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

8.11 Vance Lake

An Introduction to Vance Lake

Vance Lake, Vilas County, is a shallow lowland drainage lake with a maximum depth of 12 feet, a mean depth of 7 feet, and a surface area of approximately 30 acres. Vance Lake is considered to be mesotrophic and its watershed encompasses approximately 146,640 acres. In 2017, 27 native aquatic plant species were found in the lake, of which coontail (*Ceratophyllum demersum*) was the most common. Two non-native plants, purple loosestrife and reed canary grass were observed growing in or along the shorelines of Vance Lake in 2017.

Field Survey Notes

A dam separates Vance Lake from upstream Rest Lake and primarily sandy and rocky substrate was observed during the 2017 point-intercept survey. The shoreline is largely undeveloped and a fair amount of coarse woody structure was observed in 2017.

Photo 8.11. Vance Lake, Vilas County

Lake at a Glance* – Vance Lake

Morphology	
Acreage	30
Maximum Depth (ft)	12
Mean Depth (ft)	7
Volume (acre-feet)	197
Shoreline Complexity	2.5
Vegetation	
Curly-leaf Survey Date	June 28, 2017
Comprehensive Survey Date	August 2, 2017
Number of Native Species	27
Threatened/Special Concern Species	-
Exotic Plant Species	Purple loosestrife, Reed canary grass
Simpson's Diversity	0.91
Average Conservatism	6.0
Water Quality	
Wisconsin Lake Classification	Shallow, Lowland Drainage
Trophic State	Mesotrophic
Limiting Nutrient	Phosphorus
Watershed to Lake Area Ratio	4,946:1

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

8.11.1 Vance Lake Water Quality

Water quality data was collected from Vance Lake on three occasions in 2017. 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 2017, any historical data was researched and are included within this report as available.

Vance Lake is located on the Manitowish River downstream of the Rest Lake Dam. As such, it is more like a river than a natural lake. Because of the very short hydrologic residence time, water quality likely reflects concentrations in the river.

No historical data exist for two water quality parameters of interest – total phosphorus and chlorophyll-*a*. In 2017, average summer phosphorus concentrations (17.3 µg/L) were lower than the median value (33.0 µg/L) for other shallow lowland drainage lakes in the state and the median value (21.0 µg/L) for other lakes within the Northern Lakes and Forests ecoregion (Figure 8.11.1-1). The 2017 average summer phosphorus concentration falls in the *excellent* category for shallow lowland drainage lakes in the state.

In 2017, the average summer chlorophyll-*a* concentration (5.6 µg/L) was slightly lower than the median value (9.4 µg/L) for other lakes of this type (Figure 8.11.1-2). This value is the same as the median value (5.6 µg/L) for other lakes within the Northern Lakes and Forests ecoregion. The 2017 average summer chlorophyll-*a* concentration falls in the *excellent* category for shallow lowland drainage lakes in the state.

Both of these parameters, total phosphorus and chlorophyll-*a*, rank within a TSI category of *excellent*, indicating 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.

The clarity of Vance Lake's water can be described as *excellent* during the summer months in which data has been collected (Figure 8.11.1-3). A weighted average over this timeframe (10.9 feet) exceeds the median value for other shallow lowland drainage lakes in the state (5.6 feet) and the regional median (8.9 feet). 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 many 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 Vance Lake may 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; however, true color was not measured in Vance Lake

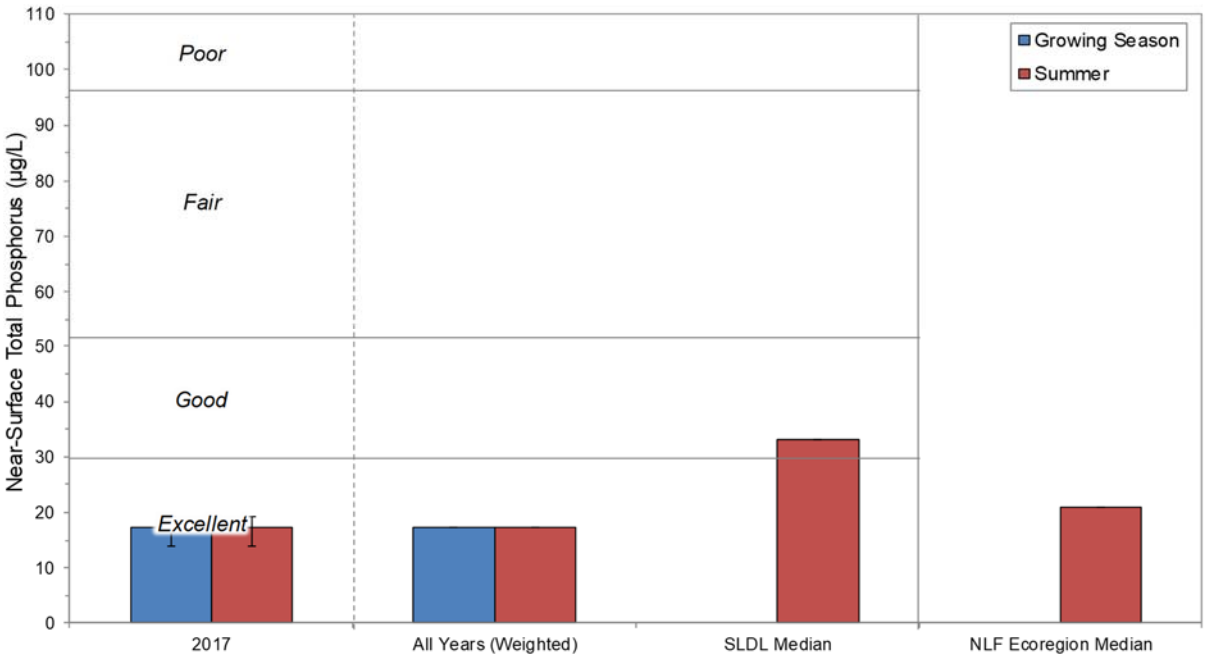


Figure 8.11.1-1. Vance Lake, state-wide shallow lowland drainage lakes, and regional total phosphorus concentrations. Mean values calculated with summer month surface sample data. Water Quality Index values adapted from WDNR PUB WT-913.

