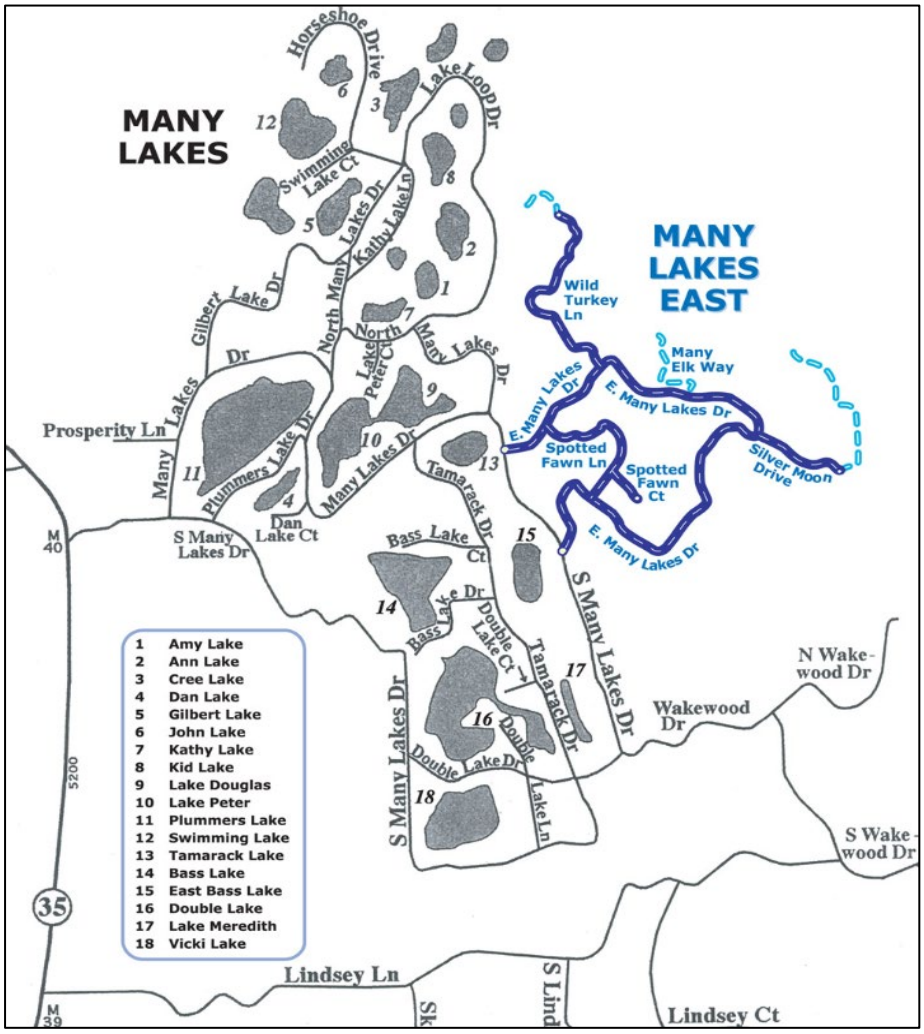
Many Lakes Water Quality Monitoring Summary

The following is a summary of the water quality monitoring data that has been collected from the lakes in the Many Lakes Neighborhood, Flathead County Montana between 2001-2020. Water quality is important because good water quality supports healthy plants, fish and wildlife in our lakes and makes recreating on the lakes enjoyable. Poor water quality degrades habitat and can cause health issues for pets and people who swim in the water. This report is not intended to be an in-depth analysis of the water quality information but rather an overview of the water quality data that has been collected by the Home-Owners Association (HOA) in fulfilment of the requirements of the HOA covenants. The tables and charts are provided to give a snapshot of the lakes' conditions with regards to Phosphorus, Nitrogen and Turbidity. Information on these water quality parameters as well as actions we can take as residents of the neighborhood are provided.



Map of the Many Lakes Neighborhood from the HOA website.

The Many Lakes Neighborhood is situated around 18 named kettle lakes that are remnants of the glaciers that were prevalent in this area. There are no streams that discharge into the lakes so all water in the lakes is from groundwater and precipitation.

Water quality monitoring is required to be conducted annually per the covenants of the Many Lakes Vacation Village HOA. Water quality sampling is normally conducted during the summer months and analyzed by Montana Environmental Laboratory of Kalispell Montana. Water quality parameters analyzed include Nitrogen, Phosphorus and Turbidity.

