2022 Virtual

# Olympic Experimental State Forest
# Science Conference

## Linking Science to Natural Resource Management

**Wednesday, May 4, 2022, 8:30 a.m. to 4:30 p.m. | on Zoom**

# Contents



# About This Conference

Welcome to the fifth annual Olympic Experimental State Forest (OESF) science conference, hosted by the Washington State Department of Natural Resources (DNR). This year's conference will focus on engaging stakeholders, tribes, community members, and others in the Type 3 Watershed Experiment, a large-scale experiment that is designed to expand the forest management toolbox.

During the conference, researchers will lead discussions on six topics. The purpose of each session is to gauge interest, answer questions, and explore ways the study can address each topic, with the ultimate goal of forming learning groups.

We hope this event will encourage dialog among researchers, natural resource specialists, managers, tribes, stakeholders, and community members about the scientific foundations of land management.

The 2022 OESF Science Conference is sponsored by DNR. The 2022 Conference Committee includes the following:

Teodora Minkova, DNR
Cathy Chauvin, DNR
Ralph Johnson, DNR
Mark Enty, DNR
Courtney Bobsin, University of Washington
Angie Thomson, EnviroIssues

# Conference Agenda

## Opening Session

| | |
|---|---|
| 8:00 – 8:30 a.m. | Technical support available |
| 8:30 – 8:40 a.m. | Opening remarks |
| 8:40 – 9:00 a.m. | Update on the Type 3 Watershed Experiment |
| 9:00 – 9:20 a.m. | Learning-based Collaboration and Learning Groups: Engagement Through the Type 3 Watershed Experiment |

## Session 1

| | |
|---|---|
| 9:20 – 10:20 a.m. | Cashflow Analyses of the Type 3 Novel Silvicultural Regimes at the Washington State Department of Natural Resources' Olympic Experimental State Forest |

### *Break*

*10:20 – 10:30 a.m.*

## Session 2

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|---|---|
| 10:30 – 11:30 a.m. | Evaluating Operational Costs of Type 3 Experimental Treatments |

## Session 3

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|---|---|
| 11:35 – 12:35 p.m. | Technological Advances in Environmental Monitoring: Drone LiDAR |

### *Lunch*

*12:35 – 1:10 p.m.*

## Session 4

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|---|---|
| 1:10 – 2:10 p.m. | Carbon and State-managed Lands: What has Been Done and What can be Done in the Type 3 Watershed Experiment? |

## Session 5

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|---|---|
| 2:15 – 3:15 p.m. | Determining the Influence of Non-native Invasive Plants on Ecosystem and Forest Management Outcomes in the OESF (and Whether Prevention of Spread is Worth the Cost) |

### *Break*

*3:15 – 3:25 p.m.*

## Session 6

| | |
|---|---|
| 3:25 – 4:25 p.m. | The Type 3 Watershed Experiment: Aquatic Response to Experimental Forest Management |
| 4:30 p.m. | Adjourn |

# The Learning Forest

DNR calls the OESF the "Learning Forest" because it provides a learning experience for DNR as well as educators, stakeholders, researchers, and others interested in sustainable forest management. This forest was specifically established to learn how to integrate revenue production (primarily through timber harvest) and ecological values (primarily habitat conservation) in a working forest.

**Figure 1. Map of the OESF.**


Across approximately 270,000 acres (110,000 hectares) of state trust lands in the OESF (Figure 1), DNR generates a sustainable flow of revenue to its trust beneficiaries and restores and maintains habitat for native species, including the federally protected northern spotted owl and marbled murrelet. DNR achieves these objectives through landscape level-planning, harvest and silvicultural techniques designed to create and maintain a variety of forest structures, and protection of habitat and other features, plus research, monitoring, and adaptive management.

The mission of the OESF Research and Monitoring Program is to learn through applied research and monitoring and deliver scientific findings to land managers. Through this program, DNR implements and coordinates projects; establishes and maintains research partnerships with universities, colleges, federal agencies, and other organizations; collaborates with local land managers, tribes, environmental organizations, and regulators; facilitates adaptive management; and provides educational opportunities such as internships and field trips.

