

APPENDIX A

PROJECT DESIGN CRITERIA AND MITIGATION MEASURES

Soils

- 1) Areas where rutting exceeds 6 inches in depth for a length of ten feet or more would be prohibited from further ground-based equipment passes to prevent detrimental rutting of the soil. The objective of this measure is to limit the degree of soil compaction, rutting, and puddling as well as reduce the potential for offsite stream sedimentation.
- 2) Skid trails would be pre-designated for all ground-based equipment operations, and would be spaced a minimum of 150 feet apart. Use of existing skid trails and roads must be used if possible rather than creating new ones. Timber would be felled to lead to the skid trails. Skidders would remain on approved skid trails and winch logs as necessary. Feller-bunchers, preferably track-mounted, operating off designated skid trails must operate over slash beds that are as thick and continuous as practicable. The objective of this measure is to limit the extent and the degree of soil damage, displacement, and disturbance. If a logging system other than described above is used, the Forest Service must first approve it to ensure that less than 20 percent of the activity area is impacted.
- 3) Rock would be used only when necessary to reduce erosion, puddling, and compaction on landings and temporary roads, and applied only where needed (“spot rocking”). One exception to this is rocking 75 feet on both sides of the new perennial stream culvert on the temporary road in Unit 12. The objective of the limited rocking is to allow better substrate for vegetative growth and water infiltration following management activities with ground based equipment.
- 4) Temporary roads and landings would be subsoiled to a depth of 18 inches (minimum). Subsoiling and grass seeding must be done immediately following treatment and create an uneven, rough surface without furrows. Proposed alternative methods to subsoiling must be approved by the Forest Service and documented. To prevent re-compacting the treated roadways and landings, no ground-based equipment would be operated on subsoiled portions of roads and landings after subsoiling is completed. Available logging debris and slash would be scattered onto the subsoiled roads and landings to maintain organic matter levels. A qualified specialist would specify acceptable grass seed mix; type of weed-free mulch, if used; and their application rates. Subsequent vehicular access to these areas would be prevented. Closure to vehicles is required to prevent these areas from being re-compacted and to allow vegetation to develop. The objective is to avoid long-term detrimental physical and biological soil conditions. More specifically, the objectives of this measure are to rehabilitate areas compacted during management activities, accelerate recovery of compacted soils, facilitate water infiltration and revegetation, and maintain the amount of organic matter to prevent nutrient and carbon cycle deficits. This measure would also provide ground cover for exposed soils in order to reduce the potential for offsite erosion. The exception to this mitigation is the subsoiling of landings in use through November. The subsoiling of these landings would take place the following dry season. In the interim, control erosion potentially resulting from concentrated water flowing off the landing by placing slash or straw bales to dissipate the flow.

- 5) One-end suspension would be required in skyline yarding units, with full suspension through riparian areas. This measure would avoid deep soil gouging and excessive erosion. BMP T-12.
- 6) If partial suspension logging systems gouge the surface greater than 12 inches deep for a length of 10 feet or more, there is detrimental soil displacement. Rehabilitate gouged soils with cross drains and erosion seeding or have slash piled over them, as determined by the sale administrator. This measure would avoid soil erosion and stream sedimentation. BMP T-16.
- 7) Machinery would not be permitted on slopes steeper than 30 percent, unless it is shown that a particular piece of equipment, such as a feller/buncher can operate on steeper slopes without causing damage to the soil. The Forest Service would be consulted before the decision is made to use such equipment. This measure would limit the amount of soil compaction and displacement associated with tractor yarding on steep slopes.

