

**Note: Methodology, explanation of analysis and biological background on Island Lake studies are contained within the Manitowish Waters Chain-wide Management Plan document.**

## 8.2 Island Lake

### An Introduction to Island Lake

DRAFT

Island Lake, Vilas County, is a deep, lowland drainage lake with a maximum depth of 35 feet, a mean depth of 13 feet, and a surface area of approximately 918 acres. The lake is fed via Rice Creek to the northwest and Island Creek and the Manitowish River to the southwest, and empties into downstream Spider Lake. The lake is currently in a mesotrophic state, and its watershed encompasses approximately 79,573 acres. In a 2011 WDNR study and studies conducted by Onterra in 2012, 40 native aquatic plant species were located in the lake, of which fern pondweed (*Potamogeton robbinsii*) was the most common. Four non-native plants, curly-leaf pondweed, pale yellow iris, purple loosestrife, and common forget-me-not were observed growing in or along the shorelines of Island Lake in 2012.

#### Field Survey Notes

*Shallower areas encountered along the eastern side of the lake, many logs and branches found. Abundant rice fields mapped during project studies – these areas provide great wildlife habitat.*



Photo 8.2 Island Lake, Vilas County

### Lake at a Glance\* – Island Lake

| Morphology                         |                                                                                 |
|------------------------------------|---------------------------------------------------------------------------------|
| Acreage                            | 918                                                                             |
| Maximum Depth (ft)                 | 35                                                                              |
| Mean Depth (ft)                    | 13                                                                              |
| Volume (acre-feet)                 | 11,934                                                                          |
| Shoreline Complexity               | 10.2                                                                            |
| Vegetation                         |                                                                                 |
| Curly-leaf Survey Date             | May 30, 2012                                                                    |
| Comprehensive Survey Date          | July 5 & 8, 2011 (WDNR), July 24, 2012 (Onterra)                                |
| Number of Native Species           | 40                                                                              |
| Threatened/Special Concern Species | Vasey's pondweed ( <i>Potamogeton vaseyi</i> )                                  |
| Exotic Plant Species               | Curly-leaf pondweed; Pale yellow iris; Purple loosestrife; Common forget-me-not |
| Simpson's Diversity                | 0.93                                                                            |
| Average Conservatism               | 6.7                                                                             |
| Water Quality                      |                                                                                 |
| Wisconsin Lake Classification      | Deep, Lowland Drainage                                                          |
| Trophic State                      | Mesotrophic                                                                     |
| Limiting Nutrient                  | Phosphorus                                                                      |
| Watershed to Lake Area Ratio       | 86:1                                                                            |

\*These parameters/surveys are discussed within the Chain-wide portion of the management plan.

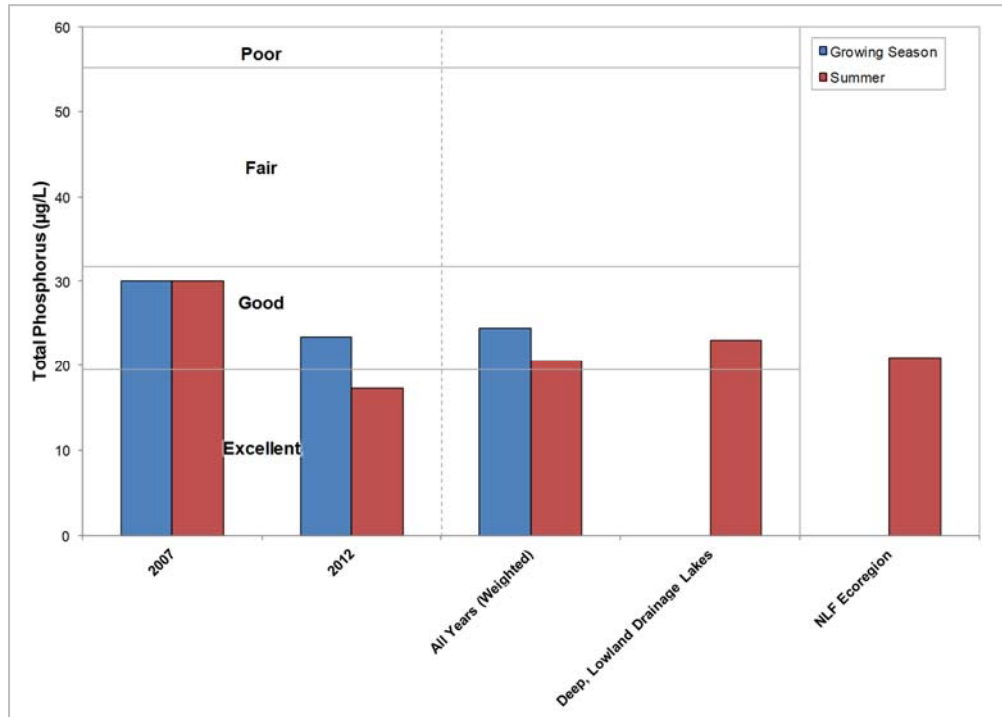
## 8.2.1 Island Lake Water Quality

Water quality data was collected from Island Lake on six occasions in 2012/2013. Onterra staff sampled the lake for a variety of water quality parameters including total phosphorus, chlorophyll-*a*, Secchi disk clarity, temperature, and dissolved oxygen. Please note that the data in these graphs represent concentrations and depths taken during the growing season (April-October), summer months (June-August) or winter (February-March) as indicated with each dataset. Furthermore, unless otherwise noted the phosphorus and chlorophyll-*a* data represent only surface samples. In addition to sampling efforts completed in 2012/2013, any historical data was researched and are included within this report as available.

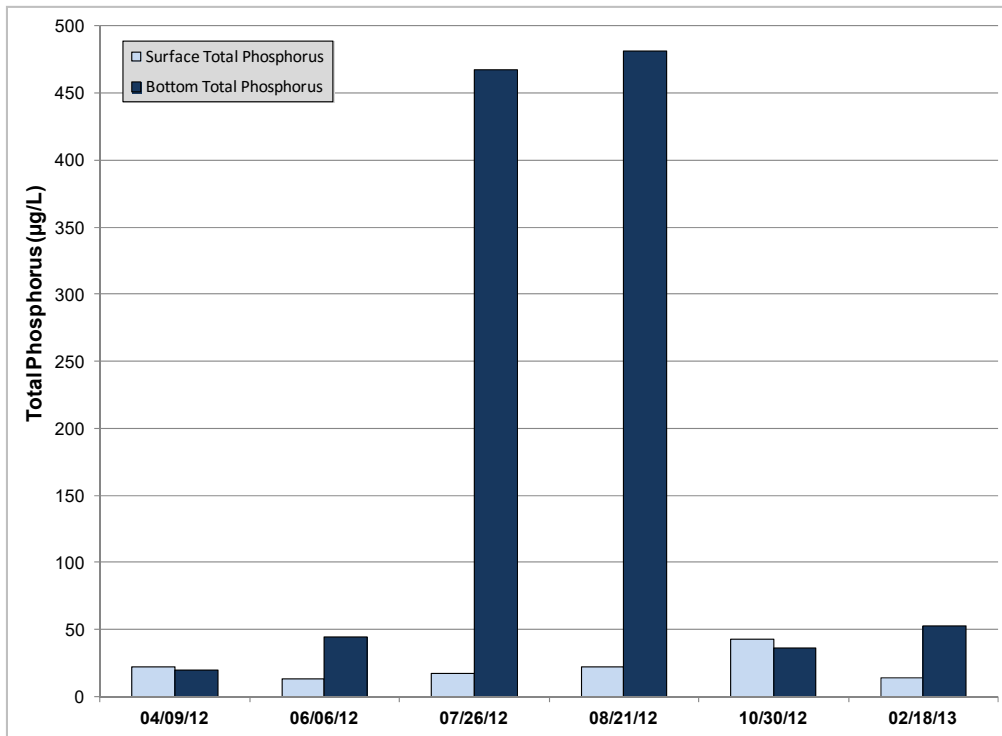
Unfortunately, very limited data exists for two water quality parameters of interest – total phosphorus and chlorophyll-*a* concentrations. In 2012, average summer phosphorus concentrations (20.5 µg/L) were less than the median value (23.0 µg/L) for other deep, lowland drainage lakes in the state (Figure 8.2.1-1). The value is also less than the median value for all lakes within the Northern Lakes and Forests ecoregion. A weighted value from all available data ranks as *Good* for a deep, lowland drainage lake.

Total phosphorus surface values from 2012 are compared with bottom-lake samples collected during this same time frame in Figure 8.2.1-2. As displayed in this figure, on several occasions surface and bottom total phosphorus concentrations were similar. However on some occasions, namely during July and August of 2012, the bottom phosphorus concentrations were much greater than the relatively low surface concentrations. During these periods, anoxic conditions were recorded near the bottom of the lake through measurement of dissolved oxygen (refer to Figure 8.2.1-6 and associated text). This is an indication of hypolimnetic nutrient recycling, or internal nutrient loading, which is a process discussed further in the Manitowish Waters Chain-wide document. While this process may be contributing some phosphorus to Island Lake's water column, the impacts of nutrient loading are not apparent in the lake's overall water quality; as previously mentioned, Island Lake's surface water total phosphorus values are slightly lower than the median value for comparable lakes in Wisconsin.

