Dear Amber,

As you are aware, Bark’s mission is to bring about a transformation of public lands on and around Mt. Hood into a place where natural processes prevail, where wildlife thrives and where local communities have a social, cultural, and economic investment in its restoration and preservation. Bark has over 25,000 supporters who use the public land forests surrounding Mt. Hood, including the areas within the Waucoma project area, for a wide range of uses including, but not limited to: clean water, hiking, nature study, non-timber forest product collection, spiritual renewal, recreation, and more. We submit these scoping comments on behalf of our supporters. We request your active response to these substantive comments; including the scientific and site-specific information herein, to draft a better restoration project for the West Fork Hood River watershed.

LOGGING EFFECTS ON MUNICIPAL WATER

The frequency of drought in Hood River County in recent years highlights the importance of protecting upstream, generative water sources in Mt. Hood National Forest. Local communities rely on the availability of water stored in forest ecosystem, especially in periods of drought. The Waucoma project area is situated above the Green Point Reservoirs and used by the Farmer's Irrigation District leading to discussion within the Hood River Stewardship Collaborative group about the impact of the proposed logging on streamflow throughout the year. An existing

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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.
body of research on this topic is easily available to land managers. In one often-cited study, long-term records from both a clearcut logged and an unlogged control unit in the H. J. Andrews Experimental Forest, spanning nine years prior to logging and 26 years following, show that the relatively large increases in water yield following logging were short-lived, existing for only about eight years. After this period, August water yields from the logged site were less than those of the unlogged units for 18 of 19 years of record. The increased discharge of water in the early years may contribute to the long-term water deficit.

Further research found that a young, rapidly growing stand (~40 years since disturbance) used 3.3 times more water during the growing season than an old-growth stand (~450 years since disturbance). This is because the young stand had 2.3 times higher sap flow rates per unit sapwood in Douglas-fir and a 21% greater total sapwood basal area, as well as a larger component of hardwoods which use 1.41 times more water than conifers per unit sapwood. These results indicate that forest management practices that reduce stand age and decrease diversity may lead to increased transpiration and consequently reduce summer stream flow.

Additional long-term, paired-basin studies extending over six decades revealed that the conversion of mature and old-growth conifer forests to plantations of native Douglas-fir produced persistent summer streamflow deficits of 50% relative to reference basins in plantations aged 25-45 years. This result challenges the widespread assumption of a rapid hydrologic recovery following forest disturbance. The mechanized transformation of mature and old-growth forests through canopy removal may contribute to summer water yield declines over large basins and regions around the world, reducing stream habitats and sharpening conflict over uses of water.

Given the conclusions of these studies and a stated project goal of increased streamflow over time, **the FS should not experiment management techniques that remove canopy in an area of public lands that provides water for public use.** If the proposed action does include such a decrease in canopy, please thoroughly discuss the short, medium and long-term effects on streamflow, including a discussion of the studies cited above.

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AQUATIC/RIPARIAN HABITAT RESTORATION

Aquatic recovery in the West Fork Hood River watershed is currently impeded by obstructed passage for aquatic organisms, a deficit of large woody debris, an oversized and deteriorating road network, and unauthorized user access. Bark requests the Forest Service create an itemized list prioritizing restoration effort to improve aquatic habitat in the Waucoma project area.

To enhance water quality and aquatic diversity Bark recommends and supports action to replace and/or remove culverts which bar fish and aquatic organism passage and/or cause other ecological detriment; in addition to adding large woody debris in streams where it is lacking due to past management.

THINNING IN RIPARIAN RESERVES

In the Waucoma scoping letter, the FS anticipates aquatic and riparian communities to potentially benefit from mechanical thinning for “huckleberry enhancement”. Riparian Reserves (RRs) are part of the NWFP’s Aquatic Conservation Strategy (ACS). RRs generally encompass and parallel aspects of a watershed, streams and waterbodies, where riparian dependent resources receive primary management emphasis; specific standards and guidelines apply. This system was established to “restore and maintain the ecological health of watersheds and aquatic ecosystems.”

The West Fork Hood River watershed supports fall Chinook, summer and winter steelhead, coho, Pacific Lamprey, cutthroat trout, bull trout, rainbow trout, and mountain whitefish. Several of these species are listed under the Endangered Species Act. In the WFHR Watershed Assessment, the FS asserts that it can best meet treaty obligations by helping to restore anadromous fish runs. FS identifies fine sediment generated by roads and management-related debris flows as the greatest risk to these improvements, particularly since West Fork watershed is generally unstable and prone to mass wasting.

Maintaining and/or decommissioning roads and completing instream work are effective methods of meeting treaty obligations and complying with the ACS. However, the FS now asserts that logging is needed in RRs, that they are “overstocked” with relatively uniform trees with low levels of diversity which lack mature and late-successional stand conditions. Data gathered through Bark’s

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groundtruthing activities in timber sale units has found frequent and drastic oversimplification of local conditions, especially regarding RRs in mature stands. Many RRs in older plantations (>60 years old) and fire origin stands are in healthy, functioning condition, currently meeting the ACS objectives. In stands like this, a logging prescription which removes existing canopy, decreases structural complexity, and adversely impacts soil stability does not meet the purpose and need of this project or comply with the ACS.

Indeed, many ACSOs would be better met through a “no action” alternative. For example, many RRs in the Hood River Ranger District are currently below the Forest Plan standards for woody debris in streams (which correlates to ACSO #3 and #8). Given that much of this area is 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 and unchanging in condition, in contrast to the action, which artificially stimulates change; not fully acknowledging that no-action will effectively allow natural processes to prevail on natural timelines.

Several sources point to passive management as the best approach to achieve ACSOs in RRs. Pollock and Beechie\(^5\) 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. Ultimately, they used a forest growth model to examine how different forest thinning intensities might affect the long-term production and abundance of live trees and dead wood. In Pollock and Beechie’s study, passive management created dense forests that produced large volumes of large diameter deadwood over extended time periods as overstory tree densities slowly declined.

Pollock and Beechie’s results showed that the few species that utilize large diameter live trees exclusively may benefit from heavy thinning, whereas the numerous species that utilize large diameter dead wood can benefit most from light or no thinning: “because far more vertebrate species utilize large deadwood rather than large live trees, allowing riparian forests to naturally develop may result in the most rapid and sustained development of structural features important to most terrestrial and aquatic vertebrates.”

Similarly, Spies et al.\textsuperscript{6} concluded that thinning produces unusually low-stem-density forests and causes long-term depletion of snag and wood recruitment that is likely detrimental in most RRs. According to this work, 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.

The FS must adequately demonstrate how commercial logging in RRs is \textit{necessary} and the action must comply with all nine of the ACSOs, on both short- and long-term timeframes. Complying with the ACSOs means that the FS must manage riparian-dependent resources to maintain the existing condition or implement actions to restore the conditions. While some aquatic degradation, standing alone, does not constitute ACS noncompliance, the FS 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.\textsuperscript{7} To make a finding that the logging “meets” or “does not prevent attainment” of the ACSOs, the NWFP requires the FS to describe the existing conditions of the watersheds within the project area, the natural variability of important physical and biological components, and explain \textit{how} the proposed logging would maintain or restore the conditions of the watershed.\textsuperscript{8}

An honest interpretation of ACSO \textbf{Objective #8 recognizes that} logging in the RRs will impede compliance, not improve it.

\begin{quote}
\textbf{ACSO #8: Species Composition and Structural Diversity:} Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.
\end{quote}

Large wood plays an important role in stream ecosystems as it modifies both hydrologic sediment and nutrient transport by slowing, storing and redirecting stream water sediments and particulate organic matter. Additionally, large wood


\textsuperscript{7} Pac. Coast Fed’n of Fishermen’s Ass’ns v. NMFS, 265 F.3d 1028, 1037 (9th Cir. 2001).

