AMERICAN FOREST RESOURCE COUNCIL

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In Reply To: Upper Applegate Watershed Restoration Project

Dear Ms. Mickley and Ms. Mastrofini:

Introduction

The American Forest Resource Council (AFRC) is a regional trade association whose purpose is to advocate for sustained yield timber harvests on public timberlands throughout the West to enhance forest health and resistance to fire, insects, and disease. We do this by promoting active management to attain productive public forests, protect adjoining private forests, and assure community stability. We work to improve federal and state laws, regulations, policies and decisions regarding access to and management of public forest lands and protection of all forest lands. AFRC represents over 50 forest product businesses and forest landowners throughout the West. Many of our members have their operations in communities adjacent to the Siskiyou Mountains Ranger District (SMRD) and Ashland Field Office (AFO), and the management on these lands ultimately dictates not only the viability of their businesses, but also the economic health of the communities themselves. The state of Oregon's forest sector employs approximately 61,051 Oregonians, with AFRC's membership directly and indirectly constituting a large percentage of those jobs. Rural communities, such as the ones affected by this project, are particularly sensitive to the forest product sector in that more than 50% of all manufacturing jobs are in wood manufacturing.

Purpose and Need

AFRC is glad to see the SMRD and AFO proposing vegetation management in their Adaptive Management Area (AMA) that will likely provide useful timber products to our membership. Our members depend on a predictable and economical supply of timber products off Forest Service (FS) and Bureau of Land Management (BLM) land to run their businesses and to provide useful

wood products to the American public. The treatments on the Upper Applegate Watershed Restoration Project (UAW) will likely provide short-term products for the local industry and we want to ensure that this provision is an important consideration for the decisionmaker as the project progresses. As we will discuss later in this letter the importance of our members' ability to harvest and remove these timber products from the timber sales generated off this project is paramount. The agency and community determined this project will aim at improving watershed conditions and reducing road-related impacts to natural resources, ecosystem resilience and function at the landscape scale in order to sustain healthy forests and watersheds for future generations. This project will provide protection to communities at risk from wildland fire, while providing for sustainable recreation opportunities, and improved community involvement for stewardship of the land to foster a respect for the ecosystems. Supporting local industry and providing useful raw materials to maintain a robust manufacturing sector is a principal objective to any project proposed on FS and BLM land, particularly those lands designated as Matrix or Harvest Land Base (HLB), but also on land designated as LSR. AFRC is glad to see "a sustainable flow of goods and services" included in the community values with the "promotion of small innovative forest products and restoration by-products" as a purpose of the project. AFRC believes **economic viability & support to the local infrastructure through forest management is a local value in its own right**. This is why the inclusion of "single species management (including clearcutting or unsustainable management practices)" is not a fair identification of threats to values of the FS, BLM, and community. Single species management is meant to imply unsustainable management practices in this context which is not equal nor synonymous. Clearcutting is a valuable and pertinent silvicultural tool in its own right. To demonize it in this paper as a threat to community values at large and to parallel it to unsustainable management is a misnomer. Please only include the language "unsustainable management practices" as a threat. If you need examples of this, please state that it happens when mean annual growth is less than mean annual harvest combined with mean annual mortality. When it is explained in this way it more easily links back to health of the forest and the connection to insect, disease, and fire risks. If you have any questions or need other examples, please contact AFRC.

During the community meetings leading up to this NEPA document, issues were identified by the public. Why is forest health/resilience or fire regime/fire severity not included? We thought these were integral to the purpose and need of the project and should be monitored and used with metrics in some manner of fashion to determine the ability of the project to meet its purpose and need. **Please explain how the project's outcomes will be monitored and measured to assess its conformance with the purpose and need.**

AFRC wants to also remind the FS and BLM that NEPA is a procedural statute. It requires only that environmental consequences of an action be analyzed and disclosed. A project designed to produce timber production is entirely consistent with NEPA.

Proposed Action

AFRC supports the proposed action for the UAW project. It is positive to see the SMRD and AFO proposing treatment on their district and within the Upper Applegate Watershed specifically. Please continue to propose treatments in this and other landscapes in the area to restore their ecosystems and obtain the necessities for the local infrastructure. Being able to sell timber is an important part of the FS and BLM missions and allows the local unit to increase funding sources for other great work such as road maintenance, road decommissioning, noxious weed abatement, pollinator habitat creation, and much more.

AFRC wants to remind the FS and BLM that they are obligated to adhere to many different guiding documents that provide a variety of direction in this project area. Both Agencies have the *1994 Applegate Adaptive Management Area Ecosystem Health Assessment* and *1998 Applegate Adaptive Management Area Guide*. The FS has 199*0 Rogue River National Forest Land and Recourse Management Plan* (RRNF LRMP) and the *Northwest Forest Management Plan*, while the BLM also has the 2016 *Southwestern Oregon Record of Decision and Resource Management Plan* (2016 ROD/RMP). All of this guidance needs to be cross-referenced to correctly manage the project area. The EA mentions these other documents and sites them throughout the EA although the FS Timber Management Areas within the project have not been identified or discussed. These include Management Areas 20 and 21, Timber Suitable 1 and Timber Suitable 2, respectively. Please explain how these management objectives from the RRNF LRMP are being addressed with the EA. Concurrently, the Land Use Allocations from the 2016 ROD/RMP are not discussed at all in the EA. Please specify how the 2016 ROD/RMP direction interacts with the AMA Guide and how it was used to develop the proposed action on the BLM lands.

