No Whisky Appeal

June 1, 2006

Linda Goodman
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36 CFR 215 APPEAL
No Whisky Plantation Thinning Project

In accordance with 36 CFR 215, I hereby appeal the Decion Notice of the **No Whisky Plantation Thinning** timber sale, Clackamas Ranger District, Mt. Hood National Forest.

Title of Decision Document: Decision Memo for No Whisky Plantation Thinning

Description of Project: Thin 423 acres of Matrix and 74 acres of Riparian Reserve.

Location: Clackamas Ranger District, Mt. Hood National Forest; R.5E and R.6E of T.4S

Date Decision Notice Published: April 17, 2006.

Deciding Officer Name and Title: Linda Goodman, Regional Forester, Mt. Hood National Forest.

I. APPELLANT'S INTERESTS

I have a specific interest in this sale. I have previously expressed my interest in this specific sale, and have standing to appeal this decision according to 36 CFR § 215.

My interests will be adversely affected by this timber sale. I use and enjoy the Mt. Hood National Forest, including the No Whisky planning area, for recreational, educational, aesthetic and other purposes. The value of those activities will be irreparably damaged by this timber sale. I have an interest in the sound management of this area, and the right to request agency compliance with applicable environmental laws.

II. REQUEST FOR STAY

Although an automatic stay is in effect for this sale as per 36 CFR 215.10(b), I formally request a stay of **all** action on this timber sale, including sale preparation, layout, road planning, any advertising, offering for bids, auctioning, logging, road construction, or other site preparation by a purchaser pending the final decision on this appeal.

A full stay is essential to prevent unnecessary expenditure of taxpayers' money and to prevent irreversible environmental damage. Without a stay, the federal government may waste taxpayer money preparing a sale that may later be canceled. Because I may pursue a legal challenge to this sale with or without this stay, offering this timber sale may unnecessarily expose the government to liability and the purchaser to financial losses.

III. REQUESTED RELIEF

1. That the Decision Notice for the No Whisky project be withdrawn.
2. That this timber sale be modified to meet the objections presented in Appellants' Statement of Reasons.
3. Revise the project to ensure consistency with the National Environmental Policy Act (NEPA), National Forest Management Act (NFMA), Clean Water Act (CWA), Administrative Procedures Act (APA), these statutes' implementing regulations, and the Mt. Hood National Forest Land and Resource Management Plan (Mt. Hood LRMP) as amended by the Northwest Forest Plan (NFP).

IV. STATEMENT OF REASONS

General Reasons

Inappropriate Reserve Management

- **The no-harvest buffer widths for intermittent streams are too small**.
- **Active Management within the Riparian Reserve needs to explicitly pursue an objective of retaining native pathogens (fungus, parasitic vegetation, etc.) during thinning operations.**

Management of Reserves

A cardinal issue found within Forest Ecosystem Management Report (FEMAT) and the Northwest Forest Plan (NFP) involves differing management approaches and objectives for Reserves and Matrix. Management plans for Reserves need to be more than a modification of the plan for the Matrix in order to properly recognize these differing management objectives. While the Clackamas River Ranger District of the Mt. Hood National Forest has made substantial and impressive progress in their approach to Matrix management, there remain substantive problems with the active management for Reserves. These issues are not about passive vs. active management, but the approach of this project plan and the implementation of the details from that plan in order to bring clarity to the restoration goals within the Reserve and

achieve the objective(s) of the active management. A more fundamentally sound approach to the active management of the Riparian Reserves, in order to advance the objectives of this project, are within the general management goals and objectives for this project and would require only minor modification of the plan. Specific and minor modifications of the plan are needed to avoid actions that will retard or prevent the attainment of the Aquatic Conservation Strategy (ACS) objectives.

Riparian Reserves

"The Aquatic Conservation Strategy of the Northwest Forest Plan," Reeves, Williams, Burnett, Gallo; Conservation Biology Volume 20, #2; 2006

> *Riparian reserves define the outer boundaries of the riparian ecosystem and are portions of a watershed most tightly coupled with streams and rivers. They provide the ecological functions and processes necessary to create and maintain habitat for aquatic- and riparian-dependent organisms over time, dispersal corridors for terrestrial organisms, and connectivity of streams within watersheds (FEMAT 1993).*

I support the variable density thinning (VDT) of Riparian Reserves as a method to aid in the introduction of late-seral characteristics such as large trees and structural complexity. However, the approach being promoted by the current plan is too one-dimensional and needlessly runs the risk of being counter-productive and inappropriate. While VDT is a necessary component of restoration silviculture, it is insufficient without a supporting set of other actions. With the plan to "enhance" the Reserves via restoration silviculture (e.g., VDT) it is not enough to thin more heavily than in the Matrix. There are other easily implemented management actions that would complement the VDT and act to further enhance the Riparian Reserves while maintaining its essential ecosystem functions and processes. Riparian Reserve restoration demands a more assiduous and holistic approach than is currently being applied in this project. With a few minor changes this becomes a project that has the potential to significantly enhance more than just one or two late-seral characteristic structure (large trees with diverse spacing), but truly act to restore the robustness of late-seral ecosystem processes, species diversity, and all structural characteristics (living and non-living) within the Riparian Reserves. Without these few minor changes what ends up being implemented is essentially a slightly heavier thin than that being applied to the Matrix. In order to achieve the restoration goals found in the ACS the approach of modifying the Matrix prescription can be appropriate as long as other key Riparian Reserve ecosystem characteristics and processes are being protected and restored.

With the relative density objectives between the Matrix and Riparian Reserve nearly identical (RD 25-35 for the Matrix, 20-35 for the Reserve), this project is implementing a silvicultural prescription for the Reserve that exceedingly similar to that for the Matrix. Even some of the smaller details are too coincident, such as the prescription for retaining trees with elements of wood decay being the same for both Matrix and Reserve (6-12 per acre where available). It could be argued that this project is managing the Matrix like the Reserve, but the complimentary management actions that are missing (i.e., appropriate stream buffers and enhancement of non-living late-seral forest characteristics) clearly demonstrate that the reverse is true. While a VDT silvicultural approach is necessary for restoration, it is insufficient without a number of supporting actions; and when supporting actions are present their design remains insufficient.

