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**Pre-proposal for AIS Established Infestation Control Project
For Lulu Lake and Mukwonago River wetlands west of Lulu Lake**

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This proposal would take place in the Mukwonago River Watershed (86.2 square miles) on property owned and managed by The Nature Conservancy (TNC). The Mukwonago River, a headwater tributary of the Fox River, is in southeastern Wisconsin in Walworth and Waukesha counties. This proposal builds upon and expands work funded by two previous Aquatic Invasive Species (AIS) grants.

The area of concern is in the middle and upper reaches of the river and Lulu Lake in sections 2, 3, 4, 9, 10 and 13 in the Town of Troy in Walworth County and in sections 32 and 33 of the Town of Eagle in Waukesha County.

The Mukwonago River has been identified as the most biologically diverse small river system in Wisconsin with 59 species of fish and 15 species of mussels. The watershed is believed to harbor the largest assemblage of native mollusk species in the state. The river is ranked as a five-star "substantial conservation significance" by the Wisconsin Land Legacy Report.

The Mukwonago River is home to several rare or threatened fish species, including the longear sunfish. Lulu Lake, through which the river flows, is also home to glacial relict fish, such as the blackchin shiner and the Iowa darter, that are dependent on clear, deep lake water.

TNC's Mukwonago River Watershed Project has about 750 acres in protected ownership within the Lulu Lake State Natural Area (SNA). And, within this SNA, the Wisconsin Department of Natural Resources has another 1,800 acres, providing a protected mosaic of more than 2,400 acres. In addition, TNC owns or protects through conservation easements another 850 acres upstream and downstream from the Lulu Lake State Natural Area. This area is distinctive in that it is made up of a number of natural communities that create an intact and functioning system, a rarity for this part of the state. The preserves feature one of the last remaining areas in the Prairie-Forest Border Ecoregion.

Work also would occur at Pickerel Lake and the Pickerel Lake Fen in the Pickerel Lake Fen State Natural Area, which provides a southern headwaters area of the Mukwonago River that flows into Lake Beulah and then into the middle section of the Mukwonago River.

Invasive species that would be targeted by this grant funding include:

- Common reed *Phragmites australis*
- Hybrid and narrow-leaf cattail *Typha X glauca* and *Typha angustifolia* L
- Reed canarygrass *Phalaris arundinacea* L
- Eurasian water-milfoil *Myriophyllum spicatum*
- Curly-leaf pond weed *Potamogeton crispus*
- Common and glossy buckthorn *Rhamnus cathartica* and *Frangula alnus*
- Purple loosestrife *Lythrum salicaria*

This grant would allow TNC to build upon the successful work funded by two previous AIS grants. Funding from those grants allowed TNC to greatly reduce the populations of invasive cattails in one of the wetlands at the Lulu Lake Preserve, scattered populations of purple loosestrife at the Lulu Lake and Crooked Creek preserves, reed canarygrass at the Crooked Creek Preserve, common reed at the Lulu Lake and Meyer preserves, Eurasian water-milfoil at Lulu Lake and common and glossy buckthorn at the Crooked Creek Preserve

This grant proposal also focuses on those species and adds curly-leaf pondweed that has been found at Lulu Lake and at Pickerel Lake.

In summary, this grant would let TNC continue to suppress the targeted invasives while expanding the area to be surveyed and treated.

1. Identification of the problems or threat to the aquatic ecosystem presented by the aquatic invasive species including recreational uses and other beneficial functions up to the time of application, and how these uses and functions may have changed because of the presence of aquatic invasive species

TNC has six preserves with a total of about 1,600 acres associated with the Mukwonago River and Lulu and Pickerel Lakes.

-- The 438-acre Lulu Lake Preserve is the easternmost of the six preserves.

-- The 277-acre Crooked Creek Preserve is one-quarter mile west of the Lulu Lake Preserve and springs on or near the preserve contribute 70 percent of the flow of water in the Mukwonago River.

-- Upstream from Crooked Creek is the 66-acre Baker Tract.

-- A quarter-mile south is the 120-acre Scout Road Tract. Both Baker and Scout have springs that contribute to the flow of the Mukwonago River.

-- The 652-acre Meyer Preserve is approximately two-thirds of a mile northwest of the Baker Tract and provides the westernmost headwaters of the Mukwonago River.

-- The Pickerel Lake Fen Preserve has 133 acres and is south of the main flow of the river. Water rising from springs in Pickerel Lake and its shoreline and from the fen to the south of the lake flows through an unnamed river into Beulah Lake and then connects with the Mukwonago River near the DNR's Rainbow Springs property.

-- TNC also has conservation easements and management agreements with other owners of another 400 acres in the area.

The most recent AIS grant provided to TNC for work on aquatic invasive species, ACEI-119-12, included funding for a thorough survey of the Mukwonago River upstream from Lulu Lake. As a result of this work and other surveys by staff and contractors, a number of populations of the target species listed above were found. After the acquisition in 2014 of the

247-acre Malek Tract adjacent to the Meyer Preserve, additional populations of reed canarygrass, narrow-leaved cattail and phragmites were discovered in the 66-acre wetland on the tract. The extent of the invasive populations at the Malek Tract is of great concern because these invasives, if left unchecked, can easily overtake the entire wetland. Funding from the new grant would allow further survey work for the above-listed species as well as such other aquatic invasive species as giant manna grass *Glyceria maxima* and flowering rush *Butomus umbellatus*.

This grant would provide funding to treat isolated populations of reed canarygrass, narrow-leaved cattail clones and purple loosestrife at the 66-acre Baker Tract, through which the Mukwonago River flows. These three species greatly reduce plant diversity and animal habitat if left untreated. This tract has a small but exceptionally diverse stream/sedge meadow/calcareous fen mound wetland. But within the past few years it has been invaded by two narrow-leaved cattail clones that are expanding rapidly. Reed canarygrass also has moved into this four-acre wetland in the stream bed and along scoured portions of the riverbank. Some purple loosestrife has also appeared at the north edge of the wetland.

Work at the Pickerel Lake Fen Preserve, which is the site of the largest fen in southern Wisconsin, would focus on removal of narrow-leaved cattails and reed canarygrass. In Pickerel Lake, work would focus on removal of curly-leaf pondweed via hand harvesting. Surveys also would be done for possible common reed populations at the three segments of the Pickerel Lake Fen Preserve.

Lulu Lake had one large and several small, isolated infestations of Eurasian water-milfoil (EWM). This plant can greatly limit recreational activities such as boating because the plant material can wind around boat propellers and create large mats that impede swimming. This grant would continue funding that has paid for work to identify and hand-harvest new and existing EWM populations. Much of the work on EWM has been conducted by D. Timothy Gerber, PhD, a biology professor at the University of Wisconsin-La Crosse. Gerber would continue to spearhead the work and also work on the curly-leaf pondweed at the Pickerel Lake Fen Preserve.

2. A description of the historical control actions taken or that are in progress

It is crucial that eradication of EWM in Lulu Lake continues. Despite more than four years of hand harvesting, new, small populations continue to occur in the lake. In consultation with DNR, it was decided before applying for its first AIS grant for the Mukwonago River Watershed to not use herbicides to control EWM at Lulu Lake because of the high diversity of native aquatic plants that could be harmed by such herbicides. Use of herbicides on EWM in Eagle Spring Lake has frequently left large dead zones that are quickly repopulated by EWM.