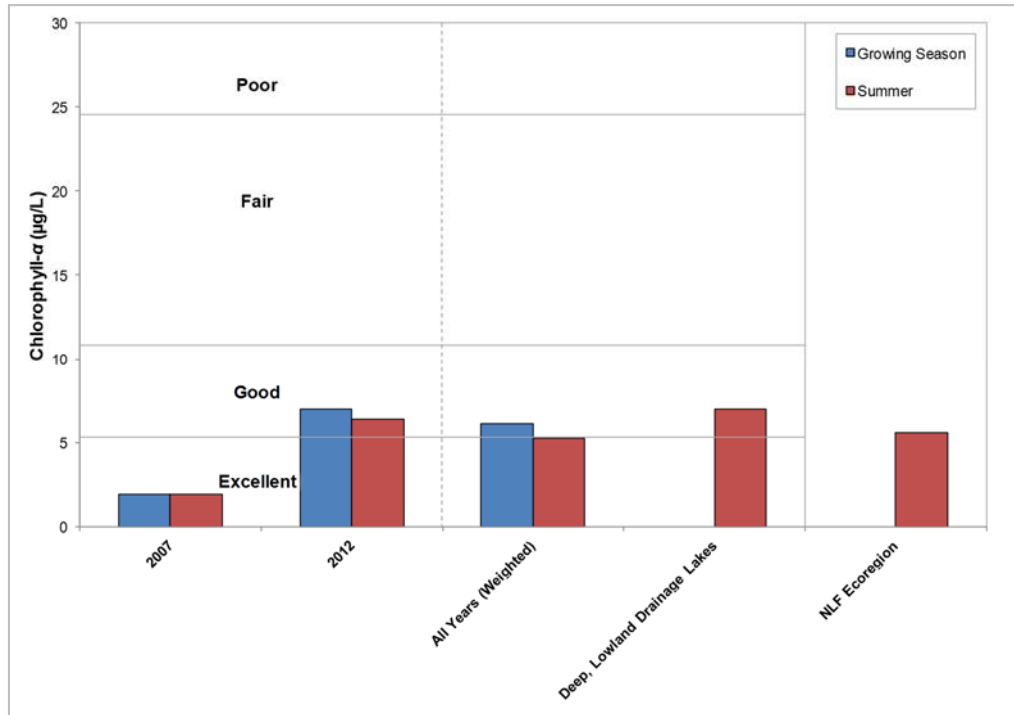
Similar to what has been observed with the total phosphorus dataset, summer average chlorophyll-*a* concentrations (5.3 µg/L) were slightly higher than the median value (5.0 µg/L) for other lakes of this type (Figure 8.2.1-3), yet slightly lower than the median for all lakes in the ecoregion. Both of these parameters indicate that the lake has enough nutrients for production of aquatic plants, algae, and other organisms but not so much that a water quality issue is present. During 2012 visits to the lake, Onterra ecologists recorded field notes describing very good water conditions.



**Figure 8.2.1-1. Island Lake, state-wide deep, lowland drainage lakes, and regional total phosphorus concentrations.** Mean values calculated with summer month surface sample data. Water Quality Index values adapted from WDNR PUB WT-913.



**Figure 8.2.1-2. Island Lake surface and bottom total phosphorus values, 2012-2013.** Anoxia was observed in the hypolimnion of the lake during July and August sampling visits.

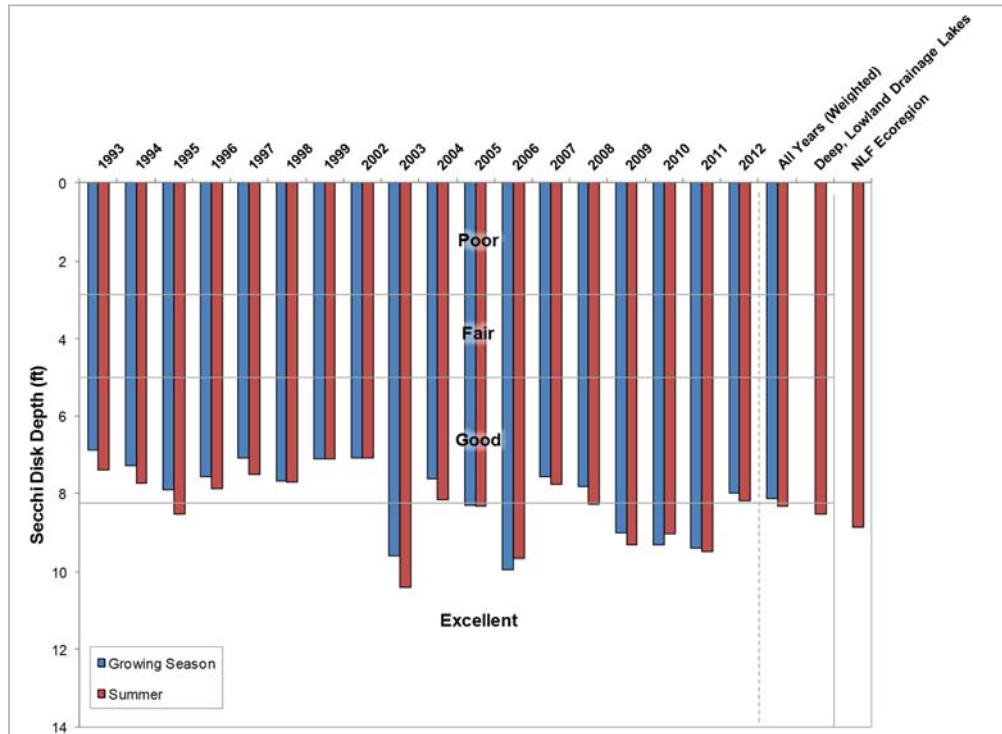


**Figure 8.2.1-3. Island Lake, state-wide deep, lowland drainage lakes, and regional chlorophyll-a concentrations.** Mean values calculated with summer month surface sample data. Water Quality Index values adapted from WDNR PUB WT-913.

From the examination of nearly two decades worth of Secchi disk clarity data, several conclusions can be drawn. First, the clarity of Island Lake’s water can be described as *Good* or *Excellent* (Figure 8.1.1-4). A weighted average over this timeframe is less than the median value for other deep, lowland drainage lakes in the state. Secondly, there is no apparent trend in the clarity of the water in Island Lake; the data indicate that clarity may differ from one year to the next, but has not gotten “worse” or “better” over this time period. Annual variation is however apparent.

Secchi disk clarity is influenced by many factors, including plankton production and suspended sediments, which themselves vary due to several environmental conditions such as precipitation, sunlight, and nutrient availability. In Island Lake as well as the other lakes in the Manitowish Waters Chain of Lakes, a natural staining of the water plays a role in light penetration, and thus water clarity, as well. The waters of Island Lake contain naturally occurring organic acids that are washed into the lake from nearby wetlands. The acids are not harmful to humans or aquatic species; they are by-products of decomposing terrestrial and wetland plant species. This natural staining may reduce light penetration into the water column, which reduces visibility and also reduces the growing depth of aquatic vegetation within the lake.

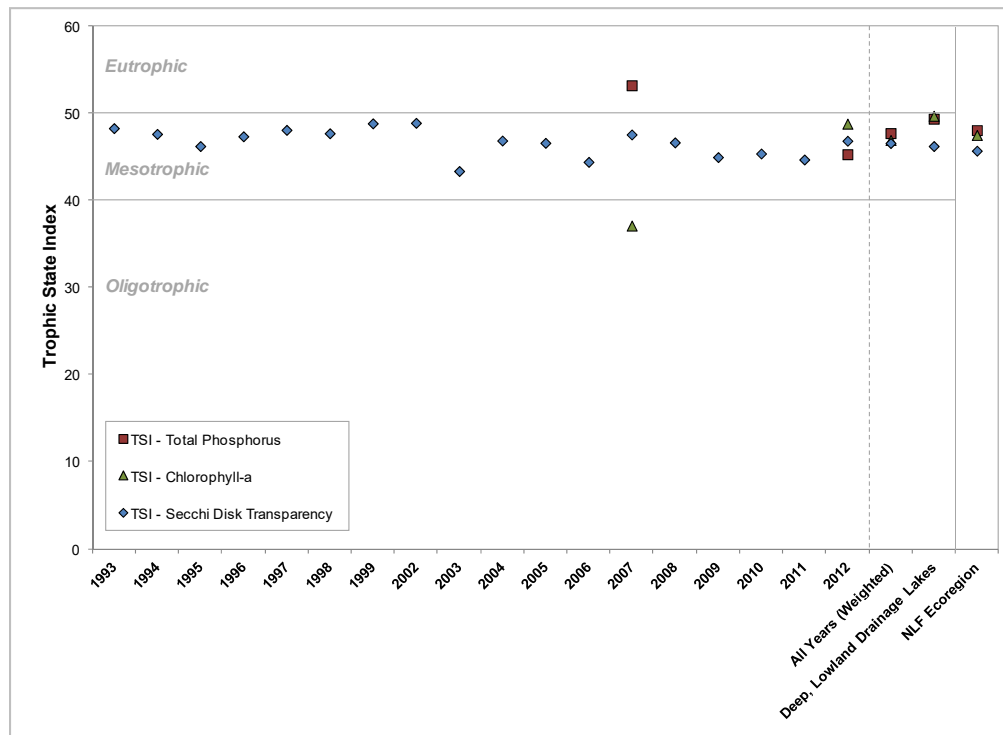
“True color” measures the dissolved organic materials in water. Water samples collected in April and July of 2012 were measured for this parameter, and were found to be 20 and 15 Platinum-cobalt units (Pt-co units, or PCU), respectively. Lillie and Mason (1983) categorized lakes with 0-40 PCU as having “low” color, 40-100 PCU as “medium” color, and >100 PCU as high color.



**Figure 8.2.1-4. Island Lake, state-wide deep, lowland drainage lakes, and regional Secchi disk clarity values.** Mean values calculated with summer month surface sample data. Water Quality Index values adapted from WDNR PUB WT-913.

### Island Lake Trophic State

The TSI values calculated with Secchi disk, chlorophyll-*a*, and total phosphorus values range in values spanning from lower mesotrophic to eutrophic (Figure 8.2.1-5). In general, the best values to use in judging a lake’s trophic state are the biological parameters; therefore, relying primarily on total phosphorus and chlorophyll-*a* TSI values, it can be concluded that Island Lake is in a mesotrophic state.



**Figure 8.2.1-5. Island Lake, state-wide deep, lowland drainage lakes, and regional Trophic State Index values.** Values calculated with summer month surface sample data using WDNR PUB-WT-193.

