



watersheds
program

treeline

partnering for climate adapted forests

September 2022

Missed the June Treeline Newsletter? Click [here](#) to learn about how our partners are looking at issues surrounding upland forest health.

Interested in submitting an article? Reach out to Kayla Seaforth kseaforth@b-e-f.org

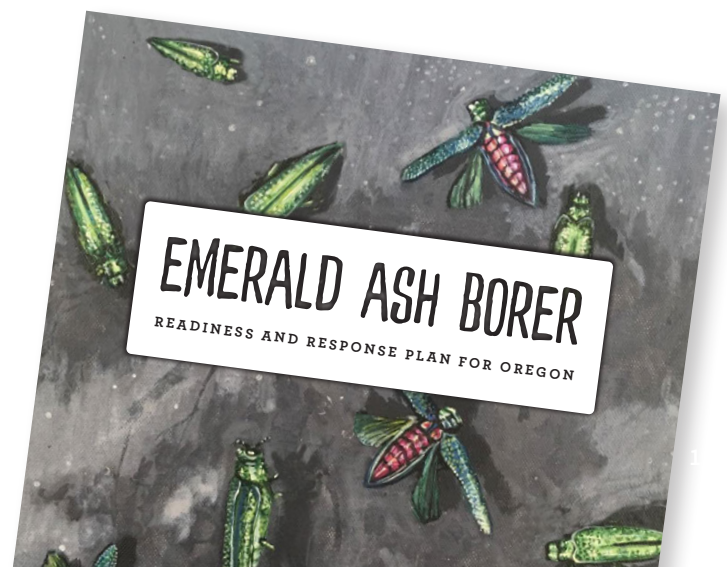
Treeline aims to: Engage PNW restoration practitioners, nursery partners and researchers who work for or represent tribes, indigenous groups, non-profits, agencies, businesses and more. We gather, disseminate, and discuss information and knowledge across a broad region.

The Stressors and Strains Issue

This issue of Treeline focuses on the stressors and strains that are challenging federal, state, local, tribal and NGO agencies to think creatively and respond in real time to the climate crisis.

Emerald Ash Borer Arrives in Oregon

On June 30, 2022 **emerald ash borer** (EAB) was observed in Forest Grove, Oregon, the first reported sighting of EAB on the west coast. Based on the damage observed, it is likely that the infestation had been present for 2-4 years. In 2021 stakeholders in Oregon published the **Emerald Ash Borer Readiness and Response Plan** which identified a plan for a coordinated response to the eventual arrival of the highly destructive forest pest.





EAB and hole. Photo Credit: Johnson Creek Watershed Council

Work is underway to establish a seedbank of Oregon Ash and test for genetic resistance to EAB, but additional seeds are needed.

If you are interested in collecting ash seeds to assist with this effort please contact Dr. Richard Sniezko at richard.sniezko@usda.gov to participate.

This plan is being implemented across the state, and you can help by being on the lookout for additional populations of EAB:

- 1 Know the signs of EAB infestation. This [guide](#) from Oregon State University is a helpful resource with photos of the insects, tunneling patterns, and tree symptoms.
- 2 After confirming EAB presence (be aware of several adult [look-a-likes](#)) report the sighting to the Oregon Invasive Species [online hotline](#).
- 3 Be more cautious than ever about moving wood from one area to another to minimize the spread.
- 4 Look up and follow local quarantine orders if they are in place.

Table 1. Oregon threatened and endangered species that will likely be impacted by widespread Oregon ash mortality caused by EAB.

Common Name	Scientific Name	State Status	Federal Status	Potential Impact of EAB
Columbian White-tailed Deer (Lower Columbia River population only)	<i>Odocoileus virginianus leucurus</i>		T	Some
Lower Columbia River Chinook Salmon	<i>Oncorhynchus tshawytscha</i>		T	Some
Lower Columbia River Coho Salmon	<i>Oncorhynchus kisutch</i>		T	High
Lower Columbia River Steelhead	<i>Oncorhynchus mykiss</i>	E*	T	Some
Oregon Coast Coho Salmon	<i>Oncorhynchus kisutch</i>		T	Some
Southern Oregon Coho Salmon	<i>Oncorhynchus kisutch</i>		T	Some
Upper Willamette River Chinook Salmon	<i>Oncorhynchus tshawytscha</i>		T	High
Upper Willamette River Steelhead	<i>Oncorhynchus mykiss</i>		T	High
Nelson’s checkermallow	<i>Sidalcea nelsoniana</i>	T**		High
Peacock larkspur	<i>Delphinium pavonaceum</i>	E**	E	Some
Bradshaw’s desert parsley	<i>Lomatium bradshawii</i>	E**	E	Some

* Listed under the Oregon Endangered Species Act (ORS 496.171 through 496.192)
 **Listed under Oregon endangered, threatened and candidate plants (OAR 603-073)
 +U.S. Endangered Species Act of 1973 (Public Law 93-205, 16 U.S.C. § 1531)

Options for Maintaining Riparian Cover as Ash Declines

By George Kral

In mixed woodlands along streams (like Gales Creek, the Tualatin and Willamette Rivers) where there are generally better-drained soils, we have several native species that can fill in gaps left by ash, including oak, maple, white alder, cottonwood and conifers. Unfortunately, three of the best — red alder, Western redcedar and grand fir — are dying likely due to climate stress. Nevertheless, we have options for canopy cover and can perhaps find others in these settings to our south, maybe including California black oak, Umbellularia and others.

