# Elliott State Research Forest

## Vision

Oregon forests have sustained life for millennia. By merely closing our eyes, we can imagine rolling hills and rising mountains, deep green forests and pastel meadows; salmon runs churning rivers and birds making the most extraordinary sounds. With some careful effort, we can find a patchwork of spaces that provide this experience in the first person. As European presence occurred across the western United States, and the expansion of populations and cities, the ability to grow trees for timber became a critical component of Oregon's rural communities and of expanding economies across the region.

In seeking to create an Elliott State Research Forest, we are reflecting on the immense capacity that exists for forests of Oregon, and beyond, to provide the values we need to sustain ecosystems and economies. We believe that carefully crafted research and scientific inquiry in a dedicated area can inform the conservation and management decisions required to protect endangered species and ultimately lead to their delisting. With broad engagement in designing such a process, economic growth in a genuinely sustainable manner could stabilize and revitalize communities that have been flailing for decades and are always at risk to the boom and bust of policy changes.

We cannot do this with our eyes closed or an unwillingness to dialogue. We must all recognize that this is a unique time for Oregon, the Pacific Northwest (PNW) and the world. We are experiencing the fruits of our unbridled consumption of fossil fuels in the form of human-induced climatic change. The impacts of these changes are evident in the increasing occurrence of extreme weather events, increased scale and effects of wildfire, and an accelerated loss of species. Forest management has a significant role in helping to bring back balance to the PNW and once again take a front seat in the environmental movement, but this remains to be seen. Science and discovery must lead in informing forestry's future.

Forestry must accept its role and responsibility in managing forests for the good of people and the environments upon which they depend. The responsibility is not a small task; people demand many values of their forests, including clean water and air, habitat for species to thrive and survive, climate regulation, places to recreate and gain the benefits of time in nature, and yes, fiber production. The Elliott State Research Forest represents an enormous and unique opportunity to apply science to sustainably provide its myriad values and guide and inform forest management everywhere in an ethical, and life-sustaining manner. The opportunity includes the study of innovative practices, investigating climate resilience of these practices, demonstrating the forest is far more than timber to be logged, and maximize the value and sustainability of ecosystem goods and services provided by the coastal slopes of western Oregon. The efforts will be for the betterment of people and society, whether they are aware of them or not.

Over a century ago, the discipline of forestry was introduced to the western US as a response to the cut-out-get-out logging of the 1800s that only viewed forests as stumpage value. Forestry as a discipline was radical, and it was the first environmental science put into practice on the landscapes of the western United States. The framing of American forestry through millennia of indigenous management that led to the development of the dramatic and beautiful forests. The condition that we often hold up as 'natural,' was actually a construct of indigenous human design, expert use of fire and conservative, yet broad scope utilization of forest resources. Importantly, it was managed for sustainability and as a part of their community identity. The establishment of American forestry was to address the scars left by wasteful, hasty logging practices and to ensure forests for future generations – to protect ourselves from ourselves.

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A century later, economic demands shifted the focus of forestry from conservation and correcting past inadequacies to centering on the net present value and financial returns. Non-economic values often associated with sustainable forest management were frequently cast in a subordinate role to efficient fiber production and addressed within that context—not quite as bad as the cut-out-get-out principles of the 1800s. The listing of at-risk species sharpened this contrast and led to increasingly polarized views of appropriate goals for active forest management and healthy working landscapes. Fast forward to today, and history defines the forestry profession. Forestry is inappropriately categorized and perceived as one of several extractive industries that are struggling (and failing) to adapt to a changing world. This characterization must change. But, forestry must also change.

In the future, forestry must maximize biological diversity, minimize fragmentation and enhance habitat for species of concern while still meeting fiber demands of a growing population. Forestry and its science should draw upon the wisdom, knowledge and history of indigenous partners to learn how to ethically approach and apply management so that nature and people may thrive. Forestry needs to support and sustain rural economies with skilled jobs that support families and livelihoods. Forestry needs to protect and promote the health and well-being of rural communities through ecosystem services and places to recreate. The practice of forestry must maximize its contributions to societies to offset global warming. Forestry can accomplish this by yielding sustainable, renewable and value-added timber for homes and cost-effective mass timber products for commercial wood buildings that displace carbon-emitting steel and concrete construction. To ensure we practice forestry in a manner that provides these multiple values on a sustainable basis will require operational scale research in representative settings that can seed enhanced methods and practices that can be implemented on forest lands across the Pacific Northwest and beyond.

Can we create such a path forward for a forestry's future? Yes, absolutely, and the size, location, and multiple values that define the Elliott State Forest present a singular opportunity to study, develop science, and demonstrate how to attain this future.

To transform the Elliott State Forest into the "Elliott State Research Forest" will require forethought and adherence to a platform that will support research initiatives today and into the future with the controls and replication that define the rigorous expectations for thoughtful science. As others in this process suggest, we must be capable of undertaking science that helps address how we can achieve broad-scale conservation goals and ameliorate climate change on forest landscapes while also producing fiber for a growing world population. Undertaking science of this scale is the central challenge that the Elliott State Research Forest must meet to fulfill its potential. While there are many issues to address before the ongoing conversations narrow to a recommendation to the Land Board, I believe there are five pillars essential to accomplishing the vision for the OSU College of Forestry to oversee an Elliott State Research Forest:

1. The primary purpose of an Elliott State Research Forest is research; however, the values people hold for it and forests everywhere drive its management. The prime motivation is the sustainable and ethical provision of all of the values. We base decisions on the principles of diversity, equity, and inclusion of all values and the people that hold them.
2. A cross-section of treatments that represent a spectrum of operational settings from reserves and conservation-oriented thinning to more intensive management must support the research design. The TRIAD research design currently being considered has excellent potential for creating a platform capable of supporting a variety of research over an extended time. The challenge is to align these different treatments with stand attributes and species concerns without introducing bias that will compromise that research.
3. While the forest must be self-supporting, harvest will not take place for the purpose of generating revenue. Only when there is certainty and transparency that revenue from harvests is a derivative of maintaining and implementing the research design platform can stakeholders and the public be assured that OSU management reflects public expectations for what the research forest is supposed to represent.

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4. TRIAD treatments need to maximize the values of older forests by minimizing impacts to the structure, composition (including species of concern) and function of older forest stands. The research design should protect past unmanaged, naturally regenerated stands. However, this has to be accomplished without limiting the scope of future research to test the relationship of management actions in different age classes to a variety of response variables.
5. The structure and values associated with how we make decisions relating to the management of the Elliott into the future are as important as the research design we agree to implement. I aim to achieve a transparent structure, collaborate with a cross section of stakeholders, and create clear lines of decision-making authority and accountability to ensure the development and execution of a forest management plan is always supportive of the research goals for the forest.

We stand at the edge of a new frontier with a choice to make. We can move forward into as-yet uncharted territory and work together to place forestry at the forefront of a sustainable future, or accept the status quo. As we know, forestry as a practice is far more than just a means of acquiring timber. Forestry, in its essence, is a conservation science and an adaptive practice that considers ecosystems holistically and seeks to meet multiple objectives and provide for future generations. Being adaptive means being able to evolve to meet challenges and opportunities. The evolution of the forestry profession requires thorough scientific inquiry, application and evaluation. The Elliott State Research Forest represents our path into this new frontier. It will require that those who care deeply for this forest, forested landscapes across the Pacific Northwest, and for the practice of forestry, remain committed partners to our College well into the future.

Sincerely,

**Tom DeLuca**
*Cheryl Ramberg-Ford and Allyn C. Ford Dean of the Oregon State University College of Forestry*



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# Elliott State Research Forest

## ESRF Guiding Principles and Oregon State University's Commitments to Public Values

### Land Board Vision and Development of Guiding Principles for the ESRF

Recognizing that the Elliott State Forest is incredibly important to the people of Oregon, the Land Board voted to keep the Elliott State Forest in public ownership in 2017. The Land Board's collective vision, as articulated at the May 2017 Land Board meeting, was for a future Elliott State Forest that "maintains public ownership and access, is decoupled from the Common School Fund, and has a habitat conservation plan."[1]

This collective vision initiated an assessment report conducted by neutral third party Oregon Consensus in 2018 for the purpose of gathering perspectives and informing a process for finding a path forward for the Elliott State Forest.3 Following OC's assessment, at the December 2018 Land Board meeting, the Land Board directed DSL to work with OSU to explore the feasibility of OSU management of the Elliott State Forest as a research forest.4 In early 2019, OSU agreed to develop a plan in collaboration with DSL that engaged tribes, local governments and other stakeholders that is consistent with the "Board Vision."

- Keeping the forest publicly owned with public access
- Decoupling the forest from the Common School Fund, compensating the school fund for the forest and releasing the forest from its obligation to generate revenue for schools
- Continuing habitat conservation planning to protect species and allow for harvest
- Providing for multiple forest benefits, including recreation, education, and working forest research

OSU began an exploratory process in early 2019 that included public listening sessions, outreach to stakeholders, and engagement with local tribes around a potential research forest concept. During public listening sessions, attendees were divided into discussion groups that roughly aligned with public values the Land Board had articulated as important to consider in the design and management of a research forest. Listening session discussion groups included: Recreation and Public Access; Research and Education; Timber, Economy and Forest Management; and Conservation.

As OSU was conducting its exploratory work, holding public listening sessions, and investigating aspects of transforming the Elliott State Forest for research, DSL formed an Advisory Committee composed of community leaders and stakeholders to provide insight and input on key elements of an Elliott State Research Forest proposal.

With the initial Land Board vision and data from the OC assessment report as the foundation, the DSL Advisory Committee and OSU Elliott project team collaboratively reviewed the input from the OSU led outreach to develop guiding principles also known as public values.

Throughout 2019, guiding principles were developed for the following areas:

- Forest Governance
- Conservation
- Recreation
- Educational Partnerships
- Local and Regional Economies

Each set of principle is a reflection of stakeholder input synthesized and reconciled to provide overarching statements of suggested direction for management of the Elliott State Research Forest in the context of the primary research mission.

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# Commitments to Public Values

The public, including all of the people it represents, hold multiple values and perspectives for the Elliott State Forest (ESF) and genuinely care about its future. Currently, the ESF provides various types of ecosystem goods and services, such as wood production, species habitat, and recreational opportunities to varying degrees. As one might expect, members of the public carry a variety of expectations regarding how to manage the ESF and which of the ecosystem goods and services of the ESF are most important to them.

The proposed research design for an Elliott State Research Forest (ESRF) is multifaceted, designed to provide opportunities for the provision and expression of many of the public's interests. The research theme is a systems-level understanding of synergies and trade-offs for conservation, production, and livelihood objectives on a forested landscape within a changing world. The goal of the ESRF is to conduct research that provides a science-based understanding of how to sustainably deliver ecosystem goods and services, delivering on multiple values important to the public, while maintaining the Land Boards vision of a publicly owned and accessible working forest. However, The ESRF, first and foremost, needs to be a viable research forest. In this context it is not a preserve or park (although it supports the same or similar ecological, social, and economic values), but rather it is a working forest—working to achieve multiple values through a combination of active and passive research-based management approaches.

