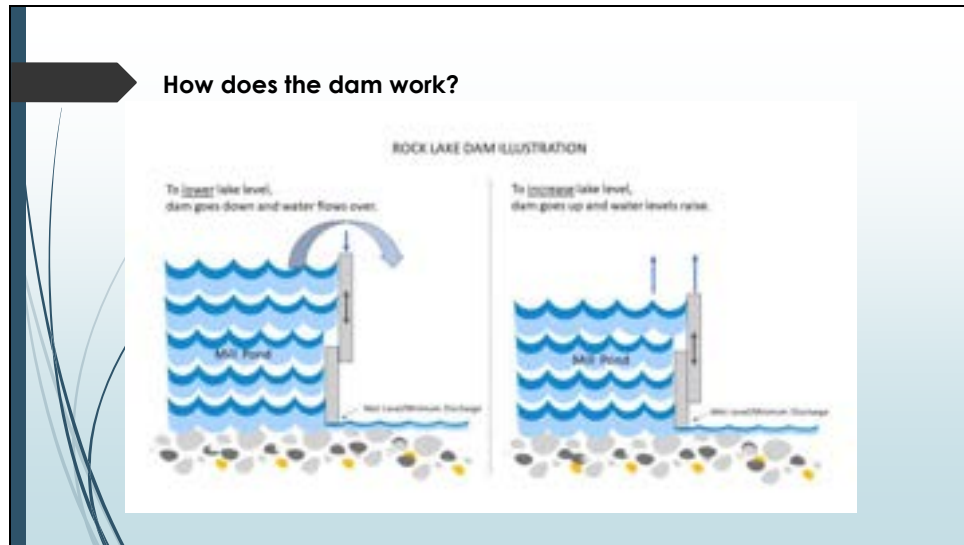


**Rock Lake Improvement Association: Title page**



I had a meeting with Eric yesterday where he drew a picture to explain how the dam works. I thought that might be helpful to others here tonight. So a friend created this image--

## Rock Lake Improvement Association: How does the dam work?



In non technical terms, the dam has two plates. The bottom one stays steady, releasing the minimum discharge. The top one automatically adjusts based on the parameters programmed into the dam. If you want to increase the lake level (as on the right), the top plate moves upward with the rising water to keep it contained. If you want to lower the water, you would lower it. If you drop the plate all the way down, that's the maximum amount of water which can be released at any moment in time. How quickly can the dam release water when fully open? That needs more modeling, but a ballpark estimate is that the dam can release 1" of lake height in 18 hours.

Now that you have a picture of how it works, let's go into the operating order.

## Rock Lake Improvement Association: DNR Dam Operating Order

**DNR Dam Operating Order:**

Season	Minimum/Maximum	Median
November 1 to Spring breakup	minimum = 827.25 ft.	median = 827.38 ft.
	maximum = 827.50 ft.	
Spring breakup to May 1	minimum = 827.25 ft.	median = 827.44 ft.
	maximum = 827.63 ft.	
May 2 to September 15	minimum = 828.03 ft.	median = 828.18 ft.
	maximum = 828.33 ft.	
September 15 to October 31	minimum = 827.25 ft.	median = 827.44 ft.
	maximum = 827.63 ft.	