\textsuperscript{8} Klamath Siskiyou Wildlands v Forest Service, 373 F. Supp. 2d.
enhances stream habitat for fish, other vertebrates, and invertebrates by providing physical cover, enhancing habitat features such as pools, backwaters and secondary channels, and creating flow velocity refugia. Having adequate levels of large woody debris is critical for healthy streams in forested ecosystems.

Bark’s concerns regarding commercial logging in RRs are based both on the clear direction of the Northwest Forest Plan and on new and developing science as synthesized by the Coast Range Association. In their key findings, the authors recommend that “(t)hinning and fuels reduction by means of mechanized equipment or for commercial log removal purposes should be generally prohibited in Riparian Reserves and Key Watersheds.”

With the points made above kept in mind, we ask the project follow the recommendations of the WFHRWA regarding the size of RRs within the Waucoma project area:

- On North Fork Green Point Creek and Green Point Creek, extend the Riparian Reserve at least 3 site potential trees on the south sides (north aspects) to provide better thermal regulation within the Reserves. WA at 6-12.
- Around Alaska yellow-cedar swamps, provide a Riparian Reserve width of at least one site potential tree beyond the edge. Ensure that concentrated areas of small patches are connected. WA at 6-12.

**UNMAPPED RIPARIAN AREAS WITHIN PROPOSED UNITS**

Northwest Research Station stated in a 2015 PNW Research Station 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.

In past projects, Bark has observed instances where sale contract maps did not reflect all wet areas within proposed units, which resulted in ground-based logging occurring over areas with riparian components. We will be submitting information regarding unmapped riparian areas with these scoping comments, and continue to

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share information that we gather as we groundtruth this project that we expect will be included in the forthcoming environmental analyses.

(above) Seep within Waucoma Potential Treatment Area #34 - 45.62964, -122.75126

(above) Waucoma Potential Treatment Area #34 - seep on and above trail #610 at 45.62734, -122.74775
(above) Waucoma Potential treatment area #45 - large seep at 45.61939, -121.76316, adjacent to buffered wet meadow

(above) Waucoma potential treatment area #45 – seep at 45.62047, -121.76343
(above) Waucoma potential treatment area #45 - unmapped intermittent stream at 45.6211, -121.76391

Unmapped intermittent stream channel at 45°37′7.96″N, 121°43′1.90″W
Intermittent stream channel at 45°36'52.00"N, 121°45'45.76"W

Intermittent stream at 45°36'55.90"N, 121°45'47.43"W
In addition to the areas pictured above, there are other riparian areas Bark requests the FS document in the NEPA analysis and buffer on unit maps:

- The southern portion of Unit 40 is crisscrossed by at least three streams, which do not always correspond to their locations on FS maps. The area is dominated by cedar, flat and very wet. We recommend keeping ground-based equipment out of these areas.
- In addition to the seep documented above on Trail #610, two unmapped intermittent stream crossings also exist on this trail at 45.62913, -121.74833 and 45.63052, -121.75065.

We share this information to help create a more informed representation of baseline condition, because “if 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.”11 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.”12

**STANDS ADJACENT TO N. FORK GREEN POINT CREEK**

Bark volunteers have surveyed some proposed units of Waucoma that have already been thinned at least once, such as units 68 and 70 which are old thins done with skyline cable. Complexity is lacking in these stands, and this condition would be perpetuated if re-entry thinning occurs. This condition was mirrored in a nearby unit visited by the Stew Crew in 2016 where they gave the following feedback: “The stand was homogeneous in structure and age; it was a single story stand and the canopy was not yet closed.”

Heading west down the #610 trail above Unit 70, there are seeps coming off the slope to the north, feeding an inboard ditch with skunk cabbage growing in it. South of the trail, the unit contained steep slopes all the way down to the North Fork. Bark has concerns about the agency’s ability to survey these very steep slopes. Moreover, these slopes pose a higher risk of erosion which could direct sediment towards habitat for listed fish.

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IMPACTS TO EXISTING AND FUTURE DEAD WOOD

The Waucoma planning area is situated within a very fragmented landscape. With industrial forest land to the south and east, the project area contains mid-elevation forest habitat not available elsewhere in this part of the watershed, and because a history of past management has created an overall snag deficit, the snags which remain hold immense ecological value given the context.

In the West Fork Hood River Watershed Analysis (WFHRWA), the FS did not in any way anticipate that the other landowners would provide enough suitable habitat to assure the continued presence of species that depend on large snags. WA at Executive Summary 3. This assumption has held true.

The agency stated in the WA that connectivity has been broken either within West Fork watershed or between West Fork and other watershed for snag dependent species, red tree vole, plants in special and unique habitats, and species with large home ranges that use a mosaic of large live trees and snags.

To give an example, three survey and manage bat species may exist in the project area: silver haired bat (Lasionycteris noctivagans), long-eared myotis (Myotis evotis), and long-legged myotis (Myotis volans). All three species depend on snags and trees and are limited by number of suitable snags.
The FS has stated that the Waucoma proposed action may include variable density thinning from below, and shelterwood and intermediate thinning that would produce an approximate 30% canopy cover in treated areas. Treatments proposed within Forest Plan land use allocations B3 and B12 would also encourage the removal of some dead and dying trees.

As you know, 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. Studies show that “cavity users typically represent 25 to 30% of the terrestrial vertebrate fauna in the forests of the Pacific Northwest.” 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.”

The FS has in the past asserted that thinning improves residual tree health and that it may take longer for the residual trees to die (reducing 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. Interestingly, while the agency recognizes that timber harvest has undisputed negative effects on snag density, it often claims that thinning will produce more structural diversity in the future. These claims do not present an accurate and complete interpretation of ecological processes regarding future snag recruitment.

Until recently, few studies have examined the effects of variable density thinning (VDT) at longer time scales. 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 revealed 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. This research does not provide support the FS’s common claim that thinning will accelerate growth of residual trees, leading to larger snags.16

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in the distant future. Please read this report and incorporate its findings into the PA for Waucoma.

Thinning of maturing forest has been shown to significantly delay attainment of Mt. Hood National Forest (MHNF)’s snag objectives. 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 may prevent or delay development of essential features of old forest ecosystems, features important to spotted owls, salmon, and their prey. 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 which was recently reviewed by Paul Reed, a PhD student at the University of Oregon. Overall, the bibliography addressed a variety of characteristics of old-growth forest structure. While there is some evidence that thinning could positively affect aspects of late-successional development, significant and consistent evidence of this type is generally lacking. 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. 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 critical habitat requirements of Westside indicator species like flying squirrels and spotted owls, and are currently in short supply due to past and present management. 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

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17 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.


19 Reed, P. 2016. Reviewing the US Forest Service and Bureau of Land Management’s “mature stand thinning” bibliography.
objectives which, although written for the Eastside forest ecosystems, is relevant to most mixed-conifer 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 ...*  

Because snags that are artificially created (through girdling) take years to provide any potential habitat (and the quality of this artificial habitat is uncertain), the Waucoma project could easily result in an immediate net reduction of snags across the landscape and contribute to the larger issue of a regional snag deficit resulting from previous Forest Service (FS) management. Since large snags are required for the habitat requirements of Westside indicator species like flying squirrels and spotted owls, 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.**

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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\(^{23}\) clearly shows

\(^{23}\) Issue 42 (March 2002) Dead wood all around us: think regionally to manage locally, by Janet Ohmann and Karen Waddell
that the lack 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.\textsuperscript{24} 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.

**ACTIVE MANAGEMENT IN LATE SUCCESSIONAL RESERVES**

The Waucoma project area includes 38 acres of Late-Successional Reserves (LSRs). According to the Northwest Forest Plan (NWFP), LSRs are to be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth reacted species, including the northern spotted owl. \textit{NWFP Standards & Guidelines, C-11}. Thinning and other silvicultural treatments inside reserves are subject to review by the Regional Ecosystem Office to ensure that the treatments are beneficial to the creation of late-successional forest conditions. \textit{NWFP Standards & Guidelines, C-13}.

