REPORT OF INDEPENDENT REVIEW TEAM FOR EAGLE SALE

Jerry F. Franklin, Chair
Professor of Ecosystem Analysis, College of Forest Resources
University of Washington, Seattle, WA

Bernard T. Bormann
Forest Ecologist, Pacific Northwest Research Station, Corvallis, OR

E. Charles Meslow
Wildlife Ecologist, Corvallis, OR

Gordon H. Reeves
Fisheries Biologist, Pacific Northwest Research Station, Corvallis, OR

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Executive Summary

The Independent Review Team was chartered by the USDA Forest Service to review scientific issues associated with the Eagle Sale, Mt. Hood National Forest. The team was specifically charged with addressing three questions: (1) Was blowdown anticipated and desired, inside and outside the unit/sale boundaries?; (2) Were the effects of blowdown on the Salmon-Huckleberry Wilderness considered?; and (3) Have there been or are there expected to be any adverse environmental effects resulting from blowdown? The team reviewed documents and scientific literature relevant to the issues, made separate field trips to the Eagle Sale area with Forest Service and with representatives of the environmental organizations, and interviewed relevant individuals.

In the opinion of the team the Eagle Final Environmental Impact Statement (FEIS) adequately considered blowdown hazards within the sale area based upon information and experience available to the agency at the time the FEIS was prepared. Some blowdown was anticipated and desired as a contribution to wildlife habitat. Potential impacts of blowdown on the wilderness were considered; subsequent to award of the sale, the Mt. Hood National Forest has proposed modifications to the sale that would substantially further reduce risks of blowdown in the Salmon-Huckleberry Wilderness, which have not yet been accepted by the purchaser. No adverse effects on water quality, aquatic ecosystems, wildlife, or other environmental values are apparent from existing blowdown nor are significant environmental impacts expected in the future.

Blowdown does appear to be greater than anticipated in some areas within and adjacent to harvested shelterwood units within the Eagle Sale. Although this does not create a current problem, the team has long-term concerns about retention of desired levels of large, live trees on some units and about the integrity of unlogged stands adjacent to harvest units, if areas of high blowdown became widespread. We recommend that the Mt. Hood National Forest use the experience gained in the Eagle Sale to date to reassess windthrow potential and modify silvicultural prescriptions so as to further reduce risks of widespread blowdown. Specific areas of concern that were identified by the team were harvest prescriptions on sites with a herb-rich understory characterized by *Oxalis oregana* and protection of remnant old-growth trees.

Introduction

The Independent Review Team was created and charged by the U. S. Forest Service with reviewing aspects of the Eagle Sale, Mt. Hood National Forest, related to ". . . *the potential for environmental effects resulting from blowdown.* . .". Specifically, the team was asked to address three questions:

(1) *Was blowdown anticipated and desired, inside and outside the unit/sale boundaries?*

(2) *Were the effects of blowdown on the Salmon-Huckleberry Wilderness Area considered?*

(3) *Have there been or are there expected to be any adverse environmental effects resulting from blowdown?*

The team conducted its work between April 19 and July 6, 2001. The primary activities included:

- Review of relevant documents, including the decision documents (draft and final Environmental Impact Statements) for the sale and correspondence among agency personnel, congressional offices, timber sale purchaser, and environmental organizations regarding the sale (see appendix for complete list);

- Full day field trips to portions of the Eagle Timber Sale with personnel of the Mt. Hood National Forest on May 29, 2001 and with representatives of the environmental organizations on June 18, 2001 (see appendix for list and affiliations of participants). During these field trips the team visited: (1) Logged Units 9 (commercial thin), 17 (shelterwood), 25 (commercial thin), 26 (commercial thin), and 27 (strip clearcut); and (2) Unlogged Units 2 and 13 (shelterwood) and 8, 14, 24, and 28 (commercial thinnings);

- Full day meeting of team members on June 19, 2001 to discuss information gained via field trips, reviews of documents and relevant scientific papers, and acquire additional information on soils, system for rating windthrow hazard on Eagle Sale, silvicultural prescriptions, and history of sale from Mt. Hood National Forest; and

- Writing, reviewing and finalizing this report.

