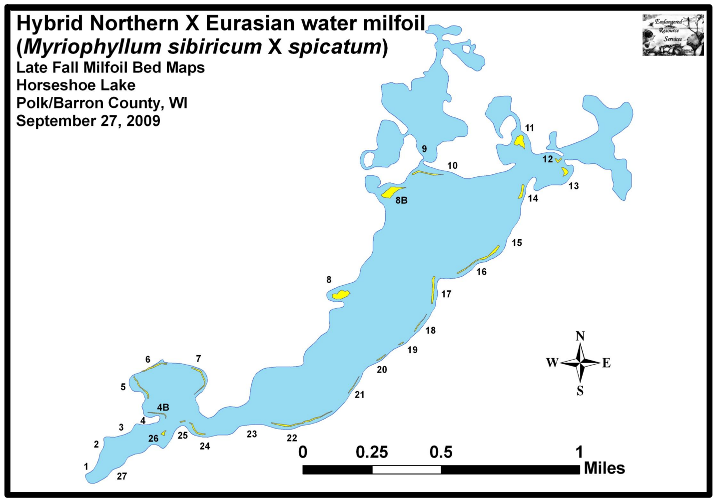
Fall HWM Bed Mapping Survey for Horseshoe Lake
Polk/Barron County, Wisconsin
WBIC: 2630100

(Hybrid Water Milfoil – Craig Nackerud)



Project Initiated by:
Wisconsin Department of Natural Resources and the
Horseshoe Lake Improvement Association

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Matthew S. Berg, Research Biologist
St. Croix Falls, Wisconsin
September 27, 2009

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INTRODUCTION:

Horseshoe Lake (WBIC 2630100) is a 398-acre, mesotrophic, stratified, seepage lake located on the border of Polk and Barron Counties in northwest Wisconsin in the Towns of Beaver/Almena (T34N R14W S06 SW SW) (Figure 1). The lake achieves a maximum depth of 57ft in the central basin, and has an average depth of approximately 25ft. The bottom is predominately sand and rock in the central basin with scattered patches of muck located throughout. Muck bottoms are more common and have a higher organic content (brown in color) in the lake's sheltered bays on the northeast end. Water clarity is good with mean Secchi visibility around 10ft under normal summer conditions (WDNR 2009).

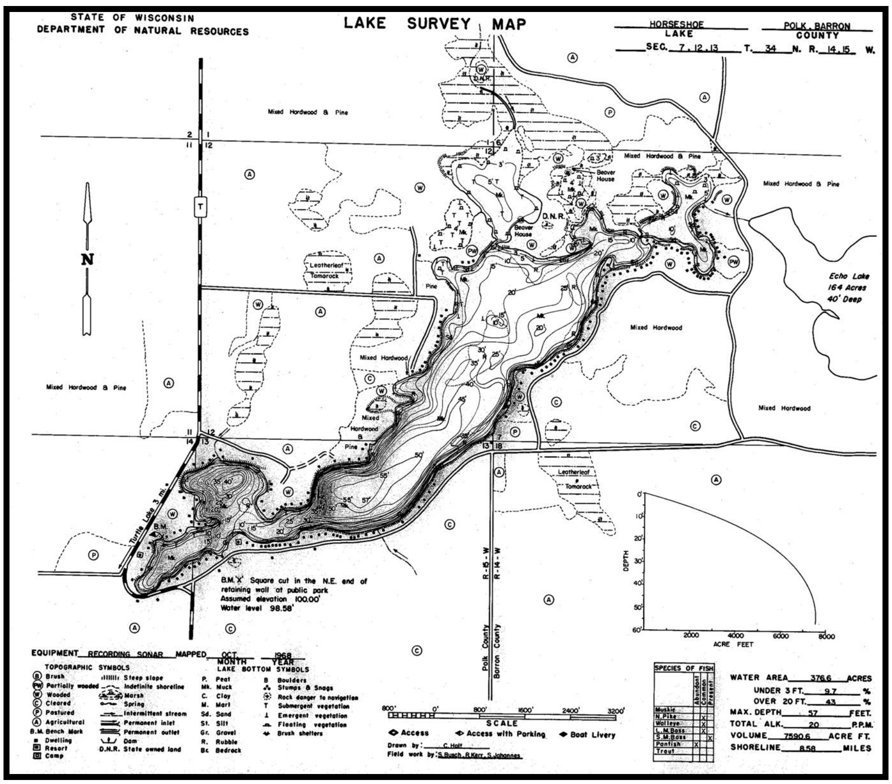

Figure 1: Horseshoe Lake Map (Busch, C., et al. 1968).

In 2006, the Wisconsin Department of Natural Resources identified the presence of Hybrid water milfoil (HWM) – a cross between Northern and Eurasian water milfoils (*Myriophyllum sibiricum* X *Myriophyllum spicatum*) in the lake. Because of this finding, the Horseshoe Lake Improvement Association commissioned an exotic species rapid assessment point intercept survey in June 2007 to determine the distribution and density of HWM. In 2008, two full point/intercept surveys and a fall bed mapping survey of HWM were requested to provide the baseline data needed to develop an Aquatic Plant Management Plan (APMP) for the lake. This survey is a follow up to the 2008 Bed Mapping Survey. The goals of the survey were to provide an estimate of total HWM acreage on the lake, to determine the effectiveness of 2009 control methods and to assist in developing control strategies for 2010.

PLANT SURVEY METHODS:

Fall Hybrid Water Milfoil Bed Mapping:

On September 27th, we mapped all known beds of HWM on the lake. A bed was determined to be any area where we visually estimated that HWM made up approximately >25% of the area's plants and was essentially continuous. After we located a bed, we motored around the perimeter of the area, took GPS coordinates at regular intervals, and estimated the average rakefull rating of HWM within the bed. As in last year's bed mapping survey, HWM was widely distributed throughout the lake. Although HWM is clearly expanding in many areas and becoming a dominant plant, there are few areas where it forms monotypic stands. (Because of this, we again chose to lower our usual criteria for what a "bed" was from >50% of an area's plants to >25%. Had we not done this, there would have been almost no areas to map).

RESULTS:

Fall Hybrid Water Milfoil Bed Mapping:

We identified and mapped a total of 21 areas (down from 27 in 2008) (Figure 2) throughout the lake that had a relatively significant amount of Hybrid water-milfoil (Figure 3) (Appendix I). These "Beds" ranged in size from <.01 acres (essentially a small patch of plants) to over 0.96 acres. All combined, they added up to 6.31 or 1.6% of the total surface area of the lake (Table 1). This is an increase of only 0.09 acres over the 6.22 acres in 2008. Despite this relatively modest increase in area, as mentioned above, many areas showed a significant increase in both numbers and density of new HWM clusters. This was especially true along the south shore of the lake where clusters were filling in to form small beds and continued to establish along the narrow ribbon of suitable habitat that is present on most of the southern shoreline.

We were pleased to find that six areas were almost totally cleared by dive removal of plants (1, 2, 3, 4, 23 and 27). Area 7 showed a large reduction in total area from a combination of chemical and dive removal. Area 13 also showed a dramatic reduction in plants following only chemical treatment. Area 9 was inaccessible due to low water.

There were two new areas (4B and 8B) that had almost no plants in 2008, but now had regular clusters and small beds. Sites 8, 11, 18 and 22 showed the biggest growth in bed area. Despite the expansion in these and other areas, all but four sites (11, 16, 17, and 22) would have again been better characterized as macrophyte beds with a significant HWM component rather than true HWM beds.

