February 11th, 2020

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Bill Westbrook
Attention: Zigzag Integrated Resource Project
Zigzag Ranger District
70220 E. Highway 26
Zigzag, OR 97049

RE: Zigzag Integrated Resource Project

Dear District Ranger Bill Westbrook,

As you are aware, Bark's is a public interest advocacy group whose organizational mission is to bring about a transformation of public lands on and around Mt. Hood such that natural ecological processes prevail, where wildlife thrives and where local communities have a social, cultural, and economic investment in its restoration and preservation. Bark has over 31,000 supporters[1] who rely on the public land forests surrounding Mt. Hood, including the areas within the Zigzag project area, for a wide range of uses including, but not limited to: clean drinking water, hiking, nature study, non-timber forest product collection, spiritual renewal, and recreation. Increasingly, our supporters and the public rely on the ecosystem function of the forest to stabilize the regional climate and mitigate the local impacts of climate change. We submit these comments on behalf of our supporters. We request that you actively engage with the substance of these comments and use both the scientific and site-specific information herein to create a better restoration project for the Zigzag Ranger District.

[1] Supporters in this case is defined as significant donors and petition-signees which Bark has identified as being active users of Mount Hood National Forest.

Contents

PUBLIC PARTICIPATION

Knowing that the Zigzag project is being planned in a high-profile area relative to where Mt. Hood's timber sale program typically focuses, Bark attempted early on to engage the FS with questions about the status of the project – its location, scale, Purpose and Need, etc. The first of these attempts was April 1st, 2019. Our emails

were not directly responded to by District staff until the fall of 2019. In the interim we were told by Forest staff that the project was at its early stages and little information existed to share. This is contradicted by notes from American Forest Resource Council (AFRC) meetings and a July 24, 2018 AFRC field trip to the area with FS staff, where the locations and approximate size of this project were shared with timber industry representatives. It seems in the case of the Zigzag project, priority information was given to the timber industry, while the interested public was left in the dark until the fall of 2019. If the District wishes to build trust in the communities surrounding this project, it must practice timely and transparent public engagement.

Bark appreciates the Forest Service (FS) responding to our request to move the upcoming scoping period beyond the 2019 holiday season. Bark staff and volunteers worked diligently to gather site-specific information pre-scoping, as we had anticipated winter weather and road closures that would prohibit our groundtruthing efforts. Volunteers worked against the clock to document conditions in the Horseshoe and Mud Creek units outlined on the pre-scoping maps. By December, groundtruthers found the Mud Creek area of the project inaccessible from winter conditions, as road closures have set in at Trillium Lake and snow prohibits access from Still Creek Rd.

Bark has continually voiced concerns about the time frame for public involvement when the public comment period overlaps with times of winter inaccessibility. The Zigzag project area will likely be covered by snow through spring 2020. Thus, site-specific, on the ground ecological conditions and characteristics will not be observable. Additionally, rare, sensitive, protected, and statutorily monitored species are best identified over the course of multiple seasons, with winter being particularly unfavorable to botanical surveys. Bark anticipates the presence of Survey and Manage species, for example, but will not be able to confirm this nor that of any ground level or many understory plant species during the winter months. Furthermore, Bark understands there is a possibility that red tree voles are living within the project area. Proper red tree vole survey involves tree climbing, which as you know is not possible during winter. Moving forward in project development without good information about the plant communities and wildlife increases the potential for this proposal to be controversial with environmental advocates and the public. **Bark strongly recommends the Forest Service commit to facilitating meaningful public engagement in the management of public lands by considering Scoping comments received until summer 2020.**

Key RECREATION issues for detailed analysis:

Not only is the Zigzag Ranger District well known for its year-round recreation opportunities, these opportunities are intertwined with the local economy. The absence of active timber sales on this district supported this economic shift and

now the area provides nationally recognized experiences which largely depend on natural, intact forest.

Trails within the Zigzag Timber Sale project area include Top Spur, Ramona Falls, Burnt Lake, Cast Creek, Horseshoe Creek, Sandy River, Upper Horseshoe, Lolo Pass, Pacific Crest Trail, Dry Fir/Veda Lake, Eureka Peak, Jackpot Meadows, Salmon River, Quarry Nordic, Mud Creek Nordic, Lost Man Nordic, and Trillium Lake loop. Developed campsites within the Zigzag Timber Sale project area include McNeil, Lost Creek, Riley Horse Camp, and Trillium Lake. Unit 4 fully encompasses a popular rock-climbing area, French's Dome, with an associated trail. Just east of this same unit, there are undeveloped, primitive campsites that get a lot of use during the spring, summer, and fall. With the cost of developed camping on the forest these kinds of sites are seeing more use.

The 18/1825/1828 roads that access most units in the Horseshoe area are single lane with few pullouts. There are several blind turns and switchbacks, making it difficult to see even a loaded log truck coming the opposite direction. With the popularity of this area during the months where logging would occur, would these roads be closed to the public for safety?

According to agency specialists, the southern portion of the Horseshoe area would utilize helicopter logging to avoid reopening roads (including 1825-380 road): Units 62, 64, 68, 80, 82. The logs would be flown down to Old Maid Flat which could result in a public closure for up to one month during the summer.

In its analysis, the Forest Service is required to disclose potential impacts to the physical, biological, social and economic environments of the affected area due to implementation of the alternatives. For the economic environment, the agency often makes an internal determination that their timber sale projects are economically viable and pursues no further evaluation. **Since the natural forest characteristics of Zigzag Timber Sale area is now economically tied to the local recreation economy, please disclose, quantitatively, all potential impacts to the local recreation economy and the related restaurant, service, and small business economies from any public closures, impacted trail or campground experiences, or change in public attitude towards the area due to the return of commercial logging.**

Top Spur trail head has several issues that can be remedied. For example, the trail head and parking area are too small and too close to streams and riparian areas, contributing sediment and contamination from human waste to streams. However, The Forest Service's proposal to create a new trail head on a proposed log landing further up the road is flawed.

Intermittent stream in Unit 61 When Bark scouted this new proposed location, we noted that the west side of the road included a wet area which feeds directly into an. This riparian area directly abuts the road – we recommend that any new trailhead be placed as far away from this area as possible, and not include the west side of the 1828-118 road. We also noted Himalayan blackberry in this new proposed trailhead area. Extra care, through a PDC, should be taken to not spread

this plant into the forest by disturbing or moving the soil which contains its rhizomes.

Key issues regarding "FUEL TREATMENTS" for detailed analysis:

The Zigzag scoping letter states that "fuel treatments" may occur "to break up the contiguity of fuels and to reduce the intensity of fire in the event of wildfire". Indeed, the 2012 Strategic Fuel Treatment Placement Plan for Mt. Hood National Forest includes several roads within the Zigzag project area.

However, this statement is not factually supported. Action designed to "reduce the intensity of fire", is inappropriate for this forest type and vegetation management is not likely to achieve this stated effect.

Fire return interval in this forest type is long and stand replacing. This type of fire regime is unlikely overly influenced by fire suppression given this lengthy interval or tree spacing and fuel density. A leading means of fire spread in this area would be long-range fire spotting. Therefore, this moist mixed-conifer forest would only burn during extreme fire weather[2] - conditions during which a fuel break, for example, would likely be largely ineffective in altering fire behavior and could put wildland firefighters' lives at risk if held as a line of defense (especially if created mid-slope).

Condition Class 1, 2 and 3 have not been identified within the areas proposed for treatment. Bark is concerned that much, if not all, of the project area is in Condition Class 1, the least departed from its natural fire regime and proposed fuels treatments would degrade natural succession in this area.

Bark understands the complexity of managing wildland fire, especially near structures and communities. On one hand, fire is recognized as essential to forest ecosystems and the past 100 years of fire suppression has degraded the forest's ecological conditions in some areas. At the same time, the Fire Management Action Plan directs the Forest Service to fully suppress all ignitions, in direct conflict with the best available science to date, which acknowledges much of the forest needs to burn[3]. Complicating things further, public perception and agency culture are strongly aligned with inaccurate narratives about the presence and effects of fire on the landscape.[4] While a significant challenge, the FS has the authority and resources to address fire appropriately, as a natural and necessary part of a forests' lifecycle, by developing fire management practices based on site specific information and application of modern scientific knowledge.

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[2] https://www.fs.usda.gov/nfs/11558/www/nepa/92487_FSPLT3_1455012.pdf

[3] Haugo, R. D., Kellogg, B. S., Cansler, C. A., Kolden, C. A., Kemp, K. B., Robertson, J. C., Metlen, K. L., Vaillant, N. M., and Restaino, C. M.. 2019. The missing fire: quantifying human exclusion of wildfire in Pacific Northwest forests, USA. Ecosphere 10(4):e02702. 10.1002/ecs2.2702

[4] Boyd, R. et. al, 1999, Indians, Fire & the Land in the Pacific Northwest, Oregon State University press, p 19, ("Development of the field of fire ecology was stymied for many years by what has been called the 'Smokey the Bear syndrome': a pervasive belief, peculiar to Western cultures, that fire was a destructive force, particularly in forests, that had to be contained or eliminated.")

Bark recommends the FS not propose "fuel breaks" as, even if topographical conditions are considered in detail, "fuel breaks" are largely ineffective[5] unless both weather and site conditions are "right", which cannot be guaranteed or even controlled. In these moist forests, vegetation regrowth in fuel breaks is typically quick and dense, giving their already unlikely effectiveness a very short time frame. FS should not seek to remove trees and vegetation, build roads, or disturb soils to establish any "fuel break" with a low likelihood of effectiveness. **Please provide a complete description of the overall condition of the project area regarding the fire regime in the forthcoming NEPA analysis and provide the scientific analysis of how these conditions may interact with "fuels treatments".**

Key issues regarding IMPACTS TO EXISTING AND FUTURE DEAD WOOD for detailed analysis:

Several stands within Zigzag units, both plantation and "fire originated", include significant amounts of large standing and down wood, which, as you know, are currently providing important habitat for the numerous species dependent on dead trees.

Snags are important resources for vertebrate and invertebrate species in forested ecosystems worldwide. In the Douglas-fir and western hemlock forests of the Pacific Northwest, over 100 vertebrate species utilize snags for some part of their life cycle. Approximately 20 percent of all bird species in the Pacific Northwest depend on snags for nesting and feeding and the abundance of snag-dependent birds is correlated with the density of suitable snags[6]. Studies show that, "cavity users typically represent 25 to 30% of the terrestrial vertebrate fauna in the forests of the Pacific Northwest."[7]. This study goes on to note that a "lack of cavity sites is the most frequently reported threat to "at-risk" species in the Pacific Northwest."

Snag Density

The FS consistently asserts that thinning improves residual tree health and that, therefore, it may take longer for the residual trees to die (reducing future snag density) in the Proposed Action scenarios compared with No Action. Research has also shown that thinning lowers snag density relative to un-harvested stands.[8] While the agency recognizes that timber harvest has negative effects on snag density, contradictorily, FS also claims that thinning will somehow produce *more* structural diversity in the future. These claims do not present a complete understanding of ecological processes regarding future snag recruitment, especially in never-logged forests. **Please disclose and discuss the peer-reviewed research**

[5] Barnett, Kevin; Parks, Sean A.; Miller, Carol; Naughton, Helen T. 2016. Beyond fuel treatment effectiveness: Characterizing interactions between fire and treatments in the US. Forests. 7: 237.
[6] Boleyn, P., Wold, E., and Byford, K., Created Snag Monitoring on the Willamette National Forest, USDA Forest Service Gen. Tech. Rep. PSW-GTR-181. 2002
[7] Bunnell, F.L., Kremsater, L.L., and Wind, E. 1999. Managing to sustain vertebrate richness in forests of the Pacific Northwest: relationships within stands. Environmental Review, 7: 97-146.
[8] Windom, M. and Bates, L. 2008. Snag density varies with intensity of timber harvest and human access. Forest Ecology and Management 255(7) pp. 2085-2093.

that supports the Forest Service's claim that thinning mature native forest increases future structural diversity.

The effects of variable density thinning (VDT) at longer time scales, have not been studied until recently. A study of 14-year growth response of residual trees in thinned and un-thinned VDT sub-treatments in five young mixed-conifer stands located on the Olympic Peninsula in western Washington[9] confirmed that thinning was ineffective at stimulating growth of upper canopy trees. In this size class neither diameter growth nor crown length increased significantly compared to trees in un-thinned patches.[10] This research does not support the FS's common claim that thinning will accelerate growth of residual trees, leading to larger snags in the distant future.

Thinning of maturing forest has been shown to significantly delay attainment of Mt. Hood National Forest (MHNF)'s snag objectives.[11] The LRMP requires that dead wood be maintained to support 60% of maximum biological potential of cavity nesting species (FW-215). According to the FS, this standard often cannot be met because of the purpose and need for the project (FW-32/33) and the on-the-ground conditions present within the stands (FW-215/219). In that case, the LRMP requires that any new timber harvest project include wildlife tree prescriptions to compensate for the deficiency (FW-217).

Commercial thinning often prevents or delays development of essential features of old forest ecosystems, features important to salmon, spotted owls and their prey. This is especially true regarding the mid & long-term impacts of thinning on the abundance and size of snags and downed wood. These old-growth structural features are largely overlooked though available data suggests that thinning does not do an adequate job managing for these features. In 2016, the FS and the Bureau of Land Management (BLM) released an annotated bibliography compiling studies that examined the impacts of thinning in mature forest stands[12] which was recently reviewed by Paul Reed, a PhD student at the University of Oregon.[13] Overall, the bibliography addressed a variety of characteristics of old-growth forest structure. According to Reed, because of the lack of compelling evidence, it is appropriate to implement a precautionary approach towards managing and thinning mature forest stands.

Large snags (as well as dense forest surrounding them) are important habitat requirements of Westside indicator species like flying squirrels and spotted owls and are currently in short supply due to past and present management.

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[9] https://www.fs.usda.gov/treesearch/pubs/55716

[10] Willis, John L.; Roberts, Scott D.; Harrington, Constance A. 2018. Variable density thinning promotes variable structural responses 14 years after treatment in the Pacific Northwest. Forest Ecology and Management. 410: 114-125. https://doi.org/10.1016/j.foreco.2018.01.006.