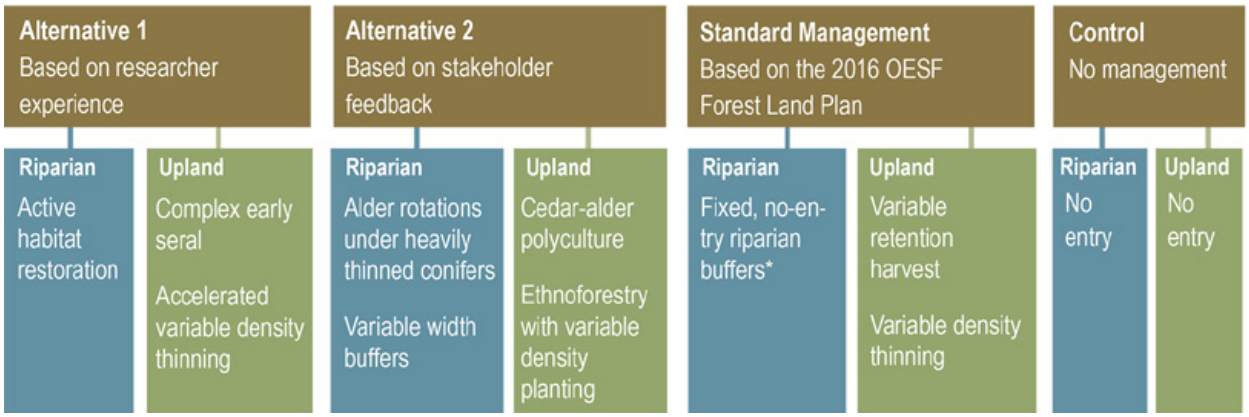
DNR's management strategies are described in the 2016 OESF Forest Land Plan and based on DNR's *State Trust Lands Habitat Conservation Plan (HCP)* adopted in 1997. For more information on the OESF, visit DNR's OESF web page.

# What is the Type 3 Watershed Experiment?

The Type 3 Watershed Experiment, which is the focus of this year's Science Conference, is a landscape-scale experiment to identify land management strategies that benefit both communities and forests. Led by DNR and the University of Washington's Olympic Natural Resources Center (ONRC), this project aims to inform DNR and other land managers on how alternative forest management treatments compare to current practices and control treatments in providing environmental, economic, and social benefits.

Alternative treatments will be tested and compared to both standard management and control treatments on state trust lands in riparian and upland areas at an operational scale (Figure 1). Researchers will measure how the treatments impact streams and forests for years into the future. Operational costs of treatments and the timber revenue they produce will be tracked to evaluate their feasibility. If proven useful, these treatments may expand the forest management toolbox of DNR and other land managers.

**Figure 1. Forest management treatments being tested in upland and riparian areas in the OESF under the Type 3 Watershed Experiment**




