

Intermediate Lake Water Levels and the Operation of the Bellaire Dam Important Facts to Know

- In 1974, Antrim County acquired the Bellaire Dam for \$1 from the City of Charlevoix. The old hydroelectric plant located at Bridge Street in Bellaire was condemned and demolished in 1973, however the overflow structure was preserved and new gates added to increase capacity. The former overflow structure became the new Bellaire Dam.
- In 1990, after 17 years of litigation and debate, the Circuit Court issued a final ruling that the level of Intermediate Lake be maintained at 606.54 from November 1st to spring ice break up, but no later than May 15th—what we refer to as winter level. A level of 607.15 feet above sea level is to be maintained at all other times, what we refer to as summer level.
- As the owner of the Bellaire Dam, Antrim County bears the responsibility to maintain the lake level in accordance with the court order. Since 2012, the Operator of Dams is the County official assigned the job to operate and maintain the Bellaire Dam on behalf of Antrim County. (The County Drain Commissioner position does not include any duties related to the dam. However, the current Operator of Dams, Mark Stone, also happens to hold the position of Drain Commissioner, which may cause some confusion about these two distinct jobs.)
- The court order limits Antrim County's responsibility to the Intermediate Lake level alone—no other bodies of water are prescribed.
- The court order allows Antrim County to create a special assessment district around Intermediate Lake in order to pay for costs related to maintaining the lake level including operation and maintenance of the Bellaire Dam. To date, Antrim County has chosen to fund these expenses from general funds and has not set up a special assessment district.
- It is physically impossible to lower or raise the water level by 7.3 inches from one day to the next, as the ruling orders. So the court acknowledges that the County has some discretion in how to make the transition from the one level to the next.
- Customarily, we don't have to take any action in the spring to raise the lake level to summer level, because nature does it for us in the form of melting snow and early spring rains. Typically, all the gates are open for the entire winter, the spring runoff drives up the water level while the gates remain open, and when the spring runoff has made its way out of the system and the level falls, we start closing gates in late spring. This spring we closed our first gate on May 29th, 2018.
- In the fall, we have customarily begun to draw the water down in mid-October and try to reach winter level by mid-November, so the middle of the drawdown corresponds to November 1st. However, high water events in the fall in recent years have caused us to

start the drawdown process earlier, and we now begin to open gates in the first week of October.

- In its summary of testimony and evidence, the 1990 court order acknowledges that the location of the Bellaire Dam—over a mile downstream from Intermediate Lake and below the confluence with the Cedar River—makes it difficult, if not impossible for the dam operator to quickly lower the water level at Intermediate Lake in response to rain events. So, during the summer months, it is common for Intermediate Lake to rise abruptly after rain, and then it may take several days or even weeks for the water to drop back down to summer level.
- On the flip side, it is possible to keep a minimum lake level on Intermediate Lake by operation of the dam. So, in the summer months, the Intermediate Lake level rarely falls much below the court ordered level of 607.15.
- The court order also acknowledges the natural flood potential in the lake basin. Steep terrain around Intermediate Lake combined with a heavy rainstorm will result in the quick accumulation of storm water in the lake, especially when the ground is already wet. Depending on how much snow has accumulated over the winter, melting snow in the early spring can cause the same problem, and is often combined with rain, which makes matters worse.
- Since 1997, when the current dam operator began in the position, the gates at the Bellaire Dam have been wide open whenever the level of Intermediate Lake was 5 or more inches above the summer level of 607.15—regardless of the time of year.
- During a flood event, with all the gates open, the Bellaire Dam does not restrict the flow or volume of the Intermediate River. The limiting factor of the rate of drainage of water from Intermediate Lake is the length, shape, depth and change in elevation of the Intermediate River above the Bellaire Dam.
- The elevation of the 100-year flood plain on Intermediate Lake is 609.1 feet above sea level (about 2 feet above summer level). The highest recorded level on Intermediate Lake occurred in 1963 and it rose to 609.55-5 inches above the 100-year flood plain.
- In the period of 2013 to present (the last five years), the lake level of Intermediate Lake has exceeded 608.5 feet above sea level during five different flooding events. In November of 2013, the lake elevation reached 608.82, and the following spring reached 608.9 on April 17, 2014—just a couple inches shy of the 100-year flood plain. In the fall of 2014 and again in the fall of 2017, the level reached over 608.5. Just this last spring, Intermediate Lake reached above 608.7 on May 6th, 2018. During all these events, flooding was widespread in the Antrim Chain of Lakes and the Northwest Michigan region.
- The widespread flooding of recent years in Northwest Michigan is due to an increase in extreme rainfall events. According to the National Climate Assessment (NCA), the

