Appendix A

PIKE LAKE
AQUATIC PLANT SPECIES DETAILS

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Figure A-1

RAKE FULLNESS RATINGS

Source: Wisconsin Department of Natural Resources and SEWRPC.

SOURCES OF INFORMATION:

Borman, S., Korth, R., & Temte, J. (1997). *Through the Looking Glass: A Field Guide to Aquatic Plants.* Stevens Point, WI, USA: Wisconsin Lakes Partnership.

Robert W. Freckman Herbarium: *http://wisplants.uwsp.edu*

Skawinski, P. M. (2014). *Aquatic Plants of the Upper Midwest: A Photographic Field Guide to Our Underwater Forests*. Wausau, Wisconsin, USA: Self-Published.

University of Michigan Herbarium: *http://www.michiganflora.net/home.aspx*

Ceratophyllum demersum — Coontail

Native

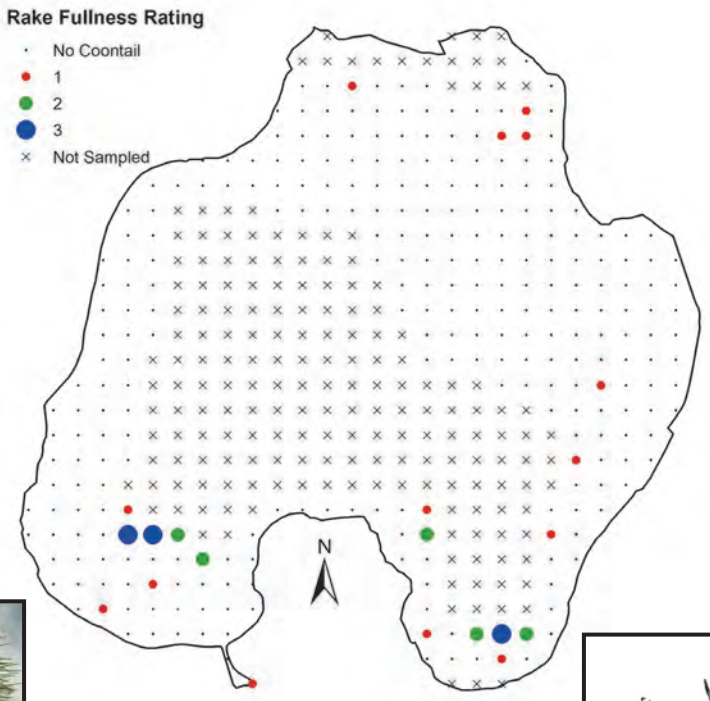
Identifying Features

- Often bushy near tips of branches, giving the raccoon tail-like appearance (“coontail”)
- Whorled leaves with one to two orders of branching and small teeth on their margins
- Flowers (rare) small and produced in leaf axils

Coontail is similar to spiny hornwort (*C. echinatum*) and muskgrass (*Chara* spp.), but spiny hornwort has some leaves with three to four orders of branching, and coontail does not produce the distinct garlic-like odor of muskgrass when crushed

Ecology

- Common in lakes and streams, both shallow and deep
- Tolerates poor water quality (high nutrients, chemical pollutants) and disturbed conditions
- Stores energy as oils, which can produce slicks on the water surface when plants decay
- Anchors to the substrate with pale, modified leaves rather than roots
- Eaten by waterfowl, turtles, carp, and muskrat

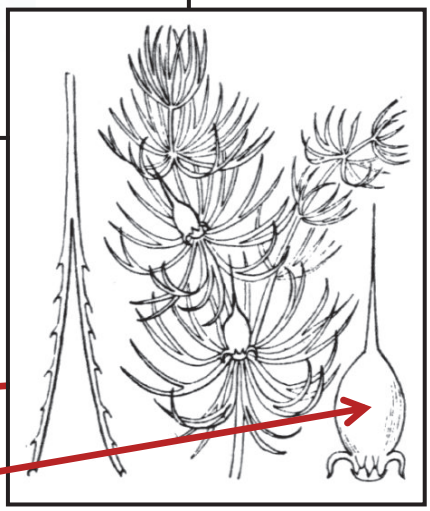


Second-Order Leaf Branching

First-Order Leaf Branching

Toothed Leaf Margins

Fruit (rare)



Chara spp.
Native

Muskgrasses
Algae (not vascular plants)

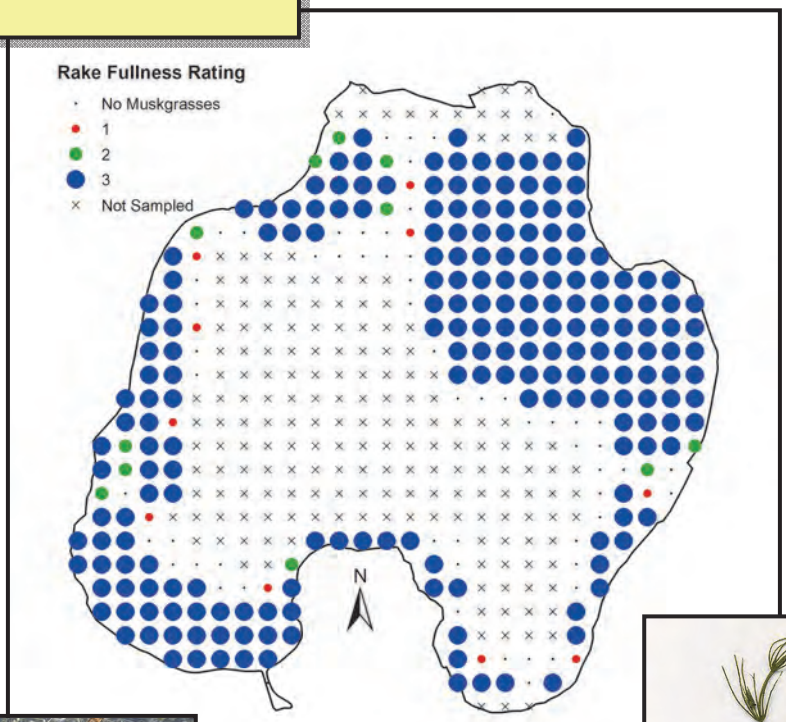
Identifying Features

- Leaf-like, ridged side branches develop in whorls of six or more
- Often encrusted with calcium carbonate, which appears white upon drying (see photo on left, below)
- Yellow reproductive structures develop along the whorled branches in summer
- Emits a garlic-like odor when crushed

Stoneworts (*Nitella* spp.) are similar large algae, but their branches are smooth rather than ridged and more delicate

Ecology

- Found in shallow or deep water over marl or silt, often growing in large colonies in hard water
- Overwinters as rhizoids (cells modified to act as roots) or fragments
- Stabilizes bottom sediments, often among the first species to colonize open areas
- Food for waterfowl and excellent habitat for small fish




Daniel Carter


Christian Fischer

Elodea canadensis — Common Waterweed

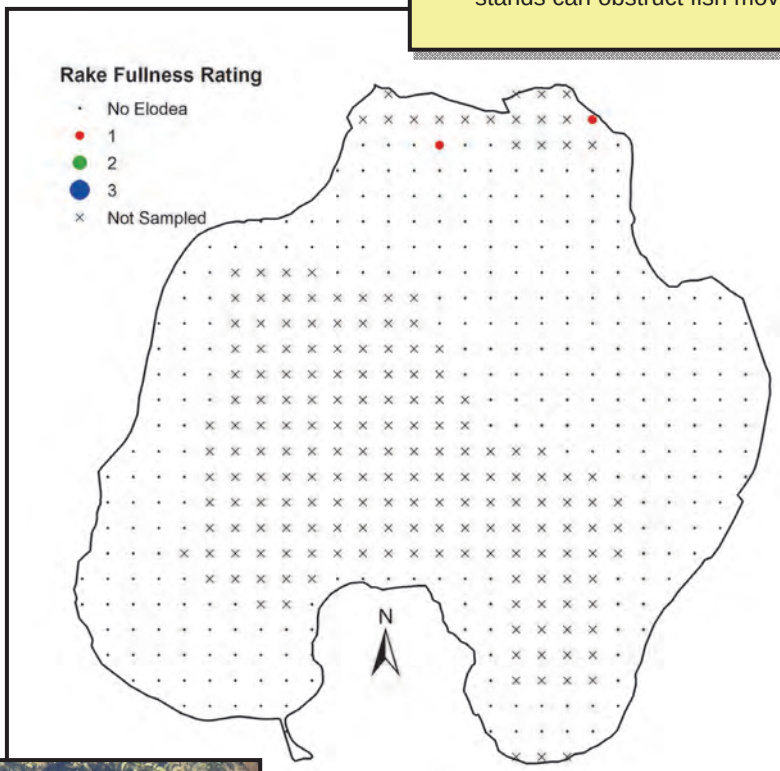
Native

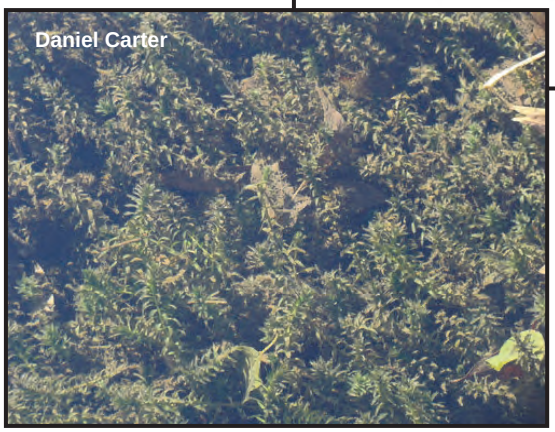
Identifying Features

- Slender stems, occasionally rooting
- Leaves lance-shaped, in whorls of three (rarely two or four), 6.0 to 17 mm long and averaging 2.0 mm wide
- When present, tiny male and female flowers on separate plants (females more common), raised to the surface on thread-like stalks

Ecology

- Found in lakes and streams over soft substrates tolerating pollution, eutrophication and disturbed conditions
- Often overwinters under the ice
- Produces seeds only rarely, spreading primarily via stem fragments
- Provides food for muskrat and waterfowl
- Habitat for fish or invertebrates, although dense stands can obstruct fish movement





Heteranthera dubia — Water Stargrass

Native

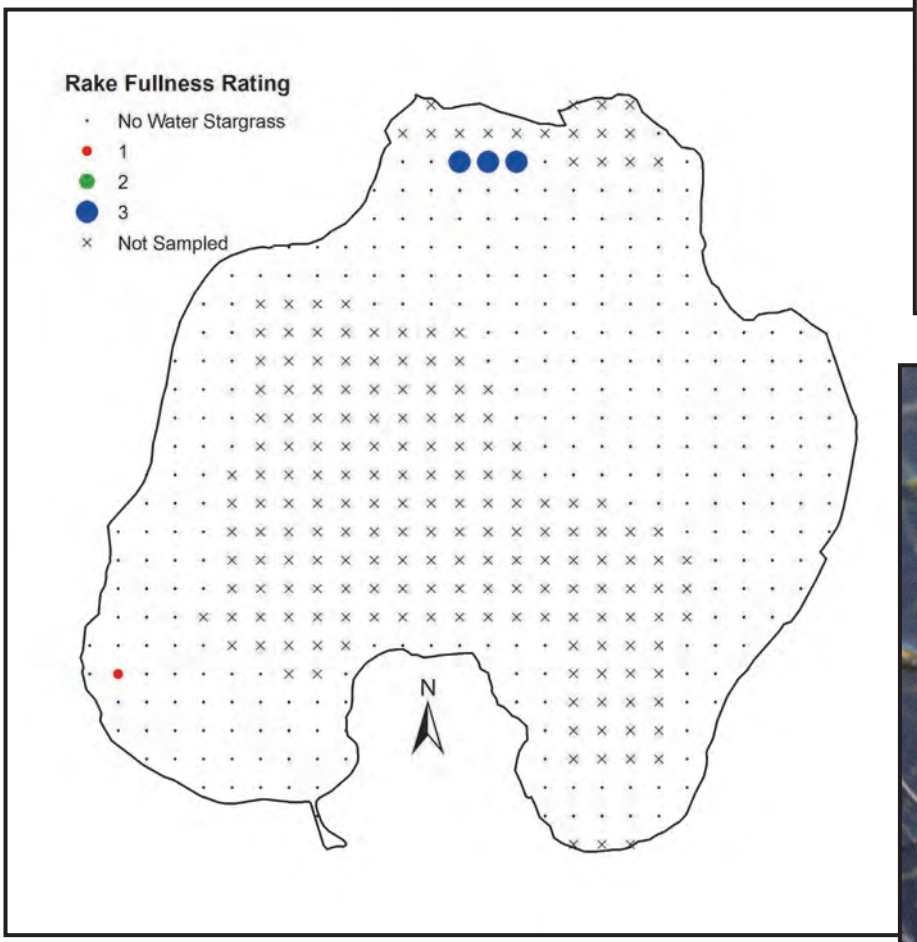
Identifying Features

- Stems slender, slightly flattened, and branching
- Leaves narrow, alternate, with no stalk, and lacking a prominent midvein
- When produced, flowers conspicuous, yellow, and star-shaped (usually in shallow water) or inconspicuous and hidden in the bases of submersed leaves (in deeper water)

