

Rose Lake Water Level Report

For several years running, Rose Lake's water level has been on the rise. Based on records taken at our property (8263 East Rose Lake Drive), the lake has risen 27 inches since October of 2015. The lowest two courses of our boulder revetment are currently beneath water. Circling the lake, the rise in water level is noticeable to everyone. The "point" is now gone, lower elevation properties on the north and south ends are seeing greater water encroachment, and increased erosion is visible around the lake.

The increasing water level is of concern to me as a homeowner, and this spring I elected to work with our local DNR Area Hydrologist to educate myself on all of the factors that influence lake water levels. Within this report you will find DNR local area elevation maps, Cloquet and Lake Superior Watershed information, catchment (overflow water runout) area projections for Rose Lake, rain event impact on Minnesota lake levels, and DNR opinions on our present situation. Please note that nothing presented in this report is subjective opinion from my end. It is pure and unfiltered dissemination of the information as it has been presented to me. I have no agenda, I'm just a concerned resident at Rose Lake who wants to know the understood causes and develop my own expectations for the future.

What is leading to the rising Rose Lake levels?

- DNR Area Hydrologist Kim Boland (of Cotton, MN) works out of the Eveleth DNR Office, and has invested her time to educate me. She has noted that heavy rain events, notably those individual rainfalls of 1-3", are occurring more often and at more intense rates than at any time on record. Since the year 2000, Minnesota statewide has seen a significant uptick in damaging, large area extreme rainstorms. Rain events that historically would have been in the 98th percentile annually (meaning the heaviest 2% of rain events), have become more and more common. Minnesota DNR climate projections indicate that these big rain events shall continue increasing into the future.
- Opinions on climate change are of course polarizing, but reality is that Minnesota has warmed by 2.9F between 1895 and 2017, while getting an average of 3.4 inches wetter. While Minnesota has gotten warmer and wetter since 1895, the most dramatic changes have come in the past five decades. Compared to 20th century averages, all but two years since 1970 have been some combination of warm and wet, and each of the top 10 combined warmest and wettest years on record have occurred between 1998 and 2017. Although climate conditions will vary from year to year, the rainfall and temperature increases are expected to continue through the 21st century based on DNR modeling. The Minnesota DNR has a website that shows the changes we are already seeing in our region from climate change. https://www.dnr.state.mn.us/climate/climate_change_info/index.html

- During the last few years in particular, late Autumn area storms have brought with them considerable amounts of precipitation and have caused significant damage to Duluth's Lake Walk and surrounding environs. Kim explained that these storms have occurred when the ground is already saturated and beginning to freeze. This leaves the water with nowhere to go, resulting in increased ground water saturation levels and subsequent exit into local lakes.