Thinning Treatments

Natural Stands

Legacy Tree Thinning

AFRC is happy to see the SMRD releasing large trees in areas to improve the health of important legacy trees. An estimated 240 acres producing 700-1500 MBF is proposed in this project. Helicopter logging has been identified as the logging system for all 240 acres. This concerns AFRC. It has become increasingly difficult to helicopter log in the Rogue Valley. AFRC cannot find any sort of economic analysis that identifies why logging systems or certain prescription details were chosen. AFRC believes it is important to propose economically feasible projects and actions. This allows for the public to understand how the tax payer dollars are reasonably being used.

AFRC suggests not only releasing legacy trees on all sides, but also thinning between the trees as well. This will help remove additional density and fuels from the stands. By removing more

volume, it is more likely the treatment will pay for the helicopter logging and allow for the highest potential for completion.

Thinning with a Commercial By-Product

On page 25 the EA states, "All diameter and age classes are available for treatment based on a description of desired conditions." AFRC appreciates the inclusion of all diameters to be taken into consideration for harvesting in the variable density treatments. Why then on page 87 does the EA state, "As less than one percent of the previously managed stands proposed for treatment contain large trees greater than 21 inches in diameter, variable density management under the Proposed Action would retain all such trees." This seems to state that all trees greater than 21" DBH will be retained. To further shackle the FS and BLM the EA goes on to say, "Some trees between 17 to 21 inches in diameter could be removed. However, removal would only occur in cases where such trees are infected, infested or would die within 1 year and are growing in a cluster of surrounding healthy large trees." The EA expresses that the analysis of the removal of these trees would result in a "minor effect." Furthermore, on page A-10 the EA explains, "[…] the application of age or diameter limits would hamper attainment of the purpose and need. This consideration would not employ ecologically based prescriptions aimed at altering species composition and structure to reduce ladder fuels concurrent with promoting resilient forests. Overall (and arbitrary) diameter limitations are not a management strategy supported by the agencies." With all of this said, why even include the diameter limits? Treatments in the variable density stands are going to be done through a thin from below having a low likelihood of ever getting close to removing trees greater than 21" DBH. Those trees 17"-21" DBH have to check off so many boxes to be removed that the EA more of less restricts them from being removed as well. In addition, on page 77 of the EA, maintenance of dispersal-only habitat is discussed. This activity has been proposed in all dispersal-only habitat. In order to maintain dispersal-only habitat the EA states, "Maintenance activities within dispersal **would not remove** the components important to owls: **trees 11 inch diameter or greater**, flying space, and some prey habitat." This diameter limit is proposed on all 5,849 acres of dispersal habitat within the UAW Project Area. AFRC does not believe the creation of diameter limits is a useful silvicultural tool for meeting desired end-results and we do not support them in any federal project. When trees are of poor health and/or restricting the vigorous growth of healthy individuals around them, they should be removed regardless of their diameter. The intent of variable density management in this project is to restore resilience to the stands. AFRC does not believe this objective can most fully be obtained with the diameter limits in place. We would like to point out a project in a similar location with similar objectives called the Butcherknife/ Slate Fuels Reduction Project (BKS). This project similarly intended to restore resilience to the landscape through mechanical thinning and prescribed fire as well as increase the number of legacy trees on the landscape. A thin from below prescription was employed along with a radial thinning around legacy trees. This project was successful in meeting its objective and no diameter limit was put in place. **AFRC would like to see this diameter limit removed from the project or an alternative created that removes it.**

We understand that producing the maximum amount of revenue is not this project's main objective, but it is important to capture some revenue to pay for all of the other restoration activities proposed in this project. The current estimated volume outcome from this thinning is between 3000-4000 MBF. AFRC believes restoration and revenue creation are not mutually exclusive and by increasing openings from ½-¾ acre to at least 2 acres the FS and BLM can obtain both of these objectives. The increased openings would help improve fire adapted landscapes, create more growing space for trees left on the landscape and provide areas of browse for big game. These are but a few positive outcomes that could occur from this type of change.

