

Ecosystem Restoration Best Management Practices For Planning, Layout, Harvesting, Silviculture and Reclamation of Open Range and Open Forest Blocks Final – April 7th 2014

From 2010 to 2013 concerns were raised that ER treatments and general Open Range/Open Forest harvesting practices were creating a highly concerning level of disturbance. It was felt that the harvest results were not achieving the objective of restoring the native plant community and enhancing forage production for ungulates and cattle, and in fact in some places was making the situation worse by creating high soil disturbance resulting in increased noxious weeds. In 2013 a sub-committee was formed to examine the concerns and on-the-ground activities and results. The following recommended practices were developed by the ER Operations Best Management Practices sub-committee based on group discussions and field visits to sites in various stages of harvesting and reclamation.



Ecosystem Restoration Committee - Overall Program

- To select the best treatment for a site, refer to the 'Treatment Type Tool Kit' at the end of this document.
- ER sites should be rated for the risk of invasive plant spread depending on the location, condition of the plant community and abundance of invasive plants. This should be arranged through the ER Steering Committee. Sites at very high risk should perhaps not be considered for treatment, unless guaranteed funding for invasive plant control is in place.
- Open Range and Open Forest sites scheduled for harvest but not burning treatment should still be rated for the risk of invasive plant spread. The prescribing Forester should do this, based on the table in Appendix C.
- Sites at high risk for invasive plants AND with sensitive soils should only be logged on frozen ground, and ideally with a 30 cm minimum snowpack. Since these conditions do not occur every

winter, NRFL contracts for these sites should be 4 years in length, rather than 1 or 2. The intent for longer contracts is to allow for selection of cold, snowy conditions and for logging to occur over multiple winters if need be, rather than being completed in wet conditions in one year to avoid contract renewal fees. The intent is not for frequent mobilization and de-mobilization of logging equipment based on the daily weather.

- The ER Steering committee should make it a requirement to power-wash equipment during mob/de-mob on sites with a high abundance of invasive plants to reduce the risk of spreading invasive plants.
- For high risk sites, the ER program should ensure that funding is added to the EKIPC (East Kootenay Invasive Plant Council) to ensure that the treatment area is sprayed following (and prior to if necessary) treatment.
- The organization responsible for spraying for noxious weeds needs to be clearly identified. Licensees do not receive any appraisal allowance for this responsibility.
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Planning and Layout

Block Boundaries and Standard Units

- Ensure UWR type calls (i.e., Open Range, Open Forest, or Managed Forest Dry) are based on soil pits and not PEM mapping alone or the vegetation alone. OR/OF is indicated by an Ah horizon over 5cm thick or more than 1% Bunchgrass (fescues or Bluebunch wheatgrass), or over 5% needlegrasses in the understory.
- If the block contains patches of OR, OF and/or MF dry, consider dividing the block into sub-units rather than treating the block all as one type. This will provide the best match of the prescription to the sites, especially for large blocks.
- Consider future burn boundaries when establishing block boundaries in OR/OF areas, discuss with the ER Program Team Leader and/or Wildfire Management Staff (send draft block boundaries).

Invasive Plants

- Assess the invasive plant (IP) risk (low, moderate, or high) by surveying IPs on site and on access roads into the site. Follow the guidelines in Appendix C. Risk will determine seeding protocol. Highly invasive plants that are currently not being treated pose the greatest risk (hawkweeds, sulphur cinquefoil, St. John's wort, knapweed, blueweed, cheatgrass etc.).
- Unless otherwise determined by the Prescribing Forester or a qualified expert, anything in the South Country (South of Cranbrook) is considered high risk.
- Check the online Invasive Alien Plant Program map display on the website below – you can zoom in to the area you are planning and see if any noxious weeds have been reported to occur there and what they are. Use the 'Identify' tool to do this, similar to a GIS program:
http://webmaps.gov.bc.ca/imf5/imf.jsp?site=mofr_iapp
- High risk sites should be treated for noxious weeds, post and possibly pre-treatment. Who is responsible for paying for this treatment needs to be clarified.
- Where possible, avoid laying out landings or roads through infested areas.
- Place machine-free zones (MFZ) around areas of infestation where practicable to do so.

