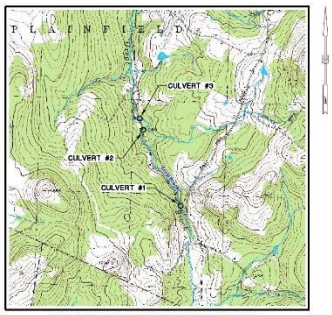
Great Brook Fish Passage Restoration Project

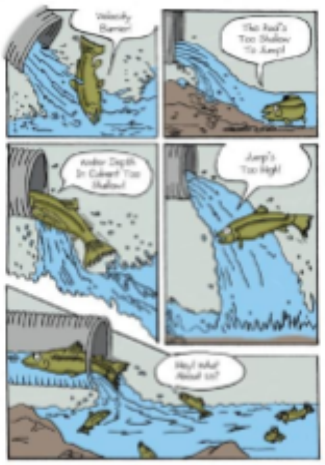
Many culverts in Vermont present a significant barrier to fish passage causing fragmented habitat and isolated populations. The Friends of the Winooski River has worked on several projects that repair, retrofit, or replace culverts to address this issue. In 2010, the Friends of the Winooski River partnered with the U.S. Fish and Wildlife Service, Vermont Department of Fish and Wildlife, Vermont River Management Program, and the Town of Plainfield to improve fish passage for native Brook trout and other aquatic species at three culverts on Great Brook. A final project report was prepared by Milone & MacBroom, Inc.



PROJECT SITE VICINITY MAP:
NOT TO SCALE

Great Brook is in the upper Winooski River watershed and originates on Signal Mountain in Groton. The stream then flows northwest to its confluence with the Winooski River in Plainfield. Great Brook features many waterfalls and boulders that fish can use for rest before or after moving through difficult areas. Great Brook passes under Brook Road in Plainfield several times. The three culverts identified as barriers to fish passage were constructed in 1929 and are maintained by the Town of Plainfield.

Free-flowing streams are valuable natural and recreational resources. Restoring stream flow protects populations of aquatic species and allows free passage of organisms in all life stages both upstream and downstream. Culverts can disrupt or block fish passage when streams flow too fast, when the water depth is too shallow, and when the culvert is perched or installed too high. Culverts can also prevent natural sediment transport, with undersized culverts commonly becoming blocked with debris.


WSDOT-Redrawn from Fish Passage Short Course, John Runyon

All three culverts along Great Brook were perched, undersized, and unpassable by aquatic species during most of the year. Each culvert had a deep depression or plunge pool on the downstream side that had gradually developed due to long-term stream incision and erosion from jetting flow. Improperly functioning culverts can prove disastrous for fish, wildlife, budgets, and public safety, especially in the event of flooding.

To improve fish passage at these culverts, the Friends of the Winooski River and partners aimed to:

1. Establish fish passage during high and low flows for adult and juvenile brook and rainbow trout
2. Maintain existing flood capacity at the culverts
3. Avoid structural changes to the culverts if possible
4. Work toward stable channel equilibrium

Local landowners were supportive of and interested in the installation of the project. Design plans were drafted for each culvert based on an analysis of alternatives and data collected in the field (e.g., water velocity, depth of flow). The Town of Plainfield preferred that the culverts remain unchanged, so some alternatives were not pursued. Types of retrofits that were ultimately

implemented included: 1) increasing the tailwater control (the depth of water downstream) by using a rock weir (a cross-section of the stream filled in with stone); 2) roughening the stream channel with random boulders downstream of the rock weir; 3) filling the existing plunge pool with stone. The rock weir was the primary method of improving fish passage by reducing the downstream drop from the culvert (outlet drop), lowering water velocity, and increasing minimum depth of flow at each culvert.

Observations from follow-up field trips in 2010 pointed to the early success of this project. Boulders and rock weirs were stable and passable through gaps in the rocks. Suitable fish passage conditions were achieved over a wide range of flows. Some fish were also observed in the culverts as well as upstream of the weirs. The culverts contained water over almost all flow conditions leading to low water velocities, suitable water depths, and no outlet drops. Before and after photos of one of the culverts demonstrate a significant improvement in river flow and in fish passage potential.

Before

After

Contact us if you own or manage land that contains a culvert, dam, or bridge that you are interested in retrofitting, repairing, or removing to improve fish passage.

Watch this video to learn more about what the State of Vermont is doing to help communities minimize flood damage by fixing culverts!