A total of 950 acres has been proposed for variable density management. There are 235 acres identified as ground based logging, 405 acres identified as ground based logging with intermixed cable logging, 130 acres identified as cable logging, and 180 acres identified as helicopter logging. As stated above, the helicopter logging is becoming increasingly expensive and will need to have the right conditions within the units and sale for turn size, landing, elevation, volume, etc. In addition, cable logging is also becoming increasingly expensive. Few operators exist in the local area and have increasing costs associated with fallers, choker setters, and other crew members. These sales will need to have enough volume in them and a low enough price point for the work to be completed. AFRC believes the consultation and analysis of habitat downgrading should have been completed everywhere in order to create a full picture of effects to the environment with economic pros and cons. We understand economics were not the driving force for this proposed action, but they do need to be factored into every decision at some point. If economics do not allow any work to be completed, then all the federal tax dollars that went into the project are for nothing. AFRC is here to help you create projects that will be successful and get completed.

Thinning with No Commercial By-Product

Approximately 730 acres have been identified to manage without any commercial product being created. AFRC is glad these ecosystems are proposed for treatment, but we are concerned with the ability of the FS and BLM to pay for all of this work. Please be transparent about how the agencies plan to pay for this work.

Previously Managed Stands

Thinning with a Commercial By-Product

Approximately 1,000-2,000 MBF is anticipated to be harvested from thinning in previously managed stands. As stated above, **AFRC does not believe the diameter limit associated with this maintenance of habitat is necessary for this project and would like to see it removed.** AFRC also believes that increasing openings from ½-¾ acre to at least 2 acres is appropriate in this area. The increased openings would help improve fire adapted landscapes, create more growing space for trees left on the landscape and provide areas of browse for big game. These are but a few positive outcomes that could occur from this type of change. There are approximately

330 acres proposed for thinning in the previously managed stands where there are 15 acres of ground based logging, 20 acres of ground based logging with intermixed cable logging, 250 acres of cable logging, and 45 acres of helicopter logging associated with this treatment.

Thinning with No Commercial By-Product

Approximately 2,560 acres have been identified to manage without any commercial product being created. AFRC is glad these ecosystems are proposed for treatment, but we are concerned with the ability of the FS and BLM to pay for all of this work. Please be transparent about how the agencies plan to pay for this work.

Prescribed Fire Treatments

Approximately 6,190 acres have been identified to burn through prescribed fire first entry and between 11,000-13,000 acres have been proposed for maintenance burning. AFRC is glad these ecosystems are proposed for treatment, but we are concerned with the ability of the FS and BLM to pay for all of this work. Please be transparent about how the agencies plan to pay for this work.

Riparian Area Treatments

AFRC is happy to see variable density thinning proposed within the Riparian Reserve. It has been well documented that thinning in dense, uniform forest stands accelerates the stand's trajectory to produce large conifer trees, vertical diversity, and tree-species diversity (Garman, Steven L.; Cissel, John H.; Mayo, James H. 2003.); all characteristics that we assume are desirable in riparian areas as much as they are desirable in the uplands. The Applegate AMA Ecosystem Health Assessment suggests thinning riparian areas to 140 square feet per acre or below to meet its objectives.

The tradeoffs that the FS and BLM is likely considering are between achieving these forest health benefits and potentially having adverse impacts to streams. These impacts to streams typically include stream temperature, wood recruitment, and sedimentation associated with active management.

Dry Forests:

> Messier, Michael S., Shatford, Jeff P.A., and Hibbs, David E. 2011. Fire Exclusion effects on riparian forest dynamics in southwestern Oregon. *Forest Ecology and Management*. 264 (2012) 60-71.
>
> Key points of the Messier paper include:
>
> - Fire exclusion has altered the structure, composition, and successional trajectory of riparian forests in fire-prone landscapes.

- Fire exclusion has been associated with increase in tree density and recruitment of shade-tolerate species that may replace large diameter, more decay-resistant Douglas-fir trees.
- A hands-off management regime for these riparian forests will have ecologically undesirable consequences.

We believe that the benefits in forest health achieved through density management greatly outweigh the potential minor tradeoffs in stream temperature and wood recruitment.

All Proposed Treatments

AFRC would like to know how long these treatments are supposed to last before a new treatment to maintain the landscape resilience is planned. When will density management maintenance planning and treatment likely occur in these stands? The Applegate AMA Ecosystem Health Assessment directs on pages 64-65, that the managers should focus pursuing density management activities in "[s]tands with conifer basal areas exceeding 120 square feet per acre" and mangers should "[p]lan for the next treatment before basal areas grow back to 120 square feet per acre". All in all, the document sums this up on page 66 by stating, "Thinnings should reduce stocking, over time, to 60 to 80 square feet per acre, and stands should be treated again when stocking increases to the upper threshold" of 120 square feet per acre in most stands and 140 square feet per acre in riparian areas. Current densities have not been reported in the EA. It is uncertain this direction is being followed without it in the EA. Please include the current and desired BA for each stand within Table 2-2 and Table 2-4. Table 2-1 describes the two legacy tree units. In this case, density is not driving the treatment but spacing or trees per acre could be used to report on the desired end results.

