Aquatic Invasive Species
Meandering Littoral Zone Surveys
Silver Lake (WBIC: 1881100)
Barron County, Wisconsin

Spiny hornwort – EWM look-alike in Silver Lake's NW bay

Aerial photo with survey tracks 8/20/22

Project Initiated by:

The Silver Lake Association and the
Wisconsin Department of Natural Resources

Dwarf water-milfoil – Silver Lake's only milfoil

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June 26 and August 20, 2022

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INTRODUCTION:

Silver Lake (WBIC 1881100) is a 331-acre, stratified, seepage lake located in the Town of Lakeland in north-central Barron County (T36N R13W S23, 24, 25). The lake reaches a maximum depth of 91ft in the central basin and has an average depth of 38ft (WDNR 2021). Silver Lake is mesotrophic in nature and water clarity is good to very good with Secchi readings averaging 13.7ft from 1987-2022 (WDNR 2022). The shoreline is dominated by sand, gravel and rock with scattered patches of sandy muck; especially at depths beyond 10ft. The lake's only nutrient-rich organic muck occurs in the northwest bay (Bush et al. 1967) (Figure 1).

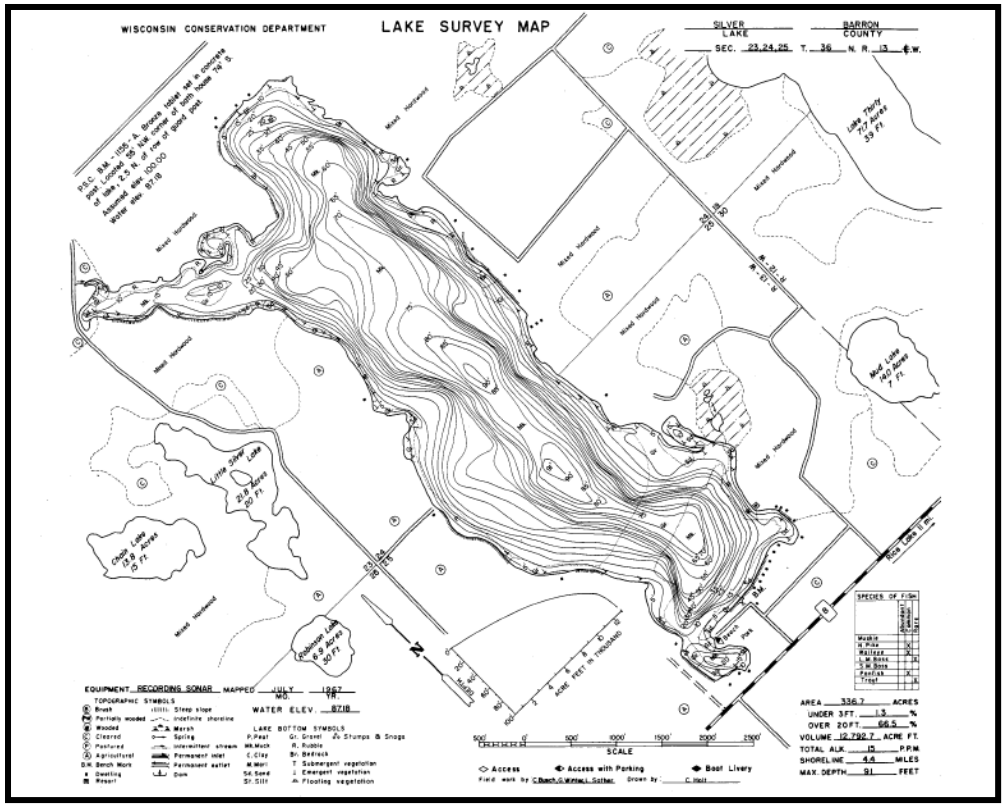

Figure 1: Silver Lake Bathymetric Map

BACKGROUND AND STUDY RATIONALE:

The Silver Lake Association (SLA) and the Wisconsin Department of Natural Resources (WDNR) authorized a full-lake plant survey in 2012 as a prerequisite to developing an Aquatic Plant Management Plan (APMP) in 2013. This survey found no evidence of Curly-leaf pondweed (*Potamogeton crispus*) (CLP), Eurasian water-milfoil (*Myriophyllum spicatum*) (EWM), or any other aquatic invasive plant species (AIS) in the lake with the exception of Reed canary grass (*Phalaris arundinacea*) (RCG) which was common on the lake's margins. In an effort to determine if the lake remained free of harmful exotic species, the SLA applied for and received an AIS education grant to complete two littoral zone surveys during the summers of 2018-2020. Following the completion of this grant, the SLA decided to continue monitoring on their own in the summers of 2021 and 2022. This report is the summary of our June 26 and August 20, 2022 AIS shoreline surveys.