- Indicate areas of high infestations on maps, so they can be passed on to machine operators.
- Report areas of infestations using the 'Report-a-Weed' application for iphones and tablets, or online. Your reports are mapped (on the site above) and provide valuable information that helps the local weed specialist plan treatments.
- Government should consider Access Management Areas in areas of high infestation, to reduce the spread of invasive plants.

Roads

- Use existing road as much as possible and minimize the amount of new road to be built.
- If the block is located in an area of key ungulate winter range (Class 1 or 2 – contact MFLNRO Habitat Biologist or Canfor Forest Scientist to determine), do not create any new open access (e.g., all new roads must be deactivated or have access blocked in some way). Use temporary roads as much as possible, and control new access that is created through various means, depending on the site.
- Ensure the standard of temporary roads is as low as possible – this will make them easier to reclaim.
- If the block will be road-side harvested, retain some WTP and/or mark live trees for retention along the in-block roads to break up the road-siding corridor. Avoid creating a large 'pipeline' through the block, which creates long sight-lines for predators.

Wildlife Tree Patches and Wildlife Trees

- High Value Snags (Py or Fd > 40 cm dbh, Class 2-7 with wildlife sign) are rare and important for species-at-risk such as Lewis's Woodpecker and Flammulated Owl. Reserve as many High Value Snags as practicable in WTP. Track them in the prescription and as High Value Snags in the Ministry WTP database. See Appendix B for the data to record for the database. For Canfor blocks, use Canfor's High Value Snag cards to record this data and enter it into Canfor's GIS system.



- Do not include steep slopes (> 45 %) in the net area to be harvested unless the soils will not be significantly disturbed by equipment. Winter harvest cannot be guaranteed. If a slope cannot be logged without significant soil disturbance leave it as a WTP for wildlife cover. Full canopy WTPs over one tree length in width usually do not burn during spring indices burning.

- North-facing slopes with high densities of trees are especially good places for WTPs. There is often little understory vegetation in these areas, and once opened up they have high levels of small CWD and high soil disturbance, making them highly likely to support noxious weed establishment.
- Patches with high densities of pole-sized trees (7.5 – 12.49 cm dbh) should be utilized for poles or left in reserves for future biofuel or wildlife cover.
- Ensure wetlands are surrounded by a reserve large and densely treed enough to discourage ATV travel through it, to avoid creating new areas for mud-bogging.
- Where harvest has opened up riparian access to cattle, use large coarse debris to limit riparian access and allow vegetation growth.
- Critical wetlands in proximity to road access should be identified on maps for C&E enforcement monitoring.
- Wetter areas likely to be wet in spring and highly susceptible to rutting should have No Machine Zone (NMZ) ribbon placed around them.
- Retain large trees or WTP along ridgelines and knolls where ungulates like to travel and bed down.
- Ungulate licks and wallows should have a WTP around them, large enough to provide visual cover to animals using these areas.
- Red squirrel middens are also good places for WTP. Make the WTP large enough to include a windfirm group of trees, all the small holes in the ground, the piles of cone bracts, and the extent of any large logs associated with the midden.
- Badger (and other carnivore) dens should have minimum 5 m NMZ ribbon placed around them so they are not collapsed by machinery. The trees with NMZ ribbon should be high-stubbed so trees are not skidded through the NMZ.
- If a den is plugged with fresh soil, a badger is likely inside. This den should have a 20 m NMZ or WTP placed around it. Dens with large mounds and extensive tracks are likely maternal dens and must have a minimum 20 m radius WTP placed around them.



Live Tree Retention



- Retain the largest trees on site, in a combination of clumps and single trees, while meeting the Open Range or Open Forest requirements (at least 5-20 sph from the top 1/3 of the diameter range for OR, 20-50 for OF).
- The most important trees from an ungulate winter range perspective are large diameter, tall Douglas fir or Ponderosa Pine trees with large crowns, as these intercept the most snow. Clumps of trees intercept more snow than single trees, and are also less susceptible to blow-down.

