Big Pine Lake Outlet Project

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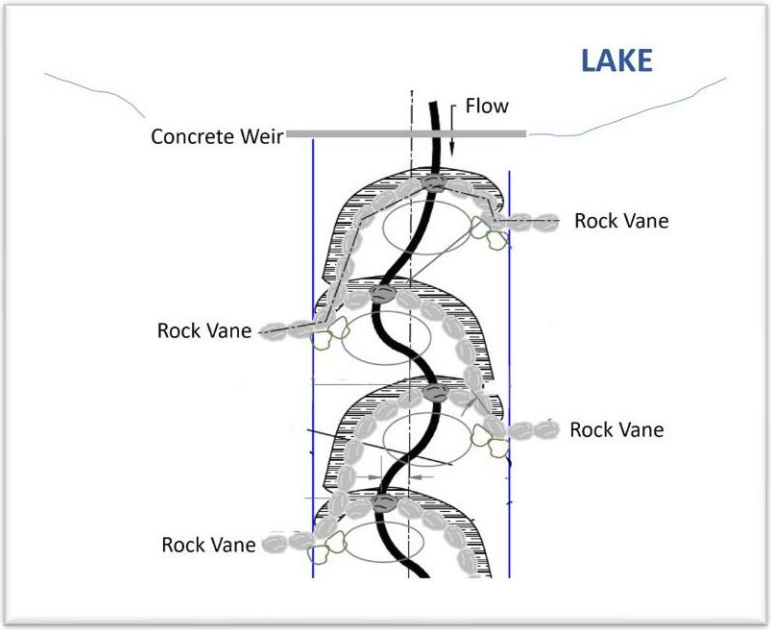
Big Pine Lake outlet structure is a 7-foot wide, 2.2-foot tall, fixed crest concrete weir that is set at a specific elevation that controls the draining of the lake into a small river that leads to Round Lake. The concrete has weathered and is showing signs of deterioration, including exposed rebar and a small leak at the edge of the structure. The structure is in need of repair and is a fish passage barrier.

One proposed project to address the deteriorating structure is to construct a small rock arch rapids at this location. The structure would include 5 separate rock vanes that would span the width of the stream. These vanes would be built directly below the current concrete weir that would remain in place to ensure proper lake elevation. Each vane would be set ½ foot in elevation lower than the previous, and set several feet apart from each other. The gentle slope down through the vanes would allow for fish to swim up into Big Pine Lake from the downstream river and lake. The rock arch rapids would be 35 feet in length and span the width of the channel that exists below the outlet. Examples of similar rock arch rapids, only larger, are included on the back of this page.

Rock arch rapids have many ecological and maintenance benefits. The rocks used in the rapids are sized to be far to large for the stream to ever move them, the rocks do not deteriorate like concrete does, and the gentle slope of the rapids allows for fish passage in and out of the water bodies on either side. This means less maintenance, less concern for future repair and replacement, and an ecologically friendly approach to removing a fish passage barrier.

Funding for this proposal would include the Aitkin County Soil and Water Conservation District applying for grant funding that would pay for up to 90% of project materials and construction costs. This funding option requires a 10% match, meaning the lake association would only have to pay for approximately 10% of the project. Currently engineering costs for the project are being covered and project estimates are roughly $35,000 in total.

Lake elevations would not change due to the rock arch rapids, the structure would not let water out faster or slower than it does now. Carp are already in Big Pine Lake, and below in Round Lake, and installing this rock arch rapids would not increase the risk for other invasive species in the area.



View of proposed structure from overhead.

Rock Arch Rapids similar to the proposal – proposal will be smaller in scale than each above.

Questions and Answers Concerning the Proposed Big Pine Lake Outlet Replacement Structure

QUESTION: Have these structures been installed on other streams of similar size and how successful have they been?

ANSWER: Over 70 similar structures of all sizes have been installed across Minnesota in the last 20+ years. No structure installed has ever had a major or catastrophic failure and many times ecological goals have been successful in addition to the structural goals.

QUESTION: What is the timeline for the new outlet control structure to be installed?

ANSWER: Construction of the rock arch rapids project should be complete by the end of 2025. The timeline must account for the grant application, scoring, and contract periods, public waters permitting process, fisheries construction exclusion dates, and contractor bidding and construction phases.

QUESTION: What species of fish will most benefit from the installation of this new structure?

ANSWER: White Suckers and Spot-tail Shiners are likely to benefit the most. Northern Pike and Walleyes may use it as well as many other species that are drawn to the current at one time or another during the year.

