Pilot Audit of Soil Conservation in the Columbia Forest District

FPB/ARC/102

August 2008

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Executive Summary

This soil conservation pilot audit, initiated in July 2006, took place in the Golden Timber Supply Area of the Columbia Forest District (see map on page 4).

Three auditees, Wood River Forest Inc, subsequently called Downie Timber Ltd. (Downie), Louisiana-Pacific Canada Ltd. (LP) and the Okanagan-Columbia business area of the British Columbia Timber Sales Program (BCTS),[1] were audited.

The audit looked at practices conducted between July 1, 2004, and July 31, 2006, focusing on their effectiveness in managing forest soil conservation. The audit scope included activities and obligations associated with: timber harvesting; road construction, maintenance, and deactivation; and, bridge construction and maintenance, as well as a review of site-level planning specifically associated with these activities. In total, the Board examined harvesting of 67 cutblocks; approximately 270 kilometres of road work or obligations; and, operational planning specific to harvesting and roads.

The Board used three criteria to assess forest practices, the results of those practices, and their relation to soil conservation.

1. Productivity and hydrological function losses to forest soils from road, trail, and landing construction activities are minimized
2. Productivity and hydrological function losses to forest soils from harvesting activities are minimized
3. Forest planning adequately supports the conservation of forest soil.

The criteria also address the necessary elements of auditees' management systems, such as planning and monitoring, which would contribute to successful results. This includes assessing auditees' awareness of forest soil impacts from their operations, and their management of those risks. For each criterion, a number of indicators were used to assess the overall results of the activities.

The audit found that the auditees have a good understanding of the legislation, and that their operations were conducted in such a manner that planning and practices were not at issue. As the licensees or BCTS were not operating under an approved forest stewardship plan (FSP), the government objective for soils was not assessed; however, soil conservation was assessed under specific requirements existing under the transitional provisions of the Forest and Range Practices Act (FRPA), which essentially state that Code requirements are to be adhered to for forest planning and practices.

[1] The BC Timber Sales Program (BCTS) has a unique role where the overall forest planning and harvesting activities are split between BCTS and their timber sale licence holders. In this audit, we have tried to differentiate the responsibilities and our findings between BCTS and BCTS timber sale licence holders.

Downie and LP conducted forest planning and practices that are in compliance with soil conservation requirements of the *Forest Practices Code of British Columbia Act* (the Code)[i] and have also been effective in minimizing impacts to forest soils.

BCTS conducted forest planning that is in compliance with soil conservation requirements of the Code and has also been effective in minimizing impacts to forest soils.

Forest practices conducted by BCTS timber sale licence holders are substantially in compliance with soil conservation requirements of the Code and are primarily effective in forest soil conservation.

However, while BCTS timber sale licence holders' practices were substantially effective in minimizing impacts to forest soils, the practices of timber sale licence (TSL) A75103 had a significant impact on soil conservation related to road and harvest activities.

Upon revisiting this area in July 2007, the Board noted substantial rehabilitation and reclamation work had been completed to reduce any future impact to soils from these initial activities, including full road rehabilitation, trail decommissioning, tree planting, and grass seeding.

Overall, the auditees identified and developed appropriate plans and implemented those plans through good practices to ensure that impacts from their on-the-ground activities were kept to a minimum. Other than the timber sale licence area noted above, the review of 35 harvest cutblocks and 269 kilometres of road construction and maintenance showed impacts to soil conservation were at a minimum.

Kinbasket Lake (within the audit area).

This audit is one of several pilot audits designed to assess forest practices in relation to key values established by government under FRPA and it is the Board's second audit targeting soil conservation. The Board's first soil conservation audit was conducted in 2003 in the Mackenzie Forest District.

Throughout this audit, the Board continued to test methodologies to assess how well forest practices on the ground are meeting government objectives.

Board Commentary

The Board is encouraged that overall, soil conservation management was conducted to a high standard for compliance, as well as effectiveness, within the Golden Timber Supply Area of the Columbia Forest District.

It is important to note that compliance and effectiveness are two separate concepts; while compliance means that a practice adheres to legislation, effectiveness means that a practice achieves its intended goal. For example, the legal maximum amount of permanent access structures (PAS) on a site is seven percent. If a licensee operated with 6.5 percent PAS, yet only three percent PAS was required to operate on that specific cutblock, then that practice, while in compliance, would not be considered effective under criterion #1 (see criterion in Executive Summary).

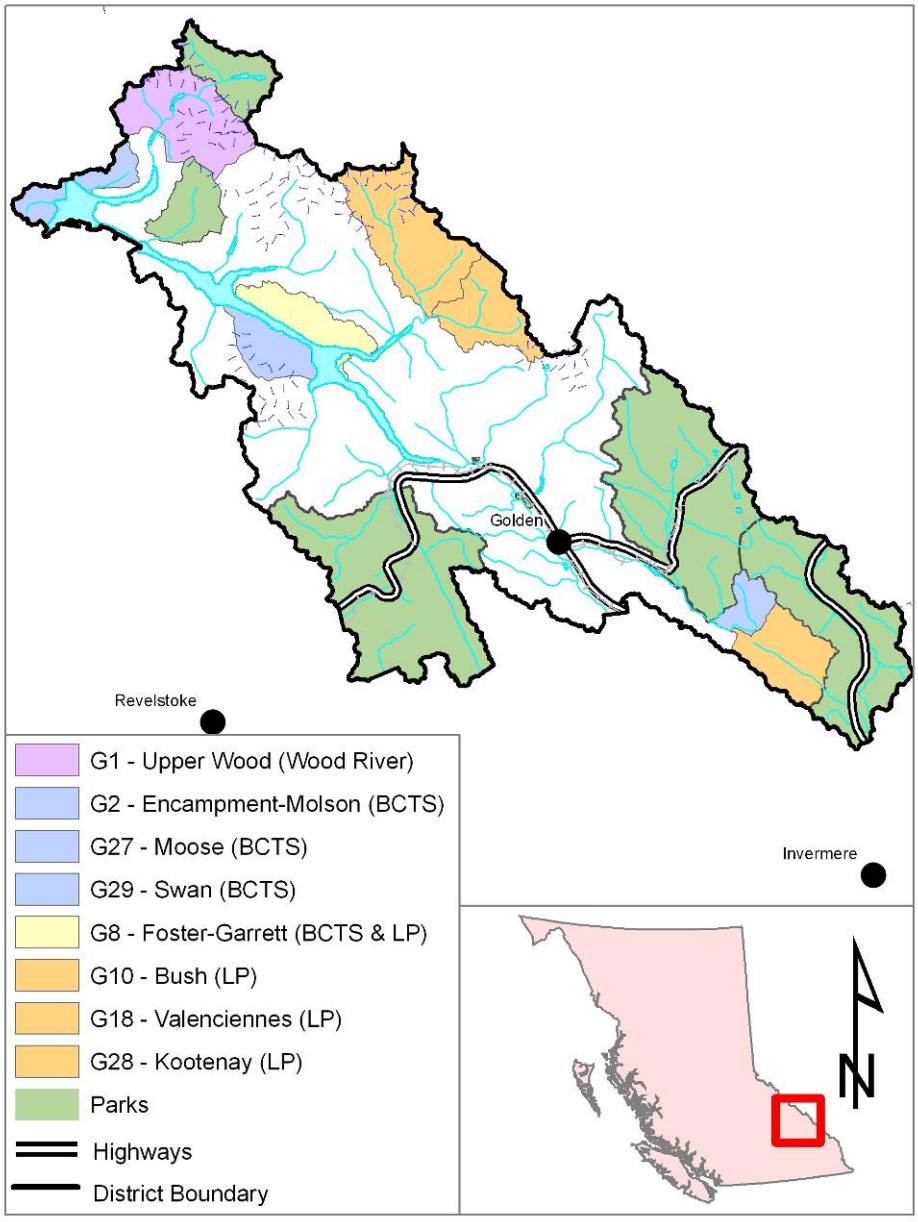
The Board is pleased to note that Downie, LP, BCTS as well as seven BCTS timber sale licence (TSL) holders are conducting forest planning and practices that are compliant with the soil conservation requirements of the *Forest Practices Code of British Columbia Act* (the Code) as well as effective, given the criterion for soil conservation. The Board commends the auditees for their efforts to be both compliant as well as effective in their management of forest soils.

The Board notes that, for the one BCTS timber sale where forest practices had a significant impact on soil conservation, substantial rehabilitation and reclamation work was conducted subsequent to the initial field audit.

The Board encourages BCTS to monitor TSL holder operations, especially new entrants to the program, to help ensure that future forest practices are consistent with legal requirements, thus promoting effective soil conservation.

In order for Board auditors to assess the rehabilitation and reclamation work that was conducted on TSL A75103 in the fall of 2006, auditors revisited the site in July 2007. This additional field visit significantly delayed the public release of this report, and the Board regrets the length of time it has taken to complete this pilot audit.

Audit of Soil Conservation
Columbia Forest District



Introduction

Soil is an essential component, which contributes to the function and productive capacity of forest ecosystems, and is one of the criteria, along with water, used by the Canadian Council of Forest Ministers (CCFM) to evaluate sustainable forest management in Canada.

The CCFM also state that directly assessing the impacts of forestry practices on soil quality and quantity across all of Canada's forests can be difficult and expensive. They feel that indicators that assess compliance (core indicators) with locally applicable soil disturbance standards and road construction standards can provide an effective measure, providing the standards are periodically updated and supported by on-going long term research and best available scientific knowledge (Defining Sustainable Forest Management in Canada Criteria & Indicators, 2003).[2]

Under the *Forest and Range Practices Act* (FRPA), the BC government in has specifically identified soil as one of its 11 resource values and, under FRPA's associated regulations, it has set an objective for soils.

Legislation

In FRPA, under the *Forest Planning and Practices Regulation* (FPPR), an objective for soils is set in section 5:

> "The objective set by government for soils is, without unduly reducing the supply of timber from British Columbia's forests, to conserve the productivity and the hydrologic function of soils."

Although this government objective for soils was not formally in place during the audit, as the auditees were not operating under an approved Forest Stewardship Plan (FSP), it was considered within the evaluation of the effectiveness criteria. Under the transitional provisions of FRPA, planning activities and on-the-ground operations under a forest development plan continue to be governed by the Code, which is the case in this audit.

To provide clarity about this objective, the Ministry of Forests and Range Forest Resource Evaluation Program (FREP)[3] website[4] states that the objectives of soil conservation are:

- To limit the extent of soil disturbance caused by harvesting and silviculture activities that negatively affect the physical, chemical, and biological properties of the soil.

[2] To view this document – go to this link: http://www.ccfm.org/ci/CI_Booklet_e.pdf.

[2] The Forest and Range Evaluation Program, also known as FREP, is a long term commitment by government to determine if forest and range policies and practices in British Columbia are achieving government's objectives for FRPA resource values and to implement continuous improvement of forest management. The Ministry of Forests and Range runs the program with assistance from other agencies.

[3] http://www.for.gov.bc.ca/hfp/frep/values/soils.htm

- To conduct forest practices in a manner that addresses the inherent sensitivity of a site to soil-degrading processes to minimize detrimental soil disturbance, landslides, soil erosion, and sediment delivery to streams.
- To limit the area of productive forest land that is occupied by permanent roads, landings, pits, quarries, and trails to the minimum necessary to safely conduct forest practices.

In summary, government objectives for soil conservation under FRPA are to:

1. limit the extent of soil disturbance;
2. address the inherent sensitivity of a site; and
3. limit the loss of productive forest land.

These three aspects also link with the three criteria chosen for this pilot audit.

The Audit Area

As part of the Forest Practices Board's 2006 audit program, the Board randomly selected the Columbia Forest District as the site of this, the Board's second, soil conservation pilot audit.

The Columbia Forest District covers a large geographical area (approximately 1,452,000 hectares) and various Crown land tenure holders include tree farm licences, forest licences, woodlots, and timber sales, the latter being administered by the BC Timber Sales program (BCTS).

As the Board has previously audited several tenure holders within the Columbia Timber Supply Area (TSA) portion of the district, the auditors selected the geographic area representing the Golden TSA portion of the district for audit.

The auditors then selected landscape units based on soil conservation related factors, including whether or not the area had experienced harvesting, road construction, maintenance, or any deactivation activities over the previous two years (refer to map on page 4).

The landscape units were originally determined through the land-use planning process and are identified in the Kootenay-Boundary Land Use Plan (KBLUP).

Landscape units chosen for this audit were the Upper Wood (G1), Encampment-Molson (G2), Lower Wood (G3), Foster-Garrett (G8), Bush (G10), Valenciennes (G18), Moose (G27), Kootenay (G28), and Swan (G29).

Landscape Units G8, G10, and G18 are part of the summer operations due to snow pack accumulations in the winter season. Harvest activities used are a combination of helicopter, cable, and ground-based methods. Slope and access are determining factors for the appropriate harvest method in these landscape units.

Landscape Units G27 and G28 feature gentler terrain and a reduced snow pack, which allows for a winter operating season and the use of ground-based harvest methods.

Landscape Units G1 and G2 are operable in both summer and winter, though these landscape units bring many challenges including steep and difficult terrain, poor weather, and challenging operational conditions (see Appendix A for more detail on landscape units).

Audit Scope and Approach

Criteria Development

As this is the second pilot soil conservation audit, two criteria developed from the initial audit (Mackenzie Forest District, 2003[ii]) continue to be used. The indicators associated with these criteria were initially developed by the Ministry of Forests and Range (MFR) (refer to Appendix C for details). The third criterion was developed by the Board and reviewed by staff from the Ministry of Forests and Range as well as BCTS and the forest licensees who participated in the audit. All three criteria were designed to address soil conservation with a focus on forest planning and practices.

Criteria #1 and #2 relate to forest practices while criterion #3 relates to forest planning.

How criteria #1 and #2 and associated indicators link with FRPA:

Criterion #1: Productivity and hydrological function losses to forest soils from road, trail, and landing construction activities are minimized.

Criterion #2: Productivity and hydrological function losses to forest soils from harvesting activities are minimized.

Under FRPA, soil disturbance, which can directly affect productivity and hydrological function, can be classified into two distinct types:

- areas occupied by permanent access structures (PAS), which is linked to criterion #1; and
- areas occupied by soil disturbance in the net area to be reforested (NAR), which is linked to criterion #2.

Permanent access structures (PAS) are the roads, landings, pits, and any trail that is required for an extended period of time or constructed in such ground conditions (i.e., rock) that establishing a future commercially viable crop is diminished or non-existent. Soil disturbance limits for PAS are set at a seven percent maximum (based on area) and can only be exceeded with an appropriate rationale acceptable to the statutory decision maker. In these cases, it is a direct result of difficult access constraints that usually require a significant amount of road to develop the cutblock.

Indicators used to assess against criterion #1 are:

- The area occupied by unproductive soil as a result of permanent access structures is minimized given the site conditions, harvest constraints and equipment utilized
- Temporary access is utilized where appropriate, and adequately rehabilitated and regenerated
- There is minimal level of altered natural drainage and no significant erosion, or risk of significant erosion, caused by roads, trails and landings
- There is an absence of unproductive soil in, or adjacent to, the net area to be reforested as a result of landslides or gully erosion caused by road construction, maintenance or deactivation.

Soil disturbance in NAR is the area occupied by corduroyed forwarding trails, excavated or bladed trails, compacted areas, areas of dispersed disturbance, and un-rehabilitated temporary access structures within the cutblock as a result of harvesting activities.

Depending on soil sensitivity hazard ratings (low, moderate, high) to soil compaction, surface soil erosion, and soil displacement, licensees identify operational activities, which include determining the appropriate harvest method. An example would be, in a high compaction area, the licensee will restrict ground-based harvest operations to either frozen ground conditions, the use of low ground pressure equipment, or the use of designated trails.

As with PAS, there are limits to the allowable percentage of NAR, which includes any temporary access structures utilized for harvest activities. The limit is directly related to the soil sensitivities determined for the site, so the higher the identified hazard, the lower the allowable disturbance limits.

Another consideration in disturbance to NAR is stand-tending activities that occur post harvest to address silviculture requirements, like de-stumping a site to address a disease such as root rot. These activities involve some method of mechanical treatment.

Rehabilitation is required for temporary access structures, and the requirement applies to certain types of soil disturbance, unless exempted by a statutory decision maker.

Indicators used to assess against criterion #2 are:

- There is an absence of unproductive soil in, or adjacent to, the net area to be reforested as a result of landslides or gully erosion caused by harvesting
- There is minimal disruption of natural drainage patterns in, or adjacent to, the net area to be reforested
- The level of dispersed and concentrated soil disturbance in the net area to be reforested is minimized given the site conditions, harvest constraints and equipment utilized

- Areas of excessive soil disturbance have been appropriately rehabilitated and regenerated
- Organic matter such as coarse, woody debris (CWD) is retained on site.

How criterion #3 and associated indicators links with FRPA:

Criterion #3: Forest planning adequately supports the conservation of forest soil
This criterion focuses on the planning aspects of forestry operations, and it consists of a number of sub-criteria and associated indicators (refer to Appendix D for details). This criterion was developed by the Board, and is linked more to effectiveness looking forward as practices are carried out under FRPA. As the auditees were not operating under an approved FSP, the approved FDP for the audit period, and company systems, were reviewed (i.e., forest certification schemes, environmental management systems, etc.).

In summary, these criteria were developed being mindful of the following questions:

- Do access structures minimize productive soil loss and impacts to the hydrologic function of soils? (permanent access structures)
- Are forest practices successful in preventing levels of site disturbance that are detrimental to soil productivity and hydrologic function? (disturbance in NAR)
- Are forestry practices successful in preventing the increased likelihood, or occurrence of, landslides, avalanches, gully processes or fan destabilization? If so, has there been, or could there be, a material adverse effect on the value of soil? (PAS and NAR)

The Auditees

The focus of this audit is on the effect of forest planning and practices on forest soils in the selected landscape units. The auditees are tenure holders who operated in the landscape units between July 1, 2004, and July 31, 2006. There are three:

1. Louisiana-Pacific Canada Ltd. (LP): Conducted harvesting; road construction, deactivation and maintenance; and silviculture activities within the audit area as these activities related to soil conservation.
2. Wood River Forest Inc., which, subsequent to the field audit, changed its name to Downie Timber Ltd. (Downie): Conducted harvesting; road construction, deactivation and maintenance; and silviculture activities within the audit area as these activities related to soil conservation.
3. Okanagan-Columbia business area of the BC Timber Sales Program (BCTS): Operated in a number of landscape units within the Golden TSA, and each timber sale may represent a different licence holder. Activities varied depending on the status of the timber sale at the time of the field visit.
    - BCTS, through the timber sale manager and staff, conducted the planning and development aspects of the operations, including: preparing FSPs (previously FDPs) and

site plans; some road construction and deactivation (primarily outside of cutblocks); as well as meeting silviculture obligations. During the course of this audit, BCTS was responsible for the planning component of soil conservation (Criteria #3).

- Timber sale licence (TSL) holders have a number of statutory and contractual responsibilities, as reflected in their timber sale licence, road permits and road use permits. TSL holders are responsible to carry out all harvesting operations, and road construction, deactivation and maintenance within the timber sale licence in compliance with provincial legislation and regulations. Within this audit, the TSL holders were responsible for all on-the-ground activity within the cutblocks in their awarded timber sales area. During the course of this audit, there were eight different TSL holders responsible for the road and harvesting components of soil conservation (Criteria #1 and #2).

Table 1 shows activities conducted during the audit period.

Table 1 - Summary of auditee planning and practices subject to audit

Auditee	Operations Under an Approved FSP or FDP	Harvest Population	Harvest Sample	Harvest In-Block Roads km (PAS)	Road Construction / Maintenance / Deactivation (km)		
Louisiana-Pacific Canada Ltd.	FDP	48	16	13.3	34.7	70.0	0.0
Downie Timber Ltd.	FDP	6	6	4.8	1.7	45.0	0.0
BC Timber Sales – Okanagan-Columbia	FDP	13	13	11.0	23.7	65.0	0.0
Total		**67 35**	**29.1**		**60.1**	**180.0**	**0.0***

* There is no permanent deactivation proposed for any permanent access structures (PAS) and the majority of main access roads are forest service roads (FSR) roads that are the responsibility of the district (as they are maintained for recreational access).
As only one block within the audit period had mechanical site preparation conducted, the Board auditors felt that it would not provide a basis for an assessment of this one activity.

Audit Team

The audit team consisted of:

- Robert Volkman, RFT, CEA (SFM)
- Bob Kopp, RPF
- Doug VanDine, PEng, PGeo
- Rick Trowbridge, RP Bio, Soil Scientist
- Chris Mosher, CA, CEA (SFM)

In undertaking this pilot audit the audit team carried out the following main steps. The *Detailed Findings* section of this report describes the findings from this work.

Interviews

Before fieldwork commenced, and after field work was completed, Board auditors conducted interviews with agencies, BCTS and licensees involved in forest soil conservation. These interviews were the primary source of information about how government agencies manage soil and how BCTS and licensees manage their responsibilities to conserve forest soil. Auditors interviewed representatives from the three auditees, LP, Downie and BCTS, as well as district staff from MFR in Revelstoke.

Compliance Assessment of Planning and Practices

The audit assessed forest planning and practices related to forest soil conservation that auditees conducted between July 1, 2004, and July 28, 2006. Auditors reviewed documents and examined field practices to assess compliance with soil-related Code obligations. Examples of planning and practices examined during the audit are:

- low pressure ground-based equipment utilized to minimize compaction
- operating in frozen ground conditions as per plan
- rehabilitation of temporary access structures as per plan
- road construction following layout and design to minimize risk to landslides or increase to permanent footprint on landscape
- utilization of terrain specialists in areas of instability and incorporating recommendations into activities
- adequate drainage structures to ensure natural drainage patterns maintained
- road maintenance practices minimized erosion of running surface
- absence of landslide activity directly related to forestry activity.

Field Assessment of Practices (Effectiveness)

The audit used a myriad of tools to assess the forest planning and practices with respect to effectiveness. For practices, the audit team incorporated assessment methodology developed by the Forest and Range Evaluation Program (FREP), tools developed from the MacKenzie Forest District pilot audit, and the FPC Soil Conservation Surveys guidebook.

For planning, a review of the commitments established in the FDP and a review of any forest certification scheme or environmental management system (EMS) did provide the necessary background information to measure effectiveness. Interviews with auditee staff were also critical in this process.

Although none of the auditees were operating under an approved FSP at the time of the audit, the auditors did review those draft FSP's that were available. This review did allow the auditors to better understand the intentions of the auditee in relation to the FRPA soils objective.

Audit Findings

Compliance

Compliance at the time the Board completed its fieldwork consisted of compliance with Forest Practices Code provisions, which were continued under FRPA as of January 2004. All activities subject to audit were conducted under Code forest development plans (FDPs)[iii] and amendments. Transitional provisions of FRPA require that these operations comply with the Code.[iv] There were no forest stewardship plans (FSPs)[v] in effect within the audit area during the audit period.

Downie Timber Ltd.

The audit found that the forest planning and practices undertaken by Downie complied in all significant respects with the Code's requirements for soil conservation.

Louisiana-Pacific Canada Ltd.

The audit found that the forest planning and practices undertaken by LP complied in all significant respects with the Code's requirements for soil conservation.

BCTS Planning

The audit found that the forest planning undertaken by the Okanagan-Columbia business area of BCTS complied in all significant respects with the Code's requirements for soil conservation.

BCTS Timber Sale Licence Holders

The audit found that, with one exception, the forest planning and practices undertaken by the timber sale licence holders complied in all significant respects with the Code's requirements for soil conservation. The exception was a finding of significant non-compliance relating to road and harvesting work in the Smith Creek fire area, conducted by the holder of TSL A75103.

At the time of the audit, permanent roads as set out in the survey and design plan, for three blocks were built to a temporary status. A general lack of road maintenance and deactivation resulted in increased risks to soil erosion.

Also, harvesting activities did not meet all Code requirements (non-compliance pertained to *Forest Practices Code Act of BC, section 47(3.1) and section 67 (1)*; *Operational and Site Planning Regulation Part 2 – Administration, Section 7.1 (1)(a); Timber Harvesting and Silviculture Practices Regulation Part 3 – Timber Harvesting and Related Forest Practices, Section 27 (1))*.

Three of the four blocks were designed for cable harvest in specific sections due to slope or terrain concerns, and the timber sale licence holder used ground-based systems in these areas. At the time of the audit, auditors determined through ground measurements and ocular estimates that soil disturbance limits in the net area to be reforested were exceeded in these three blocks. The contributing factor for this excessive soil disturbance is the numerous skid trails built.

It is also the opinion of the auditors that, for some of the constructed trails, based on the trail locations and perpendicular alignment with the contours, there is not a high likelihood of successful rehabilitation on some portions of these trails. However, through rehabilitation of some of the other trails, these three cutblocks could be brought back to within prescribed soil disturbance limits.

Overall, the timber sale licence holder was not successful in ensuring soil conservation with respect to Code requirements.

Effectiveness

Road Construction and Maintenance

Permanent and Temporary Access Structures

Criterion #1

Productivity and hydrologic function losses to forest soils from road, trail and landing construction activities are minimized.

Indicators

- **The area occupied by unproductive soil as a result of permanent access construction is minimized given the site conditions, harvest constraints and equipment utilized.**
- **Temporary access is utilized where appropriate, and adequately rehabilitated and regenerated.**

Permanent Access Structures (PAS)

Main haul roads, spur roads, landings, gravel pits, borrow pits, quarries, and permanent logging trails used in the development of a cutblock fall into the category of permanent access structures (PAS). The requirements of a PAS are (i) a structure must be in use for a long period of time and, that, (ii) even if rehabilitated, a commercial crop cannot be established on the area occupied by the structure in the same time frame as an adjacent unoccupied area. In addition, the structure may be constructed in parent soil or rock, or and in the case of a road may be ballasted with a material that that makes it unsuitable for rehabilitation.

The landscape units north of Golden are dominated by Kinbasket Lake. Kinbasket Lake is the reservoir located in the Columbia River Valley behind the Mica Dam. The valley separates the Selkirk Mountains to the west from the Rocky Mountains to the east. Kinbasket Lake is bordered by steep lower to mid-slopes and narrow and steep tributary valleys, and is a significant landscape feature that affects overall access. In addition to the steep slopes, the geology consists of highly fractured and faulted, metamorphosed sedimentary bedrock, overlain by glacially-derived deposits. The combination of the steep slopes and the geology is conducive to landslides, though

throughout the areas reviewed, there was no evidence of landslide activity, even though most roads were constructed in difficult terrain.

These factors could result in a significant increase in the permanent access to develop harvesting proposals. However, permanent access construction done in conjunction with solid planning, considerations for future access, and quality controlled practices can result in a reduced footprint wherever possible.

Another lower impact option is the use of helicopter logging to reduce permanent access, however, in general the current value of these timber stands did not warrant the use of helicopters.

The audit measured access within 35 cutblocks, including spurs and landings, in relation to the cutblocks (29 kilometres). It was determined during the review of all sample blocks that licensees and BCTS timber sale licence holders minimized the amount of PAS.

On average, in the cutblocks examined, the level of permanent access was 4.6 percent of the cutblock area. This figure is lower than the baseline average of seven percent allowed under section 30 of the *Timber Harvesting and Silviculture Practices Regulation.* It is also below the average of 6.1 percent calculated for the Golden TSA during a five-year period (1999 to 2004), which was identified as and a trend that was expected to continue (*Rationale for Allowable Annual Cut*, Golden TSA June 2004). This is a reflection of the licensee and TSL holders' significant efforts to control PAS in areas where terrain is difficult.

Two of the 35 cutblocks exceeded the prescribed PAS (by 0.7 and 2.9 percent) stated in the approved silviculture prescription or site plan. However, the road development in the first cutblock was shared with an adjacent cutblock. The analysis of PAS with the combined area of the adjacent cutblock, including the additional road development within the adjacent cutblock, showed the actual PAS would be well under the prescribed PAS. The cutblock was active at the time of the audit, so rehabilitation was not a consideration. The area that would require rehabilitation to bring the PAS in line with prescription was 0.1 hectare. Also, the second cutblock had the road configuration revised and the actual increase in the PAS was the result of the deactivation of the road. As this road was fully deactivated, the Board determined that the increase in PAS had been addressed.

During the course of the audit, auditors noted several good practices. Here are some positive examples of PAS built to minimize effects on soil. The photo on the left shows road construction techniques that reduced the overall road width (no ditchline established, stable sidecast placement downslope, adhering to road layout and design). These techniques work because permanent site loss is reduced. The photo on the right shows armouring of a culvert outlet that will reduce soil erosion (note evidence of grass-seeding, another erosion control measure used by auditees).

In conclusion, licensees and TSL holders met all requirements of criterion #1 when it comes to effectiveness with PAS with the exception of TSL A75103.

Temporary Access Structures (TAS) – roads, landings, pits, or quarries

Temporary access structures (TAS) include roads, landings, pits or quarries that are identified in the net area to be reforested (NAR) and are temporary in nature. They provide additional access in the cutblock. These structures are included in the overall soil disturbance allowances within a cutblock.

As described under PAS, the *Timber Harvesting and Silviculture Practices Regulation,* section 31, sets out the soil disturbance limits for a cutblock that are acceptable. Allowable soil disturbance limits for TAS are five percent of the cutblock area where sensitive soils are present, and 10 percent where sensitive soils are absent.

In the 35 cutblocks reviewed by the Board auditors, all access structures (typically roads) identified as temporary within a silviculture prescription or site plan had rehabilitation completed. The rehabilitation was generally suitable to restore long-term productivity of the soils in those areas where these structures were utilized to reduce soil impacts.

Here are two positive examples of TAS built to minimize effects on soil. Both photos show roads that were built in the cutblock to facilitate harvesting and provide road access. When harvest activities were complete, the roads were debuilt and the site was returned to the productive forest land-base. Grass-seeding and planting of trees completed the rehabilitation process.

Temporary Access Structures (TAS) – temporary landings and excavated or bladed trails

Sections 20.1 through to 23.2, 28, and 29 of the *Timber Harvesting and Silviculture Practices Regulation* require rehabilitation of temporary landings and excavated or bladed trails. During the audit period, no temporary landings were constructed. All excavated or bladed trails constructed during the audit period were rehabilitated in accordance with the requirements. The auditors confirmed that the rehabilitation measures undertaken were generally suitable to restore long-term productivity in those areas where excavated or bladed trails were built.

A positive example of trails appropriately decompacted, re-contoured where bladed, and covered with organic matter. Sometimes the slash was very thick as a result of moving all slash onto trails, but planters managed to find plantable spots. Stream crossings were clean and re-established well. This is an example of effective practices.

Natural Drainage Patterns

Criterion #1 (continued)

Productivity and hydrologic function losses to forest soils from road, trail and landing construction activities are minimized.

Indicators

- **There is a minimal level of altered natural drainage and no significant erosion, or risk of significant erosion, caused by roads, trails and landings.**
- **There is an absence of unproductive soil in the net area to be reforested as a result of landslides or gully erosion caused by harvesting or road construction, maintenance or deactivation.**

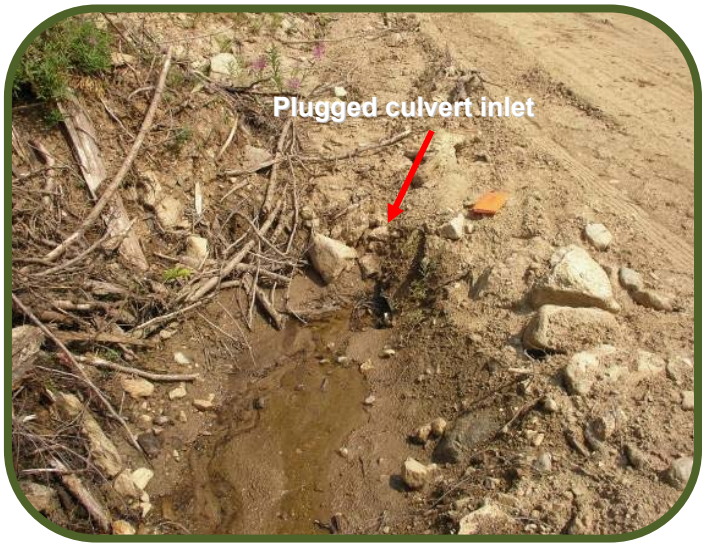
The maintenance of drainage patterns is one of the critical operational requirements when it comes to road or trail construction. When natural drainage patterns are disrupted or altered, the result can be detrimental to soil conservation. In numerous studies and research that has been done regarding landslide activity, altered drainage patterns has been identified as a primary cause of landslides in several cases.

NOTE – These photos are not part of the audit, however they are provided as an example of the importance of maintaining natural drainage patterns. The main cause of this debris slide was a plugged culvert that resulted in diverting water down a ditchline. Eventually the increased flow jumped onto the road surface, eroded the outside shoulder of fill material and propagated the debris slide.

Section 9 under the *Forest Road Regulation* outlines a number of requirements specific to road construction and maintaining natural drainage patterns. These include ensuring that:

- the drainage system prevents ponding of water where road stability may be compromised;
- any stream and cross-drain culverts are structurally sound, functional, and stable; and
- the drainage system prevents water from being directed onto potentially unstable slopes or soil material.

The Board auditors examined a total of 40 road sections, which represented 60 kilometres of road construction, during the audit period. There was no evidence of landslides or gully failures in the road sections examined by the auditors. Natural drainage patterns were recognized and appropriate works were in place to maintain these drainage patterns. The one exception is that for timber sale licence A75103, road construction activities did not maintain natural drainage patterns.



An example of a plugged culvert.

Road maintenance is another activity that, if not carried out appropriately, can result in natural drainage patterns being altered or disrupted. Section 13 of the *Forest Road Regulation* requires that roads be maintained such that structures that are an integral part of the drainage system are functional. The auditors examined 180 kilometres of road maintenance and found that natural drainage patterns were being maintained.

No roads falling under the category of PAS were deactivated during the audit period, therefore the Board was unable to audit deactivation activities and obligations.

Road Construction and Road Maintenance Findings

Downie Timber Ltd.

The audit found that the road construction and maintenance activities undertaken by Downie were effective in minimizing the alteration of natural drainage patterns.

Downie constructed five kilometres of in-block roads, two kilometres of road access development, and were responsible for road maintenance on 45 kilometres of road within the landscape unit.

Louisiana-Pacific Canada Ltd.

The audit found that the road construction and maintenance activities undertaken by LP were effective in minimizing the alteration of natural drainage patterns.

LP constructed 13 kilometres of in-block roads, 35 kilometres of road access development, and they were responsible for road maintenance on 70 kilometres of road within their landscape unit operating areas.

BCTS Timber Sale Licence Holders

The audit found that, with one exception, the road construction and maintenance activities undertaken by the eight timber sale licence holders were effective in minimizing the alteration of natural drainage patterns. The one exception is that for timber sale licence A75103, road construction and maintenance activities were not very effective in soil conservation.

Timber sale licence holders constructed 11 kilometres of in-block roads, 24 kilometres of road access development, and they were responsible for road maintenance on 65 kilometres of road within their landscape unit operating areas.

In the case of TSL A75103, the practices were ineffective, as most drainage structures that were installed were not functioning properly, i.e., plugged inlets or outlets; ditch lines not established; improper sizing and frequency of drainage structures recommended to be installed; and interrupted drainage flow (water flowing on the running surface of roads). All of these practices could or have resulted in the alteration of the natural drainage patterns.

Harvesting

Criterion #2

Productivity and hydrologic function losses to forest soils from harvesting activities are minimized.

Indicators

- **There is minimal disruption of natural drainage patterns in the net area to be reforested.**

There was minimal disruption to natural drainage patterns in the net area to be reforested in all 35 cutblocks reviewed by the auditors.

Indicators

- **The level of dispersed and concentrated soil disturbance in the net area to be reforested is minimized given the site conditions, harvest constraints and equipment utilized.**
- **Areas of excessive soil disturbance have been appropriately rehabilitated and regenerated.**
- **Organic matter, or course woody debris (CWD), is retained on site.**

Soil disturbance in the net area to be forested is regulated under sections 31 to 33 of the *Timber Harvesting and Silviculture Practices Regulation*.

Section 31 sets the limits for allowable soil disturbance in NAR, and is based on soil sensitivity in combination with the increased hazards associated with soil compaction, erosion, and displacement. Under this section, sensitive soil sites are limited to five percent disturbance, and in the absence of sensitive soils, 10 percent disturbance is allowed. The lower limit of five percent is linked to areas where very high hazard exists in the interior, and high to very high hazard exists on the coast. As this audit took place in the interior, the sites requiring the lower limit would be associated with a very high soil compaction, erosion, or displacement hazard.

Section 32 also sets limits for soil disturbance in roadside work areas, and this limit is set at a maximum of 25 percent.

Exceeding the limits in section 31 and 32 results in the application of section 33, as it outlines the requirement to rehabilitate any areas that are in excess of soil disturbance limits set in the approved silviculture prescription or site plan.

Disturbance types associated with harvesting activities in NAR are compaction, ruts, scalps, and gouges (see Appendix B for details on each type). Each type of disturbance is the result of either ground-based or cable harvest methods. Helicopter harvesting does not usually contribute to one of the above noted disturbance categories, though aerial harvesting on steep slopes may lead to an open slope failure (soil displacement) in unstable areas.

Excessive disturbance related to one of the disturbance types is usually detrimental to soil productivity as a result of compaction, displacement, or erosion of the soil.

The following photos, A to E, (taken during the audit), illustrate effective and compliant practices as well as some practices that are not so effective, yet are still compliant.

A - Acceptable dispersed disturbance (first pass) is found on and off trails but is well within the approved disturbance limits, and currently appears effective for this type of operation. Most areas will re-establish vegetation rapidly, depending on how many entries are required.

B – Flagging machine-free areas to protect wetter ecosystems is a good practice that is effective in minimizing impacts to soil.

C – E - These photos illustrate isolated machine disturbance (rutting) from operating ground-based and cable yarding machines on unfavourable soil conditions. In this case, these sites were not excessive throughout the cutblocks so overall soil disturbance did not exceed limits set in the plans. The photo to the right shows the potential end result of rutting.

Harvesting Findings

Downie Timber Ltd.

The audit found that in the six Downie harvested cutblocks examined, soil disturbance levels were within prescribed maximums set out in the approved silviculture prescription or site plan. Downie used appropriate harvest methods based on terrain features (i.e., cable vs. ground-based), operated when dry or frozen ground conditions prevailed, used forwarding trails, and avoided sensitive areas (i.e., wet ground).

Louisiana-Pacific Canada Ltd.

The audit found that in the 16 LP harvested cutblocks examined, soil disturbance levels were within prescribed maximums set out in the approved silviculture prescription or site plan. LP used appropriate harvest methods based on terrain features (i.e., cable vs. ground-based), operated when dry or frozen ground conditions prevailed, used forwarding trails, and avoided sensitive areas (i.e., wet ground).

BCTS Timber Sale Licence Holders

The audit found that, with three exceptions, in the 13 harvested cutblocks examined of the eight BCTS timber sale licence holders, soil disturbance levels were within prescribed maximums set out in the approved silviculture prescription or site plan.

The three exceptions were in timber sale licence A75103, where three of the four cutblocks had soil disturbance limits that exceeded prescribed maximums set out in the approved site plan. This occurred as a result of revising the harvest method from cable to a ground-based method, which involved establishing additional excavated or bladed trails on steeper terrain. It is the opinion of the auditors that through rehabilitation, these three cutblocks could be brought back within prescribed soil disturbance limits.

Planning

Criterion #3

Forest planning adequately supports the conservation of forest soil.

There are a number of sub-criterions associated with this criterion and the details for each sub-criterion and its indicators can be found in Appendix E.

As the auditees were not fully operating under FRPA and an approved FSP, it was difficult to fully assess the first two sub-criteria relating to soil conservation objectives and strategies. However, a review of the draft FSP indicated that forest certification schemes (i.e., Sustainable Forest Initiatives), and environmental management systems (ISO 14001 EMS) have been considered in the planning process, showing that auditees are aware of, and are implementing, objectives and strategies that adequately address forest soil conservation.

The activities of the three auditees were assessed using the indicators developed for the remaining sub-criteria.

Planning Findings

Downie Timber Ltd.

Downie was effective in developing plans that adequately support the conservation of soil, and fully complied with criterion #3 when it comes to effective soil conservation.

Louisiana-Pacific Canada Ltd.

LP was effective in developing plans that adequately support the conservation of soil, and fully complied with criterion #3 when it comes to effective soil conservation.

BCTS

The BC Timber Sales (planning) was effective in developing plans that adequately support the conservation of soil, and fully complied with criterion #3 when it comes to effective soil conservation.

Appendix A: Detailed Landscape Unit Descriptions

Upper Wood Landscape Unit

The Upper Wood Landscape Unit (G1) is 49,300 hectares in size, and includes Wood River, Molson Creek, Pacific Creek, Fortress Lake, and Dines Creek as well as numerous tributaries. Hamber Provincial Park (which borders Jasper National Park) is located in its upper reaches along with the Clemenceau Icefield (see Figure 1).

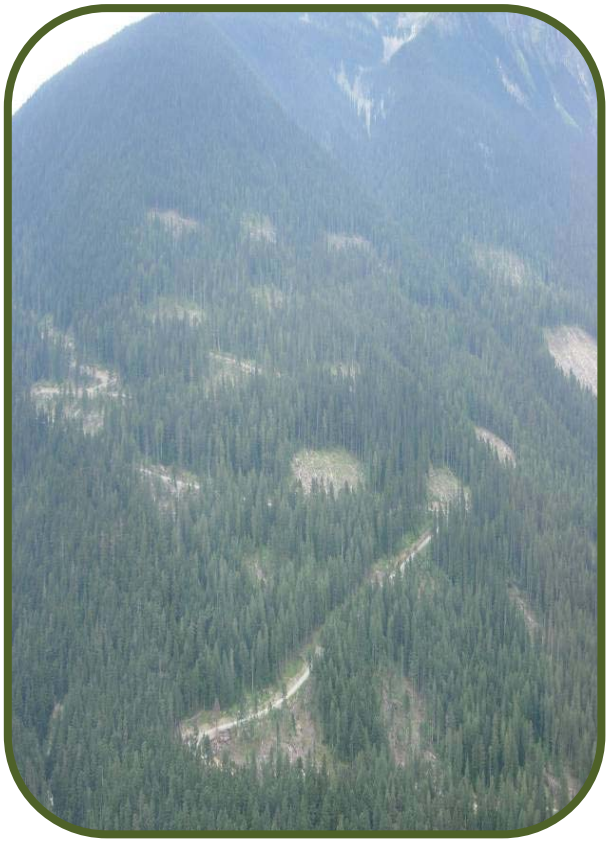


Figure 1 – Harvest pattern to address LU G1 strategies.

Access management, recreation, general biodiversity, ungulates, and fisheries are the resource management objectives for the Upper Wood, and controlling motorized access, maintaining regional connectivity corridors, maintaining semi-primitive recreation activities, and maintaining the Athabasca Pass Heritage Trail are the strategies.

Although these strategies do not directly relate to soil conservation, this landscape unit (LU) was chosen, as it is the only landscape unit that had recent forest harvesting, road construction and deactivation activities done by Downie Timber Ltd. That being said, the challenge for Downie is to minimize the duration of each timber harvest entry, maximize the time between entries, and minimize the number of entries while also adhering to soil conservation.

Encampment-Molson Landscape Unit

The Encampment-Molson Landscape Unit (G2) is 21,800 hectares in size, and includes the Molson Creek and Encampment Creek watersheds. Objectives and strategies are the same as LU G1. The main operator in this area is the British Columbia Timber Sales Program (BCTS). Both this LU and LU G1 are considered to be in the wetter portion of the Golden TSA, which means increased precipitation over any given year when compared to the more southern areas of the TSA.

Foster-Garrett Landscape Unit

The Foster-Garrett Landscape Unit (G8) is 31,200 hectares in size, and encompasses a number of smaller watersheds that drain into Kinbasket Lake, including Little Foster, Game, and others. This LU encompasses an area of similar aspect along the east side of the reservoir. Operators in this area are Louisiana-Pacific (LP) and BCTS. This LU is in the moist portion of the Golden TSA although it tends to be drier than LU's that are farther east away from the lake as the main emphasis here is to manage for winter range.

Bush Landscape Unit

The Bush Landscape Unit (G10) is 60,000 hectares in size, and encompasses the Bush River and any associated tributary watersheds that drain into it. The operator in this area is LP. This LU is in the moist portion of the Golden TSA and has the presence of calcareous soils. Harvesting activities are to incorporate the objectives and strategies that minimize the duration of each timber harvest entry, maximize the time between entries, and minimize the number of entries while also adhering to soil conservation.

Valenciennes Landscape Unit

The Valenciennes Landscape Unit (G18) is 31,400 hectares in size, and encompasses the Valenciennes River and any associated tributary watersheds that drain into it. LP is the only operator in this LU. As its location is directly south of the Bush LU, it shares similar characteristics in the moisture regime and also has the presence of calcareous soils. Harvesting activities are to incorporate objectives and strategies similar to the Bush LU.

Moose Landscape Unit

The Moose Landscape Unit (G27) is 12,100 hectares in size, and encompasses the Moose, Dainard, and Ice River watersheds This LU encompasses an area of similar aspect along the west side of the reservoir. BCTS is the only operator in this LU. Objectives and strategies are driven by grizzly bear habitat requirements, connectivity, wild land attributes, and fisheries. This LU falls within the special resource management zone.

Kootenay Landscape Unit

The Kootenay Landscape Unit (G28) is 32,200 hectares in size, and encompasses the portion of Kootenay River watershed that was once part of the Golden Forest District. LP operates in this LU. Objectives and strategies are driven by regional connectivity and fisheries.

Swan Landscape Unit

The Swan Landscape Unit (G29) is 23,800 hectares in size, and encompasses a number of smaller watersheds that drain into Kinbasket Lake between Windy Creek and Bachelor Creek. This LU encompasses an area of similar aspect along the west side of the reservoir. BCTS is the only operator within this LU. Objectives and strategies are driven by caribou habitat requirements (see Figure 2).

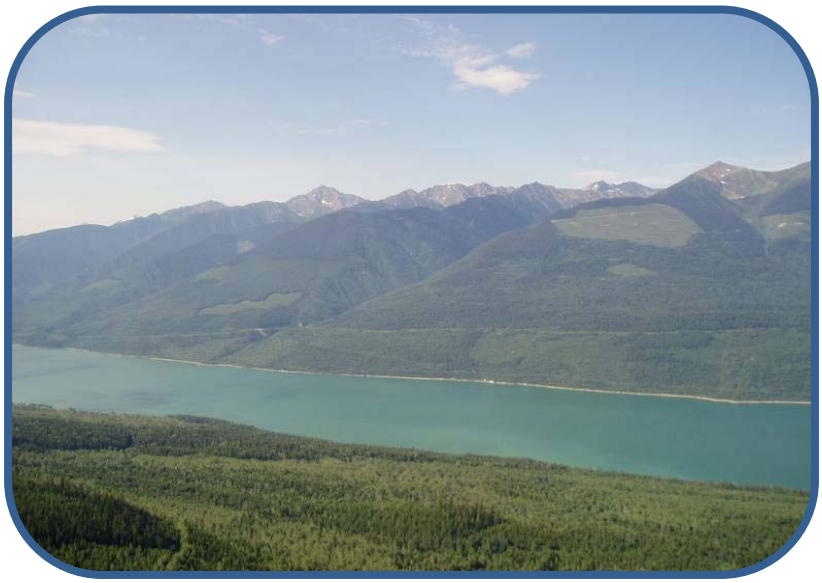


Figure 2 – Looking across Kinbasket Lake at LU G29

Landscape Units G8, G10, and G18 are part of the summer operations due to the snow pack accumulations over the winter season. Harvest activities used are a combination of helicopter, cable, and ground-based methods. Slope and access are the influential factors in determining the appropriate harvest method in these landscape units. Landscape Units G27 and G28 (see Figure 3) are comprised of much gentler terrain and a reduced snow pack, which allows for a winter operating season and the use of ground-based harvest methods. Landscape Units G1 and G2 can also be operated on in both summer and winter.

Figure 3 – An overview of the gentler terrain representing LU G27 and G28.

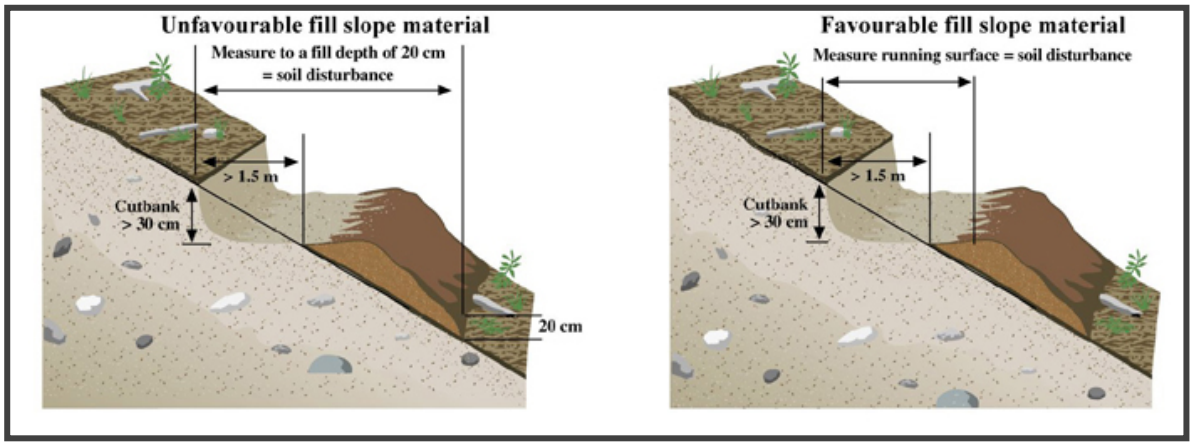
Appendix B: Background on Soil Disturbance

Impacts from Harvest Activities that Affect Soil Productivity and Hydrological Function

The following are a series of diagrams that depict various scenarios that may be present in a cutblock as the result of harvesting activity. These forms of soil disturbance are used in assessing compliance and effectiveness with the soils conservation criteria developed for this pilot.

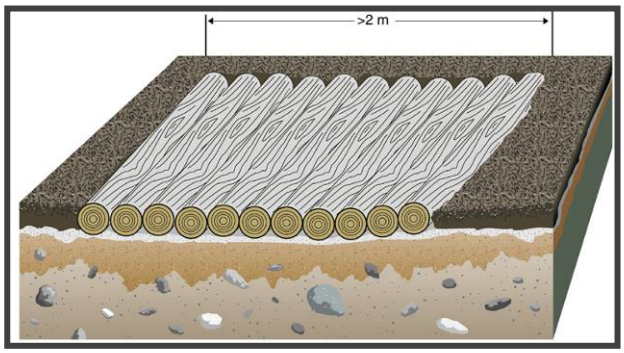
Excavated or Bladed Trail

The classification of soil disturbance on excavated and bladed trails depends on whether fill slopes are considered a favourable or unfavourable medium for growing trees.



Corduroyed Trails

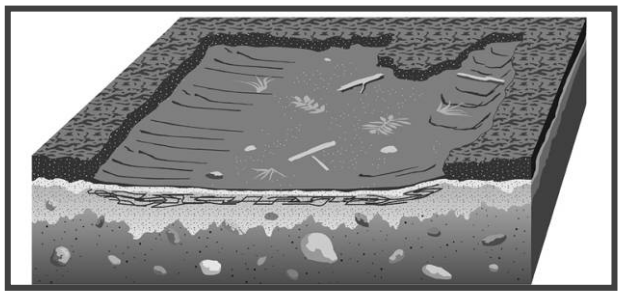
If satisfactorily rehabilitated, a corduroyed trail does not count as soil disturbance.



This is an example of a trail that has not been satisfactorily rehabilitated, as woody material covers soil and reduces plantable spots for seedlings.

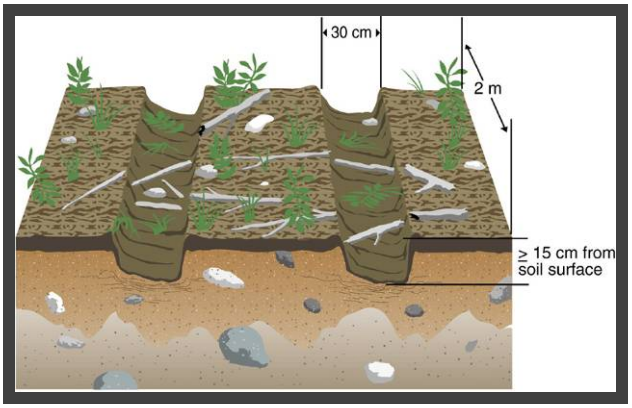
Compaction

Compacted areas are areas on which there is evidence of compaction and on 100% of a portion that is both greater than 100 m^2 in area, and greater than 5 m wide.

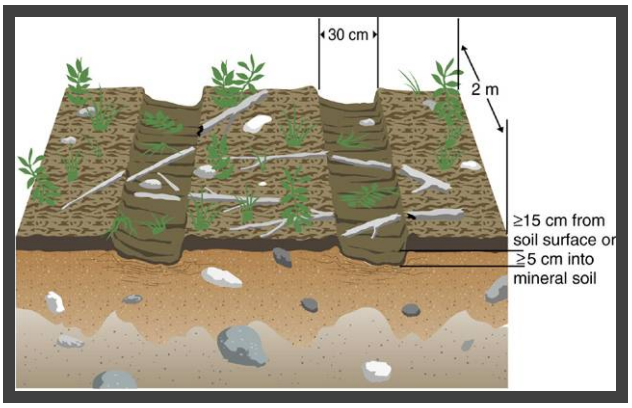


Dispersed Trail (wheel or track ruts):

Wheel or track ruts are impressions or ruts in the soil caused by heavy equipment traffic. They are at least 30 cm wide and 2 m long. Two different depth criteria (5 cm and 15 cm) apply, depending on the compaction hazard of the standards unit being assessed.



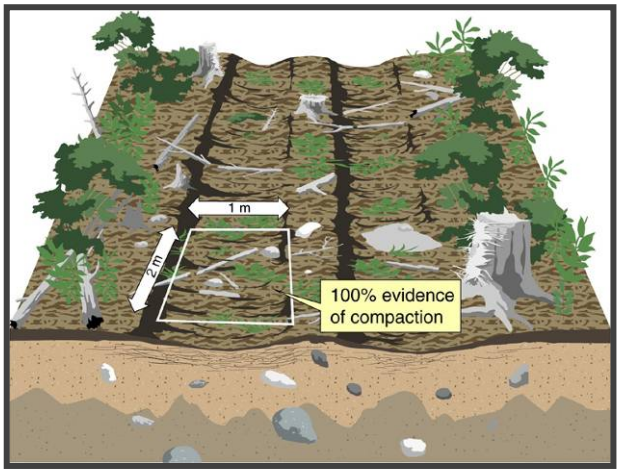
Wheel or track ruts 15 cm deep.



Wheel or track ruts 5 cm deep applies to high or very high compaction hazards.

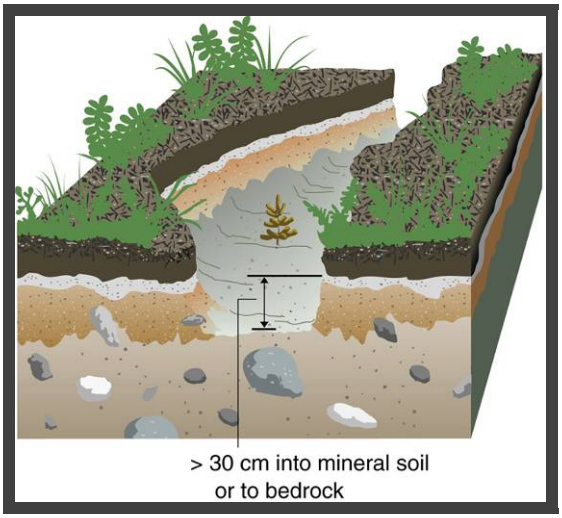
Dispersed Trail (repeated machine traffic)

The category *repeated machine traffic* describes disturbance resulting from repeated heavy machine traffic. Such disturbance is typically found on repeatedly used skid trails, which are obvious linear features. It may also occur on heavy traffic areas associated with roadside work areas and around piles constructed by windrowing or piling slash.



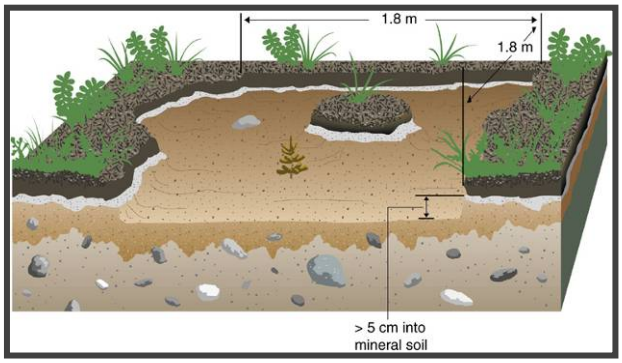
Deep Gouges

Deep gouges are excavations into mineral soil that are deeper than 30 cm or to bedrock.



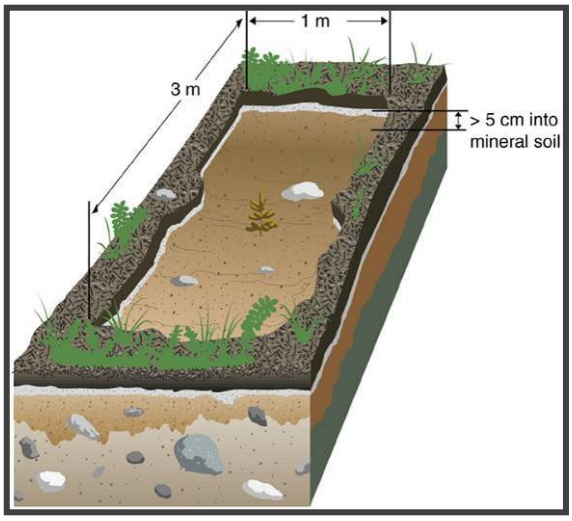
Wide Gouge

Wide gouges are excavations into mineral soil that are a) deeper than 5 cm and b) deeper than 5 cm or to bedrock, on at least 80% of an area 1.8 x 1.8 m.



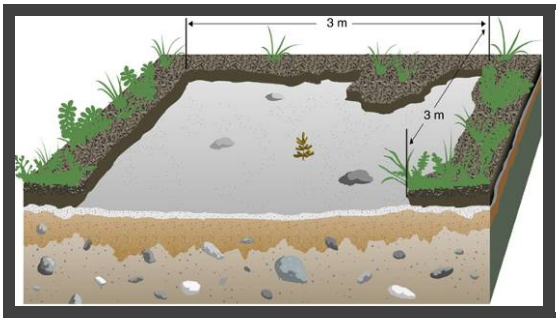
Long Gouge

Long gouges are excavations into mineral soil that are a) deeper than 5 cm and b) deeper than 5 cm or to bedrock on 100 % of an area 1 x 3 m.



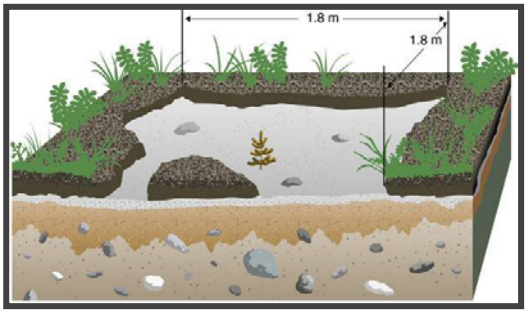
Very Wide Scalp

Very wide scalps are areas where the forest floor has been removed from over 80% of an area 3x3 m.



Wide Scalp

Wide scalps are areas where the forest floor has been removed from over 80% of an area 1.8 x 1.8 m.



Additional reference materials can be found in the Appendix E, Glossary. Also, these and other related soil conservation terms are defined in FRPA, transitional provisions, and the following FPC Guidebooks (limits and principles remain the same between the *FPC Act* and FRPA):

- Soil Disturbance Hazard Ratings for Compaction, Displacement, and Surface Soil Erosion (PDF)
- Soil Disturbance Limits (PDF)
- Soil Rehabilitation
- Soil Disturbance Measurement (PDF)
- Pre-harvest data collection and site stratification (along with forest floor displacement and mass wasting hazard keys that are recommended for harvest and site preparation planning)

Appendix C: Development of the Soil Conservation Indicators for Criteria #1 & #2

This appendix provides an overview of the process undertaken by the Board in designing an audit program for soil conservation for the Mackenzie Forest District pilot audit, and it highlights how the development of the audit program incorporated the draft indicators developed by the soils scientists.

Overview of the Indicator and Audit Program Development Process

- A team of soils scientists, independent of the Board, developed a total of eight draft indicators under five categories (or groupings) and provided these to the Board.
- The Board auditors reviewed the draft indicators and provided feedback to the soils scientists.
- The auditors received final draft indicators.
- The auditors attended a two-day session in the field where the soil scientists reviewed and discussed the indicators with the auditors.
- The auditors developed the audit approach and methodology, including adapting the indicators as necessary to facilitate the audit (see below).
- The indicators and approach and methodology to the audit were reviewed and approved by the Board Chair.
- An audit program based on the approved approach and methodology was developed by the audit team (note: the audit team included one member from the team of soil scientists).
- The Soils Conservation Audit Program was distributed to the other members of the soils scientists' team for review and comment.

Incorporating the Indicators into an Audit Program

In general, the changes described below stemmed from the need to ensure that the measurement and assessment processes employed would facilitate the Board's substantive-based audit approach (as opposed to the need to change the indicators themselves). Such an approach relies primarily on the examination of the results of forest practices in order to draw conclusions about the practices themselves. As such, the assessment procedures must, to the highest extent possible, include consideration of the underlying forest practices that led to the observed site conditions.

- All of the indicators, except two, were incorporated into the audit program.

- The two indicators associated with soil biology were not utilized primarily because there is not a clear demonstrable link between the extent of mature forest ectomycorhiza fungi retained on site and the productivity of site soils, and of the level of course woody debris on soil conservation.
- The grouping of the indicators was changed to 1) reduce the number of groupings, and 2) more closely relate the groupings to the underlying forest practices. The groupings used for the audit program were: Permanent Access Structures; Temporary Access Structures; and Net Area to be Reforested.
- The assessment of 'minimization' of soil disturbance was incorporated into relevant indicators. This notion had originally been listed as an ancillary question to the draft indicators.
- The assessment of 'landscape-level' soil conservation was incorporated into the audit program.
- An element of 'setting expectations' was introduced into the overall assessment of effectiveness (through senior management interview audit procedures).
- The measurement process was adapted to increase reliance on professional judgment, with detailed quantification of soil disturbance in circumstances of non-compliant or ineffective practices only (rather than detailed measurement on all sites). This was necessary to accommodate audit resource and time constraints.

Appendix D:
Development of the Soil Conservation Indicators for Criterion #3

This criterion is made up of a number of sub-criteria and indicators developed by the Board, and its focus is on forest planning as it relates to practices on the ground. Both it and its associated indicators were reviewed by licensees as well as MFR staff and input was incorporated into the final version described in detail below.

The sub-criteria and indicators are intended to facilitate assessments of the extent to which forest planning takes into consideration the important attributes of forest soil across the landscape, and prescribes appropriate practices that, to the extent practicable, conserves this soil over time.

Sub-criterion: Objectives for soil conservation have been developed.

Indicators

- Objectives under FRPA
- Objectives for rehabilitation of soils and regeneration of sites
- Objectives for PAS / TAS
- Objectives for preserving mean annual increment (MAI) on harvested sites

Sub-criterion: Strategies have been developed at appropriate scale in relation to objectives, and include measurable and verifiable targets for soil conservation.

Indicators

- Avoidance of highly sensitive soil sites
- Density targets (minimize PAS)
- Efficiency targets (maximize volume)
- Equivalent clearcut area (ECA) targets
- Total chance framework
- Critical thresholds

Sub-criterion: Landscape and site plans are developed that describe the operational implementation of strategies.

Indicators

- Total chance, access management or other landscape-level plans
- Site plans under FRPA

Sub-criterion: Inventory data is sufficient to support objectives, strategies and plans, and includes forest cover, topography, soil composition and areas of highly sensitive soil.

Indicators

- Forest soil sensitivity
- Roads, trails, landings
- Slides
- ECA
- Soil productivity

Sub-criterion: The results of forest practices reflect intended results established in strategies and plans.

Indicators

- ECA
- Road network density
- Road network efficiency
- Highly sensitive soil sites avoided
- MAI / productivity preserved

Appendix E:
Glossary of Soil Conservation Terms

Ballasting: The use of rock to construct a road subgrade. Where other available material is incapable of supporting the design traffic load during the period of use, ballast is commonly used, especially on locations with fine-textured or saturated soils.

Calcareous Soil: Soil that contains high levels of calcium or magnesium (i.e., limestone). When mixed in with other soil components, it affects the ability of trees to grow, as soil PH changes from an acid to a basic.

Compaction: The compaction of soil that occurs when soil particles are pressed together, reducing pore space.

Corduroyed Forwarding Trail: A trail built to move timber products from the stump to a landing for further transport. Corduroy means it is built of logs laid side-by-side transversely.

Criterion: A category of conditions or processes by which sound forest management may be assessed, underpinned by a set of indicators.

Excavated or Bladed Trails: Constructed trails that have a mineral soil cutbank height greater than 30 centimetres, and an excavated width greater than 1.5 metres.

Fine-textured Soil: Soil consisting of, or containing, large quantities of the fine fractions, particularly of silt and clay. This includes all clay loams and clays, such as: clay loam, sandy clay loam, silty clay loam, sandy clay, silty clay, and clay textured classes.

Forwarding: Transporting logs from stump to a landing without dragging them on the ground.

Gouges: Excavations into the mineral soil.

Hydrologic Function: Natural drainage patterns and flow of water.

Indicator: A measure of a criterion to assess the condition of a forest resource, which may be monitored periodically to assess change.

Landing: An area, modified by equipment, that is designed for accumulating logs before they are transported.

Roadside Processing: Processing of timber products along the length of the road, rather than at a designated landing.

Scalps: Removal of sections of the forest floor.

Skidding: The process of sliding and dragging logs from the stump to a landing.

Soil: Earth or dirt composed of solid particles (minerals and organic matter) and pore space (air and water).

Soil Disturbance: A disturbance caused by a forest practice, including areas affected by excavated or bladed trails of a temporary nature, areas affected by corduroyed trails, compacted areas, and areas of dispersed disturbance.

Soil Texture: Refers to the size of mineral particles (sand, silt and clay), which can range in size from fine to coarse. The proportion of sand, silt and clay particles in the soil determines whether a soil is classified as sandy, silty or clayey.

Soil Productivity: The capacity of a soil, in its normal environment, to support plant growth.

Soil Rehabilitation: The remedial measures taken to restore soil productivity on a disturbed site. Rehabilitation activities are site specific and may include soil decompaction, re-contouring, spreading surface organic matter and re-vegetating the site. The objectives of soil rehabilitation are to restore a site to a stable condition and to maintain and re-establish soil productivity to a level capable of sustaining the production of a crop of trees that is acceptable to site-specific standards.

Total Chance Planning: Early planning over an entire development area for the best overall realization of all objectives identified by broader planning.

Wheel Tracks or Ruts: Impressions in the soil caused by heavy equipment traffic.

[i] Most of the *Forest Practices Code of British Columbia Act* (the Code) was repealed on January 31, 2004, and replaced with the *Forest and Range Practices Act* (FRPA). The transitional provisions of FRPA say that the Code continues to apply to forest practices carried out under a forest development plan. This continues until there is an approved forest stewardship plan, at which point, the requirements of FRPA apply. Therefore, although FRPA has been in effect during the audit period, the audited legislated forest practices requirements were requirements of the Code.

[ii] The Audit of Forest Soil Conservation – Mackenzie Forest District report is found on the Board's website at: http://www.fpb.gov.bc.ca/AUDITS/ARC66/ARC66.pdf

[iii] A forest development plan is an operational plan that provides the public and government agencies with information about the location of proposed roads and cutblocks for harvesting timber over a period of at least five years. The plan must specify measures that will be carried out to protect certain forest resources prescribed by regulation. It must also be consistent with any higher level plans. Site-specific plans are required to be consistent with the forest development plan.

[iv] FRPA Sections 191 and 192.

[v] Under the *Forest and Range Practices Act* and its regulations, all major tenure holders (companies with logging rights on Crown land) and the timber sales manager, BC Timber Sales, must prepare a forest stewardship plan. Government must approve this plan before forestry operations take place. The forest stewardship plan is a cornerstone of the results-based approach governing forest practices under the Act. In their plans, tenure holders must state explicitly how they will address government objectives for key forest values, such as soils and wildlife. The forest stewardship plan may be in place for up to five years and may be extended for a further five years while its counterpart under the Code, the forest development plan, could be in place for only up to two years. The new plans are intended to encourage longer-term planning, contribute to sound forest management, reduce paperwork and encourage innovation.

Forest Practices Board

Mailing Address:
P.O. Box 9905, Stn Prov Gov't
Victoria, British Columbia
Canada V8W 9R1

Location:
3rd Floor, 1675 Douglas St., Victoria
http://www.fpb.gov.bc.ca

NEWS release

For Immediate Release
August 12, 2008

Soil conservation practices effective in Golden Timber Supply Area

VICTORIA – A pilot audit has found that forest practices were effective at conserving forest soils in the Golden Timber Supply Area of the Columbia Forest District, according to a Forest Practices Board report released today.

The audit, which started in July 2006, examined three operators – Wood River Forest Inc. (now called Downie Timber Ltd.), Louisiana-Pacific Canada Ltd., and the Okanagan-Columbia business area of the British Columbia Timber Sales Program (BCTS), and found that all operations were effective at managing soil conservation, with the exception of one of eight BCTS timber sale licence holders.

"The board is pleased with the licensees' efforts to not only comply with legal requirements, but to also be effective in their management of forest soils," said board chair Bruce Fraser. "For the one issue of non-compliance, we noted that substantial reclamation work has since been completed to reduce any future impacts to soils."

The audit looked at practices conducted between July 1, 2004, and July 31, 2006 that were most likely to impact soils. These included timber harvesting, road and bridge construction and maintenance, road deactivation, and site-level planning specifically associated with these activities. In total, the board examined 67 cutblocks, approximately 270 kilometres of road work or obligations, and operational planning specific to harvesting and roads.

The Forest Practices Board is B.C.'s independent watchdog for sound forest and range practices, reporting its findings and recommendations directly to the public and government. The board:

- audits forest and range practices on public lands;
- audits appropriateness of government enforcement;
- investigates public complaints;
- undertakes special investigations of current forestry issues;
- participates in administrative appeals; and

- makes recommendations for improvement to practices and legislation.

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This news release and more information about the board are available on the Forest Practices Board website at www.fpb.gov.bc.ca or by contacting:

Helen Davies
Communications
Forest Practices Board
Phone: 250 356-1586 / 1 800 994-5899