Recognizing that the success of such a research forest will require broad public support, OSU has articulated a set of commitments to the diverse public values expressed in each of the five sets of guiding principles developed by OSU and the DSL Advisory Committee in the process outlined above. These guiding principles align with direction provided by the State Land Board and will aid decision-making on the forest as the research design is implemented and management actions are undertaken on the forest. These commitments will shape future ESRF planning and management, but they cannot be carried out by OSU alone. OSU will rely upon partnership engagement for adequate funding and assistance in meeting many of these commitments.

The following subsections list the DSL Advisory Committee's guiding principles followed by OSU's commitments to the public and the forest based on, and in response to these guiding principles.

## FOREST GOVERNANCE

**DSL Advisory Committee's Guiding Principles**

- **Accountability.** The history and unique public nature of the Elliott Forest requires placing a premium on establishing a governance structure that will provide clear lines of accountability for forest management decisions that support research programs and articulated public values into the future. This structure should include formal and informal mechanisms that ensure commitments and principles are honored in the context of fiscal and operational management of the forest over time.
- **Transparency.** Management of the Elliott Forest requires a commitment to transparent operations and decision making that will maintain and enhance public support for the research forest over time. This includes clear and defined processes for governance and oversight, clearly defined pathways for public inquiry and input, and accessible information related to forest operations.
- **Representation.** An Elliott State Research Forest governance structure should engage and incorporate multiple interests and partnerships that reflect key public values the forest will represent over time. Representation of these values in governance of the forest should be balanced, accountable, and transparent with regard to fiscal and operational management of the forest to support research programs over time.
- **Decision Making.** Regardless of governance structure, decision-making processes directing the fiscal and operational management of the Elliott State Research Forest must be accountable, transparent, and open to input while also empowered to operate the forest efficiently and effectively to meet identified objectives.

**OSU's Commitments**

OSU's proposed governance structure for the ESRF is described in detail on pages XX in this proposal. It clearly articulates ownership rights, responsibilities, and accountability, as well as a role for representatives of public interests in the decision-making process.

- We commit to **transparency and accountability** in the management and use of the ESRF through a governance structure that includes meaningful engagement with public interest groups, local communities, the private sector, Tribes, and others, primarily through an advisory board that advises ESRF management. **The publicly-represented board and committees** will address issues such as revenue generation and economic outcomes, conservation, Tribal interests and traditional cultural uses, research and monitoring, recreation and education, and the other myriad ecosystem services benefits provided by the ESRF.
- We commit to owning and managing the ESRF **as a public forest and guarantee public access** for recreation, education, and foraging in ways consistent with research objectives and activities.
- We commit **to engaging, coordinating, and promoting research and management partnerships** with local watershed councils and associations, Tribes, conservation NGO's and other public and private entities.
- We commit to **collaborating with scientists and researchers** from other institutions in Oregon, the USA and globally.

## RECREATION

**DSL Advisory Committee's Guiding Principles**

- **Ensure Public Access Into the Future.** The Elliott State Research Forest ("forest") will remain accessible to the public for a variety of uses from multiple established entry points, by both motorized and non-motorized transportation, but not all places at all times.
- **Promote Recreational Access and Use that is Compatible with Research and Ecological Integrity.** Public use of the forest will be supported and managed for different recreational opportunities consistent with a management plan reflecting stakeholder interests and historical activities in concert with public safety, ongoing research, harvest, and conservation of at-risk and historically present species.
- **Support and Promote Diverse Recreational Experiences.** The Elliott State Research Forest recreational program will leverage partnerships within the local community and others to accommodate multiple and diverse recreational uses to provide a range of user experiences within the context of a working forest landscape. Recreational planning will not favor any one recreational type over another but will seek to ensure high-quality experiences on the forest by managing to minimize the potential for conflict between users while safeguarding research and management objectives, and conservation values.
- **Partner with Stakeholders and Manage Locally.** Elliott State Research Forest recreation programs will be managed by local staff who live in the community and work with stakeholders to enhance and protect the identified values of Elliott recreationists.
- **Conduct Research on Sustainable Recreation Practices.** An Elliott State Research Forest recreation program will support relevant research on recreation and eco-based tourism, with the goal to advance scientific knowledge and inform the general public on the opportunities and impacts of balancing multiple interests within forested landscapes.
- **Cultivate Multi-Generational Respect for the Forest.** Utilizing a collaborative approach to partner with schools, organizations, and volunteer groups recreation planning and management will seek to create more opportunities for engagement and a more widely informed forest-user community that is vested in the future of the Elliott State Research Forest.

**OSU's Commitments**

The ESRF will remain a publicly owned forest and will continue to be accessible for recreational uses. Through a direct, transparent and engaging governance structure, we will be held accountable to the public for their access and use that is consistent and does not conflict with research activities and outcomes.

- We commit to providing and enhancing **public recreation access and use** of the Elliott, including **building upon existing partnerships and new ones.**
- We commit to **collaborating with local stakeholders** in developing and implementing a **recreation management plan** for the ESRF. The work may build on or integrate with existing efforts, such as Oregon's Websites and Watersheds (ORWW), Southwest Oregon Community College (SWOCC), hunting organizations, motorized and non-motorized interests, trail groups, and the amenity sector.
- We commit to **conducting research on sustainable recreation management practices** that **advance knowledge and inform the general public** about forested landscapes represented by the ESRF and as used by locals and visitors.
- We commit to **principles of diversity, equity, and inclusion** associated with recreational access and use of the ESRF.

## EDUCATIONAL PARTNERSHIPS

### DSL Advisory Committee's Guiding Principles

- **Seek and Incorporate New Educational Partnerships.** An Elliott State Research Forest will offer opportunities to leverage and integrate existing local and state educational programs and institutions that support and generate forest-based research and knowledge.
- **Expand Accessibility to Forestry Education.** An Elliott State Research Forest will provide and promote a diversity of values, and in doing so will leverage efforts by OSU's College of Forestry to engage students with diverse social, economic, ethnic, and cultural backgrounds in forestry education programs.
- **Serve Students at All Levels of Education Through Programs on the Forest.** OSU will seek to foster and establish a programmatic link with K-12, community colleges, informal collaborative educational initiatives, and educational programs at other universities so that the forest becomes a resource for students at all educational levels.
- **Integrate and Demonstrate Elements of Traditional Knowledge in Educational Programs on the Forest.** Through active partnerships with local Tribal Governments, the Elliott State Research Forest will seek to provide demonstration areas that use traditional forest management practices and focus on Traditional Ecological Knowledge outcomes for use in educational programs.
- **Foster Public Awareness and Understanding of Sustainable Forest Management.** Management and research actions on the Elliott State Research Forest will seek to promote broader understanding and awareness of the role of healthy working forest landscapes to local economies, resilient ecosystems, innovative competitive products, and healthy communities.
- **Develop an Educational Partnerships Plan.** The Elliott State Research Forest will work with stakeholders to develop a plan to foster and implement educational partnerships consistent with the foregoing principles and will implement it pending available resources.

### OSU's Commitments

The ESRF will remain a publicly owned forest and will continue to be accessible for educational uses. Through a direct, transparent and engaging governance structure, we will be held accountable to the public for their access and use that is consistent and does not conflict with research activities and outcomes.

- We commit to providing and enhancing **educational access and use** of the Elliott, including building upon existing partnerships and new ones. For example, we will work to integrate and build on existing efforts and partnerships, such as ORWW's historical research relevant to the Elliott and partnerships with SWOCC and OSU's Outreach and Extension.
- We commit to **collaborating with stakeholders** in developing and implementing an education/outreach plan for the ESRF, including its human and natural history as well as social and economic research opportunities (in addition to other research relevant to ecological and management issues). Collaborations will ensure the forest provides professional and educational benefits to Oregonians, in particular, and to the broader public and scientific communities in general.
- We commit to the ESRF being a showcase and place of **learning about the role of healthy working forest landscapes** to local economies, resilient ecosystems, innovative competitive products, and healthy communities.
- We commit to **principles of diversity, equity, and inclusion** associated with educational access and use of the ESRF for students of all backgrounds, ages, and levels.

## LOCAL AND REGIONAL ECONOMIES

**DSL Advisory Committee's Guiding Principles**

- **Operate as a Working Forest While Managing for Research.** The Elliott State Research Forest will be owned and managed as a working forest that produces wood supply as a by-product of research, consistent with the mission of the Institute for Working Forests Landscapes at Oregon State University College of Forestry.
- **Be Financially Self-Sustaining.** The financial model of the forest should incorporate traditional and innovative options for generating revenue to support forest management, and research programs without requiring continued funding support from outside sources.
- **Generate Consistent and High-Quality Timber Harvest.** A sustainable supply of wood volume will be produced over time as a by-product of the research program on the Elliott State Research Forest. Quality should be prioritized over the quantity of harvest.
- **Support Employment Opportunities for Local Communities.** The Elliott State Research Forest should not be managed from a remote location. Management and operation of the forest should be located in proximity to the forest and promote local partnerships that provide opportunities to local businesses and residents of Coos and Douglas counties.
- **Study and report on the Relationship between the Research Forest and Local Economies.** The connections between OSU, the Elliott State Research Forest, and local economies should be documented and reported with transparency over time.

**OSU's Commitments**

The ESRF, as a working forest, will provide benefits to the economies and communities surrounding it. There is great potential for positive impacts on local economic sectors as we grow capacities associated with timber and other forest products, research, forest management, infrastructure building, maintenance, restoration, education, and recreation activities on or related to the ESRF. We also anticipate that the ESRF will generate spillover workforce and economic benefits to the broader region, state, and elsewhere.

- We commit to operating the ESRF as a research forest that is **self-sustaining** based on revenue generated directly and indirectly from the forest through timber harvesting and other revenue-generating activities, gifts, and grants/contracts.
- We commit to **providing local jobs and other economic values** associated with activities on the ESRF. These include jobs in support of timber production, supplying timber to local mills, managing and monitoring the forest, recreation, education, and other activities on the ESRF whenever possible. In addition, recreation and education opportunities may draw people from outside the local economy who spend money as they recreate and learn.
- We commit to the **sustainable production of timber products and growing high-quality trees** by maintaining approximately 19% of the forest in intensive timber production and about 20% in extensive timber production (we define intensive and extensive management practices on pages XX of this proposal). The timber production includes the ESRF playing a positive role in providing wood and research relevant to advancing market opportunities tied to high-quality wood products. It also consists of the value-added forest products the ESF has supported in the past and new products pertinent to the health of Oregon's forest products sector in the future.
- We commit to **managing the ESRF locally,** including key personnel living in the surrounding communities as well as building the infrastructure necessary to house researchers, students, and other stakeholders. Over time, OSU envisions the forest will attract researchers from around the region, USA, and the world to conduct research that brings significant investments in housing, food, and research infrastructure to Coos and Douglas counties.
- We commit to **advancing financial partnerships** tied to recreation, education, research, forest management, and habitat restoration that individually and collectively improve local economic and workforce benefits both on and off the forest. While timber harvest revenue will directly support forest research and management, it will be insufficient to fund all opportunities or needs on the forest, thus making partnerships and related external funding critical to achievement of broad public values on an ESRF (e.g., Cougar Pass fire tower restoration, habitat restoration, road removal, recreation infrastructure development and maintenance, and educational programming).

