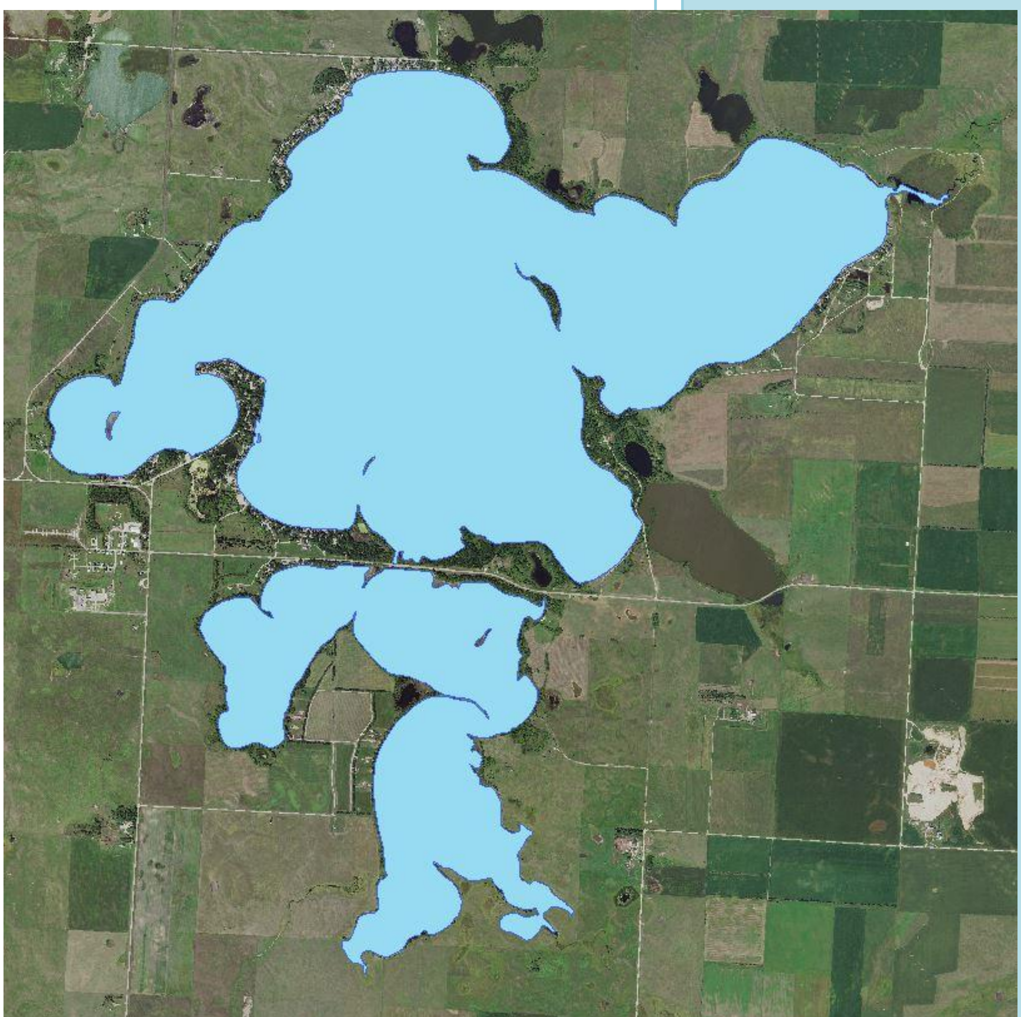
2020

Enemy Swim Lake



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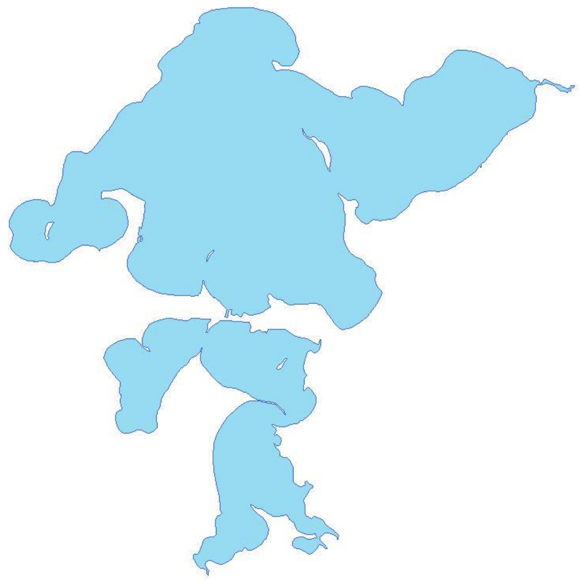
Enemy Swim Lake 22-0006-00 Day County



Introduction

Enemy Swim Lake is located 1 ½ miles east and 6 ½ miles north of Waubay, South Dakota in Day County. It is a large lake covering 2,146 acres (Table 1) with an outlet weir that prevents dramatic water level changes as seen in other local lakes. Enemy Swim Lake is one of the only lakes in South Dakota that is mesotrophic which indicates a moderate level of nutrients, generally clear water, and excellent recreational potential.

Enemy Swim Lake has one inlet and one outlet, which classify it as a drainage lake. Water flows into Enemy Swim Lake through Lewandowski Creek that enters from the northeast and drains Lewandowski Slough. Water exits the lake to the south through Campbell's slough and the outlet weir running south to Blue Dog Lake.

Water quality data has been collected on Enemy Swim Lake from 1991 to 1998 and 2002 to 2019. The data shows that the lake is mesotrophic (TSI = 47) with consistent clear water conditions throughout the summer and into fall when lake turnover may release stored nutrients from the lake bottom causing an algae bloom. Recreational and fishing opportunities are very good. Enemy Swim Lake is one of the cleanest lakes in South Dakota and is very comparable with lakes in south central Minnesota for clarity, algae, and nutrient levels.

The Day Conservation District, Enemy Swim Sanitary District, Sisseton-Wahpeton Oyate, Roberts County Conservation District, and The Northeast Glacial Lakes Project are actively involved in lake monitoring, education, and protection activities.