[11] USDA Forest Service. 2007. Curran Junetta Thin Environmental Assessment. Cottage Grove Ranger District, Umpqua National Forest. June 2007. Using data from stand exams modeled through FVS-FFE (West Cascades variant) the Umpqua NF found that the actual effect of heavy thinning is to capture mortality and delay recruitment of desired levels of large snag habitat for 60 years or more.

[12] Powers, M., and S. Wessell. 2016. Management impacts and developmental patterns in mature Douglas-fir forests of the Pacific Northwest: An Annotated Bibliography.

[13] Reed, P. 2016. Reviewing the US Forest Service and Bureau of Land Management's "mature stand thinning" bibliography.

In response to the significant loss of large and old trees, the Interior Columbia Basin Ecosystem Management Project SDEIS included the following statement in its standards and objectives, which although written for the Eastside, is relevant to Westside forests with limited large snags:

Maintain and/or restore large shade-intolerant trees and snags in densities that are consistent with the range of historical conditions. … Large trees is a relative term dependent on species and site. Large trees are a future source of large snags, and large snags are a future source of coarse woody debris, another important habitat component for many species. It is important to have present and future sources of large trees and snags at adequate levels though time. Larger snags are generally better than smaller snags because they exist longer. Large trees and/or snags are essential habitat components for many species … [14]

Snags that are artificially created (through girdling) take years to provide any potential habitat (and the quality of this artificial habitat is uncertain). The Zigzag project would result in an immediate and future net reduction of snags across the landscape contributing to the regional snag deficit resulting from previous Forest Service management. Since large snags are required for the habitat requirements of Westside indicator species like flying squirrels and spotted owls[15], but are in short supply due to past and present management, the **FS should exclude stands with high snag and large living tree densities from any logging and apply buffers on key snags and relatively large trees within proposed units.**

In short, the significant role played by large snags in the healthy functioning of the forest ecosystem is well documented. Recently, both the role of logging on the numbers of large snags and the ineffectiveness of current artificial snag creation has been documented. The impact of logging on large snag density[16] clearly shows that the paucity of large snags across a managed forest landscape relates to the logging of that landscape. Further, the usefulness of artificially-created snags has been thrown into doubt.[17] Knowing that this project has a strong likelihood of adversely impacting legacy forest features, which in turn will have a significant impact of the healthy functioning of the remaining forest ecosystem, directly contradicts the assertion that the project will enhance biological diversity. **This must be acknowledged and accounted for in the PA.**

Units for additional analysis regarding standing and down dead wood:

Unit 86, is a mature, fire-originated stand with a high quantity of legacy snags and down wood which currently provides diverse habitat structure for species dependent upon it. Since the stand reseeded naturally as a combination of western hemlock, noble fir, and Doug fir (not uniformly spaced as in a plantation), the unit would not benefit from active density or species management. Dwarf mistletoe of

[14] USDA/USDI 2000. ICBEMP SDEIS p 3-66 – 3-68.
[15] Cline, S.P., Berg, A.B., Wight, H.M., 1980. Snag characteristics and dynamics in Douglas-fir Forests, Western Oregon. Journal of Wildlife Management 44, 773–786.
[16] Issue 42 (March 2002) Dead wood all around us: think regionally to manage locally, by Janet Ohmann and Karen Waddell
[17] USDA Forest Service Gen. Tech. Rep. PSW-GTR-181. 2002

the overstory western hemlock is common within this stand, providing valuable structure for wildlife. Thinning would require the removal of many key snags and other structural components, moving this stand toward a more homogenized state.

Unit 86: concentration of snag habitat

Other units contain large snags and may be otherwise lacking the structure to support late seral dependent species.

Unit 168 is a "fire-originated" stand which contains pockets of high snag density, such as at **45°15'5.59"N, 121°45'47.72"W.**

Unit 6 contains higher amounts of diverse structure overall, there are specific areas relatively high in snag density such as **45°23'46.37"N, 121°51'7.74"W.**

Units 62, 64, and 68, contain legacy snags are scattered throughout the stand – since this and other surrounding units are proposed to be logged via helicopter, Bark is concerned that snag retention in these units would be nearly impossible as the turbulence created by the helicopter has the potential to cause trees to fall every which way, making it unsafe for the feller on the ground. In these types of stands, it is particularly important for patches of high snag density to be placed in skips so no operators would be in harm's way. Realistically, many of these snags would

likely be felled **unless they were in skips**, reducing the amount of important snag habitat.[18]

Unit 62: legacy snag at ***45.37523, -121.87183 (L);*** *Unit 168 pocket of high snag density at* ***45°15'5.59"N, 121°45'47.72"W (R)***

Safety Buffers for Legacy Snags

Project Design Criteria regularly allow for felling legacy snags presumably to ensure contractor safety. The PDCs often state "All snags would be retained where safety permits. If snags must be cut for safety reasons they would be left on site." *Rocky Preliminary Environmental Assessment (PEA) at 23*.

OSHA Regulations specifically state that if a danger tree is not felled or removed, it shall be marked, and no work shall be conducted within two tree lengths of the danger tree unless the employer demonstrates that a shorter distance will not create a hazard for an employee. *29 C.F.R. § 1910.266(h)(1)(vi).* In short, the Forest Service has the option to buffer danger snags, not cut them. While we recognize that the Forest Service needs to protect worker safety, we believe there are options beyond felling danger snags.

In order to both meet the Forest Plan standards for snag retention, and to meaningfully protect wildlife habitat in the planning area, please ensure that any PDCs state, "**All legacy snags would be retained by creating adequate safety buffers, as needed."**

[18] At the 2019 Zigzag public meeting, it was shared that the FS was planning on creating "patch cuts" in unit 62 to promote "deer and elk habitat". This unit is extremely steep and unlikely to be used by deer and elk at any time of year. This rationale should be removed from this unit.

Key issues regarding IMPACTS TO NORTHERN SPOTTED OWL HABITAT for detailed analysis:

6 historic territories and suitable habitat

While there is no critical habitat for northern spotted owls in the Zigzag Timber Sale, there are at least 6 historic territories within the project areas, and dispersal/foraging habitat also exists there. According to the FS, some of the proposed units are commercial thinning treatments with the objective to move the stands towards suitable habitat on a faster trajectory. The agency has stated that there will be no thinning directly adjacent to nest sites.

Within units in the historic home ranges of known spotted owl, we recommend:

- Retaining an average canopy cover of at least 40% to maintain dispersal owl habitat
- Limiting gaps to 1/4 acre in size with less than 10% of the total stand area in gaps
- Prohibiting cutting of trees larger than 20 inches in diameter (at a height of 4.5 feet)

At a public meeting about this sale, agency employees said that there is no existing suitable habitat for NSO. However, Bark's field surveys lead us to believe that several stands include the structures that are necessary to provide suitable habitat. **Please provide detailed information about the method of determining the relative quality of NSO habitat in the project area, a detailed map that supports your conclusions, and a thorough explanation of how this project complies with the Spotted Owl Recovery Plan.**

Impacts to northern flying squirrels

In past comments, Bark expressed concern about impacts to northern flying squirrels (a principle spotted-owl prey), and we bring this concern up again here. The owl recovery plan recommends active management in critical habitat to improve conditions for the long term. According to agency research, variable-density thinning of Douglas fir stands can reduce the suitability of the site for the northern flying squirrels for 30 to 100 years, until long-term ecological processes (often also suppressed by thinning) provide sufficient structural complexity in the mid-story and over-story favorable to squirrels. Northern flying squirrel populations in mature and second growth forests decline after the stands are thinned and remain at low levels. Research has found that squirrel populations in un-thinned patches are larger than in thinned, and even those decline when *adjacent* areas are thinned.[19] Predation seems to be the most limiting factor –

[19] Wilson, T.M. 2010. Limiting factors for northern flying squirrels (Glaucomys sabrinus) in the Pacific Northwest: a spatio-temporal analysis. Ph.D. dissertation. Cincinnati, OH: Union Institute & University.

thinning opens the stands and results in a period of several decades when squirrels are too vulnerable to predation, so the population remains very low. Prescriptions that retain visual occlusion in the mid-story layers are best suited for maintaining squirrel populations.

Since recommendations for managing forests include retaining some areas of high stem density, retaining the mid-story, and retaining a contiguous closed canopy, Bark has expressed concern about the impact of thinning, especially in fire-origin stands, on retaining these key features. A strategy of maintaining adequate area and connectivity of dense, closed-canopy forests within managed landscapes by leaving areas of young forest un-thinned has been recommended by researchers to maintain northern flying squirrel populations[20].

Increased negative interactions with barred owls

The northern spotted owl's Revised Recovery Plan identifies competition from the barred owl as an important threat to the spotted owl.[21] The FS has also previously acknowledged that "(v)egetation management activities can also benefit barred owls indirectly by providing habitat and prey species that are not necessarily preferred by the northern spotted owl." *Hunter EA at 133.* However, past projects have made very little mention of combined impacts of logging with the known effects of competition and trophic cascades associated with the barred owl. In the Pacific Northwest, the recent invasion of barred owls with loss and fragmentation of intact forest are combining to reduce population sizes of native species with limited adaptive responses to novel and fast-acting threats. As noted in the comprehensive work, *Population Demography of Northern Spotted Owls*[22], the fact that barred owls are increasing and becoming an escalating threat to the persistence of spotted owls does not diminish the importance of habitat conservation for spotted owls and their prey. In fact, the existence of a new and potential competitor like the barred owl makes the protection of habitat even more important, since any loss of habitat will likely increase competitive pressure and result in further reductions in spotted owl populations.

The *Population Demography* found that, "[o]ur results and those of others referenced above consistently identify loss of habitat and barred owls as important stressors on populations of northern spotted owls. In view of the continued decline of spotted owls in most study areas, it would be wise to preserve as much high-quality habitat in late-successional forests for spotted owls as possible, distributed over as large an area as possible."

Dugger et al. modeled extinction and colonization rates for spotted owl pairs in the South Cascade Demographic Study area where barred owls were detected on some

[20] Manning, T.; Hagar, J.C.; McComb, B.C. 2012. Thinning of young Douglas-fir forests decreases density of northern flying squirrels in the Oregon Cascades. Forest Ecology and Management. 264: 115 –124.
[21] USDI, U.S. Fish and Wildlife Service. February 2011. Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls. Region One U.S. Fish and Wildlife Service, Portland, OR.
[22] Forsman, et.al, 2011, published for Cooper Ornithological Society.

home ranges[23]. They found that extinction rates for spotted owls increased with decreasing amounts of old forest in the core area, and that the effect was 2 to 3 times greater when barred owls were detected. They found that colonization rates for spotted owls decreased as the distance between patches of old forest increased (i.e., increased habitat loss and fragmentation) and that barred owl presence similarly decreased the rate of colonization of spotted owl pairs. They concluded that conserving large blocks of contiguous old-forest habitat was important for reducing interference competition between the owl species.

In a recently published report, Holm et al. describe the potential trophic cascades triggered by the range expansion of the barred owl in our region. The authors suggest that the addition of the barred owl to PNW ecosystems may result in restructuring of communities or even potential local extinctions. If the rate of increase barred owl population continues, forests could experience a loss of prey species as well as loss of important ecological processes.[24] Increased predation pressure on traditional prey of the northern spotted owl by the barred owl could indeed result in a local decline of species present in the Zigzag project such as northern flying squirrels and red tree voles.

Holm et al. discuss several potential indirect effects on ecosystem processes, which include a decline in tree and shrub growth and establishment through increased predation pressure on seed dispersing species because of barred owl predation. Increases in barred owls could also result in a decline in tree squirrel abundance, which could indirectly lead to reduced recruitment and growth of these forests that rely on spore dispersal. A potential decrease in soil processing may also occur with the expansion of barred owls, since reduced numbers of burrowing small mammals would lead to subsequent declines in the rates of decomposition of organic matter and litter and mixing of forest soil.[25]

Since the effects of thinning on spotted owl prey (flying squirrel) as well as predator/competitor (barred owl) both have significant implications to the future survival of northern spotted owls within the Zigzag project area, please address this reality and fully disclose all associated potential impacts in the PA.

Key issues regarding THINNING IN RIPARIAN RESERVES/LISTED FISH HABITAT for detailed analysis:

[23] Dugger, K.M., R.G. Anthony and L.S. Andrews. 2011. Transient dynamics of invasive competition: barred owls, spotted owls, habitat composition and the demons of competition present. Ecological Applications 21(7): 2459-2468.
[24] Holm, S.R., B.R. Noon, J.D. Wiens and W. J. Ripple. 2016. Potential Trophic Cascades Triggered by the Barred Owl Range Expansion. Wildlife Society Bulletin; DOI: 10.1002/wsb.714
[25] Pearce, J., and L. Venier. 2005. Small mammals as bioindicators of sustainable boreal forest management. Forest Ecology and Management 208:153–175.

Aquatic Conservation Strategy

In the Zigzag project, the FS is proposing 464 acres of Variable-density thinning with skips in Riparian Reserves (RRs) in the Horseshoe area, and 178 acres in the Mud Creek area. As you know, RRs are a part of the NFP's broad Aquatic Conservation Strategy. Northwest Forest Plan, B-12. RRs generally parallel water bodies and streams and are portions of watersheds where riparian dependent resources receive primary emphasis and where specific standards and guidelines apply. *Id. at B-13.* This system was established to "restore and maintain the ecological health of watersheds and aquatic ecosystems." *Klamath Siskiyou Wildlands Ctr. v. U.S. Forest Serv., 373 F. Supp. 2d 1069, 1092 (E.D. Cal. 2004).*

Timber harvest in RRs is generally prohibited, except when **needed** to "acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives." *Northwest Forest Plan, C-31,2*. Thus, the Forest Service has the responsibility to identify which ACS Objectives (ACSO) are not currently met in the RRs and explain how the proposed commercial logging is necessary to acquire the vegetation characteristics needed to meet the ACSOs.

