MPERG Report 2007-3

Gold Run Creek Erosion Control Project
2006 Follow-up Monitoring

By

Laberge Environmental Services

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Prepared for:

Mining and Petroleum Environment Research Group

Submitted by:

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Summary

A large erosion cut, approximately 300 metres long and up to 50 metres deep, has occurred on a stockpile of frozen overburden on the east bank of Gold Run Creek, a placer mining area southeast of Dawson City.

In September 2005 erosion control structures reinforced with live willow cuttings were installed at the site. These structures consisted of earth retaining walls built to stabilize the slope failure and a flume to convey the water past the retaining walls while the willows had time to grow and strengthen the structures.

In July 2006 the site was revisited. It was found that, while the earth retaining walls were intact, the flume had malfunctioned and further erosion had occurred beyond the walls. It was concluded that the collapse of the flume was the primary cause of the failure of the erosion control project.

Contents

1.0 Background

In September 2005, erosion control structures were installed at a site near Gold Run Creek as an experimental project funded by the Mining and Petroleum Environment Research Group (MPERG).

The site is located approximately 52 kilometres southeast of Dawson City, near the left (east) bank of Gold Run Creek, about seven kilometres upstream from its confluence with Dominion Creek. It is located at UTM 614343 northing and 7069344 easting, zone 7V, NAD 83, and can be sited on NS Map 115-O/10.

The erosion site was first brought to the attention of Laberge Environmental Services (LES) in early 2003 by the Dawson City office of Client Services, Energy Mines and Resources. A subsequent MERG-funded reconnaissance survey was carried out by LES in July 2003. The results of that survey are presented in a report prepared for MERG (Laberge Environmental Services 2004).

The eroded area consists of a slope failure on an overburden stockpile on the east bank of Gold Run Creek. The overburden was stockpiled during placer mining operations in the late 1980s. Since that time, a dense stand of willows (mostly *Salix arbusculoides* and *S. planifolia*), has grown on the stockpile. It is not clear when the slope failure first occurred, but melting permafrost has since created a runoff channel that is eroding through the overburden and adding to the sediment load in Gold Run Creek. Initially, the previous owners had installed a gravel plug at the base of the erosion channel to inhibit the flow and slope failure. This was unsuccessful and the gully eroded around the plug.

By July 2003, soil had slumped back to a point about 300 metres from the creek bank. The width of the slumped-in area ranged from about 4 metres at its apex to about 60 metres at its centre. The maximum depth was estimated to be about 50 metres. The walls of the gully were nearly vertical in places.

The September 2005 stabilization efforts included the construction of earth retaining walls, supported by live dormant willow cuttings, at the actively eroding apex of the slope failure. A flume was also constructed with live willow cuttings to channel the runoff water

beyond the retaining walls. It was hoped that this flume would help minimize further erosion while the live willow cuttings had a chance to grow and further strengthen the retaining walls. All live plant material was harvested on site from the overgrown stockpile.

The 2005 field work was carried out as a MPERG-funded project in cooperation with the Dawson City office of Client Services, Energy Mines and Resources. Details of this construction project are presented in a report prepared for MPERG (Laberge Environmental Services 2006).

In order to update the status of the Gold Run Creek erosion control project, the site was revisited in mid-July 2006. The results of the 2006 survey, funded by MPERG, are presented in this report.

2.0 Results of 2006 Site Survey

The following observations were made during the July 18 survey of the Gold Run Creek erosion control site:

- The flume, constructed from live willow cuttings, had failed to direct the flow of water over the retaining walls, resulting in further upstream erosion in the gully. Although a pipe had been installed in September 2005 to divert flow around the flume temporarily for the fall, this probably was not effective by spring. The erosion had extended the gully upslope by an estimated 5 metres since the retaining walls and flume were constructed in September 2005. It is assumed that the flume failure and the new erosion began with the spring runoff and continued as the permafrost melted in the summer.

- The earth retaining walls, supported by live willow cuttings, had remained intact. The willow cuttings were showing a significant growth of new shoots and roots (see site photographs in Appendix A).

