Water Level Basics by the Glen Lake Association, Water Level Committee

Ever wonder what determines the water level of Glen Lake and consequently the water flow in the Crystal River? If so, read on. The next few paragraphs will briefly outline where the water comes from, where it goes, and the management plan philosophy we have developed to serve the Glen Lake – Crystal River community.

The water comes from the precipitation we receive throughout the year in the form of rain and snow. It finds its way into the lake two different ways: directly from the sky and through the surrounding area which is called the Glen Lake watershed. The water that flows in from the surrounding streams and underground springs (predominantly located along the East and South shores of Big Glen) contributes significantly, but water seeps in from all the hills and lands surrounding the lake. This watershed rain and snow melt filters through the surrounding properties, lawns, and forests down through the sand and gravel into the lake. Fortunately this filtration has a significant time lag so we continue to have water coming into the lake during the dry weeks of the summer. Something to keep in mind is that any chemicals, fertilizers, fuels, or septage that is spread, spilled or buried in the watershed eventually makes its way into the lakes too. So the importance of keeping ground and streams clean is obvious

Where does the water go? Water leaves the lake in three ways: river flow, evaporation and seepage through the porous ground. Measured river flow starts at the Glen Lake Association dam, located on GLA property near the start of the Crystal River along Fisher road. The GLA Water Level Committee monitors the flow electronically and manually and the data is recorded on a continuous basis. See Photos 1 and 2. Water-flow over the dam in mid-summer varies with the weather, but we try to hold close to 31 cubic feet per second (CFS) at a minimum. Evaporation is a significant source of water loss during the summer months; a mere ¼ inch of evaporation from the lake surface equals over 40,300 cubic feet of water! Water lost through the ground is hard to measure but is also significant. Glen Lake is approximately 21 feet above Lake Michigan causing a “hydraulic push” moving water through the ground, which is mainly sand. Next time you are in Glen Arbor, think about water flowing not far under your feet from Glen Lake to Lake Michigan. Amazing!

Our challenge is water level management. The Water Level Committee has developed a water management plan balancing the needs of property owners and biology – guided by a court ordered water sharing plan (there was a lawsuit in 2003 resulting in a court order which dictates a water sharing plan between Glen Lake and the Crystal River). Over the course of a year, this management strategy lowers the lake level from fall through spring to minimize shore erosion and raises it for the summer months to allow for recreational use as well as maintaining a water reserve to feed the Crystal River. See Graph 1. Fall through spring precipitation is typically higher and when the lake is cold or frozen over there is little evaporation, so typically we have plenty of water those months in both the Lake and River. During the summer months water level control is most challenging. Stated earlier, water leaves Glen Lake in three ways.

We only have control over one of the factors affecting lake level: the gate level setting at the dam. It needs to be stated that by far and away the determining factors for lake level and river flow is rainfall and evaporation, not the gate setting. Often from July until September there is little precipitation, resulting in a reduction of both lake level and river flow. See Graph 2 which shows the lake level from August 2015 to August 2016. Graph 3 add the river flow at the dam. Sometimes the lake level goes below the target. This is when the special water sharing plan comes into consideration and river flow is gradually lowered below 31 cubic feet per second. 31 cfs is the minimum flow thought necessary to maintain a healthy river. As the dry spell continues, both the Glen Lake water level and the Crystal River flow are lowered as dictated by the water sharing plan.

While many property owners and boaters on Glen Lake would prefer a higher lake, there is a very good reason to maintain a healthy river flow. The Crystal River is a very delicate ecosystem, which is impacted significantly by changes in river flow. The current management plan is designed to maintain a level in the Crystal River, which will keep it covered from bank to bank until the reserve that is maintained in the lake is exhausted. At that point flow in the river is gradually reduced with lake level to "share the pain" of drought.

It is very important to keep the river covered from bank to bank to maintain the health of micro- organisms that provide food for the fish. As the riverbed becomes exposed, these microorganisms either die off or have less space to propagate. Lower river levels also cause elevated water temperatures resulting in lower oxygen levels for marine life. Moreover these reduced water levels eliminate deeper pools, which provide cover for smaller fish as well as healthy space for larger species.

Last but not least, deeper water levels in the river are important in keeping river enthusiasts in their watercraft rather than having to exit and drag their boats over low spots. This type of foot traffic on the river bottom is very harmful to spawning activity, which ultimately impacts the fish population.