Yellow stargrass may be confused with pondweeds that have narrow leaves, but it is easily distinguished by its lack of a prominent midvein and, when present, yellow blossoms

Ecology

- Found in lakes and streams, shallow and deep
- Tolerates somewhat turbid waters
- Overwinters as perennial rhizomes
- Limited reproduction by seed
- Provides food for waterfowl and habitat for fish



Myriophyllum sibiricum — Northern Water Milfoil

Native

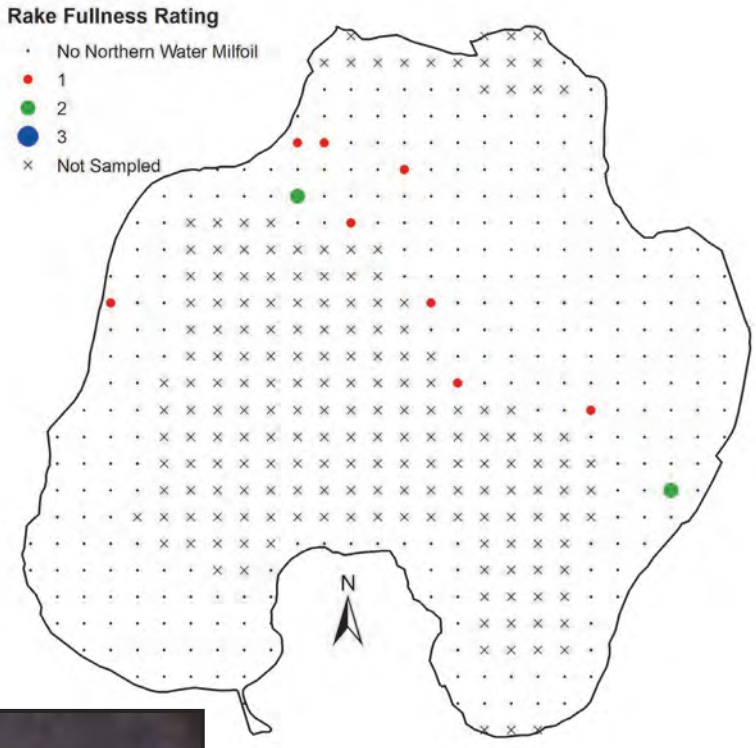
Identifying Features

- Light-colored, stout stems
- Leaves in whorls of four to five, divided into four to 12 pairs of leaflets, lower leaflets longer than the upper ones
- Forms winter buds (turions) in autumn

Northern water milfoil is similar to other water milfoils. Eurasian water milfoil (*M. spicatum*) tends to produce more leaflets per leaf and have more delicate, pinkish stems

Ecology

- Found in lakes and streams, shallow and deep
- Overwinters as winter buds and/or hardy rootstalks
- Consumed by waterfowl
- Habitat for fish and aquatic invertebrates
- Hybridizes with Eurasian water milfoil, resulting in plants with intermediate characteristics



Myriophyllum spicatum — Eurasian Water Milfoil

Nonnative/Exotic

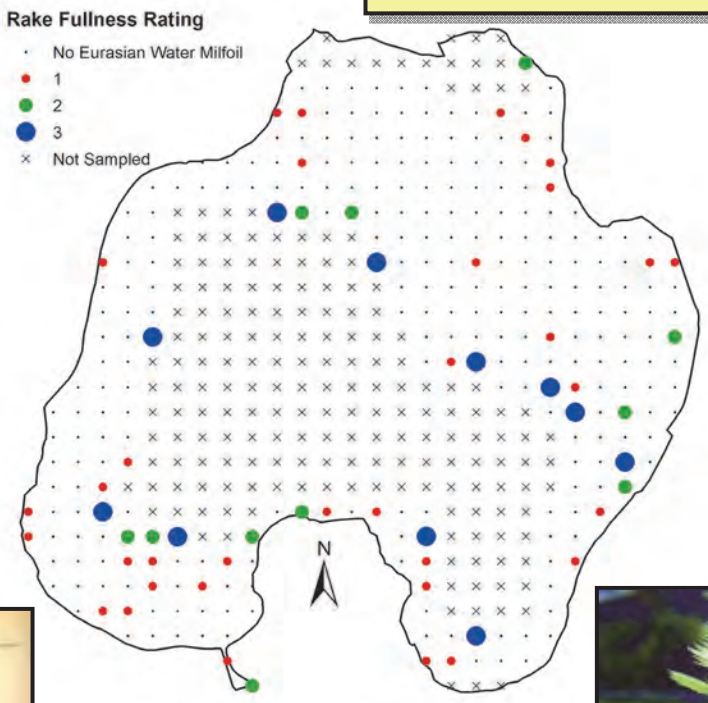
Identifying Features

- Stems spaghetti-like, often pinkish, growing long with many branches near the water surface
- Leaves with 12 to 21 pairs of leaflets
- Produces no winter buds (turions)

Eurasian water milfoil is similar to northern water milfoil (*M. sibiricum*). However, northern water milfoil has five to 12 pairs of leaflets per leaf and stouter white or pale brown stems

Ecology

- Hybridizes with northern (native) water milfoil, resulting in plants with intermediate characteristics
- Invasive, growing quickly, forming canopies, and getting a head-start in spring due to an ability to grow in cool water
- Grows from root stalks and stem fragments in both lakes and streams, shallow and deep; tolerates disturbed conditions
- Provides some forage to waterfowl, but supports fewer aquatic invertebrates than mixed stands of aquatic vegetation



Najas flexilis — Bushy Pondweed or Slender Naiad

Native

Identifying Features

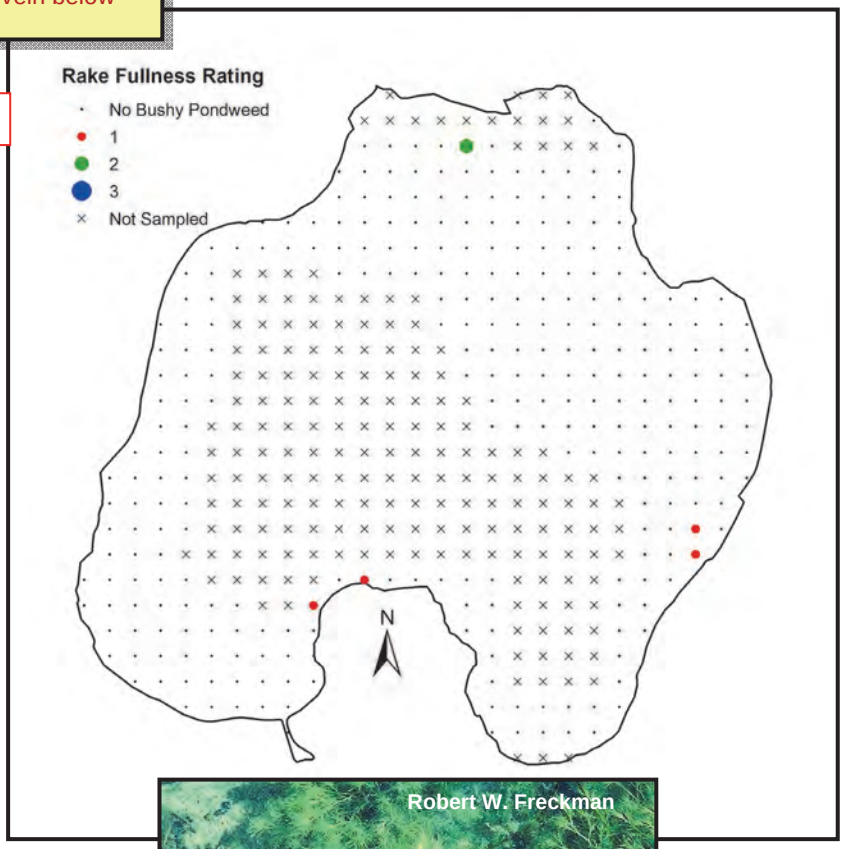
- Leaves narrow (0.4 to 1.0 mm) and pointed with broader bases where they attach to the stem and finely serrated margins
- Flowers, when present, tiny and located in leaf axils
- Variable size and spacing of leaves, as well as compactness of plant, depending on growing conditions

Two other *Najas* occur in southeastern Wisconsin. Southern naiad (*N. guadalupensis*) has wider leaves (to 2.0 mm). Spiny naiad (*N. marina*) has coarsely toothed leaves with spines along the midvein below

Ecology

- In lakes and streams, shallow and deep, often in association with wild celery
- *One of the most important forages of waterfowl*
- An annual plant that completely dies back in fall and regenerates from seeds each spring; also spreading by stem fragments during the growing season

Leaves narrow with serrated edges



Najas marina — Spiny Naiad

Nonnative/Exotic

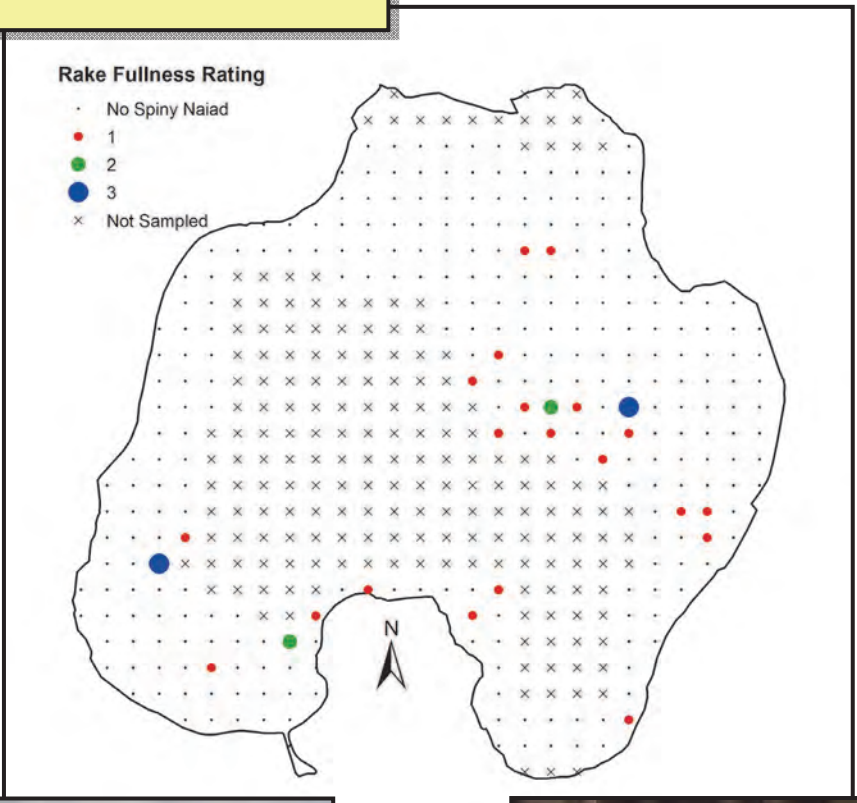
Identifying Features

- Stems stiff and spiny, often branching many times
- Leaves stiff, 1.0 to 4.0 mm thick, with coarse teeth along the margins and midvein on the underside