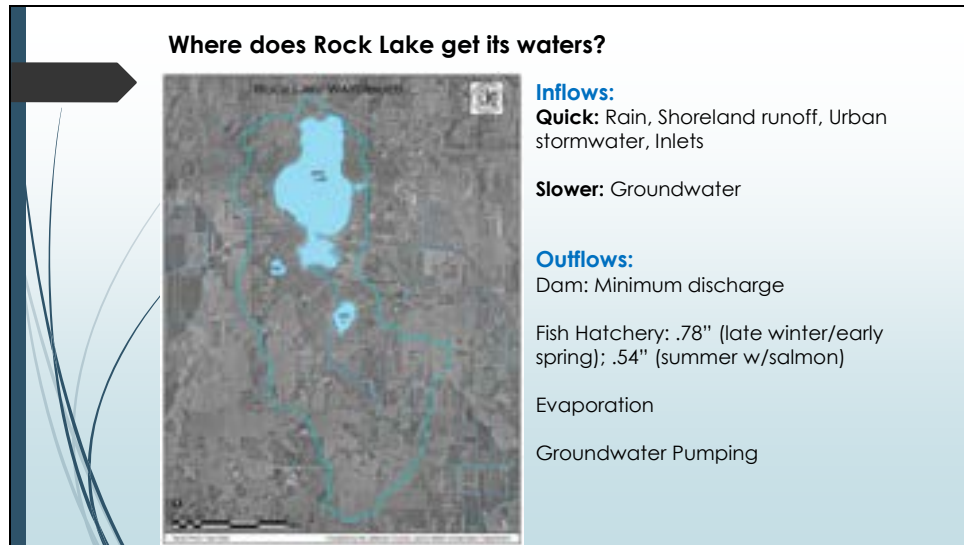
**Timeline:**

- 1959:** The PSC raises the lake level 2.28' and delineates lake level based on time of the year
- 1960:** The Fish Hatchery agreement was finalized
- 1982:** Dates were more clearly defined
- 1995:** Measurements went to sea level

Most of us have seen the DNR Dam Operating Orders, either on the City's website or from Rock Lake's Management Plan. It's structured to draw down the lake in the Fall with two steps to help reduce shoreline damage due to ice push, give the lake some ability to absorb winter's precipitation and to give the turtles and amphibians time to find places to survive the winter. Then on May 2 the City can begin to hold water to bring the lake up to summer recreational levels. For this discussion, we wanted to highlight only a few key dates in the development of the operating order. A detailed timeline will be given to the committee.

Rock Lake's water levels significantly changed in 1959 when the precursor to the DNR raised the lake 2.28'. Their order further refined what was outlined in 1926 by identifying lake levels based on the time of the year. In 1960, the Fish Hatchery came on line and we'll discuss that more later. In 1982, the dates for water level changes were more clearly defined. For example, the order was changed to "November 1<sup>st</sup> to spring breakup vs from before freeze-up to spring break up." And then in 1995, the datum was changed to mean sea level. Consequently, summer max went from 97.1 ft to 828.33 ft.

## Rock Lake Improvement Association: Where does Rock Lake get its waters?



Let's step back and look at where Rock Lake gets its waters. This is the watershed of Rock Lake which means that all the waters within this blue line from south of Hwy 18, north to interstate 94, west to Cty S, and east to sections of 89 eventually make it into the Lake. (animation)

Water that enters the lake quickly are rain, runoff from the shoreland properties, urban runoff from some of the City's neighborhoods which drain directly into the lake, and Rock Lake's inlets which are: Mud Lake flowing into Rock Creek, flowing into Marsh Lake. The slower water inflows come from groundwater. Rain that hits anywhere here must first percolate into the soil and flow towards our lake entering the lake as a spring. 45% of our watershed is in agriculture so that indicates a slower water feed than let's say Lake Monona who's watershed is primarily developed. (animation)

How does Rock Lake lose water? It can flow from the Dam. The DNR encourages managing the water levels to the median levels and also requires a minimum discharge of .13 cubic feet per second to dilute wastewater from the treatment plant as well as to keep the creek viable for aquatic life. The Fish Hatchery also uses water. According to the research done last year by Jefferson County's Land Water & Conservation Dept (LWCD), about .78" of water from Rock Lake's height is withdrawn in winter and early spring to fill the ponds for pike and walleye. When the hatchery raises salmon, a continuous supply of water is needed. This is supplied mostly by 2 wells which they operate and then additional lake withdrawals equaling about .54" of water height.

As we've seen in the dry years of 2021 and 2023, the lake loses water through evaporation. Lastly, another source of outflows would be ground water pumping.