### Dissolved Oxygen and Temperature in Island Lake

Dissolved oxygen and temperature profiles were created during each water quality sampling trip made to Island Lake by Onterra staff. Graphs of those data are displayed in Figure 8.2.1-6 for all sampling events.

Island Lake mixes thoroughly during the spring and fall, when changing air temperatures and gusty winds help to mix the water column. During the summer months, the bottom of the lake becomes void of oxygen and temperatures remain fairly cool as they were in the spring months. This occurrence is not uncommon in deep Wisconsin lakes, where wind energy is not sufficient during the summer to mix the entire water column – only the upper portion. During this time, bacteria break down organic matter that has collected at the bottom of the lake and in doing so utilize any available oxygen.

The lake mixes completely again in the fall, re-oxygenating the water in the lower part of the water column. During the winter months, the coldest temperatures are found just under the overlying ice, while oxygen gradually diminishes once again towards the bottom of the lake. In February of 2013, oxygen levels remained sufficient throughout most of the water column to support most aquatic life in northern Wisconsin lakes.

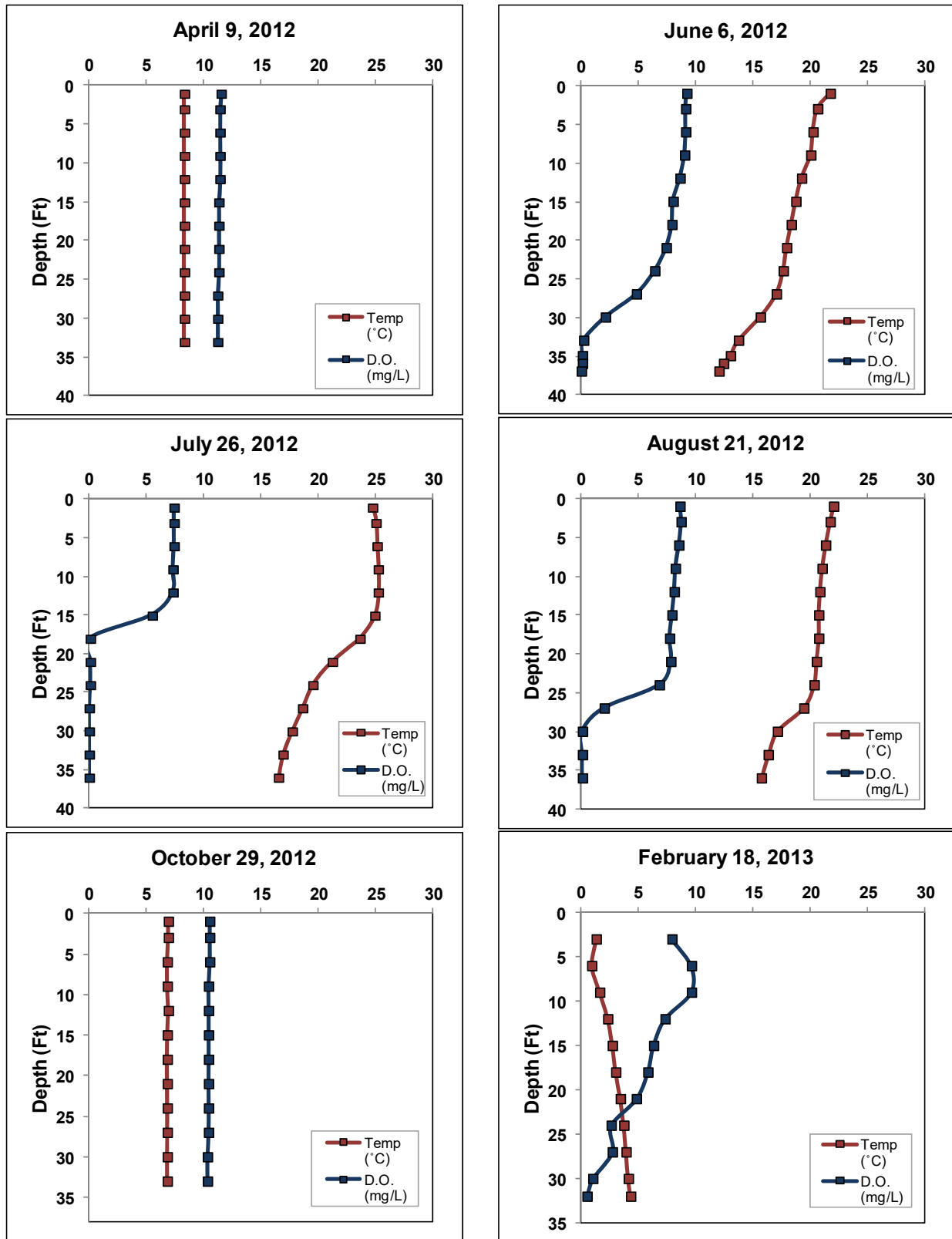


Figure 8.2.1-6. Island Lake dissolved oxygen and temperature profiles.

## Additional Water Quality Data Collected at Island Lake

The water quality section is centered on lake eutrophication. However, parameters other than water clarity, nutrients, and chlorophyll-*a* were collected as part of the project. These other parameters were collected to increase the understanding of Island Lake's water quality and are recommended as a part of the WDNR long-term lake trends monitoring protocol. These parameters include; pH, alkalinity, and calcium.

As the Chain-wide Water Quality Section explains, the pH scale ranges from 0 to 14 and indicates the concentration of hydrogen ions ( $H^+$ ) within the lake's water and is thus an index of the lake's acidity. Island Lake's surface water pH was measured at roughly 8.6 during April and 7.1 during July of 2012. These values are near or slightly above neutral and fall within the normal range for Wisconsin lakes. Fluctuations in pH with respect to seasonality is common; in-lake processes such as photosynthesis by plants act to reduce acidity by carbon dioxide removal while decomposition of organic matter add carbon dioxide to water, thereby increasing acidity.

A lake's pH is primarily determined by the amount of alkalinity that is held within the water. Alkalinity is a lake's capacity to resist fluctuations in pH by neutralizing or buffering against inputs such as acid rain. Lakes with low alkalinity have higher amounts of the bicarbonate compound ( $HCO_3^-$ ) while lakes with a higher alkalinity have more of the carbonate compound of alkalinity ( $CO_3^{2-}$ ). The carbonate form is better at buffering acidity, so lakes with higher alkalinity are less sensitive to acid rain than those with lower alkalinity. The alkalinity in Island Lake was measured at 45-46 mg/L as  $CaCO_3$  in April and July of 2012. This indicates that the lake has a substantial capacity to resist fluctuations in pH and has a low sensitivity to acid rain.

Samples of calcium were also collected from Island Lake during 2012. Calcium is commonly examined because invasive and native mussels use the element for shell building and in reproduction. Invasive mussels typically require higher calcium concentrations than native mussels. The commonly accepted pH range for zebra mussels is 7.0 to 9.0, so Island Lake's pH of 7.1 – 8.6 falls within this range. Lakes with calcium concentrations of less than 12 mg/L are considered to have very low susceptibility to zebra mussel establishment. The calcium concentration of Island Lake was found to be 13.0 mg/L in April and 12.5 mg/L in July of 2012, which is at the bottom end of the optimal range for zebra mussels. Plankton tows were completed by Onterra staff during the summer of 2012 and these samples were processed by the WDNR for larval zebra mussels. *Results to be included within the next draft.*



## **8.2.2 Island Lake Watershed Assessment**

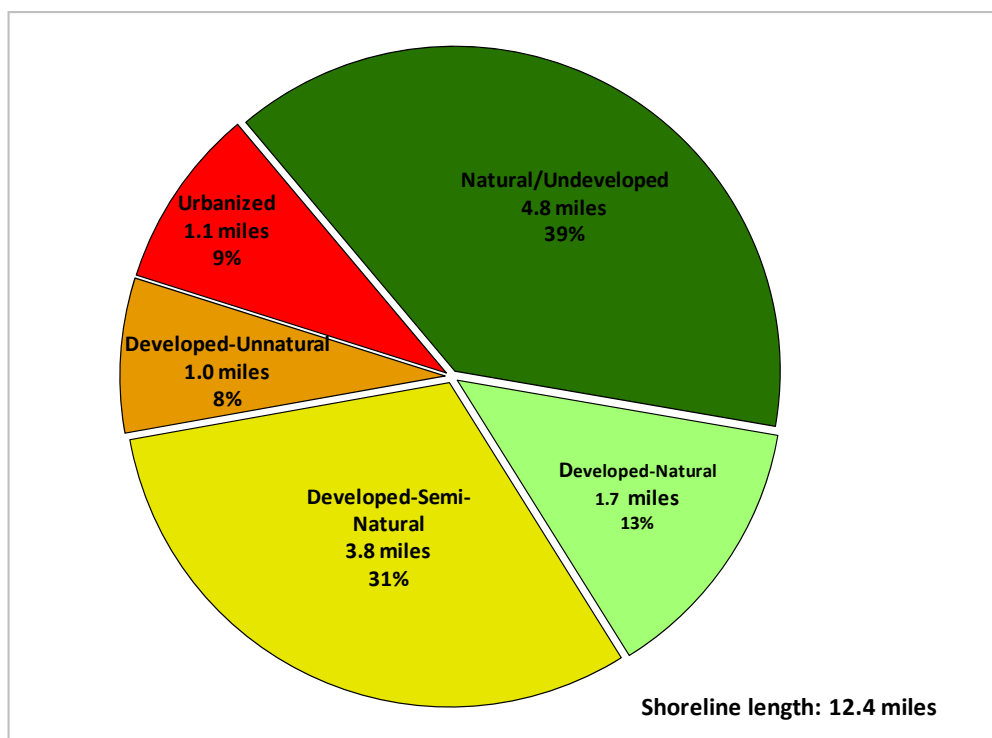
Island Lake's watershed is 79,573 acres in size. Compared to Island Lake's size of 918 acres, this makes for an incredibly large watershed to lake area ratio of 86:1.

