

September 2015 Radio Spot (LEAPS, 9/11/2015)

What's up with lake level management in Rice Lake?

As most people know, even if they don't know the right word for it, Rice Lake is an impoundment, an impounded body of water. What impounded means is that a dam was built across a river channel (in this case the Red Cedar River) allowing for the area behind or upstream from the dam, to fill up with water. An outlet on the dam allows water to pass through. Gates or doors build in the outlet makes it possible to control the amount of water that both passes through and that fills up behind the dam. Unless you are a beaver, impoundments are usually created for assorted man-made purposes like logging, navigation, recreation, drinking and/or irrigation water, flood control, and/or to generate hydro-electric power. Most of the water in an impoundment comes from upstream sources. It also comes from groundwater and precipitation in the form of rain or snow. There are many types and sizes of dams, but most either block the water until it flows over the top of the structure, or passes the water through the dam via gates (doors), tunnels, or chutes. Some have gates that can be opened and closed to let more or less water through, and some just have an overflow area called a "spillway" to let more water pass when levels get to high.

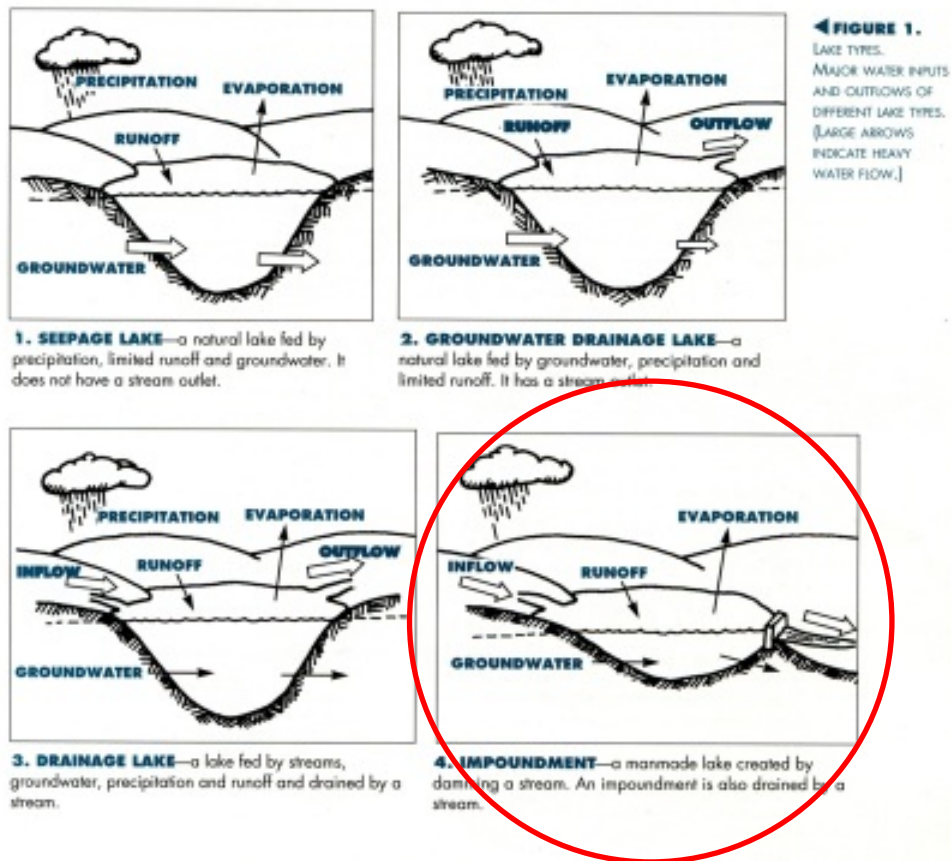


Figure 1: Lake Types - Understanding Lake Data, WDNR. Rice Lake is an "impoundment".

The first dam that actually created Rice Lake was built around 1865 by the Knapp, Stout Company to support the area logging industry. The current dam on Rice Lake was built in 1984. Prior to the first dam, Rice Lake had been a wide spot where the Red Cedar River, Bear Creek, and Tuscobia Creek met. The area was rich with wild rice, a native grain highly prized and utilized by the local Indian Tribes who had a settlement here. There are several Native American remains still in the area today, the Indian Mounds Park near the site of the old hospital being the best example.



