

Douglasia

VOLUME 49, NO. 3 Fall-Winter 2025

Journal of the
WASHINGTON NATIVE PLANT SOCIETY

To promote the appreciation and
conservation of Washington's native plants
and their habitats through study, education,
and advocacy.



Editorial Notes

by Jim Kling, Editorial Committee Chair

2026 is a special year for the Washington Native Plant Society, marking its 50th anniversary. The society's work and the community it provides have never been more important, and for the next year the society as a whole and *Douglasia* specifically will celebrate past achievements, present endeavors, and future aspirations. We'll be publishing articles that examine the past, present, and future of the three pillars of WNPS: education, conservation, and research. I hope the articles will reinforce the great foundation that WNPS has built and inspire us to build and expand upon it.

But that's next year. This issue is packed with information. We have research reports on root rot in Douglas-firs and the response of conifer seedlings to heat, the third and final installment on the life and journeys of David Douglas, an announcement of next year's Study Weekend hosted by the Wenatchee Valley Chapter, an essay looking back at 20 years of native plant stewardship, and a vicarious journey to Ahtanum State Forest. Next time you're in the field, bring your copy of *Field Guide to the Grasses of Oregon and Washington, second edition* (Talbot Roché et al. 2025. Oregon State University Press), reviewed in this issue.



Pacific willows (*Salix lasiandra* var. *lasiandra*) at Little Squalicum Beach in Bellingham. PHOTO: MARK TURNER

Information for Contributors

Members and others are invited to submit material for publication in *Douglasia*. We now accept scientific manuscript submissions that will be peer-reviewed. Other articles, book reviews, poetry, photography, or illustrations are welcome. All materials submitted should relate to the study of Washington's native plants. Acceptance will be based on space and appropriateness, and materials are subject to copyediting (substantive editing with author's permission). Contributors are reminded that the *Douglasia* audience ranges from the professional botanist to the interested enthusiast. For more information about how to contribute, see: wnps.org/douglasia/contribution.

Email submissions to Douglasia@wnps.org.

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* The WNPS Arthur R. Kruckeberg Fellow is the highest honor given to a member by our society. This title is given to those who have made outstanding contributions to the understanding and/or preservation of Washington's flora, or to the success of WNPS.

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On the cover: The East Bank Baker Lake trail winds through old-growth Douglas-firs (*Pseudotsuga menziesii*) near Anderson Point.
PHOTO: MARK TURNER

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President's Message: The View from Here

by Gail Sklar

Dear WNPS Members,

Fall is a time for celebration. Summer has ended, harvests are wrapping up, restoration work groups benefit from cooler, wetter conditions, and native plants continue to bloom, supporting pollinators. The WNPS 2026 calendar is now for sale, and it is even more beautiful than last year's. Many chapters sell them at meetings, or they are available from the WNPS online store. Each chapter is honored with the date they became part of WNPS. Happy 50th Anniversary, WNPS 2026.



A second reason to celebrate is the success and growth of the Washington Native Plant Society Stewardship (Stewardship) and the Youth Ecology Education through Restoration (YEER) programs. The Stewardship program completed a 100-hour steward program in Federal Way, as well as two 30-hour programs in Bellingham and Spokane. The YEER program has expanded from six schools to nine schools. There is a school in Spokane, Tri-Cities, Shelton, Kirkland, and now three schools in Federal Way. The Stewardship and YEER programs are now statewide.

Another item to celebrate is the development of a new strategic plan. The strategic plan is like a road map for WNPS to follow from 2026–2030. The process of developing this plan began March 2024. This process has been a slow and thoughtful one. Serving on the Strategic Planning Committee were Heather Wendt, Chair, Keyna Bugner, Denise Mahnke, and myself. In the spring of 2024, Robert Steelquist joined the committee and volunteered his services as a consulting facilitator. In November 2024, the WNPS sponsored a week-end retreat, at Rainbow Lodge in North Bend, to help with the development of the Strategic Plan. Board members and select committee members received invitations. Input from the community guided the Strategic Planning Committee's focus. The WNPS Board received the draft plan at its 2024 spring meeting. The Board gave excellent feedback, and the Strategic Planning Committee went back to work. During this time, Robert and Heather had to leave the committee. The WNPS Executive Committee approved hiring Kim Rakow Bernier, of KRB Consulting, to help the committee finish this process, as an outside facilitator. Ashley Shattuck, Jarred Glenn, and Margaret Toth joined the committee. The Executive Committee reviewed and provided feedback on the subsequent draft strategic plan. Denise emailed the plan to the Board, and the committee held two one-hour Zoom meetings to address their questions. Chapter and committee chairs shared the draft with

chapter boards and committees for feedback. The Board voted on the draft plan again on October 25, 2025. This has been a long and meaningful experience for all who have been involved.

We need to celebrate the demanding work of the Conservation Committee. Our country is experiencing various changes, and it is necessary to protect native plants and their habitats. To learn more about what the Conservation Committee has been doing this year please read "Conservation Corner" by Kathy Darrow in this issue of *Douglasia*. Also, if you have a passion for conservation and advocacy, this committee would love you to join them on the second Tuesday of each month. Contact Denise Mahnke at wnps@wnps.org or me at presidentwnps@wnps.org for a Zoom meeting invitation.

There are committee vacancies at both chapter and state levels. Attending a meeting to see if you are a good fit does not mean that you signed up for that group. It is good to test the water before you become an official committee member.

Enjoy fall and on January 1, 2026, raise your glass and wish WNPS a Happy 50th Anniversary!



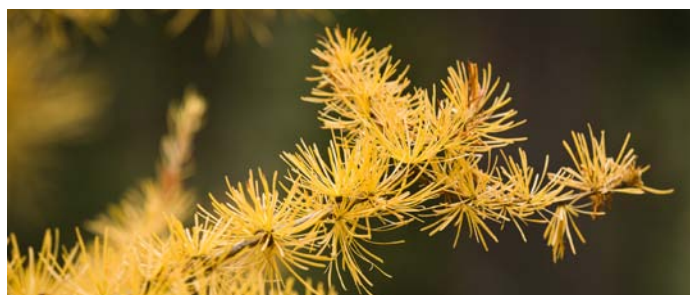
WNPS Leadership Changes

At the time of this printing, changes were made on the WNPS Board of Directors. Gail Sklar has stepped down as President to take time to recuperate from recent medical complications. Casey Leigh has been elected Board President. She will carry the torch forward with a President's message in the Spring issue.

WNPS is pleased to announce that during our recent election, three Board members-at-large were re-elected: Casey Leigh, Tina Miller, and Gail Sklar. In addition, Mike Leigh was elected for his first term on the Board. A second new Board member is David Onstead, who was appointed by the Board to serve the remainder of the term of Robert Steelquist, who resigned from the Board.

The Board elected new officers to serve in the upcoming year: President, Casey Leigh; Vice-President, Steven Clark; Secretary, Ashley Shattuck; Treasurer, Margaret Toth.

A **huge note of thanks** goes out to Gail Sklar for the time, energy, and leadership of WNPS during her 2 years as President of the Board.



Western larch (*Larix occidentalis*) foliage, autumn. PHOTO: MARK TURNER

Growth Response of Conifer Seedlings to Heat: Implications for Reforestation in the Puget Lowland, Washington

by Terry Smith, Richard Fonda, and David Peterson

Introduction

Climate change and the warmer atmosphere have already caused many extreme climate factors. Two projections of paramount importance to western Washington forests are that higher temperatures may cause 1) the decline of currently dominant tree species; and 2) more frequent wildfires. Suitable habitat for Douglas-fir (*Pseudotsuga menziesii*) forests is projected to decline by 32% by the 2060s, compared to habitat in place as late as the 1990s (Mauger et al. 2015; Snover et al. 2013; Climate Impacts Group 2009). The extent of suitable Douglas-fir habitat in the Puget Lowland that could be lost to fire is uncertain. A recent analysis projected more frequent wildfires, with greater area burned by the 2040s, although total area was less than 3,300 ha (Morgan et al. 2019). Almost certainly, insects and disease will contribute to the decline of Puget Lowland forests, but the projections for those effects are tenuous (Mauger et al. 2015).

The linked concepts that North American forest species retreated to southern refugia during Pleistocene glacial advance and migrated northward with ice recession were established for the Southern Appalachians by Braun (1950) and the Klamath Region by Whittaker (1961, 1960) and later reaffirmed by Pielou (1992). A recent review confirmed that many refugia existed in western North America at glacial maximum (Shafer et al. 2010). What Braun and Whittaker identified as Tertiary forest vegetation throughout eastern and western North America is understood today to be the forest vegetation in place before Pleistocene ice sheets began to extend southward. The Pleistocene/Holocene boundary is marked by retreat of continental ice. During the early Holocene, forest species migrated and spread northward from their refugia. Post-glacial migration and expansion from refugia produced the modern forest vegetation patterns in eastern and western North America.

The Puget Trough of Washington includes Puget Sound, extends south to the Columbia River, and continues into Oregon as the Willamette Valley. Lying between the Coast Range to the west and the Cascade Range to the east, this geographic structure creates a low elevation corridor along which tree species could migrate naturally. Indeed, Whittaker (1961, 1960) described such movement northward from the Klamath Region in the Holocene.

These reforestation mechanisms of migration and expansion are founded on natural migration. Assisted migration—the intentional relocation of tree species or populations beyond their historical ranges—has been proposed as a strategy to help

forests adapt to a warming climate. Efforts to develop sound management practices, however, are constrained by a lack of laboratory and field data on how different species and provenances (genotypes) respond to higher temperatures. In the Pacific Northwest, even basic experiments exposing seedlings to different temperature levels are largely missing. Without this foundational information, modifying species distributions or abundances is a risky undertaking. Assisted migration recently became a focus of reforestation efforts in the face of forest decline (Dumroese et al. 2015; Vitt et al. 2010; US Forest Service [date unknown]). The two approaches to reforestation are not mutually exclusive, and we believe our data can be applied to assisted migration. Nevertheless, this study assumes natural migration.

To study growth responses to heat, we grew seedlings of ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*), and Douglas-fir in four temperature regimes. The ability of ponderosa pine as a species to migrate and expand, after ice retreat in central Washington, is established (Walsh et al. 2023; Mack et al. 1979). To our knowledge, no recent studies exist that focus on incense cedar migration and range expansion. The three species used in our study exist in the Klamath Region. Ponderosa pine also dominates forests east of the Cascade Mountains. Furthermore, ponderosa pine already grows in the Puget Lowland on glacial outwash soils on Joint Base Lewis-McChord. Incense cedar is established in the foothills east of Portland, Oregon.

Our working hypothesis anticipates loss of suitable habitat for Douglas-fir, leading to its decline as the dominant forest species in the Puget Lowland of Washington. In that event, other species presumably would spread northward with the higher temperatures along the Puget Trough/Willamette Valley corridor (i.e., incense cedar) and westward across the Cascades (i.e., ponderosa pine) to occupy the Puget Lowland. Similar to post-glacial forest expansion, the warmer atmosphere is projected to drive future migration.

We asked four questions in this research:

1. Would the plant metrics in the four temperature regimes differ significantly from each other?
2. Would Douglas-fir significantly decline with elevated temperatures?
3. Would incense cedar and ponderosa pine perform significantly better than Douglas-fir with elevated temperatures?
4. Are there significant interactions between species and temperature?

Methods

This experiment was conducted in Rochester, New York. We acquired 2-year-old seedlings of Douglas-fir, ponderosa pine, and incense cedar, from Jonsteen Company, McKinleyville, California in 2022. Sixteen seedlings of each species were potted and placed in a north-facing location during the 2023 growing season to allow them to acclimate to the pots. Seed-

lings were watered as needed; fertilizer with mycorrhizae was applied every two months. Seedlings spent the 2023/2024 dormant season in a basement with natural light through windows.



Seedlings in the four heat chambers at the start of the experiment.
PHOTO: TERRY SMITH

We built four 60 cm wide $\times$ 90 cm deep $\times$ 90 cm tall heat cubicles; 3 mm polyethylene sheeting formed the walls and top, stapled to wood framing. Additionally, we put 3 mm aluminum foil bubble insulation on the tops to reduce heat escape. Mean daily high temperatures in the Puget Lowland range from 21° C early and late to 26° C in the middle of the growing season (National Weather Service 2024). We assumed a warmer atmosphere with climate change and chose higher temperatures for our study: 27°, 29°, 31°, and 32° C. Heat was supplied during daylight hours by 250-watt heat lamps on a daily 13-hour cycle (6:30 AM to 7:40 PM). For all seedlings, beginning heights were measured, and diameters were measured at a permanently marked spot on the stem with a digital micrometer caliper before they were placed in the cubicles on 19 February 2024. Heat treatments ended 19 November 2024. Heights and diameters were remeasured, then the plants were divided into shoots and roots to determine oven-dry weights at 70° C for 48 hours. Seedlings were 4-years old at the end of the experiment.

Fifteen seedlings died during the experiment, nine Douglas-fir and six ponderosa pine. We measured heights and diameters when we determined the seedlings were dead, then they were frozen until shoot and root biomass could be determined.

Biological experiments test the effects of variables (factors), such as temperature, light, water, and nutrients. The majority of experiments are designed to hold all factors constant, except for the factor being tested (i.e., the treatment). Factorial experiments, however, cause multiple factors to vary and be tested for significance, providing researchers control of the levels (values) of all the varying factors.

In this experiment, we tested two factors (temperature and species) with predetermined levels and held all other factors constant across the experiment. The experiment was a 4 $\times$ 3 factorial completely randomized design, with significance level ($p=0.05$) and degrees of freedom (Error $df=36$) chosen before the experiment began. This design allowed us to designate temperature and species as main factors. Factor A (temperature) provided four levels: a1 (27° C); a2 (29° C); a3 (31° C); a4

(32° C). Factor B (species) provided three levels: b1 (ponderosa pine); b2 (incense cedar); b3 (Douglas-fir). The two main factors combined for 12 individual treatments (e.g., a1b1, a1b2... a4b3). We used random number tables to assign seedlings to the treatments. Each species contributed four seedlings to each temperature, with 12 plants per cubicle. These individual treatments, main factors, and interactions among the main factors were tested by standard factorial analysis; significant differences between individual means were judged by multiple range tests (MRT; Zar 2009).