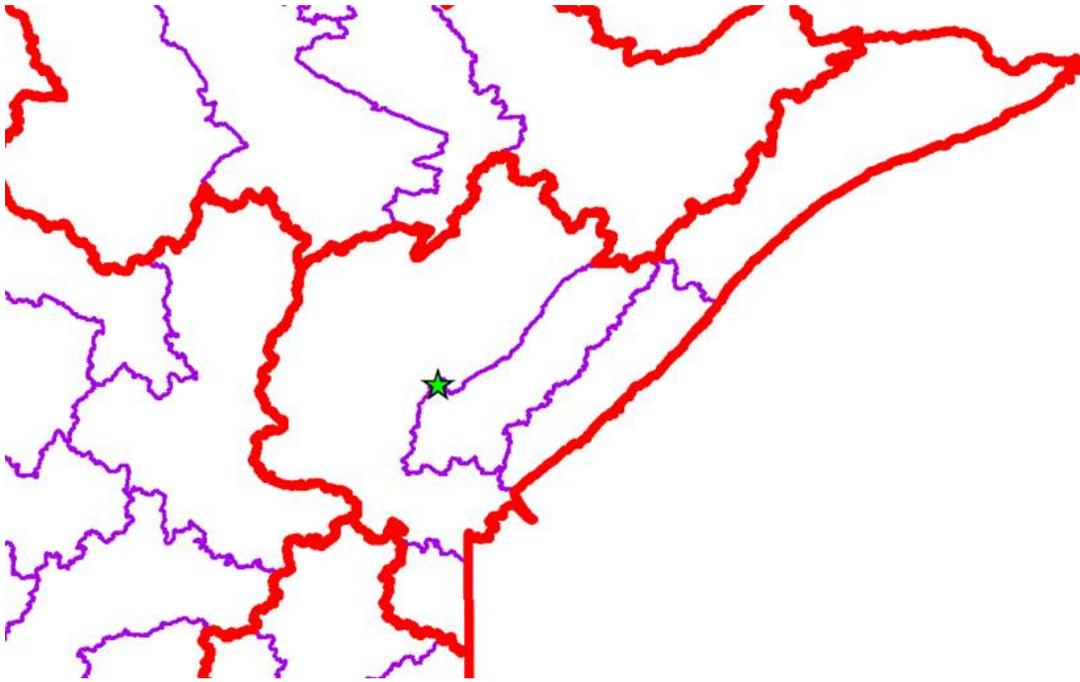
- Rose Lake as a spring-fed, land-locked lake, has no natural drainage either above ground or beneath. Springs that feed Rose Lake are one-way only. The channel(s) dug long ago from the east side of Rose Lake to the adjacent swamp offers no runoff relief, as there is little to no elevation change between Rose Lake and the adjacent swamp. For relief to occur, ground water from surrounding wetland areas would need to drain at an accelerated rate in order to accept incoming water from Rose Lake. It has long been believed that Rose Lake somehow drains into neighboring lakes via underground channels. The DNR does not believe this to be the case, even with Rose Lake enjoying a higher elevation than its closest 3 Lakes neighbor, Lake Dodo. Other standing theories as to how, or if, Rose Lake drains into surrounding bodies of water were not discussed with Kim Boland.

What impact do the Cloquet and Lake Superior Watershed have on Rose Lake water levels?

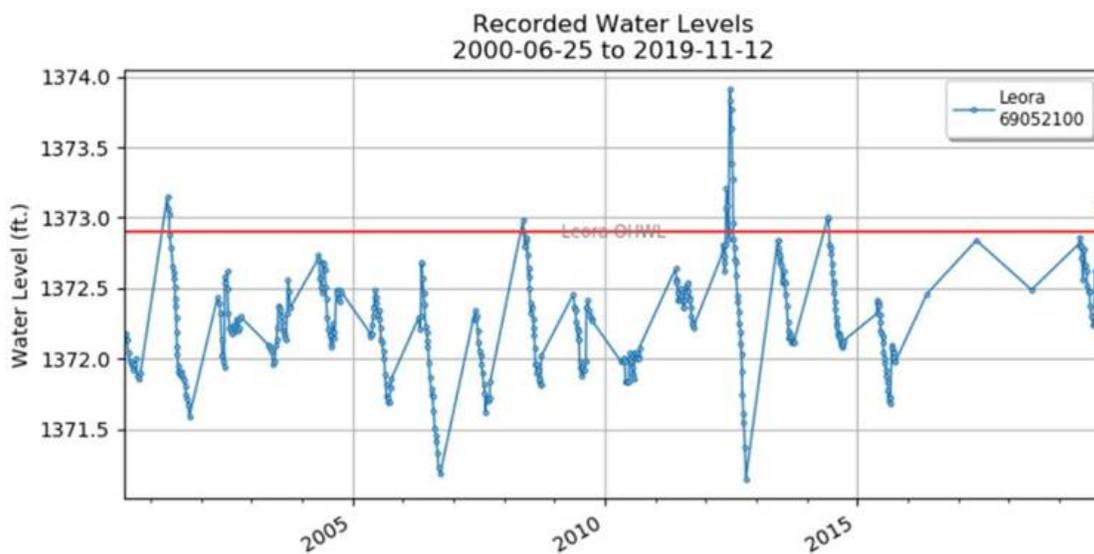
- Rose Lake has an OHWL (Ordinary High Water Level) of 1379. The Ordinary High Water Level (OHWL) is an elevation delineating the **highest** water level that has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. The high-water runout elevation for Rose Lake is between 1384 and 1386 based on elevation contours of the included quadrangle maps later in this report. **Lake levels would have to rise significantly in order to reach this runout elevation.** Due to the fact that the DNR has zero recorded Rose Lake OHWL data, Kim and the DNR will send a survey crew in the summer of 2020 to Rose Lake to take precise surface water level measurements. She also strongly suggested that it would be in our collective best interest to have a volunteer lake level reader that can report annual Rose Lake water levels to the DNR. Anyone interested in becoming the volunteer reader can connect with Kim Boland (kim.boland@state.mn.us).