## CONSERVATION

### DSL Advisory Committee's Guiding Principles

- **Improve Conservation Status of At-Risk Species.** The Elliott State Research Forest will undertake studies, research, and associated forest management activities that seek to improve the conservation status of at-risk species and the ecosystems upon which they depend.
- **Implement Science-Based Conservation Efforts to Enhance the Productivity and Conservation Values of the Research Forest.** In adhering to the academic mission of Oregon State University, and to ensure the sustainability of any management or activity that occurs on the landscape, all conservation decisions or proposed projects on the Elliott State Research Forest will be rooted in the best available scientific Manage for Multiple Conservation Values to Maintain and Enhance Essential Elements of a Forest Ecosystem. With a holistic, ecological approach, management of the Elliott State Research Forest will support the protection and enhancement of at-risk species and preservation of biodiversity, along with promoting improved natural hydrologic function and opportunities of carbon sequestration.
- **Preserve and Proactively Steward a Diversity of Forest Structures.** Management of the Elliott State Research Forest will emphasize key ecological areas ranging from early seral to late-successional forest structure in the context of the greater landscape. The future growth of the forest should encompass diverse objectives of biological quality and resilience for future adaptability.
- **Collaborate with Local Partners for Monitoring and Restoration of Habitat.** Management planning for the Elliott State Research Forest will partner with local conservation stakeholders to maintain transparency and mutual trust that protection of sensitive natural values will be prioritized.
- **Management Decisions Will Not Be Driven by Potential Financial Returns.** The integrity of the research objectives and conservation values on the Elliott State Research Forest will not be compromised by the presence of active management and economic influences on the forest.
- **Conduct Innovative Research on the Intersection of Forest Ecosystems Functions and Climate Change.** The Elliott State Research Forest will provide a unique opportunity to conduct innovative research on the role that native, mature, and managed forests can play in ameliorating the impacts of climate change for sensitive species, water quality/retention, and carbon sequestration.

### OSU's Commitments

The ESRF will make meaningful contributions to species persistence and recovery through its research platform, specific research programs on habitat restoration and enhancement, and broader commitments below. As a result of a research design that promotes older forests, complex early seral, and other valuable habitats, and the functions of resilience and resistance in riparian, aquatic, and terrestrial systems, conservation and biodiversity will be enhanced. The ESRF research design and commitments outlined below support a goal of conserving and recovering species including coastal coho salmon, marbled murrelet, the northern spotted owl, and other species of concern, which while dependent upon actions and actors across a broader landscape, is something to which an ESRF can positively contribute.

- We commit to **conserving, enhancing, and sustaining high-quality habitats for endangered species and other wildlife** through approaches such as placing approximately 60% of the ESRF into reserves where recurring timber harvests will cease and habitat restoration and protection would be their primary focus. Doing so creates the largest contiguous reserve networks in the Oregon Coast Range (detail on pg. XX of proposal). We also will foster the growth of older forest stands in the ESRF well beyond current levels and such that there will be a significant gain of older complex forests relative to today.
- We commit to **providing and enhancing other habitats beyond older forests**, in particular for complex early seral forests and the multitude of wildlife dependent upon them.
- We commit to **conserving, enhancing, and sustaining native riparian conditions and vital ecological processes** that influence the aquatic system of the ESRF and connected aquatic networks. This commitment includes recruitment of instream wood, shading for water quality and thermal refugia, and active restoration projects (with partners and contingent upon adequate funding) related to these and other aquatic system attributes.
- We commit to **conserving, enhancing, and sustaining carbon storage** on the forest by increasing rotation ages in intensively managed stands, retaining older trees in extensively managed stands, and designating reserves.
- We commit to **reducing the current road network density** and known related adverse impacts on the ESRF (in particular in the Conservation Research Watersheds), while maintaining and balancing for necessary access for research, harvesting, management, education, fire protection, and recreation.
- We commit to **limiting salvage harvesting** and related research to intensive watersheds, and with further limitations in extensive treatment areas. No salvage logging will occur in reserves (CRW and other reserve watersheds) when tree mortality is due to natural disturbances (drought, disease, wind, insects, and fire).
- We commit to helping advance a **Habitat Conservation Plan** that improves the certainty around OSU's ability to advance research, while conserving endangered species over an extended timeframe.
- We commit to a **working forest approach** that, through research and applied project work, is intentional about better understanding and highlighting the role of coastal pacific forests in carbon sequestration and climate adaptation, and the impacts of climate change on the diverse public interests associated with forests.

## TRIBAL ENGAGEMENT

Oregon currently has nine nine federally-recognized Indian Tribes. These Tribes have retained unique legal status which includes Government-to-Government relationships. Oregon has recognized this relationship through various statutes, Executive Orders and policy statements. The continued involvement of Tribes is essential in the future management of the ESF. Therefore, the guiding principles for Tribal engagement will revolve around:

- Respect for Tribal sovereignty and Government-to-Government relationships.
- Understand and appreciate the unique values of individual Tribes and their respective connection to the ESF.
- Honor Tribal Ecological Knowledge (TEK).
- Ensure accessibility by Tribes to OSU's educational programs, research, and information resources.
- Promote shared generation of knowledge from activities on and related to the ESF.
- Develop sustainable partnerships with Tribes.

A necessary first-step in expressing our commitments to Tribes, we intend to establish government-to-government MOUs between College of Forestry / Oregon State University and local Tribal governments that set standards and expectations for sustaining meaningful and productive partnerships in research, education, and outreach that directly co-benefits Tribal communities, individuals, and businesses, and OSU. The DSL Advisory Committee and sub-committees, including Research Platform and Governance, have included representatives from various Tribes. As the new governance structure of the ESRF evolves, we anticipate continued involvement from Tribes as advisory roles, committees, and/or operational levels of projects.

OSU's commitments express our desire to own and manage the ESRF for the good of science, the land, and the people it sustains. Our commitments to the public values are enduring in that they are long-term, enabling research to be conducted over large spatial and temporal scales addressing ecological, social, and economic questions in the context of sustainable forest management, including natural disturbances, changing climates, and social pressures on these forested systems. The following section provides information on the research objectives for an ESRF.

ELLIOTT STATE RESEARCH FOREST

# Descriptions of Research Treatments

This attachment contains proposed descriptions of the scope and attributes of what is intended to constitute intensive, extensive and reserve research treatments in stands on an ESRF within the context of the research principles, design, and attributes described above. It is intended to be used as the starting point for designing implementation of research treatments and experimentation that will occur within the context of the future decision-making structure of the forest in support of research. In all cases there will be monitoring protocols established including remote sensing, emerging instrumentation and technology, and historical records to determine if we are meeting key benchmarks before moving forward.

## Reserves in the Management Research Watersheds (MRW) and Conservation Research Watersheds (CRW)

1 Efforts will be made to maintain the current proposed CRW as one of the largest contiguous reserves in the southern Coast Range (See Figures 8. and 9).

2 No logging in forests greater than 65 years as of 2020.

3 Assess plantations (forests 65 years and younger) in the CRW and MRW for conservation and restoration within the context of the surrounding landscape.

4 Design and implement an experiment to explore methods for increasing the likelihood of achieving old forest structure, increasing species diversity and creating complex early seral forests from dense single-species plantations.

5 The research protocols will include treatments and controls and will be implemented over a range of forest ages up to 65 years as of 2020.

6 The timing of the treatments will depend upon the experimental design and stand age; however, anticipate the experimental treatments will complete in the CRW in approximately two decades. The MRW may take longer, given the stepwise implementation.

7 Following initial treatments, the only disturbances going forward will be natural and not include logging.

**Figure 8. Relative size of the largest wilderness areas on the Oregon Coast and the proposed CRW**

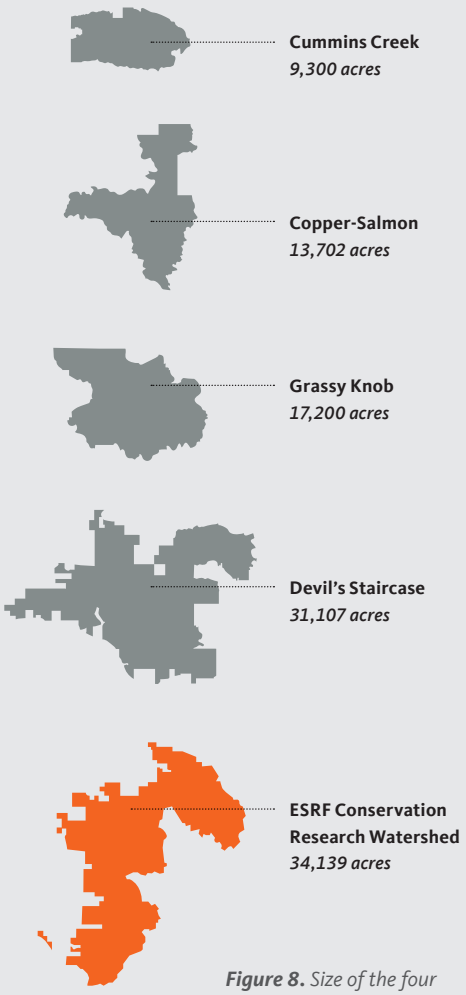



***Figure 8.*** *Size of the four largest wilderness areas in the Oregon Coast as compared to the Conservation Research Watershed. The CRW and Devil's Staircase Wilderness Area are adjacent and represent a 65,246 acre reserve, the largest in the Oregon Coast Range.*

8 Natural disturbances such as drought, disease, wind and insects will occur without salvage.

9 Suppress fire, but will not salvage if mortality does occur.

10 Potentially treat riparian areas on a limited basis during thinning to reduce density and promote the development of older forest structure. No individual trees older than 65 years in 2020 will be harvested or felled.

**Figure 9. Forest Reserves in the Oregon Coast Range**

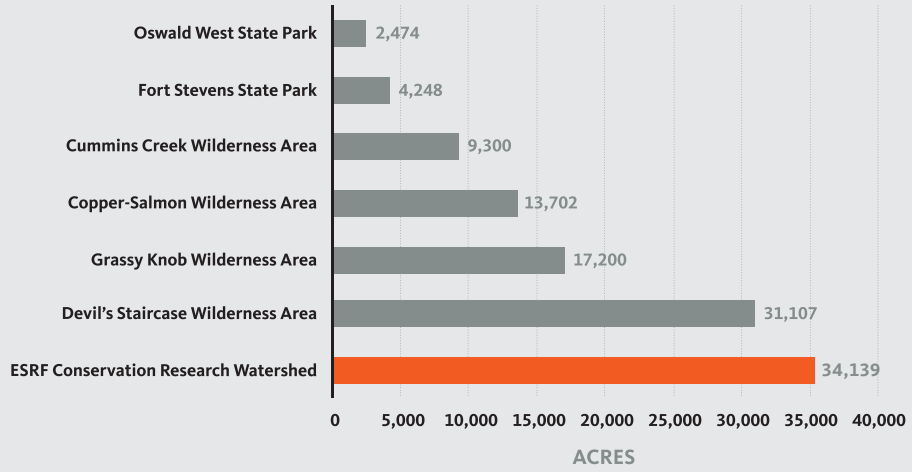



***Figure 9.*** *Number of acres of the largest state parks and wilderness areas in the Oregon Coast Range as compared to the proposed Conservation Research Watershed in an Elliott State Research Forest.*

**EXAMPLES OF RESEARCH CONCEPTS AND OUTCOMES ASSOCIATED WITH RESERVE TREATMENTS:**

- Emulate natural disturbances
- Incorporate tribal perspectives and traditions
- Vary the level of retention of the existing forest canopy in the plantations and riparian forests
- Vary distribution of retained trees in a dispersed or aggregated fashion in the plantations and riparian forests
- Apply treatments across the spectrum of forest ages up to age 65
- Natural thresholds of the size and quantity of standing dead and downed wood
- Carbon uptake and release with natural disturbance
- Climate impacts in unmanaged forests relative to actively managed forests
- Active management as compared and contrasted with natural disturbance processes

A more comprehensive list of potential research questions and opportunities that are compatible with our experimental approach on the Elliott State Research Forest can be found in the draft Research Charter in Appendix I.