The most limiting sites are bottomland clays where ash now predominates. The good news is that oak and ponderosa pine can thrive on many of these sites. Prior to European

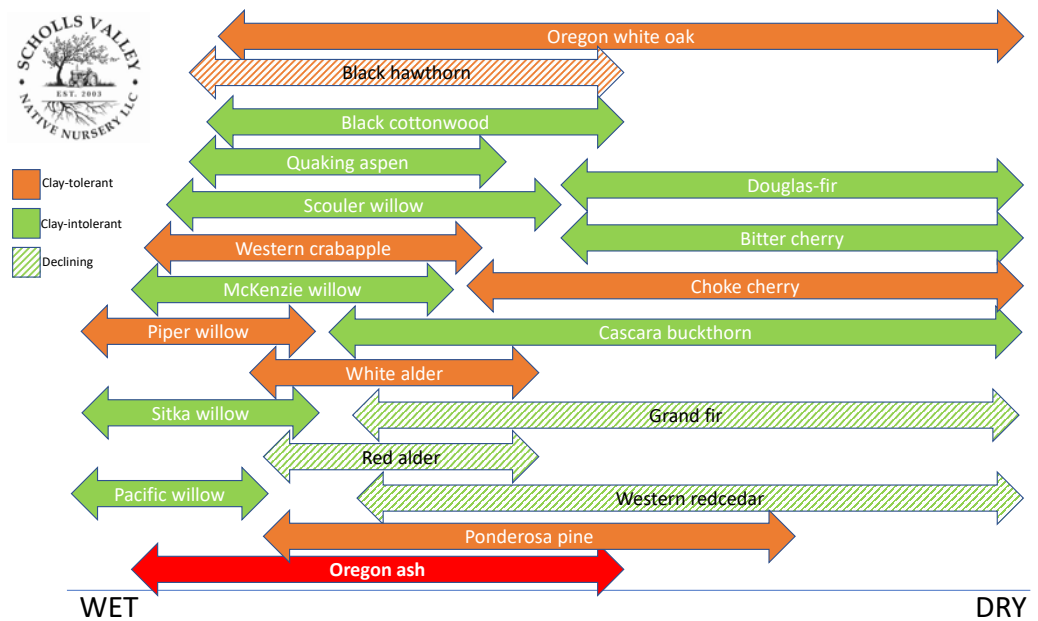
settlement, a lot of what are now ash stands were oak (and sometimes pine)-dominated savanna-wet prairie complexes and ash has invaded them. A great place to see this phenomenon is in and around Camille Park in Beaverton. Generally, if you see a stand of ash on wet ground, you are likely to find oaks mixed in as well.

In the wettest clay sites, though, we really have very little to work with. None of the willows except maybe Piper willow will be happy there, and then only if the ground holds water all the way through the summer. White alder and crabapple can hang in on moderately sticky ground, but if it's really heavy and really wet, we only have a couple of shrubs that will take it (spiraea, dogwood), a couple of

small trees, and no big trees at all. We are working on some selections with black hawthorn to get better performance because the Willamette Valley population is also in serious decline. Otherwise, this species is, along with oak and pine, among our best hopes for canopy maintenance.

Conversion to savanna/wet prairie is a great option, given the rarity and diversity of this once-common habitat. To do this effectively in the long-term, we need to restore grazing and burning as viable tools. We need these tools, but as long as agencies and policies are pyrophobic and anti-livestock, no one on the private side can do much.

This chart incorporates soil moisture, groundwater seasonality, soil texture and other variables that influence what grows where. These variables occur at landscape and microsite scales, so folks need to use this kind of information with caution when pinpointing planting locations for each species.



Perspectives on Emerald Ash Borer's Arrival from Zena Forest

Ben Deumling is the President of Zena Forest Products, a Salem, Oregon based multi-generational family business that works to save, restore and promote the endangered hardwood forests of Oregon's Willamette Valley. The forest that Ben manages encompasses several ecosystems, including Oregon ash dominated riparian forest. He knew that the arrival of the emerald ash borer was coming and worked with state officials to plan for the moment we are now in. They stopped planting ash in the Zena forest about five years ago, and have increased production of ash wood products as trees have died or become available through forest management projects in the region. Ben notes that ash wood is easy to work with because trees grow much straighter than other hardwoods, and it dries relatively quickly, but pointed out due to riparian protection measures, the supply has been limited up to this point.

Ben's concerns surrounding the arrival of the emerald ash borer are layered. He understands that eventually Oregon Ash will disappear from the landscape, and wonders what will take their place. These trees make up a major component of Willamette Valley riparian forests, and occupy a niche that no single other species can replace. He wonders how local restoration efforts will address this conundrum, and what will happen to the infested trees. How will stream temperatures be affected? What are the secondary and tertiary effects that will manifest from this loss?

He also sees an opportunity. Given the marketability of ash wood and the

capacity of his and other sawmills to turn these trees into valuable forest products, he is clear eyed about the possibilities of the situation. However, he's not jumping in just yet. Prior to the documentation of the emerald ash borer in Forest Grove, Zena had been working with a private landowner to purchase ash logs from a restoration project in Gaston, OR. The Forest Grove infestation was discovered just before the trees were to be cut down and transported to the Zena mill. Because the source of the wood was so close to Forest Grove, Ben was unwilling to have them trucked to his Salem sawmill, for fear of transporting EAB. The landowner is highly motivated and plans to strip the bark and cambium from the logs and then arrange to have them transported for processing at Zena's mill, a process that significantly reduces the likelihood of the pests hitching a ride and infesting the ash in Zena Forest, but is expensive and is unlikely to be implemented at a large scale.

Ben commended the state's efforts to prepare and now implement the Emerald Ash Borer Readiness and Response Plan, and also acknowledged that what we need now is time. The ash borer will spread throughout Oregon Ash's range and riparian ecosystem will be forever changed. If we can slow the spread by implementing and following quarantine orders, we might buy ourselves enough time to collaborate on solutions that can preserve ecological integrity in the face of this dramatic shift.

LISTEN

Emergence Magazine Podcast on the Loss of Ash, Assisted Migration and More

In a series titled "They Carry us With Them," the team at Emergence Magazine's podcast looked at many facets of tree migration, and in the [feature story](#), Chelsea Steinauer-Scudder details how the arrival of emerald ash borer has affected Mik'maq basket makers, and presents deep questions about how losses like this affect culture and ecology. This audio essay offers some solidarity with the loss that so many in Oregon are grappling with following EAB's arrival.

*Oregon ash seed clusters.
Photo Credit: Dr. Richard Sniezko*



Adapting Plantings for Prolonged Drought Conditions

By Kayla Seaforth

Gratitude to Dr. Connie Harrington, USDA-FS Emeritus Scientist, Pacific Northwest Research Station, Land and Watershed Management, for technical advice and input on this article.



Deep planting stinger bar. Photo Credit: NRCS

In the 2021 [Treeline survey](#), 46% of respondents indicated a strong interest in learning more about deep planting as a climate adaptation strategy.

Many areas around the world are experiencing prolonged drought. The Southwestern United States has been in a megadrought since 2000, the longest period since [800 CE](#). Recent [research](#) from scientists at UC Santa Barbara indicates the megadrought and mega-pluvial conditions we have experienced in the 20th and 21st centuries, and are projected to experience under business as usual climate change scenarios, reflect a shift in the baseline.