Exact land cover calculation and modeling of nutrient input to Island Lake will be completed towards the end of this project (in 2015-2016). By this time, the latest satellite imagery (and thus the most accurate land cover delineation) will be available. Additionally, when water quality sampling of the upper reaches of the chain is completed, these results will be input to predictive models and thus make the modeling of nutrient input to the entire chain more accurate.

## 8.2.3 Island Lake Shoreland Condition

### Shoreland Development

As mentioned previously in the Chain-wide Shoreland Condition Section, one of the most sensitive areas of the watershed is the immediate shoreland area. This area of land is the last source of protection for a lake against surface water runoff, and is also a critical area for wildlife habitat. In late summer of 2012, Island Lake's immediate shoreline was assessed in terms of its development. Island Lake has stretches of shoreland that fit all of the five shoreland assessment categories. In all, 6.5 miles of natural/undeveloped and developed-natural shoreline were observed during the survey (Figure 8.2.3-1). This constitutes about 52% of Island Lake's shoreline. These shoreland types provide the most benefit to the lake and should be left in their natural state if at all possible. During the survey, 2.1 miles of urbanized and developed-unnatural shoreline (17%) was observed. If restoration of the Island Lake shoreline is to occur, primary focus should be placed on these shoreland areas as they currently provide little benefit to, and actually may harm, the lake ecosystem. Island Lake Map 1 displays the location of these shoreline lengths around the entire lake.



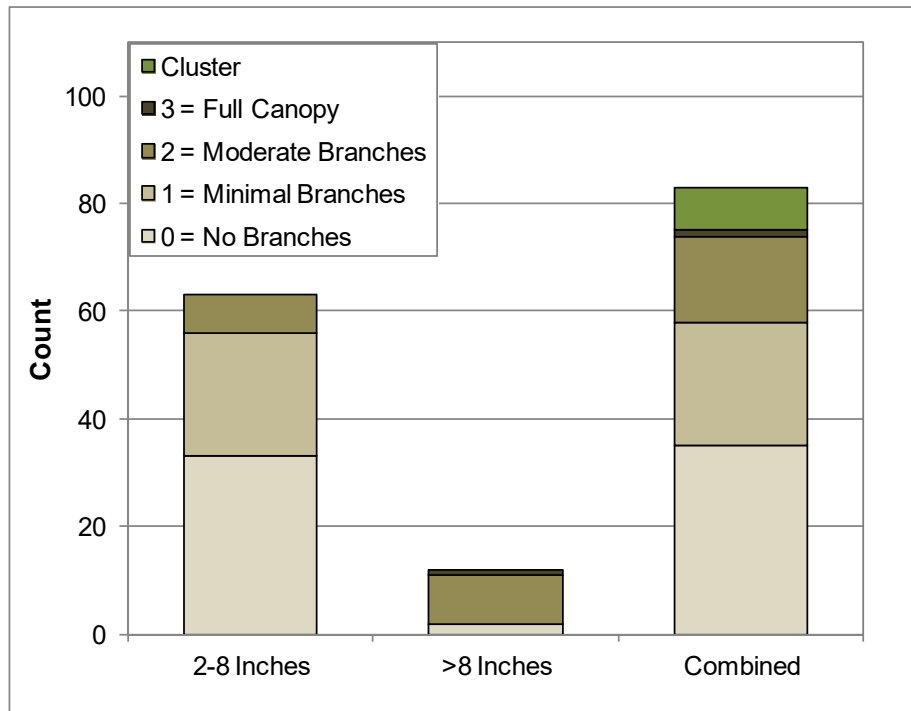
**Figure 8.2.3-1. Island Lake shoreland categories and total lengths.** Based upon a late summer 2012 survey. Locations of these categorized shorelands can be found on Island Lake Map 1.

### Coarse Woody Habitat

A survey for coarse woody habitat was conducted in conjunction with the shoreland assessment (development) survey. Coarse woody habitat was identified, and classified in several size categories (2-8 inches diameter, >8 inches diameter and cluster) as well as four branching categories: no branches, minimal branches, moderate branches, and full canopy. As discussed in the Manitowish Waters Chain-wide document, research indicates that fish species prefer some

branching as opposed to no branching on coarse woody habitat, and increasing complexity is positively correlated with higher fish species richness, diversity and abundance.

During this survey, 83 total pieces of coarse woody habitat were observed along 12.4 miles of shoreline, which gives Island Lake a coarse woody habitat to shoreline mile ratio of 7:1. Locations of coarse woody habitat are displayed on Island Lake Map 2. To put this into perspective, Wisconsin researchers have found that in completely undeveloped lakes, an average of 345 coarse woody habitat structures may be found per mile (Christensen et al. 1996).



**Figure 8.2.3-2. Island Lake coarse woody habitat survey results.** Based upon a late summer 2012 survey. Locations of Island Lake coarse woody habitat can be found on Island Lake Map 2.

## 8.2.4 Island Lake Aquatic Vegetation

An early season aquatic invasive species survey was conducted on Island Lake on May 30, 2012. While the intent of this survey is to locate any potential non-native species within the lake, the primary focus is to locate occurrences of curly-leaf pondweed which should be at or near its peak growth at this time. During this meander-based survey of the littoral zone, Onterra ecologists did not locate any occurrences of curly-leaf pondweed or any other submersed non-native aquatic plant species.

The aquatic plant point-intercept survey was conducted on Island Lake on July 5 and July 8, 2011 by the WDNR. The floating-leaf and emergent plant community mapping survey was completed on July 24, 2012 by Onterra to map these community types. During all surveys, 40 species of native aquatic plants were located in Island Lake (Table 8.2.4-1). 24 of these species were sampled directly during the point-intercept survey and are used in the analysis that follows, while 16 species were observed incidentally during visits to Island Lake. Four exotic species, pale yellow iris (*Iris pseudacorus*), purple loosestrife (*Lythrum salicaria*), common forget-me-not (*Myosotis scorpioides*) and curly-leaf pondweed (*Potamogeton crispus*) were observed within and along Island Lake also. Exotic species inventories and management actions are discussed within the Chain-wide plan document.

Aquatic plants were found growing to a depth of 10 feet. As discussed later on within this section, many of the plants found in this survey indicate that the overall community is healthy, diverse and in one species case somewhat rare. Island Lake Map 3 indicates that the majority of the aquatic vegetation found during the WDNR 2011 point-intercept survey was located in the shallow bay areas of the western and southeastern portions of the lake. Of the 230 point-intercept locations sampled within the littoral zone, roughly 26% contained aquatic vegetation. Approximately 26% of these point-intercept sampling locations where sediment data was collected at were sand, 62% consisted of a fine, organic substrate (muck) and 12% were determined to be rocky (Chain-wide Fisheries Section, Table 3.5-5).

