Alverno Dam

Black Lake Water Level Issue
Public Meeting

PRESENTATION BY: BLACK RIVER LIMITED PARTNERSHIP (BRLP)

FOREST TOWNSHIP HALL - FEBRUARY 2, 2017
Introduction

Black River Limited Partnership:

• Nelson Turcotte – Managing Partner – Black River LP

• Jim Tucker – Black River LP and Tower Kleber LP Operations Manager

The purpose of this presentation is to present data and information related to the history of Black Lake and the current issue we face with high lake water levels.
Black Lake

- State of Michigan’s 9th largest inland lake
- 75% of it sits in Cheboygan County
- Primary Inflows: Upper Black River, Rainy River, Stewart Creek, Mud Creek, Stony Creek, Milligan Creek, Tomahawk Creek
- Primary Outflows: Lower Black River

https://www.watershedcouncil.org/black-lake.html
SUMMARY OF ACTIVITIES SINCE LATE FALL 2016 AND FUTURE ACTIVITIES

- Complete review of history to re-establish a knowledge base
- Collection of Historical data on Black Lake Levels (highs and lows)
- Discussion with BLA and BLPS
- Teleconference Calls with Rick S.
- Retained Porter Survey of Onaway to confirm elevations
- BLPS also retained Cheboygan surveying company to check Porter’s results
- Update letters to FERC in December and now at end of January
- In December ran Alverno down to low 609 range
- Last three weeks ran down to 609.5 and still running at that – never ran that low this long in winter and will continue into this cold weather
- Checked our instrumentation
- Submitted data to Rick S.
SUMMARY OF ACTIVITIES SINCE LATE FALL 2016 AND FUTURE ACTIVITIES

- Contacted County Engineer

- Made contact with USACOE – in Detroit

- Retrieved County Court order from 1960s

- Communications with MDNR, MDEQ and USFWS

- To purchase and mount new staff gages on two bridges and also work with surveying firm to install these and a Bench Mark

- Committed to regular submission to BLA and BLPS websites – data during transition periods – every two weeks

- Further full updates to FERC at end of March and end of July – and deciding on whether an amendment to license request will go in

- Requesting USACOE to come and check flow values at Smith Rapids during a given Lake Level elevation this spring or summer

- if submit for license amendment request will maintain communications not only with MDNR, MDEQ, USFWS but also BLA and BLPS

- Organized this public meeting with appropriate advertisements and postings
Black Lake

Surface Area: 10,143 acres
Shoreline: 19 miles
Maximum Depth: 50 feet

http://www.sturgeonfortomorrow.org/img/black-lake.jpg

http://www.fishweb.com/maps/cheboygan/blacklake/blacklake.html
• Smith’s Rapids is pictured above as the discharge outlet of Black Lake (yellow arrow)
• The Alverno dam is pictured downstream of the rapids (blue arrow)
Alverno Dam – location of staff gage

On February 2, 2017 – was just above 609.5
Alverno Powerhouse – from Downstream
Smith’s Rapids

- Black River outlet channel
- Located between Black Lake and the Alverno impoundment
- Smith’s Rapids is a natural constriction in the river which acts as a sill or dam and holds water back until the rise in water levels of Black Lake forces larger discharges downstream
- Discharge Capacity of Smith’s Rapids is linked to the level of Black Lake (see below)
- Smith’s Rapids is in control of the level of Black Lake during drawdown and high flow periods

<table>
<thead>
<tr>
<th>LAKE LEVEL</th>
<th>DISCHARGE CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>611.00 M.S.L.</td>
<td>325 CFS</td>
</tr>
<tr>
<td>611.80</td>
<td>450</td>
</tr>
<tr>
<td>612.00</td>
<td>700</td>
</tr>
<tr>
<td>612.20</td>
<td>800</td>
</tr>
<tr>
<td>613.00</td>
<td>1400</td>
</tr>
</tbody>
</table>
Alverno

Smith’s Rapids

Black Lake
According to the report by the U.S. Army Corps of Engineers, the river bottom of Smith’s Rapids is at Elevation 608 feet, approx.