A primary objective for the Matrix is to provide timber products. This differs from the primary management objective for mid-seral plantation Reserves, specifically to restore them to a functioning late-seral condition while maintaining compliance with the ACS (on a watershed scale). This difference in objective should lead to a difference in the results of the management. In order for there to be appropriate differentiation between the results attributable to Matrix management versus Reserve management the project needs to adequately protect riparian specific functions, processes, and habitat while acting to promote or accelerate the restoration of late-seral characteristics, without the unnecessary degradation of the riparian ecosystem and/or retarding the attainment of essential non-living characteristics of late-seral forests typically found in timber emphasis (Matrix) management. The project currently does not provide appropriate protections for Riparian Reserves (specifically intermittent streams as defined by FEMAT and NFP) and its selective promotion of living late-seral characteristics directly and unnecessarily negatively impacts the desired non-living late-seral characteristics.

The no-harvest buffer widths for intermittent streams are insufficient.

The 30' (9 meter) no-harvest/no-cut buffer on intermittent/ephemeral streams as defined within the NFP is insufficient. The response to this issue (A-17), that the buffers were designed in conjunctions with NOAA for protection of aquatic resources is a necessary but insufficient response. As made utterly and completely clear by FEMAT and NFP, The Riparian Reserve buffer system is focused on both aquatic and terrestrial environments. The current protection buffer of 30' for intermittent streams (intermittent streams as defined by the NFP) is insufficient.

> NFP C-31: *"Intermittent streams are defined as any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria."*

The Riparian Reserves act as essential and unique habitat as well being pivotal to proper ecosystem function. The Riparian Reserves in the No Whisky project area are a mid-seral Douglas-fir plantation lacking in legacy features, structural heterogeneity (vertical and horizontal), and species diversity. The implementation of restoration silviculture by VDT should accelerate the development of some (not all) mature and late-seral characteristics. No-harvest buffers are implemented to balance the short- to medium-term ecosystem degradation (or potential degradation) of the VDT within the Reserve.

Intermittent Streams are an important component of the riparian ecosystem and properly functioning and protected intermittent streams are needed for compliance with ACS objectives.

> FEMAT V-31: *Intermittent streams are an important, and often over-looked, component of aquatic ecosystems (Naiman et al. 1992).*
> NFP B-14: *"Including intermittent streams and wetlands within Riparian Reserves is important for successful implementation of the Aquatic Conservation Strategy."*

Intermittent and ephemeral streams having a definable channel that exhibits evidence of annual scour and/or deposition (FEMAT V-36, NFP B-14) are important constituents of the riparian ecosystem. In addition to their value in protecting and regulating the aquatic environment, they play pivotal roles in various forest ecosystem functions (i.e.,

connectivity/dispersal, riparian microclimate, specialized habitat, etc.). Both FEMAT and the NFP fully recognize these varied and important roles, both explicitly and implicitly.

FEMAT (emphasis added)

V-31: *Intermittent streams are an important, and often over-looked, component of aquatic ecosystems (Naiman et al. 1992). Intermittent streams are defined as any non-permanently flowing drainage features having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.*

V-34: *Riparian Reserves will confer benefits to riparian-dependent and associated species other than fish. They will enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas. Improved travel and dispersal corridors for many terrestrial animals and plants and a greater connectivity of the watershed should also result from establishment of Riparian Reserves.*

NFP (emphasis added)

B-13: "*Under the Aquatic Conservation Strategy, Riparian Reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves will also serve as connectivity corridors among the Late-Successional Reserves."*

B-14: *"Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams or travel routes for fish emigrating from lakes."*

This is both explicitly stated (FEMAT, NFP):

FEMAT

V-38: *"Protection of intermittent streams is important for…providing habitat for species unique to small stream riparian areas…"*

V-38: *"Protection of intermittent streams is important for preventing increased rate and frequency of landslides in time and space, preventing accelerated surface and fluvial erosion, providing habitat for species unique to small stream riparian areas, and maintaining the landslide- and flood-delivered supplies of large woody material throughout the landscape."*

NFP

B-14: *"Including intermittent streams and wetlands within Riparian Reserves is important for successful implementation of the Aquatic Conservation Strategy."*

B-14: *"Other Riparian Reserve objectives, such as providing wildlife dispersal corridors, could lead to Riparian Reserve widths different than those necessary to protect the ecological integrity of the intermittent stream or wetland. These other objectives could yield wider Riparian Reserves than those necessary to meet Aquatic Conservation Strategy objectives."*

and implicitly recognized by the management buffers attributed to streams (intermittent and ephemeral) that exhibit scour and/or deposition:

> FEMAT
> V-35: *"Prescribed widths for Riparian Reserves of different waterbodies were determined based on several ecological and geomorphic factors."*
>
> NFP
> C-30: *"Extension from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest."*

While it is true that protection of intermittent streams is necessary to mitigate the impacts of silvicultural restoration, and this is explicitly and implicitly recognized by both FEMAT and NFP; nevertheless, active management can and should occur within the Reserves in order to fulfill objectives found within the ACS. The question is not whether vegetation management can occur within mid-seral Reserve stands, but whether the specifics of the management plan advance the ACS and meets the goals outlined in the watershed analysis. Because this is a question of detail rather than process, doesn't lessen or diminish the importance of these details. Quite the contrary, it is within these details that differentiate Matrix objectives from Reserve objectives that the legality and appropriateness of active management within a Reserve lay. Just because the agency is not currently pursuing an even-aged management plan doesn't mean that there are not significant concerns regarding ecosystem impairment due to thinning of Riparian Reserves.

> FEMAT V-57: *"Stream and riparian systems have been significantly degraded by past management actions, including selective or complete cutting of streamside forests…."*

The details and elements of the project plan must remain true to both the spirit and letter of the Reserve intended by the NFP or the management plan, by virtue of being essential a modified Matrix/timber production plan, acts to retard or inhibit the attainment of ACS objectives.

There may be an understandable temptation to minimize the potential degradation from this project on intermittent streams (hence the undersized buffer). But, just because this is a selective harvest doesn't mean that these potential negative impacts should be considered any less serious.

> FEMAT V-57 (emphasis added): *"Stream and riparian systems have been significantly degraded by past management actions, including selective or complete cutting of streamside forests…."*

Appropriate buffers are needed to protect intermittent streams from the impacts of the structural manipulation proposed for the stands in the No Whisky project area. The riparian areas currently function as a unique habitat and the proper functioning of the ecosystems within that habitat need to be protected so that they continue properly functioning during and after the completion of the project.

> FEMAT V-38: *"Protection of intermittent streams is important for…providing habitat for species unique to small stream riparian areas…"*

Intermittent stream riparian habitat is particularly vulnerable to the impacts of logging on its microclimate. Since many of the intermittent streams in the No Whisky project are located

within units (i.e., units 10, 39) or form a boundary between units (i.e., 4/5, 10/12a, 38/39) both sides of the intermittent stream are going to be logged. This will act to create an impact that is at least twice as strong as when only one boundary of an intermittent stream is being logged.

