The Sharpshooter

Oregon Society of Soil Scientists
Quarterly Newsletter
Fall 2023

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President's Message

Hello and welcome to the Fall edition of the Sharpshooter, the periodic newsletter of the Oregon Society of Soil Scientists!

Some of the gems in this edition include a recounting of the Summer tour held in the Ochoco National Forest (photo below) an expose of being a soil scientist on a BAER (burned area emergency response) team assessing the Lookout Fire, and the announcement for the Winter Meeting, which is currently slated to be held March 1-2nd in Eugene, Oregon. The meeting, themed "Visions of 2124", is being held in the spirit of our species' ability to imagine alternative futures, to navigate the unknown through thought and imagination. This theme was chosen to honor the apparently contradictory sense that the challenges we are facing as a society are both timeless yet unprecedented in scope and scale.

Take for example the extensive wildfires that have occurred in the Cascades over the past three years. Fire has now visited approximately 30-50% of the acreage in the forests of the Western Cascades in Oregon. Prior to these last few years, it was thought that within these rainforests, stand replacing fires occurred only once every couple of centuries (or longer). However, for those who study fire, it is understood that frequent (~10-20 years) low-severity fire was likely the norm and probably central to the healthy functioning of the primeval forests which the European immigrants first encountered. Thus, from some perspectives, this period of conflagration is nothing short of a once-in-10 generations-disaster; for others it's a long overdue reckoning.

Soil teaches that life is inextricable from death, that decay and decomposition is but a transformation, the release of structured energy and the creation of potential energy. Thus, decomposition serves as the basis for the next iteration of life's creative power of self-expression. This cyclic transformation of energy in its various forms represents the quintessence of what soil is and what it does – which is none other than serving as the basis for terrestrial life as we know it. Soil speaks to the truth that no "progress" occurs in the absence of "disaster", that one is an opportunity for the other and the difference between the two lies in our perspective.

With that, enjoy this edition of the Sharpshooter and I look forward to the vitalizing discussions sure to be had during the Winter Meeting of OSSS.

"The only lasting truth is Change"

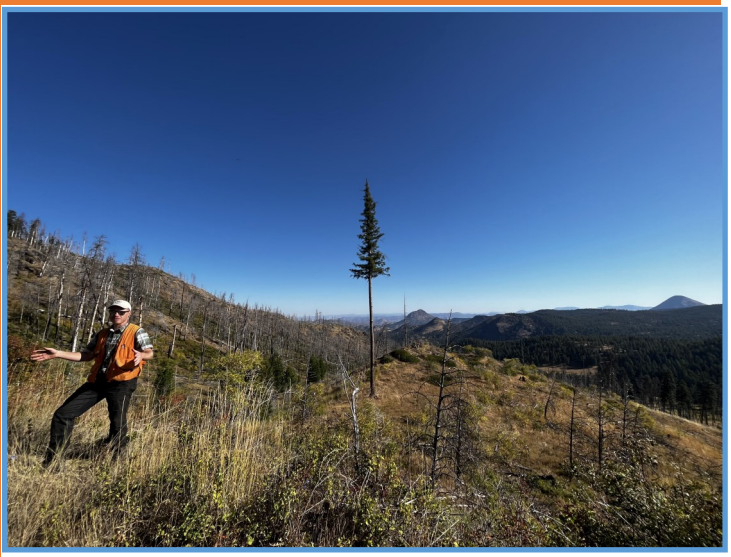
Octavia E. Butler

Vance Almquist , OSSS President

Summer Field Tour Recap

This year's Summer Tour was held in the stunning and unique Ochoco National Forest. The theme of the meeting was "Soils 2026", a reference to the National cooperative soil survey's push to finish all initial soil surveys and have wall-to-wall coverage of soils information.

