Section 21

About White Sand Lake

Waabaawangaa-zaaga'igan (White Sand)

—*Our Earth*[1]

From the northeast shore of this lake (Pokegama Lake), a portage of half a mile, over sand hills, covered with small pines and elevated about thirty feet above the general level of the small lakes which leads to Lake Wepetangok (White Sands Lake).

—R.G. Norwood,
Report of a geological reconnaissance[2]

Tourism did not employ as many people as lumbering in its heyday, but it did mix traditional and modern subsistence practices and fit within a regional tradition of seasonal work.

—Aaron Shapiro, *The Lure of the North Woods*[3]

Introduction

The *Bear River Watershed Comprehensive Lake Management Plan* includes sections for each of the ten lakes in the watershed. The lakes are in the largest watershed in Lac du Flambeau, within the Reservation's boundaries, associated with high use landings, and have complete data sets required for a lake management plan. The purpose of the plan is to establish the current health of the watershed and lakes and suggest how to maintain or improve their health in the future.

This section includes introductory information about White Sand Lake; a summary of how uses of the lake have changed over time; data from the community survey; and an assessment of the lake's health based on data for the lake's biology, chemistry, nutrients, habitat, bacteria, lake levels, and aesthetics. This section also includes an action plan for improving or maintaining the overall health of White Sand Lake.

White Sand Lake is in the Bear River Watershed (Subwatershed HUC12-070500020202) northeast of the town center of Lac du Flambeau (Figure 21-1).

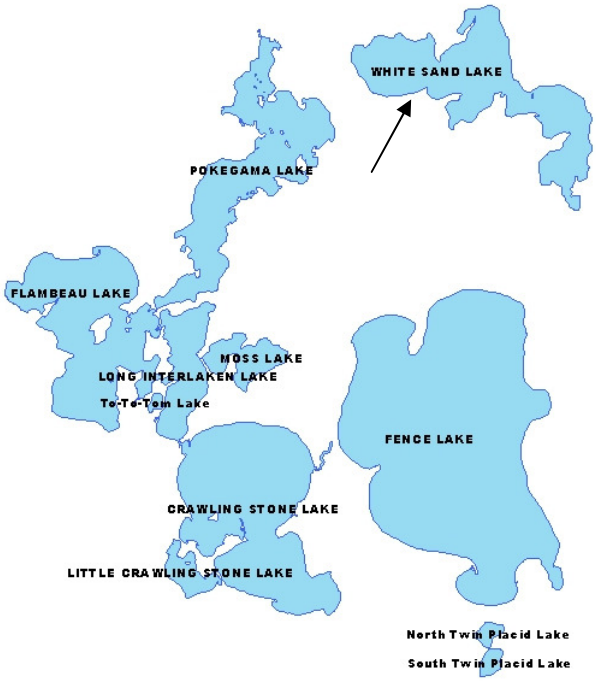

Figure 21-1. Map of Lakes

The lake is approximately 1229 acres and has a maximum depth of 63 feet (Table 21-1). White Sand Lake is classified as a drainage lake, meaning that it is fed by streams, groundwater, precipitation, and run off, and is drained by a stream or channel. White Sand Lake drains through Hutton's Creek at its western end into Pokegama Lake where it ultimately flows into the Bear River.

Table 21-1. Basic Data for White Sand Lake

Morphology	
Acreage (Acres)	1229
Maximum Depth (Feet)	63
Mean Depth (Feet)	24
Retention Time (Years)	4.42
Drainage Area (Acres)	5328
Drainage Basin/Lake Area Ratio	4.3
Vegetation	
Survey Data Collected	2010
Number of Native Species	32
Floristic Quality Index	34.5
Simpson's Diversity Index	0.91
Percent Vegetated (%)	50.33
Average Conservatism	6.41
Water Quality	
Trophic State	Mesotrophic
Limiting Nutrient	Phosphorus
Water Acidity (pH)	7.3
Sensitivity of Acid Rain	Low
Watershed to Lake Area Ratio	4:01
Aquatic Invasive Species	Rusty Crayfish Freshwater Jellyfish Purple Loosestrife

White Sand Lake stratifies annually with the hypolimnion reaching dissolved oxygen below 5mg/L. With Secchi readings averaging 15.24 feet, the lake's water clarity is considered to be good.

Based on Secchi, total phosphorus, and Chlorophyll *a* data, White Sand Lake is classified as mesotrophic. Mesotrophic lakes generally have medium levels of nutrients and water clarity when compared to other natural lakes.

White Sand Lake's watershed includes water (44.7%), forests (44%), urban (0.3%), and wetlands (11%).

There are 202 dwellings, mostly residential, within 300 feet of the lake's shoreline.

White Sand Lake has a public landing off of County Road H and two private landings, one at each of two resorts and another one at the private campground.

Brief History of White Sand Lake

The history of White Sand Lake, including how uses of the lake have changed over time, parallels the history of the other lakes in the Bear River Watershed as described at length in Section 3. Unless noted otherwise, the information here is footnoted in Section 3.

For hundreds of years White Sand Lake was used by indigenous people for subsistence. Virtually every facet of their lives depended on their relationship with the lake and its surrounding habitats for food, medicine, building materials, and transportation.

With the arrival of the Europeans in the early to mid-seventeenth century, White Sand Lake and the surrounding habitats took on a new use: to help provide the world with furs. Lac du Flambeau became a transportation center for the fur trade, and White Sand Lake became part of the network of canoe routes and portages which linked Lac du Flambeau with trade routes in all directions. White Sand Lake, for example, was part of the primary route linking Lac du Flambeau with Lac Vieux Desert to the northeast.[4]

By 1840 the fur-bearing animals were gone and White Sand Lake and its surrounding habitats took on another new use: to provide the country with timber and timber products. To facilitate the movement of logs from White Sand Lake to the mills on Long Interlaken Lake, a dam was constructed at the confluence of Flambeau Lake and the Bear River.

Hutton's Creek (Sand Creek) connects White Sand Lake at its southwest end with Pokegama Lake. The dam there was likely built originally by the Tribe in the mid-1870s. When property on White Sand Lake was subsequently sold, the creek and dam

transferred to private ownership. In 1940, the Town of Lac du Flambeau paid August Wolff $135 to replace the original dam which had washed out.[5]

In the 1900s, Marvin Hewitt, the president of the Chicago and Northwestern Railroad, decided he wanted to take his steam launch with his guests fishing in more than one lake. Railroad construction crews dug about four miles of ten-foot wide canals to link White Sand, Sunfish, Crooked, Little Trout, and Ike Walton Lakes.[6]

By 1913, the trees around White Sand Lake were gone and most of the surrounding habitats were destroyed. In the early 1900's, however, the logging industry was already being replaced by the service industry, which used White Sand Lake and its surrounding habitats to meet the recreational needs and demands of tourists and seasonal residents.

As a result of the Dawes Act (1887), much of the lakefront property on White Sand Lake was transferred from the Tribe to non-Tribal residents, opening the door shoreline to development.

In 1910, George Goller built the first tourist cabins on White Sand Lake.[7] In 1923 Gust Peterson and his two brothers, Fred and Oscar, bought the 35-acre peninsula and the property to the east and west as a retreat center for their families.[8]

Later that year, Gust Peterson sold his 35 acres on the peninsula on a land contract to his nephew Ben C. Gauthier, who constructed a hotel and 13 buildings on the 35 acre site and began work in the resort business.[9]

Dillman's Resort was born in 1934 when Marvin and Peg Peterson Dillman purchased the same 35-acre property on a land contract from Peg's father, Gust Peterson (Figure 21-2). In order to help keep the resort, Marvin and Peg tried raising chickens, mink, and milk cows plus held winter jobs in Chicago. In 1970 the present owners, Sue (Marvin and Peg's daughter) and Denny Robertson, took over managing the resort.[10]

Figure 21-2. Dillman's Resort on White Sand Lake

One of the cabins on the property today sheltered Baby Face Nelson who was on the run in April 1934 following a shootout at Little Bohemia in Manitowish Waters. At the time Baby Face Nelson used the cabin, it was the home of Ollie Catfish and was located across the lake from Dillman's. In 1935, Peg and Marvin Dillman moved the then empty building across the frozen lake for use as a cabin for their patrons.[11]

In 1923, a second of the Peterson brothers, Oscar, opened a small resort west of his brother Gust's property. Eventually he sold the resort to Joyce and Bob Watson who ran Watson's Holiday Beach Resort for 25 years. The third Peterson brother, Fred, also sold his property, which eventually became the present White Sand Resort.[12]

In the 1930s, Molly and Mitch Bloecher established Bloecher's Beach Resort near Dillman's Resort. Laurie and Rick Zelm purchased Bloecher's Beach Resort in 1986 and renamed it White Sand Resort. Timber Bay Resort, formally, Watson's Holiday Beach Resort is now owned by Sean & Darcy McEnroe.[13]

In 1922, 11 families from Winnetka, Illinois purchased 90 acres with frontage on both White Sand and Little Sand Lakes for a private camp. They called it Camp Wipigaki, Ojibwe for *Red-at-the-Leaf.* By 1925 Wipigaki had grown to 500 acres and had cabins and a common dining hall.[14]

By the 1960s, tourists could choose among several resorts on White Sand Lake, including Anderson's Resort, Field's Log Cabin Resort, Schmidt's Breezewood Resort, Watson's Holiday Beach, and Dillman's Sand Lake Lodge.[15] Presently there are three resorts on White Sand Lake, Dillman's Resort, Timber Bay Resort, and White Sand Resort.

Community Survey[16]

Approximately 3,000 households in Lac du Flambeau were invited to participate in a mail survey during the summer of 2012 to provide information for preparing the *Bear River Watershed Comprehensive Lake Management Plan*. The survey was developed with assistance from the Wisconsin Department of Natural Resources and was approved by the WDNR before it was distributed.

The survey includes questions on topics such as residents' perceptions of the quality of lake water, fishery, and overall environment; residents' familiarity with aquatic invasive species and aquatic plants; residents' perceptions of current and ideal shoreline landscaping; and residents' interests in a variety of workshops. The survey, data tables, and other information related to the survey are in the appendix.

One-third of the questionnaires (996) were returned completed, representing 51 lakes. Of the returned questionnaires, 576 (58%) provide information on the ten lakes in the Bear River watershed and of these, 102 (18%) focus on White Sand Lake.

Tables showing results of the survey are presented throughout the rest of this section. Care should be taken when interpreting the survey data because in many cases the number of respondents for White Sand Lake is very low.

Assessing Lake Health

Medical doctors assess human health by examining a patient's blood work, height, weight among numerous other measures (quantitative data) and by considering information like the patient's answers to questions, comments, even body language (qualitative data). Similarly, lake managers assess lake health by examining the lake's oxygen, nitrogen, phosphorus, among other measures (quantitative data) and by considering additional information about the lake like the presence of aquatic invasive species, nuisance aquatic plants, or even presence of trash (qualitative data).

White Sand Lake Health Report

Assessing the health of White Sand Lake has included examining qualitative and quantitative data pertinent to the lake's biology, chemistry, nutrients, habitat, bacteria, aesthetics, and fish tissue. These categories are introduced in the next few pages and are addressed at length in the rest of the section.

Table 21-2 shows the categories, their subdivisions (Indicator Assessments), and the ratings that have been applied to them, *Excellent*, *Good*, *Fair*, *Poor*, *Concern* or *Not Assessed* (See Section 10 for details on rating).

The Biology Category reflects an assessment of the number and magnitude of invasive species. White Sand Lake has rusty crayfish, freshwater jellyfish, and purple loosestrife, but none at the nuisance level. Other than purple loosestrife, the lake does not have any invasive plants.[17] The floristic quality index[18] is good (FQI 34.5), and the lake's overall status for the Biology Category is *good*.

The Chemistry Category reflects an assessment[19] of data for dissolved oxygen, pH, temperature, ionic strength, and suspended solids as compared to water quality standards criteria.[20] Dissolved oxygen for White Sand Lake during the summer can reach below 5mg/L, the criteria for cool water fish, so it has a status of *good*. White Sand Lake's overall status for the Chemistry Category is *excellent*.

Table 21-2. Assessment Categories and Indicator Values for White Sand Lake

Category	Indicator Assessment		Overall Status
Biology	Invasive aquatic plant	Excellent	Good
	Invasive fish	Excellent	
	Invasive invertebrate	Good	
	Invasive wetland plant	Good	
	FQI	Good	
Chemistry	Dis. Oxygen (DO)	Good	Excellent
	pH pH	Excellent	
	Temperature	Excellent	
	Ionic Strength	Excellent	
	Sus. Solids (SS)	Excellent	
Nutrients	Phosphorus P	Excellent	Excellent
	Chlorophyll *a*	Excellent	
Habitat	Plants H	Good	Good
	Riparian Zone	Good	
	Littoral Zone	Good	
Bacteria	Bacteria	NA	NA
Aesthetics	Oil & Grease	Excellent	Excellent
	Taste & Odor	NA	
	Turb/Color	Excellent	
	Nuisance Plants	Good	
	Trash/Debris	Good	
Tissue	Spec. Chem. H	Concern	Concern
Lake Level	Level	NA	NA

The Nutrients Category reflects an assessment[21] of data for phosphorus and Chlorophyll *a* levels as compared to National Lake Survey (NLS) thresholds[22] for the upper Midwest ecoregion health conditions and for the upper limit compared to Wisconsin's new water quality standards for a two-story fishery lake.[23] The NLS was a study of Lakes across the United States, and thresholds for good, fair and poor were developed based on the data collected for each ecoregion. White Sand Lake's overall status for the Nutrients Category is *excellent* as average total phosphorus is 11.20µg/L, and Chlorophyll *a* is 3.1µg/L.