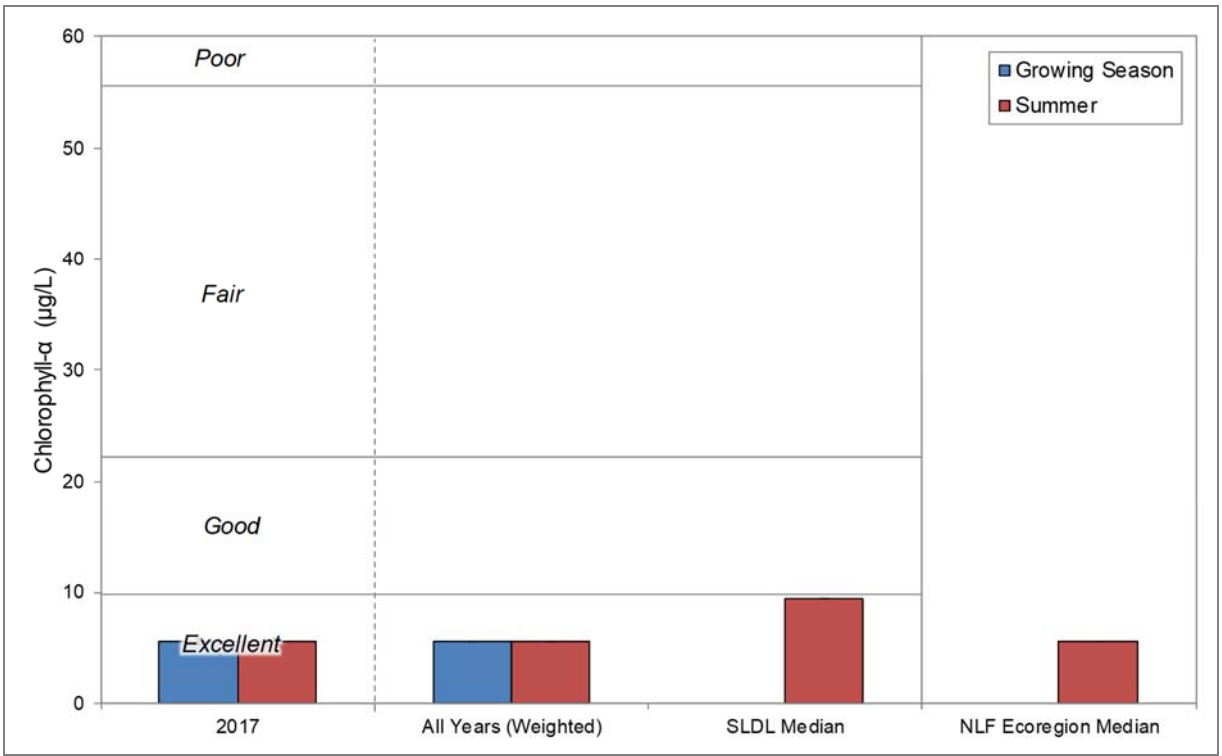


Figure 8.11.1-2. Vance Lake, state-wide shallow lowland drainage lakes, and regional chlorophyll-*a* concentrations. Mean values calculated with summer month surface sample data. Water Quality Index values adapted from WDNR PUB WT-913.

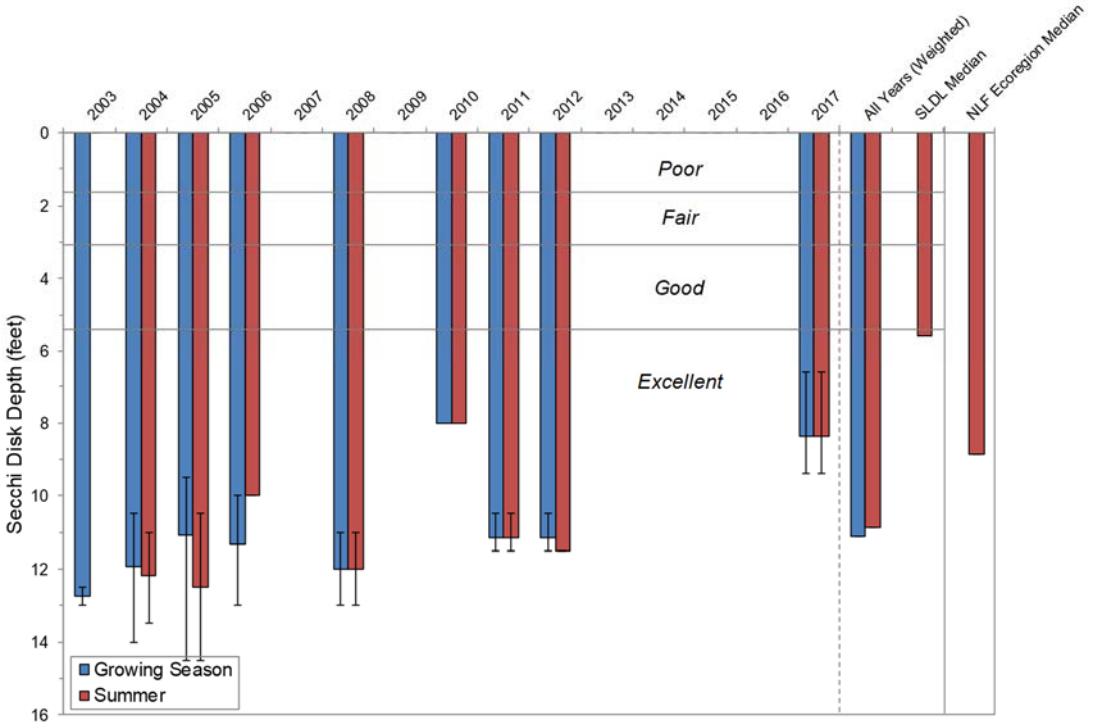


Figure. 8.11.1-3. Vance Lake, state-wide shallow lowland drainage lakes, and regional Secchi disk clarity values. Mean values calculated with summer month surface sample data. Water Quality Index values adapted from WDNR PUB WT-913.

Vance Lake Trophic State

The TSI values calculated with Secchi disk, chlorophyll-*a*, and total phosphorus values are displayed in Figure 8.11.1-4. 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 Vance Lake is in a mesotrophic state.

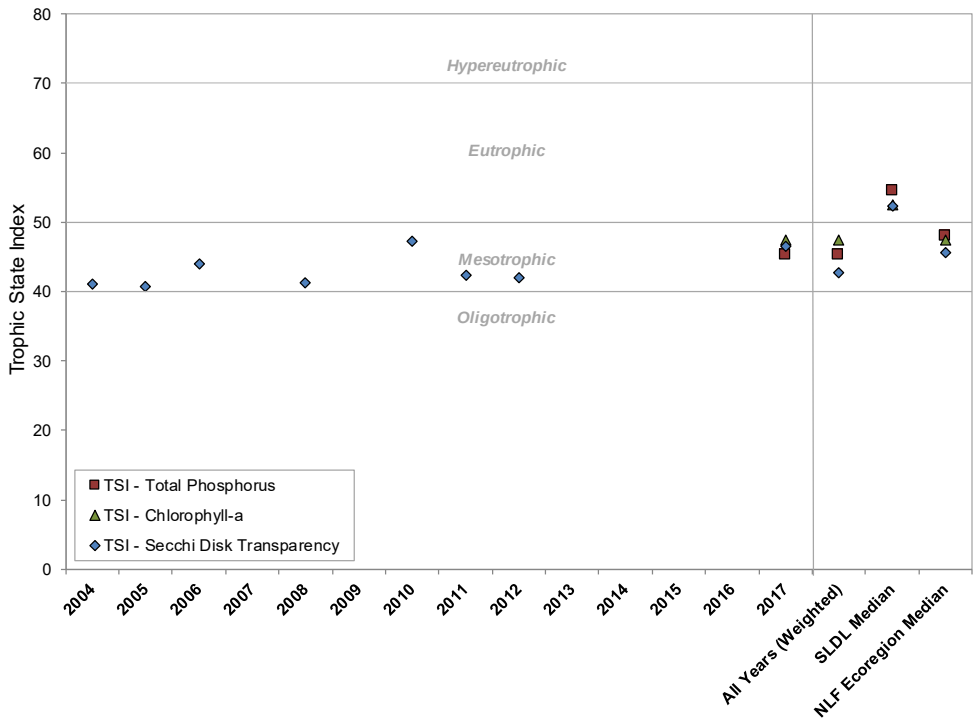


Figure 8.11.1-4. Vance Lake, state-wide shallow lowland drainage lakes, and regional Trophic State Index values. Values calculated with summer month surface sample data using WDNR PUB-WT-193.

Dissolved Oxygen and Temperature in Vance Lake

Dissolved oxygen and temperature profiles were created during each water quality sampling trip made to Vance Lake by Onterra staff. Graphs of those data are displayed in Figure 8.11.1-5 for all sampling events.

Vance Lake remained thoroughly mixed throughout the summer months in 2017 (Figure 8.11.1-5). This is not uncommon in lakes that are moderate in size and fairly shallow. Energy from the wind and flow from the Manitowish River is sufficient to mix the lake from top to bottom, distributing oxygen throughout the epilimnion and hypolimnion and keeping water temperatures fairly constant within the water column.