- Aim for at least a third of the retained trees to be in clumps, especially if the trees are smaller.
- Large Py trees help protect grasses from over-grazing. The needle-cast in the lee of these trees discourages grazing due to the sharp ends of these needles and the terpenes within them.
- A heterogeneous or uneven pattern of tree retention is preferred over a regular distribution.
- Retain large live trees along hiking/mountain biking/horse-riding trails.

Harvesting

- Inform the logging contractors as to whether the block is scheduled for burning post-harvest or not (not all OR and OF sites are burned). This should be included as an objective in the pre-work.
- Whenever possible, schedule Open Range and Open Forest blocks for winter or frozen ground, in order to protect the soils and reduce the change of invasive plants becoming established.
- In blocks that have areas with high invasive weed infestations, schedule work in these areas last, so invasive plant seeds are not transported throughout the block.
- In general, if the block is harvested on snow-pack, use random skidding. If it is harvested without snowpack, use designated trails or a minimal pass system that ensures soil disturbance targets are not exceeded.
- Avoid random skidding on slopes; try to use dedicated skid trails to get the wood straight down. If the slope is short, use parallel trails at the bottom and top of the slope and reach up to get the wood on the slope, rather than running up and down the slope.
- Ensure wet weather shut-downs are strictly followed – deep ruts are unacceptable. This applies in winter as well when sudden thaws occur.

Badger Dens and No Machine Zones

- Badger Dens should be protected with NMZ ribbon. High stub the trees with this ribbon, so the skidders do not skid over the dens.
- If operators notice badger (not ground squirrel) dens without NMZ, these dens should have a visual NMZ placed around them by high-stubbing trees in a 5-m radius around them.

Snags

- Dead trees (snags) without WTP around them should be retained where safe to do so. It is always the operators call on whether or not to retain a dead tree, based on their assessment of its safety.
- Dead trees (snags) must not be retained within 1 tree-length of roads and landings.

Coarse Woody Debris/Slash

- Coarse Woody Debris should be scattered on site, with efforts to retain the largest pieces. Some CWD discourages motorized travel off-road, and also provides refuge areas for bunch-grasses from grazing. Too much CWD increases the fire hazard, limits access by grazing animals, and will cause the soil to scorch during a prescribed burn. Moderate amounts are best if the site is to be burned – see the photo series in Appendix A for examples.
- For ER sites near communities (within 2 km), make all efforts to leave LOW or VERY LOW slash loads, to reduce the fire hazard.
- Consider using in-block processing to increase the amount of slash left on site. This slash will help carry the prescribed fire. Alternatively, consider slash-back for 1 out of every 3-5 loads the skidder brings in. Scatter the branches out so they are not concentrated in one spot.

Public Hiking/Biking/Riding Trails

- Ask if there are any maps of these trails.
- Try to ensure that slash does not cover known hiking/mountain biking/horse-riding trails. If you notice some, push it off to the side or walk the trail and remove it by hand.
- Remove poorly formed understory trees in the vicinity of the trails.
- Leave the vicinity of the trails looking clean and tidy by leaving low slash amounts in the vicinity of the trails.

Landings and Road-siding

- Do not scrape landings too low when cleaning them – this simply puts rocks into the hog piles and results in high levels of hog being left on the landings. Using a root rake for cleaning landings will allow the rocks to stay behind.
- For landing piles that will be burned, scrap the soil off the landing before piles woody debris. Once the pile has been burned, replace the soil and grass seed the area.
- If road-siding, break up the road-siding areas with clumps or live trees every 100 m or so. Avoid creating a large open swath through the block like in the photo below.



