Summary of Review of the Potential Effects of Proposed 2007 Baker Blowdown Salvage Project within USDA Forest Service, Mount Baker-Snoqualmie National Forest Mount Baker Ranger District

Report to:

Cascades Conservation Council

Prepared by:

Guy L. Pinjuv, PhD

Forest Scientist

December 10, 2007

Introduction and Background

These comments briefly discuss of some concerns related to the proposed project's major impacts on reducing tree and canopy growth, and natural regeneration of tree seedlings. In particular, it focuses on impacts to soils and residual trees that may reduce tree growth and the time taken for tree canopies to develop into Late Successional Reserve (LSR) habitat. These comments also focus on the flawed rationale for the project, to remove dead and downed wood to enhance tree seedling growth.

The proposed project site is located on the Mount Baker Ranger District, Mount Baker-Snoqualmie National Forest in Whatcom County, Washington. The project area occurs in the Baker River watershed. The project is located within ¾ mile of the boundary of the National Forest in the Baker River watershed (Township 37 north, Range 8 east, Section 35). All of the proposed project area lies within the Baker (RW 112) LSR. The land management objective for the LSR is to provide habitat for the recovery of the northern spotted owl and marbled murrelet, and to maintain populations of plant and animal species closely associated with late-successional and old-growth forests (Northwest Forest Plan, 1994). In order to meet this objective, 80% of the LSR should be old-growth or late-successional forest (USDA 2001). Currently the Baker LSR falls short of its desired condition because only 68% of forested areas are estimated to be in these habitat classes (USDA 2001).

The Baker Blowdown Salvage Project will remove commercially valuable trees that were blown down by a wind storm in December 2006 and plant conifer tree seedlings. The project encompasses 33 acres of harvesting commercially valuable downed trees using ground-based logging systems, 21 acres of harvesting commercially valuable down trees with skyline logging systems, and reforesting approximately 28 acres using native conifer tree seedlings planted at variable densities.

I reviewed the following documents produced by the 2007 Baker Blowdown Salvage Project within USDA Forest Service, Mount Baker-Snoqualmie National Forest Mount Baker Ranger District. (hereafter "BBSP"), the 2007 Decision Memo (hereafter "DM"), the Baker Blowdown Aquatic Specialist Report (hereafter "ASR"), and the Baker Blowdown Soils Specialist Report (hereafter "SSR"). I also reviewed related scientific literature. A list of scientific references is included at the end of this report. In my review, I also drew on my own professional judgment and experience.

The DM, SSR, and ASR failed to quantitatively and scientifically support statements relating to the projects likely effect on reducing tree canopy growth, thus reducing time of the project area to grow forest stands into (LSR) habitat. The DM also failed to quantitatively and scientifically support statements relating to the projects likely effects on reducing natural regeneration of tree seedlings, and also failed to mention the critical need for dead and downed wood for natural regeneration in Northwestern Forests.

Tree Growth and Canopy Cover

The DM claims (on page 1 under the Introduction) "*that no additional environmental analysis is required under the National Environmental Policy Act (NEPA) based on agency direction, analysis of public comments, and the absence of extraordinary circumstances that may result in significant effect to the environment.*" The DM, and all specialist reports fail to mention the projects likely effect on reducing tree and canopy growth which would likely have a net negative effect to the LSR. The only mention of this issue is in the SSR (section on Cumulative Effects) which states "*The minor disturbances of salvage logging a portion of the wind falls will not measurable change the affect of the windstorm on the canopy.*" This statement is supported up by any scientific evidence from literature on growth models that use root zone water balance as in input variable, and comes from a soils specialist (not a physiological growth modeller). The project will cause increased runoff due to road construction and soil compaction, which decreases the amount of water that would otherwise infiltrate into the soil surface recharging aquifers or be made available for tree growth, thus having a likely net negative effect to LSR development. The SSR (section under Forest Plan Consistency) estimates "*Total disturbed area including logging trails, logging corridors, temporary roads and landings falls varies from 1.5% in Unit 4 to 18.4% in Unit 9.*" This statement suggests a certain proportion of rainfall will not infiltrate into the soil as a result of soil compaction and be available for tree growth. The DM also makes reference to more incident rainfall that will not be available for tree growth as a result of road construction in the ASR, where the maximum amount of accelerated erosion and sediment delivery of 0.2% (due to runoff from the soil surface) of the existing sediment regime are expected to occur as a result of the project. This estimate does not directly calculate the amount of excess runoff that will result from road construction, but calculates the amount of excess sediment that will result from road construction based on a personal communication. "*To put this small amount of disturbance in perspective, several quick calculations were made. Road surfaces can yield up to 30 times forest erosion rates (pers comm. Gary Ketcheson, USFS hydrologist, 8/2007). The maximum additional sediment into Rocky Creek then, with a proposed increase of 1,608' of temporary road at a maximum of 18' wide, would be an increase in sediment yield of 30 times the average on 0.001 sq. miles, or the equivalent of adding 0.03 sq. miles of eroding area to the watershed. With a watershed area of approximately 14 sq. mi. above the analysis area, an increase of 0.03 miles would lead to a maximum increase in annual sediment yield of 0.2%.*"