Figure 2: Indian Mounds Park, Rice Lake, WI

Rice Lake is not the only impound in the Red Cedar River/stream system. Upstream of Rice Lake on the Red Cedar River is the Mikana dam that maintains water level in Red Cedar, Balsam, and Hemlock lakes; and another one upstream of Balsam Lake in Birchwood that maintains water levels in Birch and Big Chetac Lakes. Big Chetac Lake is generally considered the head waters (where the river begins) of the Red Cedar River. There is a dam on the Brill River, a smaller river that enters the Red Cedar River a few miles east of the city that maintains water level in Long Lake. And there is a dam in Haugen on Bear Creek that maintains water levels in Bear Lake. The existing dams in Haugen and Mikana were built around 1915, and the Long Lake dam on the Brill River was constructed in the 1970's. All four dams are active and pass more or less water downstream depending on many factors. All of this water ends up behind the Rice Lake dam. Rice Lake is an impound fed by 3 major upstream water sources (Red Cedar River, Brill River, and Bear Creek) with four dams that hold back water from an area nearly as large as Barron County itself (Figure 3).

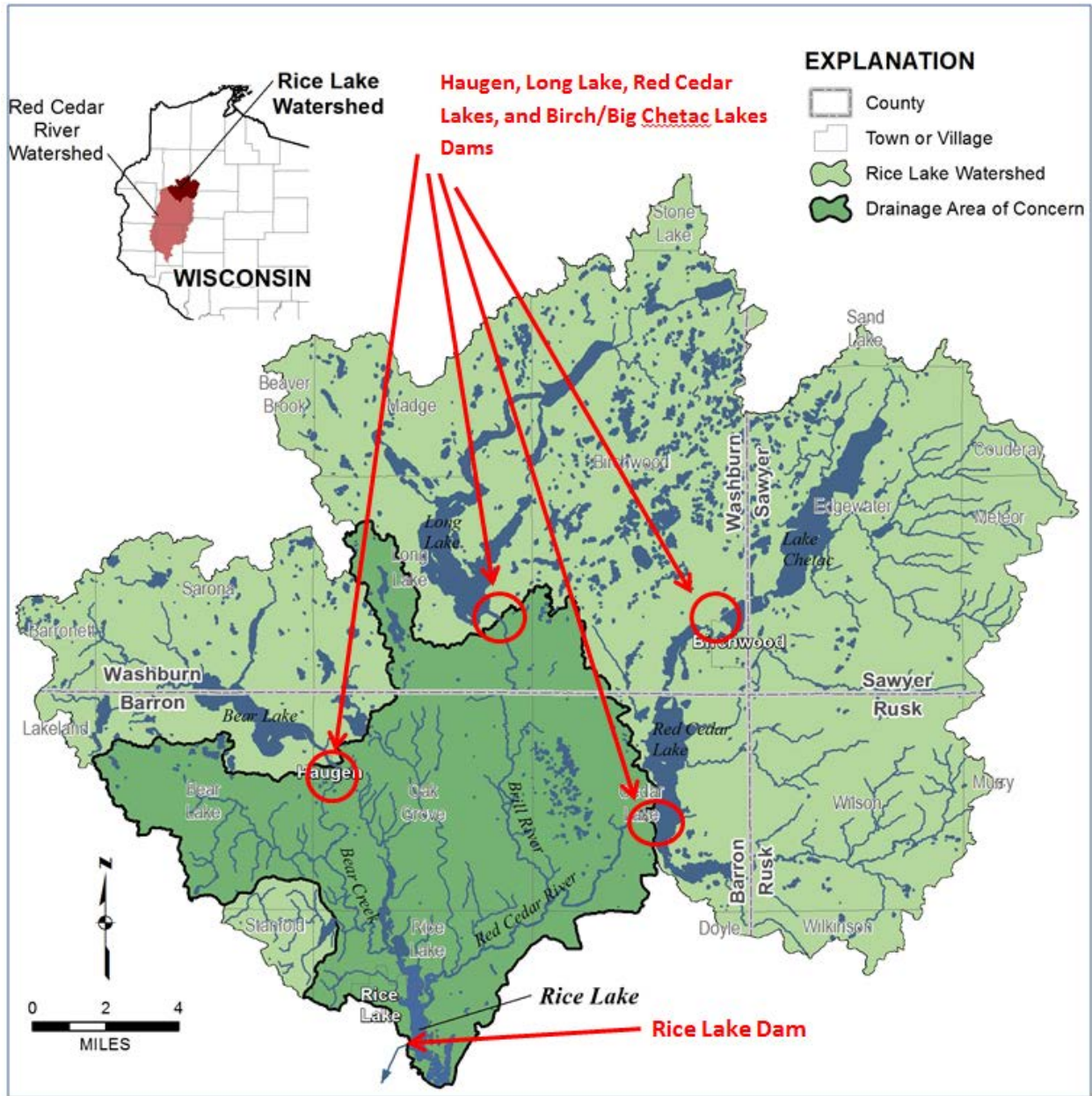


Figure 3 - Rice Lake Watershed, Direct (dark green) and Indirect (light green), Local Dams (red)

Not one of the four dams upstream of the Rice Lake dam is used to generate electrical power. Neither is the Rice Lake Dam. Their function is primarily recreational, flood control, and as a local water source. All of these dams are operated by human beings, they are not automated, except for how the gates on the dams are opened and closed. Some, like the Rice Lake dam, are operated electrically with big motors. Others, like Mikana still have hand-operated systems that open and close the gates that pass water through. Barron County currently owns the Rice Lake dam, and when asked why it does not have an automated system for maintaining the water level, the response was this. An automatic system was installed back in 1984, but it proved problematic and was disconnected many years ago. The problems were caused by the automated system making false readings that could and did open and close the