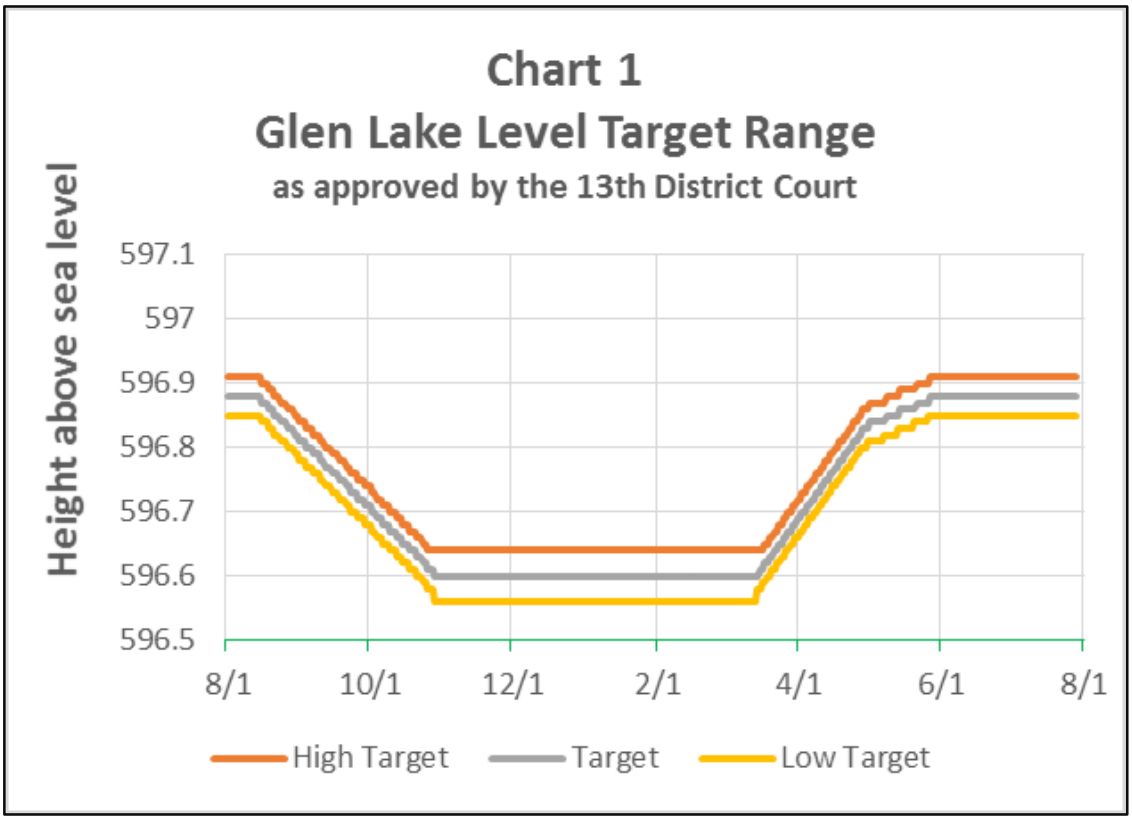
The sharing plan does not favor the river or the lake; it simply mandates a sharing of the scarce water for the betterment of both.

Lake level, water temperature and interesting articles can be found at www.glenlakeassociation.com

If you would like to know more about lake level dynamics, feel free to contact your GLA Water Level Committee.

Photo 1. Solar panel, data logger and modem at dam.
A transducer extends out into the river to the right and is covered by rocks. It reads water pressure (which is used to calculate water height) and temperature.

Photo 2. The solar panel, data logger, and modem at the narrows. The pressure transducer (calibrated to read water height above sea level) is in the channel about 3 1/2 feet under the surface.