Contractors hired by TNC have worked for a number of years treating common reed in the wetland northwest of Lulu Lake as well as at the Meyer Preserve. This work needs to continue in order to make headway on the large population there. The reed canarygrass that has been successfully held in check at the Crooked Creek Preserve and common reed that was eradicated at one spot at the Meyer Preserve need to be resurveyed and re-treated each year to prevent them from returning.

Buckthorn in the wetlands at the Crooked Creek Preserve has been greatly reduced around a small pond at the south end of the preserve.

Purple loosestrife, which once formed wide swaths of magenta flowers in July each year, has been reduced to isolated populations around Lulu Lake and at the Crooked Creek, Baker, Scout Road and Meyer preserves. As mentioned earlier, work on purple loosestrife has been one of the success stories resulting from work funded by previous grants. Although the number of purple loosestrife populations have been greatly reduced, continued surveys are needed because new populations keep popping up in areas where the plant has not been seen before, such as at the Scout Road Preserve. Funding continues to be needed for mechanical and chemical treatment for areas where purple loosestrife appears in mid-season, after purple loosestrife beetles already have been placed on plants.

An added benefit of Gerber's work has been his mentoring and education of high school and college student interns employed by TNC as well as visiting school groups.

This grant would continue that work to educate both students and adults through increased cooperation with the Eagle Spring Lake Management District (ESLMD). Eagle Spring Lake is linked to Lulu Lake by a one-half mile stretch of the Mukwonago River. The two lakes are a study in contrasts: Lulu is up to 46 feet deep while Eagle Spring Lake's maximum depth is eight feet; Lulu Lake has one full-time residence while Eagle Spring Lake has just under 300. On summer days, up to 123 powerboats per day come from Eagle Spring Lake to Lulu Lake. These boats have been the source of EWM and other aquatic invasive species.

In efforts to mitigate the threat of additional EWM introduction and identify opportunities for cooperation to sustain and improve the health of Lulu Lake, TNC and ESLMD engaging in a series of new cooperative ventures. The ESLMD also has agreed to provide a letter of support for this grant application.

Cooperative ventures would include:

-- Creation by TNC and the ESLMD of a brochure explaining to Eagle Spring Lake homeowners why boaters are asked to reverse their motors in the channel before entering Lulu Lake. Reversing motors helps to shed EWM and other aquatic plants before entering Lulu Lake. The costs of producing the brochure would be paid for by this grant. This brochure also would be provided at the Eagle Spring Boat launch.

-- TNC assistance at the Eagle Spring Lake boat landing for the Clean Boats/Clean Waters program. In the past, the ESLMD has frequently had trouble finding enough students to operate the program. Through this grant, TNC would have students from its high school summer intern program assist occasionally at the boat landing. Another problem area was having an adult supervisor at the boat landing. TNC would also provide an adult supervisor to work occasionally at the launch.

-- TNC and ESLMD would be members of an Education and Research Committee proposed by the chairman of the Town of Troy Board in the wake of the discussions over an electric-motor-only ordinance for Lulu Lake. This town board chairman charged the group with working to create a better understanding of the ecology of the lake and the impacts of recreational use, and to continue to inform property owners, lake users and the community about these issues.

In addition, students at Eagleville Charter School in the Town of Eagle will raise purple loosestrife beetles during each spring of the grant. These beetles will be released on TNC preserves in late spring.

3. A thorough characterization of the water body's aquatic ecosystem's historical and current condition, including at least one year of current baseline data quantifying the extent of the infestation.

Lulu Lake has long been known as being one of the cleanest water sources in southern Wisconsin and also as a highly diverse lake in terms of native plant and animal species. But the introduction of aquatic invasive species by boat traffic continues to threaten the long-term health of this lake.

During mapping funded by the previous AIS grants, Lulu Lake and the river channel leading to Eagle Spring Lake to the north were thoroughly surveyed for the presence of EWM. A large population covering about one acre at the northeast corner of the lake was discovered as well as a smaller population in the southeast corner of the lake and many scattered plants elsewhere in the lake. Snorkelers and SCUBA divers have removed much of the largest population but EWM persists at that spot, as well as elsewhere in the lake. A team of eight SCUBA divers that worked in the large EWM population in June of 2014 removed the equivalent of ten 30-gallon weed bags of EWM in eight hours. Members of that group said that much more than that amount remained at that spot. Funding from the proposed grant award would pay for air for SCUBA tanks, fuel for dive boats and for other supplies.

The survey work done upstream from Lulu Lake on the Mukwonago River has provided valuable data about the presence of aquatic invasive species at the Baker and the Malek tracts. It is important to attempt to limit these populations because they provide seed sources for downriver sites.

In previous years, the contractor hired by TNC for common reed work found populations that had not previously been noted in the wetland northwest of Lulu Lake. This area is roughly bounded by the Mukwonago River on the east, the Waukesha County line on the north (also the northern limit of the Lulu Lake Preserve), Department of Natural Resources land and TNC uplands to the west and the shore of Lulu Lake to the south. The contractor mapped much of the common reed in the estimated 70 acres but several areas remain to be fully surveyed. That survey work and herbicide treatment of the common reed would continue with funding from the proposed grant award.

At the Crooked Creek Preserve, a large, new area of buckthorn covering several acres has developed at the north end of the preserve in the wetlands beside a dam that was removed in 2010. Work in that area began in the winter of 2013-'14 and will continue in the winter of 2014-'15 and beyond. Discussions are under way with DNR staff to cut and herbicide the buckthorn that is on adjacent DNR land to prevent the buckthorn from moving back into TNC land.

The hybrid and narrow-leaved cattail populations at the Lulu Lake Preserve are south of the Mukwonago River between Nature Road on the west and the footbridge that crosses the river on the east. In a 2000 study of the cattail population at Lulu, Aaron Boers and Joy Zedler of the University of Wisconsin-Madison predicted that, based on their estimates of the rate of spread, the cattail population would dominate 6.7% of this sedge meadow by 2010. Surveying by the Integrated Restorations LLC, the contractor hired by TNC to map and manage the cattail population in this area, found that the population had taken over 10.88% of this area by 2010. The contractor aggressively treated the population during the summers of 2011, 2012 and 2013, instructed and assisted by TNC high school interns. The population has been reduced to

approximately 2% of the area but the area will need to be monitored to detect and treat any resurgence of this invasive.

Hot spots for purple loosestrife continue to be found in the wetlands at the Lulu Lake, Crooked Creek and Meyer preserves. PL was discovered by TNC staff in the wetland at the north side of the Scout Road Tract in 2012 and beetles were introduced. The newest area where PL has been found was the Baker Tract, where it appeared during the summer of 2013. Further survey work is needed at the remainder of the Scout Road Tract.

Reed canarygrass, which was most widely found at the Crooked Creek Preserve as expected after the removal of two dams in 2008, continues to pop up in widely scattered populations through almost all of TNC's area preserves. Thorough surveys are needed annually to discover these populations and prioritize them for treatment.

4. An assessment of the fishery, wildlife and aquatic plant community.

The diverse fish and wildlife population of the river and in Lulu Lake remains healthy. During surveys done as part of the previous grants, 37 native aquatic plant species were recorded. After the removal of invasive cattail populations at the Lulu Lake wetland, 115 species were recorded, including two listed as species of special concern.

