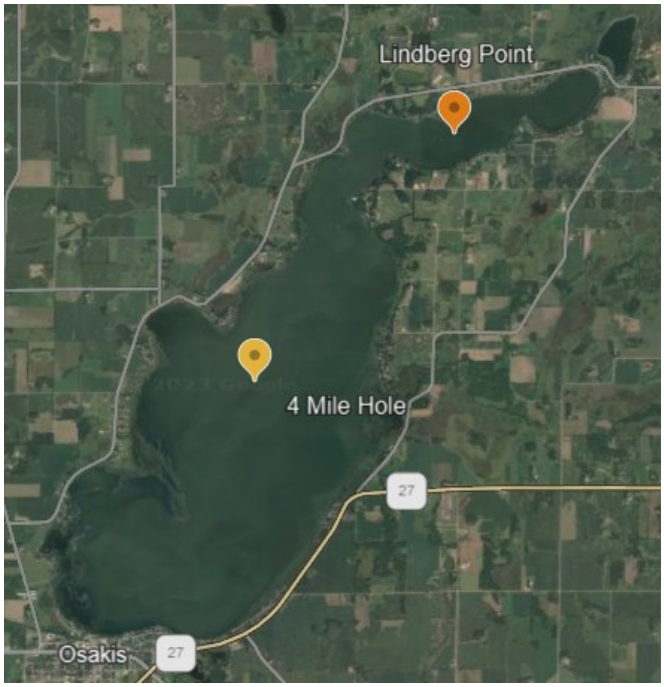
2024 Osakis Lake Association Monitoring Summary

Lake Osakis at Lindberg Point, 4-Mile Hole

Lake Osakis Overview

Lake Osakis is located in central Minnesota along the border of Todd and Douglas Counties. The lake is the official headwaters of the Sauk River, which is a 126 mile long tributary to the Mississippi River. Lake Osakis, and all of the Sauk River Watershed District, falls in the North Central Hardwood Forest (NCHF) ecoregion. This is a transitional tract of land from a forested landscape to the north, leading to a grassland savannah in the south. Both Lake Osakis and the Sauk River have been designated by the Minnesota Pollution Control Agency (MPCA) as beneficial use Class 2B - protected for aquatic life and recreation. Lake Osakis was placed on Minnesota's 303 (d) impaired waters list in 1998 for mercury in fish tissue, in 2004 for nutrients, and 2022 for poor fish bioassessment findings. Smith, Faille, and Maple Lakes are located upstream of and drain to Lake Osakis, and these lakes are also impaired for nutrients.



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Sauk River Watershed District

Created February 2025

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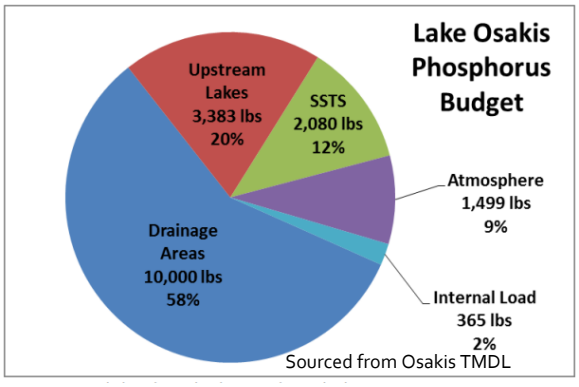
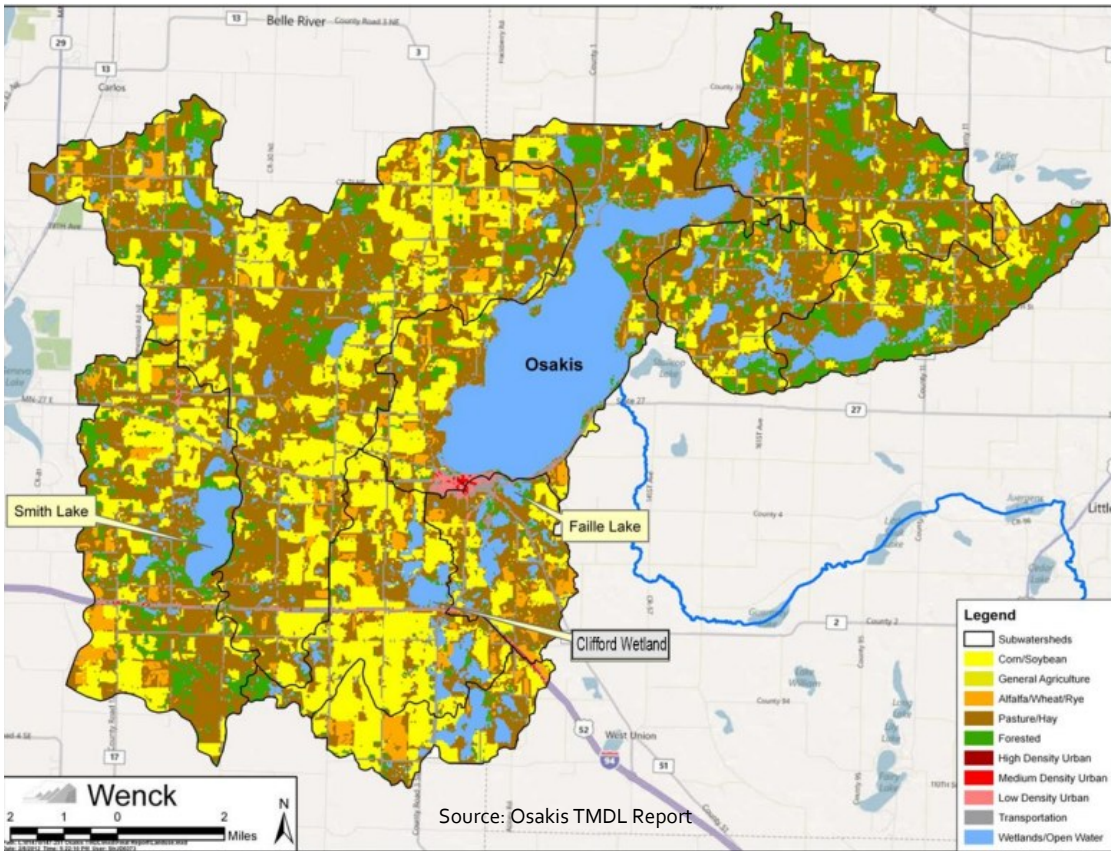
Osakis Lake Water Quality Standards and TMDL



