The Learning Forest

Sharing scientific knowledge on sustainable land management in the Olympic Experimental State Forest and beyond

Issue 1 • April 2017

Editorial Board Message

The Time is Right

by Teodora Minkova, DNR *and* Bernard Bormann, ONRC

Welcome to the first issue of *The Learning Forest*, a collaboration between the Washington State Department of Natural Resources (DNR) and the University of Washington's Olympic Natural Resources Center (ONRC).

DNR and the ONRC seek to make this biannual newsletter a beacon of optimism for sustainability of forested landscapes and adjacent rural communities across the Olympic Peninsula, Washington state, and beyond. The sources of this optimism are the emerging ideas and learning efforts unfolding largely in the Olympic Experimental State Forest (OESF).

This newsletter will focus on innovations and scientific advancements in managing lands sustainably for habitat conservation, timber harvest, recreation, and long-term productivity and resilience. Each issue will include a feature article on a project taking place in the OESF, a guest article on local research outside the OESF, and updates on regional projects, recent publications, and events. For this inaugural issue, the feature article introduces the OESF and its management approach and the guest article, written by The Nature Conservancy, describes watershed restoration efforts at Ellsworth Creek Preserve. Overall, content will link to big picture topics such as:

- A growing acceptance that decision making about forests, rivers, and shorelines should incorporate the needs of people who live nearby and depend on those resources;
- An understanding that attending to people's needs requires their engagement, through non-profit organizations and forest collaboratives or stakeholder groups, in natural resource management issues on the Olympic Peninsula;
- Recognition of the rural–urban divide as an important issue and emerging "win-win" solutions to bridge this divide, for example cross-laminated timber panel manufacturing; and
- Developments in the theory and practice of adaptive management, which enable science-based learning to be integrated more easily into management decisions (DNR and the University of Washington have become national leaders on this).

In this Issue

The Learning Forest is an electronic, biannual newsletter published jointly by the **Washington State Department of Natural Resources** (DNR) and the **Olympic Natural Resources Center** (ONRC).

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This newsletter cannot provide all of the answers. The journey to sustainability is a long one that will be filled with surprises, failures, and frank discussion. It is also challenging, because sustainability in natural resource management deals with the intersection of ever-changing natural systems, social demands, and economic realities. We believe that:

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- Science-based learning is the path forward when facing this challenge.
- Sharing knowledge and experience is the way to build trust among stakeholders and to find original and broadly acceptable solutions. Without public support, it is difficult to effectively harness knowledge and put it into action.
- Involving practitioners of natural resource management—foresters, engineers, silviculturalists, and other staff involved in day-to-day management—in learning efforts is valuable. Day-to-day field experience teaches lessons in sustainability and we hope to give these professionals a voice here.

This newsletter provides DNR and the ONRC an opportunity and forum for advancing these beliefs.

The time is right for launching this newsletter because recent scientific and organizational developments for both DNR and the ONRC provide the infrastructure needed for innovation and leadership in pursuit of natural resource management solutions. For example, DNR adopted its forest land plan for the OESF, revitalized its research and monitoring program, and developed the framework and specific procedures needed to make science-based management decisions through a formal adaptive-management process. The University of Washington expanded its support for the ONRC, enabling the ONRC to better articulate its natural resource goals and support adaptive management in the OESF, especially though management experiments. These new efforts build on the ONRC's ongoing programs, including a neutral forum, education and outreach, research and development, and a harmful algae monitoring network funded by shellfish license fees.

Exciting and important knowledge is accumulating about Pacific Northwest forests, not only those in the OESF but across the Peninsula and Washington state. That knowledge is worth sharing, for its own value and for the prospects it offers for sustainable management of our shared landscapes.

Featured Article

In the Learning Forest

by Cathy Chauvin, DNR

Along a stream on the western side of the Olympic Peninsula is a white cup attached to a pole. Inside the cup is an instrument that is logging minute changes in temperature and humidity (Photo 1). Misty mornings, wet afternoons, and the rare hot, dry day are all reduced to data.

In an office miles away, scientists are studying that data in combination with data on canopy closure, stream temperature, and other riparian vital signs to make the connections that lead to understanding. They are not just advancing riparian science. They want to understand how this stream reach and others like it are responding to timber harvest in adjacent forests.