## Why Expand the Toolbox?

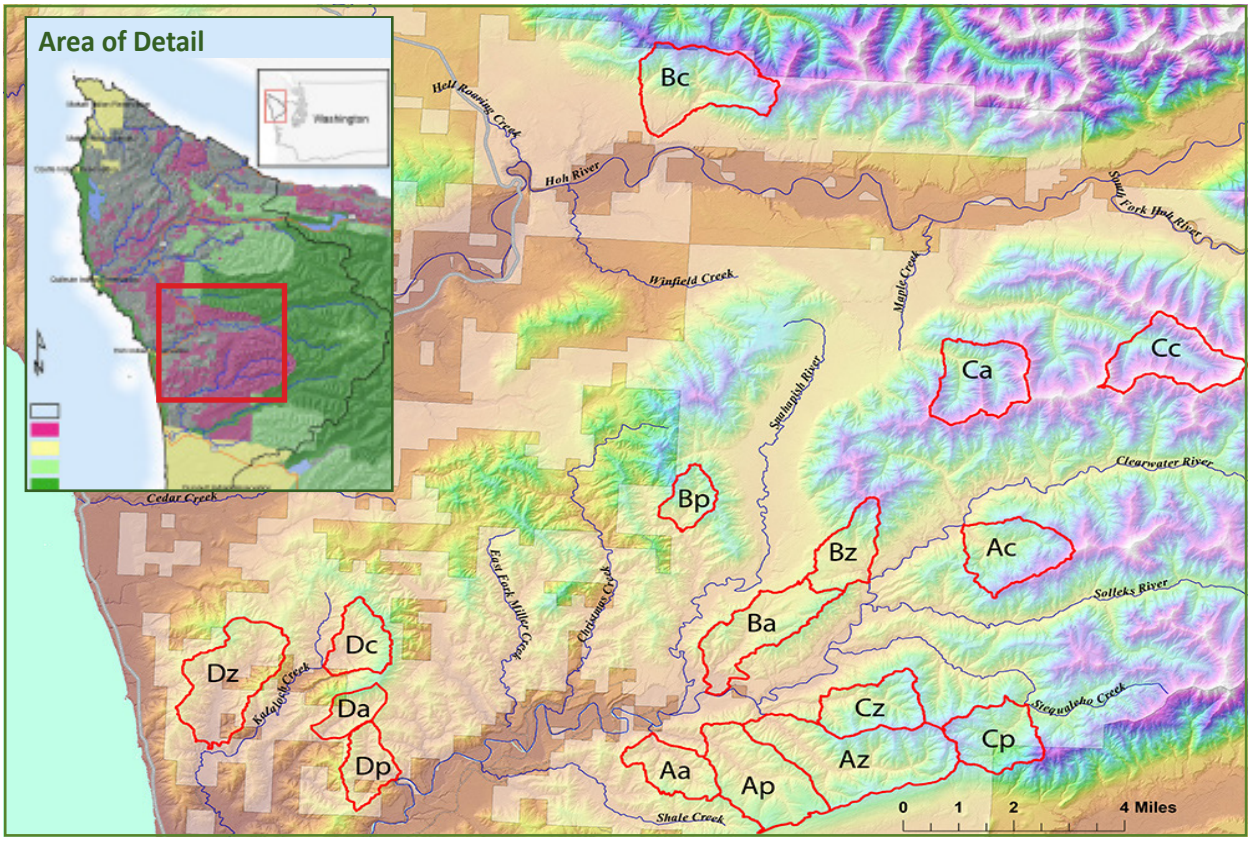
From conversations with stakeholders, tribes, and forest practitioners, researchers heard a desire to manage forests more effectively for elk and deer, birds, fish, insects, and a variety of forest products, as well as to benefit local communities. Effective new tools are needed to meet these objectives within a working forest.


**Roosevelt elk captured on a wildlife camera installed as part of the Type 3 Watershed Experiment.**

# Where Will the Study Take Place?

The Type 3 Watershed Experiment takes place in 16 watersheds in the Olympic Experimental State Forest (OESF) in Washington State (Figure 2). The study area covers 20,000 acres on the western side of the Olympic Peninsula in Jefferson County. Each selected watershed is at least 500 acres, drains into a fish bearing stream (Type 3 stream), and is managed by DNR.

**Figure 2. Location of watersheds in the Type 3 Watershed Experiment.**




# Who is Involved in the Study?

The Type 3 Watershed Experiment is an unprecedented effort that requires the collaboration of a broad range of research partners. Currently, DNR and ONRC are working with the following organizations:

- NOAA Fisheries
- Omfishient Consulting
- Oregon State University
- University of California San Diego
- USDA Forest Service Pacific Northwest Research Station
- Washington State University
- West Fork Environmental

Also essential to this study is the involvement of tribes, stakeholders, and community members. In addition, DNR and ONRC are forming learning groups, as highlighted in "Learning Group Framework" on the following page.