Hydrology/Fish

- 1) All road maintenance and reconstruction activities, and all timber hauling would occur in the dry period to minimize sediment production and delivery to the aquatic system. The September 30 end date for haul from any unit may be waived for the month of October only, if conditions are good and haul-related sediment production is not increased as a result of fall precipitation levels. Conditions typically meriting a waiver are daily precipitation levels remaining below the average daily maximum precipitation for the June through September period (1.05 inches as measured at the Carson National Fish Hatchery) and two-week cumulative total precipitation of less than the average maximum two-week precipitation levels during the June through September period. Haul from Units 2 and 20 may be waived into November if 1) the precipitation requirements are met, 2) erosion control and drainage features from the landings are established to the extent practicable while remaining accessible, and 3) haul routes have no evidence of rutting or ditch blockage/failure.
- 2) Implement dust abatement practices on Forest Road 4205 when needed during log haul to limit sedimentation reaching the East Fork Lewis River.
- 3) Trees felled within Riparian Reserves would be felled to lead and not into the stream. Trees felled outside Riparian Reserves would be felled away from the Riparian Reserves if practicable. The objective is to minimize ground and vegetation disturbance within Riparian Reserves, and particularly in near-stream areas.
- 4) No equipment would be allowed within 100 feet of the stream that drains the wetland in Unit 10, within 60 feet of any other stream and within 210 feet of Fly Creek or Big Rock Creek adjacent to Units 6 and 17. The objective of this measure is to minimize disturbance of ground cover, soils and vegetation within a minimum distance from the stream.
- 5) To minimize the extent of areas subject to soil compaction and displacement, all skidding equipment would be confined to approved temporary roads, skid trails and landings during yarding and brush disposal operations. Landings and temporary roads would be approved prior to timber felling. The landings would not be located within the no-cut buffer of any stream.
- 6) Prior to any expected seasonal period of precipitation and runoff, and after sale activities are complete, cross drains would be installed in all temporary roads, skid trails, and landings with the exception of the abandoned road extending from FR 5300607 (Burma Road). After sale activities are complete, impacted areas on landings, temporary roads and skid trails would be outsloped and

sub-soiled to a depth of 18 inches, and the surface would be seeded with a Forest Service designated mix and fertilized. (An impacted area is generally where greater than 60 feet of continuous soil compaction or displacement, identified by 6-inch deep ruts, has occurred.) In special cases (i.e. stream crossings, contributing areas near streams, or other sensitive areas), mulch, erosion matting or re-contouring may be used as needed to prevent or reduce sedimentation. The expectation of this mitigation measure is maintenance of soil permeability and soil productivity and near elimination of increased channelization of surface flows in harvest units near streams from temporary roads and harvest related activities.

- 7) To minimize the amount of sediment delivered to streams along the haul route and from reconstructed system roads, the following best management practices and mitigation measures are recommended. Add two or more ditch relief culverts to both FR 53 and FR 54 where necessary to disconnect ditch flow from the stream system. Add surface rock along FR 54 where needed. Dispose soils 100 feet from any perennial or intermittent stream at a location approved by the Sale Administrator. In addition, place sediment barriers (straw bales, slash filter windrow and/or sediment fence) in where the ground is disturbed from reconstruction activities and sediment has the potential for delivery to streams. Sediment filters should be left in place where possible to naturally degrade. If non-biodegradable filters are used, precautions should be followed to minimize transport of trapped sediment material during removal, including the following: a) work during the dry season, and/or b) relocate captured sediment to a stable location. After haul is complete, construct three water bars along the first 0.1 mile of FR5300572.
- 8) All reconstructed roads would be designed to control surface road drainage to minimize erosion and sedimentation. FR 5300607 would be reconstructed by 1) installing one 24 inch culvert 2) placing crushed rock on the sections of road that is disturbed by the culvert placement, and 3) placing rock on any other sections with a grade greater than 10 percent. The temporary road that extends from the FR5300610 would have 1) a 24 inch culvert installed so that 5 inches is buried on the inlet and outlet of the culvert at the relocated perennial crossing, 2) a ditch relief culvert installed at least 50 feet from the east side of the new perennial crossing, 3) crushed rock placed 75 feet on both sides of the perennial crossing and 3) crushed rock placed on any sections of the temporary road with a grade greater than 10 percent.
- 9) After harvest and haul activities are complete and no later than October 1 of the year the unit is harvested, the following decommissioning actions would occur on FR 5300607 and the Burma Road: the culverts and culvert fill material on the perennial streams would be removed and place at a designated location approved by the Sale Administrator and at least 100 feet from any perennial or intermittent stream. The area of culvert removals would be left in a configuration that mimics the upstream channel configuration including similar bankfull width and stream bank configuration of 1.5:1. All other culverts would also be removed. Cross drains would be constructed every 100 feet where the road grade is less than 10 percent and every 75 feet where the road grade is greater than 10 percent in a manner that would direct collected surface water onto vegetated forest ground.
- 10) Forest Road 4205522 decommission would remove all culverts by excavating down to the original stream bed, recontouring streambank to a configuration that mimics the upstream channel configuration or 1.5:1 slope and revegetate all disturbed ground. A cross drain would be located 50 feet from each side of a culvert removal area so that drainage is diverted away from the newly established streambanks. Additional cross drains would be established if culvert removal areas are greater than 200 feet apart. Culvert fill material would be placed at least 100 feet from any stream crossing and place in a stable configuration. Stream banks will be contoured to a stable configuration where the road is immediately adjacent to the stream.