In the [Pacific Northwest](#), mean temperatures are projected to increase while overall precipitation is not expected to change significantly, though historic seasonal patterns may be exaggerated. Slightly more precipitation is projected to fall in autumn, winter and spring, and less in the summer. In most projections, more precipitation is expected to fall as rain, rather than snow, [reducing overall snowpack](#) and exacerbating dry conditions in the summer. In addition to impacts on human health, agriculture, and most other sectors, these cumulative changes will have implications on water availability within natural systems, and may warrant consideration of planting practices that can buffer the anticipated impacts of climate change.

One way that practitioners in the Southwestern United States have successfully established riparian cover despite nearly unrelenting drought is by planting their [stock deep](#), so it is closer, or in some cases in direct contact with the water table. In the Pacific Northwest, this may be especially applicable in the dryland riparian areas of eastern Oregon and Washington, where degradation of these ecosystems, climate change, and other pressures have led to lowered groundwater levels and difficulty establishing native riparian cover. One [experimental study](#) along a tributary to the John Day River in eastern Oregon suggested that planting willow and cottonwood stakes in augered holes that penetrated the water table significantly increased overall survival. These researchers also looked at several browse protection strategies, and determined that vented plastic tree shelters in combination with deep planting led to the highest survival rates, possibly due to the favorable microclimate created by the tree shelter.

These experiments indicate that deep planting may be a viable strategy in restoring ecosystems that will experience more frequent drought conditions as the climate changes, though it isn't appropriate for all species. Rooting habits are an important consideration when deciding whether to plant deeper than typically recommended. Those plants that root readily from cuttings (willow, cottonwood, dogwood, etc.) may respond better to deep planting than those with slower growing, shallower or less vigorous root systems. Some trees and shrubs have bark that is sensitive to oxygen deprivation, and burying the stem too deep may result in bark deterioration which can expose the plants to increased risk of disease and pest infestation. Species that are often buried by sediment during flood events may be less susceptible to bark deterioration.

The following species are often planted by restoration practitioners across different ecoregions in the Pacific Northwest. Information on likelihood of deep planting tolerance was determined by a review of relevant literature related to physiological characteristics including ability and propensity to produce adventitious and rhizomatous roots, and tolerance of frequent flooding and subsequent burial by flood sediments. In most cases the likelihood of deep planting tolerance is an inference based on the above physiological characteristics, and should be taken as guidance for future experimentation and learning.

Common Name	Latin Name	Deep Planting Tolerant
Red Alder	<i>Alnus rubra</i>	Possible
Pacific madrone	<i>Arbutus menziesii</i>	Unlikely
Paper birch	<i>Betula papyrifera</i>	Unlikely
Red osier dogwood	<i>Cornus stolonifera</i>	Yes
Pacific ninebark	<i>Physocarpus capitatus</i>	Possible
Sitka spruce	<i>Picea sitchensis</i>	Unlikely
Black Cottonwood	<i>Populus trichocarpa</i>	Yes
Douglas fir	<i>Pseudotsuga menziesii</i>	Unlikely
Oregon white oak/Garry oak	<i>Quercus garryana</i>	Possible
Red flowering currant	<i>Ribes sanguineum</i>	Likely
Salmonberry	<i>Rubus spectabilis</i>	Likely
Willows	<i>Salix</i> spp.	Yes
Douglas spirea	<i>Spiraea douglasii</i>	Likely
Common snowberry	<i>Symphoricarpos albus</i>	Likely
Pacific yew	<i>Taxus brevifolia</i>	Possible
Western Red Cedar	<i>Thuja plicata</i>	Unlikely

It is important to note that deep planting is not a viable strategy for all species, including most conifer species. For example, planting Douglas fir too deep can reduce the amount of photosynthate produced by the crown, which supports root growth and can lead to decreased vigor or mortality. The impact of this strategy is also highly dependent on site conditions and may not be helpful in areas where plants have consistent access to water in the upper soil horizons through rainfall.

Planting practices aren't the only way to hedge our bets against plant mortality due to drought stress. Outplanting seedlings with well developed, healthy root structures can improve overall drought tolerances.

Root traits associated with better performance under drought:

- Small fine root diameters
- Long specific root length
- Considerable root length density

Learn more [here](#).

Regardless of planting depth, obtaining plants with vigorous and healthy root systems, and employing correct planting techniques are crucial for plant survival, warns Forest Service Emeritus Scientist, Constance Harrington. “Asking for deep planting of a large root system can sound like a good idea but can misfire if seedlings are misplanted such that the roots are bent up at the bottom of the hole (J-rooted). Poor planting can cause problems down the road in survival and growth, so emphasizing correct planting is very important. I also like to loosen the soil at the bottom of the planting hole to encourage rapid rooting into deeper soils,” she says. Overwhelmingly, the advice from experts stresses the importance of thoughtfulness in all aspects of ecosystem restoration. From site selection and preparation, to plant form, to planting technique and post-planting care, all elements of this process must be considered with care and attention to detail.

Tools used in deep planting:

- Hand operated and power augers — gas powered models, tractor or skid steer mounted, etc.
- **Stinger bar** attached to excavator or tractor
- **Water jet planter**
- **Electric rotary hammer drills** — can be used to penetrate frozen ground

Promising News for Autumn Bare Root Planting

By Kayla Seaforth

The Washington Association of Conservation Districts Plant Materials Center in Bow, WA (PMC) is making bare root plants available this fall after experimenting with the Missouri Gravel Bed (MGB) growing technique. Fall outplanting gives trees and shrubs more time to become established

before the stress of summer drought sets in, and may lead to more resilient restoration plantings. Decreases in **summer snowpack** combined with higher summer temperatures are likely to lead to increased drought frequency and severity. This reality is something that growers and those planting nursery

stock must take into account when selecting plants that they are relying on to survive well into the future.

The additional fine and lateral root growth that this growing regime promotes may benefit plants by providing more root surface area in

Missouri Gravel Beds

This technique is thought to promote fine root growth, which can aid in plant establishment and long term survival. In this method, bare root plants are harvested from standard nursery beds and then healed into pea gravel beds. They are irrigated daily and after 2-6 months are ready for outplanting. The large pore size between gravel particles allows ample space for fine and lateral root development, and allows for low damage harvesting. The Missouri Gravel bed technique is fairly low tech and can be easily incorporated into nursery practices. There may be appropriate rates of clay amendments that can reduce watering demands and make this more feasible as areas around the country face increased water stress.