Incense-cedar (*Calocedrus decurrens*) seedling before being placed in a heat chamber. PHOTO: TERRY SMITH

Results

Much variance existed in the data sets across the main factors, resulting in many overlaps among the MRT comparisons (Table 1). All ensuing text in the Results section refers to Table 1.

There were no significant differences among temperatures across all metrics.

All metrics for incense cedar were significantly greater than for ponderosa pine and Douglas-fir, except incense cedar and ponderosa pine were not significantly different for diameter increase. There were no significant differences between ponderosa pine and Douglas-fir metrics.

Table 1. Means for four levels of heat, three level of species, and 12 treatments. Values connected by the same underline are not significantly different. Species abbreviations: **DF**: Douglas-fir; **PP**: ponderosa pine; **IC**: incense cedar.

Height Increase (cm)											
Temperature (°C)				Species							
32°	27°	29°	31°	PP				DF		IC	
3.00	5.40	5.83	6.25	2.88				3.06		9.44	
Treatments											
DF 32°	PP 32°	PP 27°	DF 31°	DF 27°	PP 29°	DF 29°	PP 31°	IC 32°	IC 29°	IC 27°	IC 31°
0.50	1.50	2.25	2.75	3.50	3.50	4.50	5.25	7.00	9.50	10.50	10.75
Diameter Increase (cm)											
Temperature (°C)				Species							
27°	32°	31°	29°	DF				PP		IC	
0.41	0.46	0.65	0.72	−0.18				0.78		1.08	
Treatments											
DF 29°	DF 27°	DF 31°	DF 32°	PP 32°	PP 27°	IC 31°	IC 32°	IC 27°	PP 29°	PP 31°	IC 29°
−0.42	−0.37	−0.10	0.19	0.26	0.64	0.93	0.94	0.97	1.11	1.13	1.49
Shoot Biomass (g)											
Temperature (°C)				Species							
32°	27°	31°	29°	DF				PP		IC	
4.33	7.67	9.33	10.83	4.13				4.63		15.34	
Treatments											
DF 32°	DF 29°	PP 32°	PP 29°	PP 27°	DF 31°	DF 27°	PP 31°	IC 32°	IC 27°	IC 31°	IC 29°
3.0	3.5	4.0	4.0	4.5	5.0	5.0	6.0	6.0	13.5	17.0	25.0
Root Biomass (g)											
Temperature (°C)				Species							
32°	27°	31°	29°	DF				PP		IC	
2.67	3.83	4.00	4.83	2.88				2.88		5.75	
Treatments											
DF 32°	DF 27°	PP 31°	DF 32°	DF 29°	DF 27°	IC 32°	PP 29°	PP 31°	IC 31°	IC 27°	IC 29°
2.0	2.0	2.5	3.0	3.0	3.0	3.0	3.5	4.0	5.5	6.5	8.0

The only significant interaction involved shoot biomass. Incense cedar at 27°, 29°, and 31° C had the largest shoot biomass, compared to Douglas-fir and ponderosa pine for which 29° and 32° C accounted for the four lowest shoot biomass values in the experiment. Other interactions involving height and diameter increases, and root biomass, were not significant.

The 12 individual treatments displayed much MRT overlap. Incense cedar height increase at 27° and 31° C was significantly greater than ponderosa pine and Douglas-fir at 32° C. Similarly, incense cedar shoot biomass at 29°, 27°, and 31° C was significantly greater than all other treatments, which did not

differ significantly. Otherwise, there were no other significant differences. Biomass data must be interpreted with considerable caution. Almost certainly, the majority of the biomass accumulated during summer 2023, when the seedlings were outside. Of greater interest, however, declines in diameter and biomass surely reflect the elevated heat environments.

Discussion

Despite the lack of significant differences across all four temperature regimes, it is important to remember that all temperature regimes were higher than mean seasonal highs in the Puget Lowland. The variance in the data set (Table 1) illustrates the

difficulties seedlings of these species may experience with rising growing season temperatures.

At the species level, incense cedar grew well, and ponderosa pine had mixed results (Table 1). Douglas-fir, however, performed poorly across all temperatures, with nine seedlings dying in the course of the experiment. Four of the remaining six live seedlings clearly were unhealthy.

There is broad consensus that climate change will affect the distribution and abundance of tree species in the Puget Lowland, although the mechanisms and pace of this redistribution are uncertain. Douglas-fir decline was projected previously (Mauger et al. 2015; Snover et al. 2013; Climate Impacts Group 2009), but this is the first experiment to subject Douglas-fir seedlings to higher-than-current temperatures as a means of understanding mechanistic relationships.

The ability of ponderosa pine to migrate is well-documented (Walsh et al. 2023; Mack et al. 1979). Based on this experiment, it is uncertain whether this species will capitalize on the elevated temperatures in the Puget Lowland, despite ponderosa pine thriving at Joint Base Lewis-McChord under present conditions.

Viewed from a broad perspective, this experiment showed that incense cedar at all temperatures, except 32° C, dominated the analytical metrics (Table 1). If Douglas-fir and current associated tree species decline in Puget Lowland forests as projected, incense cedar may have a suitable thermal environment for regeneration, which would facilitate northward migration in the Puget Trough corridor—natural or human assisted—to become a dominant forest tree. Studies of Northwest conifer species (and different provenances thereof), including the species in this study, are currently testing the performance of seedlings in field locations with different climates (e.g., US Forest Service [date unknown]). Additional experimental studies of these species under controlled thermal conditions would inform mechanistic interpretation of the results of these field studies.

Acknowledgements

We truly appreciate the assistance provided by Elizabeth Binney for experimental design, statistical analysis, literature citations, and comments on the text. Micah Smith provided support maintaining the seedlings.

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Terry Smith, a coach for the Rochester Youth Climate Leaders, oversees a curriculum that advocates for student-focused sustainable units and improvements in environment and indigenous practices.

Richard Fonda, Professor (emeritus) Biology Department, Western Washington University, a fire ecologist, has studied Pacific Northwest vegetation ecology since 1964, mainly in the Olympic Mountains.

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Potential of Douglas-fir Rhizoplane Microbiome to Inhibit Laminated Root Rot

by Marion Brodhagen, Connor Berns, Morgan Walden, Emma Gatulis, Melody Solis, Dylan Wilding, Niamh Balaji, D. Edinger, Jason Green, Ruchika Joshi, Calum Maki, Danyal Sarkhani, Caelen Sickler, Marieke Trabant, Jessica Weaver, Abigail Weber, and Joe Somera

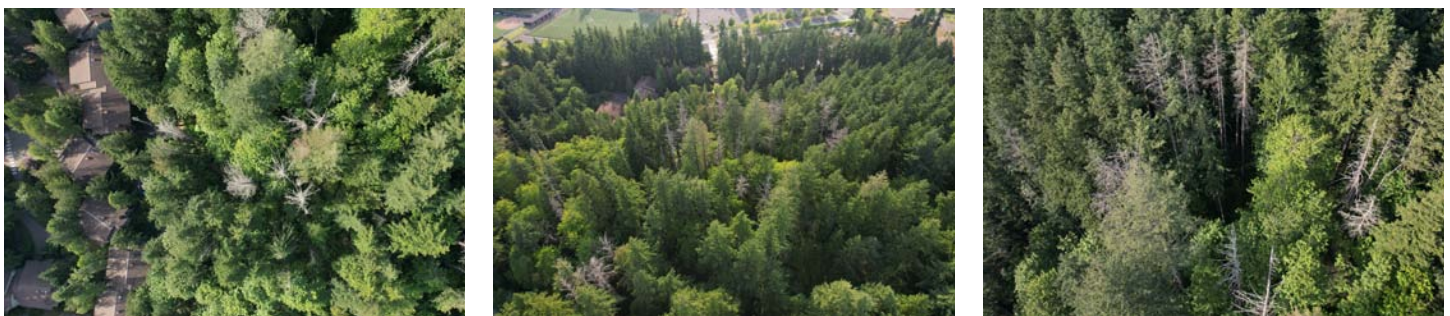
Introduction

Early in January 2021, in a wooded corner of Western Washington University's (WWU) campus, where a cluster of buildings comprising Fairhaven College nestle against Sehome Hill Arboretum, a Douglas-fir (*Pseudotsuga menziesii*) fell onto the roof of a dormitory. The tree, structurally weakened by laminated root rot (causal agent: *Coniferiporia sulphurascens*), had been growing in a disease epicenter first documented 35 years prior (Cantrell 1990). No residents were hurt in this incident, but now those charged with caring for this urban forest eyed the other trees at the edges of the epicenter with concern, knowing that they too could be infected. Freshly fallen diseased trees often occur on the edges of a disease epicenter, where *C. sulphurascens* survives in old stumps for many decades (Hansen 1979) and spreads to new hosts via root contact. The fungus often takes decades to kill a large tree and is difficult to detect in early stages (Thies and Sturrock 1995).

times western hemlock (*Tsuga heterophylla*), creating canopy gaps that allow growth of resistant or immune trees. In the Arboretum this includes western red cedar (*Thuja plicata*), bigleaf maple (*Acer macrophyllum*), and alder (*Alnus rubra*) (Hansen and Goheen 2000; Thies and Sturrock 1995).

Human perspectives about tree diseases such as laminated root rot are influenced by their management plans for the forest (Hansen and Goheen 2000; Thies and Sturrock 1995). Although laminated root rot is a natural part of the Sehome Hill ecosystem, trees falling in proximity to human dwellings and activities pose a potential problem for humans sharing this urban forest. One control measure for laminated root rot is to excavate infected stumps to eradicate long-lived inoculum. Another tactic is to remove susceptible trees at the periphery of a disease epicenter and to replant with a buffer of resistant and immune trees. Fumigation represents a potential solution for a small number of high-risk trees. Injecting chemical fumigants into the trees reduced survival of *C. sulphurascens* in root wood (Thies and Nelson 1996), but also, to varying degrees, caused tissue damage and reduced tree growth (Harrington and Thies 2007). Downsides of fumigation include concerns about their environmental fate (Zhang and Wang 2007) and non-target effects on beneficial fungi such as *Trichoderma* species (Nelson 1989).

Decomposers such as *C. sulphurascens* are not, themselves, immune to competition or to breakdown for use by other organisms. Indeed, several *Trichoderma* species, as well as *Ulocladium botrytis*, have been shown to antagonize *C. sulphurascens* (Reaves and Crawford 1994; Goldfarb et al. 1989). Despite



Aerial views of the laminated root rot epicenter in this study. A rough estimate based on its size in aerial maps puts the infection center of our Sehome Hill fallen tree at approximately 230 years of age. 1a. Sampling areas for this study were in the top center (diseased site) and further north (out of frame; healthy site). 1b. In the foreground are standing live Douglas-firs with symptoms of crown decline, dead snags, and deciduous trees, comprising the disease epicenter. To the right, asymptomatic Douglas-fir grows at the periphery of the epicenter in near-monoculture. 1c. Close view of canopy at the periphery of the laminated root rot epicenter showing Douglas-firs in various stages of decline, interspersed with deciduous trees. The canopy gap in the center was left by two recently fallen Douglas firs. PHOTOS: NEIL MANCHON

Coniferiporia sulphurascens is a native root pathogen that has evolved along with Douglas-fir for tens of millions of years (Wang et al. 2022). The fungus' activities result in generating standing and fallen coarse woody debris and are an integral part of the forest's nutrient cycles and energy flow. A significant ecosystem engineer, *C. sulphurascens* causes tree loss greater than those attributed to insects or fire (Hansen and Goheen 2000). In a Douglas-fir–hemlock–cedar forest ecosystem such as Sehome Hill Arboretum, laminated root rot fells susceptible species, such as Douglas-fir, grand fir (*Abies grandis*), and some-

identification of such potential biological control agents for laminated root rot, biocontrol is not, to our knowledge, commonly practiced. In this study, we searched for additional fungi and bacteria that could inhibit the growth of *C. sulphurascens*. The research was performed by students in a ten-week biology course at Western Washington University partially supported by a Washington Native Plant Society Education Grant. The course was paired with an environmental science course. The first iteration of the collaborative courses occurred April–June 2025, and the course goals and structure are briefly described below.



Symptoms of laminated root rot. 2a and 2b. The fungus colonizes the outer bark of its new host's root and then begins its slow path of decomposition of the outwardly healthy-appearing tree (Cook 2013). When a diseased tree falls, severed boles reveal the inner wood separating along annual rings (delamination). 2c. Laminae are punctured by 0.5–1.0 mm pits on both sides (Sinclair and Lyon 2005). PHOTOS: MARION BRODHAGEN

Course goals

1. Creating accessible authentic research experiences for undergraduates: Research opportunities for students at WWU are competitive, and sometimes out of reach for students who have limited spare time and resources. We created courses in which students could perform impactful, authentic research within a course that counts toward their major. We chose the local arboretum ecosystem not only for its familiarity to students but also for its easy accessibility as a field site, situated several minutes' easy walk from classrooms.

2. Nurturing diverse backgrounds and perspectives: One goal of the course was to break down the artificial boundaries sometimes perceived between scientific disciplines. We prepared highly structured cross-class activities to foster collaboration and integration of diverse knowledge and perspectives. One multi-week group exercise promoted consideration of multiple human, and other-than-human, perspectives in management of the Arboretum's urban ecosystem. A second exercise introduced students to the nuances of translational science communication.

3. Building investment: The final project for both classes was a joint presentation to the Sehome Hill Arboretum Board. Thus, students understood their shared work to be both relevant and potentially impactful. They were fully invested in the success of their experiments, and in understanding the course content well enough to produce a quality presentation.