Spiny naiad is quite distinct from other naiads due to its larger, coarsely toothed leaves and the irregularly pitted surface of its fruits. Spiny naiad is presumably introduced in Wisconsin, but it is considered native in other states, including Minnesota

Ecology

- Alkaline lakes, water quality ranging from good to poor
- An annual, regenerating from seed each year
- Occurs as separate male and female plants
- Capable of growing aggressively




Kristian Peters

Nitella spp.
Native

Nitellas (Stoneworts)
Algae (not vascular plants)

Identifying Features

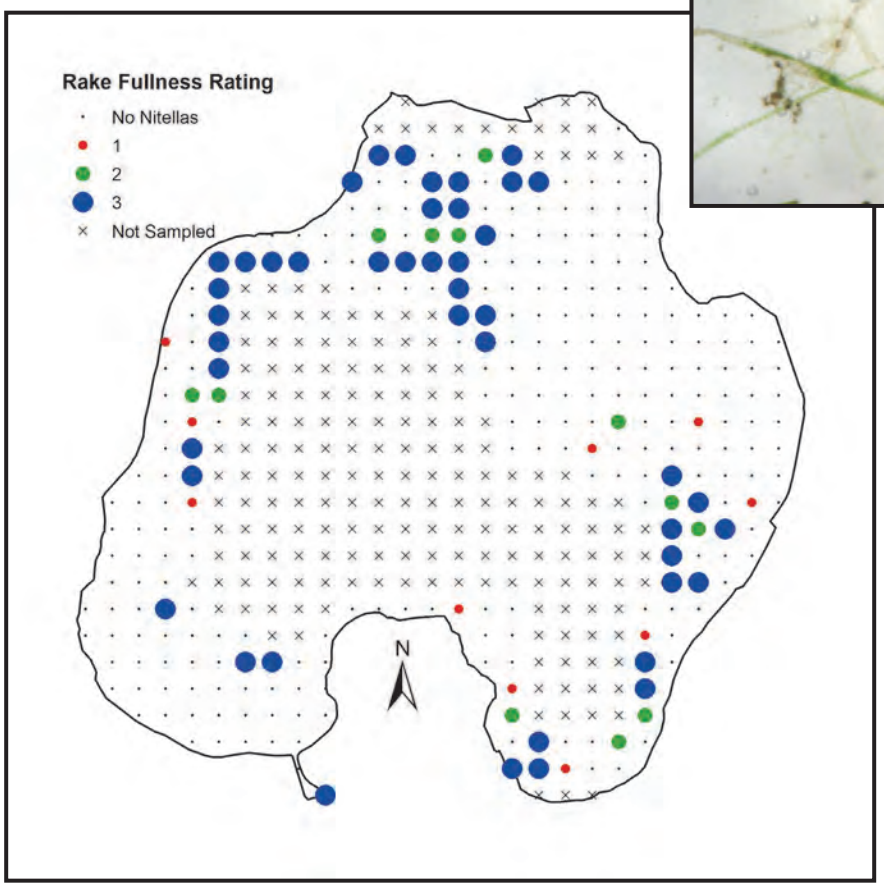
- Stems and leaf-like side branches delicate and smooth, side branches arranged in whorls
- Bright green
- Reproductive structures developing along the whorled branches

Muskgrasses (*Chara* spp.) are large algae similar to stoneworts (*Nitella* spp.), but their branches are ridged and more robust than those of stoneworts. Another similar group of algae, *Nitellopsis* spp., differ from stoneworts by having whorls of side branches that are at more acute angles to the main stem and star-shaped, pale bulbils that, when present, are near where side branches meet the main stem

Ecology

- Often found in deep lake waters over soft sediments
- Overwinters as rhizoids (cells modified to act as roots) or fragments
- Habitat for invertebrates, creating foraging opportunities for fish
- Sometimes browsed upon by waterfowl


Kristian Peters



Nitellopsis obtusa
Nonnative/Exotic

Starry Stonewort
Algae (not vascular plants)

Identifying Features

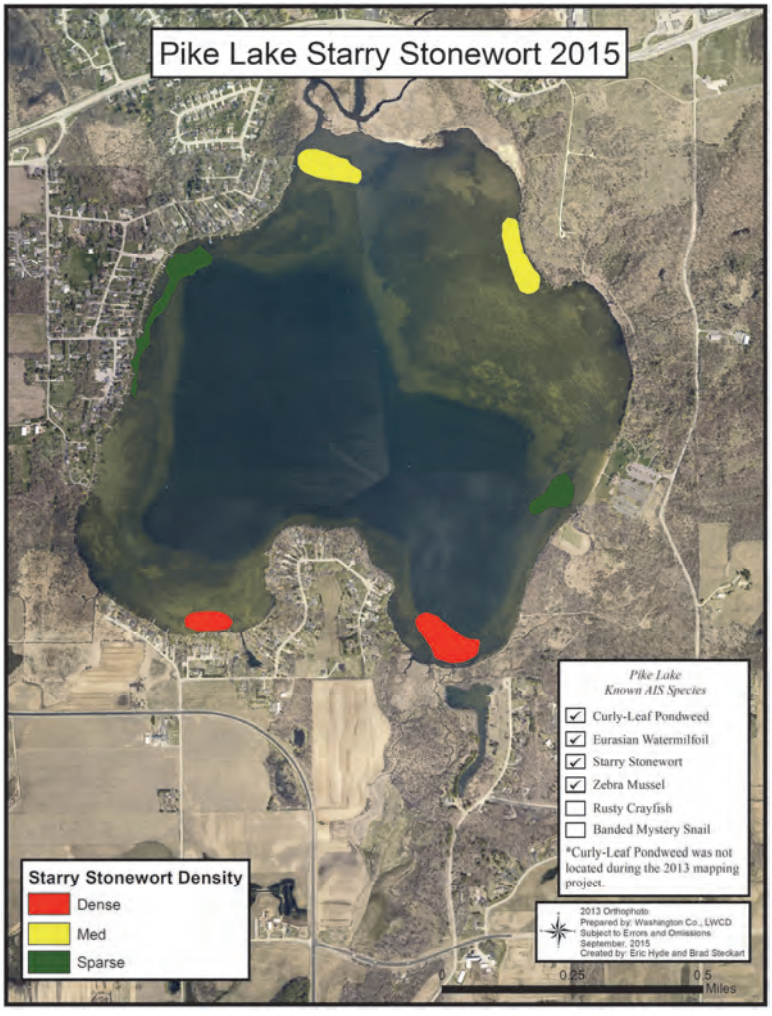
- Stems and leaf-like side branches delicate and smooth, side branches arranged in whorls or 4-6 branchlets
- More robust than other members of family
- Distinctive star-shaped bulbils

Ecology

- Alkaline lakes
- Typically annual, but can act like perennial during mild winters
- Occurs as separate male and female plants – currently, only male exists in U.S.
- Can form dense mats and grow over two meters tall

Zofia Noe

Paul Skawinski



Nuphar spp. Yellow Water (Pond) Lily and Spatterdock

Native

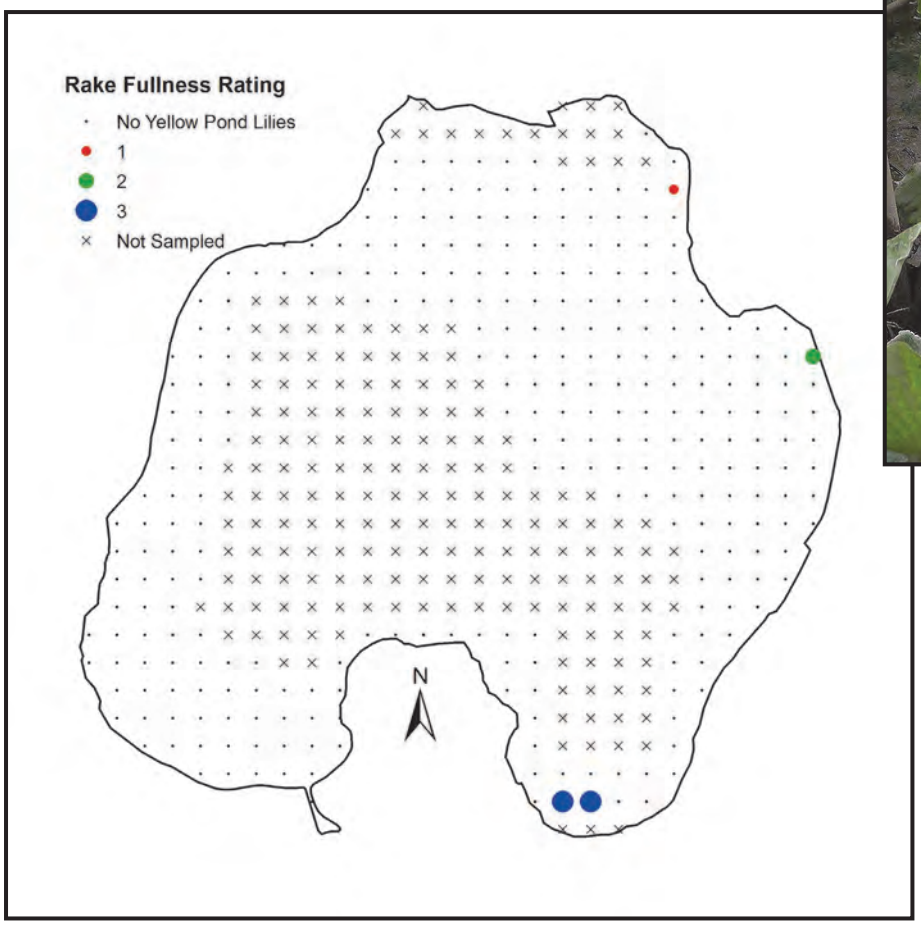
Identifying Features

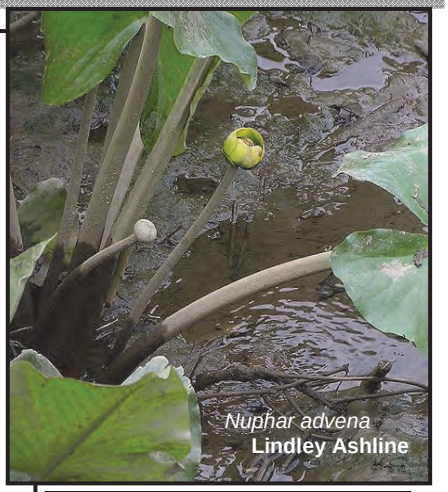
- *Heart-shaped*, *notched leaves* emerging above the water surface or floating
- Yellow flowers about one inch wide (*N. advena*) or yellow, often with dark patches at the base, and one to two inches wide (*N. variegata*)

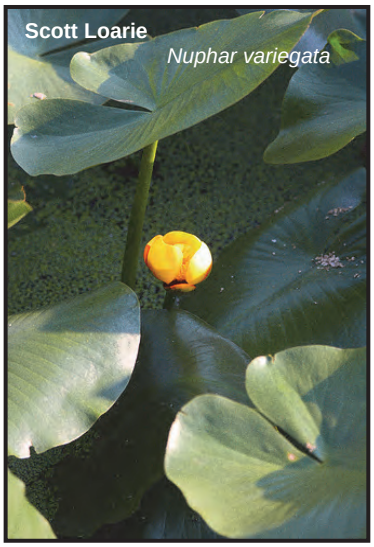
Pond lilies (*Nuphar* spp.) are superficially similar to water lilies (*Nymphea* spp.), but have yellow versus white flowers and leaves somewhat heart-shaped versus round. American lotus (*Nelumbo lutea*) is also similar, but its leaves are round and unnotched, and its flowers are much larger