To learn more about the Missouri Gravel Bed technique, see this [manual](#), which provides practical advice and background on the technique in the context of urban planting.



Missouri Gravel Bed Systems can be implemented with fairly low cost materials, such as the use of a kiddie pool pictured here. Other practitioners simply created mounded beds of gravel with minimal containment. Photo credit: John Knox

the upper soil horizons where plants can more easily access rain water and nutrients. Nurseries like the PMC often promote this type of root growth through undercutting, so use of the Missouri Gravel Bed technique is another way to achieve similar root profiles that benefit plant growth.

In 2020, John Knox of the PMC planted approximately 50 plants that were conditioned in the Missouri Gravel Beds at a site in the floodplain of the Skagit River, in partnership with Skagit Land Trust. While this trial was small, it indicated that plants conditioned this way can survive outplanting at a typical floodplain restoration site. After 2 years, salmonberry fared the best with 80% survival. Other species did not do as well; survivorship for osoberry was 58%, pacific crabapple was 42%, and thimbleberry survived at a rate of 25%. Knox attributed much of the loss to other stressors such as herbivory and buck rub by deer and elk, and suggested that additional plant protection may increase survival. He has plans to scale up the trials in partnership with the Washington Native Plant Society this fall in a 5000 plant trial.



Osoberry coming out of the gravel bed, notice new white roots. Photo Credit: John Knox

John Knox, who led the Missouri Gravel Bed trials at the PMC will be hosting a webinar to go over the results in more detail on October 20th. Email pmcjknnox@gmx.com to RSVP.



Summer transplant salmonberry. Photo Credit: John Knox



**NORTHWEST
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Go With the Snow

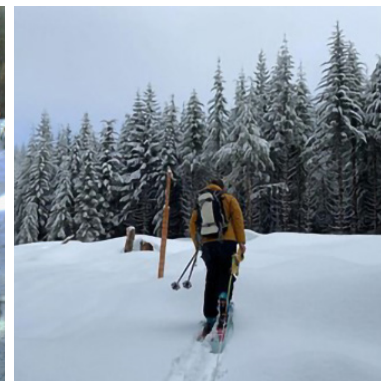
Winter Forest Monitoring Results

By Rowan Braybrook, Northwest Natural Resource Group (NNRG)

The future is looking drier, and the trees are taking notice. With climate change creating warmer and drier summers, how can we use forestry techniques to increase snowpack and slow snowmelt for water availability? This question led us at NNRG to create an experiment in practical forestry methods, in collaboration with several partners.

Forestry techniques like thinning and gap cuts (small clearcuts around 0.5 to 1 acre in size) are sometimes recommended to increase snowpack, and thereby increase ecosystem resilience in the face of a changing climate. We wanted to provide local proof of concept that these methods work, and are likely to lead to increased snow accumulation and slower snow melt. We've shared some of the planning for this project (which also included an assisted migration component) before in [this newsletter](#), and we're glad to be able to share some initial findings from last winter's snow monitoring.

Our expectation, based on similar studies, was that more snow would accumulate in the gaps and the thinned forest than the control (unthinned) forest, where snow would be intercepted by tree crowns and would evaporate or melt more quickly than snow that reaches the ground. We expected to see the most snow accumulation in the gap cut. This expectation was broadly confirmed, as you can see in the figures below. The results showed that significantly more snow accumulated in the gap, and that there was more snow in the thinned forest than the control. The snow in the gap and thinning also lasted significantly longer in spring — when the snow in the control forest had fully melted, the gap still had about one



Caught in the act! NNRG technicians pause in skiing through the forest to take a snow depth measurement. Photo Credit: NNRG

meter and the thinned plot had about 25 centimeters of snowpack. Stretching out the snowmelt later into the spring could reduce the impacts of summer drought on trees and increase the supply of cool water to streams.

Our team used several different methods to monitor the snow across the three forest types. Before snow began in late fall, we chose representative points along transects through the three forest types. At each of these points we installed a measurement pole and a wildlife camera set up across from the pole, which would capture two photos of the pole each day. These photos were uploaded and used to record a snow measurement for each day.

While we expected more snow in the gap than in the control, we were surprised by the extreme difference in snow depths between the areas. We're looking forward to continuing to monitor this site, and hope to replicate the study at a few different elevations. The sites for this study were at 3,700 to 4,200 feet in elevation. We will also hold several workshops so people can explore the study sites firsthand and learn more about the results.

If you're interested in attending one of these workshops, please [sign up](#) for our monthly newsletter to receive the announcement!

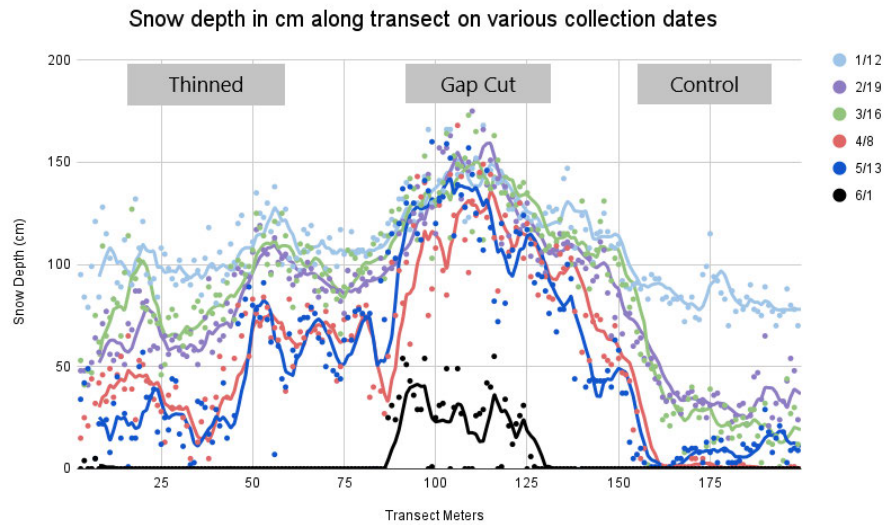


Figure 1: Snow depth measurements along the transect through all three forest types, passing first through the thinned forest, then through a gap, and finally through the control plot. This transect graph was constructed with the data collected on site every other week throughout the winter, and every week during the ablation (snowmelt) period after March. While gathering data, technicians took manual measurements of the snowpack with a snow probe at 1 meter intervals along each transect. The results show that the measured snow depth starts at mid-range in the thinned areas, increases in the gaps, and is significantly lower in the control area.