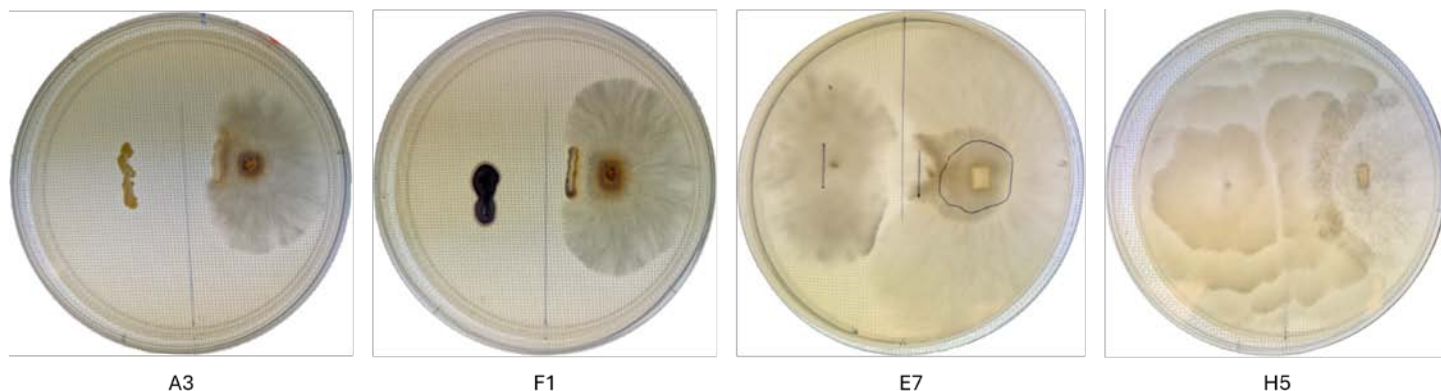
Students obtaining samples of rhizoplane soil. PHOTO: MARION BRODHAGEN

Research questions

The Environmental Science students compared soil properties between sites dominated by conifer (pre-laminated root rot) and deciduous (post-laminated root rot) canopies. The Biology students **collected and identified members of the Douglas-fir rhizoplane microbial community that inhibited *C. sulphurascens*.**

Research Methods

Two sites were sampled in Sehome Hill Arboretum, east of WWU's Fairhaven College. A diseased site was centered around a recently fallen Douglas-fir at the edge of the laminated root rot epicenter. The wood showed typical symptoms of delamination and pitting, and characteristic setal hyphae were observed. A healthy study site approximately 100 yards to the north comprised symptom-free Douglas-fir trees. Three Douglas-firs and one bigleaf maple tree (immune to laminated root rot) were sampled at each site. Large woody roots (diameter less than 6 inches) were carefully excavated with hand tools, and rhizoplane (root surface) soil was collected by brushing from the surface of mature woody roots. Soil was suspended in a buffer solution, mixed thoroughly, diluted, and spread onto five different types of microbiological growth media chosen to favor growth of a variety of root-associated bacteria and fungi.



Examples of antagonism of *Coniferiporia sulphurascens* on agar plates. L-R: Isolate A3 (*Pseudomonas* sp.), F1 (*Collimonas* sp.), E7 (*Cystosterium* sp.), and H5 (*Linnemannia* sp.). PHOTOS: MARION BRODHAGEN

Student pairs chose two fungal and two bacterial isolates for attempted identification via sequencing of ribosomal RNA genes. Each isolate was tested for its biocontrol potential by inoculating *C. sulphurascens* and the isolate approximately one centimeter apart on malt extract agar plates and then inoculating the isolate on the other side of the plate as a control for normal growth. Inhibition was inferred when *C. sulphurascens* growth in the direction opposite the isolate was greater than growth towards the isolate.

Many known and unknown antifungal metabolites and degradative enzymes may contribute to *C. sulphurascens* inhibition *in vitro*. Among these is the enzyme chitinase, which breaks down the cell walls of fungi. Four bacterial and four fungal isolates that inhibited *C. sulphurascens* were further tested for chitinase activity by growing on agar plates containing equiva-

lent amounts of powdered chitin, colloidal chitin (which is less crystalline and more accessible to enzymes than powdered chitin), or chitosan, which is partially deacetylated chitin.

Research Results and Discussion

Of 16 bacterial and 17 fungal isolates that the class chose for study, all but four bacteria and two fungi were tentatively identified to the genus level. Four bacterial and nine fungal isolates inhibited *C. sulphurascens* on agar plates. Key information about these isolates is summarized in Tables 1 and 2. Five inhibitory isolates were from diseased Douglas-firs, five from apparently healthy Douglas-firs, and three from maples. Our sample size was too small to make any statistically relevant comparisons about inhibition of *C. sulphurascens* between sites or species.

Bacterial isolates:

Isolates included common plant growth-promoting bacteria. *Flavobacterium* has recently been reclassified as *Chryseobacterium* (Jung et al. 2023), and these synonymous genera were found among our isolates (3 of 16). *Chryseobacterium* species are common rhizosphere inhabitants and plant growth-promoting bacteria of agricultural crops that produce some metabolites toxic to plant pathogens and other metabolites beneficial to plant health (e.g., Jung et al. 2023; Nishioka et al.

2016). However, none of these isolates inhibited *C. sulphurascens* in our assays.

Six of our 16 isolates were *Pseudomonas* species, another genus known for biological control of phytopathogens (e.g., Singh et al. 2022). *Pseudomonas* species collected from Douglas-fir rhizospheres have been shown to inhibit fungal pathogens *in vitro*, including the Douglas-fir pathogen *Armillaria ostoyae* (DeLong et al. 2002; Axelrood et al. 1996). However, in our assays, only one *Pseudomonas* isolate inhibited *C. sulphurascens*. One potential explanation for these observations is that *C. sulphurascens*, an ancient pathogen, has evolved resistance to the antifungal metabolites and enzymes secreted by these bacteria native to its community.

Violacein: Three of the four bacterial isolates that inhibited *C. sulphurascens* were purple in color and were identified

Table 1. Characterization and identification of bacterial isolates.

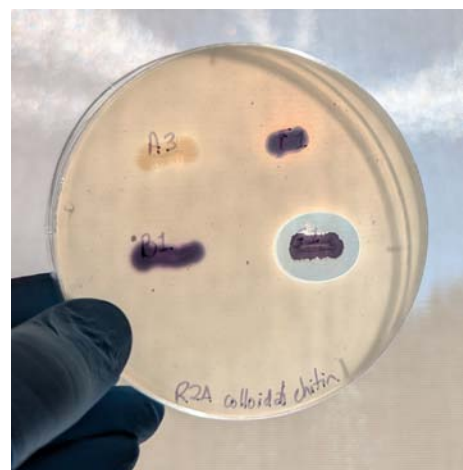
Isolate	Tentative genus	Appearance on malt extract agar	Inhibits <i>Coniferiporia sulphurascens</i> ?	Degrades colloidal chitin?	Source tree
A1	<i>Flavobacterium</i>	Yellow; swarming	No	ND*	Douglas-fir, diseased site
A3	<i>Pseudomonas</i>	Creamy; round	Yes	+ **	Douglas-fir, diseased site
B1	<i>Collimonas</i>	Purple; slimy	Yes	+	Douglas-fir, diseased site
B3	<i>Pseudomonas</i>	White; round	No	ND	Douglas-fir, diseased site
C1	Unidentified	White; round	No	ND	Douglas-fir, diseased site
C3	<i>Chryseobacterium</i>	Orange-yellow; slimy	No	ND	Douglas-fir, diseased site
D1	<i>Pseudomonas</i>	White; round	No	ND	Maple, diseased site
D3	<i>Pseudomonas</i>	Creamy; round	No	ND	Maple, diseased site
E1	<i>Pseudomonas</i>	Creamy; round	No	ND	Douglas-fir, healthy site
E3	<i>Pseudomonas</i>	Creamy; slimy	No	ND	Douglas-fir, healthy site
F1	<i>Collimonas</i>	Dark purple; slimy	Yes	-	Douglas-fir, healthy site
F3	<i>Flavobacterium</i>	Yellow, slimy; swarming	No	ND	Douglas-fir, healthy site
G1	<i>Janthinobacterium</i>	Purple; dry	Yes	+++	Douglas-fir, healthy site
G3	Unidentified	White; round	No	ND	Douglas-fir, healthy site
H1	Unidentified	Yellow; slimy; swarming	No	ND	Maple, healthy site
H3	Unidentified	White; round	No	ND	Maple, healthy site

Dark gray rows represent bacteria that inhibited growth of *Coniferiporia sulphurascens*.

* ND = not determined

**+ = visible clearing just beneath colony; ++ = incomplete clearing around colony; +++ = complete clearing around colony; - = no discernible clearing.

as *Janthinobacterium* sp. (isolate G1) and *Collimonas* spp. (isolates B1 and F1). *Janthinobacterium* has been shown to inhibit a number of plant pathogenic fungi (Yin et al. 2021; Shirata et al. 2000). Both genera are known for producing violacein (Wu et al. 2021; Leveau et al. 2010), a purple tryptophan derivative known for its toxicity, including to fungi (Durán et al. 2022). Both the *Janthinobacterium* and *Collimonas* isolates lost purple color when proximal to *C. sulphurascens*, revealing that this pigment is degraded in the presence of the fungus. The *Janthinobacterium* isolate (but neither *Collimonas* isolate) also lost its purple pigment when cultured on agar containing chitosan, suggesting substrate regulation of pigment production. In the



Chitinase activity among bacterial isolates. 3a. Clockwise from top L: Isolate A3 (*Pseudomonas* sp.), F1 (*Collimonas* sp.), B1 (*Collimonas* sp.), and G1 (*Janthinobacterium* sp.). 3b. Holding the Petri plate in bright light reveals non-diffuse chitin degradation for isolate A3 and weak diffuse chitin degradation for isolate F1. PHOTOS: MARION BRODHAGEN

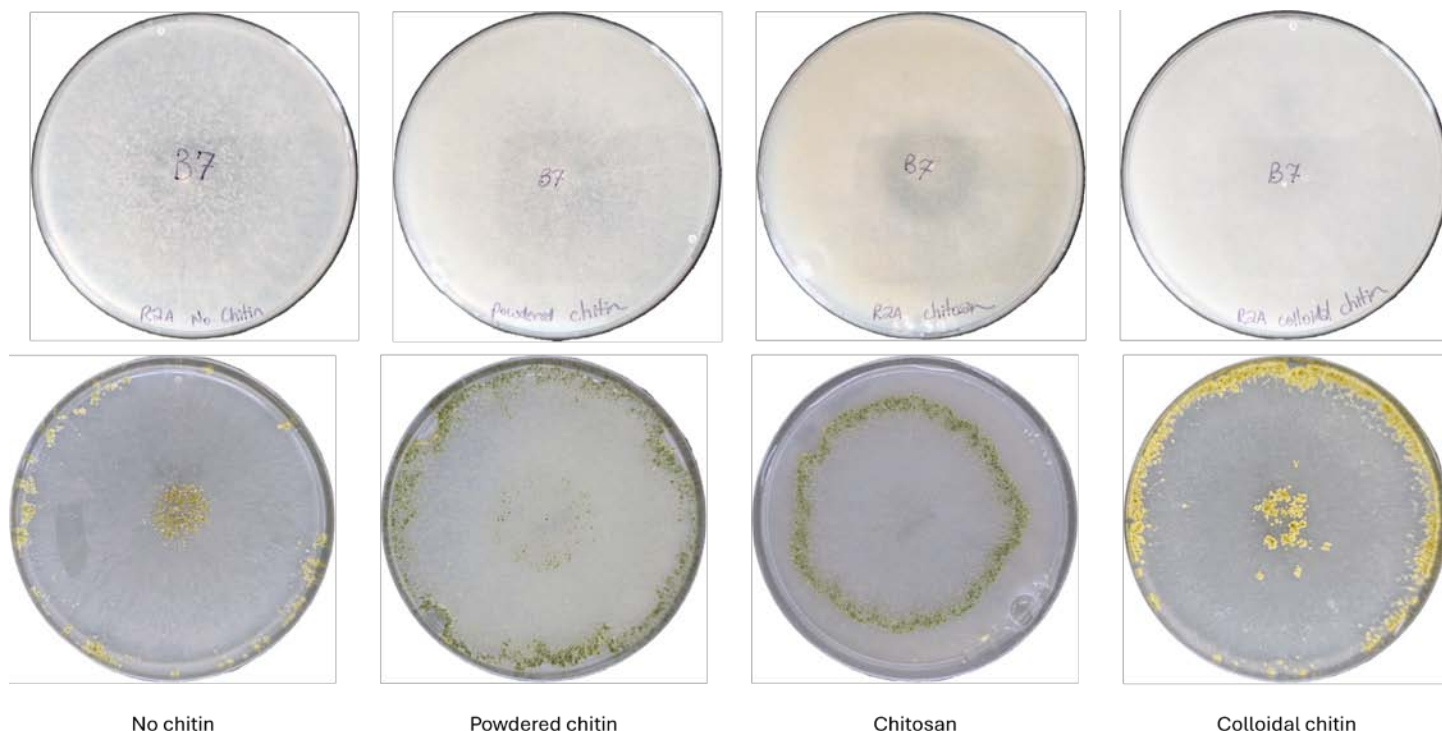
future, directly testing the effects of violacein on *C. sulphurascens* could establish whether or not this pigment contributes to antagonism of the fungus *in vitro*.

Chitinase activity: None of the four bacterial isolates that inhibited *C. sulphurascens* visibly degraded chitosan or powdered chitin, but three of the four degraded colloidal chitin to different degrees. Isolate G1 (*Janthinobacterium* sp.) produced a large clear zone around colonies on plates, demonstrating chitinase secreted into the surrounding agar. Isolate A3 (*Pseudomonas* sp.) produced a clear zone directly beneath the colony that could only be seen by tilting the plate in bright light, suggesting cell membrane-bound chitinase(s). Isolate B1 (*Collimonas* sp.) produced a hazy zone that was only visible in bright light, suggesting secreted chitinases that were fewer or less efficient than those of isolate G1. Isolate F1 (*Collimonas* sp.) did not visibly degrade chitin. Inability to degrade chitin may be inconsequential in a community where other members (e.g., isolate G1) degrade the polymer extracellularly, making chitin breakdown products available for uptake by other community members.

with endophytic communities raises the question of whether our rhizoplane isolates represent ectotrophic mycelia from predominantly endophytic fungi, or whether endophytic fungi in Douglas-fir roots originate from the rhizoplane community. Of this potentially endophyte-related group, one *Absidia* isolate (D5), and all four *Penicillium* isolates (C5, D7, E5, and G5) inhibited growth of *C. sulphurascens* on agar plates.