> FEMAT V-28: *Removing upland forest from both sides of the riparian zone of a small stream, creates two edges, and the effect on microclimatic conditions may be additive, if not synergistic. The degree to which the two edge effects are additive depends on the total width of the riparian corridor and is probably influenced by season, time of day, aspect, channel orientation, and extent of tree removal from the harvested stand. This situation is somewhat analogous to harvesting the forest adjacent to the riparian area along a larger river. When this forest is removed, the riparian area of a larger river becomes a corridor with two edges, one created by the river channel itself and one resulting from timber harvest. Thus, buffers may need to be wider to maintain interior microclimatic conditions than other riparian functions.*

The following warning from FEMAT speaks directly to the issue of intermittent stream buffers in the No Whisky project. The No Whisky Purpose and Need and Desired Future Condition for the Riparian Reserves are concerned with of the lack of mature and late-seral conditions, specifically the ability to create coarse woody debris (CWD). Recruitment of CWD is an important process provided by intermittent streams and the VDT plan addresses that concern. But, there are other important processes provided by intermittent streams and the impact of the logging plan on these processes needs to be carefully considered and balanced. While accelerating the time needed for the Reserves to develop late-seral structural components is important due to deficiencies across the watershed and landscape, the realization of those objectives doesn't provide short- or medium-term protection for the ecosystem processes that should benefit from the structural changes over the long-term.

> FEMAT V-31: *Structural components of stream habitat must not be used as management goals in and of themselves. No target management or threshold level for these habitat variables can be uniformly applied to all streams. While this approach is appealing in its simplicity, it does not allow for natural variation among streams (Gregory et al. 1991; Rosgen 1988; Ralph et al. unpub. ms.). Furthermore, attaining the predetermined value does nothing to insure aquatic ecosystem processes are protected.*

Specifically, the buffers proposed for intermittent streams, to protect them from the actions being taken to achieve certain structural component objectives, are insufficient to protect the riparian ecosystem anchored by these streams. Protection of intermittent streams was an intentional piece of the NFP and specifically chosen to provide protection of the riparian habitat and provide continuity between upland and riparian areas. Not only is this an essential piece of the Forest Plan but its inclusion was, in part, to adequately respond to Congressional concerns about species protection and viability.

"The Northwest Forest Plan: Origins, Components, Implementation Experience, and Suggestions for Change;" Thomas, Franklin, Gordon, Johnson; Conservation Biology Volume 20, #2; 2006

> *...two committees of the House of Representatives asked us to develop and evaluate several different approaches to protecting ecologically significant late-successional*

ecosystems, species, and processes, including but not confined to Northern Spotted Owls, and making sure that Congress did not get surprised by "some damn fish."

Reeves et al. 2006: *More than 800 of the 1100 organisms considered in FEMAT (1993) are associated with the riparian reserve network.* The buffer protection was increased in the NFP ROD from the suggestion in FEMAT to *…increase the likelihood of persistence of habitat for aquatic- and riparian-dependent organisms.* This change is and was a vital component of the NFP, of the options considered in FEMAT*, [o]ne option (Option 9) attempted to overlap terrestrial and aquatic protection measures from the other options and President Clinton chose it as his forest plan…*[Thomas, Franklin, Gordon, Johnson; Conservation Biology Volume 20, #2; 2006] *The Clinton administration, though, wanted to provide a plan to the courts that protected all species at a high level…Therefore, a number of changes were made to Option 9 to form the final Northwest Forest Plan (USDA Forest Service & BLM 1994a, 1994b), including enlarging buffers on intermittent streams…*

As made clear from the two preceding selections, the Courts, the President, and Congress wanted to limit the chances of significant disruptions to the supply of timber due to species viability concerns. This plan specifically attempted to keep viability issues for species that were not "on the radar" from becoming a problem in the future, and an indicative aspect of this plan was a strong protective buffer for intermittent streams. Over the last ten years the decision to protect intermittent streams has been validated.

Reeves et al. 2006: *"The ecological importance of these streams* [intermittent] *was once poorly understood. Now research results show the importance of headwater streams as areas of high amphibian biodiversity and sources of wood, sediment, cool water, and nutrients for fish-bearing streams (reviewed in Reeves 2006).*

Reeves et al. 2006: *The science emerging since the NWFP was developed supports the framework and components of the ACS, particularly for the ecological importance of smaller, headwater streams…*

With some stands in the No Whisky Riparian Reserves currently containing desired tree sizes (EA-35, DBH 13"-23"), effective and appropriate habitat protection should be a welcome component of the restoration silviculture being planned. If these stands were very young and small, the need for protections would not be as great. As some of the stands are already considered in the desired size range by both the Decision Notice/FONSI (22" DBH) and Forest Service researchers examining the effectiveness of the ACS (20" DBH), and others approach that range, the need to incorporate greater protections increases. It is not that there is no need for the VDT, it is that as these Reserves approach and enter the desired range it becomes more important for effective habitat protection to compliment the restoration plan.

Reeves et al. 2006: *Composition and size of conifers >51 cm diameter at breast height in riparian areas were estimated using GIS layers developed to assess changes in late-successional and old-growth habitat (Moeur et al. 2005)…The change in watershed condition scores during the first decade of the NWFP was attributable primarily to changes in riparian vegetation and more specifically to an increase in the number of large trees in riparian areas…The number of large trees in sampled watersheds*

increased and estimated 2-4% during between 1994 and 2003, most likely the result of tree growth into the >51 cm diameter at breast height category (Gallo et al. 2005).

Habitat

The concept that Riparian Reserves are a unique and important habitat, an essential component of a healthy forest ecosystem, is not new. This terrestrial-riparian habitat is not confined to the aquatic system, but is strongly tied to the aquatic system in a manner in which each component (aquatic and riparian terrestrial) directly responds to the other.