Soil water balance is a well established indicator of growing potential and is said to be a main constraint to tree development. Reduction in the availability of water will decrease stem growth through restricting physiological processes such as leaf area development, photosynthesis, and stomatal conductance (Boomsma and Hunter, 1990). Cell enlargement (or leaf expansion) is a process that is especially sensitive to water stress. Atwell et al. (1999) describe the process of plant or tree height growth and later phases of leaf expansion as depending mainly on cell enlargement, which depends heavily on turgor pressure of water in the cell. Further, stem growth by carbon assimilation has been found to be influenced by increases in soil water availability (Dupouey et al., 1993; Livingston and Spittlehouse, 1993). Many process-based, and hybrid models of forest growth are sensitive to water availability for plant growth (Landsberg and Warring, 1997, and Pinjuv 2005). These models decrease estimates of forest and canopy growth as a function of root zone water balance.

Tree Seedling Regeneration on Dead and Downed Wood

The Forest Service claims (on page 4 of the DM under Rationale to Salvage Harvest Blowdown Trees) that the project is needed to enhance tree seedling regeneration, and growth rate in areas of blown down wood. Its rationale is that there is little exposed ground area to replant, and seedling growth is likely to be slow as a result of shading caused by piles of blown down logs, and the time needed for downed wood to sufficiently decay. The DM states "*With the current depth and cover of down trees, available planting spots are few, and shading caused by the piles of logs will result in slow tree seedling growth. Therefore, planting trees in these areas is needed to begin development of a new forest that will develop into late successional forest in approximately 80 years*." The DM fails to acknowledge the critical need for dead and downed wood for natural regeneration in North-western Forests, and its role in producing microhabitats important for producing late successional forests. In a study done by Harmon and Franklin (1989) on tree seedlings regeneration on logs in Picea-Tsuga forests of Oregon and Washington, natural regeneration of tree seedlings in the Northwest appears to be exclusively dependent on decaying wood to act as a seedbed. They found more seedlings survived on logs than on the soil surface, regardless of whether the experimental blocks were raised or placed flush with the soil surface. They also found that competition with herbs and mosses on the forest floor appeared to be responsible for the disproportionate number of tree seedlings found on logs. They concluded that recently fallen logs represent sites where competition is low enough for tree seedling recruitment within many Picea-Tsuga forests. Managers interested in retaining a tolerant conifer component should give proper attention to deadwood dynamics. Weaver (2002) findings illustrate also that wood is an important seedbed for tolerant conifers (i.e. wood supports a greater seedling density than the adjacent forest floor). Tree falls produce a number of different microhabitats (Beatty and Stone 1986). These include root throw pits and mounds, downed boles, stumps, canopy gaps, and leaf and branch piles created from downed canopies. These microsites facilitate establishment of mycorrhizal relationships (Harvey et al. 1987), changing substrate nutrient and moisture conditions (Hale and Pastor 1998), providing suitable physical substrate for establishment of roots (DeLong et al. 1997), and increasing light and temperature regimes as with canopy gaps (Canham et al.1990).