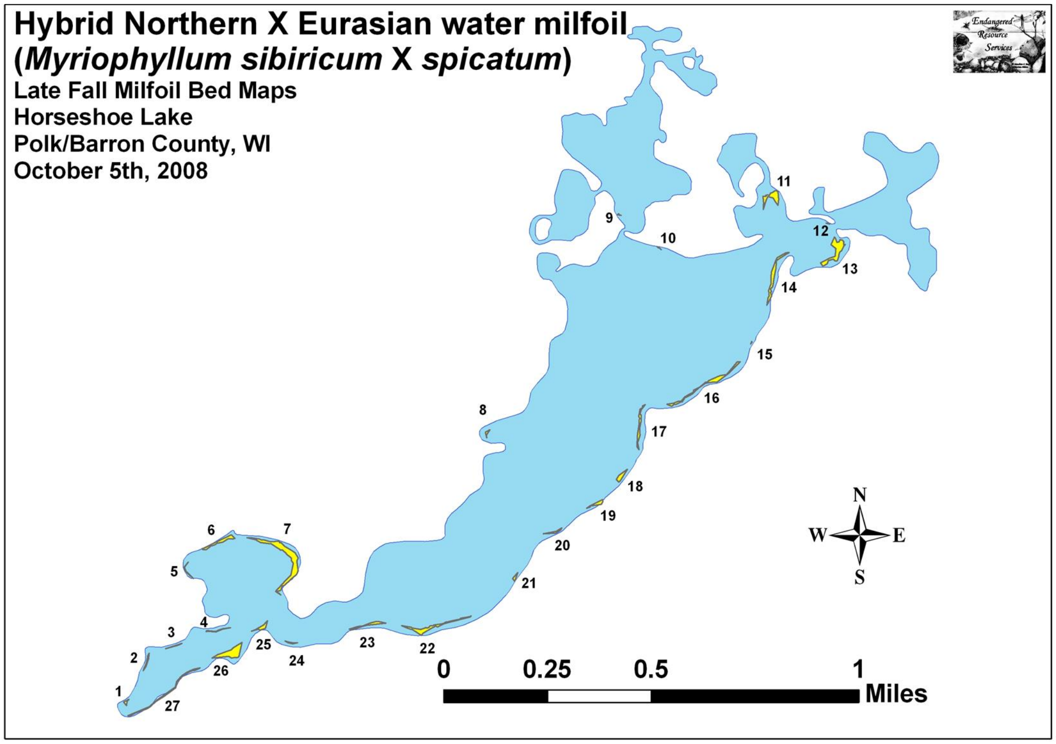

Figure 2: Late Fall 2008 HWM Beds

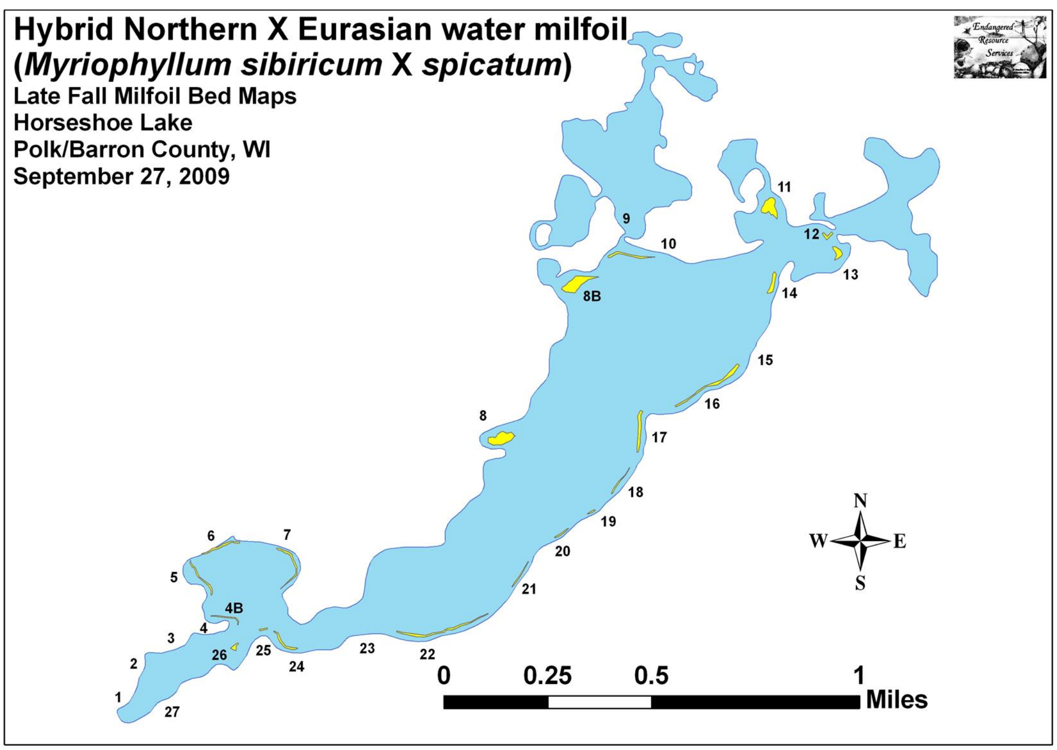

Figure 3: Late Fall 2009 HWM Beds

Table 1: Late Fall Hybrid water-milfoil Bed Mapping Data
Horseshoe Lake, Polk/Barron
September 27, 2009

Bed #	Area (Acres)	2008 Area	Change in Area	Est. Mean Rakefull	Bed Characteristics
1	0.0	0.03	-0.03	0	Almost no individuals remaining after dive removal
2	0.0	0.05	-0.05	0	Almost no individuals remaining after dive removal
3	0.0	0.02	-0.02	0	Almost no individuals remaining after dive removal
4	0.0	0.05	-0.05	0	Almost no individuals remaining after dive removal
4B	0.10	0.00	+0.10	<1	A very few widely scattered ind. throughout the area.
5	0.21	0.02	+0.19	1-3	Many smaller beds expanding outward and joining
6	0.25	0.28	-0.03	<1	Almost no individuals remaining after dive removal
7	0.27	1.33	-1.06	<1	Almost no individuals remaining after dive removal
8	0.85	0.03	+0.82	<1-2	Regular pioneer clusters expanding through zone.
8B	0.96	0.00	+0.96	<1-2	Regular pioneer clusters expanding through zone.
9	-----	0.01	-----	-----	No access due to low water – should be checked '10.
10	0.26	0.00	+0.26	<1	Regular pioneer clusters expanding through zone.
11	0.71	0.40	+0.31	2-3	Large treatable true bed that needs priority attention.
12	0.01	0.00	+0.01	<1	A few widely scattered pioneer clusters.
13	0.24	0.69	-0.45	<1-2	A few widely scattered pioneer clusters. Herbicide Trt.
14	0.27	0.48	-0.21	<1-2	A narrow ribbon of scattered plants parallel to shore.
15	0.00	0.00	0.00	0	A single plant was seen in the general area.
16	0.60	0.49	+0.11	2-3	Treatable thickening ribbon of plants parallel to shore.
17	0.40	0.24	+0.16	2-3	Treatable thickening ribbon of plants parallel to shore.
18	0.11	0.15	-0.04	1-2	Thickening ribbon of plants parallel to shore.
19	0.04	0.10	-0.06	1	A narrow ribbon of scattered plants parallel to shore.
20	0.07	0.07	0.00	1	A narrow ribbon of scattered plants parallel to shore.
21	0.10	0.05	+0.05	1-2	Thickening ribbon of plants parallel to shore.
22	0.52	0.48	+0.04	2-3	Treatable thickening ribbon of plants parallel to shore.
23	0.00	0.19	-0.19	0	Almost no individuals remaining after dive removal
24	0.20	0.03	+0.17	<1-2	A narrow ribbon of scattered plants parallel to shore.
25	0.04	0.12	-0.08	<1	Almost no individuals remaining after dive removal
26	0.10	0.64	-0.54	<1	Almost no individuals remaining after dive removal
27	0.00	0.26	-0.26	0	Almost no individuals remaining after dive removal
Total Acres	6.31	6.22	+0.09		