Nitrogen and phosphorus are naturally occurring nutrients that are essential elements for the health of water bodies. According to the Environmental Protection Agency (EPA)(EPA 2000), excess nutrients are the number one impact to lakes in the United States. Excess nutrients come from a variety of sources such as wildlife and pet waste, excess fertilizer use, conversion of forest land to home sites, and leaking or improperly maintained septic systems. Excess nutrients can cause lakes to undergo eutrophication, that results in algal blooms, excessive plant life and decline in the diversity of the biological community. Algal blooms can use up the oxygen in the water, which can result in fish kills.

Turbidity is the measure of the amount of suspended particles in water. Turbidity is used to measure the transparent of the water and can be used as an indication of the quality of the water. More turbidity equates with poor water quality.

Phosphorus

Phosphorus has been monitored since 2001 at most of the lakes in the neighborhood. Each lake in the neighborhood is a little different in size and depth and has different land use surrounding it. The levels of phosphorus in the lakes reflect these differences but in general, phosphorus levels have varied from year to year with no clear trend in the data indicating an increase or decrease in levels over the years of monitoring.

EPA has developed national water quality criteria to help States set water quality standards. Water quality standards are established as a level that indicates that there is too much of a pollutant in a water sample. The State of Montana has water quality standards but there are no specific nutrient standards for the lakes in the neighborhood, so the EPA criteria provide a level to measure the data against. The EPA recommends that phosphorus levels for our region be below 0.0065 micrograms/liter (µg/l) to protect water quality. Most of the measured phosphorus levels in the neighborhood lakes are above the EPA recommended level. Dan lake (4 on the map) has the highest average phosphorus levels at 0.032 µg/l. Cree lake (3 on the map) has the lowest average phosphorus level at 0.006 µg/l, which is close to the EPA recommended level. The table below contains the average, maximum and minimum values for each of the monitored lakes. The chart of average phosphorus levels with the EPA

recommended criteria as a red line is provided for comparison between lakes and to the criteria.

Lake #	Lake Name	Number years of Phosphorus Samples	Average Value (µg/l)	Maximum Value (µg/l)	Minimum Value (µg/l)
1	Amy Lk SW	16	0.021	0.070	0.005
2	Ann Lk W	13	0.014	0.120	0.007
3	Cree Lk W	17	0.009	0.020	0.003
4	Dan Lk	15	0.032	0.118	0.010
5	Gilbert Lk W	15	0.008	0.017	0.004
6	John Lake	15	0.012	0.060	0.007
7	Kathy Lk	15	0.014	0.180	0.005
9	Lake Douglas	14	0.011	0.022	0.004
10	Lake Peter	16	0.017	0.040	0.003
11	Plummers Lk	15	0.015	0.048	0.009
12	Swimming Lk	15	0.009	0.040	0.003
13	Tamarack Lk	15	0.008	0.022	0.003
14	Bass Lk SE	16	0.009	0.020	0.003
16	Double Lk	15	0.011	0.040	0.004
18	Vicki Lk	14	0.008	0.013	0.004

Table of Total Phosphorus Data from Many Lakes Water Quality Monitoring

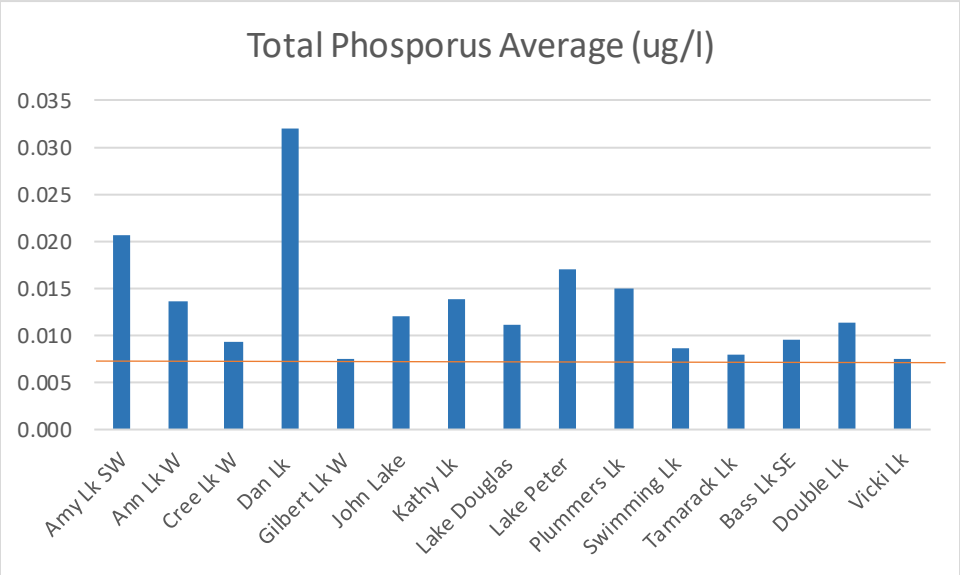


Figure of Average Total Phosphorus Data from Many Lakes Water Quality Monitoring
Note: red line is EPA Recommended Criteria of 0.0065 µg/l total Phosphorus.