Table 1. Enemy Swim Lake location and key physical characteristics

Location Data	
SD Lake WDN:	**22-0002-00**
County:	**Day and Roberts Counties**
Ecoregion:	**Northern Glaciated Plains**
Major Watershed:	**Big Sioux River**
Latitude/Longitude:	**45.4393°N 97.2662°W**
Invasive Species:	**none**

Physical Characteristics	
Surface area (acres):	**2,146**
Littoral area (acres):	**Data unavailable**
% Littoral area:	**Data unavailable**
Max depth ft, (m):	**26, (7.9)**
Inlets:	**1**
Outlets:	**1**
Public Accesses:	**2**

Table 2. Availability of primary data types for Enemy Swim Lake

Data Availability	
Transparency data	**Good, enough for trend analysis**
Chemical data	**Moderate, enough phosphorus data for trend analysis**
Inlet/Outlet data	**The inlet has not been accessible for monitoring.**
Recommendations	**For recommendations refer to page 20.**

Lake Map

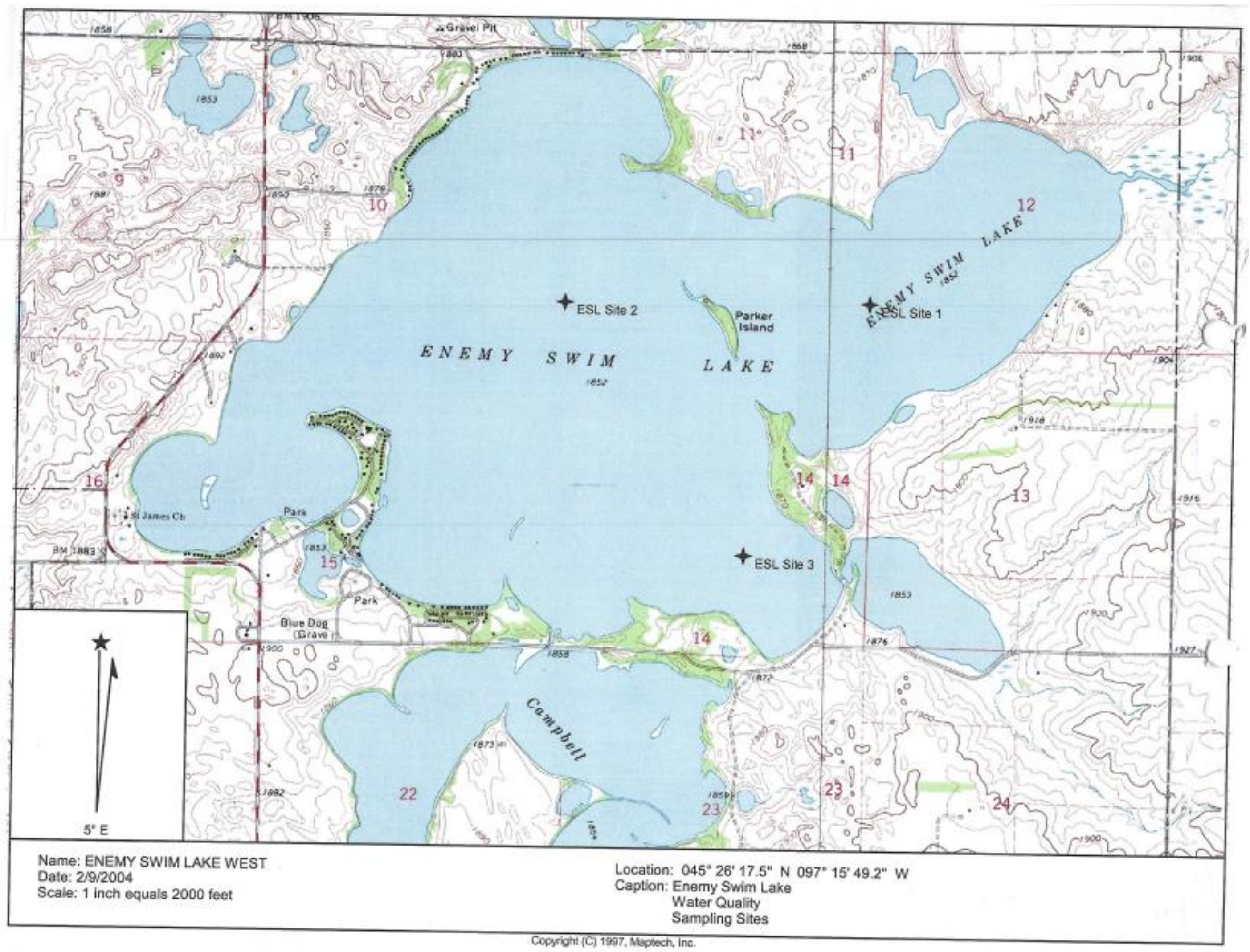


Figure 1. Map of Enemy Swim Lake with sample site locations

Average Water Quality Statistics & Comparisons

The information below describes available chemical data for Enemy Swim Lake through 2019 (Table 3).

Areas of the United States are divided into ecoregions based on land use, vegetation, precipitation and geology. Based on other lakes located within an ecoregion, lake data can be compared to the "average range" of water quality expected in each ecoregion[1] (Table 3). Enemy Swim Lake is in the Northern Glaciated Plains ecoregion.

Table 3. Water quality means compared to ecoregion ranges

Parameter	**Mean**	**Ecoregion Range[1]**	**Interpretation**
Total phosphorus (ug/L)	22.3	130 – 250	Phosphorus and chlorophyll *a* results are lower than the expected range for lakes in the Northern Glaciated Plains Ecoregion. Enemy Swim Lake's results are similar to lakes in south central Minnesota
[3]Chlorophyll *a* (ug/L)	4.9	30 – 55	
Chlorophyll *a* max (ug/L)	8.9		
Secchi depth (ft)	7.8	1 – 4	
Oxygen	*See page 12* *>5 mg/l*		Dissolved oxygen depth profiles show that the lake typically mixes throughout the summer then stratifies in early fall. Staying well oxygenated.
Total Kjeldahl Nitrogen (mg/L)	0.728	1.8 – 2.3	Indicates low levels of nitrogen to support summer algae blooms
pH	8.4	8.3 – 8.6	Within the expected range for the ecoregion
Chloride (mg/L)	ND	0.6 – 1.2	Data not available
Total Suspended Solids (mg/L)	5.9	10 - 30	Lower than the expected range for the ecoregion
Specific Conductance (umhos/cm)	ND	50 – 250	Data not available
TN:TP Ratio	21:1	7 - 14	Above the expected range for the ecoregion indicating nitrogen sources in the watershed. This ratio shows the lake is phosphorus limited. Additional phosphorous, especially ortho-phosphorous the dissolved plant-available form, will cause rapid plant and algae growth.

Hat [1]The ecoregion range is the 25th-75th percentile of summer means from ecoregion reference lakes: https://www.pca.state.mn.us/quick-links/edaguide-typical-minnesota-water-quality-conditions
[2]For further information regarding the Impaired Waters Assessment program, refer to http://www.pca.state.mn.us/water/tmdl/index.html
[3]Chlorophyll *a* measurements have been corrected for pheophytin
Units: 1 mg/L (ppm) = 1,000 ug/L (ppb)

Water Quality Characteristics - Historical Means and Ranges

Table 4. Water quality means and ranges for Enemy Swim Lake

Parameters	Composite Site
Total Phosphorus Mean (ug/L):	22.3
Total Phosphorus Min:	6
Total Phosphorus Max:	50
Number of Observations:	87
Chlorophyll *a* Mean (ug/L):	4.9
Chlorophyll-a Min:	1.5
Chlorophyll-a Max:	8.9
Number of Observations:	36
Secchi Depth Mean (ft):	7.8
Secchi Depth Min:	4
Secchi Depth Max:	17.8
Number of Observations:	90