Desired Future Conditions in RRs

The scoping notice states the desired condition in RRs is a multi-layer canopy with large-diameter trees, a well-developed understory, more than one age class, and sufficient quantities of snags and down woody debris. Bark's initial groundtruthing activities have documented that many RRs already meet this desired future condition, burdening the agency to validate their characterization of riparian areas as "overcrowded and relatively uniform". Consider that, even the FS characterization is accurate, the agency has not demonstrated that logging in RRs is necessary to attain ACSOs.

Intermittent streams with ample down wood structure in Units 88(L) and 62 (R)

Should the Forest Service legitimately and adequately demonstrate that commercial logging is ***necessary***, the action must comply with **all nine of the ACSOs**, on both short- and long-term timeframes. Complying with the ACSOs means that the Forest Service must manage riparian-dependent resources to maintain the existing condition or implement actions to restore the conditions. *Northwest Forest Plan, B-10.* While some aquatic degradation, standing alone, does not constitute ACS noncompliance, the Forest Service must avoid degradation that leads to the non-attainment of ACS objectives at both the short-term, localized scale and the long-term, watershed scale. *Pac. Coast Fed'n of Fishermen's Ass'ns v. NMFS, 265 F.3d 1028, 1037 (9th Cir. 2001).* To make a finding that the logging "meets" or "does not prevent attainment" of the ACSOs, the NFP requires the Forest Service to describe the existing conditions of the watersheds within the project area, the natural variability of important physical and biological components, and explain how the proposed logging would maintain or restore the conditions of the watershed. *Klamath Siskiyou Wildlands, 373 F. Supp. 2d at 1093.*

The FS's assertion that logging is needed in RRs because they are "overstocked" with relatively uniform trees with low levels of diversity, and that they do not have mature and late-successional stand conditions, is often a based on an illegitimate oversimplification of the local conditions, especially in fire-originated stands. **Please acknowledge that any logging prescription which removes existing canopy, decreases structural complexity, and adversely impacts soil stability cannot meet the purpose and need of this project or comply with the ACS.**

Mag Unit 184: "gap" within a Riparian Reserve. Within this unit, the entire reserve outside of the no-cut buffer, was cut.

In many instances, ACSOs would be better met through "no action". For example, RRs on the Forest are currently far below the Forest Plan standards for woody debris in streams (which correlates to ACSO #3 and #8). Given that many of the forests in Zigzag are entering the stem-exclusion phase, where trees naturally begin to die and structural diversity increases, No-Action would lead to more available LWD. However, the FS typically characterizes the no-action alternative as though it is stuck in time, in contrast to the action, in which time moves; not properly acknowledging that no-action will effectively allow natural processes to prevail.

Several sources point to passive management as the best approach to achieve ACSOs in RRs. Pollock and Beechie[26] reviewed the sizes of deadwood and live trees used by different vertebrate species to understand which species are likely to benefit from different thinning treatments. They examined how riparian thinning affects the long-term development of both large diameter live trees and dead wood. In forest growth models they created, passive management created dense forests that produced large volumes of large diameter deadwood over extended time periods as overstory tree densities slowly declined. This condition is almost always substantiated by the agency's DecAID analysis within their project areas.

Pollock and Beechie also showed that the few species that exclusively utilize large diameter live trees may benefit from heavy thinning, whereas the more numerous species that utilize large diameter dead wood can benefit most from light or no thinning.

[26] Pollock, Michael M. and Timothy J. Beechie, 2014. Does Riparian Forest Restoration Thinning Enhance Biodiversity? The Ecological Importance of Large Wood. Journal of the American Water Resources Association (JAWRA) 50(3): 543-559. DOI: 10.1111/jawr.12206

Similarly, **Spies et al.[27] concluded that thinning produces unnaturally low-stem-density forests and causes long–term depletion of snag and wood recruitment that is likely detrimental in most RRs**. Commercial thinning will generally produce fewer large dead trees across a range of sizes over the several decades following thinning and the life-time of the stand relative to equivalent stands that are not thinned. Generally, recruitment of dead wood to streams would likewise be reduced in conventionally thinned stands relative to un-thinned stands.

RR units for additional analysis

Unit 2 is a small unit with two streams, and almost completely within RRs. The mature stand is "fire origin" and is an example of a stand that would require ACS-related rationale to enter. **In the PA, the agency should drop areas within RRs that already contain complex forest structure, provide a summary of all current stand conditions in remaining proposed units in RRs, provide justifiable, ecological rationale for active management, and predicted short and long-term results of this treatment.** If rationale and short- and long-term predictions cannot be provided, these units should also be dropped.

Stream Buffers

In the **PA, Bark would like to see information regarding the** width of stream buffers **on specific reaches, especially those containing runs of listed fish species.** For example, when the original Horseshoe project was being proposed in 2012, Bark was told that units along Lost Creek would be subject to 422 ft (2 site-potential tree) buffers, essentially the width of a typical RR. More recently, we were told that the agency specialists are currently looking at recommendations of either 210' or 420' protective buffers from LFH in the western hemlock zone (one-site potential tree height) and 170' protective buffers in the pacific silver fir zone (one-site potential tree height). When considering the appropriate buffer widths, please assess the effect of blowdown associated with the upland thinning on the edges of the no-cut buffers, especially in the Lolo Pass area where the wind blows strong. **Please disclose the width of all stream buffers and the method for determining these widths.**

Upper Sandy Watershed Analysis

In the Lolo pass area within Horseshoe soil are wet and rocky and terrain is steep. The Upper Sandy Watershed Analysis at 1-6 points out that the area of the Horseshoe units averages 70% slopes. Bark has also noted that on both sides of Clear Creek are slopes of 40 – 70%, with some areas in units being much steeper. The map on 4-17 shows that geology north of the Sandy River, units along 1828, are on weak rock. These are prone to moderate to high debris flow, slumping, and earthflow. 36% of Clear Creek is at a high risk for landslides, and 29% of Lost Creek. These are places were ESA fish reside. The map on 4-29 shows that Clear

[27] Spies, T., M. Pollock, G. Reeves, and T. Beechie. 2013. Effects of riparian thinning on wood recruitment: A scientific synthesis. Science Review Team, Wood Recruitment Subgroup, Forestry Sciences Laboratory, Corvallis, OR, and Northwest Fisheries Science Center, Seattle, WA. 28 January 2013. 46pp. http://www.mediate.com/DSConsulting/docs/FINAL%20wood%20recruitment%20document.pdf

Fork and Lost Creek both have high streambank failure potential. Along with erosion from potential logging occurring on these steep slopes, 4-26 notes the already high erosion rate from the powerline corridor. The potential cumulative impacts of erosion and earthflows should be quantified and disclosed in the PA.

Steep slopes above Clear Fork in Unit 6

These risks are especially concerning given that much of the Horseshoe area is providing anchor habitat for several species (Evolutionarily Significant Units) of federally listed salmon and steelhead.

The Assessment of Anchor Habitat on the Sandy River on page 51 shows a map identifying two areas of anchor habitat within the planning area, one along the Clear Fork and one along Lost Creek. Referring to the Horseshoe map, one can see that units 4 and 6 are adjacent to this vital habitat for three separate species at the confluence of Clear Fork and the Salmon River. Unit 4, a "fire originated" is over 50% slope consistently. Many trees in the unit are pistol butting. The many rock formations coupled with steepness create conditions for rockslide/landslides above fish habitat. Further up the Clear Fork is more anchor habitat and units 48, 46, 92, 38, 40, 12, 13, 8, and 86 all propose logging right up to the RR boundary. Lost Creek has anchor habitat for two threatened species of salmon and units 74, 80, and 82 are adjacent to a section of the creek.

The Northwest Research Station stated in a 2015 issue of Science Findings: "Managing for healthy riparian areas in head-waters provides many downstream

benefits. . . (d)ownstream productivity, water temperature, and instream habitat are tied to the health of the headwater stream-riparian system." Of the 15 vertebrates recorded the recent study of headwater streams, most have strong associations to features specific to small headwater streams.[28]

Aquatic species for further analysis:

In the past, Bark volunteers confirmed pacific giant salamander, Dicamptodon tenebrosus, in unit 86.

Upper Sandy WA at 4 -105 notes that Harlequin ducks have been seen on Clear and Lost Creek. This species is in decline and was identified as a Regional Forester Sensitive Species due to impacts from logging (degraded riparian habitat). Similarly, the Cope's giant salamander (Regional Forester Sensitive Species) is thought to be present within the project area. Typically, this species depends on cold water habitat between 8-14° C. This species is in decline due to its restricted distribution along with the potential for increased habitat destruction within its range.

Dicamptodon tenebrosus in unit 86

Given the number of sensitive and protected species dependent on healthy functioning condition of riparian areas within the Zigzag project area, the FS should apply extra consideration to the impacts of logging and roadbuilding on these habitats. **Where actions included in RRs "may affect, and are likely to adversely affect", or "may impact individuals or their habitat, but would not likely contribute to a trend toward federal listing or loss of viability to the**

[28] USDA Pacific Northwest Research Station. 2015. Heed the Head: Buffer Benefits Along Headwater Streams. Science Findings #178. http://www.fs.fed.us/pnw/sciencef/scifi178.pdf

population or species" Bark requests that the FS create an alternative which deletes sections of units which contribute to the Determination.

Unmapped riparian areas

In past projects, sale contract maps did not reflect all wet areas within proposed units, resulting in ground-based logging over areas with riparian components. We know that riparian surveys were conducted summer 2019, and we want to augment that with information collected during the autumn and winter. We will continue to share information that we gather after the snows have melted.

We share this information to help create a more informed representation of baseline condition, because "(i)f an EA does not reasonably compile adequate information and sets forth statements that are materially false or inaccurate the Court may find that the document does not satisfy the requirements of NEPA, in that it cannot provide the basis for an informed evaluation or a reasoned decision." *Western North Carolina Alliance v. N. Carolina Dept. of Transp.,* 312 F. Supp. 2d 765, 776- 77 (E.D.N.C. 2003), citing *Sierra Club v. United States Army Corps of Eng'rs*, 701 F.2d 1011, 1030 (2d Cir.1983). Further, a "material misapprehension of the baseline conditions existing in advance of an agency action can lay the groundwork for an arbitrary and capricious decision." *Friends of Back Bay v. U.S. Army Corps of Engineers,* 681 F.3d 581, 588 (4th Cir. 2012).

Zigzag Unit 88 - example of an intermittent stream

Unit #	GPS	notes
28	45°23'32.57"N, 121°49'59.41"W	Stream
24	45°23'31.47"N, 121°50'15.55"W	Stream
18	45°23'38.95"N, 121°51'4.74"W	Devil's Club
18	45°23'42.22"N, 121°51'1.08"W	Large patch Devil's Club
18	45°23'43.69"N, 121°50'58.75"W	Large patch Devil's Club
62	45°22'17.84"N, 121°52'18.69"W	Devil's Club
181	45°13'30.09"N, 121°45'25.00"W	Intermittent stream
181	45°13'27.32"N, 121°45'26.08"W	Intermittent stream
61	45°24'39.20"N, 121°47'39.44"W	Intermittent stream
61	45°24'35.17"N, 121°47'21.72"W	Subterranean creek
88	45°23'45.70"N, 121°50'53.77"W	Devil's Club

88	45°23'51.18"N, 121°50'52.75"W	Intermittent stream
88	45°23'48.20"N, 121°50'55.19"W	Intermittent stream
168	45°15'5.92"N, 121°45'42.30"W	Riparian
168	45°15'6.60"N, 121°45'46.60"W	Riparian
168	45°15'4.95"N, 121°45'47.85"W	Riparian
168	45°15'3.30"N, 121°45'46.20"W	Riparian
168	45°15'0.69"N, 121°45'44.93"W	Riparian
88	45°23'48.23"N, 121°50'53.14"W	Riparian Late Seral
168	45°14'58.55"N, 121°45'59.91"W	Seep
168	45°15'0.15"N, 121°45'56.62"W	Seep
88	45°23'48.95"N, 121°50'56.40"W	Seep
168	45°14'52.32"N, 121°45'54.11"W	Spring
61	45°24'36.09"N, 121°47'26.59"W	Stream cuts through closed road
61	45°24'40.73"N, 121°47'33.99"W	subterranean stream
168	45°15'1.25"N, 121°45'51.25"W	subterranean water
61	45°24'32.44"N, 121°47'22.19"W	two creeks meet
61	45°24'39.63"N, 121°47'42.94"W	opening/riparian
44	45°24'9.25"N, 121°49'25.62"W	Creek
44	45°24'8.87"N, 121°49'21.03"W	Drainage
44	45°24'4.71"N, 121°49'13.54"W	Seasonal creek
44	45°24'7.90"N, 121°49'48.20"W	Seasonal creek
62	45°22'17.90"N, 121°52'11.70"W	Seep
62	45°22'28.47"N, 121°52'17.20"W	Stream
62	45°22'23.00"N, 121°52'7.50"W	Creek
62	45°22'30.39"N, 121°52'16.36"W	Creek
62	45°22'28.98"N, 121°52'13.29"W	healthy stream big trees
32	45°23'45.49"N, 121°50'23.74"W	Devil's Club

Underground streams

Several units Bark has groundtruthed (i.e. units 61, 88, 168) contain riparian areas which are partially underground. In situations like this, it is very difficult to know the extent of the drainage network, and the soils are often very sensitive to ground-based disturbance. When this occurs within the units, **Bark recommends no ground-based heavy machine operations within RRs**. Any thinning could occur using hand equipment, and a non-commercial thin will leave wood within the Reserves.

Intermittent stream in Unit 61 coming off wet area adjacent to proposed new Top Spur trailhead: holes in the ground and cobble show the water becoming subterranean and then resurfacing periodically

Riparian area in SW unit 88 goes completely underground (L) in some areas after being visible just upslope (R)

Units with subterranean water for further analysis:

Unit 61 includes a stream fed by two aging culverts beneath the 1828-118. Downslope and within the unit, the two streams join to form one. Upslope and between the two includes an area which should not be included in any proposed logging activities, due to the proximity to the two streams and general slope/geology

being very subject to erosion.