These scientists are participating in the learning forest, officially called the OESF. In this forest, DNR, the ONRC, and other partners monitor ecological conditions, test new ideas through research, and otherwise learn sustainable ways to balance multiple objectives in a working forest. What is learned in the OESF could prove important in a changing world.

A Dilemma

DNR manages about 270,000 acres (109,265 hectares) of forest between the Olympic Mountains and the Pacific Ocean (map on page 4). This area is known for majestic old-growth forests and extraordinary tree growth rates, with new growth on young trees shooting up three feet in a single year in a decidedly wet and mild climate. One could almost, it is joked, sit in a chair and watch the trees grow.

Prior to the late 1980s, DNR primarily harvested old-growth forests. It made sense at the time; old-growth forests were a concentrated source of revenue, local mills were optimized to handle huge logs, and the cut forest could be replaced with young, fast-growing stands to produce revenue for the next generation of trust beneficiaries.

Ellis Cropper, DNR

Photo 1. Temperature and humidity logger

Why trust beneficiaries? Because these 270,000 acres are state trust lands. Harvests on these lands fund fire departments, hospitals, schools, and other essential facilities and services. These harvests also support local economies and form the fabric of local cultures. On the walls of a diner in Forks, Wash., loggers stare out from historic black and white photos, reminders of this community's long relationship with timber harvest.

By the late 1980s, however, a new approach was clearly needed, not only to protect remaining old-growth forests and the species that depend on them but to provide a more sustainable path for long-term revenue. At this point, DNR could have taken the traditional approach of designating old-growth forests and other sensitive areas as permanent ecological reserves, which would be fixed in location on the land base. All other areas would be managed intensively for timber harvest.

But instead, DNR took a bold step: it designated the area as a working and learning forest called the OESF, to be managed under an experimental management approach with a major emphasis on science-based learning.

Integrate, Not Separate

The approach is sometimes called land sharing. DNR once referred to it as unzoned and later settled on integrated management as more descriptive. Regardless, under integrated management the forest is managed as an integrated whole.

In the OESF, most sensitive areas, such as old-growth forests, riparian areas, wetlands, habitat for protected

species, and areas too unstable to manage actively, are managed for ecological values but are not part of fixed ecological reserves. In some of these areas, DNR can perform light, often experimental, treatments to enhance ecological values and, in some cases, provide a limited amount of revenue. An example of the latter is a commercial thinning in a riparian area that helps the stand develop a second canopy to better support wildlife. Also, the location of some sensitive areas can shift over time. For example, the location of northern spotted owl habitat should gradually shift as new areas mature into habitat and other areas are harvested or change due to natural disturbance.

All other areas, sometimes called the "matrix," are managed with harvest methods that produce revenue and create and maintain a structurally varied forest. Clearcuts are replaced with "variable retention harvests" in which snags, down wood, and some green trees are left from one harvest to the next to enrich the structure of the stand when it regenerates. Harvests have complex edges, curving around the sensitive areas. Thinnings are non-uniform; trees are removed in an irregular pattern, some gaps are introduced into the canopy to encourage development of an understory, and other areas are left as-is to provide additional variation and forest cover (Photo 2).

The end result is a forested landscape with openings and young, mature, and old-growth stands arranged in a shifting, irregular pattern (Photo 3) similar to what might develop in an unmanaged forest through growth and natural disturbance. The theory is that the integrated forest will provide not only wood for harvest, but greater overall support for ecological values than a divided forest in which ecological values come primarily from smaller ecological reserves.

Cathy Chauvin, DNR

Photo 2. Variable density thinning, looking toward a gap created in the Canopy

Scott Horton, DNR

Photo 3. Variations in forest stand structure

An Emphasis on Learning

The questions of this approach are many. How will harvest affect watershed health over time? Will stands manipulated through thinning provide the same ecological benefits of those that develop more naturally? How will the complex shapes of variable retention harvest affect tree growth?

In the OESF, DNR and its partners investigate these and other questions that are tightly focused on this management approach. Research, monitoring, and management experiments, such as testing various intensities of treatments, happen in conjunction with timber harvest. Learning is applied to management through a learn-as-you-go approach called adaptive management.