Ecology

- In sun or shade and mucky sediments in shallows and along the margins of ponds, lakes, and slow-moving streams
- Overwinters as a perennial rhizome
- Flowers opening during the day, closing at night, and with the odor of fermented fruit
- Buffers shorelines
- Provides food for waterfowl (seeds), deer (leaves and flowers), and muskrat, beaver, and porcupine (rhizomes)
- Habitat for fish and aquatic invertebrates




Nuphar advena
Lindley Ashline


Scott Loarie
Nuphar variegata

Nymphaea odorata — White Water Lily

Native

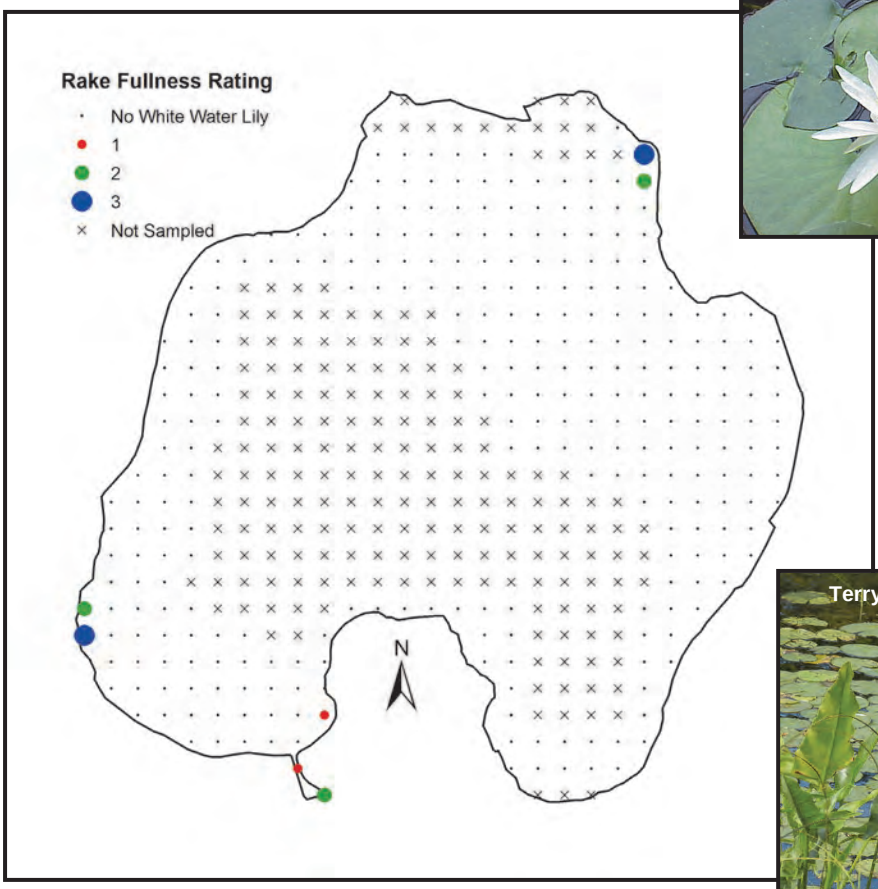
Identifying Features

- Leaf stalks round in cross-section with four large air passages
- Floating leaves round (four to 12 inches wide under favorable conditions), *with a notch* from the outside to the center, and reddish-purple underneath
- Flowers white with a yellow center, three to nine inches wide

Pond lilies (*Nuphar* spp.) are superficially similar, but have yellow flowers and leaves somewhat heart-shaped. American lotus (*Nelumbo lutea*) is also similar, but its leaves are *unnotched*

Ecology

- Found in shallow waters over soft sediments
- Leaves and flowers emerge from rhizomes
- Flowers opening during the day, closing at night
- Seeds consumed by waterfowl, rhizomes consumed by mammals



Potamogeton crispus — Curly-Leaf Pondweed

Nonnative/Exotic

Identifying Features

- Stems slightly flattened and both stem and leaf veins often somewhat pink
- Leaf margins very wavy and finely serrated
- Stipules (3.0 to 8.0 mm long) partially attached to leaf bases, disintegrating early in the season
- Produces pine cone-like overwintering buds (turions)

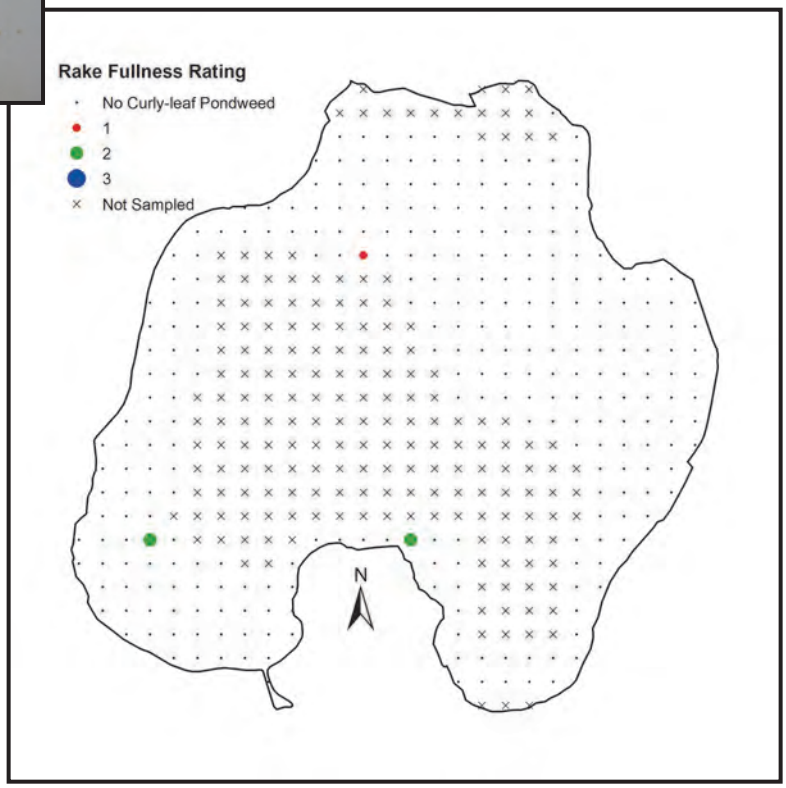
Curly-leaf pondweed may resemble clasping-leaf pondweed (*P. richardsonii*), but the leaf margins of the latter are not serrated

Ecology

- Found in lakes and streams, both shallow and deep
- Tolerant of low light and turbidity
- Disperses mainly by turions
- Adapted to cold water, growing under the ice while other plants are dormant, but dying back during mid-summer in warm waters
- Produces winter habitat, but mid-summer die-offs can degrade water quality and cause algal blooms
- Maintaining or improving water quality can help control this species, because it has a competitive advantage over native species when water clarity is poor

Zofia Noe

Zofia Noe



Potamogeton foliosus — Leafy Pondweed

Native

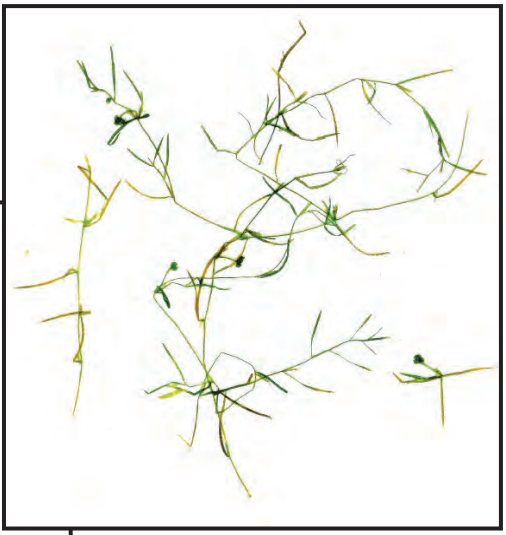
Identifying Features

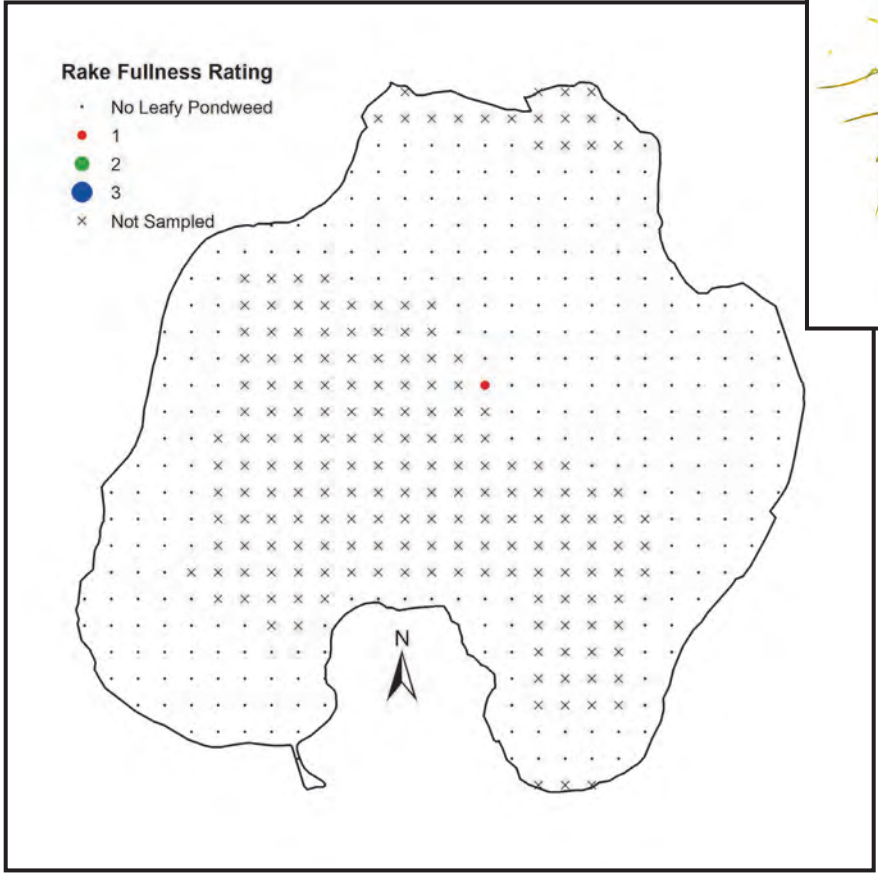
- Narrow, submersed leaves (one-half to three inches long and one-half to two mm wide), narrowing slightly near the stem, with 3-5 veins, and the leaf tip usually tapering to a point
- No floating leaves
- Flowers and fruit on short stalks in the axils of the upper leaves

Leafy pondweed is similar to small pondweed (*P. pusillus*), when not in flower and fruit. However, unlike small pondweed, it lacks glands where the leaves meet the stem. The flowers and fruits of small pondweed are borne on longer, more slender stalks and in whorls that are spaced apart.

