Please note that study methods and explanations of analyses for Fawn Lake can be found within the Town of St. Germain Town-wide Management Plan document.

8.4 Fawn Lake

An Introduction to Fawn Lake

Fawn Lake, Vilas County, is a 22-acre, eutrophic, shallow lowland drainage lake with a maximum depth of 10 feet and a mean depth of 5 feet (Fawn Lake – Map 1). Its watershed encompasses approximately 40,000 acres (63 square miles), and the lake is fed by upstream Big Saint Germain Lake. Fawn Lake is drained via the Saint Germain River to south which flows into downstream Pickerel Lake. The Big Saint Germain Dam, owned and operated by the Wisconsin Valley Improvement Company, is located on the southern end of Fawn Lake, and artificially raises water levels in Fawn, Big Saint Germain, and Lake Content by approximately 2 feet. In 2019, 31 native aquatic plant species were located within the lake, of which common waterweed (*Elodea canadensis*) was the most common. No non-native, invasive plant species were located in Fawn Lake in 2019.

Lake at a Glance - Fawn Lake

Morphology	
LakeType	Shallow Lowland Drainage Lake
Surface Area (Acres)	22
Max Depth (feet)	10.0
Mean Depth (feet)	5.0
Perimeter (Miles)	0.8
Shoreline Complexity	1.5
Watershed Area (Acres)	41,370
Watershed to Lake Area Ratio	1,914:1
Water Quality	
Trophic State	Eutrophic
Limiting Nutrient	Phosphorus
Avg Summer P (μg/L)	25.2
Avg Summer Chl-α (μg/L)	9.2
Avg Summer Secchi Depth (ft)	8.4
Summer pH	8.3
Alkalinity (mg/L as $CaCO_3$)	38.2
Vegetation (2019)	
Number of Native Species	31
NHI-Listed Species	Vasey's pondweed (*Potamogeton vaseyi*)
Exotic Species	None
Average Conservatism	6.1
Floristic Quality	27.3
Simpson's Diversity (1-D)	0.87

Descriptions of these parameters can be found within the town-wide portion of themanagement plan

8.4.1 Fawn Lake Water Quality

It is often difficult to determine the status of a lake's water quality purely through observation. Anecdotal accounts of a lake "getting better" or "getting worse" can be difficult to judge because a) a lake's water quality may fluctuate from year to year based upon environmental conditions such as precipitation, and b) differences in observation and perception of water quality can differ greatly from person to person. It is best to analyze the water quality of a lake through scientific data as this gives a concrete indication as to the health of the lake, and whether its health has deteriorated or improved. Further, by looking at data for similar lakes regionally and statewide, the status of a lake's water quality can be made by comparison.

Water quality data were collected from Fawn Lake on three occasions in 2019. Data was collected by Onterra staff and citizen lake volunteers. The lake was sampled for a variety of water quality parameters including total phosphorus, chlorophyll-*a*, Secchi disk depth, temperature, and dissolved oxygen. Please note that the data in these graphs represent concentrations and depths taken during the growing season (April-October) and summer months (June-August) 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 2019 any historical data was researched and are included within this report as available.

Near-surface total phosphorus data from Fawn Lake are only available from 2010 and 2019 (Figure 8.4.1-1). Average summer total phosphorus concentrations ranged from 20.7 µg/L in 2019 to 29.7 µg/L in 2010. The weighted summer average total phosphorus concentration is 25.2 µg/L and falls into the *excellent* category for shallow lowland drainage lakes in Wisconsin. Fawn Lake's summer average total phosphorus concentrations are lower than the median values for shallow lowland drainage lakes in the state and slightly higher than the median concentration for all lake types in the Northern Lakes and Forests (NLF) ecoregion.

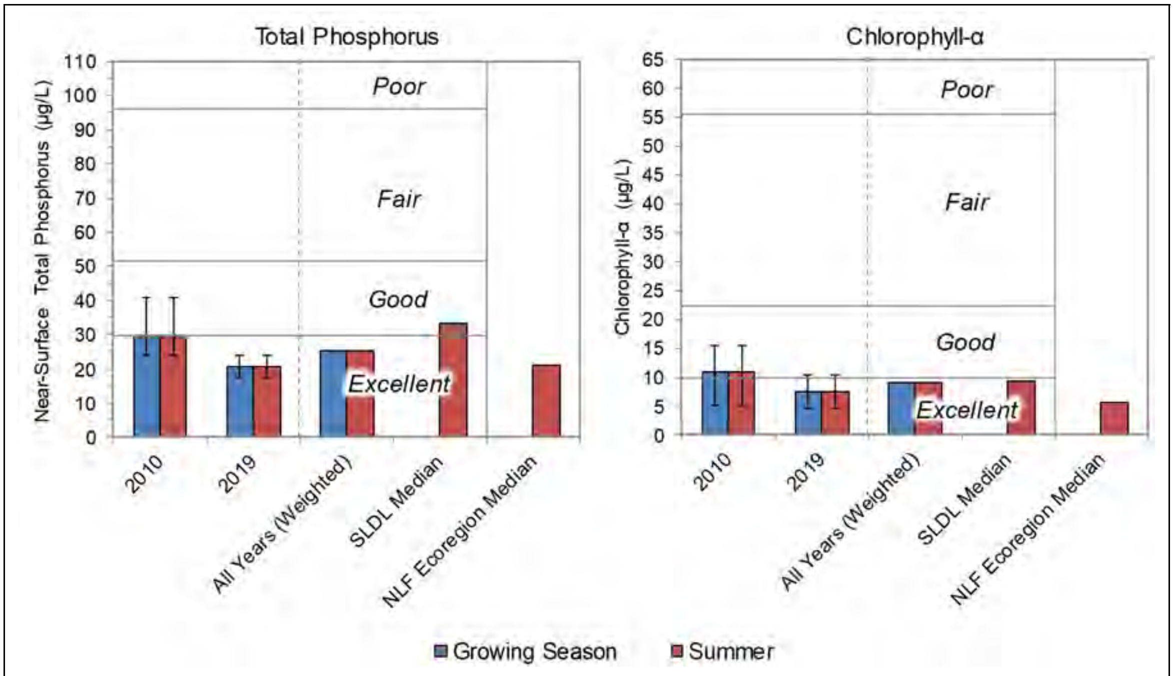


Figure 8.4.1-1. Fawn Lake average annual near-surface total phosphorus and chlorophyll-α concentrations and median near-surface total phosphorus and chlorophyll-α concentrations for state-wide shallow lowland drainage lakes (SLDL) and Northern Lakes and Forests (NLF) ecoregion lakes. Water Quality Index values adapted from WDNR PUB WT-913. Error bars represent maximum and minimum values.

Chlorophyll-*a* data from Fawn Lake are available from 2010 and 2019 (Figure 8.4.1-1). Average summer chlorophyll-*a* concentrations ranged from 7.4 µg/L in 2019 to 10.9 µg/L in 2010. Fawn

Lake's summer average chlorophyll-*a* concentration is 9.2 µg/L and falls in the *excellent* category for shallow lowland drainage lakes in Wisconsin. Fawn Lake's summer average chlorophyll-*a* concentration is similar to the median values for shallow lowland drainage lakes in the state and slightly higher than the median concentration for all lake types in the NLF ecoregion.

Secchi dis depth data from Fawn Lake are available from 1979 and annually from 2001-2019 (Figure 8.4.1-2). Average summer Secchi disk depth has ranged from 7.1 feet in 2008 to 9.5 feet in 2004. In many years, particularly in spring and early summer, the Secchi disk was visible while lying on the bottom of the at the maximum depth of 9.5-10 feet. This indicates that Fawn Lake's weighted summer average Secchi disk depth of 8.4 feet is slightly underestimated. Regardless, Fawn Lake's average summer Secchi disk depth falls into the *excellent* category for Wisconsin's shallow lowland drainage lakes and is relatively similar to the median depth for lakes in the NLF ecoregion. Trends analysis indicates that there have been no trends, positive or negative, in water clarity in Fawn Lake over the period from 2001-2019.

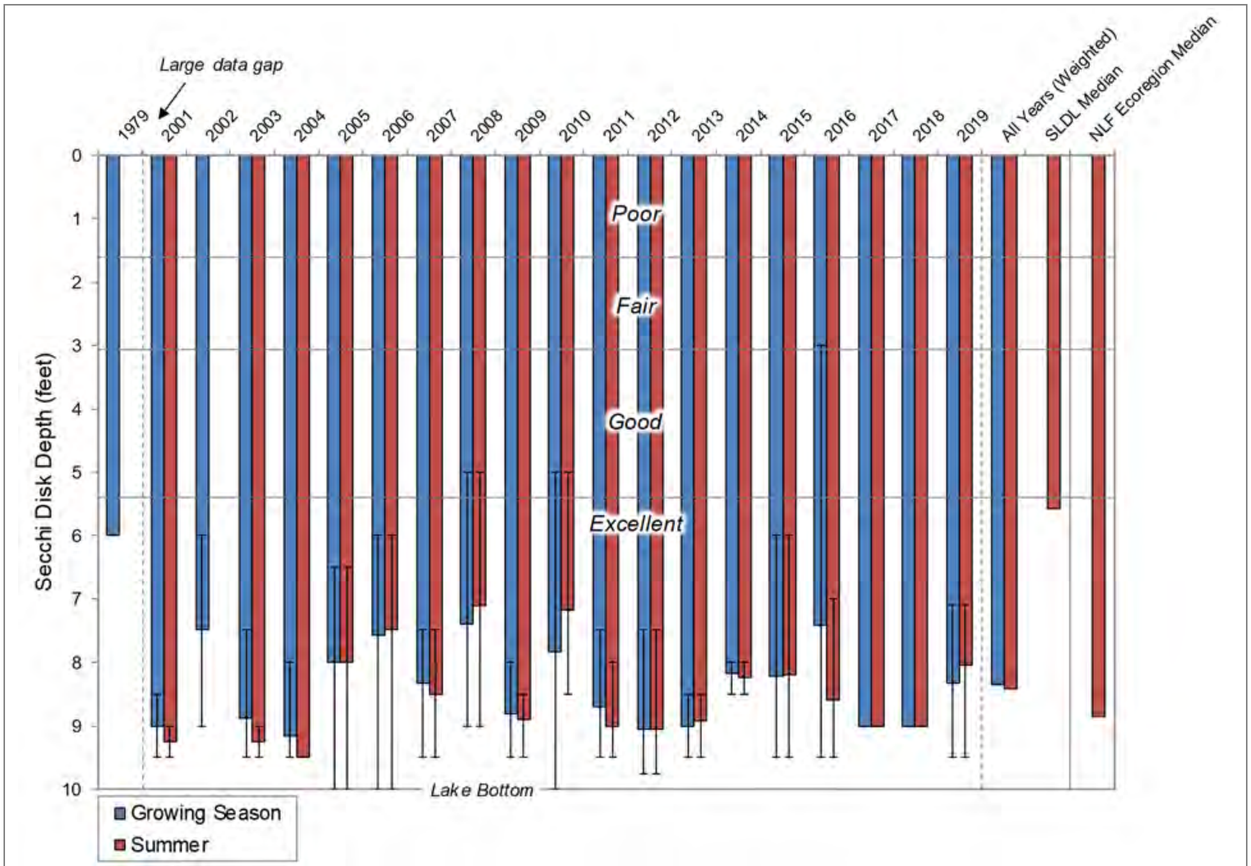


Figure 8.4.1-2. Fawn Lake average Secchi disk depth and median Secchi disk depths for state-wide shallow lowland drainage lakes (SLDL) and Northern Lakes and Forests (NLF) ecoregion lakes. Water Quality Index values adapted from WDNR PUB WT-913. Error bars represent maximum and minimum values.