Chitinase activity: Despite inhibiting *C. sulphurascens*, our *Absidia* and *Penicillium* isolates are related to known human pathogens and therefore were excluded from further study. The remaining inhibitory isolates, B7 (*Bjerkandera* sp.), E7 (*Cystosterium* sp.), H5 (*Linnemannia* sp.), and UWF2 (*Trichoderma* sp.), were tested for chitinase activity.

Although *B. adusta* was reported to inhibit the fungal pathogen *Fusarium oxysporum* via mycoparasitism (Feng et al. 2021), chitinase activity was not apparent for isolate B7 (*Bjerkandera* sp.); nor was it observed for isolate E7 (*Cystosterium* sp.). These fungi appear to inhibit *C. sulphurascens* via other mechanism(s). *Bjerkandera* and *Cystosterium* are white rot fungi capable of degrading cellulose and



Chitinase activity among fungal isolates. Top row: example of isolate B7 (*Bjerkandera* sp.), which produced clearing zones in the center (oldest growth) of agar plates containing chitosan but not chitin. Bottom row: example of isolate UWF2 (*Trichoderma* sp.), which exhibited different pigmentation and sporulation patterns on different chitin derivatives. PHOTOS: MARION BRODHAGEN

Fungal isolates:

Isolates included Douglas-fir root endophytes: In a survey of endophytes (fungi dwelling within plant tissues) gathered via core samples from Douglas-fir roots, Hoff et al. (2004) isolated members of the genera *Byssoschlamys*, *Umbelopsis*, *Mucor*, and *Penicillium* most frequently. In our sampling from root surfaces, we did not isolate *Byssoschlamys* species, but two of our isolates were *Umbelopsis* species, two were *Absidia* species (a relative of *Mucor*), and four were *Penicillium* species. This overlap

lignin, and *Bjerkandera* species also degrade dyes, mycotoxins, and pollutants (e.g., Shao et al. 2024; Li et al. 2022).

Only isolate H5 (*Linnemannia* sp.) produced an obvious clearing zone on any chitin substrate (chitosan). *Linnemannia* species have been reported to form symbiotic associations with agricultural plant roots. When lettuce (*Lactuca sativa*) and *Arabidopsis thaliana* were jointly amended with chitin and *Linnemannia elongata*, synergistic plant growth promotion was observed (De Tender et al. 2024). *Linnemannia* has also been

Table 2. Characterization and identification of fungal isolates.

Isolate	Tentative genus	Inhibits <i>Coniferiporia sulphurascens</i> ?	Potential opportunistic pathogen?	Degrades powdered chitin?	Degrades chitosan?	Degrades colloidal chitin?	Source tree
A5	<i>Umbelopsis</i>	No	Yes				Douglas-fir, diseased site
A7	<i>Apiotrichum</i>	No					Douglas-fir, diseased site
B5	<i>Umbelopsis</i>	No	Yes				Douglas-fir, diseased site
B7	<i>Bjerkandera</i>	Yes		- **	+	-	Douglas-fir, diseased site
C5	<i>Penicillium</i>	Yes	Yes				Douglas-fir, diseased site
C7	<i>Apiotrichum</i>	No					Douglas-fir, diseased site
D5	<i>Absidia</i>	Yes	Yes				Maple, diseased site
D7	<i>Penicillium</i>	Yes	Yes				Maple, diseased site
E5	<i>Penicillium</i>	Yes	Yes				Douglas-fir, healthy site
E7	<i>Cystosterium</i>	Yes		-	-	-	Douglas-fir, healthy site
F5	Unidentified	ND*					Douglas-fir, healthy site
F7	Unidentified	ND					Douglas-fir, healthy site
G5	<i>Penicillium</i>	Yes	Yes				Douglas-fir, healthy site
G7	<i>Absidia</i>	No	Yes				Douglas-fir, healthy site
H5	<i>Linnemannia</i>	Yes	Yes	-	-	+	Maple, healthy site
H7	Unidentified	No					Maple, healthy site
UWF2	<i>Trichoderma</i>	Yes		-	-	-	Douglas-fir, diseased site

Dark gray rows represent fungi that inhibited growth of *Coniferiporia sulphurascens* and were not identified as members of phyla known to contain opportunistic human pathogens.

*ND = not determined

** = no discernible clearing; + = visible clearing in plate. Note that vigorous fungal growth across the plate surface may obscure partial clearing.

associated with tree health; Hauschild et al. (2025) observed that in apple treated with catch (cover) crops, populations of *Linnemannia* increased in the soil, concurrent with increased nutrients in soil, and increased phytoalexins in root tissues.

Isolate UWF2 was identified as an unknown *Trichoderma* species. *Trichoderma* is a genus commonly used for biological control of fungal plant disease via induction of plant defenses, production of antibiotics, and mycoparasitism (reviewed in Sharma and Sharma 2020). Because of the latter trait, isolate UWF2 was predicted to degrade chitin, but clearing of chitin-derived substrates was not readily apparent beneath the fungal mycelia. However, isolate UWF2 was finely attuned to the form of chitin available: as mycelium radiated outward from the point of inoculation, the color and location of spores varied across chitin substrates, demonstrating regulation of reproductive and pigment development. Thus, for isolate UWF2 and bacterial isolate G1 (*Janthinobacterium* sp.), the presence and form of chitin available appears to regulate metabolic pathways for pigment production and may also regulate other metabolites important for the inhibition of *C. sulphurascens*.

Conclusions

Disease, competition, and decomposition are integral processes of forest ecosystems not only at the landscape scale, but also at the level of the microbiome. This study highlights the intricate dynamics at the Douglas-fir rhizoplane, including use of tree tissues for nutrition by *C. sulphurascens*, followed by the inhibition and eventual decay of this fungus by other microbiome members. In the age of microbiome science, we can investigate *C. sulphurascens* as part of the Douglas-fir holobiont (the tree plus its microbiome), to better understand its natural place in its ecosystem. When forest managers wish to stop the slow progression of laminated root rot, such knowledge could be useful in an integrated approach that minimizes disruption to the ecosystem.

Acknowledgements

Sehome Hill is part of the traditional, ancestral land of the Lummi and Nooksack people. Thanks to Dr. John Tuxill for introducing us to the history of Sehome Hill and its laminated root rot story, to Dr. Rebecca Bunn for creating and teaching

the parallel course in WWU Environmental Science, and to Leif Swanson and Dr. Mike Cruickshank for invaluable advice about the Douglas-fir-*C. sulphurascens* pathosystem. Cultures of *C. sulphurascens* used herein were a gift from Dr. Jared LeBodus. Course development for BIOL 497W was supported by a WWU Research and Sponsored Programs Summer Teaching Grant, and course supplies were purchased with an Education Grant from the Washington Native Plant Society.

This work is dedicated to the memory of Leif Swanson, who was dedicated to trees.

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Dr. Brodhagen is a Professor of Biology at Western Washington University. Joe Somera transformed a vision of the course into reality with course planning and technical support. All other authors were enrollees in BIOL 497W at Western Washington University, the first iteration of this course, and contributed to careful experimentation, data analysis, and data interpretation, resulting in the story you have just read.



Study Weekend 2026

Botanical Rambles from the Wenatchee River to the Wenatchee Mountains

by Joan Frazee

The Wenatchee Valley Chapter is excited to announce that planning is underway for Study Weekend 2026. The event will be based at the Chelan County Expo Center in Cashmere. Mark your calendars to attend, May 29–31, 2026.

We are hoping to offer 20 field trips each day, exploring the rich diversity of plant species and habitats from the shrub-steppe to the foothills of the Wenatchee Mountains. Known to host the richest concentration of endemic species in the state, the Wenatchee Mountains offer a variety of botanical delights. Depending on the snowpack, there will be a good chance of viewing the salmon pink flowers of the endemic Tweedy's Lewisia (*Lewisiopsis tweedyi*). Other endemic plant species likely to be seen are line-petaled larkspur (*Delphinium lineapetalum*), snow douglasia (*Androsace nivalis*), and yellow-white larkspur (*D. xantholeucum*)

A number of factors have contributed to the amazing diversity of habitats and a high degree of endemism. Terry Lillybridge, Wenatchee Valley Chapter member and co-author of the *Field Guide to Forested Plant Associations of the Wenatchee National Forest*, offers these factors:

- The climate varies from moist and nearly maritime on the western, subalpine end of the range to dry on the eastern, shrub-steppe end of the range.



Snow douglasia (*Androsace nivalis*). PHOTO: JOAN FRAZEE

- There is a mixture of geologic types, including igneous, sedimentary, and metamorphic rocks. Especially interesting are the serpentine formations, which host an adapted flora.
- During the ice age, continental glaciers stopped north of what we now call the Wenatchee Mountains, which themselves had alpine glaciers. This area likely provided a refuge for species that were ice-covered to the north.
- Another effect of continental glaciation was a unique “para-glacial” climate, which had far-reaching effects on hybridization and speciation.

Friday evening will be an informal social gathering as registered attendees check in at the Event Center at the Chelan County Expo Center in Cashmere. Live bluegrass music, an array of appetizers, libations, and interactive games will enhance the gathering. We will gather at the Event Center on Saturday night for a catered chip and salsa bar followed by a taco buffet from El Chavo, a Mexican restaurant in Cashmere. Dinner will be accompanied by a continuous slide show featuring photos from the Saturday field trips followed by a guest speaker and awards.

Lodging and breakfast will be on your own with camping available on site. RV sites with full hook-up for \$25/night and tent sites for \$15/night will be available by calling the Expo Center phone number rather than using their website. Lodging options are also plentiful in Leavenworth and Wenatchee.

Registration is scheduled to open online on February 15, 2026. We look forward to botanical rambles with you in May 2026.

Joan Frazee (joanfrazee@icloud.com), Immediate Past Chair of the Wenatchee Valley Chapter Board, is currently serving as chair of the Planning Committee for Study Weekend 2026. She has been a member of WNPS since 1992 and served on the state board for several years. She worked as a botanist for the U.S. Forest Service on the Wenatchee River District in Leavenworth and on the Umatilla National Forest in Pendleton, Oregon. Now retired, she spends her days gardening, hiking, biking, skiing and occasionally traveling.



Field Guide to the Grasses of Oregon and Washington, second edition

Cindy Talbot Roché, Richard E. Brainerd, Barbara L. Wilson, Nick Otting, and Robert C. Korfhage.

Oregon State University Press, 2025

Paperback, \$45.00, 486 p., ISBN: 978-1-962645-26-3

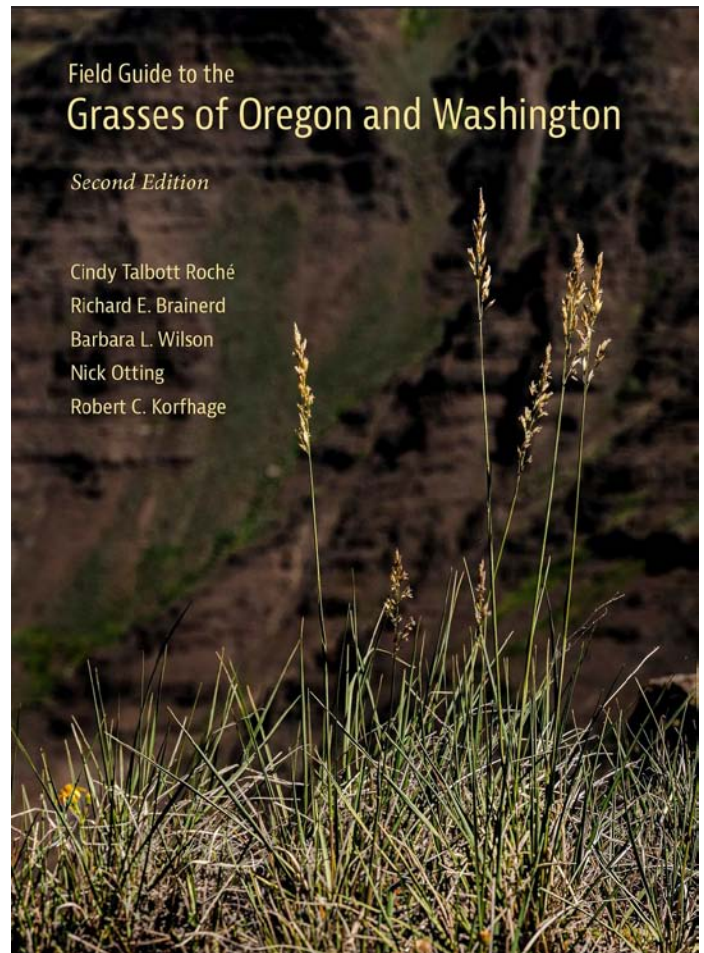
How to order: 1-800-621-2736, <https://osupress.oregonstate.edu/book/field-guide-to-grasses-of-oregon-and-washington-0>

Reviewed by Peter Zika

Explore a meadow and contemplate the grasses. You might admire their grace, and how they dominate the landscape, or when the sun is low, how they catch and hold the light. On your next meadow walk, bring this book, to satisfy your curiosity about members of the grass family (Poaceae). The second edition is small enough to be portable in a rucksack, yet it's packed with information on every grass known to grow wild in Oregon and Washington.

Reflecting the authors' decades of teaching experience, there is extensive introductory material explaining how to identify grasses, with an emphasis on use in the field (bring a hand lens). Topography of a grass is analyzed and illustrated. For those new to botanical terminology, a glossary in the back of the book is available. I rarely used the glossary, because so many grass terms and comparative shapes and sizes were lucidly displayed in the detailed photographs assembled for each species treatment. This level of illustration is rare in any natural history field guide, and indeed, the first edition of the book won the world-wide Annual Literature Award in 2020 from the Council on Botanical and Horticultural Libraries.

With the first edition running out of print, the authors undertook an overhaul and upgraded their volume. Some new grasses turned up in their bi-state coverage, and 18 more taxa were added to the second edition. Their coverage now includes 214 native species and 166 non-natives, as well as few species of ambiguous provenance. The total is 394 species, subspecies, and varieties. Among these are 11 endemic grasses in Oregon and Washington; their populations can be found nowhere else. Two of the authors described *Calamagrostis utsutsuensis*, a reedgrass endemic to Steens Mountain in southeastern Oregon. A few years later they published a new species of bentgrass, *Agrostis swalalaho*s, a narrow endemic from the mountains of the northern Oregon Coast Range. Those of us who appreciate the botanical biodiversity of the Pacific Northwest have a unique opportunity to see (and accurately identify) the endemic grasses of the region, so handsomely illustrated, with this guide in hand.