The purpose of any silvicultural treatment within an LSR must be to benefit the creation and maintenance of these late-successional forest conditions. \textit{NWFP at C-12}. As there is a general prohibition on commercial logging in LSRs, it is the burden of the agency to show that the proposed actions are clearly needed and will not prevent the LSR from providing the habitat for which it was created. In the PA, please provide specific stand information for any units proposed for logging within LSRs, and the ecological rationale for the actions proposed within these stands. In particular, please discuss the role of standing and down dead trees in enhancing biodiversity and the ecological impact of decreasing future snag retention by logging in LSRs. If your rationale is incomplete or inconsistent with the projected outcomes of commercial thinning (in relation to expediting the creation of late-successional structure), Bark recommends dropping these units from consideration.

**IMPACTS TO NORTHERN SPOTTED OWL HABITAT**

In the Waucoma scoping letter, the FS states that it anticipates wildlife habitat to potentially benefit from logging for huckleberry enhancement. Here we will discuss this assertion as it relates to suitable habitat for the northern spotted owl. Suitable

spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees. If the FS intends to improve spotted owl habitat, it must allow no degradation of high-quality habitat from the West Fork Hood River watershed as part of the Waucoma project.

At the landscape scale, owl select for stands with high canopy cover (>70%). In one recent study, dispersing owls selected vegetation types that were more similar to habitat selected by adult owls than habitat that would result from following guidelines previously proposed to maintain dispersal habitat. The analysis indicates that juvenile owls select stands for roosting that have greater canopy cover than is recommended in current agency guidelines. In contrast to the assumption that stands with relatively open canopies provide suitable dispersal habitat for spotted owls, these results suggested that dispersing juveniles selected stands for roosting that had relatively high canopy closure. The authors recommended that the target for canopy cover in stands managed for dispersing spotted owls should be at least 80%.

**Impacts to northern flying squirrels**

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. Predation seems to be the most limiting factor – 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,

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Bark has expressed concern about the impact of thinning, especially in fire-originated 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. In a 2013 paper by Todd M. Wilson and Eric D. Forsman, the Management Considerations includes the idea that: “It may be possible to develop new thinning prescriptions that keep moderately high populations of arboreal rodents in young forests while still achieving long-term management objectives for the stand.” We have suggested one such approach in our past comments which includes developing prescriptions in plantation stands that focus solely on skips (patches of trees left un-thinned) and gaps (removal of patches of trees). This strategy is in marked contrast with most prescriptions which typically thin throughout a stand (with or without delineated skips or gaps). For this, Wilson and Forsman’s research recommends keeping gaps extremely small compared to most “gaps” proposed elsewhere (100-400 m²). Bark supports noncommercial treatments to improve owl habitat by creating few small gaps (dropping small trees and leaving on the ground) to help increase structural diversity. Bark also asks the FS to consider this technique in replacement of proposed thinning, wherever deemed more appropriate to achieve improved habitat for the owl.

Logging increases 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. The FS has also previously acknowledged in other project analyses 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 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

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noted in the comprehensive work, Population Demography of Northern Spotted Owls, 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 home ranges. 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. 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 Waucoma project such as northern flying squirrels.

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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.  

**MATURE/FIRE ORIGINATED STANDS**

The “Waucoma Planning Area Potential Treatment Area” map that was provided at the June 2018 Stew Crew meeting identified some stands proposed for logging as being 30 to 180+ years old. Bark believes the best way for the FS to ensure that there is an overall increase of old growth forest habitat in the future is to let mature forests grow with little to no management. Furthermore, there is new urgency to protect mature forests to store carbon in order mitigate climate change, and to provide additional habitat as soon as possible to increase the chances that the spotted owls can co-exist with the invading barred owl (both issues which extremely important to Bark and are elaborated upon in other sections of these comments).

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.

Bark has observed that old-growth characteristics, such as large trees, snags, multiple layers, and slope stability, often begin to be present in mature stands (defined here as being 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.”  

When old-growth forests are in such short supply, as they are in the Waucoma project area, these mature stands act as important “life boats” that will carry closed-canopy

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dependent wildlife through the habitat bottleneck created by decades of overcutting.

The WFWRWA states that historically in the watershed “major disturbances were rare and stands often reached great age…” *WA at 4-4*. Figure 4.4: West Fork of Hood River Watershed Vegetation Pattern (Early 1900’s) shows mostly mature stand conditions in Waucoma area (which is a drastically different situation than now). The Watershed Analysis recommends: “Due to its scarcity (19% of the watershed) and location, do not harvest any existing Late Seral Multistory stands until objectives and management strategies have been developed.” *WA at 6-6.*

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 Waucoma will continue growing and removing carbon from the atmosphere for decades. 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.35

In a recent study, Lutz and 95 co-authors compiled detailed forest plot data from 48 sites around the world and found that because large-diameter trees constitute roughly half of the mature forest biomass worldwide, their dynamics and sensitivities to environmental change represent potentially large controls on global forest carbon cycling. They recommended managing forests for conservation of

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35 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.”
existing large-diameter trees or those that can soon reach large diameters as a simple way to conserve and potentially enhance ecosystem services.\textsuperscript{36}

Bark has visited several stands in the Waucoma project area and found that tree ages and sizes vary, but that legacy trees and snags are scattered throughout the units. Of the units we have surveyed in Waucoma, many contain legacy trees and snags that should be carefully retained as part of this proposal since it has a goal of promoting habitat dependent on these stand qualities. The eastern portion of Unit 28 contains large old legacy trees, some Doug firs measured at 61 inches DBH, and western hemlocks measured at 41 inches DBH. Bark volunteers found that units 1-5 in the northeastern project area all include old growth characteristics including large trees, snags and down wood, with a mix of sizes and age. Unit 45 is erroneously labeled on stand maps as being 30-50 years old, however we found that the stand is dominated by mature trees, some measured up to 69 inches DBH.

Where these mature forest structures exist (large down wood, large snags, large live trees, minor trees), \textbf{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.}

REGENERATION HARVEST

The Waucoma Project would include Forest Plan project-level amendments which would allow creation of 5-acre gaps in “uneven age management stands.” The four-total project-level amendments are listed below:

- FW-323: The maximum size of an opening in the group selection method shall be two acres.
- FW-324: Openings greater than two acres shall be managed by the even-age silvicultural system.
- FW-306: Timber stands should not be regeneration harvested until they have reached or surpassed 95 percent of culmination of mean annual increment measured in cubic feet.
- FW-307: Exceptions may be made where resource management objectives or special resource considerations require earlier harvest (Regional Guide for Pacific Northwest Region, 1984).

Bark has observed the inclusion of heavier logging prescriptions in recent projects proposed by MHNF, oftentimes branded as “gaps” or “regeneration harvest” with 15% green-tree retention. The Pacific Northwest Research Station Science Findings found that for a number of microclimatic and ecological attributes, as well as public perceptions of scenic beauty, 15-percent green-tree retention resulted in responses to harvest that are not significantly different from those in a clearcut.

“Regeneration harvest” tends to leave few or no snags, and even when logging retains snags, the usual prescription is to have a minimum per acre which can be considerably fewer than needed for cavity-nesting animals, and snags often fall over from wind. As noted above, when snags decay, they provide a long-term nutrient and water supply and their removal obstructs nutrient cycling on the site. As such, this logging will reduce the species richness and key ecological processes associated with early-successional ecosystems.

Natural early-successional forest ecosystems have unique characteristics, including high species diversity, complex food webs and ecosystem processes. Compared to historic conditions (i.e. before industrial-scale logging was common on public lands), this type of habitat is currently lacking on the public forest landscape, mainly because of the decades of fire suppression, and the program of

37 Green-tree retention in harvest units: Boon or bust for biodiversity, Issue 96, 2007
39 Swanson, M. E., et. al. 2010. The forgotten stage of forest succession: early-successional ecosystems on forest sites. Frontiers in Ecology and Environment: 10.1890/090157
“salvage” logging of areas where fires did occur and replant conifers, quickly taking away any early-seral habitat value.