Junction of two streams within Unit 61

Unit 168 includes a spiderweb-like network of streams is centered on approximately **45.251, -121.763.** These streams weave through this unit and through rocky, loose soils. Many of the streams are wide and slow moving, while others are more channelized and contain down wood structure. Bark recommends avoiding this area (mapped as RR in the FS's story map), and makes a recommendation similar to the units above with subterranean water: do not bring ground-based equipment into these Reserves, and take upmost care to locate and buffer all water within this part of the unit (after dutifully making the clear justification for entering these areas at all since they are located in RRs).

Unit 168 riparian areas

Key issues regarding MATURE/FIRE ORIGIN STANDS for detailed analysis:

In the Mud Creek area, units 198, 196, 194, 192, 190, 182, 102, 108, 114, 117, 119, 129, 130, 132, 180, 181, 184, 185, 186, 165, 168, 175, 176, and 178 are all fire origin stands. Of these stands, only 168, 182, 102, 165 and 175 overlap with 1902 fire layer provided in the Zigzag story map, so the vast majority have a fire history which is currently either unknown or not disclosed.

In the Horseshoe area, units 2, 4, 6, 7, 8, 20, 16, 18, 88, 86, 26, 28, 24, 34, 31, 62, 63, 64, 65, and 68 are all fire origin stands in the Horseshoe area which overlap with the 1902 fire layer provided.

Most, if not all, of these stands are over 100 years old and naturally re-seeded after a fire or after post-fire logging. Not all these stands include forest typically thought of as "late seral" or "mature" in structure (this largely has to do with previous logging history). However, the best way for the FS to ensure that there is an overall increase of mature and old growth forest habitat in the future is to let mature forests like these grow unmanaged. Furthermore, there is new urgency to provide additional intact, closed canopy, late seral habitat as soon as possible to increase the chances that the spotted owls can co-exist with the invading barred owl (which is more resilient to thinning).

Any commercial logging, including thinning mature stands and/or removing mature trees, can reduce the quality of habitat and delay attainment of defining old-growth characteristics such as snags and dead wood that provide essential ecological services, including fish & wildlife habitat, carbon storage, slope stability, and capture-storage-release of water and nutrients.

Unit 68, late seral trees and legacy downed wood

Old Growth Features

Bark has observed that old-growth features, such as large trees, snags, and multiple tree canopy layers, often begin to be present in mature stands (defined here as over 80 years old). Scientific literature demonstrates how "(s)ites that do not have the full complement of old-forest characteristics can partially function as old forests for those attributes that are present."[29] When old forests are in such short supply,

[29] Everett, R., P. Hessburg, J. Lehmkuhl, M. Jensen, and P. Bourgeron. 1994. Old Forests in Dynamic Landscapes: Dry-Site Forests of Eastern Oregon and Washington. Journal of Forestry 92: 22-25.

these mature stands act as important "life boats" that will carry closed-canopy dependent wildlife through the habitat bottleneck created by decades of overcutting.

In David Perry's (Professor [emeritus], Oregon State University School of Forestry) correspondence to David Dreher (Legislative Assistant to U.S. Rep. Peter DeFazio), 15 June 2002, he writes:

The biological importance of mature forests (roughly 80-150 years old) was recognized by FEMAT, and the NRC panel agreed with their assessment. Basically, these are the next generation of old growth, and many are probably already developing aspects of OG [old growth] habitat. With remaining OG at such low levels, the NRC panel felt that including forests on the cusp could make a significant difference in survival of some species over the next 100 years, and I would imagine that was the reasoning of FEMAT biologists as well.

If retained, mature forest stands in Zigzag will continue growing and removing carbon from the atmosphere for decades or even centuries. These mature forests have not yet reached their full potential for carbon storage and will continue to sequester additional carbon in both wood and soil for a long time. Old-growth forests in the moist "westside" portions of the Pacific Northwest store more carbon per-acre than any other temperate forests in the world.[30]

[30] Smithwick EAH, Harmon ME, Acker SA, Remillard SM. 2002. Potential upper bounds of carbon stores in the Pacific Northwest. Ecological Applications 12(5): 1303-1317. "The C densities we measured in old-growth forests of the PNW are higher than C density values reported for any other type of vegetation, anywhere in the world. … Results showed that coastal Oregon stands stored, on average, 1127 Mg C/ha, which was the highest for the study area, while stands in eastern Oregon stored the least, 195 Mg C/ha. … the highest C density was at stand CH04 at Cascade Head, ORCOAST, with 1245 Mg C/ha."

Late seral habitat in Unit 6 1

Bark has visited several “fire origin” units and found that tree ages and sizes vary, and legacy trees and snags scattered throughout the units. It isn’t just fire-origin units that include mature forest habitat characteristics. Some “plantation” units Bark has visited also include legacy trees and snags, among other structural components of a healthy forest.

Late seral forest units for further analysis:

In pure late seral forest (such as in *Unit 6, Unit 86, Unit 88* at 45°23'49.22"N, 121°50'56.34"W), **Bark recommends dropping these proposed units.** Where there are pockets of this habitat within units, as there are in *Unit 18, 20, 62, 63*, Bark recommends dropping these sections from the units. Where scattered large down wood, large snags, large live trees, or minor trees exist (is it does in most of the “fire origin” units), **Bark recommends retaining no less than 40% of the canopy cover, retaining as much mid-story component of the stand as is feasible, retaining the largest trees in the stand, as well as retaining all legacy features.**

Zigzag Unit 88 - pocket of late seral habitat in south unit

Unit 6 mature noble fir in northeastern 1

Unit 6 mature noble fir in northeastern

Key issues regarding BOTANY FINDINGS in the PROJECT AREA for detailed analysis:

Bark volunteers noted species within proposed units which Bark recommends buffering from ground-based logging operations –

Allotropa virgata and Usnea longissima. Our findings are included in the table below. **We recommend that the locations of these species will be placed in skips during sale layout**.

Unit	Species	GPS
16	Allotropa virgata	45°23'38.95"N, 121°50'47.13"W
16	Allotropa virgata	45°23'39.04"N, 121°50'48.35"W
88	Allotropa virgata	45°23'41.00"N, 121°50'51.55"W
6	Allotropa virgata	45°23'42.21"N, 121°51'22.09"W
4	Usnea longissima	45°23'37.9"N, 121°51'42.6"W

A. virgata was formally designated a "C-3 species" under the Northwest Forest Plan. *See Table C-3.* It is currently a Forest Service Sensitive species in the Intermountain Region.

The habitat in which *A. virgata* is found may primarily be a function of the requirements of the fungus with which it associates, with important factors being those of the soil environment and the availability of host trees. Buried, rotten wood is one important aspect of *A. virgata* habitat, probably because it retains moisture and provides organic substances essential to the associated fungus.

Dependence of *A. virgata* on its conifer host suggests that anything that destroys the tree component or severs the mycorrhizal relationship[31] will result in death of the plant. Plants on the margins of canopy openings produced by logging may also be adversely affected by the increased insolation.

Although *A. virgata* no longer has any conservation status as a Region 6 sensitive or strategic species or a Survey and Manage species, **Bark recommends that sites be protected from logging disturbance due to the species' obvious affinity to intact, healthy soils in mature forest as well as its overall rarity on the Mt. Hood National Forest.**

U. longissima is currently a Survey and Manage Category F species under the Northwest Forest Plan. Although it has a large range and was once common, U. longissima is now considered rare in the United States. *U. longissima* is a declining species with sporadic distribution on the Mt. Hood National Forest and throughout the Northwest Forest Plan area. It has been extirpated from all of its range in Europe and Scandinavia due to habitat loss and air pollution, except for parts of Norway and Italy where it is "red-listed" as an endangered species.[32] It is also listed on the "Red List of California Lichens" and is valued and used medicinally for its reputed anti-bacterial, anti-viral, and anti-cancer properties.

Populations of *U. longissima* occur predominantly in riparian areas, hanging from trees growing along or nearby rivers and tributaries, but populations can also occur in upland forest. Falling or limbing of trees on which *U. longissima* is growing would destroy populations of the lichen. It cannot survive on fallen trees, branches, or the forest floor. *U. longissima* is vulnerable to changes in tree density and canopy closure.[33], [34]

Past project planning documents have stated that "trees with these lichens would be marked as leave trees." No Whisky EA at 76. Bark recommends that this action be taken in the case of Zigzag, with the option of expanding this provision to retaining trees with canopies that touch trees containing *U. longissima*.

[31] Furman, T.E. and J.M. Trappe. 1971. Phylogeny and ecology of mycotrophic achlorophyllous angiosperms. Quarterly Review of Biology 46:219-225.
[32] Storaunet, K.O., J. Rolstad, M. Toeneiet, & E. Rolstad. 2008. Effect of logging on the threatened epiphytic lichen Usnea longissima: a comparative and retrospective approach. Silva Fennica 42(5): 685-703.
[33] Sillett, S.C. & Goslin, M.N. 1999. Distribution of epiphytic macro lichens in relation to remnant trees in a multiple-age Douglas-fir forest. Canadian Journal of Forest Research 29: 1204–1215.
[34] Dettki, H. & Esseen, P.A. 1998. Epiphytic macro lichens in managed and natural forest landscapes: a comparison at two spatial scales. Ecography 21:613–624


Allotropa virgata in Unit 18

Spread of "invasive" plant species

The area around Lolo Pass road is at risk for spread of "invasive"[35] species, especially two types of hawkweed along the road and in the nearby power line, and nearby private land clearcuts. Scotch broom and Tansy Ragwort are also species that colonize disturbed areas but would not otherwise if the stands are left intact. In Bark's on-the-ground experience walking logged timber sale units, nearly 100% of stands which are recently logged contain invasive plant species which did not occur before logging took place. Please disclose how the FS will be defining and responding to the risk of spreading these species into the forest.

Key issues regarding RED TREE VOLES for detailed analysis:

Red tree voles (RTV) are Category C Survey and Manage species under the Northwest Forest Plan, and according to the IUCN Red List are "near-threatened". Threats to the species include loss of forest habitat and forest fragmentation. This species has limited dispersal capabilities and early seral stage forests are a barrier to dispersal. Red tree vole Habitat Areas[36] within proposed timber sales require a

[35] As per Executive Order 13112 (Section 1. Definitions) an "invasive species" is defined as a species that is: 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

[36] https://www.blm.gov/or/plans/surveyandmanage/files/mr-rtv-v2-2000-09-att1.pdf

minimum of 10-acres and are intended to provide for the protection of the physical integrity of the nest(s) and retain adequate habitat for expansion of the number of active nests at that site. The Habitat Areas must include a buffer of one site-potential-tree height around nests on the outer edge of such polygons and include any confirmed inactive red tree vole nests that are located within 100 meters (330 feet) of a confirmed active red tree vole nest.

In the Zigzag project, several proposed units meet the survey protocol prerequisite[37] required by the agency to conduct surveys for RTVs.

In the past, the FS's interpretation of the red tree vole survey protocol recently led to a gross under-representation of red tree vole colonies present in the North Clack Timber Sale. The Northwest Ecosystem Survey Team (NEST)'s recent findings in the North Clack project have shown that simply running transects and looking nests from the ground was not sufficient in locating red tree vole nests.[38]

To this end, we are pleased to hear that the agency is conducting surveys consistent with draft survey protocols under development by USDA FS Region 6.[39] At the Zigzag public field trip, it was stated that there were trees found within units which are suitable for RTV, and that they will be climbed by surveyors if they are below 3,500 feet in elevation. We noted within Zigzag units that several trees had been flagged by surveyors, presumably to mark the dominant trees in the stand. However, not all trees we found marked were suitable for RTV. Additionally, we found several trees which were suitable for RTV which were not flagged. Protocol requires that these trees and others found throughout the planning process for this project be climbed and that any nests found be buffered appropriately.

Unmarked trees suitable for RTVs

Unit	GPS	Notes
88	45°23'45.99"N, 121°50'49.00"W	
88	45°23'47.47"N, 121°50'49.21"W	64.5" DBH
6	45°23'35.77"N, 121°51'22.96"W	55" DBH
6	45°23'44.18"N, 121°51'22.45"W	2 OG Doug fir
34	45°23'55.29"N, 121°50'30.54"W	38.5" DBH remnant Doug fir

[37] https://www.blm.gov/or/plans/surveyandmanage/files/sp-RedTreeVole-v3-0-2012-11.pdf

[38] A tree vole nest can be the size of a fist to upwards of 90cm cubed. While a 90 cm cubed nest is visible from the ground if it is in the lower third of the canopy, it is not visible if you cannot see into the canopy. Which is the case for most of the legacy trees in the Zigzag project. A fist sized nest is never visible from the ground nor in the upper canopy. Research by Eric Forsman and Jimmy Swingle indicate that RTV nests are usually in the upper 3rd of the canopy, thus not likely to be easily visible. These findings are in line with the data from the North Clack project. A vast majority of them were not only in the upper 3rd, but at the very top of the tree when it is a broken top. The nests in broken top cavities are often large multi-generational nests. Cavity nests that are probably less likely to be predated because cavity nests provide protection than nests out on branches cannot provide. These cavity nests are also well protected against the elements so often there will be a multitude of layers created by each successive generation. Cavity nests are likely to be important to the persistence of a given tree vole population at the local level.

[39] Huff, R., and C. Marks-Fife. In review. Survey protocol for the red tree vole, Arborimus longicaudus, (= Phenacomys longicaudus in the record of decision for the Northwest Forest Plan version 4.0, April 2017. USDA Forest Service and USDI Bureau of Land Management. Portland, Oregon.

62	45°22'32.0"N, 121°52'18.4"W	
62	45°22'29.0"N, 121°52'13.3"W	


Examples of flagged potential RTV trees in Unit 88 (L); Unit 62 (R)


Unit 88 unflagged potential RTV trees at ***45°23'45.99"N, 121°50'49.00"W*** *(L);* ***45°23'47.47"N, 121°50'49.21"W*** *(R)*

Unmarked suitable RTV tree in Unit 6 at ***45°23'44.18"N, 121°51'22.45"W***

Unit 62 unmarked suitable RTV trees at ***45°22'29.0"N, 121°52'13.3"W*** *(L);* ***45°22'32.0"N, 121°52'18.4"W*** *(R)*

Key issues regarding CLIMATE CHANGE for detailed analysis:

Lack of quantitative carbon analysis:

In recent projects, Bark has observed that the FS has made a choice not to pursue a quantitative carbon analysis, or address current OSU forest carbon research and its recommendations[40] which were provided to them in multiple ways during Scoping, and since that time have been supported by the Oregon Global Warming Commission's Forest Carbon Accounting Project Report[41]. These findings highlight the importance of project-level tracking of carbon emissions, and question whether converting standing timber into wood products can be an effective strategy for maintaining or increasing overall forest carbon storage.