Sourced from Osakis TMDL

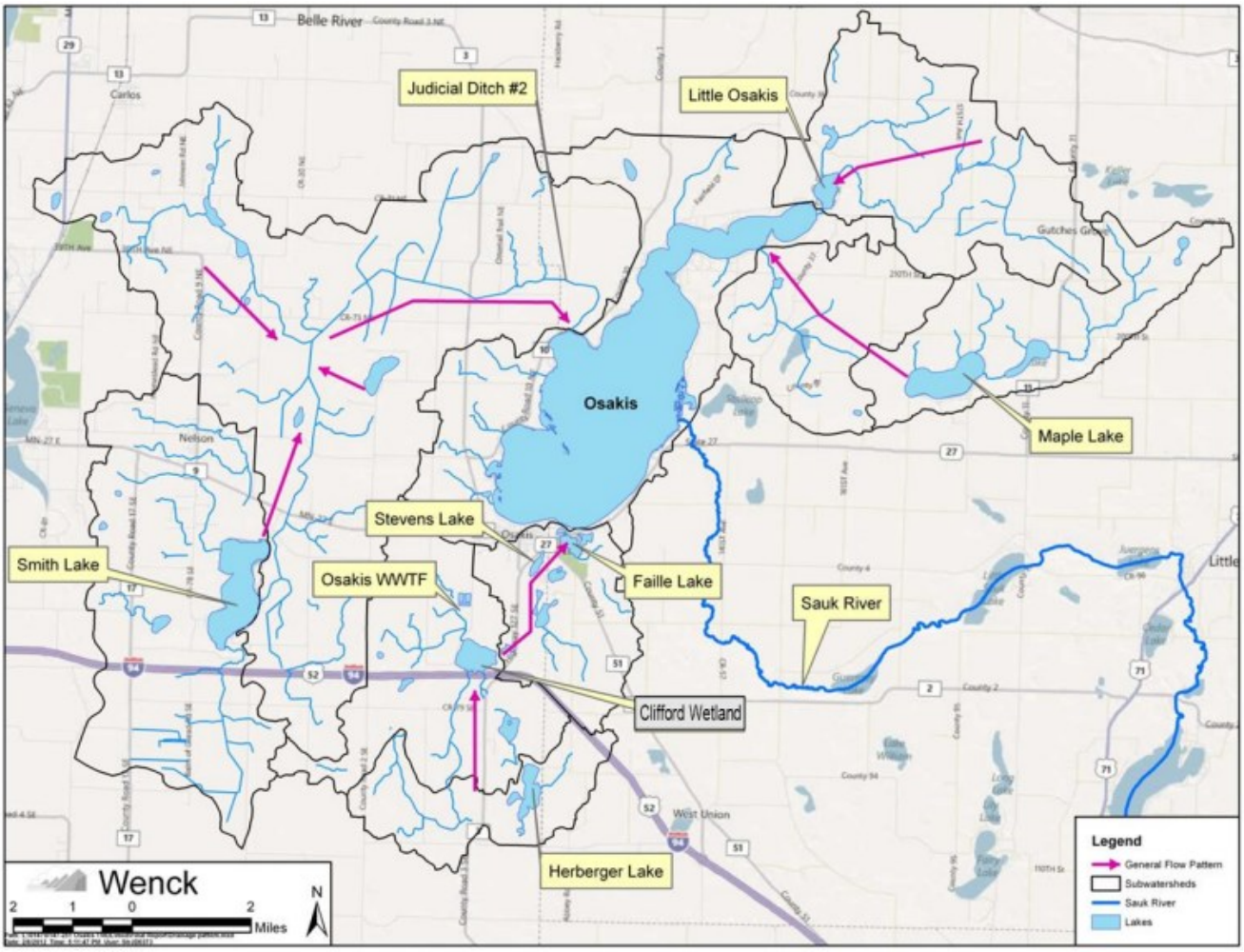
Lake Osakis is a large, deep lake with a water residence time of approximately five years. Despite deep spots reaching 73+ feet ,about 45% of the 6,300 acre lake is shallow enough to support submerged aquatic vegetation. Lake Osakis has been considered impaired for excessive nutrients since 2004 and, has undergone a Total Maximum Daily Load (TMDL) study to address its impairments. Smith, Faille, and Maple Lake are all located upstream of and drain to Lake Osakis. The purpose of the TMDL was to calculate the existing phosphorus load in the sub-watershed and the reduction amount needed for the waterbodies to meet state water quality standards (WQS). WQS are largely based on the ecoregion and designated used of the waterbody. Osakis Lake has been designated as beneficial use classification 2B by the MPCA, which specifies water quality standards to ensure the protection of aquatic life and recreation. The numeric water quality standards for Osakis Lake is a maximum annual average concentration of 40 µg/L for total phosphorus, 14 µg/L for chlorophyll-A, and an average greater than 4.6 feet for Secchi depth visibility (for a table of these water quality parameters, see page 5).

The primary source of excessive phosphorus for Smith, Faille, and Osakis Lake is non-point source runoff from the surrounding agricultural landscape. Over 50 percent of the phosphorus entering Lake Osakis comes by direct drainage to the lake.



Source: Osakis TMDL Report

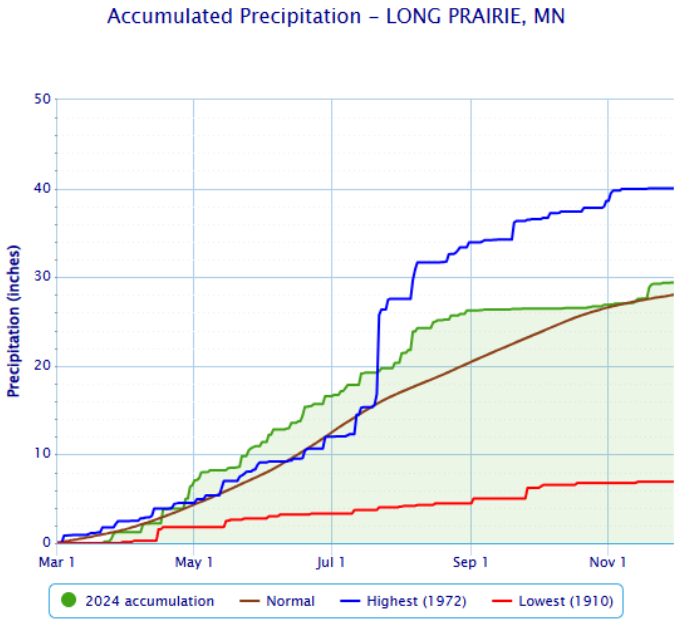
Lake Osakis TMDL, Clifford Wetland, and Faille Lake



The initial Osakis Lake Area TMDL was approved in 2013, but did not account for an additional impaired lake in the watershed at that time, "Clifford Lake." The small, shallow lake had limited information available, and development of a TMDL for "Clifford Lake" was postponed until additional depth and size information was obtained. "Clifford Lake" is the receiving water of effluent from the city of Osakis Wastewater Treatment Facility (WWTF), a point source discharge. As data was gathered, it was revealed that Clifford was much more shallow than previously indicated. It was determined in 2023 that Clifford Lake was not a lake, but a wetland. This led to the delisting of "Clifford Lake" for a nutrient impairment since wetlands in MN currently do not have water use classification protections (like for phosphorus for example). Clifford Wetland drains into Faille Lake, which is impaired for nutrients. Faille Lake then flows to Osakis Lake. Once Clifford Lake was reclassified Clifford Wetland, the MPCA rewrote the TMDL in 2023 and recalculated Faille Lake's total phosphorus load calculations to include the effluent coming from the Osakis WWTF. Water quality monitoring in 2017 and 2018 showed Faille Lake still exceeds its total phosphorus standard, but is not showing an associated increase in chlorophyll-A concentrations or a reduction in Secchi disk visibility. Faille Lake was taken off the Minnesota Impaired Waters List in 2020.

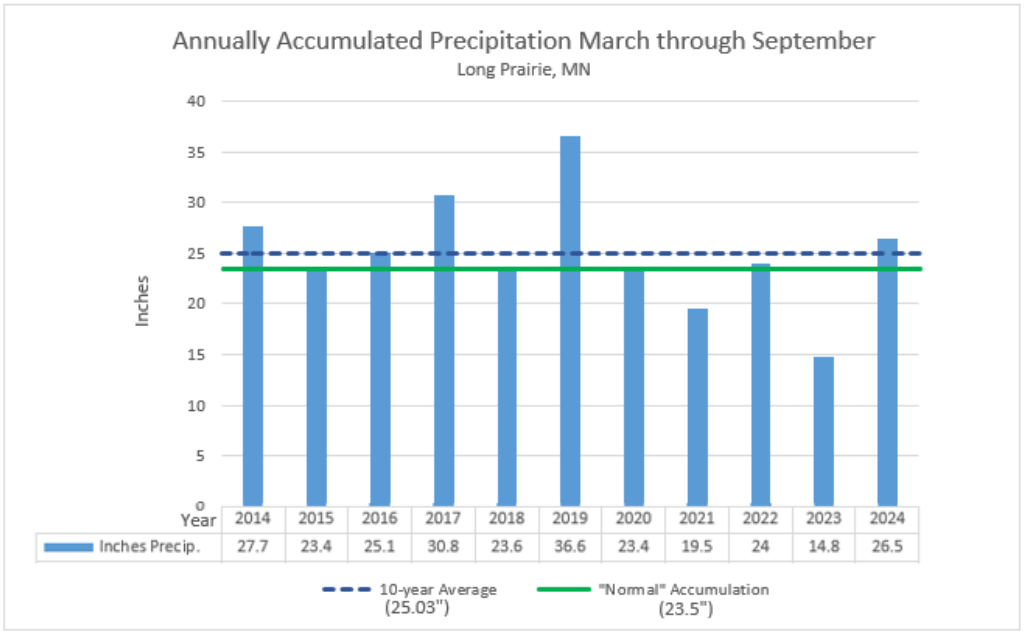
2024 Precipitation near Lake Osakis

Precipitation events during the 2024 sampling season near Long Prairie, the closest long term precipitation monitoring site to Lake Osakis, were significantly different than the previous year. The graph to the right shows the rainfall received in 2024 from March through November (green line). Several large rain event occurred throughout the summer months, and the region received over 19" between March 1st to September 1st, 4" greater than the same period in 2023. A "Normal" amount of rainfall for the region (brown line) for that time period is ~23.7 inches.