NSO Canopy Condition

Among other findings, a Northern Spotted Owl (NSO) Canopy Condition study concluded that partial-harvest forestry, primarily commercial thinning, has the potential to improve foraging habitats for spotted owls. The treatments being proposed will likely affect NSO habitat to some degree. Often this level of effect is quantified by the amount of forest canopy that remains following thinning treatments. AFRC has general concerns with how the FS and BLM has been measuring these effects to NSO habitat, specifically regarding canopy cover/closure. There is no scientific or biological justification for canopy closures greater than 40% regarding providing dispersal habitat for the northern spotted owl. Page 28 discloses that the treatments within previously managed stands with commercial by-product were designed to maintain 40% canopy cover. Please explain why this canopy threshold was chosen and how in all cases it will help restore resilient stand conditions.

The EA states on page 77 and 108, "Dispersal-only habitat conditions can be highly variable but in general consist of forested stands with moderate canopy cover that are dominated by smaller,

single aged trees with little if any structural features other essential habitat components for nesting or roosting. Effects to dispersal-only habitats are evaluated at a larger landscape scale due to the life history function of dispersal habitat." Did the FS conduct an analysis to determine whether the landscape contained a level of dispersal habitat sufficient to support dispersing owls? Only such an analysis would support the project design feature of having 40% canopy cover being maintained in all treated stands throughout the entire project area. The EA states that 28% of the dispersal-only habitat in the analysis area is being treated (5849 acres). All of these acres are being maintained as dispersal habitat through maintaining 40% canopy cover, leaving all trees 11 inches in diameter or greater, and generally maintaining functionality of dispersal habitat. AFRC does not believe this is warranted. There is no analysis of the positive and negative effects of downgrading any of this habitat. Page 79 discloses that, "Currently, within the Upper Applegate watershed, 68 percent of the area provides dispersal habitat in the form of dispersal-only and NRF habitat. However, there are also other non-conifer dominated stands of oak and pine that can act as dispersal habitat and may also facilitate dispersal by northern spotted owls." In addition, page 107 identifies the presence of "25 NSO home ranges within 1.3 miles of the proposed actions that overlap portions of the treatment units." The EA points out that 7 of these sites are at or above the minimum threshold for NRF habitat in the core use area while 9 sites are at or above the minimum threshold NRF for habitat in their home ranges. It does not state anything about the dispersal habitat for these owl sites and whether or not these are historic/inactive nesting sites or active nesting sites. Please specify the type of owl sites that overlap the project area and whether or not they are active. AFRC would like to see the need (or not) to maintain all dispersal within the project area clearly stated in the final EA as well.

The BKS Project utilized a slightly different approach to dispersal habitat maintenance. It can be viewed on page 34 of the EA and states, "Within suitable spotted owl dispersal habitat, maintain at least a 40% canopy cover following treatment. However, up to 20% of these acres can have less than 40% canopy cover with individual openings less than 2 acres." Ultimately AFRC would like to see the UAW Project doing 'right by the land'. Often, habitat conditions such as canopy cover that are accepted thresholds for NSO life-cycle needs are in conflict with desired forest health outcomes. One pertinent example is the Big Pines project where the Rogue River-Siskiyou NF, High Cascades District made the decision to sacrifice forest health objectives in order to maintain a canopy cover threshold on a portion of the project area. Page 12 of the Big Pines EA described the impacts appropriately: ***"to preserve current spotted owl NRF habitat required a tradeoff in not achieving historic and scenic objectives, forest health and diversity objectives, partial fire resilience objectives, and improvements for other wildlife."***

In addition to the information provided above, page 77 of the EA is contradictory about NRF habitat. It first states, "Some commercial thinning in unmanaged stands (251 acres) would downgrade NRF habitat (120 acres), one percent of the total NRF habitat within the analysis area" but then goes on to say, "In addition to the dispersal habitat that would be maintained (or improved in over dense young stands), all NRF would be maintained. NRF provides high quality habitat for

dispersing owls." Please explain the contradiction in this NEPA document related to NRF maintenance and NRF downgrading and whether unit 51 is 251 acres or 120 acres?

Economics and Operating Restrictions

The timber products provided by the FS and BLM are crucial to the health of our membership and local economy. Without the raw material sold by the FS and BLM, these mills would be unable to produce the amount of wood products that the citizens of this country demand. Without this material, our members would also be unable to run their mills at capacities that keep their employees working, which is crucial to the health of the communities that they operate in. These benefits can only be realized if the FS and BLM sells their timber products through sales that are economically viable. This viability is tied to both the volume and type of timber products sold and the manner in which these products are permitted to be delivered from the forest to the mills. There are many ways to design a timber sale that allows a purchaser the ability to deliver logs to their mill in an efficient manner while also adhering to the necessary practices that are designed to protect the environmental resources present on FS forestland. To be clear, we are advocating that you consider the economic viability of the project and make sure that it is designed in a way that makes sense for the market. This is not the same thing as maximizing economic value of the project.