**Table 8.2.4-1. Aquatic plant species located in Island Lake during 2012 plant surveys.**

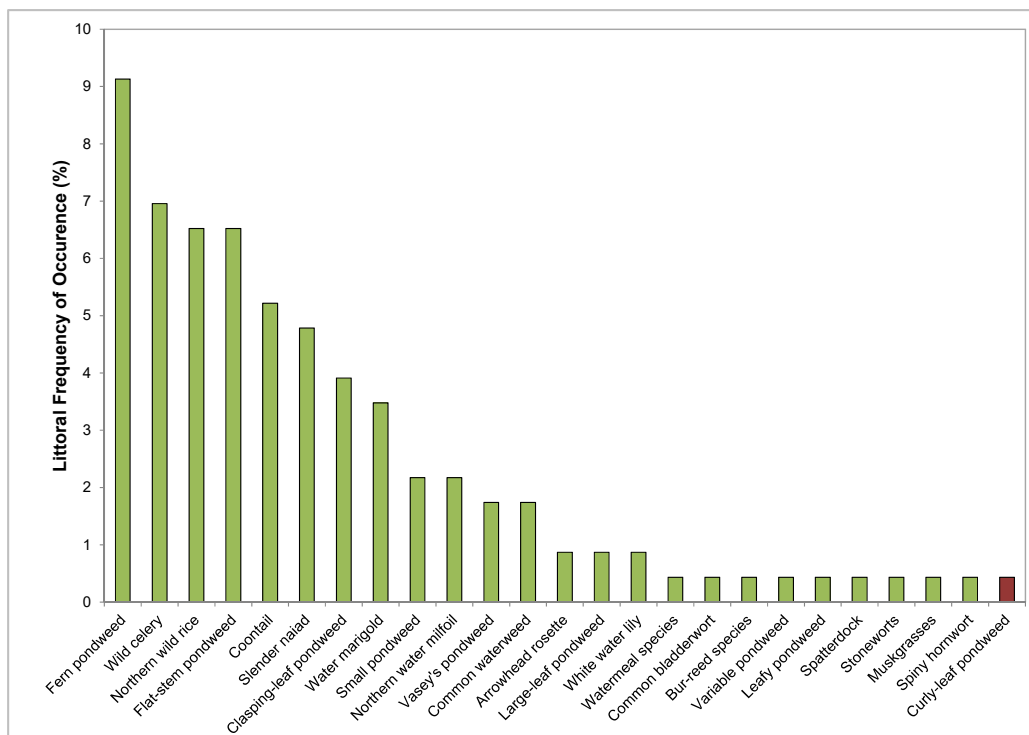
| Growth Form                     | Scientific Name                       | Common Name            | Coefficient of Conservatism (C) | WDNR 2011 & Onterra 2012 |
|---------------------------------|---------------------------------------|------------------------|---------------------------------|--------------------------|
| Emergent                        | <i>Carex crinita</i>                  | Fringed sedge          | 6                               | I                        |
|                                 | <i>Carex retrorsa</i>                 | Retrorsed sedge        | 6                               | I                        |
|                                 | <i>Carex vesicaria</i>                | Blistersedge           | 7                               | I                        |
|                                 | <i>Eleocharis palustris</i>           | Creeping spikerush     | 6                               | I                        |
|                                 | <i>Iris pseudacorus</i>               | Pale-yellow iris       | Exotic                          | I                        |
|                                 | <i>Iris versicolor</i>                | Northern blue flag     | 5                               | I                        |
|                                 | <i>Juncus effusus</i>                 | Soft rush              | 4                               | I                        |
|                                 | <i>Leersia oryzoides</i>              | Rice cut grass         | 3                               | I                        |
|                                 | <i>Lythrum salicaria</i>              | Purple loosestrife     | Exotic                          | I                        |
|                                 | <i>Myosotis scorpioides</i>           | Common forget-me-not   | Exotic                          | I                        |
|                                 | <i>Sagittaria latifolia</i>           | Common arrowhead       | 3                               | I                        |
|                                 | <i>Schoenoplectus tabernaemontani</i> | Softstem bulrush       | 4                               | I                        |
|                                 | <i>Scirpus cyperinus</i>              | Wool grass             | 4                               | I                        |
|                                 | <i>Sparganium sp.</i>                 | Bur-reed species       | N/A                             | X                        |
|                                 | <i>Typha sp.</i>                      | Cattail sp.            | 1                               | I                        |
| <i>Zizania palustris</i>        | Northern wild rice                    | 8                      | X                               |                          |
| FL                              | <i>Nuphar microphylla</i> **          | Yellow pond-lily       | 9                               |                          |
|                                 | <i>Nuphar variegata</i>               | Spatterdock            | 6                               | X                        |
|                                 | <i>Nuphar x rubrodiscalis</i> **      | Intermediate pond-lily | 9                               |                          |
|                                 | <i>Nymphaea odorata</i>               | White water lily       | 6                               | X                        |
| FL/E                            | <i>Sparganium americanum</i>          | Eastern bur-reed       | 8                               | I                        |
|                                 | <i>Sparganium angustifolium</i>       | Narrow-leaf bur-reed   | 9                               | I                        |
|                                 | <i>Sparganium eurycarpum</i>          | Common bur-reed        | 5                               | I                        |
|                                 | <i>Sparganium fluctuans</i>           | Floating-leaf bur-reed | 10                              | I                        |
| Submergent                      | <i>Bidens beckii</i>                  | Water marigold         | 8                               | X                        |
|                                 | <i>Ceratophyllum demersum</i>         | Coontail               | 3                               | X                        |
|                                 | <i>Ceratophyllum echinatum</i>        | Spiny hornwort         | 10                              | X                        |
|                                 | <i>Chara sp.</i>                      | Muskgrasses            | 7                               | X                        |
|                                 | <i>Elodea canadensis</i>              | Common waterweed       | 3                               | X                        |
|                                 | <i>Myriophyllum sibiricum</i>         | Northern water milfoil | 7                               | X                        |
|                                 | <i>Najas flexilis</i>                 | Slender naiad          | 6                               | X                        |
|                                 | <i>Nitella sp.</i>                    | Stoneworts             | 7                               | X                        |
|                                 | <i>Potamogeton amplifolius</i>        | Large-leaf pondweed    | 7                               | X                        |
|                                 | <i>Potamogeton crispus</i>            | Curly-leaf pondweed    | Exotic                          | X                        |
|                                 | <i>Potamogeton foliosus</i>           | Leafy pondweed         | 6                               | X                        |
|                                 | <i>Potamogeton gramineus</i>          | Variable pondweed      | 7                               | X                        |
|                                 | <i>Potamogeton pusillus</i>           | Small pondweed         | 7                               | X                        |
|                                 | <i>Potamogeton richardsonii</i>       | Clasping-leaf pondweed | 5                               | X                        |
|                                 | <i>Potamogeton robbinsii</i>          | Fern pondweed          | 8                               | X                        |
|                                 | <i>Potamogeton vaseyi</i> *           | Vasey's pondweed       | 10                              | X                        |
|                                 | <i>Potamogeton zosteriformis</i>      | Flat-stem pondweed     | 6                               | X                        |
| <i>Sagittaria sp. (rosette)</i> | Arrowhead rosette                     | N/A                    | X                               |                          |
| <i>Utricularia vulgaris</i>     | Common bladderwort                    | 7                      | X                               |                          |
| <i>Vallisneria americana</i>    | Wild celery                           | 6                      | X                               |                          |
| S/E                             | <i>Sagittaria graminea</i>            | Grass-leaved arrowhead | 9                               | I                        |
| FF                              | <i>Wolffia sp.</i>                    | Watermeal species      | N/A                             | X                        |

FL = Floating Leaf; FL/E = Floating Leaf and Emergent; S/E = Submergent and Emergent; FF = Free Floating

X = Located on rake during point-intercept survey; I = Incidental Species

\* = Species listed as 'special concern' in Wisconsin

\*\* = Species incidentally located in Rice Creek in 2012



**Figure 8.2.4-1. Island Lake aquatic plant littoral frequency of occurrence analysis.** Created using data from a 2011 WDNR point-intercept survey. Exotic species indicated in red.

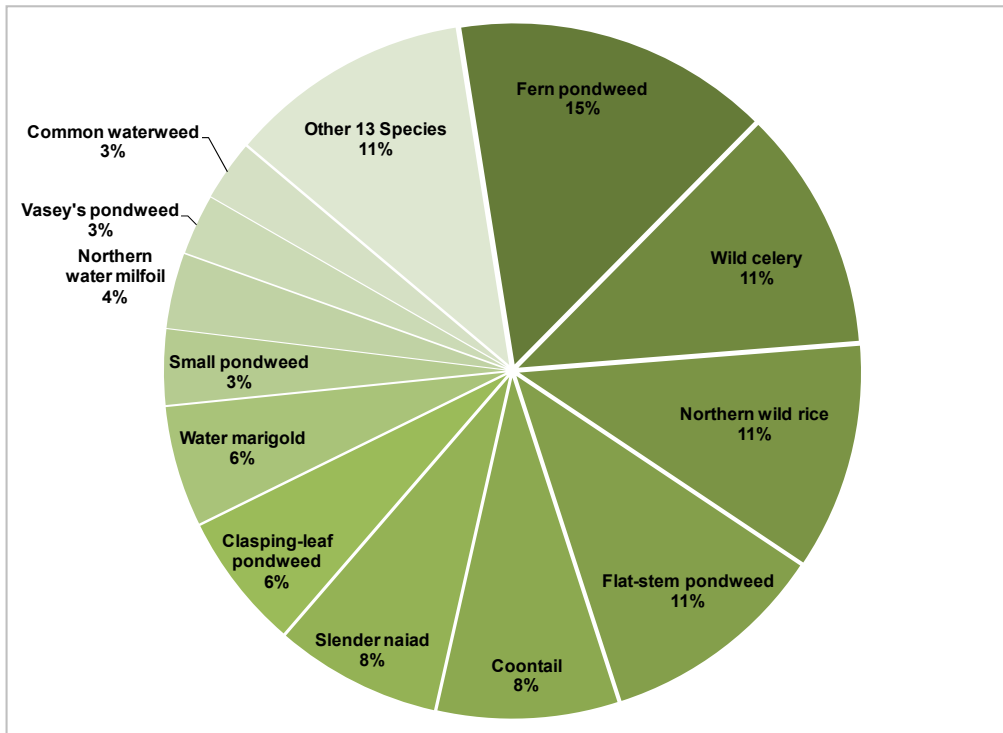
Figure 8.2.4-1 (above) shows that fern pondweed, wild celery and northern wild rice were the most frequently encountered plants within Island Lake. Fern pondweed is a low-growing plant that was likely named after its palm-frond or fern-like appearance. This plant is known to provide habitat for smaller aquatic animals that are used as food by larger, predatory fishes. Wild celery is a long, limp, ribbon-leaved turbidity-tolerant species that is a premiere food source for ducks, marsh birds, shore birds and muskrats. Animals may eat the entire plant, including the tubers that reside within the sediment. Northern wild rice is an emergent annual plant that grows along the fringes of some lakes within relatively shallower water (up to 4-5 ft). Because of its significance to Native American communities and to management of the Manitowish Waters Chain lakes, extensive discussion of northern wild rice is included within the Chain-wide management plan document.

One species discovered during 2011 and 2012 studies, Vasey's pondweed (*Potamogeton vaseyi*), is listed by the Wisconsin Natural Heritage Inventory as a species of special concern in Wisconsin due to uncertainty regarding its distribution and abundance in Wisconsin. Vasey's pondweed is typically found in bays of large soft-water lakes as well as in rivers and ponds.

During aquatic plant inventories, 40 species of native aquatic plants (including incidentals) were found in Island Lake, along with one non-native plant. Because of this, one may assume that the system would also have a high diversity. As discussed earlier, how evenly the species are distributed throughout the system also influence the diversity. The diversity index for Island

Lake's plant community (0.93) lies above the Northern Lakes and Forest Lakes ecoregion value (0.86), indicating the lake holds exceptional diversity.

As explained earlier in the Manitowish Waters chain-wide document, the littoral frequency of occurrence analysis allows for an understanding of how often each of the plants is located during the point-intercept survey. Because each sampling location may contain numerous plant species, relative frequency of occurrence is one tool to evaluate how often each plant species is found in relation to all other species found (composition of population). For instance, while fern pondweed was found at 9% of the sampling locations, its relative frequency of occurrence is 15%. Explained another way, if 100 plants were randomly sampled from Island Lake, 15 of them would be fern pondweed. This distribution can be observed in Figure 8.2.4-2, where together 12 species account for 89% of the aquatic plant population within Island Lake, while the other 12 native (and one non-native – curly-leaf pondweed) species account for the remaining 10%. Sixteen additional species were located from the lake but not from of the point-intercept survey, and are indicated in Table 8.2.4-1 as incidentals.



**Figure 8.2.4-2 Island Lake aquatic plant relative frequency of occurrence analysis.**  
Created using data from a 2011 WDNR point-intercept survey.