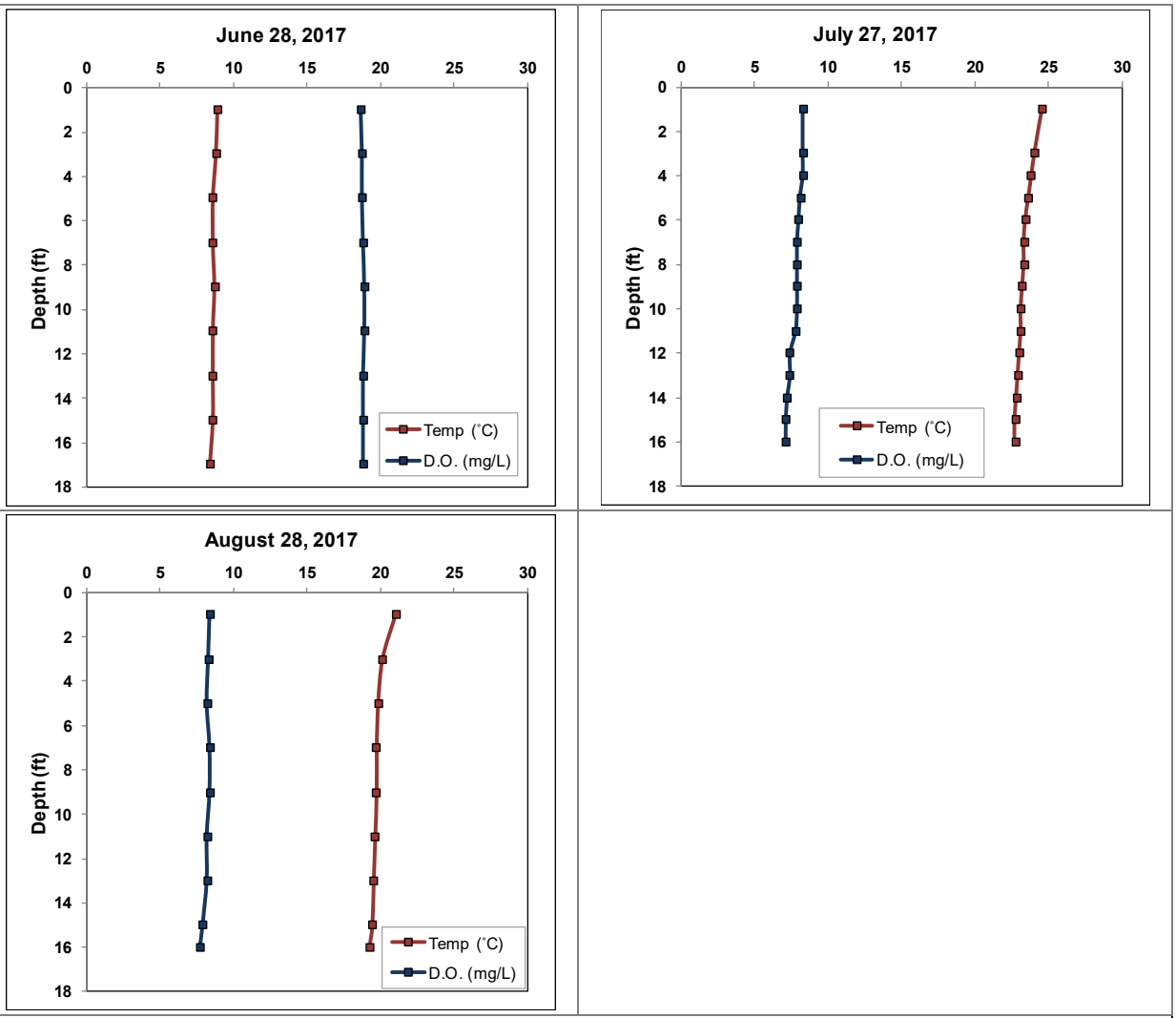


Figure 8.11.1-5. Vance Lake dissolved oxygen and temperature profiles.

Additional Water Quality Data Collected at Vance 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 Vance 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. Vance Lake's surface water pH was measured at roughly 7.8 July of 2017. This value is slightly above neutral and falls 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 adds 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 ($CO_3^=$). 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 Vance Lake was measured at 38.8 in July of 2017 and indicates that the lake has a substantial capacity to resist fluctuations in pH and has a low sensitivity to acid rain.

While samples of calcium were not collected from Vance Lake in 2017, 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 Vance Lake's pH of 7.8 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. Plankton tows were completed by Onterra staff during the summer of 2017 and these samples were processed by the WDNR for larval zebra mussels. No veligers (larval zebra mussels) were found within these samples.

8.11.2 Vance Lake Watershed Assessment

Vance Lake's watershed is 146,640 acres in size. Compared to Vance Lake's size of 30 acres, this makes for an incredibly large watershed to lake area ratio of 4946:1. Similar to most lakes that are downstream of other lakes, the large majority of the lake's watershed consists of the lake immediately upstream. For Vance Lake this means that 146,517 acres (100%) of Vance Lake's watershed is the Vance Lake subwatershed. The direct watershed of Vance Lake is a very small part of the lake's total watershed (Figure 8.11.2-1). Wisconsin Lakes Modeling Suite (WiLMS) modeling indicates that Vance Lake's residence time is approximately one half of a day, or that the water within the lake is completely replaced 803 times per year.

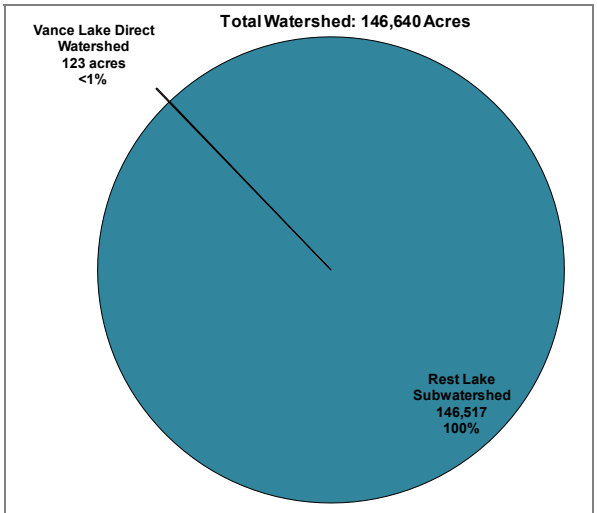


Figure 8.11.2-1. Vance Lake watershed proportion of land cover types. Based upon National Land Cover Database (NLCD – Fry et. al 2011).

Of the estimated 6,278 pounds of phosphorus being delivered to Vance Lake on an annual basis, nearly all of it originates from Rest Lake which is the lake immediately upstream of Vance Lake (Figure 8.11.2-2). Using the estimated annual potential phosphorus load, WiLMS predicted an in-lake growing season average total phosphorus concentration of 14 µg/L, which is similar to the measured growing season average total phosphorus concentration of 17 µg/L. This means the model works reasonably well for Vance Lake and that there are no significant, unaccounted sources of phosphorus entering the lake.

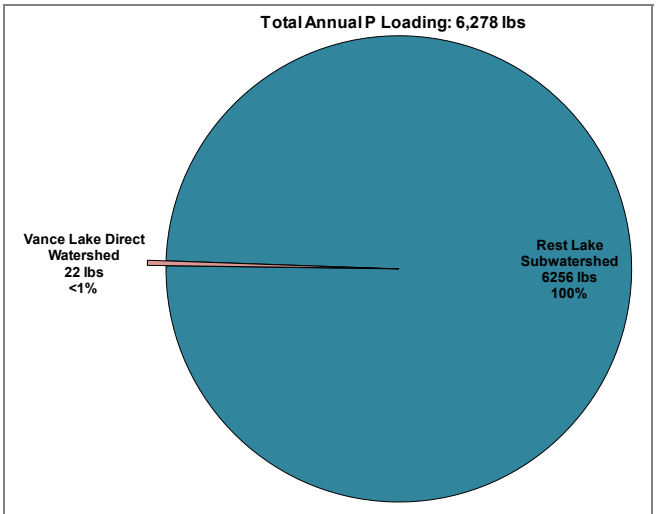


Figure 8.11.2-2. Vance Lake estimated potential annual phosphorus loading. Based upon Wisconsin Lake Modeling Suite (WiLMS) estimates.