FEMAT V-34: *"Riparian Reserves will confer benefits to riparian-dependent and associated species other than fish. They will enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas. Improved travel and dispersal corridors for many terrestrial animals and plants and a greater connectivity of the watershed should also result from establishment of Riparian Reserves."*

NFP B-13: "*Under the Aquatic Conservation Strategy, Riparian Reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves will also serve as connectivity corridors among the Late-Successional Reserves."*

An example of the direct impact of the riparian zone on the aquatic system comes from the figure taken from FEMAT V-27:

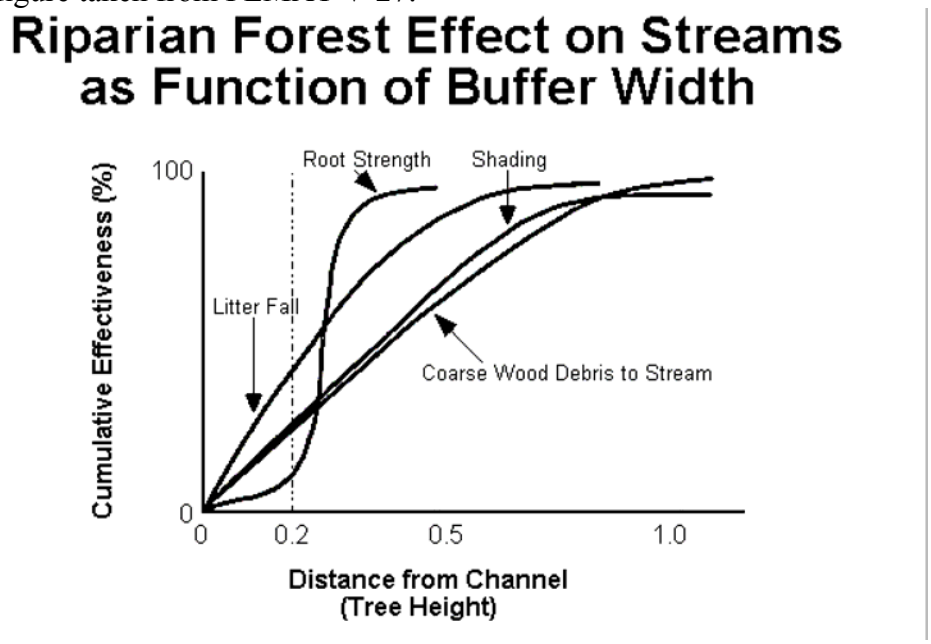

Figure 5-12. Generalized curves indicating percent of riparian ecological functions and processes occurring within varying distances from the edge of a forest stand.

Riparian Microclimate

Conversely, the aquatic system directly impacts the terrestrial riparian ecosystem's microclimate, which in turn affects species composition and interaction.

FEMAT V-27:

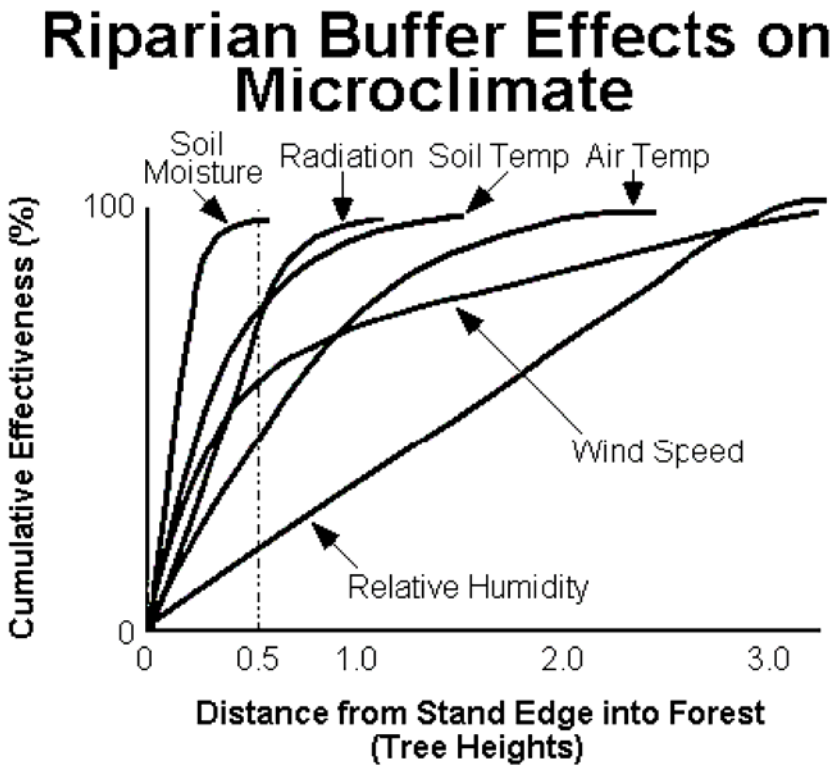

Figure 5-13. Generalized curves indicating percent of microclimatic attributes occurring within varying distances of the edge of a riparian forest stand (after Chen, J 1991).

Significant Forest Service and scientific literature support a larger buffer for intermittent streams. Findings on microclimate, amphibian recovery, avian usage, biological diversity 'hot spots', and intermittent stream roles for fish-bearing perennial streams are documented in Highlights of Science, Contributions to Implementing the Northwest Forest Plan 1994-1998; PNW Science Findings Issue 53; The Effects of Buffer Strip Width on Air Temperature and Relative Humidity in a Stream Riparian Zone (Ledwith, 1996), etc.

Highlights of Science, Contributions to Implementing the Northwest Forest Plan 1994-1998:

> *The importance of intermittent streams was further underscored by studies that showed they often tend to be "hot spots" for biological diversity…*

PNW Science Findings Issue 53: **Arise Amphibians, Stream Buffers Affect More Than Fish**
In this study, which emphasized small headwater streams, examined the impact of buffers and post-logging recovery of various species. It found a complex reaction but with a very clear caution regarding the impact of logging and microclimate on amphibian populations.

> *Amphibian populations decline sharply after timber harvest, and with narrow streamside buffers. Furthermore, populations are slow to recover in second growth forest…*

Biological Criteria for Buffer Zones around Wetlands and Riparian Habitats for Amphibians and Reptiles; Semlitsch & Bodie, 2003

> *Data from these studies also indicated the importance of terrestrial habitats for feeding, overwintering, and nesting, and, thus, the biological interdependence between aquatic and terrestrial habitats that is essential for the persistence of populations…These results*

indicate that large areas of terrestrial habitat surrounding wetlands are critical for maintaining biodiversity.

The Effects of Buffer Strip Width on Air Temperature and Relative Humidity in a Stream Riparian Zone (Ledwith, 1996)

Changes in microclimate conditions can alter the ecosystem of the riparian environment. Buffer widths that allow increased direct and indirect solar radiation into the riparian zone will increase air temperature and decrease relative humidity in that area. If these measurements move beyond the tolerance levels of terrestrial riparian flora and fauna, these species may perish or be forced to find other suitable habitat to complete their life cycle.