The team chair did speak with Mr. G. A. Hertrich and Mr. Ed Harris of Vanport Manufacturing, Inc. by phone on July 5, 2001.

The team focused primarily on the issues identified in its charter, all of which have to do with technical and scientific aspects of blowdown in the Eagle Timber Sale. A number of other issues were raised in correspondence and in the field regarding other aspects of the Eagle Timber Sale. However, the team judged these to be primarily process issues—i.e., did the Forest Service follow procedures and standards, such as those required under the Northwest Forest Plan—rather than scientific issues. These issues were identified and relayed to Dr. Ann Bartuska of the USDA Forest Service' Washington Office who will be addressing them through internal processes.

Location and Description of the South Fork Eagle Creek Drainage

Eagle Sale is located within the drainage of the South Fork of Eagle Creek, a tributary of the Clackamas River in northwestern Oregon. It is federal land administered by the Clackamas River Ranger District of the Mt. Hood National Forest. Eagle Creek is part of the Matrix land allocation under the Northwest Forest Plan, excepting the unmapped Riparian Reserves associated with aquatic features. Management objectives on Matrix forests are expected to include production of wood and other commodities. Managed stands are expected to incorporate structural complexity using silvicultural approaches, such as dispersed and aggregated retention at time of regeneration harvest. Development or maintenance of late-successional conditions is not a primary management objective in the Matrix, however.

Forests in the South Fork Eagle Creek drainage are predominantly "mature" stands in their second century of development (Franklin et al. 2001). They originated by natural regeneration following wildfires during 1840-1850. Very few old-growth trees, which predate the fire, survive. Composition of the stands is dominantly Douglas-fir, noble fir, western hemlock, western redcedar, and Pacific silver fir. Natural stands at this stage of development exhibit several distinct attributes including relatively large accumulations of biomass but modest structural complexity, such as low masses of coarse woody debris (snags and down wood). Stands at this stage are undergoing a transition in spatial pattern and causes of tree death from dispersed competition-based mortality to spatially aggregated mortality caused by insects, diseases, and wind (Franklin et al. 2001).

Perspectives on Windthrow as an Ecological Process

Toppling of trees by strong winds is an important natural process in most unmanaged and managed forests (Barnes et al. 1998). Windthrow is a natural disturbance in northwestern forest ecosystems. In fact, windthrow is an essential process in stand development that generates structural complexity—such as logs and small openings or gaps—which are required by many plant and animal species (Harmon *et al.* 1986, Maser *et al.* 1988, and Franklin *et al.* 2001). Wildlife benefits include habitat for dens, cover for hiding and movement, and foraging sites. Downed trees benefit in-stream habitat, such as by creating pools, retaining organic matter and spawning gravel, and providing energy and nutrients for the aquatic food chain. Other ecosystem benefits include soil mixing (Bormann et al. 1995), which speeds soil development and increases fertility, and creation of substrate (nurse logs) for many plants (Harmon and Franklin 1989).

Freshly windthrown trees can also result in increased bark beetle activity, however. Downed trees may provide substrate in which broods can successfully develop and attack live trees. For example, outbreaks of the Douglas-fir bark beetle (*Dendroctonus pseudotsugae*) have developed in blowdown following severe winter storms (e.g., in 1952-1954) although such outbreaks are far from universal responses to large-scale windthrow. Low to moderate levels of Douglas-fir bark beetle activity are, however, very much a part of normal patterns of mortality and make important contributions to structural development in mature (80 to 250-year-old) Douglas-fir stands in western Oregon and Washington (Franklin *et al.* 2001).

A history of blowdown predating harvesting is readily evident today throughout the South Fork Eagle Creek watershed in the form of numerous soil mounds and pits created when roots were lifted from the ground by falling trees. This history is well recognized and documented in the Eagle Sale FEIS. One notable example observed by the team was a western redcedar tree that started its life atop a windthrow mound that was created in a storm event about 300 years ago.

Another example was widespread pit-and-mound topography found along the northeastern boundary of the timber sale (Units 8 and 24).