Because the nearly all of the phosphorus that enters Vance Lake comes from the upstream Rest Lake, efforts to reduce phosphorus levels in Vance Lake should concentrate on reducing phosphorus inputs to Rest Lake.

8.11.3 Vance 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 fall of 2017, Vance Lake's immediate shoreline was assessed in terms of its development. Vance Lake has stretches of shoreland that fit all of the five shoreland assessment categories. In all, 2.2 miles of natural/undeveloped and developed-natural shoreline were observed during the survey (Figure 8.11.3-1). This constitutes about 92% of Vance 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, less than a tenth of a mile of urbanized and developed–unnatural shoreline (3%) was observed. If restoration of the Vance 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. Vance Lake Map 1 displays the location of these shoreline lengths around the entire lake.

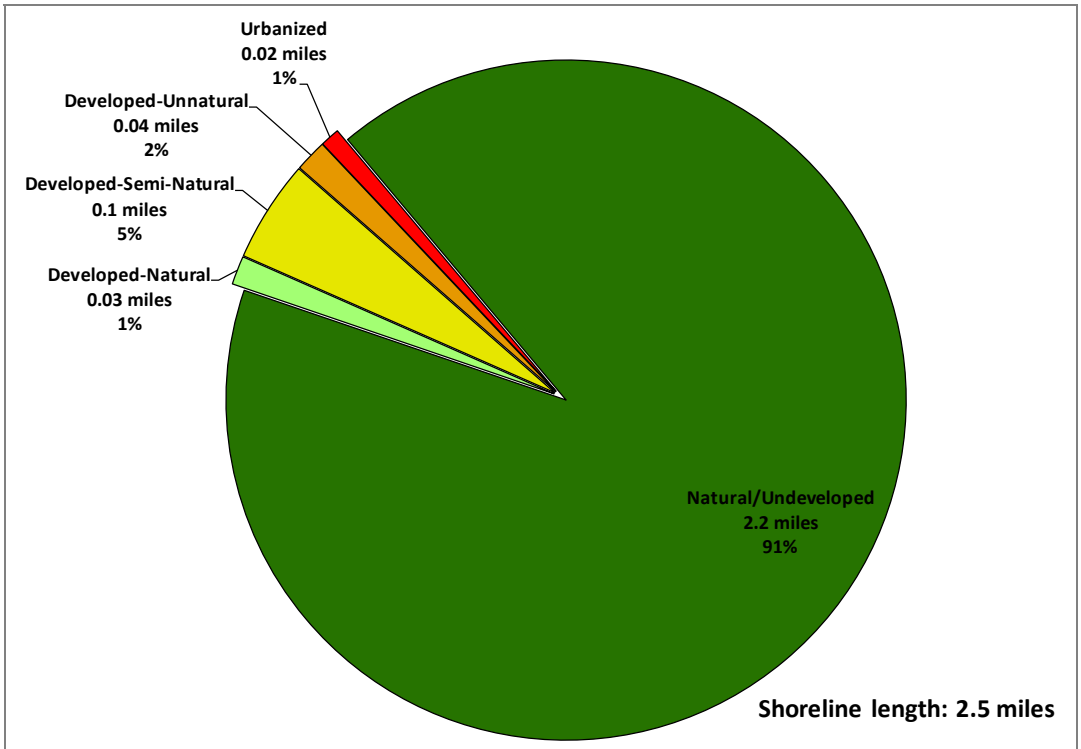


Figure 8.11.3-1. Vance Lake shoreland categories and total lengths. Based upon a fall 2017 survey. Locations of these categorized shorelands can be found on Vance Lake Map 1.

Coarse Woody Habitat

As part of the shoreland condition assessment, Vance Lake was also surveyed to determine the extent of its coarse woody habitat. Coarse woody habitat was identified, and classified in three size categories (2-8 inches in diameter, 8+ inches in diameter, or clusters of pieces) as well as four branching categories: no branches, minimal branches, moderate branches, and full canopy. As discussed earlier, 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 (Newbrey et al. 2005).

During this survey, 133 total pieces of coarse woody habitat were observed along 2.5 miles of shoreline (Vance Lake Map 2), which gives Vance Lake a coarse woody habitat to shoreline mile ratio of 46:1 (Figure 8.11.3-2). Only instances where emergent coarse woody habitat extended from shore into the water were recorded during the survey. Eighty-nine pieces of 2-8 inches in diameter pieces of coarse woody habitat were found, 19 pieces of 8+ inches in diameter pieces of coarse woody habitat were found, and five clusters of coarse woody habitat were found.

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). Please note the methodologies between the surveys done on Vance Lake and those cited in this literature comparison are much different, but still provide a valuable insight into what undisturbed shorelines may have in terms of coarse woody habitat.

Onterra has completed coarse woody habitat surveys on 98 lakes throughout Wisconsin since 2012, with the majority occurring in the NLF ecoregion on lakes with public access. The number of coarse woody habitat pieces per shoreline mile in Vance Lake falls well above the 75th percentile of these 98 lakes surveyed since 2012 (Figure 8.11.3-2).