DISCUSSION AND CONSIDERATIONS FOR MANAGEMENT:

Fall Hybrid Water-Milfoil Bed Mapping:

Horseshoe Lake has an abundant, diverse and rare plant community which provides a variety of high quality habitats for fish, waterfowl, and other wildlife. Unfortunately, Hybrid water-milfoil poses a significant threat to that diversity and the resource as a whole. Because it is unlikely HWM will ever be totally eliminated from the lake, management should focus on maintaining HWM at or reduce it from its current level in a way that minimizes impact to native vegetation.

We were impressed with the effectiveness of both dive/hand removal and chemical application control methods in 2009. All areas that were treated using either or both of these methods showed significant reduction in HWM. The strongest recommendation for next year would be to expand these efforts to more or even all areas depending on available resources and volunteer divers.

If it isn't possible to treat all beds in 2010, we believe Beds 8, 8B, 11, 18 and 22 should be priorities. Sites 8 and 8B would be great candidates for dive removal, but the other three, due to their density and large area would seem to be better candidates for spring chemical treatment.

Site 11 should receive special priority attention as it is located in sensitive area B, and many of the HWM plants here were mixed in with waterlilies and Watershield (*Brasenia schreberi*). To minimize impacts on these and other rare natives that occur in this area, the earliest possible spring application should be performed here.

General Considerations:

Although HWM control has become and will likely continue to be the lake's top management priority, there are other management goals that could be undertaken concurrently. Improving water clarity and quality would not only add to the lake's esthetic value, but also make it easier to locate and eliminate HWM later into the summer. Secchi readings over the past 10 years appear to indicate stable clarity in Horseshoe Lake. Filamentous algae, a threat to many lakes' water clarity/quality, is normally associated with an abundance of nutrients in the water from failed septic systems, and lawn and field fertilizer runoff. It had a low relative frequency of 0.98 in the 2008 July survey. Although there were few places that exhibited excessive algal growth, these levels could be lowered even further by testing septic systems around the lake, reducing or eliminating fertilizer applications near the lake, and developing native vegetation buffer strips to restore shorelines and limit nutrient runoff.

Throughout the lake, but especially around the boat landing, lakeshore owners should refrain from removing native plants from the lake unless absolutely necessary as these patches of barren substrate can provide an easy place for invasive plants like HWM to take root and become established. Reestablishing a "milfoil free zone" around the boat landing will also hopefully prevented HWM from spreading to other area lakes.

Management Considerations Summary:

- Preserve Horseshoe Lake's abundant, diverse and rare native plant community.
- When herbicide usage is required to control HWM, it should be the minimum amount required to meet management goals.
- Prioritize the elimination of HWM by area beginning with the lake's five "sensitive areas" on the east side which serve as fish nurseries and provide critical habitat for many of the lake's rarest plants.
- Work to eliminate HWM from directly around the boat landing to prevent its spread to other area lakes.
- Reduce and, wherever possible, eliminate fertilizer applications near the lakeshore.
- Establish native vegetation buffer strips along the lakeshore.
- Encourage shoreline restoration.
- Encourage owners to refrain from removing native plants from the lake – especially near the boat landing as they provide an easy place for HWM to establish.