## Intensive Treatments in the Management Research Watersheds

1 Even age management using clearcut harvesting techniques suitable for the terrain.

2 Follow all Oregon Forestry Protection Act rules except for self-selected, more stringent requirements in the ESRF riparian areas in headwalls and all streams.

3 Post-harvest application of site preparation and vegetation control practices to ensure seedling establishment and initial growth. This can include a variety of experimental methods to increase our knowledge about the role of vegetation control on seedling establishment and growth. This may consist of the aerial application of herbicides if in compliance with OFPA. Aerial spraying will be used only when necessary and other types of herbicide application are operationally impractical. Over a 60 year period, an intensively treated stand could potentially receive 1-2 applications of herbicide. We need to conduct research using broadly applicable practices so our work can extend beyond the borders of the ESRF. In addition, we are committed to transparency in our herbicide applications and monitoring of them. OSU will engage in monitoring water quality in areas where aerial spraying takes place. Should any evidence be found that herbicide applications in specific target areas are adversely affecting nearby aquatic areas, the practice will be changed in that area.

4 Animal control techniques will not involve the use of rodenticides.

5 Establish plantations at densities that ensure relatively quick canopy closure using species and seed sources best suited for future predicted climate conditions.

6 Maintain stand densities at levels that provide vigorous trees and maintain high wood production through thinning operations. With commercial thinning typically occurring between 35-50years.

7 Determine regeneration harvest and commercial thinning by growth patterns (mean annual increment), vulnerability to disturbances, and markets. With a minimum rotation age of approximately 60 years.

8 Based on context, treatments may vary in rotation length, type of site preparation, species planted, and other

processes. Riparian buffers will be a minimum of 120 feet on fish bearing streams and 50 ft on non-fish bearing streams. These values could be increased or decreased based on identifying key debris flow torrents and the large wood delivery target to fish-bearing streams.

9 As a baseline, all activities will comply with the Oregon Forest Practices Act, the federal Clean Water and Endangered Species Acts.

**EXAMPLES OF RESEARCH CONCEPTS AND OUTCOMES THAT MAY BE ASSOCIATED WITH INTENSIVE TREATMENTS:**

- Resilience and resistance to minimizing tree loss to drought and diseases over decades
- Social values as represented by differences in perceptions and behaviors
- Economic and carbon analysis of increasing rotation length
- Market analysis and impacts of tree size
- Carbon fluxes and pools through time
- Logging technology and forest engineering
- Site preparation and seed sources
- Species and genotypes for climate resilience and resistance
- Clear-cut harvest impacts hydrological changes, erosion and mass wasting events
- Recreation use levels/patterns and perceptions over time
- Density management and wood yield over time
- Response of aquatic ecosystems

A more comprehensive list of potential research questions and opportunities that are compatible with our experimental approach on the Elliott State Research Forest can be found in the draft Research Charter in Appendix I.

## Extensive Treatments in the Management Research Watersheds

1 On **average**, extensive treatments will seek to produce harvest volumes that approximate 50% of the fiber production of stands managed according to intensive experimental treatments. This means that some treatments with lower retention (20%) will have more than 50% relative yield, and those with high retention (80%) will have a less than 50% relative yield. The goal is to have the yield average 50% at the sub watershed level.

2 Extensive treatments are limited to stands that were established following the 1868 fire or regeneration harvests that have occurred primarily since the 1950's. If there are obvious discrete stands and individuals within younger stands that are very old and we make a commitment to not harvest these. However, aging large trees is not precise enough to specify an age to the year. Even with increment cores, determining tree age is not an exact science, especially when some of the oldest trees do not always "look" their age. We also recognize that due to safety issues in camp sites and logging operations and other unforeseen circumstances trees that predate the 1868 fire may need to be removed on rare occasions. However, we are committed to working with the stakeholders to achieve our commitment to the oldest forests and individual trees as part of further planning and project-level implementation of the research platform. The adaptive management approach calls for the development of a list of criteria or "trigger points" that would trigger changes in experimental protocols. Our intention is that members of the advisory board will be a part of developing these criteria or trigger points.

3 Retain the number of live trees needed to meet various experimental goals (and may or may not include established Riparian Management Areas in overall retention goals to study the integration of those areas into upland management objectives). As a result, the percent retained will range from 20-80% of pre-harvest density and should occur in a variety of spatial and age class patterns (including aggregated and dispersed) to encourage a wide range of conditions that align with the integration of objectives.

4 Size of the experimental units will represent the ecosystem's natural disturbance patterns, including the appropriate mix of clumps and open patches, snags, and down wood while recognizing operational constraints. This design will function as a test of pressing questions such as reduced fragmentation on biodiversity and other attributes such as harvest efficacy and safety.

5 Tree age will vary within a stand, with most having a minimum of two age or canopy position age classes. Return intervals for harvest will depend on monitoring growth and meeting the objectives for a range of conditions, including complex early seral to old growth forests.

6 Focus retention areas and prioritize retention preference based on the following:

- **A** A landscape analysis that identifies what is limiting biodiversity today and into the future using a variety of metrics, including species richness, species at risk, genetic diversity, and landscape diversity).
- **B** Prioritize retention of large, mature (complex canopy structures) trees (based on a combination of factors, including DBH, bole and bark characteristics, tree height, and crown and branching characteristics that are underrepresented.
- **C** If the number of large standing dead and down trees are low relative to controls, experimentally test ways to increase their abundance.
- **D** Incorporate designated marbled murrelet management areas and northern spotted owl habitat (not already located in designated reserves) into the highest (60-80%) retention category unless otherwise allowed by an existing HCP approved pursuant to the federal Endangered Species Act and explicitly incorporated into an experimental protocol designed to quantify the impact of extensive treatments on species abundance.

7 Experimentally test if aggregating retention on unstable slopes is critical to providing attributes including mitigation of landslides, delivery of large wood to streams, habitat for owls, murrelets, and other terrestrial species, and corridors for movement within and among watersheds.

8 Limit and selectively use herbicides only where necessary to manage invasive species or as a last resort to promote tree regeneration.Targeted application of herbicides will be used in extensive if regeneration is not successful. Use of fixed wing planes or helicopters will not be practiced due to large number of retained trees.

9 Plant only where regeneration goals cannot be met otherwise.

10 In the landscape analysis, assess and monitor the spatial pattern of retention areas using a combination of factors; including, but not limited to: population dynamics of at-risk species, maximizing opportunity for biodiversity, aesthetics, promoting wildlife habitat favoring early seral conditions, retention of hardwood trees, wood production, harvest methods, and harvest unit size.

11 Riparian forests that emulate their critical roles in natural disturbance and are fully integrated with upland management, thereby meeting the goals outlined in the riparian management plan. These extensive forests will have different configurations of the riparian ecosystem that maintain critical ecological processes.

12 While the goal to enhance biodiversity may be the same in all cases, the extensive treatments will be adjusted because the initial conditions are highly variable. For example, the initial conditions as represented by age on the ESRF are highly variable; therefore, the experimental treatments will require flexibility to maintain relevance.

**EXAMPLES OF RESEARCH CONCEPTS AND OUTCOMES THAT MAY BE ASSOCIATED WITH EXTENSIVE TREATMENTS:**

- Emulate and measure response of natural disturbance
- Tribal perspectives and traditions
- Level of retention of the existing forest canopy
- Distribution of retained trees in a dispersed or aggregated fashion
- Treatments across the spectrum of forest ages
- Thresholds of size and quantity of standing dead and downed wood
- Selective and no use of herbicides
- Tree and shrub regeneration
- Prescribed fire to generate pyro-diversity
- Riparian integration with upslope conditions
- Logging systems under varying levels of retention
- Economic thresholds and markets
- Monitoring objectives and protocols

A more comprehensive list of potential research questions and opportunities that are compatible with our experimental approach on the Elliott State Research Forest can be found in the draft Research Charter in Appendix I.

**EXAMPLES OF ATTRIBUTES THAT WOULD NOT CHARACTERIZE AN EXTENSIVE TREATMENT:**

- Conversion of a forest from a diverse to a less-diverse condition by not retaining key existing legacies
- A selective harvest without accounting for whether the objective of regeneration has been accomplished so that the long-term desired characteristics of the stand are not sustained
- Establishing merchantable volume as the primary or dominant management objective
- Routine or pervasive use of herbicide
- No plan for or monitoring of desired forest, riparian or wildlife attributes
- No landscape level plan

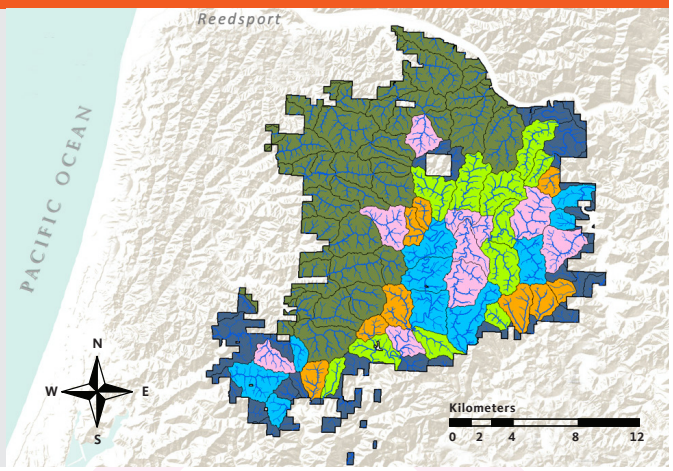
**The following tables and figures provide further detail on the allocation of proposed sub watershed Triad treatments and stand level research treatments as of August 2020.**

## Figure 13. Potential Sub watershed Triad Treatment Assignments

KEY

- CRW
- Extensive
- Triad-E
- Triad-I
- Intensive
- MRW Partial

***Figure 13.*** *Map illustrating the western reserve (CRW) and one potential allocation of sub watersheds Triad Treatments in the eastern half (MRW). Each triad treatment will test different arrangement and types of forest management practices described more fully in the research design brief or in figure 4 below. Partial watersheds have multiple landowners and are not wholly contained in the ESF boundary.*