To this end, we encourage the FS to engage with and include Land use strategies to mitigate climate change in carbon dense temperate forests[42], a paper released in 2018 which explores PNW forests' role in the regional carbon cycle.

In this paper, reforestation, afforestation, lengthened harvest cycles on private lands, and restricting harvest on public lands increase net ecosystem carbon balance 56% by 2100, with the latter two actions contributing the most. Resultant co-benefits included water availability and biodiversity, primarily from increased forest area, age, and species diversity. **Increasing forest carbon on public lands reduced emissions compared with storage in wood products because the residence time is more than twice that of wood products.** Hence, temperate forests with high carbon densities and lower vulnerability to mortality have substantial potential for reducing forest sector emissions.

Carbon and "long-lived" wood products

The FS asserts that utilizing trees to create "long-lived" wood products *sequesters* carbon, and that using wood to build houses has a more favorable carbon balance when compared to other building materials such as steel, concrete or plastic. To be clear, while some carbon can be stored temporarily in wood products, these products don't *sequester* carbon.

Pacific temperate forests can store carbon for many hundreds of years, which is much longer than is expected for buildings that are generally assumed to outlive their usefulness or be replaced within several decades. Recent analysis suggests substitution benefits of using wood versus more fossil fuel-intensive materials may have been overestimated by at least an order of magnitude. While product substitution reduces the overall forest sector emissions, it cannot offset the losses

[40] https://www.pnas.org/content/115/14/3663

[41] https://static1.squarespace.com/static/59c554e0f09ca40655ea6eb0/t/5c094beaaa4a99fa6ad4dcde/1544113138067/2018-OGWC-Forest-Carbon-Accounting-Report.pdf

[42] Land use strategies to mitigate climate change in carbon dense temperate forests. Beverly E. Law, Tara W. Hudiburg, Logan T. Berner, Jeffrey J. Kent, Polly C. Buotte and Mark E. Harmon PNAS March 19, 2018. 201720064; published ahead of print March 19, 2018. https://doi.org/10.1073/pnas.1720064115

incurred by frequent harvest and losses associated with product transportation, manufacturing, use, disposal, and decay.

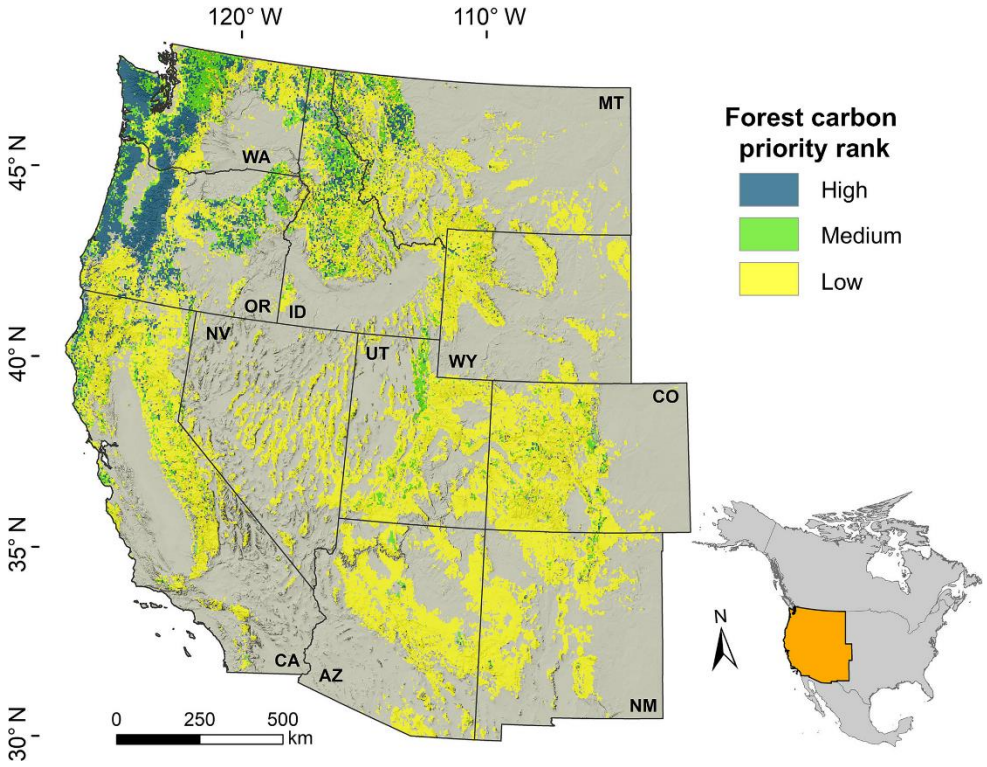
The recent OSU research has identified forests in the western conterminous United States with highest potential carbon sequestration and lowest vulnerability to future drought and fire, and found that these high-carbon-priority forests exist in the westside cascade mountains.

According to the authors of *Carbon sequestration and biodiversity co-benefits of preserving forests in the western USA*,[43] the pacific northwest's high-productivity, low-vulnerability forests have the potential to sequester up to 5,450 Tg CO2 equivalent (1,485 Tg C) by 2099, which is up to 20% of the global mitigation potential previously identified for all temperate and boreal forests, or up to ~6 yr of current regional fossil fuel emissions. Additionally, these forests currently have high above- and belowground carbon density, high tree species richness, and a high proportion of critical habitat for endangered vertebrate species, indicating a strong potential to support biodiversity into the future and promote ecosystem resilience to climate change.

Carbon Priority Areas

These results show considerable potential for forests in the western United States to sequester additional carbon over the coming century and demonstrate that protecting high-carbon-priority areas could help preserve components of biodiversity. Preserving high-carbon-priority forests avoids future CO2 emissions from harvesting and mitigates existing emissions through carbon sequestration.

[43] Polly C. Buotte, Beverly E. Law, William J. Ripple, Logan T. Berner. Carbon sequestration and biodiversity co-benefits of preserving forests in the western USA. *Ecological Applications*, 2019; DOI: 10.1002/eap.2039



Forested land in the western conterminous United States classified into priority for preservation to mitigate climate change based on the spatial co-occurrence of low vulnerability to drought and fire and low, medium, and high potential carbon sequestration. WA, Washington; ID, Idaho; MT, Montana; OR, Oregon; CA, California; NV, Nevada; UT, Utah; CO, Colorado; AZ, Arizona; NM, New Mexico.

This is supported by recent research showing that growing existing forests intact to their ecological potential—termed *proforestation*—is the most effective, immediate, and low-cost approach that could be mobilized across suitable forests of all types. Proforestation serves the greatest public good by maximizing co-benefits such as nature-based biological carbon sequestration and unparalleled ecosystem services such as biodiversity enhancement, water and air quality, flood and erosion control, public health benefits, low impact recreation, and scenic beauty.

Proforestation

For example, a study of 48 undisturbed primary or mature secondary forest plots worldwide found, on average, that the largest 1% of trees [considering all stems ≥1 cm in diameter at breast height (DBH)] accounted for half of above ground living biomass (The largest 1% accounted for ~30% of the biomass in U.S. forests due to larger average size and fewer stems compared to the tropics). Each year a single tree that is 100 cm in diameter adds the equivalent biomass of an entire 10–20 cm diameter tree, further underscoring the role of large trees. Intact forests also may sequester half or more of their carbon as organic soil carbon or in standing and fallen trees that eventually decay and add to soil carbon. Some older forests continue to sequester additional soil organic carbon and older forests bind soil organic matter more tightly than younger ones.

Proforestation has the potential to provide rapid, additional carbon sequestration to reduce *net* emissions in the U.S. by much more than the 11% that forests provide currently.[44]

Administrative direction on Climate Change

The agency claims that the "Forest Plan, as amended, does not contain direction related to climate change." While this may be true, environmental law arguably does.

In responding to comments, the Forest Service has recently claimed that "climate change is a global phenomenon" with the implication that it is impossible to assess the impact of any given project. This excuse was thoroughly rejected by the Ninth Circuit, which found the fact that "climate change is largely a global phenomenon that includes actions that are outside of [the agency's] control . . . does not release the agency from the duty of assessing the effects of its actions on global warming within the context of other actions that also affect global warming." The impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct. *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin., 538 F.3d 1172, 1217 (9th Cir. 2008).*

The Ninth Circuit established a rule in *Hapner v. Tidwell* that NEPA analyses must consider a project's "impact on global warming in proportion to its significance," 621 F.3d 1239, 1245 (9th Cir. 2010). Because of the importance of mature Cascadian forests to the carbon cycle, local forest management decisions on MHNF have a disproportionately high impact on climate change. Indeed, studies have found that decreasing logging on National Forests in the Pacific Northwest is one of the top land use strategies to mitigate climate change.

Council on Environmental Quality

In 2016, the Council on Environmental Quality (CEQ) released final guidance for federal agencies on how to consider the impacts of their actions on global climate change in their NEPA analysis. This final guidance provides a framework for agencies to consider both the effects of a proposed action on climate change, as indicated by its estimated greenhouse gas emissions, and the effects of climate change on a proposed action.

However, on March 28, 2017 the Trump Administration issued an executive order titled "Presidential Executive Order on Promoting Energy Independence and Economic Growth" which attempts to relieve agencies from the requirement to consider the effects of GHG emissions and climate change. Among other things, this executive order rescinds the CEQ guidance regarding consideration of climate change in federal decision-making, but the E.O. also recognizes that "[t]his order shall be implemented consistent with applicable law" and "all agencies should take appropriate actions to promote clean air and clean water for the American people, while also respecting the proper roles of the Congress and the States concerning these matters in our constitutional republic." While the guidance was finalized in

[44] https://www.frontiersin.org/articles/10.3389/ffgc.2019.00027/full

August 2016, it followed a series of court rulings addressing the issue of greenhouse gases and NEPA, which found that whenever greenhouse gases are significant or rise from the project, either directly or indirectly, they much be analyzed in a NEPA document. **Thus, despite the E.O., the FS must continue to carefully consider the effects of GHG emissions and climate change in all its decisions.**

Newly released draft guidance from CEQ states: Agencies should attempt to quantify a proposed action's projected direct and reasonably foreseeable indirect GHG emissions when the amount of those emissions is substantial enough to warrant quantification, and when it is practicable to quantify them using available data and GHG quantification tools.5 Agencies should consider whether quantifying a proposed action's projected reasonably foreseeable GHG emissions would be practicable and whether quantification would be overly speculative. If an agency concludes that quantification would not be practicable or would be overly speculative, it should explain its decision. Where GHG inventory information is available, an agency may also reference local, regional, national, or sector-wide emission estimates to provide context for understanding the relative magnitude of a proposed action's GHG emissions.[45]

And,

When an agency determines that the tools, methods, or data inputs necessary to quantify a proposed action's GHG emissions are not reasonably available, or it otherwise would not be practicable, the agency should include a qualitative analysis and explain its basis for determining that quantification is not warranted.

Outdated FS assertions on Carbon

Recently, in the North Clack EA, the FS made an unsupported claim that "Rapidly growing forests are recognized as a means of carbon sequestration" (the source "FAO 2007", is not included in the References). This unsupported claim is also outdated and false. Removal of biomass from any forest limits its ability to sequester carbon for a period after the disturbance and subsequently turns the forest into a carbon source.[46] Not only that, but also the act of removing trees requires carbon emissions. Moreover, reducing tree densities increases weatherization of dead biomass, which would increase the rate of carbon emissions from decay.

The Oregon Global Warming Commission states in its 2018 Forest Carbon Accounting Project Report: "Based on credible evidence today, forest harvest does not appear to result in net carbon conservation when compared to carbon retention in unharvested forests…Current analysis suggests that treatments which include

[45] https://www.govinfo.gov/content/pkg/FR-2019-06-26/pdf/2019-13576.pdf

[46] Mitchell SR, Harmon ME, O'Connell KEB. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest Ecosystems. Ecological Applications, 19:3; 643-655.

medium to heavy thinning result in reduced carbon stores that do not recover in any meaningful time periods."

The FS has often claimed the short-term carbon emissions and the difference in long-term carbon storage that could be attributable to the Proposed Action are of such small magnitude that they are unlikely to be detectable at global, continental or regional scales. Additionally, it has asserted that changes in carbon stores are unlikely to affect the results of any models now being used to predict climate change. The same thing could be, and is, said about every individual timber sale in National Forests in the Pacific Northwest. The failure of federal agencies to place projects within the context of emissions from logging on a regional or statewide level has led the public to thinking that the forestry sector is no longer a contributor to global greenhouse gas emissions.

Again, the FS insists that the scale of climate impact is inherently global, **ignoring the fact that all emissions are local and the point sources of impact on global climate trends.** It is absolutely possible to quantify the amount of carbon sequestered in the Zigzag project area (see, for example, the BLM's Hole in the Road EA in which did just that).

To take a hard look at climate change, the questions that the FS should be answering are: How many tons of carbon will the Zigzag Timber Sale emit into the atmosphere during and after project implementation from logging operations and decay? How much carbon sequestration does the project area currently sequester? How much sequestration capacity will be lost, and for how long? How will the forests' resiliency to a changing climate be affected by the logging and road building?

The FS should quantify climate change emissions from its projects and take the analysis a step further to examine the carbon tradeoffs, including carbon emitted from the project and the loss of future carbon sequestration because of the project.

The CEQ guidance also requires the FS to **consider alternatives that would make the action and affected communities more resilient to the effects of a changing climate.** The FS should also choose mitigation measures to reduce action-related GHG emissions or increase carbon sequestration in the same fashion as they consider alternatives and mitigation measures for any other environmental effects.