SURVEY METHODS:

We conducted a meandering littoral zone survey along the shoreline of the entire lake to look for aquatic invasive plant species in the zone of growth they would most likely be found in. During the June survey, we searched for the presence of Curly-leaf pondweed, Reed canary grass, Japanese Knotweed (*Polygonum cuspidatum*), and any other exotic/invasive plant species that may be present during the early growing season. The late summer survey focused on looking for Eurasian water-milfoil and Purple loosestrife (*Lythrum salicaria*) (PL). During this survey, we especially focused on the north and east shorelines as these are places that floating fragments introduced at the public boat landing would most likely get blown to by prevailing winds before settling to the lake bottom.

RESULTS AND DISCUSSION:

In June, we surveyed transects totaling 9.7km (6.0 miles) throughout the visible littoral zone, and in August we covered 10.8km (6.7 miles) of search lines (Figure 2) (Appendix I). We **did NOT find any evidence of Eurasian water-milfoil, Curly-leaf pondweed, Japanese knotweed, Purple loosestrife, or any other new aquatic invasive species anywhere in Silver Lake**.

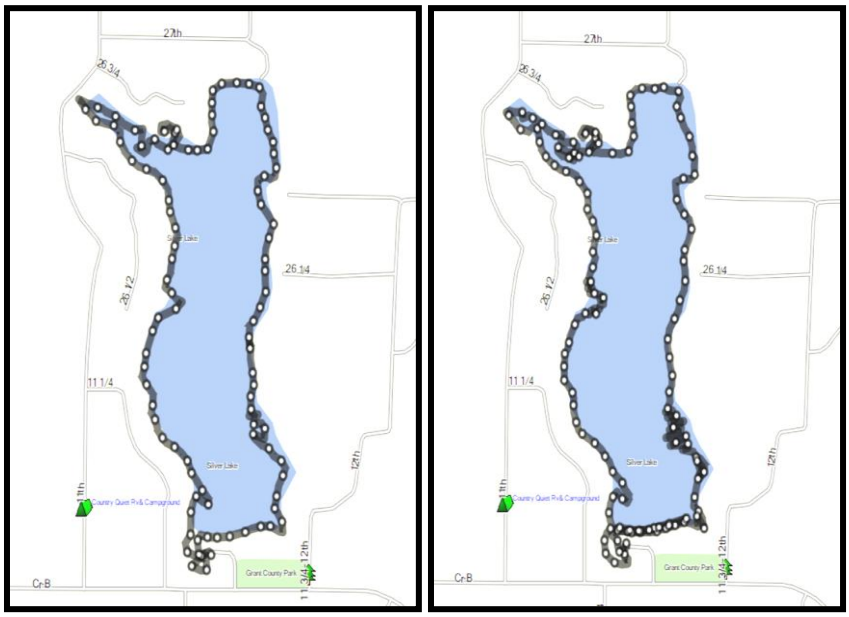

Figure 2: June and August 2022 Shoreline Survey Tracks

The only AIS we found during the surveys was again Reed canary grass. It was common in shallow water, and, to a greater or lesser extent, we documented it on the margins of the entire lake. This species often invades shoreline areas when water recedes on seepage lakes as it's good at quickly colonizing this barren substrate. This was the case in 2012 when the lake's water levels were down many feet (Figure 3). This species can then persist when water levels rise like they have over the past five years. However, it often dies out within a few years after being fully submerged or becomes noticeably thinner if partially submerged. Currently, although its presence is not ideal, it occupies a narrow band inshore from other beneficial native emergent species like Creeping spikerush (*Eleocharis palustris*) and Northern manna grass (*Glyceria borealis*) (Figure 4).