The layout of the book mirrors the successful first edition. The topic is introduced; next come the essential identification keys, easily found on pages with green margins. First is an extensive key to grass genera, tested and improved through use by many grass classes taught by the authors. Keys to species are arranged alphabetically by genus. You can skip the index and easily flip to the correct genus to work out your unknown grass.

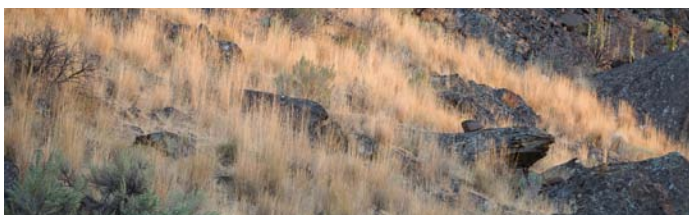
The majority of the field guide is taken up with detailed species coverage, arranged to be self-indexing in alphabetical order by genus and species. A species account usually consists of a full page, and includes the scientific and common name, with a compact description. A highlight is the color dot map displaying the known distribution in Oregon and Washington, overlain on a topographic relief map. There is a concise habitat discussion, and comments on taxonomy, ecology, native range, and insightful tips to sort your grass from others that might look similar. These clues offer a supplement to the identification keys earlier in the book. All of these are authoritative and useful as one works out an identification. But where this book shines is across the rest of the page. Color photographs, often at magnification, provide clear labels and sharp illustrations of various parts of the grass. Photos generally include the habit as well as ingredients of the spikelet, the ligules, the entire inflorescence, the hairs on the stem, and so forth. The way I use the book, I run my grass through the keys, then I hurry to the species account and see if my result matches the crisp photos and the discussion. I can't thank the photographers enough for

their efforts, which present a model of clarity in a subject that can seem all too fuzzy to the uninitiated.

Elsewhere on my shelf I have the two hefty volumes of grass treatments for the *Flora of North America*, which include many line drawings by Cindy Roché. I also have the first volume of the *Flora of Oregon*, with its grass treatment written by Barbara Wilson, Richard Brainerd, and Nick Otting. And, of course, I have the second edition of the *Flora of the Pacific Northwest*, which also covers the grass family. Yet, whenever I want to look up or identify a grass, my first choice is the second edition of the *Field Guide to the Grasses of Oregon and Washington*. The illustrations, maps, and text are indispensable. This is a book for botanists, ecologists, range scientists, wetland biologists, consultants, teachers and students, professionals, and amateurs. Anyone with even a remote interest in grasses in our area should own this. I use it regularly.

As a botanist who reads technical science writing on a daily basis, I can recommend the occasional touches of sincerity and humor in the *Field Guide*. Enjoy a letter from Darwin to Hooker, celebrating his successful identification of a grass. Any grass! Share in the authors' annoyance when you learn that grasses are not much different from ferns, such that generic transfers and name alterations continue to flood our scientific literature. This reflects how new techniques and technology allow systematists and geneticists to improve our estimates of the true relationships among living things, which is a good thing. Really. Although some of these classification changes are still controversial and tentative, at least here in the *Field Guide* you get an up-to-date summary of the news. I counted 36 grasses that changed their name between the publication of the first edition in 2019, and the release of the second edition in 2025. The familiar genus *Vulpia* moved to *Festuca* (fescue). Our *Achnatherum* are now in the genus *Eriocoma* (ricegrass and needlegrass). Some of our *Trisetum* shifted to *Grapphephorum* (though their common names are still trisetum). The sandbinders we knew as *Ammophila* are now parked in the genus *Calamagrostis* (reedgrass and beachgrass), and the two beach species, so widespread on our outer coast, have generated a hybrid. There is always something to learn when you pick up the second edition. Our grasses are now accessible to all, with this updated field guide.

Peter Zika is an Affiliate Curator at the University of Washington Herbarium, Burke Museum, where he conducts research on the taxonomy of Pacific Northwest vascular plants.



Bluebunch wheatgrass (*Pseudoroegneria spicata*) at Frenchman Coulee near Vantage. PHOTO: MARK TURNER

Places to Go:

Ahtanum State Forest, Yakima County

by David E. Giblin, Ph.D., University of Washington Herbarium, Burke Museum

As fall turns to winter, memories of the past season's wildflower walks seem to fade away under the weight of clouds (or snow) that will fill our days for the next few months. However, unlike many parts of the country, here in Washington we don't have to wait for the technical start of spring for the wildflowers to return. An abundance of flowers can be seen in late February and early March in the Columbia River Gorge because of its lower latitude and the lower elevations found there.

Another relatively southern and low elevation area in Washington is the Yakima region, where spring arrives in March as well. A quick search of the Consortium of Pacific Northwest Herbaria online database (<https://www.pnwherbaria.org/data/search.php>) shows that nearly 60 species from 33 genera and 22 families have been collected in Yakima County in March—not bad! In the interest of full disclosure, 17 of those species are in the genus *Lomatium* (desert-parsley), which is quite impressive. If one waits another month, there is a wonderful area to the southwest of Yakima near the town of Tappico that deserves a spring visit (or two): Ahtanum State Forest. I have been traveling across Washington for work and recreation for nearly the past 25 years, and I had never been to this destination before this year—oh, what I have been missing.



Looking east from Ahtanum State Forest over a patch of Garry oak forest (*Quercus garryana*) with Yakima Reservation in the distance.

PHOTO: DAVID GIBLIN

Ahtanum State Forest is owned by the Washington Department of Natural Resources, so it is public access, however the gates to access roads are closed until May 1st to protect elk nurturing their young. I was there in late April 2025, so I just parked at the access gate at the end of the South Fork Ahtanum Road that runs south from the town of Tappico. From the parking area I walked along gravel access roads into the property and followed a mix of hiking trails and deer trails, or



Poet's shooting-star (*Primula poetica*) with older, pollinated flowers pointing upward, and younger, unpollinated flowers hanging downward. PHOTO: DAVID GIBLIN

just ambled through the open country. The area is a delightful mix of lithosol, Garry oak (*Quercus garryana*) forest patches, and seasonal streams. The plant diversity is overwhelming—poet's shooting star (*Primula poetica* formerly *Dodecatheon*), the Columbia Basin endemic Yakima milk-vetch (*Astragalus revertiformis*), several *Lomatium* species, tons of wild onion (*Allium*), Hooker's and arrowleaf balsamroot (*Balsamorhiza hookeri* and *B. sagittata*), and the hybrid between these two, grass-widow (*Olsynium douglasii*), swamp saxifrage (*Micranthes integrifolia*), big-headed clover (*Trifolium macrocephalum*), sagebrush violet (*Viola trinervata*), and two of my favorite spring annuals, spring-gold (*Crocidium multicaule*) and flatpod (*Idaho scapigera*). The list goes on. I saw nearly 70 species the day that I was there, and I only walked about 2 miles. The views to the adjacent Yakama Reservation lands are spectacular, and I'm sure that the birding is excellent as well (I tend to keep my head down, so not the best one to comment on this).

Speaking of poet's shooting star, I learned something new about its pollination biology on my walk. I was aware that the flowers are buzz-pollinated—the stamens are fused into a cylinder-like structure, and the flowers hang downward. This morphology allows bumblebees to grab onto the stamen cylinder while pointing their heads upwards. With the cylinder in the grasp of their legs, the bees vibrate their body muscles at a frequency that causes the pollen to flow out of the pores at the top of the anthers and coat the bees' bodies with pollen. What I didn't know is that after the flowers are pollinated, the pedicel holding the flower curves upwards over the next day or two. This orientation makes the flowers unavailable to the bees,

which effectively communicates to the bees that the flower does not need to be pollinated. Amazing!

After May 1st one has access to the full system of roads that traverse the forest, and the altitudinal gradient across the lands is substantial. You can find a road map for the lands by doing a Google search on "Ahtanum Green Dot Map." The high point is Mount Darland at 6,982 feet, which doesn't become entirely snow-free until July. What this means is that one could return several times to Ahtanum State Forest over the course of the wildflower season and follow the wildflower boom to the upper elevations. I have been told that Sedge Ridge is a particularly spectacular location to visit in late spring and early summer. I hope to get there this year.

For the past several years, Thomas Belfield has been conducting extensive botanical surveys of Ahtanum State Forest in general, and Darland Mountain in particular. You can find his thorough report on his efforts, including a comprehensive plant list online (https://www.researchgate.net/publication/385859652_A_Botanical_Exploration_of_Darland_Mountain_Belfield_111424). Note that there is no plant list on the WNPS Plant List website for Ahtanum State Forest, though there is one for Sedge Ridge—it only has 39 species! If you go, consider making a list.

You will need a Discover Pass for parking at the gate or driving along the roads, which are gravel. I hope that you're able to go. You won't be disappointed!

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Yakima milk-vetch (*Astragalus revertiformis*) in full flower. PHOTO: DAVID GIBLIN

David Douglas, Botanical Explorer: Part 3

by Ed Alverson

(continued from the previous issue)

David Douglas departed from England for his second expedition to western North America on October 31, 1829, and reached Fort Vancouver after a seven-month journey on June 3rd, 1830. For this trip he had acquired a dog named Billy, whom he described as his “faithful Scotch terrier, the companion of all my journies (sic)” (Hooker 1856, p. 148). At Fort Vancouver, Hudson’s Bay Company also provided him with an assistant, William Johnson, who also traveled with Douglas for the remainder of the explorer’s life.

Back in familiar territory, Douglas journeyed again up the Columbia to Walla Walla and the Blue Mountains, and up the Willamette and Santiam rivers into the Oregon Cascades. For the second time, he lost his collections crossing the Santiam River, at the very same place he had experienced a similar mishap in November 1826. But much had changed since his previous visit. A disease epidemic, believed to be malaria, had arrived in the Pacific Northwest. Presumably carried by sailors from the tropics, the epidemic had decimated the local Indian population, reducing numbers by as much as 90%. Douglas wrote to W.J. Hooker “Villages, which had afforded from one to two hundred effective warriors are totally gone, not a soul remains. The houses are empty and flocks of famished dogs are howling about, while the dead bodies lie strewn in every direction on the sands of the river.” (Hooker 1836–1837, p. 148). Apparently Douglas, too, contracted malaria during the summer of 1830.

Douglas continued his collecting through 1830 and in October sent another shipment of material back to England. He continued to admire the conifers of the Northwest:

I...transmit one bundle of six species, exceedingly beautiful, of the genus *Pinus*. Among these, *P. nobilis* (now *Abies procera*) is by far the finest. I spent three weeks in a forest composed of this tree, and day by day could not cease to admire it...I have added one new species during this journey, *P. grandis* (*Abies grandis*), a noble tree, akin to *P. balsamea*, growing from one hundred and seventy to two hundred feet high. (Hooker 1836–1837, p. 147)

While he had hoped to travel south to California overland, and on the way revisit the sugar pine country, this route passed through territory of Indians thought to be hostile. Instead, Douglas traveled to California by sea. He reached Monterey, then an outpost of the Mexican Republic, on December 22, 1830. His motives may have appeared suspicious to the authorities; he was, after all, equipped with sophisticated equipment to determine latitude and longitude of specific locations.

It took four months to receive a passport that would allow Douglas to travel widely. Still, there are few areas richer botanically than the Monterey peninsula, and to be stuck there would seem to be a small inconvenience.

In late spring, Douglas traveled south to Santa Barbara, and later north to San Francisco and Sonoma. While he appreciated the botanical variety of the California springtime, Douglas lamented the speed at which it vanished under the summer heat. Coming from cool, damp England he apparently suffered from the hot weather, and from the bright sun, which aggravated problems with his eyesight that had begun during his first expedition. Still, he successfully added to the knowledge of the California flora during his travels in 1832: “I think that I added not less than one hundred and fifty undescribed species this year, including some new genera...I might have effected more, but being in constant dread of a vessel arriving, and sailing without me, I could not venture to be absent more than fifteen or twenty days at a time from the coast.” (Hooker 1836–1837, p. 152)

Douglas endeavored to return to the Columbia but was unable to find any means of passage through the fall and winter of 1831–32. When another spring arrived, he resumed his explorations in California, this time finding the gray pine, *Pinus sabiniana*, as well as the rare and beautiful bristlecone fir, *Abies bracteata*, (North America’s rarest true fir) high in the Santa Lucia Mountains. Douglas is also credited with the first introduction to England of the Monterey pine, *Pinus radiata*. By the time Douglas finally left California, he had two growing seasons of specimen and seed collecting in California behind him. He was the first botanist to thoroughly explore the region, and the number and significance of his collections and introductions of Californian plants reflect that fact (Howell 1937–1940; Jepson 1933). While his seeds and specimens made it safely back to England, little is known of his day-to-day experiences in the California landscape because of the loss the following year of his field notes in yet another river accident.

Douglas returned to the Columbia in the autumn of 1832, via Hawai‘i. While there, Douglas received word that his supporter at the Horticultural Society, Joseph Sabine, had resigned his position as Secretary due to the organization’s financial problems. In an act of loyalty to Sabine, Douglas resigned as an employee of the Horticultural Society and became a freelance plant collector. While he continued to send his plant collections to W.J. Hooker, this meant that there was no one in London to receive or process the other materials from his travels, including seeds, live plants, animal skins, and most significantly, his field notes (“journal of occurrences”). For the sake of posterity, this was an unfortunate turn of events.

The winter of 1832–33 was spent at Fort Vancouver, with a brief trip northward to Puget Sound and the newly established Fort Nisqually, which resulted in the collection of some 250 specimens of mosses. While at Fort Vancouver, Douglas met Nathaniel Wyeth, an American merchant who had traveled overland from the east in an attempt to establish a trade

network to compete with the Hudson's Bay Company. Harvey (1947) suggests that Douglas encouraged Wyeth to collect botanical specimens on Wyeth's return trip, and possibly even helped Wyeth collect specimens from the vicinity of Fort Vancouver. Wyeth's resulting botanical collections were studied and described by Thomas Nuttall, which led to Nuttall's participation in a subsequent Wyeth expedition west to the Columbia country between 1834 and 1836.