The Summer 2023 tour was put together with two goals in mind:
1.) to discuss the concept of the "*Soils2026" initiative in the context of a complex soilscape where detailed soils information is of central importance in determining whether land management activities will achieve their intended goals or not; and 2.) To demonstrate in the field, the role of plant-soil relationships in mapping soils, understanding their genesis, and how they can be used to digitally map soils. The Ochoco was chosen in large part because it had been used previously as a test ground for leveraging a largely complete soil survey within the algorithmic context of a digital soil mapping project in an attempt to map a remaining*



portion of the forest's soils. The lessons and the challenges learned during that process directly relate to the ongoing Soils2026 initiative and thus served as the basis of the field stops and discussion topics.

We began the tour with a beautiful and blue Friday morning visit to a meadow restoration nearing completion on Williams Prairie. This first stop provided for an introduction to the general goals of the tour, the soilscape of the Ochocos and the various approaches to soil mapping and use of the information contained therein. It provided a great opportunity to discuss the variability of the site's alluvial soils and past climate conditions which gave rise to them, consideration of which was necessary for the successful implementation of the restoration project. We then began a series of 3 stops, and 5 soil pits which were selected to illustrate soil-landscape relationships and the plant-soil interactions characteristic of the semi-arid conditions prevalent across the forest. We ended the day with a stop featuring a catenary sequence of soils formed in Mazama ash overlying a dark brown paleosol where we once again discussed site-level variability of soil properties/ classification and the effects on management activities..

We returned to the rather rustic and charming Crystal Springs group Camp. Dinner was a group effort and resulted in a marvelously simple yet delectable version of chicken diavolo. Conversations inspired by a day in the field could be heard late into the night.

Our second field day was focused on observing the complexity of the soil scape in a portion of the forest underlain by the John Day/Clarno formation. We examined large landslides, soils which have formed in this lithology, and discussed how the high clay content affects hydrology, drought susceptibility, and wildfire risk. We serendipitously ended the tour with an impromptu and much fun search for fossils after a certain expert (Dr. Greg Retallack) pointed out that what we thought was a tuff was actually a sedimentary rock replete with fossilized plant remnants. We took our precious finds and headed back the way we came, bringing yet another summer outing of the Oregon Society of Soil Scientists to close.

However, this brief recounting of the summer tour would not be complete without a big thanks in recognition of Jim David, Forest Soil Scientist on the Ochoco National Forest (photo below). Jim has been integral to the Soil Survey efforts on the Ochoco for close to, if not more than three decades, and his knowledge of the forest's soils and their management is unparalleled. Having him as a co-leader of the tour made for an unforgettable experience and inspiration to intimately understand the landscapes in which we work.

Vance Almquist , OSSS President

North American Forest Soils Conference

The 14th North American Forest Soils Conference was held July 16-21 in Eugene this year. We were lucky to have this event take place here in Oregon, mainly because this conference happens every 5 years in different locations between Canada and the states.

Over a hundred people attended from different areas of the country and Canada from various universities and land management agencies, including many OSSS members.

Field tour with OSSS members

The conference focused on bridging the gap between current forest soil research and land management direction, as well as connecting with each other moving forward. Main topics of the week centered around nutrient cycles and forest productivity, carbon flow through forest soils, and fire research on forest soils. Each day included a panel discussion with different presenters, along with a field day visiting sites around the area. Many of us walked away from the conference with refreshed inspiration and stronger connections among the soil science community.

One of the highlights was a speech given by Dr. Cindy Prescott, professor at University of British Columbia, during the closing panel discussion on "The Future of Forest Soils". She opened the panel discussion with a paper she had written titled "Resilient Soils". It was powerfully presented and inspirational, and I wanted take the opportunity to share it here. Enjoy!

Sarah Brame– Sharpshooter editor

Resilient Soils by Cindy Prescott

Our forests are under siege. Insect outbreaks are killing trees across millions of acres of forest. Wildfires are converting more biomass and organic matter into CO_2 in moments than we can possibly replace even if we knew how to lock more C away in soil.