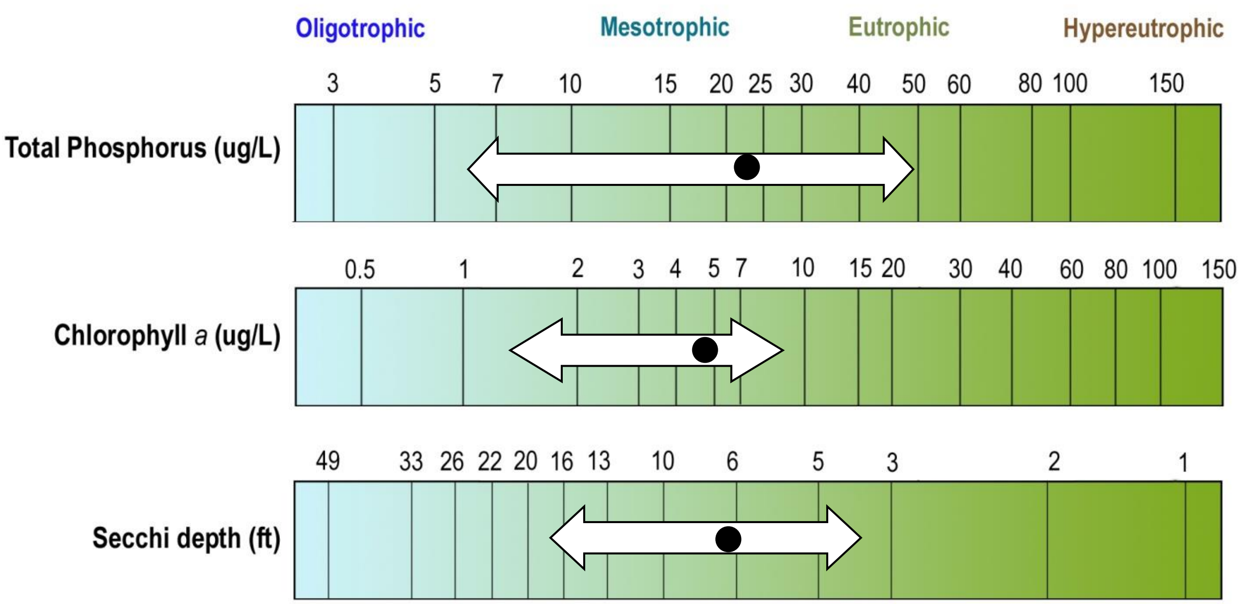


Figure 2. Enemy Swim Lake total phosphorus, chlorophyll a, and transparency historical ranges. The arrow represents the range and the black dot represents the historical mean of the three sites composited. Figure adapted after Moore and Thornton, [Ed.]. 1988. Lake and Reservoir Restoration Guidance Manual. (Doc. No. EPA 440/5-88-002)

Transparency (Secchi Depth)

Transparency is how easily light can pass through a substance. In lakes, it is how deep sunlight penetrates through the water. Plants and algae need sunlight to grow, so they are only able to grow in areas of lakes where the sun penetrates. Water transparency depends on the number of particles in the water. An increase in particulates results in a decrease in transparency. The transparency varies year to year due to changes in weather, precipitation, lake use, flooding, temperature, lake levels, etc.

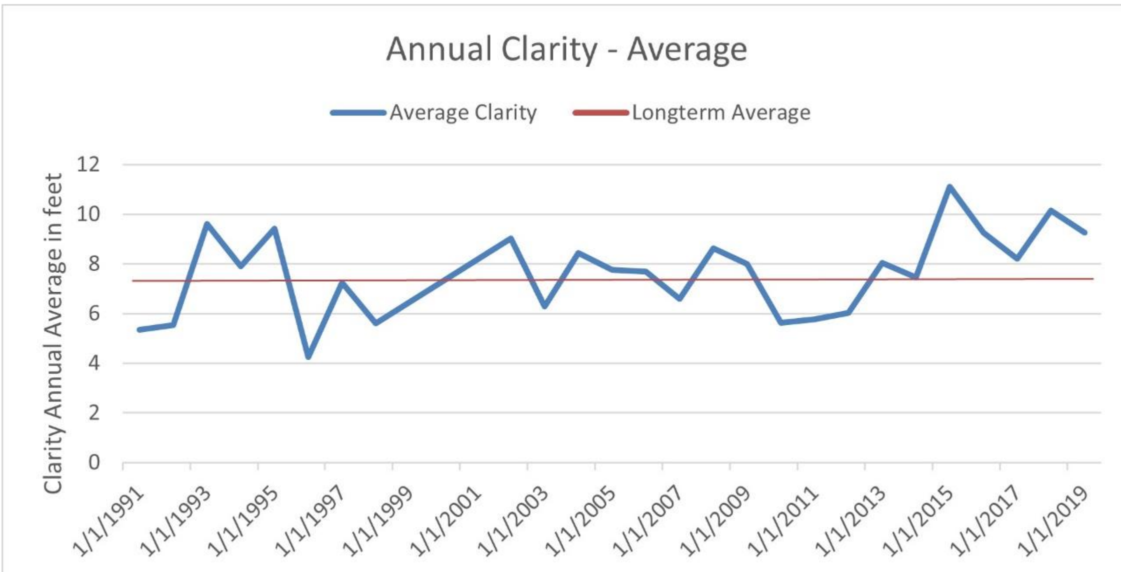


Figure 3. Annual average transparency with long-term mean from 1991 to 2019

Enemy Swim Lake's transparency was monitored annually from 1991 to 1998 and 2002 to 2019 at three sites. The annual average transparency in Enemy Swim Lake ranges from 4 to 10.5 feet. The long term mean transparency is 7.75 feet (Figure 3) which indicates good recreational quality. For the last five years the transparency has been better than the long term mean. For trend analysis, see page 14. Transparency monitoring should be continued at least monthly every summer in order to track water quality changes.