Conclusion

The project will have many enduring direct and cumulative impacts on the development of Late Successional Reserve habitat. These impacts include: a net negative effect on tree growth, and canopy development. Furthermore, the rationale for removing dead and downed wood to increase tree seedling regeneration is not supported by existing literature and may also have long term negative effects on the development of microhabitats important for producing Late Successional Forests.

The failure of the DM to credibly estimate net negative effects of the proposed project on the development of LSR forest conditions should at very least exclude the project from a categorical exclusion Under the National Environmental Policy Act, and may exclude the project under the North West Forest Plan land management objective for LSR as it may in fact slow progress of such a reserve.

Literature Cited

Atwell, B.A., Kriedemann, P.E., Turnbull, C., 1999. Plants in action; adaptation in nature and performance in cultivation. MacMillan Education Australia Pty. Ltd. 627 Chapel Street, South Yarra 3141. 664 pages.

Beatty, S. W.; Stone, E. L. 1986. The variety of soil microsite created by tree-falls. Canadian Journal of Forest Research 16: 539-548.

Boomsma, D.B., Hunter, I.R., 1990. Effects of water, nutrients and their interactions on tree growth, and plantation forest management practices in Australasia: a review. Forest Ecology and Management. 30, 455 – 476.

Canham, C. D.; Denslow, J. S.; Platt, W. J.; Runkle, J. R.; Spies, T. A.; White, P. S. 1990. Light regimes beneath closed canopies and tree-fall gaps in temperate and tropical forests. Canadian Journal of Forest Research 20: 620-631.

DeLong, H. B.; Lieffers, V. J.; Blenis, P. V. 1997. Microsite effects on first-year establishment and overwinter survival of white spruce in aspen-dominated borealmixedwoods. Canadian Journal of Forest Research 27: 1452-1457.

Dupoey, J., Leavitt, S., Choisnel, E., Jourdain, S., 1993. Modelling carbon isotope fractionation in tree rings based on effective evapotranspiration and soil water status. Plant, Cell and Environment. 16, 939-947.

Hale, C. M.; Pastor, J. 1998. Nitrogen content, decay rates, and decompositional dynamics of hollow versus solid hardwood logs in hardwood forests of Minnesota, U.S.A. Canadian Journal of Forest Research 28: 1276-1285.

Harmon, M.E. and J.F. Franklin. 1989. Tree seedlings on logs in Picea-Tsuga forests of Oregon and Washington. Ecology 70:48-59.

Harvey, A. E.; Jurgensen, M. F.; Larsen, M. J.; Graham, R. T. 1987. Relationships among soil microsite, ectomycorrhizae, and natural conifer regeneration of old-growth forests in western Montana. Canadian Journal of Forest Research 17: 58-62.

J.K. Weaver. 2002. Substrate availability and regeneration microsites of tolerant conifers in mixed-species stands in Maine. MS Thesis, University of Vermont. 80 pages.

Landsberg, J.J., Waring, R.H., 1997. A generalized model of forest productivity using simplified concepts of radiation use efficiency, carbon balance and partitioning. Forest Ecology and Management. 95, 209 – 228.

Livingston, N.J., Spittlehouse, D,L., 1993. Carbon isotope fractionation in tree rings in relation to the growing season water balance. In ‘Stable Isotopes and Plant Carbon-Water Relations’. (Eds J.R. Ehleringer, A.E. Hall and G.D. Farquhar.) pp. 141-154. (Academic Press: San Diego.)

Northwest forest plan. 1994. Record of decision for amendments to Forest Service and Bureau of Land Management planning documents within the range of the Northern Spotted Owl, and standards and guidelines for management of habitat of late-succesional and old-growth forest related species within the range of the Northern Spotted Owl. Major amendments by USDA and USDI to 1990 plan.

Pinjuv, G.L., 2006. Hybrid forest modelling of Pinus radiata D. Don in Canterbury, New Zealand. Forestry thesis for Ph.D. School of Forestry, University of Canterbury, 198 pp.

USDA. 2001, Late successional reserve assessment for Snoqualmie National Forest. United States Department of Agriculture, Forest Service, 2001.