

BEST PRACTICES FOR RESOURCE ROAD RECLAMATION

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ABSTRACT

Access roads are a necessary part of resource extraction. Road deactivation is a simple solution to minimizing many of the effects of resource roads on the environment. Best practices and solutions to road deactivation are explored, and include seasonal deactivation, semi permanent deactivation, and permanent deactivation.

Key Words: Environment, Environmental Effects, Road Deactivation, Planning

INTRODUCTION

Resource industries depend on access roads to move equipment, supplies and people in and resources out. Individually, resource roads have a relatively small footprint. Cumulatively, however, the hundreds of thousands of kilometres of active and abandoned roads arguably have the largest and most significant environmental effects on resource extraction activities.

Best practices related to resource roads include planning to construct a road where it avoids unstable terrain and sensitive ecosystems, using appropriate road design and construction standards, planning for deactivation before road construction, using proper maintenance during road use and completing appropriate deactivation during and after a road's life.

Road deactivation is a simple solution to minimizing many of the effects of resource roads on the environment. The main forms of deactivation include:

- Seasonal deactivation
- Semi permanent deactivation and;
- Permanent deactivation

These best practices greatly reduce the cumulative environmental impacts of resource roads. Reducing these impacts will also ensure less money is spent in the long-term by resource development companies and governments on environmental restoration to fix the impacts of poorly located, designed, built and maintained roads, and on the eventual deactivation of abandoned roads.

ENVIRONMENTAL EFFECTS

The effects of resource roads on the environment are varied and depend on a number of local factors including climate, geology, ecosystem sensitivity, road design and location, and standard of construction. The main direct effects of roads are related to surface and groundwater hydrology, water quality, wildlife and geomorphology. Indirectly, roads also provide human access to remote areas.



Photograph 1: A large landslide initiated at a high elevation has travelled hundreds of meters to the valley bottom impacting three other roads along the way.

Hydrology

Resource roads can affect the timing and volume of flow in creeks, streams and rivers that they cross. They intercept groundwater flow, causing it to come to the surface, and run off more rapidly. These effects are particularly significant on hillslopes. Roads are essentially impermeable, and precipitation that may otherwise have infiltrated into the ground runs off roads and is concentrated in ditches and eventually into surface watercourses.

This concentration of water and more rapid runoff leads to higher flows in tributary and main valley streams. As a result, this can create more frequent and extreme flooding, watercourse bank erosion and channel widening, a greater movement of sediment which leads to deeper scour in places, and large sediment deposits elsewhere.

Water Quality

Resource roads are typically constructed from local materials. This generally consists of blasted rock, silty sandy glacial material and occasionally sand and gravel if available. Due to the generally fine textured materials used to ‘cap’ the road and provide a smooth running surface, the finished resource road is prone to erosion. This is exacerbated by traffic of both light and heavy duty vehicles. Run-off from active roads during precipitation events is often sediment laden, which fouls water quality for aquatic life. Blasting is frequently necessary in road building, and can result in unweathered bedrock becoming exposed to air and water. Weathering of the newly exposed rock faces lead to acid rock drainage and leaching of metals from the road, both of which can significantly affect the receiving environment.



Photograph 2: A large active landslide is the result of poor water management at the road.



Photograph 3: An abandoned road that has chronic instability as a result of filling across a steep slope including poor water management at the road.

Wildlife and Fisheries

Resource roads can impact wildlife through mortality from traffic and impediments to migration corridors. But the most significant impact is they change the relationship between predator and prey species. Predators such as wolves use the roads for easier access across steep slopes, rivers, and deep snow terrain when the road is ploughed to reach prey animals that otherwise are protected by these natural barriers.

Resource roads can also block the passage of fish through improperly located and, or installed culverts. When culverts are installed that ‘hang’ above the creek at the outlet and are preventing migration, fish are unable to move upstream. When culverts are undersized, significant water velocities through the culvert can exceed a fish’s ability to swim through it.

Mass Movement

The construction of resource roads across steep slopes, unstable and potentially unstable terrain, and the concentration of water by roads onto such terrain frequently leads to mass movement events such as landslides and debris flows. These mass movement events can travel hundreds of meters and have significant impacts on water quality, the morphology of rivers and creeks, vegetation, infrastructure and human life.

Road-related Human Impacts

Resource roads provide access for people travelling deep into wilderness areas. This leads to increased hunting and fishing pressures; increased ATV, snow machine and off road vehicle use and the environmental effects associated with those activities; access to sensitive ecosystems; and can also increase the potential for wildfire.

TYPES OF SOLUTIONS

The resources that these roads access have a finite lifespan which dictates the lifespan of the roads that service them. Given our era of Google earth and hyper sensitive monitoring of resource development industries by Environmental Non-Governmental Organizations who can rapidly broadcast environmental degradation around the world, it is in the best interest of all resource industries to operate using environmental best practices. This includes reclamation of resource roads following today's high standards. In the old days it was called "putting a road to bed"; today it is known as road deactivation.