A measure of water clarity once all of the suspended material (i.e., phytoplankton and sediments) have been removed, is termed *true color*, and measures how the clarity of the water is influenced by dissolved components. True color was measured in Fawn Lake in 2019 at 10 SU (standard units), indicating the lake's water is *slightly tea-colored* and contains low concentrations of these dissolved organic compounds. This indicates that Fawn Lake's water clarity is primarily influenced by free-floating algae, but may also be slightly darkened by these dissolved organic compounds.

Limiting Plant Nutrient of Fawn Lake

Using midsummer nitrogen and phosphorus concentrations from Fawn Lake, a nitrogen:phosphorus ratio of 16:1 was calculated. This finding indicates that Fawn Lake is indeed phosphorus limited as are the vast majority of Wisconsin lakes. In general, this means that phosphorus is the primary nutrient regulating algal production.

Fawn Lake Trophic State

Figure 8.4.1-3 contains the Trophic State Index (TSI) values for Fawn Lake. These TSI values are calculated using summer near-surface total phosphorus, chlorophyll-*a*, and Secchi disk depth data collected as part of this project along with available historical data. In general, the best values to use in assessing a lake's trophic state are chlorophyll-*a* and total phosphorus, as water clarity can be influenced by other factors other than phytoplankton such as dissolved organic compounds. The closer the calculated TSI values are for these three parameters are to one another indicates a higher degree of correlation.

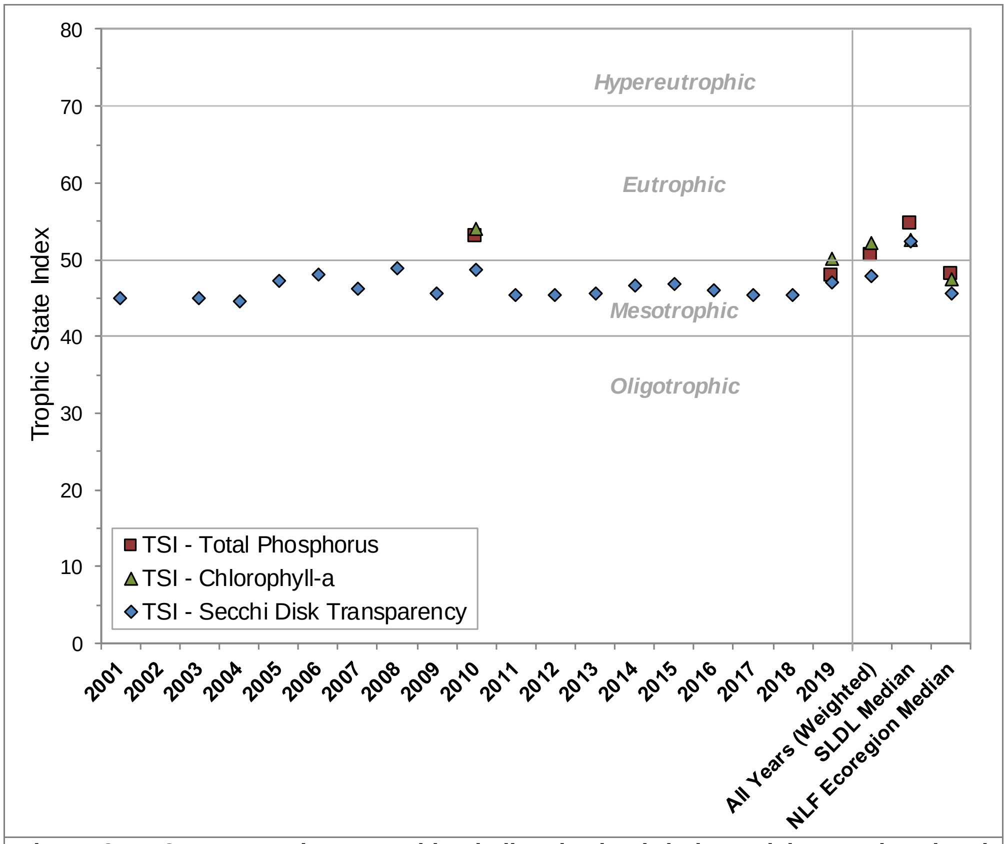


Figure 8.4.1-3. Fawn Lake, statewide shallow lowland drainage lakes, and regional Trophic State Index values. Values calculated with summer month surface sample data using WDNR PUB-WT-193.

The weighted TSI values for total phosphorus and chlorophyll-*a* in Fawn Lake indicate the lake is at present in a meso-eutrophic state. The Secchi disk TSI values are lower when compared to those for phosphorus and chlorophyll-*a*, indicating water clarity is higher than excepted given phosphorus and chlorophyll-*a* concentrations. This was also observed in upstream Big Saint Germain Lake and Lake Content. While it is possible that this indicates that the algal communities of Big Saint Germain Lake and Lake Content are dominated by larger particulates such as *Aphanizomenon* and *Gloeotrichia*, the higher water clarity in Fawn Lake could be the result of its high flushing rate. As is discussed in the subsequent Lake content Watershed Assessment Section (8.4.2), watershed modeling estimates that the water in Fawn Lake is completely replaced in less than one day. With such a short retention time, algae are flushed out of the system before they have time to multiply and accumulate within the lake.

Dissolved Oxygen and Temperature in Fawn Lake

Dissolved oxygen and temperature were measured in Fawn Lake on four occasions by Onterra staff in 2019. Profiles depicting these data are displayed in Figure 8.4.1-4. Fawn Lake is *polymictic*, meaning the lake does not develop strong thermal stratification during the summer, and maintains relatively uniform temperature and dissolved oxygen concentrations throughout the water column. The temperature and dissolved oxygen profiles collected in 2019 show that water temperature is relatively uniform from the surface to the deepest point in Fawn Lake.

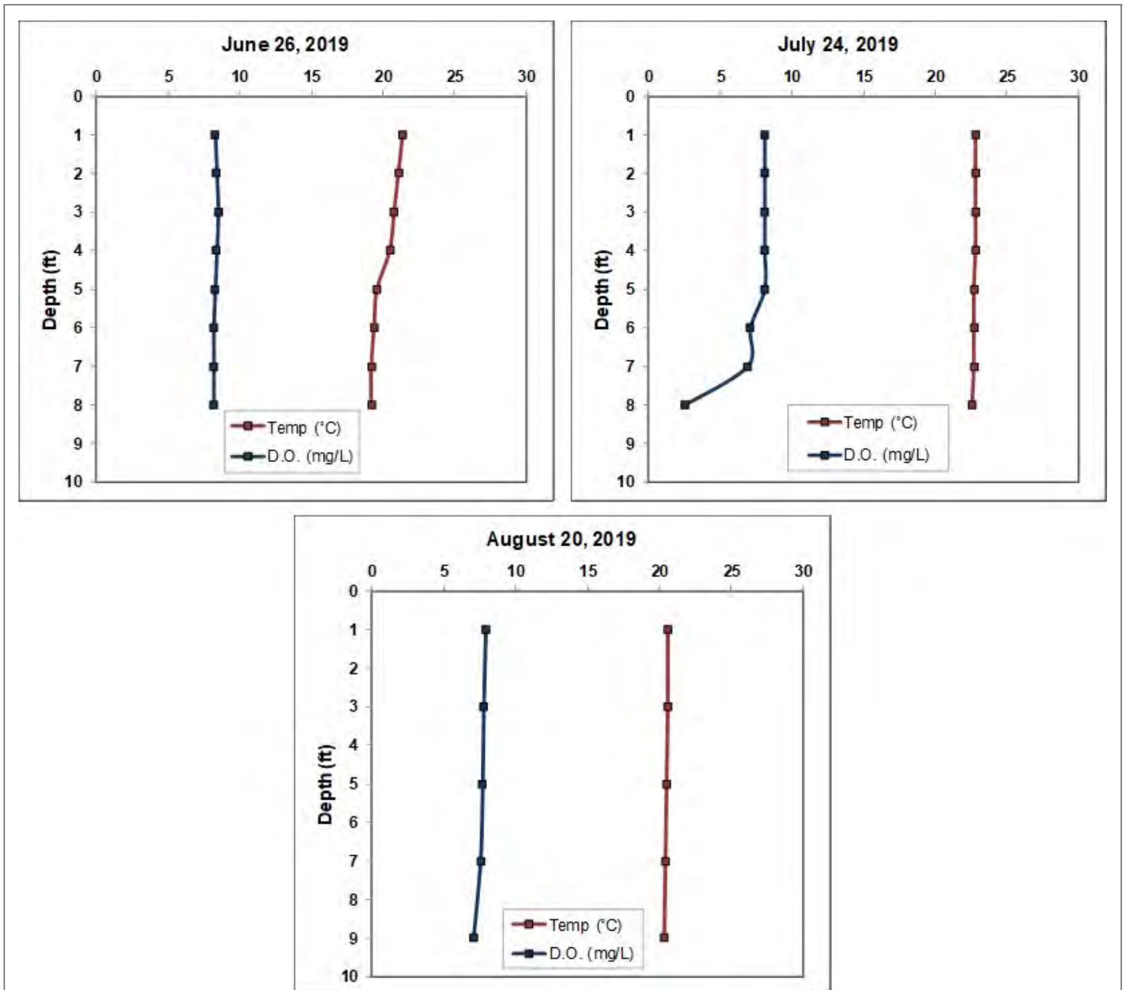


Figure 8.4.1-4. Fawn Lake 2019 dissolved oxygen and temperature profiles.

Additional Water Quality Data Collected at Fawn 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 Fawn 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.

The pH scale ranges from 0 to 14 and indicates the concentration of hydrogen ions (H^+) within the lake's water and is an index of the lake's acidity. Water with a pH value of 7 has equal amounts of hydrogen ions and hydroxide ions (OH^-) and is considered to be neutral. Water with a pH of less than 7 has higher concentrations of hydrogen ions and is considered to be acidic, while values greater than 7 have lower hydrogen ion concentrations and are considered basic or alkaline. The pH scale is logarithmic; meaning that for every 1.0 pH unit the hydrogen ion concentration changes tenfold. The normal range for lake water pH in Wisconsin is about 5.2 to 8.4, though values lower than 5.2 can be observed in some acid bog lakes and higher than 8.4 in some marl lakes. In lakes with a pH of 6.5 and lower, the spawning of certain fish species such as walleye becomes inhibited (Shaw and Nimphius 1985). The mid-summer pH of the water in Fawn Lake was found to be alkaline with a value of 8.3 and falls within the normal range for Wisconsin Lakes.

Alkalinity is a lake's capacity to resist fluctuations in pH by neutralizing or buffering against inputs such as acid rain. The main compounds that contribute to a lake's alkalinity in Wisconsin are bicarbonate (HCO_3^-) and carbonate (CO_3^-), which neutralize hydrogen ions from acidic inputs. These compounds are present in a lake if the groundwater entering it comes into contact with minerals such as calcite ($CaCO_3$) and/or dolomite ($CaMgCO_3$). A lake's pH is primarily determined by the amount of alkalinity. Rainwater in northern Wisconsin is slightly acidic naturally due to dissolved carbon dioxide from the atmosphere with a pH of around 5.0. Consequently, lakes with low alkalinity have lower pH due to their inability to buffer against acid inputs. The alkalinity in Fawn Lake was 38.2 mg/L (mg/L as $CaCO_3$), indicating that the lake is not sensitive to lower pH values from acid rain.

Like associated pH and alkalinity, the concentration of calcium within a lake's water depends on the geology of the lake's watershed. Recently, the combination of calcium concentration and pH has been used to determine what lakes can support zebra mussel populations if they are introduced. The commonly accepted pH range for zebra mussels is 7.0 to 9.0, so Fawn Lake's pH of 8.4 falls just below 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 Fawn Lake was found to be 11.0 mg/L, meaning it is unlikely to support the growth of zebra mussels.