The Habitat Category reflects an assessment[24] of White Sand Lake's aquatic plants, riparian zone (shoreline), and littoral zone (shallow water along shoreline). Comparisons are made with ecoregional data and National Lake Survey thresholds.[25] All indicators for White Sand Lake have a rating of *good*. White Sand Lake's overall status for the Habitat Category is *good*.

The Bacteria Category reflects an assessment[26] of summer *E. coli* measurements that were taken weekly and then compared to Water Quality Standards criteria[27] for human health protection. White Sand Lake does not have a public beach so the lake was not assessed for bacteria.

The Aesthetics Category reflects an assessment of data and information on water quality, color, and turbidity as well as an assessment of reports received by the Tribal Natural Resources Department for White Sand Lake on the presence of oil, grease, nuisance aquatic plants, and trash/debris. This information is compared to narrative criteria as described in the Water Quality Standards.[28] White Sand Lake's overall status for the Aesthetics Category is *excellent*.

The Tissue Category reflects an assessment of the amount of mercury in the flesh of fish in White Sand Lake as compared to the Water Quality Standards.[29] Larger edible fish have more mercury in their flesh than what is protective for human health concerns. White Sand Lake's overall status for the Tissue Category is of *concern*.

The lake levels were assessed for White Sand Lake but a condition criteria has not been developed at this time. Information about lake levels is presented at the end of this section.

Biology Category

Biology is the science of living organisms. The organisms that live together in the lake interact in large part based on their food relationships. The food pyramid for lakes (Figure 21-3) shows the proportion of biological production to the yield of large fish. The organisms are in balance after thousands of years of naturally evolving together within these food relationships.

Invasive species, however, are organisms that evolved originally in other locations and when they move into a naturally balanced area disrupt the native organisms' relationships.

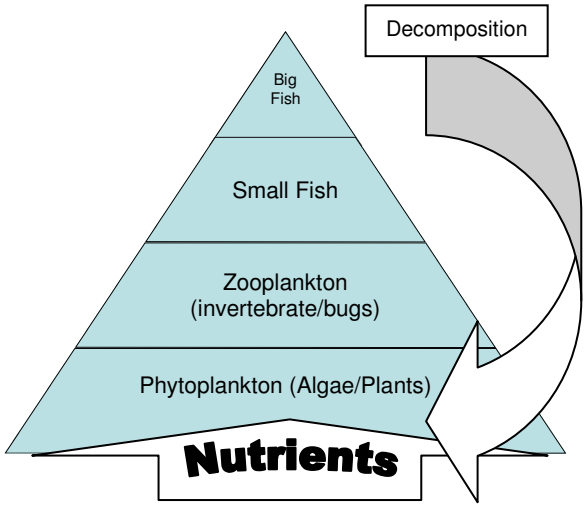

Figure 21-3. Lake Food Pyramid

Invasive species are a great concern. Their introduction can cause changes of native organisms' distribution and abundance and contribute to water quality degradation. The introduction of the invasive aquatic plant, Eurasian water milfoil, can cause the reduction in large game fish as the native insects and small fish have not evolved to eat EWM, causing a loss of food resource for large fish and an overabundance of plant matter.

White Sand Lake has rusty crayfish, freshwater jellyfish, and purple loosestrife (see Section 7 for specifics). At this time, however, there is no evidence that they are disturbing the abundance or distribution of native organisms or causing economic or ecological harm.

To help determine the extent of residents' familiarity with Aquatic Invasive Species (AIS), the community survey asked residents to answer a few questions about AIS. Their responses to some of the questions follow.

Residents were asked if they had heard of AIS before reading about them in the survey. For White Sand Lake, 34 of 102 respondents (33%) indicate they had prior knowledge of AIS as compared to 171 of 576 (30%) for respondents of the ten lakes in the Bear Watershed, and 300 of 996 (30%) for all respondents from Lac du Flambeau.

Residents having prior knowledge of AIS were shown a list of AIS and then asked which, if any, are currently in the lake. Table 21-3 shows the responses of 34 residents for White Sand Lake. The table also shows whether the AIS are actually in the lake. For example, 3 of the 34 residents believe that Eurasian water milfoil is in the lake, when in fact it is not. The table shows there is a general disconnection between residents' perceptions of the presence of AIS and the actual presence of AIS.

Table 21-3. White Sand Lake - Perceived vs Actual Presence of AIS

AIS	# Respondents	Perceived Presence	Actually Present
Banded Mystery Snail	2 of 34	6%	No
Eurasian Water Milfoil	3 of 34	9%	No
Rainbow Smelt	0 of 34	0%	No
Chinese Mystery Snail	2 of 34	6%	No
Freshwater Jellyfish	1 of 34	3%	Yes
Rusty Crayfish	5 of 34	15%	Yes
Curly-leaf Pondweed	1 of 34	3%	No
Purple Loosestrife	7 of 34	21%	Yes
None of Above	9 of 34	27%	

The same 34 respondents were asked to identify what they believe is threatened by AIS. Table 21-4 summarizes the responses for White Sand Lake, the ten lakes in the Bear River Watershed, and the 51 lakes in the survey. The largest percentages of responses for all three groups of respondent's show that native fish, aquatic plants, and water quality are most threatened. The lowest percentage of responses for all three groups of respondents is for air quality.

Table 21-4. White Sand Lake - Perceived to be Threatened by Aquatic Invasive Species

	White Sand Lake		Bear River Lakes		All Lakes	
	# Respondents	%	# Respondents	%	# Respondents	%
Native Fish	13 of 34	38%	75 of 171	44%	113 of 302	37%
Air Quality	0 of 34	0%	9 of 171	5%	16 of 302	5%
Aquatic Plants	9 of 34	27%	60 of 171	35%	92 of 302	31%
Wetlands	1 of 34	3%	31 of 171	18%	45 of 302	15%
Shoreline Plants	7 of 34	21%	47 of 171	28%	72 of 302	24%
Amphibians	2 of 34	6%	33 of 171	19%	48 of 302	16%
Water Quality	16 of 34	47%	83 of 171	49%	125 of 302	41%
Crustaceans	3 of 34	9%	32 of 171	19%	42 of 302	14%
Other	0 of 34	0%	5 of 171	3%	8 of 302	3%
None	7 of 34	21%	28 of 171	16%	72 of 302	24%

The same residents were also asked if they are concerned about AIS getting into the lake. Table 21-5 shows that for 34 respondents for White Sand Lake, 48% indicate *extremely concerned*, 39% *somewhat concerned,* 7% *not too concerned*, 0% *not concerned at all*, and 7% *unsure*. Data for all three reference groups shows respondents have great concern about AIS getting into the lakes.

Table 21-5. White Sand Lake - Concern about AIS Getting into the Lake

Lake	# Respondents	Extremely	Somewhat	Not Too	Not at All	Unsure
White Sand Lake	34	48%	39%	7%	0%	7%
Bear River Lakes	170	49%	41%	4%	0%	7%
All Lakes	294	42%	42%	9%	2%	6%

The same residents were asked if they have been taking time to look for AIS in the lake. Table 21-6 shows that for 32 respondents affiliated with White Sand Lake, 38% indicate *not at all*, 34% *once a season*, 22% *monthly*, 6% *weekly*, and 0% *daily*.

The data for White Sand Lake is similar to the data for the other lakes and shows that despite concern for AIS, very few residents indicate they spend time looking for AIS regularly.

Table 21-6. White Sand Lake - Time Spent Checking for AIS During Open Water Season

	White Sand Lake		Bear River Lakes		All Lakes	
	# Respondents	%	# Respondents	%	# Respondents	%
Not at all	12 of 32	38%	66 of 161	41%	114 of 280	41%
Once a Season	11 of 32	34%	45 of 161	28%	85 of 280	30%
Once a Month	7 of 32	22%	30 of 161	19%	47 of 280	17%
Once a Week	2 of 32	6%	12 of 161	8%	21 of 280	8%
Once a Day	0 of 32	0%	8 of 161	5%	13 of 280	5%

Chemistry Category

Chemistry is the science of matter and its properties and composition with a particular focus on the properties of chemical bonds. Dissolved oxygen, pH, temperature, ionic strength, and suspended solids each have a particular role in chemical bonding and movement of chemicals within the lake.

Seasonal changes and water temperature of the lake have an impact on the amount of dissolved oxygen in the lake, important for fish respiration and viability (see Section 9, *Understanding Lake Data*).

Dissolved oxygen in White Sand Lake during the summer and late winter can reach below 5mg/L, the minimum criteria for cool water fish (Figure 21-4). Lake whitefish (*Coregonus elupeaformis*), for example, is a cool water fish that is very susceptible to temperature and dissolved oxygen. White Sand Lake has had occasional die-offs of whitefish in the shallow parts of the lake where the fish were confined.

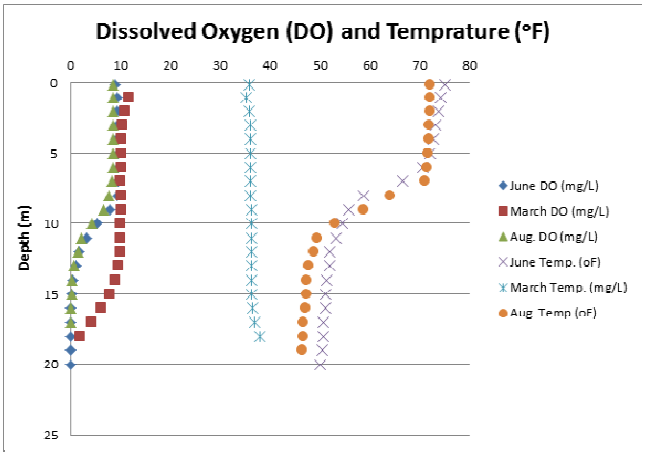

Figure 21-4. Dissolved Oxygen and Temperature Values for White Sand Lake at Various Depths

Calcium for White Sand Lake as measured in 1990 was on average 3 mg/L, quite low, meaning White Sand may be less susceptible to infestations of Zebra Mussels.

Nutrients Category

Based on Secchi, total phosphorus, and chlorophyll data, White Sand Lake's trophic state is mesotrophic, meaning it has medium amounts of nutrients to support a productive food web. A productive food web includes a diversity of rooted plants, macro-invertebrates (insects), and healthy fish populations.

Phosphorus and nitrogen are two nutrients that play key roles in limiting the growth of aquatic plants and algae (see Section 9, *Understanding Lake Data*). Of these, phosphorus is most critical to White Sand Lake.

Phosphorus originates from sources like human and animal wastes, soil erosion, detergents, septic systems and runoff from lawns. Phosphorus is the limiting nutrient for White Sand Lake, meaning that when the amount of phosphorus increases, the probability of algae growth also increases. Total phosphorus between 10 and 18ug/L is associated with mesotrophic lakes and medium production of biomass (Figure 21-5).

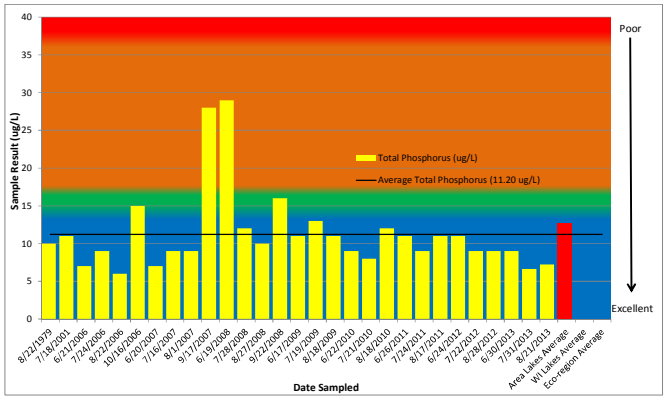

Figure 21-5. Total Phosphorus Concentration Trends in White Sand Lake

As the amount of algae increases, it is likely that the amount of chlorophyll *a* increases. Chlorophyll *a* is a green pigment present in all plant life and is necessary for photosynthesis. The amount of Chlorophyll *a* is a common measure of water quality (Figure 21-6).

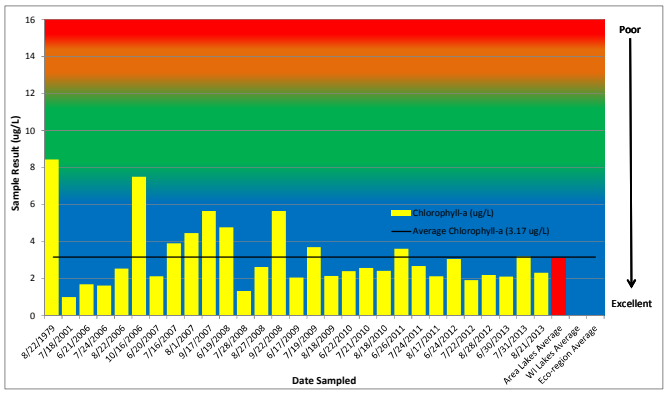

Figure 21-6. Chlorophyll *a* Concentration Trends in White Sand Lake

Figure 21-7 shows Secchi depth, total phosphorus, and Chlorophyll *a* trends for White Sand Lake from 1979 until present. No significant change in water quality is noted over this time period.

