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.

**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.

**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, and a greater movement of sediment that 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. Runoff 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 leads to acid rock drainage and leaching of metals from the road, both of which can significantly affect the receiving environment.

**Wildlife**

Resource roads can impact wildlife through mortality from traffic and impediments to migration corridors. The most significant impact is that 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.

**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 hypersensitive monitoring of resource development industries by ENGOs 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 deactivation**

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,
A team assesses a road for deactivation that crosses steep rocky terrain.

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**

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 British Columbia 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.

**Permanent deactivation**

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.

- Access roads are a necessary part of resource extraction. Road deactivation is a simple solution to minimize many of the effects of resource roads on the environment.
- Seasonal deactivation mitigates the effects of heavy precipitation on the road and subsequently reduces mass movement, erosion and sedimentation events.
- Semi permanent deactivation generally restores natural hillslope hydrology and significantly limits the potential for road induced mass movement events.
- Permanent deactivation generally removes all environmental effects, and can be used to generally remove all environmental liabilities and release the permit holder of responsibility for the road.

For more information on this topic, please contact Scott Weston at 604.669.0424 or sweston@hemmera.com. Scott Weston (M.Sc., P.Geo.) is a Project Director and Mining Sector Leader at Hemmera, a full service environmental consulting firm that supports clients through all aspects of mining resource development project lifecycle. Hemmera has a strong track record of supporting mining, power, oil and gas and other resource development firms in projects across Northern and Western Canada, and has handled some of the most complex environmental projects in these areas.