8.4.2 Fawn Lake Watershed Assessment

Two aspects of a lake's watershed are the key factors in determining the amount of phosphorus the watershed exports to the lake: 1) the land cover (land use) within the watershed and 2) the size of the watershed. The type of land cover and the amount of that land cover that exists in the watershed is largely going to determine the amount of phosphorus (and sediment) that runs off the land and eventually makes its way to the lake. The actual amount of pollutants (nutrients, sediment, toxins, etc.) depends greatly on how the land within the watershed is used. Areas within a lake's watershed that are naturally vegetated (e.g., forests, grasslands, and wetlands) strongly influence the way water behaves on the land surface after it falls as precipitation or is released by the melting of snow (Silk and Ciruna 2005).

Runoff is slowed down in areas with denser vegetation and increases the time it takes for precipitation from a storm event to reach the lake. This allows more water to soak into the soil and reduces the potential for flooding. Intact wetlands within a lake's watershed have been likened to the "kidneys of the landscape" as they filter out nutrients, sediments, and other pollutants from water which passes through them (Silk and Ciruna 2005). The water quality within a lake is largely a reflection of the health of its watershed, and maintaining natural land cover within a lake's watershed is essential for maintaining good water quality.

Among the largest threats to a lake's water quality is the conversion of natural areas to agriculture and urban development. Conversion of natural areas to agriculture disrupts the hydrologic regime and increases surface runoff due to increased soil compaction and reduced water infiltration. Wetlands which were drained and converted to farmland were shown to increase runoff by 200-400% (Silk and Ciruna 2005). Agriculture accounts for 60% of the pollutants in lakes and rivers in the United States due to increased runoff in combination with the application of fertilizers, pesticides, and manure.

Similar to agriculture, urban development can significantly alter the hydrologic regime within a watershed, primarily through the installation of impervious surfaces (e.g., roads, driveways, roof-tops) which decrease water infiltration and increase runoff. As impervious surface cover increases, the time it takes water from a storm event to reach the lake decreases. With the increase in water velocity and volume entering the water body, nutrient and sediment input also increase, degrading water quality. Nutrient input can also increase from urban areas as the result of fertilizer application, wastewater treatment facilities, and other industrial activities.

As is discussed further in this section, Fawn Lake's watershed is largely comprised of intact upland forests and wetlands with some smaller areas of rural and urban development. In the forested watersheds of northern Wisconsin where soils and climate are not as conducive for farming, apart from shoreland development (discussed in the next section) forestry or timber harvest likely represents the largest man-made disturbance occurring in these watersheds. While timber harvest has the potential to increase sediment erosion through the removal of vegetation and construction of access roads and bridges, the impacts of timber harvest to a lake's water quality are going to be highly dependent upon harvest rates and methods, vegetation management, and the location and size of these activities within the watershed (Silk and Ciruna 2005).

Wisconsin is required by federal law to develop and implement a program of best management practices (BMPs) to reduce nonpoint source pollution, including from timber harvesting activities

(WDNR PUB FR-093 2010). In summary, any forestry activities that occur within Fawn Lake's watershed must be implemented under this framework and should not impart significant impacts to the lake's water quality.

In addition to land cover within the watershed, the size of the watershed relative to the water volume within the lake also influences water quality. The watershed to lake area ratio (WS:LA) defines how many acres of watershed drain to each surface-acre of the lake. Larger ratios result in the watershed having a greater role in the lake's annual water budget and phosphorus load. In systems with lower WS:LA ratios, land cover type plays a very important role in how much phosphorus is loaded to the lake from the watershed. In these systems, the occurrence of agriculture or urban development in even a small percentage of the watershed (less than 10%) can unnaturally elevate phosphorus inputs to the lake. If these land cover types are converted to a cover that does not export as much phosphorus, such as converting row crop areas to grasslands or forested areas, the phosphorus load and its impacts to the lake may be decreased. In fact, if the phosphorus load is reduced greatly, changes in lake water quality may be noticeable, (e.g., reduced algal abundance and better water clarity) and may even be enough to cause a shift in the lake's trophic state.

In systems with high WS:LA ratios, like those 10-15:1 or higher, the impact of land cover may be tempered by the sheer amount of land draining to the lake. Situations actually occur where lakes with completely forested watersheds have sufficient phosphorus loads to support high rates of primary production. In other systems with high ratios, the conversion of vast areas of row crops to vegetated areas (grasslands, meadows, forests, etc.) may not reduce phosphorus loads sufficiently to see measurable changes in primary production. Both of these situations occur frequently in impoundments.

Regardless of the size of the watershed or the makeup of its land cover, it must be remembered that every lake is different and other factors, such as flushing rate, lake volume, sediment type, and many others, also influence how the lake will react to what is flowing into it. For instance, a deeper lake with a greater volume can dilute more phosphorus within its waters than a less voluminous lake and as a result, the production of a lake is kept low. However, in that same lake, because of its low flushing rate (a residence time of years), there may be a buildup of phosphorus in the sediments that may reach sufficient levels over time and lead to a problem such as internal nutrient loading. On the contrary, a lake with a higher flushing rate (low residence time of days or weeks) may be more productive early on, but the constant flushing of its waters may prevent a buildup of phosphorus and internal nutrient loading may never reach significant levels.

Watershed Modeling

A reliable and cost-efficient method of creating a general picture of a watershed's effect on a lake can be obtained through modeling. The WDNR created a useful suite of modeling tools called the Wisconsin Lake Modeling Suite (WiLMS). Certain morphological attributes of a lake and its watershed are entered into WiLMS along with the acreages of different types of land cover within the watershed to produce useful information about the lake ecosystem. This information includes an estimate of annual phosphorus load and the partitioning of those loads between the watershed's different land cover types and atmospheric fallout entering through the lake's water surface.

WiLMS also calculates the lake's flushing rate and residence times using county-specific average precipitation/evaporation values or values entered by the user. Predictive models are also included within WiLMS that are valuable in validating modeled phosphorus loads to the lake in question and modeling alternate land cover scenarios within the watershed. Finally, if specific information is available, WiLMS will also estimate the significance of internal nutrient loading within a lake and the impact of shoreland septic systems.

A lake's **flushing rate** is simply a determination of the time required for the lake's water volume to be completely exchanged. **Residence time** describes how long a volume of water remains in the lake and is expressed in days, months, or years. The parameters are related and both determined by the volume of the lake and the amount of water entering the lake from its watershed. Greater flushing rates equal shorter residence times.

Fawn Lake Watershed Assessment

Fawn Lake's watershed encompasses approximately 41,370 acres (65 square miles) across Vilas County, yielding a watershed to lake area ratio of 1,914:1 (Figure 8.3.2-1 and Fawn Lake – Map 2). In other words, approximately 1,914 acres of land drain to every one acre of Fawn Lake's surface area. WiLMS modeling estimates that Fawn Lake's water residence time is approximately 0.8 days, meaning the water within the lake is completely replaced (flushing rate) on average over 430 times per year.

For modeling purposes, Fawn Lake's watershed was divided into two main subwatersheds: the Big Saint Germain Lake subwatershed and the Fawn Lake direct watershed (Figure 8.4.2-1). The vast majority (41,283 acres or 99.99%) of Fawn Lake's watershed is comprised of the Big Saint Germain Lake subwatershed, meaning most of the land drains water to Big Saint Germain Lake first before flowing into Fawn Lake. Fawn Lake's direct watershed, or the area of land draining directly to Fawn Lake is only 87 acres, or 0.002% of Fawn Lake's watershed.

Using total phosphorus data measured from Big Saint Germain Lake and outflow estimates from WiLMS, phosphorus loading from the Big Saint Germain Lake subwatershed into Fawn Lake was calculated. WiLMS was also utilized to estimate phosphorus inputs from land cover within the Fawn Lake's direct watershed. Phosphorus loading estimates from the Big Saint Germain Lake subwatershed and Fawn Lake's direct watershed were combined to estimate the total amount of annual phosphorus loading to Fawn Lake.

The 2016 land cover data indicate that Fawn Lake's direct watershed is comprised of upland forests (42%), the lake's surface itself (25%), wetlands (18%), rural open space (13%), rural residential areas (2%), and medium density urban areas (<1%) (Figure 8.4.2-2). The majority of land cover within the Big Saint Germain Lake subwatershed is comprised of upland forests and wetlands.

Using the land cover types and their acreages within Fawn Lake's direct watershed along with the estimated outflow of phosphorus from the four subwatersheds, WiLMS was utilized to estimate the annual potential phosphorus load delivered to Fawn Lake from its watershed. In addition, using data obtained from the 2019 stakeholder survey, an estimate of phosphorus loading to the lake from septic systems was also incorporated into the model. The model estimated that a total of 3,753 pounds of phosphorus are delivered to Fawn Lake from its watershed on an annual basis (Figure 8.4.2-3).

Of the 3,753 pounds of phosphorus being delivered to Fawn Lake annually, 3,740 pounds (99.7%) is estimated to originate from the Big Saint Germain Lake watershed while only 13 pounds (0.3%) is estimated to originate from Fawn Lake's direct watershed (Figure 8.4.2-3).

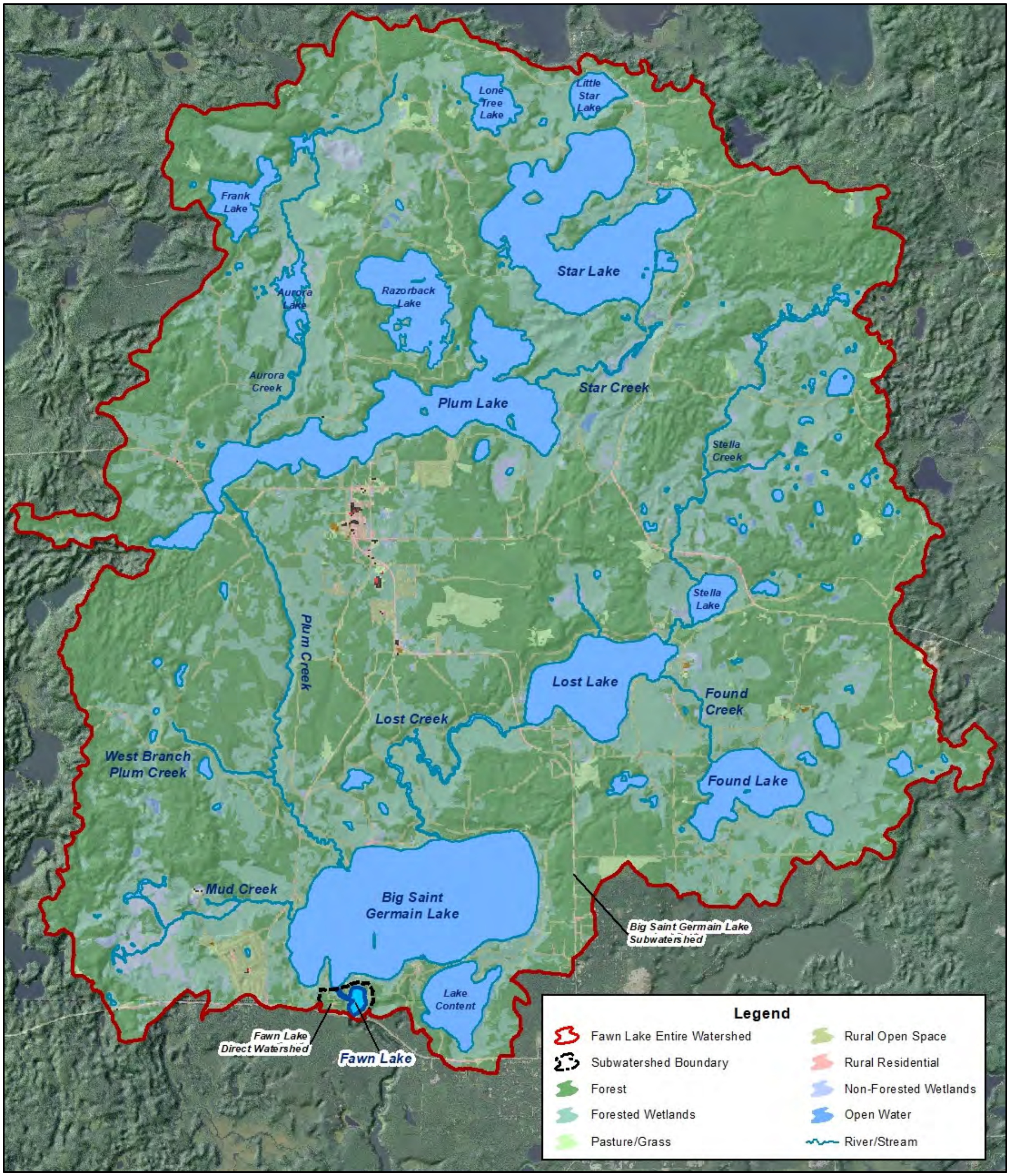


Figure 8.4.2-1. Fawn Lake watershed and land cover types.