Graph obtained from the National Oceanic and Atmospheric Administration (NOAA)

The graph below shows annual precipitation over the last 10 years from March through September. 2024 was the wettest year since 2019 and above the 10-year average. 2023 remains the driest year over the last 10 years. After little to no precipitation over winter, drought conditions continued into the start of 2024. However, things changed in early May when heavy rain events began and continued into early September and brought precipitation levels above "Normal". The consistent precipitation throughout the summer months relieved a 3 year drought and pushed us into normal conditions, at least for a while. Mid-way into September, it seemed that the natural tap was shut off, and above normal temperatures brought us back into a drought. Unlike 2023, water levels and flows in monitored tributaries never stopped in 2024.



"Normal" Accumulation obtained from NOAA data.

Lake Osakis 2024 Monitoring Activities

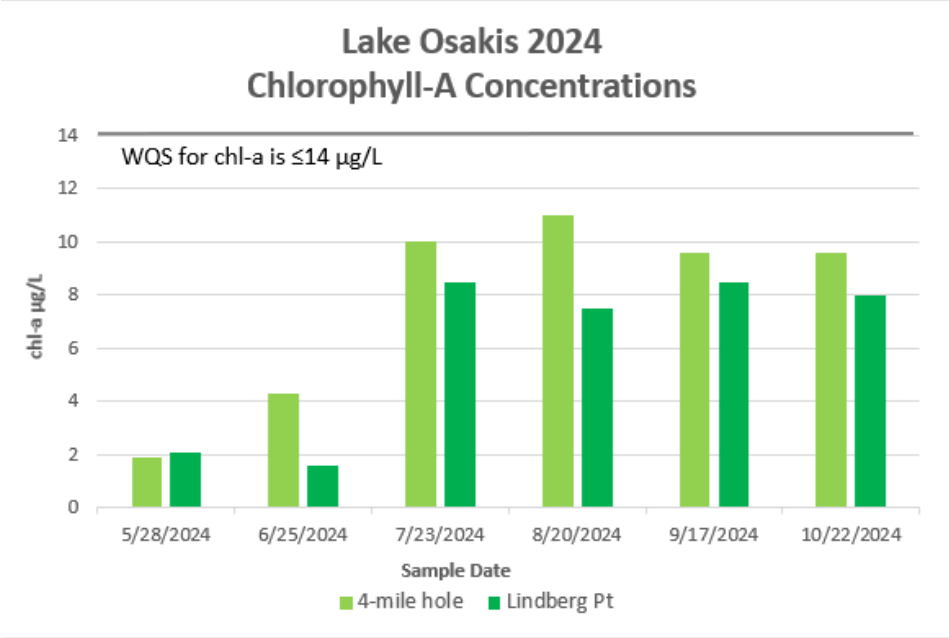
Osakis Lake Association's water quality sampling activities in 2024 continued at Lindberg Point in the "small lake" at the northern end of the lake and 4-Mile Hole, which is in the "big lake" section of the lake to the south. These locations are the intensive monitoring sites the SRWD visits on a 5-year rotation. They were chosen because they are deep spots in the lake with less influence from nearshore microenvironments, and surface water at these sites is representative of ambient lake surface conditions. The deep spots in the lake are also where lake stratification and thermoclines usually occur (see page 10 for more information), so oxygen and temperature depth profiles are taken by the SRWD at these deep spots to assess bottom loading of nutrients.

A raindrop falling into Lake Itasca in Minnesota will travel the length of the Mississippi and arrive at the Gulf of Mexico about ninety days later.

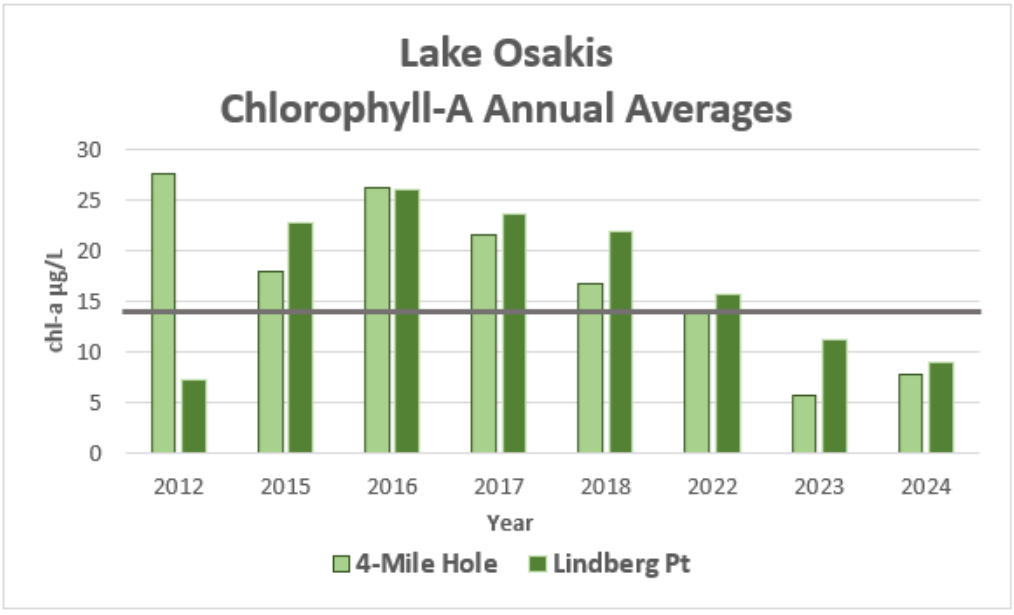
It is important to note that water quality standards differ between lakes and streams and also differ by ecoregion and designated use. Below is a table outlining the water quality standards for the Sauk River Watershed based on its beneficial use classification and ecoregion. Lake Osakis and its tributaries have been designated by the MPCA as Class 2 - beneficial use for aquatic life and recreation. Most streams in the watershed, like the Sauk River, are further classified as Class 2B, which has a designated use for cool and warm water fisheries, but not protected for drinking water. Lakes, streams, and rivers throughout Minnesota are classified differently based on their designated use, and their water quality standards are written to protect that determined resource for future generations.

E. coli Water Quality Standards for Class 2 Waters		
Monthly Geometric Mean	10% of Samples Max.	Applicable Season
126	1260	April 1 - October 31
Eutrophication standards for class 2B rivers and streams.		
Substance	**Units**	**Chronic Standard**
Total Suspended Solids	mg/L	less than or equal to 30
Phosphorus, total	µg/L	less than or equal to 100
Lakes and Reservoirs in North Central Hardwood Forest Ecoregion		
Substance	**Units**	**Chronic Standard**
Phosphorus, total	µg/L	40
Chlorophyll-a	µg/L	14
Secchi disk transparency	feel	Not less than 4.6
Shallow Lakes in North Central Hardwood Forest Ecoregion (<15 ft)		
Substance	**Units**	**CS**
Phosphorus, total	µg/L	60
Chlorophyll-a	µg/L	20
Secchi disk transparency	feet	Not less than 3.3

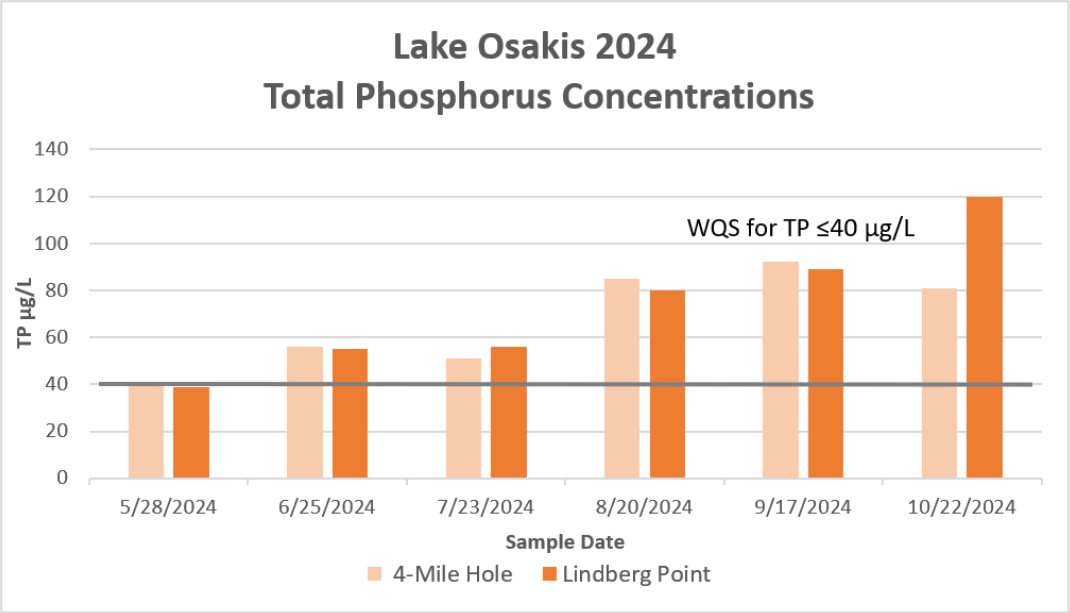
2024 Water Quality at 4-Mile Hole & Lindberg Point



