Effectiveness Monitoring Committee

Initial Concept Proposal
Deadline: 5:00 pm PDT May 24, 2023

Date Submitted: May 24, 2023

Project Title: Pre- and Post-Harvest Fuel Loads and Implications for Site Productivity

Project # (to be assigned by EMC):

Principal Investigator(s), Affiliation(s), and Contact Information (email, phone):

John D. Bailey
Oregon State University, College of Forestry
[redacted]

Collaborator(s) and Affiliation(s):

Sal Chinnici, Mendocino and Humboldt Redwood Co., [redacted]

Joshua Petitmermet, Mendocino and Humboldt Redwood Co., [redacted]

Hayley Ross, Mendocino and Humboldt Redwood Co., [redacted]

Research Theme(s), Critical Monitoring Question(s), and Rules or Regulations Addressed.

Theme 6: Wildfire Hazard

Are the FPRs and associated regulations effective in…

a) *treating post-harvest slash and slash piles to mitigate fuel hazard, modify fire behavior and reduce wildfire risk?*	Our proposed research investigates how many tons per acre of fuels exist pre- and post-harvest given several commonly applied regional silvicultural methods.
b) *treating post-harvest slash while retaining wildlife habitat structures, including snags and large woody debris?*	Fixed-area plots will be augmented with basal area points and fuels transects as needed to develop custom fuel models for projecting fire behavior. We will include measures of deadwood structures, including herbicide-treated hardwoods in "frilled"' stands.
c) *managing fuel loads, vegetation patterns and fuel breaks for landscape-level fire hazard reduction and risk mitigation?*	Our study will use a before-after control-impact (BACI) design to contrast fuel hazard associated with three silvicultural methods (Group Selection/Variable Retention, Individual Tree Selection, and Commercial thinning) each in combination with and without understory fuels reduction treatments.

	Landscape wildfire risk assessment integrates this fuel hazard information over space with topographic position, weather patterns, and probable ignition sources. It includes a values layer (i.e., timber, water, habitat, and human structures) for assessing the probable impacts of wildfires to design potential operational delineations for fire suppression and priority fuel mitigation treatment areas.
d) *managing forest structure and stocking standards over time to promote and maintain wildfire resistance and resilience?* ***(Thematic question for Fiscal Year 2023/2024 funding)****.*	This project will follow multiple replicate harvest units from pre-harvest to post-harvest to determine if site development (regeneration) and productivity has been affected by slash treatment and vegetation management conducted for wildfire hazard mitigation.

Theme 12: Resilience to Disturbance in a Changing Climate

Are the FPRs and associated regulations effective in …

a) *improving overall forest wildfire resilience and the ability of forests to respond to climate change (e.g., in response to drought or bark beetle; reducing plant water stress)?*	Our study will improve understanding of the effectiveness of current management practices to reduce unwanted wildfire impacts. This project would link broad, relatively untested ideas about the effectiveness of fuels treatments with actual, on-the-ground operational numbers for hazard reduction and growth on a per management unit basis and for landscape-scale wildfire risk reduction in aggregate.

Forest Practice Rules and Regulations:

14 CCR § 912.7, 932.7, 952.7 *Resource Conservation Standards for Minimum Stocking*	Our study seeks to investigate if FPR fuels treatment requirements effective in reducing fire hazard in the near term and wildfire risk overall following these common silvicultural methods, while providing for adequate stocking, growth, and stand health.
14 CCR § 913 *Silvicultural Methods*	Before- and after-treatment fuel measurements and hazard modeling will inform the effectiveness of fire hazard reduction in the target intermediate, uneven-aged, and special prescription silvicultural methods (913.2 (a) Selection, 913.3 Commercial Thinning, and 913.4 (d) Variable Retention), and should also inform 913.4 (c) Fuelbreak/Defensible Space.
14 CCR § 917, 937, 957 *Hazard Reduction*	Our study will test the efficacy of slash treatment (required under 917.2 adjacent to roads and structures) in harvest units utilizing various silvicultural methods.

14 CCR § 1038 *Exemption*	Before- and after-treatment fuel measurements and hazard modeling will inform the effectiveness of harvests operating under a Forest Fire Prevention Exemption 1038(i), where extensive slash treatment is conducted following tree thinning similar to a Commercial Thin.