Clearcut harvesting continues unabated despite the vast areas being removed from the harvestable landbase by fire and insects. Look at a time lapse of forest cover over the past 30 years and you will appreciate the rate at which we are losing mature forests.

This is removing transpiring canopies, resulting in soils with reduced capacity to retain water during extreme precipitation events, leading to floods and landslides. Organisms dependent on mature forests are being extirpated. Our vast forested landscape is now a net carbon source rather than sink.

This is our new normal.

How can we get out of this death spiral?

Let's look at previously forested sites after these disturbances.

What remains after a severe wildfire or insect outbreak or clearcut harvesting?

The soil.

This is where the next forest is coming from. This is what will produce the next crop of timber. This is the basis of stand productivity. This is the basis of the future viability of the forest industry. The cornerstone of the forest and the industry.

We know this. Does anyone else know this?

How are we stewarding this critical resource? *Are* we stewarding this critical resource?

Our metric of success in forestry is still sustained yield. As long as we are getting as much timber from successive rotations we can claim that our forestry is sustainable. But our success in increasing productivity is attributable to our ingenuity in developing faster-growing genotypes and manipulating trees through fertilization and other silvicultural practices to produce timber faster.

Do we know if the soils underlaying them are being sustained or degraded? I expect they are being degraded. Does it matter if the soil is quietly degrading, if we can manipulate trees to grow faster regardless of the state of the soil beneath them? If we think long-term, it does matter.

But our management of the soil resource is still limited to don't lose it, don't squish it, and put a log on top.

This was fine in 1990, but **it's not 1990 anymore**. Sustainable forestry is not enough. In the 21st century our forests need to be resilient. And resilient forests need resilient soil. We need to be managing forest soils for resilience.

What makes a soil resilient? I would describe it as being high functioning. Fully alive. Dynamic. Able to respond quickly and effectively to perturbations. Processes occurring at rates needed to maintain fluxes of nutrients and energy. A dynamic and complex belowground food web. Active transformation of litter and generation of soil organic matter. Continuous replenishment of soil organic matter and carbon pools. A high level of hydrological function able to sustain the forest through droughts and extreme precipitation events.

How can we help our soils to be resilient? And in so doing to make our forests more resilient?

We can get some insights from agriculture. So far, we have mostly borrowed from industrial agriculture – manipulating the plants and increasing inputs of nutrients and water to maximize the yield of the singular product that we desire.

What if we instead focused on **improving** the soil – the basis of the forest?

This is the key focus of regenerative agriculture. Here are three relevant principles of regenerative agriculture:

1. Keep living roots in the soil. Living roots are a major conduit of energy from plant photosynthesis to soil organisms. Cover crops maintain the flow of energy and keep the soil alive between crops.

2. Reduce inputs. Stop the laser focus on maximizing aboveground growth and yield. Instead focus on optimizing aboveground *and* belowground production. Produce a plentiful crop while also promoting the soil food web.

3. Encourage diversity. Plant diversity fosters belowground biodiversity. The Jena experiment showed that this happens because different plant species produce different exudates, and diverse exudate cocktails generate diverse soil microbial communities. Think of ways to intercrop in space and time. If you have to monocrop, have a diverse cover crop. Include N-fixers and many types of plants.

How can we apply these lessons in forestry?

1. Take some stems, just don't take them all. Leave enough trees to keep the soil alive while the next generation gets started.
2. Add nutrients that will improve the soil, not just feed the trees, possibly at the expense of soil life. Aim for the sweet spot of nutrient supply where both above- *and* belowground productivity are optimal.
3. Manage for more than one tree species. Embrace broadleaves and N-fixing species like alder. They will rebuild soil life, soil organic matter and soil nutrients including N, but also Ca and other base cations. We know this could happen in a few years. We know that it will increase the productivity of the Douglas-fir crop that follows. Have a fallow period of alder and/or other broadleaves. Or grow them in mixtures. Alder with cedar, aspen with spruce. Or just allow them to be part of the forest. Don't kill everything that isn't your tree crop.