## Rock Lake Improvement Association: Water Levels: The Goldilocks Dilemma / Too High

**Water Levels: The Goldilocks Dilemma**

**Too High:**

- Shoreline Damage: city/township, county, private
- Flooding
- Damage to piers
- Recreational boating impact
- Must be mitigated by dam management




Determining water levels is a little bit of a Goldilocks Dilemma. If the water is too high, shoreline damage could incur to city, town, and county parks, as well as private landowners. Flooding can occur. Once levels exceed the DNR maximum water heights by 5", Slow No Wake requirements will activate to help protect shorelines which will limit some recreational activities. High water will also require active management of the dam.

## Rock Lake Improvement Association: Water Levels: The Goldilocks Dilemma / Too Low

### Water Levels: The Goldilocks Dilemma

**Too Low:**

- Access for riparian owners
- Extending piers, reducing open water
- Damage to public boat launches
- Bottom scouring, releasing nutrients, increasing algae



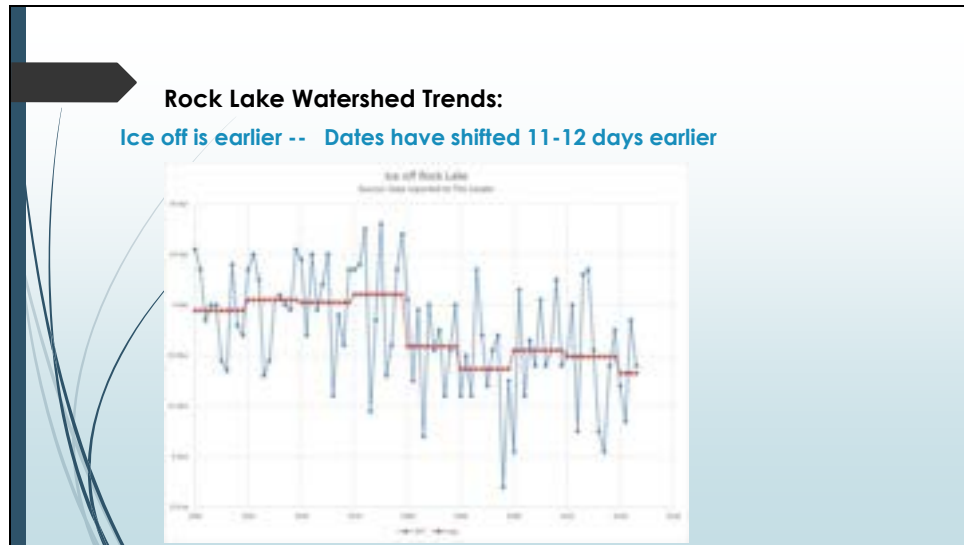
Ray Street public pier, 7/2/2023

Too low, as we've heard tonight, riparian owners have difficulty getting their boats into the water since their lifts might not lower far enough. They might have difficulty getting their piers in or out and they might reconfigure their piers to extend further out into the lake. One riparian owner I spoke to doubled the length of his pier this year. Since DNR boating regulations require boaters to stay 100' from pier ends, this effectively reduces open water. In addition, some riparians have been digging into the lake bottom, creating channels so that their props won't hit.

Public boat launches will see more damage since motorized boats might "power load" their boats onto trailers that don't extend far enough into the water. City residents have said that there is power loading damage at Sandy Beach this year. The City has noticed more activity at Sandy Beach's launch because boaters are using that launch rather than the Town's North Launch due to power loading damage. At the end of this boating season, the City will need to investigate the possible expenses to repair the launch. If low water levels persist, the City might need to consider extending the cement boat launch pad to reduce power loading damage. Residents have indicated that there's damage at the North Launch as well. Last year, the Town repaired the damage done to their North and Ferry boat launches from the 2021 season. It cost the Town \$621 in DNR permits and \$7,210 in labor by Forest. They will need to investigate what needs to be done to repair damage from this year.