Project Duration and Dates (MM/YY - MM/YY): 12/23 – 3/26

This project will follow multiple replicate harvest units from pre-harvest measurements to one to two years post-harvest to determine if site development (regeneration) and productivity has been affected by slash treatment and vegetation management conducted for wildfire hazard mitigation.

Timeline:

2023/2024 – Site selection begins
2024 – Year 1 pre-harvest field data collection and analyses
2025 – Year 2 post-harvest field data collection and analyses; hazard synthesis
2026 – Report completion

Estimated Funds Requested for Project: Please provide the total amount of funding requested from the EMC, broken down by year of expenditure, with a brief justification of costs not to exceed 200 words.

- ☐ **< $10,000**
- ☐ **$10,000 - $25,000**
- ☐ **$25,000 - $75,000**
- ☐ **$75,000 - $150,000**
- ☑ **>$150,000**

Total: $236,320

FY23/24 – $52,516
FY24/25 - $105,031
FY25/26 - $78,773

Project cost estimate is based on one graduate student over two years at $75,000/year each for two years ($150,000) plus 5%-time commitment for research direction/oversight by the PI ($24,000), associated field and conference travel for students and PI ($30,000), publication costs ($3000), supplies ($4000), and indirect project costs ($25,320 or 12%).

Humboldt and Mendocino Redwood Company (landowner) field personnel will contribute an estimated $10,000 in personnel time.

Project Description: *In not more than 2,000 words*, describe the project, including (1) Background and Justification, (2) Research Question(s), including Objective and Scope, (3) description of Research Methods, (4) Scientific Uncertainty and Geographic Applicability, including identified monitoring location(s), and (5) a description of the roles of Collaborators and Project Feasibility.

Background and Justification

Unusually large and intense wildfires have dramatically altered California's forests in recent years, affecting ecosystem services including wildlife habitat, carbon storage, and wood supplies. Current management practices variably include surface fuels reduction treatments intended to reduce per-unit wildfire hazard and landscape wildfire risk by creating breaks in landscape-scale fuel continuity.

For commercial timber harvesting projects, California Forest Practice Rules (FPRs) include limited requirements for reducing activity fuels (slash) on the forest floor, for example, adjacent to structures and along access roads (FPRs 2022). However, few studies have quantified fuel loads both with and without surface/ladder fuels treatments and connected those effects on future stocking and stand growth.

Research Questions, including Objective and Scope

In partnership with Humboldt and Mendocino Redwood Companies, Oregon State University will conduct a pre-and post- harvest fuel loading study to understand how commonly applied forest management methods (group selection/variable retention, single tree selection, and commercial thinning) combined with fuels reduction treatments affect wildfire hazard, tree regeneration, and site productivity.

This study will measure and compare fuel loads in pre- and post-harvest forest stands, with and without fuel treatments, and quantify these effects on unit wildfire hazard, tree regeneration, and stand growth.

Our proposed research investigates:

- How many tons per acre of fuels exist pre- and post-harvest given several commonly applied regional silvicultural methods?

- Are FPR fuels treatment requirements effective in reducing fire hazard in the near term and wildfire risk overall following these common silvicultural methods, while providing for adequate stocking, growth, and stand health?

Our study will improve understanding of the effectiveness of current management practices to reduce unwanted wildfire impacts. This project would link broad, relatively untested ideas about the effectiveness of fuels treatments with actual, on-the-ground operational numbers for hazard reduction and growth on a per management unit basis and for landscape-scale wildfire risk reduction in aggregate.

Scientific Uncertainty and Geographic Applicability (include identified monitoring locations)

This study seeks to answer important questions regarding how forest management can affect wildfire hazard, tree regeneration and site productivity during a period of a warming climate and increased environmental stress. Results will be applicable to the Coast District but may also be applicable to the Northern and Southern districts depending on species and silvicultural similarities.

Monitoring locations would include Humboldt Redwood Company (HRC) lands in Humboldt County, CA (~210,000 acres) and Mendocino Redwood Company (MRC) Lands in Mendocino and Sonoma

Counties, CA (~240,000 acres).

Research Methods

Site selection on HRC/MRC (Figure 1) will follow planned canopy harvest treatments opportunistically, with additional sites as needed to provide sufficient replication across landscape conditions and stand types. Fuels hazard reduction treatments will be implemented on nested, replicated subunits within harvest units; smaller units will be separated in half randomly, but larger units could potentially have multiple fuels reduction areas at appropriate operational scales (e.g., fuels treatments along roads and nearer to the WUI).