Be polyculturalists.

In every decision, think about the soil. Think about the belowground ecosystem. Consider how your actions could impoverish it or steward it. Manage it as if it were your most critical asset, your #1 ally in making a resilient forest.

Because it is.

We know this.

Does anyone else know this?

Dr. Cindy Prescott University of British Columbia

Action Committee Update

This is an informal group that comes together to work on issues near and dear to soil enthusiasts. Anyone in OSSS is welcome to join. Contact me (503-334-7345, pam.mark.keller@gmail.com) if you'd like a copy of our mission statement (also in the last Sharpshooter) or details about our activities.

Our two focus areas are to expand the Soil Science program (especially undergraduate) at OSU and to learn about legislation (especially in Oregon) that has a soils connection.

In the winter and spring we zeroed in on legislation. The "Healthy Soils" bill which we had endorsed did not pass, but the "Natural Climate Solutions" bill did pass and it should have positive effects. It will support forestland owners, farmers, and ranchers across the state to implement climate-smart land management practices. It specifically addresses soil practices to improve carbon management.

This summer we looked at Soil Science education at OSU. A major concern is the decline of hands-on, field experience. With the move to online courses, field trips are rare. We decided to work on organizing a soils field camp to add to the course offerings. There would be a week of intensive field study in the Willamette Valley and a week of extensive landscape study east of the Cascades. That is the one sentence summary, but there has been a lot of work already on details. Feel free to jump in with ideas. Good news from OSU is that they recently hired a Pedologist!

Pam Keller

CONTRIBUTE YOUR OREGON SOILS PHOTOS TO THE OSSS ARCHIVE

Send an email with the following and any additional information to morenov@oregonstate.edu to contribute to our interactive map of Oregon soils

01

High resolution photo of entire soil profile

Please only send JPG or PNG file format photos

02

A link to an Official Soil Description

If not yet described by the NRCS, share a brief description of the soil properties

03

Location of the soil profile

Include coordinates, general location or regional description

04

Photo credits

Include the name of photographer and source of the additional soil information

High School Soil Judging at Pilot Rock

Spreading the gospel of soil one pit at a time.

What could be better than a real live soil? A herd of 163 high schoolers got a close up look in four soil pits at the Blue Mountain District Future Farmers of America Soil Judging.

A farmer hosted the sites for Agriculture classes from eleven high schools on the lava plateau near Pilot Rock. The participants cycled through four backhoe-dug soil pits, and described soil features (color, texture, structure) and assigned horizon nomenclature. For each site, management implications were also among the answers judged according to soil scientists' previous assessments.

The soil pits displayed showed how soils differ in sometimes short distances. The examples were a moderately-deep-over-duripan upland soil, an alluvial fan foot slope soil which had a thick buried Mazama ash deposit (10YR 8/1!), and a beautiful silty floodplain soil.

Two reporters from the "Eastern Oregon" newspaper also turned out. Don Wysocki, Soil Scientist for OSU Extension, got a good quote into the newspaper article: "Just about everything you do relates to the soil. You build homes on it, you produce food on it, you discharge your waste into it. It purifies water. .... Soil is probably the most critical natural resource we have."

Congratulations to Don and other organizers for this field exercise. It was great to see these young adults looking up close at real live soils!

Mark Keller

Save the Date

March 1 – 2nd, 2024

Eugene OR

Winter Meeting

Oregon Society of Soil Scientists

What might the Willamette Valley look like in 2120? Will the valley be a corridor of sprawling cities, a bastion of sustainable agriculture, or something hitherto unknown to us? What technologies and knowledge might we as soil scientists bring to bear in the hopes of tackling problems of the past and navigating a sustainable future? These are just some of the questions we hope to address during the 2024 Winter Meeting of the Oregon Society of Soil Scientists – **"Visions of 2124".**

Poster Session and Competition!