With the arrival of spring, Douglas embarked on yet another ambitious journey: an attempt to return to England by traveling overland through western Canada, to Sitka, Alaska, sail across the Pacific to Siberia, and then return overland to Europe. Douglas apparently was aware of the difficulty of accomplishing this feat, but perhaps feeling a need to perform even greater accomplishments, he started northward on March 20, 1833. He traveled up the Columbia, and then the Okanagan River to Fort Kamloops, over to Fort George on the Fraser River, and eventually Fort St. James on Lake Stuart. He had an opportunity to accompany an exploring party down the Skeena

River to the Pacific, but with no fort or establishment there to stay at, and 250 miles of unexplored coastal waterways to go to reach Sitka, Douglas thought the better of it. Perhaps the prospect of traveling through a region populated with potentially hostile Indians also weighed in his decision. He decided to return to the Columbia, from which he hoped to find passage on a ship to Sitka.

But on the return trip down the Fraser River, disaster struck. Below Fort George, his canoe overturned in the rapids, and nearly all of his possessions, including his field notes, were lost, as he described in a letter to W.J. Hooker:

...The 13th of June, (was) a most disastrous day for me, on which I lost, what I may call, my all! On that morning, at the Stony Islands of Fraser's River... my canoe was dashed to atoms, when I lost every article in my possession, saving an astronomical journal, book of rough notes, charts and barometrical observations, with my instruments. My botanical notes are gone, and, what

A Visit to the Doctor's Pit

by Tom Kaye

On June 13, 2011, I set out to find the spot where David Douglas met his end. Part homage to a great botanist and part picnic outing with my mother, who was living on the island of Hawai'i at the time, the day combined sightseeing with site seeking. We steered my mom's Nissan 4 x 4 pickup off the Saddle Road onto an unnamed dirt track and headed north in a broad arc around Mouna Kea's east flank along the ca. 6,000 foot contour. The area had been pastured for over 200 years but scattered native trees like ohia lehua (*Metrosideros polymorpha*) and koa (*Acacia koa*) still shared the soil with introduced grasses, patches of invasive gorse (*Ulex europaeus*), and the odd native fern. We drove across slopes dotted by cinder cones, with pasture to our left, and dense forests to the right. Loud birdsong from native honeycreepers echoed from the forests strewn with passionflower (*Passiflora tarminiana*) vines.

Our directions turned out to be inaccurate, and we drove a few miles farther than anticipated, with doubt that we would find our spot increasing every tenth of a mile.



Douglas-fir trees (*Pseudotsuga menziesii*) planted to commemorate David Douglas on the Island of Hawai'i.

PHOTO: TOM KAYE

So, we were relieved to spot a quaint red sign hanging from a wrought iron post reading "David Douglas," and a trailhead labeled "Dr.'s Pit." The trail led downhill to a depression below the road and against the forest edge where we discovered a monument in the shape of a tall, narrow pyramid, about eight feet high, assembled from rough cobble-sized lava blocks and mortared with cement. One side bore a brass plaque with the words "Kaluakauka, In Memory of David Douglas, Killed near this spot in a wild bullock pit, July 12, 1834 A.D. This tablet erected 1934 by the Hilo Burns Club." Although I saw no remnants of the fatal pit, I was surprised to look up at the nearby trees and see a small but towering commemorative grove of Douglas-firs (*Pseudotsuga menziesii*) looking out of place in the rainforest of Hawai'i. While walking the slopes of this volcano in the middle of the Pacific Ocean it was impossible not to think of David Douglas himself exploring these highlands before meeting his untimely end.

Tom Kaye, PhD, is founder and Chief Scientist at the Institute for Applied Ecology.



The monument to David Douglas placed at the Doctor's Pit location 100 years to the day after his death. PHOTO: TOM KAYE

gives me most concern, my journal of occurrences also, as this is what can never be replaced, even by myself. All the articles needful for pursuing my journey were destroyed, so that my voyage for this season was frustrated. I cannot detail to you the labour and anxiety this occasioned me, both in body and mind, to say nothing of the hardships and sufferings I endured. Still I reflect, with pleasure, that no lives were sacrificed. I passed over the cataract and gained the shore in a whirlpool below, not however by swimming, for I was rendered helpless and the waves washed me on the rocks. The collection of plants consisted of about four hundred species -two hundred and fifty of these were mosses and a few of them new. This disastrous occurrence has much broken my strength and spirits. (Hooker 1836–1837, p. 159)

He returned to Fort Vancouver in August 1833, with little to show for an entire collecting season's effort. He was philosophical about his losses, however. "Such are the not unfrequent disasters attending such undertakings," he wrote to W.F. Tolmie in September 1833 (Harvey 1947, p. 206). "On the whole I have been fortunate for considering the nature and extent of the country I have passed over (now 8 years here) and the circumstances under which I traveled my accidents have been few." Douglas gave up his plan to return to England via Siberia, and instead sailed again for Hawai'i, arriving there on December 23, 1833. As it would be some time before the departure of the next ship to England, he set about exploring and collecting in Hawai'i.

On the Island of Hawai'i, Douglas continued his explorations. In his botanical collections, he focused especially on ferns, and several Hawaiian fern species bear his name for their specific epithet. He organized expeditions to climb to the summits of Mauna Kea and Mauna Loa (perhaps the first European to reach the summit of the former, and the second, after Archibald Menzies, to reach the summit of the latter mountain). On these climbs, Douglas determined the heights of both volcanoes to a high degree of accuracy. Douglas also explored the active volcano Kilauea in January 1834. The physical exertions of these climbs took their toll, and he returned to Honolulu on the island of Oahu to recuperate.

Then in July 1834 Douglas returned to the island of Hawai'i, intending to travel overland on a trail that led from the northwest corner of the island to Hilo, on the east side of the island. This would prove to be Douglas' last adventure. On July 12, 1834, Douglas' body was found, trampled to death by a bull, in a pit used to trap wild cattle. Whether Douglas' death was by accident (he was known to have poor eyesight) or by design will never be known for sure. There was suspicion that he had been murdered by a local cattle hunter, but the investigations that followed could find no definitive proof of this (Greenwell 1988). Thus came to an end, at the young age of 35, the travels and adventures of one of the most significant early botanical explorers of western North America.

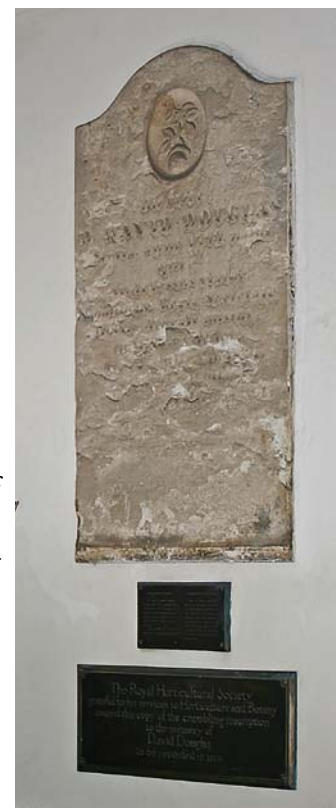
Following his death, Douglas' body was returned to Honolulu for burial. Though unmarked, the grave is located on the grounds of the Christian Mission, adjacent to historic Kawaiaha'o Church. In 1855, a marble tombstone was purchased from San Francisco, and because the grave location was not known, the monument was placed on the outside wall of the church. It was inscribed in Latin, the text of which translates:

Here lies master David Douglas, born in Scotland A.D. 1799. An indefatigable traveler, he was sent out by the Royal Horticultural Society of London, and gave his life for Science in the wilds of Hawaii, July 12, 1834. "E'en here the tears of pity springs and hearts are touched by human things" – Virgil.

By 1929, the inscription was eroding and becoming illegible, so the Royal Horticultural Society arranged to have the monument moved to the inside of the church, where it still can be found. In addition, a stone cairn marks the spot on the Island of Hawai'i where Douglas was killed.

In a sense, Douglas can be considered to have been the first resident botanist in western North America. Working out of Fort Vancouver and Monterey, Douglas spent eight years covering the West, in some cases repeatedly visiting the same areas at different seasons and in different years. As such, he was able to develop a familiarity with the country and its flora that was not achieved by Northwest botanists until the late 19th century with W.N. Suksdorf, T.J. Howell, W.C. Cusick, and their contemporaries. This was due in part to Douglas' mission: not only was he to collect herbarium specimens for scientific study, but he was also charged with gathering seeds for horticultural introduction. This often meant several visits to the same locality during the season so that seeds could be gathered at the proper time, which provided him with the opportunity to more completely experience the botanical features of such areas.

After Douglas' death, the Royal Horticultural Society retained his personal herbarium of some 1,460 specimens, which was subsequently sold in 1856 to the British Museum (now known as the Natural History Museum). Additional herbarium specimens collected by Douglas were apparently divided



David Douglas monument in Kawaiaha'o Church, Honolulu. PHOTO: ED ALVERSON

between some of the prominent botanists of the day—W.J. Hooker, J. Lindley, G. Bentham, and to a smaller extent other botanists throughout Europe. Asa Gray even brought some back to America with him. At present, Douglas’ specimens are primarily housed at the Natural History Museum, Kew Herbarium, and Cambridge University Herbarium. Following his

death, many of Douglas’ new species, for which he had given temporary, unpublished names or written descriptions in notes or manuscripts, were formally published by others, particularly W.J. Hooker and J. Lindley (Reveal 1989). W.J. Hooker edited and published a sketch of Douglas’ first Western expedition, along with letters sent by Douglas to Hooker during the second

Douglas at Kew Herbarium

by Peter Dunwiddie

I am standing at a railing overlooking the main floor of the “C” Wing of the Kew Herbarium in London. The ancient wooden herbarium cabinets filling each floor include some of the oldest and most noteworthy botanical specimens in the world. As I gaze at the desks and tables on the main floor below, it is humbling to realize that many of the most eminent botanists in the world sat in this same space, studying some of the specimens I was now in search of. I came to London in hopes of seeing firsthand some of the specimens collected by David Douglas during his two trips to western North America. Recently, Kew began to photograph their collections and make them available online (<https://collections.data.kew.org>), together with transcriptions of the specimen labels. It is a true delight to be able to study this material directly from my computer in Seattle. But I had more tangible reasons for visiting the herbaria.

First, I wanted to see how difficult it would be to find even just a few of Douglas’ specimens amongst the more than seven million housed in several buildings at Kew. I had visions of endlessly thumbing through stacks of plants in rows of herbarium cabinets. And second, my online examination of the specimens, together with reading scanned copies of his journals and letters, led me to realize that there might be a goldmine of untapped information about precisely where Douglas made his collections. The transcribed label information in the online database was often incomplete or indecipherable. Names like “Walla Walla” and “Multnomah” often were incomprehensible. Clearly, what was needed was a familiarity with the historic placenames of the region, an ability to read the cursive handwriting of 1820s England, and the patience to match up Douglas’ journals with the information on his specimens. The cabinets holding specimens in the genus *Lomatium* are close to where I had been given space to work, so I begin rather arbitrarily leafing through the sheets of *Lomatium macrocarpum* (large-fruit desert-parsley), knowing it was a species that Douglas collected. To my amazement, I turned up several of his specimens in the very first folders I examined. As I studied more of his specimens, it becomes easier to pick out errors made by the transcribers who struggled to read the scrawled handwriting. But even bigger surprises awaited. I soon noted peculiar, even unique, features of Douglas’ collections. The paper on which some of the specimens were mounted was subtly different from other sheets in the folders. Quirks in the handwriting, mannerisms in wording, commonalities in the place names, even an occasional note written on the back of the sheet, all provide important clues and details. So when I come across a *Lomatium* sheet with several of the distinctive features but no collector’s name on it, I am certain it is one of Douglas’ even before I decipher the label, which reads as follows (together with bracketed text that are my own clarifications):

“Gravelly soils on the Columbia [text cut off] from the Great Falls [=Celilo Falls] to the Grand Rapids [=Cascade Rapids] 1825.”

It is unmistakably a David Douglas collection that had not previously been recognized since it lacked his name on the label. To me, it was like finding a forgotten original sketch of Michelangelo’s tucked away in a museum basement.

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Kew Herbarium old wing. PHOTO: IAN ALEXANDER, WIKIMEDIA

Western expedition. In 1914, the Royal Horticultural Society finally published the full journal of Douglas' first Western expedition, which had been languishing unpublished until urged to do so by Washington botanist C.V. Piper, who had consulted the handwritten manuscript while visiting Kew in 1911 (Piper 1915). The full journal had apparently been written by Douglas during his time in London between 1827 and 1829, based on his field notes. Two of Douglas' papers are also included in the 1914 book, containing his descriptions of North American oaks and western conifers.

One can imagine, however, that if Douglas had survived to return to England with all his collections and field notes intact, he might have used his later years to produce a memoir that ultimately could have become a Western natural history classic. After all, Charles Darwin spent a lifetime publishing books and articles based upon a single expedition he made as a youth! Even in its incomplete form, Douglas' journal is enjoyable reading and time travel, particularly if one knows the country being described and the species encountered, and is available on online at the Biodiversity Heritage Library (<https://doi.org/10.5962/bhl.title.19661>).

Based upon plant specimens and observation from his travels in North America, Douglas named some 130 new taxa of Western plants, including the genus *Garrya* (silktassel), as well as six currently recognized species of conifers, 10 taxa of *Astragalus* (milk-vetch), 13 species of *Penstemon* (beardtongue), and 14 species of *Lupinus* (lupine). He is commemorated by the genus *Douglasia* (Primulaceae, now subsumed in *Androsace*) and more than 45 other recognized plants, plus several vertebrate animals, that bear his name as a species epithet. Among his collections are the type specimens for over 500 plant species. Douglas collected seeds of many plants and was responsible for the introduction of over 200 species of Western plants to cultivation in European gardens. Many of these plants were illustrated in horticultural journals such as Curtis' Botanical Magazine and Edwards' Botanical Register. Douglas is also commemorated by the name of several geographic localities, including Mt. David Douglas, a 6,255 ft. peak located in the Cascade Mountains of Lane County, Oregon, near Willamette Pass (43.654, -122.162); and Mt. Douglas, (10,614 ft.) and nearby Douglas Lake, located in the Canadian Rockies in Banff National Park, Alberta (51.527, -115.968). Another peak near Lake Louise was originally named Mt. Douglas, but this peak was subsequently renamed Mt. Kitchner in 1916.