# Learning Group Framework

A key aim of the Type 3 Watershed Experiment is to achieve ecosystem wellbeing, whereby community and environmental wellbeing are addressed simultaneously and understood as reciprocally interconnected (Figure 3). To achieve this goal, researchers facilitate the practice of l**earning-based collaboration**. Learning based collaboration is a process in which managers, researchers, tribes, stakeholders, and collaborators engage with one another to ask and answer questions about options and the effects of management choices.

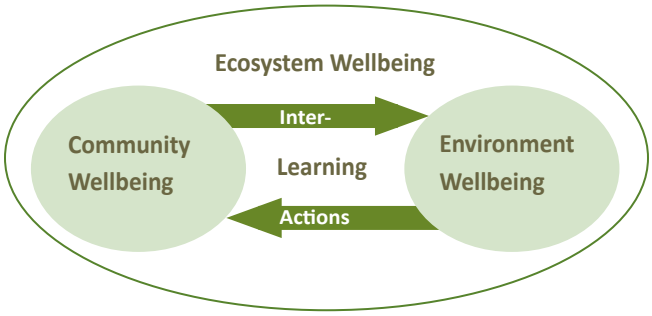



**Figure 3. The interconnected relationship between community and environmental wellbeing and the vital importance of learning.**

In order to facilitate this practice, researchers are developing volunteer **learning groups** to address particular aspects of the Type 3 Watershed Experiment and to create space to learn together.

## What is the Goal of the Learning Groups?

The goal is to engage additional researchers, managers, tribes, stakeholders, and community members in the specific portions of the study in which they have expertise or interest. Groups can assist with existing research and monitoring components of the study, create their own projects and goals that align with those of the participants and the study, or both.

## Can Anyone Join a Learning Group?

Yes! Anyone interested in the topic of the group may join any group (with the exception of the tribal group, in which the members may be asked to approve any new member who is not associated with a local tribe). Study researchers will not restrict or control membership.

## Do I Have to be a Scientist?

No. Although scientific expertise is welcome, you do not need to have any experience or background in forestry, biology, or other scientific disciplines to join a group. All you need is curiosity, interest, and a willingness to actively participate.

## What Will the Groups do?

Because each group will have different interests and goals, tasks may differ from group to group. Some common tasks between all groups may include identifying research and management questions, review-

ing or preparing study documents (for example, monitoring protocols), assisting with data collection and/or analysis, or seeking funding. Each group will develop a list of tasks that they would like to accomplish.

## How Often Will the Groups Meet?

Groups will meet either in-person or remotely (depending on the preference of the group) once per month to discuss the objectives of the group and to make progress on goals. If necessary, the group may meet more or less often based on their needs and schedules. Depending on the topic, some groups may meet more often during certain phases of study implementation.

## Who Will Lead the Groups?

Initially, each group will be led or facilitated by study researchers. In time, the goal is to transition leadership to one of the group members. Group leaders will organizes meetings and agendas, with key participation and assistance from the Type 3 research team.

## Will Funding be Available?

While group participants are volunteers, learning groups will coordinate with the study researchers to explore funding options if a learning group requires funding to complete their goals, for example to establish a small-scale study within the Type 3 watersheds. Funding may come from the current Type 3 Watershed Experiment budget or through additional grants.

## How Will the Results be Used?

The Type 3 Watershed Experiment is designed as an adaptive management study, meaning that its scientific findings will be used by DNR managers and others to improve forest management tools and practices. The project has both a research component, in which study researchers will perform and gather data on the experimental treatments, and a management component, in which land managers will consider possible management adjustments based on the study results.

For the research component, study researchers will, to the best of their abilities, use the input and feedback from the learning groups. Although some areas of the study cannot be changed (for example, the spatial layout of the treatments), researchers will encourage dialogue, exploration of ideas, input, and innovation. As land managers consider management adjustments, learning group members will have the opportunity to be informed advocates, supporters, interpreters, and in some cases constructive critics of these adjustments.

The input and feedback received through the learning groups will be invaluable to the study. Through past engagement events, study researchers received important feedback that has been incorporated into the study plan and has shaped the treatments and research questions.