- Most of the willow cuttings staked in the watercourse upstream from the control structures had survived and were sprouting new growth.

- There was very little flow of water in the erosion channel at the time of the survey. The estimated discharge at the downstream end of the gully, before its confluence with Gold Run Creek, was 10 to20 mL/sec.

- A good regrowth of willows was observed at the cutting donor site at the top of the overburden stockpile.

- Some sections of the gully continue to stabilize, with a good growth of plant material covering the gully floor and walls.

- Slumping of the northwest facing wall near the gravel plug had induced mature willow trees to fall onto the surface of the steep gully wall. In September 2005

these willows were sending up shoots from their prone position, assisting in the stabilization of the slope. Willows were continuing to grow here in July 2006.

- The water flow, likely during freshet, appears to have undermined the lower section creating unstable areas below the southeast facing wall.

3.0 Conclusions

The malfunction and collapse of the flume, constructed from live willow cuttings, was the obvious cause of failure of the erosion control project at the Gold Run Creek site. In order for this project to succeed, it is apparent that a reliable technique for conveying water discharge during spring runoff and subsequent permafrost melt is required to permit the live reinforced retaining walls to have time to grow and strengthen so that they can perform their purpose.

4.0 Acknowledgements

Laberge Environmental Services would like to thank the Mining and Petroleum Environmental Research Group for porviding the funding for this project. We also appreciate the field assistance and logistical support provided by Lorraine Millar, Client Services Officer, of Energy Mines and Resources, YTG in Dawson City.

We extend gratitude to Alberta Gold Diggers for allowing us access to the site, which is located on their mining property.

References

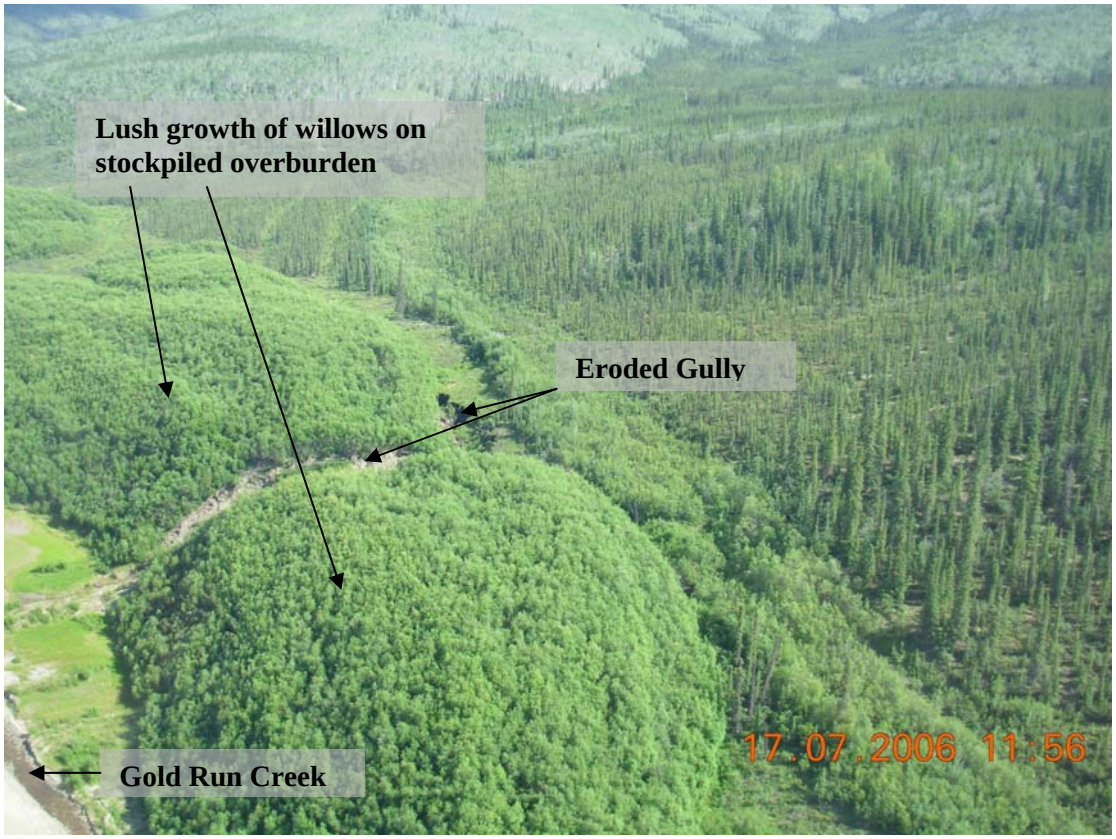
Laberge Environmental Services. 2004. *Reconnaissance Survey of Erosion Site at Gold Run Creek*. Prepared for Mining Environmental Research Group (MERG). Report No. 2004-3.