Ecology

- Prefers shallow waters over soft sediments in lakes and streams
- Overwinters as rhizomes or winter buds (turions)
- *Tolerates eutrophic waters and can improve water quality in such environments*
- Fruits fed upon by waterfowl and available earlier in the year than most other aquatic fruits
- Cover for invertebrates and juvenile fish





Potamogeton gramineus — Variable Pondweed

Native

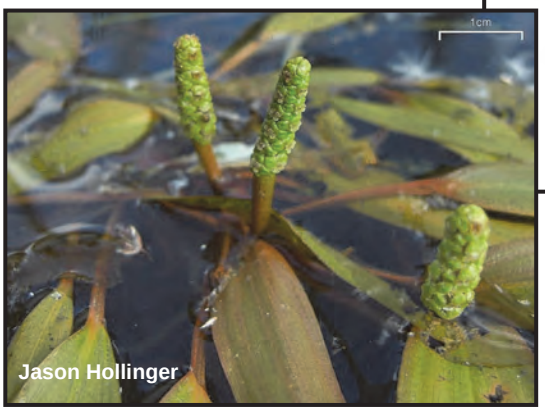
Identifying Features

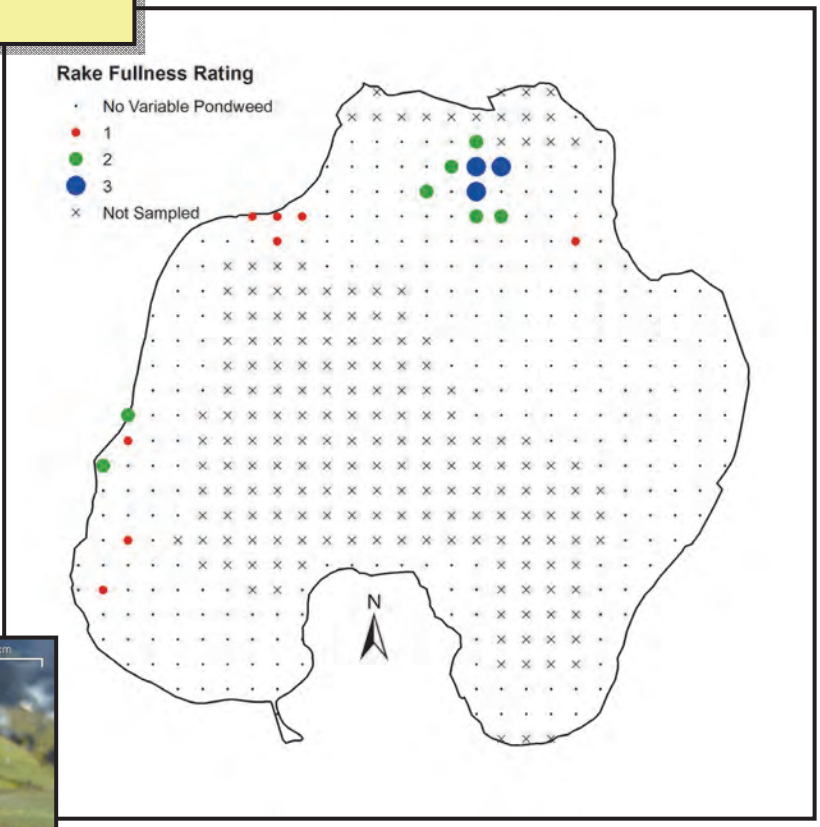
- Often heavily branched
- Submerged leaves narrow to lance-shaped, with three to seven veins, smooth margins, without stalks, but the blade tapering to the stem
- Floating leaves with 11 to 19 veins and a slender stalk that is usually longer than the blade
- Often covered with calcium carbonate in hard water

Variable pondweed is similar to Illinois pondweed (*P. illinoensis*), but Illinois pondweed has submerged leaves with nine to 19 veins

Ecology

- Shallow to deep water, often with muskgrass, wild celery, and/or slender naiad; requires more natural areas that receive little disturbance
- Overwinters as rhizomes or winter buds (turions)
- Provides food for waterfowl, muskrat, deer, and beaver
- Provides habitat for fish and aquatic invertebrates





Potamogeton illinoensis — Illinois Pondweed

Native

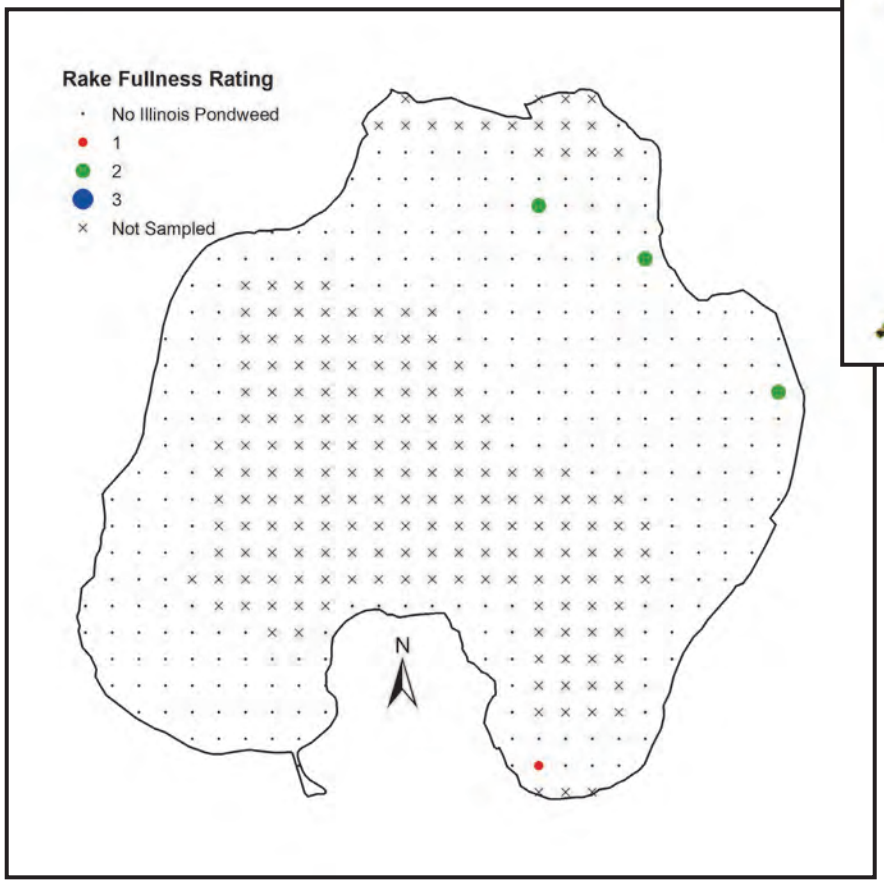
Identifying Features

- Stout stems up to 2.0 m long, often branched
- Submerged leaves with nine to 19 veins (midvein prominent) on short stalks (up to 4.0 cm) or attached directly to the stem
- Floating leaves, if produced, elliptical, with 13 to 29 veins
- Often covered with calcium carbonate in hard water

Variable pondweed (*P. gramineus*) is similar to Illinois pondweed, but differs in having three to seven veins on submerged leaves

Ecology

- Lakes with clear water, shallow or deep, neutral or hard, over soft sediments
- Overwinters as rhizomes or remains green under the ice
- Provides food for waterfowl, muskrat, deer, and beaver
- Provides excellent habitat for fish and aquatic invertebrates



Potamogeton natans — Floating-Leaf Pondweed

Native

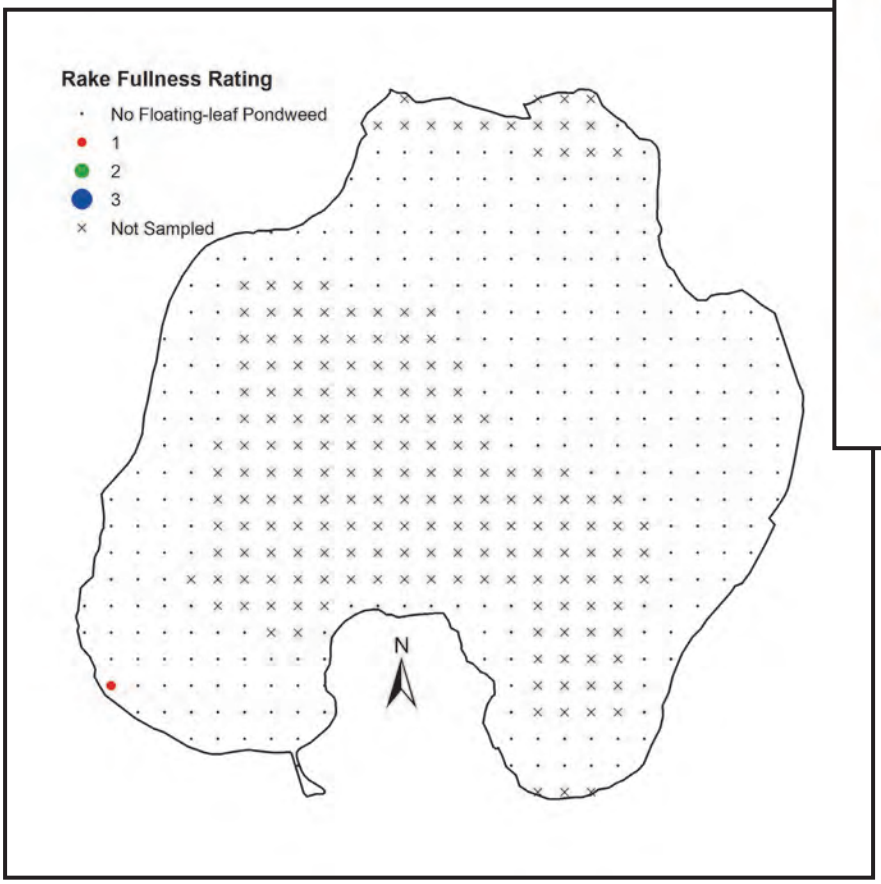
Identifying Features

- Floating leaves (5.0 to 10 cm long) with heart-shaped bases and 17 to 37 veins
- Floating leaf stalks bent where they meet the leaf, causing the leaf to be held at roughly a 90-degree angle to the stalk
- Submersed leaves (1.0 to 2.0 mm wide) linear and stalk-like, with three to five veins

Floating-leaf pondweed is similar to Oakes' pondweed (*P. oakesianus*) and spotted pondweed (*P. pulcher*). Oake's pondweed is smaller, with floating leaves 2.5 to 6.0 cm long and submersed leaves 0.25 to 1.0 mm wide. Spotted pondweed differs in having small black spots on its stems and leaf stalks and lance-shaped submersed leaves with wavy margins

Ecology

- Usually in shallow waters (<2.5 m) over soft sediment
- Emerges in spring from buds formed along rhizomes
- Provides food for waterfowl, muskrat, beaver, and deer
- Holds fruit on stalks until late in the growing season, which provides valuable feeding opportunities for waterfowl
- Provides good fish habitat



Potamogeton nodosus — Long-Leaf Pondweed

Native

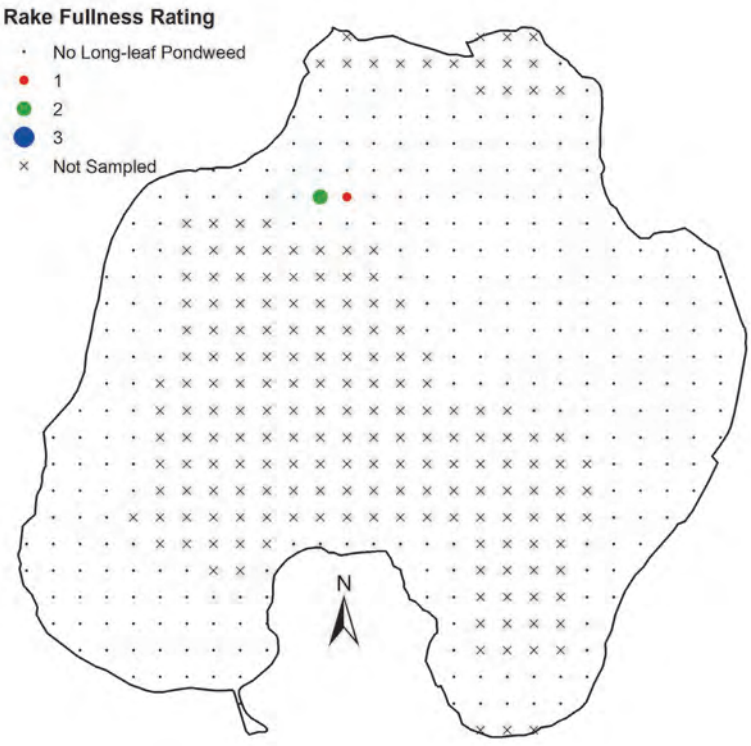
Identifying Features

- Floating leaves 5.0 to 13 cm long, tapering to leaf stalks that are longer than the attached leaf blades
- Submersed leaves up to 30 cm long and 1.0 to 2.5 mm wide, with seven to 15 veins, and long leaf stalks
- Stipules 4.0 to 10 cm long, free from the leaves, disintegrating by mid-summer