A recent California case discussed the government's failure to take a hard look at how a changing climate exacerbates the adverse impacts of the proposed project, finding that to meet the hard look requirement, "NEPA requires an evaluation of the impact of climate change."*AquAlliance v. U.S. Bureau of Reclamation*, 287 F.Supp.3d 969, 1028 (E.D. Cal. 2018). The court in *AquAlliance* found that failure to consider climate change is a "failure to consider an important aspect of the problem" facing the proposed action. Id. at 1032, citing *Wild Fish Conservancy v. Irving*, 221 F.Supp.3d 1224, 1233 (E.D. Wa. 2016) (Biological Opinion was arbitrary and capricious for failing to adequately consider impacts of climate change). In your PA, please recognize that mature forests are the most climate-resilient ecosystems

and provide important habitat refugia for organisms stressed by a changing climate. In this context, old-growth forests take on new significance, thus logging them has greater impact. **We request you analyze the impacts of the Zigzag project in the context of a rapidly changing climate, and not rely on the results of past logging to inform your analysis as the baselines are rapidly changing.**

Impact of Management on Ecosystems Experiencing Climate Change

Human-caused climate change will not only affect natural systems, it will also intensify the impacts of human activities such as off-road vehicles, roadbuilding and logging. Looking at climate impacts in National Forests, one report concluded that, "climate change will directly affect the ecosystem services provided by national forests and will exacerbate the impacts of current natural and anthropogenic stress factors."[47] Climate change is predicted to result in more flood events and fires across the Pacific Northwest.[48] Many Oregon streams will experience higher winter flow and reduced summer flows as temperature rises and the variability of precipitation increases. The well documented shift from snow to rain, coinciding with increases in temperature, affects hydrologic trends. Snow cover typically accumulates at temperatures close to the melting point, and thus is at risk from climate warming because temperature affects both the rate of snowmelt and the phase of precipitation. With a projected 2°C winter warming by mid-century, almost 10,000 km² of currently snow-covered area in the Pacific Northwest could receive winter rainfall instead.[49]

Climate change, combined with effects from past management practices, is exacerbating changes in forest ecosystem processes and dynamics to a greater degree than originally anticipated in the NWFP.[50] This includes changing patterns of fire, insect outbreaks, drought, and disease.[51] Land managers need to consider this uncertainty and how best to integrate knowledge of management-induced landscape pattern and disturbance regime changes with climate change when making spotted owl management decisions.

In a recent study, the influence of weather and climate on spotted owl populations was evidenced in northern California, Oregon, and Washington. Climate related factors accounted for 84% and 78% of the temporal variation in population change of spotted owls in the Tyee and Oregon Coast Range study areas, respectively. Climate and barred owls together accounted for nearly all (~100 percent) of the changes in spotted owl survival in the Oregon Coast Range.[52] The presence of high-quality habitat appears to buffer the negative effects of cold, wet springs and winters on survival of spotted owls as well as ameliorate the effects of heat. The

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[47] Blate, G.M., et. al, Adapting to climate Change in United States national forests, Unasylva 231/232, Vol. 60, p57, 2009.
[48] USDA Forest Service, Pacific Northwest Region, Aquatic and Riparian Conservation Strategy, p. 30 (2008).
[49] Heejun Chang, Julia Jones, *Climate Change & Freshwater Resources in Oregon*, Oregon Climate Change Research Institute, Oregon Climate Assessment Report, College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR (2010) at 84.
[50] Revised Recovery Plan for the Northern Spotted Owl, Recovery goal, objectives, criteria and strategy II-11.
[51] *Id.* at III-5.
[52] Revised Recovery Plan for the Northern Spotted Owl, Recovery goal, objectives, criteria and strategy III-9.

high-quality habitat might help maintain a stable prey base, thereby reducing the cost of foraging during the early breeding season when energetic needs are high. In general, climate change can increase the success of introduced or invasive species in colonizing new territory. Invasive animal species are more likely to be generalists, such as the barred owl, than specialists, such as the spotted owl and adapt more successfully to a new climate than natives.[53]

Instead of considering alternatives that would make the action and affected communities more resilient to the effects of a changing climate, the Forest Service has instead added an alternative which includes additional clearcutting. Along with removing this activity from the Proposed Action, the FS should take a hard look at the climate science and design an alternative which uses precaution as a guiding principle, along with the prioritization of protecting climate refuges, as well as identifying forest types vulnerable to ecosystem change.

Key issues regarding SYSTEM ROADS for detailed analysis:

In the Zigzag information sheet, the FS provided the chart below to describe the current condition of the transportation system within the project area.

Forest Road Status	Mud Creek Miles	Horse Shoe Miles
Total National Forest System Roads in 1990	37.2	37.7
Decommissioned National Forest System Roads (no longer part of the Forest's Transportation system)	7.5	10.3
Current National Forest System Roads	29.7	27.4

Decommissioning

It is not clear from the table above if the FS is counting "Decommission with Delay" roads from the Increment process toward it's decommissioned roads total. It would be most appropriate if the FS created another category in this chart for "Decommission with Delay" and other roads that have NEPA decisions for decommissioning but have not yet been decommissioned. **Please specify in the PA how many NEPA-ready roads exist within the project area along with what plans/timelines there are to decommission them.**

In Zigzag, the FS is proposing to close five miles of system road and **decommission 0.5 miles** (FSR 2656-037 and 2656-903 past the junction with 2656-053. Both roads are not roads included in the Increment process and are newly identified roads).

For several reasons, Bark believes there should be an emphasis on reducing the road network in the Zigzag project area, including road decommissioning, and road-to-non-motorized trail conversion. Within the Zigzag project area, the Salmon River watershed has been identified by the Forest Service as being analogous to Tier 1

[53] *Id.*

Key Watershed. The Upper Sandy is a proposed Key Watershed. The Northwest Forest Plan (NFP) states that "(t)he amount of existing system and non-system roads within Key Watersheds should be reduced through decommissioning of roads." *NFP at B-19*.

FSR **1828-125** was identified for Decommission with Delay (5-10 yrs.) through the Mt. Hood National Forest Increment Road decommissioning process. It has the Objective D – DECOMMISSION. This road is not yet decommissioned.

Near its junction with 1828, there is channelization and water running down the road and collecting at the culvert where some road fill is even making it into the tributary to the Clear Fork. A bit past this point, there is a spot on the downslope from this road where Bark has regularly seen large quantities of trashed dumped (construction materials, animal carcasses, household waste). Currently, there are dips in the road near every stream crossing. During peak flows the water likely runs over the road surface. In some places there is sheet erosion on the upslope of the road, and a few places exist where fill failure is occurring. This road is also on a steep slope above the Clear Fork, habitat for listed fish. **For the reasons outlined above Bark requests that this road be decommissioned as soon as possible.**

Fill failure on FSR 1828-125 (L); At nearly every stream crossing there is a dip in the road, often pooling. Likely that water is washing out this road (R)

FSR 1828-125 channelization with water carrying road fill into ditch and into culvert feeding Clear Fork tributary

The **1828-180** road is another Decommission with Delay road which has not been decommissioned at its junction with the 1828. Like the 1828-125, this road also runs along a mid-slope above the Clear Fork. According to Increment I analysis this road was supposed to be ripped and bermed at its start, but it was decommissioned approximately half a mile down the road. The **1828-180 road should be decommissioned as soon as possible.**

FSR 1828-180 at 1828, not yet decommissioned

FSR 1828-180 approximately half a mile down the road.

The **1828-024** road is a Decommission with Delay road which terminates into a popular but illegal target shooting spot where Bark volunteers have observed over the years more and more trees being shot down, and trash being shot at dangerously and left on-site. For this reason and others, the **1828-024 road should be decommissioned as soon as possible.**

Terminus of Rd 1828-024, photo taken in 2012

Rd 1828-024 at its terminus, photo taken in 2019

The **1828-118** past the Top Spur trailhead is also an approved Decommission with Delay road. This road contains several deteriorating culverts and road-related erosion. Every culvert along this road is outdated and two at **45°24'35.31"N, 121°47'19.72"W** are broken and creating scour and additional erosion. These culverts are failing to capture all the water being directed through the inboard ditch on the upslope, and as a result water is moving over the road and taking fill and sediment with it. Similarly, at its junction with decommissioned road **1828-021**, there is a seep feeding a long inboard ditch with no cross drainage **45°24'51.21"N, 121°47'53.30"W.** This results in pooling occurring just off and on the road along this ditch's length. For these reason's Bark requests that the **1828-118 road be decommissioned as soon as possible** just past the junction of the new Top Spur trailhead, wherever that is relocated to.

Two dated culverts under 1828-118 at Unit 61

Road runoff from 1828-118 at ***45°24'35.31"N, 121°47'19.72"W***

The **1828-022** road has a decision to decommission *without* delay. This road has not been actively decommissioned. It's junction with the 1828 is arguably passively decommissioned for approximately 15-20 feet in but is then stable and drivable. **If this road is reopened and used to for access, it will need to be actively decommissioned upon completion of this project.**

1828-022 road, "passive" decommission

There is a road that was decommissioned prior to Increment I that runs along the north side of unit 16 (approx. **45.395, -121.843**). This road was actively ripped out, including multiple stream crossings. Bark is concerned that reopening this road would undo the work previously done and the rehabilitation that's occurred. We recommend avoiding reopening this road it at all possible. At the very least, the FS should recontour/de-compact/rehabilitate this road to the same extent or more upon completion of this project.

Decommissioned road North of unit 16

In the Mud Creek area, there is a broken gate on closed road **2656-130** accessing Units 119, 120, 121, 122 as well as almost a mile of new temporary road. In the wintertime, snowmobiling occurs in this area, which conflicts with Nordic

recreation opportunities. Keeping road closures functional is critical to avoiding unauthorized access throughout the seasons. **We request that the FS place a functional closure on this road during the non-operating seasons during years in which logging operations are occurring, and then a functional, permanent closure upon completion of this project.**

Broken gate on 2656-130

Decommissioned road **2656-124** accesses units 141, 142, 143 along with their associated rebuilt and new temporary roads. This road is right off the main Mud Creek loop and would open access to a large part of the surrounding forest if left open during or after logging would occur. Bark requests that **FS place a functional closure on this road during the non-operating seasons during years in which logging operations are occurring, and then a be decommissioned to an equal or greater extent than it is now after this project is completed.**

Decompaction on road 2656-124 (L); berm (R)

Like the road above, FSR **2656-309** has been actively decommissioned just past the Salmon River/Jackpot Meadows trailhead. Bark requests that **FS place a functional closure on this road during the non-operating seasons during years in which logging operations are occurring, and then a be decommissioned to an equal or greater extent than it is now after this project is completed.**

Berm and de-compacted pavement on Rd 2656-309

If not planned to be accessed by helicopter, it appears that accessing Unit 74 would require reopening road **1825-111**. The road itself has hydrological connectivity to Lost Creek, which is habitat for listed fish. **We ask that the FS not reopen the 1825-111 road.** We are unsure whether the section of the **1825-111** road in Unit 80 was actively ripped out. When we field surveyed this unit previously, a tributary to Lost Creek ran E-W through unit's northern boundary and was crossed by this road. This section of road should be considered for erosion control if not already de-compacted. In unit 82, the first part of **1825-101** road is ripped/recontoured, but further was is intact with lots of water moving across it. Again, this section of road should be considered for erosion control if not already de-compacted.

In **Unit 61**, at the end of the temporary road (**45°24'32.66"N, 121°47'34.11"W**) into the unit from the 1828-118, there is a barbed wire that remains from some past activity. It is hard to see from a distance and may be posing a risk to wildlife or people. Bark requests that this barbed wire be removed and disposed of during this project in order to eliminate this risk.

It is not clear which 5 miles of road the FS is planning to close with this project. It was shared at the Zigzag Timber Sale public meeting and field trip in 2019 that the agency was considering lengthening the 772/Burnt Lake trail by converting the 1825-109 to trail, essentially pulling the trailhead back approximately half a mile. We did not see this road specifically called out in the Scoping documents or the Story Map. **In the PA, please include a list of roads proposed to be closed in the Zigzag project area.**

Travel Analysis Process

Given that the FS is considering changes to a number of miles of roads within the Zigzag project area, and given the large geographic scale of this project, the agency must consider its Travel Analysis Report (TAR) for the Zigzag project, and identify the Minimum Road System (MRS).[54]

In 2015, the FS released its TAR, a synthesis of past analyses and recommendations for project-level decisions regarding changes in road maintenance levels. Included in this report was a list of roads "not likely needed", with the objective maintenance level being "D-decommission".

To identify the minimum road system, the FS must consider whether each road segment the agency decides to maintain on the system is needed to meet certain factors outlined in the agency's own regulation.[55] Here, the FS should consider whether each segment of the road system within the project area is needed to:

- Meet resource and other management objectives adopted in the relevant land and resource management plan;
- Meet applicable statutory and regulatory requirements;
- Reflect long-term funding expectations; and
- Ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance.

In assessing specific road segments, the FS should also consider the risks and benefits of each road as analyzed in the TAR, and whether the proposed road management measures are consistent with the recommendations from the travel analysis report. Within the Zigzag project area, the TAR recommended that the Forest Service decommission roads 1828-024, 1828-125, 1828-118, and close roads**:** 1825-043, 1825-080, 2656-012, 2656-080, 2656-096, 2656-120.

Bark requests that the Forest Service fully implement the recommendations in the TAR regarding decommissioning and closing roads. Even if the agency does not currently have a funding source to accomplish this road work, having them included in a NEPA decision will make it much easier for the work will occur when such funding is acquired. If the Forest Service does not include all the TAR recommendations, please provide a detailed explanation why these roads are still needed over time.

MHNF staff have expressed to Bark that while considering road work in proposed project areas, it is appropriate to recommend that the FS consider changes in maintenance levels on roads with *high combined resource risk* along with those recommended by the TAR for decommissioning. For Zigzag, please consider closing

[54] 36 C.F.R. § 212.5(b)(1) ("For each national forest . . . the responsible official must identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands.").

[55] 36 C.F.R. § 212.5(b)(1). *See also* Attachment A ("analyze the proposed action and alternatives in terms of whether, per 36 CFR 212.5(b)(1), the resulting [road] system is needed"); ("The resulting decision [in a site-specific project] identifies the [minimum road system] and unneeded roads for each subwatershed or larger scale").

roads which have high combined resource risk, if they are not already identified for closure.