Silviculture

- 1) To minimize the wounding (bark slough) of residual trees, restrict log skidding from April 15th to July 1st. This does not apply to tree felling or slash piling activities.
- 2) Plant seedlings (60% western hemlock, 40% western redcedar) on a 16' x 16' spacing (170 trees/ac) within the 38 acres of riparian reserves.
- 3) Vexar tubing, with 2 stakes, should be installed on the western redcedar seedlings to deter animal browsing. Vexar tubing should be installed within 24-48 hours after the planting of the western redcedar.

Botany

- 1) *Tetraphis geniculata* occurrences located less than 75 ft. from the edge of harvest units (i.e. near harvest boundaries) would be protected through implementation of a 75 ft. radius buffer centered on the population. Sites located within the interior of units (greater than 75 ft. from the edge of harvest units) would be protected through implementation of a 120 ft. radius buffer centered on the population. During thinning operations, timber should be directionally felled away from the flagged occurrences, but may fall within buffered areas. Application of buffers by unit is described in the table below.
- 2) In coordination with Wildlife project design criteria, leave large woody debris within the stand, preferably within 300 ft. of sites of *Tetraphis geniculata* – this would provide future habitat for this species.
- 3) Minimize soil compaction and soil disturbance through the efficient use of heavy equipment within the project area. This would primarily benefit mycorrhizal fungi species, by minimizing disturbance to underground mycelial networks.
- 4) Use log manipulation methods that minimize soil and woody debris disturbance (avoid dragging logs whenever possible). This would benefit both mycorrhizal fungi and saprobic and parasitic fungi, by minimizing disturbance to their substrates.
- 5) Establish no cut buffer distances for the following botanical species:

<i>Tetraphis geniculata</i> protection within Canyon Thinning Timber Sale Units		
Unit	Number of occurrences	Design feature
9	2	120 ft. radius buffer centered on occurrences would protect occurrences and maintain moist microclimate.
12	1	120 ft. radius buffer centered on occurrences would protect occurrences and maintain moist microclimate.
17	6	Some <i>Tetraphis</i> occurrences may be protected by 210 ft. no-cut buffer along Fly Creek. Occurrences located within riparian reserves but less than 75 ft. from the harvest boundary would receive 75 ft. buffer centered on occurrence. Sites located outside riparian

		reserves less than 75 ft. from unit boundary would receive 75 ft. radius buffer centered on occurrence. Sites located more than 75 ft. from unit boundary would receive 120 ft. radius buffer centered on occurrence.
--	--	---

<i>Peltigera pacifica</i> protection within Canyon Thinning Timber Sale Units		
Unit	Number of occurrences	Design feature
3	2	90 ft. radius buffer centered on population. During thinning operations, timber should be directionally felled away from known site, but may fall within reserve.
10	1	90 ft. radius buffer centered on population. During thinning operations, timber should be directionally felled away from known site, but may fall within reserve.
14	2	90 ft. radius buffer centered on population. During thinning operations, timber should be directionally felled away from known site, but may fall within reserve.
17	4	90 ft. radius buffer centered on population. During thinning operations, timber should be directionally felled away from known site, but may fall within reserve.

Invasive Weeds

- 1) To prevent the introduction of noxious weeds into the project area, all heavy equipment, or other off- road equipment used in the project is to be cleaned to remove soil, seeds, vegetative matter or other debris that could contain seeds. Cleaning should be done before entering National Forest Lands, and when equipment moves from or between project sites or areas known to be infested into other areas, infested or otherwise. Cleaning of the equipment may include pressure washing. An inspection would be required to ensure that equipment is clean before work can begin. (Equipment cleaning provision Wo-C6.35) (**Standard 2**).
- 2) Use weed-free straw and mulch for all projects, conducted or authorized by the Forest Service, on National Forest System Lands. If State certified straw and/or mulch is not available, individual Forests should require sources certified to be weed free using the North American Weed Free Forage Program standards or a similar certification process (**Standard 3**). Mulch species shall preferably be from native seed sources or annual rye or cereal grain fields. See the Botany report for a list of local suppliers.
- 3) Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for lead bullets and invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock judged to be weed free by District or Forest weed specialists (**Standard 8**). Avoid using any material using lead bullets.