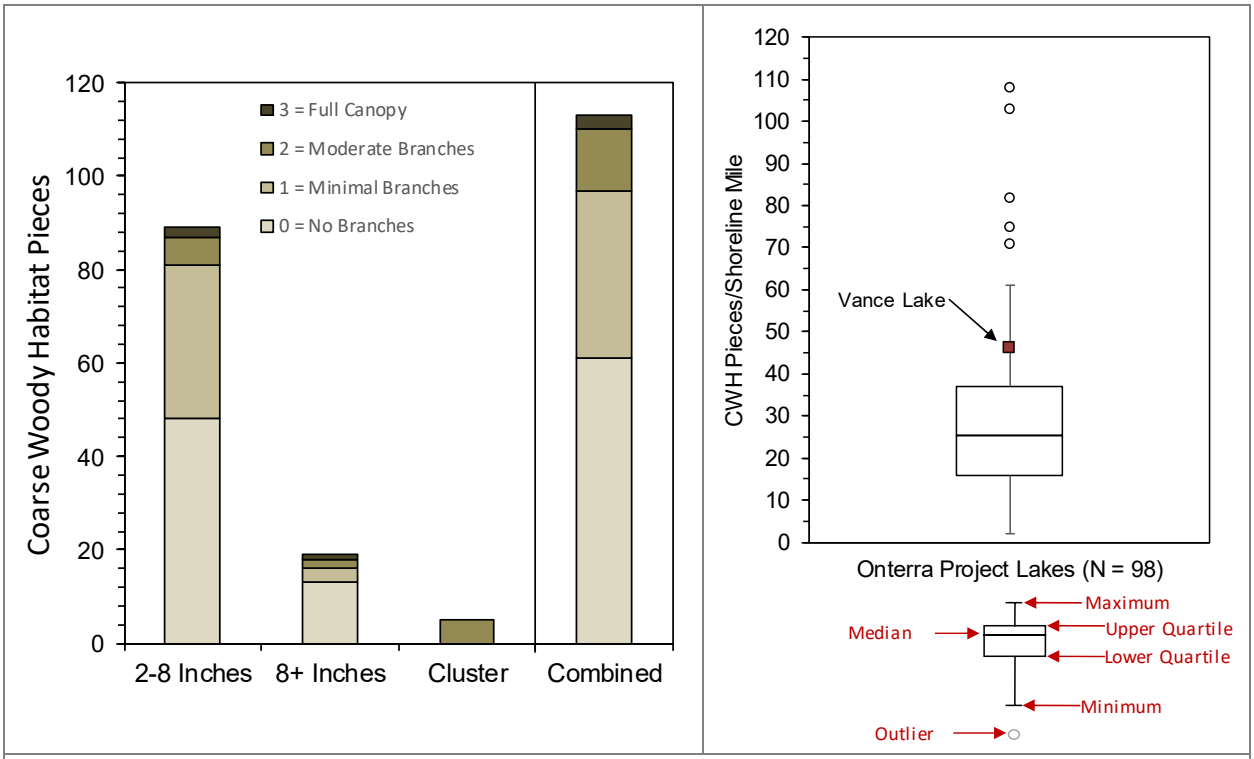


Figure 8.11.3-2. Vance Lake coarse woody habitat survey results. Based upon a fall 2017 survey. Locations of the Vance Lake coarse woody habitat can be found on Vance Lake Map 2.

8.11.4 Vance Lake Aquatic Vegetation

An early season aquatic invasive species survey was conducted on Vance Lake on June 28, 2017. 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 and floating-leaf and emergent plant community mapping survey were conducted on Vance Lake on August 2, 2017 by Onterra. During all surveys, 27 species of native aquatic plants were located in Vance Lake (Table 8.11.4-1). Fifteen of these species were sampled directly during the point-intercept survey and are used in the analysis that follows, while 12 species were observed incidentally during visits to Vance Lake. Two non-native species, purple loosestrife (*Lythrum salicaria*) and reed canary grass (*Phalaris arundinacea*) were observed along the Vance Lake shoreline.

Aquatic plants were found growing to a depth of 12 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. Of the 72 point-intercept locations sampled within the littoral zone, roughly 22% contained aquatic vegetation. Vance Lake Map 3 indicates that most of the point-intercept locations that contained aquatic vegetation are located in shallow areas that are more likely to hold organic substrates. Approximately 67% of the point-intercept sampling locations where sediment data was collected at were sand, 6% consisted of a fine, organic substrate (muck) and 26% were determined to be rocky (Chain-wide Fisheries Section, Table 3.5-5).

Table 8.11.4-1. Aquatic plant species located in Vance Lake during 2017 plant surveys.

Growth Form	Scientific Name	Common Name	Coefficient of Conservatism (C)	2017 (Onterra)
Emergent	*Carex comosa*	Bristly sedge	5	I
	Carex utriculata	Common yellow lake sedge	7	I
	Dulichium arundinaceum	Three-way sedge	9	I
	Eleocharis palustris	Creeping spikerush	6	X
	Lythrum salicaria	Purple loosestrife	Exotic	I
	Phalaris arundinacea	Reed canary grass	Exotic	I
	Pontederia cordata	Pickerelweed	9	I
	Sagittaria latifolia	Common arrowhead	3	I
	Sagittaria sp. (sterile)	Arrowhead sp. (sterile)	N/A	I
	Schoenoplectus tabernaemontani	Softstem bulrush	4	I
	Sparganium eurycarpum	Common bur-reed	5	I
	Typha spp.	Cattail spp.	1	I
FL	*Nuphar variegata*	Spatterdock	6	I
	Nymphaea odorata	White water lily	6	X
Submergent	*Ceratophyllum demersum*	Coontail	3	X
	Chara spp.	Muskgrasses	7	X
	Elodea canadensis	Common waterweed	3	X
	Heteranthera dubia	Water stargrass	6	X
	Myriophyllum sibiricum	Northern watermilfoil	7	X
	Najas flexilis	Slender naiad	6	X
	Nitella spp.	Stoneworts	7	X
	Potamogeton amplifolius	Large-leaf pondweed	7	X
	Potamogeton foliosus	Leafy pondweed	6	X
	Potamogeton gramineus	Variable-leaf pondweed	7	X
	Potamogeton nodosus	Long-leaf pondweed	5	I
	Potamogeton pusillus	Small pondweed	7	X
	Potamogeton spirillus	Spiral-fruited pondweed	8	I
	Potamogeton zosteriformis	Flat-stem pondweed	6	X
	Vallisneria americana	Wild celery	6	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

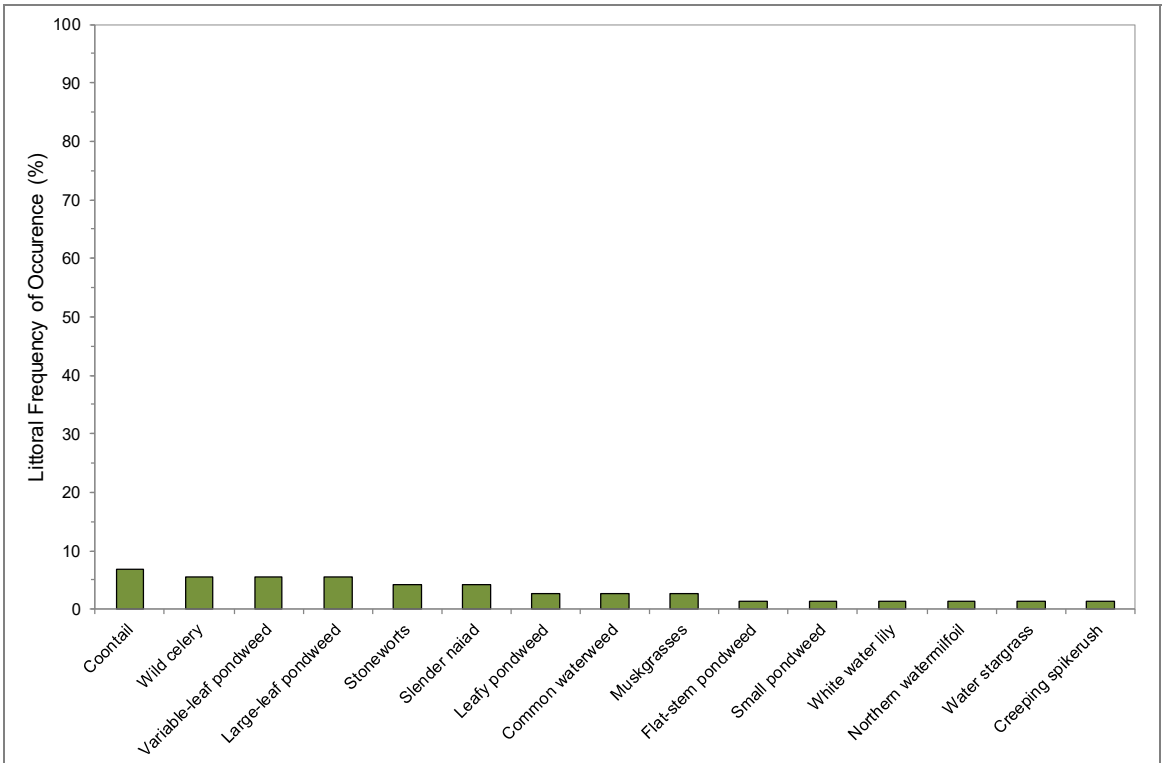


Figure 8.11.4-1. Vance Lake aquatic plant littoral frequency of occurrence analysis. Created using data from a 2017 point-intercept survey.