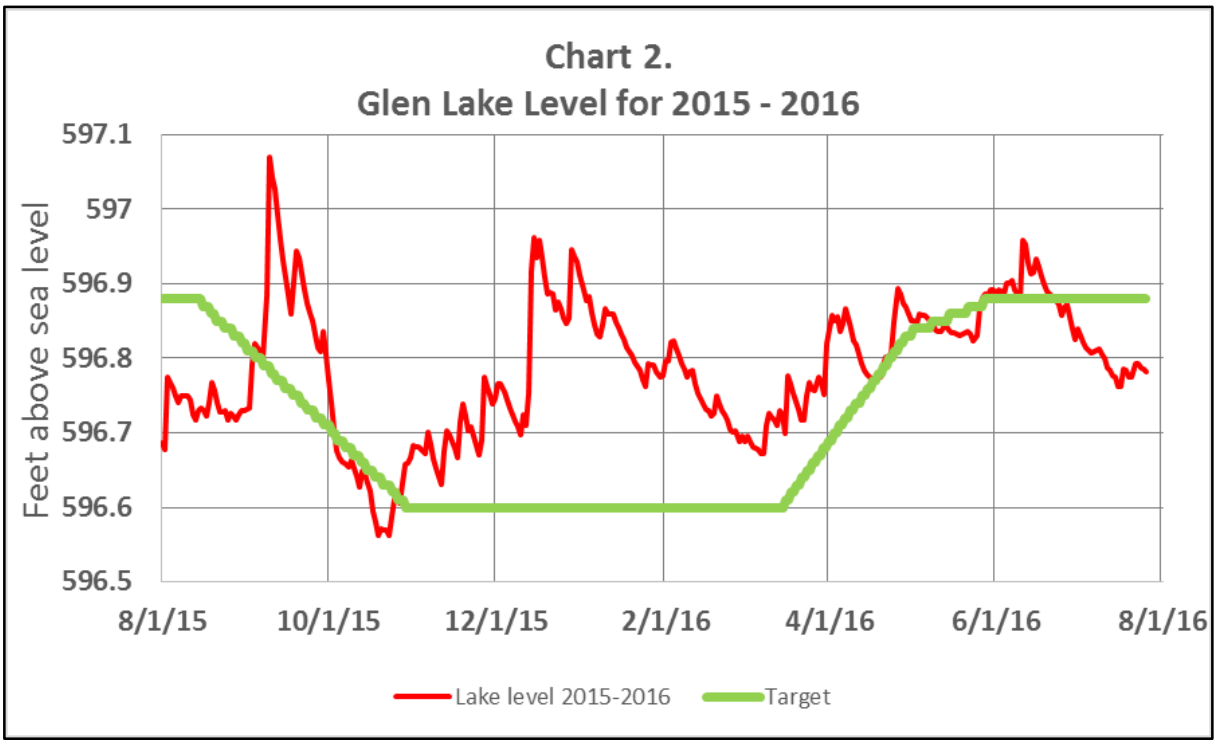


Chart 2.
Glen Lake Level for 2015 - 2016
Feet above sea level
597.1
597
596.9
596.8
596.7
596.6
596.5
8/1/15
10/1/15
12/1/15
2/1/16
4/1/16
6/1/16
8/1/16
Lake level 2015-2016
Target

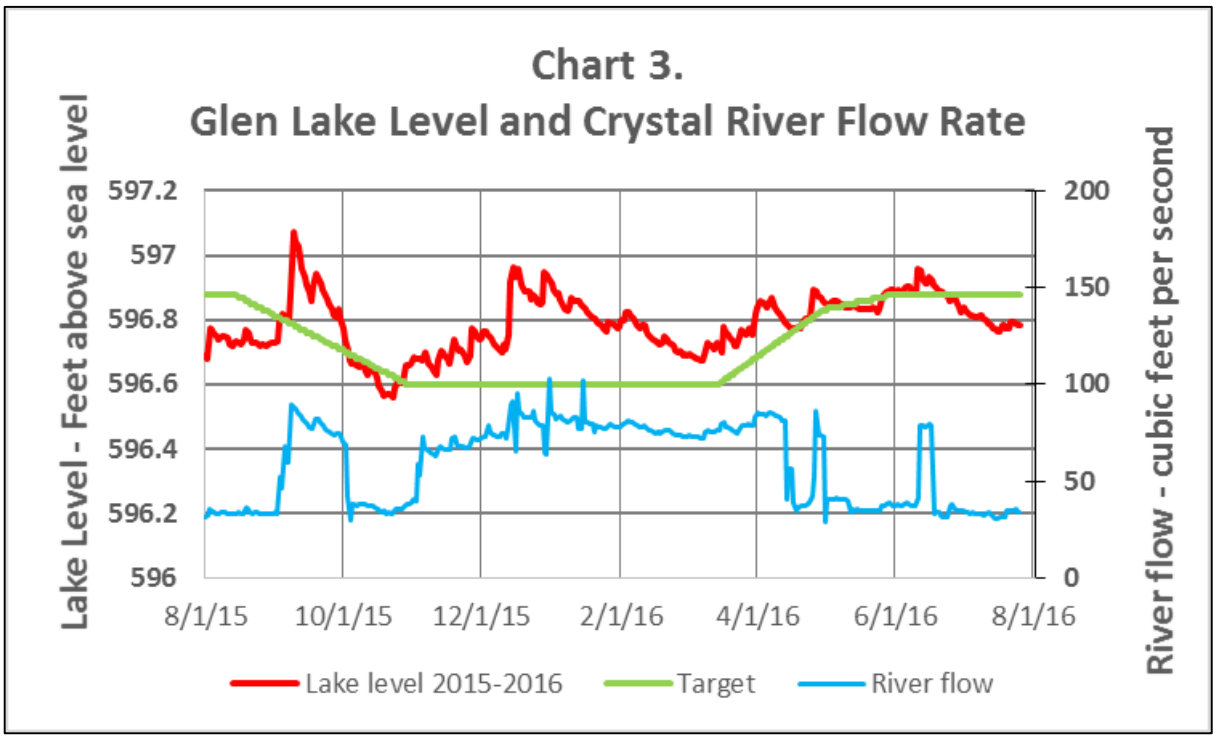


Chart 3.
Glen Lake Level and Crystal River Flow Rate
Lake Level - Feet above sea level
597.2
597
596.8
596.6
596.4
596.2
596
River flow - cubic feet per second
200
150
100
50
0
8/1/15
10/1/15
12/1/15
2/1/16
4/1/16
6/1/16
8/1/16
Lake level 2015-2016
Target
River flow