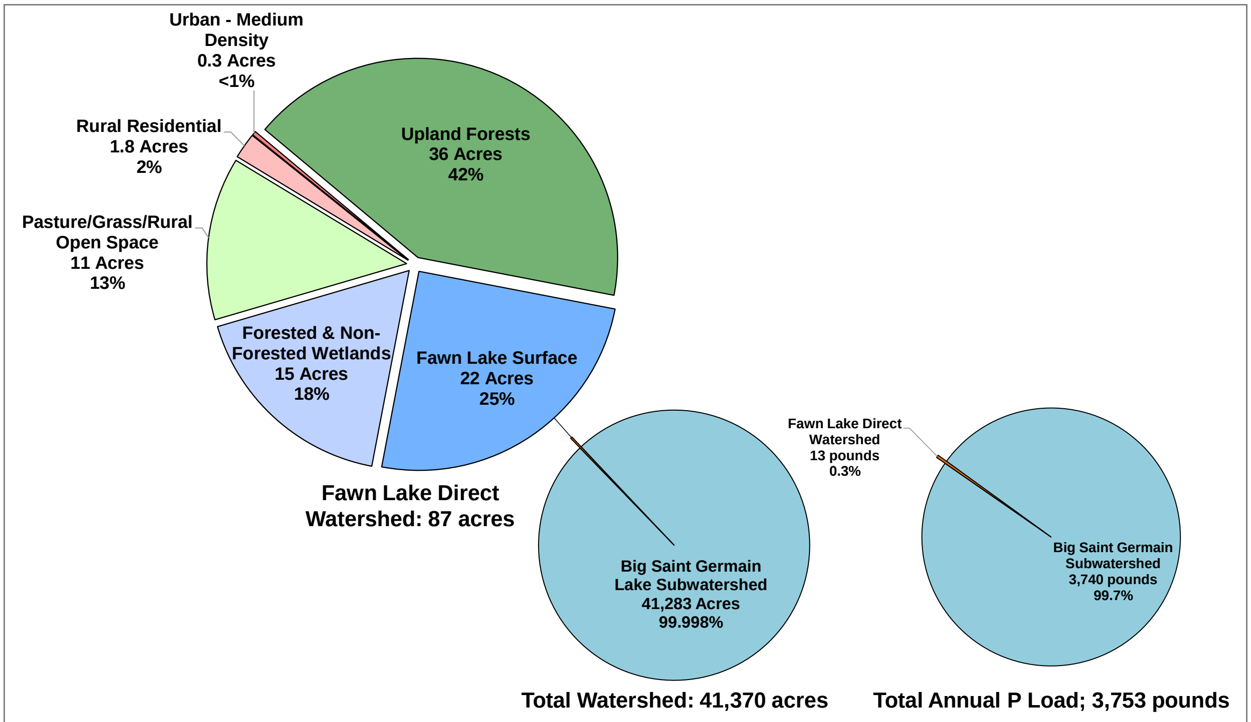


Figure 8.4.2-2. Fawn Lake watershed land cover types (left) and estimated annual phosphorus loading (right). Based upon National Land Cover Database (NLCD) **(Fry et al. 2011)**.

Using the estimated annual potential phosphorus load of 3,753 pounds, WiLMS predicts that Fawn Lake should have an in-lake growing season mean total phosphorus concentration of 26 μg/L, which is similar to the measured 25.2 μg/L. The similarity between the predicted and measured total phosphorus concentrations in Fawn Lake indicates that the watershed model is relatively accurate and that there are no significant unaccounted sources of phosphorus entering Fawn Lake at the current time.

8.4.3 Fawn Lake Shoreland Condition

As mentioned previously in the Town-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 2019, Fawn Lake's immediate shoreline was assessed in terms of its level of development.

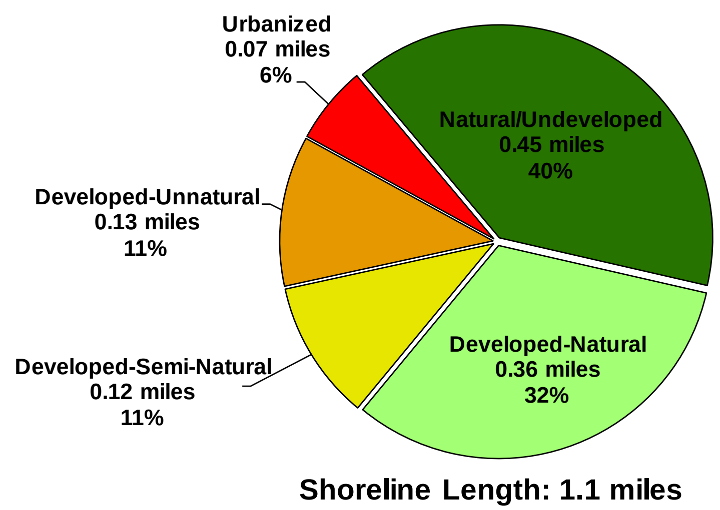


Figure 8.4.3-1. Fawn Lake shoreland categories and total lengths. Based upon a fall 2019 survey. Locations of these categorized shorelands can be found on Fawn Lake Map – 3.

Fawn Lake has stretches of shoreland that fit all of the five shoreland assessment categories (Figure 8.4.3-1). Approximately 62% (0.8 miles) of the lake's shoreline contains little to no development, categorized as natural/undeveloped or developed-natural. 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, 17% (0.2 miles) of shoreline with a higher degree of development was observed, categorized as either urbanized or developed-unnatural. If restoration of the Fawn 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.

Coarse Woody Habitat

As part of the shoreland condition assessment, Fawn Lake was also surveyed to determine the extent of its coarse woody habitat. Coarse woody habitat was identified, and classified in three size categories (cluster of pieces, 2-8 inches in diameter, and 8+ inches in diameter) as well as four branching categories: no branches, minimal branches, moderate branches, and full canopy. Pictures descriptions of these categories can be found in the Town-Wide Section 3.4. 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, 18 total pieces of coarse woody habitat were observed along 1.1 miles of shoreline (Fawn Lake Map – 4), which yields a coarse woody habitat to shoreline mile ratio of 16:1 (Figure 8.4.3-2). Only instances where emergent coarse woody habitat extended from shore into the water were recorded during the survey. Three pieces of 2-8 inches in diameter pieces of coarse woody habitat were found, 15 pieces of 8+ inches in diameter pieces of coarse woody habitat were found, and zero instances of 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 Fawn 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 111 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 Fawn Lake falls in the 23rd percentile of these 111 lakes.

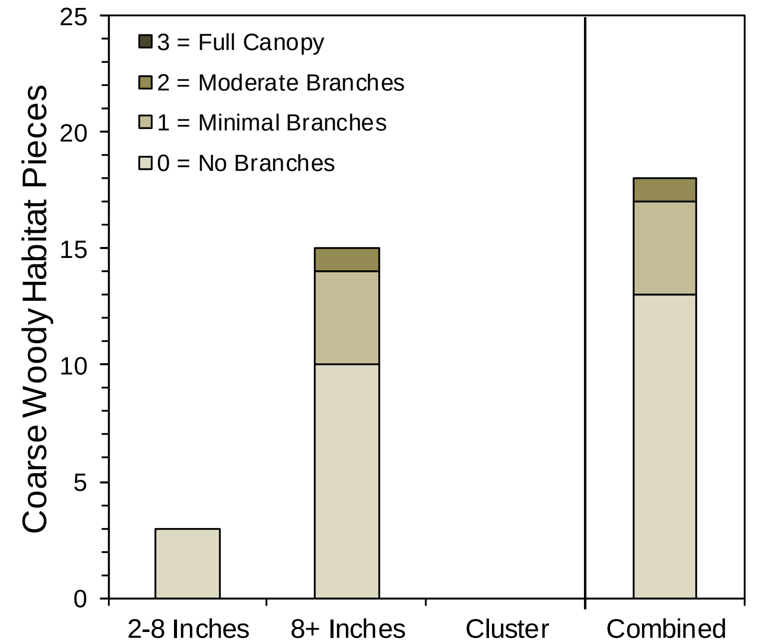


Figure 8.4.3-2. Fawn Lake coarse woody habitat survey results. Based upon a Fall of 2019 survey. Locations of the Fawn Lake coarse woody habitat can be found on Fawn Lake – Map 4.

8.4.4 Fawn Lake Aquatic Vegetation

An Early-Season Aquatic Invasive Species (ESAIS) Survey was conducted by Onterra ecologists on Fawn Lake on June 21, 2019. 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 the non-native curly-leaf pondweed, which should be at or near its peak growth at this time. No curly-leaf pondweed or any other non-native plant species were located in Fawn Lake during this survey.

The whole-lake aquatic plant point-intercept survey and emergent and floating-leaf aquatic plant community mapping survey were conducted on Fawn Lake by Onterra ecologists on August 19, 2019. During these surveys, a total of 31 native aquatic plant species were located (Table 8.4.4-1). One native aquatic plant species present in Fawn Lake, Vasey's pondweed, is listed by the Wisconsin Natural Heritage Inventory Program as a species of 'special concern' because it is rare or uncommon in Wisconsin, and there is uncertainty regarding its abundance and distribution within the state. Onterra also completed a whole-lake point-intercept survey on Fawn Lake in 2010, and the species located during that survey are also included in Table 8.4.4-1.

Lakes in Wisconsin vary in their morphometry, water chemistry, water clarity, substrate composition, management, and recreational use, all factors which influence aquatic plant community composition. Like terrestrial plants, different aquatic plant species are adapted to grow in certain substrate types; some species are only found growing in soft substrates, others only in sandy/rocky areas, and some can be found growing in either. The combination of both soft sediments and areas of harder substrates creates different habitat types for aquatic plants, and generally leads to a higher number of aquatic plant species within the lake.