Laberge Environmental Services. 2006. *Pilot Scale Erosion Control Using Bioengineering Techniques At Gold Run Creek, 2005*. Prepared for Mining and Petroleum Environmental Research Group (MPERG).

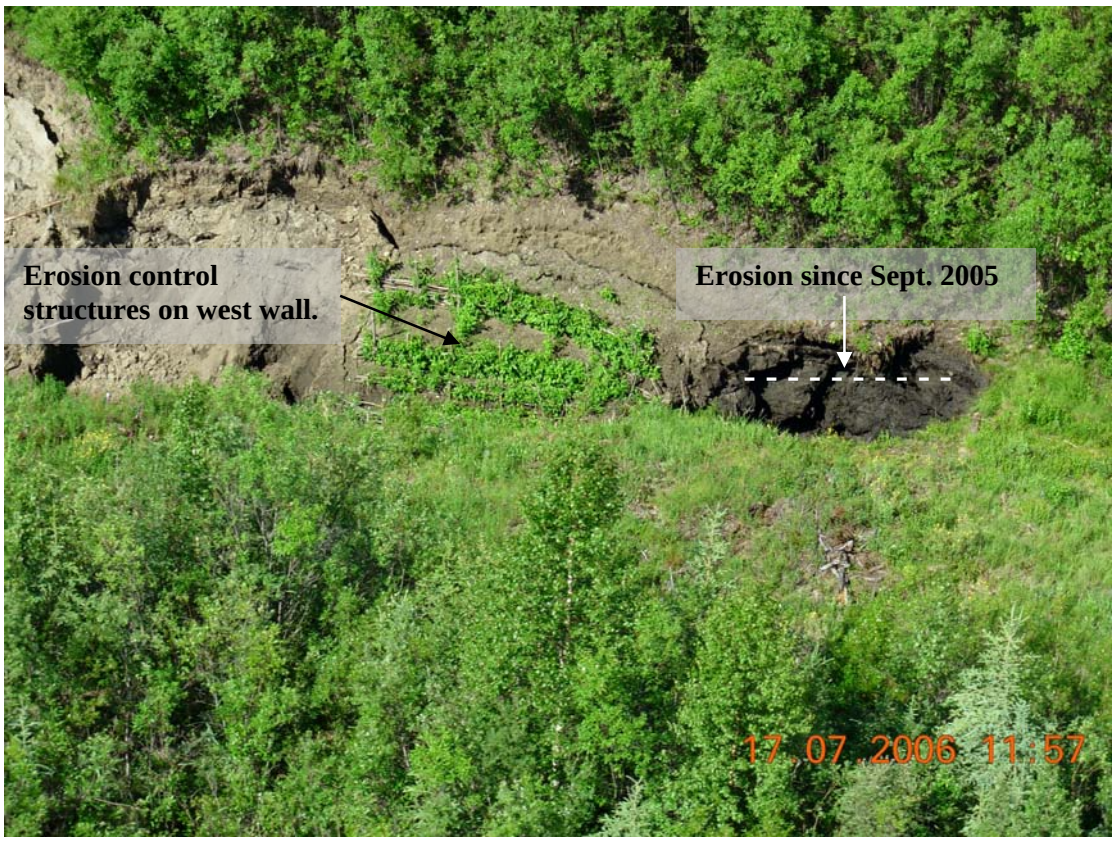
Polster, David F. 2005. *Soil Bioengineering for Land Restoration and Slope Stabilization*. Polster Environmental Services, Duncan, BC.