Bark has previously pointed out that logging designed to emulate a natural disturbance (to create early-seral habitat) has a much different effect on soils, water, wildlife habitat, and biodiversity than the disturbance it attempts to step in for. In one case already cited for example, results of current research on streamflow deficits suggests that reported trends of streamflow reduction in recent decades could be caused as much or more by cumulative effects of clearcut logging than by climate change.40

As an alternative to attempting to create early-seral habitat mechanically, we recommend reintroducing fire in the landscape, which could improve huckleberry production, and deer & elk forage, while also benefiting a host of other species. We encourage the agency to look to existing openings to take advantage of what forage opportunities these conditions provide, including identifying locations for prescribed burning in the Waucoma.

**SURVEY AND MANAGE AND OTHER SENSITIVE SPECIES**

Bark expects that surveys for Survey and Manage species will be completed for all proposed units 80 years and older. For example, C-3 plant species in the Waucoma area include candystick (Allotropa virgata), Botrychium minganense, and Botrychium montanum. We remind the agency that sufficient buffers are required for ALL survey and manage species, and that these buffers must be identified in sale and NEPA documentation. The scoping letter did not indicate how the FS will manage the located species. We request that the agency make this disclosure in forthcoming NEPA documents. Below are some species of interest found by Bark in the project area thus far.

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(above) Ramaria species in Waucoma Potential Treatment Area #34: 45.62993, -122.75113

(above) Ramaria species in Waucoma Potential Treatment Area #34: 45.63003, -122.75105
(above) Ramaria species in Waucoma Potential Treatment Area #40: 45°37'27.91"N, 121°45'19.27"W
According to the IUCN Red List, red tree voles are “near-threatened” and are also Category C Survey and Manage species under the Northwest Forest Plan. Threats to this species include loss of forest habitat and forest fragmentation. This species has limited dispersal capabilities, and early seral stage forests (which largely surround the Waucoma project area to the south and east) may be a barrier to dispersal. According to the WFHRWA, in 1996 the best red tree vole habitat in West
Fork occurred on what was then Longview Fibre lands. The FS was unsure if the species would persist in the watershed on the more marginal habitat on National Forest System Lands or if it would be temporarily extirpated from the watershed. 

WA at Executive Summary – 3.

While it is unclear whether red tree voles are present in the Waucoma project area, Bark requests that the FS survey for this species and that any new information regarding the presence of red tree voles be included in the NEPA effort, and that the appropriate no-cut buffers are immediately applied: a 10-acre surrounding buffer where no ground disturbing activities can occur.

The WFHRWA cites evidence of both fisher and pine marten presence within the watershed. Management that emphasizes closed-canopy forests at low to mid elevations benefits the fisher and has a long-term result of promoting interactions between local populations adjacent to the project area. The Waucoma area may be large enough to support a viable population of fishers capable of providing individuals for recolonization of other adjacent portions of its former range, but only if management for the habitat needs of this species is prioritized.

Martens are also associated with dense mature forests, are important indicators of a forest’s biodiversity, and are vulnerable to management activities such as thinning treatments that open the forest canopy or remove woody debris. Recently the Pacific Northwest Research Station investigated the effects of thinning on marten use of forest stands compared to untreated areas. In this study, twenty-two martens outfitted with GPS collars avoided openings and forest stands that had been treated to reduce small-diameter trees, understory plants, and logs in Lassen National Forest. During the summer breeding and kit rearing season, martens were 1,200 times less likely to be detected in openings and almost 100 times less likely to be detected in areas structurally simplified by fuel-reduction treatments compared to structurally complex forest stands. Marten behavior was more erratic, with increased speeds and decreased complexity of movements, in open and simplified stands compared to forested and structurally complex stands. Martens move 3 to 4 miles daily, which is energetically demanding and increases their vulnerability to predation compared to animals that have a smaller daily range. Since martens selected home ranges with fewer openings and avoided stands with reduced structural complexity, the researchers of this study concluded that populations would benefit from increased stand connectivity within home ranges and at a landscape scale.

The West Fork Hood River also has some of the last sightings of wolverine within MHNF. In fact, the basin may have historically acted as a major habitat link north of Mt. Hood with wolverine populations in Washington. “West Fork watershed provides some foraging habitat in winter throughout much of the watershed,
especially in high snow years. During these periods, recreational use of much of the West Fork is limited, affording the wolverine a relatively ‘people free’ landscape. The level of human activity in the summer makes it unsuitable for wolverine denning and foraging. Road closures would increase the available habitat.” WA at 5-8. Please analyse the impact of Waucoma on the long-term viability of wolverine within the project area.

OTHER SPECIES CONCERNS

Unit 68, and surely other units, contain numerous Mountain Beaver (Aplodontia) burrows. A study of logging impacts to Aplodontia which was carried out in British Columbia found that impacts were greatest in areas used as skid trails, and these trails needed to be carefully designated to minimize impacts. Post-harvest persistence appeared to be highest in riparian no-machine buffer zones where there was no machinery impact.

Within proposed timber harvesting areas that contain Aplodontia, researchers recommended that to protect the species:

- Mountain Beaver tunnel/runway system perimeters are to be delineated
- No machine use within these perimeters (except on top of a deep snowpack, which is not likely to occur as part of this project)
- No mechanical site preparation within these perimeters, since any machine use will collapse nests and tunnels.\(^{41}\)

Pika are known by the FS to exist in the project area, but Bark would like to highlight two areas of occurrence which are bordered on all sides by Unit 33 and 45 at 45°37'36.56"N, 121°44'45.44"W (Unit 33) and at 45.613259, -121.760281 (Unit 45). Volunteers observed Pika within a talus rock pile and recorded vocalizations. We believe these populations of Pika should be monitored closely as they are especially vulnerable to the impacts of climate change and have limited dispersal capacity.

Unit 28 has the highest diversity of wildlife use that we have seen thus far. In this unit, Bark volunteers recorded several instances of deer and elk sign, woodpecker foraging, lizards, thrushes, snowshoe hares, ravens, crossbill, western tanager, and a junco nest with eggs tucked into bear grass. Where species diversity is currently this high in a proposed unit, Bark has concerns about the rationale for thinning.

and the potential adverse impacts it would have to a functioning assemblage of wildlife.

**SYSTEM ROADS**

The Waucoma project area contains approximately 1.4 miles of closed road, and 21.3 miles of open (high clearance vehicle) roads in the planning area with an open road density of 2.2 miles/square mile.

The FS states in the Waucoma scoping letter that “transportation management” may occur as part of the Proposed Action. Much of the West Fork Hood River watershed has been identified by the FS as being analogous to Tier 1 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.*

Bark generally supports, and appreciates the emphasis on, reducing the road network in MHNF, including road-to-non-motorized trail conversions. However, Bark has observed a mixed record of MHNF’s ability to successfully close and restore roads to a hydrologically stable condition. Because of the current high road density and the certain degradation that existing open, “closed,” and new roads will cause, the USFS needs to address this issue in subsequent NEPA analysis. *Sierra Club v. Morton,* 510 F.2d 813, 824 (5th Cir. 1975) (requiring the agency to “disclose the history of success and failure of similar projects”). In addition, the FS cannot
rely on closing roads as mitigation for impairment that the Waucoma project would cause if implemented.