White Sand Lake's shoreline includes primarily seasonal residences and properties. Though the lake's shoreline has been almost completely developed, the watershed overall remains forested. More growth and development are expected, however, on the Highway 47 corridor with the arrival of new residents and requisite housing, roads, businesses, and support services (Figure 21-8).

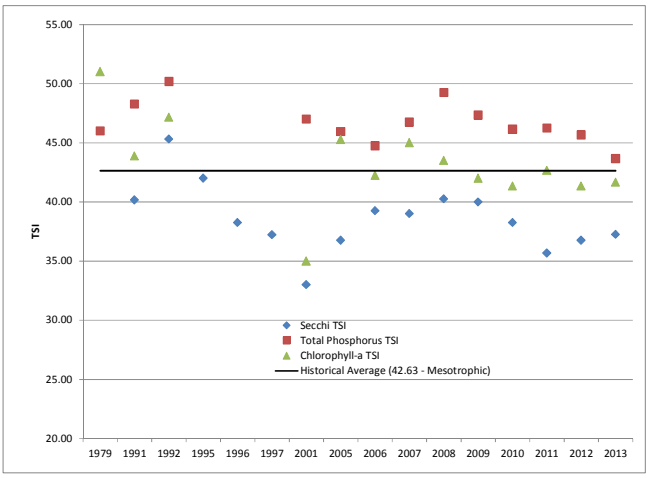

Figure 21-7. Secchi Depth, Total Phosphorus, and Chlorophyll *a* Trends for White Sand Lake

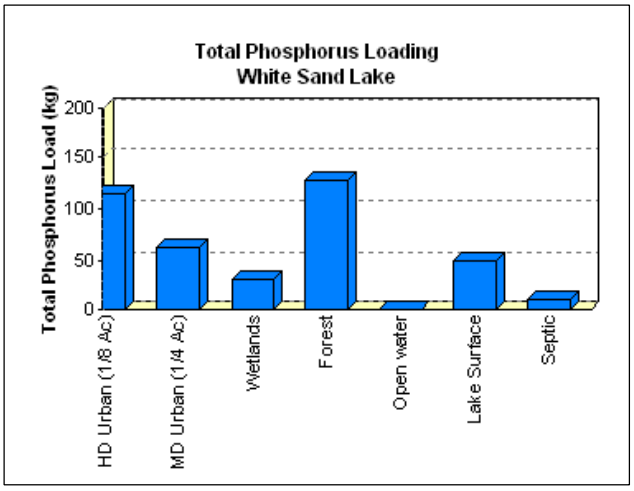

Figure 21-8. Phosphorus Loading Sources for White Sand Lake

Future amounts of phosphorus for White Sand Lake can be anticipated by using a tool (Wisconsin Lake Modeling Suite - WiLMS) designed to predict phosphorus levels based on changes of land use in the watershed (Figure 21-9).

Use of the WiLMS tool reveals that high and medium disturbance areas characterized by the presence of roads, homes, buildings, parking areas, and lawns, yield the most total phosphorus per unit area. Forested and wetland areas contribute less total phosphorus as the runoff is slowed and allowed to seep into the ground instead of washing into the lake transporting sediment and phosphorus.

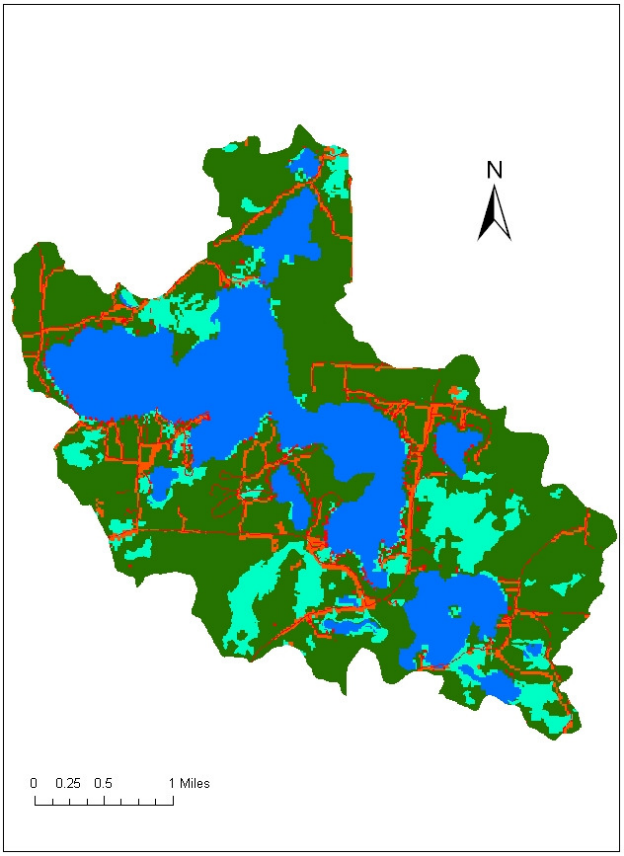

Figure 21-9. White Sand Lake Watershed Land Uses (Red – Developed; Blue – Open Water; Light Green – Wetland; Dark Green – Forest)

Habitat Category

Habitat refers to a specific place that is inhabited by a particular organism. Habitat includes all that the organism needs to live, including physical factors such as soil, temperature, light; and biotic factors, such as the availability of food and shelter from predators. The Habitat category includes substrate (rock, sand, muck); aquatic plants; riparian zone (shoreline); and littoral zone (shallow water along shoreline).

Substrates are the surfaces on which organisms grow, and rock, sand, and muck are the primary substrates of a lake. Figure 21-10 shows the distribution of White Sand Lake's substrates. Substrates often indicates the type of plants that will grow in an area. The diversity of White Sand Lake's substrates is important to the health of the lake's fishery.

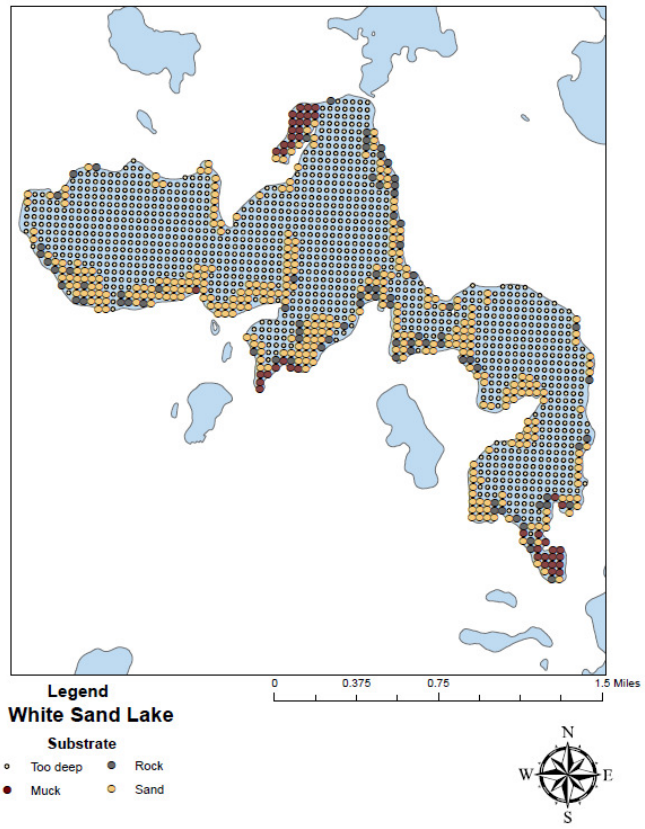

Figure 21-10. Substrate Map of White Sand Lake

Aquatic plants (macrophytes) are plants that grow in the water either submerged (all under water), emergent (sticking out of the water), or floating leaf. The north end of White Sand Lake has a large area of dense submerged plants with the most predominant being fern pondweed.

The Tribal Natural Resources Department assessed the aquatic plants in White Sand Lake in 2010 by following the Wisconsin Department of Natural Resources Protocol for conducting an aquatic plant point intercept survey (see Section 8).

Table 21-7 presents the statistics associated with the point intercept survey, and Figure 21-11 shows plant locations and additional data. The table shows that of the 681 sites sampled, vegetation was found at 232 sites and 461 sites were shallower than the maximum depth of plants, 20 feet. The total number of plant species found (Taxonomic Richness - Frequency of Occurrence) was 32 plants, and the Simpson Diversity Index was 0.91. (See Section 8 for detailed explanations of the terms).

- Frequency of occurrence is an estimate of how often a particular plant species is likely to be found within a lake. The estimate is based on an analysis of the data collected during the point intercept survey.
- Simpson's Diversity Index is a measure of how diverse a plant community is in the lake. The index is within a range of 0 to 1. The higher the value, the more diverse the plant community is in a particular lake. Plant diversity is an indicator of the lake's overall resiliency. Generally, a lake with high species diversity is considered to be more stable than a lake with low species diversity because it has a greater ability to withstand environmental fluctuations. A lake with a diverse plant community is better equipped to compete with exotic infestations than is a lake with low diversity.

Table 21-7. 2010 Aquatic Plant Community Statistics, White Sand Lake, Vilas County, WI

Aquatic Plant Community Statistics	2010
Total sites sampled	681
Total sites with vegetation	232
Total site shallower than max depth of plants	461
Frequency of occurrence at sites shallower than maximum depth of plants	50.33%
Simpson Diversity Index	0.91
Maximum Depth of Plants (Feet)	20
Taxonomic Richness (Number Taxa)	32
Average Number of Species per Site (sites less than max depth of plant growth)	0.95
Average Number of Species per Site (sites with vegetation)	1.90

* - There was one specie sampled that was not identified.

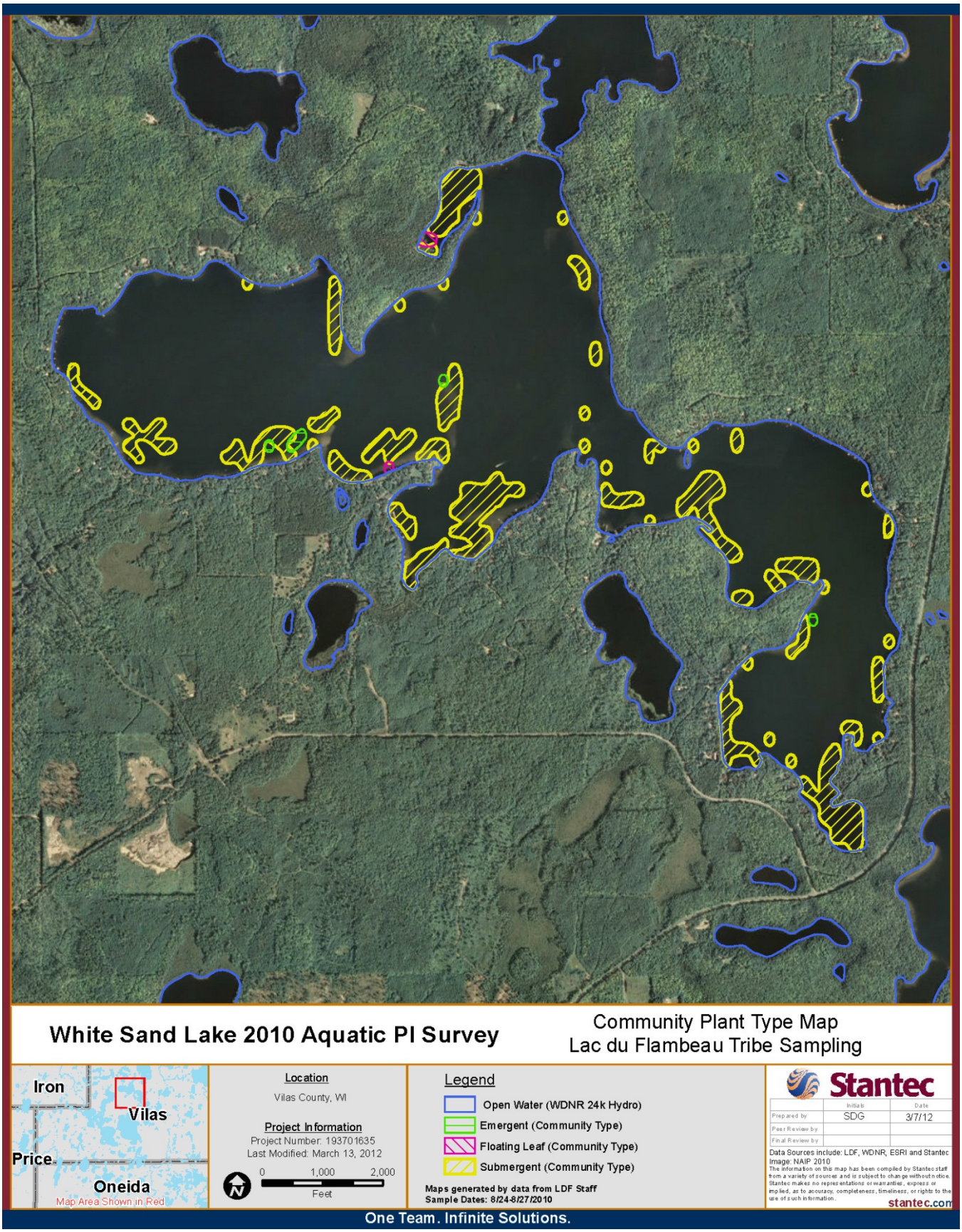

Figure 21-11. White Sand Lake 2010 Aquatic Point Intercept Survey

Table 21-8 lists the aquatic plants found in White Sand Lake and shows the Floristic Quality Index (FQI) for the lake. The FQI is the extent to which a lake's plant community is similar to that of a pristine or undisturbed lake. The higher the floristic quality index, the closer a lake is to an undisturbed system. FQI is used to determine whether a lake's plant community is changing over time. It is also used to determine the extent to which a lake's plant community is similar to other lakes in the same ecoregion. The Floristic Quality Index for White Sand Lake was 34.5, meaning most of the plants can tolerate moderate disturbances (see Section 8).