• The channel width varies from 80-100 feet

• The original license application, from 1999, suggests that discharge through the rapids is not dependent upon the level of the impoundment
Tower and Kleber Hydro Dams

- Two hydro dams upstream of Black Lake on the upper Black River
- They are situated on the largest inflow to Black Lake (i.e. the Upper Black River)
- Tower – 29.3ft high concrete dam and 102 acre reservoir
- Kleber – 40ft high earth dam and 295 acre reservoir just downstream of Tower
- These plants do not provide and meaningful control with regards to the drawdown of Black Lake – and noted by USACOE in their 1965 report
Alverno Dam and Black Lake

Black River LP is required by our License and Order Modifying and Approving Gaging and Flow Compliance Plan (2003) to maintain Black Lake at a target elevation of:

- 610.2 feet from December 1\textsuperscript{st} to April 15\textsuperscript{th}
- 612.2 feet from May 15\textsuperscript{th} to October 31\textsuperscript{st}

Note the 1965 Court Order has a winter elevation of 610.5

April 16\textsuperscript{th} to May 14\textsuperscript{th} and November 1\textsuperscript{st} to November 30\textsuperscript{th} are transition periods

November is the fall drawdown period – it is during these 30 days that we have been required to draw the lake down from summer to winter levels
Operation of Alverno Dam

- During the **summer**, with higher lake levels and low basin inflows, the operation of the Alverno dam closely functions as a run-of-the river project required to maintain a set level in Black Lake.

- Because the lake and dam impoundment are at similar elevations, the rapids and river system is essentially flooded out and the dam has control of the lake in all but extreme rainfall events in the summer.

- During hot, dry summer months, the evaporation from the large lake surface can be extensive.

- The inflow to the dam can be minimal and the generating units will be shut down only passing a minimum flow to keep the lake elevation up.
Operation of Alverno Dam

- The dam has a limited influence on the lake during the winter because of the low water level in the rapids and river. Winter level is greatly influenced by temperature and precipitation.
- The transition period (April 15 – May 15) is also affected by temperature, precipitation and snowmelt.
- Late spring snowstorms that melt quickly can have a big impact on lake levels. Many years the lake is above summer target level during this transition time and summer level comes when the inflow slows and the lake drains down to the summer level.
• Although the Alverno Dam cannot fully achieve the control results envisioned in the 1964 Circuit Court Order, the dam does provide some benefit to getting there – note the context to which the County Judge issued the Order (i.e. dredging of channel)

• Without the dam, the lake would cycle through levels each year that are much more extreme. In an attempt to tighten and improve the operating procedure to meet the court order conditions the following operating procedures were proposed in the Licensing Conditions
Court Order

• Start lowering the dam impoundment November 1, to an elevation of 610.5 by November 20th (changed to 610.2 in 2003)

• When Black Lake drops to elevation 611.3, drop the impoundment level to 610.4 (WHAT IS THIS)

• Maintain the 610.40 level in the impoundment until spring runoff has passed.

• When Black Lake spring time elevation drops or is evident it has peaked below 613.00, the impoundment level will be raised to 611.00

• When Black Lake elevation drops to 612.5 the impoundment elevation level will be raised to 611.50

• When Black Lake elevation drops to summer level 612.2 the impoundment will be adjusted as necessary to maintain the level.

• It must be recognized due to the size of Black Lake, its large drainage basin, and the river and rapids leading to the dam, the above stated elevations cannot be maintained as absolute values given. They should only be considered as target elevations to be maintained as close as possible.
Concerns

We along with the FERC and MDNR have been receiving complaints regarding the lake level and river level as noted below:

<table>
<thead>
<tr>
<th>BLACK LAKE</th>
<th>BLACK RIVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lake levels too high in spring for the last few years</td>
<td>Water has been too low between Black Lake and Alverno dam</td>
</tr>
<tr>
<td>• Lake level too high in the summer</td>
<td>Residents not able to get boats in the water</td>
</tr>
<tr>
<td>• Drawdown period unsuccessful and high levels in the winter</td>
<td>Lowering the river too soon in the fall</td>
</tr>
<tr>
<td>• Significant damage to property</td>
<td></td>
</tr>
<tr>
<td>• Flooding, erosion, loss of beach area</td>
<td></td>
</tr>
</tbody>
</table>
The Issue with Black Lake

• High water levels, flooding, erosion + property damage

• Smith’s Rapids is the outlet channel that discharges water from Black Lake, and it only has a certain capacity based on level of Black Lake

• This issue has been going on for almost a century – there are documents from the 1960’s and beyond that discuss high levels at Black Lake, the outlet channel Smith’s Rapids, and how precipitation and temperature, as well as other factors affect lake levels.

• Wind may have a significant effect on lake level at certain locations and resulting damage and this is but one more variable affecting the issue – further ice formation can hurt
INFLOWS

Precipitation and meltwater are major contributors to rising levels of Black Lake.

Meltwater contributes to high spring levels which can result in flooding and damage.

High precipitation, along with limited discharge capacity of rapids caused lake to rise.

Other inflows such as rivers, creeks, groundwater, and runoff contribute to the lake level.

When the total inflow is greater than Smith’s Rapids discharge capacity, the lake will rise regardless of what happens at Alverno dam.
If winter is warmer, precipitation is not stored as snow or ice and contributes directly to lake level.