gates improperly, causing - rather than solving water level issues. It was felt that a dam that is as visible as the Rice Lake Dam should be managed by human beings on a daily basis, not left to the limited capabilities of a machine.

Although owned by Barron County, the Rice Lake dam is operated by a City of Rice Lake Dam Operations Crew. Using their combined experience gained over many years, the City Crew checks on and operates the dam daily with a goal of keeping the lake level as close to constant as they can. With the large area draining into the lake, and four upstream dams, fluctuations should be expected, but the Crew does a very good job at maintaining the water in the lake at its approved level, which was set by the WDNR a long time ago. The following information (Table 1) about the Rice Lake dam was taken from WDNR website at <http://dnr.wi.gov/damsafety/damSearch.aspx>.

Table 1 – Rice Lake Dam Information from the WDNR

ASSIGNED_ENGINEER	AUTHORIZATION_APPROVAL_DESC	COUNTY_NAME	CREST_LENGTH_FT_AMT	DAM_KEY_SEQ_NO	DAM_NID_ID	DAM_OFFICIAL_NAME	DAM_SIZE_TYPE
Michael Rogney	GEN LAW	Barron	192	103	WI102	RICE LAKE	LARGE
DRAIN_BASIN_SQ_MI_AMT	ESTD_HAZ_RATING_CODE	FIELD_FILE_NO	FIRST_DAM_AT_SITE_YEAR	HAZ_RATING_CODE	HYD_NR333_YEAR	HYDRAULIC_HT_FT_AMT	IMPOUND_AC_AMT
230	H	03.08	1865	H	2015	12	939
IMPOUND_LOCAL_NAME	IMPOUND_MAX_DEPTH_FT_AMT	IMPOUND_WB_CODE	IOM_NR333_YEAR	LEVEL_MAX_MSL_FT_AMT	LEVEL_MIN_MSL_FT_AMT	LEVEL_NORM_MSL_FT_AMT	MAX_STORAGE_ACFE_AMT
RICE LAKE	19	0	1984	1123	1122.7	1122.7	10300
NORM_STORAGE_ACFE_AMT	OWNER_ORGANIZATION_NAME	PURPOSE1	PURPOSE2	REG_AGENCY_CODE	SPILL_PRNC_DISCHG_CFS_AMT	SPILL_PRNC_WIDTH_FT_AMT	SPILL_TOT_DISCHG_CFS_AMT
7500	BARRON COUNTY	HYDROELECTRIC	RECREATION	WDNR	10480	129	10480
SPILL_TYPE_DESC	STREAM_LOCAL_NAME	STRUC_HT_FT_AMT	STRUCTURE1	STRUCTURE2	ACTIVE_FLAG		
Controlled	RED CEDAR	18	GRAVITY	EARTH	Y		