During the 2019 point-intercept survey, information regarding substrate type was collected at locations sampled with a pole-mounted rake (less than 15 feet). Given the maximum depth of Fawn Lake is 10 feet, all of the locations were able to be sampled. These data indicate that 95% of the point-intercept locations contained soft organic sediments, 5% contained sand, and 0% contained rock (Figure 8.4.4-1). As is discussed in previous sections, Fawn Lake is a eutrophic system with an immense watershed. These higher nutrient conditions result in abundant aquatic plant growth, the decay of which over time builds up soft, organic sediments. Fawn Lake's position just upstream of a dam results in

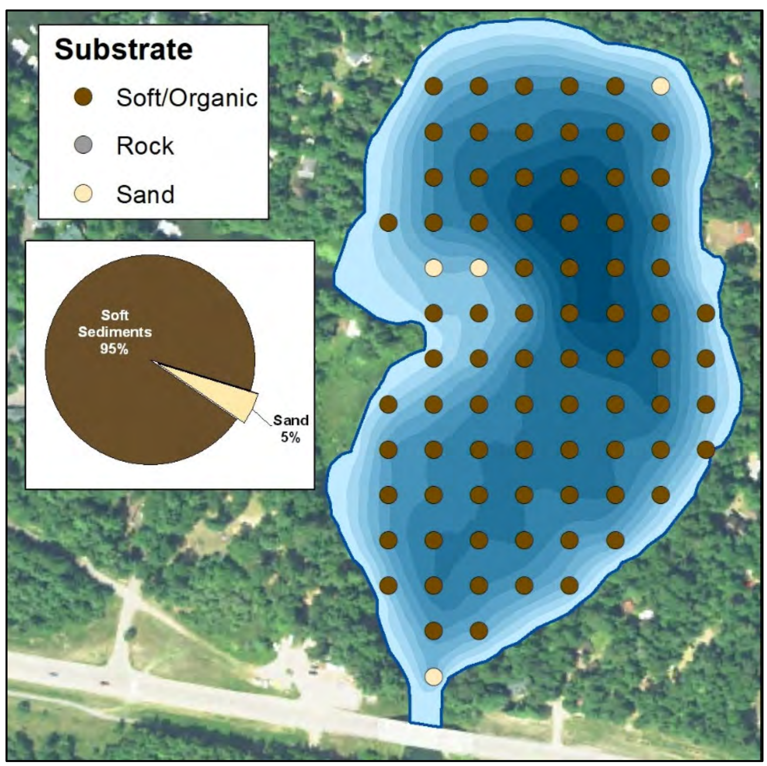


Figure 8.4.4-1. Fawn Lake substrate types as determined from the 2019 point-intercept survey. Please note substrate types can only be determined at sampling locations in 15 feet of water or less.

organic material settling out in the lake, creating nutrient rich substrate that supports abundant plant growth.

Table 8.4.4-1. Aquatic plant species located in Fawn Lake during 2010 and 2019 aquatic plant surveys.

Growth Form	Scientific Name	Common Name	Status in Wisconsin	Coefficient of Conservatism	2010	2019
Emergent	*Calla palustris*	Water arum	Native	9	X	I
	Decodon verticillatus	Water-willow	Native	7	I	I
	Iris versicolor	Northern blue flag	Native	5	I	I
	Juncus canadensis	Canadian rush	Native	9	I	
	Pontederia cordata	Pickerelweed	Native	9	I	
	Sagittaria latifolia	Common arrowhead	Native	3	X	I
	Sagittaria rigida	Stiff arrowhead	Native	8		I
	Scirpus cyperinus	Wool grass	Native	4		I
	Sparganium eurycarpum	Common bur-reed	Native	5	X	
	Typha angustifolia	Narrow-leaved cattail	Non-Native - Invasive	N/A	X	
	Typha latifolia	Broad-leaved cattail	Native	1	I	I
FL	*Brasenia schreberi*	Watershield	Native	7	I	
	Nuphar variegata	Spatterdock	Native	6	X	I
	Nymphaea odorata	White water lily	Native	6	X	X
	Sparganium fluctuans	Floating-leaf bur-reed	Native	10	I	
FL/E	*Sparganium emersum var. acaule*	Short-stemmed bur-reed	Native	8		I
Submergent	*Bidens beckii*	Water marigold	Native	8		X
	Ceratophyllum demersum	Coontail	Native	3	X	X
	Chara spp.	Muskgrasses	Native	7		X
	Elodea canadensis	Common waterweed	Native	3	X	X
	Heteranthera dubia	Water stargrass	Native	6		X
	Myriophyllum sibiricum	Northern watermilfoil	Native	7	X	X
	Najas flexilis	Slender naiad	Native	6	X	X
	Nitella spp.	Stoneworts	Native	7	X	
	Potamogeton amplifolius	Large-leaf pondweed	Native	7	X	X
	Potamogeton berchtoldii	Slender pondweed	Native	7		X
	Potamogeton foliosus	Leafy pondweed	Native	6		X
	Potamogeton praelongus	White-stem pondweed	Native	8	X	I
	Potamogeton richardsonii	Clasping-leaf pondweed	Native	5	X	X
	Potamogeton robbinsii	Fern-leaf pondweed	Native	8	X	X
	Potamogeton spirillus	Spiral-fruited pondweed	Native	8	X	X
	Potamogeton vaseyi	Vasey's pondweed	Native - Special Concern	10	X	X
	Potamogeton zosteriformis	Flat-stem pondweed	Native	6	X	X
	Ranunculus aquatilis	White water crowfoot	Native	8	X	I
	Vallisneria americana	Wild celery	Native	6	X	X
SE	*Sagittaria graminea*	Grass-leaved arrowhead	Native	9	X	
FF	*Lemna trisulca*	Forked duckweed	Native	6	X	X
	Lemna turionifera	Turion duckweed	Native	2	X	X
	Spirodela polyrhiza	Greater duckweed	Native	5	X	X

X = Located on rake during point-intercept survey; I = Incidentally located; not located on rake during point-intercept survey
FL = Floating-leaf; FL/E = Floatiing-leaf and Emergent';SE = Submergent and/or Emergent; FF = Free-floating

The maximum depth of plant growth is largely going to be determined by water clarity. In general, aquatic plants grow to a depth of two to three times the average Secchi disk depth. Fawn Lake's mean Secchi disk depth in 2019 was 8.0 feet, and aquatic plants were recorded growing to the maximum depth of the lake at 10 feet. Fawn Lake's high water clarity allows for sufficient light availability at the maximum depths to support aquatic plant growth lake-wide.

The littoral frequency of occurrence of vegetation in Fawn Lake in 2019 was 99%, which was not statistically different from the littoral frequency of occurrence of 100% in 2010 (Figure 8.4.4-2). This indicates that the entire area of Fawn Lake is littoral zone, or the entire lake can support aquatic plant growth. Total rake fullness ratings recorded in 2010 and 2019 indicated overall biomass of aquatic plants in Fawn Lake is high. Approximately 16% of the sampling locations that contained aquatic vegetation in 2019 had a total rake fullness rating of 1, 72% a rating of 2, and 12% a rating of 3. In 2010, 98% of sampling locations had a total rake fullness of 3, 2% a rating of 2, and no total rake fullness ratings of 1 were recorded.

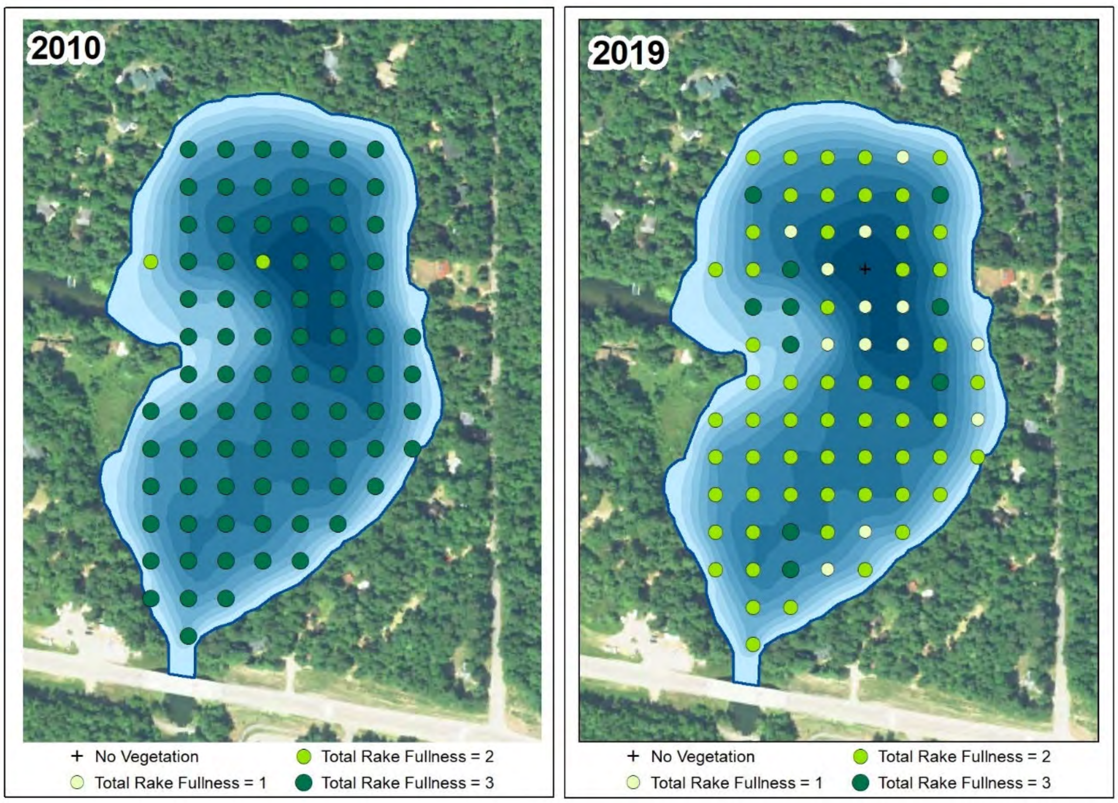


Figure 8.4.4-2. Distribution of aquatic vegetation in Fawn Lake in 2010 and 2019 illustrating the same distribution in vegetation occurrence. Littoral frequency of occurrence of vegetation in 2010 was 100% (n = 82) and 99% in 2019 (n = 82). Created using data from Onterra 2010 and 2019 point-intercept surveys.

Unlike some of the other Town of Saint Germain project lakes which have seen significant declines in the occurrence of vegetation between 2010 and 2019 due to either changes in water levels or reductions in water clarity, the occurrence of vegetation in Fawn Lake has remained stable. Fawn Lake is a drainage lake with a dam which can regulate and prevent large fluctuations in water level. In fact, the average depth of littoral sampling locations was 5.6 feet in 2010 and 5.9 feet in 2019, indicating water levels were similar during both survey years. In contrast, the seepage lakes of Alma and Moon lakes saw water levels increase by over 3.0 feet between 2010 and 2019, causing a significant reduction in overall aquatic plant occurrence.

While Figure 8.4.4-2 illustrates that the distribution of aquatic vegetation in Fawn Lake remained the same between 2010 and 2019, some individual species within Fawn Lake's aquatic plant community saw large changes in abundance between these two surveys. The data from the two point-intercept surveys completed on Fawn Lake can be used to compare how the occurrence of individual species have changed between the 2010 and 2019 surveys. The littoral frequencies of occurrence of aquatic plant species which had a littoral occurrence of at least 5% in one of the two point-intercept surveys are displayed in Figure 8.4.4-3. Due to their morphologic similarity and often difficulty in identification, the occurrences of muskgrasses (*Chara* sp.) and stoneworts (*Nitella* sp.) were combined for this analysis.

Seven species in Fawn Lake exhibited statistically valid reductions in their occurrence between 2010 and 2019 and include: coontail (18% decline), fern-leaf pondweed (40% decline), flat-stem pondweed (87% decline), large-leaf pondweed (78% decline), clasping-leaf pondweed (61% decline), white-stem pondweed (100% decline), and white water crowfoot (100% decline). While white-stem pondweed and white water crowfoot were not recorded on the rake during the 2019 point-intercept survey (littoral occurrence of 0%), they were observed and recorded as incidental species. Although some of these species have seen large declines in their occurrence between 2010 and 2019, these same species also saw declines in Big Saint Germain Lake and Lake Content, indicating these changes are not localized to Fawn Lake. If the populations of these plants are combined across all three of these lakes, the white-stem pondweed population has seen a decline of over 80%, large-leaf pondweed nearly 60%, and white water crowfoot 90%.