Small Tree Reduction

- Reasonable efforts should be made to reduce the total number of trees left post-harvest (not including seedlings or very small trees) to below 400/ha for Open Forest and 76/ha for Open Range.
- If residual trees are non-merchantable and the block is scheduled as an ER treatment, the responsibility for tree reduction lies with the Ministry ER program.
- However if the trees are pole-sized or larger, they should be removed at the time of harvest and used for pulp or fence-posts. If they cannot be utilized, they should be left in reserves for future biofuel rather than smashing them down.
- Tree reduction may involve the use of an excavator with mulcher or a skid steer. When mulching, be careful that the mulcher does not create a thick layer of mulch – this will prevent grass from growing up underneath. Mulching trials show that grass growth is reduced when the mulch is over 10cm thick, and the risk of the mulch bursting into spontaneous combustion increases if the mulch layer is over 20cm thick.

Chipping and Grinding

- Wherever possible, keep the chipper at the mill, rather than in-block. This will avoid having to create level, wide roads for chip truck vans (B-trains) and will reduce the requirement for large landings.
- All products should be removed within 24 months of harvest completion. This includes logs, poles, and hog fuel.

Roads – Post-harvest

- Motorized Access should be controlled on new roads through deactivation or spreading of slash on the road, or by blocking off access at the beginning of the road with debris or a tank-trap.
- Not all roads need be deactivated. In some cases it may be advantageous in very open stands to leave roads furrowed and grass seeded but with a running surface. This may concentrate off road use and facilitate access for prescribed burning. This is best used in areas of low invasive plant danger and easy terrain that will not create ORV play areas.

- Do not bury upturned stumps along the road-side; leave these in place unless they form a barrier to wildlife travel. If so, separate them with small gaps. Although unsightly to some, these stumps do provide perches for birds and habitat for small mammals.



Landings:

- Strip and pile the topsoil on landings when building them, and re-spread the soil after landing use is complete.
- If landing debris is to be chipped and hauled after following the main harvest it is still an advantage to grass seed the landings and roadside piles to reduce the risk of invasive plants.
- Landing piles should either be burned, or spread on roads to prevent motorized access if the block is in an area of Class 1 or 2 winter range.
- When decompacting landings, avoid ripping so deeply that rocks and calcareous soil is turned up and the organic layer is buried. The depth of ripping should generally be no deeper than 6-8 inches.
- For landings with a deep mulch layer, rip deeply enough to incorporate some mineral soil with the mulch, otherwise nothing will grow. Be cautious of ripping too deeply as above.
- Leave furrows 4 to 10cm deep in the surface of the ripped surfaces to improve seed catch and germination.

Blowdown Salvage:

- Scattered blow-down of large trees should not be salvaged. Blow-down trees provide refuges for grazing as well as large CWD. Salvaging them could further disturb the soil. Harvest only if forest health will be an issue.
- Areas of high blow-down (where animal movement is impeded) may be salvaged, but ensure the soil is not disturbed by salvaging on snow-pack wherever possible.

Seeding:

- Seed road right-of ways and burn piles in the fall of the year the disturbance was made. Use the current **Ecosystem Restoration seed mix** available from Interior Reforestation
- In the South Country (anywhere south of Cranbrook), also seed trails with lots of exposed soil, to minimize areas for noxious weeds to colonize.
- Re-examine seed mix every 3 years to gauge effectiveness & impact. Consider modifying current mix to reduce wheatgrasses and increase annual and perennial rye, especially for skid trails.
- The current (2014) seed mix is

Species	% by Weight	% by Species
Slender Wheatgrass	35%	19%
Pubescent Wheatgrass	25%	21%
Dryland Alfalfa	20%	23%
Perennial Ryegrass	15%	17%
Orchard grass	5%	17%

Grazing:

- Cows should be kept off sites with low grass cover for several years, to give the grass a chance to recover after treatment.