For example, when harvesting stands DNR leaves buffers on streams. Buffers can vary in width depending on ground and watershed conditions; if conditions are good, buffers can be narrower and vice versa. DNR is currently monitoring aquatic and riparian conditions along stream reaches in both managed and unmanaged watersheds to better understand how riparian and aquatic habitat respond to management (the white cups mentioned earlier are part of this effort). DNR will consider these results when evaluating the effectiveness of its buffering strategy. Initial results are promising; so far, so good in the learning forest.

A Changing World

The integrated management approach may not conjure images of an untrammeled wilderness. It has uncertainty, and also involves something else that may feel uncomfortable: compromise.

But it may be one possible solution to the challenges of a changing world. Changing how? Growing cities, fueling the need for more wood from sustainable sources to build houses. A progressively smaller pool of forests to work with due to land conversion and other causes. And the increasing need for recreation, views, habitat, and everything else that forests provide, set against a backdrop of climate change and its effects.

Working forests managed with integrated techniques might be a win-win, a way to produce the wood we need while supporting biodiversity and other ecological values. Such forests could provide habitat and corridors for wildlife to travel between one park or nature preserve and another, which could prove important as forests shift on the landscape due to climate change. Plus, the emphasis of this approach on variability at both a stand and landscape level may increase the forest's resilience to change.

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The integrated management approach is still developing and there is still much to learn. But it has potential. DNR and its partners are sharing what they learn, through digital media, seminars, field trips, and this newsletter; DNR recently hosted a tour for students from the U.S. and Canada and foresters from as far away as Belgium. As more is learned and information is shared, the OESF could do more than change how people relate to working forests. It also could bring the working forest to the table as one part of a long-term solution for sustainability.

For More Information

DNR recently released a **management plan** for the OESF that describes the integrated management approach as well as the specific objectives DNR has set and the management strategies DNR will use to get there.

About the Author

Cathy is a writer, editor, planner, and graphic designer for DNR. She was part of the team completing the OESF forest land plan and related environmental documents.

Guest Article

Of Science, Partnerships, and Rainforests: the Ellsworth Experiment

by Ryan Haugo, The Nature Conservancy

On a misty December morning, a group of forest scientists and managers from across the Pacific Northwest met along the shores of Willapa Bay to talk science and ecological restoration. This group had driven through the dark morning hours in order to spend the day tromping around the forest and building and strengthening science partnerships while gaining a first-hand experience with The Nature Conservancy's "Ellsworth Experiment."

The Conservancy's 8,229 acre (3,330 hectare) Ellsworth Creek Preserve is best known for protecting some of the largest remaining stands of coastal old-growth rainforest in southwest Washington. Towering forests of western red cedar, Sitka spruce, western hemlock and Douglas-fir provide habitat for endangered and threatened forest wildlife species and support streams with coastal cutthroat trout, chum, and coho salmon.

However, the majority of the lands in Ellsworth are former industrial forests. Today, many of these forests are young and densely spaced because of past intensive harvesting. At Ellsworth, the Conservancy launched the audacious goal of restoring these former industrial forest lands to facilitate the recovery of old, complex forest habitats and to aid recovery of coastal watersheds.

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When the Ellsworth Preserve was established in the early 2000s, moving from the protection of small preserves to entire watersheds and diving headlong into active forest management was a huge step for the Conservancy. At the time, the Conservancy's motto was "Saving the Last Great Places," which typically did not include contracting loggers. However, the best available science suggested that the most effective way to restore these forestlands was through mechanical thinning and repair or decommissioning of forest roads. Left alone, it was feared that many of the young, dense forests would stagnate and slow the recovery of complex forest habitats, while roads would continue to deteriorate and potentially degrade aquatic habitat. Additionally, active restoration efforts should benefit local communities, members of which can be the most capable and devoted stewards of restored landscapes.