Littoral Zone Habitat

The littoral zone extends along the shoreline from the water's edge into the water to a depth of about 20 feet for White Sand Lake. This is the area where most of the aquatic plants grow, providing shelter for fish to reproduce and protect their young. The plants also reduce erosion caused by waves, stabilizing the shoreline.

To help determine the extent of residents' perceptions of aquatic plants, the survey asked residents if their enjoyment of the lakes was impeded by the presence of aquatic plants in the littoral zone. Table 21-9 shows that 45% of 98 residents from White Sand Lake indicate *never*, 39% *rarely*, 15% sometimes, 1% *often*, and 0% *always*. When comparing the data for White Sand Lake with the data for the other lakes, it appears that aquatic plants are perceived to be somewhat of a less impediment.

Residents were asked if they or members of their households have tried to control aquatic plant growth by removing plants from the lake. Table 21-10 shows that 85% of 94 respondents for White Sand Lake indicate *never*, 12% *some years*, and 3% *yearly*.

Residents were also asked if they or members of their household have removed trees that have fallen into White Sand Lake. Table 21-11 shows that 62% of 95 respondents indicate *never*, 37% *some years*, and 1% *every year*. The data for the respondents of White Sand Lake are very similar to the data to the other lakes. They rarely remove trees that have fallen into the lake.

Residents were asked whether there is a need to control aquatic plants for White Sand Lake. Table 21-12 shows that 10% of 94 respondents indicate *definitely no*, 28% *probably no,* 22% *probably yes,* and 7% *definitely yes*. Thirty-three percent indicate they are *not sure*.

Residents were asked what should be done if an aquatic invasive plant is found in the lake. Table 21-13 shows that for 34 respondents for White Sand Lake, 24% indicate *remove with chemicals,* 24% *remove mechanically*, 32% *remove with biological control*, 50% *remove by hand,* 0% *do nothing/no treatment*, and 41% indicate they *need more information*. When considering the data for all methods and lakes, it is evident that respondents seem most comfortable with removing aquatic plants by hand, and they want more information on the topic.

Table 21-8. 2010 Floristic Quality Index, White Sand Lake, Vilas County, WI

Genus	Species	Common Name	Coefficient of Conservatism C
Alisma	*triviale*	Northern water plantain	4
Bidens	*beckii*	Water marigold	8
Brasenia	*schreberi*	Watershield	6
Ceratophyllum	*demersum*	Coontail	3
Chara	*sp.*	Muskgrass	7
Eleocharis	*acicularis*	Needle spikerush	5
Eleocharis	*erythropoda*	Bald spikerush	3
Eleocharis	*robbinsii*	Robbins' spikerush	10
Elodea	*canadensis*	Common waterweed	3
Eriocaulon	*aquaticum*	Pipewort	9
Heteranthera	*dubia*	Water star-grass	6
Isoetes	*sp.*	Quillwort	8
Juncus	*pelocarpus*	Brown-fruited rush	8
Myriophyllum	*sibiricum*	Northern water-milfoil	6
Myriophyllum	*tenellum*	Dwarf water-milfoil	10
Najas	*flexilis*	Slender naiad	6
Nymphaea	*odorata*	White water lily	6
Potamogeton	*amplifolius*	Large-leaf pondweed	7
Potamogeton	*epihydrus*	Ribbon-leaf pondweed	8
Potamogeton	*foliosus*	Leafy pondweed	6
Potamogeton	*gramineus*	Variable pondweed	7
Potamogeton	*illinoensis*	Illinois pondweed	6
Potamogeton	*pusillus*	Small pondweed	7
Potamogeton	*richardsonii*	Clasping-leaf pondweed	5
Potamogeton	*robbinsii*	Fern pondweed	8
Potamogeton	*strictifolius*	Stiff pondweed	8
Potamogeton	*zosteriformis*	Flat-stem pondweed	6
Schoenoplectus	*acutus*	Hard-stem bulrush	6
Stuckenia	*pectinata*	Sago pondweed	3
Utricularia	*vulgaris*	Common bladderwort	7
Vallisneria	*americana*	Wild celery	6
		Total Species	32
		Mean C	6.41
		Floristic Quality Index (FQI)	**34.5**

Please note: There is no Coefficient of Conservatism for exotic species such as Eurasian Water-Milfoil or for species not identified to the species level (*Sagittaria sp.*).

Coefficient of Conservatism C

0-3 taxa found in wide variety of plant communities and very tolerant of disturbance.

4-6 taxa typically associated with specific plant communities and tolerate moderate disturbance.

7-8 taxa found in narrow range of plant communities and tolerate minor disturbance.

9-10 taxa restricted to a narrow range of synecological conditions, with low tolerance of disturbance.

Table 21-9. White Sand Lake - Whether Aquatic Plants Impede Enjoyment of the Lake

Lakes	# Respondents	Always	Often	Sometimes	Rarely	Never
		%	%	%	%	%
White Sand Lake	98	0%	1%	15%	39%	45%
Bear River Lakes	556	3%	4%	16%	44%	33%
All Lakes	957	3%	7%	21%	40%	29%

Table 21-10. White Sand Lake - Removal of Aquatic Plants from the Lake

Lakes	# Respondents	Yearly	Some Years	Never
		%	%	%
White Sand Lake	94	3%	12%	85%
Bear River Lakes	458	6%	14%	80%
All Lakes	816	8%	18%	74%

Table 21-11. White Sand Lake - Removal of Fallen Trees from the Lake

Lakes	# Respondents	Yearly	Some Years	Never
		%	%	%
White Sand Lake	95	1%	37%	62%
Bear River Lakes	456	2%	27%	72%
All Lakes	814	1%	24%	75%

Table 21-12. White Sand Lake - Whether Aquatic Plant Control is Needed

	White Sand Lake	Bear River Lakes	All Lakes
	94 Respondents	503 Respondents	868 Respondents
Definitely yes	7%	8%	8%
Probably yes	22%	21%	19%
Probably no	28%	27%	29%
Definitely no	10%	9%	12%
Unsure	33%	35%	32%

Table 21-13. White Sand Lake - Preferences for Treating/Removing Aquatic Invasive Plants

	White Sand Lake	Bear River Lakes	All Lakes
	34 Respondents	171 Respondents	302 Respondents
Apply chemicals	24%	18%	15%
Use machines	24%	21%	19%
Bio-control	32%	25%	24%
No treatment	0%	3%	2%
Pull by hand	50%	49%	51%
Need more info.	41%	41%	41%

Riparian Zone Habitat

The riparian zone is the land area along the shoreline from the water's edge inland. In general this area is where most people access the lake via stairs or paths. It sometimes includes boathouses, storage sheds, homes, lawns, and other structures.

The riparian zone contributes the most nutrients from erosion, fertilizers, septic systems, and general habitat runoff. The area is critical in providing woody for fish and leaf material for invertebrates, like the dragon fly which lives a life cycle requiring both water and land. It is also critical in providing habitat to sustain other animals that rely on the lakes, like song birds, eagles, loons, otter, deer, along with a multitude of other creatures. A poor riparian habitat often results in fewer species and excess nutrients, while a good riparian habitat is replete with abundant wildlife and healthy levels of nutrients.

To help determine the extent of residents' perceptions of the riparian zone, the community survey asked residents to describe the landscape in the 35 foot buffer between the shoreline and their house, and to identify what they believe should be in an ideal landscape for the same area.

Table 21-14 lists several landscape features ordinarily found in riparian zones. Residents were asked to check those features that characterize the

current riparian landscape (Current) for their property and then check those features that they believe should be in an ideal riparian landscape (Ideal). The table compares residents' descriptions of the current landscape with their perceptions of an ideal landscape. For example, 34% of respondents affiliated with White Sand Lake identify mowed grass as a feature of the current buffer zone for their property, yet 25% of them identify mowed grass in an ideal landscape.

Table 21-14. White Sand Lake - Current Shoreline Landscaping vs Ideal Shoreline Landscaping

	White Sand Lake		Bear River Lakes		All Lakes	
	99 Respondents		481 Respondents		847 Respondents	
	Current	Ideal	Current	Ideal	Current	Ideal
Mowed grass	34%	25%	45%	30%	41%	28%
Rock terrace	26%	28%	19%	24%	16%	20%
Wild	47%	28%	44%	26%	44%	28%
Native prairie grasses	26%	26%	24%	27%	26%	24%
Wood terrace	6%	10%	4%	9%	5%	9%
Sand beach	18%	22%	25%	31%	26%	33%
Rain garden	0%	5%	2%	6%	2%	4%
Flower gardens	14%	12%	10%	10%	9%	9%
Shrubs	32%	22%	36%	25%	31%	22%
Wild with wood picked up	19%	24%	23%	21%	27%	22%
Trees	68%	48%	70%	50%	66%	47%
Something else	4%	3%	3%	2%	4%	3%
It doesn't matter		8%		7%		7%

The current primary features identified by all three respondent groups include mowed grass, wild, shrubs, and trees. When characterizing the ideal landscape, the same respondents prefer landscapes characterized by less mowed grass and less wild with fewer trees and shrubs, but more sand beach.

Residents were asked if they are interested in learning about landscape designs tailored to help protect the lakes and habitats. Table 21-15 shows that of 89 respondents for White Sand Lake, 5% indicate *no interest,* 37% *little interest*, 2% *some interest,* 10% *a lot of interest*, and 46% *don't know*.

Table 21-15. White Sand Lake - Interest in Learning About Landscape Design

	White Sand Lake	Bear River Lakes	All Lakes
	89 Respondents	443 Respondents	787 Respondents
No interest	5%	4%	4%
Little interest	37%	40%	40%
Some interest	2%	5%	6%
A lot of interest	10%	11%	11%
Don't know	46%	40%	39%

Assessment of Riparian & Littoral Zones

The Habitat Category reflects an assessment of White Sand Lake's aquatic plants, riparian zone (shoreline), and littoral zone (shallow water along shoreline). Comparisons are made with ecoregional data, National Lake Survey thresholds and WISCALM (Table 10-4).

Riparian cover includes cover-class estimates of large and small diameter tree cover in the >5m high vegetation layer; woody and non-woody vegetation in the mid-layer (0.5 to 5 m); and woody, non-woody, inundated, and barren classes in the ground cover layer (<0.5 m) of the 10 lakeshore plots. Littoral cover index excludes submerged aquatic macrophytes, but increases the weighting of floating and emergent macrophytes.

Table 21-16 compares the thresholds developed by WISCALM for Plants and the National Lake Survey for Riparian Zone and Littoral Zone to the index value calculated based on the assessment of White Sand Lake's habitat.

Table 21-16. Index Values for Environmental Assessment Parameters

Indicator Assessment	Index Value	Water Quality Assessment Thresholds			
		Excellent	Good	Fair	Poor
Plants	50.33	Below 79.7%	89.7% - 79.8%	89.8% - 94.8%	100% - 94.9%
Riparian Zone	1.25		>0.8074	0.5906-0.8074	<0.5906
Littoral Zone	1.46		>0.7001	0.4156-0.7001	<.4156

Lakeshore habitat is the biggest problem in the nation's lakes; over one-third exhibit poor Shoreline condition. Poor biological health is three times more likely in lakes with poor lakeshore habitat.[30]

To help learn about residents' perceptions on habitat and environmental change, the community survey asked residents if elements of the habitat have been changing over time. Table 21-17 shows the responses for White Sand Lake, the Bear project lakes, and the other lakes. The data are very similar for all three response groups. The predominant response is *no change*.

Bacteria Category

Bacteria is assessed based on a measure of the most probable number (MPN) of *E. coli* in 100 milliliters of water. *E. coli* is the abbreviated name of the bacterium in the family *Enterobacteriaceae*, named *Escherichia coli*. The presence of *E. coli* in our intestines is normal. The presence of *E. coli* in swimming areas indicates that other microorganisms (including the ones that could causes illness) that live in the gastrointestinal track could also be present. The water quality criterion to protect human health, 235 MPN, is based on an illness rate of eight per 1,000 swimmers. White Sand Lake does not have a public swimming beach so bacteria is not assessed for White Sand Lake.