Lastly, another impact of low water, particularly in our DNR designated Sensitive Areas like Korth Park, is boat props scouring the lake's bottom sediments. This churning releases nutrients within the sediment, making them available for algae blooms. This year has seen some extensive and long lasting algae blooms.

## Rock Lake Improvement Association: Watershed Trends: Ice Off

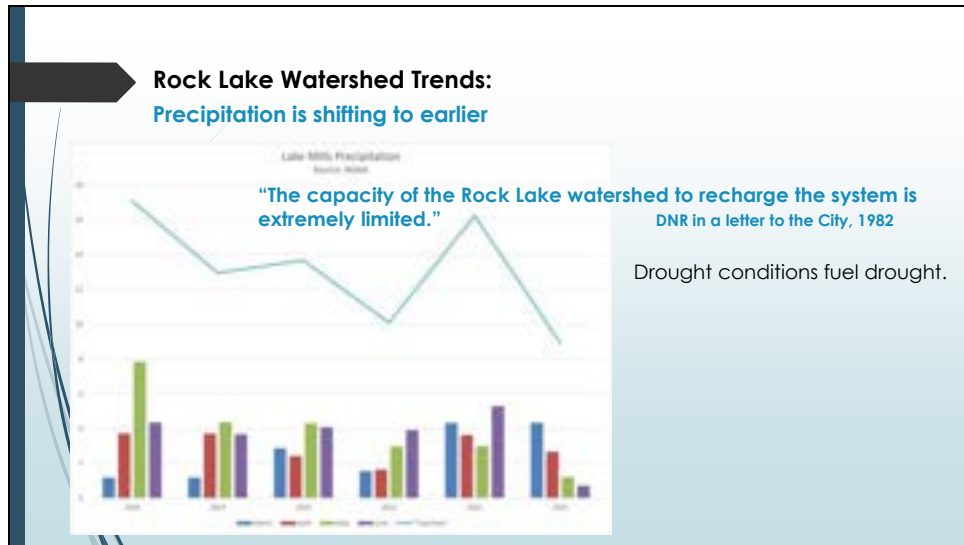


We're seeing some trends in the Rock Lake watershed which are indicating that significant changes are happening. One of these is Ice Off. Here's Ice Off dates supplied to the DNR by a Lake Mills volunteer. In this relatively small data set, the average ice off is 3/23.

(animation) This graph shows data published in the Lake Mills Leader. From 1940-1979, average ice off was April 4<sup>th</sup>. We take a downward step in the 80s, with our recent data in the 2020s, ending at an average of 3/24<sup>th</sup>.

The trends that we're seeing are supported by the predictions that the state of Wisconsin has outlined for Southern Wisconsin. (animation) Whichever data set you use, since the operating orders were developed, dates have shifted 11-12 days earlier.

## Rock Lake Improvement Association: Watershed Trends: Precipitation



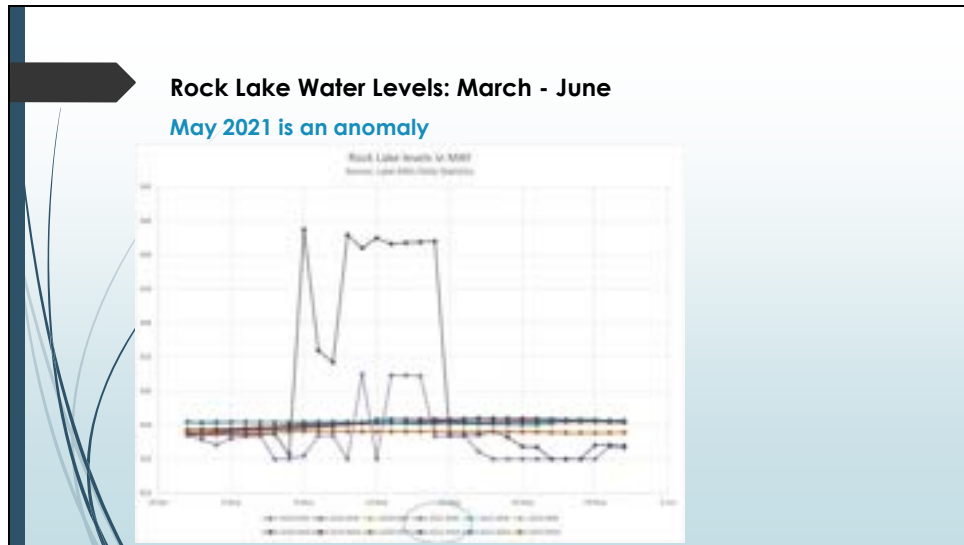
Another trend we are seeing is that precipitation is increasing in March and April. These are precipitation values for Lake Mills. We retrieved them from NOAA which is the National Oceanic & Atmospheric Administration. There are no surprises here. Forecasts indicate greater amounts and shorter duration of precipitation during the spring months. Since the automated dam, we can see diminishing rainfall for May. We can also see that three of the last four years are showing increased precipitation in March.