Lightning Talks (15 min)

Soil Scientists in the Fire Environment

A glimpse into the Burned Area Emergency Response

When a wildfire touches the landscape, the impacts are striking and last long after it has been fully extinguished. Soils affected by fire are destabilized when the organic matter in them is burned and have a high potential for debris slides and flows when the rainy season begins. This can have negative impacts on both natural resources and on infrastructure throughout the wildland-urban interface. So how do we estimate the immediate impacts of fires on soil resources and make

Figure 1 - Hillslope view of mosaic fire pattern west of Frissell Ridge.

recommendations for mitigating some of the adverse effects of this disturbance? That's where, on public lands, the Burned Area Emergency Response Team (BAER) steps in. BAER is an interagency program headed by the Forest Service which deploys scientists with expertise in soil science, hydrology, cultural resources, geology, fisheries, botany, wildlife, and recreation into the post-fire landscape on fires larger than 500 acres to size up the damage in a rapid (10 to 14-day) assessment and make recommendations for mitigating some of those more extreme impacts expected in the first two years after a fire.

This year I was lucky enough to join the BAER team as a Soils Trainee on the Lookout Fire, which affected 25,751 acres on the Willamette National Forest, including about 10,720 acres of the H.J. Andrews Experimental Forest. This area is special to me, as I conducted field work at the Andrews Forest in soil carbon cycling and soil physical structure variations among harvesting practices and hillslope aspect during my graduate studies at Oregon State University. To hear that the idyllic old growth areas of the Andrews I have grown to love had been impacted by fire was initially alarming to me, but then curiosity kicked into the soil scientist part of my brain, and I knew I wanted to be one of the first on the

Figure 2- Jalene Weatherholt, lead Soil Scientist on the BAER team, pictured in a moderate severity burn area.

ground to witness the behavior of the Lookout fire and to assess soil properties and burn severity.

So how exactly do we evaluate soil burn severity? During a BAER assessment, soil scientists will first perform reconnaissance of the affected area using GIS products such as a Burned Area Reflectance Classification (BARC) map. This is a satellite product showing differences in near- and mid-level infrared reflectance values pre- and post-fire. The BARC map, provided to the Lookout BAER team by the Geospatial Technology and Applications Center (GTAC) is interpreted as a change in vegetation cover as a result of the burn. Using this as guidance, we then perform field work to hone in on specific areas of interest and ground truth the accuracy of burn severity from the BARC map. A protocol created by the Forest Service, the Field Guide for Mapping Post-Fire Soil Burn Severity, sets the guidelines for assessing how much fire has changed the properties of soil. Key attributes that we look for are changes in soil color, structure, root density, and water repellency. Assessing for these features was tricky at times in the Lookout fire, as these soils have inherent hydrophobicity, some reddish soil colors and weak granular soil structure at the surface (Fig 3).

Figure 3 - Photo of a typical unburned soil profile in a low-elevation old growth section of the Andrews Forest.

But in many areas, particularly those with high soil burn severity, the effects of the fire were hard to miss. A section downslope of Frissell Ridge, northeast of Lookout Mountain, is where intact old-growth forest had burned from the crown down through the A horizon (Fig 4).

Figure 4—A downed tree is burned completely, leaving only black, red, and white oxidized mineral soil behind.

In these areas, we observed complete consumption of fuels and the topmost layer of A horizon organic matter, resulting in soil that varied from black to red and in some places white, where soil had burned at the hottest temperatures (Fig 5).

Figure 5- A pocket of high soil burn severity.

Some of these locations were quite the puzzle to interpret soil burn severity in. On some of the steeper slopes in this drainage, vegetation burn severity was extremely high, but just a few cm below the soil surface, we observed intact, unburned, or dried fine roots (figure 6).