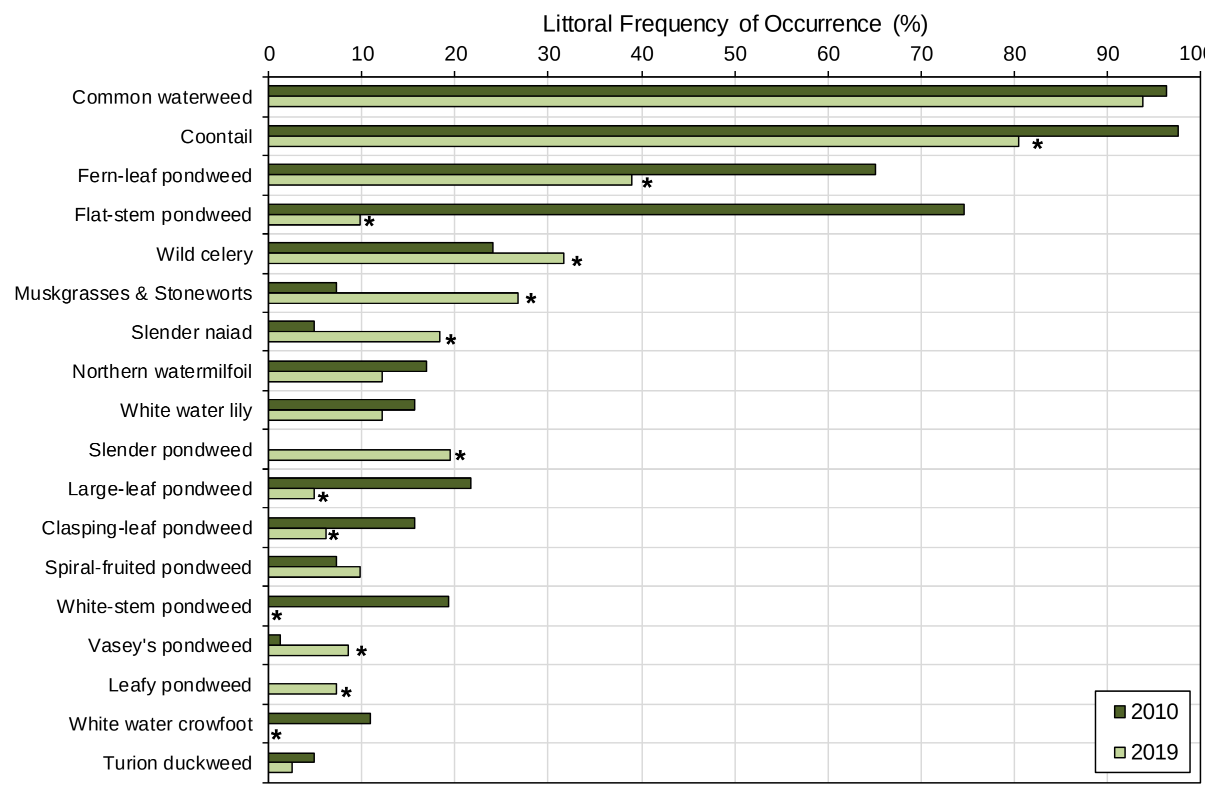


Figure 8.4.4-3. Littoral frequency of occurrence of select aquatic plant species in Fawn Lake from 2010 and 2019 point-intercept surveys. Species with a littoral frequency of occurrence of at least 5% in one of the two surveys are displayed. * = Statistically valid change in occurrence from 2010. Created using data from Onterra 2010 and 2019 point-intercept surveys.

While seven species in Fawn Lake saw declines in their occurrence, six species exhibited statistically valid increases in their occurrence between the 2010 and 2019 surveys. These include: muskgrasses and stoneworts (27% increase), slender naiad (280% increase), and Vasey's pondweed (9% increase). The two remaining species whose increases were statistically significant, slender pondweed and leafy pondweed, both increased from a littoral occurrence of 0% in 2010 to littoral occurrences of 20% and 7%, respectively. These same species also saw increases in their occurrences in Big Saint Germain Lake and Lake Content. The occurrences of northern watermilfoil, white water lily, spiral-fruited pondweed, and turion duckweed were not statistically different between the two surveys in Fawn Lake.

The data that continues to be collected from Wisconsin lake's is revealing that aquatic plant communities are highly dynamic, and populations of individual species have the capacity to fluctuate, sometimes greatly, in their occurrence from year to year and over longer periods of time. These fluctuations are driven by a combination of interacting natural factors including variations in water levels, temperature, ice and snow cover (winter light availability), nutrient availability, changes in water flow, water clarity, length of the growing season, herbivory, disease, and competition (Lacoul and Freedman 2006). While some of the changes in species abundance have been significant in Fawn Lake between 2010 and 2019, this is not believed to be an indicator of environmental degradation, but likely responses to a combination of variations in the environmental changes mentioned previously.

Lakes with diverse aquatic plant communities are believed to have higher resilience to environmental disturbances and greater resistance to invasion by non-native plants. In addition, a plant community with a mosaic of species with differing morphological attributes provides zooplankton, macroinvertebrates, fish, and other wildlife with diverse structural habitat and various sources of food. One may assume that because a lake has a high number of aquatic plant species that it also has high species diversity. However, species diversity is influenced by both the number of species and how evenly they a distributed within the community.

While a method for characterizing diversity values of fair, poor, etc. does not exist, lakes within the same ecoregion may be compared to provide an idea of how Fawn Lake's diversity values rank. Using data collected by Onterra and WDNR Science Services, quartiles were calculated for 212 lakes within the NLFL Ecoregion. The Simpson's Diversity Index values were calculated for Fawn Lake using the 2010 and 2019 point-intercept survey data. Fawn Lake's species diversity was similar between the 2010 and 2019 surveys with values of 0.88 and 0.87, respectively (Figure 8.4.4-4). These values fall at or near the ecoregion median value of 0.88.

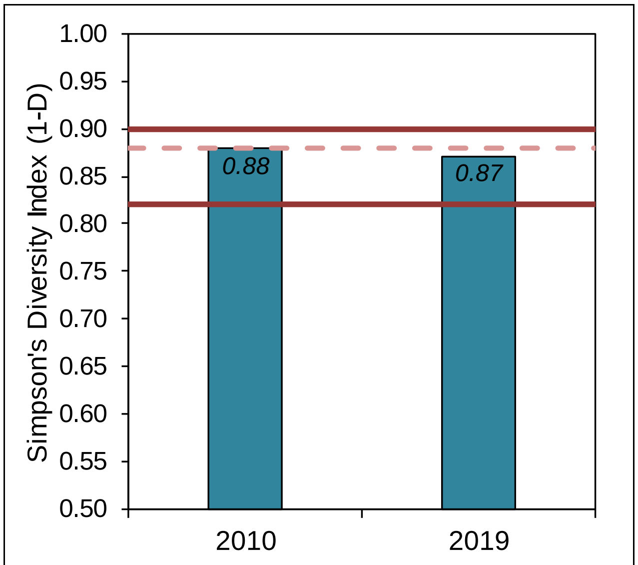


Figure 8.4.4-4. Fawn Lake Simpson's Diversity Index. Red solid lines represent NLFL upper and lower quartiles; light red dashed line represents NLFL median. Regional and state values calculated with Onterra & WDNR data.

In other words, if two plants were randomly sampled from two locations in Fawn Lake in 2010, there would have been an 88% probability that the plants would be two different species. In 2019, this probability decreased slightly to 87%. The Simpson's diversity values are essentially the same between the two survey years. The consistency of this value indicates that although there were small fluctuations in the abundance of individual species the overall plant abundance and species diversity in Fawn lake remained the same between the two surveys.

One way to visualize the diversity of Fawn Lake's plant community is to examine the relative frequency of occurrence of aquatic plant species. Relative frequency of occurrence is used to evaluate how often each plant species is encountered in relation to all the other species found. For example, while common water weed was found at 95% of the littoral sampling locations in 2010 (littoral occurrence), its relative frequency of occurrence was 19% (Figure 8.4.4-5).

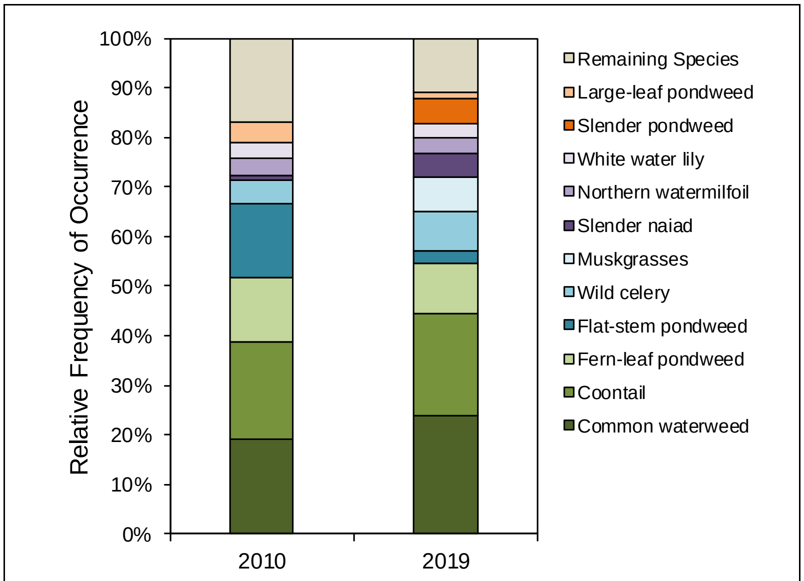


Figure 8.4.4-5. Fawn Lake aquatic plant relative frequency of occurrence. Created using data from Onterra 2010 and 2019 point-intercept surveys.

Explained another way, if 100 plants were randomly sampled from Fawn Lake in 2010, 19 of them would have been common waterweed, 19 coontail, etc. In 2010, 65% of Fawn Lake's plant community was comprised of just four species: common waterweed, coontail, fern-leaf pondweed, and flat-stem pondweed. This dominance of the plant community by a small number of species results in lower species diversity. In 2019, the majority of the species distribution of dominant species in Fawn Lake remained the same.

Submersed aquatic plants can be grouped into one of two general categories based upon their morphological growth form and habitat preferences. These two groups include species of the *isoetid* growth form and those of the *elodeid* growth form. Plants of the isoetid growth form are small, slow-growing, inconspicuous submerged plants (Figure 8.4.4-6). These species often have evergreen, succulent-like leaves and are usually found growing in sandy/rocky soils within near-shore areas of a lake (Boston and Adams 1987) (Vestergaard and Sand-Jensen 2000).

In contrast, aquatic plant species of the elodeid growth form have leaves on tall, erect stems which grow up into the water column, and are the plants that lake users are likely more familiar with (Figure 8.4.4-6). It is important to note that the definition of these two groups is based solely on morphology and physiology and not on species' relationships. For example, dwarf watermilfoil (*Myriophyllum tenellum*) is classified as an isoetid, while all of the other milfoil species in Wisconsin such as northern watermilfoil (*Myriophyllum sibiricum*) are classified as elodeids.

Alkalinity, as it relates to the amount of bicarbonate within the water, is the primary water chemistry factor for determining a lake's aquatic plant community composition in terms of isoetid versus elodeid growth forms (Vestergaard and Sand-Jensen 2000). Most aquatic plant species of the elodeid growth form cannot inhabit lakes with little or no alkalinity because their carbon demand for photosynthesis cannot be met solely from the dissolved carbon dioxide within the water and must be supplemented from dissolved bicarbonate.