Seasonal Solution

Resource extraction is rarely year round, and there is often a period of several months where a road is not in use. Seasonal deactivation involves installing ditches skewed across the road surface. Culverts are "backed up" by digging a ditch on the downslope side of the culvert to ensure that if the culvert becomes plugged, water will be intercepted and directed across the road and back into the watercourse rather than running down the road. This prevents road erosion and damage to other culverts and watercourse-grade on the road, and helps to limit the initiation of landslides and debris flows. Seasonal deactivation mitigates the effects of heavy precipitation on the road and subsequently reduces mass movement, erosion and sedimentation events.

Semi-permanent Solution

When a road is no longer needed in the short term (2-10 years), but there is potential for the road to be used again in the future, semi permanent deactivation is appropriate to limit the environmental liability of the road, while still preserving the road as an infrastructure asset. This involves removing most culverts, digging extra cross ditches between watercourses and pulling back potentially unstable road sections, but leaving in major crossing structures such as bridges. A seasonally deactivated road can still normally be used by a pickup truck.

These roads do not require annual maintenance, but still represent a long-term environmental liability for the road permit holder as major structures are still in place, and inherent instability of the road bed still exists. Semi permanent deactivation generally restores natural hillslope hydrology and significantly limits the potential for road induced mass movement events.

Permanent Deactivation Solution

When a road is no longer required for industrial or other human access, permanent deactivation is undertaken. This deactivation involves removing all culverts and bridges, pulling back unstable and potentially unstable road shoulders and fillslopes, installing water bars, and in some cases scarifying the road surface to permit water infiltration and vegetation growth. Sometimes the road is completely 'debuilt' and the hillslope is recontoured with the objective of eventually returning the site to a productive forest.

Vehicle access is often not possible along a permanently deactivated road. The level of deactivation is designed to return the hillslope hydrology to as close to preconstruction conditions as possible, and remove any inherent instability presented by the road. A permanently deactivated road requires no maintenance, and should remove any environmental liability from the permit holder. Permanent deactivation is also an opportunity to restrict human access into wilderness areas.

PROPER PLANNING RECOMMENDATIONS

Just as mine closure and reclamation planning is undertaken prior to mine construction, planning for deactivation and decommissioning of resource roads should also be addressed prior to road construction. Since the mid 1990s the BC forest industry has regulated a high standard of road construction and deactivation planning. Government funds are also made available each year to assess and deactivate abandoned forest roads in sensitive and heavily impacted watersheds. These measures have resulted in a reduction in long-term environmental degradation from forest roads.

Best practices related to resource roads include planning to construct a road where it avoids unstable terrain and sensitive ecosystems, using appropriate road design and construction standards, planning for deactivation before road construction, using proper maintenance during road use and completing appropriate deactivation during and after a road's life. These best practices greatly reduce the cumulative environmental impacts of resource roads. Reducing these impacts will also ensure less money is spent in the long-term by resource development companies and governments on environmental restoration to fix the impacts of poorly located, designed, built and maintained roads, and on the eventual deactivation of abandoned roads.

BC has a wealth of qualified registered professionals who include registered geoscientists, engineers, foresters and agronomists, who have world class expertise in all aspects of resource road design, construction, maintenance and deactivation.

ROAD DEACTIVATION REFERENCES

Significant road deactivation occurred in BC during the mid 1990s, particularly in mountainous areas where the impacts of roads were the largest. As limited deactivation had occurred prior to this time, there was a significant learning curve for professionals. Many training events, research trials, case studies and discussions papers were made available, and as a result most of the best deactivation references are from

that time period. Below is a collection of available relevant literature, standards, and techniques for road deactivation in BC.

Effectiveness Evaluation of Road Deactivation Techniques on the West Coast of Vancouver Island
www.for.gov.bc.ca/rco/research/wrp/en-020.pdf

Forest Investment Account. Activity Specific Standard - Permanent Road Deactivation, Landslide and Gully Rehabilitation
<http://www.for.gov.bc.ca/hth/engineering/FIA/PermanentRoadDeactivationLandslideandGullyRehabilitation.htm>.

Forest Practices Code. Forest Road Engineering Guidebook
<http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/Road/fre.pdf>.

Hillslope Restoration. Best Management Practices Handbook
http://www.for.gov.bc.ca/hth/engineering/documents/publications_guidebooks/publications_reports/bmp_hndbk_nov_01.pdf

Resource Road Rehabilitation Handbook.
www.env.gov.bc.ca/wld/documents/wrp/wrtc_3_part1.pdf

Technical Standards and Guidelines for Forest Road Deactivation/Restoration Activities.
www.clayoquot.org/.../Appendix%201,%20Road%20Deactivation%20Standards.pdf