Treatment Type Tool Kit

Treatment Type	Criteria for treatment	Limiting factors to Treatment
Logging	Generally need average >90m ³ /ha of sawlog	Forestry License to Cut must be under 5000m ³ , Partitioned AAC is 35,000m ³ /yr for the RM District; Limited by stumpage rates, low quality trench wood, markets, acceptability of Douglas fir as pulpwood and Ponderosa pine as sawlog
Slashing/spacing/scattering	Stand should be under 2000 stems/ha to cut and under 5cm diameter per stem	lower costs of \$200-700 hectare; needs follow up prescribed burn to reduce fire hazards; logistics of meeting venting regulations; larger stems do not disappear in a fire; no felling of trees over 15cm Diameter
Slashing/spacing/piling / burning	Stand should be under 5000 stems/ha density and under 10cm Diameter per stem	High costs of \$1200-1900 hectare; logistics of burning piles and meeting venting regulations; larger denser stands not cost effective; no felling of trees over 15cm Diameter
Front mounted Mastication	Concentrate on Density over 5000 sph and piece size 10 to 40cm; non merchantable stands <75m ³ /ha sawlog	Skid steer not over 20% slope; LamTrac up to 100% Both do poorly with surface rock Will not work well with dense residuals, pivot badly Better with frost to snap trees off more easily
Excavator mounted Mastication	Concentrate on Density over 5000 sph and piece size 10 to 40cm; non merchantable stands <75m ³ /ha sawlog Retains residuals better	Slopes to 50% Keep chip depths under 15cm Masticate to fist sized chunks not pulp chips May turn surface fires into ground fires Watch site degradation issues on slopes and sensitive soils.
BioEnergy Harvests	Stands 10 to 25cm diameter, little or no bunchgrass on site,	No true bio-Energy market as yet, economics not known for identifying economic stands

Appendix A – Photos of relative CWD/slash loads following slashing



1 - Light fuel loading on a site.



2 – Moderate fuel loading. The slash and scatter method of slashing. This facilitates a light prescribed burn and most of the fuel under 5cm diameter flashes off. This also keeps ATVs out of the site.



3. Heavy fuel loading. This site had to be relogged before the prescribed burn to prevent the soil from being burnt severely.

Appendix B. Data fields required for the provincial Wildlife Tree Patch database

Range Unit

Treatment Unit

Date

Wildlife Tree Number

UTM location

Species

DBH

Tree Height

WT Class

WT Value (H/M/L)

Danger Tree Assessment Required? (Y/N)

Assessment Date

Assessor

Protection Treatment Utilized (Brush/Fuel Removal/Delimb/Slash/Rake)

Date Protection

Heart Rot Treatment (Y/N) – specify

Wildlife Use

Comments

Ownership

Photo ID

Appendix C Factors to Consider in rating Soil hazard and Invasive Plant Hazard

Soil Hazard;

Rate Soil hazard by way of *Land Management Handbook Field Guide Insert 8 Hazard assessment Keys for Evaluating Site Sensitivity to Soil Degrading Processes-Interior sites* 1993 T Lewis and W Carr. As set by law in Section 25 of the Forest Planning and Practices Regulation; sensitive soils are ones in which Soil displacement, Soil compaction or Soil erosion are rated as Very High

NB soil compaction is measured in the first 30cm of soil, and most Trench soils tend to be a light Aeolian cap over a morainal till of Sandy Clay loam and the most limiting soil texture is to be used; most Trench soils tend to Very High sensitivity.

Invasive Plant Risk

The threat of invasive plants increasing after harvest is high if any of the following conditions occur:

- 1) The block is any of the following range units: Grasmere, Newgate, Gold Plumbob (under 1200metres), Waldo, Colvalli, Tokay Hills, Rampart, Pickering Hills, Powerplant, Peckham's Lake, St. Mary's Prairie, Cherry, Tata-Skookumchuck, and Premier Ridge.
- 2) If the Invasive Alien Plant Program shows more than ten invasive plant infestations in the unit of harvest.
- 3) If invasive hawkweeds or cinquefoils are in the unit. These are rapid colonizers.
- 4) There is more than 0.25 hectares of cheatgrass infestation on site (plant not in IAPP)
- 5) Surface soil texture is fine texture, silt or clay improving invasive plant uptake.