Our study will use a before-after control-impact (BACI) design to contrast fuel hazard associated with three silvicultural methods (Group Selection/Variable Retention, Individual Tree Selection, and Commercial thinning) each in combination with and without understory fuels reduction treatments (Figure 2). Methods for sampling and measuring surface and ladder fuels and calculating tons per acre follow Brown (1974) and Snell and Brown (1980) to augment standard fuel models. We will use 4-10 plots per stand depending on the amount of stand-level variability, since commercial thinning treatments produce less variability than group selection treatments. Fixed-area plots will be augmented with basal area points and fuels transects as needed to develop custom fuel models for projecting fire behavior. We will include measures of deadwood structures, including herbicide-treated hardwoods in “frilled”’ stands.

Landscape wildfire risk assessment integrates this fuel hazard information over space with topographic position, weather patterns, and probable ignition sources. It includes a values layer (i.e., timber, water, habitat, and human structures) for assessing the probable impacts of wildfires to design potential operational delineations for fire suppression and priority fuel mitigation treatment areas.

Roles of Collaborators and Project Feasibility

Oregon State University will provide a graduate student, and advisors including the PI who are responsible for progress reports and deliverables. Humboldt and Mendocino Redwood Companies will provide access to site data, operational planning/oversight of silvicultural treatments, and field assistance with plot measurements.

Project feasibility is considered high given the knowledge and experience of the collaborators, availability of and access to a land base for treatments, established sampling methods, and access to a large and stable study area.

Brief Statement of Qualifications

Principle investigator John Bailey, Professor of Silviculture and Fire Management in OSU’s College of Forestry, specializes in characterizing the effects of fuel treatment on fire risk and forest succession. His research focuses on using traditional and experimental silviculture practices to achieve a spectrum of management objectives.

Humboldt Redwood Company and its sister company, Mendocino Redwood Company, own and manage approximately 440,000 acres across three North Coast counties, with timber harvest activity covering an average of 9,600 acres per year. The ownership provides ample and varied locations for sampling within planned treatment areas, with a high degree of certainty of operations timing and access to study sites.

