



This landslide, the second largest in Canadian recorded history, obliterated five pieces of heavy equipment (not even a paint chip left) and destroyed several kilometres of road and access infrastructure.

A Goldilocks Solution: Restoring Road Access in the Most Geologically Unstable Area of Canada

ON SEPTEMBER 19, 2009, CAPRICORN CREEK HAD A ‘SMALL’—1 MILLION CUBIC meter landslide that wiped out the existing Capricorn Creek bridge and another 500 metres of approach roads. Road access up Meager Creek, near Pemberton, was completely cut off as this was the only road into the valley.

The Meager drainage has had road access since the mid 1970s with ongoing forestry activities. Meager Creek is also the location of a very popular, semi-developed recreational hot springs. There has also been extensive geothermal power exploration work intermittently since the road access was developed in the 1970s. Developers have been trying to drill into the sweet spot under the Meager Mountain extinct volcano.

The Meager Creek Valley is the most geologically active and unstable area in Canada. There are frequent large natural landslides that initiate on Meager Mountain and flow down into the valley. Over the past 40 or so years, since roads were built into the area, there have been a series of these natural slide events in the Meager and Upper Lillooet drainages that have damaged the road system.

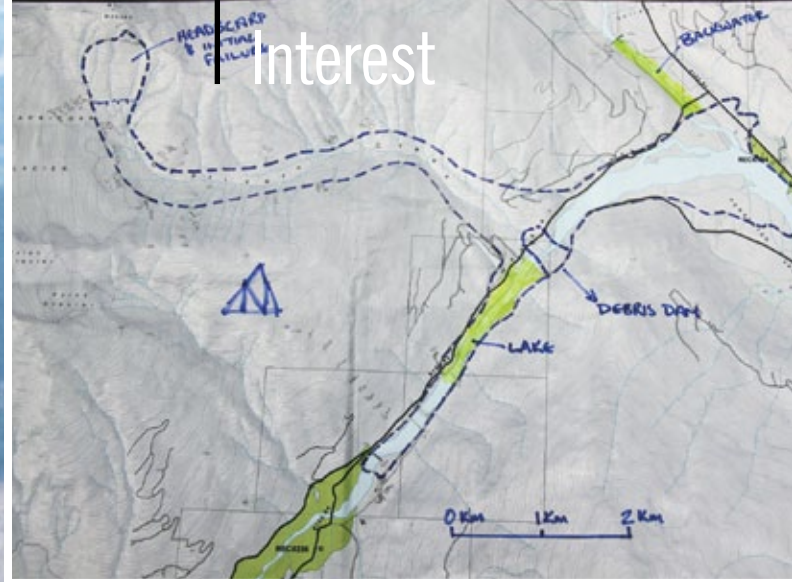
A team was assembled to plan and implement the appropriate solution for restoring road access after the September 19th slide. The team was looking for a “goldilocks” solution for restoring the road. The road and bridges needed to be good enough to last the

normal water flow conditions for the estimated one to 15 years until the next slide event was expected, but not so well done as to waste money when the next slide comes. Everyone on the team understood this fact and worked together to develop a practical solution.

My role was to seek the necessary information from this resource team, coordinate their inputs and apply their recommendation on the ground. That is, to direct the reconstruction works and ensure the work was done under safe operating conditions.

The team decided that the most appropriate solution was to install a simple, low cost, log crib and stringer gravel decked bridge. This would allow us to use local materials to construct a high strength, scour resistant bridge. Although simple in materials, design and construction, log crib and stringer bridges are well suited for a short-term crossing structure due to the inherent strength and tolerance of timber. Log bridges can shift slightly due to abutment settlement and still perform as intended.

Everyone involved had worked on these bridges before or claimed they had. This was obviously the best solution. What could be technically and operationally easier? What could go wrong? (At this point, I want readers of a certain age to gently hum the theme song to Gilligan’s Island.)



This map shows the path the slide took through the valley.

All photos: John C. Howe, RPF

Looking down the Capricorn and Meager Creek valleys into the Lillooet River, this photo was taken 12 hours after the August 5th slide occurred.

Forest professionals are taught that Murphy was an optimist. Meaning what you did not even expect to be an option, is an option and will go wrong. On this project Murphy brought us many things:

- Quicksand. (Why else would an excavator sink in what looks like solid ground?)
- Indignant tourists demanding we open the road immediately so they could use the hot springs.
- High water flows with a sediment load that changed hourly depending on the temperature induced snow melt. The stream was moving approximately a thousand cubic meters of sand and boulders an hour.

Did I mention that this is the most geologically unstable area in Canada and that there are required safety procedures for working in the area? Throughout the construction process, we had someone looking upstream and monitoring stream flow conditions in accordance with our operational shutdown criteria and emergency evacuation plan. The plan was that if the watchman observed something coming down the hill, he would notify all other workers and they would evacuate the site to a safe refuge. This would work fine for a slow moving, million cubic metre slide.

Eventually the bridge and approaches were built and armoring was almost completed. In mid summer we curtailed operations due to hot weather triggering the “get out of Dodge” conditions identified under the operational shutdown criteria. We left to wait until the weather cooled down and we could safely return to the valley.

The weather cooled and on August 5th we scheduled the crew to return for 7 am the next day. At 3:31 am, August 6, 2010, another slide came down and flowed through the worksite at an estimated 100 meters/second. It was through the area in a matter of seconds and was the second largest landslide in Canadian recorded history. Thankfully, no one was there. The slide obliterated

five pieces of heavy equipment (not even a paint chip left) and destroyed several kilometres of road and access infrastructure.

Miraculously, no one has been hurt or injured by this event to date. Sometimes, despite Murphy, you just get lucky.

At this time we are looking at options for getting back into the Meager Valley. That will be another story. 🐼

Stirling Angus, RPF, has been involved in the BC forestry community since 1976 with his first job as a rap-attack fire fighter. Since then he has worked throughout the province in a number of positions including forest land manager, logger, woods manager, forestry instructor, policy research forester and consultant.

I would like to name and sincerely thank the main players in this saga to date including:

- Francesca Knight, RPBio, with the Department of Fisheries and Oceans for providing guidance on Federal Fisheries legislation compliance.
- Malcolm Schulz, RPF, with MFR Squamish District for providing oversight and professional coordination on behalf of the province.
- Pierre Friele, PGeo, with Cordilleran Geoscience for providing geotechnical advice on everything from peak flows, landslide hazard and road repair design criteria.
- Gino Fournier, RPF, PEng with MFR Coast Region for providing advice on design structures and access options.
- Brett Allen, RPBio, with Diamondhead Consulting for serving as environmental monitor.
- Jeff Drenka and Squamish Mills' construction crew who actually did the work while in the bight the entire time. Thanks to Bill & Mike Brotherston, Warren Fredericks, Travis, Ray Shier, Sandy McCormack and Tom Carney.
- Dave Southam, RPF, with MFR Squamish for ensuring that the funds necessary to do the work were made available.
- John Howe, RPF with JCH Forestry Ltd. for providing field layout and designs as well as general all round guidance.