Key issues regarding TEMPORARY ROADS for detailed analysis:

Bark has many concerns about the amount of temporary roadbuilding the agency states is required to achieve the Purpose and Need. In the Zigzag project, the FS is proposing to build 3.9 miles of new "temporary" road (3 miles in Mud Creek, 0.9 miles in in Horseshoe), 2.7 miles of "temporary" road rebuilding (1.3 in Mud Creek, 1.4 in Horseshoe), and 4.8 miles of system road rebuilding for temp roads (3.2 in Mud Creek, in 1.6 Horseshoe).

"Passively" Decommissioned Roads

As in past projects, the FS is planning to re-use previously decommissioned roads, and since many of these roads have been passively decommissioned, the agency will likely claim it will be achieving a net reduction in road density after the project when these roads are "rehabilitated". Although in different stages of recovery, every single road segment has recovered some degree of hydrologic function, and with this project could lose the benefit from years of the recovery.

In Zigzag specifically, the agency asserts that "Temporary roads would be rehabilitated after use by the placement of one or more berms at the road's entrance, construction of water bars, and/or placement of debris such as root wads, slash, logs or boulders where available."

It is well-documented that road construction vastly elevates erosion for many years, particularly in the first two years when the construction causes a persistent increase in erosion relative to areas in a natural condition. [56],[57],[58]. Specifically, major reconstruction of unused roads can increase erosion for several years and potentially reverse reductions in sediment yields that occurred with non-use. *Id.*

Available scientific information shows that reconstruction of closed and abandoned roads, could persistently elevate erosion and sediment delivery in several ways. Reconstructed roads cause elevated erosion and sediment for many years after decommissioning.[59] The USFS Region 5 method for estimating cumulative watershed effects indicates that even 10 years after road decommissioning, a mile of decommissioned road is equivalent to 0.2 miles of new road in terms of adverse

[56] Potyondy, J.P., Cole, G.F., Megahan, W.F., 1991. A procedure for estimating sediment yields from forested watersheds. Proceedings: Fifth Federal Interagency Sedimentation Conf., pp. 12-46 to 12-54, Federal Energy Regulatory Comm., Washington, D.C.

[57] Rhodes, J.J., McCullough, D.A., and Espinosa Jr., F.A., 1994. A Coarse Screening Process for Evaluation of the Effects of Land Management Activities on Salmon Spawning and Rearing Habitat in ESA Consultations. CRITFC Tech. Rept. 94-4, Portland, Or.

[58] Beschta, R.L., Rhodes, J.J., Kauffman, J.B., Gresswell, R.E, Minshall, G.W., Karr, J.R, Perry, D.A., Hauer, F.R., and Frissell, C.A., 2004. Postfire Management on Forested Public Lands of the Western USA. Cons. Bio., 18: 957-967.

[59] Id.

cumulative effects.[60] After 50 years, a mile of obliterated road still has impacts equivalent to 0.1 mile of new road. Thus, as it is apparent that decommissioning will not instantaneously eliminate the persistent impacts of roads on erosion and sediment delivery, building these roads will likely have adverse impacts to the aquatic and terrestrial environment.

Road construction is by far the greatest contributor of sediment to aquatic habitats of any management activity.[61],[62] Temporary road construction can cause resource damage including erosion and sedimentation, exotic species spread and disruption of wildlife.[63] Unpaved roads and stream crossings are the major source of erosion from forest lands contributing up to 90% of the total sediment production from forestry operations.

When we first spoke with the District Ranger, and with agency specialists, we were told that there would not be reopening of previously decommissioned roads as temporary roads in the Horseshoe area. Looking at the Story Map, it seems this is not the case. Given that this area is within listed fish critical habitat, and that presumably these roads were decommissioned to reduce impacts to aquatic species, **we ask the FS to thoroughly develop an alternative that does not require building temporary roads in the Horseshoe area.**

Unit 6

In other sections of these comments we have raised issues with areas containing proposed temporary roads. However, we have concern for the new "temporary" road which is proposed into Unit 6. The route would cut through very structurally diverse habitat containing old growth noble firs, large snags, and down wood. **Unit 6** is a multi-aged unit that has no apparent ecological need for thinning in the first place. This unit contains several old growth trees and healthy mature forest. Dropping this unit would eliminate the need to inappropriately place a new "temporary" road.

[60] Menning, K. M., D. C. Erman, K. N. Johnson, and J. Sessions, 1996. Aquatic and riparian systems, cumulative watershed effects, and limitations to watershed disturbance. Sierra Nevada Ecosystem Project: Final Report to Congress, Addendum, pp. 33-52. Wildland Resources Center Report No. 39, Centers for Water and Wildland Resources, University of California, Davis.

[61] Meehan, W.R. (ed.). 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. Am. Fish. Soc. Special Publication 19.

[62] Robichaud, P.R., L.H. MacDonald and R.B. Foltz. 2010. Fuel management and erosion. Ch. 5 in: W.J. Elliot, I.S. Miller and L. Audin (eds.). Cumulative Watershed Effects of Fuel Management in the Western United States. USDA For. Serv. Rocky Mtn. Res. Sta. Gen. Tech. Rep. RMRS-GTR-231. Fort Collins, CO.

[63] Trombulak, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14:18-30.

Route of temp road into unit 6

"Temporary" roads are one of the main vectors for noxious weeds into the forest. Units 2, 4, and 8 all abut the energy corridor to the west of the planning area. This puts the forest at risk for the increased spread of these species, especially two species of Hawkweed in the nearby power line and in Longview holdings. On public field trips to these units (in 2012 and 2019) specialists shared that it is "likely" that Hawkweed would spread into these units in at least a few locations if logging took place off the main 1800/Lolo Pass road.

Regarding "temporary" roads, we encourage the FS to consider these concerns and recommendations, including significantly reducing temporary roadbuilding, as they develop their alternatives, as this will assist the agency moving forward with the best project possible for the Zigzag District**.**

Key issues regarding A4 SPECIAL INTEREST AREAs for detailed analysis:

Regulated harvest prohibited in A4

According to the Zigzag Information sheet, there are seven acres of thinning proposed in an A4 Special Interest Areas, located in Horseshoe Unit 74. This A4 is part of the Old Maid Flats Geologic area. Regulated Timber Harvest **shall be prohibited**. *A4-019, LRMP Four-154.* The Forest Plan defines "regulated harvest" as that which contributes timber volume to ASQ. Non-regulated timber harvest activities necessary to achieve Special Interest Area objectives may be allowed. *A4-20.* If the FS is proposing un-regulated timber harvest in unit 74, the **rationale and necessity as stated above must be included in the project analysis.**

Key issues regarding WILD AND SCENIC RIVERS for detailed analysis:

The Zigzag information sheet Proposed Action includes 79 acres of logging in the recreational segment of the Mud Creek A1&B1 Wild and Scenic Rivers. Looking at

the Story Map, it is not apparent where these 79 acres are located. However, it does appear that parts of some of the Horseshoe Units overlap with the Wild and Scenic Upper Sandy River corridor: **units 2, 4, 20, and 68.**

All management activities in the Salmon and Upper Sandy river corridors must protect and or enhance the identified outstandingly remarkable values for those segments. *B1-001; B1-002.* For the Upper Sandy, the outstandingly remarkable values are: scenery, recreation, fisheries, geology, and botanical. For the Salmon river, the outstandingly remarkable values are: scenery, recreation, anadromous fishery, wildlife, hydrology, and botany/ecology. **In the PA, the FS must disclose how the activities included in the proposed action protect and/or enhance these values.**

Key issues regarding VISUAL QUALITY OBJECTIVES for detailed analysis:

Looking at the Horseshoe Story Map it is apparent that the project area contains a mix of Visual Quality Objectives that should be defined and addressed within the project analysis.

"Preservation" objective is identified along the 774/Horseshoe trail immediately adjacent to Unit 62. Extra care should be given not to cause any impacts to this area inadvertently while carrying out activities within this unit (landings, slash, temporary roads, etc.)

A "Retention" objective is identified at Unit 74 (relatively same area as A4 land allocation overlap). There is also a "Retention" objective surrounding Trillium lake. According to the Forest Plan, within landscapes where Retention VQOs are prescribed the maximum percent of the seen area visually disturbed should not exceed 8 percent at any one time or 4 percent per decade. *FW-564.*

"Partial Retention" is a common objective in the Zigzag area. Within landscapes where Partial Retention VQOs are prescribed the maximum percent of the seen area visual1y disturbed should not exceed 16 percent at any one time or 8 percent per decade. *FW-565.*

Timber harvest units within all distance zones should not dominate over natural landscape character i.e. form line color and texture in areas where VQOs of Retention and Partial Retention are prescribed. *FW-560.*

Within units where Modification VQOs are prescribed the maximum percent of the seen area visually disturbed should not exceed 25 percent at any one time. *FW-566.* Harvest units should blend with the natural landscape character where VQOs of Modification are prescribed. *FW-561.*

Key issues regarding HUCKLEBERRY ENHANCEMENT for detailed analysis:

The FS has stated that one opportunity in the Zigzag project is to "create and maintain current and future huckleberry habitat across the landscape to benefit cultural and recreational uses". According to the FS, the Zigzag planning area was identified as an area of emphasis for "huckleberry enhancement" because of the existing ecological site potential and past cultural interest.

The FS plans to enhance huckleberry productivity by removing some of the trees across 50 acres along the Sheerer Burn Road (Road 2613). These areas, according to the FS would be accessible right off the road. Will there be consideration given to the location of existing pullouts or other existing parking opportunities for gatherers? Please address this issue of access in the PA.

FS research has found that huckleberry habitat is typically found in open and forested habitats between altitudes of 1000 m and 1800 m above sea level throughout the Pacific Northwest. As an understory species, big huckleberry can grow beneath a partially closed forest canopy, or in sunny openings. In mid-elevation and subalpine of the Mount Hood area, big huckleberry occurs in early or late seral stages, and generally have their greatest productivity on sites that had experienced disturbance about 50 years prior. They have greatest frequency and coverage in open stands of mountain hemlock, subalpine fir, Pacific silver fir, and Douglas-fir associations.

Big huckleberry may require the protection of a sparse canopy, such as that provided by dead snags after a wildfire, for vigorous growth and fruit production. In one study, the highest fruit production class values were observed in huckleberry fields with 35-50% canopy cover and 4-7m^2/ha of conifer basal area. However, the FS should be prepared to wait as long as a decade for big huckleberry fruit production after canopy disturbance.

The FS often emphasizes increased sunlight as *the* key component to increase berry production in huckleberry plants. However, there are some additional takeaways related to berry production that do not explicitly have to do with sunlight which can help guide the agency towards the best areas to focus on for enhancement activities.

Historically, burning of big huckleberry patches by Native Americans was a regular activity in the subalpine zone of the Cascade and Pacific ranges. To enhance production, fires were set in autumn after berry harvest to reduce invasion of shrubs and trees. Fields of big huckleberry in the Pacific Northwest were also created by uncontrolled wildfires that occurred before effective fire suppression.

In preferred habitats, big huckleberry will generally survive low to moderate severity fires, attaining pre-burn coverage in 3-7 years with stem number and density increasing. Foliage is of low flammability, allowing for survival after low severity fires, with top-kill resulting from higher severity fires. However top-killed plants can resprout from rhizomes. The clonal habit favors ecotypic variation among populations: plants subjected to regular fire intervals may be better suited to surviving fire than individuals developed under fire suppression.[64] With an

[64] Ecology and Management of Big Huckleberry Literature Review, USFS R6 Ecology Program, 2016.

objective of enhancing huckleberry in an economically viable way, **Bark requests that any logging for huckleberry be followed with prescribed fire.**

Minore et al. noted that weather influenced annual berry crops more than any site characteristic and suggested that conclusions about site production could not be based on samples from 1 or 2 years. [65] Meteorological events determine yearly production, but the physical, vegetative and historical site characteristics are the ultimate factors that affect presence or absence of the globe huckleberry on a site.

Depth and duration of previous winter snowpack, killing frosts, and erratic weather events obscure the effects of soil, topography, and elevation on berry production in any given year.[66] Huckleberry fruit production is affected by snow pack duration[67], snow depth[68], drought, cold or wet weather during critical phases of pollination and fruit development, and volcanic ash fall.[69] Sites protected from frost have more consistent fruit production.

Hunn and Norton found yields were correlated with elevation, slope, and distance east or west of the Cascade Crest.[70] Mesic aspects also produced more fruit than xeric aspects. Greater berry production occurs in soils high in organic matter. Soil moisture availability will affect quality and quantity of berry production within a growing season.

We encourage the FS to consider these and other factors which have been found to lead to the success vs. failure of huckleberry fruiting in choosing sites for huckleberry enhancement and make this process clear in the PA.

Consultation

The FS revealed at the 2019 Zigzag public field trip that no official consultation has been done with the Tribes. We expected that the FS will be in formal consultation with the Confederated Tribes of Warm Springs and other Tribal governments and referencing the Forest's Huckleberry MOU in the PA. **Please address and disclose**

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[65] Minore, D., A.W. Smart, and M.E. Dubrasich. 1979. Huckleberry ecology and management research in the Pacific Northwest. Gen. Tech. Rep. PNW-93. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 50 p.
http://www.treesearch.fs.fed.us/pubs/29446

[66] Minore, D. and M.E. Dubrasich. 1978. Big huckleberry abundance as related to environment and associated vegetation near Mount Adams, Washington. Research Note PNW-322. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 8 p.
http://www.treesearch.fs.fed.us/pubs/30427

[67] Minore, D. 1972. The wild huckleberries of Oregon and Washington -- a dwindling resource. PNW-143. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 20 p.
http://www.fs.fed.us/pnw/pubs/pnw_rp143.pdf

[68] Martin, P.A. E. 1979. Productivity and taxonomy of the Vaccinium globulare, V. membranaceum complex in western Montana. Missoula, MT: University of Montana. 136 p. Thesis. http://scholarworks.umt.edu/etd/7398/

[69] Hunn, E.S. and H.J. Norton. 1984. Impact of Mt. St. Helens ashfall on fruit yields of mountain huckleberry, Vaccinium membranaceum, important Native American food. Economic Botany. 38(1): 121-127. Contact cfriesen@fs.fed.us or http://ecoshare.info/ for a copy.