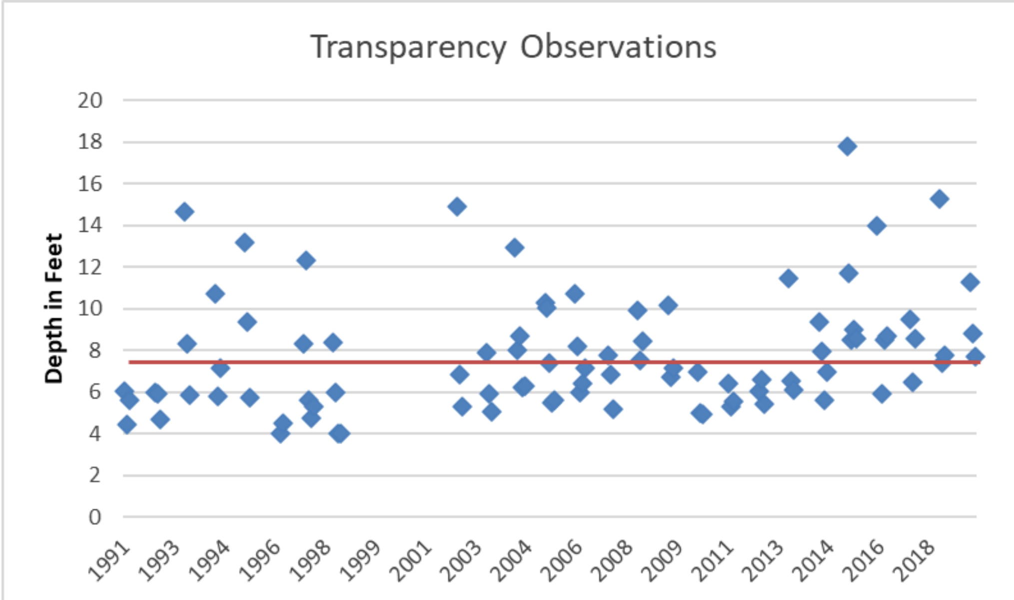


Figure 4: Historical transparency for Enemy Swim Lake from 1991 to 2019

The water clarity in Enemy Swim Lake follows a typical seasonal pattern. Water clarity dynamics have to do with algae population dynamics and lake turnover. It is important for lake residents to understand the seasonal transparency dynamics where transparency can be lower in August than it is in June. Enemy Swim Lake is consistently clear in May and June with slightly lower transparency levels in July and August.

Algae – Chlorophyll *a*

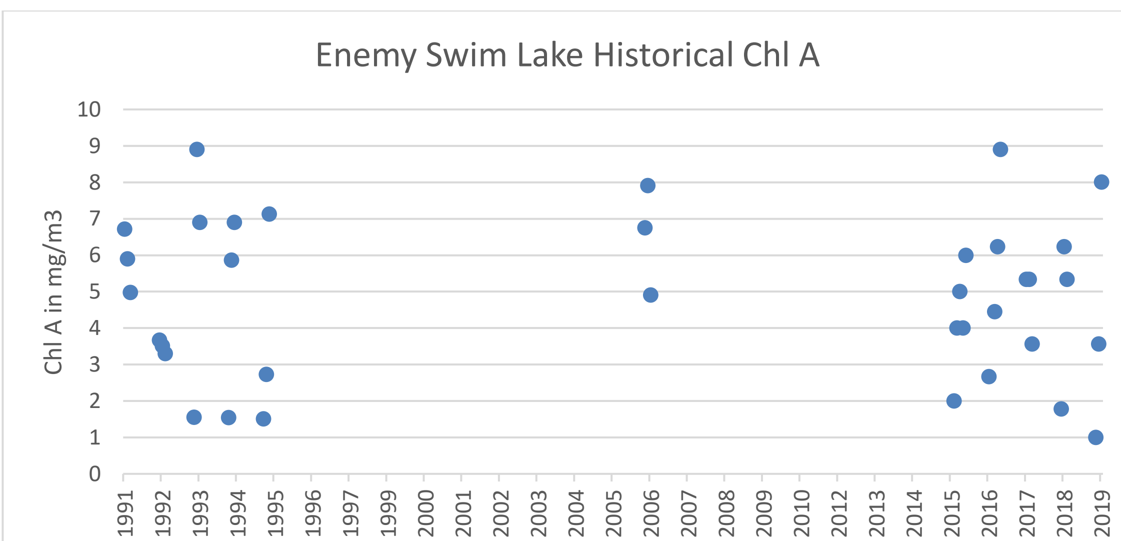


Figure 5. Historical chlorophyll a concentrations (mg/m3) for Enemy Swim Lake from 1991 to 2019

Chlorophyll *a* is the pigment that makes plants and algae green. Chlorophyll *a* is tested in lakes to determine the algae concentration or how "green" the water is. Concentrations greater than 10 mg/m3 are perceived as a significant algae bloom, while concentrations greater than 20 mg/m3 are perceived as a nuisance.

Chlorophyll *a* was evaluated occasionally in Enemy Swim Lake since 1991 (Figure 5). All of the samples were below the 10 mg/m3 significant algae bloom level. Over the period of observation chlorophyll a levels have remained consistent. The range observed is typical for a mesotrophic lake with excellent recreational quality.

Phosphorus

Enemy Swim Lake is phosphorus limited, which means that algae and aquatic plant growth is dependent upon available phosphorus. Total phosphorus was evaluated in Enemy Swim Lake from 1991 to 2019 (Figure 6). A majority of data points fall into the mesotrophic range which is below 0.025 mg/l of phosphorous. During early summer months when the lake is stratified, the phosphorus is at the lowest concentration, and it increases in late summer when lake turnover begins.

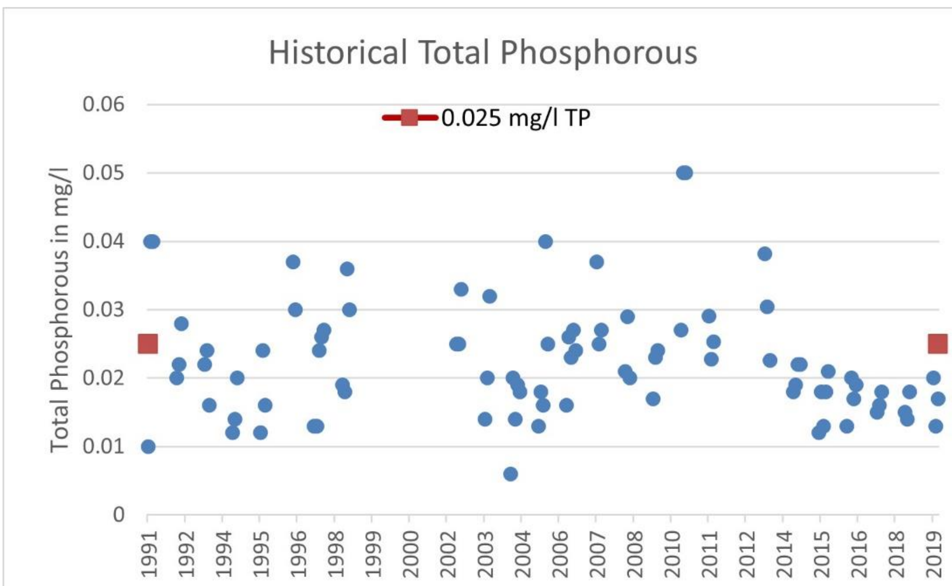


Figure 6. Historical total phosphorus concentrations in surface samples from 1991 to 2019

Similar results are being seen at the lake bottom where levels of phosphorous have remained quite stable (Figure 7). Accumulated nutrients are stored in a lake by binding to bottom sediments. The measure of phosphorous close to the lake bottom is a good indicator of how well a lake is storing nutrients and how much is being released into the water. Levels of phosphorous at the lake bottom also reflect how much oxygen is available in the water. High loads of nutrients can deplete oxygen levels and alter the lake's nutrient storage process. This can make additional phosphorous available to plants and algae that was previously stored in the bottom sediments. This process, known as internal loading, causes elevated levels of dissolved phosphorous near the lake bottom that can cause weed growth and algae blooms if it mixes into the water column.

