

In the Fall of 2014, a vortex rock weir was installed on Culvert C051, located where Route 895 intersects Mitton Brook. This crossing had a downstream slope of 3.79% and an outflow drop of 19 cm. This outflow drop was potentially blocking aquatic access to approximately 2.5 km of upstream habitat for brook trout and other species. A rock volume of 1 m<sup>3</sup> was calculated.

$$\begin{aligned}
 \text{Volume} &= \text{length} \times \frac{1}{2} \text{width} \times \text{height} \\
 V &= 5.0 \text{ m} \times \frac{1}{2} (0.57 \text{ m}) \times 0.19 \text{ m} \\
 V &= 0.5415 \text{ m}^3 \text{ (round up)} \\
 V &= \mathbf{1 \text{ m}^3}
 \end{aligned}$$

The culvert on Mitton Brook had an average bankfull height of 0.440 m and a downstream slope of 3.79%. Given this information, an incipient diameter of 16.676 cm was calculated. The safety factor of two was used to calculate a minimum rock size of 34 cm. For the large, flat footer stones that composed the base of the weir, a safety factor of four resulted in a rock size of 67 cm.

$$\begin{aligned}
 \tau \left( \frac{\text{kg}}{\text{m}^2} \right) &= \text{Incipient Diameter (cm)} \\
 \tau &= 1000 \times d \times s \\
 \tau &= 1000 \times 0.440 \text{ m} \times 0.0379 \\
 \tau &= 16.676 \frac{\text{kg}}{\text{m}^2} \\
 &= \mathbf{16.676 \text{ cm}}
 \end{aligned}$$

Figure 19 displays an immediate reduction in the outflow drop after the the rock weir was installed on Culvert 51 in the Little River Basin.



**Figure 1:** Photos of the 19 cm outflow drop before constructing the rock weir (top left and center) with their corresponding after photos following rock weir completion. (bottom left and

center). The pictures on the right show the tailwater control before (top) and after (bottom) the rock weir was constructed.

Installing this rock weir allowed fish to gain 2.5 km of upstream habitat that, especially for small or juvenile species, may have otherwise been inaccessible. When the results of remedial efforts from all four debris removals and the tailwater control installation are combined (Table 9), a net upstream habitat gain of 25.5 km was restored to aquatic species in the Pollett and Little River basin.

The third and final rock weir installation took place in the fall with the assistance of the Blue Action Committee (high school students in the Greater Moncton Area interested in environmental learning opportunities) where the Sanatorium Road crosses an unnamed stream. Rock volume and diameter were calculated to order rock from a local rock quarry. Culvert 4 had an outflow drop of 18 cm and a bankfull width of 4.6 m. Given this information a rock volume of  $0.47 \text{ m}^3$  was rounded up to  $1 \text{ m}^3$ .

$$\begin{aligned} \text{Volume} &= \text{length} \times \frac{1}{2} \text{width} \times \text{height} \\ V &= 4.6 \text{ m} \times \frac{1}{2} (0.54 \text{ m}) \times 0.18 \text{ m} \\ V &= 0.45 \text{ m}^3 \text{ (round up)} \\ \mathbf{V} &= \mathbf{1 \text{ m}^3} \end{aligned}$$

An incipient diameter of 8.20 cm was multiplied by two to calculate a minimum rock size of 16.40 cm. For the large, flat footer stones that composed the base of the weir, a safety factor of four resulted in a rock size of 32.80 cm.

$$\begin{aligned} \tau \left( \frac{\text{kg}}{\text{m}^2} \right) &= \text{Incipient Diameter (cm)} \\ \tau &= 1000 \times d \times s \\ \tau &= 1000 \times 0.745 \times 0.011 \\ \tau &= 8.20 \frac{\text{kg}}{\text{m}^2} \\ &= \mathbf{8.20 \text{ cm}} \end{aligned}$$

With our high school student and teacher volunteers (Figure 26) fish passage was facilitated to 4.5 km of upstream habitat.



**Figure 2:** Member of the Blue Action Committee action committee (top left and top right) volunteered their time to construct a rock weir (bottom right) and minimizes the outflow drop at Culver 4 (bottom left).