# Abstracts

## Opening Session

### Learning-based Collaboration and Learning Groups: Engagement Through the Type 3 Watershed Experiment

Courtney Bobsin[1]

[1] University of Washington, Olympic Natural Resources Center

A key goal of the Type 3 Watershed Experiment from the outset has been to achieve ecosystem wellbeing, made up of both community and environment wellbeing, in which both elements are addressed simultaneously and with equal seriousness. Achieving ecosystem wellbeing must begin with a way to engage people. We developed a process to do so called learning-based collaboration, in which researchers, managers, tribes, stakeholders, and other community members engage with one another, focusing on asking and answering questions about options and effects of management choices through formal and informal exchanges and activities. Input gained from this process has already influenced treatments, research questions, and monitoring of the Type 3 Watershed Experiment.

While the experiment is large-scale, covering both upland and riparian areas, other aspects could be addressed. There has been interest amongst stakeholders to focus their expertise and efforts on a particular sub-topic of the study, for example invasive species monitoring. To address these additional interests, the study researchers believe the formation of learning groups can be a way to build on current momentum, engage interested people, and importantly, learn together through this process. We propose a framework for creating these independent learning groups that we will explore throughout this conference.

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## Session 1

### Cashflow Analyses of the Type 3 Novel Silvicultural Regimes at the Washington State Department of Natural Resources' Olympic Experimental State Forest

Sándor F. Tóth[1]

[1] University of Washington, School of Environment & Forest Sciences

In this presentation, I will outline the most important financial considerations that we plan to incorporate in our cashflow analyses of the proposed Type 3 Watershed Experiment novel silvicultural treatments at the Washington State Department of Natural Resources' (DNR) Olympic Experimental State Forest (OESF).

Our proposed silvicultural treatments seek to increase the provision of social and ecosystem services for the OESF's trust beneficiaries at minimum or no financial cost to the trusts. We will calculate the expected net present value of the proposed treatments under different growth scenarios. Since all projected costs and revenues must be discounted at a positive discount rate, determined by DNR, the contribution of cashflows to net present value that are to occur early in the silvicultural regime will be more influential than those farther into the future. We hypothesize that the proposed regimes are going to be competitive with DNR's standard treatment options in DNR's Woodstock model, if they can help more cost-effectively achieve environmental constraints.

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# Session 2

## Evaluating Operational Costs of Type 3 Experimental Treatments

Woodam Chung[1]

[1] Department of Forest Engineering, Resources and Management, Oregon State University

Time studies have long been used in timber harvesting operations to gather data on the production process and to estimate production rates of individual machines or the entire system. When coupled with machine costs, production rates can allow managers to make economic comparisons among different equipment, systems, and treatments. We propose to conduct a series of time studies on a variety of Type 3 experimental treatments involving tree felling, extraction, and processing under various work conditions. Comparative paired studies also will be conducted to quantify fine-scale impacts of alternative management treatments on machine productivity and treatment costs. Statistical analysis will be carried out to develop predictive models that can estimate production rates for future treatments under various vegetation and terrain conditions. These predictive models will provide analytical tools useful for long-term management planning and economic analysis of management strategies. This presentation overviews the concepts of time study, cost analysis, and analytical tool development, presents a recent paired study example, and discusses design of time studies for Type 3 experimental treatments.

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# Session 3

## Technological Advances in Environmental Monitoring: Drone LiDAR

Robert J. McGaughey[1]

[1] USDA Forest Service, Pacific Northwest Research Station

Traditionally, light detection and ranging (LiDAR ) data have been collected efficiently from piloted aircraft over large blocks of land. Projects smaller than a few thousand acres are often expensive and limited to high-importance areas. LIDAR sensors installed on unmanned (remotely piloted) aircraft systems (UAS or drone) offer the ability to collect data over small areas and at frequent intervals. Such data facilitate the study of forest operations and ecological processes at the scale of individual trees.