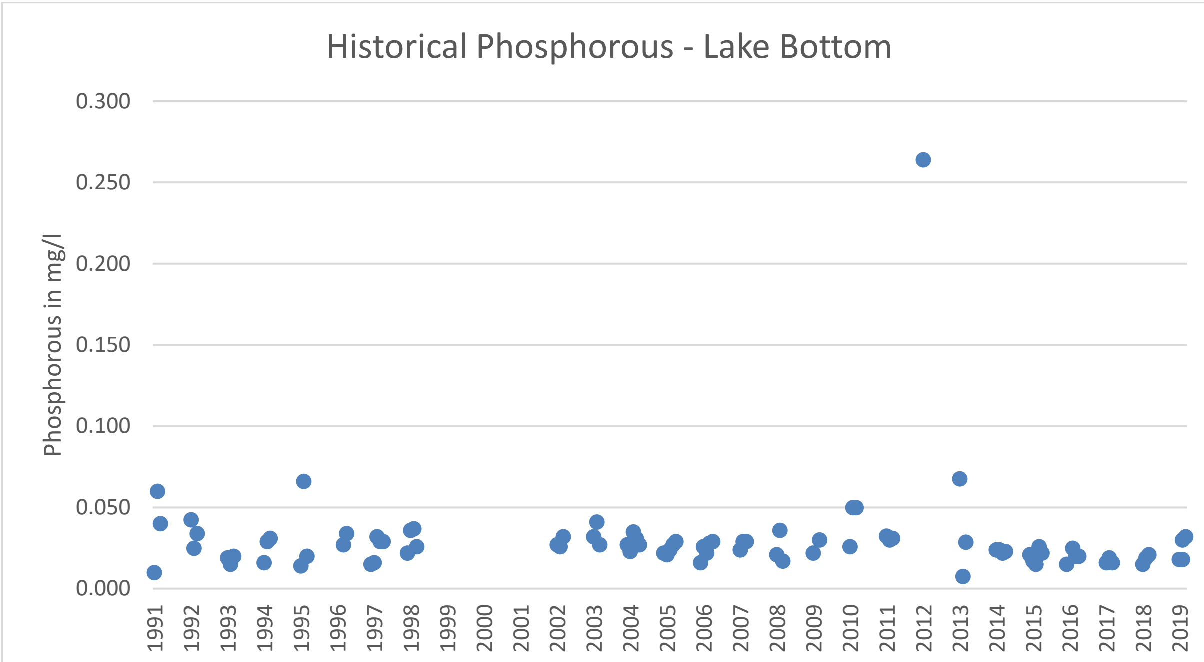


Figure 7: Total phosphorous as measured at the lake bottom from 1991 to 2019

The phosphorous concentrations observed in the samples taken at the bottom of Enemy Swim Lake show almost no indication of an internal loading pattern. The samples show only small increases of phosphorous during periods of low oxygen with levels staying close to the mesotrophic range. Only one sample, from 2012, showed signs of elevated phosphorous levels. Monitoring dissolved oxygen levels and nutrient levels near the lake bottom provides excellent information about the rate of lake aging in Enemy Swim Lake.

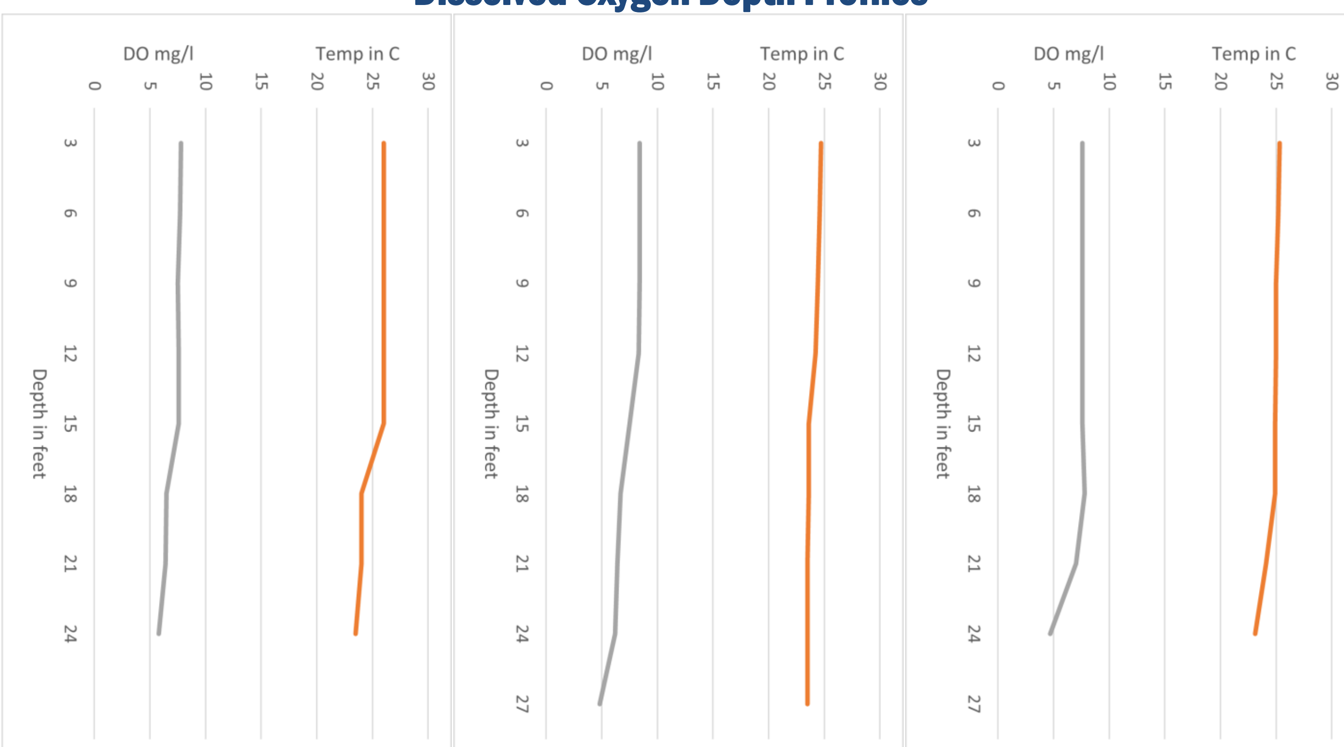
Oxygen

Dissolved Oxygen (DO) is the amount of oxygen available in lake water. Oxygen is necessary for all living organisms to survive except for some bacteria. Dissolved oxygen levels of <5 mg/L are typically avoided by game fisheries. While the surface of the lake stays well oxygenated, the bottom layers can run out.

