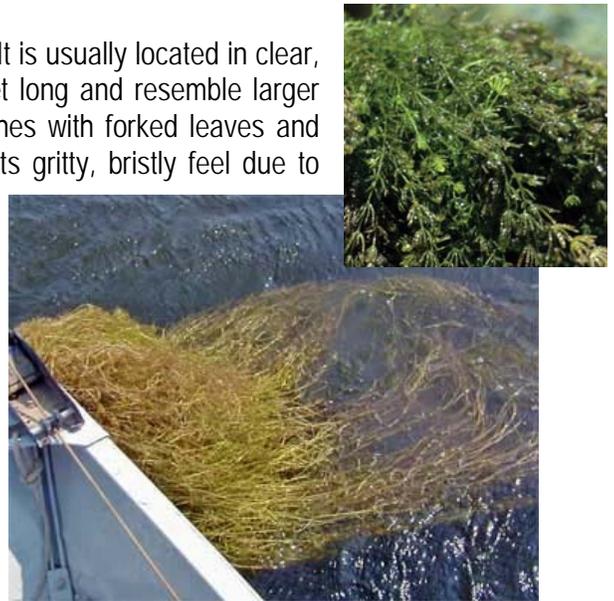
Algae

Chara

Chara is commonly known as Muskgrass, Stonewort, and sand grass. It is usually located in clear, hard water. It is an advanced form of algae. It may grow several feet long and resemble larger plants; light-green or gray-green in color. Chara has stem like branches with forked leaves and grows entirely below the water surface. Chara can be identified by its gritty, bristly feel due to mineral deposits on leaf surfaces. It emits a strong musky odor when crushed. It is sometimes mistaken for coontail or milfoil, but has a lighter green color than most other aquatic plants.

Chara stabilizes bottom sediments and provides food for waterfowl and cover for fish. Chara also supports insects and other small aquatic animals, which are important foods for trout, bluegills, small mouth bass, and largemouth bass.

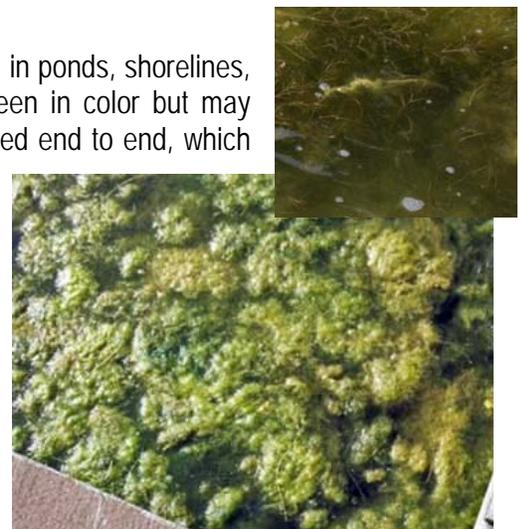
It's best to leave these plants alone. If they interfere with boating or swimming and removal is absolutely necessary, try hand-pulling or cutting.



Filamentous Algae

Filamentous algae are commonly known as pond scum, and moss. It is located in ponds, shorelines, and backwaters, and is a mass of long, stringy, hairlike strands; usually green in color but may become yellow grayish or brown. Individual filaments are a series of cells joined end to end, which give them a thread-like appearance. Filamentous algae can be identified by its greenish mats on the water surface. Slimy or cotton-like in appearance it may form hair-like growth on logs, rocks, and other vegetation at lake bottom and on the shoreline.

Nuisance growth of filamentous algae may indicate that a lake has excessive nutrients. Adopting preventative measures such as limiting the flow of nutrients into the lake may help reduce the severity of nuisance conditions.



Plankton Algae

Plankton algae are commonly known as blue-green algae, scum, or a waterbloom. It is located lakewide and is generally free-floating, but concentrations occur along windward shores and backwater areas. Abundant growth results in "blooms" that color the water green or turquoise blue. Plankton algae can be identified by a change in water color; severe blooms often resemble pea soup. Blue-green algae form unsightly, jellylike masses or a blue, paint-like scum on beaches and shorelines.



Plankton algae provides food for certain small aquatic animals and young fish.