amount of rain falling in heavy downpours—rainstorms at the top 1 percent of intensity—has increased by 37 percent in the Midwest region. (A 1 percent rainstorm is roughly the amount of rain that would cause a 100-year flood—about 5-6 inches of rain in a 24 hour period for our region, and somewhat less for certain lakes in the Antrim Chain.) The NCA study is based on data from the period of 1958-2012, but the majority of the increase has happened since 1991. Note that our flooding patterns in the Antrim Chain are increasing in frequency since 2012 (after the data period in the NCA study), so the increase in heavy downpours appears to be escalating. Our local climate is changing.

- Clearly, the historical data suggests that the current 100-year floodplain may have to be revised. In the meantime, common sense applies. The Operator of Dams recommends that, if possible, homeowners should site the elevation of any new building well above the 100-year floodplain—even as much as an entire foot or two above the 100-year floodplain.
- If a landowner chooses to build a structure within a 100-year floodplain, special requirements will apply. The Antrim County Building Department enforces the requirements through the permitting process, and homeowners who follow the special guidelines for flood resilience encounter the least damage from flooding events.
- Below is a list of 100-year flood plain elevations for the Antrim Chain as determined by the Michigan Department of Environmental Quality (MDEQ):

Scotts Lake	624
Six Mile Lake	612
St. Clair Lake	612
Ellsworth Lake	611.0
Wilson Lake	611.0
Benway Lake.....	610.4
Hanley Lake	609.7
Intermediate Lake.....	609.1
Lake Bellaire	593.0
Clam Lake	591.5
Torch Lake	590.6
Lake Skegemog.....	589.88
Elk Lake	589.88
Lake Michigan	584.6

Note that this list is a simple way to determine the relative elevations of the lakes in the Antrim Chain. For instance, Six Mile Lake is approximately 3 feet higher in elevation than Intermediate Lake. So, a few inches of additional water in Intermediate Lake has minimal effect on Six Mile Lake.

- Fluctuating water levels are a natural part of the Antrim Chain of Lakes ecosystem and the remaining natural shoreline of Intermediate Lake is the only type of shoreline that

showed virtually no damage as a result of flooding events. This is true for all the lakes of the Antrim Chain. Lake shorelines are, by definition, one of the most dynamic ecosystems in nature. When humans alter the natural shoreline by building structures, removing natural vegetation, or altering the earthen configuration of the shoreline, they do so at their own peril. Structures which are built or installed adjacent to the shore of the lake, or within the 100-year floodplain, such as docks, decks, seawalls, lawns, landscaping, etc., are, by definition, temporary—the dynamic forces of the shoreline will eventually damage and break them down. We shouldn't expect anything different.

- Based on field observations and consultation with engineers at the DEQ Dam Safety Division and our consulting engineer retained by the County, the Operator of Dams believes that sediment buildup in the Intermediate River partially obstructs the flow of the river and therefore reduces the capability of the river to lower Intermediate Lake. The remedy of dredging to clear the sediment is too expensive to be a cost effective solution to the problem. As a result, the Dams Department continues to explore alternatives such as the large woody debris technique currently being tested and evaluated in the Grass River.

- It is important to note that the sediment blockage is only a problem during normal water levels. When flooding occurs, the Intermediate River rises as the lake rises, and the area in the river blocked by the sediment becomes a tiny fraction of the capacity of the river's flow. So, dredging will not solve the flooding problem—we are at the mercy of the natural elements and need to design and adapt our human infrastructure to the increasing likelihood of flooding.

Prepared by Mark Stone, Antrim County Operator of Dams, September, 2018