

**MEMORANDUM**

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DATE: 20 August 2005 Proj No. P52-7207  
TO: File  
FROM: Nathan Schmidt  
RE: Hardisty Creek Post-Flood Inspection Notes – 15 July 2005

A site inspection of the Hardisty Creek Kinsmen Park reach was performed on 15 July 2005. In attendance were Rich McCleary and Don Podlubny of Foothills Model Forest, Connie Bresnahan of the Hardisty Creek Restoration Committee, Lisa Graul of the Town of Hinton, Jan den Dulk of Millennium EMS and Nathan Schmidt of Golder Associates.

The Creek was inspected by the group, photographed and restoration features were discussed. The discussion focused on the effects of recent high water (June 2005) in the Creek. A summary of observations related to restoration features follows, and photographs from the site inspection are attached.

### **Floodplain Reconstruction**

Section 7.1 of the design report recommended floodplain reconstruction for the reach between Riffle 1 and Riffle 2. A floodplain width of 40 m, approximately 1 m above the stream thalweg, was recommended. This corresponded to a bed width of approximately 10 m (bankfull width of approximately 12 to 18 m) as shown in Appendix IV, Figure 1.

Floodplain reconstruction requires excavation and placement of relatively large quantities of bank material and placement of geotextile for bank reconstruction. Budgetary constraints and precluded reconstructing the floodplain for the entire Kinsmen Park Reach, but the area that was treated appears to have fared well through the high water event (see photos 28, 29, 30 and 36). No erosion was apparent, live staking has been successful and some vegetation has begun to establish itself through the geotextile.

Floodplain reconstruction will eventually be achieved naturally, if slowly, by deposition of sediment and organic debris. This is addressed further in the discussion of meanders.

### **Riffle Structures**

Nine riffle structures were constructed in 2004. The lower eight were considered complete, while the uppermost was a “starter riffle” that is intended to be completed to backflood the Hardisty Avenue culverts in 2005. The riffles appeared to be successful at creating pool areas upstream (see photos); however, two issues were identified with regards to the lower riffle construction:

1. 250 minus material placed downstream of riffle boulders was washed downstream, creating a situation where flow spills over the riffle boulders, rather than flowing downstream at a 5% slope. This provides less effective fish passage;
2. In several locations (in particular, at Riffles 2 and 8), several riffle boulders have moved downstream. While this does not currently affect upstream pools, stability of the riffle during future flood events is in question.

It appears that the 250 minus material may have been graded with a higher proportion of gravel material. Bars of medium gravel were observed adjacent to pool areas during the site inspection, and it is likely that the source of this material was the downstream face of the upstream riffle.

It is likely that the mechanism for movement of large boulders was not frictional forces, but rather scouring of gravel and cobble from below the riffle, followed by downstream movement of the large boulders due to hydrostatic forces.

The recommended remediation for at riffles where material has been lost from the downstream face is to place larger material (small boulder and large gravel, with some smaller fractions) on the downstream face of the riffle.

### **Meanders**

Large woody debris, anchored by boulders, were placed at locations along the reach to provide fish habitat, protect bank areas at the outside of bends and encourage sediment deposition at the inside of bends. Live staking at selected locations was also specified.

Live staking appeared to have been successful, with buds and small branches observed emerging from stakes during the site inspection (see photos 1, 4, 20, 25 and 30).

Though it appears that supply of silt and sand fractions in Hardisty Creek may be limited, some areas of deposition (fines and organics) were observed during the site inspection. In particular, some areas in pools, upstream of riffles where woody debris was placed, have experienced significant deposition (see photos 9 and 33). Other depositional areas were observed upstream of riffles, where the channel width is oversized and there is minimal overbank area at the bankfull elevation.

In time, the pools created by riffle construction are expected to cause deposition along banks and create a narrower channel width, floodplain within the existing high channel banks, and increased channel sinuosity. This process could be accelerated by placing wood or rock structures to trap sediment and organic debris outside of the equilibrium channel width. Efforts to achieve this would be best applied in the area immediately downstream of the pedestrian bridge, where the existing channel width is most oversized. The RDB area upstream of Riffle 4 would also lend itself to placement of debris and sediment trapping structures.