Nitrogen

Nitrogen has been monitored as part of the annual water quality monitoring since 2015. A review of the nitrogen data collected over the past 5-years indicates that in general nitrogen levels in the lakes has been increasing over the past five years.

There are no set Montana state water quality standards for the Lakes in the neighborhood, so the EPA Ambient Water Quality Criteria Recommendations serve as a comparison for the data collected by the HOA. The EPA recommends that Total Nitrogen should be below 0.26 milligrams/liter (mg/l) to protect water quality. The chart of average nitrogen levels with the EPA recommended criteria as a red line is provided for comparison between lakes and to the criteria. Dan lake (4 on the map) has the highest average nitrogen levels at 1.37 mg/l. Cree lake (3 on the map) has the lowest average phosphorus level at 0.39mg/l.

Lake #	Lake Name	Number of years of Nitrogen samples	Average Value (mg/l)	Maximum Value (mg/l)	Minimum Value (mg/l)
1	Amy Lk	5	0.64	0.95	0.3
2	Ann Lk	6	0.62	1.09	0.2
3	Cree Lk	6	0.39	0.66	0.1
4	Dan Lk	6	1.37	2.89	0.3
5	Gilbert Lk	6	0.48	0.64	0.3
6	John Lk	6	0.42	0.71	0.1
7	Kathy Lk	6	0.53	0.78	0.2
9	Lake Douglas	6	0.65	1.6	0
10	Lake Peter	6	0.61	1.02	0.1
11	Plummers Lk	6	0.97	1.8	0.3
12	Swimming Lk	6	0.42	0.53	0.2
13	Tamarack Lk	6	0.39	0.5	0.2
14	Bass Lk	6	0.39	0.79	0
16	Double Lk	4	1.07	1.41	0.49
17	Lake Meredith	6	0.73	1.98	0
18	Vicki Lk	6	0.45	0.65	0

Table of Total Nitrogen Data from Many Lakes Water Quality Monitoring

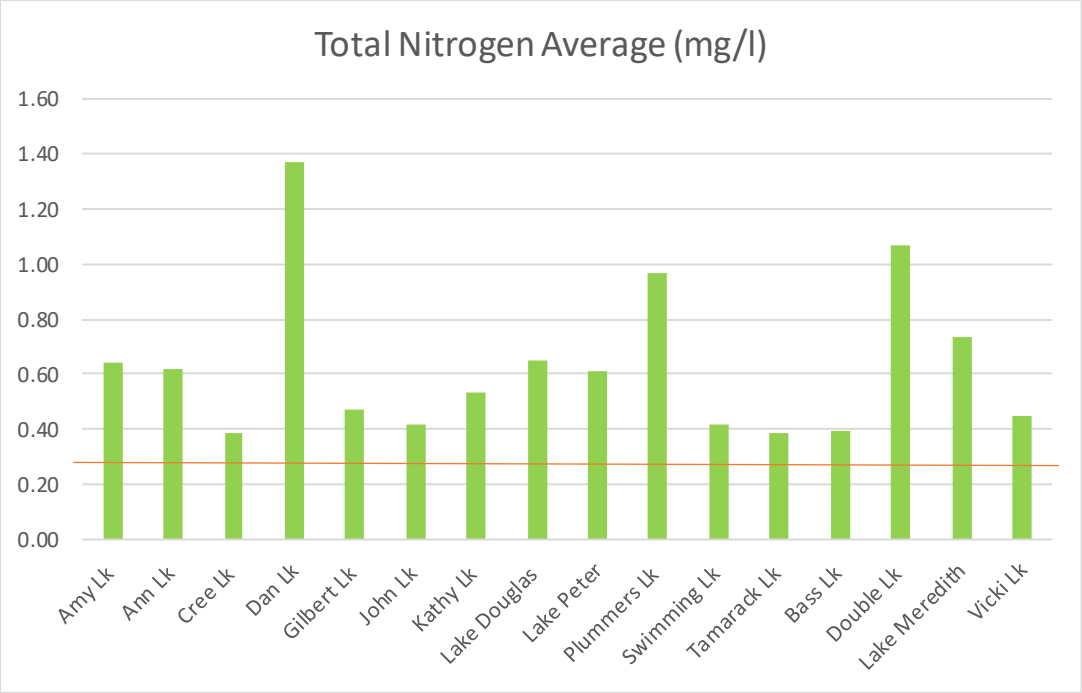


Figure of Average Nitrogen Data from Many Lakes Water Quality Monitoring
Note: red line is EPA Recommended Criteria of 0.26 mg/l Nitrogen.