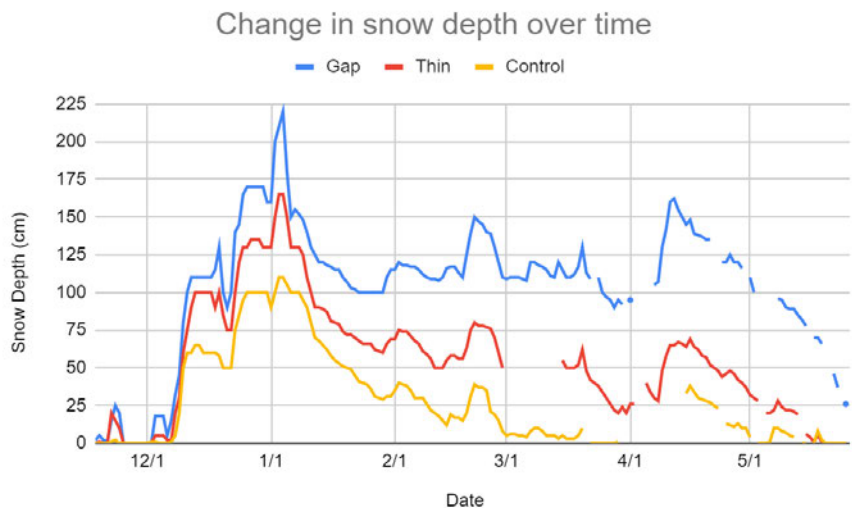


Figure 2: This graph represents the data collected from wildlife monitoring cameras throughout the season. For each day, two photos were taken. The depth measurement from the clearest photo was selected, as one out of the two was often difficult to read. Gaps in the charts are due to the cameras being obstructed, usually by snow or excess moisture.



Planting a Trillion Trees is Great, But Don't Neglect the Other Elements of the Reforestation Pipeline

A Conversation Between Diane Haase, Western Nursery Specialist, USFS and Kayla Seaforth, BEF

KAYLA: You co-wrote a great [paper](#) about the reforestation pipeline and all of the elements that are necessary to get it right. How do you think we're doing with that?

DIANE: I have spent my entire career working with nurseries. I'm going to be retiring next year and I have always seen nurseries as off the radar. I mean, I created a PowerPoint years ago when I worked at Oregon State University, trying to get students interested in nurseries and pursuing a nursery career. I had this radar screen with all these things about forestry in the radar, and nurseries and seedlings off to the side. I've used that same slide many times over the years to show that seedlings and nurseries are off the radar. So for the first time in my career, I'm seeing that nurseries are becoming front and center. But it's almost disproportionate because we need to see the entire pipeline. There's [currently] a lot of funding and interest from private investors that want to invest

in nurseries, expand nurseries, update their infrastructure, but we also need to focus on other parts of the reforestation pipeline. There are a limited number of seed collectors, and we also need to have the outplanting ability. Most tree planting is done with contract crews with guest workers, which is a labor pool that the agricultural sector also employs, so there aren't always enough workers to get the job done. The Forest Service in particular wants to scale up their outplanting and reforestation to fill in the backlog of some areas where they haven't been able to catch up with seedling planting due to wildfires, funding availability, seedling supply, and available personnel. That is one of the key bottlenecks: even if they have the outplanting crews, they don't have the capacity to go out and survey what needs to be planted and oversee it. There's also post planting care. One of my concerns about all of this attention focused on large-scale tree planting targets is, when you focus on how many

trees get planted it's not really the right measure of success. The measure of success needs to be how many trees survived and are thriving. I've seen these great articles that proclaim things like, "we planted 1 million trees in one day." But the first thing I want to know is what was the quality of those trees and how many are still alive a year later. The fourth piece of the reforestation pipeline that is really critical is the post-planting care. We can't just plant and walk away.

Overall, you have to plant the right tree in the right place at the right time for the right reasons. That's the [target plant concept](#). For example, if you're planting ponderosa pine, one ponderosa pine is not the same as another; the source of the seed matters. They have to be genetically adapted to the site. Seed collectors cannot just collect from one tree at one location, they have to collect for genetic diversity. They also have to collect from different elevation zones, and they have to keep track of where



Diane Haase

Western Nursery Specialist, USFS

Diane Haase joined the Forest Service in 2009 and is now the Western Nursery Specialist with the Reforestation, Nurseries, and Genetics Resources team, or RNGR. She also is the editor of [Tree Planter's Notes](#). Previously, she spent 20 years conducting nursery and reforestation research at Oregon State University.

the seed came from. The nursery has to do all that too, they're making sure that their client is getting the correct seed source. Then the nursery has to know how to culture those trees and grow them up to specific specifications. If [the plant is] going to a dry site, that's where the **root:shoot ratio** comes in; you want a seedling that has bigger root mass than say one that's going to a very weedy site, in which case you'd want a really tall plant that can get above the competing vegetation. The nursery has to manipulate seedling quality to match it to the site. Labor is a big issue in the nursery industry, too. There are lots of people retiring. And there are too few young people wanting to pursue a career in nurseries.

When I was a college student, in my junior year, I got really disillusioned with forestry. All of my fellow students, this is back in the 80s, they all were wearing their red suspenders and their big boots. It was all about the culture of logging, and it wasn't really what I wanted to do. I wanted to work with trees, so I worked a summer job with the Forest Service. I was talking to my supervisor one day during lunch and I said "I just don't know where I'm going to fit in forestry. I don't want to go out and mark trees to

cut them down. What am I gonna do?" And he said, "well, maybe you'd like to work with seedlings." And, you know, I was about to be a senior in college, that had never been on my radar. That was a life changing moment. I mean, I couldn't even sleep that night. I was just like, "that's what I'm gonna do." It was a lightbulb moment. I went right back to the one teacher that had the one lecture about seedlings, and I said, "I want to do this." And so here I am, I became a nursery specialist. And so my point with that story is that it's just not on the radar for college students. They really like things that sound a lot more modern like ecology and climate change. Growing trees is more like farming, but it's still really rewarding. The people that do get into nurseries tend to stay there. They love it. It's the feel good side of forestry. And yet it's hard to fill the positions. So there's that bottleneck of labor in the nursery industry.