In addition, we urge the FS and BLM analyze the economic effect of a "No Action" situation. Stressing the importance of timber harvest on local economies and the need for industry to stay vibrant to fund other work in the woods. Please help us tell the sustainability story of conscious timber harvest across landscapes. The "what would happen if industry went away" story that often is neglected in the No Action situation.

The primary issues affecting the ability of our members to feasibly deliver logs to their mills are firm operating restrictions. As stated above, we understand that the FS and BLM must take necessary precautions to manage their resources; however, we believe that in many cases there are conditions that exist on the ground that are not in step with many of the restrictions described in FS and BLM's EA and contracts (i.e. dry conditions during wet season, wet conditions during dry season). We are glad to see that the FS and BLM is shifting their methods for protecting resources from that of firm prescriptive restrictions to one that focuses on descriptive end-results. There are a variety of operators that work in the SMRD and AFO market area with a variety of skills and equipment. Developing an EA and contract that firmly describes how any given unit shall be logged may inherently limit the abilities of certain operators.

For example, restricting certain types of ground-based equipment rather than describing what condition the soils should be at the end of the contract period unnecessarily limits the ability of certain operators to complete a sale in an appropriate manner with the proper and cautious use of their equipment. We feel that there are several ways to properly harvest any piece of ground, and certain restrictive language can limit some potential operators. Though some of the proposed area

is planned for cable harvest, there are opportunities to use certain ground equipment such as feller bunchers and processors in the units to make cable yarding more efficient. Allowing the use of processors and feller bunchers throughout these units can greatly increase its economic viability, and in some cases decrease disturbance by decreasing the amount of cable corridors, reduce damage to the residual stand, and provide a more even distribution of woody debris following harvest.

The newest operating system is cable assisted logging. This should be analyzed in the document. It allows ground based equipment to operate on slopes greater than 35% by decreasing the PSI of the machine and therefore the ground disturbance. This system can be utilized in conjunction with a traditional cable system where the cable assisted machine is utilized to fell the trees and a carriage is utilized to skid the trees to the landing. Few operators in southern Oregon have a forwarder for skidding using the cable assist method and this type of equipment produces a log many purchasers deem as inferior (short log), so a traditional cable system would be optimal on steep slopes for skidding when a cable assist system is utilized for the felling. Please do not write yourself out of using this innovative technology. **We recommend phrasing the language in your ensuing NEPA document to focus on desired end results for soil conditions rather than prescribing the type of equipment necessary to meet those conditions.**

Sound disturbance is analyzed in the EA. on page 75 the EA states, "By limiting operating periods (depending on type of operations and distance from homes) to 7:00 a.m. to 7:00 p.m. with no operations on holidays and weekends would limit the time and day disturbance would occur. The most prominent noise disturbance would result from the use of helicopters. Topographic features may act to cause "echoing", particularly as helicopters work to lift logs off the forest floor." AFRC does not see any mitigation measures or project design criteria around this topic. Will it be a requirement in the contract/s for the UAW project? Please expand on the timing restrictions the FS and BLM would take to place on certain activities.

The pacific fisher is discussed on page 99 of the EA. It states, "Thinning of unmanaged stand and prescribed fire within suitable denning habitat would be restricted to outside of the denning season, March 1 to June 1." AFRC would like to know what units this impacts and how many acres will be tied up in this restriction. In addition, the EA says on page B-11, "1) Retain a minimum of one 0.5 to 1 acre untreated patch per 40 acre block of the largest diameter trees, snags, and CWM where overstory canopy closure is $\geq$ 70%. These patches are designed to provide suitable den and rest sites for Pacific fisher throughout all treatment areas. In addition, where there is suitable den sites in mixed conifer/hardwood (black oak) on ridges with south east to south west aspects, restrict burning and cutting activities from March 15 through June 1. (E1, F2)". It seems likely that this mitigation will be completed through typical prescription language. Will this be in addition to current mitigations? AFRC would also like to know how a 40 acre block is being defined. Is this per 40 acre block of treatment or of suitable habitat? AFRC would like to see

strategic placement of fisher retention areas in places that have previously been identified as retention for other reasons as well.

Impacts of the Proposed Action on Carbon Sequestration and Climate Change

AFRC has provided addition information to consider about climate change and carbon sequestration. Carbon sequestration as it relates to climate change is a topic that often gets broadly analyzed in NEPA documents. The analysis that the FS and BLM will likely be conducting through the ensuing environmental analysis will discuss forest health benefits, effects on carbon sequestration and storage potential and meeting the purpose and need all within the context of an economically viable timber sale. We would like the FS and BLM to review the following summary of information and incorporate this into its environmental analysis. AFRC believes this will help educate the public about and disclose localized effects to the forested landscape regarding carbon sequestration, carbon storage, and climate change as a whole.