Figure 8.4.4-6. Lake quillwort (Isoetes lacustris) of the isoetid growth form (left) and large-leaf pondweed (Potamogeton amplifolius) of the elodeid growth form (right). Photo credit: Onterra.

On the other hand, aquatic plant species of the isoetid growth form can thrive in lakes with little or no alkalinity because they have the ability to derive carbon dioxide directly from the sediment, and many also have a modified form of photosynthesis to maximize their carbon storage (Madsen 2002). While isoetids are able to grow in lakes with higher alkalinity, their short stature makes them poor competitors for space and light against the taller elodeid species. Thus, isoetids are most prevalent in lakes like Alma or Moon that have little to no alkalinity where they can avoid competition from elodeids.

In the other Town of Saint Germain lakes which have more moderate alkalinity levels, isoetids are generally restricted to shallower, wave-swept areas where elodeids are unable to grow, or scattered amongst less dense elodeid communities where light can penetrate to the bottom. In fawn lake the dominance of organic sediments and likelihood of sedimentation due to its position directly upstream of a dam does not provide ideal habitat for isoetid communities. No isoetid species were recorded in fawn lake in either the 2010 or 2019 survey. Isoetid communities are vulnerable to sedimentation and eutrophication (Smolders, Lucassen and Roelofs 2002), and a number are listed as special concern or threatened in Wisconsin due to their rarity and susceptibility to environmental degradation.

Using the aquatic plant species recorded on the rake during the point-intercept surveys completed on Fawn Lake, the Floristic Quality Index (FQI) was also calculated for each survey (Figure 8.4.4-7). Native plant species richness, or the number of native species recorded on the rake was 24 in 2010 and 20 in 2019. Average species conservatism was 6.5 in 2010 and 6.1 in 2019, while the FQI was 32.1 in 2010 and 27.3 in 2019. Fawn Lake's species richness is similar to the median values for lakes in the NLFL ecoregion (21) and the state (19). Fawn Lake's average conservatism values are lower than the median value for the ecoregion (6.7) and the 2019 value is also lower than the state median (6.3), indicating the lake supports a fewer number of environmentally-sensitive species when compared to other lakes in the ecoregion and the state. Fawn Lake's FQI values are also similar to both the median values for ecoregion lakes (30.8) and the state (27.2).

Overall, this analysis shows that Fawn Lake's aquatic plant community is of similar quality when compared to the majority of lakes in the ecoregion and the state. The reduction in Fawn Lake's FQI value between 2010 and 2019 is likely due to changes in the species present in Fawn lake and the changes in abundance of environmentally sensitive species. In the 2010 survey, water arum (c-

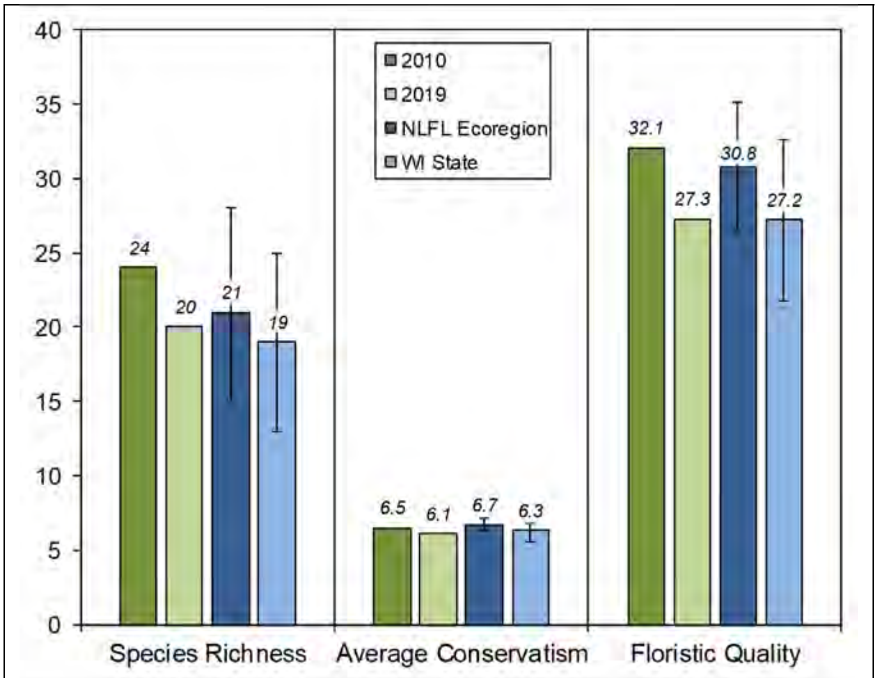
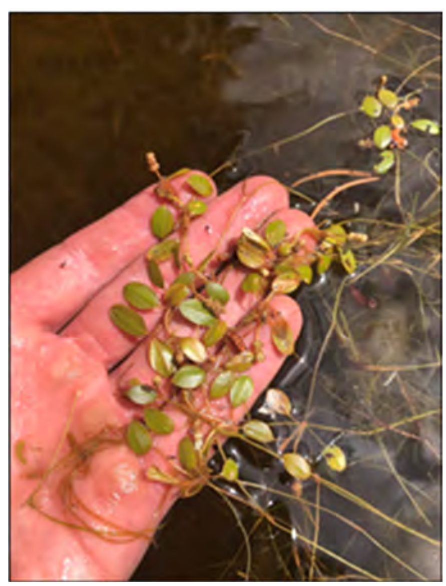


Figure 8.4.4-7. Fawn Lake Floristic Quality Assessment. Error bars represent interquartile range. Created using data from Onterra 2010 and 2019 point-intercept surveys. Regional and state medians calculated with Onterra and WDNR data. Analysis follows Nichols 1999.

value of 9), white-stem pondweed (c-value of 8), and white water crowfoot (c-value of 8) were sampled on the rake, but in 2019 were recorded as incidentals meaning their c-values were not included in the average. Grass leaved arrowhead (c-value of 9) was recorded in 2010 but not observed in 2019. This likely indicates a slight decline in abundance of these species and also affects the FQI calculation because the incidental species c-values are not included in the calculation. These declines are not isolated to Fawn Lake. If these populations are combined across Big Saint Germain Lake, Lake Content, and Fawn Lake, white-stem pondweed has seen an 80% decline between surveys and white water crowfoot has seen a 90% decline. These fluctuations in abundance are likely due to a combination of natural factors and not an indication of degrading conditions in Fawn lake, over time these species abundance will likely increase again.

One native aquatic plant species, Vasey's pondweed (*Potamogeton vaseyi*; Photograph 8.4.4-1), that is listed as special concern in Wisconsin was re-located in Fawn Lake in 2019. Vasey's pondweed produces very thin and pointed leaves that alternate along a long fine stem. In instances when it is able to reach the surface it frequently produces small oval to oblong floating leaves no larger than a human thumbnail. When floating leaves are produced, they often support a small cluster of flowers on a stalk which are held above the water's surface. In Wisconsin, Vasey's pondweed is generally found in lakes in the northern and central regions of the state. Species are listed as special concern by the WDNR's Natural Heritage Conservation Program when a problem with abundance or distribution is suspected by not yet proven, and this designation is to focus attention on these species before they become threatened or endangered. During the 2019 survey the littoral frequency of occurrence of Vasey's pondweed was 8.6%, a statistically significant increase from its littoral occurrence of 1.2% in 2010.



Photograph 8.4.4-1. Vasey's pondweed (Potamogeton vaseyi), with floating leaves and flowering present. *P. vaseyi* is an uncommon native aquatic plant listed as special concern found in Fawn Lake. Photo credit: Onterra.

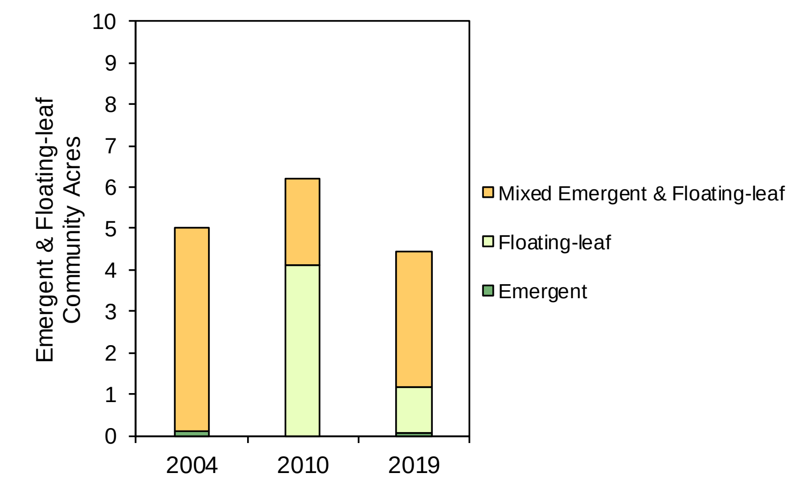


Figure 8.4.4-8. Fawn Lake emergent and floating-leaf community acres from 2004, 2010, and 2019. Change in acreage likely due to fluctuations in water levels over this period.

In 2019, Onterra ecologists also re-mapped emergent and floating-leaf aquatic plant communities in Fawn Lake (Fawn Lake – Map 5). Figure 8.4.4-8 illustrates that the size of these communities has fluctuated since they were first mapped by NES Ecological Services in 2004. These communities have fluctuated from 5.0 acres in 2004, 6.2 acres in 2010, and 4.4 acres in 2019. While some fluctuations in species abundances were observed, overall aquatic plant occurrence was not statistically different from what was recorded in 2010.

The relatively small changes in Fawn Lake's aquatic plant community compared to some of the other project lakes is likely due to the fact that the lake has maintained relatively stable water levels and water clarity over this period. Alma and Moon lakes have seen large fluctuations in water levels while Found Lake has seen a significant reduction in water clarity, disturbances which have caused more significant changes in the plant communities of these lakes.