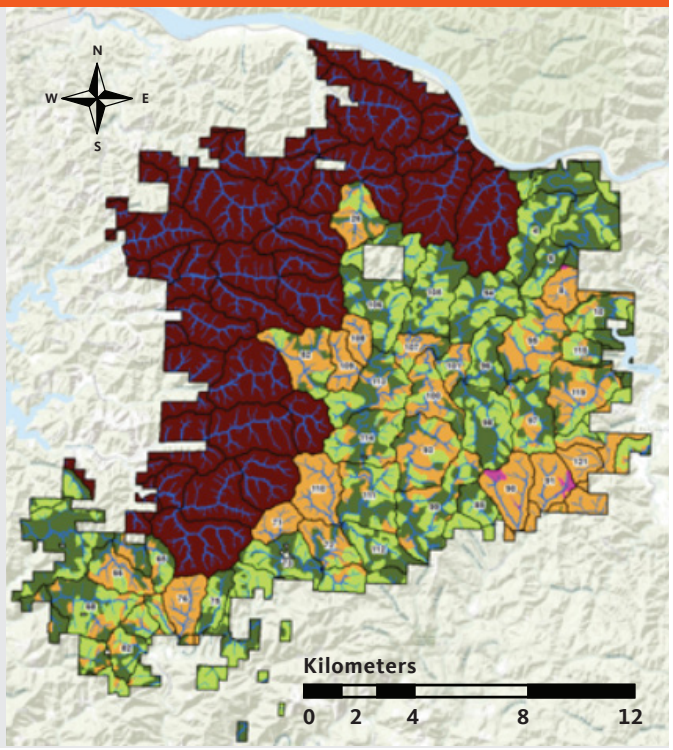



## Figure 14. Potential Stand level allocation of extensive, instensive and reserve treatments

KEY

- MRW Reserve
- Intensive
- Extensive
- CRW
- Extensive Reserve (GT152)
- GRMA

***Figure 14.*** *Draft allocation to illustrate one potential suite of allocations on the Elliott State Research Forest. This is primarily to serve as an example of our goal to find a suite of forest management approaches that integrate fiber production, biodiversity, recreation and aesthetic objectives.*




## Figure 4. Four Triad Treatments

***Figure 4.*** *Four Triad treatments that will be applied at the sub watershed level in the Elliott State Research Forest. All of the sub watersheds (400-2000ac) in the Multiple Research Watersheds will receive one of these four treatments. Note that these are sample proportions, not spatial layout. The treatments are designed to have a roughly equal yield of wood supply using different combinations of reserves, extensive and intensive forest management, with the assumption that extensive has half the productivity of intensive.*

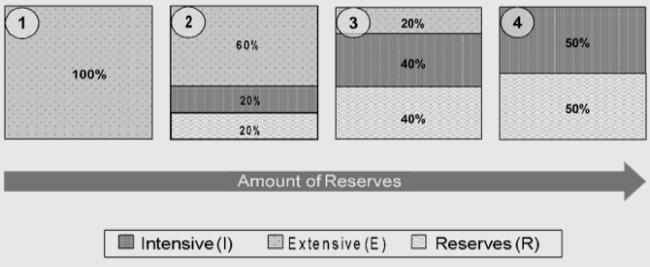


**Table 4. Acres per proposed watershed level Triad treatment allocation**

| Watershed Level Triad Treatment | Gross Acres | GRCA Acres (not including stands in reserve) | Total Acres |
|---|---|---|---|
| Extensive | 5,930 | 636 | 5,294 |
| Triad-E | 9,779 | 1,197 | 8,583 |
| Triad-I | 10,320 | 1,229 | 9,094 |
| Intensive | 10,862 | 1,261 | 9,602 |
| MRW Partial | 11,490 | 1,038 | 10,454 |
| CRW | 34,139 | 3,700 | 30,439 |
| **Total Acres** | **82,520** | **9,061** | **73,467** |

***Table 4*** *shows estimated acres per Triad treatment allocation based on the September 2020 draft allocation. GRMA is Generic Riparian Management Area and was estimated by fixed buffer widths of 100ft and 50ft on fish bearing and non fish bearing streams respectively. There are no GRMA's in reserve as there will not be harvesting in reserves. Definition of Triad Treatments can be found in figure 4. included again below for reference.*

**Table 5. Acres per stand level treatment allocation in the Management Research Watershed (MRW) and the Conservation Research Watersheds (CRW) on the Elliott State Forest**

| Watershed Level Triad Treatment | Stand Level Research Treatments Acres Net of GRMA | | | | Generic Riparian Management Area | Gross Acres |
|---|---|---|---|---|---|---|
| | CRW | MRW Intensive | MRW Extensive | MRW Reserve | | |
| Extensive | 0 | 0 | 5,148 | 146* | 636 | 5,930 |
| Triad-E | 0 | 1,714 | 5,145 | 1,722 | 1,197 | 9,778 |
| Triad-I | 0 | 3,638 | 1,816 | 3,638 | 1,229 | 10,321 |
| Intensive | 0 | 4,797 | 0 | 4,804 | 1,261 | 10,862 |
| MRW Partial | 0 | 4,448 | 1,660 | 4,344 | 1,038 | 11,490 |
| CRW | 34,139 | 0 | 0 | 0 | 0 | 34,139 |
| **Total Acres** | **34,139** | **14,597** | **13,769** | **14,654*** | **5,361** | **82,520** |

***Table 5*** *shows estimated acres per stand level treatment in each Triad treatment allocation based on the August 2020 draft allocation. GRMA is Generic Riparian Management Area and was estimated by fixed buffer widths of 100ft and 50ft on fish bearing and non fish bearing streams respectively. There are no GRMA's in reserve as there will not be harvesting in reserves. Definition of Triad Treatments can be found in figure 4. included again below for reference.*

**These 146 acres in extensive Triad treatment are too old for any harvest and therefore have been designated to reserve.*

ELLIOTT STATE RESEARCH FOREST

# Aquatic and Riparian Area Research Strategy

We cannot implement and study forestry on a landscape scale without addressing the concerns of terrestrial, riparian, and aquatic ecosystems as an integrated system. Riparian forests provide several critical functions, including large wood recruitment, controls on stream temperature, litter input, flow regimes and reducing stream sediment loads that are important for maintaining native aquatic biota in headwater streams. We will use observational and experimental research across the Elliott State Research Forest (ESRF) landscape to explore how different management strategies affect these processes and will inform future forest policy and management practices.

Fundamental aquatic and riparian conservation studies will be set in the context of a research forest that includes studies on terrestrial and aquatic ecosystems. The studies will recognize both as interconnected components of a larger system. Riparian ecosystems potentially encompass a wide range of habitats and conditions across the landscape, including fish bearing and non-fish bearing streams, perennial and intermittent streams, adjacent forests, saturated streamside soils, headwalls, side slopes, ridges, and the biota contained within. Because previous research has primarily sectioned the landscape into seemingly discrete areas such as designated riparian areas along fish-bearing versus non-fish bearing streams, there is a knowledge gap around an integrated whole-ecosystem response to alterations in streamside and key upland forests. How do we sustainably integrate across the forest landscape, including headwalls and intermittent streams, when managing for aquatic biota? By studying a suite of forest management approaches and seeking practices compatible with forest values, we can envision a future where forest management doesn't lead to the degradation of our aquatic and terrestrial ecosystems.

The ESRF will contribute to the recovery of imperiled species by: (1) conducting research that expands our knowledge and understanding of aquatic ecosystems and the ecological processes that influence them in coastal Oregon; (2) conveying findings to land-managers and other interested parties to improve management and conservation of aquatic ecosystems in coastal Oregon and elsewhere; and (3) by restoring key ecological attributes and processes that affect onsite and downstream habitat for Oregon Coast Coho Salmon ESU (OCCS) in streams of the ESRF. The ESRF has a limited potential to directly contribute to the increased production of the ESU because it is dominated by steep streams and narrow valleys, which have a limited potential to provide productive habitat for coho salmon. However, the areas in the lower portions of watersheds that originate on the ESRF, but that are on private lands downstream of the ESRF, have some of the greatest capacity to provide freshwater habitat and production for coho salmon within the range of the OCCS ESU. The ESRF can definitely contribute to the recovery of OCCS by providing wood, sediment, high quality water, nutrients, and food to the lower portions of watersheds that are outside of the ESRF, where the potential for productive habitats is greatest. Thus, the ESRF is the foundation for developing comprehensive recovery and conservation efforts for the three independent coho populations that it supports [C6] (Lower Umpqua, Tenmile, and Coos).

## Core Strategies

The Elliott State Research Forest will advance knowledge of riparian areas and aquatic systems through passive management and active restoration experiments. The core framework for studying riparian areas is part of the land-use allocation of watersheds across the forest into Conservation Research Watersheds (CRWs) and Managed Research Watersheds (MRWs). In the approximately 35,000-acre CRW, all actions will aim to research long-term, landscape-level conservation outcomes. In the Management Research Watersheds (MRW), a range of research treatments are applied at a watershed scale, with multiple replicates, to support the investigation of a wide variety of response variables.

Typically, in actively managed forests, designated riparian conservation areas (RCAs) of a given width are delineated and explicitly managed for conservation of aquatic and riparian functions. The ESRF and proposed research design scale creates a unique opportunity to measure the long-term effects of varying levels of integration of RCAs with upland forests on species recovery. Within the reserve treatment areas that are not actively managed, the relevance of designated RCAs is less evident. Currently, approximately 61% of the ESRF is proposed to be placed in reserves, where restoration thinning of approximately 14,000 acres of existing Douglas-fir plantations may occur over the next 10-20 years and where no harvests will occur on roughly 37,000 acres of naturally regenerated older forests. Therefore, in the near term, the aquatic, riparian and upslope ecosystems within the unlogged reserves will be the same fully integrated system that has been in place since the last significant disturbance over 100 years ago, without need for RCAs. Designated RCAs are most applicable in the approximately 18.5% of the landscape under Intensive management, with even-age clearcuts on a 60 year or greater rotation. The older, more diverse designated RCAs will be less integrated with these young upslope homogenous plantations. With their retention of legacies, longer rotations, and canopy complexity, the extensive treatments on 20% of the landscape will be managed to facilitate better integration with the RCAs.

The research design for the forest intends to move beyond forest management alternatives alone and also explore

restoration actions designed to improve the ecological function of RCAs (including forests and associate streams). Further, because we are approaching research in the ESRF from a whole system perspective, the riparian and aquatic research program will encompass the assessment of research outside riparian areas (such as research on road restoration and decommissioning, recreation, harvest on steep slopes, earth movement, and natural disturbances). Upslope activities will include components to preserve their integrity and understand resilience and resistance of RCAs associated aquatic ecosystems.

## Key Attributes of a Riparian Conservation Strategy

**Land Use Allocation:** The large area of forest placed in reserve in the CRW anchors the conservation strategy by establishing a contiguous area managed for long term ecological functions in support of full integration of terrestrial and aquatic ecosystems. Here, research-related actions will be limited to those that are likely to benefit the long-term conservation of native biota (e.g. restoration of forest complexity). In the MRW, research will utilize a framework including reserve forests and forests influenced to a varying degree by timber harvesting. The MRW will be capable of testing the ability to integrate and quantify these strategies' capacity to accommodate a broader suite of values and variables.

**Riparian Conservation Areas:** The aquatic and riparian conservation component of the system-based research strategy will rely on a set of designated RCAs. These RCAs design will maintain and restore vital ecological processes that influence the aquatic ecosystem in the Intensively managed and Extensively managed treatments. In the Reserves, the designated RCA will only be applicable for a limited time when thinning occurs over the next 10-20 years. Activity within RCAs will be limited to forests where prior management actions have resulted in conditions that require limited intervention to test restoration of ecological processes (such as over-stocked plantations, or the absence of large conifers or hardwoods). The activity may occur throughout the entire width of the RCA with the objective of removing trees that were established following harvesting activities that have occurred since the 1950's. The criteria and characteristics of restoration and experimental treatments in RCAs will always be to maintain and restore the ecological process. The aim of the treatments will not be to produce timber volume. All treatments will occur within an experimental context with monitoring, data collection and analysis, and reporting within an adaptive management framework. Trees that are cut down in the RCA will remain on site and some may be removed depending on the specifics of the particular research study. A detailed study plan will be submitted to the advisory board for the ESRF (the structure and operation of this is not complete at this time) for approval before the study is initiated. There may be some studies, such as those that examine the effects of additional light reaching the stream by reducing canopy density in the riparian area, that may require the felling or girdling of trees over 65 years of age when there are a large number of these trees in the experimental area. In such cases, only trees that predate the 1868 fire may be felled or girdled, and only after the study plan is reviewed and approved by the advisory board.