The most noticeable effects of forest management on blowdown are associated with cutting patterns that generate sharp edges with remaining forest stands (Franklin and Forman 1986). Trees grown within an intact stand that become exposed to the direct impacts of winds may undergo substantial mortality due to wind, particularly when edges are associated with particular topographic or soil conditions (Chen et al. 1992, Barnes et al. 1998). For example, clearcutting in the Bull Run watershed, which preceded strong east winds in 1973 and 1983, resulted in blowdown along clearcut and road edges covering about 7% of the watershed (Sinton et al. 2000).

Many factors affect the interaction between wind and management. For example, as trees get taller the risk for windthrow increases because of an elevated center-of-gravity and increased wind leverage on tree crowns; this is true in both managed and unmanaged stands. Thinning dense stands can increase risk of blowdown in the short term as stands are opened up and trees are exposed to increased winds; however, thinning can also decrease risk of blowdown in the long term, by stimulating remnant trees to expand their root systems. Other factors include the location of exposed (cut) edges with regards to topographic position, exposure (azimuth), soil type, and soil moisture (both long-term and during specific storm periods). The timing, intensity, and direction of storms interact in a complex way with these factors, leading to substantial uncertainties in predicting windthrow probabilities.

Management plans need to incorporate the potential for and effects of blowdown in wind-prone landscapes. The complex of site, stand, and edge factors and highly stochastic nature of storm events currently makes prediction of blowdown hazards difficult and outcomes uncertain. Silvicultural prescriptions need to assess goals and risks as accurately as possible, such as by:

- Assessing windthrow hazards from analyses of risk factors (e.g., soils and topography), evidence of past blowdown events, and responses to previous management activities;
- Identifying desired long-term densities of standing trees and logs on the forest floor and incorporating the probable effects of windthrow on these objectives;
- Maintaining the integrity of the forest stands adjacent to the management unit, such as by minimizing creation of sharp forest edges in high-risk areas; and
- Avoiding larger patterns of management that put whole landscapes at risk, such as occurred in the Bull Run Watershed.

Continual monitoring of the effects of management activities on blowdown can provide the opportunity to adjust management prescriptions when windthrow effects are either greater or lesser than those that were anticipated initially.

Blowdown in the Eagle Sale

The 1996 Eagle Final Environmental Impact Statement adequately addressed the issue of blowdown based upon existing knowledge. The FEIS incorporates a comprehensive analysis of historical patterns of blowdown within the South Fork Eagle Creek drainage (Appendix H). It also provides a conceptual background and recommendations regarding windthrow considerations in the design of the harvest units and development of silvicultural prescriptions (pages 96-99). Implicit in the FEIS were expectations that there would be moderate levels of blowdown associated with the timber sale and that this process would contribute to desirable increases in coarse woody debris on the forest floor.

Blowdown associated with some of the shelterwood units does appear to exceed the desired and anticipated amounts (percentages of the residual stand) within the unit and in some locations (adjacent unlogged forests) where it was not anticipated. We assume, for example, that the silviculturalist intended for many retained trees on the shelterwood cuttings to remain standing through the next rotation as live trees and snags since this is one objective of retention harvest prescriptions under the Northwest Forest Plan.

The substantial blowdown on these harvested units is probably due to a variety of factors, some of which were not fully comprehended at the time the FEIS was completed. For example, some sites characterized by a well-developed herbaceous understory dominated by *Oxalis oregana* appear to have higher blowdown potential than might have been predicted based upon soil and topographic conditions. Unit 17--a harvested shelterwood noted as having high levels of blowdown--represents this site condition as do portions of several unlogged units (e.g., 13, top of 14, 28). The *Oxalis* sites have high productivity--hence, trees are tall with well-developed crowns providing high leverage for winds. Soils are deep, moist, and of low bulk density; these soils may have a lower than average sheer strength, especially when wet, thereby contributing to windthrow potential.

Remaining Eagle sale units that have not yet been harvested may also have higher potential for blowdown than anticipated based on previous blowdown hazard ratings. Several units are entirely (Units 13 and 28) and some are partially (ridgetop in Unit 14) characterized by the vegetation and soils of the *Oxalis* site type. The east-west orientation of a temporary logging road planned at the top of Unit 14 may increase risks to that area; this road also has the potential to funnel east and west winds (either of which can generate windthrow in this area) into the adjacent shelterwoods (Unit 13 on west and Unit 15 on east). The strip shelterwood in Unit 27, which was designed to reduce visual impacts, appears to have significantly affected flows of southwesterly winds and is contributing to uprooting of trees in unlogged portions of Unit 28; this circumstance will probably continue to generate substantial blowdown within this commercial thin (Unit 28).