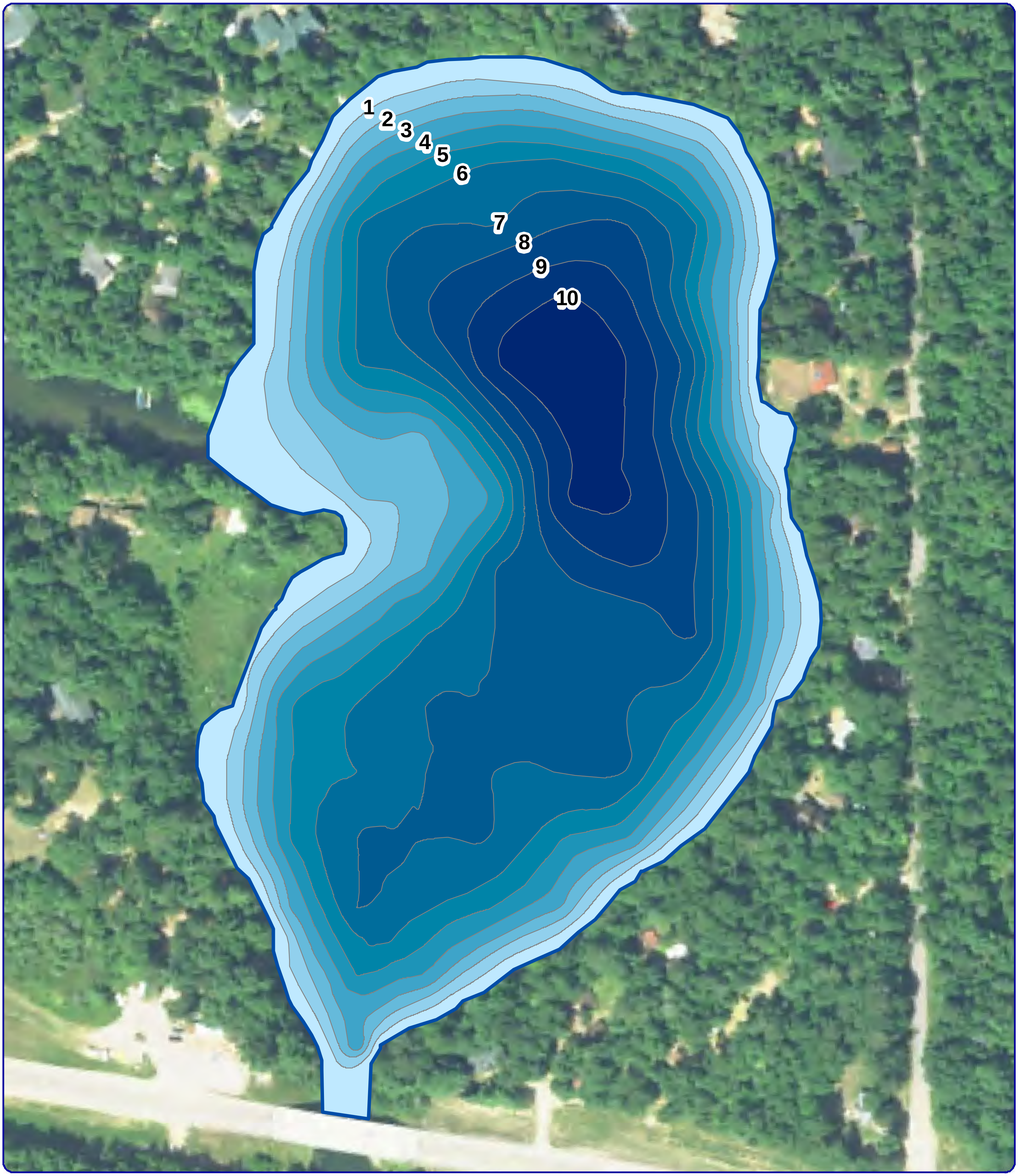
Aquatic Invasive Species in Fawn Lake

Narrow-leaved Cattail (Typha angustifolia)

Like purple loosestrife, narrow-leaved cattail is a perennial invasive wetland plant which invades shallow marshes and other wet areas. Like Wisconsin's native broad-leaved cattail (*T. latifolia*), narrow-leaved cattail produces tall, erect, sword-like leaves that can grow nearly 10 feet tall (Photograph 8.4.4-2). The leaves are generally narrower than broad-leaf cattail, typically 0.15-0.5 inches wide. Unlike broad-leaf cattail in which the male and female flowers are typically touching, there is typically a gap of 0.5-4.0 inches between the male and female flowers of narrow-leaved cattail.

Photograph 8.4.4-2. Onterra ecologist amongst a colony of the invasive narrow-leaved cattail. Photo credit: Onterra.

A small colony of narrow-leaved cattail was located on the southern shore of Fawn Lake in 2010 but it was not recorded in the 2019 survey. Narrow-leaved cattail was found on Big Saint Germain Lake and Lake Content in 2019.



N
W E
S

180
Feet

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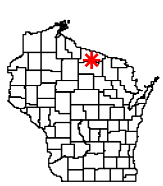
920.338.8860
www.onterra-eco.com

Sources:
Hydro: WDNR
Bathymetry: WDNR, digitized by Onterra
Orthophotography: 2018 NAIP
Map Date: March 3, 2020 BTB
File Name Map1_Fawn_Location.mxd



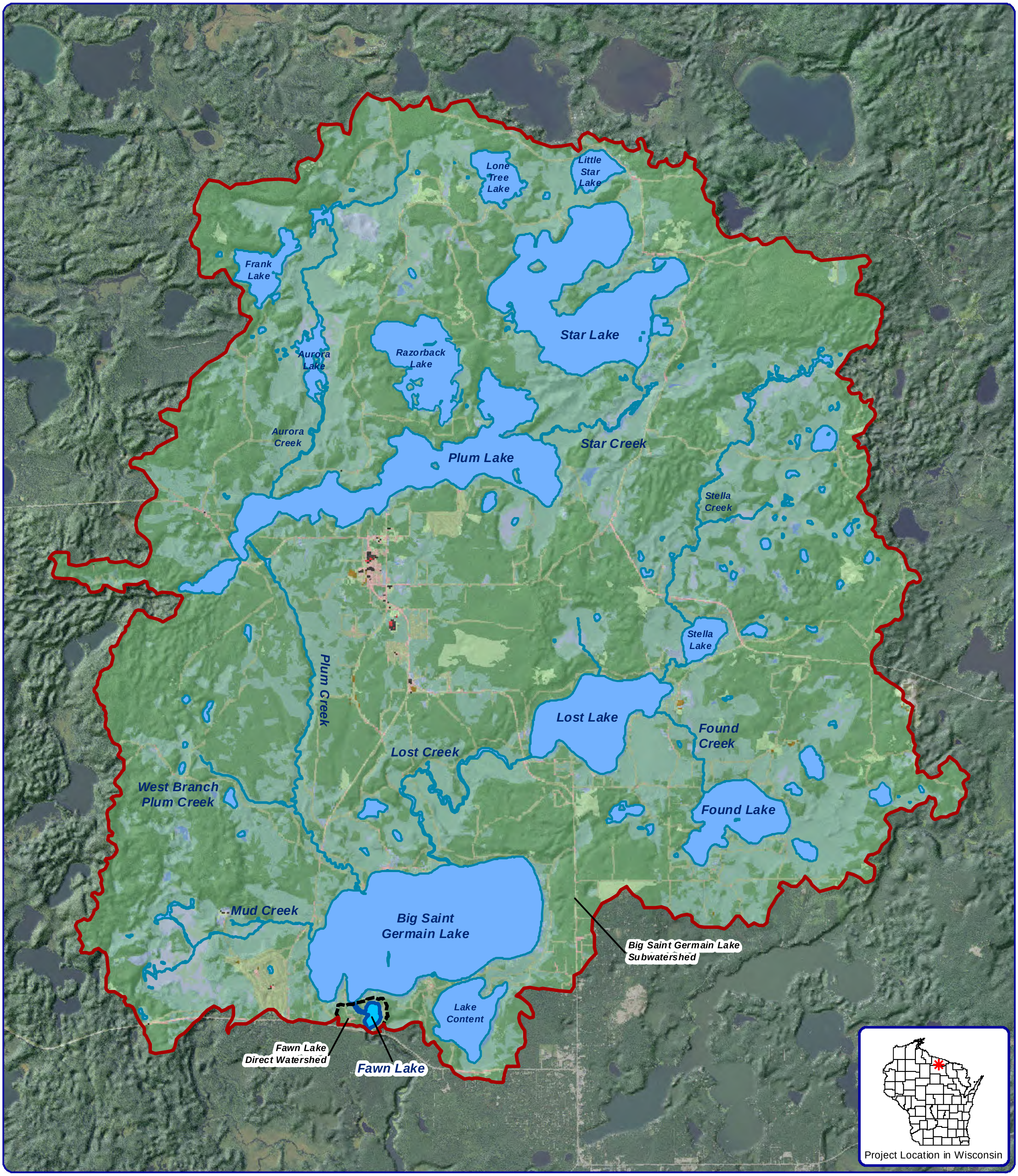
Project Location in Wisconsin

Legend

Lake Content
(10 acres - WDNR definition)

Fawn Lake - Map 1
Town of Saint Germain
Vilas County, Wisconsin

Project Location & Lake Boundaries



N
W E
S
6,900
Feet

Legend

- Fawn Lake Entire Watershed
- Subwatershed Boundary
- Forest
- Forested Wetlands
- Pasture/Grass
- Rural Open Space
- Rural Residential
- Non-Forested Wetlands
- Open Water
- River/Stream

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Sources:
Hydro: WDNR
Watershed: Onterra 2019
Orthophotography: 2018 NAIP
Map Date: March 3, 2020 BTB
File Name Map2_Fawn_WS.mxd

Fawn Lake - Map 2
Town of Saint Germain
Vilas County, Wisconsin

Watershed Boundaries & Land Cover Types

N
W E
S

225

Feet

Legend

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

Seawall

Masonry/Wood/Metal
Rip-Rap

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Sources:
Hydro: WDNR
Bathymetry: WDNR, digitized by Onterra
Orthophotography: 2018 NAIP
Map Date: March 3, 2020 BTB
File Name Map3_Fawn_SCA_2019.mxd

Fawn Lake - Map 3

Town of Saint Germain

Vilas County, Wisconsin

2019 Shoreland Condition Assessment

N
W E
S
225
Feet

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Sources:
Hydro: WDNR
Bathymetry: WDNR, digitized by Onterra
Orthophotography: 2018 NAIP
Map Date: March 3, 2020 BTB
File Name Map4_Fawn_CWH_2019.mxd

Legend

2-8 Inch Pieces	8+ Inch Pieces	Cluster of Pieces
No Branches	No Branches	No Branches
Minimal Branches	Minimal Branches	Minimal Branches
Moderate Branches	Moderate Branches	Moderate Branches
Full Canopy	Full Canopy	Full Canopy

Fawn Lake - Map 4
Town of Saint Germain
Vilas County, Wisconsin
2019 Coarse Woody Habitat Assessment

N
W E
S

225

Feet

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Sources:
Hydro: WDNR
Plants: Onterra 2019
Orthophotography: 2018 NAIP
Map Date: March 3, 2020 BTB
File Name Map5_Fawn_CM_2019.mxd

Large Plant Community

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

Small Plant Community

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

Fawn Lake - Map 5

Town of Saint Germain

Vilas County, Wisconsin

2019 Emergent & Floating-leaf Aquatic Plant Communities

Fawn Lake 2019 Emergent & Floating-Leaf Plant Species

Corresponding Community Polygons and Points are displayed on Fawn - Map 5

Large Plant Community (Polygons)						
Emergent	**Species 1**	**Species 2**	**Species 3**	**Species 4**	**Species 5**	**Acres**
A	Short-stemmed bur-reed	Common arrowhead	Water arum			0.06
Floating-leaf	**Species 1**	**Species 2**	**Species 3**	**Species 4**	**Species 5**	**Acres**
B	White water lily					1.11
Floating-leaf & Emergent	**Species 1**	**Species 2**	**Species 3**	**Species 4**	**Species 5**	**Acres**
C	White water lily	Short-stemmed bur reed	Water willow	Spatterdock	Cattail sp.	1.36
D	White water lily	water arum	Short-stemmed bur reed			0.07
E	White water lily	Water willow	Broad-leaved cattail	Stiff arrowhead	Water arum	1.84

Small Plant Community (Points)					
Emergent	**Species 1**	**Species 2**	**Species 3**	**Species 4**	**Species 5**
1	Wool-grass				
2	Water arum				
3	Short-stemmed bur-reed	Water arum			
4	Cattail sp.	Stiff arrowhead			
5	Water arum	Short-stemmed bur-reed			
6	Short-stemmed bur-reed				
7	Short-stemmed bur-reed	Iris sp.			
8	Iris sp.	Water arum			
Floating-leaf	**Species 1**	**Species 2**	**Species 3**	**Species 4**	**Species 5**
9	White water lily				
Floating-leaf & Emergent	**Species 1**	**Species 2**	**Species 3**	**Species 4**	**Species 5**
10	White water lily	Short-stemmed bur-reed			
11	White water lily	Water arum			

Species are listed in order of dominance within the community; Scientifc names can be found in the species list in the Fawn Lake Aquatic Vegetation Section 8.4.4