Northwest Brook Restoration Project: In-stream Restoration Techniques

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Abstract: This paper outlines the in-stream restoration techniques used throughout Northwest Brook as part of a restoration project conducted by the Indian Bay Ecosystem Corporation (IBEC). The Northwest Brook Stream Restoration Project removed obstructions, stabilized stream banks and mitigated a culvert outfall as well as enhanced critical spawning grounds and created resting areas for salmon and trout populations in an effort to improve the longevity of the natural resources for use by future generations.

Introduction

The Indian Bay Ecosystem Corporation (IBEC) was launched as a community based initiative in 1988 in response to deteriorating natural resources and the absence of effective management practices. The creation of IBEC offered a bold new model for ensuring the conservation and enhancement of ecosystems through the use of sustainable management practices. The continued implementation of these practices are expected to improve the longevity of the Indian Bay Watershed's natural resources for use by future generations.

The Northwest Brook Stream Restoration project conducted by IBEC removed blockages, reduced erosion and installed velocity control mitigation measures along approximately 8km of Northwest Brook located in Indian Bay, NL. IBEC's team of project staff worked with board members and other volunteers to remove obstructions (i.e. beaver dams, fallen logs), stabilize stream banks and mitigate a culvert outfall as well as deepening the stream beds, enhancing critical spawning grounds and creating resting areas for salmon and trout populations. These enhancements improved fish migration and spawning throughout the length of the brook and helped restore access for salmon and trout to spawning and rearing habitat

within the headwaters of the Northwest Brook watershed – an area that has long supported salmon and trout populations.

Culvert Outfall

Passing through a culvert can be stressful for fish and this stress may be increased by a lack of resting pools, high stream velocities and the presence of an outlet drop. The two culverts present underneath Highway 320 at Northwest Book were enhanced by mitigating these three variables. The culvert outlets were higher than the water level, causing low water levels through the culverts as well as an outlet drop which reduced the ability for fish to migrate upstream. In an effort to mitigate these issues, IBEC installed a low head weir downstream of the culverts to create a wetted lip, which deepened the water level through the culverts and enhanced the resting pools on both sides of the culvert.

Figure 1: Low head weir located downstream of Highway 320.

The low head weir, as shown above, has a low profile design which allows for the water level to be raised through the culverts while limiting the pressure placed against the structure during high water levels which frequently occur during the spring freshet. Constructed in accordance with the drawing below, gabion baskets were used to hold rocks, stabilizing the structure and increasing its lifespan. Geotextile fabric was placed along the upstream side of the weir and along the streambed to capture suspended sediment, decreasing the permeability of the structure over time. The fabric was then covered by a rock ramp to prevent the creation of an undercut and to push ice and debris over the weir. Wooden beams were placed on the

downstream side of the gabion baskets and braced into large boulders along both stream banks to support the structure.

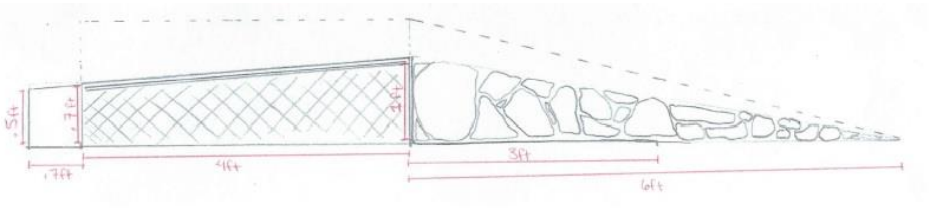

Figure 2: Cross section of low head weir

Additionally, a rock sill was placed upstream of the culvert and a portion of the right culvert was blocked. The abundance of boulders and the ability to access the structure were determining factors in building a rock sill at this location to create a resting pool for fish after migration through the culvert. The partial blocking of the right culvert was completed to redirect and deepen the water in the left culvert during low water levels.

Water Levels, Narrowing Stream Banks

Low water levels are a concern in numerous sections along Northwest Brook, this is due to several anabranches and severely eroded stream banks causing the flow of water to disperse from the main channel. Natural stream widths in numerous watersheds throughout the Bonavista North Region have been altered by events such as a great fire which removed much of the riparian vegetation and the use of logging dams which altered the water flow to move timber downstream.

In an effort to mitigate low water levels and enhance the naturalization of the stream width, IBEC installed multiple deflectors (Figures 3 & 4) to divert the flow of water into the natural channel to maintain adequate water levels for fish passage. The type of material used was determined by multiple factors including structure size, location, water level and velocity. In locations with low water levels and limited velocity, rock deflectors were used with the largest rocks being placed along the bottom upstream portion of the structure. In areas with high water velocity or high water levels, increased pressure is placed against the structure. To offset this increased pressure, timber was laid across the downstream side of the structure and braced by large boulders as well as fastened to rebar which was driven a minimum of three feet into the streambed. The deflectors consist mostly of rock with Geotextile fabric draped over the upstream side and along the streambed. This was done to decrease the permeability and catch suspended

sediment, allowing for the gaps between the rocks to be filled and the structure to become more stable over time. The Geotextile fabric was then covered by a rock ramp to prevent the formation of an undercut and allow for peak flows, ice and debris to pass over unimpeded.

Figure 3: Timber support

Figure 4: Tree deflector

Stabilize Stream Banks

To minimize erosion along Northwest Brook, stream bank stabilization measures were undertaken. Logs were laid at the determined edge of the new bank with rebar being driven into the ground on either side of the logs. The log was then fastened with wire to the rebar (in a figure 8 fashion) to prevent the buoyancy of the logs to cause displacement. The space between the logs and the old bank was then backfilled with rock and other natural materials. Rocks were also placed along the instream side of the structure to prevent an undercut from forming.

Conclusion

Ongoing monitoring of the structures installed along Northwest Brook has been carried out by IBEC staff to ensure the techniques used are working as expected. Water quality parameters have also been documented monthly to determine any changes throughout the duration of the project. To date, the structures are stable and performing as anticipated with no maintenance being required.