Figure 8.11.4-1 shows that coontail, wild celery, variable-leaf pondweed, and large-leaf pondweed were the most frequently encountered plants within Vance Lake. Coontail is largely un-rooted (although do sometimes possess structures that function similar to roots or become partially buried in the sediment) and its location can be largely a product of water movement. 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. Variable-leaf pondweed is one of several pondweed species found in Wisconsin. Variable-leaf pondweed produces long, slender stems with alternating lance-shaped leaves. As its name indicates, this plant can look very different from lake to lake, with some populations having larger leaves and others possessing smaller leaves. Large-leaf pondweed, often called "cabbage" due to its appearance, has the broadest leaf (3.5-7 cm wide) of any pondweed in the Midwest. The leaves are arched and slightly folded, and though often found in a greenish color can take on a reddish appearance in the late summer.

During aquatic plant inventories, 27 species of native aquatic plants (including incidentals) were found in Vance Lake. 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 Vance Lake's plant community (0.91) 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 of Lakes-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 coontail was found at 37% of the sampling locations, its relative frequency of occurrence is 14%. Explained another way, if 100 plants were randomly sampled from Vance Lake, six of them would be coontail. This distribution can be observed in Figure 8.11.4-2, where together 14 native species account for 65% of the aquatic plant population within Vance Lake, while the other 9 species account for the remaining 35%. Twelve additional native species were found incidentally from the lake but not from of the point-intercept survey, and are indicated in Table 8.11.4-1 as incidentals.

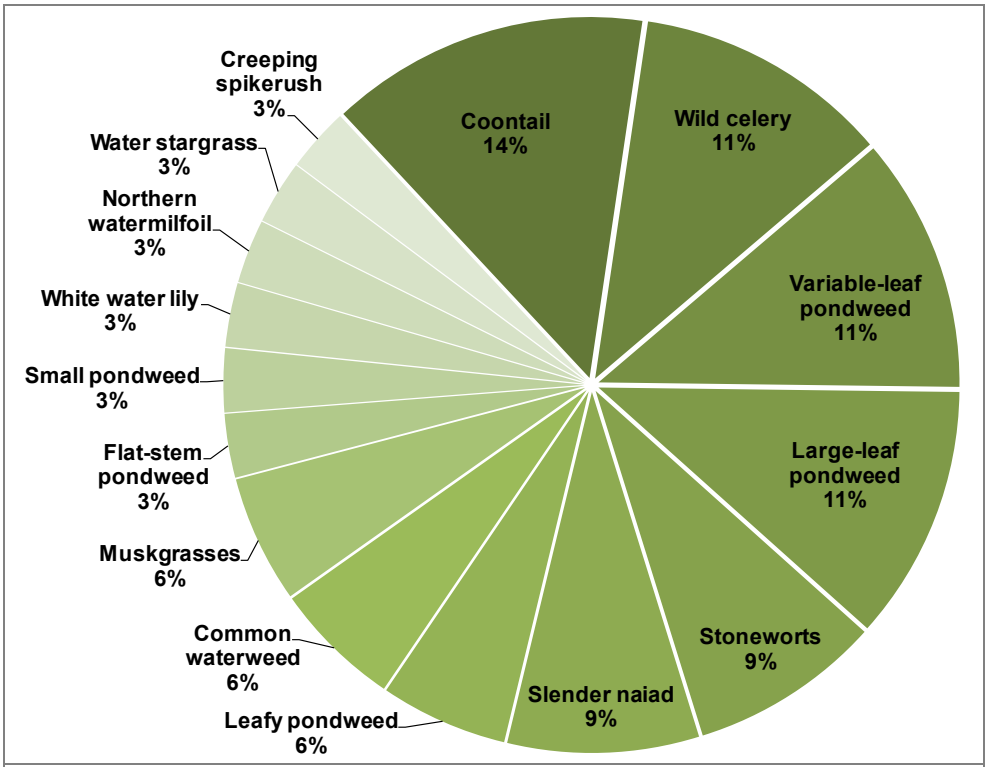


Figure 8.11.4-2. Vance Lake aquatic plant relative frequency of occurrence analysis. Created using data from 2017 point-intercept survey.

Vance Lake's average conservatism value (6.0) is lower than the state median (6.3) and the Northern Lakes and Forests ecoregion median (6.7). This indicates that the plant community of Vance Lake is indicative of a moderately disturbed system. Combining Vance Lake's species richness and average conservatism values to produce its Floristic Quality Index (FQI) results in a value of 23.2 which is below the median values of the ecoregion and state.

Vance Lake was found to have few emergent and floating-leaf aquatic plant communities. The 2017 community map indicates that approximately 3.3 acres of the lake contains these types of plant communities (Vance Lake Map 4, Table 8.11.4-2). Fourteen floating-leaf and emergent species were located on Vance Lake (Table 8.11.4-1), all of which provide valuable wildlife habitat.

Table 8.11.4-2. Vance Lake acres of emergent and floating-leaf plant communities from the 2017 community mapping survey.

Plant Community	Acres
Emergent	0.2
Floating-leaf	0.3
Mixed Emergent & Floating-leaf	2.7
Total	**3.3**

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 Vance 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.

Non-Native Aquatic Plants in Vance Lake

Purple loosestrife

Purple loosestrife (*Lythrum salicaria*) is a perennial herbaceous plant native to Europe and was likely brought over to North America as a garden ornamental. This plant escaped from its garden landscape into wetland environments where it is able to out-compete our native plants for space and resources. First detected in Wisconsin in the 1930's, it has now spread to 70 of the state's 72 counties. Purple loosestrife largely spreads by seed, but also can vegetatively spread from root or stem fragments.

In Vance Lake, purple loosestrife was located along the shoreline of the lake (Vance Lake – Map 4). There are a number of effective control strategies for combating this aggressive plant, including herbicide application, biological control by native beetles, and manual hand removal. Due to the low occurrence and distribution of plants, hand removal by volunteers is likely the best option as it would decrease costs significantly. Additional purple loosestrife monitoring would be required to ensure the eradication of the plant from the shorelines and wetland areas around Vance Lake.

Reed canary grass

Reed canary grass (*Phalaris arundinacea*) is a large, coarse perennial grass that can reach six feet in height. Often difficult to distinguish from native grasses, this species forms dense, highly productive stands that vigorously outcompete native species. Unlike native grasses, few wildlife species utilize the grass as a food source, and the stems grow too densely to provide cover for small mammals and waterfowl. It grows best in moist soils such as wetlands, marshes, stream banks and lake shorelines. Reed canary grass was observed along the northeastern shore of Vance Lake (Vance Lake – Map 4). Reed canary grass is difficult to eradicate; at the time of this writing there is no commonly accepted control method. This plant is quite resilient to herbicide applications. Small, discrete patches have been covered by black plastic to reduce growth for an entire season. However, the species must be monitored because rhizomes may spread out beyond the plastic.

8.11.5 Vance Lake Fisheries Data Integration

Fishery management is an important aspect in the comprehensive management of a lake ecosystem; therefore, a brief summary of available data is included here and within the chain wide report section as a reference. The following section is not intended to be a comprehensive plan for the lake's fishery, as those aspects are currently being conducted by the fisheries biologists overseeing Vance Lake. The goal of this section is to provide an overview of some of the data that exists. Although current fish data were not collected as a part of this project, the following information was compiled based upon data available from the Wisconsin Department of Natural Resources (WDNR) the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) and personal communications with DNR Fisheries Biologist Hadley Boehm (WDNR 2018 & GLIFWC 2017).