[70] Norton, H.H.; R. Boyd, and E. Hunn. 1999. The Klikitat Trail of south-central Washington: A reconstruction of seasonally used resource sites. In: Boyd, Robert, ed. Indians, fire, and the land in the Pacific Northwest. Corvallis, OR: Oregon State University: 65-93. Contact cfriesen@fs.fed.us or http://ecoshare.info/ for a copy.

the FS's coordination process as it relates to this issue in the Consultation and Coordination section of the analysis.

According to the information sheet provided, the Zigzag project includes 3 acres of "Huckleberry Enhancement" within the **B6 Special Emphasis Watershed** land allocation. This land LRMP allocation directs the FS to "(m)aintain or improve watershed, riparian, and aquatic habitat conditions and water quality for municipal uses and/or long-term fish production. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices. *LRMP Four-246.* In B6, wildlife and fisheries rehabilitation and enhancement projects should emphasize Improvement or rehabilitation of key and/or sensitive wildlife and fisheries habitat. *B6-14, 15, LRMP Four-249.*

Any timber harvest activities shall be consistent with accomplishment of riparian management objectives with consideration for hydrologic recovery. *B6-18, 19, LRMP Four-249.* Watershed impact shall not exceed Threshold of Concern for each B6 area; for example, Still Creek TOC is currently 25%. **In the PA, please address how the proposed activities align with these LRMP S&Gs.**

Key issues regarding HEMLOCK DWARF MISTLETOE UNIT/REGENERATION HARVEST for detailed analysis:

The Zigzag scoping letter includes "regeneration harvest" using mastication treatment of 13 acres of forest within the project area that contain native dwarf mistletoe. In these stand, Unit 129, the FS proposes to remove brush as well as the stunted, small diameter hemlock trees and presumably to plant the stands with species not susceptible to the parasite.

It is unclear whether this stand ever supported large permanent openings, or large old growth trees which could support late successional species. The FS in the past stated that forage has declined in large part due to the continued policy of full fire suppression on the District, as fire is the historic source of forage openings. However, there has not been a scientifically supported effort by the FS to provide evidence that increased acres of "regeneration harvest" will result in increased forage overall.

Additionally, recent OSU research has found that in the Pacific Northwest overall, species dependent on late-seral habitat continue to suffer greater population declines compared to early-seral species.[71] In contrast to generalization that the reduction of clearcutting on federal lands has negatively affected the creation of early-seral ecosystems, the area of diverse early-seral ecosystems on federal land has remained more or less constant.

Increases in areas of large, high-severity wildfires appear to have compensated for any decline in early-seral ecosystems created from logging. Projections of

[71] https://today.oregonstate.edu/news/nw-forest-plan-25-years-later-wildfire-losses-bird-populations-down

vegetation change and fire in the Pacific Northwest point to increased prevalence of wildfire and expansion of conditions suitable for hardwoods. These changes could create more habitat for species associated with early-seral ecosystems and suggest that active management (including "ecological forestry") may be less needed where these processes occur. **In the PA, the FS should address this reality and disclose the numbers of early seral vs. late seral species in the project area.**

While we acknowledge the agency's interest in actively improving early successional forest structure, and subsequently growing stands of merchantable timber, Bark also values - and must draw attention to - the variety of ecological benefits of mistletoe such as food, cover, and nesting platforms birds and other small animals[72]. Mistletoe has been a natural component of a healthy forest ecosystem for thousands, if not millions, of years.

During this project planning, the ecological benefits of mistletoe should not be under-estimated, and prescriptions should reflect these benefits. For example, it has been suggested that mistletoe is a "keystone species" in many vegetation communities. The abundance and diversity of birds is correlated with the degree of mistletoe occurrence, and avian vectors seem to prefer infected hosts.[73]

It has also been noted that mistletoe brooms provide important habitat for relatively high densities of flying squirrels (important prey for spotted owls and other carnivores).[74] This function of mistletoe brooms is quite valuable in typical stands that are deficient in large snags.

Dwarf mistletoe brooms in Unit 129

The fruit, foliage and pollen of dwarf mistletoe are a food source for numerous bird, mammalian and insect species. Dwarf mistletoe of all types alters the growth patterns of infected trees, creating structural complexity within forests in the form

[72] Watson, D.M. 2001. Mistletoe — A keystone resource in forests and woodlands worldwide. Annu Rev Ecol Syst 32: 219-249.
[73] Aukema, J.E. 2003. Vectors, viscin, Viscaceae: Mistletoes as parasites, mutualists, and resources. Frontiers in Ecology I(3): 212-219.
[74] PNW Research Station. Rocky to Bullwinkle: Understanding Flying Squirrels Helps us Restore Dry Forest Ecosystems. Science Findings. Issue Eight. February 2006. http://www.fs.fed.us/pnw/sciencef/scifi80.pdf

of witches' brooms and snags, both which are used by numerous wildlife species (including some species of owls) for nesting, roosting and cover.

Research suggests that greater bird diversity is associated with increased mistletoe infestation; the key limiting resource for the birds in this situation may be snags. Management Strategies for Dwarf Mistletoe: Silviculture describes mistletoe control treatments in which infected trees were killed but left standing for woodpeckers and other cavity-nesting animals. Although these snags are used, they remained standing for only a few years. Studies of broom use by wildlife include work by Hedwall[75], and Garnett[76]. These studies identify which birds and mammals use witches' brooms, how they use it (for nesting and roosting), and what kinds of brooms are preferred. This information is useful to determine if retaining certain brooms is a potential benefit for a favored species. Still lacking are specifics of how the number and distribution of snags and brooms relates to levels of mistletoe infestation, and to wildlife populations and the dynamics (rates of generation and loss) of these features.

Key issues regarding RESTORING BEAVERS TO THE ZIGZAG RANGER DISTRICT for detailed analysis:

Current research predicts that climate change will severely alter precipitation and temperature patterns in the Pacific Northwest by midcentury, resulting in both more flood events and drought in forested ecosystems. On the Zigzag Ranger District, river flow has likely already shifted to greater rain-driven flows and less snow-melt driven flows. This combined with less summertime flow is a significant concern for both drinking water and salmon habitat. These changes are projected to be most prominent in the highest elevation watersheds, where flows are currently most dependent on winter snow accumulation.[77]

[75] Hedwall, S. 2000. Bird and mammal use of dwarf mistletoe witches' broom in Douglas-fir in the Southwest. MSc Thesis, Northern Arizona university, Flagstaff, AZ.
[76] Garnett, G. N.; Chambers, C. L.; Mathiasen, R. L. 2006. Use of witches' brooms by Abert squirrels in ponderosa pine forests. Wildlife Society Bulletin 34:467–472.
[77] Columbia River Gorge National Scenic Area Mount Hood National Forest, and Willamette National Forest (CMW) Adaptation Partnership: Vulnerability Assessment Summaries: http://adaptationpartners.org/

While reliable baseline data is lacking, beaver-created wetlands with high water storage capacity are believed to have been historically more common in forested areas of the Zigzag Ranger District than they are now. As shown for beaver-maintained wetlands elsewhere, beavers in the Upper Sandy and Salmon River watersheds would have created productive and complex slow-water habitats for fish and other aquatic species, helped moderate both base flows and peak flows, trapped excess sediment and nutrients, and helped to maintain riparian hardwood plant communities.[78] Indeed, the decrease of beaver activity within the Mt. Hood National Forest boundary has led to altered ecosystem processes and functions, as documented in the North Clack Integrated Resource Project Environmental Assessment.[79]

Recent Beaver chew at Trillium Lake

Beaver chew along Clear Fork adjacent to Units 4 and 6

Beaver-generated and maintained sites, as with other wetland types, are gaining increasing attention as 'natural infrastructure' in both undeveloped and developed areas given their ability to mitigate the effects of climate change on water quantity and flows by storing runoff, temporarily or over the longer-term, and contributing to groundwater recharge.[80],[81],[82] Estimating beaver habitat value and potential water storage capacity of wetlands across the Forest will lay the groundwork that the agency needs to actively restore the ecosystem services provided by beaver-mediated ecosystems. Bark believes that much potential exists for on-the-ground restoration activities that will lead to the enhancement of water storage capacity (and other functions). For example, Beaver Dam Analogs can simulate beaver dams and encourage beavers to build dams in incised channels, across potential floodplain surfaces, or at the outlets to wetlands that have the

[78] McCreesh et al. (2019). Reintroduced beavers rapidly influence the storage and biogeochemistry of sediments in headwater streams (Methow River, Washington). Northwest Science, 93(2): 112-121. https://doi.org/10.3955/046.093.0203

[79] North Clack Integrated Resource Project Environmental Assessment: www.fs.usda.gov/nfs/11558/www/nepa/105362_FSPLT3_4729785.pdf

[80] Holmes et al. (2017). A geospatial approach for identifying and exploring potential natural water storage sites. Water (9): 585.

[81] Puttock et al. (2017). Eurasian beaver activity increases water storage, attenuates flow and mitigates diffuse pollution from intensively-managed grasslands. Science of the Total Environment (576): 430-443.

[82] Jones et al. (2018). Tualatin Beaver Poster 1. Overview of the Tualatin Urban Beaver Dam Study.

potential for increased surface water levels.[83] As BDAs and/or beaver dams develop, they can be expected to accumulate more woody debris and create deeper pools or series of pool complexes. The complexity that beaver-mediated wetlands add to the landscape provides habitat for other species, as well. Thus, beaver-based wetland restoration can ultimately help to store rainwater and recharge groundwater while also supporting juvenile fish and preventing downstream erosion and flooding during high flow events.

Beaver presence at pond at the end of 1828-118;
45°25'8.31"N, 121°47'44.54"W

Several species in the Zigzag project area depend on riparian hardwoods promoted by beaver presence including yellow warblers, red-eyed vireos, and downy woodpeckers. Black cottonwoods are especially important to downy woodpeckers for cavity excavation. The lack of beavers within the Forest has been correlated to the lack of large cottonwood and alder.

Beaver dams and the habitat they create are considered the foraging habitat for the peregrine falcon, a R6 Sensitive Species. As a R6 Sensitive Species, current policy guides the FS to manage for suitable nesting and foraging habitat for the peregrine falcon. As beaver populations increase with development of beaver dams and ponds, waterfowl populations increase, which in turn provides increased prey species for the peregrine falcon.

CONCLUSION

Bark has several suggestions for improving the Zigzag project, and requests that the agency review these key issues for detailed analysis and develop project Alternatives that meaningfully incorporate these suggestions – singly or together – to assess their ecological benefit and to create a project that also achieves the purpose & need for the Zigzag project:

- Exercise commitment to facilitating meaningful public engagement in the management of public lands by considering Scoping comments until summer 2020;
- Disclose, quantitatively, all potential impacts to the local recreation economy from any public closures, impacted trail or campground experiences, or

[83] The Beaver Restoration Guidebook: Working with Beaver to Restore Streams, Wetlands, and Floodplains, Edition: 1.0, Chapter: 6, Publisher: US Fish and Wildlife Service, Portland, Oregon, pp.82 - 96

change in public attitude towards the area due to the return of commercial logging;

- Provide a complete description of the overall condition of the project area regarding fire in the forthcoming NEPA analysis;
- Exclude stands with high snag and large living tree densities from any logging and adopt a PDC to state "All legacy snags would be retained by creating adequate safety buffers, as needed.";
- Address impacts to northern spotted owls resulting from the interaction between thinning and their predator/prey availability and success in the PA;
- In the PA, please provide specific stand information for units proposed for logging within RRs, and rationale for the actions proposed within these stands;
- Continue to engage with Bark's information regarding unmapped riparian areas, and to ensure these habitats are to be protected, please include buffers on project Decision maps in the form of unit boundary adjustments and make subsequent acreage adjustments;
- Where it is found that actions included in RRs "may affect, and is likely to adversely affect" aquatic species, or "may impact individuals or their habitat, but would not likely contribute to a trend toward federal listing or loss of viability to the population or species", create an alternative which deletes sections of units which contribute to the Determination;
- Drop any late seral units (specifically Unit 6, 86, 88), or sections of pure late seral forest from proposed units. In mixed-aged stands where large down wood, large snags, large live trees, or minor trees exist, retain no less than 40% of the canopy cover, retain as much mid-story component of the stand as is feasible, retain the largest trees in the stand, and retain all legacy features;
- Protect individuals of rare botanical species located by Bark in the project area from ground disturbance;
- Engage with Bark's information regarding unflagged suitable RTV nest trees and continue to survey for RTVs in stands over 80 years old using the draft Regional protocol;
- Appropriately buffer any RTV nests located and include these unit deletions and acreage changes in the PA maps and Proposed Action;
- Please specify in the PA how many NEPA-ready roads exist within the project area along with what plans/timelines there are to decommission them;
- Look for additional opportunities provided by Bark to reduce the road network in the watershed and include more miles of road decommissioning in the Proposed Action;
- Engage with Bark's site-specific system roads comments;
- Significantly reduce the mileage of "temporary" road construction, along with considering an alternative which does not require building temporary roads in the Horseshoe area;
- Pursue beaver habitat enhancement/restoration in the Zigzag project area and elsewhere;

- Quantify carbon emissions from this project and examine the carbon tradeoffs, including carbon emitted from the project and the loss of future carbon sequestration because of the project;
- Consider factors which have been found to lead to the success vs. failure of huckleberry fruiting in choosing sites for huckleberry enhancement and make this process clear in the PA;
- Analyze and disclose how a changing climate exacerbates the adverse impacts of the proposed project;

As the FS is considering the optimal method of accomplishing the ecological purpose and need for the Zigzag project, please consider that active management is not always the best avenue to achieve forest health. In the comments above, Bark has provided ample suggestions to improve this project – based on our survey of both the project area and the scientific literature pertaining to aquatics, wildlife, roads, and forest health. We anticipate a thorough review of these comments and look forward to the necessary changes made to both the forthcoming decision and the project itself.

Thank you,

Michael Krochta

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