- *Air temperature above the streams increased exponentially with decreasing buffer width.*
- *There was a 19% decrease in mean relative humidity along the riparian zone between the 150 meter and 0 meter buffer width collection sites.*

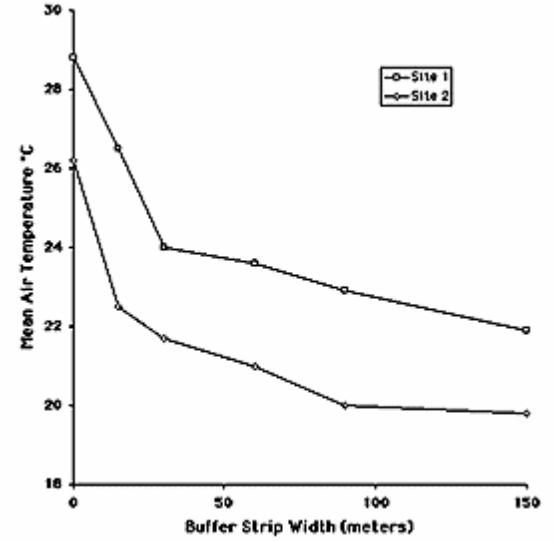

Figure 1. Change in Mean Air Temperature in a Stream Riparian Zone with Varying Buffer Widths during the Study Period.

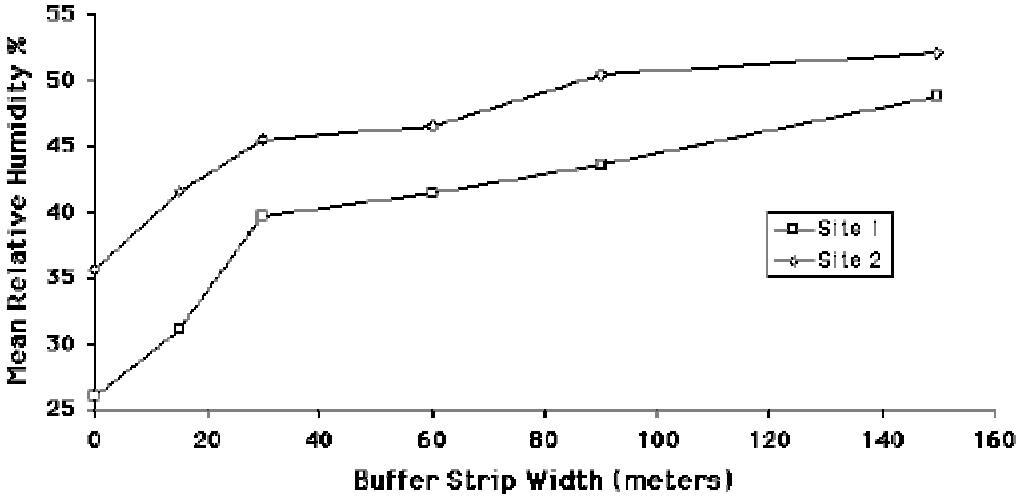

Figure 2. Change in Mean Relative Humidity in a Stream Riparian Zone with Varying Buffer Widths during the Study Period.

> *Changes in microclimate conditions can alter the ecosystem of the riparian environment. Buffer widths that allow increased direct and indirect solar radiation into the riparian zone will increase air temperature and decrease relative humidity in that area. If these measurements move beyond the tolerance levels of terrestrial riparian flora and fauna, these species may perish or be forced to find other suitable habitat to complete their life cycle. Rudolph and Dickson (1990) reported amphibian and reptile populations were significantly lower in aquatic habitats with narrow buffer widths (<30 meters) than those with wider buffer strips due to greater shading (i.e., less solar radiation and lower air temperatures) and open understory vegetation. Evapotranspiration rates increase with increasing air temperature and may contribute to a lowering of the groundwater table and soil moisture content. This may prematurely dry up intermittent streams, depriving flora and fauna of an important water source during the dry season. Increased solar radiation and air temperature may also raise the water temperature in a stream to sublethal or lethal levels for resident aquatic life.*

While the role of buffers acting to mitigate microclimate changes has received significant examination with implications and results that are fairly common, they are not unanimous.

> **Harvesting Effects on Microclimatic Gradients from Small Streams to Uplands in Western Washington**, Brosofske, Chen, Naiman, JF Franklin, *Ecological Applications*, Vol. 7, No. 4 (Nov., 1997), pp. 1188-1200
> Abstract
> *Six weather stations measuring air temperature, soil temperature, surface air temperature, relative humidity, short-wave solar radiation, and wind speed were installed along transects running across the stream and into the upland, and two reference stations were established, one in an upland clearcut and one in an upland interior forest…After harvesting, microclimate values at the buffer edge and each subsequent location toward the upland began to approximate clearcut values instead of forest interior values, indicating an interruption or elimination of the stream-upland*

gradient. In addition, regression analyses showed that stream microclimate was affected to some degree by buffer width and microclimate in the surrounding area. We conclude that a buffer at least 45 m on each side of the stream is necessary to maintain a natural riparian microclimatic environment along the streams in our study, which were characterized by moderate to steep slopes, 70-80% overstory coverage (predominantly Douglas-fir and western hemlock), and a regional climate typified by hot, dry summers and mild, wet winters.

Microclimate gradients across a forest edge, R. J. Davies-Colley, G. W. Payne, and M. van Elswijk, 2000

http://www.nzes.org.nz/nzje/free_issues/NZJEcol24_2_111.pdf

Our microclimate work suggests that forest buffers c. 40 m wide may be needed on both sides of small streams to protect riparian ecology where the surrounding land use is open pasture or cropland. "Small streams" in this context are those < 3.5 m wide and which have light exposure comparable to the low levels of surrounding forest, implying an unbroken canopy above the channel (Davies- Colley and Quinn, 1998). Narrower buffers may be suitable in tree plantations where the adjoining land is only exposed for part of the timber crop rotation (i.e., after clear-cutting).

Microclimate Patterns Associated with Density Management and Riparian Buffers; Chan, Larson, Anderson, 2004

http://ocid.nacse.org/nbii/density/pdfFiles/BLMDMSInterimReport2July2004.pdf

Microclimate gradients at 4 pm, the warmest and driest part of the day, indicated a significant influence of the stream extending about 75 ft outward from stream center. The strongest influence of the stream on microclimate, as indicated by steepness in temperature and relative humidity gradients, occurred within 15 ft of the stream…among stands thinned to various densities, microclimates on average were not significantly different. There was considerable overlap in observed temperatures and humidities between thinned and unthinned stands suggesting that these stands provide a wide-range of microclimates.

The Chan (2004) study cited above is reassuring (and not surprising) that the microclimatic impacts of VDT are less than those from clearcuts. But, it does note that gaps and heavier thins do have increasing impacts. These studies show that restoration silviculture and appropriate protection of intermittent stream ecosystems should be compatible.