### **Boulder Clusters**

Boulder clusters (3 to 5 boulders) were installed at various locations in the channel to enhance fish habitat (see photos 2, 5, 6, 11, 19, 23 and 31). These clusters appear to have been stable during the recent flooding.

## **Summary**

Boulder clusters, meanders, LWD structures, live staking and floodplain reconstruction work undertaken in October 2004 appears to have been successful and effective at achieving the goals of the construction.

Riffles constructed in October 2004 showed movement of individual boulders in some locations. It appears that this is primarily due to loss of small boulder and cobble material from the downstream face of the riffle during recent flooding. It is recommended that the downstream riffle faces be repaired using larger material (up to 350 mm minus; suitable for hand placement; size to be confirmed prior to construction). The goal of this is to provide support for upstream boulders and to enhance fish passage across the riffle.

Given the preceding observations, it is also recommended that care be taken in construction of the upper riffle that is intended to backflood the Hardisty Avenue culverts. Consideration should be given to placement of impermeable geotextile in the upstream portion of the riffle, to prevent seepage through the riffle and piping losses of fined. Consideration should also be given to placement of larger diameter rock on the downstream face of Riffle 1 and placement of a large boulder elevation control between Riffle 1 and Riffle 2.

Given the limited budget available for construction in 2004, Jan den Dulk is to be commended for procuring materials and construction equipment from a number of sources, frequently at costs significantly lower than market value. Without his efforts, it would not have been possible to complete the eight riffles and associated bank, boulder and LWD structures during the first phase of construction.

**Photo Survey and Notes – 15 July 2005**



**Photo: 1**  
**Location:** Below Riffle 9 on RDB  
**View:** Upstream  
**Description:** Successful live stakings



**Photo: 2**  
**Location:** Below Riffle 9  
**View:** Upstream  
**Description:** Riffle 9 in background  
and boulder clusters below riffle



**Photo: 3**  
**Location:** At Riffle 9 on RDB  
**View:** Upstream  
**Description:** LWD anchored to bed





**Photo: 4**  
**Location:** Above Riffle 9 on RDB  
**View:** Upstream  
**Description:** Successful live stakings



**Photo: 5**  
**Location:** Below Riffle 8  
**View:** Upstream  
**Description:** Riffle 8 in background  
with boulder clusters below riffle



**Photo: 6**  
**Location:** Below Riffle 8  
**View:** Upstream  
**Description:** Riffle 8 in background



**Photo: 7**  
**Location:** At Riffle 8  
**View:** Upstream  
**Description:** Pool above Riffle 8



**Photo: 8**  
**Location:** At Riffle 8  
**View:** From RDB  
**Description:** Riffle 8



**Photo: 9**  
**Location:** Above Riffle 8  
**View:** From LDB  
**Description:** LWD anchored to bed on RDB, note sediment deposition at upstream end





**Photo: 10**  
**Location:** Above Riffle 8  
**View:** Upstream  
**Description:** LWD (root wad)  
anchored to RDB above Riffle 8



**Photo: 11**  
**Location:** Above Riffle 8  
**View:** Upstream  
**Description:** Boulder clusters  
between Riffle 7 and Riffle 8



**Photo: 12**  
**Location:** At Riffle 7  
**View:** From LDB  
**Description:** Riffle 7



**Photo:** 13  
**Location:** Above Riffle 7  
**View:** Downstream from RDB  
**Description:** LWD anchored to bed on RDB