As organic matter decays, natural iron compounds bind with phosphorus, storing it in lake sediments. The process of decomposition also consumes oxygen, if the supply of dissolved oxygen gets too low then the bottom of a lake can become anoxic – oxygen depleted. These areas of oxygen depletion allow phosphorus to be released from the sediments back into the water as dissolved phosphorus. In very deep lakes, this anoxic layer is often restricted to the lake bottom until fall turnover due to stratification which is the layering of warm light upper water on top of cool dense lower water. In moderately deep lakes the water column can temporarily stratify. While stratified the lower water can become depleted of oxygen and nutrients released from the lake sediments. A windy day can then mix up the water, causing phosphorus from the anoxic lake bottom to resuspend into the water. This process is known as internal nutrient loading and can cause rapid algae blooms. Moderately deep lakes still turnover in fall and spring causing some nutrient recycling. Shallow lakes usually stay well mixed all summer due to wind action and then turnover as water temps cool in the fall.

Sampling in Enemy Swim Lake has indicated the lake only occasionally stratifies and rarely sees oxygen depletion even when stratified. The lake stays well mixed with similar temperature and oxygen levels throughout the water column. Oxygen levels rarely fell to the levels that would affect game fish, 5 mg/l, and when it does occur it is limited to a thin zone of water at the lake bottom.

Dissolved Oxygen Depth Profiles



2005 **2010** **2019**

Trophic State Index (TSI)

TSI is a standard measure or means for calculating the trophic status or productivity of a lake. More specifically, it is the total weight of living algae (algae biomass) in a waterbody at a specific location and time. Three variables, chlorophyll a, Secchi depth, and total phosphorus independently estimate algal biomass.

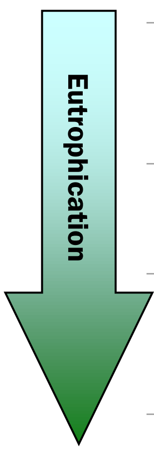
If all three TSI numbers are within a few points of each other, they are strongly related. If they are different, there are other dynamics influencing the lake's productivity, and TSI mean should not be reported for the lake. Enemy Swim Lake falls into the mesotrophic range (Tables 5,6).

Table 5. Trophic State Index for Enemy Swim Lake

Trophic State Index	
TSI Phosphorus	49
TSI Chlorophyll-a	46
TSI Secchi	47
TSI Mean	47
Trophic State:	Mesotrophic

Numbers represent the mean TSI for each parameter.

Enemy Swim Lake



TSI	Attributes	Fisheries & Recreation
<30	**Oligotrophy:** Clear water, oxygen throughout the year at the bottom of the lake, deep cold water.	Trout fisheries dominate.
30-40	Bottom may become anoxic (no oxygen).	Trout fisheries in deep lakes only. Walleye, Cisco present.
40-50	**Mesotrophy:** Water moderately clear most of the summer. May be "greener" in late summer.	No oxygen at the bottom of the lake results in loss of trout. Walleye may predominate.
50-60	**Eutrophy:** Algae and aquatic plant problems possible. "Green" water most of the year.	Warm-water fisheries only. Bass may dominate.
60-70	Blue-green algae dominate, algal scums and aquatic plant problems.	Dense algae and aquatic plants. Low water clarity may discourage swimming and boating.
70-80	**Hypereutrophy:** Dense algae and aquatic plants.	Water is not suitable for recreation.
>80	Algal scums, few aquatic plants.	Rough fish (carp) dominate; summer fish kills possible.

Source: Carlson, R.E. 1997. A trophic state index for lakes. *Limnology and Oceanography*. 22:361-369.

Table 6. Trophic state index attributes and their corresponding fisheries and recreation characteristics

Trend Analysis

For detecting trends, a minimum of 8-10 years of consecutive data with 4 or more readings per season are recommended. Minimum confidence accepted by the Minnesota Pollution Control Agency is 90%. This means that there is a 90% chance that the data are showing a true trend and a 10% chance that the trend is a random result of the data. Only short-term trends can be determined with just a few years of data, because there can be different wet years and dry years, water levels, weather, etc, that affect the water quality naturally.

Enemy Swim Lake had sufficient data to perform a trend analysis for phosphorous and transparency from 2002 to 2019 (Table 7). Chlorophyll *a* data did not have 8 consecutive years of data, so a trend could not be run. Continuing to monitor the chlorophyll *a* in the next few years will allow for future analysis. The data was analyzed using the Mann-Kendall Trend Analysis. No statistically significant trends were detected for total phosphorus or transparency, but there is a trend of increasing levels of dissolved phosphorus which indicates declining water quality.

Table 7. Trend analysis for Enemy Swim Lake

Parameter	Date Range	Trend	Probability	Significance
Total Phosphorus	2002-2019	Improving - Decreasing Nutrient Levels	95%	Lower levels of nutrients indicate higher recreational quality.
Transparency	2002-2019	Improving – Increasing Water Clarity	90%	Improving clarity enhances recreational quality.

Lakeshed and Land Cover

Understanding a lakeshed requires an understanding of basic hydrology. A watershed is defined as all land and water surface area that contribute excess water to a defined point. The Minnesota DNR has delineated three basic scales of watersheds (from large to small): 1) basins, 2) major watersheds, and 3) minor watersheds.

The Big Sioux River Major Watershed is one of the watersheds that make up the Missouri River Basin, which drains south to the Gulf of Mexico. The Waubay Lakes Basin is part of the Big Sioux River watershed, and Enemy Swim Lake's lakeshed is in the Waubay Lakes Basin. These lakesheds (catchments) are the "building blocks" for the larger scale watersheds. Lakesheds are very useful for displaying the land and water that contribute directly to a lake, but they are not always true watersheds because they may not show the water flowing into a lake from upstream streams or rivers. While some lakes may have only one or two upstream lakesheds draining into them, others may be connected to a large number of lakesheds, reflecting a larger drainage area via stream or river networks.

In an effort to prioritize protection and restoration efforts of fishery lakes, the Minnesota DNR has developed a ranking system by separating lakes into two categories based on their lakeshed: those needing protection and those needing restoration. Modeling by the DNR Fisheries Research Unit suggests that total phosphorus concentrations increase significantly over natural concentrations in lakes that have a watershed with disturbance greater than 25%. Therefore, lakes with watersheds that have less than 25% disturbance need protection and lakes with more than 25% disturbance need restoration (Table 8). Watershed disturbance was defined as having urban, agricultural and mining land uses. Watershed protection is defined as publicly owned land, public water, wetlands, or conservation easement.

Table 8. Suggested approaches for watershed protection and restoration of DNR-managed fish lakes in Minnesota

Watershed Disturbance (%)	Watershed Protected (%)	Management Type	Comments
< 25%	> 75%	Vigilance	Sufficiently protected -- Water quality supports healthy and diverse native fish communities. Keep public lands protected.
	< 75%	Protection	Excellent candidates for protection -- Water quality can be maintained in a range that supports healthy and diverse native fish communities. Disturbed lands should be limited to less than 25%.
25-60%	n/a	Full Restoration	Realistic chance for full restoration of water quality and improve quality of fish communities. Disturbed land percentage should be reduced and BMPs implemented.
> 60%	n/a	Partial Restoration	Restoration will be very expensive and probably will not achieve water quality conditions necessary to sustain healthy fish communities. Restoration opportunities must be critically evaluated to assure feasible positive outcomes.

