



**GROVER
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Water and Wastewater - Site Design
Stormwater Management - Environmental Consulting

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Aquatic Organism Passage Restoration Project – Friends of the Mad River

Sugarbush Resort Snowmaking Weir Retrofit for SW-2 on Chase Brook

Fayston, Vermont

Design Notes – April 2016

- The reach containing SW-2 includes three structures: an artificial boulder weir below SW-2 that has partially disintegrated, the SW-2 weir itself, and a large circular metal pipe culvert upstream of SW-2 under German Flats Road.
- Hydraulic characteristics and fish passage were evaluated using hydraulic equations including the weir equation, the continuity equation and the Bernoulli equation. The forms used were obtained from the HEC-RAS hydraulic reference manual.
- Hydraulics were evaluated for flows ranging from 7-day-duration 2-year-recurrence low flow of (0.29 cfs) to the April 2-day-duration 20%-frequency high flow (48 cfs).
- The proposed modifications consist of installing two 1.75-foot deep, 2-foot wide cutouts in SW-2, as well as partially rehabilitating the disintegrating boulder weir downstream. This boulder weir is located in a relatively steep segment, therefore fully rebuilding this boulder weir to its original crest profile is inadvisable. Work should be limited to filling gaps to help raise the tailwater below the SW-2 weir.
- Under existing conditions, the required jump height over the weir ranges from approximately 1.5 to 2 feet at all flows. Thus passage for both juvenile and adult brook trout is effectively impossible.
- With the proposed retrofits, drop height over the weir is reduced to less than one foot for most flows.
 - For juvenile brook trout, passage by jumping is possible up to approximately 13 cfs. Above 13 cfs both jump and velocity barriers exist.
 - For adult brook trout, passage by jumping is possible up to approximately 18 cfs. The jump barrier is passable by burst swimming up to around 20 cfs. Above 20 cfs both jump and velocity barriers exist.