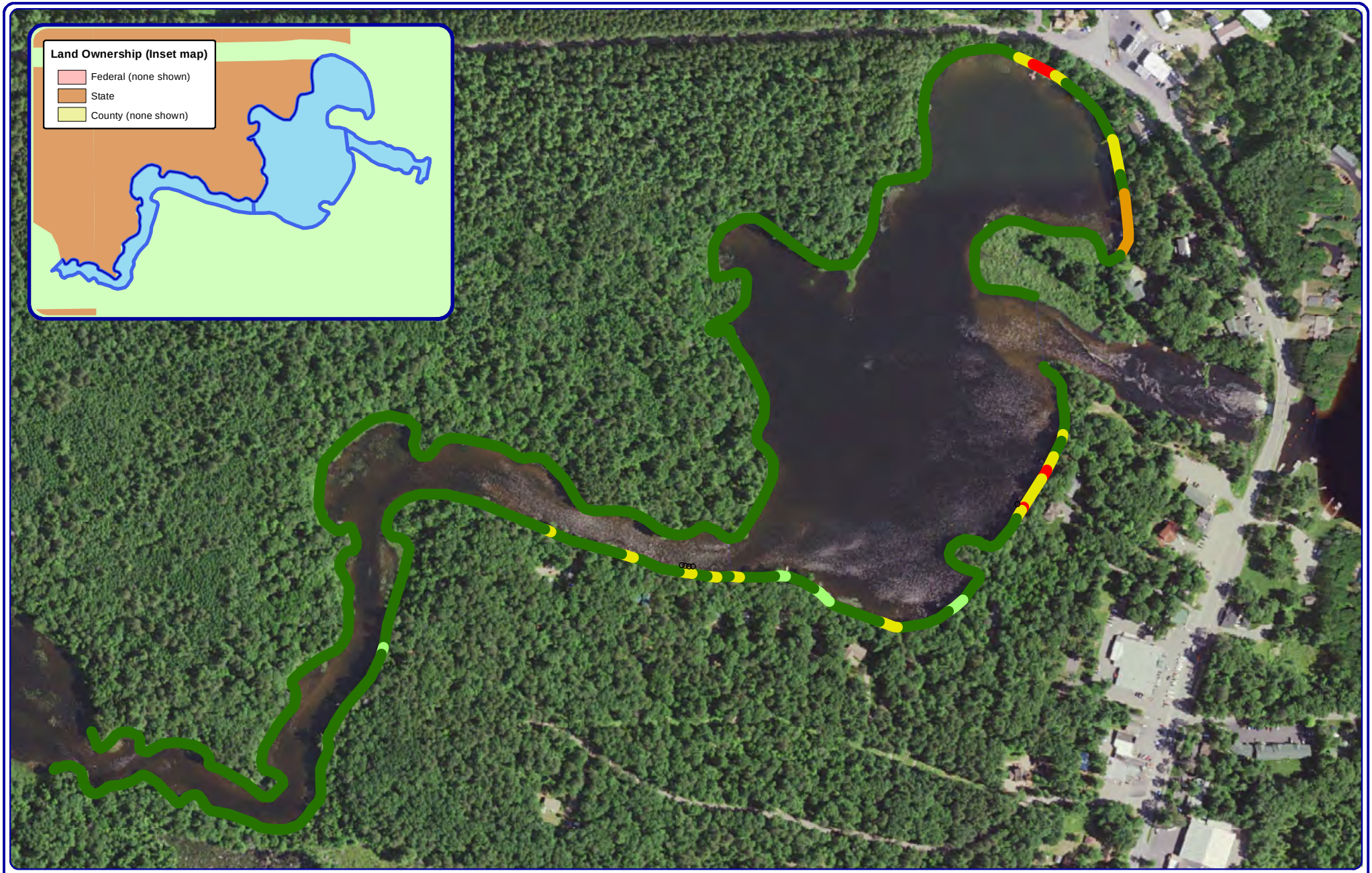
Fish Stocking

To assist in meeting fisheries management goals, the WDNR may stock fry, fingerling or adult fish in a waterbody that were raised in nearby permitted hatcheries (Photograph 8.11.5-1). Stocking of a lake may be done to assist the population of a species due to a lack of natural reproduction in the system, or to otherwise enhance angling opportunities. Vance Lake historically has only been seen one stocking event of 100 fingerling muskellunge in 1972.

Photograph 8.11.5-1. Fingerling Muskellunge.

Vance Lake Spear Harvest Records

Although Vance Lake has been declared as a spear harvest lake, it has not historically seen a harvest. It is possible that spearing efforts have been concentrated on other larger lakes in the region, which would potentially have a higher estimated safe harvest for both walleye and muskellunge.



N
W E
S

400
Feet

Onterra LLC
Lake Management Planning
815 Prosper Road
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920.338.8860
www.onterra-eco.com

Sources:
Hydro: WDNR
Orthophotography: NAIP, 2017
Shoreline Assessment: Onterra, 2017
Map Date: October 10, 2017
Filename:Vance_Map1_ShorelandCondition_2017.mxd