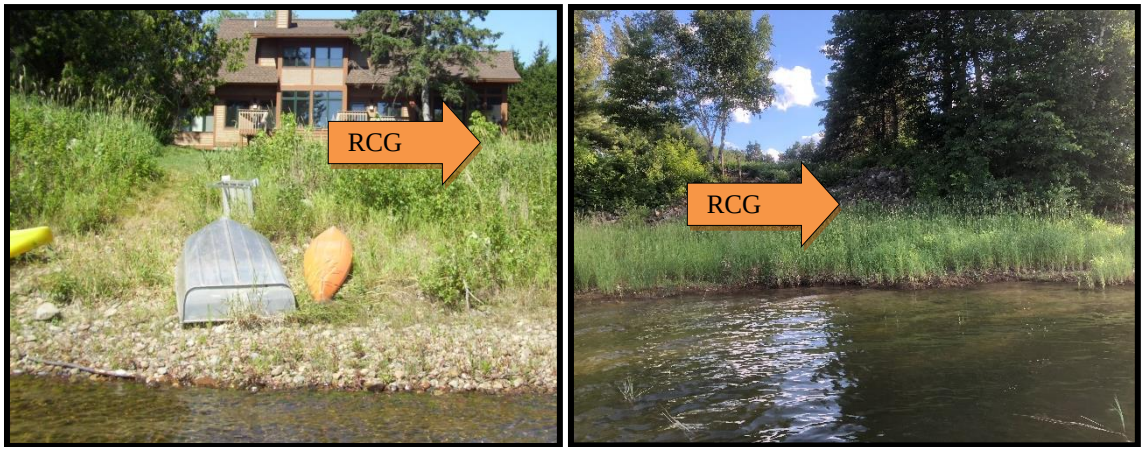

Figure 3: Reed Canary Grass in 2012 (terrestrial) and 2022 (emergent)

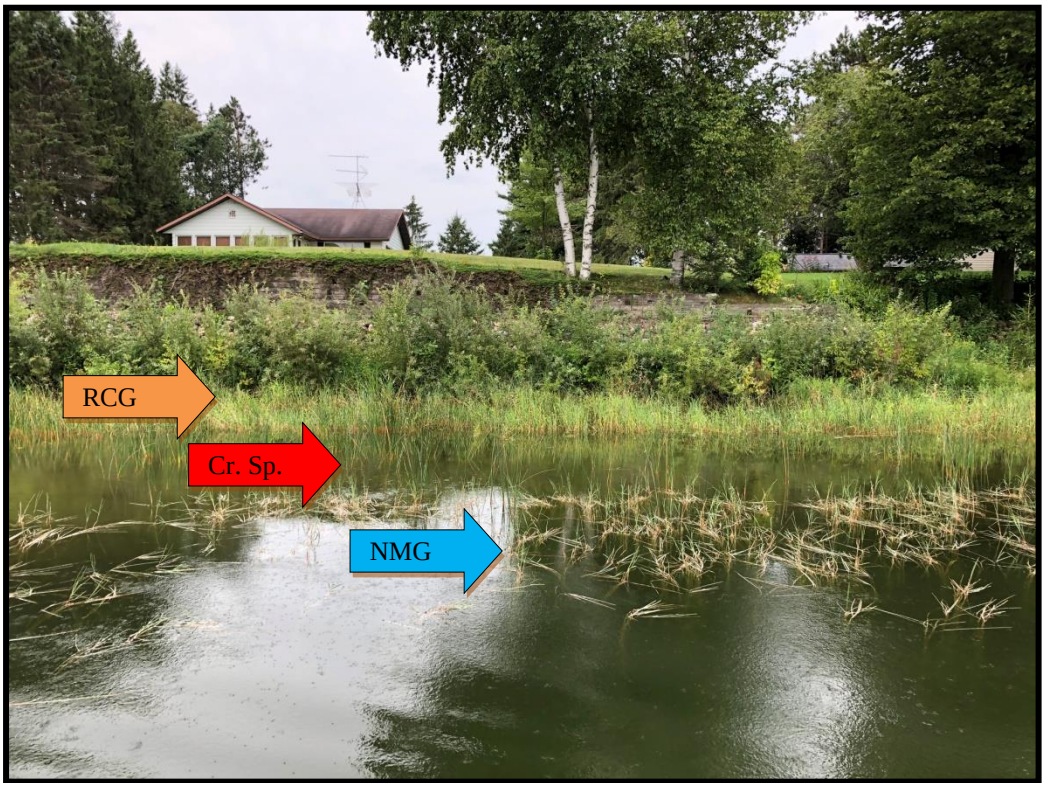

Figure 4: Emergent Community of Reed Canary Grass (unhealthy looking pale green – orange arrow), Creeping Spikerush (dark green with orange base – red arrow) and Northern manna grass (floating and emergent leaves – blue arrow)

As in the past, we noted that Silver Lake **does NOT** have any Northern water-milfoil (NWM) – a native species that is closely related to EWM and common in most local lakes. Despite their superficial resemblance, EWM and NWM can be told apart by their number of leaflets – NWM has <24 whereas EWM normally has >26 (Figure 5). EWM also tends to have a bright red growth tip on the top of the plant whereas NWM has a bright lime green growth tip. In the fall, NWM forms winter buds on the tips of shoots whereas EWM has none.

Although Silver Lake has no milfoil species (with the exception of the diminutive Dwarf water-milfoil (*Myriophyllum tenellum*) which doesn't have leaflets and is almost unrecognizable as a milfoil – see report cover), the lake's northwest bay continues to support moderate amounts of two somewhat similar looking beneficial native species: Spiny hornwort (*Ceratophyllum echinatum*) (Figure 6 and report cover) and Common bladderwort (*Utricularia vulgaris*) (Figure 7). Both species primarily occur in water <1.5m over organic muck substrates. Hornwort can be told from the milfoils as it has leaflets that fork repeatedly, while bladderworts have tiny "bladders" along their forked leaflets where these carnivorous plants trap and digest minute aquatic animals like mosquito larvae.