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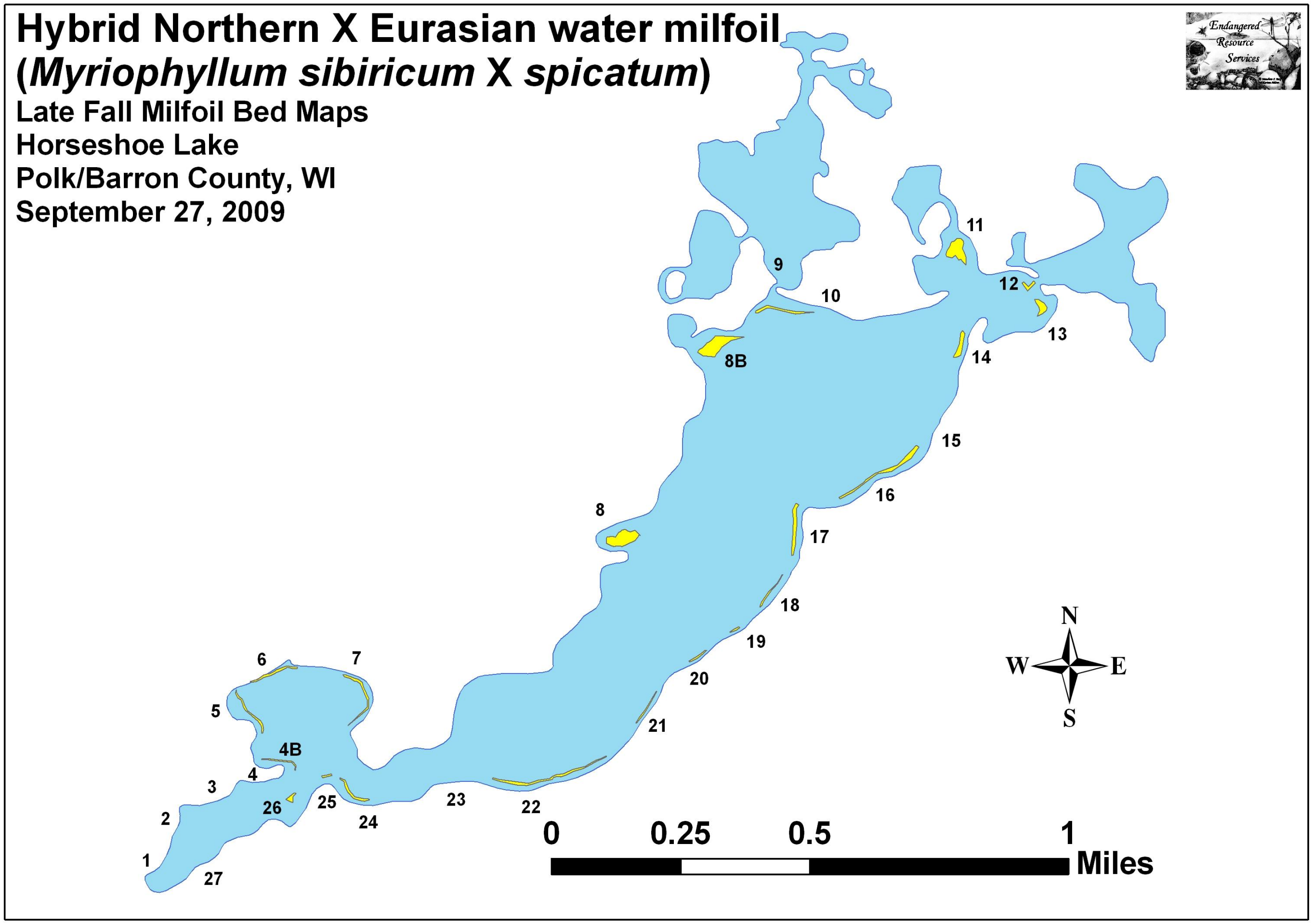
Appendix I: Fall 2009 Hybrid Water Milfoil Bed Maps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Late Fall Milfoil Bed Maps
Horseshoe Lake
Polk/Barron County, WI
September 27, 2009
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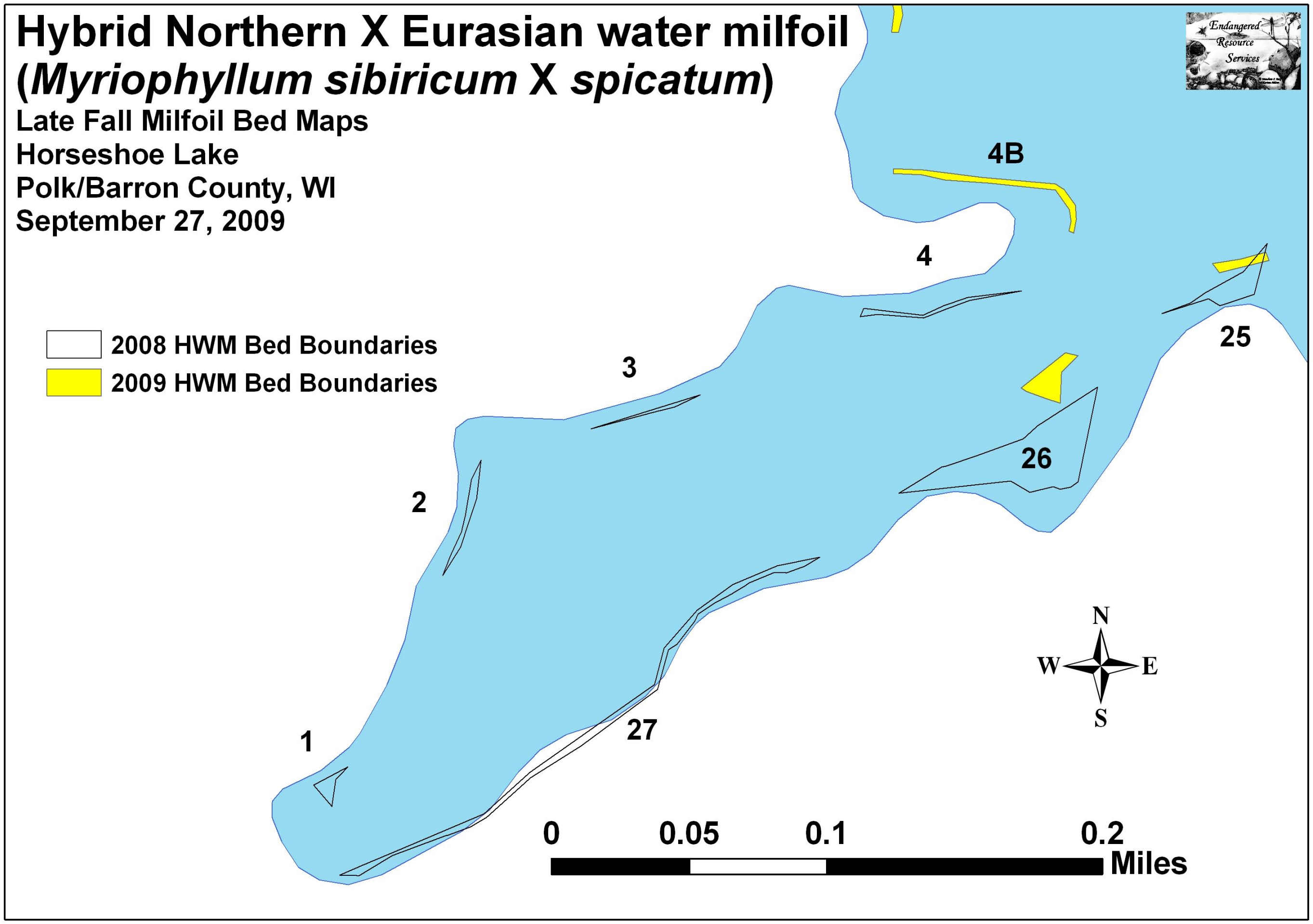