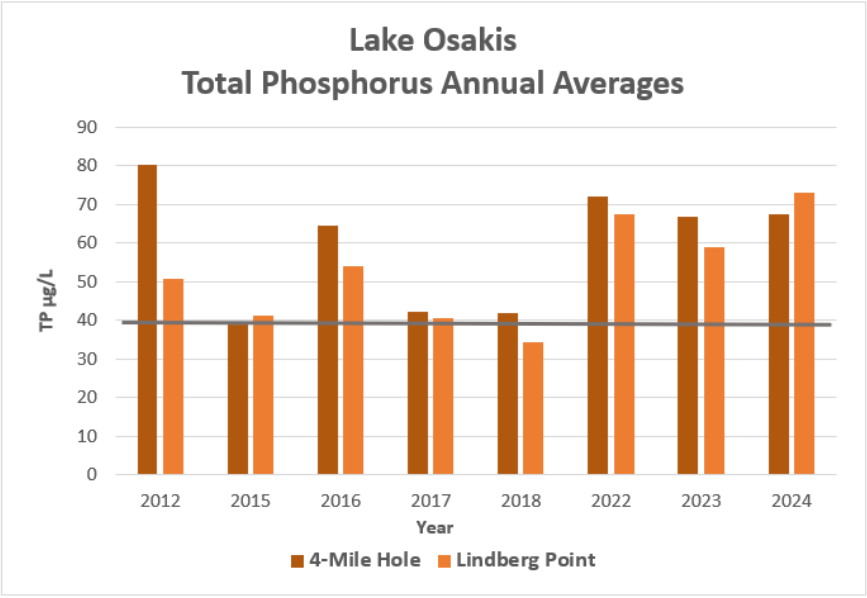
The graph above contains the 2024 chlorophyll-A (chl-A) sample results for both sites on Lake Osakis. These samples were taken from the first 6 feet of lake surface water, which is the common range for light penetration and algae growth. All chl-A samples collected in 2024 met the water quality standard of less than 14 µg/L. There was some variation in chlorophyll-A concentrations between the two sites, but no extreme differences. Concentrations were consistently higher at the 4-Mile Hole site, except for the first sample collected. The bottom graph shows the annual average chl-A concentrations for both sites. It appears that chl-A concentrations have been decreasing in Lake Osakis over the last decade. Each year's climate conditions vary, and in response, the chlorophyll-A concentrations can vary from month-to-month and year-to-year. Long term data collection is necessary to accurately identify trends.



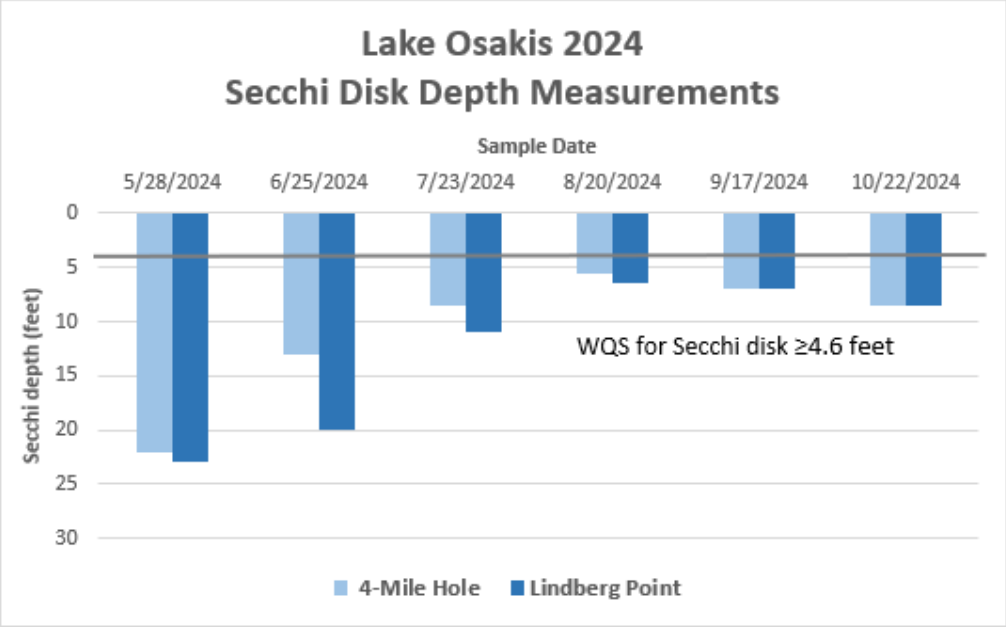
2024 Water Quality Cont…



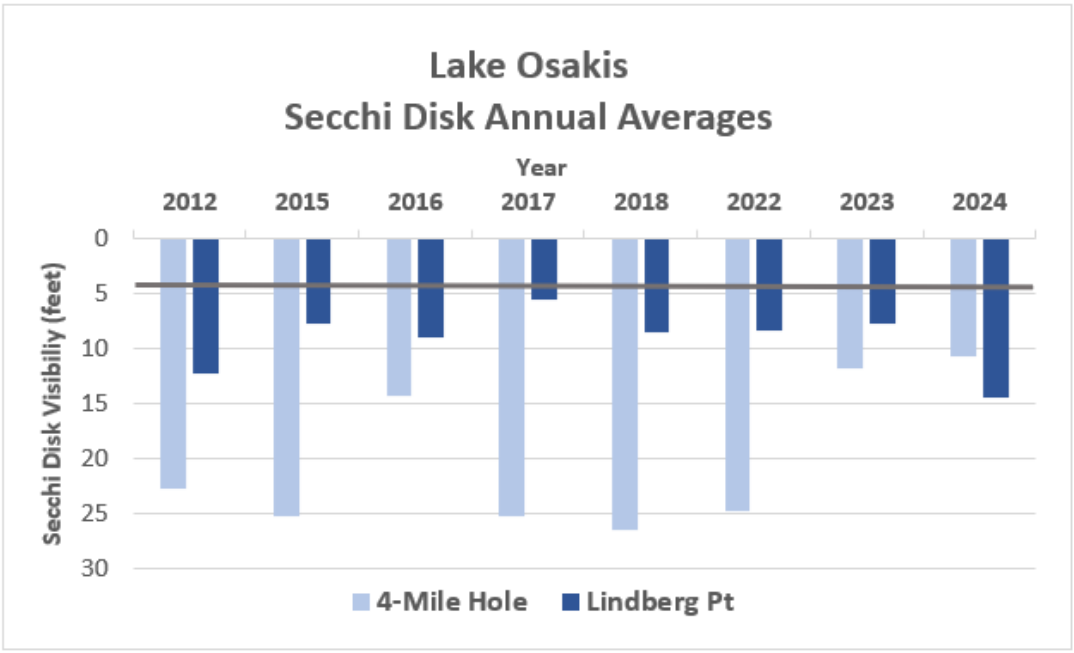
The graph above shows the 2024 total phosphorus (TP) samples at both sites, and all results either exceeded or were within 1 µg/L of the water quality standard of 40 µg/L. There was some variation in TP concentrations between sites, but no extreme differences in 2024. It is notable that for the final sampling of 2024, TP concentrations were 20 µg/ L higher at the Lindberg Point site. Sampling in 2024 did go one month longer than in 2023. The graph below contains the annual average TP concentrations at both sites from 2012 to 2024. There does not appear to be a trend in TP data over that time, likely because environmental conditions differ considerably from year-to-year. Continuing to maintain long term data collection is necessary to identify trends accurately.



2024 Water Quality cont…



The graph above shows that all of the Osakis Secchi disk depth measurements met the water quality standard of greater than 4.6 feet in 2024. As the season progresses, it is common for Secchi disk depth readings to reduce and visibility to decrease, which we can see in the graph above. The bottom graph shows the annual average Secchi disk depths for both sites. There does not appear to be a trend in Secchi disk depth data at either location at this time. Lindberg Point had a slight improvement trend until 2024.



Carlson Trophic State Index

To better understand the interplay of phosphorus, chlorophyll-A, and Secchi disk visibility on lake water quality, the Carlson Trophic State Index (TSI) was chosen as an assessment tool. The Carlson TSI is designed to indicate how much biomass (plants, animals, and bacteria) a waterbody can sustain and measures the abundance of nutrients available, called the trophic state, of a waterbody. The word *trophic* is Greek and means nourishment or food. The more nutrients available, the more likely the waterbody is to have problems with algae and aquatic plant overgrowth. The index consists of a scale ranging from 0 to 100+ and is used as a predictor of poor water quality conditions. Under the Carlson TSI scale, water bodies may be classified as follows:

Oligotrophic: TSI 0 - 40, Clear water, good oxygen conditions, limited nutrients available, deep or shallow lake. From the Greek "oligos" meaning few, scant.