The water level set by the WDNR and considered “normal” for Rice Lake is 1,122.7 feet above sea level. This level is also the minimum amount of water that is supposed to be maintained in the lake. The maximum water level, not to be exceeded for any long period of time is 1,123 feet above sea level, only about 3.6 inches higher on the water level gauge at the dam. The City Crew works very hard to maintain this level, and does a pretty decent job. In 2014, with record rainfalls in Rice Lake during the summer season the water level in Rice Lake was maintained within 2.5 inches of the “normal” for all but 22 days during the open water season. Of those 22 days, the water level for 14 days was greater than the 2.5 inches above normal. Only 8 days was it greater than 2.5 inches below normal (see the pdf document entitled 2014 Lake Levels).

Rainfall over Rice Lake is just one of the factors that affect how the water level changes in Rice Lake. As previously mentioned, all four of the dams upstream are also operated by humans. Like the Rice Lake dam, each of the other dams has a minimum and maximum lake level that the Operators are trying to maintain. Any rain that falls within 25 miles or more north and/or east of Rice Lake affects the water levels in Rice Lake. Meaning, a 3 inch rain fall north of the City of Birchwood will affect the water level in Rice Lake, even though there may not have been a drop of rain in Rice Lake. As the Operators of the Birchwood dam try to maintain their lake level, water moves into the Red Cedar Lakes, which in turns makes the Operators there jump into action to maintain their water level, which then moves water into Rice Lake making the Operators of the Rice Lake dam jump into action. The same thing happens with both the Haugen dam and the Long Lake dam. When the Operators of those dams have to open the gates to pass water, Rice Lake is affected.

Conversely, in an extended period of little rainfall or drought, all the Operators up stream of the Rice Lake dam will try to maintain their water levels, which then may limit the amount of water held back by the Rice Lake dam. This problem could be much worse, except for the fact that operators of all of these dams must maintain a designated amount of water going through the dams to at least achieve “base water flow” conditions in the rivers they are built on. No dam operator, including the operators of the Rice Lake dam can shut the gates entirely as this would cut off the main water supply to the river or stream below the dam, and cause a ripple effect of low or no water that could extend many miles downstream.

In some impounds the water level is intentionally drawn down in the fall to make room for the expected increase in runoff from spring snowmelt; or to keep ice away from the shore; or to implement aquatic plant management actions that may include control of aquatic invasive species like EWM, improving native aquatic plant growth, increase the growth of wild rice; or to consolidate loose sediment. In these cases, the water level is typically brought back to “normal” by spring snowmelt and spring rains. The water level in Rice Lake is drawn down by about 6 inches beginning in late October, and the water level in Red Cedar Lake is drawn down a little less than 5 inches at the same time. Both are filled back up again starting at ice out in the spring.

If there is a lot of snow and/or a lot of spring rain, the impoundment may fill back up very quickly. If there is little snow and/or little spring rain, it may take longer to bring water levels back up. The same thing can be said when water levels are intentionally or unintentionally drawn down too low at any time during the open water season. If the amount of rainfall is sparse, it may take an increased amount of time to bring water levels back to normal.

Dams are man-made structures that also need maintenance and upkeep. In August, one of the five electric motors that open and close the gates on the Rice Lake dam was replaced (Figure 4).



Figure 4 - Electric motor installed on one of the gates of the Rice Lake dam

The County and the City have plans to replace one motor a year. This was the third motor to be replaced, so two more are scheduled, one in 2016 and one in 2017. When the motor was replaced, several tests were made of the new motor, so there were some water level fluctuations noticed in the lake due to this activity, but they were very short term. Depending on the type of maintenance needed, repairs can be made in the winter or during the open water season. Sometimes maintenance requires a

prolonged period of low water to complete. Sometimes it requires no change in water level. Even beavers have to continually maintain and often repair their dams.