In addition to the habitat concerns that Riparian Reserve logging creates for some species there is the additional unknown consequences for how well the Riparian Reserves will continue to function as connectivity and dispersal corridors. This important function will experience a disturbance from the Reserve logging. The impact of this disturbance is not well known. Providing a slightly larger buffer on intermittent streams is a prudent response that would act to continue to protect riparian ecosystem function while allowing for restorative silviculture within the majority of the Reserve.

Protection

The idea that Riparian Reserves designated for intermittent streams provide a unique and important habitat is well established. The management goal of protecting the important forest ecosystem processes provided by this habitat is equally well established. The question

remains, how best to protect this habitat and processes while engaging in restoration silviculture within the Reserves? Setting no-cut/no-harvest buffers is an appropriate approach. What are currently missing are buffers adequate to the protection of intermittent streams. As demonstrated above, the ecosystem processes that support this intermittent stream riparian zone habitat needs more than 30' (9 meters) of protection because microclimatic change directly impacts species use and habitat availability. The buffer, currently designed to protect aquatic resources due to changes in hydrology, shading, sedimentation is likely not sufficient.

> FEMAT V-19 (**emphasis added**): *Aquatic organisms require adequate flows be maintained at critical times to satisfy requirements of various life stages….*
> *Timber harvest and associated activities can alter the amount and timing of streamflow by changing onsite **hydrologic processes** (Keppeler and Ziemer 1990; Wright et al. 1990). These activities, which include harvest, **thinning**, yarding, road building, and slash disposal can produce changes that are either short-lived or long-lived depending on which hydrologic processes they alter and the intensity of the alteration (Harr 1983).*
>
> FEMAT V-28 (**emphasis added**): *Effectiveness of **streamside forest to provide shade** varies with topography, channel orientation, extent of canopy opening above the channel, and forest structure, particularly the extent of both under- and overstory. Although, any curve depicting this function is by necessity quite generalized (Figure 5-12), buffer width correlates well with degree of shade (Beschta et al. 1987). In the Oregon Coast Range and **western Cascade Mountains riparian buffers of 100 feet** or more have been reported to provide as much shade as undisturbed late successional/old-growth forests (Steinblums 1977).*
>
> FEMAT V-28 (emphasis added): *Castelle et al. (1992) provide a thorough literature review of widths of riparian areas required to protect water quality functions. In general, the authors found that widths of riparian areas required to protect water quality ranged from 12-860 feet. Widths varied as a function of geomorphic characteristics such as slope and soil type and by vegetative structure and cover. Effectiveness of buffers at improving water quality adjacent to logging operations was studied by Broderson (1973), Darling et al. (1982), Lynch et al. (1985), and Corbett and Lynch (1985). Broderson studied three watersheds in western Washington and found that 200 foot buffers, or about one site-potential tree height, would be effective to remove sediment in most situations if the buffer were measured from the edge of the floodplain.*

The concept that intermittent streams don't need as large a no-cut buffer as perennial streams is logically flawed. Examples such as air-borne dust, rain, and rain-on-snow events – primary non-catastrophic mechanisms for sediment transport into local streams operate equally well for both perennial and intermittent streams. Simply put, intermittent streams (streams with enough water flow that they show either annual deposition or scour) are running when you get either rain or rain-on-snow and need the same level of protection as the perennial streams. Airborne dust from summer road travel deposits in intermittent streambeds and on the surrounding vegetation – this dust will mobilize when it rains and the intermittent streams flows again. There is little difference in terms of sediment transport between perennial and intermittent streams.

Further, with the significant problem of OHV abuse within the LaDee flats area (see Appendix E) intermittent streams need at least a 50' no-cut buffer to protect them from potential future OHV abuse. OHV abuse appears to target wet areas, and since intermittent streams are wet much of the year they are particularly at risk from this form of abuse. A 30' "or less" buffer is inadequate to protect these streams from this type of abuse.

In providing protection to the function of habitat and ecosystem the no-harvest/no-cut buffers must look to protecting both aquatic and riparian environments in both the near-term and over longer periods. As noted over a decade ago:

> FEMAT V-31: *In addition, extended time periods and triggering climatic event may be required before the effects of land management are expressed in streams.*

Climate change will be providing both stronger and more frequent extremes in weather. While it is well beyond our current understanding of events to predict the exact hows and whens of this impact, it remains prudent to provide a small amount of already needed additional protection to intermittent streams while pursuing restoration silviculture within the Riparian Reserves.

Active Management within the Riparian Reserve needs to explicitly pursue an objective of retaining native pathogens (fungus, parasitic vegetation, etc.) during thinning operations.

Currently the forest is too healthy to provide snags and downed wood (EA-61). As a forest moves from mid-seral into and through a late-seral/mature condition the structural elements most elusive are those associated with dead and dying trees. While the EA assures that this is for the "short to moderate term" (EA-60), this assurance runs counter to current scientific literature. While the No Whisky plan is to provide specific protection to 6-12 trees per acre (EA-20) may (or may not) be enough for the Matrix, and is better than that found in the South Fork management plan, it is not appropriate for Reserve management.

In mid-seral plantation Reserves, a primary management objective is restore late-seral/mature forest characteristics and processes. One of the appropriate approaches is through restoration silviculture and that is the approach used with this project. Active management that acts to safe-guard a more complete set of late-seral and mature forest characteristics, rather than just the living components, is possible and should be an imperative. Setting a numerical ceiling on retained trees with elements of wood decay is inappropriate due to the importance and lengthy timelines needed for this late-seral/mature forest characteristic to develop. Attempting to retain all trees with elements of wood decay in unrealistic, but active management that <u>specifically</u> looks to retain as many trees with elements of wood decay as possible is not just possible, it is vital to achieving the goals of Reserve-based restoration silviculture.

It is typical for mid-seral forests, as they mature, to slowly lose their woody non-living elements and characteristics as legacy snags and large downed wood decay. These relatively younger forests have smaller trees and lower incidents of disease so there is a time-lag in the creation of new snags and replacement of downed wood.

> "Disturbances and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example,"

Franklin et al., 2002, http://www.fs.fed.us/pnw/pubs/journals/pnw_2002_franklin001.pdf

- [characteristics over the next 100 years or so include] *coarse woody debris at minimal levels*

"Conserving Forest Biodiversity," Lindenmayer and Franklin, 2002

- Figure 4.4 on page 65

It is true, and only somewhat relevant, that plantion management/salvage logging has left few non-living legacy features. Those that do remain will be protected as much as possible. The important point of the current approach to restoration silviculture (active management) is its traditional focus on accelerating the living characteristics of late-seral/mature forests. This approach provides an unbalanced forest structure that can last from decades to centuries. Management actions that retard or inhibits proper riparian functioning for decades to centuries specifically violates the ACS.