Abundant growth indicates that a lake has excessive nutrients, usually phosphorus. When some species of blue-green algae are decaying, their cells release toxic materials, which can poison animals that drink the water. These toxic blooms are uncommon, but it is wise to keep your pets and livestock away from the water when any algal bloom is breaking up. Preventive measures such as limiting the flow of nutrients into the lake may reduce future blue-green algae blooms.

Stonewort

Stonewort is usually located in deeper zones of lake to depths of 30 feet. It is an advanced form of algae. It may grow several feet long and resemble larger plants; light-green to bright-green in color; stemlike branches with whorls of leaves; grows entirely below the water surface. It resembles muskgrass but does not emit a strong musky odor when crushed. Translucent stems and leaves appear to be filled with green jelly.

Stonewort provides food for waterfowl and cover for fish. It also supports insects and other small aquatic animals, which are important foods for trout, bluegills, small mouth bass, and largemouth bass.

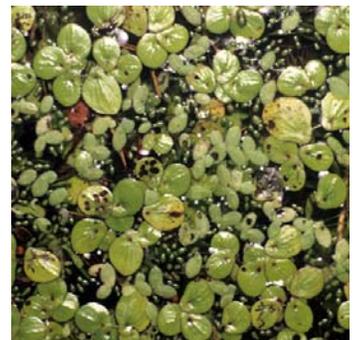
It's best to leave these plants alone. Stoneworts typically grow in deep water where they do not interfere with boating or swimming.



Floating Leaf Plants

Duckweeds and Watermeal

Duckweeds and Watermeal is commonly known as lesser duckweed, duck's meat, or water lentil. It is located in ponds and quiet backwaters of lakes and streams. Some duckweed is often found near creek inlets or in ditches. Rarely will duckweed become overly abundant on lakes and large ponds exposed to wind and heavy wave action. Watermeal is often found growing with duckweed. Duckweeds and Watermeal are tiny, free-floating green plants. Watermeal resembles small grains floating on the water surface; no roots are present. Duckweed typically consists of a leaf or cluster of leaves with small roots that hang down into the water. Leaves and stem are not distinguishable from each





other. From a distance, duckweed is often mistaken for algae; it may form a thick, green blanket on the water surface. Duckweed is not interconnected as is filamentous algae. Watermeal resembles green cornmeal floating in the water.

Duckweeds and Watermeal provide food for waterfowl, marsh birds, and support insects that fish eat. Duckweeds and Watermeal may shade out larger submerged plants.

Spatterdock

Spatterdock is commonly known as yellow water lily, yellow cow lily, and pond lily. It is located in sheltered areas, such as shallow waters with muck or silt bottoms. Spatterdock is a rooted plant with bright yellow flower that extends slightly above the surface. The flower is surrounded by a heart-shaped leaf. The leaf is grass-green colored, 8 to 16 inches long, and may float or extend above the water surface. The petiole (leaf stalk) is mostly below the surface. The spatterdock flower forms a yellow sphere with petals that curve inward. The flower rises several inches above water.



Spatterdock fruits are eaten by waterfowl and muskrats. The underwater roots contain starch and are edible.

Because spatterdock is a valuable and decorative plant, removing it may allow less desirable plants to move in.

Swamp Smartweed

Smartweed is also known as floating smartweed, water smartweed. It is found in quiet waters of lake and ponds in water depths less than 6 feet. This amphibious plant can grow as an emergent or as a floating-leaf plant. Leaves are elliptical in shape and alternate along the stem; pink flowers occur in a cluster. It is similar in appearance to broad-leaf pondweeds but can be distinguished by the presence of swollen nodes on the stem and lack of submerged leaves.

Water smartweed provides seeds for waterfowl, game birds, deer and muskrat. Leaves provide shelter for fish and habitat for invertebrates. It's best to leave these plants alone. They typically do not form dense stands.



Watershield

Watershield is also known as dollar bonnet. It is found in clear water to depths of 10 feet. Its leaves float on the water surface. Stems are firmly rooted and leaves are oval-shaped, 2 to 5 inches long. The leaves are green on the top and purple on the underside. A dull purple flower, about 1-inch long, blooms in June. The leaves are similar to a lily pad's but are smaller and have no slit. Flowers are smaller than the water lily's. The stem is attached to the center of the leaf and has a clear jelly-like coating on the stem and the underside of each leaf.