**Non-fish bearing streams:** These streams are the most abundant portion of the riverine network of the ERSF, comprising more than 80% of the stream miles on the ESRF. Non-fish bearing streams are critical to maintaining the aquatic ecosystem's productivity by providing cool water, wood, sediment, fish prey, and nutrients to fish-bearing streams. These streams provide habitat for a suite of native amphibians, insects, birds, bats and other organisms, and they function as a corridor for energy and nutrient flux within the watershed. Research on these streams will focus on: (1) Their ecological role and influence on fish-bearing streams; (2) How they may serve as movement corridors within and among watersheds for terrestrial organisms, energy and carbon; (3) How to treat previously managed forest areas adjacent to these streams to change the vegetative composition and structure. By doing so, it will create opportunities to study the influences on riparian soils and use by terrestrial and riparian organisms, the behavior of landslides and the effects on fish-bearing streams, and the production of invertebrates and nutrients that transport to fish-bearing streams.

In recognition of the importance of non-fish bearing streams we are expanding the stream channel network in our analysis to facilitate the identification of headwater areas. Our complete modeled stream network is 2,099 miles, which is approximately 3 times the length of the stream network defined by ODF (702 miles) and by the National Hydrography Dataset (747 miles).

**Fish bearing streams:** We used the regulatory definition of fish-bearing streams , which encompasses the upper limit of coastal cutthroat trout in stream networks. Cutthroat trout presence generally extends further into the headwaters of stream networks than any other fish species, even higher than non-game fish such as sculpin. We have defined fish bearing streams as those with a gradient of 20% or less, which is based on eDNA data for resident cutthroat trout, and provides a fish-bearing stream network approximately 30% longer than that employed by ODF on the Elliott State Forest.

**Steep Slopes:** Steep slopes are a key attribute of the ESRF landscape. If you add up the area proposed for the CRW reserve, the reserves in the MRW and the riparian conservation areas (RCA) approximately 61% of the Elliott will be placed in reserves or highly protected status. Many of these reserve areas will provide additional protection to steep slopes since, aside from some initial restoration thinning in the plantations being converted to reserves, there will be no harvesting or sustained soil disturbance. The riparian strategy is focused on increasing protections to sites with steep slopes which contain streams

most likely to deliver wood to fish bearing streams. In the approximately 17% of the land base in extensive harvests, there will be longer intervals between regeneration harvests and high levels of retention from 20-80% during harvest entries thereby reducing logging-based disturbance on steep slopes. In the remaining 18% of the land in intensive regeneration harvests we will follow the OFPA rules related to steep slopes that include reports on risk level. The Tyee formation has special limits for harvest operations on steep slopes. Side slopes greater than 75% and head walls greater than 65% require special consideration related to ground disturbance during timber harvests. The combination of large-scale reserves, RCAs and extensive harvests will provide significant resource protection on approximately 81% of the Elliott.

As integrators of local and watershed-scale processes, streams in the ESRF are ideal locations to research how steep slopes, directly and indirectly, affect ecological processes in aquatic ecosystems. There are opportunities to better understand the integration of steep slopes and the streams confined by them and how this relationship changes with time and space. Do key processes leading to the production and delivery of large trees and sediment/nutrient pulses to the aquatic systems occur more quickly in steep landscapes? And if so, what implications does this have for the retention of carbon, nutrients and biota in headwater ecosystems? We are particularly interested in quantifying the role of large wood in sorting sediments and creating functional habitat in steep landscapes. This process is generally understood but lacks long-term empirical data. Studies will seek to provide knowledge of short and long-term impacts of headwater stream retention and headwater stream failure (landslides). While conducting this research, we will monitor the landscape using the High Landslide Hazard Location database produced by the State of Oregon, followed by more site-specific examinations to address the hazards brought by specific operations.

Our riparian protection strategy is integrated with shallow translational landslide probabilities in non-channel areas and is conceptually based on identifying and prioritizing for protection those slopes and stream channels most likely to initiate and sustain a debris torrent that delivers large wood to fish-bearing streams. Potential debris torrent initiation sites and debris torrent channels are a component of the evaluation of large wood recruitment potential that we are employing in our riparian strategy. As a key part of our debris torrent and wood recruitment modeling methodology, delineated stream channels are extended far upslope and into headwall areas that are not identified as stream channels in existing stream inventories, which is approximately three times the length of the channel network identified by the Oregon Department of Forestry and in the National Hydrographic Dataset (NHD). This network includes areas that may be susceptible to debris flow initiation and, to the extent possible with the available data and research methodologies, identifies these areas as potential sources of large wood to fish-bearing streams. Additionally, our modeling identifies areas on slopes not identified as stream channels that have a high probability of initiating shallow translational landslides that evolve into a debris flows that deliver large wood to fish-bearing streams. Riparian buffers will extend to these high-probability areas.

**Roads:** We commit to reducing the current road network density and their related adverse impacts on the ESRF, and in particular in the Conservation Research Watersheds, while maintaining and balancing for necessary access for research, harvesting, management, education, fire protection, and recreation. Roads are imposed on the landscape to maintain access to remote sites for several uses, including recreation, firefighting and removing wood products. Roads also represent a significant human impact on the larger forest system in terms of chronic long-term disturbance, fragmentation, sediment yield, and access for invasive species. Regardless of the use, gaining access via roads disrupt ecosystem processes essential for the proper functioning of aquatic and riparian ecosystems. This disruption is especially evident where there are hydrologic connections between the road and aquatic networks such as sediment-laden runoff and rapid peak flows. Given the density of roads and streams on the ESRF and the presence of listed species, ways to mitigate impacts of strong hydrologic connections are areas of potential significance and wide application in the Northwest.

While still early in development, the OSU proposal for an ESRF envisions studies on the degree of hydrologic connections of current and legacy roads and their primary locations on the ESRF. Monitoring will identify candidate roads for modification with the goal of testing methods for reducing hydrologic connections through road restoration, and long-term monitoring of subsequent impacts on habitat. In support of this, the ESRF will maintain an inventory of the road network to identify current and legacy roads that present a risk to the aquatic and riparian system and seek to implement modifications to the road system prioritizing segments that pose the highest risk to aquatic resources.

We will examine the possibility and effectiveness of partial road decommissioning in the context of providing access for firefighting and recreation consistent with reserve goals and State Land Board guidance. The road network in the CRW and MRW reserve watersheds will likely decline over time, and new, permanent roads may be constructed as part of a strategy to decommission road segments that are a problem. Still, we must implement such a strategy in the context of the forest research plan.

OSU is committed to working with the local watershed councils to restore and improve the ecological condition of streams on the ESRF. OSU will ensure that the work of these groups continues by: (1) supporting their efforts to secure funds from OWEB and other sources; (2) attempting to integrate restoration efforts into the research design; and (3) providing data for and input into the restoration work of the various watershed groups. The councils should be able to use the establishment of the ESRF as the foundation for developing a comprehensive watershed recovery program for each of the independent populations that occur on the ESRF. The councils will be briefed on research activities and findings on regular basis once the ESRF is established.

**ATTACHMENT C**

*Attachment C describes the steps we are taking to conduct a landscape analysis to allocate and integrate the riparian areas with adjacent research treatments and for determining RCA width requirements in intensive and extensive research treatments.*

## Integrating riparian areas with adjacent research treatments

**The process for determining where wood delivery will occur and prioritization for RCA width requirements in Extensive and Intensive research treatments.**

We propose to use modeled potential large wood recruitment to fish-bearing streams as a criterion for the development and evaluation of stream buffer strategies incorporated into the research designs of MRWs. The aquatic and riparian research strategy envisioned for the ESRF relies on wood recruitment for its specific value as habitat for imperiled species and as a proxy for the attainment of other ecological functions. Typically, most large wood recruited to fish-bearing streams comes from channel-adjacent sources through processes such as chronic and episodic tree mortality, bank erosion, and landslides. These same processes recruit large wood to non-fish-bearing channels. In steep and constrained non-fish-bearing (NFB) channels, episodic debris flows can deliver substantial quantities of accumulated large wood to fish-bearing streams. However, not every NFB tributary has the same potential to deliver wood. Therefore, we want to integrate our treatment of the riparian system with the upslope forests' treatments to ensure water quality and fish habitat as follows.

1. Establish the wood recruitment goal for the MRWs in the ESRF. The CRWs will have a goal of 100% of potential wood recruitment to fish bearing streams since the system is being managed as a reserve.

2. Delineate and classify NFB streams on the ESRF as to their potential for wood recruitment to fish bearing streams. Identify tributaries and headwalls with high potential for wood recruitment and other conservation components.

3. Calculate site potential tree height and riparian buffer needed to ensure wood delivery to the stream.

4. Overlay potential Reserves, Intensive and Extensive treatments, and adjust to better integrate Reserves and Extensive with NFB streams with high potential for wood recruitment. Reserves, Extensive treatments, and RCA's will have the largest trees on the landscape, so they will best emulate historical conditions.

5. Calculate wood recruitment potential and compare against goal. Repeat as needed.

6. Create riparian systems in which different combinations of stream buffers on fish-bearing and non-fish-bearing systems achieve a stated goal for wood recruitment into FB streams.

7. Use riparian systems to test the effectiveness of buffer combinations relative to tradeoffs with other social and ecological attributes, such as habitat, accessibility, and fiber yield. Design several different wood recruitment strategies that meet the goal and develop an experiment to test effectiveness and tradeoffs with other values (see example Figure 12).