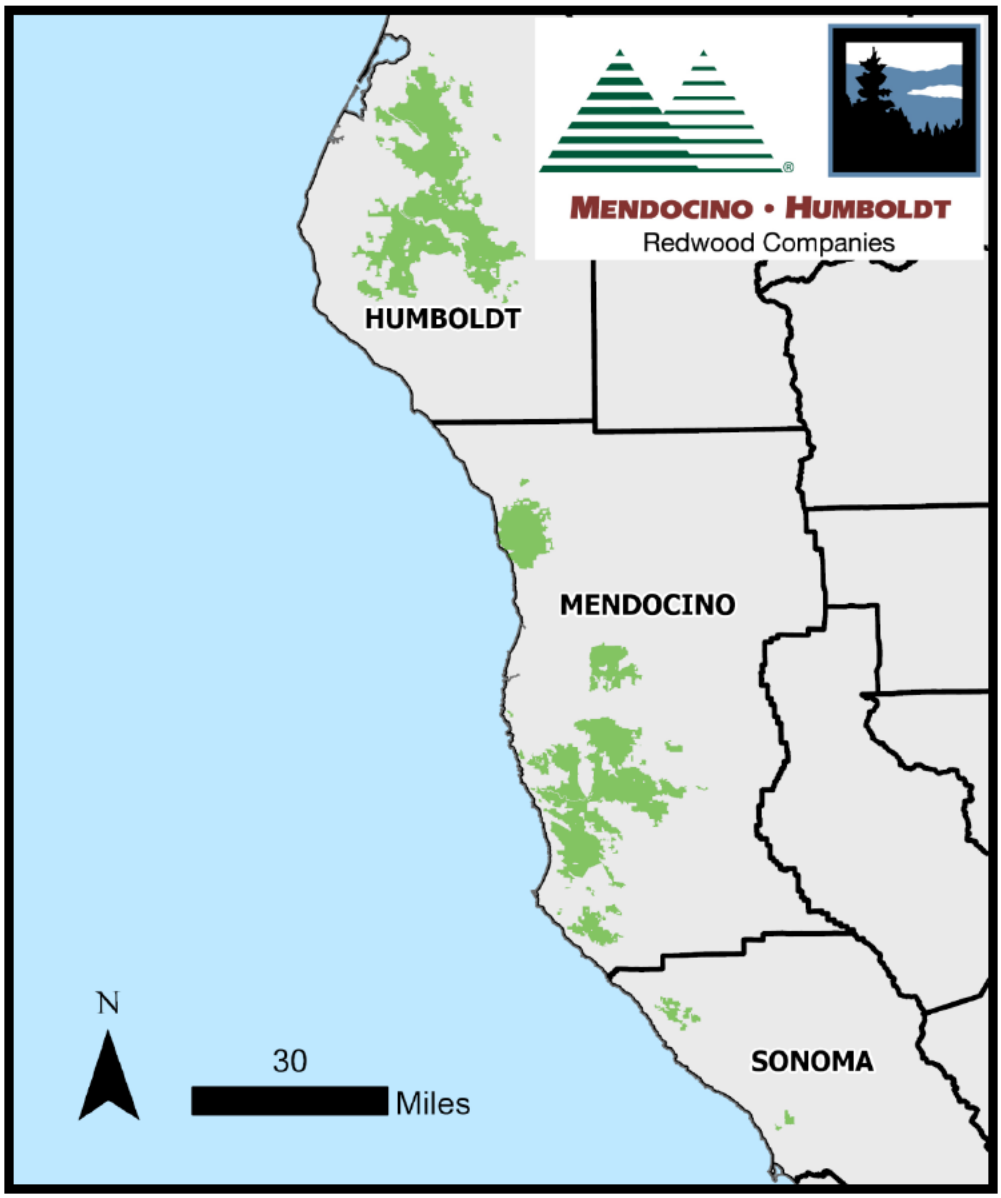

Figure 1. Map of Mendocino Companies timberlands, located in Humboldt, Mendocino, and Sonoma Counties. The timberlands together comprise over 440,000 acres of redwood and mixed conifer forest managed for long-term sustainable timber production.

	Clumpiest structure, lowest canopy connectivity	*Moderate*	*Most uniform structure, highest canopy connectivity*
HIGH FUEL HAZARD	Group Selection / Variable Retention[1] (Douglas-fir) without fuels reduction	Individual Tree Selection[2] (redwood) without fuels reduction	Even-aged commercial thinning[3] treatments without fuels reduction
LOW FUEL HAZARD	Group Selection / Variable Retention (Douglas-fir) **with** fuels reduction	Individual Tree Selection (redwood) **with** fuels reduction	Even-aged commercial thinning treatments **with** fuels reduction

[1] Group Selection /Variable Retention: uneven-aged management based on the creation of multiple sizes of tree clumps, low density areas, and openings for regeneration while retaining structural elements and biological legacies from the pre-harvest stand for integration into the post-harvest stand. A range of 50-125 square feet per acre of basal area is to be retained depending on site class (FPRs 2022).

[2] Individual Tree Selection: uneven-aged management (primarily in redwood dominated stands) in which trees of different age and size classes are removed in small groups or individually in order to stimulate the growth of residual trees, provide smaller openings for regeneration, and create canopy fuel breaks (i.e. reduced canopy bulk density and increased height to the base of live crowns), but retaining at least 125 square feet per acre of basal area (FPRs 2022).

[3] Commercial Thinning: an intermediate stand treatment in young, even-aged plantations in which trees are removed to maintain or increase average stand diameter of the residual crop trees, promote timber growth, and/or improve forest health and wildfire resistance as with other canopy treatments. A range of 50 to 125 square feet per acre of basal area is to be retained depending on site class (FPRs 2022).

Figure 2. The study will use a before-after-control-impact (BACI) study design using three silvicultural treatments – group selection/variable retention, individual tree selection, and commercial thinning – each in combination with fuels reduction treatments.

References

Brown, James K. 1974. Handbook for inventorying downed woody material. Gen. Tech. Rep. INT-16. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 24 p.

California Department of Forestry and Fire Protection. 2022. California Forest Practice Rules 2022. Title 14, California Code of Regulations Chapters 4, 4.5, and 10. California Department of Forestry and Fire Protection, Resource Management, Forest Practice Program. Sacramento, CA. 432 pp.

Snell, J.A. Kendall; Brown, James K. 1980. Handbook for predicting residue weights of Pacific Northwest conifers. Gen. Tech. Rep. PNW-GTR-103. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 51 p.