Background

The UAW Project consists of variable density thinning which may affect the treated stands ability to resist, respond, or be resilient to climate change in the project area. The direct, indirect, and cumulative effects of carbon sequestration and storage and its relationship to climate change in regard to this project must be viewed at much larger scales than the general project area because the scientific literature regarding these, only support analysis on larger scales. There is a large body of literature on management strategies that have the greatest carbon sequestration benefit. In general, actively managing the forest will produce a positive net increase in carbon sequestration thus a positive benefit to reducing anthropogenic effects on climate change (IPCC, 2007). AFRC urges you to analyze the type of treatments being proposed and determine through the literature how they will affect carbon sequestration potential through time.

As defined by the USFS in the Climate Change Glossary,

> "Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use" (USFS, n.d.).

The United States Environmental Protection FS(EPA) estimated that national greenhouse gas emissions were 6.87 billion metric tons CO_2-eq/yr in 2015 (EPA, 2016). With increased concentrations of greenhouse gasses, more heat is retained leading to an increase in the earth's average surface temperature e.g. global warming (USFS, 2010). In total, 91.262 billion metric tons of carbon is stored in the managed US forests as of 2016. In 2016, the US sequestered 216 million metric tons of carbon in its forests (Woodall et. al, 2015). According to the EPA (2016), 11% of the US CO_2 emissions were sequestered in forests and associated wood products in 2014. National Forest System lands only represents 13% of all forest sequestration in the US.

Strategies

There are two main strategies for addressing climate change: adaptation and mitigation.

"The International Panel on Climate Change (IPCC) (*http://www.ipcc.ch/*) defines *adaptation* as an initiative to reduce the vulnerability of natural or human systems to expected climate change effects." (USDA, 2011)

Adaptation strategies include the following:

1. Building *resistance* to climate-related stressors such as drought, wildfire, insects, and disease.
2. Increasing ecosystem *resilience* by minimizing the severity of climate change impacts, reducing the vulnerability and/or increasing the adaptive capacity of ecosystem elements.
3. Facilitating large-scale ecological *transitions* in response to changing environmental conditions." (USDA, 2011)

According to the Office of Sustainability and Climate Change, "Forest ecosystems capable of adapting to changing conditions will sequester carbon and store it more securely over the long term, while also furnishing woody materials to help reduce fossil fuel use (Office of Sustainability and Climate Change, 2016). Therefore, adaptation can be enhanced through active forest management activities which improve the health and vigor of the forest ecosystem. By enhancing the vigor and growth of the forest, the forest as a carbon sink, can also be vitalized.

"The IPCC defines *mitigation* as an intervention to reduce the emissions or enhance the storage of greenhouse gases. Mitigation is predicated on adaptation: the long-term capability of ecosystems to capture and store carbon depends in large part on their ability to adapt to a rapidly changing climate" (USDA, 2011).

Mitigation strategies include the following:

1. Promoting the uptake of atmospheric carbon by forests and the storage of carbon in soils, vegetation, long-lived wood products, and recycled wood materials.
2. Indirectly reducing greenhouse gas emissions (for example, through the use of carbon-neutral bioenergy to offset fossil fuel emissions and substituting wood for more fossil fuel-intensive building products)
3. Diminishing greenhouse gas emissions (for example, through the cooling effects of urban forests, which reduce the need for fossil fuels to run air conditioners) or through more prudent consumption in facilities, fleet, and other operations.

This is why active management is vitally necessary. The world is at a time where deliberate action needs to be taken for the future of humankind. Through meaningful and well-developed forest practices, increased adaptation and mitigation can occur. "An actively managed forest landscape that provides a large amount of sustainable biomass yield while at the same time maintaining large standing forest carbon stocks, provides greater climate benefits in the long run

compared to unmanaged forests" (Lundmark et al. 2016). Which is tied back to Nabuurs and Masera 2007 and Lundmark et al. 2014. "Several studies have shown the importance of a sustained or increased yield in actively managed forest to increase the climate benefit (Canadell and Raupach 2008; Malmsheimer et al. 2008; Poudel et al. 2012; Lundmark et al. 2014; Sieva¨nen et al. 2014) … In order to make additional climate benefits compared with today, the most efficient strategy … is to increase growth and yield and to maximize the substitution benefits" (Lundmark et al. 2016).

Carbon Sequestration

Regeneration and Patches

When a forest stand is harvested, the stored carbon removed is transferred into other pools. It could go into the carbon sequestration of harvested wood products (HWP pool), into the soil organic carbon (SOC pool) or released into the atmosphere due to decomposition or slash burning. The small portion that is released into the atmosphere is captured again through increased photosynthesis of the remaining or new stand in a short period of time. Davis et al. (2009) suggested that just after 55 years, carbon sequestration was similar in harvested as un-harvested forests. Not only can forests have equal sequestration over the long term, but it is suggested that the recovery of the ecosystem can be extremely elastic as well. Amiro et al. (2010) discovered that, "A clear GPP[1] recovery occurred within about the first 20 years following a stand replacing harvest." AFRC acknowledges the fact that there is a reduction in the short term in net primary production (NPP[2]) following a harvest. However, when a long-term (>40years) scale is used, harvesting older trees or thinning overstocked stands will always increase positive climate change benefits because of long term storage of carbon in furniture, houses, etc., the substitution effect and increased CO2 sequestration due to increased photosynthesis.