Warm winter means snow melts and passes through gradually, keeping lake level higher but less of a spring melt.

If winter is cold, all precipitation is stored as snow and melts abruptly in the spring, causing high levels and flooding.
Alverno Dam and Black Lake

• The drawdown period is often unsuccessful because of Smith’s Rapids and other environmental factors

• We have no control over inflows (precipitation, melt, rivers, etc.), nor can we control outflow via Smith’s Rapids

• It has been suggested that the only way to have control over Black Lake is to dredge rapids and eliminate them (U.S. Army Corps of Engineers)

• We have been conducting tests at the Alverno dam and calculations in order see if there is anything else we can do to help
Time Calculations to lower Black Lake 1 foot
(assuming no inflow and an outflow of 500cfs)

1 acre foot = 43,560 ft³ = 325,851 gallons

10,000 acre foot = 435,600,000 ft³ = 3,258,510,000 gallons

500cfs outflow = 225,000 gallons per min

3,258,510,000 gallons \( \div \) 225,000 = 14,482 minutes

14,482 minutes \( \div \) 60 = 241.37 hours

241.37 hours \( \div \) 24 = 10.06 days

*** Assuming NO INFLOW which is NEVER the case ***
Dam and Powerhouse Example

- Dam
- Reservoir
- Control Gate
- Trashracks
- Intake
- Penstock
- Generator
- Turbine
- Powerhouse
- Transmission Line
- Switchyard
- Transformers
- Tailrace
Reading the Charts

612.0
611.0
610.0  610.25  Winter target level
609.0
609.0

Blade River Monitor
Add 609.0
Reading the Charts
Historical Water Level Data
Historical Water Level Data

The charts illustrate the water level data for Black Lake over the years 1978 to 1983. The data includes actual lake levels and desired lake levels, along with average temperatures and precipitation. The charts highlight the fluctuations in water levels and the impact of temperature and precipitation on the lake levels.

Temperature and precipitation data is sourced from the National Weather Service, No. 6438, Pellston FFA.
**Historical Water Level Highs**

<table>
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<th>LAKE LEVEL</th>
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<tr>
<td>615.01</td>
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<tr>
<td>614.48</td>
<td>4-20-71</td>
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<tr>
<td>614.36</td>
<td>4-12-67</td>
</tr>
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<td>614.08</td>
<td>4-9-76</td>
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<tr>
<td>614.00</td>
<td>4-24-72</td>
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<tr>
<td>613.94</td>
<td>5-13-60</td>
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<td>613.70</td>
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Alverno Dam and Black Lake

• The original license application (1999) included much information on the issue with Smith’s Rapids and high levels

• Given all the historical studies, data and information, the license application was approved by FERC shortly after the application for license was submitted

• The license was approved under the conditions presented, including the very limited capacity of the Alverno dam to control the levels of Black Lake despite having a court order to maintain 612.2ft in the summer and 610.5ft in the winter

• The Order Modifying and Approving Gaging and Flow Compliance Plan (2003) changed the target winter level from 610.5ft to 610.2ft
A study conducted in 1986 (by H.S. Stanteford, Ph.D and G.R. Alger Ph.D) concluded that:

“even with a low winter level for the lake, it is the inability of the existing outflow river system to pass large flows at moderate lake elevations which has the more significant influence on resulting lake levels. With regard to all evidence we have considered, we feel effective management of Black Lake levels can only be accomplished with outflow channel capacity improvements.”
USACOE Study

• A comprehensive study and flood report completed in 1965 by the U.S. Army Corps of Engineers
• They strongly suggested channel improvement (at Smith’s Rapids) as the only real solution to increase the dam’s regulatory ability
• The considered improvements would have taken the rapids’ discharge capacity from **800cfs** to **1,650cfs** while Black Lake at **612.2ft**
USACOE Study

- The proposed project included 1.2 miles of improved channel
- COSTS BELOW IN 1965 DOLLARS
- Cost of detailed project study = $38,500
- Total cost of project = $364,000 ($322,000 federal costs, $42,000 local land costs)
- Costs included clearing, excavation, structures, engineering and design, supervision and inspection, and necessary upgrades to Alverno dam, etc.
USACOE Study

- Beach erosion starts at 612.5ft (target summer lake level is 612.2ft)
- Significant damage to property occurs at 613.5ft
- The considered 100ft wide channel would provide relief from lake flooding (1.2 miles long)
- The frequency of lake levels exceeding 612.2ft would be reduced from 1 per year to 1 every 3 years
- The level of 613.5ft (level of potentially serious damage) would be reached 1 in 11 years compared to 1 in 3 years with the existing channel
USACOE Study

- Impounding water at the Tower and Kleber dams upstream was considered

- The USACOE concluded that the two dams on the Upper Black River have little influence on the storage characteristics of Black Lake:
  
  “There are no suitable reservoir sites upstream of Black Lake which are large enough to have a significant flood reducing effect on Black Lake. The almost negligible effect that the Tower and Kleber dams have attest to this. The damage area is too expansive to consider levees. Improvement of the existing channel was the only recourse to alleviate floods in the Black Lake area.”
• Study concluded:

• The plan of improvement considered the most suitable consists of improving the Black River through the rapids area

• The proposed plan was justified at the time (1965) as the estimated annual benefits would have exceed annual charges.