- 4) Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur. Non-native, non-invasive plant species may be used in any of the following situations: 1) when needed in emergency conditions to protect basic resource values (e.g., soil stability, water quality and to help prevent the reestablishment of invasive species), 2) as an interim, non-persistent measure designed to aid in the re-establishment of native plants, 3) if native plant materials are not available, or 4) in permanently altered plant communities. Under no circumstances would non-native invasive plant species be used for revegetation. (**Standard 13**). Contact Forest Service botanist for appropriate seeding and site preparation prescription. When seed is used it should be either certified noxious weed free or from Forest Service native seed supplies.
- 5) Save topsoil on site from areas to be disturbed and replace over disturbed soil before replanting (*Standard Procedures to Reduce the Risk of Spreading Weeds*).
- 6) Minimize road maintenance clearing zones, as much as safety regulations would allow, in order to maintain shady conditions that help minimize invasive plant population expansion.
- 7) During years of project implementation, conduct road brushing activities during spring-early summer, before seed heads mature, in order to prevent formation and release of viable seeds that could be dispersed along hauling corridors by vehicles, and/or when wind-borne seeds could disperse into newly harvested Units.
- 8) Control specified invasive plants at landings, culvert replacement sites, and along Canyon Thinning Timber Sale access roads for 1/2 mile preceding areas of ground disturbance (i.e. staging areas, and harvest units adjacent to roads), to 1/2 mile following area of ground disturbance, and within timber harvest units, as specified below:
 - During the season before the ground disturbing phase of project implementation begins, weeds shall be hand pulled, bagged and disposed of outside of Gifford Pinchot National Forest boundaries (unless Forest NEPA analysis allows for alternative treatment). Hand control efforts should occur before invasive species have set seed for the year (May or June). The Gifford Pinchot National Forest (contact: South Zone Botanist) shall provide a list of weeds to be controlled previous to project implementation. The project lead shall inform the Gifford Pinchot South Zone botanist when the weed control work would be performed, and when it is complete.
 - During seasons of project implementation weed re-occurrences along access roads shall be controlled as specified above.
 - For two field seasons following project completion, weed re-occurrences at landings, and along access roads, shall be controlled as specified above. In addition, harvest units shall be surveyed for invasive plant establishment and/or encroachment. If new invasive plant populations are located within harvested units, population data shall be collected for entry into the Natural Resource Inventory System (NRIS) database, and invasive plants shall be controlled, as specified above.
 - After two years, the Forest Service botanist shall re-evaluate the weed control needs within the project area and determine whether further treatment is needed. It is likely that, at some sites, weed control beyond two years would be necessary.

Wildlife

- 1) Protect known jumping slug sites by designating a no-cut buffer with a 120-foot radius (approx 1 acre) around each site.
- 2) To the extent possible, protect all existing down logs that are remnants of the previous stands by not designating trees adjacent to these features for harvest, falling trees away from them and routing skid trails around them. If snags must be felled for safety reasons, leave the resulting log in place.
- 3) Ensure that existing remnant logs are not affected by slash treatments. Ensure that these features are not incorporated into slash piles, or burned when burning slash.
- 4) Create 2.6 snags per acre that are at least 17 inches diameter in Units 2, 3, and 12, and maintain an average of at least 120 linear feet of hard logs per acre that are at least 12 inches diameter in all units.
- 5) Implement a limited operating period prohibiting logging and yarding activities from March 1 to June 30 in Units 6, 8, 10, 11, 12, 16, and 20 to reduce noise disturbance to adjacent spotted owl habitat. This mitigation is required in the Programmatic Biological Assessment to ensure a Not Likely to Adversely Affect determination.

Recreation

1. Log haul will be permitted only Monday through Friday, except holidays to limit the potential for road use conflicts with recreational visitors.