Eurasian water- milfoil **Northern water-milfoil**

Figure 5: Eurasian and Northern Water-milfoil Identification (Berg 2007)

Figure 6: Spiny Hornwort Identification (Skawinski 2010)

Figure 7: Common Bladderwort Identification (Skawinski 2010)

Water smartweed, a Purple loosestrife lookalike, was scattered around much of the lake where it grew both as a terrestrial and as an emergent (Figure 8). It was especially common in the southeast bay and the adjacent wetland where it dominated the plant community. This native species can be told from Purple loosestrife by having bright pink finger-length flowers (not fuchsia and candle length as in PL). Its leaves are also thumb-sized or bigger and are arranged alternately along the stem (not finger-sized or smaller and arranged oppositely along the stem). For more information on a selection of aquatic exotic invasive plant species, see Appendix II.

Figure 8: Water Smartweed (terrestrial and emergent) on Silver Lake

CONSIDERATIONS FOR FUTURE MANAGEMENT:

With Eurasian water-milfoil growing in eight other nearby Barron County Lakes (Sand, Beaver Dam, Kidney, Duck, Shallow, Horseshoe, Lower Vermillion, and Echo), we encourage the SLA to continue landing inspections on a regular basis into the foreseeable future. Early detection of an AIS like EWM provides the best chance to economically contain them once an infestation has occurred. We also encourage any lake resident or boater that discovers a plant they even suspect may be a new AIS to immediately contact Matthew Berg, ERS, LLC Research Biologist at 715-338-7502 for identification confirmation. Ideally, a specimen, a jpg, and the accompanying GPS coordinates of the location should be included. However, even a texted picture of the plant in question held in hand is often enough to confirm identification.

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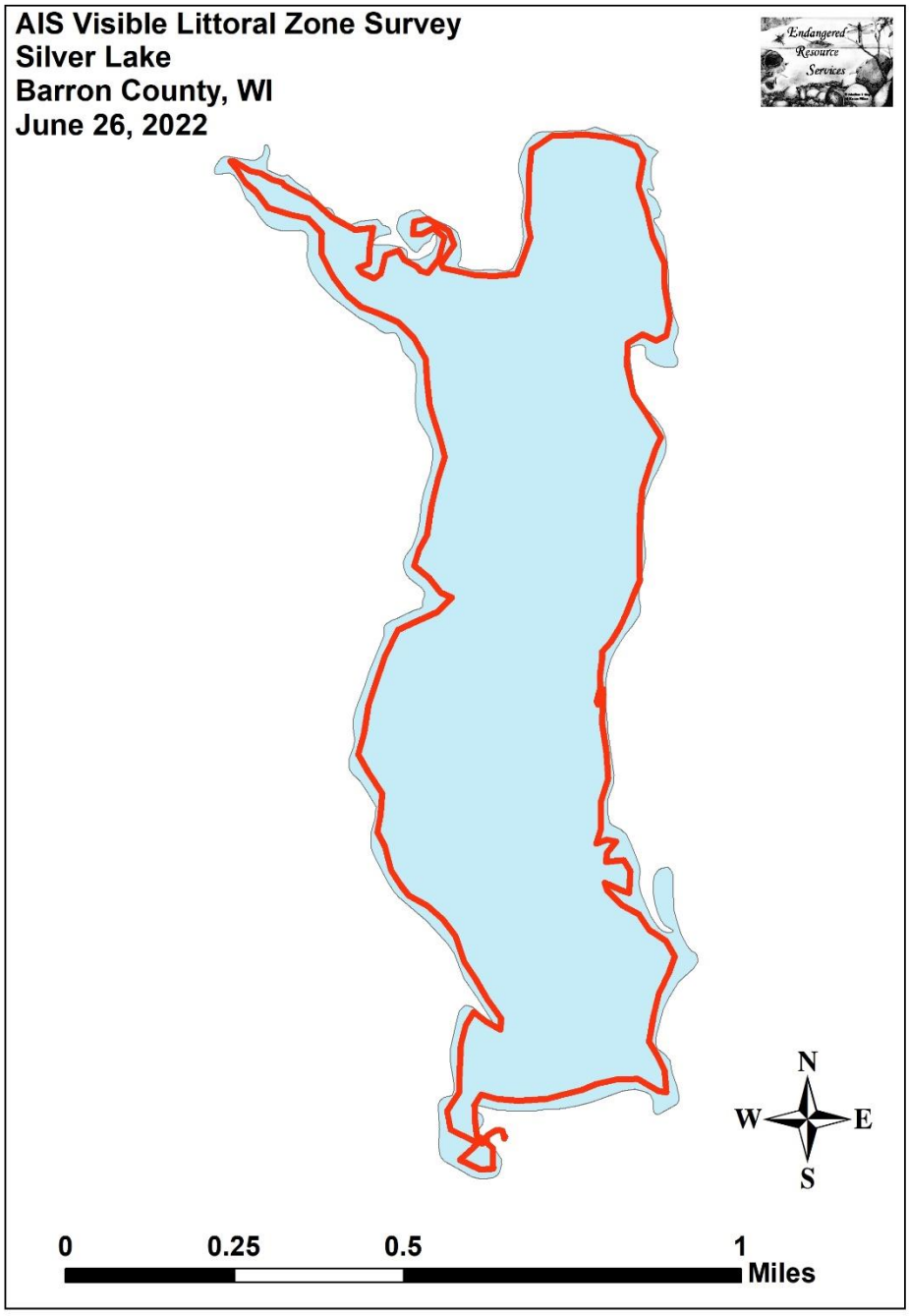
WDNR. [online]. 2012. Reed canary grass fact sheet. http://dnr.wi.gov/topic/Invasives/fact/ReedCanaryGrass.html (2012, October).