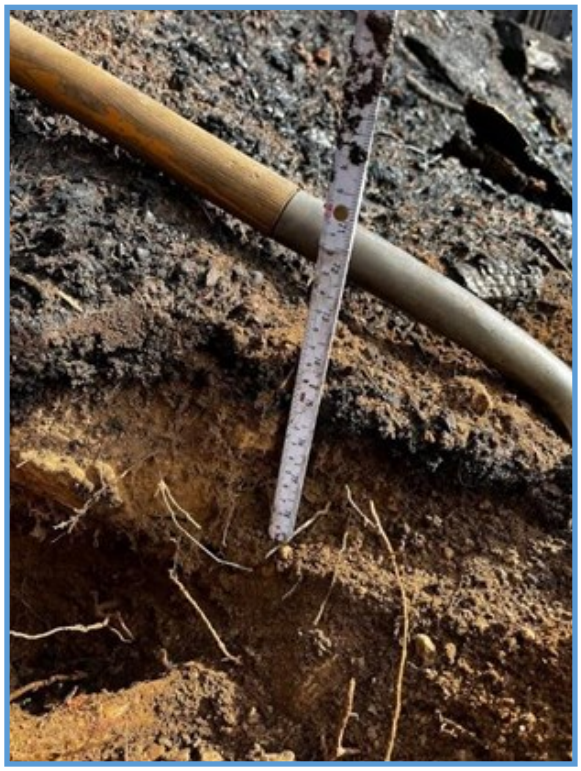


Figure 6 -Just about 10cm below the burned soil surface, some fine and coarse roots remained and were not brittle.

Once this field reconnaissance is completed and the soil burn severity map is finalized, we move into soil erosion modeling of drainages within the burned area to provide a quantitative estimate of sediment export to streams downslope, which is a major concern for fish-bearing streams in burned areas.

What we assume took place in these areas was removal of the most intensely burned surface soil by winds in the weeks following the initial ignition of the Lookout drainage, a phenomenon termed "soil drop", which is will become a central point of focus in the post-fire environment by the Forest Service for the fire seasons to come.

All in all, my takeaways from this experience were an enormous amount of new information on the post-fire environment, more memories of time spent in such a special place to me, and connections with incredible scientists. I want to thank Jalene Weatherholt (Fig 2), the primary Soil Scientist on this team who was super helpful in training me on every aspect of this process. In addition, the guidance of Ut Hyunh (Mt. Hood NF), Vance Almquist (Willamette NF), Megan McGinnis (Siuslaw Field Office BLM), and our BAER Team Lead and Soil Scientist on the Willamette National Forest, Wendy Peterman, was invaluable to me, and I am super grateful to these incredible humans for all their support!

Until next time,

Victoria Moreno (Soils Technician, Siuslaw Field Office BLM)

Annual Regional Forest Service Soil Field Camp

Every year, Forest Service Soil Scientists from Washington and Oregon meet for a few days to talk soils! We discuss soil management, policy, research, as well as dig pits together and refresh our soil taxonomy skills. Its also a great opportunity for training and learning from each other and ongoing projects. This year's field camp was in the Umpqua National Forest in SW Oregon. Many seasonal soil crews joined this year which added to the value and importance of these field camps for mentoring and building soil scientists.

The agenda included learning soils and geology on the Umpqua, soil taxonomy and mapping with NRCS soil mappers, ongoing research with the long-term soil productivity (LTSP) plots on the Umpqua, subsoiling and recovery, soil impacts from logging systems, and soil monitoring protocols.

We were lucky to have an honored guest with us this year, James Archuleta, who previously worked as a soil scientist on the Umpqua and was involved in setting up the LTSP plots, along with many other projects, including biochar and subsoiling research.

Below is a deep pumice soil profile overlaying a buried A horizon on the edge of a LTSP plot near Diamond Lake.

Sarah Brame– Sharpshooter editor

OREGON SOCIETY OF
Soil Scientists

The Sharpshooter is the official quarterly newsletter distributed to the members of the Oregon Society of Soil Scientists. Send address changes or inquiries about membership to: osss.pres@gmail.com or

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