<https://www.dnr.state.mn.us/climate/waterlevels/lakes/volunteering.html>

- The green-colored star in the map below is the location of Rose Lake, which is located within the Cloquet Watershed (purple line). The Cloquet watershed is in turn part of the larger Lake Superior Watershed, depicted in the thicker red line. Annual surface water levels of Rose Lake are basically dependent upon the amount of area snowfall and precipitation, watershed charge to and discharge from Rose Lake, as well as evaporation. Kim pointed out several times that **the levels of all Minnesota lakes fluctuate**, and in Minnesota, fluctuations up and down are typically 1 to 2 feet on an annual basis. Those that have decades of time here at Rose Lake, have witnessed dramatic fluctuations in lake water levels. Jim Rich told me recently of years when he was able to drive a jeep around the interior of Rose Lake along the shore.

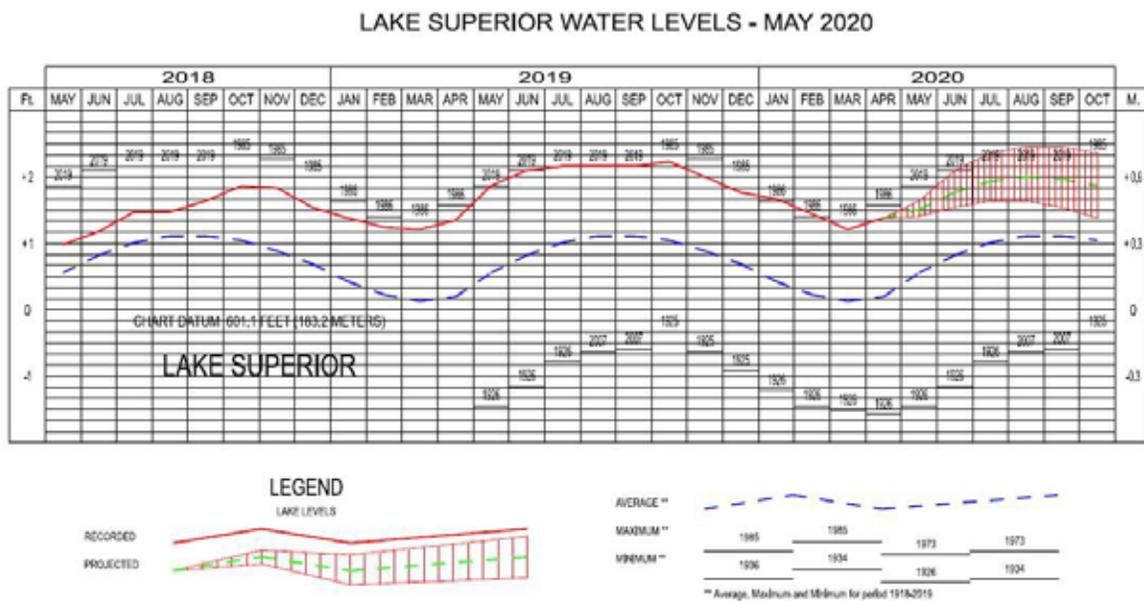


●Our neighboring Lake Elora has experienced what the DNR defines as a “typical” bounce in water levels. However, during the last few years the increase in precipitation is highlighted in the hydrograph below, where the low lake levels for Elora were not as low as they have been historically. Lake Elora has been submitting formal rise and fall lake level information to the DNR for at least the last twenty years, as you’ll see in the graph below. Pay particular attention to the higher level “low” readings from 2007 forward. Rose Lake is certainly not the only local area lake that is experiencing increases in water level.