KS: You mentioned a number of elements that it takes to be a good nursery. Could you talk a little bit about what resources are available for folks who are struggling with a specific issue in their nursery or want to elevate their nursery practices?

DH: The Forest Service's Reforestation, Nurseries, and Genetics Resources Team (RNGR, the program I work in) provides publicly accessible resources on our website rngr.net. We are a really unique group in the Forest Service, because we are cross-deputy. The Forest Service has three deputy areas, which are state and private, national forests, and research and development, and the RNGR team operates across all three of those branches. Right now we're a seven-member team and we have members from each of those [deputy] areas. With the scaling up of reforestation, we're proposing that the RNGR team needs to scale up also, because we provide expert support to all of the parts of the pipeline, and we get stretched pretty thin. We do on-site visits, we produce research that's relevant to nurseries and outplanting, and we occasionally help with international programs. We also provide input on the national level when they're developing new policies. Right now, one of our people has been helping with the National reforestation strategy.

Our [website](http://rngr.net) has tons of resources. We have a directory of nurseries and something like 12,000 articles that are searchable and free to download. We publish a list of upcoming events,



nursery meetings, and conferences. There is also a page for tropical nurseries and a page for tribal nurseries. Recently, we added a page with education and employment opportunities.

Visit [RNGR.net](https://www.rngr.net) to explore technical assistance documents and manuals related to nursery management and to view the full archive of Tree Planter's Notes. The RNGR team also hosts regional conferences and offers consultations with Nursery Specialists to facilitate technology transfer.

KS: Of the nurseries that are producing native plants for reforestation, what proportion do you think seek guidance from RNGR?

DH: I think we reach most people through the website, which gets a lot

of traffic. We also reach people when we have our annual meetings. The audience for those is growers, nursery managers, and some people that are on the reforestation side, the people that get the seedlings. We mostly reach folks that are in the forestry realm. We're in the Forest Service, but RNGR is also into native plants of all kinds; forestry species are native plants. We also provide support beyond just forestry species. I have visited several native plant nurseries that are working in restoration or conservation, not just in reforestation.

KS: It goes back to what you were saying before; the pipeline for reforestation is all about having many people who are deeply engaged in the place that they work so they can know where the seeds are, know the phenology, know when they need to be collected, and then monitor the plants after they are planted and understand how the changes are playing out in their specific place. So it's great that you're getting interest from conservation and restoration folks.

DH: I have seen a lot of the same pipeline issues [in restoration]. For example, there's funding for a great restoration project and they get all the trees, shrubs,

forb, etc. in the ground. And then after two years the funding is up and they move onto a new project. If you do not get to the monitoring and post-planting care, what is the point of spending all that money on seed collection, seed storage, seed processing, and cleaning, sowing, culturing, lifting, pruning, storing the seedlings, transporting them, putting them in the ground only to have them die, or be outcompeted by invasive vegetation, or to be browsed heavily? If we're not taking care of them, or planting them properly there's really no point in the whole rest of the pipeline. We cannot just use the metric of how many trees went in the ground — that's the easy part. It's meaningless unless they are surviving and thriving. If you can do 10 acres really well, that's way better than doing 50 acres and having nothing to show for it.

KS: Over the course of your career, have you seen any improvements in effectiveness monitoring?

DH: Forestry companies are motivated to have success so they get good quality seedlings and do vegetation control because they need to have a new forest growing fast. When a planting project is not for profit, then I see some failures.



Large cottonwood seedlings and others have been well tended in preparation for outplanting at restoration sites in Skagit County.

And I don't know if I have seen that improving much. My concern is that [success] will actually decline with this fixation on the number of seedlings planted. I am also worried that and owners are not necessarily going to feel that they need to put much effort or investment into maintaining planted seedlings if they don't see any return in it. We have to really look at the big picture: what do we want it to look like in five years, 10 years, 20 years, regardless of whether it's going to be harvested. It still has value, and we need to really look at that value. So even if it's a non-commercial species, it still has value in its ecological function. We can't be looking at just how many trees got established, we have to look at making sure that they're providing the value that was initially intended. One thing that is driving the urgency around seedling production are GIS analyses of areas with potential to be reforested. Mostly it is marginal pasture land that used to be forest land. To convert those areas back to forests, you have to get the landowners on board with it; landowner participation is going to be a limitation. There is also a need for a workforce to do that engagement and provide landowners with appropriate information and incentives for this work.

Sometimes I think we're putting the cart before the horse a little bit with wanting to scale up seedling production. We need to make sure that those seedlings have a place to go, that they're the right seedlings for the right place, and that the people are engaged and enthusiastic and going to follow through.

KS: Private restoration on riparian systems and assistance with forest management is something that is supported by Conservation Districts across the Pacific Northwest, but I'm not aware of that sort of movement happening with reforestation. Are you aware of anything like that?

DH: Federal and state agencies have the Legacy Program, which exists mostly to maintain forests that exist already as well as stewardship programs to support new projects. States also have extension programs to provide technical support to landowners, but unfortunately, many of those have been watered down over the years. That's a support to the reforestation pipeline

that is not adequate if reforestation is to be scaled up at the levels proposed. It's barely serving what exists already, and to suggest that we need to do two and a half times as much without the people in place — it needs to be a coordinated effort. It'll take a while to get that moving but I'm excited. Even if we can only do half of what is suggested, and if we can do it well, then that's huge. But it's going to take a lot of coordination, a lot of people and monitoring to make sure it's successful.

KS: If you could wave a magic wand and describe the perfect reforestation pipeline, what would that look like?

DH: It would probably be doubling the workforce capacity that we currently have in every aspect. You know, seed collectors, nursery people, reforestation foresters, tree planters, plus the support network of extension people and other experts like the RNGR team, so people have the technical advice that they need.

KS: Hopefully, we'll get there. And like you said, even if we accomplish a fraction of this, that's better than where we're at today.

DH: Part of doubling that workforce is not just manual labor, but also getting the educated young people enthusiastic about wanting to spend their career in nurseries or reforestation. We need the next generation coming in and really running things effectively. Also, another concern for nurseries is market confidence, they are hesitant to scale up production for say five years, and then have the demand dry up. In order to do so, they have to expand their facilities and their storage capacity and recruit new employees. If suddenly, all the interest and demand for seedlings is gone, their business could collapse, and that's very, very risky for them.