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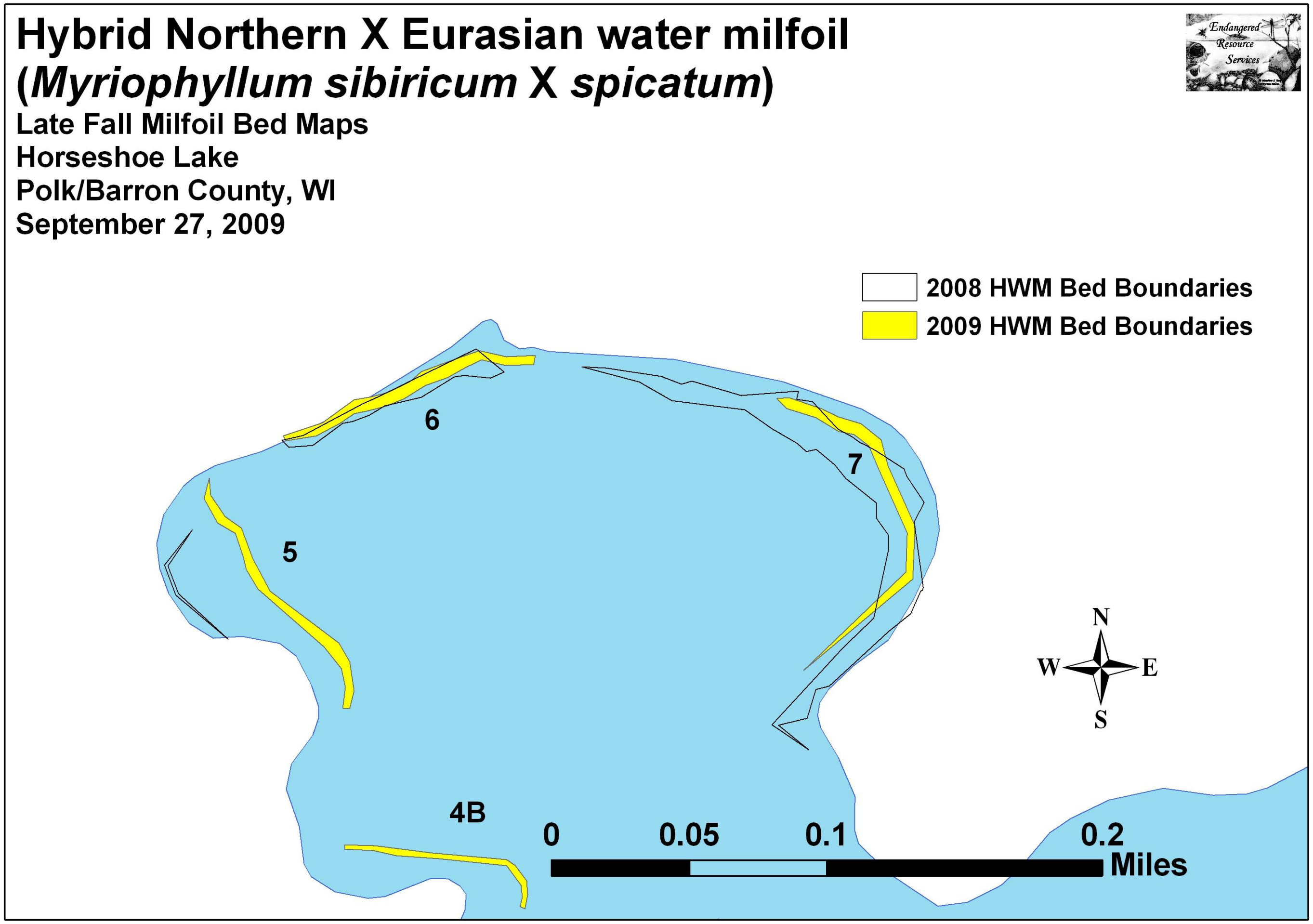
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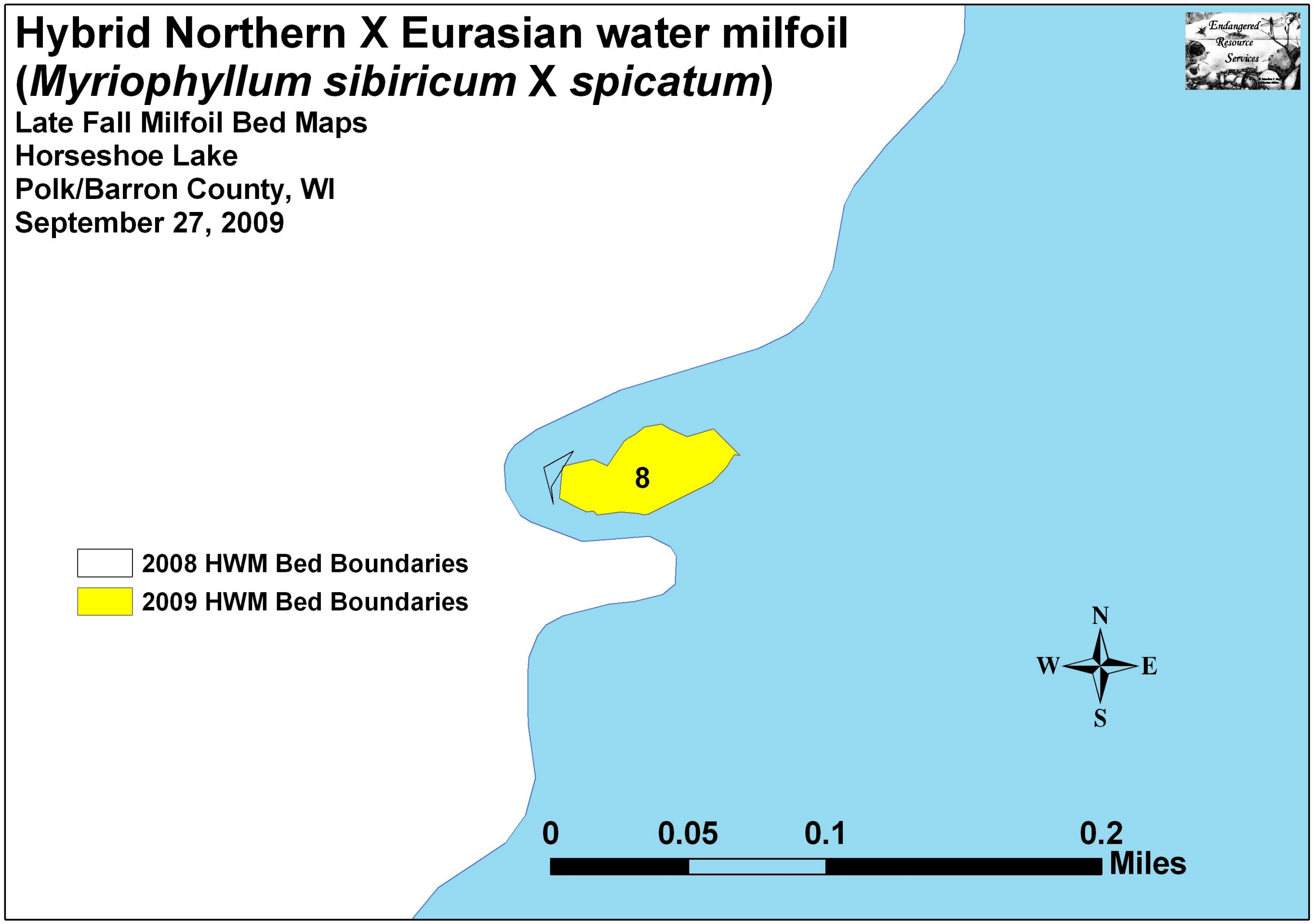
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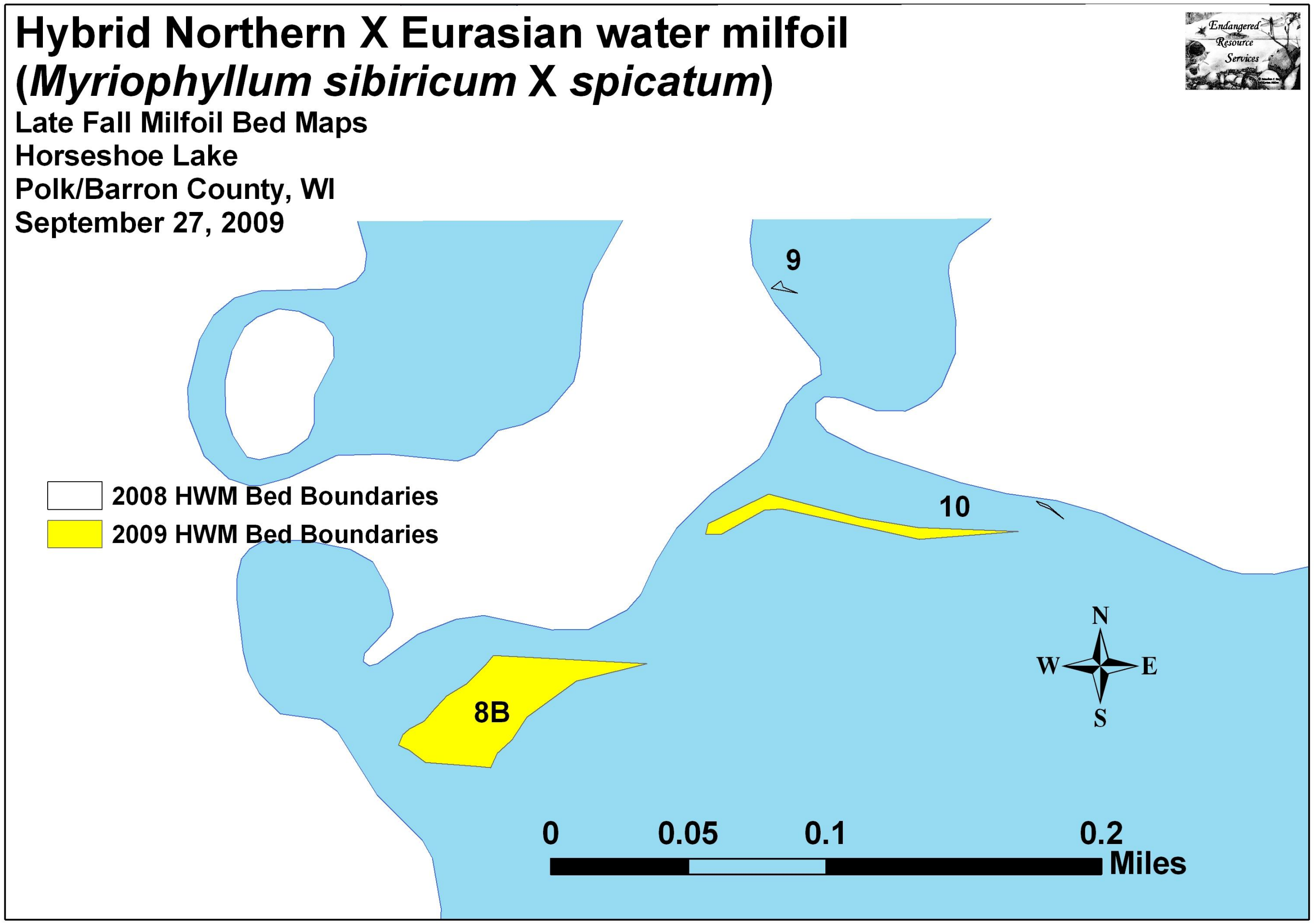
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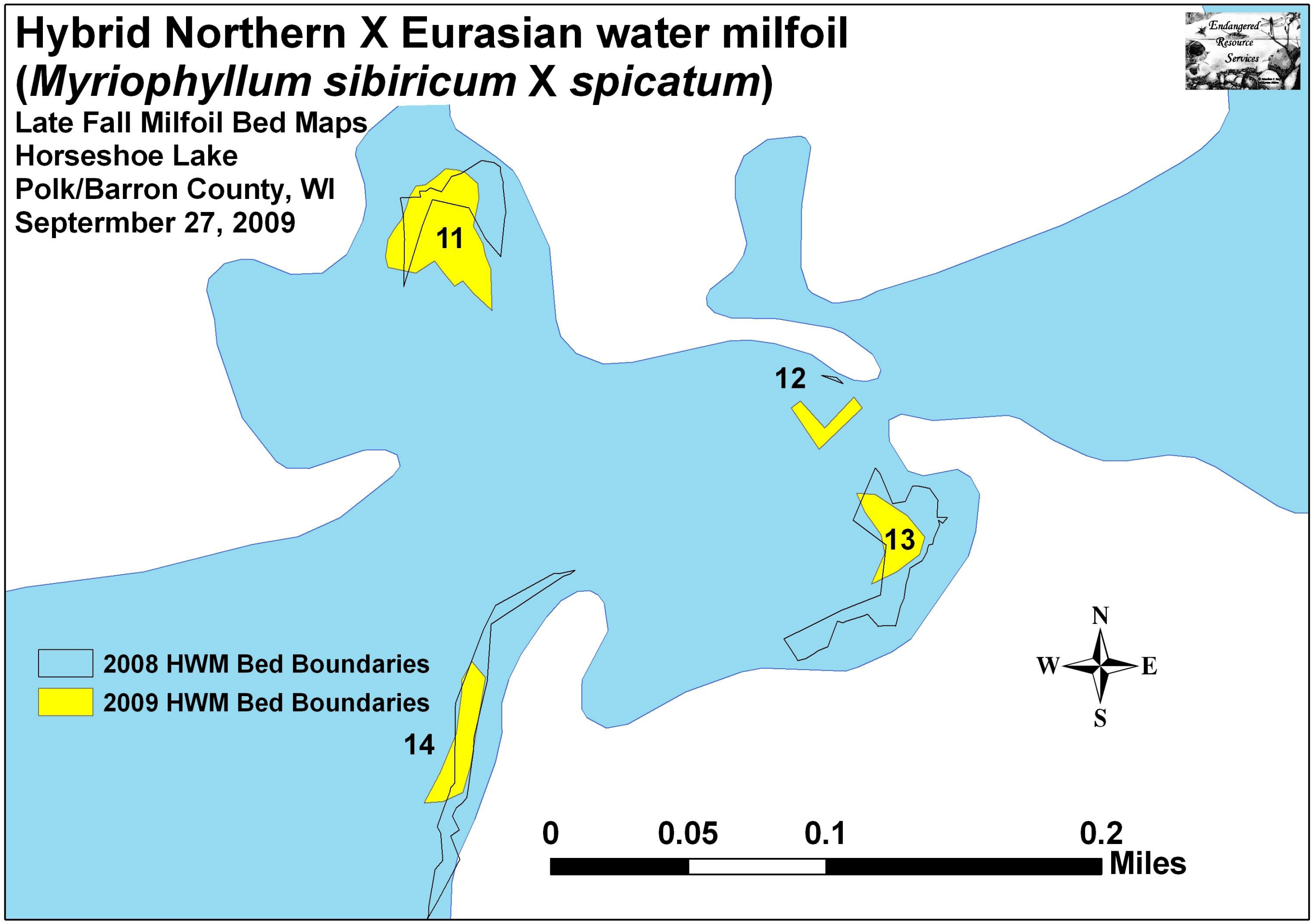