Terrestrial wildlife is greatly influenced by road density. Roads impact wildlife in a variety of ways including direct mortality from vehicle collisions, increased poaching, over-hunting, and over-trapping facilitated by access; reduced numbers of snags and down logs; increased negative edge effects; facilitated or hindered movement depending on species; and chronic negative interactions with humans.42

The Pacific River Council’s (PRC) recommended target road density of less 1.5 miles per square mile in 6th field watersheds is an example of a robust, science-based target for watershed restoration in MHNF. PRC published these management recommendations after they were reviewed and contributed to by the Western Environmental Law Center, Friends of Mount Hood, Oregon Wild, Crag Law Center, the Columbia River Inter-Tribal Fisheries Commission, Clackamas River Providers, Oregon Trout Unlimited, Bark and several others.

Given that the FS is considering changes to the road system within the Waucoma project area, and the large geographic scale of this project, the FS must consider its Travel Analysis Report (TAR) for the Forest, and identify the Minimum Road System (MRS).43 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”.

Recent project analyses have failed to discuss the need for a minimum road system, much less assess what the minimum road system for the project areas might look like or whether the proposed road related actions work towards that minimum road system. 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.44 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;

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43 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.”).
44 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”).
• 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 travel analysis report, and whether the proposed road management measures are consistent with the recommendations from the travel analysis report. To the extent that the final decision in this project differs from what is recommended in the travel analysis report, the FS must explain that inconsistency. *See, e.g., Smiley v. Citibank*, 517 U.S. 735 (1996).

Table 7.1 “Proposed road obliterations” in the WFHRWA includes several roads within the Waucoma project area, including segments of 2810, 2820, 2810-640, 2810-660, and 2810-650. Please refer to this table in addition to the TAR when prioritizing road decommissioning in the Waucoma area.

**Road surface as a vector for sediment**

Elevated road use for log-haul greatly increases erosion and sediment delivery on unpaved roads. Research on logging roads has consistently documented that roads used by more than four logging trucks per day generated more than seven times the sediment generated from roads with less use and more than 100 times the sediment from abandoned roads.\(^\text{45}\) The FS’s own summary of scientific information on roads\(^\text{46}\) concluded that “rates of sediment delivery from unpaved roads are . . . closely correlated to traffic volume.” Even with a road surface of crushed rock aggregate,\(^\text{47}\) documented that elevated truck traffic increased sediment production by 2 to 25 times that on unused roads in western Oregon.

Primary mechanisms for increased erosion and sediment production from road use are the production of highly mobile fine sediment on road surfaces, road prism damage, disruption of gravel or aggregate surfaces, and rutting. On constructed and reconstructed roads, the highly elevated sediment production from roads used for haul is delivered to streams at stream crossings and other points of connectivity between streams and roads, such as gullies and relief drainage features that dump elevated road runoff laden with sediment to areas in relative proximity (e.g., less


than 300 feet) to streams. This impact of log hauling at stream crossings, alone, could greatly elevate sediment delivery to the stream system. **The Waucoma PA should include data regarding the projected increase of sediment from log haul on all roads used.** If it is likely that sediment would increase from wet-weather hauling, the FS should also include these projections in the PA.

Roads 2810, 2820, 2820-620 and 2821-620 are known to have issues with drainage functionality and structural stability that will require reconstruction work in the form of ditch reconditioning, culvert replacements, and roadbed reconditioning. Recently, a storm event caused a substantial culvert failure on FSR 2820, resulting in significant damage to the road. Please include these activities listed above in the Proposed Action for Waucoma to remedy these issues.

![Road gully on FSR 2820 caused by recent storm event](image)

**TEMPORARY ROADS**

The Waucoma area has low road density in some areas, combined with steep terrain, so many of the proposed stands will be difficult to access without building costly temporary roads. Generally, Bark does not support the amount of temporary roadbuilding the agency believes to be required to achieve their Purpose and Need in their project areas. As the agency is aware, roads are vectors for stream sediment, illegal activity, disruption of wildlife, noxious weeds, and more.

As in past projects, the FS is planning to re-use previously decommissioned roads. Many of these roads have been passively decommissioned and we expect the agency will claim a net reduction in road density after the project when these roads are “rehabilitated”. Bark has long suggested that, while this approach appears good
on paper, it is not what always happens on the ground. For example, in Bark’s monitoring of the implementation of the Bass, Drum, and Mag timber sales, we have found many roads that were not properly winterized and/or closed after the work had been complete. This information was previously shared with the FS. The problem is so systemic that when NMFS assessed the Jazz Timber Sale, it estimated that “…approximately 21% of the roads may not be decommissioned after project completion”. Jazz LOC at 25. This does not provide much assurance that the FS will, in fact, follow-through with the road work these projects require.

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. 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. 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 cumulative effects. After 50 years, a mile of obliterated

51 Id.
Road construction is by far the greatest contributor of sediment to aquatic habitats of any management activity. Even temporary road construction can cause resource damage including erosion and sedimentation, exotic species spread and disruption of wildlife. 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.

We provide the following road-related recommendation for this project based on a recent synthesis of science relating to implementation of the Aquatic Conservation Strategy: **Prohibit the construction of new permanent and “temporary” roads, except in limited instances were construction of a short segment of new road is coupled with and necessary for the decommissioning of longer and more damaging segments of existing road.**

**OHVs and UNAUTHORIZED MOTORIZED ROUTES**

In addition to impacts from the proposed action, significant additional impacts often come from illegal OHV use in FS project areas. NEPA requires the agency to address the impacts “on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions...cumulative impacts can result...by collectively significant actions taking place over a period of time.” 40 C.F.R. § 1508.7. The cumulative effects of OHVs and timber harvest – including that proposed here, which may include construction of new skid trails and other roads needs considered in the subsequent analysis.

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Bark is concerned that building or rebuilding roads for logging in the Waucoma area could result in an increase of OHV access and would undo the restoration work done to remedy the damage done by the original entries.

Some road closure and trail rehabilitation projects completed recently within the Clackamas River Ranger District’s Goat Mountain project area have been effective in reducing unauthorized target shooting, OHV use, and garbage dumping in stands proposed for thinning. Effective restoration actions have included boulders and slash being placed along the road, large berms, re-contouring/de-compacting, re-vegetating, and the removal of trash. We believe these actions, where implemented, have been effective and encourage the FS to employ these types of strategies within the Waucoma project area.

While Waucoma is under contract, roads constructed for the project could provide unregulated motorized access over the course of multiple years, as roads may be needed for more than one season.

Bark requests a commitment from the agency to enforce effective barricades on roads built or rebuilt for this project when operations are not occurring. This includes time when the area is still under contract but outside the normal operating season.

We suggest that any final decision mitigate potential risks associated with future road development by: 1) continuing to firmly limit construction of new roads; 2) ensuring controlled access during the project implementation; and 3) ensuring timely & secure road closure upon the project’s completion.

Specific Recommendations for Project Design Criteria to reduce impacts from unauthorized recreational use in the Waucoma project:

To restrict access to temporary roads and skid trails built or rebuilt for this project when operations are not occurring (including between the normal operating seasons if work in sale unit in question is not complete in one season), please consider the following recommendations:

- Between operating seasons and at the end of the contract, include seasonal erosion control measures such as waterbar placement and diversion ditch creation;

- Between operating seasons and at the end of the contract, include piling slash on the first few hundred feet of temporary road or skid trail, and placing boulders at the entrance to units from main road;
• Incorporate skips to help obstruct unauthorized OHV use in thinned units. Leave a thick, “vegetated screen” along roads in areas where OHV use is expected based on past and current use. If there are areas within the units in question that would benefit ecologically from skips (such as seeps or other riparian areas), do not remove these in exchange for the vegetated screens, but look to achieve both the visual and ecological goals of the skips in these units;

• Provide adequate Sale Administration staffing for workload, so that coverage is available when the assigned Sale Administrator is not working;

• Require the Sale Administrator to discuss all requirements with contractor at pre-work meeting, review all pre-work discussions with contract representatives on site, and reemphasize as unit completion is eminent;

• Require inspection by Sale Administrator before contractor’s equipment is moved offsite;

• Require implementation and effectiveness monitoring of PDCs by both Sale Administrator and other specialists, including during the harvest activities; and

• After project implementation and before conclusion of the contract, fully implement and monitor effectiveness of these activities in order to impede further damage from unauthorized motorized access to units after thinning has taken place.