We think that it is important to note that blowdown associated with the Eagle Sale thus far has been generated by winter storm winds of only moderate intensity. A truly high intensity wind event has not occurred since logging of the timber sale began.

Finally, the Mt. Hood National Forest has advised us that they do not intend to do any salvage logging of blowdown within the Eagle Sale area. Obviously, if blown-down timber is viewed as a contribution to coarse woody debris and wildlife habitat, removal of such material is inappropriate.

Environmental Effects of Current and Potential Blowdown

Do we expect adverse environmental effects with current levels of blowdown and levels that might be expected if the sale continues in its current form?

Aquatic ecosystems. There is no apparent effect of the current blowdown on the aquatic ecosystems in the South Fork Eagle Creek drainage. There is no evidence of surface erosion resulting from blowdown in any of the units that were visited. The absence of erosion is most likely due to the rapid infiltration of water into the soil and the resulting low stream densities in the watershed. The geology is ". . . resistent and intermediate rock-gentle slopes" (Eagle Creek Watershed Analysis, Appendix C of FEIS). Sediment transport is minimized under the low

stream density characteristic of the landscape. Additionally, the presence of ground cover reduces the potential for surface erosion.

We did not observe riparian buffers that were associated with harvested units so we could not judge how wind firm such buffers might be. We visited a buffer in Unit 24 (not yet harvested) that is reported as 440 feet or two site potential trees in height on both sides as required by the Northwest Forest Plan. Buffers of any size should resist blowdown under the lighter thinning prescription, such as the 35% basal area removal planned for Unit 24.

In the watershed, the primary impacts of forest harvest on water quality are associated with development and maintenance of the main roads that are directly connected with stream channels via drainage ditches. Most existing roads appear very stable in this landscape.

Wildlife. Blowdown sustained to date in and adjacent to harvested sale units contributes to wildlife habitat in the short and mid-term. Patches of blowdown concentrate down woody material and provide an element of habitat diversity that would otherwise not be present in the planned, post-harvest landscape. The relatively small areas of concentrated coarse woody debris creates no problem for wildlife and, in fact, provide refugia for species that utilize tangles of down material for denning, foraging and escape.

Concentrated blowdown can be a long-term problem when it eliminates many or most of the retained green trees (e.g., the overstory trees in the "shelterwood" cuts of the Eagle Sale). These trees are intended, in part, to provide an element of large tree diversity in the developing new stand and landscape. Some of these retained large trees are also expected to be the source of the large snag component in future stands. Large snags are an important and routinely scarce wildlife habitat element in managed forests.

The extent of blowdown in and adjacent to harvest units and the landscape context (e.g., South Fork Eagle Creek drainage) are both critical in evaluating the tradeoff between positive values of concentrated patches of down woody material and the need for retained large standing structures as live trees and snags. We are not in a position to make such an analysis. Although the blowdown sustained to date in the Eagle Sale is a positive rather than negative contribution to wildlife habitat, the forest should continue to refine efforts to avoid extensive loss of residual green trees.

As a final note, one objective in regeneration harvests under the Northwest Forest Plan is provision for structural diversity in subsequent managed stands by retaining or providing for the creation of key structures, such as large green trees, large snags, and large logs. A minimum of 15% of the harvested stand is supposed to be retained in order to restore and maintain a variety of ecosystem processes and elements of biological diversity (Franklin et al. 1987). As just noted with regards to wildlife habitat, habitual rapid loss of the majority of retained green trees on harvest units should be avoided. In areas with high blowdown risks, greater numbers of trees may need to be retained to increase probabilities of achieving desired densities of surviving standing trees.

Threat to Salmon-Huckleberry Wilderness. We looked carefully at the potential effects of the harvesting in Units 8 and 24, which are located on the southwestern boundary of the Salmon-Huckleberry Wilderness. These units are in a critical location since they are on the windward side of the ridgetop boundary between Eagle Creek and the wilderness with respect to the southerly and westerly winds that dominate in this drainage. For example, timber harvest could

potentially generate windthrow in the wilderness by modifying airflow and creating turbulence on the lee (northeast) side of the ridge.