Maintenance is required by state and federal law as dams like those in the Rice Lake watershed pose a serious threat to human lives and property downstream. The Rice Lake dam and all four dams upstream of Rice Lake are considered “high hazard” dams due to the amount of human development and therefore human life and property that could be affected if the dams were to fail. Rice Lake holds an estimated 3.36 billion (yes billion!) gallons of water, most of which would move downstream if the dam failed, likely wreaking great havoc.

Open communication between all the Operators of the dams in the Rice Lake watershed are important, and are what is continually strived for by Barron County and other owners of these dams. Operating them is not as easy as opening and closing a gate on a particular dam. It is a complex system where a simple if/then management scenario is not appropriate. Whether you approve of the way the Rice Lake dam is operated or not, as a resident on the lake or in the area, try to be tolerant of the fluctuations. Voice your concerns when there are some, but also praise the efforts of these people when things are going along nicely.

How do fluctuating water levels affect the average landowner?

While the discussion in this document suggests that the fluctuation in water level in Rice Lake is very small, how those fluctuations affect property owners and lake users is not a small issue. It is how these fluctuations are perceived by the public that is important.

The most important thing to consider when discussing this perception is the type of shoreland property that is owned. If the property adjacent to the lake is very steep and next to deep water, small fluctuations will hardly be noticed. If the shoreland property is flat and next to shallow water even small changes in water level (high or low) may cause hardship. Both of these situations refer to the “slope” of the property and can best be explained by looking at triangles (Figure 5). A right triangle that is tall and narrow will have a steep slope (Part 1, Figure 5), like a steep shore. In many cases a steep shoreline also indicates water that gets deeper faster in the near shore area. A right triangle that is short and wide will have a fairly flat slope (Part 3, Figure 5) which generally indicates water in the near shore area that is shallow and stays shallow for a long way away from shore.

An equal change in water level on each of these shorelines has a different effect. The water may go up and down on a steep shore, but the boat stays in plenty of water to float and the water level does not go over the banks and flood the house, or dock, etc. When the water goes up on a flat shoreline, the boat may end up in the living room of the house, and conversely when the water level goes down, the boat may be sitting on the bottom of the lake unable to float. The amount of exposed shoreline is different as well.

More shoreline is exposed on a flat slope during low water than is exposed on a steep slope under the same low water conditions. Conversely, more shoreline is flooded on a flat slope during high water than is flooded on a steep slope under the same high water conditions.

Determining what should be the “correct” water level is very difficult. High water may make it easier for some people to launch their boats, but somewhere else on the lake it may flood someone’s home or increase shoreline erosion. Low water for some prevents shoreline erosion, but may leave someone unable to launch their boat from their boat lift somewhere else on the lake. Human hardships are generally the result of a lake level too high, or too low. So maintaining the “perfect” water level is what the Dam Operators strive for and is the best thing for the lake...or is it?