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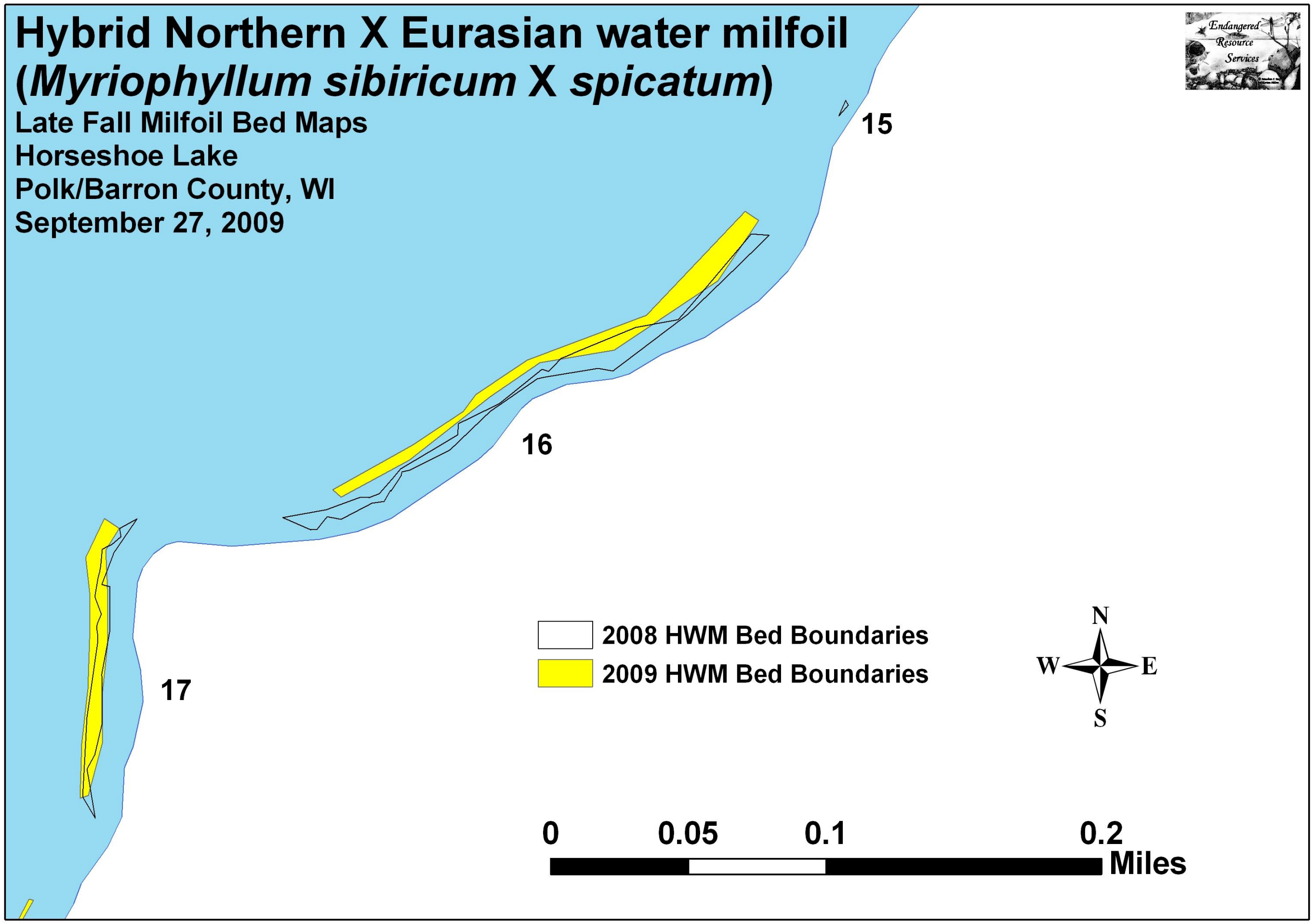