Long-leaf pondweed may be distinguished from other pondweeds that have similar floating leaves (e.g. *P. illinoensis* and *P. natans*) by the long leaf stalks of its submersed leaves. The floating leaves of *P. natans* also differ by having a heart-shaped base and by being held to the leaf stalks at roughly 90-degree angles. In *P. illinoensis* the stalks of floating leaves, if produced, are shorter than the leaf blades

Ecology

- Streams and lakes, shallow and deep, but more often in flowing water
- Emerges in spring from buds formed along rhizomes
- Provides food for waterfowl, muskrat, beaver, and deer
- Harbors large numbers of aquatic invertebrates, which provide food for fish



Potamogeton pectinatus — Sago Pondweed

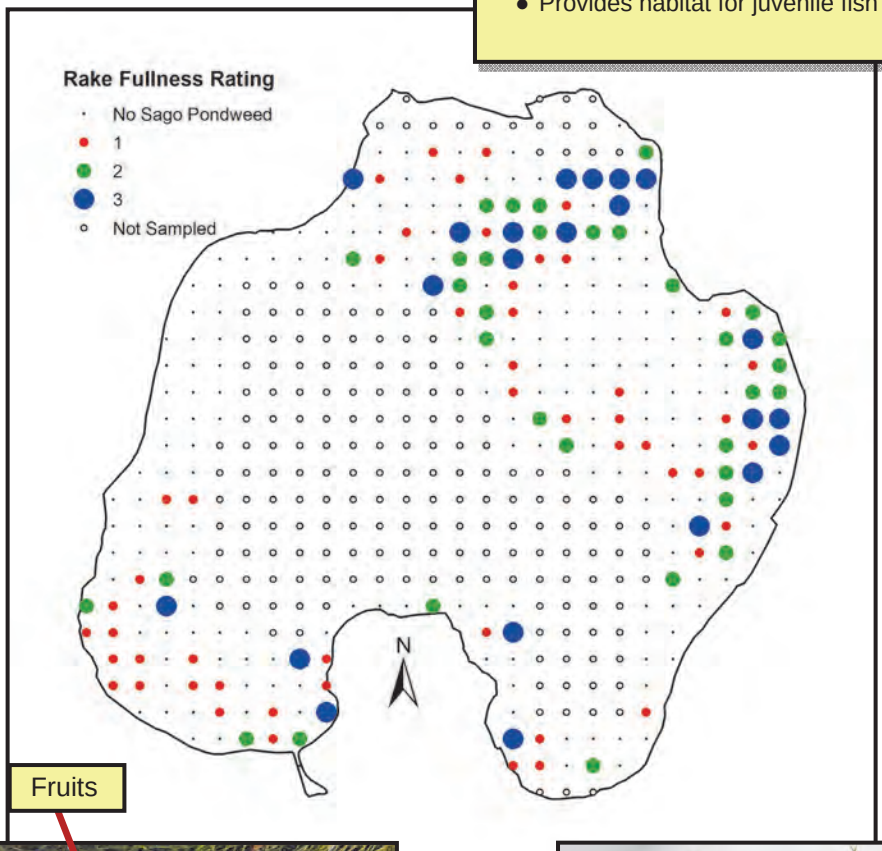
Native

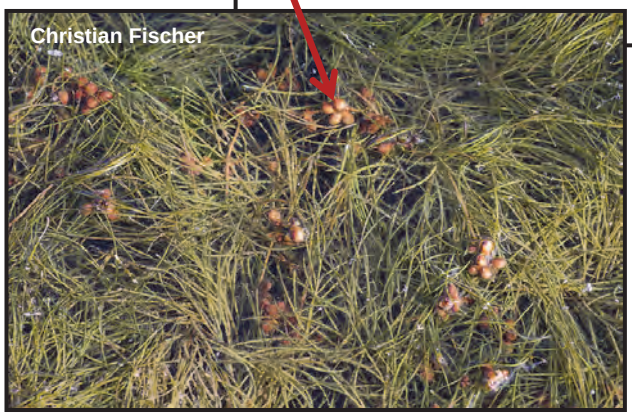
Identifying Features

- Stems often *slightly zig-zagged* and forked multiple times, yielding a fan-like form
- Leaves one to four inches long, very thin, and ending in a sharp point
- Whorls of fruits spaced along the stem may appear as beads on a string

Ecology

- Lakes and streams
- Overwinters as rhizomes and starchy tubers
- Tolerates murky water and disturbed conditions
- Provides abundant fruits and tubers, which are an *important food for waterfowl*
- Provides habitat for juvenile fish





Potamogeton praelongus — White-Stem Pondweed

Native

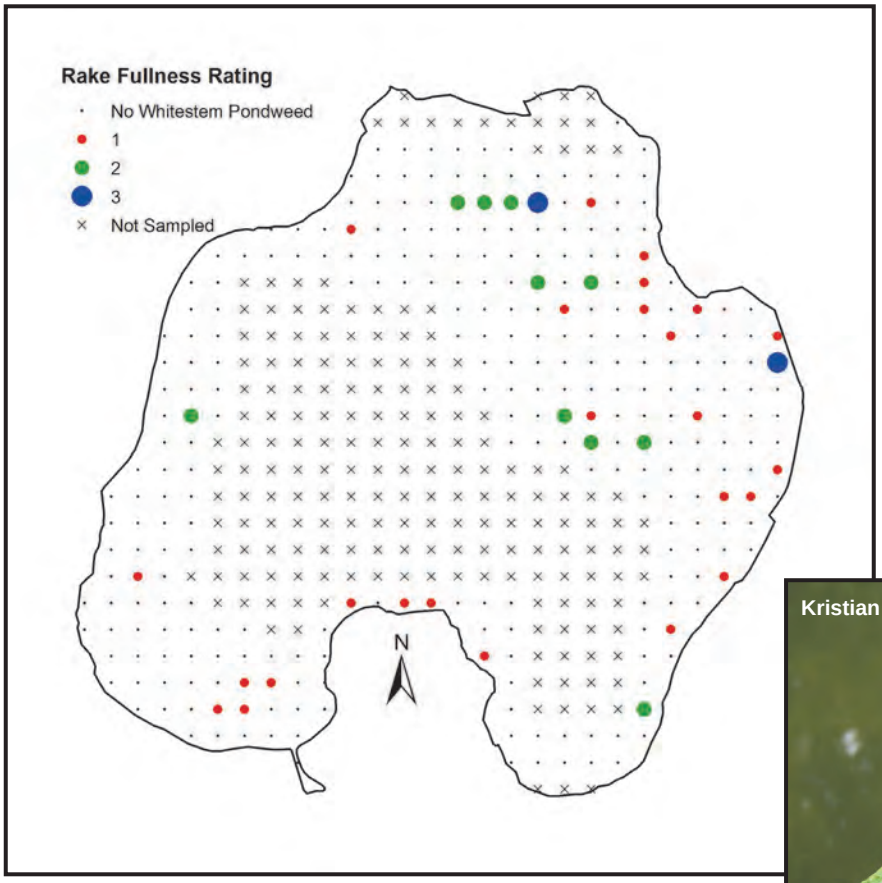
Identifying Features

- Stems usually pale and zig-zagging
- Leaves clasping, alternate, with three to five prominent veins and 11 to 35 smaller ones, with boat-shaped tips that often split when pressed between fingers

White-stem pondweed is similar to clasping pondweed (*P. richardsonii*), but the leaves of clasping pondweed do not have boat-shaped tips that split when pressed

Ecology

- Found in clear lakes in water three to 12 feet deep over soft sediments
- *"Indicator species"* due to its sensitivity to water quality changes; its disappearance indicating degradation; requires more natural areas that receive little disturbance
- Sometimes remains evergreen beneath the ice
- Provides food for waterfowl, muskrat, beaver, and deer
- Provides habitat for trout and muskellunge




Kristian Peters

Potamogeton pusillus — Small Pondweed

Native

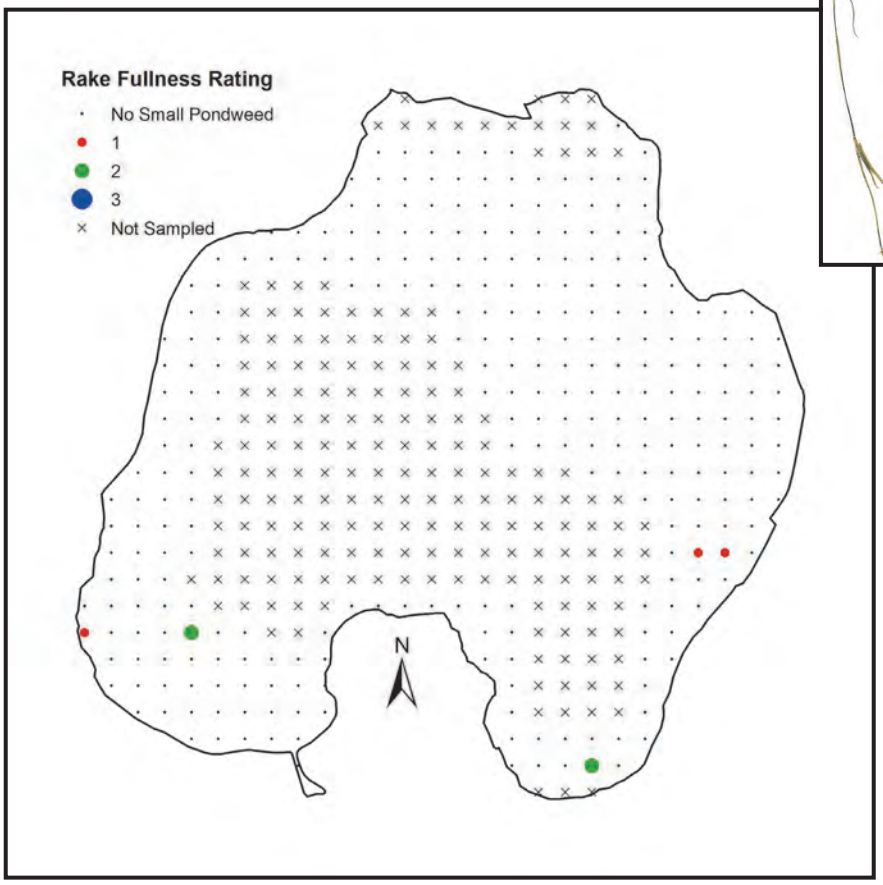
Identifying Features

- Narrow, submersed leaves (1-7 cm long and 0.2-2.5 mm wide), attaching directly to the stem, with 3 veins, leaf tips blunt or pointed, and often with raised glands where the leaf attaches to the stem
- Produces no floating leaves
- Numerous winter buds (turions) produced with rolled, inner leaves resembling cigars
- Flowers and fruits produced in whorls spaced along slender stalk

Small pondweed is similar to leafy pondweed (*P. foliosus*), when not in flower and fruit. However, unlike leafy pondweed, it often has raised glands where the leaves meet the stem. The flowers and fruits of small pondweed are also borne on longer, more slender stalks and in whorls that are spaced apart.