Island Lake's average conservatism value (6.7) is higher than the state (6.0) and equal to the Northern Lakes and Forests ecoregion (6.7) median. This indicates that the plant community of Island Lake is indicative of a moderately disturbed system. Combining Island Lake's species richness and average conservatism values to produce its Floristic Quality Index (FQI) results in a value of 32.7 which is above the median values of the ecoregion and state.

The quality of Island Lake is also indicated by the high incidence of emergent and floating-leaf plant communities that occur in many areas. The 2012 community map indicates that approximately 298 acres of the lake contains these types of plant communities (Island Lake Map

4, Table 8.2.4-2). Twenty-two floating-leaf and emergent species were located on Island Lake (Table 8.2.4-1), all of which provide valuable wildlife habitat.

**Table 8.2.4-2. Island Lake acres of emergent and floating-leaf plant communities from the 2012 community mapping survey.**

| <b>Plant Community</b>           | <b>Acres</b> |
|----------------------------------|--------------|
| Emergent                         | 97.9         |
| Floating-leaf                    | 0.7          |
| Mixed Floating-leaf and Emergent | 9.7          |
| <b>Subtotal</b>                  | <b>108.3</b> |
| Adjacent Wetland Area            | 189.8        |
| <b>Total</b>                     | <b>298.1</b> |

The community map represents a ‘snapshot’ of the emergent and floating-leaf plant communities, replications of this survey through time will provide a valuable understanding of the dynamics of these communities within Island Lake. This is important, because these communities are often negatively affected by recreational use and shoreland development. Radomski and Goeman (2001) found a 66% reduction in vegetation coverage on developed shorelines when compared to undeveloped shorelines in Minnesota Lakes. Furthermore, they also found a significant reduction in abundance and size of northern pike (*Esox lucius*), bluegill (*Lepomis macrochirus*), and pumpkinseed (*Lepomis gibbosus*) associated with these developed shorelines.



## 8.2.4 Island Lake Implementation Plan

The Implementation Plan below is a result of collaborative efforts between Island Lake stakeholders, the MWLA, the NLDC, the Towns of Manitowish Waters and Boulder Junction, and ecologists/planners from Onterra. This plan provides goals and actions created to protect the quality and integrity of Island Lake and will serve as reference for keeping stakeholders on track and focused upon these science-driven management activities.

While the Manitowish Waters Chain of Lakes are geographically similar, they are certainly ecologically diverse, as evidenced by the studies described within this report. This diversity leads to the need for individual plans aimed at managing the specific needs of each individual lake. Some of the lakes within the Manitowish Waters Chain have more complicated management needs than others, but in general most lakes' needs center on protecting the current quality of the lake as opposed to performing activities aimed at enhancing or resolving particular issues. The Chain-wide Implementation Plan will serve each of the project lakes well in terms of protecting their current condition as a chain. Island Lake's Implementation Plan illustrates how Island Lake stakeholders should proceed in implementing applicable portions of the Chain-wide Implementation Plan for their lake.

### **Chain-wide Implementation Plan – Specific to Island Lake**

#### ***Chain-wide Management Goal 1: Strengthen Association Relationships, Effectiveness and Lake Management Capability***

**Management Action:** Enhance involvement with other entities that have a hand in managing the Manitowish Waters Chain of Lakes.

**Description:** While the MWLA and NLDC are primarily responsible for facilitating partnerships with many defined management units, Island Lake property owners may participate in this management goal by keeping the lines of communication open with the MWLA and NLDC, as well as members from other Manitowish Waters Chain lakes. This may be done through representation on the MWLA Board of Directors, active participation in the Lake Captain and Deckhand Program, involvement in MWLA and NLDC sponsored events, attending meetings, etc.

**Management Action:** Increase the Manitowish Waters Chain of Lakes' volunteer base

**Description:** Island Lake property owners may assist in this management action by simply donating several hours of their time a year towards MWLA and NLDC activities including active participation in the Lake Captain and Deckhand program. While it is beneficial to volunteer on their own lake, the entire chain would benefit by having Island Lake individuals assist with activities occurring on other lakes within the chain.

## **Chain-wide Management Goal 2: Maintain Current Water Quality Conditions**

**Management Action:** **Continue and expand monitoring of the Manitowish Waters Chain of Lakes' water quality through the WDNR Citizen Lake Monitoring Network.**

**Description:** Currently, Island Lake is enrolled in the CLMN's water clarity monitoring program. This means that Secchi disk clarity data is collected several times during the year on Island Lake. Although this is a great accomplishment, it must be continued in order to ensure the quality of Island Lake is protected. Additionally, a better understanding of the lake's water quality would be obtained from volunteers enrolling in the CLMN's advanced water quality monitoring program. In this program, phosphorus and chlorophyll-*a* data is collected from the lake as well.

Volunteers from Island Lake must also be proactive in recruiting others to participate. This will ensure that the program will continue after the current volunteers have retired their commitments to monitoring the lake's water quality.

**Management Action:** **Restore highly developed shoreland areas on the Manitowish Waters Chain.**

**Description:** As a part of this project, the entire Island Lake shoreline was categorized in terms of its development. According to the results from this survey, 17% of the shoreline is in an urbanized or developed-unnatural state, while another 31% of the shoreline is currently in a semi-natural state. Continuing research indicates that the shoreland zone is a critical part of determining a lake's ecology, through providing both pollutant buffering wildlife habitat. The natural vegetative scenery provides an additional aesthetic benefit.

TAISP is prepared to provide Island Lake property owners with the necessary informational resources to restore their developed shoreland, should they be interested. Interested property owners may contact the NLDC and Vilas County Land and Conservation office for more information on shoreland restoration plans, financial assistance, and benefits of implementation.

**Management Action:** **Protect natural shoreland zones along the Manitowish Waters Chain of Lakes.**

**Description:** While 17% of the shoreland was found to be highly developed along Island Lake, about 52% of the shoreland is currently in a very natural or undeveloped state. These areas are extremely important to protect for the environmental and aesthetic benefits they provide.

Island Lake property owners interested in preserving their shoreland may contact the NLDC and Vilas County Land and Conservation office for information on land trusts, conservation easements, or best management practices. Implementing a number of these options will ensure the integrity of these undeveloped shorelands will remain well into the future.

**Management Action: Investigate algal blooms on the Manitowish Waters Chain.**

**Description:** While some algae blooms are natural and do not impact a lake ecosystem or human health in a negative manner, some blooms may cause recreational or health impairment. Island Lake residents who observe algae blooms may contact the NLDC with their concerns. The NLDC can take the appropriate response in contacting WDNR officials about the matter. Residents may be asked to provide a sample of the algae for identification purposes.

***Chain-wide Management Goal 3: Expand Awareness and Education of Lake Management and Stewardship Matters***

**Management Action: Engage stakeholders on priority education items through participation in educational initiatives and efficient communication.**

**Description:** Island Lake stakeholders can assist in the implementation of this action by actively participating in the MWLA and NLDC's educational initiatives. Participation may include attending presentations and trainings of educational topics, volunteering at local and regional events, participating in committees and the Lake Captain and Deckhand program, or simply notifying the MWLA or NLDC of concerns involving Island Lake and its stakeholders.

***Chain-wide Management Goal 4: Control Existing and Prevent Further Aquatic Invasive Species Establishment within the Manitowish Waters Chain of Lakes***

**Management Action: Continue control strategy for curly-leaf pondweed on the Manitowish Waters Chain of Lakes.**

**Description:** Island Lake residents may participate in curly-leaf pondweed control actions through a variety of passive means, such as keeping themselves up to date on aquatic invasive species matters through trainings, media releases, or participating in local meetings on the issue. Island Lake residents can also assist by participating in the Lake Captain and Deckhand program, actively monitoring for curly-leaf pondweed. Additionally, lake users may report sightings of aquatic invasive species to the NLDC and remove floating CLP fragments when they are observed.

**Management Action:** **Maintain connection and open dialogue with management partners on matters pertaining to wild rice growth on the Manitowish Waters Chain.**

**Description:** As this is an action designed for a designated individual, there is no action necessary for Island Lake property owners.

**Management Action:** **Continue control and monitoring efforts on purple loosestrife, Japanese knotweed, phragmites, and pale yellow iris throughout the Manitowish Waters Chain of Lakes.**

**Description:** Emergent shoreland plants such as purple loosestrife, Japanese knotweed, phragmites, and pale yellow iris can be easily identified and small infestations addressed through simple control methods. Island Lake property owners may participate in this action through monitoring their shorelands and wetlands and removing plants in accordance with methods determined by the NLDC, MWLA and Vilas County Invasive Species Coordinator.

**Management Action:** **Continue locally-based aquatic invasive species monitoring and watercraft inspections.**

**Description:** Prevention of aquatic invasive species introduction remains the most effective way of minimizing the spread of this threat. Island Lake property owners may participate in this initiative through volunteering for aquatic invasive species monitoring or Clean Boats Clean Waters inspections.

**Management Action:** **Investigate feasibility of alternative aquatic invasive species control methodologies for applicability to the Manitowish Waters Chain of Lakes.**

**Description:** As this is an action designed for a designated individual, there is no action necessary for Island Lake property owners.

### ***Chain-wide Management Goal 5: Enhance the Available Habitat and General Understanding of the Manitowish Waters Chain of Lakes Fishery***

**Management Action:** **Work with WDNR fisheries managers and other stakeholders to enhance and understand the fishery.**

**Description:** Angling is often one of the most enjoyed recreational activities that takes place on Wisconsin lakes. A complete understanding of a lake's fishery is needed to base decisions off of, both for the fishery manager and the fisherman. Island Lake residents can help the fishery of the Manitowish Waters Chain of Lakes by attending events aimed at educating the public about the chain's fishery, as well as volunteering for habitat improvement efforts, including shoreland preservation/remediation and coarse woody habitat projects.