Project Location in Wisconsin

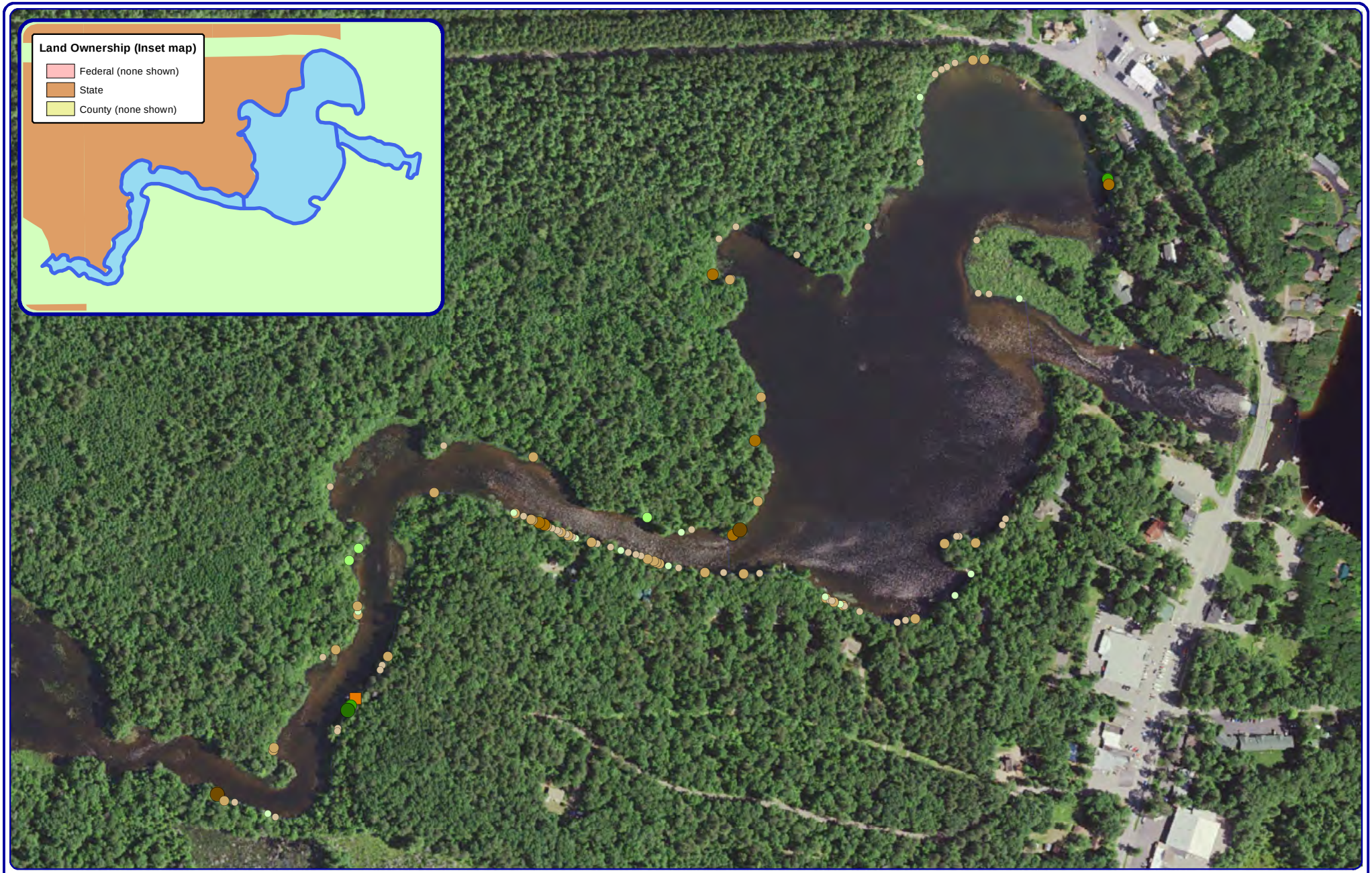
Legend

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

Seawall
- Rip-Rap
- Wood/Masonary/Metal

Map 1
Vance Lake
Vilas County, Wisconsin

2017 Shoreland Condition



N
W E
S

400
Feet

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

Sources:
Hydro: WDNR
Orthophotography: NAIP, 2017
Coarse Woody Habitat Survey: Onterra, 2017
Map Date: October 10, 2017
Filename:Vance_Map2_CWH_2017.mxd

Project Location in Wisconsin

Legend

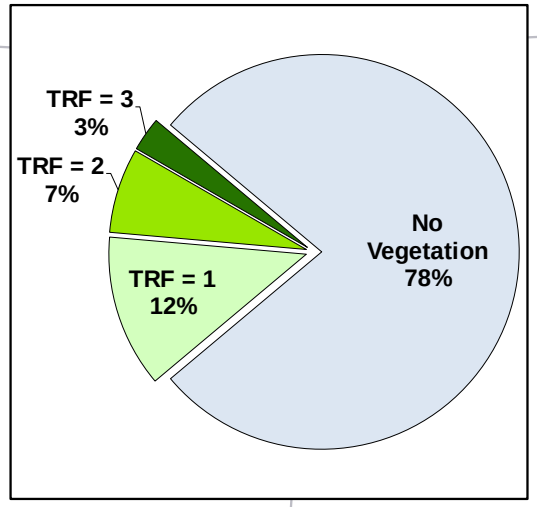
2-8 Inch Pieces
- No Branches
- Minimal Branches
- Moderate Branches
- Full Canopy

8+ Inch Pieces
- No Branches
- Minimal Branches
- Moderate Branches
- Full Canopy

Cluster of Pieces
- No Branches (none)
- Minimal Branches (none)
- Moderate Branches
- Full Canopy (none)

Map 2
Vance Lake
Vilas County, Wisconsin

Coarse Woody Habitat



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300
Feet

Onterra LLC
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www.onterra-eco.com

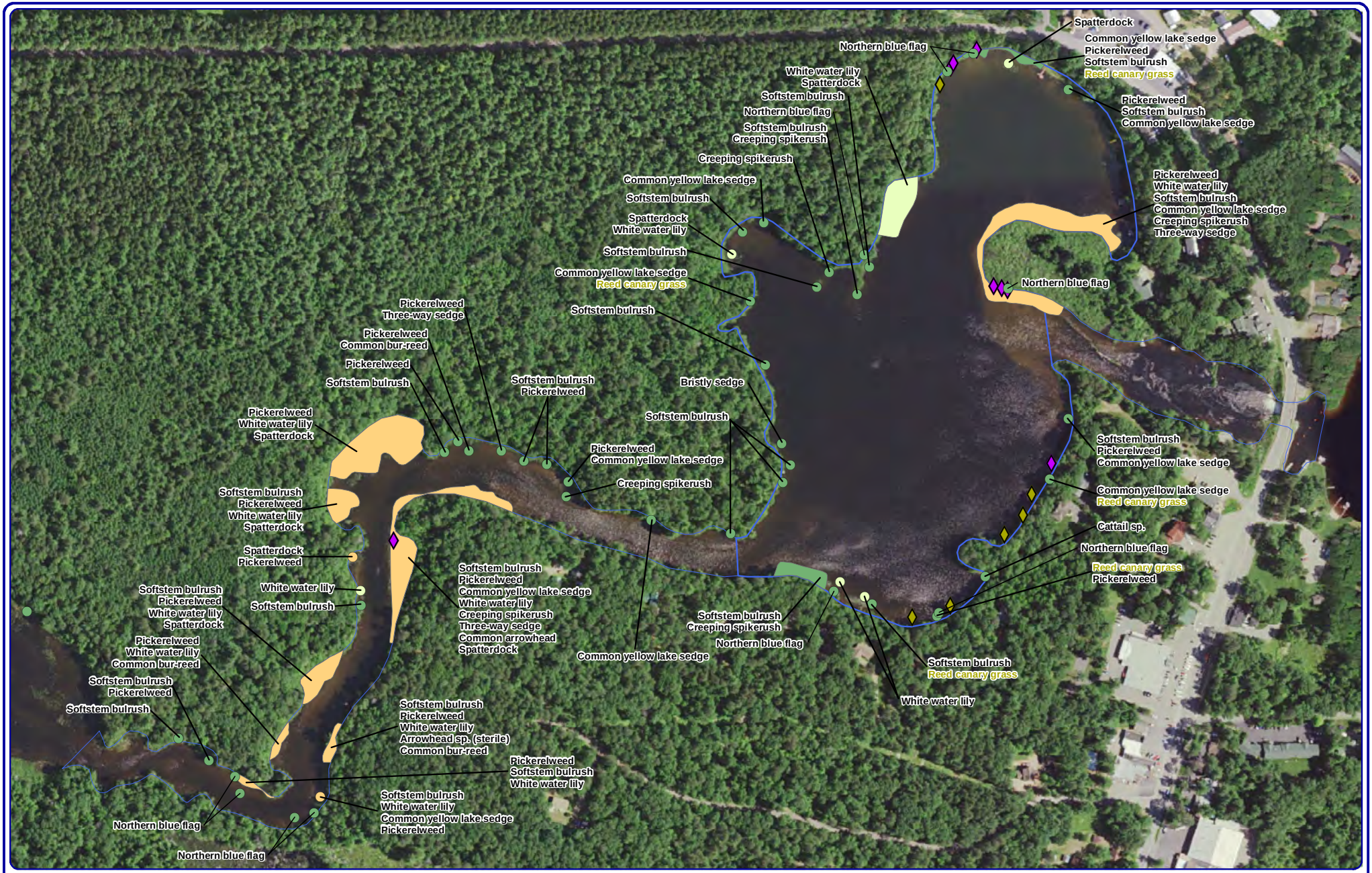
Sources:
Roads and Hydro: WDNR
Plant Survey: Onterra, 2017
Map Date: November 17, 2017
Filename: *MapX_Vance_TRFPI_2017.mxd*


Project Location in Wisconsin

Legend

- Total Rake Fullness = 1
- Total Rake Fullness = 2
- Total Rake Fullness = 3
- \+ No Vegetation
- \+ Non-Navigable

Map 3
Vance Lake
Vilas County, Wisconsin
2017 PI Survey:
Aquatic Vegetation Distribution



N
W E
S

400
Feet

Onterra LLC
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Sources:
Aquatic Plants: Onterra, 2017
Orthophotography: NAIP, 2017
Map date: November 3, 2017
Filename: Vance_Comm_2017.mxd

Project Location in Wisconsin

Legend

Small Plant Communities
- Emergent
- Floating-leaf
- Mixed Floating-leaf & Emergent

Large Plant Communities
- Emergent
- Floating-leaf
- Mixed Floating-leaf & Emergent

Map 4

Vance Lake

Vilas County, Wisconsin

Emergent & Floating-leaf Aquatic Plant Communities