Mesotrophic: TSI 40 - 50, Moderately clear water but increased chance of low oxygen conditions in shallow lakes. From the Greek "meso" meaning middle, moderate.

Eutrophic: TSI 50 - 70, Moderately clear to cloudy water, with a high chance of low oxygen conditions in the summer, extensive plant growth, and potential algal scum. From the Greek "eu" meaning well, plenty.

Hypereutrophic: TSI 70+, Dense plant growth, heavy algal blooms and scum possible, low oxygen conditions, fish kill possible. From the Greek "hyper" meaning over much.

The table below contains the calculated Carlson TSI scores for Lindberg Point and 4-Mile Hole since 2012. These scores are calculated using the annual average chlorophyll-A and total phosphorus concentrations, and the annual average Secchi disk measurement for each sampling year. The annual average TSI scores for both 4-Mile Hole and Lindberg Point are in the *eutrophic* category, which indicates nutrients are plentiful in Lake Osakis. The common TSI range for our North Central Hardwood Forest ecoregion is a TSI between 46 to 58, which Lake Osakis falls within. Results in 2024 are comparable to results in past years, indicating that the water quality is holding steady and not degrading or improving at this time in terms of Carlson TSI ranking.

Year	4-Mile Hole TSI	Lindberg Pt TSI
2012	54	57
2015	49	55
2016	55	59
2017	50	55
2018	49	53
2022	51	56
2023	51	51
2024	53	52

Lake Stratification and Water Quality

Temperature and dissolved oxygen concentrations in a lake give us clues about what is going on in the depths of the lake. If the oxygen and/or temperature readings fall markedly as the probe descends into the lake, this is a sign the lake is undergoing stratification, and a thermocline is forming. Stratification most commonly occurs in deep (greater than 15 feet) lakes when the surface water warms in the spring and summer. Since cold water is more dense than warm water, the colder water settles to the bottom of the lake (hypolimnion) and the warmer water stays near the lake surface (epilimnion). If the water remains stratified and does not mix as the summer progresses, the oxygen concentration can become depleted near the lake bottom. This is due to the decomposition of organic matter by bacteria, which eventually uses up the oxygen. The bottom layer will stay oxygen depleted until winter in deep lakes that lack the fetch and wind energy to mix the water column frequently. Lake oxygen concentrations can become "hypoxic" when the dissolved oxygen in the water drops below two milligrams per liter (mg/L), or even become "anoxic," or totally devoid of oxygen. These conditions are strongly linked to lake eutrophication and can create a stressful, or even deadly environment for aquatic organisms that need oxygen to survive.

Hypoxic conditions in the lake water also create hypoxic conditions in the lake bottom sediments. This lack of oxygen changes the chemical interaction of the sediment and water, leading to more dissolved phosphorus and nitrogen being released from the bottom sediment into the lake. Additionally, lake bottom-dwelling bacteria use oxygen to metabolize phosphorus and nitrogen into energy. Hypoxic lake bottom conditions change the bacteria's metabolism; they switch from aerobic respiration to anaerobic respiration, which can lead to the release of more phosphorus. The process of low oxygen conditions leading to a release of sediment nutrients, and a reduction of nutrient-fixing bacteria, is known as *internal lake nutrient loading*. Internal loading occurs naturally in many lakes but can lead to a large input of nutrients in the fall or winter when lake water cools and the water column mixes. This can move legacy nutrients from the lake bottom into the upper water column and potentially lead to noxious algae blooms and reduce water quality.

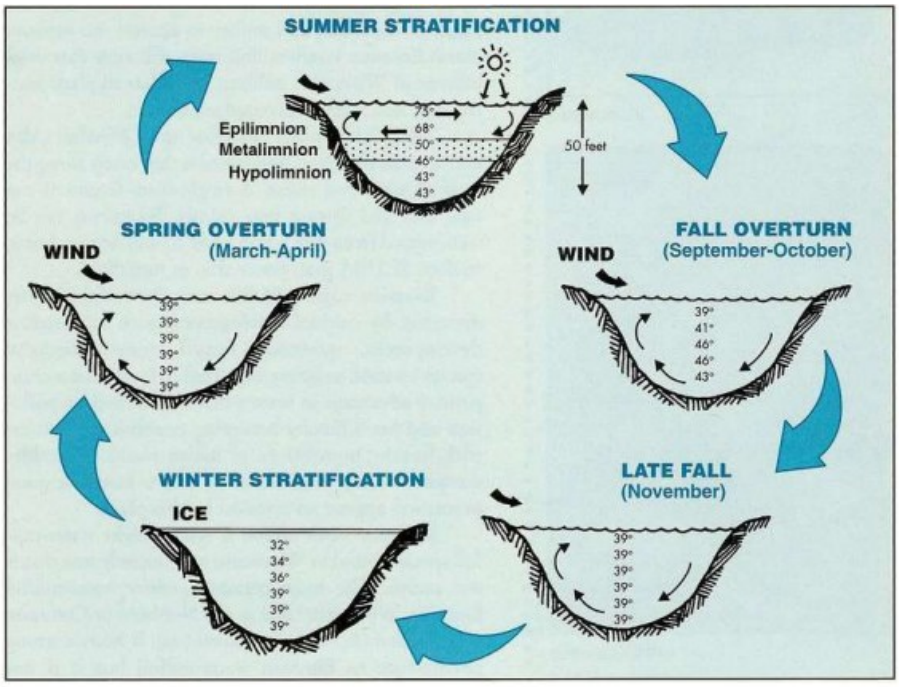
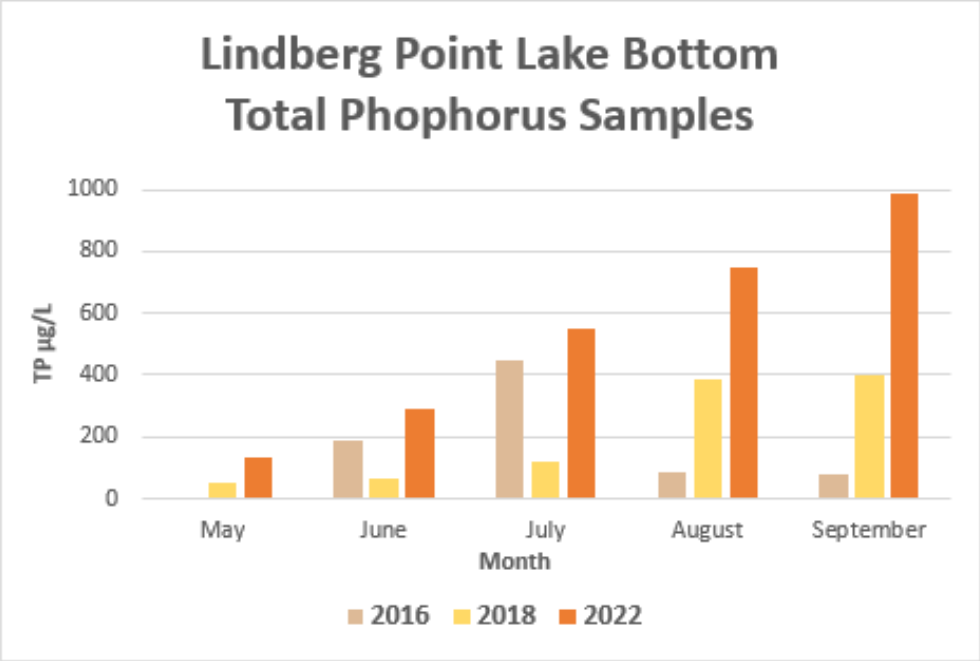


Photo courtesy of the City of St Cloud 2020 Limnology Report, created by SEH.