QUESTION: There is an electric fish barrier just east of Borden lake in Crow Wing County and a large beaver dam just southwest of Big Pine Lake's outlet structure. How does this proposed structure increase fish passage with those other 'blockages' in-place downstream?

ANSWER: The proposed structure would allow movement between Round and Big Pine, independent of the fish barrier. The beaver dam is not permanent and in highwater scenarios is regularly breached. It could also be removed or notched during important time periods.

QUESTION: How will fish navigate through the proposed rock-weirs upstream?

ANSWER: Most fish species native to Minnesota do not have the ability to jump over obstacles so fish must use their burst swimming ability to traverse over each rock weir. Rock weirs are spaced apart from each other in order to provide fish pools to rest in allowing them time to recover before swimming up and over the next weir. This is also why it is important that each rock weir is set within ½ foot in elevation from each other.

QUESTION: Will the new structure change how quickly water is retained or released after rain events from Big Pine Lake (i.e. affect surface water lake elevations)?

ANSWER: No, it will not. As part of the design phase, detailed modeling is performed using known site-specific information to determine if the existing vs. proposed structure will change the outlet's hydraulic capacity, volumetric flow rate, and lake surface water elevations. In short, the proposed structure will decrease water movement velocities and may increase the hydraulic capacity to allow for increased fish passage and decreases in blockages at the mouth, but it will not result in a change to surface water elevations because of the new structure.

QUESTION: If requested, could the new outlet control structure's elevation be raised, lowered, or allowed to have stop-logs to actively manage water levels on Big Pine Lake?

ANSWER: In short, no – nor is this something the MN DNR would support. Raising the height of the outlet structure may raise Big Pine Lake's regulatory 100-year floodplain elevation. Structures and septic systems are required to be set back a certain distance from the OHW and the 100-year floodplain elevation to protect both the natural functions of the lake and guard against potential flooding of structures from high water events. There are likely

homes surrounding both lakes at the 100-year floodplain elevation. If raising the lake's water level puts additional structures within the 100-year floodplain boundary, those damages would need to be mitigated for through relocation, demolition, or elevation of the structures. Changing the outlet height is not a quick or easy process. The lake's current outlet elevation has been established for some time and is the basis for the natural ecology of the area and how it responds to rain events in a predictable manor.

QUESTION: Once installed, who (or what entity) is responsible for the work and money to maintain the structure in perpetuity?

ANSWER: Minnesota law requires that a responsible party be identified for the permit to be approved. This is typically in the form of a government unit (GU) – i.e., the Soil and Water Conservation District, a county, a township, etc. – or the property owner for which the structure is located. The reason for this is to ensure that if issues come up, they are addressed by the appropriate entity in charge of maintaining the structure. This would be the case for both maintaining the current structure as well as the proposed rock-weir structure.

QUESTION: The grant will pay 90% of the costs of the proposed structure. Who will pay the remaining 10% of the structure?

ANSWER: The 10% remaining costs will be coming from the Lake Association.

QUESTION: Taking grants into account, will the cost to maintain the current structure be less than *constructing the new fish passage structure?*

ANSWER: We estimate that the proposed rock weir structure will cost roughly $35,000 to construct. The grant, if successful, will pay 90% of the costs, which means that the remaining 10% amounts to apx. $3,500.00. We estimate that if the current structure is repaired and/or replaced with the same similar design, it may cost about the same as the 10% match amount, but will result in fish passage blockage, likely more maintenance issues, and may receive more blockage. Additionally, no engineering and design work would be supplied in-kind by Minnesota DNR and other agency partners.

QUESTION: Will the proposed new structure involve more maintenance vs the current in-place structure?

ANSWER: Since MN DNR began removing dams and fixed-crest structures on rivers and converting them to rock-weir structures over 20 years ago, we have seen very few maintenance issues on these types of structures. This is likely due to the fact that very large boulders are used that are deeply footed into the stream bottom and then stabilized using a variety of techniques. They are more or less flood proof and have no moving parts other than the flow of water over them. The current structure may be subject to cracking and deterioration because it may be constructed of concrete, which can be brittle.

For additional questions regarding the structure itself or the regulation of structures in public waters, please contact:

- Jake Frie, MN DNR Area Hydrologist – 218-203-4367 or Jacob.frie@state.mn.us.

For additional questions about how this project will benefit fish, please contact:

- Brady Swanson, MN DNR Natural Resources Specialist – 218-203-4301 or Brady.Swanson@state.mn.us
- Rick Bruesewitz, MN DNR Aitkin Area Fisheries Supervisor – 218-429-3037 or rick.bruesewitz@state.mn.us