Today, a reconstruction of Fort Vancouver occupies the site on the north bank of the Columbia River, where David Douglas arrived and departed so many times during his botanical travels in the Northwest. Below the fort lies a freeway, and beyond that a major railway. Transcontinental jets fly low overhead on their landing approach to Portland International Airport, just across the Columbia River. Yet, stately old Oregon white oak (*Quercus garryana*) trees still grace the slope that rises above the river, and with a bit of imagination one can be transported back to the time of the Hudson's Bay Company,

when our hero Douglas camped under the oaks, and dreamed of botanical riches still to be found.

Recommended reading

Note: Harvey's biography is the most thoroughly researched and completely referenced work and has been a primary source for this series of essays. Nisbet's two engaging books (2009, 2012), together provide an excellent overview of Douglas' life and times. Readers who have enjoyed these articles may also be interested in the 2012 documentary film "Finding David Douglas", which is available for viewing on YouTube (https://www.youtube.com/watch?v=118zfxLXt_8).

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Ed Alverson currently works as the Natural Areas Coordinator for Lane County Parks in Eugene, Oregon. Ed has a BS in Biology from The Evergreen State College and a MS in Botany from Oregon State University and has worked as a field botanist and stewardship ecologist in the Pacific Northwest for 45 years. Ed has also authored or co-authored more than 50 popular and scientific articles on a variety of botanical and ecological topics, from plant taxonomy and ecology to botanical history and exploration. This essay was prepared for the "Plant Hunters" project, which was convened by Art Kruckeberg and Rhoda Love.



A Practitioner's Perspective: Thoughts on Herbicide, Outreach, and Stewardship Incentives

by Steve Richmond, Editor of seedrain.org

In 2003, I was delighted to be accepted into WNPS's Native Plant Stewardship Program, back when WNPS founder Art Kruckeberg kicked off the 10-week training. I consumed this crash course and soon landed a paying restoration job. Wow! A beginner earning-while-learning well before completing the program's 100-hour volunteer commitment. Now, after two decades as a full-time practitioner, I'm still trying to fulfill the steward's purpose—to be a liaison between the science and the public—by sharing on-the-job lessons on my educational website, seedrain.org. Seedrain.org is a simplified “why and how of restoration” west of the Cascades addressing the epidemic spread of invasive seeds that rain down by birds, reinfesting all our hard work.

My first on-the-job lesson was the cascading consequences of hand-removing three acres of dense English ivy (*Hedera helix*) in Seattle's Carkeek Park. Our contract mandated digging four inches to remove all roots. After a rainy winter, all the forest duff had eroded—a fungal layer rare in the city and taking centuries to build. If my math is correct, that's 43,560 cubic feet of eroded sponge, what King County estimates as 45,000 gallons of turbid runoff *every rainstorm* that might otherwise be soaked up and fungal-filtered before percolating into Pipers Creek, Seattle's best remaining salmon stream.

I began to question my dream job—eroding soil and driving around four counties to do environmental work. I knew the company truck would be an injustice to all downwind, warming the planet and threatening the forests I was working to save. So, I hung up a shingle and started a business on a bicycle, revegetating invaded eroded slopes and transforming lawns into native plant habitat. It wasn't long before I landed a city contract and started hiring crews to restore urban forests.

My next lesson was grubbing Himalayan blackberry (*Rubus bifrons*) across 15 acres of steep terrain. We were just learning about stormwater, the “No. 1 polluter of Puget Sound.” After a summer of back-breaking work, my crew mutinied, knowing we were doing more damage than good. We were eroding “atmospheric deposition of air pollution,” much like washing grit off a car into a storm drain, right into the Salish Sea. We saw that blackberry root fragments only grew back, and without capacity to mulch 15 acres, uprooting invasives only cultivated the soil's bank of weed seeds. We soon learned that an eroded fungal layer made it nearly impossible to sustain new plantings, much less natural regeneration of native plants.

I was making a living, but I faced a choice: get paid for feel-good environmentalism or lobby for better practices.

So, I called a meeting of contractor-practitioners to compose a “white paper” of suggestions, including judicious use of herbicide, to be presented to municipal managers. With the help of key WNPS members, the paper's revisions were my real education that later became the step-by-step guide in seedrain.org. Our petition was part of a growing consensus in the practitioner community who recognized the scale of the invasive problem, the rate of spread, the limited budgets and the futility of manual removal methods. Proposing the use of herbicide was blasphemous, so my contracts weren't renewed (and employees laid off) until two years later when municipal managers agreed that careful applications of low-toxic herbicides were the “best practice” or most “environmental” approach on large-scale landscapes, a tradeoff to avoid erosion and stormwater toxins worse than herbicide.

Quite a reversal for an organic gardener, health nut, and bicyclist, thirty years now car-free. I wanted to know the relative worry of the herbicides we were commissioned to use, so I read the research about glyphosate, the active ingredient in Roundup. According to the World Health Organization, the International Agency for Research on Cancer ranked the cancer probability of glyphosate on par with 1) red meat, 2) high-temperature frying, 3) late-night work shifts, and 4) indoor wood smoke. This ranked glyphosate as a lower risk than known carcinogens such as 1) processed meats, 2) all alcoholic beverages, 3) sunlight, 4) engine exhaust (diesel), 5) benzene (in some gasoline formulations), 6) arsenic (in some soils), and 7) outdoor air pollution.

So why all the hype if glyphosate is less worrisome than a beer, hotdog, and fresh air at the ballfield? “The dose is the poison” the saying goes, so sounds like if we're not drinking or bathing in concentrated chemicals, we should be okay working on treated sites. I am not suggesting that stewards apply “mid-night Roundup” on their projects. Public opinion and lawsuits are real, so only the landowner and managers can legally hire licensed applicators. After such work, follow-up by stewards is critical to restore native plant communities. More important, we need stewards to be active liaisons to help neighbors control fruiting invasives within a community “seedshed.” Especially climbing ivy vines before they set seed, reducing its spread plus saving the tree.

Invasive species are said to be the second leading cause of species extinctions, giving rise to an incremental, too-slow-to-notice silent spring. Rachel Carson, author of *Silent Spring*, said, “We need wild habitats in which original populations of insects and other organisms can be maintained. To destroy the homes and food of wildlife is perhaps worse in the long run than direct killing. A perfectly sound method of selective spraying is known, which can achieve long-term vegetational control.” Ms. Carson wrote this long before the terms “restoration” or “Integrated Pest Management” were in use, but now practitioners employ even more selective injections or cut and treat methods to target invasives. Consistent with IPM's directive to consider other options before resorting to pesticides, she

wrote, “The best and cheapest controls for vegetation are not chemicals but other plants.” If I may add, favoring evergreen plants to intercept stormwater and shade out weed reinvasions.

As we organize volunteers with IPM to guide our practices, we should recognize the cumulative impacts of individual small actions, what ecologists call “non-point sources of pollution.” It all adds up. We should also consider best available science that aims for all-around healthier outcomes. Let’s promote sunscreen and consider the carbon and disposal footprint of weed cloth, plus see how we can encourage volunteers to walk, bicycle, or bus to our work parties. We need to recognize when licensed herbicide applications are necessary for knotweed and invasive trees, or when large ivy patches are too steep or erosion prone on polluted soils. Weigh the “eco-logic” of tradeoffs to best navigate wildlife, soil, and human health.



Invasive English ivy (*Hedera helix*) covers the forest floor and tree trunks at Point Defiance in Tacoma. PHOTO: MARK TURNER

Even with herbicide, our modest efforts won’t make much of a dent given the epidemic nature of spreading invasives. The near-exponential trajectory of holly may slow down in shady forests, but west of the Cascades, English ivy (both *Hedera helix* and *H. hibernica*) is relentless in sun, shade, wet or dry conditions. Ivy is a slow-motion time bomb, potentially entrenched—irreversibly—if we don’t soon control the fruiting “seed rain” crossing public and private land boundaries.

How do we change the hearts and minds of private landowners who love their lawns or Christmas holly (*Ilex aquifolium*)? If lawmakers realize that regional ecosystems are at stake, along with fisheries, timber and eco-tourism economies, then they might mandate weed control or, better, figure out an incentive scheme to motivate widespread stewardship. Banning the sale of ivy was symbolic and good public education, but alone it won’t make a difference. The unneutered cat is already out of the bag.

Perhaps only WNPS has the credibility to make a case for strategic statewide reforms. Before considering my suggestions, take a moment to think—what would you do to make stewards out of people who, for whatever compelling reasons, currently neglect their land?

I make my case on the last page of seedrain.org, but the basic idea is a “tax shift,” an incentive strategy instead of heavy-handed government. That is, offer “eco-assessments” to interested landowners who choose to invite certified assessors to measure tree cover, stormwater management (rain gardens), forest management (thinning fuels), septic health, soil health, natural shorelines, native habitat quality, and other public benefits deemed important by local governments. The resulting “eco-rating” could be applied to reduce utility fees or annual property taxes, kickstarting stewardship statewide.

When lawmakers choose to respond, and they must if they want to save forest regeneration and all the eco-services that biodiversity provides, then WNPS needs to be ready to scale up training for home stewards. Not 300 more, not 3,000, but 300,000 new stewards. This will require modular online resources and YouTube demos that have broader appeal than our scientific bent. In addition to the wealth of wnps.org resources, we need something like an improved seedrain.org. We need a WNPS committee to hone such a website.

Expect frustrated homeowners to overapply chemicals in the wrong seasons when manual control efforts don’t work. There are only two dozen aquatic herbicide applicators in King County who can manage the insurance and licensing, hardly enough, so we need to discourage consumer misuse of herbicide. A proactive risk-management approach is needed, one that factors insurance costs into the price of products, that adds fees according to science-assessed human and environmental risks. Knowing that consumers rarely read and follow the legal label on pesticide products, they will be more likely to read the price tag. This will affect pesticide sales, encouraging manufacturers to educate their own customers about judicious applications and ensure that the cheapest products are also the safest.

As invasives spread, we can wring our hands and toil in our parks, or we can actively shape our future. Yes, these are grandiose ideas and a grander order to implement. But it’s a discussion that needs to start. The longer we wait, the more expensive—or catastrophic—it could be. Our region’s economic and environmental health are at stake. Not to mention the plants we love. Will WNPS play a role?

Steve Richmond’s UW education comprises Business Administration with a minor in Russian Language, plus study at the Pushkin Institute in Moscow, Russia. Early careers include news photography for legacy print media, the founding director of a Russian language program in the former Soviet Union, then a midlife redirection working with plants for landscapers and nurseries. After taking WNPS’ Stewardship Training and working in restoration, in 2005 Steve started the longest-standing restoration company in Seattle, working by bicycle and eventually employing 20 crew restoring hundreds of acres of forests for municipalities throughout King County. Described as “the most experienced practitioner who actually does the work,” at age 65, Steve continues professional fieldwork on rural Vashon Island, still by bicycle.



Conservation Advocacy Highlights of 2025

The Conservation Committee wraps up yet another year of advocacy on behalf of WNPS, one in which our volunteer membership continually referred to the Society's mission when addressing both issues that came before us and during our annual reviews of grant proposals presented to us by the 2025 applicants.

We responded to a plethora of initiatives coming from officials in Washington, D.C. that threaten many long-established policies and programs designed in part to protect native plants and their habitats, including the Endangered Species Act (ESA), National Environmental Policy Act (NEPA), the United States Forest Service (USFS) Roadless Rule, and the Bureau of Land Management's (BLM) Plant Conservation & Restoration Program. We weighed in at critical development stages on two National Forest Management Plans. In addition, we expressed concerns to Washington municipal and state agency officials on several close-to-home topics. This work included the drafting and revision of ten letters by Conservation Committee members. Summaries of the letters are listed below.

You can find details of each of these issues and letters at the WNPS's Advocacy webpage: <https://www.wnps.org/advocacy-reports>

February: Letter of Support to the WA State Legislature for SB5325 and the designation of **basalt cactus** (*Pediocactus nigrispinus*) to be the Official Cactus of the State of Washington. WNPS gave testimony at the WA House State Government & Tribal Relations Committee hearing on this issue during the 2025 legislative session. The state senate approved SB5325, but the final bill did not pass both the House and Senate.

March: Comment Letter to WA State Noxious Weed Control Board (NWCB) urged the Board to list common holly (*Ilex aquifolium*) as a Class C noxious weed. WNPS representatives also attended two NWCB public hearings to provide testimony. After postponing the vote for a year, NWCB approved listing *Ilex aquifolium* as a Class C noxious weed. Though this status does not prohibit holly from being sold in WA, it creates awareness of unmonitored spread by birds and wildlife.

March: Comment letter to USFS Regional Forester addressed WNPS concerns with the Northwest Forest Plan Amendment Draft Environmental Impact Statement (DEIS). These comments focused on Forest Stewardship. Our stance is summarized in closing: "We support a holistic approach to protecting all remaining mature (age 80 years and older) and old-growth closed canopy forests as well as younger forests that can be recruited over time to become mature and old-growth forests."

March: Comment Letter to National Council on Environmental Quality (CEQ): We opposed removal of NEPA implementing regulations that require evaluation of long-term and cumulative effects of proposed actions on Federal public lands. In summary, our letter stated: "We urge CEQ to abandon this misguided rollback and instead focus on strengthening NEPA to ensure responsible, informed federal decision-making."



Old-growth forest near Ohanapecosh, Mt. Rainier National Park. PHOTO: DAVID HAGAN

May: Comment letter to BLM in support for continued funding of the BLM Plant Conservation and Restoration Program. This letter, co-signed by nearly 100 other organizations, is summarized here: On behalf of our millions of members and supporters, we respectfully ask that you retain funding for native seed generation, storage, and distribution in BLM appropriations so the agency can continue to effectively implement the National

Seed Strategy. We urge Congress, at a minimum, to maintain existing funding for the BLM Plant Conservation and Restoration Program including support for contracting with farmers to grow seed, agency botanists to direct the National Seed Strategy implementation, and the national seed warehouses.