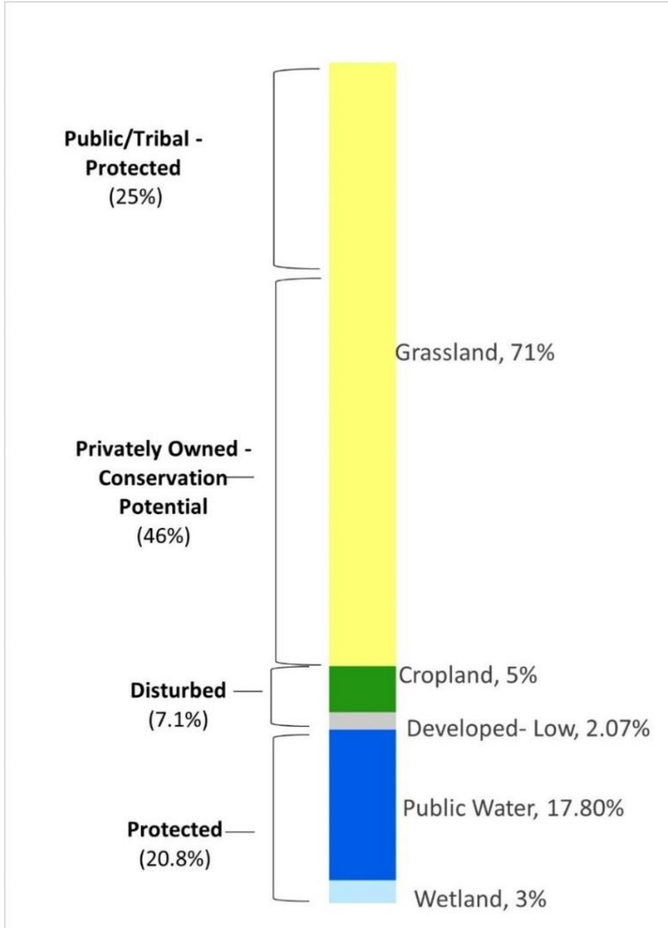


Figure 8. Land use in the Enemy Swim Lake lakeshed

According to the 2011 National Land Cover Data Set Enemy Swim Lake's lakeshed is classified as having 45.8% of the watershed protected and 7.1% of the watershed disturbed (Figure 8). Therefore, this lakeshed should have a protection focus. Goals for the lake should be to limit any increase in developed or agricultural land uses and increase the amount of protected lands. Runoff reduction, cover cropping, and wetland restoration projects are some potential tools for reducing the impacts existing development and intensive land uses have on Enemy Swim Lake's recreational quality.

Land use and Ownership

Activities that occur on the land within the lakeshed can greatly impact a lake. Land use planning helps ensure the use of land resources in an organized fashion so that the needs of the present and future generations can be best addressed. Enemy Swim Lake receives water from the northeast through one perennial stream.

The majority, over 2/3rd's, of the Enemy Swim Lake's watershed is privately owned. Almost half (45%) of the watershed could be considered protected lands. This total includes Public land, Tribal land, open water, and wetlands. Some of the areas mapped as Protected may actually be developed land, roadways, and other intensive uses but the level of protection in this lakeshed is still considered high. Protecting and restoring wetlands in the Enemy Swim lakeshed would provide additional nutrient and water storage. This can reduce the amount of nutrients transported to Enemy Swim Lake if the restored wetlands function properly. This lakeshed vitals table identifies where to focus organizational and management efforts for each lake (Table 9). Criteria were developed using limnological concepts to determine the effect to lake water quality.

KEY

● Possibly detrimental to the lake
◍ Warrants attention
○ Beneficial to the lake

Table 9. Enemy Swim Lake lakeshed vitals

Lakeshed Vitals		Rating
Lake Area	2146 acres	descriptive
Littoral Zone Area	Data unavailable	descriptive
Lake Max Depth	26 ft	descriptive
Lake Mean Depth	16 ft	◍
Water Residence Time	5 years	●
Miles of Stream	Data unavailable	descriptive
Inlets	1	◍
Outlets	1	○
Major Watershed	Big Sioux River	descriptive
Minor Watershed	Waubay Lakes Basin	descriptive
Ecoregion	Northern Glaciated Plains	descriptive
Total Lakeshed to Lake Area Ratio (total lakeshed includes lake area)	10.4:1	◍
Standard Watershed to Lake Basin Ratio (standard watershed includes lake areas)	10.4:1	Not Available
Wetland Coverage	3%	●
Aquatic Invasive Species	None	○
Public Drainage Ditches	Data unavailable	Not Available
Public Lake Accesses	2	◍
Miles of Shoreline	11.8	descriptive
Shoreline Development Index	2.3	●
Public Land to Private Land Ratio	Data unavailable	Not Available
Development Classification	Recreational Development	◍
Miles of Road	52.8	descriptive
Municipalities in lakeshed	None	○
Forestry Practices	None	●
Feedlots	13	●
Percent Disturbed Land Use	7.1%	○
Percent Protected Land	20.8%	◍
Sewage Management	Sanitary Sewer	○
Lake Management Plan	Several	○
Lake Vegetation Survey/Plan	None	◍

Enemy Swim Lake, 2020 Fisheries Survey Summary from SD G&F

Enemy Swim, located 1.5 miles east and 6.5 miles north of Waubay, is managed as a multiple-species fishery including panfish (i.e., black crappie, bluegill, and yellow perch), black bass (largemouth and smallmouth) and walleye.

• Black crappie. More black crappies were sampled in 2020 than in 2019, but relative abundance remained low (2.2/frame net). Sampled black crappies ranged from 3.9 to 9.1 inches, of those that were at least 5.0 inches, 35% were 8.0 inches or longer.

• Bluegill. Bluegill CPUE declined for the second straight year. At 46.0/frame net, relative abundance was considered low to moderate for Enemy Swim Lake. Sampled bluegills ranged in length from 3.1 to 9.8 inches, 19% were >6.0 inches and 2% were >8.0 inches. Individuals from five consecutive year classes (2014 – 2018) contributed to the catch. Bluegills from the 2016 (age-4) cohort were the most abundant accounting for 50% of fish in the sample, those from the 2017 (age-3) year class made up an additional 34%. Since 2011, mean length at capture values for age-5 bluegills have ranged from 5.4 to 7.8 inches. In 2020, age-5 bluegills had a mean length of 6.2 inches.

• Largemouth/Smallmouth bass. Spring electrofishing was not completed in 2020.

• Walleye. Similar to 2019, walleye numbers were low (1.8/gill net). Sampled walleyes ranged in length from 7.1 to 28.0, more than half (57%) were >15.0 inches. Individuals from 10 year classes produced between 2001 and 2018 contributed to the catch, each was represented by six or fewer fish. The oldest walleye sampled was from the 2005 (age-15) cohort.