Some may argue that maintaining canopy cover or a continuous forest will best allow for trees to remain as secure carbon storage on the landscape while thinning underneath can provide the wood the timber industry needs, but "[t]he long-term annual average carbon stock change in living trees is close to zero for a continuous cover forest while an annual net increase occurs on production forests where clear-cuts are utilized." (Lundmark et al. 2016). This shows how forests that grow in a patchy environment will always have higher increment growth with greater carbon sequestration potential than continuously thinned stands.

Old Trees

[1] (Gross primary production (GPP) is the total amount of carbon dioxide "fixed" by land plants per unit time through the photosynthetic reduction of CO2 into organic compounds."

[2] Net primary production (NPP) of plant structural biomass in stems, leaves, and fruit, labile carbohydrates such as sugars and starch, and, to a much lesser extent, volatile organic compounds used in plant defense and signaling.

Yu et al. (2017) in their paper titles "Influence of site index on the relationship between forest net primary productivity and stand age" found the following:

- "Similar to previous studies, our results also show that forest NPP[2] increases quickly at young ages, reaches the maximum value at middle age (10±40 years old), and then decreases to a relative stable level at old ages. However, we additionally found that forests under better site conditions have faster growth rates in young ages and steeper declines after reaching the maximum."
- "NPP increases rapidly before reaching its maximum and thereafter decreases to a relatively steady state. At younger ages, carbon is mostly accumulated in stems, branches and coarse roots so the total NPP is dominated by living biomass increments. The decline of NPP with age is mainly caused by the decreasing rate of living biomass increment. At older ages, NPP-age curves are dominated by leaf and fine-root turnovers since carbon allocations to these two components are larger than the other parts."
- "Coniferous forest NPP decreases substantially after reaching to its maximum value."
- "Studies indicated that NPP in old forests generally decreased to about half or one-third of its maximum value."
- "The decrease of NPP at old ages is mainly due to the declining carbon allocation to wood components, in addition to increased autotrophic respiration for sapwood maintenance, decreased photosynthesis efficiency and declining N-availability to trees (Ryan et al. 1997). In addition to these factors affecting the performance of individual trees, changes in forest structure, such as self-thinning and wind damage, would also negatively impact forest NPP at old ages (Smith et al. 2001). For old age forests, leaf and fine root turnovers take a large part of photosynthetic productions (DesRochers et al. 2001). Accurate estimates of leaf and fine root turnovers and carbon allocation ratio of new fine roots to new leaves are of importance to NPP calculation." (Yu et al., 2017).

Harvested Wood Products (HWP)

The utility that forest products provide humans in their day to day lives is paramount. Products connected to the forest are used every day by everyone. "If forested ecosystems are to be managed with carbon sequestration in mind, then wood product market fluctuations must be considered in addition to ecosystem responses to harvest" (Davis et al., 2009). Often when carbon pools are brought up, the HWP pool is left out or misrepresented. The fact is that humans use wood products that do not decompose quickly; in fact, "only 30% of the carbon from paper and 0–3% of the carbon from wood are ever emitted as landfill gas. The remaining carbon … remains in the landfill indefinitely. Some of this carbon may be removed during leachate treatment, but a large portion is permanently sequestered where its impact on global warming is negligible. The placement of forest products in landfills serves as a significant carbon sink, and its importance in the global carbon balance should not be overlooked" (Micales & Skog, 1997). Carbon is stored securely in HWP of all kinds. The potential of any given acre to store carbon is exponentially increased when active management occurs on that piece of land because of harvesting and storing wood in the HWP pool, the substitution effect, and replanting after final harvest. When carbon is stored in houses, furniture, fences, light poles and other products, the wood is not only storing carbon, but serving a tangible benefit as well. Many of these products will outlive the tree/s they came from due to

insects, disease, or fires that would have otherwise killed the tree, released the stored carbon and had its carbon legacy taken away. The homes, dresser, rocking chair, or local bar all get to live on.

Substitution

One of the most frequently disregard factors concerning the harvest of trees as it relates to CO2 sequestration or emissions is the carbon footprint of the materials that will be used as substitutes if these trees are not utilized to build homes, make furniture or any of the myriad of products produced from wood fiber. These commonly include concrete, steel, and plastics. The use of "forest products led to a significant reduction in atmospheric carbon by displacing more fossil fuel-intensive products in housing construction. The result has important policy implications since any incentive to manage forest lands to produce a greater amount of forest products would likely increase the share of lands positively contributing to a reduction of carbon dioxide in the atmosphere." (Perez-Garcia et al. 2005)

The Consortium for Research on Renewable Industrial Materials (CORRIM; www.corrim.org), a not for profit university lead research group of 16 research institutions, developed a research plan in 1998 to study the complete environmental performance of wood. Since its inception in 1996, CORRIM has developed comprehensive environmental performance information on wood building materials consistent with International Organization for Standardization (ISO) standards for life-cycle inventory (LCI) and lifecycle assessment (LCA) research.