## **Chain-wide Management Goal 6: Continue to Understand, Protect and Enhance the Ecology of the Manitowish Waters Chain of Lakes Through Stakeholder Stewardship and Science-based Studies**

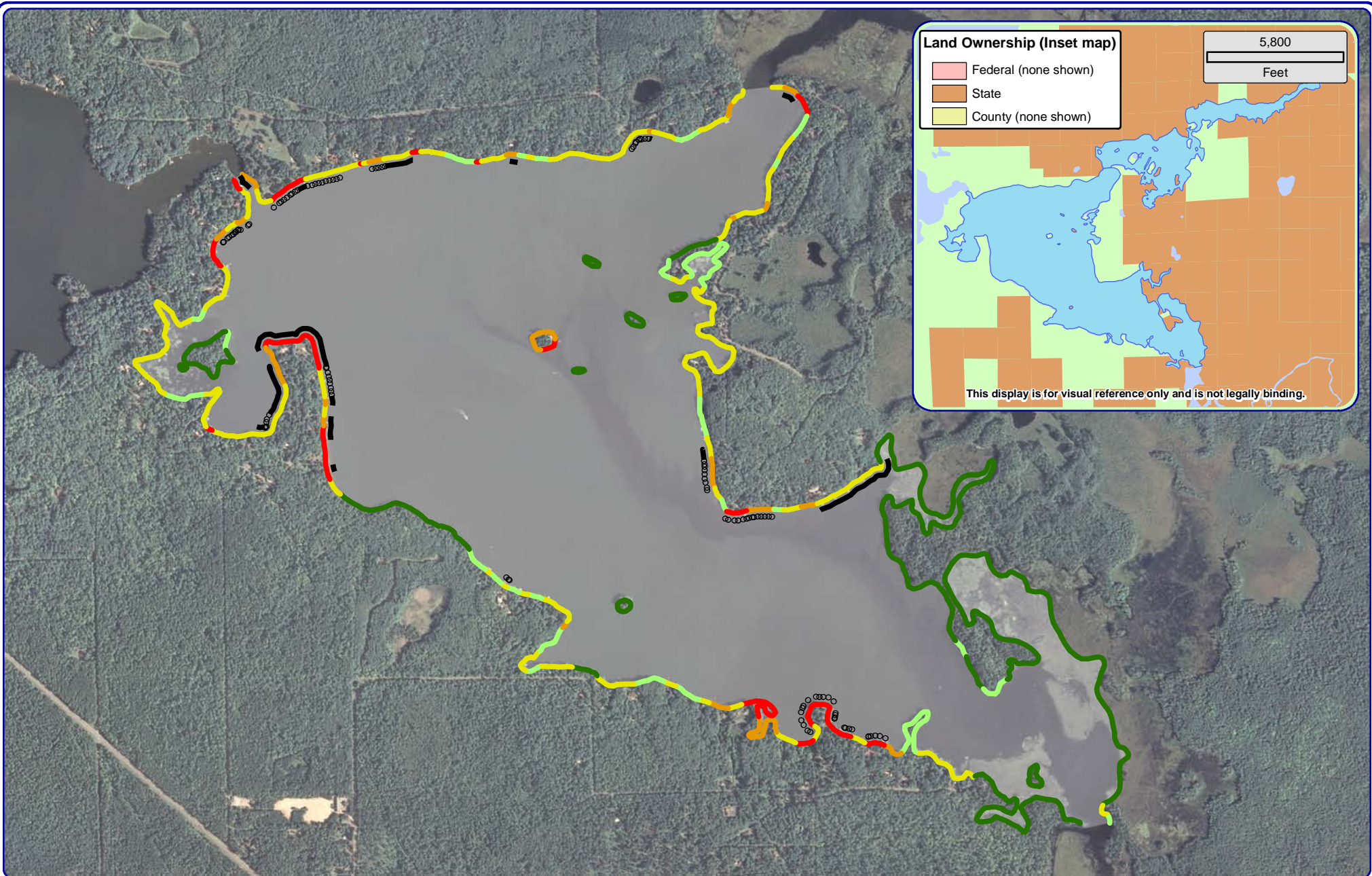
**Management Action:** Continue the development of comprehensive management plans for the Manitowish Waters Chain waterbodies.

**Description:** Though studies have been completed on Island Lake as part of this chain-wide management planning project, it is up to Island Lake stakeholders to continue monitoring and protecting the lake through the initiatives set forth by the goals described in this management plan. Additionally, these efforts may be extended to other lakes within the chain as needed.

In addition to current monitoring and protection, Island Lake may wish to revisit their lake management plan in 5-10 years or as necessary. Comprehensive studies undertaken at that time would be able to point towards trends or changes in the lake with regards to water quality, watershed land use, aquatic plants, etc.

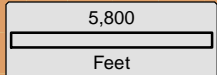




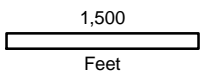


**Land Ownership (Inset map)**

- Federal (none shown)
- State
- County (none shown)



This display is for visual reference only and is not legally binding.



Project Location in Wisconsin

**Onterra LLC**  
 Lake Management Planning  
 815 Prosper Road  
 De Pere, WI 54115  
 920.338.8860  
 www.onterra-eco.com

Sources:  
 Shoreline Assessment: Onterra, 2012  
 Orthophotography: NAIP, 2010  
 Map Date: September 24, 2013  
 Filename: Island\_Map1\_SA\_2012.mxd

- Natural/Undeveloped
- Developed-Natural
- Developed-Semi-Natural
- Developed-Unnatural
- Urbanized

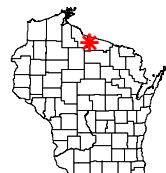
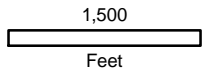
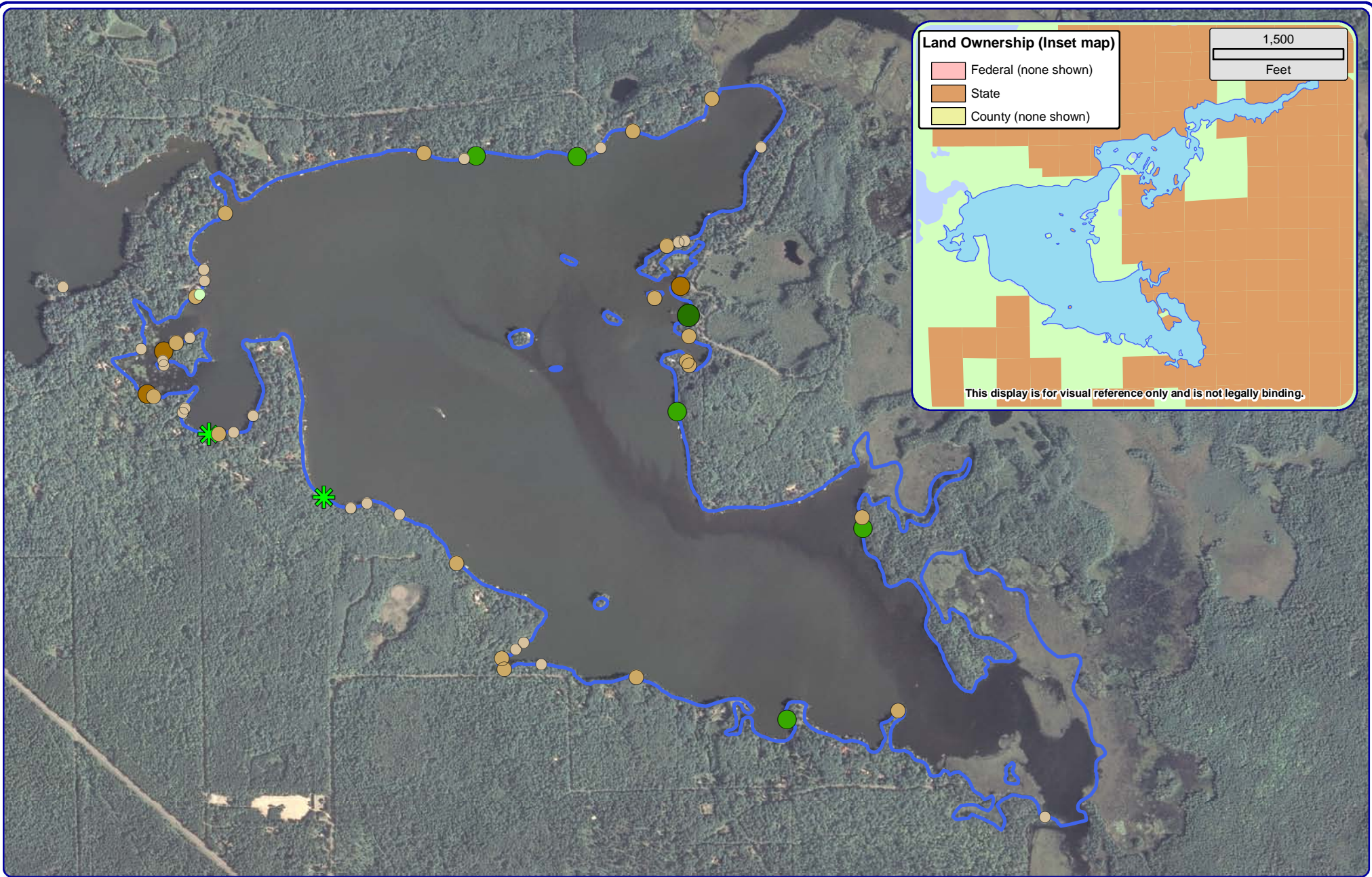
**Legend**

- Seawall
- Masonary/Metal/Wood
- Rip-Rap

Island Lake - Map 1  
 Manitowish Waters  
 Chain of Lakes  
 Vilas County, Wisconsin