• Yellow perch. Yellow perch numbers were higher in 2020 than in 2019. In 2020, the mean gill net CPUE was 13.2 and suggested moderate relative abundance. Those sampled ranged from 5.1 to 7.5 inches, most (75%) were from the 2018 (age-2) cohort. Yellow perch growth tends to be slow with mean length at captures at age 2 from 3.8 to 5.8 inches in surveys conducted since 2011. In 2020, age-2 fish had a mean length of capture of 5.8 inches.

For more detailed results see the computer generated South Dakota Statewide Fisheries Survey for Enemy Swim https://apps.sd.gov/GF56FisheriesReports/ExportPDF.ashx?ReportID=22891

Key Findings and Recommendations

Monitoring Recommendations

Transparency monitoring at the primary sites should be continued every year. It is important to continue transparency monitoring, possibly weekly but at least monthly every summer to enable year-to-year comparisons and trend analyses. Phosphorus, dissolved phosphorous, Total Kjeldhal Nitrogen, and chlorophyll *a* monitoring should continue, as the budget allows, to track future water quality trends. Additional dissolved oxygen data would be helpful in gauging the lake's condition.
Monitoring the aquatic plant communities composition and coverage can be important for tracking lake aging if zebra mussels should infest the lake in the future. By consuming free floating algae and redepositing it onto the shallow lake bottom zebra mussels shift lakes from their current phytoplankton (algae) dominated state to a periphyton (rooted algae and plants) dominated state.

Overall Conclusions

Enemy Swim Lake is a mesotrophic lake (TSI = 47) with improving water quality trends for total phosphorus and transparency. Water quality measures appear to be stable to improving. Nutrients are being effectively stored in the lake bottom with little to no sign of internal loading which occurs when previously stored nutrients recycle back into the lake water.

Phosphorus Loading and Priority Impacts

Enemy Swim Lake is a headwaters lake so very little nutrients or sediment are transported to the lake from far away. Water that enters Enemy Swim Lake takes several years to flow through the system and the lake retains almost all of the nutrients and sediment that wash into it. This means that the land practices immediately around the lake have the greatest impact on the lake's water quality.

Table 10. Watershed characteristics

Lakeshed to Lake Area Ratio (lakeshed includes lake area)	10:1
Watershed to Lake Area Ratio (watershed includes lake areas)	10:1
Number of Upstream Lakes	0
Headwaters Lake?	Yes
Inlets / Outlets	1/ 1
Water Residence Time	~5 years

Enemy Swim Lake is primarily fed by surface inflow and there are some springs discharging groundwater into the lake. The large lake size and reasonable depth gives the water a moderate residence time in the lake, likely 5 or more years. Most lakes permanently retain at least half of the nutrients that flow into the lake in their bottom sediments. Enemy Swim Lake likely retains over 75% of the nutrients that reach the lake.

Only 3% of the lakeshed is covered with wetlands, which does not provide very much water storage and filtration (Figure 8). Protecting and restoring wetlands will help maintain water levels and water storage, reduce flooding, and filter runoff during large storm events. Maintaining existing grassland acres will help preserve the lake's water quality.

Development pressure is increasing around the shorelines and within the watersheds of many lakes. This development can degrade water quality and impact valuable shoreline habitat. Native shoreline vegetation provides habitat for fish and wildlife, filters harmful nutrients, and protects against shoreline erosion. Lakeshore owners can minimize their impact on the shoreline and maintain a more natural setting while reducing annual maintenance. For more information on how to accomplish this, go to the following website: www.dnr.state.mn.us/shorelandmgmt

Best Management Practices Recommendations

The management focus for Enemy Swim Lake should be to preserve and improve the condition of the watershed implementing grassland stewardship and preservation projects. Efforts should also be focused towards managing and/or decreasing the impacts caused by agriculture, current and additional development, nutrient-saturated wetlands, and impervious areas. Project ideas include grazing easements, rotational grazing promotion, cover crops, shoreline restoration, rain gardens, and runoff infiltration systems.

Enemy Swim Lake Goals

1. Protection Focus: minimize disturbed land uses with BMPs and maintain protected lands through stewardship and easement programs.
2. Manage phosphorus loading from the **nearshore.**
3. Restore wetlands where appropriate and functional conditions can be attained.
4. Encourage maintaining a living soil cover including rotational grazing, cover crops, and no till cropping.

Table 11. Best Management Practices specific to Enemy Swim Lake

Category	Land use type	Conservation project ideas	Results	Who	Contact for help
Conservation Potential	Pasture/grassland/CRP 71%	Conservation Reserve Program (CRP), managed grazing, plant trees, conservation/grazing easements, maintain/restore wetlands.	Reduce water runoff and soil erosion, better water storage.	• Individual Property Owners • Sisseton-Whapeton Sioux	Day County Conservation District (605) 345-4661
Disturbed Land	Cultivated crops 5%	Restore wetlands; Conservation Reserve Program (CRP), Cover Crops	Reduce water runoff and soil erosion, better water storage. Maintain a living soil cover.	• Individual Property Owners	Day County Conservation District (605) 345-4661
	Developed, low intensity 2%	Shoreline buffers, tree planting, rain gardens.	Reduce water runoff and shoreline erosion.	• Individual Property Owners	Day County Conservation District (605) 345-4661
	Developed, high intensity (0.01%, 2 acres)	Infiltration trenches, permeable pavements, tree planting, rain gardens, shoreline buffers, stormwater retention.	Reduce water runoff into streams and lakes.	• Individual Property Owners	Day County Conservation District (605) 345-4661

The current lakeshore homeowners can lessen their impacts on water quality and lake health by planting native plants, shoreline buffers, or maintaining the trees on their properties. Suitable tree species can intercept rainfall, loosen the soils, and reduce the movement of nutrients and sediment to the lake. Forested uplands contribute about one tenth as much phosphorus (lbs/acre/year) compared to developed land.

Native aquatic plants stabilize the lake's sediments and tie up phosphorus in their tissues. When aquatic plants are uprooted from a shallow lake, the lake bottom is disturbed, and the phosphorus in the water column gets used by algae instead of plants. Protecting native aquatic plant beds will ensure a healthy lake and healthy fishery. If a swimming area is necessary in front of people's docks, clear only the area of plants necessary and permitted.

Organizational contacts and reference sites

South Dakota Game & Fish Office	603 East 8th Ave, Webster, SD 57274 605-345-3381
South Dakota Department of Agriculture & Natural Resources	523 E Capitol Ave, Pierre, SD 57501 (605) 773-3151
Northeast Glacial Lakes Watershed Project	info@neglwatersheds.org (605) 345-4661
Enemy Swim Sanitary District	(605) 947-4319
Sisseton-Wahpeton Oyate	PO Box 509, Sisseton, SD 57262 (605) 698-3911
Day County Conservation District	600 E Highway 12, Ste 1 Webster, Sd 57274 (605) 345-4661
Roberts County Conservation District	2018 SD Highway 10, Sisseton, SD 57262 (605) 698-3923

Table 12. Organizational contacts and reference sites