**Figure 10. Example of the first step in integrating treatments along the West Fork of the Millicoma River**

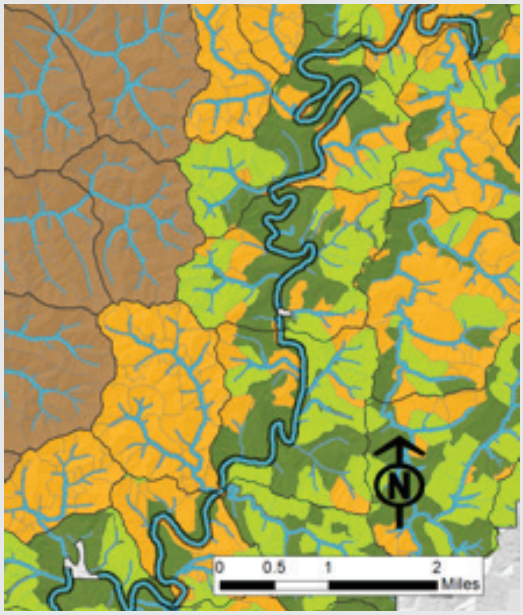



***Figure 10.*** *Example of the first step in integrating riparian and upslope treatments along the West Fork of the Millicoma River on the ESRF. The goal is to ensure the presence of large trees where wood recruitment is most likely to occur from riverside to headwall. The current percentage of each riverside riparian treatment is listed in table 2.*

**Table 2. Percent of river miles along the West Fork of the Millicoma River**

| Treatment | Percent bordering river | Proposed riparian conservation area width (ft) |
|---|---|---|
| Extensive | 26% | 200 |
| Intensive | 6% | 200 |
| Reserve | 68% | NA |

***Table 2.*** *Percent of river miles along the West Fork of the Millicoma River that are bordered by the proposed experimental treatments in Figure 10.*

## Figure 11. Proposed Stand level allocation of extensive, instensive and reserve treatments

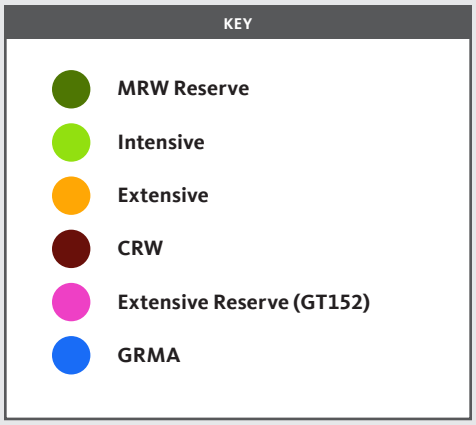
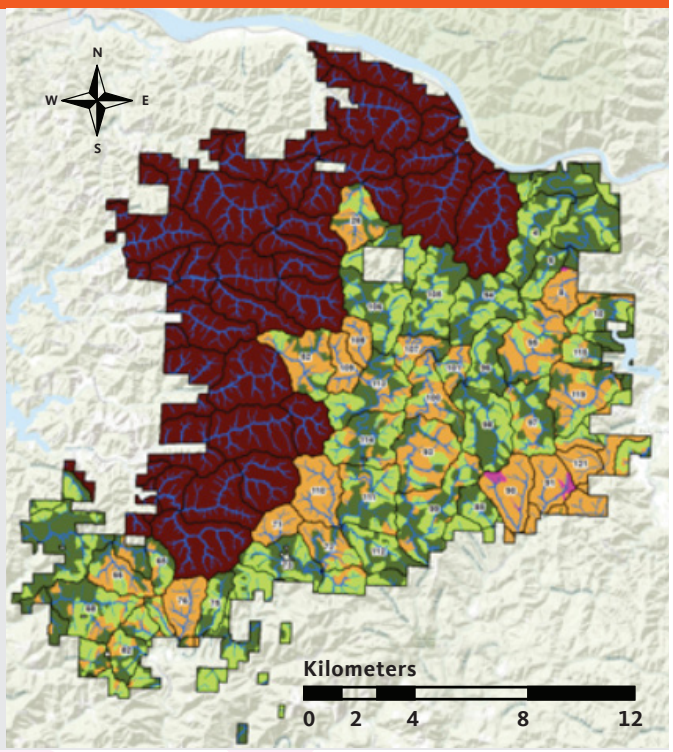



*Figure 11. Map showing proposed stand level allocation of intensive, extensive, extensive reserve and GRMA (Generic Riparian Management Areas). GRMA's were estimated by fixed buffers of 100ft and 50ft on fish bearing and high debris torrent non fish bearing streams respectively that flow through areas where timber harvests will occur.*




## Figure 12. Three example buffer configurations with ~70% wood yield on the Elliott State Forest

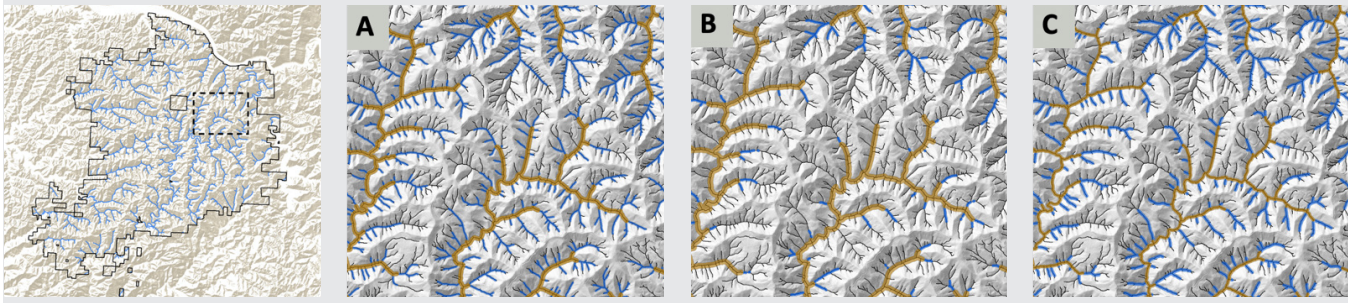



**Table 3. Three example riparian buffer width scenarios attaining ~70% wood recruitment**

| Alternative | Fish-bearing | | | Non-fish-bearing | | | Total Modeled Stream Miles | Total ODF Stream Miles | Total NHD Stream Miles | Protected Potential Recruitment | Total NHD Stream Miles |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Buffer Width (feet) | Buffered Miles | Total FB Stream Miles | Buffer Width (feet) | Buffered Miles | Total NFB Stream Miles | | | | | |
| A | 100 | 237 | 237 | 50 | 721 | 1,862 | 2,099 | 702 | 747 | 70% | 16.5% |
| B | 120 | 237 | 237 | 60 | 151 | 1,862 | 2,099 | 702 | 747 | 70% | 10.8% |
| C | 80 | 237 | 237 | 70 | 706 | 1,862 | 2,099 | 702 | 747 | 70% | 14.8% |

## ATTACHMENT D

*Attachment D is intended to provide initial riparian area treatments and details on stream buffers in the CRW, MRW, and the West Fork of the Millicoma River.*

Aquatic and riparian treatments are structured to test the effectiveness and tradeoffs of providing critical ecological processes, such as wood recruitment, cold water, litter fall, and sediment, all of which are important to Coho salmon. Because past management has reduced the supply of wood in streams in the Elliott and other Coast Range forests, particularly of large wood, ensuring high levels of wood recruitment necessitates riparian buffers wide enough to encompass many other riparian functions.

Monitoring and data analysis will test large wood's ability to be a proxy for other ecological functions while ensuring riparian functions are protected to achieve the desired level of effectiveness needed to meet the ecological, social, and regulatory requirements for the RCAs. The research plan objective is to attain nearly 100% of potential wood recruitment in the CRW and reserve watersheds located in the MRW, and a minimum of 70% in the portions of the MRW that are not in reserves.

Research protocols call for RCAs to vary in size and configuration according to stream type and upslope research treatment. Stream types reflect the presence of fish, timing of flow (perennial versus seasonal), and susceptibility to landslide-associated debris flows that deliver wood to fish-bearing streams. Measure RCAs as the slope distance from the outer edge of the channel migration zone and reference to a site potential tree height of 200 feet, per local BLM data. The ESRF research design, in which the RCAs play a critical role, allows for varying, site-specific implementation, with a minimum set of standard prescriptions applied as set forth below.

### STREAM TYPES:

1. Fish-bearing: Streams connected and accessible to reaches with a gradient of 20% or less.

2. Perennial non-fish bearing: Streams modeled as providing year-round flow but not having game fish.

3. Key Debris Flow Torrent intermittent streams: Streams with a high potential to deliver wood to fish-bearing streams. These streams are typically steep, with few gradient breaks and with approximately 90-degree angle of entry into fish-bearing streams.

4. Other: Streams primarily intermittent streams with low potential for wood delivery to fish-bearing streams.

### RCA BUFFERS IN THE CRW AREA AND AREAS DESIGNATED AS RESERVES IN THE MRW:

The Reserve treatments include existing Douglas-fir plantations, in recognition of the need for a focused effort to recruit future old stands and unlogged naturally regenerated older forests. Therefore, Reserves will have two starting points: a) Exploring treatments to restore and enhance conservation value in established plantations transitioning to older, more complex forests; b) Conserving unmanaged mature forests as they move through natural successional processes. Since there is no harvesting in "b", there is no need for designated RCAs. Designated RCAs are only applicable when thinning adjacent to reserve stands to restore dense Douglas-fir plantations. Once these thinning treatments are complete, there will be no more harvesting in the Reserves, thus the designated RA will integrate with the surrounding forest over time. However, during thinning, RCAs at these locations will be 200 feet slope distance on fish-bearing and non-fish-bearing perennial streams, and key debris flow torrents. Thinning to reduce the density of existing plantation stands within RCAs buffers that are less than 65 years of age may be undertaken if determined necessary to support and enhance long-term ecological functions of the RCAs. Thinning would primarily be conducted to promote the more rapid development of large trees that can potentially be recruited to the stream or the establishment of hardwoods to provide higher quality litter resources to the stream, increase habitat diversity and stream productivity. No removal of residual trees (>65-year-old trees as of 2020) will occur from the RCA or upslope areas during thinning operations.

### RCA BUFFERS IN THE MRW:

The following are standard prescriptions that apply to RCAs adjacent to Intensive and Extensive treatments. No intensive stand replacement management will be conducted within RCAs. Thinning to reduce the density of less than 65-year existing plantation stands within RCA buffers may occur, but only in the context of a study aimed to understand how management can enhance long-term ecological functions of the RCA.

- Fish-bearing: 120 - 200 feet
- Perennial Non-Fish: 50 - 200 feet
- Key Debris Flow Torrent: 50 – 200 feet for high potential

The specific size and configuration of the different RCA components will depend on the level of desired wood delivery potential.

### WEST FORK MILLICOMA RIVER PROPOSED RCAS:

The designated RCAs for the West Fork Millicoma River from its entry into the ESRF in the southwest portion of the forest through the confluence with Elk Creek will be established and maintained as follows:

- The RCA will be a distance equal to the site potential tree height, (200 feet measured as the horizontal distance from each side of the channel migration zone) on either side of the river and 200 feet measured as horizontal distance along any non-fish bearing stream that has a high potential to deliver wood to the adjacent fish-bearing stream.

- Note that under the current research plan, the river's main channel will be bordered by 68% Reserves, 26% Extensive and 6% Intensive treatments. Since 68% of the river is bordered by Reserves that will not experience timber harvests, the area protected greatly exceeds the 200' designated RA (Table 2.).

- To further minimize the potential for adverse impacts to this ecologically and recreationally valuable region, the approximately 30% of the West Fork Millicoma watershed in Reserves and 30% of the area in Extensive can be integrated with the non-fish bearing streams identified as high potential for debris flow torrents that deliver wood to fish-bearing streams. Doing so would ensure the wood delivered during a debris flow will be large diameter.

# Elliott State Research Forest

## Research Opportunities Under the Triad Research Design

Although the unifying 'grand vision' for the Elliott is the question of how to meet society's wood demands while maintaining biodiversity, carbon sequestration and other socio-ecosystem processes, there are numerous opportunities short term and long-term research on a wide variety of topics.

A list of potential examples of the types of short term and long term research project, research questions, and possible collaborations have been compiled from several sources: the ESRF Exploratory Committee, three meetings focused on discussions with researchers from the College of Forestry and Fish and Wildlife, and external reviews from research faculty at University of Oregon, Swedish University of Agricultural Sciences, University of Sheffield (UK), The National Center for Air and Stream Improvement, Colorado State, and Oregon State University. We have also included recent concept paper submissions to the Fish and Wildlife Habitat in Managed Forests research program that is led by the College of Forestry, but includes a wide range of collaborators.