Appendix I: Silver Lake June and August Survey Tracks


AIS Visible Littoral Zone Survey
Silver Lake
Barron County, WI
June 26, 2022
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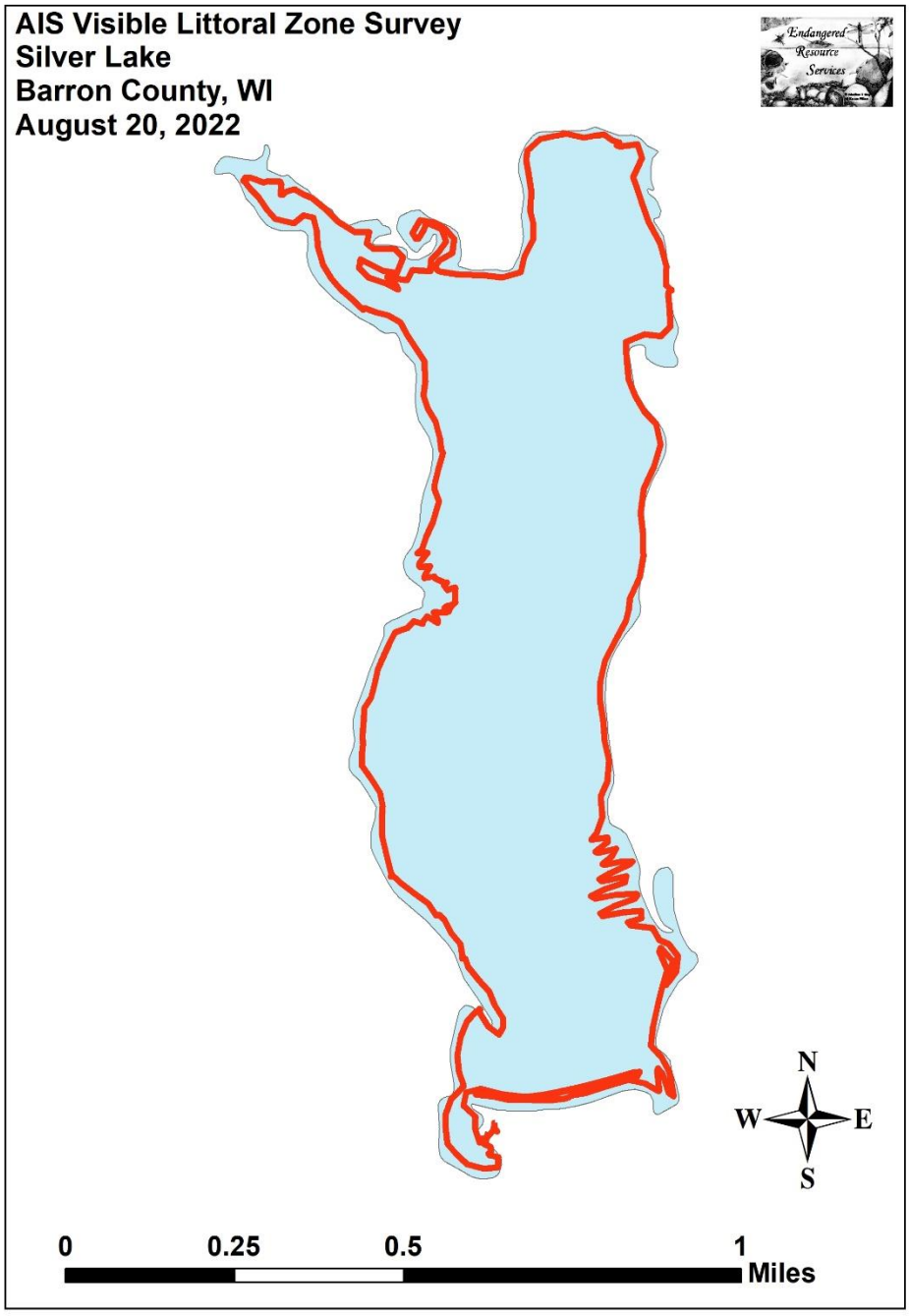
AIS Visible Littoral Zone Survey
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Barron County, WI
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Appendix II: Aquatic Exotic Invasive Plant Species Information