Watershield provides shade and cover for panfish, largemouth bass, and northern pike. It is also eaten by waterfowl.

Because watershield provides good habitat for fish, be conservative, remove only enough to obtain access.

White Water Lily

White water lily is also known as lily pad or fragrant water lily. It grows rooted in mucky or silty bottoms up to 5 feet deep. It has a white flower with rows of petals surrounding a yellow center. It is rooted on the bottom and floating on the water surface or extending slightly above it. It is also surrounded by round, floating leaves that are green-colored and 6 to 12 inches in diameter. White water lily has the familiar lily pad shape. It has floating round leaves, green on top and green or purplish underneath. The leaves have a slit from the edge to the center. A flower opens in morning and usually closes by afternoon.



White water lily provides excellent habitat for largemouth bass and sunfish. Seeds are eaten by waterfowl.

Because of its value as fish habitat and as a decorative plant, the white water lily is usually best left alone. Removing it may allow less-desirable plants to move in. If removal is necessary to clear space for boat access; traffic will open and maintain a path, however herbicide can also provide effective control. The lily's thick tubers make hand-pulling or cutting difficult.

Yellow Lotus

Yellow Lotus is also known as American lotus, duck acorn, and water nut. It is located in lakes, quiet streams, and river back waters. It has grayish-green leaves up to 2 feet wide that float or stand above water surface. The flowers are fragrant, pale-yellow, and grow as large as 6 inches in diameter. It has an extensive underground root system. The leaves that protrude above the water often look like inverted umbrellas. The petiole (leaf stalk) is attached to the center of the completely circular leaf. The yellow flower contains many petals. Acorn like seeds are housed in a spongy, flat-topped structure.



Yellow Lotus is aesthetically appealing and waterfowl eat the seeds. The starchy tubers (roots) can be eaten by humans. In Minnesota, the yellow lotus is a protected wildflower: no removal is allowed.

Emergent Plants

Bulrushes

Bulrushes are also known as reeds, or pencil reeds. They are located in marshes, shorelines, sand and gravel bars, and shallow waters up to 8 feet deep. Hardstem bulrush grows on firm bottoms; softstem bulrush grows on mud bottoms. They grow above water to a height of 5 to 10 feet tall and have triangular or round-shaped stems. Slender green leaves appear to be a continuation of the bulrush stem. A loose cluster of brownish flowers and seeds are located near the tip of the stem. Bulrushes have a long



tubular stem without leaves, or a triangular stem that may have long leaves similar to those of tall grasses.

Bulrushes provide an excellent fish habitat and spawning areas for northern pike, largemouth bass, and bluegills. Bulrushes attract marsh birds and songbirds and provide food for ducks, geese, and swans. To preserve natural habitat, the DNR allows the removal of bulrushes only in a small area to provide boat access to deeper lake water. Once an area is cleared, periodic cutting below the surface will generally provide control.

Cattails

Cattails are located in marshes, ditches, shorelines; shallow areas of lakes, ponds, and slow streams, or any quiet water up to 4 feet deep. They grow above water surface, and are thickly rooted. They have long slender stalks growing 3 to 10 feet high. The flower consists of a cigar-shaped "cattail" which is green during early summer and turns brown and fuzzy in the fall and following spring. Cattails can be identified by looking for the fuzzy brown "cattail" near the top of the stalk. The leaves are long, flat, and about 1-inch wide.



Cattails help stabilize marshy borders of lakes and ponds and protect shorelines from wave erosion. Northern pike may spawn along shore behind the cattail fringe. Cattails provide cover and nesting sites for waterfowl and marsh birds such as the red-winged blackbird. Cattail stalks and roots are eaten by muskrats and beavers, the starchy roots, young flowering spikes, and pollen can be eaten by humans too.

To preserve as much cattail habitat as possible, the DNR permits the removal of these plants only in a small area to provide boat access to deeper lake water. Cutting cattails below the water surface after first frost provides good control, as will application of a DNR-approved herbicide to the leaves. Once an area is cleared, control may not be needed again for several years.