KS: How do we bring more people in?

DH: Potential nursery workers can also come from areas like horticulture and other fields. Nurseries will recruit from those areas to try and find people who have some education and can become managers or growers. Technicians get trained up from entry level. We could be offering internships or getting high school students to work [in nurseries]. There are a lot of ideas being tossed

around to get more people involved and build enthusiasm around nursery sciences. We can't have this just be a flash in the pan. It makes me think of the Issue - Attention Cycle that we wrote about in "[developing and supporting quality nursery facilities and staff are necessary to meet global forest and landscape restoration needs](#)." First there's all this enthusiasm, but then people realize how much time and energy and expense are required, and then some new issue comes up and the enthusiasm shifts away. So with this current explosion of interest in scaling up reforestation, I hope that is not what happens when some new issue in the world diverts attention and funds elsewhere. Instead I'd like to see it really sustained to the point where the goals are met. Given the critical need for reforestation around the planet, I'm optimistic that could happen.

KS: Thank you so much, Diane. This has been illuminating and it all feels a little daunting, but I really appreciate your thoughts on everything.



Spruce seedlings.

Bigleaf Maples in Decline Across the Northwest

By Kayla Seaforth

The often massive bigleaf maple is one of the first trees to show signs of life in the spring; their dangling flower clusters are an early sign that winter is drawing to a close. These giants provide shade to our riparian forests and city streets. Bigleaf maples are vital habitat for many birds and small mammals who find refuge in their many cavities and crevices. They are an iconic species of the Pacific Northwest, and they are one of many species facing mortality as the climate changes. Their decline has the potential to radically shift the landscapes that sustain us, especially as this phenomenon is compounded by other losses.

A 2021 [study](#) published by researchers at the University of Washington found that bigleaf maple dieback has increased since 2011 and is more prevalent near roads and areas of intensive development, and is associated with warmer summers. Of the 59 trees sampled in the study, 22% showed symptoms of dieback. Symptoms include crown thinning and dieback, clumps of small leaves and heavy seed crops, and yellow leaves that sometimes appear scorched around the edges ([WSU Extension](#)).

The study also looked at nutrient concentrations in soil and leaves to examine whether pollutants had an effect

on the health of the maples, but results were inconclusive. Forest pests and pathogens routinely affect bigleaf maples, but the UW study did not see any trends that indicate a single outbreak leading to overall decline. Most likely is the stress of hotter, drier summers, compounded by the increased heat associated with heavy development leading to additional resource stress on the maples, and making them more susceptible to disease and insect outbreaks.

Study co-author Jacob Betzen said of the bigger picture “climate change, habitat loss, and increased development are leading to declines in many tree



Maples seem to be faring better in areas with limited development like this Skagit River shoreline. Photo Credit: Jacob Betzen

species, and bigleaf maple appears to be experiencing the same fate.”

A small ray of hope exists however, in healthy, well connected riparian forests. The results of the study discussed above indicate that trees growing closer to roads or nearby significant human development are suffering, while those rooted within ecologically in-tact low elevation forests are faring much better. Landscape level approaches that prioritize connection and biodiversity are one tool we have to preserve this important species.

If you are interested in contributing to data collection on bigleaf maple decline, you can record observations through the [Bigleaf Maple Health Watch project](#) on iNaturalist. These community science observations are used to estimate the extent of dieback across the northwest and may help with future research efforts.

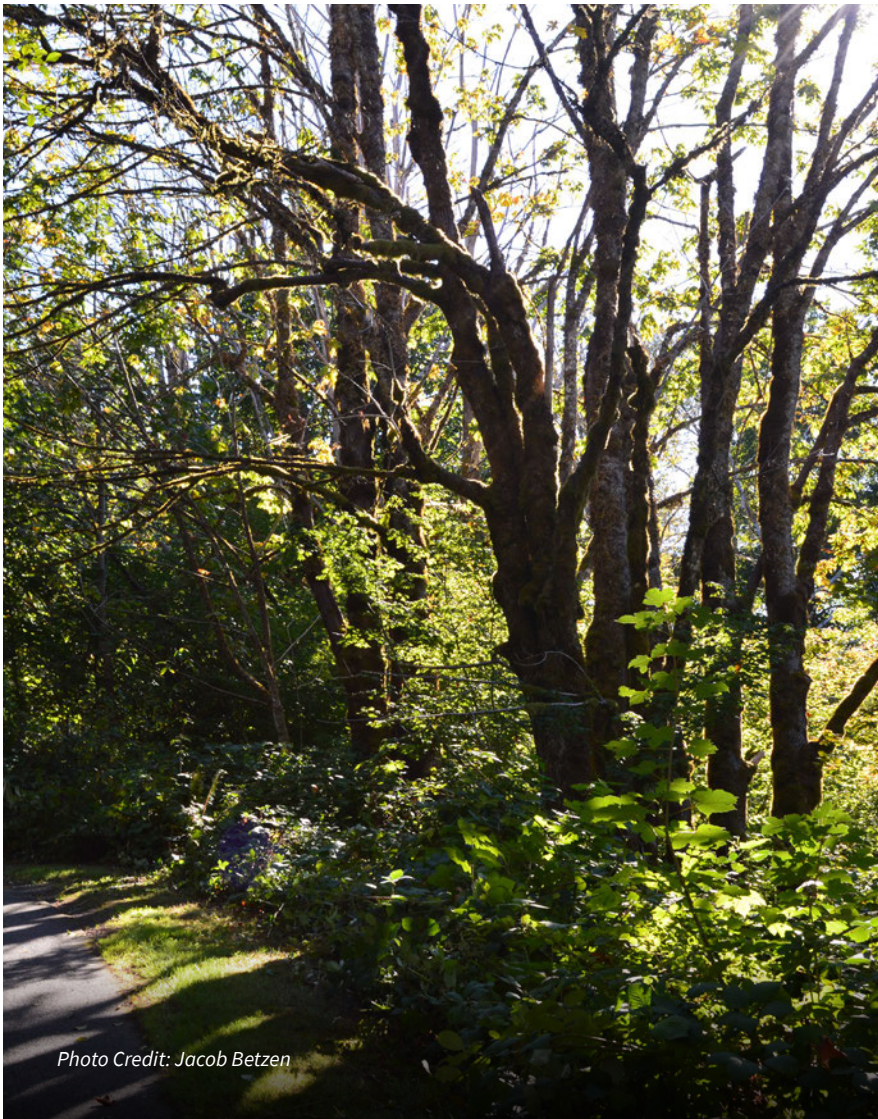
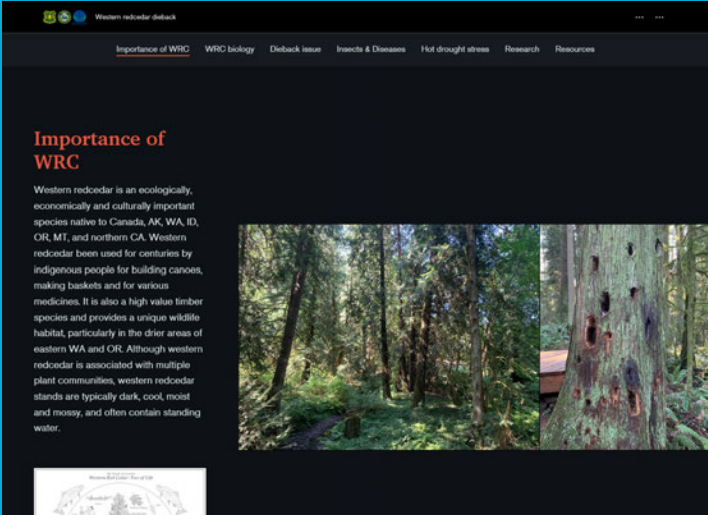