Eurasian Water-milfoil

DESCRIPTION: Eurasian Water-milfoil is a submersed aquatic plant native to Europe, Asia, and northern Africa. It is the only non-native milfoil in Wisconsin. Like the native milfoils, the Eurasian variety has slender stems whorled by submersed feathery leaves and tiny flowers produced above the water surface. The flowers are located in the axils of the floral bracts, and are either four-petaled or without petals. The leaves are threadlike, typically uniform in diameter, and aggregated into a submersed terminal spike. The stem thickens below the inflorescence and doubles its width further down, often curving to lie parallel with the water surface. The fruits are four-jointed nut-like bodies. Without flowers or fruits, Eurasian Water-milfoil is nearly impossible to distinguish from Northern Water-milfoil. Eurasian Water-milfoil has 9-21 pairs of leaflets per leaf, while Northern milfoil typically has 7-11 pairs of leaflets. Coontail is often mistaken for the milfoils, but does not have individual leaflets.

DISTRIBUTION AND HABITAT: Eurasian milfoil first arrived in Wisconsin in the 1960's. During the 1980's, it began to move from several counties in southern Wisconsin to lakes and waterways in the northern half of the state. As of 1993, Eurasian milfoil was common in 39 Wisconsin counties (54%) and at least 75 of its lakes, including shallow bays in Lakes Michigan and Superior and Mississippi River pools.

Eurasian Water-milfoil grows best in fertile, fine-textured, inorganic sediments. In less productive lakes, it is restricted to areas of nutrient-rich sediments. It has a history of becoming dominant in eutrophic, nutrient-rich lakes, although this pattern is not universal. It is an opportunistic species that prefers highly disturbed lake beds, lakes receiving nitrogen and phosphorous-laden runoff, and heavily used lakes. Optimal growth occurs in alkaline systems with a high concentration of dissolved inorganic carbon. High water temperatures promote multiple periods of flowering and fragmentation.

LIFE HISTORY AND EFFECTS OF INVASION: Unlike many other plants, Eurasian Water-milfoil does not rely on seed for reproduction. Its seeds germinate poorly under natural conditions. It reproduces vegetatively by fragmentation, allowing it to disperse over long distances. The plant produces fragments after fruiting once or twice during the summer. These shoots may then be carried downstream by water currents or inadvertently picked up by boaters. Milfoil is readily dispersed by boats, motors, trailers, bilges, live wells, or bait buckets, and can stay alive for weeks if kept moist.

Once established in an aquatic community, milfoil reproduces from shoot fragments and stolons (runners that creep along the lake bed). As an opportunistic species, Eurasian Water-milfoil is adapted for rapid growth early in spring. Stolons, lower stems, and roots persist over winter and store the carbohydrates that help milfoil claim the water column early in spring, photosynthesize, divide, and form a dense leaf canopy that shades out native aquatic plants. Its ability to spread rapidly by fragmentation and effectively block out sunlight needed for native plant growth often results in monotypic stands. Monotypic stands of Eurasian milfoil provide only a single habitat, and threaten the integrity of aquatic communities in a number of ways; for example, dense stands disrupt predator-prey relationships by fencing out larger fish, and reducing the number of nutrient-rich native plants available for waterfowl.

Dense stands of Eurasian Water-milfoil also inhibit recreational uses like swimming, boating, and fishing. Some stands have been dense enough to obstruct industrial and power generation water intakes. The visual impact that greets the lake user on milfoil-dominated lakes is the flat yellow-green of matted vegetation, often prompting the perception that the lake is "infested" or "dead". Cycling of nutrients from sediments to the water column by Eurasian Water-milfoil may lead to deteriorating water quality and algae blooms of infested lakes. (Taken in its entirety from WDNR, 2012 http://www.dnr.state.wi.us/invasives/fact/milfoil.htm)

Curly-leaf pondweed

DESCRIPTION: Curly-leaf pondweed is an invasive aquatic perennial that is native to Eurasia, Africa, and Australia. It was accidentally introduced to United States waters in the mid-1880s by hobbyists who used it as an aquarium plant. The leaves are reddish-green, oblong, and about 3 inches long, with distinct wavy edges that are finely toothed. The stem of the plant is flat, reddish-brown and grows from 1 to 3 feet long. The plant usually drops to the lake bottom by early July.