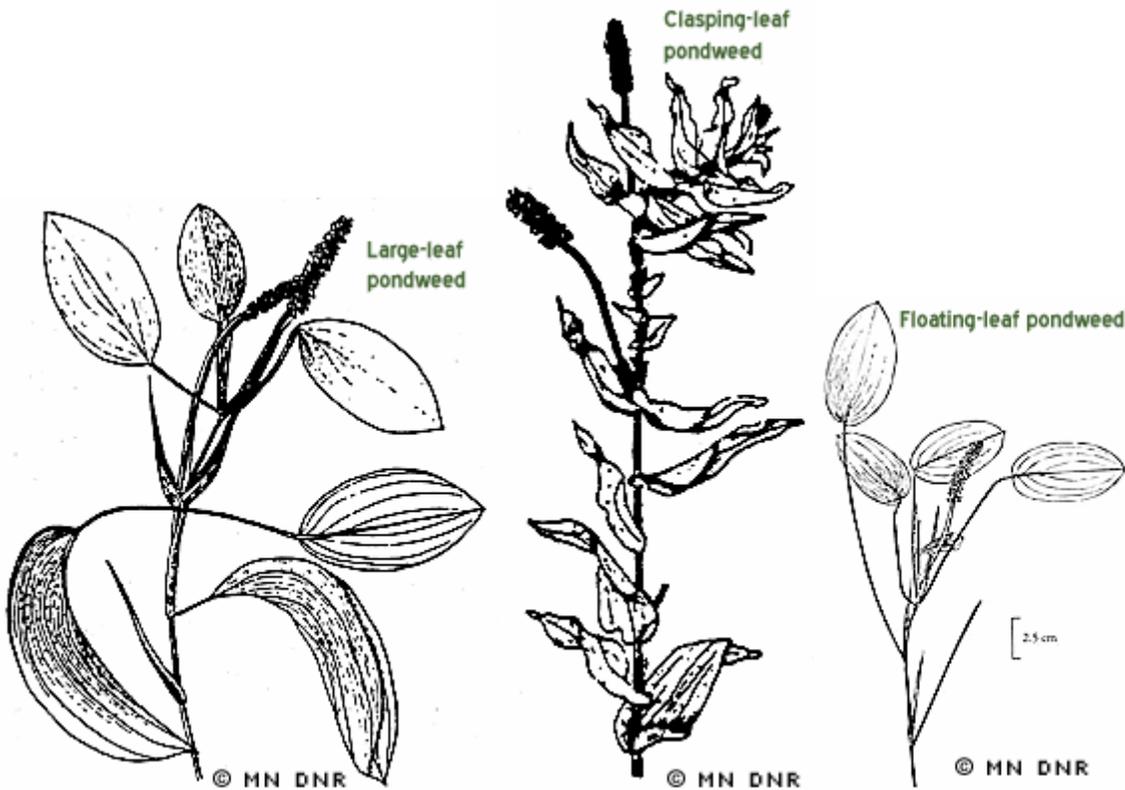
Submerged Plants

Broad-leaf Pondweed

Common names include: Large-leaf pondweed, claspingleaf (Richardson) pondweed, floating-leaf pondweed, whitestem pondweed, broad-leaf cabbage, musky cabbage, bass weed. They are found in lakes and streams growing in depths up to 20 feet. They often grow near drop-offs. Their leaves are 2 to 8 inches long. Large-leaf and claspingleaf pondweeds grow below the water surface, except for the flowering stalk. Floating-leaf pondweed grows below the water surface, except for their flowering stalk and large, floating leaves. All species have thin and delicate submerged leaves, tough stems that are firmly rooted, and a stiff appearance when out of the water. Broad-leaf pondweed leaves alternate along the stem and often grow in patches or beds. They have small seed heads crowded into spikes, often sticking up above water from June through August. Floating-leaf pondweed has floating leaves that are slightly heart-shaped. Large-leaf pondweed has floating leaves that are oval-shaped. Submerged leaves are large and wavy. Plants are seldom branched. Claspingleaf pondweed has leaves that are wide and wavy with a broad base that clasps the stem. The plant often branches toward tip and is often confused with curlyleaf pondweed.

Broad-leaf pondweeds provide excellent habitat for panfish, largemouth bass, muskellunge, and northern pike. Bluegills nest near these plants and eat insects and other small animals found on the leaves. Walleyes use these pondweeds for cover.