Ecology

- Shallow or deep waters over soft sediments in lake and streams
- Overwinters as rhizomes or winter buds (turions)
- Food for waterfowl, muskrat, deer, and beaver
- Cover for invertebrates and fish



Potamogeton richardsonii — Clasping Pondweed

Native

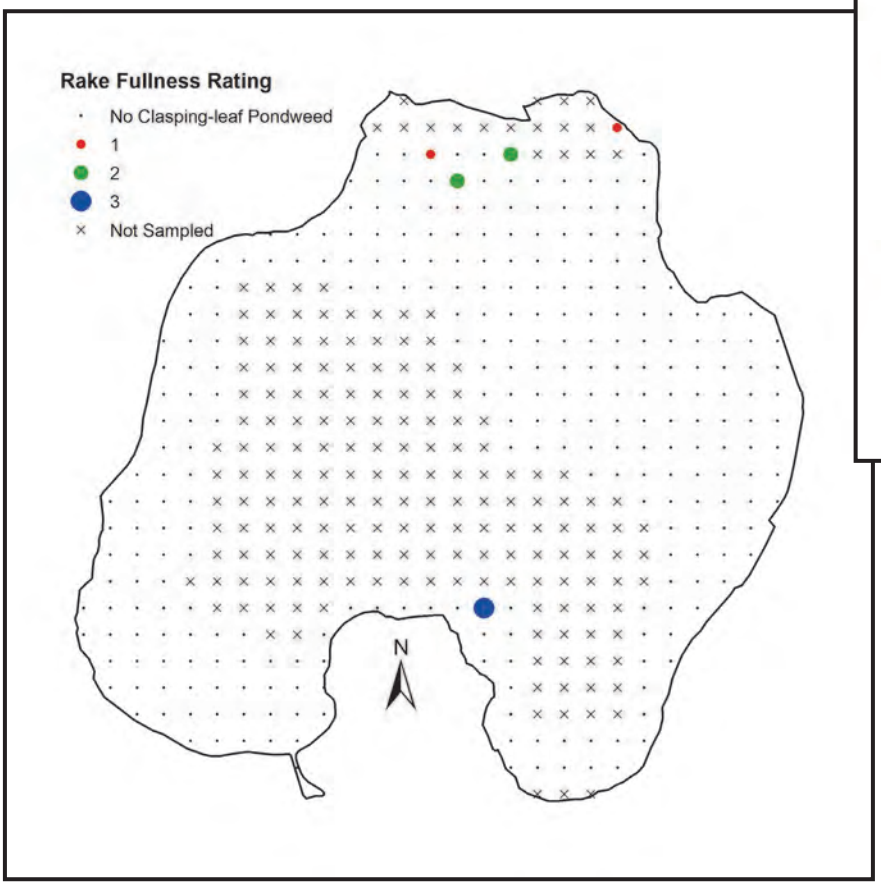
Identifying Features

- Leaves alternating along and clasping the stem, with wavy edges, coming to a point at the tip, and often with three to five veins prominent among many more that are faintly visible
- Produces no floating leaves

Clasping pondweed is similar to white-stem pondweed (*P. praelongus*), but the latter has boat-shaped leaf tips that split when pressed between one's fingers. The exotic curly-leaf pondweed (*P. crispus*) may appear similar, but differs by having serrated leaf margins

Ecology

- In lakes and streams, shallow and deep, often in association with coontail
- Tolerant of disturbance
- Fruits a food source for waterfowl and plants browsed by muskrat, beaver, and deer
- Stems emerging from perennial rhizomes



Potamogeton robbinsii — Robbins Pondweed or Fern Pondweed

Native

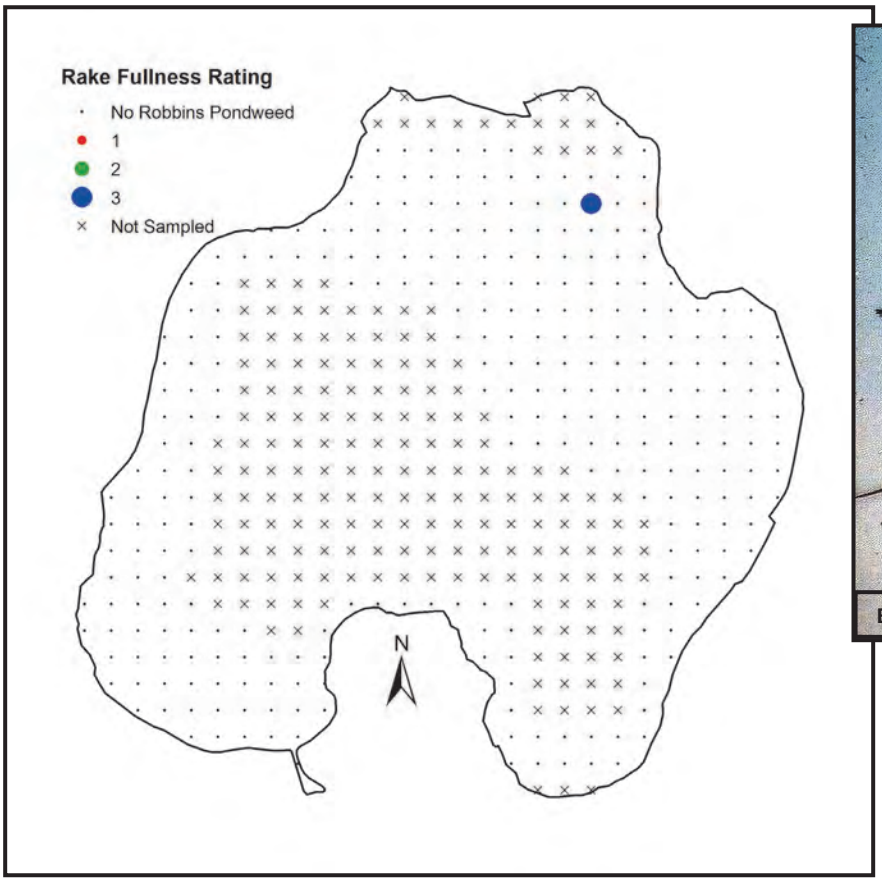
Identifying Features

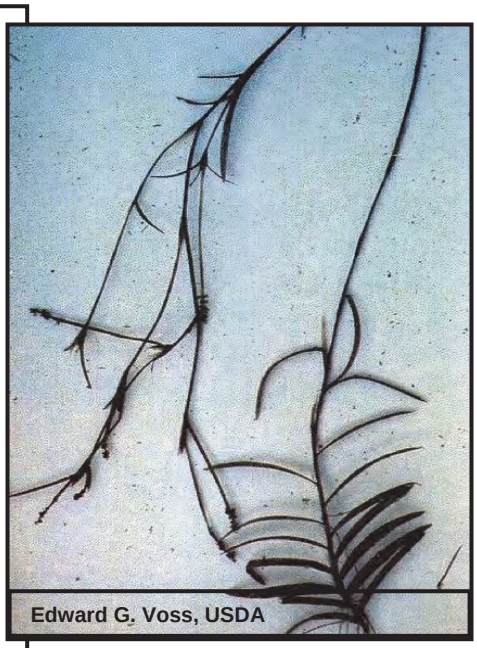
- Robust stems; stems and leaves often dark green to brown
- Leaves two-ranked (in opposite directions) along the stem, long and pointed, wrapping around the stem at the base, with edges finely serrated
- No floating leaves

Robbins pondweed is similar to flat-stem pondweed (*P. zosteriformis*) and water stargrass (*Zosterella dubia*), but is distinguished from both by its round stem

Ecology

- Lakes, often deeper than other pondweeds; requires more natural areas that receive little disturbance
- Plants often remaining green over the winter
- Regenerates from rhizomes and winter buds (turions), fruit only rarely produced
- Provides food for waterfowl
- Provides habitat for invertebrates and fish, particularly pike





Edward G. Voss, USDA

Potamogeton zosteriformis — Flat-Stem Pondweed

Native

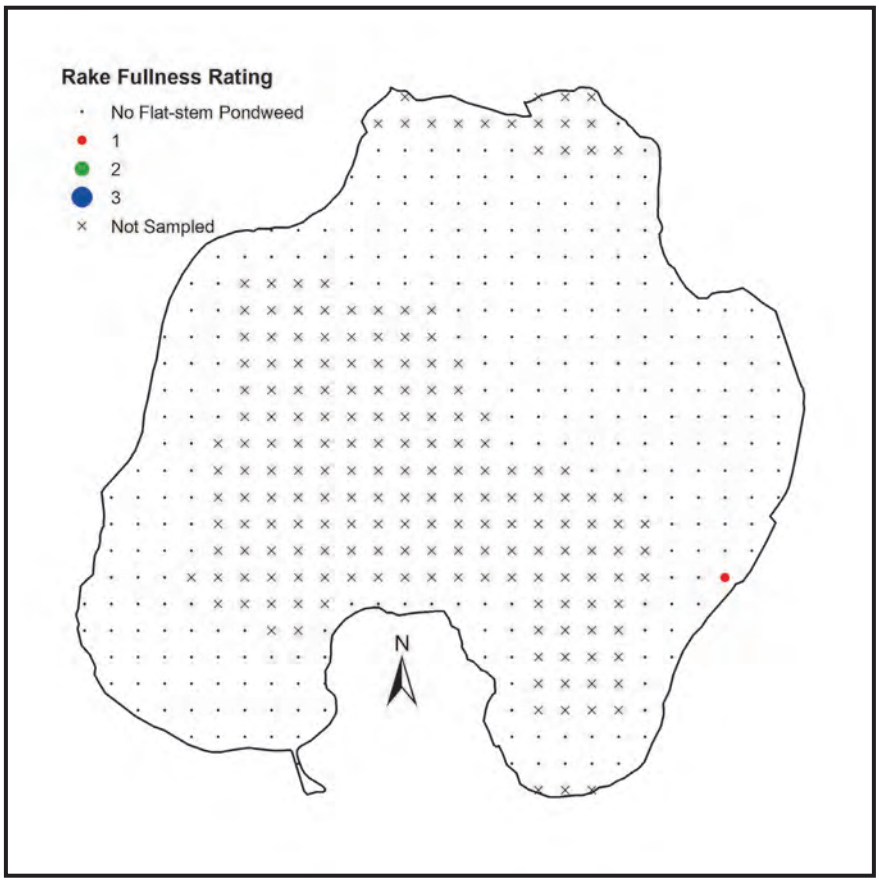
Identifying Features

- Stems strongly flattened
- Leaves up to four to eight inches long, pointed, with a prominent midvein and many finer, parallel veins
- Stiff winter buds consisting of tightly packed ascending leaves

Flat-stem pondweed may be confused with yellow stargrass (*Zosterella dubia*), but the leaves of yellow stargrass lack a prominent midvein.

Ecology

- Found at a variety of depths over soft sediment in lakes and streams
- Overwinters as rhizomes and winter buds
- Has antimicrobial properties
- Provides food for waterfowl, muskrat, beaver, and deer
- Provides cover for fish and aquatic invertebrates



Ranunculus aquatilis — White Water Crowfoot

Native

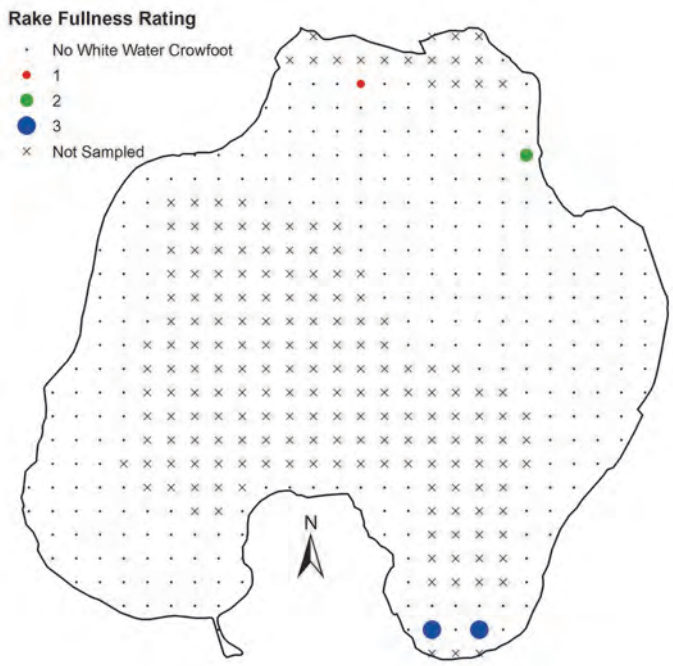
Identifying Features

- Submersed leaves finely divided into thread-like sections, and arranged alternately along the stem
- Flowers white, with five petals
- May or may not produce floating leaves