Madison has had more rain than our area, yet they are reporting that this year's May/June combination is the lowest precipitation on record. As we've seen, (animation) dry air makes it very difficult for precipitation to happen. Remember how we indicated that the majority of our watershed is in agriculture and that creates a slower access to water? (animation) In 1982, the DNR indicated to the City that the capacity of our watershed to recharge is extremely limited.

At this point, we've seen where Rock Lake gets its waters and noted some watershed trends. Let's look at Rock Lake's water levels since 2018. Just a quick note, SLIDE CHANGE



## Rock Lake Improvement Association: Rock Lake Water Levels: March - June



Back in May of 2021, a dam's sensor malfunctioned and it sent out just crazy readings. Our lake level didn't look anything like this so in the summary graph we dropped May of 2021 to make it easier to focus on the relevant data.

## Rock Lake Improvement Association: Rock Lake Water Levels: March - June



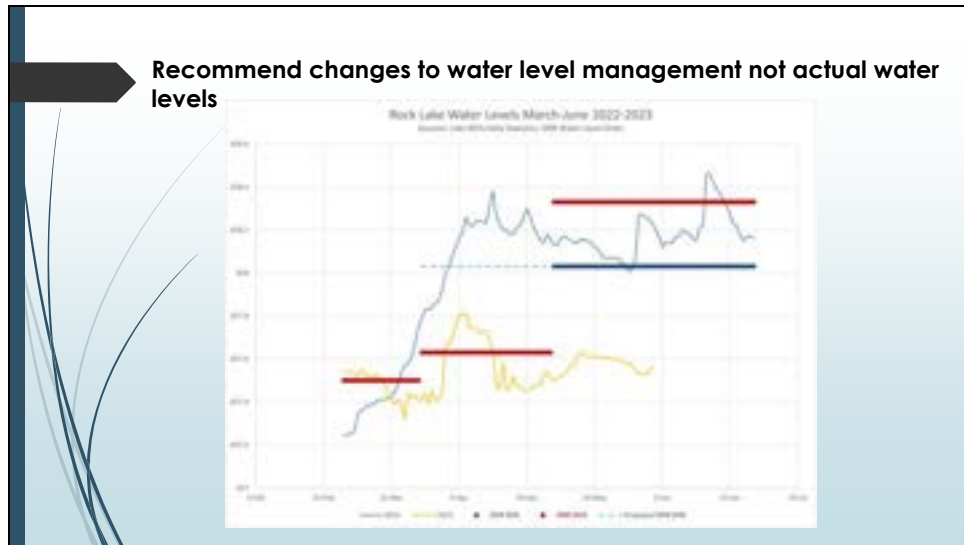
This is a very informative graph but it can be difficult to understand at first. The vertical line is water levels. Time is across the horizontal. The first maroon line is representing the max value for winter levels which the order calls “Nov 1 to Spring breakup”. We put it at 3/23-3/24 due to our Ice Off data shown previously. The second maroon line is the max DNR for spring or “Spring breakup to 5/1”. The blue line is the minimum summer water level and the last maroon line is the max summer levels.