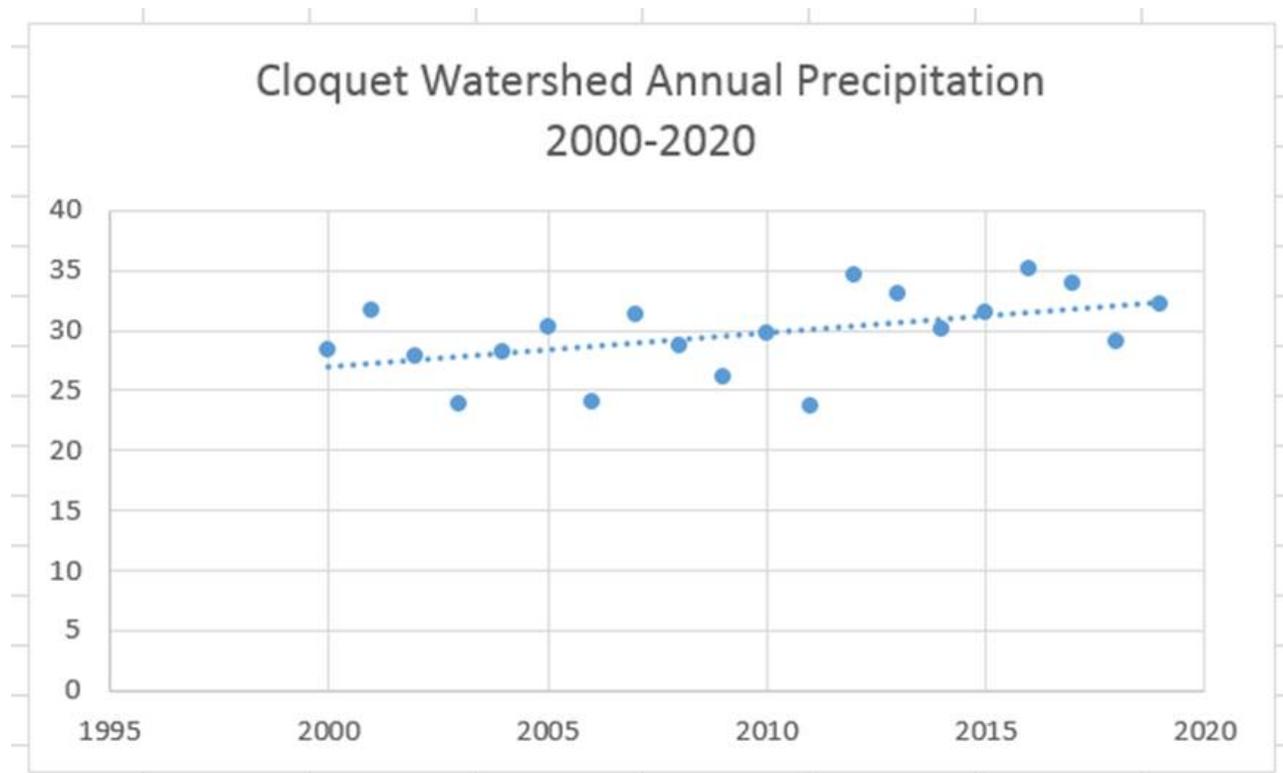


The relationship between watersheds, precipitation, and their impact on lake levels