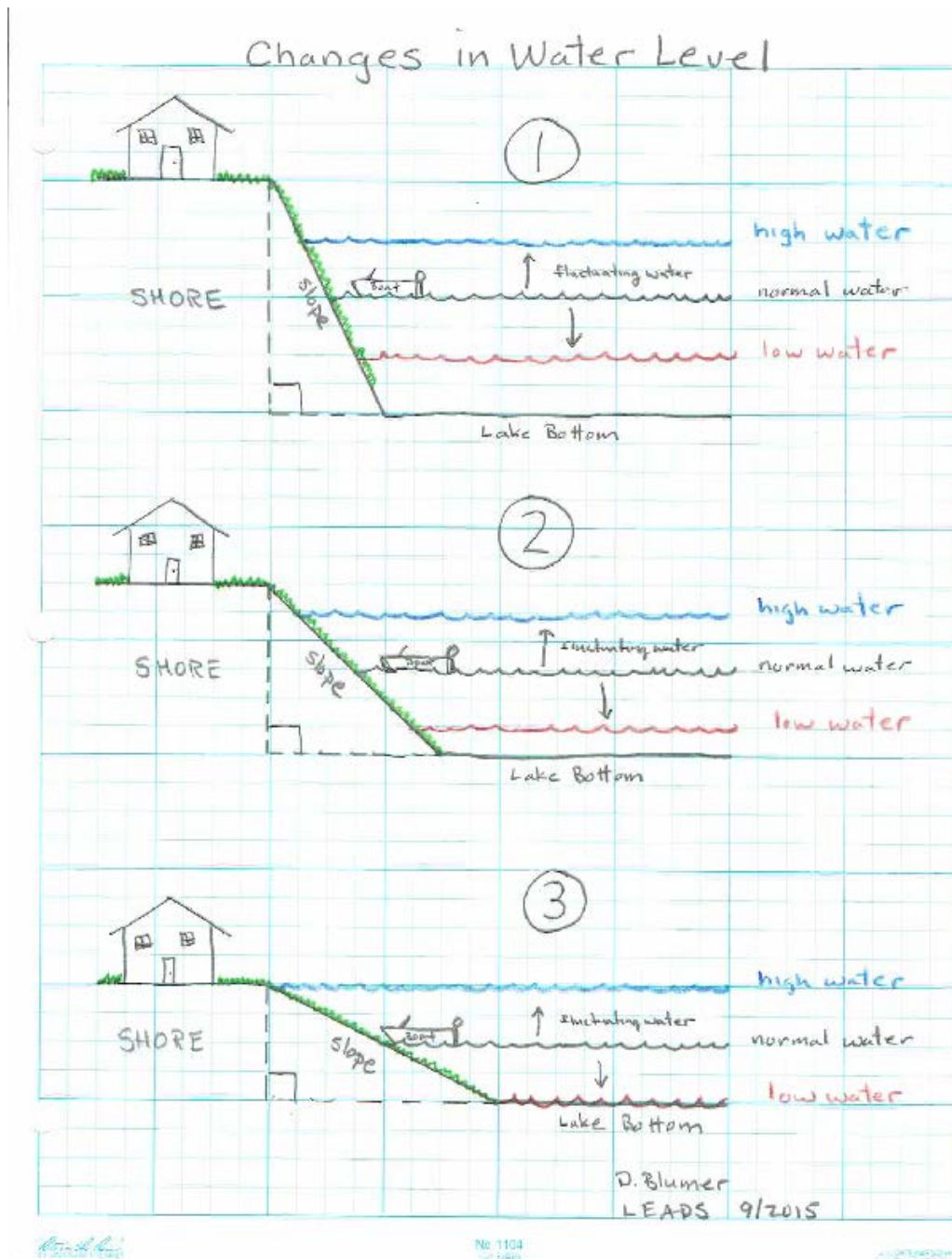


Figure 5 – Steep (1), moderate (2), and flat (3) lake property

What problems can be caused by maintaining a constant water level in a lake?

Assuming there has been a “normal” water level determined for an impoundment, that level may not be considered the “best” level by property owners and users of the body of water. As was previously mentioned, some prefer high water, and some prefer low water. The perfect level is not attainable in such a manner that everyone is going to be completely happy. But again, assuming that a normal lake level has been established and set for a goal, there are other things to consider.

Natural lakes that are fed either by groundwater alone or by ground water and surface water flowing in or out naturally fluctuate. This fluctuation creates diverse habitat for plants and animals alike. For example, natural wave action may erode even a protected shoreline causing a tree to fall into the water. When that tree falls into the water, it creates marvelous fish and other critter habitat. Natural variation means different plants can grow at different times, increasing diversity and health. Removing the natural variation in a body of water may cause long-term harm that may not even be visible on a daily basis. When water levels remain static, only the vegetation that does well in that particular type of water is going to survive long-term. So plant diversity may be reduced. When that is reduced, so is other animal life. A continuous problem with many impoundments is the deposit of sediment over many years that may fill in the lake. Some impoundments can only be kept usable for humans by repeated dredging to take the sediment out. By placing a dam on any flowing water system, the amount of flow, the temperature of the water, the types of plants and animals, and many other factors change.

Humans have built dams to create impoundments for many centuries, simply because the perceived benefits from doing so out-weigh the costs. As long as we remain aware of what the true costs are (many more expenses than just the almighty dollar) humans can continue to benefit from impoundments hopefully without causing greater harm.

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This document is drafted on behalf of the Rice Lake – Lake Protection and Rehabilitation District Board, but does not necessarily represent the viewpoints of all board members.