Lindberg Point—Lake Bottom Phosphorus

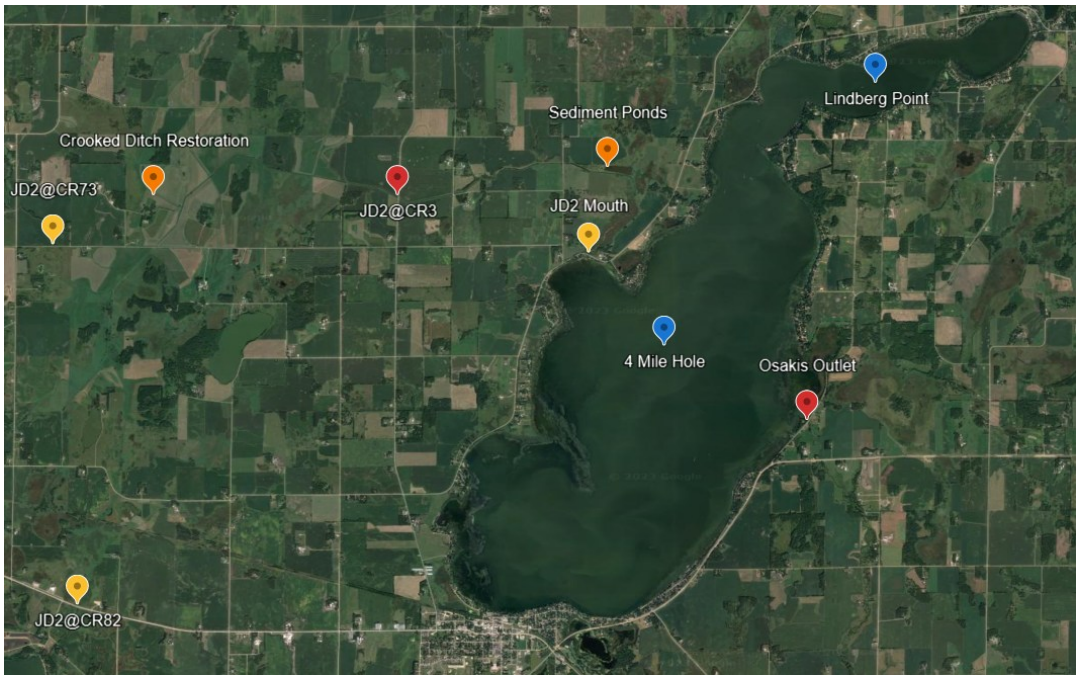


Kemmerer depth sampler

When the SRWD performs intensive monitoring on a lake, water column profiles are made for dissolved oxygen concentrations and temperature. If the oxygen or temperature readings change in the profile (change by ~6° F and/or by 2 mg/L dissolved oxygen), this is a sign the lake water is not mixing well and is stratified. When stratification occurs, a bottom sample is taken ~3 feet above the lake bottom sediment. These bottom samples are collected to assess internal lake nutrient loading. They also aid in identifying if the nutrient contributions to the lake are mostly coming from overland inputs, or if nutrients already present are causing internal nutrient loading. The graph above contains only Lindberg Point data, shown by month, for 2016, 2018, and 2022. The graph shows that total phosphorus (TP) values at Lindberg Point near the lake bottom have been increasing over the years, and that the concentration climbs progressively month-to-month. The Osakis Area TMDL reports that internal loading has a relatively small contribution to phosphorus in Lake Osakis due to the lake's large fetch in the "big lake." The narrow, deep regions of the lake appear to stratify around 30 to 40 feet deep, leading to somewhat patchy areas of anoxia in the lake due to lake bottom geography. Anoxic conditions lead to the release of high levels of phosphorus from the bottom sediment, as shown in the graph above. The TMDL recommends that more depth information be gathered to further assess the internal loading of phosphorus in Lake Osakis. Lake turnover varies from year-to-year and from lake-to-lake but has been occurring later in the fall in more recent years. It may be beneficial to deviate from the MPCA recommendation of taking samples from only May to September and take lake samples in October as well to assess nutrient loading after lake turnover.

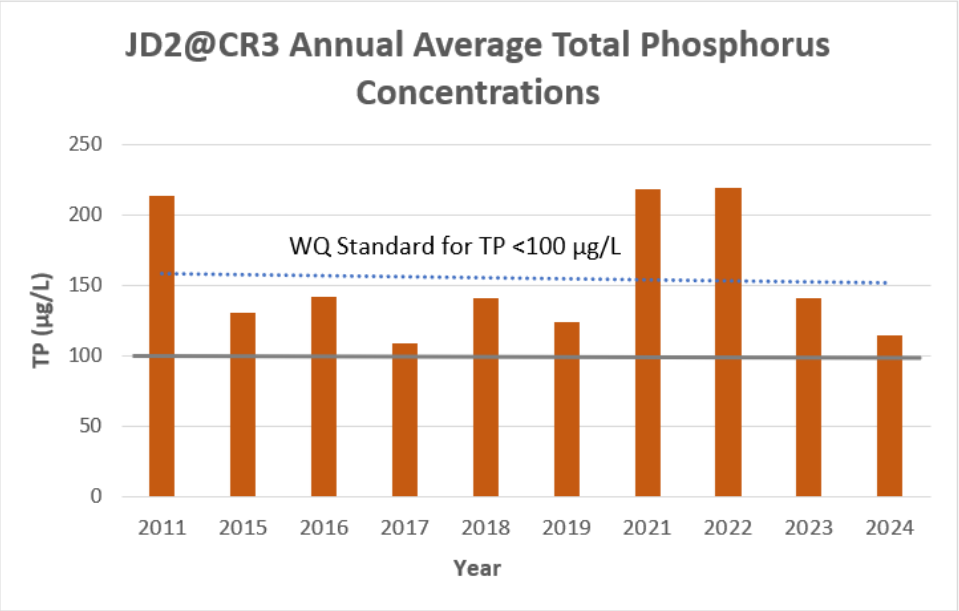
Lake Osakis Watershed Monitoring History

SRWD, MPCA, and DNR have monitored many locations on Lake Osakis and its tributaries, for water quality and aquatic life. Judicial Ditch 2 (JD2) is a 37 mile-long ditch that flows from Smith Lake to Lake Osakis. JD2 ditch drains around 40% of the Lake Osakis watershed area. Due to the flat landscape in the Crooked Lake area that JD2 resides in, water quality samples and flow monitoring have been difficult. Monitoring has been affected by high lake levels reversing the flow in the ditch, limited ditch access locations, no flow in summer, and dense aquatic vegetation. The map below shows a few of the monitoring locations the SRWD no longer uses (yellow markers), the sites that we still operate today (red markers), select projects in the region (orange markers), and the lake sampling locations (blue markers). The table below explains more about the monitoring sites.

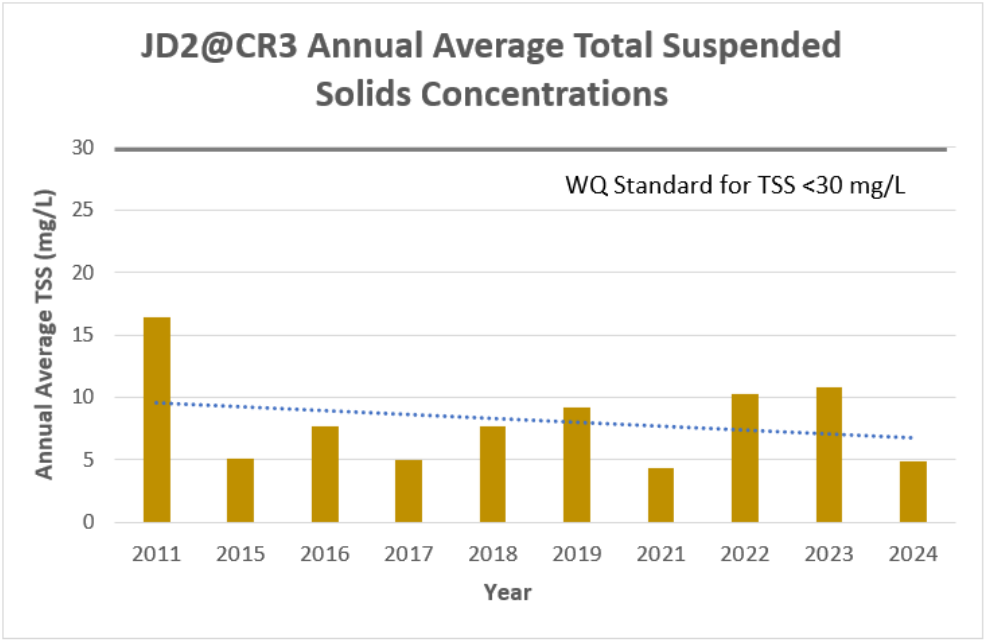


Site	Status
JD2@CR82	Site active in 2018 only. MPCA Staff reviewed the weekly sample and flow data collected at this site during the 2018 monitoring season and found the site unsuitable for data collection. It was recommended that this site not be monitored in the future unless site conditions change.
JD2@CR73	Site last active in 2018 and was uninstalled after Osakis Lake Area TMDL project was completed. Site is no longer being monitored at this time as JD2 @CR3 is adequate.
JD2@CR3	Site active from 2011 - Present. Dense aquatic plants affect water levels in the channel by creating mass that displaces the water. Flow usually stops in July each year.
JD2 Mouth	Site active from 2016 - 2018. Discontinued due to how close this site was to the lake. There was commonly a backwater effect or stagnant water due to the relatively flat slope leading to Lake Osakis. Sampling and flow measurements were not reliable.
Osakis Outlet	Active site since 1989, located at the outlet of Lake Osakis and the beginning of the Sauk River. Site cannot deploy long term monitoring equipment due to outlet design, so a staff gauge is used.