- Influence from area groundwater has an impact on Rose Lake's level. Since Rose Lake is part of the Lake Superior watershed, which would be a controlling factor for some of the groundwater influence, I have included the water level information below on Lake Superior. As you can see, the big lake has been well above average the last couple of years and is projected to likely continue at those levels. If you would like to read more detailed information on Superior lake levels you can find them at: <https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Water-Levels/Water-Level-Forecast/>. The increase base water level of Lake Superior can influence subsurface water flows like the Lake Superior Watershed. As Lake Superior rises, the Lake Superior Watershed's angle of drain flattens out, and slows water flow between Rose Lake and Lake Superior. This reality impacts all lakes located between Rose Lake and Lake Superior.



- As noted, high water level impacts have been commonly seen across our area the last few years because of large precipitation events. Higher lake levels could potentially become something that we experience more often with the increase in rainfall projections from climate change. The rate of change is greatly unknown, and there is always the potential for a drought which will bring down our lake levels. Because Rose Lake is land locked and spring fed, it could experience greater increases in lake levels. Below is a chart showing annual precipitation within the Cloquet Watershed for the last 20 years, with a trend line showing the overall increase in precipitation.



Rose Lake Mapping

- Below are current mapping images with LiDAR imagery. The elevation of 1384 in red, based on the LiDAR contours, looks like it would be the elevation where water would runout into the southwest wetland area. Without a detailed study we cannot know with 100% confidence exactly what the elevation would be, but based on the available data it would be between 1386 and 1384. We know that the OHWL (Original High-Water Level) is 1379, and we will have exact data as to where we stand against the OHWL when Kim Boland and her crew formally survey Rose Lake in Summer 2020. For reference, the yellow lines represent runout areas for our neighboring lakes.



The images below are of Rose Lake with LiDAR imagery; 1384 contour is in red showing the elevation that the lake would have to reach in order to inundate the nearby wetland area. I've blown up the images to show greater detail for the north and south ends of Rose Lake. **Just because the high-water runout elevation is significantly higher than the OHWL, or the typical water levels seen on Rose lake, it does not necessarily mean the lake would ever get to that elevation.** These images simply depict the likely elevation on the landscape that the water would need to reach in order to have a runout based on today's available data. As you can see, except for a large swath of cabins on the west side of the lake, the majority of us would be negatively impacted by lake levels reaching runout levels.





So what?

Kim Boland says that we're not alone, and this makes sense. The more it continues to rain year over year, should this trend continue, the higher our lake level and neighbor lakes will be. Simple stuff, and it's not exactly breaking news to anyone. But as I noted at the top, I for one am concerned as I look out my office window and see a water level never higher in my 43 years at Rose Lake.

Can we do anything about it besides hope that we soon get to the recession side of the cycle? Yes, but at a significant expense. Any work to divert water can be terribly intrusive, and the DNR never wants to result to artificially lowering lake levels unless they reach absolute emergency stage levels. **We are not at emergency stage.** Kim noted temporary outlets that can be installed, but they require environmental review and additional permitting from local government authorities. There are lakes in the southern part of our state that have pumping plans to manage water levels from reaching flood stage, but again, this is extremely intrusive and very rare. I likely speak for everyone in saying that only under emergency situations should DNR intervention be considered or even explored.

The point of doing this level of research was to educate myself on the subject, and in turn share that information with those on the lake that might also be interested in the matter at hand. I wanted to understand clearly what my expectations should be based on science rather than innuendo and folklore, and I expect that reading this report will generate some resident questions. I welcome the opportunity to serve as an information clearinghouse for us as a group of residents.

I encourage anyone with questions to send them to me at gklindberg@aol.com. I will in turn communicate directly with Kim Boland at the DNR and compile feedback. The longer-range plan is to have the DNR send a Hydrology Department representative to the end-of-summer TLDA meeting, which will hopefully be held for public attendance at the French Club. By that time, the Rose Lake measurements should have been taken, and we can have a baseline from which to better discuss the subject.

Thank you for taking the time to read my report.

-Gary Lindberg