

A photograph of a desert landscape. In the foreground, several tall, slender stems of purple lupine flowers rise from a bed of green, needle-like foliage. The flowers are in various stages of bloom, showing vibrant purple petals. Behind the flowers, a dense, tangled mass of grey, leafless shrubs is visible. The background consists of a dry, hilly landscape with sparse green vegetation and patches of brown soil. In the upper left corner, there is a white, stylized graphic of a leaf with prominent veins.

Douglasia

VOLUME 49, NO. 1 Spring 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.

President's Message: The View from Here

by Gail Sklar

Dear WNPS Members,

Spring is a time of renewal. For many of us it is a personal renewal as we put the winter rains behind us. Our gardens are beginning to show signs of growth, and our hearts are lightened when we see signs of buds. We are looking forward to enjoying our beautiful flora. The Washington Native Plant Society is experiencing renewal. I am delighted to announce that we have seven new board members who can bring new energy and ideas! Two are Directors at Large, one is a committee chair and four are new chapter chairs. Erik Ertsgaard has taken over the Chair of the Research and Plant Inventory Committee. Jarred Glenn has taken over Eric's term as Director at Large, and Robert Steelquist was elected Director at Large in the fall. The new Chapter Chairs are Kelsey Kemel, Columbia Basin; Mattie Whitney, Northeast Washington; Kristen Kloc from Salal; Dawn Doctor for the South Sound Chapter; and Nate Ulrich for Suksdorfia



Change is a part of renewal. We want to ensure that change is done well through our strategic planning process. We began this process with a retreat at the Rainbow Lodge at the foot of Mount Si. Board members as well as other members of WNPS participated. We were led by Bob Steelquist, who volunteered his services and who will not take his place as a Director at Large until the Strategic Planning process is completed. Bob led us with a series of activities aimed at getting folks to share their priorities for WNPS. At the last Board meeting in January, Heather Wendt, chair of the Strategic Planning Committee, shared with the Board what had taken place at the retreat,

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.

JOURNAL OF THE WASHINGTON NATIVE PLANT SOCIETY

WNPS Arthur R. Kruckeberg Fellows*

Clay Antieau
Joe Arnett
William Barker**
Jerry Benson
Bill Brookreson
Nelsa Buckingham**
Pamela Camp
Tom Corrigan**
Melinda Denton**
Lee Ellis
Betty Jo Fitzgerald**
Mary Fries**
Sarah Gage
David Giblin
Amy Jean Gilmartin**
Al Hanners**
Lynn Hendrix**
Karen Hinman**
Marie Hitchman
Catherine Hovanic
Art Kermoade**
Don Knoke**
Terri Knoke**
Arthur R. Kruckeberg**
Ellen Kuhlmann
Dixie Llewellyn
Dean Longrie

Mike Marsh
Joy Mastrogiuseppe
Wendy McClure
Lou Messmer**
Joe Miller**
Margaret Miller**
Mae Morey**
Brian O. Mulligan**
Richard Olmstead
Ruth Peck Ownbey**
Sarah Reichard**
Jim Riley**
Don Schaechtel
Fayla Schwartz
Gary Smith
Ron Taylor**
Richard Tinsley
Ann Weinmann
Fred Weinmann

* 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.

** Deceased

Douglasia Staff

Managing Editor
Melissa Islam
douglasia_editor@wnps.org
Layout Editor
Mark Turner
douglasia_layout@wnps.org
Technical Editor
David Giblin
douglasia_tech@wnps.org
Editorial Committee Chair
Vacant
douglasia@wnps.org

Send address and similar changes to:
Washington Native Plant Society
6310 NE 74th St., Suite 215E
Seattle, WA 98115
206-527-3210
info@wnps.org

WNPS Staff

Executive Director
Denise Mahnke
206-527-3319 office
206-473-7694 cell
wnps@wnps.org
Administrative Assistant
Coming in late March
206-527-3210 office
206-475-2413 cell
info@wnps.org
Program Manager, Stewardship and YEER Programs
Cynthia Updegrave
206-794-5928
stewardsyeermgr@wnps.org
Program Associate – Stewards & YEER
Debbie Lassiter
206-514-9891
stewardsyeerassoc@wnps.org
Native Plant Stewardship Coordinator
Joe Albrecht
pugetsoundstewards@wnps.org