**Photo:** 14  
**Location:** Above Riffle 7  
**View:** Upstream from RDB  
**Description:** LWD anchored to bed on LDB

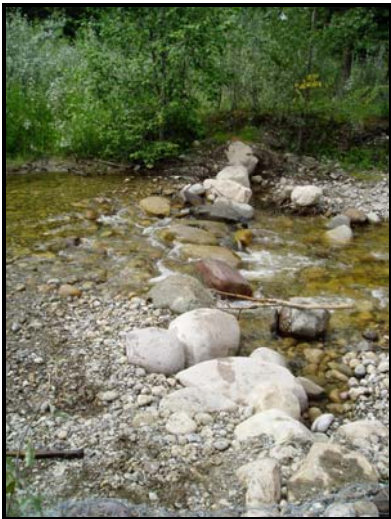


**Photo:** 15  
**Location:** Below Riffle 6  
**View:** Upstream  
**Description:** Riffle 6 and run below riffle





**Photo: 16**  
**Location:** At Riffle 6  
**View:** From RDB  
**Description:** Riffle 6



**Photo: 17**  
**Location:** At Riffle 6  
**View:** From RDB  
**Description:** Riffle 6



**Photo: 18**  
**Location:** Above Riffle 6  
**View:** Upstream  
**Description:** Pool above Riffle 6



**Photo: 19**  
**Location:** Below Riffle 5  
**View:** Downstream  
**Description:** Boulder clusters  
between Riffles 5 and 6



**Photo: 20**  
**Location:** Below Riffle 5 on RDB  
**View:** Towards RDB  
**Description:** Successful live staking  
on RDB



**Photo: 21**  
**Location:** Just below Riffle 5  
**View:** Upstream  
**Description:** Riffle 5





**Photo:** 22  
**Location:** At Riffle 5  
**View:** From RDB  
**Description:** Riffle 5



**Photo:** 23  
**Location:** Below Riffle 4  
**View:** Downstream  
**Description:** Boulder clusters below Riffle 4



**Photo:** 24  
**Location:** At Riffle 4  
**View:** From RDB  
**Description:** Riffle 4





**Photo:** 25  
**Location:** At Riffle 4  
**View:** Downstream from RDB  
**Description:** Live staking at root of Riffle 4



**Photo:** 26  
**Location:** Above Riffle 4  
**View:** Upstream  
**Description:** Channel above Riffle 4



**Photo:** 27  
**Location:** Above Riffle 4  
**View:** Upstream  
**Description:** LWD anchored to bed on RDB above Riffle 4



**Photo:** 28  
**Location:** At Riffle 3  
**View:** From RDB  
**Description:** Riffle 3, note reconstructed bank on RDB upstream



**Photo:** 29  
**Location:** At Riffle 3  
**View:** From RDB  
**Description:** Riffle 3, note reconstructed bank on RDB upstream



**Photo:** 30  
**Location:** Above Riffle 3  
**View:** Upstream  
**Description:** Reconstructed bank on RDB, note successful live stakings





**Photo:** 31  
**Location:** Below Riffle 2  
**View:** Upstream  
**Description:** Riffle 2 and  
downstream boulder clusters



**Photo:** 32  
**Location:** Riffle 2  
**View:** From RDB  
**Description:** Riffle 2



**Photo:** 33  
**Location:** Riffle 2  
**View:** From RDB  
**Description:** Riffle 2





**Photo:** 34  
**Location:** Below Riffle 1  
**View:** Upstream  
**Description:** LWD anchored to RDB below Riffle 1



**Photo:** 35  
**Location:** Below Riffle 1  
**View:** Upstream  
**Description:** Riffle 1 and downstream run



**Photo:** 36  
**Location:** Below Riffle 1  
**View:** Upstream  
**Description:** RDB bank treatment below Riffle 1



**Photo:** 37  
**Location:** Riffle 1  
**View:** Upstream  
**Description:** Riffle 1 and upstream pool



**Photo:** 38  
**Location:** Riffle 1  
**View:** From RDB  
**Description:** Riffle 1



**Photo:** 39  
**Location:** Riffle 1  
**View:** From RDB  
**Description:** Riffle 1





**Photo:** 40  
**Location:** At Hardisty Avenue  
**View:** From RDB  
**Description:** Hardisty Avenue  
culvert outlets