### CLIMATE CHANGE & CARBON

- We have been invited to join the Adaptive Silviculture for Climate Change project.
- Microclimate instrumentation and modeling such as forest canopy wetness and temperature dynamics and accompanying physiological research.
- Interdependence of carbon sequestration and biodiversity across regions.
- Ecosystem modeling of forest carbon and water stocks and fluxes (with ED2 and/or FATES-HYDRO), to examine questions like the impacts of harvesting on carbon stocks and fluxes as well as surface energy balance.
- Does terrain and fog in this rugged ecosystem provide hydroclimatological heterogeneity that contributes important biophysical refugia and environmental buffering to this system, i.e., locations experiencing less exposure to climate change/climate extremes, climate variability?
- Can forest management and conservation approaches be used to support ecosystem resiliency in a changing climate?
- What is the relationship between forest management practices and carbon cycling in temperate conifer forests?
- Soil productivity and long-term aspects of climate change (soils). Contemporary harvesting practices have maybe brought down sedimentation levels back to normal levels, but there's the rare events that could blow materials out (happening more frequently than in the past). This is something we can't do in the Andrews without active management.

### SOCIAL, ECONOMIC, & RECREATION

- How do we monitor and manage human access to forested landscapes across large spatial and temporal scales?
- How do different management practices influence the social capitol of stakeholder groups?
- How do we incorporate traditional ecological knowledge into the research, education, and outreach objectives for the ESRF?
- How do recreationists perceptions of management practices change in relation to the continuum of triad treatments?
- What are the types, levels, and extent of recreation-related impacts across the ESRF and triad continuum?
- What is the process and outcomes of a governance structure for the ESRF?
- Socio-economic and cultural impacts of the triad dichotomy
- How do we provide a sustainable supply of forest products without compromising cultural ecosystem services?
- The exploratory process we are currently undergoing is creating several relevant social science questions pertaining to forest governance models, pubic trust, recreation, public health, economic viability, and rural development.



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## AQUATIC

- Developing an intrinsic potential model from LIDAR to evaluate habitat conditions for Coho Salmon under different scenarios of forest management.
- Stream temperature network instrumentation to evaluate downstream effects of forest management.
- Environmental DNA to asses aquatic biodiversity across working forests.
- Mapping connectivity of aquatic systems at the Elliott State Research Forest.
- How forest structure created by regeneration management and natural disturbances affect streams. Within streams, exploring wood input and wood movement, aquatic biogeochemistry and the resident and anadromous fish in this catchment system.
- How does timber harvest or fire influence how water storage and transit times change within a catchment? Is it sensitive? Is there a gradient considering a range of management activities?
- How does the gradient of potential management activities affect both hydrologic and geomorphic processes (flow of groundwater, water T, landslides, debris flows, wind throw?) Is there a threshold where management levels produce a significant change?

## FOREST PRACTICES & MANAGEMENT

- Roads and associated disturbance - a key difference in the system and related to several of the thematic research areas (e.g. biodiversity, disturbance, water quality).
- Alternate road surfacing systems: operational performance, environmental impact, cost, sensitivity to fire.
- Worker hazard recognition and risk assessment in complex silviculture systems.
- Managing forest operations to minimize energy consumption; comparing new ground based steep slope harvesting systems to traditional cable systems.
- Creating a parallel research forest in Sabah, Borneo that would be a mirror experimental project in a tropical forest. Oregon could build on its ability to serve a capacity building and modeling in mixed use forest landscapes (College of Forestry International Programs).
- How does the gradient of potential management activities affect both hydrologic and geomorphic processes (flow of groundwater, water temperature, landslides, debris flows, windthrow)?
- How does the frequency and magnitude of landslides change in managed and unmanaged terrain? How does this compare under baseline conditions or extreme events? The Elliott is a perfect testing ground due to its relatively homogeneous geology.
- Access places pre-harvest and we could study organismal response to harvest and how harvest might impact dispersal of organisms that have sub-stand home ranges.
- Given that we need X wood supply, what is the best way to achieve this to minimize costs to other ecosystem processes/ services (including biodiversity)?
- Are there means of optimizing harvest system planning in the context of potential impacts on soil and water?
- Can we identify the Pareto frontier (at least 4 points) between biodiversity conservation and timber production under a variety of climate projections?

## FIRE & DISTURBANCE

- Large-scale prescribed fire impacts on terrestrial and aquatics ecosystems.
- Do natural influences (i.e. extreme events, geology, climate) outweigh management activities in the long-term?
- How do disturbances (e.g. fire, wind, invasive species) move across the landscape with different levels of management?

## SOIL

- Soil productivity and long-term aspects of climate change (soils).
- Contemporary harvesting practices have maybe brought down sedimentation levels back to normal levels, but there's the rare events that could blow materials out (happening more frequently than in the past). This is something we can't do in the Andrews without active management.



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## TERRESTRIAL

- How does edge density/ distance to edge influence MAMU occupancy rates and nest success?
- Does mature fragment size influence occupancy and nest success? We have one massive patch that will be aging over time (35,000 acres to the west), and then a gradient in patch sizes in the east (not sure of range but say 5 – 300 ha).
- Overall, which management strategy best conserves MAMU populations?"
- Bioacoustic monitoring with auto-recognition of marbled murrelet, to lead to terrestrial monitoring network. By automating extractions of bird syllables to recognize species by vocalization, Songmeters can collect audio data (similar to experiments conducted at HJ Andrews on songbirds) for monitoring in diverse and expansive terrains.
- A study looking at nest success in response to harvest/thinning, which will help answer some of the questions around thinning that's taking place on USFS lands
- Does edge contrast matter (mature forest to intensive management versus mature forest to 'ecological forestry') The prediction here that the latter might be worse because of the early seral shrub diversity, which should result in more nest predators. 'Ecological forestry' could also include various sorts of things, so we'd have the chance to get at a bunch of the questions relating to adjacent thinning effects and landscape-scale effects of thinning.
- Forest carnivore habitat and populations (martens plus) – we can look at prey base dynamics at small scales but can only model and monitor larger-scale population dynamics and movement patterns of the carnivores.
- Do conclusions about land management strategies from tropical agricultural landscapes hold, or are an entirely different set of hypotheses supported?
- Maintain a focus on the size and configuration or spared patches. This is a key question that should be embedded in the experiment.

## FISH AND WILDLIFE HABITAT IN MANAGED FORESTS (FWHMF) CONCEPT PAPER SUBMISSIONS

- How do riparian forest gaps affect macroinvertebrates and fish diet in headwater streams –Dana Warren
- Development of a UAV based method of assessing the effectiveness of riparian areas in regulating stream temperature- Bogdan Strimbu, Kevin Bladon
- Balancing values in forested landscapes: Prioritizing distributions of beaver dams in riparian systems- Jimmy Taylor, Jason Dunham, Brenda McComb, Vanessa Petro, John Stevenson
- Choosing retention trees for cavity nesting wildlife- David Shaw, Jared LeBoldus, Joan Hagar, Francisca Belart
- The impact of fire and management actions on demographic rates of a forest health indicator group- James W. Rivers, Jake Verschuyl
- Aggregated early seral habitat in intensively managed plantations – do songbirds notice? - Klaus J. Puettmann, Matthew Betts
- Development of Molecular Monitoring Tools for Enhanced Management of High Priority Species- Taal Levi, Brian Sidlauskas, Jim Rivers, Rich Cronn, Brooke Penaluna
- Biodiversity in Natural and Managed Early Seral Forests of Southern Oregon - Meg Krawchuk, Matthew Betts, James Rivers, A.J. Kroll, Jake Verschuyl
- Assessing pollinator response to forest management: Method development that will determine the soil and ecological factors controlling the distribution of ground-nesting bee nests- Jeff Hatten, Jim Rivers, Ben Leshchinsky, John Bailey, Rebecca Lybrand, Chris Dunn
- Purple Martins as Indicators of High Quality Early Seral Forest Habitat - Joan Hagar, Taal Levi
- Impacts of Cable-Assisted Steep Slope Harvesting on Soil and Water Resources- Woodam Chung, Kevin Bladon, Jeff Hatten, Ben Leshchinsky, and John Sessions
- Early seral habitat longevity in production forests in the Oregon Coast Range - Matt Betts, AJ Kroll
- Effect of Tethered Assist Harvesters on Water Quality- Francisca Belart
- How does contemporary forestry influence aquatic food webs in headwater streams – Ivan Arismendi, Dana Warren
- Development of Molecular Monitoring Tools for Enhanced Management of High Priority Species – Taal Levi, Jim Rivers
- Reducing sediment discharge from forest roads using alternate surfacing materials – Kevin Lyons
- Assessing Stump Use by Small Mammals and Pollinators in Young and Mature Douglas-fir Stands – Matthew Powers, Joan Hagar
- Assessing the response of aquatic biota to alternative riparian management practices – Dana Warren, Ashley Coble
- Quantifying Postfire Salvage Woodpecker Habitat with 3D Remote Sensing – Michael Wing



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- Black-Backed Woodpecker Vital Rates in Unburned and Burned Forest Within a Fire-Prone Landscape – Jim Rivers, Jake Verschuyl
- Assessing pollinator response to natural and anthropogenic disturbances in mixed-conifer forests – Jim Rivers, Jim Cane
- Revisiting the CFIRP: Assessing long-term ecological value and characteristics of snags created for wildlife – Jim Rivers, Joan Hagar
- Assessing the demographic response of early seral songbird species to intensive forest management – Matt Betts, Jim Rivers.

This list represents a broad and deep look at the potential for research using our proposed research design and it is still under development. The time dimension of these projects spans one season to centuries with projects that could be classified as near term (0-10 yrs), mid-term (20-60 yrs) and long-term (70+ yrs). This list demonstrates that the ESRF can provide a base for essential forest research.

## EXAMPLES OF NEAR, MID, AND LONG-TERM STUDIES

**Near-term**

- Structured tests for tethered harvesting and grapple yarding on steep slopes (no one on the ground)
- Structured tests comparing short and longwood harvesting systems (stump to mill)
- Testing rock replacement strategies for forest roads
- Testing rock substitutes for forest roads
- Improving logistics for tree planting on steep ground
- Improving pole recovery from forest stands
- Testing non-mechanical methods of PCT
- Optimizing thinning decisions in real-time
- Monitoring 2nd generation genetically improved stock
- Testing all electric trucks on steep forest roads
- Monitoring regeneration under alternative leave tree configuration for Extensive
- Monitoring growth under Extensive and Intensive systems
- Monitoring biodiversity and Extensive and Intensive systems

**Mid-term**

- Monitoring regeneration under alternative leave tree configuration for Extensive
- Monitoring growth under Extensive and Intensive systems
- Monitoring biodiversity and Extensive and Intensive systems
- Monitoring micronutrient needs for DF stands
- Structured fertilization trials to accelerate growth
- Testing 3rd / 4th /5th generation genetically improved stock
- Testing remote controlled harvesting and transport equipment

**Long-term**

- Monitoring regeneration under alternative leave tree configuration for Extensive
- Monitoring growth under Extensive and Intensive systems
- Monitoring biodiversity and Extensive and Intensive systems

While the College of Forestry is providing leadership, the research at the ESRF should extend well beyond the College. As in many of our programs, we continue to look for partnerships with our campus, regional, and international colleagues.



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