These plants are important fish habitat, so it is best to let them be. Removing them may allow less-desirable aquatic plants to move in. These plants are also highly resistant to chemical control, for small problem areas, try raking or cutting the plants.



Brushy Pondweeds and Naiads

Common names include: Bushy naiad, (pronounced NAY-ads) water naiad, brittle naiad, slender naiad, and spiny leaf naiad. They are found in clear water at depths of up to 20 feet. They grow entirely below water surface; have long, waving stems in deep water and are dense and bushy in shallow water. These are annual plants which must start from seed each year. Their leaves are tapered to a fine point with tiny "spines". Their seeds are shiny and smooth. Bushy pondweed is sometimes confused with chara, but chara has a musky odor when crushed and bushy pondweed does not.

Entire plants are eaten by waterfowl, especially mallards. They provide cover for young largemouth bass, northern pike, small bluegills and perch.

Bushy pondweed has become more common in recent years. It can grow abundantly in some areas and cause problems. In most areas, it will not be a nuisance and is best left alone. Removal may allow less-desirable plants to move in. When control is necessary, aquatic herbicides can be effective.



Canada Waterweed

Common names include: Elodea (pronounced el-oh-DEE-a), American elodea, common elodea, and anacharis. It is found in lakes in depths up to 10 feet and often in hard water, and near stream inlets. It grows entirely underwater, except for a small white flower that blooms during the summer. It has branched stems. The plants and leaves are usually a dark, grass-green color. The leaves are oval-shaped and arranged in clusters of three or four around the stem. It can be identified by looking for leaf clusters

compacted near the tip and spaced farther apart down the stem. The stems are brittle, branched, and form a large mass near the lake bottom. White flowers have three to four petals and bloom during the summer. The flowers are attached to the stem by a threadlike stalk.

Canada waterweed provides habitat for many small aquatic animals, which fish and wildlife eat. It is an excellent oxygen producer. Its attractive leaves make it a popular aquarium plant. However, dense growth of this plant can create a nuisance, and its closed, compact structure is not ideal fish habitat.

Canada waterweed is often associated with nuisance conditions. If the plant is controlled by cutting or pulling, pick up all fragments since they can grow into new plants.



Coontail

Coontail is also known as Hornwort. It is located in clear-to-murky water up to 20 feet deep. It grows underwater with no roots. The upper leaves may reach the surface. The central hollow stem has stiff, dark-green leaves. The plants may be long and sparse, but are often bushy near the tip. They are often confused with watermilfoil, but coontail leaves are spiny and forked rather than feather-like.

Many waterfowl species eat the roots. They provide cover for young bluegills, perch, largemouth bass, and northern pike. They also support insects that fish and ducklings eat. However, when growing densely, commonly causes nuisance conditions along shorelines.



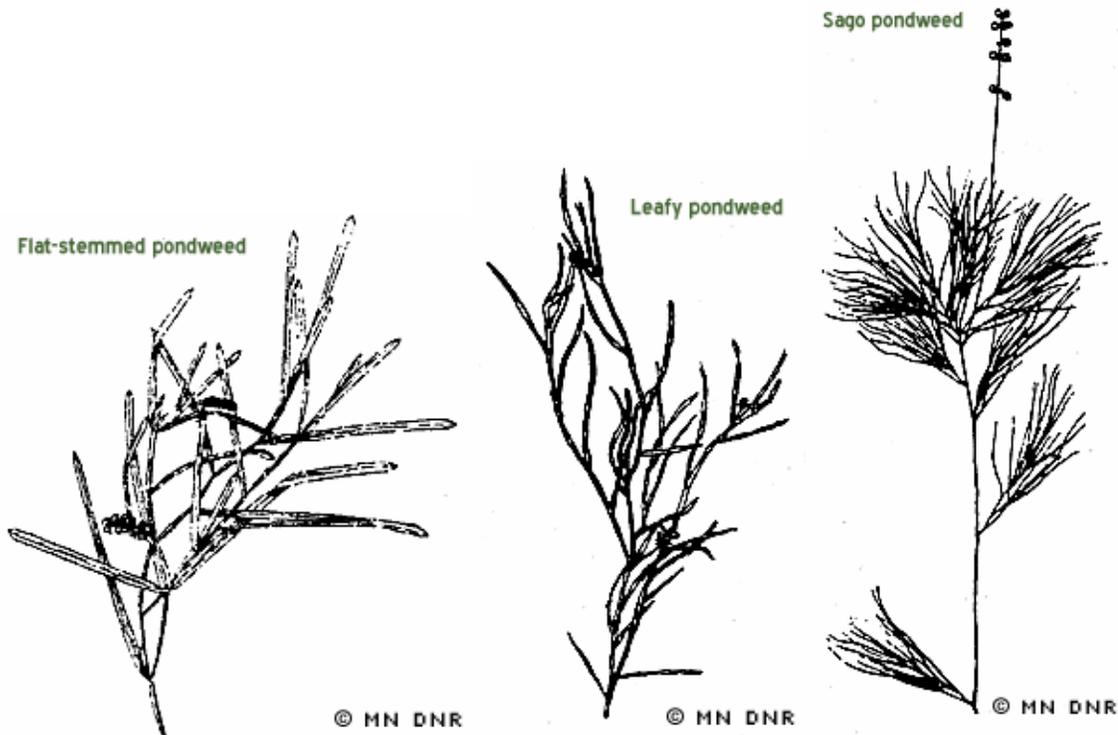
Coontail is important to young fish, so remove as little as possible. Use cutting or raking to reduce the amount of plants. Remove all plant fragments from the water because they can regenerate into new plants.

