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.

Oregon State University

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.

Oregon State University

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

Oregon State University

- 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.

Oregon State University