Generally, the Tribe is responsible for septic systems on property owned by the Tribe, and Vilas County is responsible for septic systems on property on non-Tribal land. Currently, all septic systems

Table 21-17. White Sand Lake - Perceptions of Environmental Change

	Shorelines	Wetlands	Streams	Air	Forests	Grasslands	All Environment
White Sand Lake							
#Respondents	94	90	89	94	93	90	95
Improving	2%	0%	0%	1%	3%	0%	4%
No change	52%	53%	46%	73%	53%	43%	52%
Worsening	33%	9%	9%	10%	26%	12%	28%
Don't know	13%	38%	45%	16%	18%	44%	16%
Bear River Lakes							
#Respondents	534	522	513	522	524	513	526
Improving	5%	3%	1%	3%	4%	2%	5%
No change	52%	51%	42%	68%	52%	48%	54%
Worsening	30%	12%	11%	8%	24%	10%	23%
Don't know	13%	34%	46%	22%	20%	40%	18%
All Lakes							
#Respondents	923	901	873	909	910	882	903
Improving	4%	2%	1%	3%	4%	2%	4%
No change	56%	55%	45%	71%	57%	52%	59%
Worsening	28%	12%	9%	5%	20%	7%	19%
Don't know	13%	31%	45%	21%	19%	40%	18%

under the jurisdiction of Vilas County are on a three-year pumping/inspection schedule.

Residents were asked how often they have their septic tank inspected. Table 21-18 shows that for 63 respondents of White Sand Lake, 0% indicate they *do not own the property*, 86% *at least every three years*, 0% *no septic tank*, 10% *more than every three years*, and 5% *no inspection*.

Table 21-18. White Sand Lake - Septic Tank Inspection

	White Sand Lake	Bear River Lakes	All Lakes
	63 Respondents	360 Respondents	609 Respondents
Do not own property	0%	7%	4%
At least every 3 years	86%	67%	71%
No tank	0%	9%	6%
More than every 3 years	10%	12%	12%
No inspection	5%	6%	7%

Aesthetics Category

The Aesthetics Category includes data and information on water quality, color, and turbidity. It also reflects an assessment of reports received by the Tribal Natural Resources Department for White Sand Lake on the presence of oil, grease, nuisance aquatic plants, trash, and debris.

Reports and concerns submitted by residents to the Tribal Natural Resources Department on the turbidity and color of the lake water are not uncommon.

The extent to which lake water appears to be clear or murky is a function of the total amount of solids that are suspended in the water. Generally, the greater the amount of suspended solids in the water, the murkier it appears.

The major source of turbidity in open water away from shore is typically phytoplankton (algae). Closer to shore, suspended matter also comes from sources such as septic systems, sewage treatment plants, storm runoff, shoreline erosion and lake bottom sediments.

The major effect of turbidity noticed by lake property residents might simply be aesthetic - people do not like to look at dirty water. High levels of turbidity can, however, cause major problems by inhibiting the penetration of light, leading to the suffocation of larvae, damage to fish gills, fish reproduction, and loss of aquatic plants and habitat.

Turbidity or cloudy water can be measured in a variety of ways. A method commonly used in Lac du Flambeau to measure water clarity is to employ a Secchi disk. The 8-inch diameter disk with white and black quadrants is tied to a line and lowered slowly down into the water. The depth at which the white quadrants are no longer visible is taken as a measure of the transparency of the water. This information provides a way to look at changes in water clarity over a long period of time. Secchi data also correlates to total phosphorus and trophic state index data. Figure 21-12 shows that over the past 22 years no significant change in water clarity has occurred for White Sand Lake.

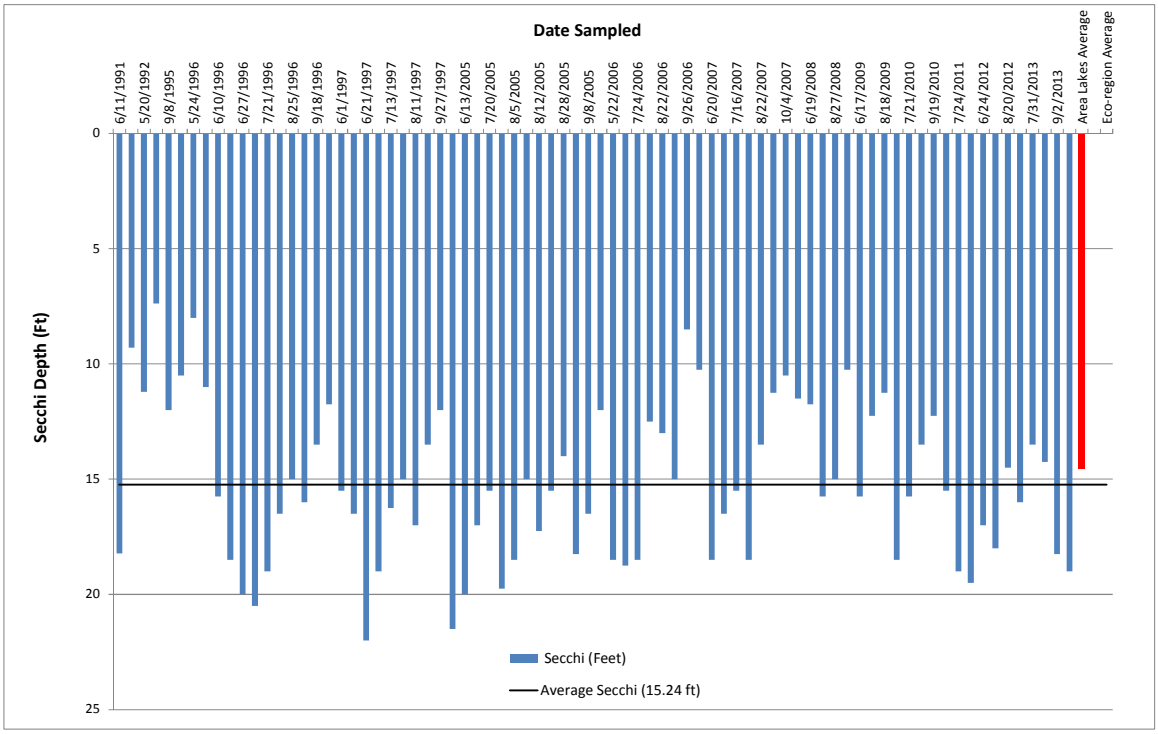

Figure 21-12. Secchi Depth Trends for White Sand Lake

The Secchi disk was created by Father Pietro Angelo Secchi in 1865. He was a priest, astronomer, and professor of physics who taught for a time at Georgetown University in Washington, DC.[31]

The color of lake water reflects the type and amount of dissolved organic chemicals it contains. Transparent water with a low accumulation of dissolved materials appears blue and indicates low productivity. Dissolved organic matter, such as humus, peat or decaying plant matter, can produce a yellow or brown color. Some algae produce a reddish or deep yellow color. Water rich in phytoplankton and other algae usually appears green.

Volunteers for White Sand Lake have been subjectively observing and recording the lake's water color since 1995 as part of the WDNR's Citizen Lake Monitoring Network. Table 21-19 summarizes the observations for the North location and Table 21-20 for the Deep Hole location. The numbers preceding the colors indicate the number of dates of observation. For the North location, blue was recorded 19 times, green 5 times, and brown 1 time. For the Deep Hole location (Table 21-20), blue was recorded 23 times, green 12 times, and brown 1 time. The specific dates of the observations are available on the Citizen Lake Monitoring website at http://dnr.wi.gov/lakes/clmn/. The website also shows that despite the variations in water color, the observers reported that, with very few exceptions, the water appeared to be clear as opposed to murky.

Table 21-19. White Sand Lake North - Lake Water Color

Year	May	June	July	August	Sept	Oct
2007	1 Blue	1 Blue 1 Green		1 Blue 1 Green		1 Green
2008		1 Green		1 Blue	1 Brown	
2009		1 Green	1 Blue	1 Blue		
2010	1 Blue		1 Blue	1 Blue	1 Blue	
2011		1 Blue	1 Blue	1 Blue		
2012		1 Blue	1 Blue	1 Blue 1 Green		
2013		1 Blue	1 Blue	1 Blue		

Table 21-20. White Sand Lake Deep Hole - Lake Water Color

Year	May	June	July	August	Sept	Oct
1996	1 Blue	2 Blue	1 Blue 1 Green	2 Green	3 Green	
1997		3 Blue	2 Blue		1 Blue	
2005		2 Blue	2 Blue	5 Blue 1 Green	1 Green	1 Blue
2006	1 Green		2 Blue	1 Blue 1 Green	2 Green	1 Blue
2007					1 Blue	1 Brown
2013					2 Blue	
1996	1 Blue	2 Blue	1 Blue 1 Green	2 Green	3 Green	

In order to learn about residents' perceptions of the lake water quality, the community survey posed a few questions about water quality. Residents were asked to describe the current water quality of White Sand Lake and whether they believe that quality has been changing.

Table 21-21 shows that 57% of 100 respondents for White Sand Lake indicate that the current water quality of the lake is *excellent,* 42% *good*, 1% *fair*, 0% *poor,* 0% *very poor*, and 0% are *unsure*. Respondents have a very positive perception about the current quality of White Sand Lake's water.

Table 21-21. White Sand Lake - Perception of Current Water Quality

Lakes	# Respondents	Excellent	Good	Fair	Poor	Very Poor	Unsure
		%	%	%	%	%	%
White Sand Lake	100	57%	42%	1%	0%	0%	0%
Bear River Lakes	554	38%	49%	7%	3%	0.2%	3%
All Lakes	956	34%	53%	7%	3%	0.1%	3%

The data for White Sand Lake regarding perceptions of current water quality are reasonably consistent with the data for the other lakes identified in the table. Table 21-22 shows that 1% of 95 respondents for White Sand Lake indicated that water has been *improving*, 66% *no change*, 16% *worsening*, and 17% are *unsure*. Again, the data for White Sand Lake are reasonably consistent with the data for the other lakes noted in the table.

Table 21-22. White Sand Lake - Perception of Change in Water Quality

Lakes	# Respondents	Improving	No Change	Worsening	Unsure
		%	%	%	%
White Sand Lake	95	1%	66%	16%	17%
Bear River Lakes	519	1%	60%	17%	22%
All Lakes	719	2%	62%	16%	20%

Fish Tissue Category & Fishery

The Fish Tissue Category refers to the amount of mercury in fish flesh as compared to Water Quality Standards. Larger edible fish have more mercury in the fish flesh than what is protective for human health concerns. Tribal Water Quality Standards are protective for subsistence fish consumption and the criterion to protect human health is 0.16 PPM.

Anthropogenic (meaning caused by human activity) sources of mercury are mainly from coal fired electric utilities emissions that ultimately enter the lake and watershed via rainwater. The chemistry of Lac du Flambeau Lakes is such that mercury becomes mobilized into the food chain accumulating in larger fish at the top of the food chain. Reductions in mercury emissions on coal fired power plants have helped to reduce mercury in the rain as seen in Figure 21-13. A comparison of 1991 data to 2007 data shows a trend of reduction, yet more than what is protective for human health.

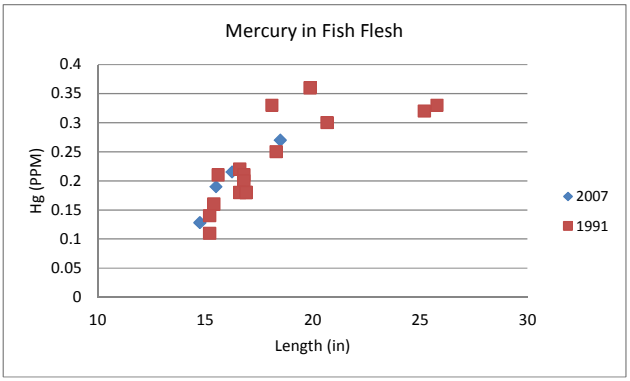

Figure 21-13. Mercury Fish Tissue Concentrations vs Fish Length

White Sand Lake's fishery supports both subsistence and sport fishing. The lake's fishery includes panfish such as bluegill and black crappie and gamefish like smallmouth and largemouth bass, northern pike, musky, and walleye. The lake also includes lake sturgeon.

The Tribal Hatchery has a history of stocking White Sand Lake, particularly with walleye, musky, and sturgeon. Table 21-23 shows the numbers of these fish that have been stocked in White Sand Lake from 2003–2012.

Table 21-23. Number of Fish Stocked During 2003–2012 in White Sand Lake (1,195 acres)

Year	Walleye		Sturgeon	Musky
	Fry	Fingerlings	Fingerlings	Fry
2012	1,500,000	7,497		
2011	1,500,000	43,512	50	10,000
2010	1,500,000	18,310		
2009	1,500,000	7,625	100	50,000
2008		15,912		35,000
2007	1,500,000	33,312	169	
2006	1,600,000	19,271		
2005	1,500,000	24,000	593	
2004	600,000	19,250		
2003	400,000	11,250		

In order to determine residents' perceptions on the quality of fishing and whether that quality has been changing, this survey asked residents a few questions about the fishery. Residents were asked if they have fished or speared on White Sand Lake within the past ten years. Seventy-six of 102 (75%) respondents for White Sand Lake responded affirmatively.