Let’s look at 2019. We start the season below spring max. The City holds the water. We get rain and it makes it up to summer levels. Notice it did take a couple of weeks in May to gain those levels. 2020 starts similarly but takes even longer to get there—it looks like around Memorial Day weekend.

Let’s look at this year, 2023. At the end of March we were under spring’s max. In early April, we received rain bumping us up. The City managed that water according to the order and kept the dam fully open, bringing the water level down back within DNR’s orders. May 2<sup>nd</sup> the City started holding back water and the rain never came. As of 7/12 (before our nice rain yesterday), we are at 827.24 which is about 9.5” below our summer minimums.

Something interesting happened in 2022. The spring precipitation was never released. We achieved summer levels in late March and sustained that for the rest of the season. There was not much difference in March and April rain for 2022 vs 2023. 2022 had 7.96”. 2023 had 7.01” If the 2023 spring water levels had been retained like 2022, would we have reached summer levels? It’s not clear, but chances are, our levels would be higher.

**Rock Lake Improvement Association: Recommend changes to water level mgmt. not water levels**




What can we do to manage Rock Lake’s water levels so they can achieve DNR prescribed summer levels? The examples of 2022 and 2023 point to the need to shift the hold date earlier to capitalize on spring rains. Giving the city the flexibility to manage within a window makes sense. The current step approach is impossible to achieve. The City cannot gain the prescribed summer elevation in a day. In years of good rainfall, it took weeks. Technically, the City was out of tolerance with DNR operating orders every single year.

All the weather patterns are shifting left and we need to respond to these changes and create an operating zone. It’s easier to let water out than to put it in.

## Rock Lake Improvement Association: Recommend changes to water level mgmt. not water levels

**Recommend changes to water level management not actual water levels**



The Madison Chain of Lakes operating orders is to meet **summer minimum** levels by **early March**. Beginning in **mid-April**, adjustments are made to the lock and dam structures to raise the lake levels **within the summer range**. The goal is to maintain the lakes within the summer range to provide flexibility in dealing with both dry and wet periods.

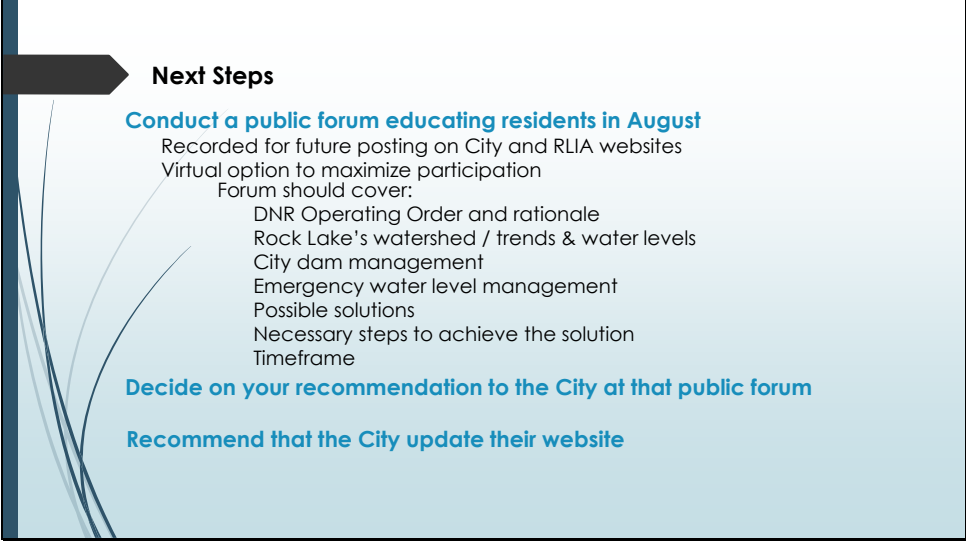
**“The capacity of the Rock Lake watershed to recharge the system is extremely limited.”**