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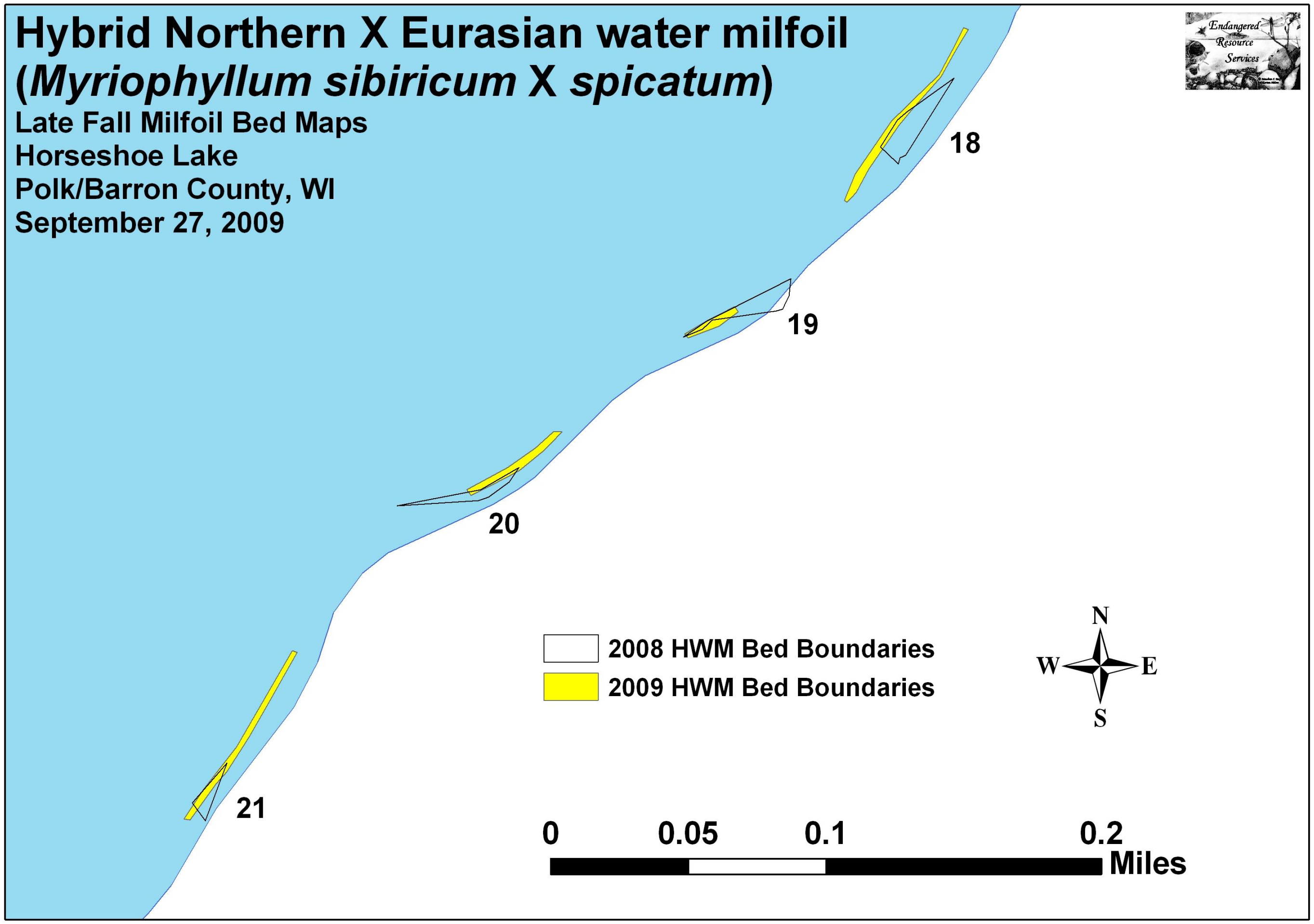
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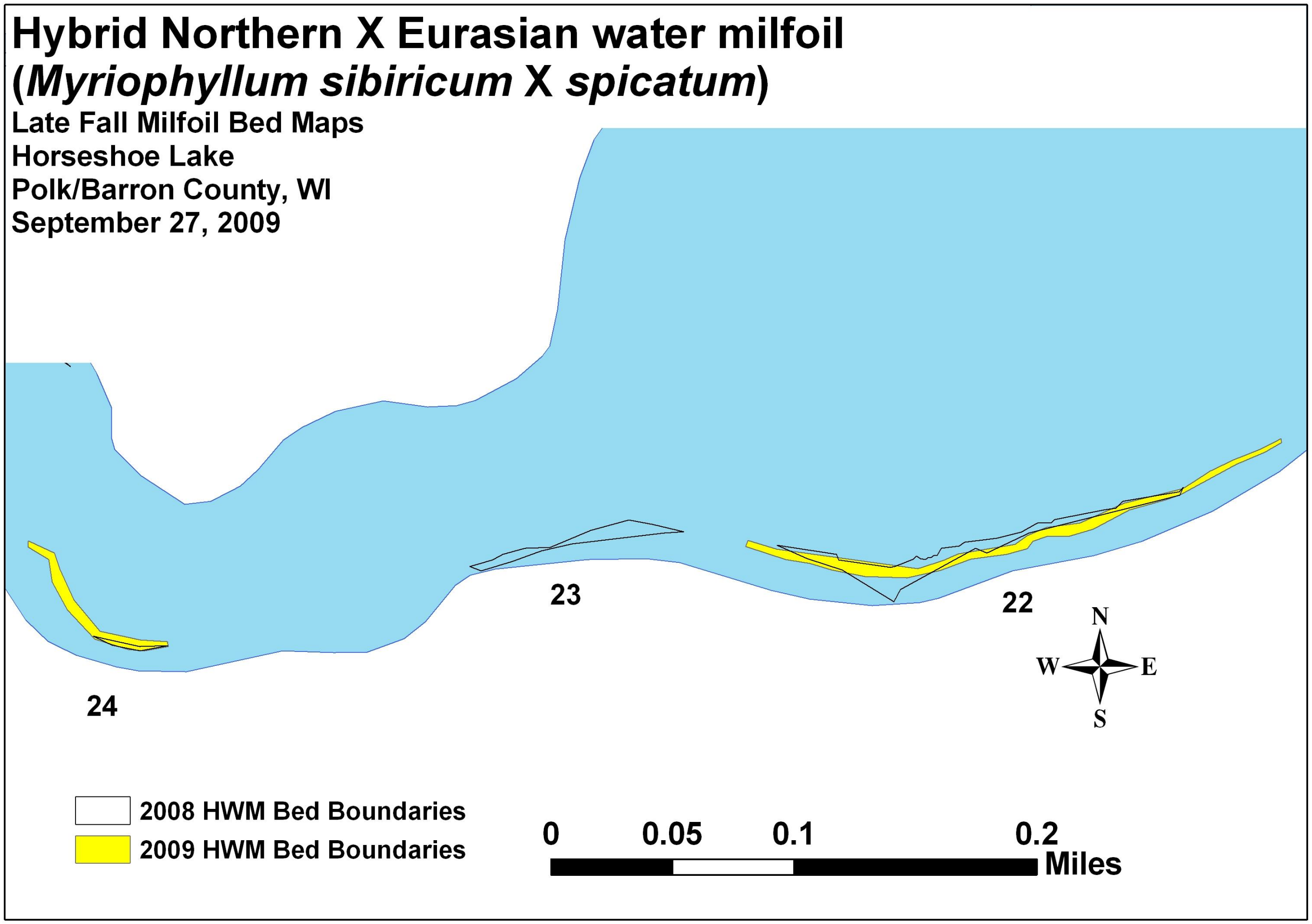
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Appendix II: Glossary of Biological Terms
(Adapted from UWEX 2009)