DISTRIBUTION AND HABITAT: Curly-leaf pondweed is commonly found in alkaline and high nutrient waters, preferring soft substrate and shallow water depths. It tolerates low light and low water temperatures. It has been reported in all states but Maine.

LIFE HISTORY AND EFFECTS OF INVASION: Curly-leaf pondweed spreads through burr-like winter buds (turions), which are moved among waterways. These plants can also reproduce by seed, but this plays a relatively small role compared to the vegetative reproduction through turions. New plants form under the ice in winter, making curly-leaf pondweed one of the first nuisance aquatic plants to emerge in the spring.

It becomes invasive in some areas because of its tolerance for low light and low water temperatures. These tolerances allow it to get a head start on and out compete native plants in the spring. In mid-summer, when most aquatic plants are growing, curly-leaf pondweed plants are dying off. Plant die-offs may result in a critical loss of dissolved oxygen. Furthermore, the decaying plants can increase nutrients which contribute to algal blooms, as well as create unpleasant stinking messes on beaches. Curly-leaf pondweed forms surface mats that interfere with aquatic recreation. (Taken in its entirety from WDNR, 2012 http://www.dnr.state.wi.us/invasives/fact/curlyleaf_pondweed.htm)

Reed canary grass

DESCRIPTION: Reed canary grass is a large, coarse grass that reaches 2 to 9 feet in height. It has an erect, hairless stem with gradually tapering leaf blades 3 1/2 to 10 inches long and 1/4 to 3/4 inch in width. Blades are flat and have a rough texture on both surfaces. The lead ligule is membranous and long. The compact panicles are erect or slightly spreading (depending on the plant's reproductive stage), and range from 3 to 16 inches long with branches 2 to 12 inches in length. Single flowers occur in dense clusters in May to mid-June. They are green to purple at first and change to beige over time. This grass is one of the first to sprout in spring, and forms a thick rhizome system that dominates the subsurface soil. Seeds are shiny brown in color.

Both Eurasian and native ecotypes of reed canary grass are thought to exist in the U.S. The Eurasian variety is considered more aggressive, but no reliable method exists to tell the ecotypes apart. It is believed that the vast majority of our reed canary grass is derived from the Eurasian ecotype. Agricultural cultivars of the grass are widely planted.

Reed canary grass also resembles non-native orchard grass (*Dactylis glomerata*), but can be distinguished by its wider blades, narrower, more pointed inflorescence, and the lack of hairs on glumes and lemmas (the spikelet scales). Additionally, bluejoint grass (*Calamagrostis canadensis*) may be mistaken for reed canary in areas where orchard grass is rare, especially in the spring. The highly transparent ligule on reed canary grass is helpful in distinguishing it from the others. Ensure positive identification before attempting control.

DISTRIBUTION AND HABITAT: Reed canary grass is a cool-season, sod-forming, perennial wetland grass native to temperate regions of Europe, Asia, and North America. The Eurasian ecotype has been selected for its vigor and has been planted throughout the U.S. since the 1800's for forage and erosion control. It has become naturalized in much of the northern half of the U.S., and is still being planted on steep slopes and banks of ponds and created wetlands.

Reed canary grass can grow on dry soils in upland habitats and in the partial shade of oak woodlands, but does best on fertile, moist organic soils in full sun. This species can invade most types of wetlands, including marshes, wet prairies, sedge meadows, fens, stream banks, and seasonally wet areas; it also grows in disturbed areas such as bergs and spoil piles.

LIFE HISTORY AND EFFECTS OF INVASION: Reed canary grass reproduces by seed or creeping rhizomes. It spreads aggressively. The plant produces leaves and flower stalks for 5 to 7 weeks after germination in early spring, then spreads laterally. Growth peaks in mid-June and declines in mid-August. A second growth spurt occurs in the fall. The shoots collapse in mid to late summer, forming a dense, impenetrable mat of stems and leaves. The seeds ripen in late June and shatter when ripe. Seeds may be dispersed from one wetland to another by waterways, animals, humans, or machines.