Ryan Haugo, The Nature Conservancy

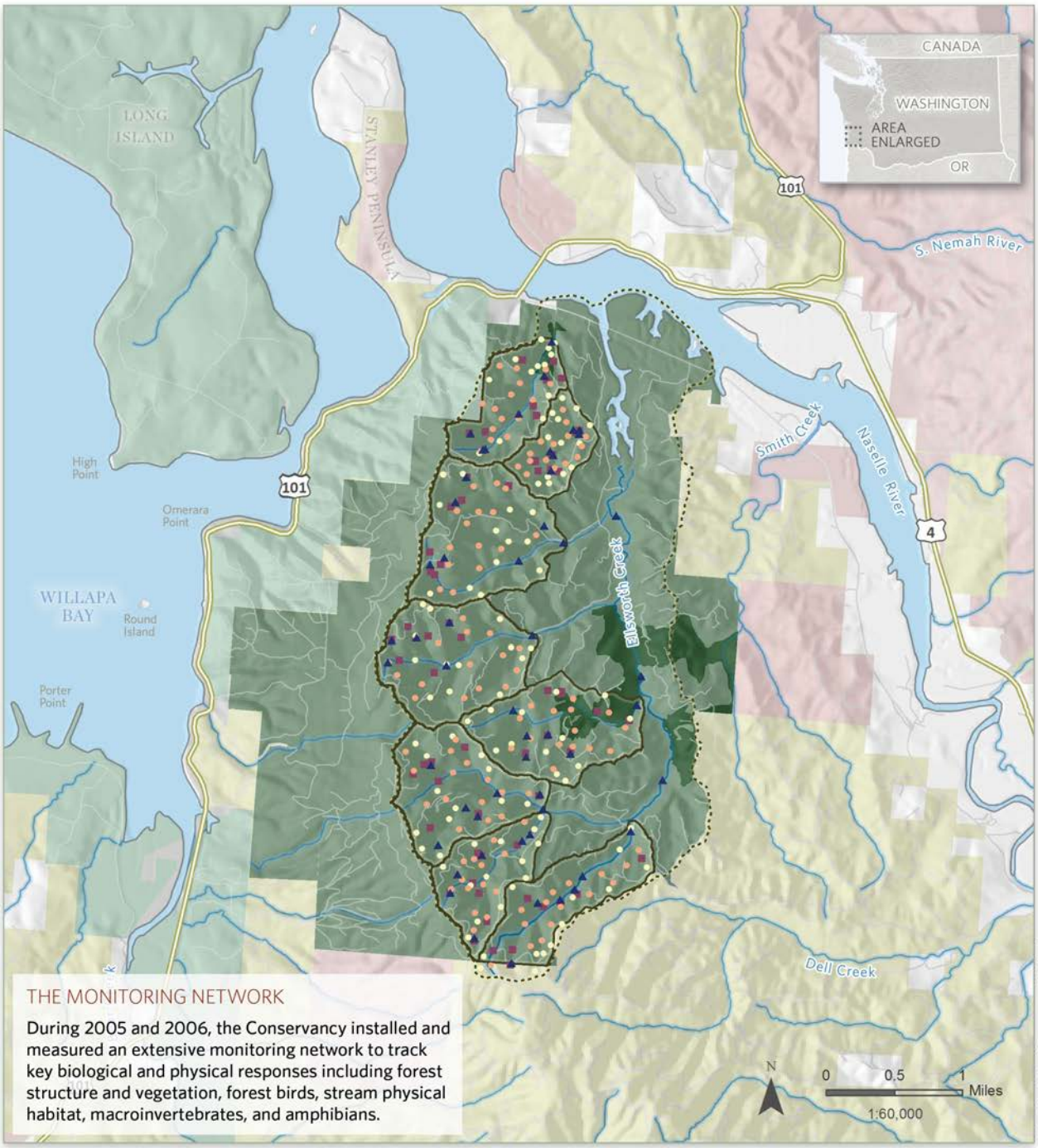
Kyle Smith, Washington forest manager for The Nature Conservancy, explaining the finer points of thinning at Ellsworth

Across the Pacific Northwest coast, however, there were few examples of ecological restoration at such a scale. Consequently, the Conservancy recognized the need to approach restoration at Ellsworth through the lens of a strong adaptive management framework. Three major questions faced the Conservancy in its efforts to restore Ellsworth's ecosystems:

- Can ecosystems resembling those in natural occurring late successional forests be restored from former industrial forestlands?
- Can a resource management system be devised to accelerate ecosystem recovery in a young, managed-forest landscape?
- Can restoration of a young, managed -forest landscape, including forest stands and roads, be cost effective?