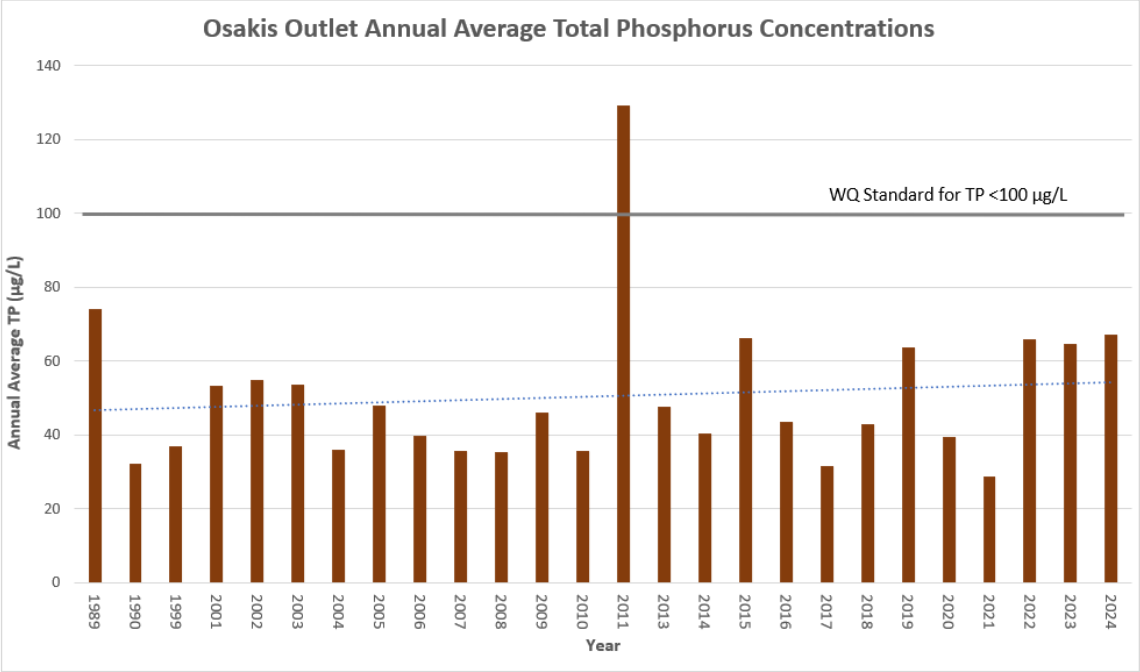
Monitoring on JD2 at County Rd 3



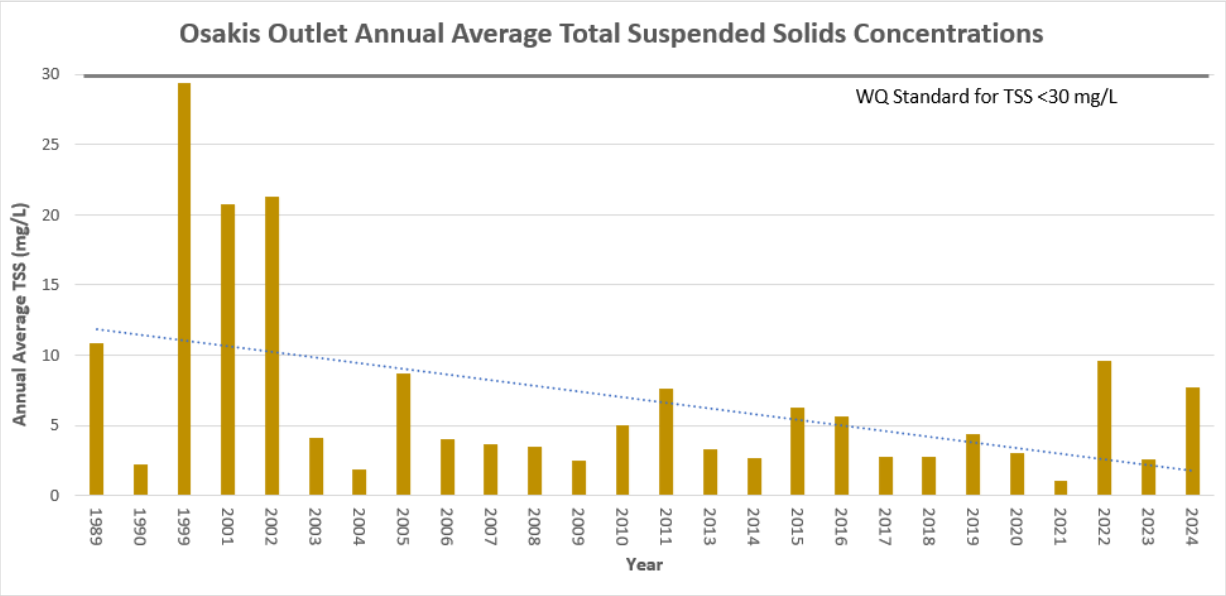
The annual average total phosphorus (TP) concentration in Judicial Ditch #2 at County Road 3 are presented in the graph above. The data shows a slight decrease in TP over time, but the water quality standard of <100 µg/ L is exceeded each year. The graph below shows the annual average total suspended solids (TSS) concentration at the JD2 site. A subtle decreasing trend can also be seen. All annual averages for TSS values were well below the water quality standard of <30 mg/ L. The intensity of precipitation events and the amount of winter snowpack affects TSS and TP levels, so long term and frequent sampling is performed to account for these variables.



Monitoring at Osakis Outlet



The annual average total phosphorus (TP) concentration at Osakis Lake outlet are in the graph above. The data shows a subtle upward trend in TP over time, and that the annual average water quality standard of less than 100 µg/ L was exceeded once since 1989. The graph below shows the annual average total suspended solids (TSS) concentration at Osakis Outlet and an obvious decreasing trend can be seen. All annual averages for TSS concentrations were below the water quality standard of less than 30 mg/L. The intensity of precipitation events and amount of winter snowpack affects TSS and TP levels. Long term and frequent sampling is performed to account for these variables.



2024 Monitoring Summary

The 2024 monitoring season started polar opposite than that of 2023, with a record breaking warm and virtually snow-free winter. By mid-April/early May, the consistent precipitation began and continued through late summer. We were finally relived of drought conditions until October. Water levels and flow were consistently higher throughout the summer. Chlorophyll-A levels at both sites on Lake Osakis continued to be low and below the WQS for the year, and there is a decreasing trend in the annual average chl-A concentrations over time . Annual average Secchi disk measurements at 4-Mile-Hole show a slight improving trend as well, but Lindberg Point does not indicate any trend at this time. Total phosphorus, however, was either at or exceeded the water quality standard at both sites on all sampling days in 2024, and many of the annual averages exceeded the standard as well.

The Osakis Area TMDL specifies that a 41% reduction in phosphorus is needed to meet phosphorus water quality standards. Additionally, habitat restoration projects are needed along the Osakis shoreline and in the creeks and rivers flowing to Lake Osakis to address aquatic life impairments. Restoration modeling of the JD2 drainage area indicated that utilizing best management practices (BMPs) alone will not be enough to reduce nutrients and meet water quality standards. It will require larger capital improvement projects, particularly those that reduce phosphorus loading, to adequately address Osakis's nutrient impairments. Continued water quality monitoring is vital for early identification of changes to water quality in Lake Osakis. Maintaining long-term monitoring data allows for annual variations in weather, temperature, and rainfall to be accounted for. The longer and more frequently data collection occurs on a waterbody, the stronger the data set is for water quality assessments.