This species prefers disturbed areas, but can easily move into native wetlands. Reed canary grass can invade a disturbed wetland in less than twelve years. Invasion is associated with disturbances including ditching of wetlands, stream channelization, deforestation of swamp forests, sedimentation, and intentional planting. The difficulty of selective control makes reed canary grass invasion of particular concern. Over time, it forms large, monotypic stands that harbor few other plant species and are subsequently of little use to wildlife. Once established, reed canary grass dominates an area by building up a tremendous seed bank that can eventually erupt, germinate, and recolonize treated sites. (Taken in its entirety from WDNR, 2012 http://www.dnr.state.wi.us/invasives/fact/reed_canary.htm)

Purple loosestrife
(Photo Courtesy Brian M. Collins)

DESCRIPTION: Purple loosestrife is a perennial herb 3-7 feet tall with a dense bushy growth of 1-50 stems. The stems, which range from green to purple, die back each year. Showy flowers vary from purple to magenta, possess 5-6 petals aggregated into numerous long spikes, and bloom from August to September. Leaves are opposite, nearly linear, and attached to four-sided stems without stalks. It has a large, woody taproot with fibrous rhizomes that form a dense mat.

This species may be confused with the native wing-angled loosestrife (*Lythrum alatum*) found in moist prairies or wet meadows. The latter has a winged, square stem and solitary paired flowers in the leaf axils. It is generally a smaller plant than the Eurasian loosestrife.

By law, purple loosestrife is a nuisance species in Wisconsin. It is illegal to sell, distribute, or cultivate the plants or seeds, including any of its cultivars.

Distribution and Habitat: Purple loosestrife is a wetland herb that was introduced as a garden perennial from Europe during the 1800's. It is still promoted by some horticulturists for its beauty as a landscape plant, and by beekeepers for its nectar-producing capability. Currently, about 24 states have laws prohibiting its importation or distribution because of its aggressively invasive characteristics. It has since extended its range to include most temperate parts of the United States and Canada. The plant's reproductive success across North America can be attributed to its wide tolerance of physical and chemical conditions characteristic of disturbed habitats, and its ability to reproduce prolifically by both seed dispersal and vegetative propagation. The absence of natural predators, like European species of herbivorous beetles that feed on the plant's roots and leaves, also contributes to its proliferation in North America.

Purple loosestrife was first detected in Wisconsin in the early 1930's, but remained uncommon until the 1970's. It is now widely dispersed in the state, and has been recorded in 70 of Wisconsin's 72 counties. Low densities in most areas of the state suggest that the plant is still in the pioneering stage of establishment. Areas of heaviest infestation are sections of the Wisconsin River, the extreme southeastern part of the state, and the Wolf and Fox River drainage systems.

This plant's optimal habitat includes marshes, stream margins, alluvial flood plains, sedge meadows, and wet prairies. It is tolerant of moist soil and shallow water sites such as pastures and meadows, although established plants can tolerate drier conditions. Purple loosestrife has also been planted in lawns and gardens, which is often how it has been introduced to many of our wetlands, lakes, and rivers.

Life History and Effects of Invasion: Purple loosestrife can germinate successfully on substrates with a wide range of pH. Optimum substrates for growth are moist soils of neutral to slightly acidic pH, but it can exist in a wide range of soil types. Most seedling establishment occurs in late spring and early summer when temperatures are high.

Purple loosestrife spreads mainly by seed, but it can also spread vegetatively from root or stem segments. A single stalk can produce from 100,000 to 300,000 seeds per year. Seed survival is up to 60-70%, resulting in an extensive seed bank. Mature plants with up to 50 shoots grow over 2 meters high and produce more than two million seeds a year. Germination is restricted to open, wet soils and requires high temperatures, but seeds remain viable in the soil for many years. Even seeds submerged in water can live for approximately 20 months. Most of the seeds fall near the parent plant, but water, animals, boats, and humans can transport the seeds long distances. Vegetative spread through local perturbation is also characteristic of loosestrife; clipped, trampled, or buried stems of established plants may produce shoots and roots. Plants may be quite large and several years old before they begin flowering. It is often very difficult to locate non-flowering plants, so monitoring for new invasions should be done at the beginning of the flowering period in mid-summer.

Any sunny or partly shaded wetland is susceptible to purple loosestrife invasion. Vegetative disturbances such as water drawdown or exposed soil accelerate the process by providing ideal conditions for seed germination. Invasion usually begins with a few pioneering plants that build up a large seed bank in the soil for several years. When the right disturbance occurs, loosestrife can spread rapidly, eventually taking over the entire wetland. The plant can also make morphological adjustments to accommodate changes in the immediate environment; for example, a decrease in light level will trigger a change in leaf morphology. The plant's ability to adjust to a wide range of environmental conditions gives it a competitive advantage; coupled with its reproductive strategy, purple loosestrife tends to create monotypic stands that reduce biotic diversity.

Purple loosestrife displaces native wetland vegetation and degrades wildlife habitat. As native vegetation is displaced, rare plants are often the first species to disappear. Eventually, purple loosestrife can overrun wetlands thousands of acres in size, and almost entirely eliminate the open water habitat. The plant can also be detrimental to recreation by choking waterways. (Taken in its entirety from WDNR, 2012 http://www.dnr.state.wi.us/invasives/fact/loosestrife.htm)