FPInnovations prepared this guide in order to provide forest workers with information on purpose built skid trails on steep slopes. FPInnovations worked in close cooperation with BC Timber Sales, Kootenay Business Area during the development of this guide. Reference material for this guide included The Construction and Rehabilitation of Purpose-Built Skid Trails on Steep Slopes: Discussion Paper; FPInnovations Technical Report No. 3 (March 2015) by C. Gillies.

Photo's courtesy of BCTS

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The construction and rehabilitation of purpose built skid trails on steep slopes

A PRACTICAL GUIDE FOR FOREST WORKERS

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REDUCING SITE IMPACTS

Constructing purpose-built skid trails to extract timber from steep slope harvest areas needs to be done with careful construction practices and with rehabilitation in mind. This guide will help forest workers choose appropriate construction and rehabilitation methods which aim to address soil protection and water management in an environmentally sensitive manner.

Best Practices and Sustainablity

The goal is to minimize soil disturbance, rehabilitate disturbed areas, and maintain / restore subsurface and surface drainage.

Forest workers need to choose harvesting strategies that minimize soil disturbance and maintain the biological and physical function of forest soils. Long-term soil productivity, hydrologic function, sediment generation, and the stability of current and rehabilitated trails are all key aspects to focus efforts towards, in order to sustain a healthy and productive forest ecosystem / productive forest land base.

Plan your work

Purpose-built skid trails have historically been used to aid ground-based harvesting on steep side slopes, specifically to accommodate the extraction of timber. The following should be considered during construction:

- Use appropriate type and size of equipment.
- The amount of newly constructed trails should be minimized.
- Use existing / historic trails when appropriate.
- Utilize professional reports when available (terrain stability assessment, hydrology, soil, etc.)
- Constructed trails should not result in any concentration or redirection of runoff. As well, avoid locating trails where there is a risk of damaging any existing drainage structures.
- Trails should be constructed with a plan for rehabilitation; trails should be fully rehabilitated upon completion of harvesting and prior to spring runoff (not left to overwinter).
- As a best management practice, plan to rehabilitate trails concurrent with harvesting such as when a logical unit / area is complete.

Trail Construction

Use small excavators

- Narrow trails will minimize disturbance
- Sort and place woody materials using the excavator's bucket and live thumb; the placement of woody material along the toe of the fill slope helps to reduce disturbances and provides a visual cue of the disturbance limits during rehabilitation.
- Use of an excavator during construction allows for the exposure and sorting of the forest floor and soil horizons. The aim of trail construction should include the separation of nutrient-rich productive surface soil and organic material from less productive subsoil, so that during trail rehabilitation, both layers can be retrieved and deposited in the original undisturbed order. This placement of soil back to the location it was removed from helps to maintain site productivity.
- Light weight machines help to reduce compaction.

Construct with deactivation in mind

- Planning ahead for rehabilitation by minimizing soil disturbance will reduce the rehabilitation efforts required.
- Stumps along the low side of a skid trail can be used to support fill and reduce the quantity of cut and fill required by holding the material at a steeper angle.
- The use of snow during winter construction helps to reduce the amount of cutbank excavation required to build the trail to the desired width, resulting in less disturbance. Use of the trail during frozen conditions will reduce soil disturbance due to reduced compaction and the reduced depth of decompaction required.
- Use of log bundles placed in a temporary stream crossings or seepage during trail construction:
  - Will deactivate more easily than excavating through solid frozen ground.
  - Will result in less soil disturbance resulting in a reduced erosion of the crossing site.
  - Provide a high level of protection to the channel and banks.

TRAIL REHABILITATION

GOAL

The goal is to improve site nutrient and soil moisture holding capacity (which provides a good substrate for seedling establishment and growth), restore soil structure, improve aeration porosity, control erosion, restore drainage patterns, and leave hummocky surface with variable micro-relief which incorporates large woody material.

Timing: Rehabilitate trail before spring runoff

A summer-built trail, which will not be rehabilitated before operations end and winter begins, will require seasonal deactivation to manage water. Waterbars and / or swales need to be constructed to shed water from the trail and prevent erosion.