Cascade Research Group "Management in Young Forests"
http://www.fsl.orst.edu/lter/research/related/ccem/pdf/Comque3.pdf
(emphasis added) *One particular sequence of three commercial thins met the live subset of late-successional conditions (live stem and canopy characteristics, but not snags and logs) by age 117, compared to 220 yrs without thinning.*

"Ecological scale and forest development: squirrels, dietary fungi, and vascular plants in managed and unmanaged forests." Carey et al., 1999
http://www.fs.fed.us/pnw/pubs/journals/pnw_1999_carey003.pdf

Thinnings without active management for decadence could result in dimunition of decadence, decline in coarse woody debris, and a change in trajectory of forest development away from complexity and resiliency.

The thinning of the Matrix and Reserve will create a forest with trees that are even more healthy and vigorous. This will specifically work against the development of decadence in the Riparian Reserve. This approach of concentrating on generating healthier and more vigorous stands, as described by Oliver and Oliver/Larson (see citations in EA & Appendix E), is appropriate for managing timber plantations for timber production but has serious liabilities for managing the Reserves.

Franklin et al., 2002: *Approaches to forest structure have evolved from a near-exclusive focus on live trees (e.g. Oliver, 1981)…*

Oliver (1981) and Oliver and Larson (1990) created a widely-cited stand-structure model…These conceptual models have limited usefulness in guiding silviculturalists seeking to imitate natural forests, however. They fail to consider several important variables including…coarse woody debris and other residual structures…

The need for active management to recognize the "pivotal role" of native pathogens in ecosystem-based forestry has been recognized and is becoming more widely understood.

Ecology and Biogeography of Pinus, DM Richardson (Editor), 1998
http://www.public.iastate.edu/~tcharrin/Pine.pdf
However, with the burgeoning interest in ecologically-based management of forest resources and forest health, there has been increasing attention given to the pivotal role of pathogens in forest ecosystems (Castello, Leopold & Smallidge, 1995; Haack & Byler,

1993; Monnig & Byler, 1992; van der Kamp, 1991; Worrall & Harrington, 1988)…These diseases interact strongly with bark beetles and fires in maintaining the heterogeneity of the forest landscape and in driving successional patterns…The roles of diseases in natural pine ecosystems have often clashed with human interests and human manipulations, but with understanding of these often subtle relationships, wiser management practices follow.

It is of vital importance to the appropriate restoration of habitat and ecosystem processes to avoid the danger that thinning appears to create, namely a significant and long-term problem with future numbers of snags/dead wood. Thinning with a "near-exclusive focus on live trees" appears to depress future recruitment of essential late-seral non-living characteristics. While negative impacts due to the logging are unavoidable, the extent and duration of the impact can and should be managed. Proper management can reduce the quantity and duration of this negative aspect of the silvicultural prescription.

Although the objectives of the ACS are watershed-scale and this project covers a number of sub-watersheds, the collective and cumulative impacts of similarly designed projects within the same watershed (i.e., No Whisky and Winslow) do have watershed-scale impact. Regardless of the benefits of a single entry thin to enhance a singular aspect of the Riparian Reserves, by treating them essentially as single-entry matrix units these projects collectively act in a manner that retards or prevents the attainment of the ACS objectives. With minor changes this project can actively manage the Riparian Reserves in a manner that promotes the ACS.

As noted by Carey et al. (1999), not only does it appear that "[a]ctive management may be necessary to maintain decadence in the first 150 years of ecosystem development," but that these expressions of decadence within a forest are essential components of its structure and process ("coarse woody debris is of central importance in promoting ecosystem stability, habitat diversity, and long-term productivity").

"Ecological scale and forest development: squirrels, dietary fungi, and vascular plants in managed and unmanaged forests." Carey et al., 1999
http://www.fs.fed.us/pnw/pubs/journals/pnw_1999_carey003.pdf

Four factors (crown-class differentiation, decadence, canopy stratification, and understory development) accounted for 63% of variance in vegetation structure. Decadence contributed to variation mostly in late-seral forest.

The 4 structural factors each represented an important ecological process; decadence and canopy stratification apparently had profound influences on other life forms. Carefully timed variable-density thinnings could accelerate crown-class differentiation, canopy stratification, and understory development and increase habitat breadth. Management of decadence is more problematic and may require various interventions, including inducing decay in live trees, conserving biological legacies from previous stands, and ensuring recruitment of coarse woody debris.

Coarse woody debris (standing and fallen) was a result of 3 separate phenomena: (1) retention of legacies through catastrophic disturbance, (2) recruitment of fallen trees through suppression- mortality, and (3) development of decadence in live trees over time.

…coarse woody debris is of central importance in promoting ecosystem stability, habitat diversity, and long-term productivity…

[emphasis added] *Managing decadence is the most challenging aspect of intentional ecosystem management. Our research shows that decadence is more than snags and logs; it is a process that is influential in multiple aspects of ecosystem development from providing cavities for wildlife, to creating gaps in the canopy, to altering forest floor microclimate and structure. Active management may be necessary to maintain decadence in the first 150 years of ecosystem development. Thinnings without active management for decadence could result in dimunition of decadence, decline in coarse woody debris, and a change in trajectory of forest development away from complexity and resiliency.*

With this admonition that active management for these components is probably of fundamental importance comes the need to pursue a more diligent approach to maintaining and promoting decadence within the Reserves. There are specific aspects of a restoration silvicultural regimen that could be used to address this area that would complement the current approach being pursued within the Matrix (retaining 6-12 trees per acre with elements of wood decay).

- Patches of laminated root rot that occur in riparian areas should be left untouched since they naturally act to create canopy openings. Not only do they create these openings, the disease also acts to enhance deciduous growth (very important to creating more diversity within homogeneous plantation conifer forests) by targeting confers (deciduous maple and alder are immune) in a manner that varies among species. The argument that "totally avoiding" root rot patches is irrelevant. When working within the Riparian Reserves a greater level of planning is required, this higher level allows for a stand examination that could catch many or most areas of infection; claiming that it can't be done because you can't catch all the areas is irrelevant and not a valid excuse for a sound management approach.
- Not just root rot should be maintained within Riparian Reserves, but protection of all fungal infections should be actively pursued by the management plan for the Reserve.