DETRIMENTAL SOIL CONDITIONS IN B3 & B12

The Waucoma project includes commercial logging in both B3 Roaded Recreation and B12 Backcountry Lake Area LRMP land allocations. Both of these allocations include specific guidelines for soil disturbance.

B3-008: No more than 5 percent of an activity area should be in detrimental soil condition from the combined impact of compaction, puddling and displacement

B12 005: No more than 5 percent of an activity area should be in detrimental soil condition from the combined impact of compaction, puddling and displacement

If the FS is to propose ground-based logging in any units overlapping with these allocations, they must provide site-specific Project Design Criteria (PDCs) to
ensure that detrimental soil conditions will not exceed 5% of the activity area.

**HUCKLEBERRY ENHANCEMENT**

The FS has stated that the purpose of the Waucoma 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 Waucoma planning area was identified as an area of emphasis for “huckleberry enhancement” because of the existing ecological site potential and past cultural interest.

The agency has stated that while no specific areas for gathering plants had been identified in West Fork watershed, historic accounts and cultural resource surveys have found sites traditionally used for gathering huckleberries and peeling cedars. Some sites were still used during the 1940s. WA at 5-44. In July 2018, the Stew Crew visited some of these sites off the 2820 road.

![Huckleberry plants in Potential Treatment Area 38](image)

The Waucoma area contains a concentration of Pacific silver fir (*Abies amabilis*) plant communities unique for the east side of the Cascades. 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.

On the June 27, 2016 Stew Crew field trip, the collaborative group noted that it was difficult to determine what ‘restoration’ means for this area because the plant associations used by the FS are based off an ideal condition without any disturbance, and climate change impacts what can grow currently and into the future.

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 4-7m²/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 Waucoma scoping letter states that “Recent treatments on the Mt. Hood National Forest demonstrate that an improved huckleberry response rate can be achieved by opening the canopy and reducing competing vegetation.” Bark requests that these past treatments and their results over time be detailed in the PA.

It was stated on the July 2018 field trip that the project area is mostly within a stand-replacing fire-regime. The agency shared that prior to the initial logging of the area, there was a combination of disturbance agents which encouraged huckleberry growth and production while maintaining low ground competition and minimal canopy.

According to the WA, Mt. Defiance area likely experienced “semi-frequent” fire that saw a mix of low intensity under-burning and high intensity stand replacing fire. Fires occurred just frequently enough to promote a more even mix of these two fire types across the landscape. Around Mt. Defiance, the average fire return interval was around 50-100 years, based on the precipitation and current species compositions. The areas of mixed intensity fire are defined by the WA as areas where grand fir is a major stand component.

Looking back, Reverend Daniel Lee, who drove cattle between what is now Oregon City and The Dalles in the 1830s passed through the West Fork Hood River watershed and his observations were described in the WA at 2-10: “Considering the
open condition of the trail and the huckleberry fields for much of the distance along it, the trail was probably one regularly burned by the American Indian users.”

The FS stated that the authors of the WA did not have a good understanding of some disturbance types within the watershed. For example, they believed that burning was common to maintain travel-ways due to evidence from elsewhere in the western United States. However, they did not know how much burning for travel-ways may have historically occurred in West Fork.

In the WA, Table 4.3. Major disturbance types for each sub-watershed and approximate scale and frequency identifies “Burning by American Indians” as “Common” in the West Fork and Lake Branch, and “Semi-common” in Green Point.

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.

“The huckleberry patches were burned about every seven years in the fall and after collecting the year’s production. They burned when huckleberry production fell off or when tree encroachment reached an undesirable level. Since the fires were spread late in the year, they rarely spread beyond the berry patch...Before 1900, huckleberry field burning may have been a significant and frequent ignition source in the lower elevations of Green Point sub-watershed. This burning would have occurred in association with maintaining travel routes along Hood River and possibly fishing at Punchbowl falls.” WA at 4-12

As part of their summary of logging history in Waucoma during the July 2018 Stew Crew field trip, the FS stated that broadcast burning was stopped in the 1980s, and since then fire has not been used as a management practice except to burn slash after cutting. Although the FS does have some evidence of indigenous burning practices in the Waucoma area, they have not included any burning in the Proposed Action.

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.57 This could

mean that if the FS were to burn for huckleberries in Waucoma, not only would they be creating more fire-resilient stands of trees, but they would also be doing the same for stands of huckleberries. This seems contrary to the very Purpose & Need of the project.

The FS states that this project should be designed to achieve the objective of huckleberry enhancement in an economically viable way. To this point, Bark requests that fire use become an integral part of this project. We recognize that the FS sees several barriers to using this method to achieve their objectives in the Waucoma project area. In this recent University of Oregon investigation, interviews conducted by researchers did not yield clear indications that policy change is needed at the federal level at this time to allow more burning, as most interviewees said there were opportunities to increase the use of prescribed fire that would not require changes to federal law. We encourage the District to review this document to more fully assess the obstacles to burning which may be present, and how to potentially navigate them.

The FS often emphasizes increased sunlight as the key component to increase berrying 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.

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. 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. Huckleberry fruit production is affected by snow pack duration,

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http://www.treesearch.fs.fed.us/pubs/29446

http://www.treesearch.fs.fed.us/pubs/30427

http://www.fs.fed.us/pnw/pubs/pnw_rp143.pdf
snow depth, drought, cold or wet weather during critical phases of pollination and fruit development, and volcanic ash fall. 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. 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.

In addition, protecting the soils by logging on snow seems correlated with a much more rapid increase in berry production than dry ground logging and yarding. In a presentation at the 2008 Huckleberry Summit to the Confederated Tribes of Warm Springs, BIA Sale Planner Matt Jimenez disclosed the preliminary monitoring results that the stands that were logged over a 3 ft. snow pack had an immediate flush of berries the first season following logging, whereas huckleberry in areas logged over partial or no snow pack had much longer recovery times. Bark requests that the FS incorporate these findings into the Waucoma project and include a PDC requiring logging over snow for all units for which the Purpose & Need is enhanced huckleberry production.

The FS has stated in the Waucoma scoping letter that “(T)here is a need to maintain opportunities for access to huckleberry fields in this location of the Forest.” However, many of the areas proposed for logging in the Waucoma scoping letter are steep, remote, and completely inaccessible by most people on foot. It is not appropriate to include Unit 56 and other stands which are adjacent to the North Fork Green Point Creek in any proposal to promote huckleberry picking opportunities. These stands would need to be accessed by traversing down extremely steep slopes and dangerous terrain. Bark requests that stands which are not accessible for huckleberry harvest be removed from the project, as since their treatments will not meet the Purpose & Need.

The WFHRWA recommends that the agency work with the Confederated Tribes of Warm Springs “to identify potential huckleberry production areas and develop a

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strategy to manage for huckleberries...One potential production area may be the BPA powerline corridor.” In past projects Bark has engaged with, we encouraged the agency to look to these permanent openings for increasing early-seral forage, since there is not an option of promoting conifer growth under the transmission corridor. Has this assessment of feasibility been done in the West Fork Hood River?

**PROTECT ALASKA YELLOW-CEedar**

The Waucoma area includes scattered individuals of *Cupressus nootkatensis*, or Alaska yellow-cedar. According to the WFHRWA, “Alaska yellow-cedar is at the eastern limits of its main range in West Fork. Further east, it appears only as isolated individuals or small clumps, or disjunct populations. Most of the yellow-cedar in the watershed is found near Black Lake, where portions have been harvested. Harvesting of this species should occur with caution since it is limited and strongly associated with wetlands.” *WA at 5-8*
Based on these recommendations, we encourage the FS to **treat yellow-cedar as a minor tree species and protect it within units whenever possible**. This will ensure that both the species and the habitats it occupies will remain intact post-project implementation.