May: Comment letter to U.S. Fish & Wildlife Service re: Rescinding the Definition of "Harm" to exclude habitat as a necessary aspect of plant conservation under the ESA. Seven

Mission of the WNPS Conservation Committee

WNPS advocates for ecological land management practices and policies that conserve or restore native plants and habitats on public and private lands in Washington State, and actively influences public policy promoting the preservation and restoration of our native flora, habitats and ecosystems.

species of native plants are currently protected via the ESA in Washington. Our statement emphasized that “Protecting habitats against harm IS the only way to protect at-risk species. All proposed Public Land Use Actions must consider habitat damage as DIRECT HARM to species designated under the Act. Please withdraw this Proposed Rulemaking Request.”

May: Comments to City of Westport, WA re: Draft Environmental Impact Statement for proposed Golf course within Westport Light State Park: This proposal received responses from more than 1,000 concerned citizens and organizations due to severe impacts that would result from this project. Our letter specifically addressed native plant habitat and lichens: “We are concerned by the impacts of the proposed development on the rare riparian ecological community and rare lichens that currently occur at Westport Light State Park.” We support Alternative 3—No Action for the proposed Westport Golf Links project. Read more on this project proposal here: <https://www.thewestportdrift.com/thelineup/environmental-groups-raise-concerns-about-westport-golf-links>

Meanwhile, WNPS submitted a Letter of Concern to the City of Port Townsend from WNPS in August 2024 advocating for protection of Kah Tai Prairie Preserve, a 1.5-acre fragment of camas prairie that the Olympic Peninsula Chapter co-manages with the City of Port Townsend. The Preserve exists within a 125-year-old golf course. WNPS supports current golf course management as partners in habitat conservation and restoration and opposes the City’s desire to develop housing near the Preserve within the Park. The letter states that “People all over our city love and take pride in the Kah Tai Prairie Preserve. It is indeed a city and even statewide landmark that we cannot afford to put in danger.” This issue remains unresolved.

June: Letter of Concern to WA U.S. Senators re: Proposed Sale of Public Lands: Washington includes about 12.2 million acres of federally owned public land, mostly under USFS jurisdiction. These lands include a majority of the habitats and healthy native plant populations that are our mission to

conserve. Our summary statement requested: “We call on policymakers at every level to reject broad or otherwise reckless land disposal proposals and instead invest in the stewardship, accessibility, and conservation of our public lands for future generations.” WNPS sent a special announcement email via the newsletter list-serve encouraging members to comment on this issue.

September: Letter of Concern re: USFS Roadless Rule Rescission: Our letter summary stated: “WNPS urges the U.S. Forest Service to continue to uphold the 2001 Roadless Rule and protect our native plants and ecological communities.” WNPS delivered a call to action to our membership via Instagram encouraging members to comment on this issue and received positive encouragement and support.

October: Comments to the Umatilla National Forest Supervisor and Forest Plan Revision Team Leader at the “scoping phase” for the Revised Blue Mountains Forest Plan. Our letter addressed monitoring of plant Species of Conservation Concern, non-native plant species management, protection of riparian areas and other wetlands, and grazing management.

This Committee is always interested in supporting advocacy for preservation and protection of native plants. If there is a conservation related issue emerging in your part of Washington, let us know, and we’ll try to help you advocate effectively. The best way to engage with the Conservation Committee is to fill out an information sheet for issues of concern. The form is located on the WNPS website here: <https://www.wnps.org/content/documents/conservation/20180828-conservation-information-sheet-template.pdf>

Most importantly, we are seeking representatives from all State Chapters for the Conservation Committee. Our current committee members represent only half of the 12 chapters. If you or someone in your Chapter is interested in tracking conservation issues in your region, please consider becoming a member of the Committee. We are also seeking a Committee Chair, which is also a State Board position. All members are welcome to join our Zoom meetings on the second Tuesday of each month, 7:00–8:30 PM. Please contact Denise Mahnke if you are interested: wnps@wnps.org

Respectfully submitted by the 2025 Conservation Committee:

Alec Sorenson
Ed Lisowski
Emil Doyle
Jamie Bails
Katherine Darrow
Susan Saul

*South Sound Chapter
Wenatchee Valley Chapter
Columbia Basin Chapter
Central Puget Sound Chapter
Olympic Peninsula Chapter
Suksdorfia Chapter*



Iconic topography of the “northernmost” Blue Mountains—steeply dissected, “tiger striped” slopes with mostly treeless southerly aspects. PHOTO: EMIL DOYLE

WNPS Grants Programs

Some of the articles published in *Douglasia* are the results of WNPS grant funding provided by our three grants committees: Conservation, Education, and Research and Plant Inventory. These articles are so valued by WNPS members and donors as they demonstrate the great work done around the state to support native plants and habitats.

This grant funding is made available by generous contributions to the WNPS Endowment, with interest assessed annually for grant giving funds available.

The 2026 grant cycle for all three committees is undergoing some revisions. Beginning with the dates for application, the 2026 grant funding cycle will open on December 1, 2025, with the deadline for grants submissions being February 1, 2026, midnight. Applications can be submitted by email or postal mail.

Each grant committee will have \$8000 in funding available with grants ranging from \$500–\$2000, totaling \$24K of overall funding available. Interested applicants should pay close attention to the criteria listed on each committee's web page to make sure their application aligns with program area requirements. The Conservation, Education, and Research and Plant Inventory are separate committees, and each group functions somewhat differently. An application can be denied for failing to align with the committee's criteria. The web pages are now updated for the 2026 cycle and ready for applicant review.

- **Conservation** – wnps.org/conservation-grants
Questions? conservationgrants@wnps.org
- **Education** – wnps.org/education-grants
Questions? education@wnps.org
- **Research & Plant Inventory** – wnps.org/research
Questions? researchinventory@wnps.org



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JOIN the WNPS Native Plant Steward Monthly eNews

<https://bit.ly/3WUN0zq>

In the Beginning

by Jim Kling

In its inaugural issue, printed in the summer of 1976, the WNPS newsletter was six pages long, with illustrations. The issue was titled “Where We Are and How We Got There.” It celebrated the over 100 (!) founding members along with the first program and two field trips held that year: one to Cle Elum and Vantage, Washington; and the other to Hart’s Pass.

The newsletter also called for society objectives that included sponsoring field trips, conducting inventories of rare and endangered plants, public and legal action to encourage protection of endangered habitats, provision of expert testimony, and establishment of local chapters throughout the state.

It’s fair to say the organization met those hopes. WNPS now has over 2,500 members, our chapters sponsor dozens if not hundreds of field trips around the state, our members participate in the Washington Natural Heritage Rare Care program along with many other individual enthusiasts who track and monitor rare plants, our conservation committee is active in giving a voice in support of statewide and local habitat preservation, and we now have 12 statewide chapters.

The society’s first newsletter also calls for local and regional action to conserve plants, with words that continue to ring true today: “This summer, the Interior Department will implement legislation to protect about 700 endangered species in the United States. Most of the initiative for saving rare plants must come from individual states, however. In Washington, the WNPS can be the single most important organization in finding out more about the status of our threatened flora and influencing local authorities to preserve endangered habitats.”

The issue also calls for suggestions and a contest to name the eventual journal that WNPS planned to publish. Possibilities named by the writer included *The Kinnikinnik*, *Douglasia*, and *The Washington Botanist*. I guess we all know the eventual winner.



Snow-encrusted mountain hemlocks (*Tsuga mertensiana*) on Artist Ridge near Mt. Baker. PHOTO: MARK TURNER

NEWSLETTER

WASHINGTON NATIVE PLANT SOCIETY

Vol. 1, No. 1 Summer 1976

Department of Botany
University of Washington
Seattle, Wa 98195



WHERE WE ARE AND HOW WE GOT THERE

The new organization, WASHINGTON NATIVE PLANT SOCIETY, is barely five months old and yet has come a good way since its February beginnings. There are now over 100 paid members from all over the state--students, amateurs, professional botanists and institutions, forming a broad spectrum of concern for our native flora. Since our beginnings early this year, a Steering Committee consisting of Ted Anderson (Walla Walla), Joan Canfield (Seattle), Melinda Denton (Seattle), Betty Fitzgerald (Olympia), Judy Kawasaki, (Seattle), Art Kruckeberg (Seattle), Dennis Jablonski (Randle), Margaret and Joe Miller (Bellevue), Brian Mulligan (Kirkland), Marilyn Perks (Seattle), and Harold Wood (Seattle) has met to further the well-being of the organization. By-laws for the organization have been drafted, discussed and revised for eventual ratification. They were accepted by the membership at our first membership meeting last month. The first program meeting (April 23) was very well attended with nearly a hundred in the audience to listen to Professor Ron Taylor of Western Washington State College describe a floral transect across the state. His richly illustrated lecture was a most appropriate beginning for the Society: an enjoyable educational experience. The Steering Committee also organized the Society's first field trip led by Dr. Melinda Denton (U.W.). On Saturday, May 1, a large

turn-out enjoyed perfect weather and a rich floral display in the Cle Elum area and at Vantage on the Columbia River.

OBJECTIVES OF WNPS

It is timely to restate some of the objectives of the WASHINGTON NATIVE PLANT SOCIETY, especially as some of us will be out among the native plants this summer:

1. Sponsoring of field trips which serve the dual purpose of providing an educational outing as well as familiarizing members with unusual plants in critical areas around the state.
2. Conducting inventories of rare and endangered, or otherwise unusual plants throughout the state.
3. Taking action to save endangered areas through publicity, persuasion or on occasion legal action.
4. Providing expert testimony to government bodies, especially in land use planning on issues concerning the survival of native plants.
5. Establishment of local chapters throughout the state to further all of the above objectives



Old-growth forest on the Mt. Baker-Snoqualmie National Forest. PHOTO: MARK TURNER

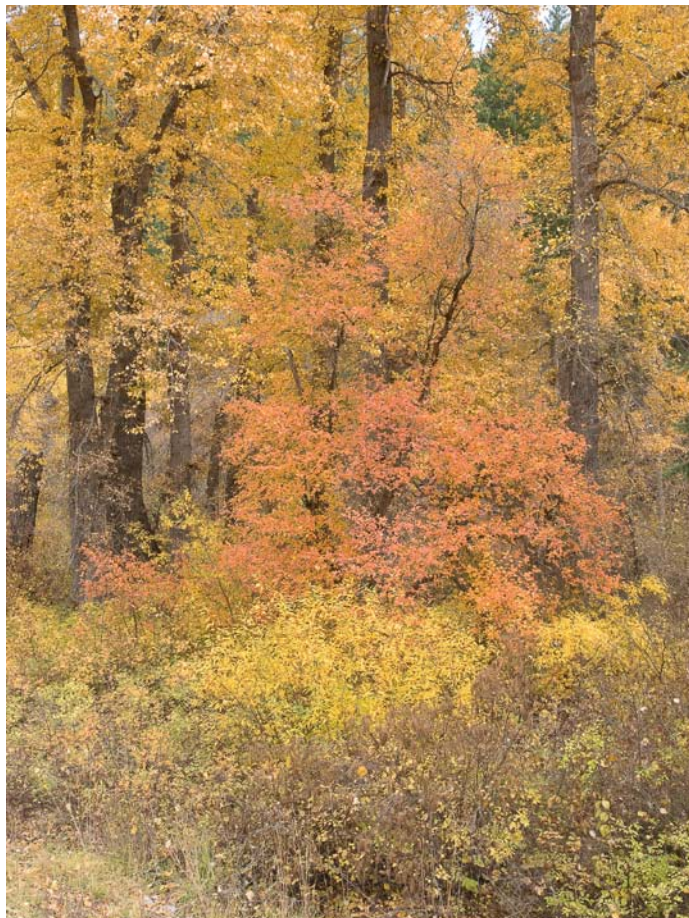


The 2026 WNPS Calendar is now available for purchase in the WNPS online store: wnps.org/store/wnps-2026-calendar

Enjoy this wonderful celebration of the 2025 photo contest, and reminder of the WNPS 50th Anniversary in 2026.

The calendar sells for \$12 plus shipping and tax in the online store. Members can find a bargain at their chapter meetings, picking one up in person for as little as \$11 including tax.

Support WNPS and your chapter with your calendar purchase today!



Serviceberries, willows, snowberries and black cottonwoods in autumn plumage along US 97 on the Okanogan-Wenatchee National Forest. PHOTO: MARK TURNER

Support Our Work

The Washington Native Plant Society depends on your support to deliver the mission of the society. Your help can make the difference and sustain the impact of WNPS into the future.

Become a Member

Join our community of plant lovers and be the first to learn about the programs in your area. Contact the office or go online at www.wnps.org/store-membership/membership.

Donate Online

You may donate any amount online through our secure website at www.wnps.org/donation/make-a-donation.

Donate through Your Workplace

- Workplace giving is an easy way to support WNPS.
- Benevity Giving Portal—If your employer is registered with Benevity, your gifts to WNPS could be matched by your employer.
- Washington State Employees may donate through the Combined Fund Drive—CFD # 0315051.
- King County Employee giving—WNPS agency code #9600.
- Workplace matching gifts: Your employer may offer to match your charitable donations.

WNPS Endowment Fund Giving

Endowment gifts are kept as permanently restricted funds as designated by the donors. This fund provides annual distributions that support the WNPS Grant programs in Research and Plant Inventory, Conservation, and Education. Donations may be made in the following ways:

- Online at www.wnps.org/donation/endowment.
- By mail: Please make checks payable to WNPS Endowment Fund.

Make A Planned Gift

Making a gift through your estate is a powerful way to express your values, care for the earth, and ensure a lasting impact. *“One generation plants the trees, another gets the shade.”—Chinese Proverb*

Here are examples of how to make a planned gift:

- Name the Washington Native Plant Society in your will.
- Make the Washington Native Plant Society a beneficiary to your IRA or life insurance policy.
- Name the Washington Native Plant Society as the beneficiary of a charitable remainder trust.

Make a Contribution with Stock

WNPS can now support a transfer with a brokerage account. Contact the WNPS office for our FAQ sheet that provides information to share with your broker.

Learn all the ways you can support WNPS at www.wnps.org/donate. For more information on giving options, call the WNPS office 206-527-3319, or email wnps@wnps.org.

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* Denotes a voting position

** Ad hoc committees are formed to address society business and are not defined by WNPS bylaws, as are standing committees.



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Snow-covered mountain hemlocks (*Tsuga mertensiana*)
at Artist Point near Mt. Baker. PHOTO: MARK TURNER