  Are Heart Rot Fungi Major Factors of Disturbance in Gap-Dynamic Forests? Hennon, 1995
  http://www.fs.fed.us/r10/spf/fhp/top20/HeartRot.pdf:

  > *Heart rot fungi may also facilitate the change from the maturing even-aged stage (i.e., understory reinitiation, to use Oliver and Larson's (1990) terminology) that is in transition to the true old- growth stage. Mortality of dominant trees may be necessary for this transition or at least it speeds the rate of change."*

  Patches identified with native tree disease in addition to laminated root rot that occur in riparian areas should be left untouched since they naturally act to create canopy openings and increase structural heterogeneity. Retention of native pathogens is particularly important in Riparian Reserves as the remaining trees (post VDT) will be more resistant to disease and the initiation of new decadent trees and snags will be delayed – even though decadent trees and snags remain vital to the proper operation of the Riparian Reserve ecosystem.
- Retention of higher levels of trees with elements of wood decay in the Reserve is needed because of loss of "save" trees during logging operation. It is a common experience for

> save trees to be lost during the actual logging operation, if there is a ceiling on the number of save-trees with elements of wood decay then the additional loss of these trees during the logging operation will further act to reduce their numbers and depress the initiation of essential forest decadence.

As clearly discussed in the EA and Appendix E, the resulting Matrix and Riparian Reserve trees will be stronger and healthier; they will be more resistant to disease. While this may be understandably desirable in the Matrix, it is undesirable in the Riparian Reserves because it acts to retard or prevent the attainment of ACS goals and objectives. The essential role of various native pathogens in healthy forest ecosystems has been well documented. No matter what occurs within the Matrix in the future (more thinning entries or even-aged management), those plantations will continue have reduced incidence of, and effects from, native pathogens. Consequently, the Riparian Reserve will need to inherit the pathogens necessary for proper ecosystem functioning from the currently infected trees. While the current plan is to try to leave trees with elements of decay, there needs to be a more clearly managed approach to protecting native pathogens.

As noted in the Purpose section of the EA-4 (emphasis added):

> *This action is needed because these plantations lack certain elements of diversity. They do not have the mix of tree species that were present in the original stand…*

As noted in the Appendix E, the silvicultural objectives and practices are to "control stocking" and:

> *Enhance riparian reserves by accelerating the development of mature and late successional stand conditions*

Native pathogens are instrumental in both enhancing species diversity and are integral components of late successional stand conditions via their role in maintaining structural diversity. As noted earlier, not only does laminated root rot act to create canopy openings enhancing species diversity in the same manner as the gaps created during variable density thinning, the disease specifically acts to enhance the mix of tree species by targeting confers while deciduous trees are immune. A consequence of this aspect of the disease susceptibility of the conifers provides for a long-term passive management that acts to enhance the mix of tree species by favoring deciduous trees. The vital role played by deciduous trees and shrubs in enhancing biodiversity is well documented in USGS Biological Science Report USGS\BRD\BSR – 2002-0006 "Managing for Biodiversity in Young Douglas-Fir Forests of Western Oregon" (MB 2002) which clearly demonstrates the singular importance of deciduous trees and shrubs for increasing biological diversity in young managed Douglas-fir forests.

It isn't just forest diversity that needs for native pathogens to play their key role; it is over-all forest health. Consider the keystone complex[i] (essential forest functions) that is filled by native pathogens, ecto-mychorrizal truffles, pileated woodpeckers, and flying squirrels. The presence of pathogens within a tree begins the process of creating habitat for keystone species (woodpecker and squirrel) that play essential roles in distributing the truffle spores in "a web of mutual support." As noted in PNR Science Findings #20 and reinforced in PNR Science Findings #57 and PNR Science Findings #60 in a discussion regarding the ecosystem keystone[ii] species the pileated woodpecker and its role in the keystone complex.

> *Because the hollowing process is quite specific, it has to begin early in the life of a stand, and start on a living tree, according to Parks; an already dead tree not previously infected with heart-rot fungi will not become hollow.* (PNR 20)
>
> *"One of the reasons roost sites may be more limiting for pileateds than nest sites, is because hollow trees are relatively rare in forests; they are created only by the process of heartwood decay occurring in live trees over a long period of time," Raley explains*. (PNR 57)
>
> *Management can have diverse effects on truffle diversity and abundance. In general, managing for biocomplexity—multiple tree species, understory diversity, decaying trees—at fine scales contributes to biodiversity and ecosystem resilience.* (PNR 60)

The present course of active management of Riparian Reserves needs to include the retention of patches infected with native tree disease since these pathogens act to create canopy openings over time. This increase in structural heterogeneity increases species diversity and provides the necessary habitat for ecosystem keystone species. Retention of native pathogens is particularly important in Riparian Reserves as the remaining trees will be more resistant to disease and the initiation of new decadent trees and snags will be delayed – even though decadent trees and snags remain vital to the proper operation of the Riparian Reserve ecosystem.

The presence of disease is extremely important to the continued health and diversity of the forest ecosystem. Healthy and vigorous stands are a primary goal in maximizing timber production; conversely it is the loss of timber to disease that is a key indicator of a healthy Reserve forest ecosystem. It is the initiation of disease and the results of disease that are missing both from plantations and from the currently planned restoration silvicultural pathway for these Reserves. Managing the Reserve in a manner that explicitly acknowledges its need for decadence (differing from the Matrix) can be pursued in a number of different ways – greater frequency of skips, greater concentration of stand exam for wood decay, no ceiling on save trees with signs of wood decay (e.g., eliminate 6-12 trees/acre as a ceiling), explicit guidance in the project documentation, etc.

Management of the Reserves found in the NFP revolves around objectives that differ from the management objectives for the Matrix. Restoration silviculture (via VDT) allows for an active management approach with projects that are very similar between the two areas, but it does not eliminate the different objectives. In order for the project level planning to appropriately pursue restoration silviculture within the Reserve, with its differing objectives over the short-, medium- and long-term, the project level planning needs to clearly address where the objectives allow for similar approaches (i.e., VDT) and where the approaches will need to diverge (i.e., buffers and disease). Project level planning of restoration silviculture within Reserves begins with greater attention to explicitly pursuing a fuller spectrum of the restoration silviculture needs (i.e., greater retention of native pathogens to off-set the decline in dead-wood biomass accumulation) of the Reserves while appropriately mitigating (via larger buffers for intermittent streams) the short- to medium-term degradation initiated by the silvicultural treatment.

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[i] **Keystone complex:** "A keystone complex is a more complicated idea that recognizes a number of essential components that are building blocks of an ecosystem and supporters of its processes." (PNR Science Findings 60)

[ii] **Keystone species:** A "keystone" species is functionally linked to the persistence of an array of other species, and influences the ecosystem in ways that are disproportionately large compared to its abundance or biomass. (PNR Science Findings 57)