West Fork Environmental collected high-density drone LIDAR data over several of the Type 3 treatment units. These data provide overall information for the treatment units such as canopy cover, the distribution of gap sizes and tree clumps, and the distribution of tree heights, along with information for individual trees including height, branch and crown details, overall crown size and shape, stem form, and potentially species.

Additional work is focused on species identification using the point cloud data; determining more accurate stem locations; analyses of gap size; relationships between gap size, overstory species, and understory species composition; and using pre- and post-treatment data to measure treatment effects. Researchers involved in evaluating the drone LIDAR data and using it to measure stand conditions and monitor treatment effectiveness welcome additional ideas for stand and tree attributes that might be interesting or useful beyond attributes related to stand structure.

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# Session 4

## Carbon and State-managed Lands: What has Been Done and What can be Done in the Type 3 Watershed Experiment?

Warren Devine[1], Joshua Halofsky[1], Daniel Donato[1, 2]

[1]Washington State Department of Natural Resources, [1]University of Washington

As part of its overall mission, DNR both considers and assesses various socio-ecological values of public interest. One value receiving greater public attention over the last several years is carbon. In this session, we will first review how 1) carbon is measured by DNR, 2) carbon is incorporated into DNR planning documents, and 3) DNR has begun to investigate carbon markets. Following this brief review, we will provide

some initial ideas for how carbon-related questions can be incorporated into the Type 3 Watershed Experiment. These ideas include modeling and comparing carbon accumulation across different prescriptions, as well as the use of drone-collected light detection and ranging (LiDAR) data to estimate carbon in trees and other vegetation. Following the presentation, a panel will be available to discuss participant questions and interests.

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# Session 5

## Determining the Influence of Non-native Invasive Plants on Ecosystem and Forest Management Outcomes in the OESF (and Whether Prevention of Spread is Worth the Cost)

Jill Silver[1]

[1] 10,000 Years Institute

Invasive, non-native plants including Scotch broom (*Cytisus scoparius*), reed canarygrass (*Phalarus arundinacea*), and herb Robert (*Geranium robertianum*) are observed to affect the quality and condition of forest and aquatic ecosystems through aggressive competition for light, water, and space, as well as alterations of soil chemistry and microbial communities, and through allelopathy. These plants replace native species without providing the ecosystem services provided by diverse forest communities, including species diversity, terrestrial and aquatic habitats, water filtration and storage, nutrient cycling, carbon sequestration, and generation of forest products.

To determine whether populations of invasive plants impair or alter the desired future condition of forest stands, inventories to establish the distribution of these species (especially Scotch broom) and research to determine the influence on forest health and services are needed. An important question is whether an investment in prevention is important to support OESF goals of forest products, species diversity, wildfire prevention, and carbon sequestration.

This session will cover a range of options for monitoring and experimental or passive research design, to evaluate how the Type 3 Watershed Experiment can help address management uncertainties regarding invasive species, and determine if stakeholders are interested in contributing.

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# Session 6

## The Type 3 Watershed Experiment: Aquatic Response to Experimental Forest Management

Peter M. Kiffney[1]

[1] NOAA, National Marine Fisheries Service, Northwest Fisheries Science Center

Research on the ecological effects of clear-cut logging demonstrates that this forest management approach can degrade stream and riparian habitat, leading to negative effects on stream-rearing fish populations including streams salmonids, such as coho salmon. As a result of this research, alternative forest management approaches were implemented, including no-harvest fixed width buffers and forest thinning. Unfortunately, our understanding of how these newer forest management approaches affect stream and riparian ecosystems is relatively poor, especially with regards to fish populations and the food webs that support them. The Type 3 Watershed Experiment offers a unique opportunity to fill in our knowledge gaps regarding the effects of alternative forest management techniques on stream food webs. For example, will thinning and creation of light gaps within the riparian management area increase prey availability (for example, aquatic invertebrates) for stream-dwelling salmonids? This talk will briefly discuss the state of knowledge regarding logging effects on stream food webs, followed by some of the expected outcomes of the four forest management treatments on study streams.

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