THE ELLSWORTH EXPERIMENT

The Nature Conservancy



THE MONITORING NETWORK

During 2005 and 2006, the Conservancy installed and measured an extensive monitoring network to track key biological and physical responses including forest structure and vegetation, forest birds, stream physical habitat, macroinvertebrates, and amphibians.

March 1, 2017

MAP LEGEND

- The Nature Conservancy Property
- Ellsworth Creek Experimental Basin
- Ellsworth Creek Old Growth Stands
- Stream Reaches
- Vegetation Plots
- Bird Plots
- Amphibian Reaches
- The Nature Conservancy Property
- Willapa National Wildlife Refuge
- State Land
- Private Timber

In order to rigorously address these questions, the Conservancy designed the "Ellsworth Experiment" in partnership with an external science review panel. Through the Ellsworth Experiment, three different management treatments were replicated in eight experimental sub-basins that range in size from 185 to 546 acres (75 to 221 hectares):

- Active restoration (three sub-basins): Forest stands thinned to promote growth and development of structural complexity, with an appropriately maintained road system.
- Passive restoration (two sub-basins): Forest stands left to develop without management intervention, with all roads removed.
- Control (three sub-basins): Forest stands initially left to develop without management intervention, with an appropriately maintained road system to allow for potential future changes in management operations.

During 2005 and 2006, the Conservancy installed permanent sample plots and took baseline measurements of key biological and physical responses including forest structure and vegetation, forest birds, stream physical habitat, macroinvertebrates, and amphibians. Active forest thinning treatments began in 2008, after the pre-treatment measurements had been completed.

Now, 10 years after the pre-treatment measurements, the first round of active management at Ellsworth (forest thinning, road repair and decommissioning) is nearing completion. The time is right to start building the partnerships necessary to conduct the first post-treatment re-measurements of the Ellsworth monitoring network. Although ecosystems change slowly and restoration-focused management at Ellsworth will be ongoing for many decades, re-measurement will allow us to start answering the fundamental questions of the Ellsworth Experiment. The insights yet to be revealed have the potential to inform future forest restoration within and beyond Ellsworth.

As we concluded the Ellsworth science partners tour in the early December twilight, our boots were heavy with mud but our spirits were light. The pretreatment data provides a tremendous foundation, new technologies are emerging to aid in our efforts, and exciting new science partnerships are on the horizon. The second decade of science at Ellsworth is looking very promising.

About the Author

Ryan Haugo is the Conservancy's senior forest ecologist for Washington and is also an affiliate assistant professor at the University of Washington's School of Environmental and Forest Science. Ryan focuses on bringing the necessary science capacity, data, and analytical tools to collaborative forest conservation and restoration across the Northwest.

Project Updates

Status and Trends Monitoring of Riparian and Aquatic Habitat in the OESF

DNR recently released a **report** on the status of aquatic and riparian habitat in the OESF. This report reflects the first round of monitoring under this project, which started in 2012.

In this project, DNR is monitoring sample stream reaches in 50 small, managed watersheds in the OESF and 4 reference watersheds in Olympic National Park using nine aquatic and riparian indicators (channel morphology, stream temperature, hydrology, shade, in-stream wood, habitat units, channel substrate, riparian microclimate, and riparian vegetation). Results suggest that the 50 sample reaches in the managed watersheds, which represent a broad range of habitat conditions, have relatively good habitat quality. A brief description of the project and first results are available through a new **interactive story map** on DNR's website.

Riparian Validation Monitoring for Salmonids in the OESF

For this project, DNR published a peer-reviewed **study plan** and initiated long-term monitoring to better understand how salmonids are responding to the managed landscapes of the OESF.

DNR will initially use an observational approach to determine the need (if any) for experimental studies. Initial sampling began in 2015 using the monitoring sites from the status and trends project (described above) to identify fish assemblages (the species of fish occupying the site). In 2016, DNR began sampling under the study plan by snorkeling in the Clearwater River and conducting juvenile salmonid abundance and redd surveys in a subset of the status and trends sites. In addition, DNR collected water samples in collaboration with the US Forest Service Pacific Northwest Research Station to use eDNA to help determine aquatic species assemblages (for example, fish, amphibians, and macroinvertebrates).