**RECREATION IN WAUCOMA**

Since the Waucoma project was first introduced to the Stew Crew in 2016, Bark has advocated for the FS to re-examine the project area for its potential to bring a world-class recreational experience to Hood River County.

The 1996 WFHRWA stated that “Recreation use levels in the West Fork watershed...continue to increase. Activities are that are stable are so due to limitations of facilities.” Currently there are approximately 8.5 miles of recognized trail located in the Waucoma planning area: Trail 610, 409 (Rainy/Wahtum), 413 (Mt. Defiance), 413B, 409A (Black Lake), plus portions of Wyeth, Bear lake and Herman Creek Cutoff.

Bark believes that the FS has an exciting opportunity to expand recreational opportunities in Waucoma by opening new trails, converting some roads to trails, and ultimately changing the land allocations through a Forest Plan amendment to protect these unique recreational values.

“The Mt. Hood National Forest is classified as an urban forest due to the current and projected population levels... As population levels increase on the westside and in the Columbia River Gorge, the pressure on recreational opportunities will increase, yet recreation budgets continue to decline...The topography and ownership patterns in the West Fork results in most recreation use being concentrated around the many lakes in the watershed...One of the most popular alternative recreational pursuits is mountain biking...The potential to provide such trails in the West Fork is present, but funding to actually develop such a system is highly questionable.” **WA at 3-4.**

The FS has recently emphasized this last point regarding funding, stating that they would rather not complete an analysis for an action they do not currently have funding to implement. To this point, Bark must remind the agency that they often complete NEPA analysis for actions where the funding is not yet secured (such as road decommissioning or prescribed burning). When a funding opportunity *does* come along, which is unpredictable, and can take several years, they will have the action already approved and ready for implementation. We advocate the FS take this approach to recreation planning in the Waucoma area.
In the recent PNW Research Station article *How much fun? Evaluating economic implications of recreation in national forests*, USFS researchers worked with colleagues to summarize results from more than 400 studies that measure the economic value that people hold for recreation opportunities. The information shows that the economic importance of national forests and other public lands for recreation is substantial.

The number of people participating in outdoor recreation is projected to increase through 2030 in almost all forms of outdoor recreation considered in the studies, largely because of population growth and the popularity of nature-based recreation.

We encourage the Forest Service to use this research to evaluate the magnitude of public benefits provided by recreation in the Waucoma area and gauge the social benefits of investing in recreation planning, programs, and infrastructure there.

Over the long-term, Bark believes that there is great potential for the Waucoma project area to eventually be managed as an Unroaded Recreation Area through a Forest Plan amendment. This Land Use Allocation, described in the 1990 Forest Management Plan (Four-157 to 162), provides for managing for non-motorized recreation in a natural environment where timber harvest and new roads are prohibited. We would recommend that the change in management emphasis and Land Use Allocations only apply to the area from NFS Road 2820 south to the southern boundary of the Waucoma timber sale planning area (approx. 72% of area). The RRs should remain as an overlay on the Unroaded Recreation Area. In this scenario, the area north of NFS Road 2820 can remain as Matrix land with a timber management emphasis (approx. 28% of area).

An extensive network of multi-use, non-motorized trails could provide a backcountry experience for mountain bikers and other forest visitors in a predominately natural or natural-appearing landscape (Semi-primitive Recreation Opportunity Spectrum). This will help to meet the increasing demand for mountain biking and other non-motorized recreation activities.

The FS could maintain a Semi-primitive Recreation Opportunity Spectrum experience on trails and road-to-trail corridors by establishing a Visual Quality Objective of Retention in the near foreground on both sides of each trail and road-to-trail corridor.

Some key benefits of this LUA change could include:

- Developing new trails will help meet the growing demand for hiking, bikepacking, mountain biking and trail running.
- Converting old logging roads to trails will help improve water quality in the West Fork Hood River and reduce on-going road maintenance costs.
• Allowing older, mature forests to continue growing into old growth forests will help store carbon to offset the effects of climate change.
• Protecting the area will further enhance the quality of life for residents in the Hood River area and help support the growing recreation economy.
• The land allocation would protect diverse types of habitat for fish and wildlife including: creeks and their associated riparian forests; mature, upper elevation forests; talus slopes and rock outcrops and the forested edges next to them; and small, upper elevation lakes and the forests surrounding them.

Experts in the field of bike packing (i.e. backpacking by bicycle) have told us that the Waucoma area, with a network of trails and the opportunity to camp at small lakes, would be unique in the State of Oregon. New trails in the area will complement the existing mountain bike trail system on Hood River County forest land in the Kingsley Reservoir area. And riders on the Oregon Timber Trail will have the option of including Waucoma trails as an add-on loop in their ride. To offset costs, the FS has the option of converting some existing roads to trails in Waucoma. The WFHRWA authors made the recommendation in 1996: “Convert unneeded roads to trails by ripping half the road surface, pulling the culverts, and constructing “bikable” drain dips. Such a system would require less maintenance than a new trail system. WA at 6-10.

Bark has attached maps of a potential trail system within the Waucoma area, created by Tom Kloster. The viability of this proposal is in its simplicity: less than three miles of new trail would open a 25-mile network, with dozens of loop options that could be tailored to the ability of individual mountain bikers. Most of the work required could be done with the help of volunteers, from trail building and campsite development to signage and ongoing maintenance. Some heavy equipment would be required to develop the new, main trailhead and decommission vehicle access to converted roads.

As a comparison, the BLM-managed Sandy Ridge Trail system near Welches, Oregon attracts huge numbers of mountain bike riders and is so popular that the agency recently completed an Environmental Assessment for a proposal to expand the main parking lot to over 150 cars. Otto’s Ski Shop in Sandy rents mountain bikes and the owner has said that her customers now include international visitors who fly to Portland to be able to ride at Sandy Ridge.65

In the Waucoma area, we advocate for and support an effort to create new recreation opportunities for residents of Hood River, the Gorge, and Portland –

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65 Personal communication with Andreanne Rode at Otto’s Ski Shop. 2015.
Vancouver metro area while also conserving important forest, watershed and wildlife values within the Waucoma timber sale planning area.

**Logging near Designated Recreation Sites**

The scoping maps show proposed logging directly adjacent to several designated recreation sites within the Waucoma area:

- Units 2 & 3 are adjacent to the Warren Lake trailhead
- Unit 28 is adjacent to the Mt. Defiance South trailhead
- Unit 39 is adjacent to the Rainy Lake Campground and trail, and the Rainy Whatum trail
- Unit 45 is adjacent to the Black Lake Campground and trail, and the Rainy Whatum trail

Because so many important recreation sites could be impacted by the Proposed Action, we ask that the FS take clear steps to ensure that recreational values are not adversely affected by logging through the inclusion of PDCs that include very large trail and campground buffers. Additionally, Bark does not support any actions which would impact visual quality from any of these sites, especially the Unit 45 which surrounds Black Lake, contains steep slopes, and is in an LSR and RR. **An immediate action that the FS should take is to drop Unit 45, which, apart from bordering the lake, includes mature and old growth forest habitat, several unmapped riparian areas, and a large wet meadow adjacent to the Rainy Whatum trail upslope.**

**CLIMATE CHANGE ANALYSIS**

In very short – please do not use the same climate change “analysis” that has appeared in both the Polallie Cooper and Crystal Clear NEPA documents. Climate
change is the most pressing ecological issue of our times. A recent draft report from 13 federal agencies finds that “strong evidence has emerged for continuing, rapid, human caused warming of the global atmosphere and ocean” and that “it is extremely likely that human influence has been the dominant cause of observed warming since the 20th century.” The impacts of climate change, both locally and globally, requires in-depth, site-specific analysis to ensure that the FS has taken a hard look at all the environmental impacts of the proposed Waucoma action. To help with that analysis, please analyze and respond to the information below.