These respondents were then asked to identify the type of fishing they employed. Of those who responded, 96% indicate *open water hook and line fishing*, 24% *ice fishing*, 0% *spearing*, and 0% *netting*.

The residents who have fished or speared within the past ten years were asked to describe the current quality of fishing on the lake, and how, if at all, the quality of fishing on the lake has changed during the past ten years.

Table 21-24 shows that of the 71 White Sand Lake residents who responded about the current quality of fishing, 1% indicate *excellent*, 25% *good*, 52% *fair*, 11% poor, and 9% *very poor*. One percent indicates *unsure*. A higher percentage of respondents for White Sand Lake indicate the current quality of fishing is fair to good as compared to respondents of the other lakes.

Table 21-24. White Sand Lake - Perceptions of Current Quality of Fishing

	White Sand Lake	Bear River Lakes	All Lakes
	71 Respondents	397 Respondents	750 Respondents
Excellent	1%	5%	5%
Good	25%	34%	34%
Fair	52%	42%	44%
Poor	11%	13%	11%
Very Poor	9%	4%	4%
Unsure	1%	3%	2%

Regarding whether the quality of fishing has changed during the past ten years, Table 21-25 shows that of 75 White Sand Lake respondents, 7% indicate fishing has *been improving*, 29% *no change*, 49% *worsening*, and 15% *unsure*. A higher percentage of respondents for White Sand Lake

indicate the quality of fishing has been worsening as compared to respondents of the other lakes.

Table 21-25. White Sand Lake - Perceptions of Change in Fishing Quality

	White Sand Lake	Bear River Lakes	All Lakes
	75 Respondents	414 Respondents	750 Respondents
Improving	7%	9%	8%
No Change	29%	28%	31%
Worsening	49%	42%	42%
Unsure	15%	21%	20%

Lake Water Levels

Lake levels fluctuate naturally due to precipitation and evaporation, both of which may vary widely from season to season and year to year. Low levels may cause stressful conditions for fish and increase the number of nuisance aquatic plants. High water levels can boost the amounts of nutrients from runoff of flooded lakeshore soils. Another consequence of fluctuating water levels is shoreline erosion.

White Sand Lake is artificially stabilized by a static dam on the out flow at the beginning of Hutton's Creek.

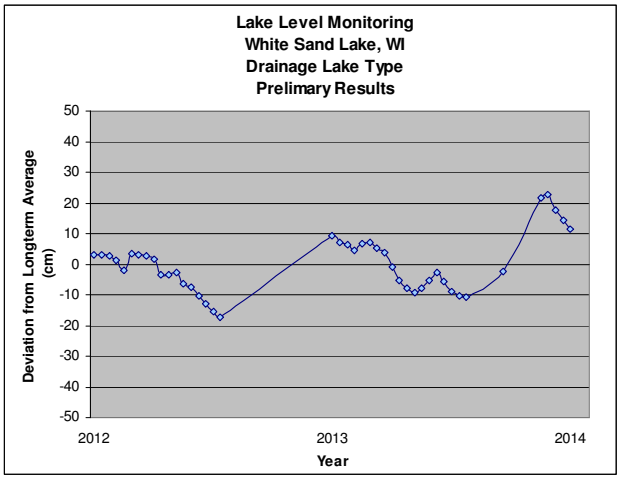

Figure 21-14. Lake Water Level Fluctuations During 2012-2014

Volunteers from Lac du Flambeau have been subjectively observing and noting lake water levels through the WDNR's Citizen Lake Monitoring Network for many years (Tables 21-26 and 21-27), while in 2012 the Tribal Natural Resources Department began to collect water level data systematically for selected lakes. With assistance from North Lakeland Discovery Center, Vilas County Association of Lakes, and Town Lakes Committee, monitoring equipment was installed and calibrated on sites at Little Crawling Stone Lake, Fence Lake, Flambeau Lake, Ike Walton Lake, and White Sand Lake (Figure 21-14). The equipment at the Flambeau Lake site is being monitored by the Tribal Resources Department while equipment at the other sites is being monitored by volunteer lakefront property owners.

Table 21-26. White Sand Lake North - Number of Observations of Lake Water Levels

Year	Low	Normal	High
2007	4	2	
2008		2	2
2009	2	1	
2010	1	3	
2011		2	1
2012	1	2	1
2013		2	1

Table 21-27. White Sand Lake Deep Hole - Number of Observations of Lake Water Levels

Year	Low	Normal	High
2005	9	3	
2006	7	1	
2007	2		
2013		2	

Other Survey Results for White Sand Lake

Residents affiliated with White Sand Lake who responded to the survey in 2012 shared their perceptions on several topics in addition to those already presented in this section.

Activities & Watercraft

From a list of activities (fishing excluded), residents were asked to identify those in which they most often choose to participate. The activities most often identified by residents affiliated with White Sand Lake include relaxing and enjoying nature (80%), swimming (91%), and motor-boating (79%). The activities least often identified include sailing (20%), ricing (2%), and trapping (1%).

From a list of different types of watercraft, residents were asked to identify those which they and members of their household use most often. The watercraft most often identified by residents affiliated with White Sand Lake include motorboats with more than 25 hp (75%), pontoon boats (47%), and canoes or kayaks (61%). Watercraft least often identified includes row boats (22%), jet skis (21%), and sailboats (21%). One percent of the respondents indicate they and members of their household do not use watercraft.

Issues of Concern

From a list of 16 concerns, residents affiliated with White Sand Lake were asked to identify three concerns about the lake that they believe are of most concern. For those who responded, Table 21-28 shows the three issues of greatest concern include *aquatic invasive species* (45%), *loss of fish habitat* (25%), and *degradation of water quality* (26%). The three issues of least concern include *noise* (5%), *loss of wildlife habitat* (8%), and *degradation of native aquatic plants* (9%). The items on the list are of *no concern* to 17% of the respondents.

Table 21-28. White Sand Lake - Lake Issues of Most Concern

	White Sand Lake	Bear River Lakes	All Lakes
	102 Respondents	576 Respondents	1074 Respondents
Algae bloom	18%	17%	16%
Light pollution	9%	10%	8%
Shoreline runoff	18%	14%	12%
Aquatic invasive species	45%	42%	35%
Loss of fish habitat	25%	25%	22%
Water quality degradation	26%	27%	23%
Boat traffic	15%	16%	15%
Loss of shoreline	12%	13%	10%
Septic discharge	21%	18%	15%
Degradation of native aquatic plants	9%	11%	9%
Loss of wildlife habitat	8%	10%	10%
Excessive aquatic plant growth	11%	12%	10%
Noise pollution	5%	6%	6%
Shoreline development	14%	13%	11%
Excessive fishing	15%	12%	10%
Shoreline erosion	24%	18%	10%
Not concerned about any of these	17%	17%	19%

Interest in Attending Workshops

Residents were asked if they have an interest to attend workshops on a variety of topics related to the lakes and habitats. Table 21-29 shows the largest percentages of responses for all three response groups include *identifying AIS* and *identifying aquatic plants*. Respondents from of White Sand Lake also show interest in *controlling purple loosestrife and limnology*.

Table 21-29. White Sand Lake - Interest in Attending Workshops

	White Sand Lake	Bear River Lakes	All Lakes
	102 Respondents	576 Respondents	1074 Respondents
Preventing AIS	14%	13%	11%
Starting a lake association	0%	5%	14%
Controlling Purple Loosestrife	22%	17%	14%
Identifying AIS	37%	42%	38%
Lake Stewardship	13%	13%	11%
Identifying aquatic plants	33%	38%	36%
Limnology	22%	22%	20%
Other	5%	5%	4%
No interest	29%	28%	28%

Town Website

Residents were asked how often, if at all, they check the town's website to gets information about the Town Lakes Committee, such as newsletters, meeting agendas, and information on AIS. Table 21-30 shows that of 95 respondents for White Sand Lake, 2% indicate *often*, 14% *sometimes*, 35% *rarely*, and 50% *never*.

Table 21-30. White Sand Lake - Accessing the Town's Website

	White Sand Lake	Bear River Lakes	All Lakes
	95 Respondents	541 Respondents	938 Respondents
Never	50%	60%	63%
Rarely	35%	26%	23%
Sometimes	14%	14%	12%
Often	2%	1%	1%

Accessing Information

Residents were asked where they would most likely go to get information about environmental issues. Table 21-31 shows that residents are most likely to seek information from the Wisconsin Department of Natural Resources, the Tribal Natural Resources Department, and the Town Lakes Committee.

Table 21-31. White Sand Lake - Accessing Sources of Information for AIS

	White Sand Lake	Bear River Lakes	All Lakes
	102 Respondents	576 Respondents	1074 Respondents
Tribal Natural Resources Department	27%	37%	31%
Town Lakes Committee	28%	21%	18%
Wisconsin DNR	55%	61%	59%
LdF Town Hall	20%	19%	19%
Tribal Main Office	10%	7%	5%
Other	13%	9%	9%

White Sand Lake Association[32]

Volunteer organizations in Wisconsin have long played an important role in protecting the lakes from declining water quality and other human impacts. To address such issues, residents on Lake Geneva established the first lake association in Wisconsin 1898.

In July, 2004, 76 residents representing about 50 families on White Sand Lake decided to establish their own lake association at a meeting held at Dillman's Resort. Education and communication were identified as the new organization's primary purposes.

The following June, the association held its first business meeting, again at Dillman's. A Board of Directors and officers were identified, by-laws were adopted, and dues were set at $20 per family.

A resident from White Sand Lake and member on the original planning committee for the White Sand Lake Association, John Bartosz, was instrumental in establishing the Lac du Flambeau Town Lakes Committee, indeed serving as the organization's first chair. The White Sand Lake Association has been represented on the Lac du Flambeau Town Lakes Committee since its inception in 2005.

Several lake association members have attended various training sessions conducted by the Lac du Flambeau Town Lakes Committee and help monitor the public boat landing and

shorelines for AIS, testing for and reporting on water quality, depth, and lake water levels each season.

Several association members assisted in the survey of the aquatic plant life of White Sand Lake in preparation of the *Bear River Comprehensive Lake Management Plan*.

Relying in part on WDNR grant funds, the White Sand lake Association hired watercraft inspector in 2014.

Setting the Pace & White Sand Lake

In summary, White Sand Lake has a very healthy ecosystem with many strong qualities. The primary challenge is ensure these attributes do not degrade from their current conditions. At the same time, there is room for improvement, particularly with respect to improving the lake's habitat, monitoring the presence of mercury in fish tissue, and guarding against the arrival of aquatic invasive species.

The following tables, Setting the Pace, constitute a long-term action plan to maintain or improve the overall health of White Sand Lake. The plan includes six goals with supporting objectives and activities. The goals include:

I. Preserve or Improve Current Water Quality.

II. Prevent Infestations of Aquatic Invasive Species.

III. Control or Reduce the Spread of Aquatic Invasive Species.

IV. Broaden Residents' Understanding of Swimmer's Itch.

V. Reduce User Conflicts.

VI. Strengthen or Increase Collaborations.

Table 21-32. Setting the Pace - White Sand Lake

Goal I - Preserve or Improve Current Lake Water Quality					
Objective A - Provide residents with opportunities to learn about the current lake water quality and how they can help preserve or improve it.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Attend CLMN Workshops	Tribe, TLC, Lake Assoc.	# Attendees	Availability of workshops & support of Tribe, Town, Lake Associations	$50 per attendee	Annual
2. Attend CBCW Workshops	Tribe, TLC, Lake Assoc.	# Attendees	Availability of workshops & support of Tribe, Town, Lake Associations	$50 per attendee	Annual
3. Teach at After-School Program	Tribe/TLC	Pre & Post Survey	Support of Tribe & School, availability of volunteers	$35 per volunteer	Annual Spring Term
4. Host Limnology/Ecology Workshops	Tribe/TLC	# Attendees, workshop evaluation	Availability of presenters, # registrants	$100 per attendee	Every 2-3 years
5. Host Lake Steward Workshops	TLC/Tribe	# Attendees, workshop evaluation	Availability of presenters, # registrants, support of partnering organizations	$300 per registrant (based on 50 registrants)	Every 3-4 years
6. Host Landscaping/Shoreline Habitat Workshops	Tribe/TLC	# Attendees, workshop evaluation	Availability of presenters, # registrants, support of Tribe, Town	$100 per attendee	Every 2-3 years
7. Update Webpages	Tribe, TLC, Lake Assoc.	# Clicks	Support of Tribe, Town, Lake Associations	Variable	Ongoing
8. Host Lakes Fest	Tribe	# of Attendees	Support of Tribe, presenters, attendees	$7,000 per Event	Annual