Commercial thinning with 35% removal is proposed for Units 8 and 24, neither of which has been harvested. The forest has concentrated much of this harvest in small openings so as to reduce the potential for windthrow. The forest advised us that most of these openings are ¼ acre with a few larger openings (maximum 1 ½ acre) although we did not verify the size distribution. Such an approach could appropriately be labeled *group selection* and is analogous to natural gap-forming processes (Franklin et al. 2001). Concentrating the harvest in this way may be preferable to a uniform thinning in Units 8 and 24 from the standpoint of blowdown. In blowdown-prone environments, silvicultural prescriptions that create small openings well distributed through an undisturbed or intact forest matrix may be superior to prescriptions that uniformly disturb forests and open canopies over large areas. The openings must be kept small, however, so that opportunities for wind penetration are limited. Our opinion about the merits of group selection contrasts with views expressed by the purchaser (letter from G. A. Hertrich of Vanport Manufacturing to Forest Supervisor, dated November 18, 1999).

With regards to Units 8 and 24, we found that the original silvicultural prescriptions provided substantial buffering and, further, that the Mt. Hood National Forest already has reassessed potential blowdown hazards and proposed modifications to the Eagle Sale so as to further reduce risks to the wilderness. The original prescription provided for a no-cut buffer along the ridgeline/wilderness boundary of 75 to 200 feet; harvesting intensity would increase gradually from 10 to 15% right at the no-cut buffer boundary to 35% further downslope. Subsequently, the forest has proposed an additional 200' of buffering—i.e., 200 additional feet of no-harvest buffer beginning at the current no-cut boundary. This would provide a total no-cut buffer of 275 to 400 feet between harvested areas and the top of the ridgeline/wilderness boundary. The purchaser is still considering the proposed modifications of the boundaries of Units 8 and 24 as of the date of this report. We endorse the Mt. Hood proposal, which we believe will reduce the risk of blowdown in the Salmon-Huckleberry Wilderness to low levels.

Threats to forest health. Concerns over both bark beetles and fire provide incentives for forest managers to avoid creating large concentrations of blowdown in the watershed. Douglas-fir bark beetles can breed in freshly windthrown trees and emerge from them to attack live trees. Successful beetle attacks are clearly evident at several locations both inside and outside harvest units in the form of individual and small groups of beetle-killed Douglas-firs. In fact, low to moderate levels of Douglas-fir bark beetle activity are expected and appropriate in mature (100- to 250-year-old) stands, such as those found in South Fork Eagle Creek. These attacks rebuild large snag populations and create spatial heterogeneity (gaps) within previous homogenous stands (Franklin et al. 2001). However, chronic rather than epidemic levels of beetle activity in a landscape are preferred as contributors to development of forest structure.

Blowdown also influences fire risk and resistance-to-control by increasing fuel loadings directly and indirectly. Contributions to fine and medium fuels are a direct but relatively short term issue. Direct effects of blowdown on large fuels (down boles) and indirect effects (through bark beetle activity) on snag densities are long-term issues. We do note that these are west-side forests where large fuel loadings are characteristic, unlike east-side ponderosa pine and mixed conifer forests, where high fuel loadings are often the result of fire suppression programs.

Recommended Actions

In our opinion, in the Eagle FEIS the Mt. Hood National Forest did analyze and address blowdown hazards within the Eagle Sale area based on information that was available in 1996. However, additional knowledge has accumulated as a result of experiences with the areas logged to date. The forest has the opportunity to make adjustments in the sale using this information to modify some of the silvicultural prescriptions so as to reduce the probabilities of blowdown in excess of desired amounts. This is an adaptive process that the forest has already begun with its proposed modifications of Units 8 and 24. We again note our opinion that the sale as currently configured presents no significant threat to water quality or to wildlife. We also opine that the sale has a low probability of producing significant blowdown within the Salmon-Huckleberry Wilderness—provided that the modifications of harvest plans in Units 8 and 24 proposed by the Mt. Hood National Forest are adopted.

