Experiment with Carlson Road Dam on Little Round Lake

Final Report

June 17, 2013

I. Executive Summary

The data collected during the experiment supports SEH's assertion that the dam at Carson Road is inconsequential as long as the primary beaver dam in Osprey Creek between Osprey Lake and Highway NN remains intact at its current elevation. As long as conditions within the watershed remain unchanged, replacing the structure at Carlson Road with a simple box culvert set at stream bed level as proposed by Sawyer County would have no effect on water levels in Round, Little Round, and/or Osprey Lake.

However, the conditions within the watershed that impact water levels are not static. They are subject to various forces of nature including, but not limited to, changes in beaver activity, flooding, drought, and changes in vegetation, any of which have the potential to significantly alter the way in which water flows into and out of the watershed and the resultant water levels in the lakes.

Should changes in beaver activity result in increasing the elevation of the current primary beaver dam or in the creation of new beaver dams with elevations higher than the current primary beaver dam, water levels could see a significant increase. If this were to happen, the lakes could be at risk of serious damage due to erosion and flooding.

Conversely, if a significant rain event were to wash out the beaver dams and other obstructions within the system, with only a simple box culvert at Carlson Road as proposed by Sawyer County, the average level of Round and Little Round Lakes would drop over a foot. Osprey Lake would drop even further. Such a situation would have a negative impact on lake access at current public landings, make navigation on the lakes problematic and would likely have a negative impact on the ecosystem and increase the spread of invasive species of aquatic vegetation.

Therefore, to ensure the long term health of the lakes and to protect the interests of the public as well as riparian owners on the watershed, The Round Lake Property Owners Association recommends the following steps be taken:

1. That either Sawyer County or the DNR be charged with the responsibility to monitor conditions on the watershed that impact water levels and take appropriate action should conditions warrant.
2. That Sawyer County maintain the Dam Permit for the Carlson Road structure and design the new structure to be convertible from a simple box culvert as

currently proposed to a dam with a v-notch weir similar the one used in the experiment. The conversion from a simple box culvert to a dam would be required when and only if conditions within the watershed changed such that a low water control at Carlson Road would be beneficial.

3. That the 1941 PSC Order be changed to reflect the fact that it is not possible to manage the water level in Round Lake and Little Round Lake as specified. This would alleviate Sawyer County's concern regarding potential liability related to the 1941 Order as it is currently written.

The Round Lake Property Owners Association stands ready to help with the development and implementation of specific plans to support the above steps.

II. Summary of Data Collection and Results

The experiment conducted during the 2012 open water season on the Round Lake Watershed met the project objectives of providing real world data to test the conclusions drawn by SEH after completing their analysis of the Carlson Road Dam. SEH's conclusions and recommendations were published in a report dated December 27, 2010 (Appendix 3).

March 23 – May 27 Experimental Weir Installed In The Dam

We were very fortunate to begin the open water season with the water level at about the "normal" level specified by the 1941 PSC Order. The experimental weir was installed in the dam within a couple of days of ice out on March 23 with the water level at approximately 1345.0 NAVD 88. Above average rainfall early in the season resulted in the water level rising to a level significantly above the 1941 Order specified maximum of 1345.33' NAVD 88 by the end of May, allowing us to collect important data relating to the effectiveness of the passive structure in influencing the water level in Round, Little Round and Osprey Lakes during a period of significant rainfall.

As predicted by the engineering analysis, during this period, the experimental weir had no influence on the water level in the three lakes. The water level stayed essentially the same in all three lakes as it rose from 1344.99 to 1345.47. There was very little flow through the v-notch as the water level rose (estimated at 2-4 cfs), and at no time was there any measurable difference in the water level from the upstream side to the downstream side of the dam as would be expected if the dam were working as it was intended by the 1941 Order.

May 27- August 26 Experimental Weir Removed From The Dam

Because of concerns that the experimental weir may be preventing water from evacuating Round and Little Round Lakes at as high a rate as the Carlson Road structure and the associated channel to Osprey Lake would allow, Sawyer County

ordered the experimental weir to be removed on May 27 to minimize their liability related to controlling the water level per the 1941 Order specifications. The County further mandated that the dam remain fully open until the water level on Round Lake receded to a level below the 1941 Order maximum.

The removal of the weir allowed us to witness the impact of opening the dam when the water level was above the 1941 order maximum. What we learned further supported the engineering analysis that the dam is inconsequential. As the weir was removed, fully opening the dam, there was no discernible change in the flow of water through the structure, validating the assumption that obstructions in Osprey Creek downstream of Osprey lake are in fact the low water control for the watershed at all levels below 1345.30 NAVD 88 (the lowest point on the primary beaver dam in Osprey Creek between Osprey lake and Highway NN), rendering the dam inconsequential.

The period from May 27 to June 21 saw continued above average rainfall resulting in water levels rising to the high point for the season on June 21 of 1345.76, a little over 5 inches above the 1941 Order specified maximum of 1345.33. Even at this high water level, flow through the dam was estimated to be only 6 cfs and there was no discernible flow through the culverts at Highway NN.

The 1941 Order prescribed a system that was expected to evacuate water from Round and Little Round Lakes at a rate of up to 150 cfs when water the water level exceeded the specified Maximum of 1345.33.

The period from June 21 through August 26 saw below average rainfall. During this period, the water level in all three lakes receded at the same rate, and the water level remained essentially the same from lake to lake.