Narrow-leaf Pondweeds

Common names include: Flat-stemmed, leafy, and sago pondweed. They grow below water surface and are firmly rooted. They have branched, slender stems and grass like, narrow leaves. They also may have flowers or seeds extending above water surface. They are limp when out of the water. Most narrow-leaf pondweeds have no floating leaves; it is only the seeds of some types that reach or extend above the surface. Sago pondweed has stiff, threadlike leaves that appear bushy and are alternately arranged on one stem. It has spreading leaves in the water resemble a fan. Small, pebble-sized fruits are spaced on the stem and emerge from the water.

Narrow leaf pondweeds provide some cover for bluegills, perch, northern pike, and muskellunge, though these fish prefer broad-leaf pondweeds. They provide good cover for walleye as well. They are food for waterfowl and support aquatic insects and many other small animals that fish and ducklings eat. Swans, geese, and diving ducks such as canvasbacks favor the tubers and seeds of sago pondweed.

Removing narrow-leaf pondweeds may allow less-desirable plants such as curlyleaf pondweed or Eurasian watermilfoil to move in. If control is absolutely necessary, try hand-pulling, raking, or underwater cutting.



Northern Watermilfoil



Northern watermilfoil grows entirely underwater in depths from 1 to 20 feet. It has dark-green, feathery leaves are grouped in fours around a hollow stem that is usually brown or pinkish colored. Leaves are comprised of 5 to 10 pairs of leaflets. Northern watermilfoil is often mistaken for coontail or Eurasian watermilfoil, but it does not branch at the surface as much as Eurasian watermilfoil does; northern typically has half as many leaflet pairs as Eurasian has. Northern leaves are rigid when removed from the water, but Eurasian leaves are limp when out of water. The northern species also forms winter buds (groups of small, dark, brittle leaves) in late fall and winter, but the Eurasian variety does not.



Northern watermilfoil provides cover for fish and invertebrates and supports insects and other small animals eaten by fish. Waterfowl occasionally eat the fruit and foliage.

When control is absolutely necessary, hand-pulling, raking, or cutting can be effective in small infestations. Collect and dispose of all fragments since they can regenerate into new plants.

Invasive Aquatic Plants

Curly-leaf Pondweed (CLP)

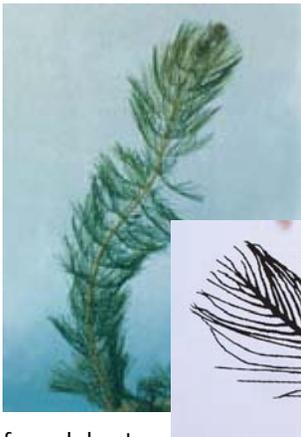
Curly-leaf pondweed grows from the shore to depths of up to 15 feet. Its leaves are somewhat stiff and crinkled approximately 1/2-inch wide and 2 to 3 inches long. Leaves are arranged alternately around the stem, and become denser toward the end of branches. It produces winter buds that can be confused with claspingleaf pondweed. Curly-leaf pondweed has small "teeth" visible along edge of leaf; begins growing in early spring before most other pondweeds and dies back during midsummer. The flower stalks, when present, stick up above the water surface in June. It appears reddish-brown in the water, but is actually green when pulled out of the water and examined closely. It is easily confused with claspingleaf pondweed, which has leaves with no "teeth" around their edges.