DNR in a letter to the City, 1982

We understand that Rock Lake is a very different watershed, however, the DNR has given that flexibility to Madison’s Chain of Lakes. According to the Dane County Lake Level Management Guide, The Madison Chain of Lakes operating orders is to meet **summer minimum** levels by **early March**. Beginning in **mid-April**, adjustments are made to raise the lake levels **within the summer range**. The stated goal is to maintain the lakes within the summer range to provide flexibility in dealing with both dry and wet periods. In an article published yesterday (7/12/23), WMTV indicated that although Madison is experiencing a drought and the lake levels are low, they are still 1-2” above the DNR’s summer minimum range.

The DNR needs to give the City the same flexibility to meet summer levels in both dry and wet periods, particularly since we are seeing a shift in our weather patterns. (animation) Perhaps since Rock Lake does have difficulty in recharging our system, we need that flexibility even more. Realistically, 2022 was a pilot for this approach.

## Rock Lake Improvement Association: Next Steps



**Next Steps**

- Conduct a public forum educating residents in August**
  - Recorded for future posting on City and RLIA websites
  - Virtual option to maximize participation
  - Forum should cover:
    - DNR Operating Order and rationale
    - Rock Lake's watershed / trends & water levels
    - City dam management
    - Emergency water level management
    - Possible solutions
    - Necessary steps to achieve the solution
    - Timeframe
- Decide on your recommendation to the City at that public forum**
- Recommend that the City update their website**

There are a couple of clear next steps. The JRLC needs to host a public forum which seeks to both educate residents and listen to their concerns. This forum should be recorded and offered with a virtual option to maximize access to the information. In this forum, the DNR operating order history and rationale should be explained. The information we shared here regarding the watershed, its trends, and water levels should be shared. Specific details on how the City manages the dam and the processes in place to ensure proper dam management as well how extensive or sudden rain events would be handled should be discussed. Residents would want to hear about possible solutions as well as the necessary steps to accomplish it. Lastly, and very importantly, a timeline should be identified.

This forum should take place in August (animation) and we respectfully request that the JRLC decide on their recommendation to the City at that forum rather than at a subsequent meeting. The JRLC should also recommend that the City update its website with current information on dam management practices and dam capabilities. The dam was put in 2018 and that is plenty of time to expect an update. Contact information should be updated as well.

## Rock Lake Improvement Association: Urgency

**Urgency**

**This winter is predicted to be an El Nino year resulting in less snowfall**

**Change takes time:**

- JRLC makes recommendation to City Council
- City Council votes on recommendation
- City creates a written petition to the DNR requesting an amendment
- DNR conducts a preliminary review
- City submits a dam permit application
- DNR conducts a full review (additional information, public notice period and/or public hearing)
- The dam management software would need to be updated

**Residents are concerned. Can this be accomplished by March 2024?**

I would like to end by stressing the need to take action quickly. There is a sense of urgency. According to the World Meteorological Organization (WMO), the likelihood of El Niño developing later this year is increasing. According to WKOW.com, as we head into winter, temperatures should rise and precipitation will likely be below average. In the past, El Niño has resulted in less snowfall for southern Wisconsin, so we have reason to believe that may be the case again this year.

A change in operating orders takes time. The JRLC must make the recommendation to the City Council. The City Council must vote whether they will ask the DNR to look at the operating dates. City staff will then need to write up a petition requesting an amendment to the operating order. The DNR will do an initial review. If that looks OK, the City will need to submit a dam permit application. A full review may be relatively simple requiring a public notice period or it could be lengthier, requiring more information which could require funding an environmental study. Since we are not requesting a change in actual water levels, we are hopeful that an environmental impact study would not be required.

All this activity is against a backdrop of resource constraints at the DNR and City staff who's not been through this process. Needless to say, residents are concerned and would like to see some action. We need to shepherd this process forward as quickly as we can. Thank you very much for a chance to share our research with you and we look forward to the public forum.