Caroline Walls, DNR

Ellis Cropper, field technician, checks for fish presence in an OESF stream

Large Scale Integrated Management Experiment in the OESF

The ONRC and DNR have released a **study proposal** for this project and will develop a study plan in the spring of 2017.

The purpose of this project is to compare different management strategies, each of which has a different level of integration of revenue production (primarily timber harvest) and ecological values (mainly habitat conservation). The ONRC and DNR will apply a series of replicated experimental treatments in upland and riparian areas at a watershed scale as part of DNR's timber sale program. Response variables will include ecological, economic, and operational feasibility metrics.

Stakeholder engagement is an important element of this study. Multiple stakeholders provided comments on the proposal, and social research may be added to the project at a later date.

Long-term Ecosystem Productivity Study

In 2015 and 2016, University of Washington graduate students and interns led re-measurements of 200 tree and more than 600 understory plots on the 600-acre OESF installation of the Long-term Ecosystem Productivity Study. Results will be presented at an ONRC evening talk on May 12 and described in future issues of *The Learning Forest*.

The study on the OESF installation, led by Forest Service Pacific Northwest Research Station and conducted in collaboration with DNR and the University of Washington, evaluates how long-term productivity, a key component of sustainable forest practices, is affected by forest management. Experimental treatments include varying early- and late-seral species (as an alternative to traditional Douglas-fir plantations), varying the amount of woody debris left on the soil surface, and leaving one area as a no-cut control. A particularly valuable, and rarely documented, response variable in the study (and an important part of a full ecosystem analysis) is the change in soils.

You are Invited to Participate

DNR and the ONRC invite researchers and stakeholders to participate in research, monitoring, and other learning activities in the Olympic Experimental State Forest (OESF). Contact Teodora Minkova at Teodora.Minkova@dnr.wa.gov or Franklin Hanson at fsh2@uw.ed. Information on past and current projects in the OESF can be found at this **link**.

Upcoming Events

OESF Science Conference

Thursday, April 20, 2017, 8 am – 4 pm
Hemlock conference room, ONRC, 1455 S. Forks Avenue, Forks, Wash.

At this one-day conference, scientists from DNR and other organizations will describe their current work in the OESF. Presentations will focus on linking science to natural resource management, and will be followed by a brief field tour. More information can be found at this **link**.

Urban and Rural Divide Lecture at the University of Washington

Thursday, May 11, 2017, 10:30 am
Anderson Hall, Forest Club room (Anderson 207), University of Washington, Seattle, Wash.

William R. Burch of Yale University will give a talk on the rural and urban divide in views about sustainability.

ONRC Evening Talks

Friday May 12 and 19, 7-9 pm
Hemlock conference room, ONRC, 1455 S. Forks Avenue, Forks, WA

Friday, May 12, 2017

Cortney Bobsin, a University of Washington graduate student, will share the results of her research on understory plant development in thinned forest stands as part of the Long-Term Ecosystem Productivity Study.

Friday, May 19, 2017

Korena Mafune, a University of Washington Ph.D student, will speak about her research on plant-fungal relationships in temperate old-growth rain forests, with a specific focus on canopy soils and host tree fungal interactions.

Recent Publications

People, Forests, and Change Lessons from the Pacific Northwest

Island Press, 344 pages

Editors Deanna H. Olson and Beatrice Van Horne assembled an expert panel of social and forest scientists, including Bernard Bormann and Teodora Minkova, to update the scientific consensus behind forest management in the temperate moist-coniferous forests of the U.S. Pacific Northwest. Two key concepts are 1) that local communities and the forest can be managed as a unit for mutual benefit; and 2) that forests and communities are much more dynamic than previously thought and demand a more flexible approach to managing them. The text is divided into sections that set the stage for forests and rural forest economies, describe dynamic forest systems at work, consider new science in forest ecology and management, and ponder the future for these coniferous forests under different scenarios.

Featured Photo

Alex Foster, PNWRS

Monitoring is not for the faint hearted. Teodora Minkova, OESF research and monitoring manager, navigates knee-deep mud and water in the OESF.