They summarize their research to date in the following fact sheet.

Wood Use Can Reduce Carbon Dioxide in The Atmosphere By:

1. Growing trees removes CO2 from the atmosphere and stores it as carbon in the forest.
2. Products made from trees move the stored tree carbon to their point of use.
3. Using Wood Products Creates Opportunities to Avoid the use of Fossil Intensive Products (like steel, concrete, aluminum & plastics) that emit far more CO2 than using wood products.
4. Wood is both Renewable and Sustainable resulting in CO2 initially taken out of the atmosphere and being returned to the atmosphere when decomposed at end of life (a two-way flow) whereas using fossil fuels creates a one-way flow of CO2 accumulating in the atmosphere.
5. Intensively managing forests increases yields, resulting in greater opportunities to avoid using fossil fuels.
6. Using woody biomass for fuel displaces CO2 emissions from fossil fuels although with a lower efficiency of conversion compared to displacement from wood products used in construction.

7. Further CO2 benefits are possible by recycling demolition wood at the end of first life through reuse or reprocessed products such as panel boards, burning the lowest grades of wood for energy, or storing waste wood in landfills where it either does not decompose or the gases produced are collected and burned to avoid producing methane a most harmful greenhouse gas, or better yet use the energy from burning to displace the use of fossil fuels.
8. Managing forests for best use varies by region with natural disturbance risk playing a key role.
9. Increasing carbon values (taxes or incentives) will affect the cost of sustaining critical habitat.
10. Policies customized for specific interests that ignore life cycle impacts, need revision in order to avoid their unintended consequences.

Fire Risk

In Oregon Forest & Industries Council's (OFIC) October newsletter a forestry specialist from the University of California Berkley is highlighted who spoke at their 2018 Annual Meeting. Dr. William Stewart's research focuses on carbon impacts of active management of private forestlands compared to the "not-so-active" management on federal forestlands. He uses comprehensive forest carbon modeling systems to do this. Stewart's research suggests that private landowners are sequestering significantly more carbon than USFS. His research proposes this phenomenon is due to institutional decisions not climate change. Stewart's research also points to the probability of federal forest reserves burning and releasing carbon emissions being three times more likely now than in previous decades. Stewart thinks the prognosis is clear, less active management on federal forests slowed net growth across Oregon, California, and Washington. Conversely, active management clearly moves carbon out of the forest and into products which decreased the likelihood of mass carbon dumps from fire into the atmosphere.

In summary, any analysis of the effects of timber harvest on CO2 emissions or sequestration must be made using a long term, life cycle approach incorporating long term storage of currently sequestered carbon, net primary production of forest stands, and the net increase of CO2 emissions associated with the use of substitute materials. Much research has been done on these subjects which supports the position that managing forests using regeneration timelines related to NPP will result in greater net carbon sequestration than non-management approaches. Research also supports positive potential climate change effects of thinning to promote increased growth and vigor. Fire should also be included in this type of analysis due to their large carbon loading into the atmosphere. Generally, all of the silvicultural tools need to be used to maximize the positive benefits trees and forests provide for the world. To find more information about Oregon's forest benefits you can view a report by the OFIC here. OFIC does a wonderful job at explaining just how wonderful an environment Oregon is to grow trees and the fantastic carbon sequestration power they have here.

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Monitoring

AFRC recognizes all the demanding work put into completing NEPA. Therefore, we would like to see a detailed monitoring methodology for implementation and post implementation (pre-sale and post cut-out). A brief plan has been laid out in the EA. It is not always clear if and how all the arduous work on the front end is coming to fruition. It is paramount quality control occurs. If site specific prescriptions are not written correctly or if those prescriptions are not implemented correctly, then all the work put into the NEPA is moot. AFRC would be happy to be involved in the creation of the Monitoring Plan and looks forward to the outcomes of this project. We understand that monitoring includes checking to make sure standard practices and mitigation measures are not under-protecting the environment and producing the desired project outcomes, but are they ever analyzed to see if they are doing too much and overburdening the employees or

contractors. AFRC would like the monitoring efforts to also shed light on those restrictions that can be improved for efficiency as well.

AFRC has been happy to be involved with the iterative NEPA process of the UAW Project. The need to treat the Upper Applegate Watershed is paramount in order to protect the Jacksonville community. It is positive to see the SMRD AND AFO pursuing treatment of their lands in order to restore the environment through mechanical harvesting and subsequent prescribed burning. It has been shown to be more effective than prescribed burning alone. This environment is in dire need of a return to its historic fire regime. AFRC looks forward to helping with the future projects in the area and the continued success of the SMRD AND AFO. Thank you for the opportunity to provide scoping comments on the UAW Project. We look forward to following the implementation of this project as it moves forward.

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