Photo Credit: Jacob Betzen

Climate change is affecting many species that are vital to the ecology and culture of the Pacific Northwest. Western redcedar has also been suffering under warming conditions and many fear what its decline will mean for northwest tribes who have stewarded the forests where the trees once thrived for millenia. This [story map](#), a product of collaboration between the US Forest Service, Oregon Department of Forestry and Washington Department of Natural resources details the extent of the dieback and shares the finding of research that points to lower precipitation and higher temperatures as major factors associated with areas where cedars are dying.



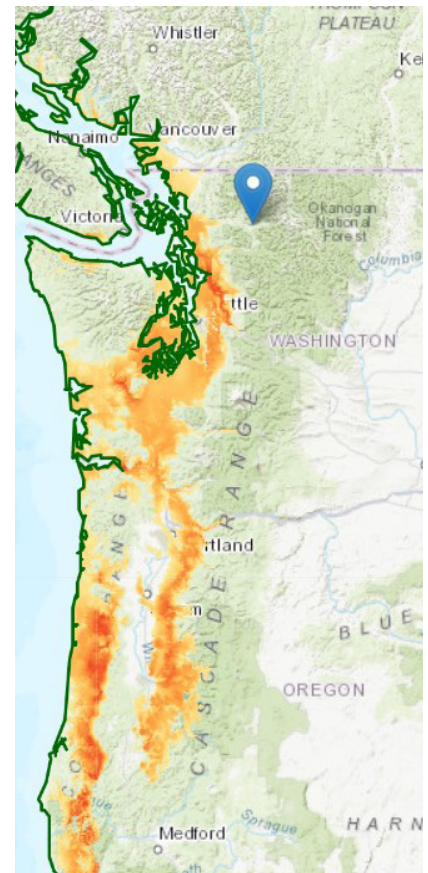
Deep Dive into the Seedlot Selection Tool

Co-Author and Climate Change Impacts Scientist Dominique Bachelet shares her thoughts

A recently published [paper](#) shows practical applications of the [Seedlot Selection Tool](#) in implementing climate adaptation projects in the Western United States. The authors share how the SST was developed, steps for using it, and three case studies that utilize the tool in selecting climatically appropriate stock for restoration.

Since Brad St. Clair, lead author of the Ecosphere paper, always likes to quote famous scientists, I thought I would follow his footsteps to introduce the Seedlot Selection Tool and illustrate what it means for a climate change impacts scientist like me. William Arthur Ward once said: “The pessimist complains about the wind; the optimist expects it to change; the realist adjusts the sails.”

Given the various weather events Pacific Northwesterners have been challenged with in the last few years (extreme fires and smoke in 2020, heat dome in 2021, late frost in 2022, heat records broken every summer, drought conditions lingering), we have heard many complaints about loss of revenue and extensive mortality in various industrial timber operations. The climate scientists who predicted such events 30 years ago are amazed they are occurring so early in the 21st century since these conditions had not been expected before mid-century. The seedlot selection tool was designed to help forest managers prepare for the reality check from these latest weather events and ultimately the ongoing changes in local climates. The web tool does not show the temperature extremes the region has already been confronted with, but it does allow the users to look at the expected and verified trends for their area of concern. It is about time people start realizing that in a few years, Portland weather will be that of central California, and that what needs to be planted today to prepare forests and woodlands of the future is not what their ancestors had chosen but what their southern neighbors grew up with. It is almost past time to adjust the sails.



The orange area on the above map indicates suitable seed sources for Sitka spruce that will be planted at a site in the foothills of the North Cascades in Washington. Darker colors indicate a better match for the future climate of the planting site.

Funding Opportunity for Oregonians

The Oregon Department of Fish and Wildlife Conservation and Recreation Grant is open now and closes on October 7th. This program seeks to fund projects that benefit fish and wildlife habitat, and/or provide meaningful connections to the outdoors for Oregonians. Learn more and apply [here](#).

2022 Tribal Exchange Network Forum

October 18–20

This conference will take place both virtually and in person in Flagstaff, AZ. In addition to networking and knowledge sharing, the conference will focus on how tribes can incorporate and manage data in a way that supports their management goals. Learn more and register [here](#).

National Adaptation Forum

October 25–27

The National Adaptation Forum brings together those working toward climate adaptation from various sectors across the country to discuss everything from flood risk and resilience to community led strategies, to dealing with climate trauma and healing. Learn more and register [here](#).



WEBINARS:

Monthly Webinars on Climate Adaptation for Forest-Dependent Wildlife

Federal land and wildlife management agencies are hosting a 12 part, monthly webinar series on forest ecosystems under climate change, as well as tools and management approaches that may facilitate adaptation. Webinars are hosted on the third Tuesday of each month through March 2023. Learn more and register [here](#).



watersheds
program

Do you have an idea for a future newsletter article or interview, or a suggestion for how we might improve? Please reach out to Kas Guillozet at kguillozet@b-e-f.org.