A winter-built trail, which has a snow layer as part of the fill, will require careful planning in order to have all rehabilitation completed before snow melts. If the snow fill melts, the stability of the trail will be compromised.

PHASES OF REHABILITATION

1 **Site Preparation:** Remove long branches and stems before decompaction. No long branches or stems should be left in place during decompaction or recontouring (do not mix branches in with the soil). The stems could intercept and direct subsurface seepage resulting in concentrated flows causing erosion or instability.

2 **Decompaction:** Rip with teeth of excavator bucket to loosen soil below compacted surface. Rip deeper in the middle of the trail than the inside (uphill) track. This will provide an outsloping profile for the loosened soil. The outer (downhill) track will be decompacted during sidecast retrieval as part of recontouring.

3 **Recontouring:** Placement of soil material in reverse order – manage nutrient rich top soil to promote soil productivity. Place soil material to top of the cut bank.

4 **Water Management:** Construct waterbars to help ensure slope hydrology has been restored. Waterbars can be regularly spaced as well as positioned at obvious swale locations. Waterbars are constructed to collect flows and disperse water down slope. Waterbar spacing will prevent concentrated flows from forming.

Outsloped swales or rolling grades constructed along the rehabilitated trail will provide water management benefits similar to those of waterbars.

5 **Surface Roughness:** The placement of large woody debris over the recontoured surface will help provide microsites more suitable for tree seedling growth; woody debris provides both shade and associated moisture retention.

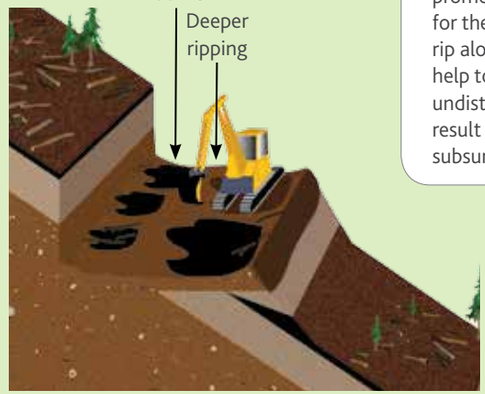
Keep the surface rough and irregular to prevent erosion. The use of large woody debris will aid in preventing rainfall from eroding bare soils.

6 **Planting:** Tree seedlings provide the growing stock of timber for future forest management.

The phases of decompaction and the retrieval of soil during recontouring help with seedling establishment and growth. Large woody debris should not be spread too thick otherwise it would interfere with the planting areas for tree seedlings.

TRAIL DECOMPACTION

1 Decompaction should be done by ripping the trail surface with the teeth of an excavator-mounted bucket. A ripping depth of 10 to 30 cm is easily achieved.



2 The mid track position should be ripped deeper than the inner track (upslope) position. This will promote an outsloping profile for the loosened soil. The shallow rip along the inner track will also help to prevent ripping into the undisturbed subsoil which could result in intercepting any functioning subsurface drainage.

3 The outer track location will be decompacted during sidecast retrieval and the placement of this material during recontouring.

4 Further spreading of the ripped material can be done with the bucket of the excavator which also will loosen the **newly ripped surface material**

SEASONAL CONSIDERATIONS

- When full rehabilitation of a summer-built trail needs to be suspended due to the onset of winter and frozen conditions, partial deactivation is required to control the water and prevent erosion along the trail network. Waterbars must be constructed along the trail before abandoning the trail network for the winter. Full deactivation can start again once the weather permits, allowing decompaction and recontouring to be completed. Rehabilitating trails concurrent with the completion of a logical unit / area will help to reduce the need to suspend activities.
- Deactivation of a winter constructed trail needs to be completed during the winter and before the snow melts. The snow placed as fill is providing support to the trail. If the snow melts the width of the trail will be reduced and the sorted soil layers will be compromised. A reduced trail width would not provide the needed trail width or stability for an excavator to rehabilitate the trail.
- During winter recontouring, retrieved material placed along the trail will settle as the snow melts, therefore material should be placed higher to compensate for this settlement.