Table 21-33. Setting the Pace - White Sand Lake

Goal I - Preserve or Improve Current Lake Water Quality					
Objective B - Continue monitoring lake water quality.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Improve or establish standards for assessing aesthetics	Tribe/WDNR	Implementation of improved/new standards Report Card: Aesthetics	Support of Tribe & WDNR	$30,000 to establish	Ongoing once established
2. Collect data on lake water levels, temperature, chemistry, clarity, nutrients	Tribe/TLC/ Lake Assoc	Data Reports Report Card: Biology, Chemistry, Nutrients	Support of Tribe, WDNR, Volunteers	$20,000	Annual
3. Expand & implement schedule of Point Intercept Surveys	Tribe	WDNR Verification Report Card: Biology, Habitat	Support of Tribe, WDNR	$7,000 average per lake	Ongoing
4. Conduct shoreline sweeps	Tribe/TLC/ Lake Assoc	CLMN Data Sheets Report Card: Biology, Habitat, Aesthetics	Support of Tribe, TLC, Volunteers	$12 per hour, .58 per mile	Annual
5. Conduct individual property sweeps	Tribe/TLC/ Lake Assoc	CLMN Data Sheets Report Card: Biology, Habitat, Aesthetics	Support of Tribe, TLC, Property Owners	$48 per property	12 per season
6. Collect data on bio-accumulative pollutants (fish tissue)	Tribe	Database Report Card: Tissue	Support of Tribe	$20,000	Annual
7. Collect & analyze data on stream flow	Tribe/USGS	Report Card: Flow	Support of Tribe & USGS	$16,000	Annual
8. Expand participation in CLMN	Tribe/TLC/ Lake Assoc.	CLMN Data Sheets Biology, Chemistry, Nutrients	Support of TLC, Lake Associations	$12 per hour, .58 per mile	Ongoing
9. Collect & analyze data on weather/climate	Tribe/ Volunteers	List of sources	Support of Tribe	$10,000	Annual
10. Expand taking core samples from the lakes	Tribe	Reports of data Report Card: Biology, Habitat	Support of Tribe	$50,000-$100,000 for all lakes	One time lake
11. Identify impact of the operation of motor vehicles and motorboats on the lakes	Tribe	Report of study Report Card: Aesthetics	Support of Tribe	$10,000-50,000 per study	To be determined
12. Identify impact of forestry clear-cutting practices on the lakes	Tribe	Report of Study Report Card: Habitat, Nutrients	Support of Tribe	$20,000-70,000	To be determined
13. Consider monitoring species of concern, like frogs, bats, etc.	Tribe/TLC/ Lake Assoc	Document discussions	Support of Tribe, TLC, Lake Associations	$12 per hour, .58 per mile	To be determined
14. Consider maintaining/expanding propagation of wild rice	Tribe	To be determined	Support of Tribe Availability of resources	To be determined	To be determined
15. Consider monitoring for spiny waterflea	Tribe/TLC/ Lake Assoc	To be determined	Support of Tribe, TLC, Lake Associations	To be determined	To be determined

Table 21-34. Setting the Pace - White Sand Lake

Goal I - Preserve or Improve Current Lake Water Quality					
Objective C - Minimize impact from development.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Identify shoreline restoration needs	Tribe	Report of Study Report Card: Habitat, Nutrients	Funding	$10,000 for five lakes	Ongoing
2. Establish shoreline restoration demonstration project	Tribe	Finished project Report Card: Habitat	Funding, Available shoreline	$10,000 per 100 feet of shoreline	2015
3. Restore selected shorelines	Tribe	Finished projects Report Card: Habitat	Land ownership, jurisdictions	$10,000 per 100 feet of shoreline	2015, ongoing
4. Encourage lake home shoreline restorations	Vilas Co/Tribe	Finished projects Report Card: Habitat	Support of Tribe, County, & Landowners	$10,000 per 100 feet of shoreline	Ongoing
5. Install erosion controls bank stabilization	Tribe/Vilas Co	Finished projects Report Card: Habitat	Support of Tribe, Federal funding	$3,000 per erosion site	Ongoing
6. Review & suggest best management practices on all land-disturbing projects	Tribe	Report of study Report Card: Habitat	Support of Tribe, Federal funding	$10,000-$50,000	Annual
7. Review & comment on all storm water projects	Tribe	Reports/documents Report Card: Habitat, Nutrients, Bacteria	Support of Tribe, Federal funding	$10,000-$50,000	Annual
8. Review & comment on all National Pollution Discharge Elimination Permits	Tribe	Reports/documents Report Card: Habitat, Nutrients, Bacteria	Support of Tribe, Federal funding	$10,000-$50,000	Annual
11. Work with Planning and Land Department for future low-impact development initiatives	Tribe	Report Report Card: Habitat, Nutrients, Chemistry	Support of Tribe	Variable	To be determined
12. Review & update water quality standards and shoreline codes	Tribe	Revised documents Report Card: All categories	Support of Tribe, Federal funding	$50,000 per review	Triennial
13. Enforce inspection schedule for all development initiatives	Tribe	Completion reports Report Card: All categories	Support of Tribe, Federal funding	$20,000	Annual
14. Conducting septic inspections	Tribe/Vilas Co	Report of inspections Report Card: Nutrients Bacteria	Support of Tribe, Vilas County	$150 per unit	Ongoing
15. Evaluating Dam Permit Applications	Tribe, WDNR, Army Corps of Engineers	# permits evaluated Report card: habitat, lake levels	Jurisdiction, Federal funding	Variable	Ongoing
16. Review & comment on all potential rules or permits regulating mercury emissions	Tribe	Reports/documents Report Card: Fish Tissue	Support of Tribe, Federal funding	$10,000-$50,000	Annual

Table 21-35. Setting the Pace - White Sand Lake

Goal II - Prevent Infestations of Aquatic Invasive Species					
Objective A - Provide the public with opportunities to learn about Aquatic Invasive Species and how to prevent their introduction.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Coordinate TLC/Tribal planning with lake associations' planning	TLC/Tribe Lake Assoc	Partner feedback	Support of TLC, Tribe & lake associations	Volunteers @ $12/hour & .58/mile	Annual
2. Encourage volunteers to attend training sessions provided by the Clean Boats Clean Waters (CBCW) program	TLC/Tribe/ Lake Assoc	Identify number of attendees	Availability of workshops, volunteers, & help from lake associations	$50 per attendee	Annual
3. Periodically offer workshops locally on how to identify and prevent AIS	TLC	Agendas, participant evaluations	Availability of presenters and registrants, & help from lake associations	$35 per attendee	Annual
4. Encourage volunteers to attend training sessions provided by the Citizen Lake Monitoring Network (CLMN)	TLC/Tribe	Identify number of attendees	Availability of workshops, volunteers, & help from lake associations	$50 per attendee	Annual
5. Disseminate information via media, including Town, Tribal, and Lake Association websites	TLC/Tribe/ Lake Assoc	Copies of releases	Availability of writer(s)	Variable	Ongoing
6. Highlight AIS and prevention in documents produced locally, such as newsletters, brochures	TLC/Tribe/ Lake Assoc	Copies of documents	Availability of writers	Volunteers @ $12/hour & .58/mile	Ongoing
7. Highlight AIS prevention at landings through signage & distribution of educational materials	TLC/Tribe Lake Assoc	Periodic review of signage	Availability of new signage & WDNR education materials	Cost of signage, volunteers @ $12/hour, .58/mile, WDNR materials	Ongoing
8. Identify local Key Communicators who will speak about AIS at community events	TLC/Tribe	List of individuals	Availability of communicators	Volunteers @ $12/hour, .58/mile	Annual
9. Ask resorts & select businesses to distribute AIS information	TLC/Lake Associations	List of accepting business	Availability of materials, approval of businesses	Volunteers @ $12/hour, .58/mile, WDNR materials	Annual
10. Continue hosting the Lake Steward Workshop	TLC/Tribe	Participant evaluation	Availability of presenters, # registrants, support of partnering organizations	$300/registrant (based on 50 registrants)	Every 3-4 years

Table 21-36. Setting the Pace - White Sand Lake

Goal II - Prevent Infestations of Aquatic Invasive Species					
Objective B - Provide the public with opportunities to actively and purposefully look for Aquatic Invasive Species.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Coordinate TLC/Tribal planning with lake associations' planning	TLC/Tribe Lake Assoc	Partner feedback	Support of TLC, Tribe & lake associations	Volunteers @ $12/hour, .58/mile	Annual
2. Organize and support whole-lake shoreline sweeps	Tribe/TLC/ Lake Assoc	# sweeps, participant feedback Report Card: Biology	Support of TLC, Tribe & Lake Associations	$12/hour, .58/mile, supplies @ $300/lake	Annual
3. Support establishing system of personal property sweeps	TLC/Lake Assoc	# properties, participant feedback Report Card: Biology	Support of TLC & Lake Associations	Volunteers @ $12/hour, .58/mile	Annual
4. Inspect watercraft at landings	Tribe/TLC/ Lake Assoc	# inspectors, # hours inspection Report Card: Biology	Support of TLC, Tribe, Lake Associations, Volunteers, WDNR	$12/hour, .58/mile, supplies @ $200/landing	Annual
5. Coordinate SCUBA diving/ snorkeling sweeps near landings	TLC/Tribe	Log Report Card: Biology	Support of Tribe & volunteers	$500/season	Annual
6. Provide convenient drop-off points on each lake for suspected AIS samples	TLC/Lake Assoc	# participants Report Card: Biology	Support of TLC & lake associations	$100 per lake	Annual
7. Assist Lake Associations with grant applications for hiring watercraft inspectors	TLC	# attendees, workshop evaluation Report Card: Biology	Support of TLC & Lake Associations	$30 per attendee	Annual

Table 21-37. Setting the Pace - White Sand Lake

Goal III - Control or Reduce the Spread of Aquatic Invasive Species					
Objective A - Provide the public with opportunities to learn about local infestations of Aquatic Invasive Species and how they can help control or reduce their spread.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Coordinate TLC/Tribal planning with lake associations' planning	TLC/Tribe Lake Assoc	Lake association feedback	Support of TLC & lake associations	Volunteers @ $12/hour, .58/mile	Annual
2. Encourage volunteers to attend training sessions provided by the Clean Boats Clean Waters (CBCW) program	TLC/Tribe/ Lake Assoc	# of attendees	Availability of workshops, volunteers, & help from lake associations	$50 per attendee	Annual
3. Offer TLC workshops on how to identify and control or reduce AIS	TLC	Agendas, participant evaluations	Availability of presenters and registrants, & help from lake associations	$30 per attendee	Annual
4. Encourage volunteers to attend training sessions provided by the Citizen Lake Monitoring Network (CLMN)	TLC/Tribe/ Lake Assoc	# of attendees	Availability of workshops, volunteers, & help from lake associations	$50 per attendee	Annual
5. Disseminate information via media, including Town, Tribal, and Lake Association websites	TLC/Tribe/ Lake Assoc	Copies of releases	Availability of writer(s)	Volunteers @ $12/hour, .58/mile	Ongoing
6. Highlight AIS and prevention in documents produced locally, such as newsletters, brochures	TLC/Tribe/ Lake Assoc	Copies of documents	Availability of writers	Volunteers @ $12/hour, .58/mile, printing	Ongoing
7. Highlight AIS control at landings through signage & distribution of educational materials	TLC/Tribe Lake Assoc	Periodic review of signage	Availability of new signage	Cost of signage, volunteers @ $12/hour, .58/mile, WDNR materials	Annual
8. Identify local Key Communicators who will speak about AIS at community events	TLC/Tribe/ Lake Assoc	List of individuals	Availability of communicators	Volunteers @ $12/hour, .58/mile	Annual
9. Ask resorts & select businesses to distribute AIS information	TLC/Tribe/ Lake Assoc	List of accepting businesses	Availability of materials & approval of businesses	Volunteers @ $12/hour, .58/mile	Annual
10. Continue hosting the Lake Steward Workshop	TLC/Tribe	Participant evaluation	Availability of presenters, # registrants, support of partnering organizations	$300 per registrant (based on 50 registrants)	Triennial

Table 21-38. Setting the Pace - White Sand Lake

Goal III - Control or Reduce the Spread of Aquatic Invasive Species					
Objective B - Reduce the scope of existing infestations of purple loosestrife and minimize the spread of the infestations to new locations.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Establish Action Team & Action Plan	TLC	Written Plan	Support of TLC/Tribe/Town	$12/hour. .58/mile	Annual
2. Encourage lake association participation	TLC/Lake Assoc	# Lake Associations involved	Support of Lake Associations	$12/hour, .58/mile	Annual
3. Continue inter-agency relationships on Purple Loosestrife (Tribe, WDNR, Public School)	TLC/Lake Assoc	Survey agencies	Support of agencies	Variable	Annual
4. Raise & distribute beetles	TLC/Lake Assoc	150 plants & 200,000 beetles Report Card: Biology, Habitat	Support from Tribe, WDNR, school, & availability of volunteers, materials, roots & seed beetles	$3,000-5,000	Annual
5. Host or conduct workshops on Purple Loosestrife	TLC/Lake Assoc	Agendas, participant evaluations	Support of volunteers & other agencies	$30/attendee	Annual
6. Provide residents with information on bio-control	TLC/Lake Assoc	Documents provided	Support of TLC/Tribe/Lake Associations	$1000 printing/supplies	Annual
7. Consider restoring tall native wetland plants to infested areas	Tribe/TLC/ Lake Assoc	Document discussions	Support of TLC/Tribe/Lake Associations, others	To be determined	To be determined