Appendix A:

2006 Photographs – Gold Run Creek Erosion Control Project



Aerial shot of the eroded gully taken on July 17, 2006.



Aerial shot of the erosion control structures and increased erosion, taken on July 17, 2006.

Top of the gully has eroded back approximately 5 additional metres since Sept 2005.

Looking from the top of the gully to the collapsed flume and the intact retaining wall structures, July 18, 2006. Note new grass growth on the terraces of the west retaining wall.

Good growth on both of the side walls, however the top tier of the rear wall has collapsed along with the flume. July 18, 2006.

Good growth on the structures of the side walls abutting the newly eroded area, July 18, 2006.
Note young willow sprouts on the remaining portion of the flume at the base of the retaining walls.

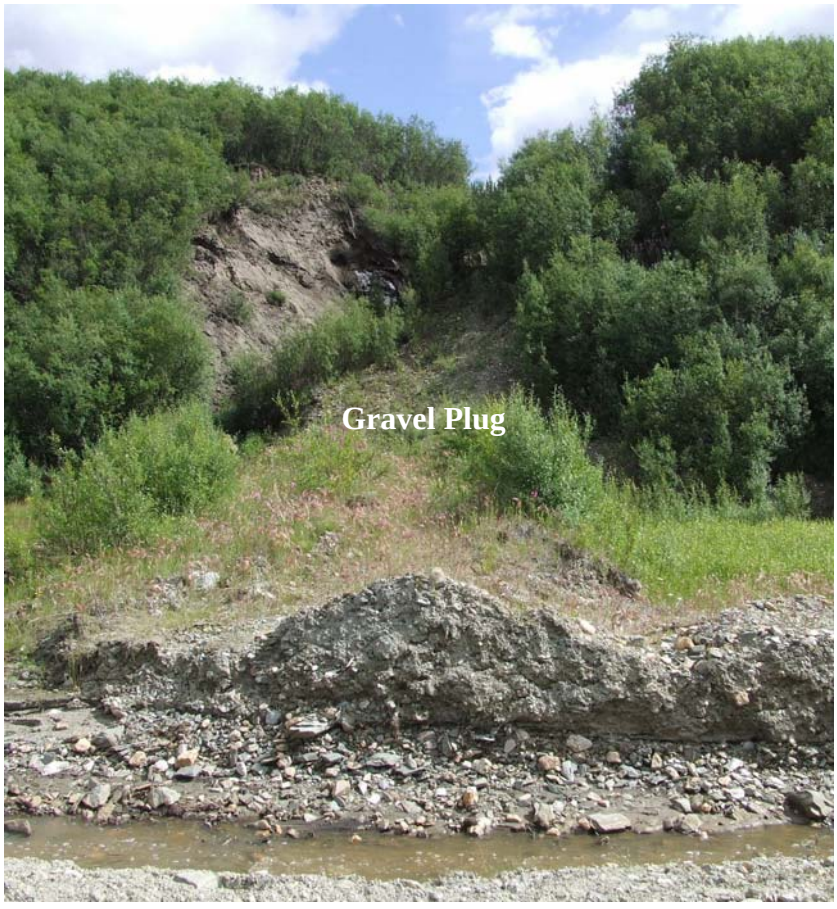
Looking toward the control structures, stabilized area of gully in foreground.

Looking back from control structures to the stabilized area, July 18, 2006. Willows growing on floor of gully where the Big-O pipe had lain.

Regrowth of willows at the donor site, July 18, 2006.

One of the donor willows sporting robust regrowth over the first growing season since harvesting, July 18, 2006.

Willows growing from fallen trees on the southeast slope near the gravel plug, July 18, 2006.



The gravel plug is re-vegetating naturally, July 18, 2006.

Flow at base of cut was estimated at 10 to 20 mL/sec, July 18, 2006.

Confluence of flow from the cut and Gold Run Creek, July 18, 2006