Hillslope Watershed Restoration Projects

Road Deactivation Effectiveness Monitoring

M. Leslie, W. Warttig and M. Wise

Project Description

The Lost Shoe – Thunderous Creek/Toquart Bay study areas are located on the west coast of Vancouver Island, ~30 km southeast of Tofino and 55 km southwest of Port Alberni, B.C. The study areas were logged primarily between 1975 and 1985. The Lost Shoe – Thunderous roads were deactivated in 1994, and the roads in Toquart Bay were deactivated in 1995. Objectives of road deactivation were to enhance forest site productivity along the road corridor and to decrease slope instability, thereby minimizing landslides from roads, soil erosion, and sedimentation along the road corridor.

Techniques for road deactivation for the Lost Shoe – Thunderous Creek Watershed and the Toquart Bay Watershed differed slightly. At Toquart Bay, trench drains and French drains, and therefore fewer cross-ditches, were used. At Lost Shoe – Thunderous Creek, more cross-ditches were used for hillslope drainage, and there was less soil sorting. In both projects, the road subgrade was decompacted prior to roadfill pullback. In addition, roadfill pullback material was sorted to establish improved subsurface water flow (also known as 'flow-through water management'), and all roads were hand-seeded and fertilized. These road deactivation variations, along with the storms that have affected the area since deactivation, provide a means to evaluate the effectiveness of the road deactivation activities.

The study sites were chosen to reflect the representative types of terrain, deactivation work, and revegetation work carried out. Most of the sites were located on open (unconfined) slopes. Only three of eleven sites were located on gully sidewall, gully headwall, or gully channel sites.

Criteria for Restoration Evaluation: Vegetative cover, road erosion, tree species, height, health, damage, and % ground cover.

Eleven sites were evaluated with respect to common visual field indicators of potential instability and erosion. Each study site consists of two vegetation-only circular plots within a 50 m road section (instability indicator). All existing road deactivations were recorded, along with any visual indicators of apparent and/or potential slope instability and soil erosion. At each study site, two revegetation plots were established, and data were measured/recorded in the plot area, typically 3.94 m radius.

Data for both road deactivation and site productivity were collected. For site productivity, the sites were evaluated for tree species, height, apparent health and damage, as well as ground coverage (understory) from grass or native plants.

For road deactivation, the sites were assessed for field indicators that are commonly associated with slope instability and erosion. Sites were also evaluated for overall effectiveness. The residual risk at the sites was also assessed with respect to safety, fish habitat and water quality, forest resources/property, and visual quality. For site productivity, the sites were evaluated for tree species, height, apparent health, and damage, as well as ground coverage (understory) from grass or native plants.

Restoration Responses

For the eleven sites, the road deactivation work was successful in decreasing slope instability and minimizing erosion due to the absence of field indicators at all but three sites. Statistical analysis of the plot data revealed most sites had a good cover of grass with abundant alder growth. Conifer regeneration was more sporadic, due to damage by deer, and perhaps inadequate soil sorting during pullback. Figure 1 summarizes variations in tree species and density for the three areas.

Examining the sites in terms of the degree of pullback also produced some interesting results (Figure 2). The

Site	Alder (sph*)	Cedar (sph)	Hemlock (sph)	Fir (sph)	Grass Cover
Toquart	872	179	26	0	Good (>67%)
Lost Shoe	4004	96	0	473	Fair (34 - 66%)
Thunderous	3076	0	0	649	Good to Fair
Average	2650	92	9	374	Good

* sph = stems per hectare

Figure 1. Tree species, density, and grass cover for Toquart, Lost Shoe, and Thunderous sites.

Hillslope Watershed Restoration Projects

Degree of Pullback	Alder (sph*)	Cedar (sph)	Hemlock (sph)	Fir (sph)	Grass Cover	Deer Browse (sph)
Light	0	0	0	615	Poor (<33%)	615
Medium	5229	0	0	718	Fair (34 - 66%)	461
Heavy	2840	183	0	298	Good (>67%)	205
* sph = stems per hectare						

Figure 2. Degree of pullback with tree density, grass cover, and deer browse.

reduced damage from deer browse in the heavy pullback areas may be because it is more difficult for the deer to access the seedlings. It is significant to note that both Lost Shoe and Thunderous sites had almost four times as many trees as Toquart; this may have been a result of the different types of grass seed mixtures used. The mixture was primarily sod forming in Toquart but a mixture of bunch and sod forming in Lost Shoe and Thunderous areas. Bunch grasses leave some exposed soil, allowing natural seed to get in.

Lessons Learned

I. Roadfill pullback appears to be an effective means of decreasing instability on slopes greater than 20 degrees.

II. Cross-ditches, trench drains and French drains are effective means of restoring hillslope drainage paths. Consider using trench drains and French drains in areas of heavy pullback to maximize the use of the stable road bench for pullback.

III. Field indicators, associated with potential landslides and erosion events for different terrain and climatic conditions, can be used to determine the effectiveness of the road deactivation.

IV. Use local and project-specific experience to select the study sites, in conjunction with senior personnel familiar with road deactivation techniques and monitoring studies.

V. Where possible, the site evaluation procedure should be made as straightforward as possible, using simple visual indicators where appropriate. A photographic record should be kept for the study sites, to provide a visual record of the site over time.

VI. Roadfill pullback, in addition to stabilizing the road prism, in many cases also provides an improved growth medium for revegetation.

VII. Consider alder a benefit in cases where the roadfill pullback material is likely to be deficient in soil nutrients. In these cases, alder can significantly increase the amount of nitrogen in the soil; these trees are often the first stage in pioneering by successional species.

VIII. Deer browse is a major problem when trying to re-establish conifers on deactivated roads, especially where deer have easy access. Sites where access is more difficult, such as heavy pullback with randomly scattered debris, appear to have far less deer browse.

IX. Grass seed deactivated roads with a balanced mixture of sod forming grasses, bunch grasses and nitrogen fixers that encourage the invasion by later successional species. As opposed to sod forming grasses, the bunch grasses allowed for small areas of soil under their leaf structure to remain exposed. These exposed areas are good sites for seed from later successional species to germinate.

X. Randomly distribute large woody debris and slash over deactivated road surface to make deer access as difficult as possible; this activity should reduce deer browse.

XI. Plant conifers among obstacles to make deer access as difficult as possible. ▲

Based on: Leslie, M., W. Warttig and M. Wise. 1999. Road Deactivation Effectiveness Monitoring: Lost Shoe – Thunderous Creek Watersheds and Toquart Bay Area, South Island Forest District. Prepared for Ministry of Forests, Nanaimo, B.C. 24 pp.