• The proposed improvements would greatly reduce the reoccurrence of high lake levels causing damage to property (in 1965 - there has since been more development on the floodplain)
USACOE Study

- A public meeting was held on June 7, 1965 to outline the results of the study to all interested parties.

- Attendees included County board members, Michigan Water Resources Commission, Michigan Department of Conservation, Consumers Power Company (owner of Alverno dam at the time), Black Lake Association, County prosecutors, and others.

- No objections were voiced during the meeting, project was considered generally acceptable.
USACOE Study

• The Black Lake Association strongly urged the removal of the rapids, however no determination was made on who would be responsible for the costs

• The plan was abandoned in 1966

• A newspaper article from November 11, 1966 titled “Black Lake Level Special Assessment Plan is abandoned” stated:
  • “The federal government would have dredged out the Smith’s Rapids in the Black River so that the spring runoff would be speeded at flood time from Black Lake. The Black Lake Association opposed it because the cost to taxpayers would outweigh the advantages of the project.” At the time, the project would have costed the Federal Government over $300,000 and proposed local expenses of over $40,000. Many were worried about the cost to repair the Alverno dam, which would be included in the special assessment.
Rise in Lake Level

• The rate of rise on the lake can be very fast in the spring
• If the lake hits the target winter level, this is still no guarantee you will not see high water levels in spring or summer
• Once there is high inflow into the lake, lake levels are difficult to maintain
Recent Data

- The drawdown period this winter (November 1 – 30, 2016) was unsuccessful at reaching the target winter level of 610.2 feet

- The lowest we have reached this winter has been 610.85ft at the marina gage

- So far all of our recent experimental test at the Alverno impoundment, (such as holding levels lower than the normal target of 610.20) have not showed a significant impact, if any, and appears to follow what the historical data and studies from the ACOE and others tells us that the dam has little direct influence on the lake level in the winter
Recent Efforts to Maintain Black Lake Level

- Black River Hydro LP has been in close communication with representatives of the public, Black Lake Preservation Society, Black Lake Association and the Michigan DNR regarding this issue

- We have been conducting various trials and experiments to see what sort of affect they would have on the lake level
The Alverno dam provides necessary control of Black Lake in the summer months of drought (evaporation can reach 1 inch per day).

During dry summers the turbines do not run at all in order to hold back water and maintain the level of Black Lake.

If the dam were removed, the lake would lower 4-5 feet (Michigan Department of Conservation, 1967).

The shoreline would shrink considerably inward, exposing almost two thousand acres of shoal water area.

One third of the fish productive areas would be destroyed and spawning grounds virtually eliminated.

River flows and levels altered, along with other environmental consequences.
Future Actions

• This issue has remained constant for almost a century, despite efforts at the Alverno dam by previous owners – but really noticeable since cottage and home development in the 1930’s and 40’s

• We have been and will continue to diligently monitor levels

• We are open to contributing funds to purchase and install new gages for Black Lake so the public may be aware of water levels and will be surveying in and installing new staff gages at two bridges

• We are maintaining close contact with the Federal Energy Regulatory Commission (FERC), providing them with updates on the issue. We have just submitted an update and will do so again at the end of March and July

• We understand the severity of the damaged caused by high levels (flooding and erosion) and commit to being available to educate the public on this issue
Follow-up

• BRLP understands with the number of residents on the lake and on the river that they may not be able to answer each individual’s questions and notify each individual of operational and maintenance changes in a timely manner.

• During Transition periods we will send to the BLA and BLPS – spreadsheets of data, every two weeks for posting on their websites.

• There are two groups that can and do represent interests at the lake, the Black Lake Association and the Black Lake Preservation Society.
Follow-up

• We have been working with the BLA and BLPS and will continue to work with them more as an efficient effective way to inform of any events going on at the dam locations.

• We urge you to use their websites and information meetings to help improve the lake and voice your suggestions, opinions and concerns.

• We urge people not to take the word of mouth as fact until you have checked out these websites and verified the facts

• If there is information you would like – we can make it available through the BLA and BLPS websites

• Annual newsletter with an update on the issue to be available every year at end December
Thank You!