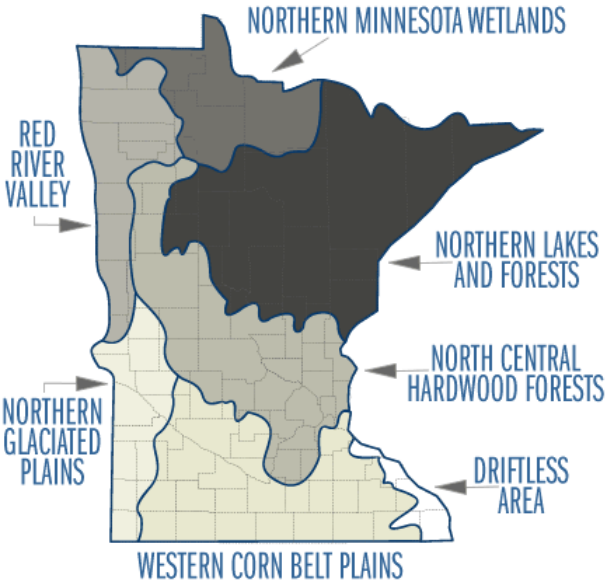
Osakis Outlet, 11/1/2024

Common Terms

Eutrophication - The term comes from the Greek *eutrophos*, meaning "well-nourished." Eutrophication occurs when an excess of nutrients that are usually environmentally limited enter a river or lake system and contribute to excessive plant and algae growth. Eutrophication can have quite negative impacts on aquatic communities' health. The excessive plant growth can clog up boat motors, outcompete native plants, and change the animals that are able to survive in the waterbody. When the excessive plant growth dies back and decomposes, microbes in the water break down the plant material and use up the majority of the available oxygen in the waterbody. This creates low oxygen (hypoxic) conditions and will stress and even kill aquatic animals. Additionally, water clarity and recreational suitability are greatly reduced in eutrophic conditions, and physical contact with or ingestion of the water could result in indigestion or even death.

Point Source and Nonpoint Source - These terms are used when referring to how a pollutant enters a waterbody. **Point** sources are single and identifiable locations, such as the end of a pipe, and are regulated by state and federal agencies. **Nonpoint** sources are can be rain and snow runoff, which accumulate pollutants as water drains. Places like parking lots, farmland, construction sites, and eroding streambanks are considered nonpoint sources of pollution and are harder to track, control, and regulate.

Ecoregion - A region defined by distinctive geography, plant and animal communities, land uses, soil profiles, and sun and moisture patterns. Ecoregions are used by the Environmental Protection Agency (EPA) and Minnesota Pollution Control Agency (MPCA) to characterize regional differences in the state and their effects on water quality. The Minnesota ecoregion Osakis Lake resides in is the North Central Hardwood Forest (NCHF). The NCHF ecoregion is a transitional zone between the predominantly forested northern lakes region and the corn belt plains in southern Minnesota. In addition to the ecoregion classification, lakes are further classified as shallow or deep, depending on the maximum and average lake depths. The size and depth of a lake influences characteristics such as water clarity, water temperature, and aquatic plant growth.



Water Quality Monitoring Parameters

Chlorophyll-A (chl-A) - Chlorophyll-A is a measure of the amount of algae growing in a waterbody and can be used as an indicator of water quality. Chl-A is a comparable analysis to TSS in streams. As water warms, algae begins to grow, and the amount of growth is dependent on the amount of nutrients in the water body.

Although algae is a natural part of freshwater ecosystems, too much algae can result in decreased levels of oxygen in the waterbody and cause aesthetic problems, such as green scum and bad odors. Some algae naturally produce toxins as well and can be a public health concern in high concentrations. Waterbodies that receive septic systems discharges and agricultural and urban runoff may have high concentrations of chl-A in response to the excess nutrients. The general water quality standard for chl-A in lakes within the north central hardwood forest (NCHF) ecoregion is less than 14 µg/L.

Total Phosphorus (TP) - Total phosphorus is a measure of both the organic and inorganic forms of phosphorus. Organic phosphorus is not commonly found in suspension in the water column and is not as chemically available as food to bacteria and algae. Inorganic phosphorus, referred to as ortho-phosphorus, is commonly dissolved in water and is readily available to plants and animals. Phosphorus is an essential nutrient for growth but is only necessary in small concentrations to sustain life. Phosphorus can also be found in the water column and embedded in water bottom materials. Most rivers and lakes have elevated phosphorus, with point source contributions from wastewater and industrial releases, and nonpoint source contributions from agricultural fertilizers and contaminated groundwater. Minnesota is broken up into ecoregions to account for the variability in landscape, land use, and weather across the state, and each ecoregion has unique water quality standards. The Central River Nutrient Region standard for total phosphorus in JD2 and Osakis Outlet is less than 100 µg/L. The NCHF ecoregion water quality for Lake Osakis, a deep water lake, is less than 40 µg/L.

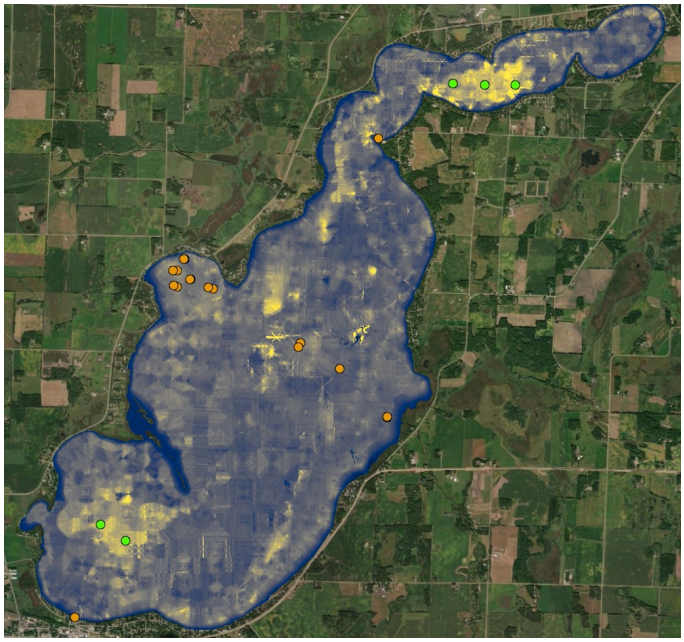
Secchi Disk - Water clarity is measured using a Secchi disk (also known as a transparency disk) that is lowered into the water until it can no longer be seen, and the depth of visibility is noted. Secchi disk readings are used to assess water visibility and quality. The general water quality standard for deep lake Secchi disk readings in the North Central Hardwood Forest (NCHF) ecoregion is greater than 4.6 feet (1.4 meters).

Lake Osakis Projects

The SRWD appreciates the time and efforts of the Osakis Lake Association in 2024 and looks forward to continuing a partnership to pursue fishable and swimmable waters in Lake Osakis. **The US Army Corps of Engineers (USACE) PAS Alternatives Analysis** study has completed up-front data collection and survey work this past year, and they are now working on developing a lake response model to recommend future projects. During the summer months, there were crews from both Houston Engineering (HEI) and the St. Croix Watershed Research Station out on the lake to collect sediment core samples. These samples will provide a wealth of knowledge to inform the USACE Alternatives Analysis study, such as the infilling rate of sediment and the potential for internal loading of phosphorus from the nutrients in the lake bottom. We expect to see those results within the next couple months.

More samples were collected by SRWD staff and HEI, along with help from several Osakis Lake Association (OLA) members, in January through the ice. These samples were collected to complete the work done by HEI to better understand the sediment accumulation rate and supplement the bathymetric survey done last summer. The preliminary results of that data are included in the visual below. The blue/yellow background represents unconsolidated sediment thickness on the lake bottom. Blue represents a thin sediment layer, and yellow represents a thicker sediment layer. The dots indicate where sediment core samples were collected, with the orange dots being samples from this summer and the green dots from this winter.

Next steps will be to use the lake response model to establish goals and identify alternatives/projects that best improve the water quality and habitat of Lake Osakis. This work will be done during the summer of 2025. It is also worth mentioning that the OLA has completed their Feasibility Study on the outlet structure of the lake, potentially changing it to a rock arch rapids. It will be designed in a way that would reduce peak levels, and the structure would maintain a more stable water level in the lake.



You can stay up to date on the Lake Osakis Area water quality news and events by joining our Constant Contact emailing list. Sign up on our website homepage at www.srwdmn.org under "Keep Up to Date."

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Please Note:

The data and recommendations included in this report are based on the 2024 monitoring season. Lake samples were collected by Tim Green, OLA's water quality volunteer, and all data was reviewed by the Sauk River Watershed District. This report is not a complete picture of all conditions, but built to assess specific measurements of water quality.

Contact Abi Parker, Environmental Monitoring Manager with the Sauk River Watershed District, with any questions or concerns regarding the information presented in this report.

All aerial photos taken from Google Earth, and all water quality standard information and state statistics were gathered from Minnesota Pollution Control Agency (MPCA) documents accessed Feb. 2025.