Table 21-39. Setting the Pace - White Sand Lake

Goal III - Control or Reduce the Spread of Aquatic Invasive Species					
Objective C - Continue monitoring infestations of Rainbow Smelt and Rusty Crayfish.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Publicize history of previous actions to monitor/control infestations	Tribe	Documents	Tribal support	$12/hour, .58/mile	Ongoing
2. Conduct workshop on the fishery, including monitoring smelt and crayfish	Tribe/TLC	Agenda, participant evaluations	Tribal Support	$12/hour, .58/mile	Ongoing
3. Continue monitoring Rainbow Smelt & Rusty Crayfish	Tribe/ Volunteers	Documents Report Card: Biology	Tribal Support, TLC Support	$12/hour, .58/mile	Ongoing

Table 21-40. Setting the Pace - White Sand Lake

Goal IV - Broaden Residents' Understanding of Swimmer's Itch					
Objective A - Provide residents with a variety of educational experiences and materials on Swimmer's Itch, including alternatives treating it or reducing the probability of contracting it.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Establish Action Plan	Bear River Team	Written Plan	Support of Tribe, Town, Availability of volunteers	$12/hour, .58/mile	Annual
2. Review current research and literature	Bear River Team	List of items reviewed	Availability of research & literature	$12/hour, .58/mile	Ongoing
3. Contact appropriate professionals and authorities about Swimmers' Itch	Bear River Team	List of individuals/organizations	Availability of professionals	$12/hour, .58/mile	Ongoing
4. Host community-wide workshops	Bear River Team	Agenda & evaluation of participants	# registrants, availability of presenters	$30/attendee	Annual
5. Distribute information in newsletters, bulletins, and PSAs	Bear River Team	Copies of items distributed	Support of partnering agencies	$12/hour, .58/mile	Annual
6. Identify alternatives for treating it or reducing the probability of contracting it	Bear River Team	Summative report	Availability of alternatives	$12/hour, .58/mile	To be determined
7. Conduct or participate in a research study of Swimmer's Itch	Bear River Team	Final research report	Support of partnering agencies	$150,000	To be determined

Table 21-41. Setting the Pace - White Sand Lake

Goal V - Reduce User Conflicts					
Objective A - Provide the public with opportunities to learn about user conflicts.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Determine extent of user conflicts	Tribe	Survey	Tribe/TLC/Funding	To be determined	Triennial
2. Develop & distribute education materials on minimizing user conflicts	Tribe, WDNR	Availability of materials, distribution list	Support of Tribe, WDNR, availability of resources	To be determined	Ongoing
3. Host workshop on fishery (size limits, stocking, etc.)	Tribe	# attendees, workshop evaluation	# registrants, support of Tribe, availability of resources	$100/attendee	Quadrennial
4. Joint review of current enforcement (# wardens, incidents, etc.)	Tribe/Town	Report	Support of Tribe & Town	To be determined	To be determined

Table 21-42. Setting the Pace - White Sand Lake

Goal VI - Strengthen or Increase Collaborations					
Objective A - Encourage participation in educational experiences related to partnerships and collaborations.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
2. Encourage attendance at Lake Leaders Institute	TLC/Tribe/ Lake Assoc	# attendees	Availability of volunteers, resources	$800/attendee	Biennial
3. Encourage attendance at Wisconsin Lakes Conference	TLC/Tribe/ Lake Assoc	# attendees	Availability of volunteers, resources	$800/attendee	Annual
4. Encourage attendance at Vilas County Lakes Association	TLC/Tribe/ Lake Assoc	# attendees	Availability of volunteers, resources	$100/attendee	Annual
5. Encourage attendance at Lakes Fest	Tribe/TLC/ Lake Assoc	# attendees	Support of partnering agencies	$7,000/event	Annual
6. Provide workshop or meeting for lake associations on planning	TLC	# attendees, workshop evaluation	Support of TLC, # registrants	$30/attendee	Annual
7. Provide a workshop for lake associations on preparing grant applications	TLC	# attendees, workshop evaluation	Availability of grants, support of TLC, # registrants	$30/attendee	Annual

Table 21-43. Setting the Pace - White Sand Lake

Goal VI - Strengthen or Increase Collaborations					
Objective B - Provide a variety of ways to share information about watershed and lake planning.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Host a Lake Association Gathering	TLC/Tribe	# attendees, program evaluation	Support of Tribe/TLC/ Lake Associations	$50/attendee	Annual
2. Establish an ongoing exchange of newsletters, brochures, etc. between lake associations, the Tribe, and the TLC	TLC	Participant evaluation	Support of partnering agencies	$100	Annual
3. Disseminate information to lake associations about the Wisconsin Lakes Association, Annual Convention, Leadership Program, & other local, County and State offerings	TLC	Lake association feedback	Support of TLC and lake associations, availability of materials	Volunteers @ $12/hour, .58/mile	Annual
4. Present information at Local, County, State, & National conferences and meetings	Tribe/TLC	Per host agency	Support of Tribe, Town, availability of presenters	Variable	Per host agency
5. Consider issuing joint TLC/Tribe/Lake Association newsletter	TLC/Tribe/ Lake Assoc	Newsletter distribution	Support of partnering agencies, availability of author	$7,000/issue	Annual

Table 21-44. Setting the Pace - White Sand Lake

Goal VI - Strengthen or Increase Collaborations					
Objective C - Focus on ways to reach out to individuals and organizations.					
			Limitations		
Potential Activities	**Facilitator(s)**	**Evaluation**	**Limitations**	**Cost Estimates**	**Timeframe**
1. Establish system for contacting new residents	TLC	# residents contacted	Support of TLC	$100/visit	Ongoing
2. Encourage the WDNR to establish a protocol for writing watershed and lake management plans.	Bear River Action Team	Development of protocol	Support of WDNR	TBD	To be determined
3. Revise the current *Rapid Response Plan*	Tribe/TLC	Availability of revised plan	Tribal support	$1,000-$5,000	Quinquennial
4. Consider establishing a watershed plan for the other watersheds in Lac du Flambeau	Tribe/TLC	Additional watershed plans	Positive evaluation of Bear River Watershed plan, support of Tribe & TLC, availability of volunteers and resources	$50,000/ watershed	To be determined
5. Evaluate establishing the position of Invasive Species Coordinator for Lac du Flambeau	Tribe/TLC	Report	Support of Tribe, Town, & Lake Associations	TBD	To be determined
6. Develop an indigenous arts and sciences institute	Tribe/ Universities	# Participants	Support of Tribe and Universities	$4,000,000	To be determined

Notes for Section 21

1. GIDAKIIMINAAN (Our Earth): An Anishinaabe Atlas of the 1836, 1837, and 1842 Treaty Ceded Territories (Great Lakes Indian Fish & Wildlife Commission, 2007) 50.
2. R.G. Norwood was a field scientist who participated in a geological survey in 1847 of Wisconsin sponsored by the U.S. government. His report was presented to Congress in a letter by David Owen in 1848, Letter of the Secretary of the Treasury, communicating a report of the geological reconnaissance of the Chippewa Land District of Wisconsin, and the northern part of Iowa. Pages 91-93. https://archive.org/details/lettersecretary00offigoog
3. Aaron Shapiro, The Lure of the North Woods: Cultivating Tourism in the Upper Midwest (University of Minnesota Press, 2013) 97.
4. James K. Bokern, History of the Primary Routes of the Six Bands of Chippewa from the Lac du Flambeau District Unpublished Masters Thesis, 1987, Chapter IX. Online at: http://www.marshfield.k12.wi.us/socsci/discovery/bokern/default.htm
5. Information from several correspondences from July-October, 2009 between the Pokegama Lake Association, White Sand lake Association, and the WDNR.
6. Michael J. Goc, Reflections of Lac du Flambeau: An Illustrated History of Lac du Flambeau, Wisconsin, 1745-1995 (New Past Press Inc., 1995) 92.
7. Ibid, 149.
8. Conversations with Sue Robertson, daughter of original owners, February 2014, and August 2014 (Public Meeting).
9. Neil Johnson, Resorts of Wisconsin (NLJ Books, Hibbing, MN, 2012) 114.
10. Ibid, 115-119.
11. Ibid. Also see, Chad Lewis, The Wisconsin Road Guide to Gangster Hot Spots (On the Road Publications, 2012). www.ontheroadpublications.com.
12. Information from interviews with Sue Robertson, daughter of original owners, February 2014, and August 2014 (Public Meeting).
13. Information from interview with Rick Zelm, current proprietor of White Sand Resort, February 2014.
14. Goc, 92. Additionally, the following statement was provided by Hoyt Bacon, son of William Thompson Bacon, Jr., an early supporter and owner of the camp. *Camp Wipigaki was founded in 1922 by ten Chicago families. Today, the majority of the original families still retain an interest in the Camp, which is now owned by 12 families. The vision was to create a communal family camp retaining as much as possible of the natural environmenrt in the woods and lakes. Over the years the camp has acquired more land and today has land adjoining seven lakes - White Sand, Little Sand, Eagle, Ike Walton, Pokegama, Sunfish and Crooked. The Camp is in the State of Wisconsin's Managed Forest Plan and has harvested the forests according to the plan. There are no plans for any more development on the land or to sell any portion of the land the Camp owns.* (Hoyt Bacon, 2014).
15. Resorts listed on two Lac du Flambeau Chamber of Commerce maps in the 1960s: Lac du Flambeau Indian Reservation and Lac du Flambeau Lake Region.
16. The survey data presented throughout the section is from the Bear River Watershed Comprehensive Lake Management Plan Survey, Lake-by-lake Comparisons, June 2012. See Appendix.
17. Quality Assurance Protection Plan (QAPP) , Lac du Flambeau Band of Lake Superior Chippewa Indians, Aquatic Plant habitat Point Intercept Survey of Lakes for Plants 2010.
18. Results of the WISCALM Botanist Review Panel for Aquatic Macrophyte Impairment.
19. Quality Assurance Protection Plan, Lac du Flambeau Band of Lake Superior Chippewa Indians, General Chemistry Assessment of Waters within the Lac du Flambeau Reservation 2012 (QAPP) for General Chemistry.
20. Tribal Water Quality Standards.
21. Quality Assurance Protection Plan, Lac du Flambeau Band of Lake Superior Chippewa Indians, General Chemistry Assessment of Waters within the Lac du Flambeau Reservation 2012 (QAPP) for General Chemistry.
22. National Lakes Assessment: Technical Appendix, Data Analysis Approach; Lakes, Ponds, and Reservoirs January 2010 Pg 10-12.
23. Wisconsin 2012 Consolidated Assessment and Listing Methodology (WISCALM) for Clean Water Act Section 305(b), 314, and 303(d) Integrated Reporting, April 2012 http://dnr.wi.gov/topic/surfacewater/documents/FINAL_2012_WisCALM_04-02-12.pdf.
24. Quality Assurance Protection Plan, Lac du Flambeau Band of Lake Superior Chippewa Indians, (QAPP) Shore land Development Habitat 2008.
25. National Lakes Assessment: Technical Appendix, Data Analysis Approach; Lakes, Ponds, and Reservoirs January 2010 Pg 10-12.
26. Quality Assurance Protection Plan, Lac du Flambeau Band of Lake Superior Chippewa Indians, (QAPP) for Beach Monitoring 2008.
27. Tribal Water Quality Standards.
28. Ibid.
29. Ibid.
30. National Lake Survey Report.
31. http://www.manresa-sj.org/stamps/1_Secchi.htm.
32. Information in the first paragraph is from *People of the Lakes: A Guide for Wisconsin Lake Organizations*, DNR Publication PUB-FH-821-2006. The remaining information about the White Sand Lake Association was provided by association members Pam Anthony and Kris LaMarche, August, 2014.

Figure Notes for Section 21

Figure 21-1. Map of Lakes. Provided by Tribal Natural Resources Department.

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Table Notes for Section 21

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Table 21-6. Time Spent Checking for AIS During Open Water Season. Data from Bear River Watershed Comprehensive Lake Management Plan Survey, Lake-by-lake Comparisons, June 2012, Question #28. See Appendix.

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Table 21-26. White Sand Lake North Observations of Lake Water Levels. Data from the Citizen Lake Monitoring Network database. http://dnr.wi.gov/lakes/clmn/.

Table 21-27. White Sand Lake Deep Hole Observations of Lake Water Levels. Data from the Citizen Lake Monitoring Network database. http://dnr.wi.gov/lakes/clmn/.

Table 21-28. Lake Issues of Most Concern. Data from Bear River Watershed Comprehensive Lake Management Plan Survey, Lake-by-lake Comparisons, June 2012, Question #31. See Appendix.

Table 21-29. Interest in Attending Workshops. Data from Bear River Watershed Comprehensive Lake Management Plan Survey, Lake-by-lake Comparisons, June 2012, Question #33. See Appendix.

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Figures

Tables

"A Healthy Lake"
Tyler Wildcat, Grade 1, 2013
Lac du Flambeau Public School