Turbidity

Turbidity is the measure of the clarity of water. Turbidity is not a pollutant in and of itself but reflects the amount of particles in the water. These particles can be from soil, algae or other materials that are suspended in the water column. High turbidity can restrict the amount of light the enters the water and make the water unpleasant for recreation. Extremely high turbidity can impact the gills of fish, impacting their ability to obtain oxygen from the water. The higher the amount of turbidity, the murkier the water will appear. The water quality data collected over the past years indicates that turbidity values are increasing in the Many Lakes.

There is no numeric standard for turbidity in Montana, but the state regulations limit increases of turbidity of more than 5 Nephelometric Turbidity Unit (NTU) over the background level. This regulation is primarily applied to land disturbing activities such as construction to make sure that the site is not contributing large amounts of soil or sediment in its runoff. Ann Lake (2 on the map) has the highest average turbidity reading and Swimming Lake (12 on the map) has the lowest turbidity reading.

Map Number	Lake	Number of years of Turbidity samples	Average Value (NTU)	Maximum Value (NTU)	Minimum Value (NTU)
1	Amy Lk	14	0.57	0.8	0.34
2	Ann Lk	14	1.08	5.5	0.35
3	Cree Lk	14	0.43	1.3	0.2
4	Dan Lk	12	0.81	1.5	0.38
5	Gilbert Lk	14	0.45	0.78	0.3
6	John Lk	14	0.49	0.85	0.05
7	Kathy Lk	7	0.63	1	0.39
9	Lake Douglas	13	0.62	1.3	0.34
10	Lake Peter	13	0.71	1.6	0.35
11	Plummers Lk	14	0.84	1.6	0.45
12	Swimming Lk	14	0.37	0.5	0.3
13	Tamarack Lk	14	0.43	0.8	0.25
14	Bass Lk	14	0.73	3.1	0.3
16	Double Lk	14	0.50	1.1	0.25
17	Lake Meredith	9	0.52	0.75	0.35
18	Vicki Lk	14	0.49	0.78	0.3

Table of Turbidity Data from Many Lakes Water Quality Monitoring

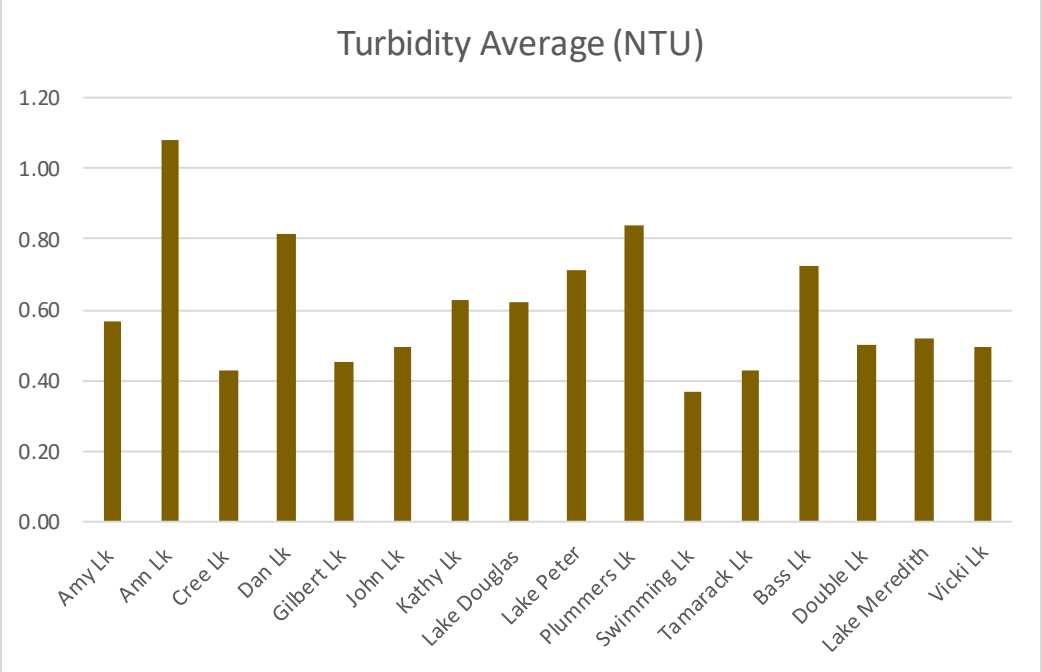


Figure of Average Turbidity Data from Many Lakes Water Quality Monitoring. There is no EPA recommended level for Turbidity.