There are several variables that affect the rate at which the lakes recede during times when there is no precipitation. Temperature, sunlight, humidity, wind, barometric pressure, water level and the rate of outflow all play a role. We did not monitor all these variables. However, the fact that the rate of recession during short periods of no precipitation did not follow a consistently smooth pattern is not surprising because of the multiplicity of the influencing factors. However, it is interesting to note that the daily drop in water level during these times ranged from .12” to .24” with an average of .17”. Given that the maximum rate of outflow observed at the dam during these times of approximately 6 cfs equates to a drop in water level of .04 inches per day, evaporation is the primary contributor of the lowering of the water level, accounting for more than 75% of the average daily drop.

August 26 – November 22 Experimental Weir Installed In The Dam

The experimental weir was reinstalled in the dam on August 26 with the water level in all three lakes at 1345.23. The remainder of the open water season saw rainfall

below average. All three lakes remained at essentially the same level from lake to lake, with the level receding to 1344.76 on November 22 just before ice-up.

III. Conclusions, Comments and Recommendations

The results of the experiment supports SEH's engineering analysis that the dam at Carlson Road is inconsequential under the present conditions within the Round Lake Watershed. The primary beaver dam in Osprey Creek approximately 300 feet upstream from County Highway NN was surveyed to have a minimum elevation of 1345.30 NAVD, approximately the same as the maximum water level specified by the 1941 PSC Order. This beaver dam has therefore become the low water control for Round, Little Round, and Osprey Lakes.

During periods of average precipitation patterns, the water level in all three lakes can logically expected to be the same from lake to lake and to equilibrate around the minimum elevation of the beaver dam (1345.30 NAVD 88) with variation reflecting the day to day differences in sunlight, temperature, wind, humidity, barometric pressure and precipitation.

During extended periods of low precipitation or drought, water levels can be expected to drop significantly below the 1941 PSC Order specified "normal" (1345.00 NAVD 88), as there are no tributaries feeding the watershed. The low water levels experienced in 2010 could happen again, and in fact, could be even lower in the event of a more severe drought. The Placid Lake Diversion channel was created in the late 1930's in an attempt to address this issue, but the channel was never really used for its intended purpose and was closed in 2011.

During extended periods of high precipitation, water levels can be expected to rise significantly above the 1941 PSC Ordered "maximum". There is almost no flow out of the system until the water level exceeds the minimum height of the primary beaver dam (1345.30 NAVD 88). Even at levels above this, the heavy vegetation in Osprey Creek creates significant obstruction to flow as illustrated by data collected up to the maximum water level of 1345.74 seen during the project. At water levels above this, there is risk of flooding and damage to the shoreline and the lakes' eco system. Because we did not see a major rain event when water levels were at their maximum, we don't know for sure what will happen. Therefore, it is recommended that further study and analysis be undertaken by Sawyer County and/or The Wisconsin DNR to better assess the risk and to develop strategies to minimize it.

It should be noted that throughout the course of the experiment, representatives from Sawyer County, SEH, Osprey Lake Property Owners Association, and Round Lake Property Owners Association visited the primary beaver dam in Osprey Creek. While it is generally understood and accepted that this structure has been in place for many years (It was photographed 10 years ago), all who have been there agree that, as a natural structure, it may change significantly over time. If it were to get larger and higher, the risk of high water damage would increase. If the beaver dam

were to erode or wash out, without another reliable low water control such as the experimental weir at the Carlson Road dam, the average water level could potentially be lowered in all three lakes, as over time, the water level will equilibrate around the elevation of whatever low water control is in place.

It is also generally understood and accepted by representatives of Sawyer County, SEH, the DNR, Osprey Lake Property Owners Association, and Round Lake Property Owners Association that the system specified by the 1941 PSC Order has seen significant change and degradation over the past 72 years. The silting in of the channel connecting the dam to Osprey Lake, prolific vegetation growth in both the channel and in Osprey Creek, and of course the unmanaged expansion of beaver dams have resulted in a system that is incapable of evacuating water as was intended during periods of above normal precipitation. It is recommended that government agencies with jurisdiction over the Round Lake Watershed area develop a plan to maintain the system in accordance with the intent of the 1941 PSC Order to minimize the risk for damage due to flooding and erosion.

IV. Other Key Outcomes

1. Common Benchmarks and Data Conversion

   There has been a long history of disagreement over the elevation of key benchmarks around the watershed and the conversion of local datum to NAVD 88. This has exacerbated the conflict related to management of the water level on the lakes. As a result of the survey work that was part of this project, we now have agreement among all constituents on the elevation of the benchmarks and key geographical features throughout the watershed as well as a conversion factor for local datum to NAVD 88. They are shown in Table 1.

2. Identification of New Obstructions in Osprey Creek

   Because we had a situation where the water level exceeded the minimum elevation of the primary beaver dam in Osprey Creek, we were able to document that once water topped the beaver dam and began to flow down Osprey Creek toward Lake Courte Oreilles, it backed up downstream of highway NN such that the culverts under the highway were filled to within about a foot of the top with no flow. This indicates that there are obstructions in Osprey Creek downstream of Highway NN. These obstructions significantly reduce the culverts ability to efficiently evacuate water from the upstream lakes should we ever be in a dangerous high water situation. It is recommended that this issue be investigated by the agencies of government that have jurisdiction for this area of Osprey Creek and that appropriate steps be taken to minimize the risk of damage due to flooding and erosion.