A decade ago, the FS released its Strategic Framework for Responding to Climate Change, followed in January 2009 by a directive on the importance of addressing climate change in NEPA analysis. In this document, then FS Chief Abigail R. Kimbell characterized the Agency’s response to the challenges presented by climate change as “one of the most urgent tasks facing the Forest Service” and stressed that “as a science-based organization, we need to be aware of this information and to consider it any time we make a decision regarding resource management, technical assistance, business operations, or any other aspect of our mission.” To this end, we encourage the FS to engage with and include Land use strategies to mitigate climate change in carbon dense temperate forests, 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.

The authors conclude that 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 have been overestimated by at least an order of magnitude. While product substitution reduces the overall forest sector emissions, it cannot

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66 US Climate Change Research Program, Climate Change Science Special report, final draft, 28 June 2017, p. 16.
offset the losses incurred by frequent harvest and losses associated with product transportation, manufacturing, use, disposal, and decay.

The evolving analysis on climate change within the EA process is an important benchmark in the future of public involvement. This has become a major point of concern, not just for the scientific community, but an issue that has squarely fallen within the public interest. Unfortunately, recent EA project analysis by the FS on climate change is almost non-existent.

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: https://www.whitehouse.gov/the-press-office/2017/03/28/presidential-executive-order-promoting-energy-independence-and-economic-growth. 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 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 must 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.

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.

The aforementioned CEQ guidance, which we encourage you to follow, 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.

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.”

Climate change is predicted to result in more flood events and fires across the Pacific Northwest. 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.

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. This includes changing patterns of fire, insect outbreaks, drought, and disease. 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

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70 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.
71 Revised Recovery Plan for the Northern Spotted Owl, Recovery goal, objectives, criteria and strategy II-11.
72 *Id.* at III-5.
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.\textsuperscript{73} 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 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.\textsuperscript{74}

The FS must analyze the impacts of the proposed logging in the broader context of climate change and acknowledge that the historic impacts of these activities will be exacerbated by climate change.\textsuperscript{74} The FS must then commit to specific management actions to address the increased impacts of these threats now and to take additional actions as necessary.

Forests play a role in the carbon cycle in several ways. As natural ecosystems, they remove CO2 from the atmosphere through photosynthesis, storing the carbon primarily as wood and other biomass, and in the soil. These stores are referred to as a carbon pool, stock, or reservoir. Globally, forests account for about one-half of terrestrial carbon stores and, taken as a whole, they store carbon in roughly equal amounts above and below ground in the U.S.\textsuperscript{75} When trees decay or burn, CO2 is released back to the atmosphere, some immediately, most more slowly through decay. At large scales, the processes of storage and release of carbon have historically been in approximate balance. Individual forest stands might be killed by fire, wind, insects, or disease, but across landscapes, balances of growth, decay, and combustion would produce a characteristic level of carbon storage. Over long periods of time, climate, resulting disturbance regimes, and thus the relative balance of carbon stores, would change. Historically, forests were one of the mechanisms that helped maintain stable concentrations of atmospheric CO2, and they still remove some of the excess CO2 from burning fossil fuels.\textsuperscript{76}

Estimates vary, but it appears that about one-half of the carbon absorbed by terrestrial ecosystems in the conterminous U.S. is absorbed by forests, equivalent to around 10% of U.S. carbon emissions from fossil fuels. The amount of carbon

\textsuperscript{73} Revised Recovery Plan for the Northern Spotted Owl, Recovery goal, objectives, criteria and strategy III-9.
\textsuperscript{74} Id.
\textsuperscript{75} Brown, Rick. The Implications of Climate Change for Conservation, Restoration, and Management of National Forest Lands, p7
\textsuperscript{76} Id.
sequestered by forest ecosystems plays an important role in regulating atmospheric levels of carbon dioxide. Factors affecting the amount and rate at which forests sequester carbon include climate, disturbance, management, land use history, and species composition.\textsuperscript{77} The potential to store additional carbon in Pacific Northwest forests is among the highest in the world because much of the area has forests that are long-lived (e.g., Douglas-fir) and maintain relatively high productivity and biomass for decades to centuries.

While old growth forests act as abundant stores of carbon from past centuries of growth, within a carbon sequestration regime it is the role of the young forests to add new carbon to these stores. When a stand is cut it creates a debt of carbon due to the release of the stores previously held in the soil, as well as dead and live tree matter. For over a decade after the initial cut the stand continues to emit carbon as the soils gradually recover from the disturbance and post-logging slash continues to decay.

Removal of biomass from any forest limits its ability to sequester carbon for a period after the disturbance and can even turn the forest into a carbon source.\textsuperscript{78} Not only that, but also logging activities, equipment, and transport produces carbon emissions. Moreover, reducing tree densities increases weatherization of dead biomass, which would increase the rate of carbon emissions from decay. Current enthusiasm for wide-scale thinning must be tempered with a realization that removing too much wood makes forests hotter, dryer, and windier which can increase fire hazard and increases decomposition rates, both of which conflict with carbon storage and other objectives.

The FS insists that the scale of climate impact is inherently global, when in fact local actions add up to global climate trends. However, it is absolutely possible to quantify the amount of carbon sequestered in the Waucoma project area (see, for example, the BLM’s Hole in the Road EA in which did just that). How many tons of carbon will the Waucoma project 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?

\textbf{The FS should be quantifying climate change emissions from all of its projects and taking 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.

CONCLUSION

Bark has several suggestions for improving the Waucoma project to better meet its existing Purpose & Need, and to expand the Purpose & Need to better address the need for more recreation in the area. We request that the agency review these suggestions and create alternatives that meaningfully incorporate them – singly or together – to assess their ecological and community impacts and benefits:

- Do not experiment with forest management techniques that remove canopy to meet the stated goal of increasing streamflow over time;
- Make a meaningful effort to improve aquatic habitat in the Waucoma project area that addresses obstruction of passage for aquatic organisms, the deficit of large woody debris, an oversized road network, and unauthorized user access;
- Include, and respond to, Bark’s information provided herein regarding unmapped riparian areas;
- Provide specific stand information for units proposed for logging within LSRs and RRs, and the ecological rationale for the actions proposed within these stands;
- Exclude stands with high snag and large live-tree densities from logging and apply buffers on key snags and relatively large trees within proposed units;
- In the PA, quantify impacts to snags and down wood over time from logging for Action and No Action scenarios;
- Drop units which would lead to degradation or removal of NSO suitable habitat;
- Identify required buffers for all Survey and Manage species in sale and NEPA documentation;
- Look for additional opportunities to reduce the road network in the watershed and include road decommissioning in the Proposed Action;
- Include data regarding the projected increase of sediment from log haul on all roads used;
- Significantly limit the mileage of “temporary” road construction;
- Reduce OHV impacts by 1) limiting construction of new roads; 2) ensuring controlled access during the project implementation; and 3) ensuring timely & secure road closure upon the project’s completion;
• In both B3 Roaded Recreation and B12 Backcountry Lake Area land allocations provide site-specific Project Design Criteria (PDCs) to ensure that detrimental soil conditions will not exceed 5% of the activity area;
• Drop Potential Treatment Area 45;
• Summarize monitoring results re: past huckleberry enhancement projects completed on the MHNF;
• Do not include stands which are not accessible for huckleberry harvest, since their treatments will not increase access to this resource;
• Include prescribed burning as a tool for huckleberry enhancement;
• Include logging over snow as a PDC for the huckleberry enhancement units;
• Provide a robust, quantitative carbon sequestration and climate change analysis as part of the PA;
• Protect Alaska yellow cedar; and
• Enhance and expand recreational opportunities in the Waucoma area using concepts summarized by Bark in these comments.

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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