Our recommendations are as follows:

- Mt. Hood National Forest's proposed modification of the harvest-free buffer in Units 8 and 24 should be adopted;

- Mount Hood National Forest should review the silvicultural prescriptions for all remaining units in Eagle Sale in view of the blowdown experienced up to this time;

- Units partially or entirely located on sites characterized by *Oxalis* plant communities should receive particular attention with regards to location (e.g., relationship to existing and proposed harvest units) and silvicultural prescription (increased overstory retention). Unit 13, the ridgetop portion of Unit 14, and unharvested portions of Unit 28 are exemplary.

- The forest should consider an alternative to the temporary road proposed along the ridgetop in Unit 14 because of its east-west orientation; and

- The forest should review their approach to protection of remnant old-growth trees in the sale area since they are very uncommon in the South Fork Eagle Creek drainage. We recommend that the forest consider protecting such remnants as part of a retained aggregate rather than by marking individual trees for retention.

Process Issues

Environmentalists and congressional offices have raised a number of additional issues regarding the Eagle Sale. These include conformity with provisions of the Northwest Forest Plan (e.g., Survey and Manage requirements), consistency with the Eagle Creek Watershed Analysis, communication, entry into an inventoried roadless area, adequacy of tree marking, and removal of marked trees as a result of logging methods. We view these as procedural or policy issues and not appropriate for a scientific or technical review—i.e., they have to do whether the forest has followed procedures and policies and the veracity of forest statements about the intent and specifics of the timber sale

Conclusions

The Independent Review Team for the Eagle Sale concludes that the Eagle FEIS did adequately address the issue of possible blowdown and blowdown effects. In our judgement:

- Blowdown was an anticipated and desired effect of timber harvesting within the Eagle Sale;
- Effects of blowdown in the Salmon-Huckleberry Wilderness were considered and, in fact, the Mt. Hood National Forest has proposed modifying sale units to further reduce the risk to the wilderness; and
- At current levels of blowdown no adverse environmental effects are expected, such as on water quality, aquatic ecosystems, or wildlife.

Blowdown levels experienced in some logged portions of the Eagle Sale do appear to exceed the desired amounts in some harvested stands and to have occurred in some locations where it was not anticipated. The experience with blowdown during the initial phases of the sale can be used to modify silvicultural prescriptions on remaining harvest units so as to reduce the potential for blowdown in excess of desired levels.

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Appendix

Participants in field trips and office presentations:

May 29, 2001	Jeff Walter	Clackamas River District Ranger
	K. J. Silverman	Assistant Supervisor, Mt. Hood National Forest
	Tim Johnson	Contracting Officer, Clackamas District
	K. C. Goodrich	Law enforcement, Mt. Hood National Forest
June 8, 2001	Ivan Miluski	American Lands Alliance
	Brenna Bell	Cascadia Forest Alliance
	Donald Fontenot	Cascadia Forest Alliance
	Jeremy Hall	Oregon Natural Resources Center
	Ann Bartuska	Director of Forest Management, FS, WO
June 9, 2001	Gary Larsen	Supervisor, Mt. Hood National Forest
	Jeff Walter	Clackamas River District Ranger
	Jim Rice	Timber Management Coordinator
	Jean Rice	Clackamas District Silviculturalist
	Don Davis	Leader, Eagle ID team
	Ann Bartuska	Director of Forest Management, FS, WO

Major documents reviewed by Independent Review Team

1990. Land and resource management plan Mt. Hood National Forest.
1995. Eagle Creek Watershed Analysis. Mt. Hood National Forest & Bureau of Land Management
1996. Eagle Final Environmental Impact Statement
1996. Eagle Final Environmental Impact Statement Record of Decision
1996. Eagle Supplemental Draft Environmental Impact Statement
2000. Memoranda dated 8/10/2000 with attachments on "Eagle Timber Sale Unit 17 blowdown monitoring"
2001. Eagle Creek background notebook provided by Ivan Miluski containing copies of information sheets, newspaper articles, and correspondence among congressional offices and other elected officials, Vanport Manufacturing, Forest Service offices, and environmental groups.
Undated. Information pack entitled "Eagle FEIS and related timber sales", distributed by Mt. Hood N.F.
Undated. Color photos for blowdown analysis, referenced in EIS Analysis File (Appendix H)