Aquatic:
organisms that live in or frequent water.

Cultural Eutrophication:
accelerated eutrophication that occurs as a result of human activities in the watershed that increase nutrient loads in runoff water that drains into lakes.

Dissolved Oxygen (DO):
the amount of free oxygen absorbed by the water and available to aquatic organisms for respiration; amount of oxygen dissolved in a certain amount of water at a particular temperature and pressure, often expressed as a concentration in parts of oxygen per million parts of water.

Diversity:
number and evenness of species in a particular community or habitat.

Drainage lakes:
lakes fed primarily by streams and with outlets into streams or rivers. They are more subject to surface runoff problems but generally have shorter residence times than seepage lakes. Watershed protection is usually needed to manage lake water quality.

Ecosystem:
a system formed by the interaction of a community of organisms with each other and with the chemical and physical factors making up their environment.

Eutrophication:
the process by which lakes and streams are enriched by nutrients, and the resulting increase in plant and algae growth. This process includes physical, chemical, and biological changes that take place after a lake receives inputs for plant nutrients--mostly nitrates and phosphates--from natural erosion and runoff from the surrounding land basin. The extent to which this process has occurred is reflected in a lake's trophic classification: oligotrophic (nutrient poor), mesotrophic (moderately productive), and eutrophic (very productive and fertile).

Exotic:
a non-native species of plant or animal that has been introduced.

Habitat:
the place where an organism lives that provides an organism's needs for water, food, and shelter. It includes all living and non-living components with which the organism interacts.

Limnology:
the study of inland lakes and waters.

Littoral:

the near shore shallow water zone of a lake, where aquatic plants grow.

Macrophytes:

refers to higher (multi-celled) plants growing in or near water. Macrophytes are beneficial to lakes because they produce oxygen and provide substrate for fish habitat and aquatic insects. Overabundance of such plants, especially problem species, is related to shallow water depth and high nutrient levels.

Nutrients:

elements or substances such as nitrogen and phosphorus that are necessary for plant growth. Large amounts of these substances can become a nuisance by promoting excessive aquatic plant growth.

Organic Matter:

elements or material containing carbon, a basic component of all living matter.

Photosynthesis:

the process by which green plants convert carbon dioxide (CO2) dissolved in water to sugar and oxygen using sunlight for energy. Photosynthesis is essential in producing a lake's food base, and is an important source of oxygen for many lakes.

Phytoplankton:

microscopic plants found in the water. Algae or one-celled (phytoplankton) or multicellular plants either suspended in water (Plankton) or attached to rocks and other substrates (periphyton). Their abundance, as measured by the amount of chlorophyll a (green pigment) in an open water sample, is commonly used to classify the trophic status of a lake. Numerous species occur. Algae are an essential part of the lake ecosystem and provides the food base for most lake organisms, including fish. Phytoplankton populations vary widely from day to day, as life cycles are short.

Plankton:

small plant organisms (phytoplankton and nanoplankton) and animal organisms (zooplankton) that float or swim weakly though the water.

ppm:

parts per million; units per equivalent million units; equal to milligrams per liter (mg/l)

Richness:
number of species in a particular community or habitat.

Rooted Aquatic Plants:
(macrophytes) Refers to higher (multi-celled) plants growing in or near water. Macrophytes are beneficial to lakes because they produce oxygen and provide substrate for fish habitat and aquatic insects. Overabundance of such plants, especially problem species, is related to shallow water depth and high nutrient levels.

Runoff:
water that flows over the surface of the land because the ground surface is impermeable or unable to absorb the water.

Secchi Disc:
An 8-inch diameter plate with alternating quadrants painted black and white that is used to measure water clarity (light penetration). The disc is lowered into water until it disappears from view. It is then raised until just visible. An average of the two depths, taken from the shaded side of the boat, is recorded as the Secchi disc reading. For best results, the readings should be taken on sunny, calm days.

Seepage lakes:
Lakes without a significant inlet or outlet, fed by rainfall and groundwater. Seepage lakes lose water through evaporation and groundwater moving on a down gradient. Lakes with little groundwater inflow tend to be naturally acidic and most susceptible to the effects of acid rain. Seepage lakes often have long ,residence times. and lake levels fluctuate with local groundwater levels. Water quality is affected by groundwater quality and the use of land on the shoreline.

Turbidity:
degree to which light is blocked because water is muddy or cloudy.

Watershed:
the land area draining into a specific stream, river, lake or other body of water. These areas are divided by ridges of high land.

Zooplankton:
Microscopic or barely visible animals that eat algae. These suspended plankton are an important component of the lake food chain and ecosystem. For many fish, they are the primary source of food.

Appendix III: Aquatic Exotic Invasive Species Information

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, 2009 http://www.dnr.state.wi.us/invasives/fact/curlyleaf_pondweed.htm)

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, 2009 http://www.dnr.state.wi.us/invasives/fact/milfoil.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, 2009 http://www.dnr.state.wi.us/invasives/fact/reed_canary.htm)

Purple loosestrife

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 July 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, 2009 http://www.dnr.state.wi.us/invasives/fact/loosestrife.htm)