**Shoreline Condition**





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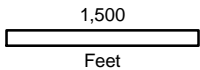
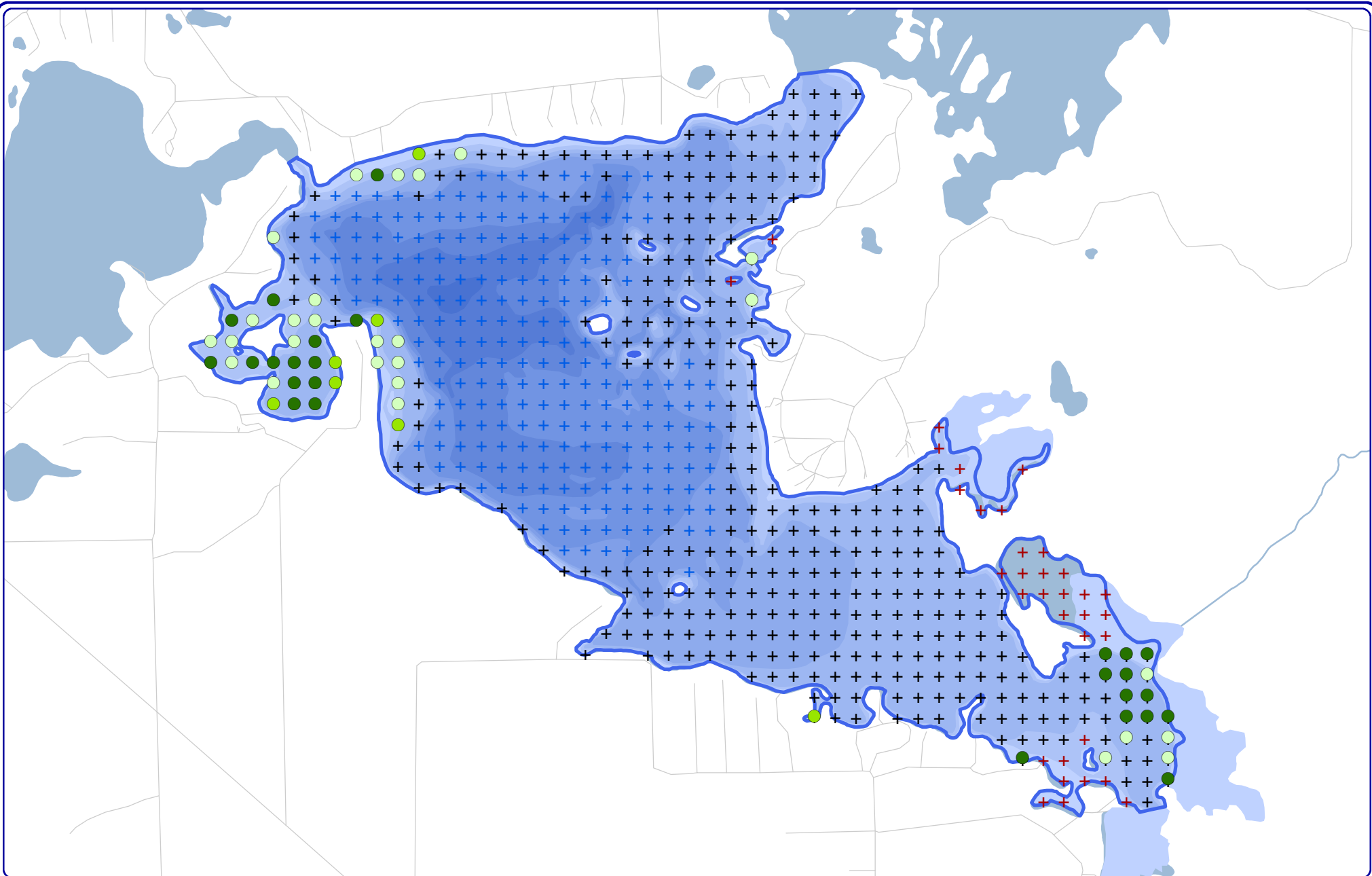
Sources:  
 Shoreline Assessment: Onterra, 2012  
 Orthophotography: NAIP, 2010  
 Map Date: September 24, 2013  
 Filename: Island\_Map2\_CWH\_2012.mxd

**Legend**

- 2-8 Inches, No Branches
- 2-8 Inches, Minimal Branches
- 2-8 Inches, Moderate Branches
- 2-8 Inches, Full Canopy (none)
- >8 Inches, No Branches
- >8 Inches, Minimal Branches (none)
- >8 Inches, Moderate Branches
- >8 Inches, Full Canopy
- ★ Cluster

Island Lake - Map 2  
 Manitowish Waters  
 Chain of Lakes  
 Vilas County, Wisconsin  
**Course Woody Habitat**





Project Location in Wisconsin

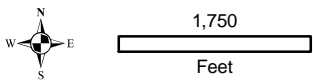
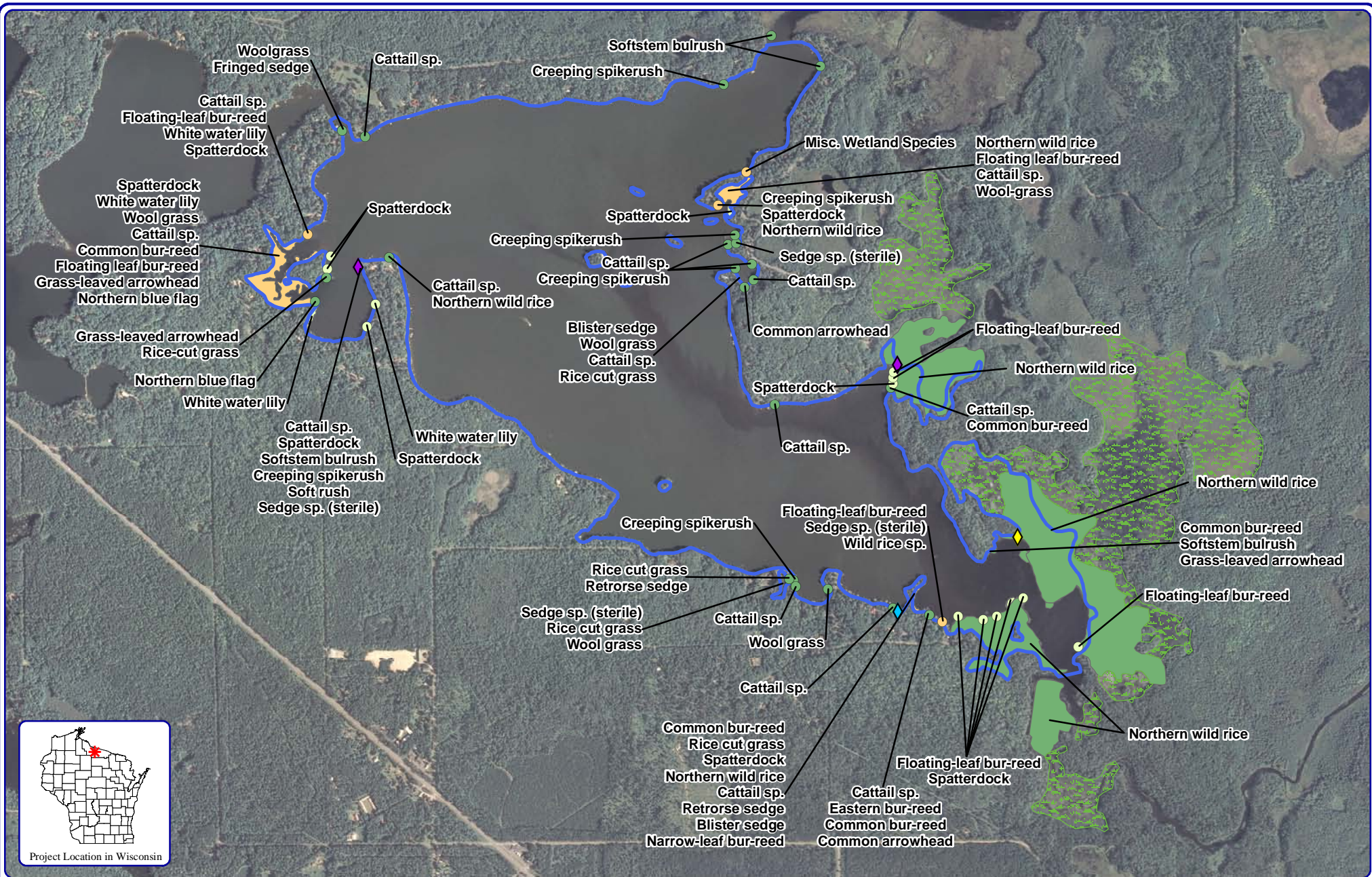
**Onterra LLC**  
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 815 Prosper Road  
 De Pere, WI 54115  
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 www.onterra-eco.com

Sources:  
 Aquatic Plant Survey: WDNR, 2011  
 Roads and Hydro: WDNR  
 Map Date: September 24, 2013  
 Filename: Island\_Map3\_TREPI\_2012.mxd

**Legend**  
 2011 Point-intercept Survey

- + No Vegetation
- + Too Deep (Below Max Depth of Plants)
- + Non-navigable
- Total Rake Fullness = 1
- Total Rake Fullness = 2
- Total Rake Fullness = 3

Island Lake - Map 3  
 Manitowish Waters  
 Chain of Lakes  
 Vilas County, Wisconsin  
**Aquatic Plant Distribution**



**Small Plant Communities**

- Emergent
- Floating-leaf
- Mixed Floating-leaf & Emergent

**Legend**

**Large Plant Communities**

- Emergent
- Floating-leaf
- Mixed Floating-leaf & Emergent
- Adjacent Wetland Habitat

**Exotic Plant Communities**

- ◆ Purple loosestrife
- ◆ Pale Yellow Iris
- ◆ Common forget-me-not

**Onterra LLC**  
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 www.onterra-eco.com

Sources:  
 Aquatic Plants: Onterra, 2012  
 Orthophotography: NAIP, 2010  
 Map date: December 12, 2012  
 Filename: Island\_Map4\_Comm\_2012.mxd

Island Lake - Map 4  
 Manitowish Waters  
 Chain of Lakes  
 Vilas County, Wisconsin  
**Emergent & Floating-leaf  
 Aquatic Plant Communities**