White water crowfoot is similar to other aquatic *Ranunculus* spp. However, the latter have yellow flowers and leaf divisions that are flat, rather than thread-like

Ecology

- Shallow water in lakes or streams, often with high alkalinity
- Often forms dense patches near springs or sand bars
- Emerges from rhizomes in the spring
- Fruit and foliage consumed by waterfowl and upland birds alike
- Habitat for invertebrates that are food for fish like trout



Sagittaria latifolia — Broadleaf Arrowhead

Native

Identifying Features

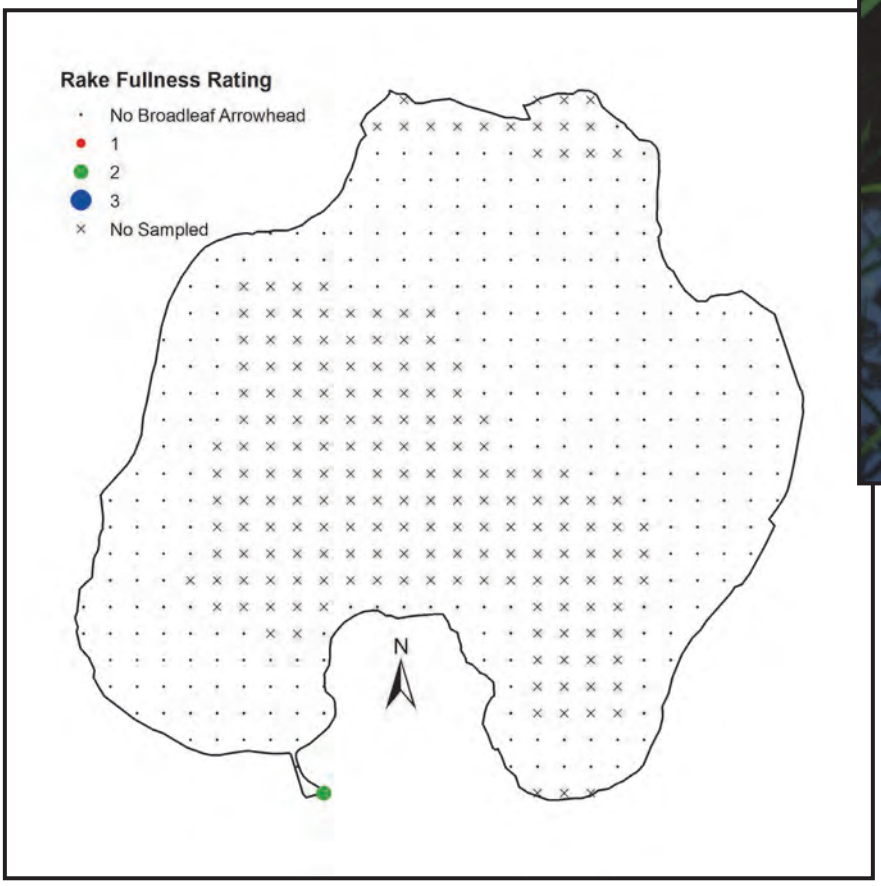
- Produces a cluster of emergent, arrow-head-shaped leaves that may be narrow or broad
- Produces flowering stems with whorls of short-stalked male flowers near the top, longer-stalked female flowers below, and three boat-shaped bracts (4-15 mm long) beneath each whorl
- Flowers with three rounded, white petals

Other arrowhead species (*S. cuneata* and *S. brevirostra*) are similar to broadleaf arrowhead, but both have bracts that tend to be longer (up to 1.5 inches long). Broadleaf arrowhead also produces nutlets (seeds) with longer beaks (0.6-1.8 mm long) than those of *S. cuneata* (0.1-0.5 mm long).

Ecology

- Shallow waters of lakes, streams, and marshes
- Emerges in spring from perennial rhizomes and tubers and reproduces by seed under favorable conditions
- *Among the highest value aquatic plants for wildlife, with high-energy tubers providing important food for mammals and migratory waterfowl (another common name is "duck potato") and leaf canopies providing shade and shelter for small fish*


Zen Sutherland



Scirpus subterminalis — Water Bulrush

Native

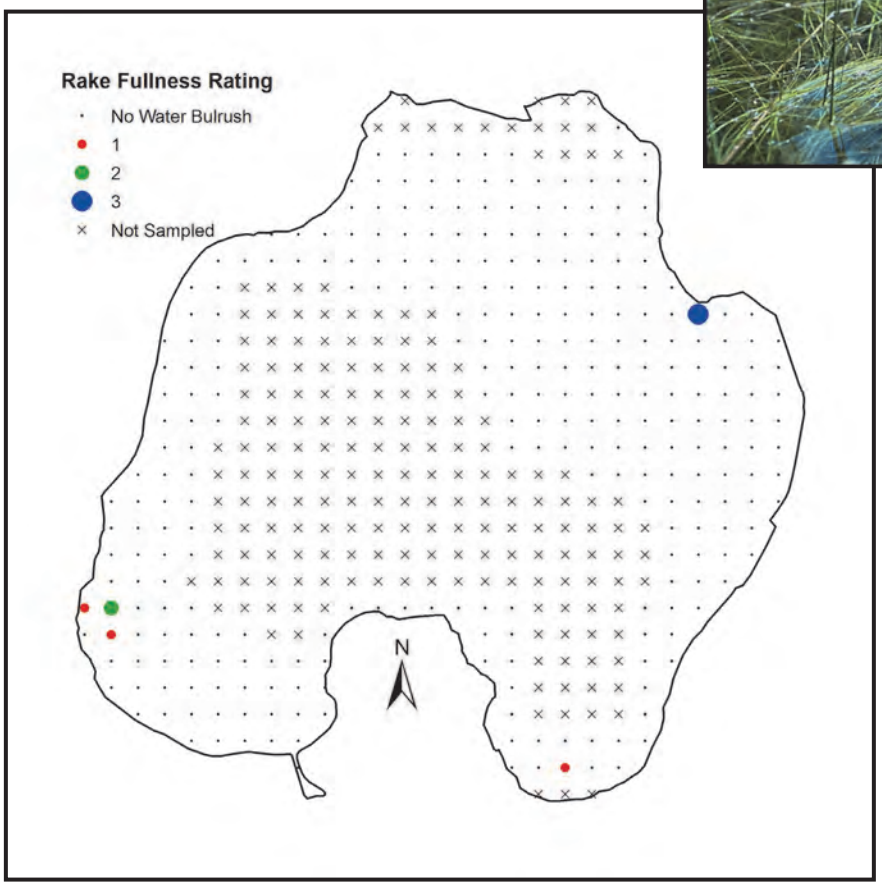
Identifying Features

- Leaves hair-like, with one to five veins length-wise and some perpendicular “cross veins”
- Leaves sheathing one another at the base
- Spikelets (fertile structures), when present, 7.0 to 12 mm long, with a floral leaf extending above the spikelet

The fine submersed leaves of water bulrush could be confused with the fine, submersed stems of Robbins’ spikerush (*Eleocharis robbinsii*). However, the stems of Robbins’ spikerush are separate from one another, unlike the fine leaves of water bulrush, which sheath each other at the base of each shoot

Ecology

- Found in a variety of shallow to deep waters
- Spreading by rhizomes, forming grass-like, submersed meadows
- Provides phosphorus to algae that grow on its surface, which, in turn, are important for invertebrate growth
- Provides habitat for invertebrates and fish



Vallisneria americana — Eelgrass

Native

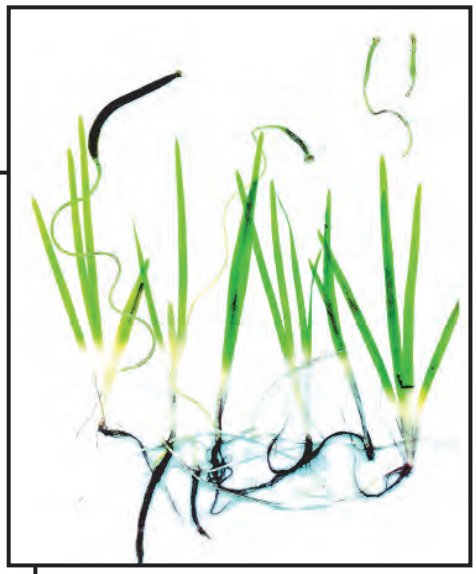
Identifying Features

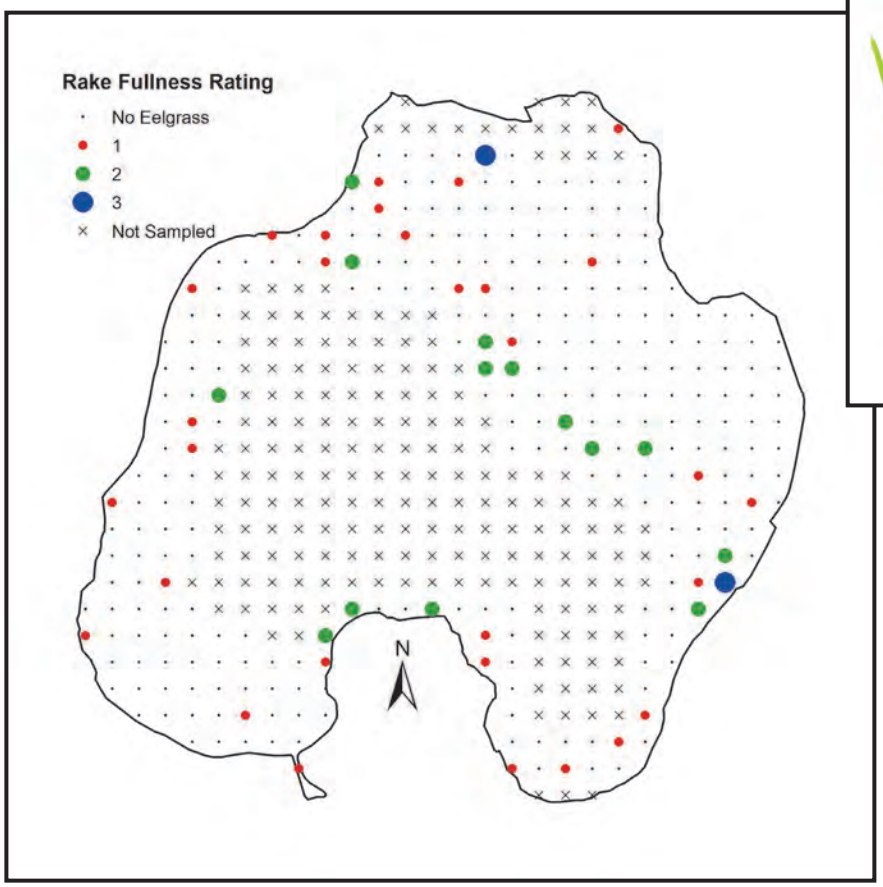
- Leaves ribbon-like, up to two meters long, with a prominent stripe down the middle, and emerging in clusters along creeping rhizomes
- Male and female flowers on separate plants, female flowers raised to the surface on spiral-coiled stalks

The foliage of eelgrass could be confused with the submersed leaves of bur-reeds (*Sparganium* spp.) or arrowheads (*Sagittaria* spp.), but the leaves of eelgrass are distinguished by their prominent middle stripe. The leaves of ribbon-leaf pondweed (*Potamogeton epihydrus*) are also similar to those of eelgrass, but the leaves of the former are alternately arranged along a stem rather than arising from the plant base

Ecology

- Firm substrates, shallow or deep, in lakes and streams
- Spreads by seed, by creeping rhizomes, and by offsets that break off and float to new locations in the fall
- All portions of the plant consumed by waterfowl; an especially important food source for Canvasback ducks
- Provides habitat for invertebrates and fish





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Appendix B

PIKE LAKE
2012 AND 2016 AQUATIC PLANT SURVEY DATA TABLES