Maintenance of a diverse macrophyte population in the Mukwonago River and on Lulu Lake is crucial to the continued health of the fishery in this system. According to the Mukwonago River Watershed Protection Plan published in 2010 by the Southeastern Wisconsin Regional Planning Commission, Page 184, "Recent research by the Wisconsin Cooperative Fisheries Research Unit at the University of Wisconsin-Stevens Point has shown that the characteristics and composition of macrophyte beds significantly influences fish community structure in littoral zones of northern temperate lakes, such as the lakes of the Mukwonago River system."

That diversity in turn has an impact on the mussel population in the river system. According to the above-referenced SEWRPC document, Page 203, "The Mukwonago River is one of the most biologically rich mussel habitats in the state, with 16 mussel species having been found..." And mussels are dependent on a parasitic relationship with fish, in some cases with only one or two species of fish. Take, for example, the endangered species Slippershell found in the upper reaches of the Mukwonago River. According to the SEWRPC document, Table 25 on Page 202, the Slippershell is dependent only on the Johnny darter and the mottled sculpin in this parasitic relationship. The mottled sculpin is an indicator of a healthy cold water system, according to the SEWRPC document (Page 185) and is often called a good trout indicator, according to the book "Fishes of Wisconsin," Page 973.

In July of 2013, during a wetland training session being conducted by DNR staff at Lulu Lake, Asiatic clams *Corbicula fluminea* were discovered in the south end of Lulu Lake. Subsequent snorkeling surveys by DNR and TNC staff discovered evidence of more of the invasive clams all the way along the eastern side of the lake. The clams were believed to have been brought into the lake via boat traffic coming from Eagle Spring Lake.

More than 600 plant species, including 22 that are rare or threatened, exist along the Mukwonago River. And a June 2010 bird survey in the area found 88 bird species, including 12 rare or threatened species. "The presence of these numerous and diverse bird species is

consistent with the overall high quality of the riparian buffer areas within the Mukwonago River watershed... ,” according to the SEWRPC document, Page 205.

5. An identification of the need for the protection and enhancement of fish and wildlife habitat, endangered resources, and other local natural resource concerns.

Continued mapping and surveying of the Mukwonago River and Lulu Lake is essential to maintain its high water and species quality. New invasive species, including Japanese knotweed, have been reported in and around Eagle Spring Lake. The appearance of this invasive along the Mukwonago River upstream from Eagle Spring Lake could pose a severe threat to both the shoreline and to the water in the river and Lulu Lake because of the role of this plant in fostering erosion.

Because of the large amount of boat traffic entering Lulu Lake it is essential to continue surveys not only for existing invasive species but for new invasives.

6. Identification of the management objectives needed to maintain or restore the beneficial uses of the aquatic ecosystem.

The management objectives needed to maintain the healthy aquatic ecosystem of the upper reaches of the Mukwonago River include continued and expanded surveys for known and new aquatic invasives. Surveys of the river and wetlands west of Nature Road have revealed many previously unknown populations of the invasives targeted in this grant application. Funding is needed to treat these populations, many of which are small and can be easily eliminated.

7. Identification of target levels of control needed to meet the objectives.

A critical area that needs work is the large wetland on TNC’s newly acquired Malek Tract. Combined with the adjacent wetland on the existing Meyer Preserve, this wetland comprises about 135 acres and forms the northwestern headwaters of the Mukwonago River. Surveys of the area conducted in late summer 2014 characterized the area as a slightly degraded sedge meadow remnant. This area is at a tipping point; recovery of a high-quality wetland is possible with aggressive restoration work as soon as possible. Otherwise, the dominant species encroaching on the wetland – glossy buckthorn, willow, dogwoods and box elder – will continue to consume the wetland. There is a cascading effect that has begun to occur. The above-mentioned woody species have a high rate of evaporation and are creating a hydrological disturbance on the edges of the wetland, according to the surveyor. That in turn creates conditions that favor reed canarygrass. That reed canarygrass incursion is expected to keep progressing at a rapid pace unless treated. Work that needs to be done with funding from this grant includes thinning the shrub car that is evolving with the incursion of woody species. Care must be taken to leave some randomly-distributed woody species, such as Bebb’s willow and red-osier dogwood, to benefit wildlife. Also needed is the suppression of narrow-leaved cattail clones in the Malek Tract before this species advances to a monoculture. Likewise, work is needed to check the advance or reed canarygrass in this area. One previously unknown common reed clone has been found and

others may be in the area, so continue survey work is needed, especially on the Meyer side of the wetland.

Elsewhere, continued SCUBA and snorkel work is needed to slow the advance of Eurasian water-milfoil in Lulu Lake. TNC continues to favor hand-pulling over herbicide use to avoid collateral damage to desirable species in the lake. At the rate of harvesting undertaken during the summer of 2014 and observations from divers, it is estimated that the large population of EWM in deep water at the northeast corner of the lake could be reduced to a small amount in three years.

Because of the large amount of common reed in the wetland northwest of Lulu Lake, work will need to continue there for the foreseeable future. Even after all of the clones in that area have been treated at least one time, repeat visits and treatment will need to be undertaken to handle resprouts and plants that were missed.

Purple loosestrife treatment has reached the point where it amounts to vigilant annual surveys and the ability to quickly treat a new population. As mentioned earlier, the transition from the use of herbicides to the use of biocontrol has been one of the big success stories over the past five years.

Following is an estimate of the amount the target species will be reduced through funding provided by this grant. Annual surveys to search for resprouting and new populations will be needed:

Anticipated Reduction of Target Species Occurrences

| Species | Anticipated Reduction |
|--|--|
| Common reed <i>phragmites australis</i> (Lulu Lake Preserve) | 50% by the end of the grant period |
| Common reed (Meyer, Crooked Creek, Pickerel Lake Fen Preserves) | Eradicate by the end of the grant period |
| Hybrid and narrow-leaf cattail <i>Typha X glauca</i> and <i>Typha angustifolia</i> L (Meyer, Pickerel Lake Fen, Crooked Creek preserves) | 75% by the end of the grant period |
| Hybrid and narrow-leaf cattail (Lulu Lake, Baker) | Eradicate by the end of the grant period |
| Reed canary grass <i>Phalaris arundinacea</i> L | 75% by the end of the grant period |
| Eurasian water-milfoil <i>Myriophyllum spicatum</i> | 50% by the end of the grant period |
| Curly-leaf pondweed <i>Potamogeton crispus</i> | 50% by the end of the grant period |
| Common and glossy buckthorn <i>Rhamnus cathartica</i> and <i>Frangula alnus</i> | 75% by the end of the grant period |
| Purple loosestrife <i>Lythrum salicaria</i> | 90% by the end of the grant period |

8. Identification and discussion of the alternative management actions considered for aquatic invasive species control including the expected results.

The major alternative method considered for aquatic invasive species control was chemical treatment of EWM in Lulu Lake. Collateral damage to native species would have occurred if a generalized herbicide treatment had been undertaken. Any chemical treatment might impact an artesian spring on the lake from which people drink.

Prescribed burning had been considered as a tool to control reed canary grass at the Crooked Creek Preserve but was rejected because burning actually can favor and promote the dominance of RCG populations unless done after April 15. TNC staff will retain the option for prescribed burning as a management tool for RCG if crews are available.

Prescribed burning can be an effective tool for buckthorn of one inch in diameter or less because the fire can damage the plant. After buckthorn grows to more than an inch or so in diameter, the outer layer provides a protective barrier to fire. But the prospects for prescribed burning at the Lulu Lake and Crooked Creek Preserves are dependent on weather and the availability of limited personnel. Alternatively, another tool for buckthorn is a forestry mower, which is capable of clearing species of four inches or less in diameter. The problem with this approach is that it requires a diligent followup either in the form of fire or in foliar applications of herbicides to attack resprouts, since the forestry mower at best kills 10% of the buckthorn. And, a forestry mower cannot work on steep terrain or in the wetlands present at both the Lulu Lake and Crooked Creek preserves.

Digging out stands of phragmites and cattail was considered and rejected because of the extensive rhizome system that is impossible to completely remove and the inaccessibility of the plants in wetlands. And, the heavy disturbance to these areas that would follow on the removal would open the area for an explosion of other invasives.

Likewise, digging out purple loosestrife is effective but impractical because of its location in wetlands and the possibility of leaving part of the root system behind to regenerate.

9. An analysis of the need for and a list of the proposed control actions that will be implemented to achieve the target level of control.

- EWM: This invasive can form dense mats that cause plant and animal species diversity to plunge and also greatly reduce recreational opportunities because swimming areas are crowded with the plant and it can wrap around boat propellers. Hand-pulling, although labor-intensive and slow, offers an ecologically sound alternative to the use of chemicals.
- RCG: Reed canarygrass continues to occur even in areas on TNC preserves that would be thought to be inhospitable to this aquatic species. Pioneer plants are often found in upland areas and although they will not survive, they usually produce seed that can spread the species. Diligent, widespread surveys of the areas preserves are essential to keep this species in check. After the removal of RCG, it has been found that native species can outcompete this invasive. But RCG continues to pop up, especially in disturbed wetland areas.

- PL: Herbicide treatment of purple loosestrife continues to be needed because, although biocontrol is favored, it is not effective in treating a purple loosestrife population that develops in mid-summer. Work must be a two-step process with herbicide used to treat outbreaks and beetle populations created for long-term maintenance.
- Hybrid and narrow-leaved cattail: Work relying on cut stem and herbicide application done since 2011 has been very effective in eliminating much of the clones in the wetland in the center of the Lulu Lake Preserve between the old railroad grade and Nature Road. That area will shift into a resurvey mode while the major effort funded by this grant would focus on the large populations discovered at the Meyer Preserve.
- Buckthorn: Work to remove both glossy and common buckthorn primarily in the area around the wetlands at the Crooked Creek Preserve has opened up the areas formerly shadowed by these plants and has allowed the regeneration of native plants by removing the mid-story canopy that block light. The wetland and riparian area along the river at the Baker Preserve must be tackled in order to foster the return of native species there.
- Common reed: Chemical treatment of common reed using a formulation of the herbicide glyphosate that is appropriate for use near water must continue northwest of Lulu Lake and at the Meyer Preserve to push back this invasive to allow the growth of native aquatic plants.

10. A discussion of the potential adverse impacts the project may have on non-targeted species, drinking water or other beneficial waterbody uses.

The use of targeted rather than broadcast herbicide application for treatment of common reed, invasive cattail, reed canarygrass, buckthorn and purple loosestrife will be used by TNC and its contractors in order to minimize negative impacts on native plant and animal species. It is expected that there may be some short-term displacement of reptiles and amphibians but that they will return to their habitat.

More specifically, the contractor who will treat the hybrid and narrow-leaf cattail populations uses a low-pressure hand sprayer with a plastic cone attached that limits the herbicide to the cut stem. Low-pressure hand sprayers also are used for applications of herbicide to buckthorn stumps, common reed and reed canarygrass. In all of these applications, herbicides that are approved for use over standing water are used.

11. A prevention strategy to reasonably assure that new introduction of aquatic invasive species will not re-infest the waterbody.

An early concern of TNC staff and Gerber was that the removal of the largest population of EWM in Lulu Lake would open the area for the return of the same species. That fear was well-founded; in the summer of 2011, parts of the area cleared in 2010 had been reclaimed by EWM. This was the genesis of the idea for creating mats of native plants that could be placed on the lake bottom to keep out invasives.

One stumbling block was that these mats cannot be used in areas where there is EWM intermingled with native species because the mats might harm native plants. As part of this grant, the mat experiment would be conducted in shallow (four to five feet deep) water on the east side of Lulu Lake. This area has a marl bottom with no native vegetation and one area where EWM has been hand-harvested for several years. This area also is advantageous because there is little boat traffic there. A similar experiment mats would be conducted in Pickerel Lake in an area with an unvegetated bottom and water approximately three feet deep. Unlike the bottom at Lulu, this area is sand and gravel and would provide another dimension to the experiment.

The biodegradable mats are made of cocoa-fiber and were designed for use in controlling erosion in road construction projects. High school and college interns would weave cuttings of native plants taken from Lulu and Pickerel lakes (two-leaved or variable-leaved milfoil *Myriophyllum heterophyllum* and Illinois pondweed *potamogeton Illinoensis*) into the mats, which would then be placed at the two experimental sites and monitored for three to four growing seasons. Based on experiments in a TNC greenhouse and with one- and two-meter mats, the native plant cuttings can be expected to form roots and attach to the lake bottom. Within two years, the cocoa-fiber mat has been show to deteriorate, leaving the native plants in place.

Plant material taken from Lulu Lake to the greenhouse will be labeled so that it is returned to Lulu Lake and likewise, plant material taken from Pickerel Lake to the greenhouse will be labeled so that that material is returned to Pickerel Lake.

TNC staff will apply in early 2015 for separate Chapter 30 miscellaneous structures permits for Lulu Lake and for Pickerel Lake from the Wisconsin Department of Natural Resources for the use of the biodegradable mats. TNC staff also will apply to amend its Wisconsin DNR NR109 mechanical harvesting permit for Lulu Lake to allow for the removal of native plant material for use in the cocoa-fiber mats and will apply for a separate permit for the removal of native plant material from Pickerel Lake for use in cocoa-fiber mats.

ESLMD, which has agreed to write a letter of support for this grant, has been asked to specifically endorse the mat experiment. The district's director has personally agreed to support the mat experiment and will ask his board to vote on the endorsement at its December, 2014 meeting.

12. A contingency strategy for effectively monitoring and preventing the re-introduction of aquatic invasive species following initial control.

In addition to the use of the biodegradable mats to control EWM, continued surveys are the key to both keeping known invasive populations in check and discovering previously unknown or new populations of the other target species.

- A survey of Lulu Lake would be conducted in early June to assess the extent of EWM;
- Contractors hired by TNC to work on the target species would be asked to use the Great Lakes Early Detection Network (GLEDN) web application, which allows very accurate mapping of the location and size of each population of the target species. The use of this tool will greatly improve the ability to monitor progress in treating the target populations as well as detecting previously unknown or new populations of the target species.

13. Sufficient information for determining the feasibility of alternative control measures, including: costs; the relative permanence of the control; the potential for long-term control of the causes of the infestation as well as the baseline data required to measure subsequent change.

The major alternative control measure that might be considered would be the use of a mechanical harvester and herbicides to control Eurasian water-milfoil at Lulu Lake.

These alternatives are impractical.

Use of a mechanical harvester would be expensive and would not produce any favorable results; in fact, it likely would cause more damage to the lake. The harvester would not be able to work on the deep-water EWM at Lulu and in other areas, the harvester would needlessly remove many native aquatic plants. For example, EWM on the west side of the lake is in close proximity to a large wild rice bed which would certainly be damaged by the harvester's work.

The use of herbicides to control EWM in Lulu Lake would provide a "quick fix" but cause damage to many desirable species. And, because the source of the problem – boat traffic – has not been fixed, the EWM would continue to be brought into the lake.

So the expense of both a harvester and chemicals would be wasted money.

TNC will begin using a much more accurate web application during the summer of 2014 that will allow the development of more precise polygons to measure the size of EWM for baseline data.

One consideration should always be to consider what the lake would be like today if TNC had done nothing to control EWM. The scattered plants that have been harvested over the past five years on the west and northwest sides of the lake most certainly would have developed into large masses, choking out native species of plants and animals. TNC's work can best be characterized as holding EWM in check, a finger in the dike, so to speak. But work must continue to hand-harvest and aggressively mount a continuing education campaign for boaters.

For the other species, such as common reed, buckthorns, invasive cattails, reed canarygrass and purple loosestrife, alternatives would include excavation for all of these species. In most cases, it would not be practical and in some cases, the soil disturbance, would set up conditions for the incursion of new invasives.

Attachments:

- Endorsement letter from TNC director of land conservation;
- Maps of project areas;
- Map of public access.



Wisconsin Field Office
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Madison, WI 53703

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Wednesday, November 26, 2014

Heidi Bunk,
Water Resources Management Specialist
141 NW Barstow St. Room 180
Waukesha WI 53188

I have reviewed the pre-proposal for an Aquatic Invasive Species grant for Established Infestation Control Project at Lulu Lake and Mukwonago River wetlands west of Lulu Lake. This project would build upon the successful work that was funded by two previous AIS grants during the past four years, and catalyze the undertaking of new control efforts.

The two previous grants allowed TNC to:

- Greatly reduce several narrow-leaved and hybrid cattail clones that had encroached upon a high-quality wetland at the Lulu Lake Nature Preserve;
- Reduce the population of Eurasian water-milfoil in Lulu Lake;
- Reduce the population of common reed in the Lulu Lake wetlands;
- Reduce the population of reed canarygrass at the Crooked Creek Preserve;
- Reduce the population of purple loosestrife at the Lulu Lake, Crooked Creek and Meyer preserves.

This new funding would allow The Nature Conservancy to continue to monitor and suppress six aquatic invasive species and expand the scope of the work upstream to areas where new populations of these invasives have been discovered. Discovering and treating the upstream populations is crucial to preventing the spread of these species.

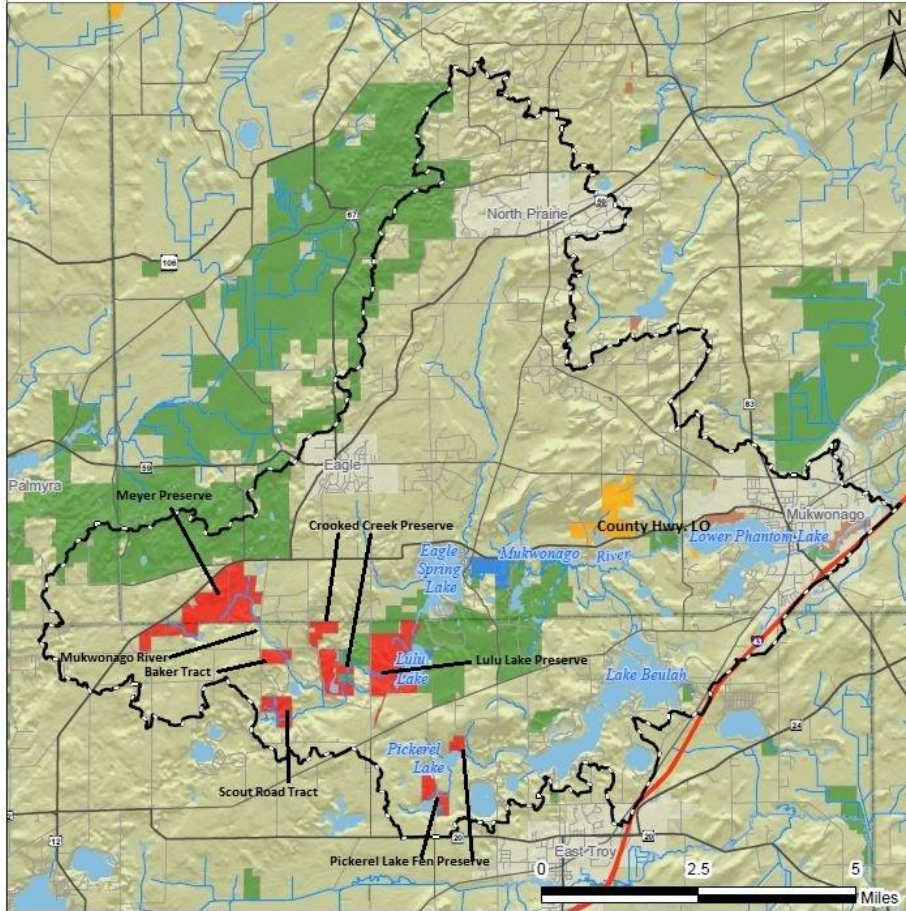
I fully endorse this pre-proposal and formal adoption of this grant pending an award of funding. Thank you for your consideration of this proposal, and for all your efforts and support for the project.

Sincerely,

Hannah Spaul

Director of Conservation Land Management,
The Nature Conservancy,
Wisconsin Chapter

Conservation and Public Ownership within the Mukwonago River Watershed



Mukwonago River Watershed

The Nature Conservancy

- Easement
- Ownership

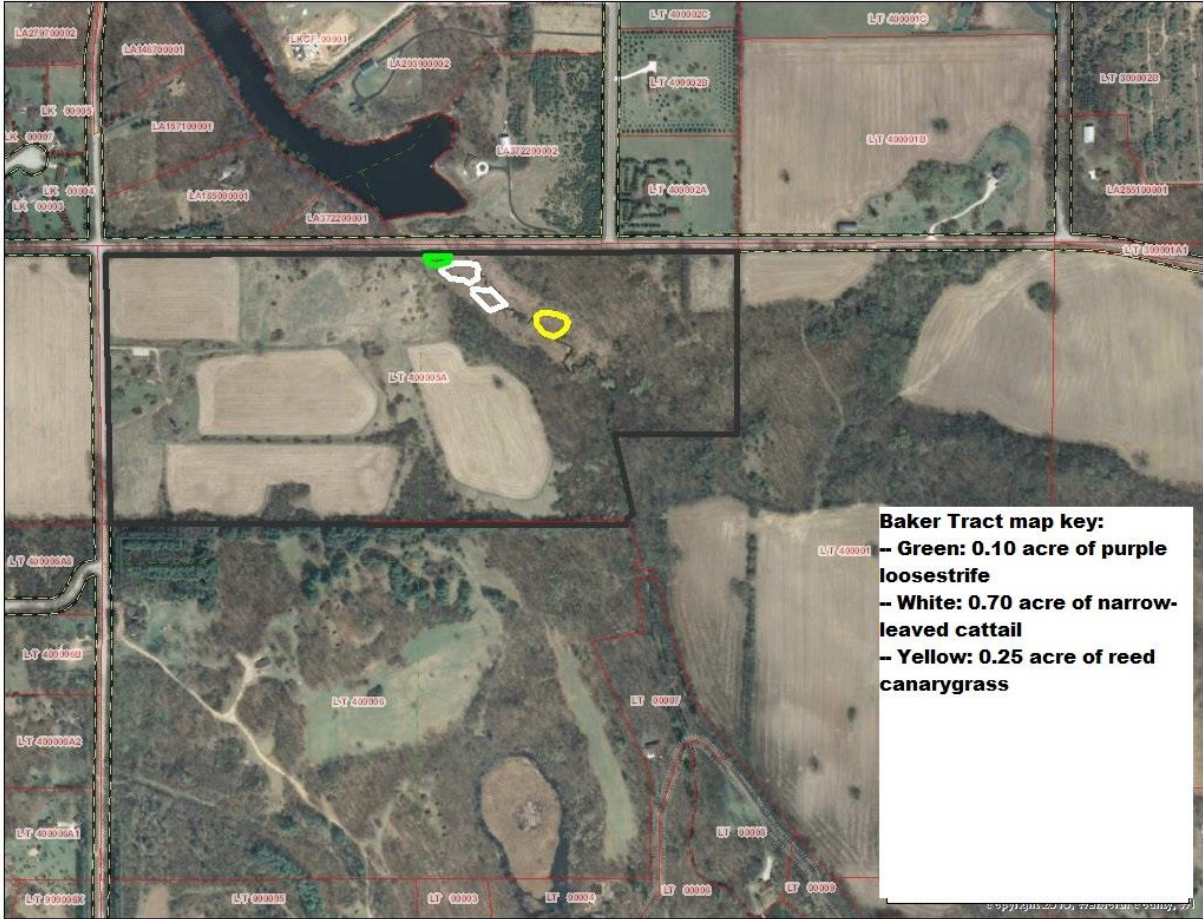
Public Land Ownership

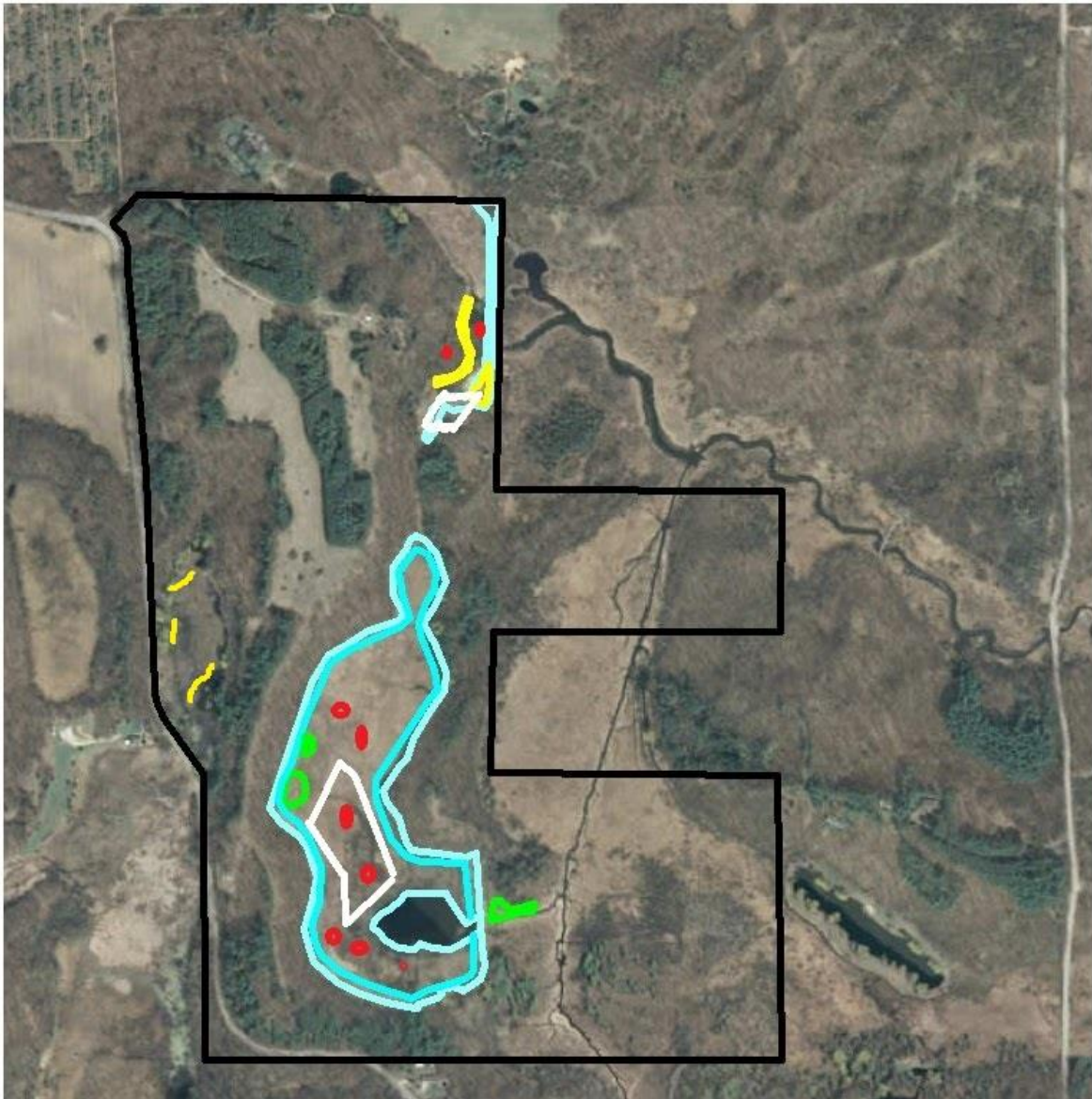
- State
- Federal
- City/Village Property
- County Property
- Village of Mukwonago
- Waukesha County

Interstate Highway
 US Highway, State Highway
 County Hwy
 Local Road
 Water



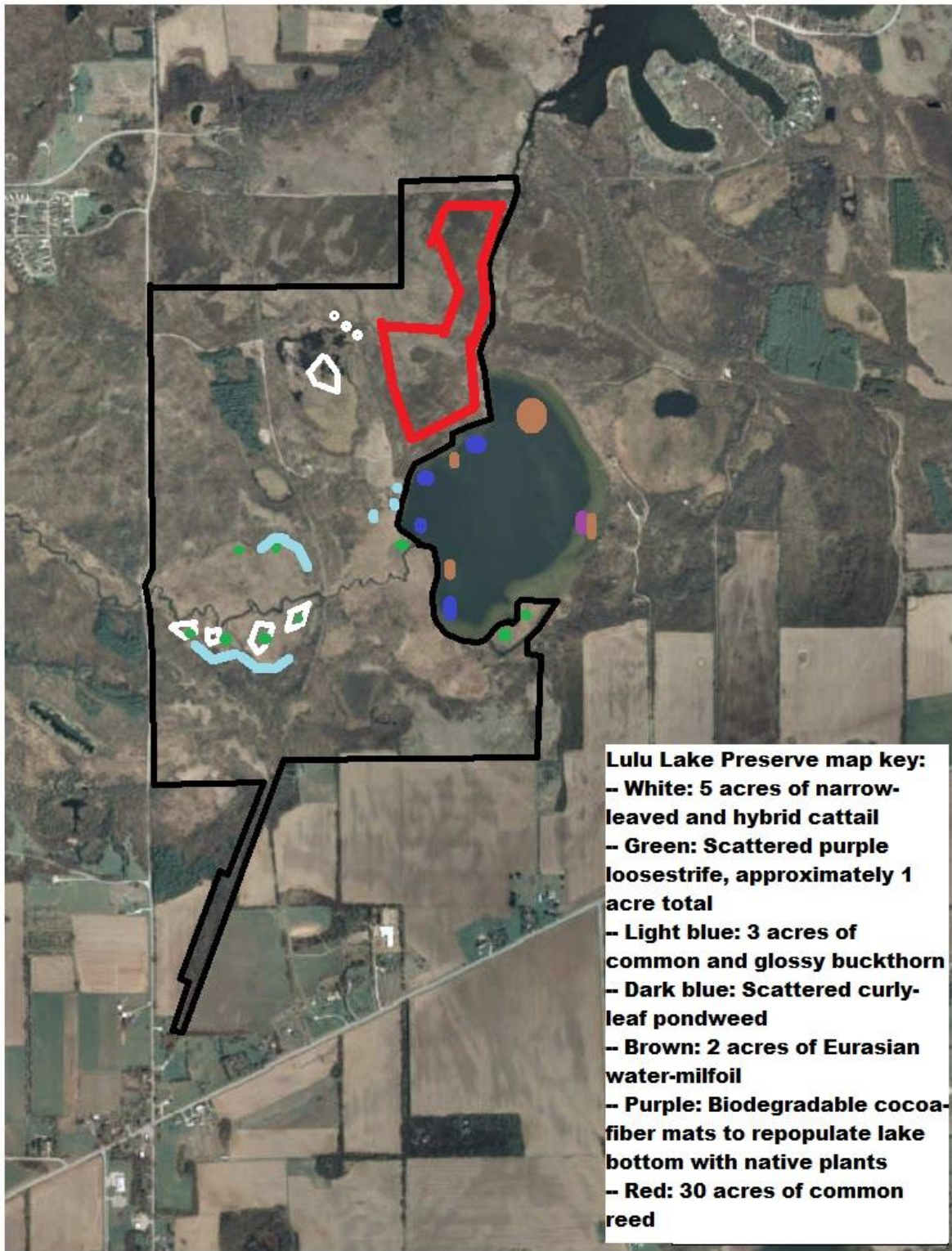
The Nature Conservancy, 9/3/2014
 Data from SEWRPC, The Nature Conservancy and WI DNR. Property boundaries are for illustration purposes only and do not constitute legal representations of ownership.
 I:\Geodata\ProjectAreas\Mukwonago\Projects\Watershed_AllConserved_2013_letter.mxd





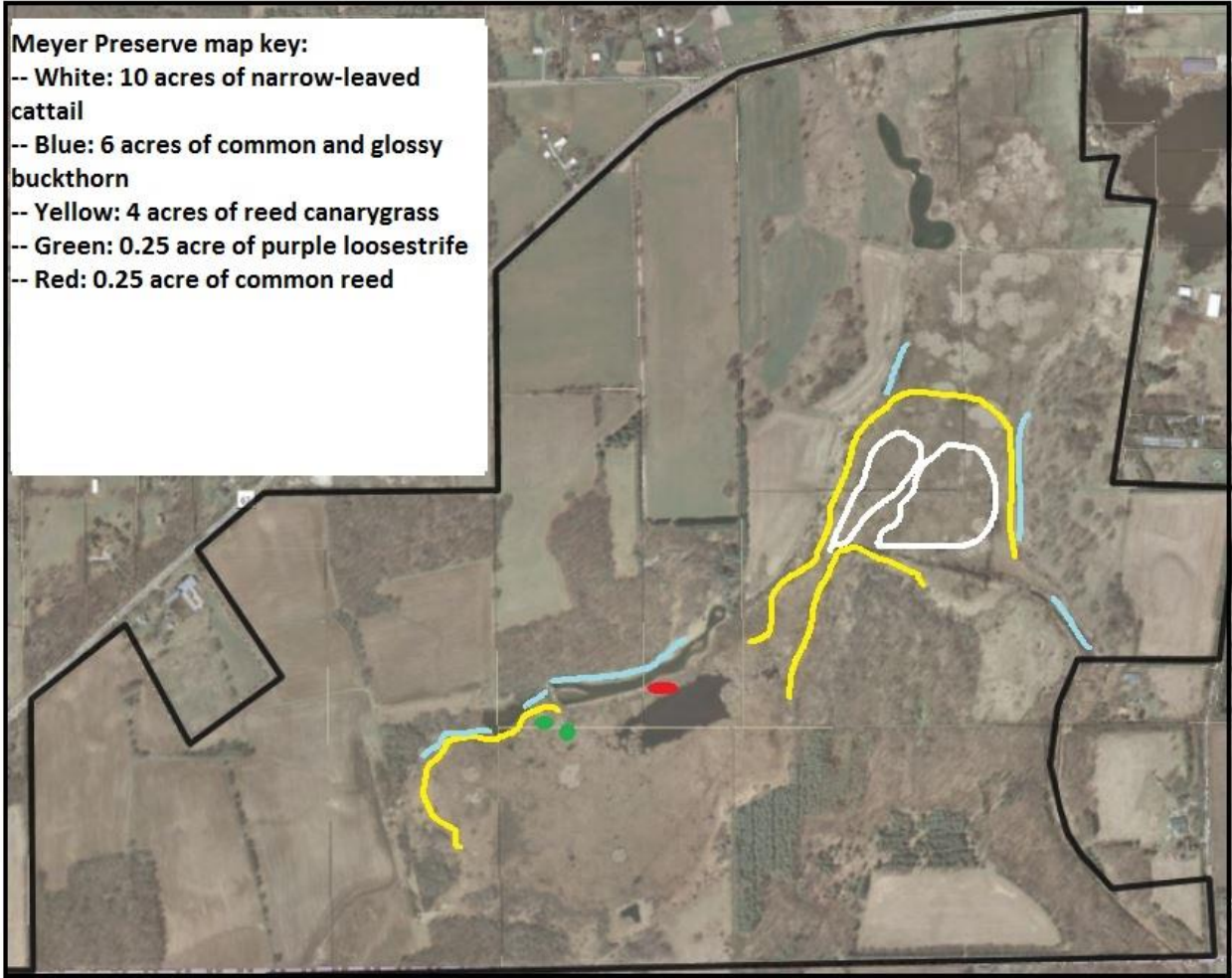
Crooked Creek map key:

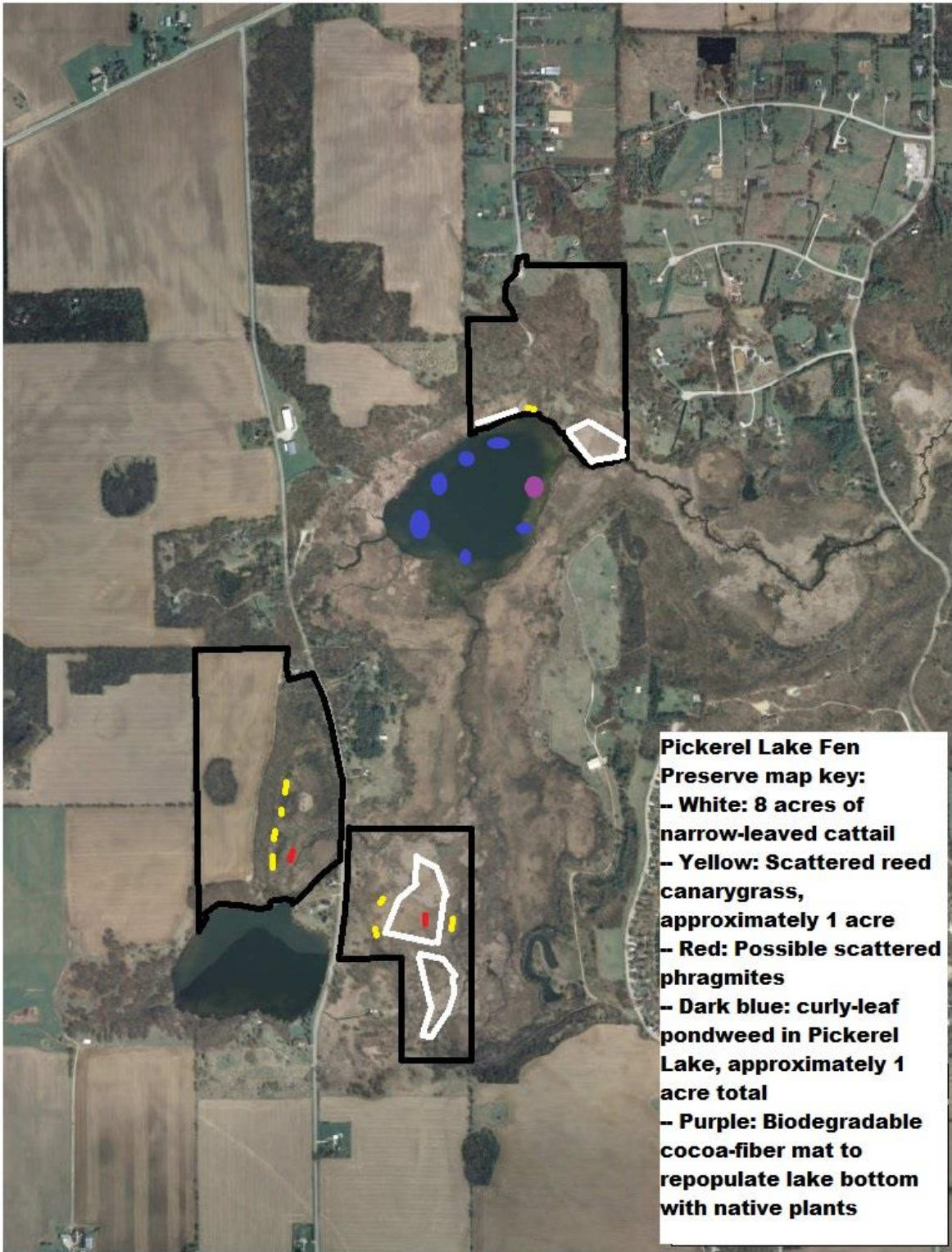
- Red: Scattered small common reed clones
- Light blue: 6.5 acres of buckthorn
- Green: 0.70 acre purple loosestrife
- Yellow: 0.70 acre reed canarygrass
- White: 5 acres of narrow-leaved cattail



Meyer Preserve map key:

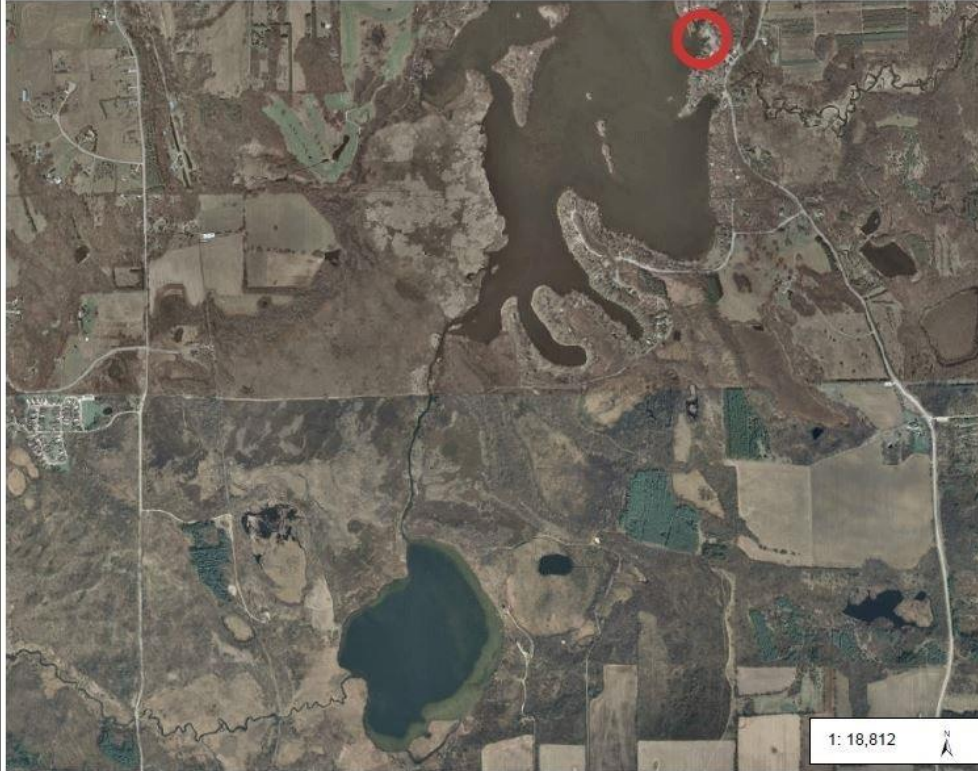
- White: 10 acres of narrow-leaved cattail
- Blue: 6 acres of common and glossy buckthorn
- Yellow: 4 acres of reed canarygrass
- Green: 0.25 acre of purple loosestrife
- Red: 0.25 acre of common reed







Lulu Lake public access

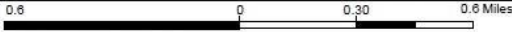


Legend

2010 Air Photos (WROC)

Public access for boats traveling to Lulu Lake is at the DNR launch at the northeast corner of Eagle Spring Lake. The launch area has parking for 14 vehicles and trailers and additional parking is available along Highway E one block away.

1: 18,812



NAD_1983_HARN_Wisconsin_TM
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Notes



Pickerel Lake public access



Legend

2010 Air Photos (WROC)

Boats can be launched at the ramp on the west side of Townline Road where it crosses the unnamed river the flows out of Pickerel Lake. Parking is available for two vehicles and trailers.

1: 8,724

Notes

0.3 0 0.14 0.3 Miles

NAD_1983_HARN_Wisconsin_TM
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