What you can do as a resident of Many Lakes to improve lake water quality

The lakes in the Many Lakes neighborhood are unique and make this neighborhood a special place to live. The water quality monitoring the has been conducted each year indicates that phosphorus, nitrogen and turbidity are elevated and as residents of this neighborhood we can take actions to make sure the lakes water quality does not degrade further. Suggested actions that residents can take include the following.

Minimize Fertilizer Use

If you use fertilizer on your lawn, strive to have the proper timing and application amounts of fertilizer on lawns and landscaping. Fertilizer contains phosphorus and nitrogen so using the right among of fertilizer at the right time can keep your yard looking good and limit the potential for excess fertilizer from running off your property into the lakes. In addition, proper timing and application of fertilizer may save homeowners money by only applying fertilizer when needed. Consider having your soil tested to determine if and how much fertilizer is required.

For more information on fertilizer use please review the document "Does my lawn need fertilizer" https://apps.msuextension.org/magazine/assets/docs/LawnFertilizer.pdf from the Montana State University Extension Service

Maintain Septic Systems

The soils in our neighborhood consist of gravel and cobble outwash left over from the glaciers. Soils in the neighborhood are in the Krause association and are gravely, stony and well drained (NRCS 2020). These soils drain well and water that drains through these soils can ultimately end up in the lakes. Septic drain fields function to disperse liquid from the holding tank into the soil so that the liquid can be filtered and cleaned by the soil. Lack of maintenance in the form of pumping solids from the holding tank can result in solids moving from the holding tank to the drain field. Once in the drain field, solids can overload the soils ability to filter which may cause groundwater contamination. Solids in the drain field can also cause clogging which reduces the proper function of the drain field. In extreme cases, failed drain fields can cause sewage to pond on the grounds surface, which can cause health issues and runoff into the lakes.

For more information on septic system maintenance please review the document " A Montana Homeowners Guide to septic Systems" https://riverstonehealth.org/wp-content/uploads/2015/04/HomeownerGuideSepticSystems1-2010-2.pdf

Maintain Lakeside Vegetation

One of the best tools to help lake water quality is to maintain a strip or buffer of natural vegetation between your yard and the lake. This area of natural vegetation will act as a filter to slow down and collect any pollutants that may be running off your yard when it rains. In addition, this area provides habitat and food for the turtles, birds and other wildlife that use the lakes. Mowing a small area of the vegetation to access the lake is acceptable as well as trimming the lower branches of trees to maintain the view.

Additional Recommendations for Healthy Lakes

Pick up pet waste and dispose of it in the trash – pet waste can wash off into the lakes and can contribute nitrogen. In addition, pet waste may contain pathogens and virus that can make animals and people sick.

Clean up spills of oil, gasoline or other substances that occur on roadways and property using kitty litter or other absorbent materials to prevent them from washing off into the lakes.

Non-motorized watercraft are allowed on the lakes. If the watercraft was used outside of the Flathead basins it must be inspected for the presence of invasive species such as zebra mussels. There are inspection stations throughout Flathead county and more information can be found here: http://cleandraindry.mt.gov/

Additional Resources:

Flathead Basin Commission: The Flathead Basin Commission (FBC) was created in 1983 by the Montana Legislature to monitor and protect water quality and the natural resources in one of the State's most important watersheds. http://flatheadbasincommission.org/

Flathead Lake Biological Station: The Flathead Lake Biological Station (FLBS) is a Center of Excellence and administrative unit within the University of Montana system. We are an ecological research and education center located on Flathead Lake in the Rocky Mountains near Glacier National Park. https://flbs.umt.edu/newflbs/

Montana Department of Environmental Quality, Water Quality Division. https://deq.mt.gov/Water

Whitefish Lake Institute: Focused on conducting research and provide scientific data to help citizens and resource managers make informed decisions. https://whitefishlake.org/

References:

EPA, 2000, Ambient Water Quality Criteria Recommendations, Lakes and Reservoirs in Nutrient Ecoregion II. EPA 822-B-00-007.

Many Lakes Vacation Village HOA website: http://manylakesmt.org/

Natural Resources Conservation Society, 2020, Web Soil Survey
https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx