BCTS Supplement Guide to Minimizing Soil Disturbance

This supplement has been developed in support of the BCTS Kamloops Business Area Environmental Management System. It is to be used solely as a reference guide and is not intended to replace BCTS Site Plans. BCTS staff, Contractors and Licensees is asked to ensure that a Pre-work has been completed prior to the commencement of work and to ensure that they are familiar with both the Site Plans and the applicable Environmental Field Procedures.

What is Soil Disturbance?

- Includes compaction, rutting, gouging, scalping and the construction of trails, roads, landings, pits and quarries.
- It is caused mainly by moving machinery and logs
- Excessive soil disturbance is that which is beyond what is necessary under the right combination of equipment and site conditions. This is caused by excessive random (unplanned) traffic over sensitive terrain or under wet conditions, commencing or continuing to work in poor (wet) soil conditions, or by heavily concentrated activity outside of road side work areas. This is to be avoided through proper planning, familiarity with Site Plans and recognizing these situations before they become a problem.

Compaction	Rutting
Keys to identification: Caused by felling, skidding, and forwarding routes with repeat traffic. Compacted mineral soil, puddled mineral soil (soil that has liquefied then hardens), and compacted deposits of slash and organic debris. *Compacted soils reduce drainage, aeration and reduce root growth and forest productivity. Also reduces water infiltration which can lead to off-site drainage problems.*	Keys to identification: Ruts or impressions into the soil from wheels and tracks On sensitive soils these are of concern when only 5 cm deep On all sites be concerned about ruts that are, 2 m long and over 15 cm deep. *Rutting can occur from just one pass and cause compaction which decreases drainage, aeration and damage shallow feeder roots*
Gouging, Scalping and Scraping	**Trails (Bladed or Excavated)**
Keys to identification: Forest floor (surface organic layer) has been removed, exposing the mineral soil, or where organics are absent, top soil has been excavated 5 cm or more. Mainly a concern if over 30 cm deep or to bedrock, or wider than 1m. *Gouging and Scalping displaces nutrients and increases erosion potential as the topsoil contains large reserves of nutrients and contains the majority of roots.*	Keys to identification: Trails excavated into side slopes, either along the contour of the slope or at an angle to the slope. *Excavation exposes subsurface seepage and creates drainage paths during runoff events (thunderstorms). Soils under trails become very compacted. Excavated cuts and fills expose subsoils with few nutrients and steep, exposed surfaces that can erode .and deliver sediments to streams.*

General Soil Disturbance Guidelines

- PRE-WORKS: Review Site Plan soil disturbance limits. Identify sensitive or difficult harvesting areas during Pre-work, and areas identified with sensitive soils, low lying drainage and receiving areas.
- PLAN: Identify and plan felling and skidding routes ahead of time. When designating main trails, a herring bone pattern may reduce overall trafficked area. Consider manual treatments such as hand felling, especially in ecologically sensitive areas.
- WEIGHT: Reduce loads carried by logging equipment.
- TURNING: Creates the most disturbance off main trails. Avoid sharp turns with loaded equipment, especially at the base of hills. Use trails and road surfaces to turn where possible.
- SOIL MOISTURE: Monitor soil moisture and frost. Dry or frozen soils do not compact as easily. Soils lose strength as the moisture level increases.
- GROUND PRESSURE: Use low ground pressure equipment.

Contact your Supervisor should you feel excessive Soil Disturbance has occurred

- DEPRESSIONS: and wetter, more sensitive areas avoid traveling through these areas, if unavoidable, designate and design a crossing to reduce impacts.
- ORGANIC SOILS: Avoid disturbing predominantly organic wet soils. Utilize slash for traction and padding (puncheon). Maintain soil organic matter, litter, and slash in place when harvesting.
- SLASH PLACEMENT: Avoid piling slash on good high spots and other good growing sites.
- MONITOR WEATHER: Shift harvest operations to upland areas of a timber sale if weather conditions deteriorate. Shut down when soil disturbance objectives are threatened.

Operating Techniques

Excavated or Bladed Trails

Where bladed or excavated trails are planned:

- Keep the excavated area as small as necessary.
- Avoid excavating the cut slope into the subsoil layers. Maintain organic debris and productive soil for re-contouring and rehabilitation later. Scatter slash and organic debris onto exposed mineral soil.
- Use excavators to build trails, where possible.
- Maintain the natural drainage pattern for all identifiable watercourses.
- Where conditions change over the length of the trail, be prepared to modify techniques.
- Control drainage and erosion on excavated trails to reduce the likelihood of landslides, mass wasting events or stream sedimentation.
- Where the forest floor is sufficiently thick, remove it separately from the topsoil and stockpile in mounds. Avoid mixing this material with unproductive soils.
- Where forest floors are too thin to be easily separated, keep these materials with salvaged topsoil.
- When building trail sections with deeper cuts and fills, place the excavated material down in the fill bank in the following order: topsoil, intermediate soils, then subsoils on top. The outer track of the running surface will run on the excavated subsoil, preserving the topsoil at the bottom of the fill.
- To minimize the amount of side cast required and for rehabilitation, use stumps and logs to create a crib to fill.
- Long machine trails on steep slopes should be placed so there are grade breaks and run-offs to prevent water channeling.

Winter Harvesting

When harvesting in Winter:

- Use compacted snow trails from harvesting equipment to skid or forward. Skid one or two turns in sensitive areas and then allow frost to penetrate compacted snow. Soil frozen to a depth of 15 cm offers maximum strength and protection.
- Soil frost begins to disappear after snowfall covers the soil and/or night temperatures stay above freezing for three or four days.
- When building excavated trails in the snow, avoid piling topsoil on top of snow or mixing the two.
- When building excavated trails in snow, excavate the snow on the inside, compact it on top of the snow on the fill side, cut out the soil on the inside and lay it on top of the snow and compact it. Cover this with snow and compact it to form the running surface. Operators rehabilitating the trail will recognize the bottom of the stockpile is at the lower layer of snow.

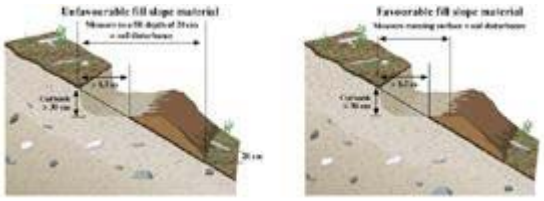
Rehabilitation

When building and rehabilitating bladed trails along a hill slope:

- Rehabilitation and mitigation should be conducted under the best soil and weather conditions possible.
- Outslope the trail surfaces to avoid collecting water. Decompact the running surface to a greater depth on the outer portion of the trail to avoid creating a subsurface water trap next to the cut.
- Decompact all compacted soils on running surfaces.
- Restore slopes to natural contours. Place slash on exposed soils.
- Deconstruct all corduroyed trails (puncheon) and scatter slash material away from drainage courses.
- Ruts may be rehabilitated by restoring natural drainage, loosening the soil at the bottom of the rut and gently distributing berm material into the depression. Create an even soil layer for rooting while not exposing poor soils.
- Avoid mixing woody debris with top soil. Avoid handling top soil under wet conditions. When stockpiling top soil, develop standard methods to aid in finding and re-using the material. Avoid burying top soil with slash and protect it from water runoff and traffic. Avoid stockpiling top soil in wet areas.
- Cover exposed subsoils as well as organic matter with scattered slash to provide protection from erosion.

BCTS Supplement
Soil Disturbance Definitions

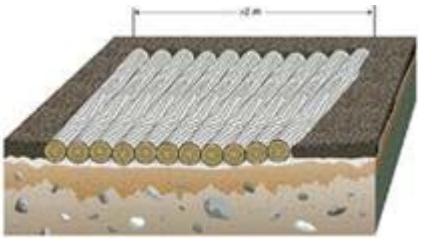
Excavated or bladed trails



Excavated or bladed trails are constructed trails that have:

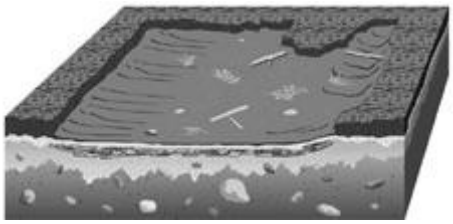
- a mineral soil cutbank height greater than 30 cm, and
- an excavated width greater than 1.5 m.

Corduroyed trails



Corduroyed trails are constructed using logs and woody debris placed side by side to form a surface greater than 2 m in length and capable of supporting equipment traffic.

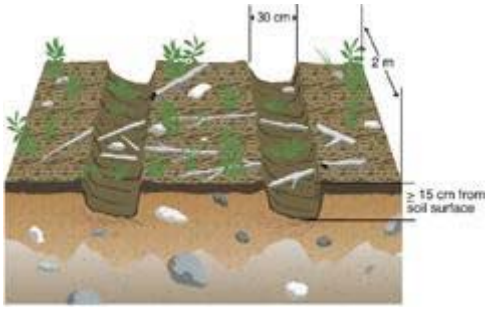
Compacted areas



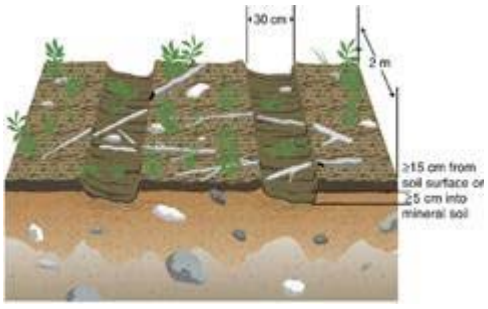
Compacted areas are areas on which there is evidence of compaction at the survey point and on 100% of a portion that is both greater than 100 m^2 in area and greater than 5 m wide.

Can also be compacted mineral soil, puddle mineral soil, and compacted slash and organic debris. Mineral soil compaction compare to condition of adjacent undisturbed soil.

Dispersed trail: wheel or track ruts

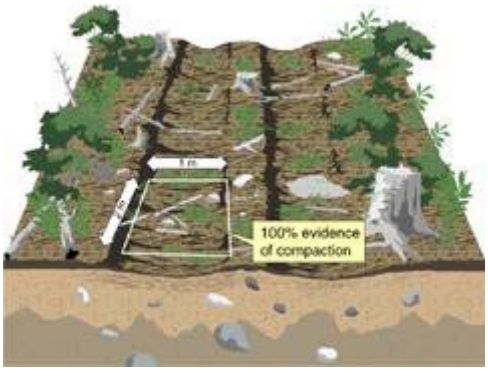


Wheel or track ruts 15cm deep X 30cm wide and 2m long are counted as soil disturbance on all sites.



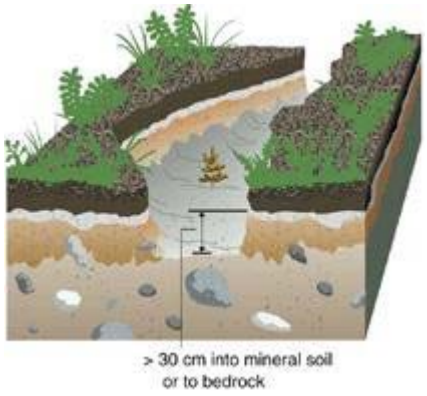
Wheel or track ruts 5cm deep X 30cm wide X 2m long are counted as soil disturbance on sites with high or very high soil compaction hazard or where compaction hazard has not been assessed.

Dispersed trail: repeated machine traffic



Repeated machine traffic must be counted as soil disturbance where there is 100% evidence of compaction in a 1m X 2m area on all sites, except those with low compaction hazard. Where the compaction hazard has not been assessed, repeated machine traffic must be counted as soil disturbance.

Deep gouges

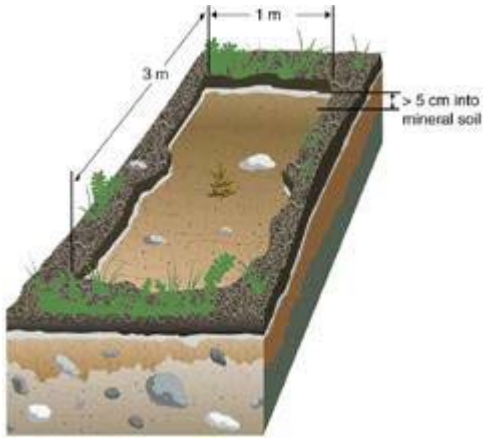


Deep gouges are excavations into mineral soil that are deeper than 30 cm or to bedrock at the survey point.

Wide gouges

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

Long gouges

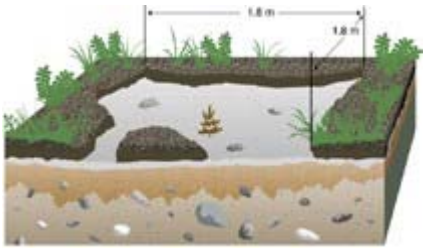


Long gouges are excavations into mineral soil that are a) deeper than 5 cm at the survey point and b) deeper than 5 cm or to bedrock on 100% of an area 1 x 3 m.

Very wide scalps

Very wide scalps are areas where the forest floor has been removed at the survey point and from over 80% of an area 3 x 3 m.

Wide scalps



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