Curly-leaf pondweed provides some cover for fish. Several waterfowl species feed on the seeds. Diving ducks often eat the winter buds. Like Eurasian watermilfoil, curlyleaf pondweed is not native to the United States and often causes problems due to excessive growth. When control is necessary, herbicides and harvesting can be effective.

PGOLID has initiated a 5 year treatment program with Minnesota Shoreline Restoration, Inc. to control CLP. CLP will be treated near the Bob Creek inlet, the Pelican River between Little and Big Pelican Lakes, and the northern shore on Little Pelican Lake. CLP has become a nuisance in these areas.

Eurasian Watermilfoil (EWM)



Eurasian watermilfoil was accidentally introduced to North America from Europe. Spread westward into inland lakes primarily by boats and also by waterbirds, it reached Midwestern states between the 1950s and 1980s.

In nutrient-rich lakes it can form thick underwater stands of tangled stems and vast mats of vegetation at the water's surface. In shallow areas the plant can interfere with water recreation such as boating, fishing, and swimming. The plant's floating canopy can also crowd out important native water plants.

A key factor in the plant's success is its ability to reproduce through stem fragmentation and runners. A single segment of stem and leaves can take root and form a new colony. Fragments clinging to boats and trailers can spread the plant lake. The mechanical clearing of aquatic plants for beaches, docks, and landings

from lake to creates thousands of new stem fragments. Removing native vegetation creates perfect habitat for invading Eurasian watermilfoil.

Eurasian watermilfoil has difficulty becoming established in lakes with well established populations of native plants. In some lakes the plant appears to coexist with native flora and has little impact on fish and other aquatic animals. Milfoil may become entangled in boat propellers, or may attach to keels and rudders of sailboat. Stems can become lodged among any watercraft apparatus or sports equipment that moves through the water, especially boat trailers.

EWM has not been identified on any of the Pelican group of Lakes as of 2006. Public accesses and the high potential growth area need to be continually monitored for EWM.

Flowering Rush

Flowering rush is also known as Eurasian waterweed or Eurasian rush. It grows 1-4' high on an erect stem along shores in shallow water. In deeper water it grows submerged without producing flowers. Flowering rush is very difficult to identify when not in flower. It closely resembles many native shoreland plants, such as the common bulrush. Its leaves are sword-shaped, triangular in cross section.



It can produce Pink flowers are arranged in umbels (umbrella-shaped). Only populations in the eastern U.S. produce seeds. Only one Minnesota population (Forest Lake) produces viable seeds. Flowering rush reproduces by vegetative spread from its rootstock in form of bulb-lets. Both seeds and bulb-lets are dispersed by water current.

Flowering rush was introduced into Detroit Lake in the 1970's. Since then it has spread down the Pelican River and into Lakes Sallie and Melissa and has become a major nuisance to lakeshore owners by making swimming and boating impossible in shallow waters. The Pelican River watershed district (PRWD) sought to control the exotic species by mechanical harvesting. Mechanical harvesting has ceased since there is significant evidence that it is assisting in the spread of flowering rush. Herbicides use is being experimented with currently.



PGOLID and the PRWD is working on a exotic flowering rush control plan, since it is likely for flowering rush to enter Pelican Lake through the Pelican River. This control plan will be included in the 2007 Lakes Management Plan.

References and Additional Resources

Minnesota Department of Natural Resources (DNR) <http://www.dnr.state.mn.us/nr/plants/aquatic/index.html>

Submersed Aquatic Plant and Algae Guide: <http://www.cerexagri-nisso.com/ahm/Index.asp>

A Field Guide to VALUABLE UNDERWATER AQUATIC PLANTS of the Great Lakes:
<http://www.mlswa.org/UnderWaterPlantGuide>