On the cover: Wanapum crazyweed (*Oxytropis campestris* var. *Wanapum*), 14 May 2024. PHOTO: KATY BECK AND MARK DARRACH

Douglasia (ISSN 1064-4032) is published triannually by the Washington Native Plant Society. *Douglasia* logo designed by Louise Smith of Seattle. Printed on paper that contains 10% post-consumer waste. © 2025 Washington Native Plant Society. Authors and photographers retain the copyright of articles and photos.

and asked the Board members to fill out a prioritization spreadsheet. The Strategic Planning committee will meet and, based on this and some other information, make recommendations to the Board at their next meeting in April. We want to make WNPS become even better.

At the same time, we are working to impact our communities. The Master Native Plant Stewardship Program—100 hours, coordinated by Joe Albrecht, is working on their projects in Federal Way. A new 30 Hour Steward Program in Spokane will begin soon under the guidance of Sarah Verlinde-Azofeifa. Our stewards often become leaders in WNPS. Jarred Glen is one of our new 100 Hour Stewards and is now serving on the board. I became involved as a 30 Hour Steward starting in 2016. They also help in other areas of our chapters and with the YEER Program. They play a key role in renewal.

As we take on new roles, we need more resources. Denise, our amazing Executive Director, is finally getting some help with new staff hires which she has shared in the eNews. Denise has been doing the jobs of four people. With the staff complement complete, it will give her time to breathe and focus on what is ahead.

With our environment threatened perhaps as never before, we need to respond in new and creative ways. WNPS Programs are growing and diversifying! Two 30 Hour Steward Programs is one such program. Native Plant Appreciation Month (NPAM) in April, Exploring Biodiversity: Exercises in Community Science is another. This year, the NPAM emphasis will be on community science and will be aided as we learn to use iNaturalist. Each chapter can have its own Collection project site, and these sites can be shared with the WNPS Umbrella site so that it may be viewed by members across the state! This is an exciting way to help grow chapter excitement while on hikes.

As community programs we know and love are being decimated, we need your volunteer efforts in WNPS. We need help to find chairpeople for both our chapters and the state board. While I do not know how many chapters need positions filled, I do know that the state board has key vacancies on our standing committees. If you have an interest in volunteering to serve on the board, please contact me at wnpspresident@wnps.org. Filling these positions will help WNPS continue to grow, have an impact, and meet its mission to promote the appreciation and conservation of Washington's native plants and their habitats through study, education, and advocacy.

Happy spring renewal!



Pacific bleeding hearts (*Dicentra formosa*). 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.
- Federal Employees may donate through the Combined Federal Campaign—CFC # 69374.
- 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.

David Douglas, Botanical Explorer: Part 1

by Ed Alverson

Let's go back 200 years—to April 9, 1825, to be exact—to the moment when the Scottish botanical explorer David Douglas first set foot on the soil of western North America. Douglas was at the mouth of the Columbia River, in present-day Pacific County Washington, after an eight-month journey from England. This was the beginning of an extraordinary nine-year odyssey, one of the most productive episodes in the history of botanical exploration. The success of his endeavors can be measured in several ways, including the number of plant and animal taxa that bear his name (over 45), and the number of species (over 200) he is credited with introducing to British and European gardens.

Douglas' greatest fame came from his investigations of western conifers; he is commemorated with the common name of the conifer genus *Pseudotsuga* (Douglas-fir) because he was the first to collect cone-bearing specimens of this important tree. Douglas "discovered" many genera and species of plants new to western science, and he is commemorated by the genus *Douglasia* (Primulaceae) and over 40 other taxa that bear his name. Douglas also collected seeds of many species and was responsible for the introduction of over 200 species of western plants for cultivation in European gardens. Douglas was a well-rounded field naturalist, and his journals and correspondence, though not published in full until 1914, provide many insights into the biota, ecology, and anthropology of western North America before significant changes had been brought about by Euro-American settlement. Douglas' legacy is a monument to the curiosity, persistence, and hardiness that was necessary to bring our native Western flora to the attention of a wide audience.

David Douglas was born in Scone, Scotland, on June 25, 1799, one of six children of Jean Drummond and her husband, John Douglas, a stonemason. Douglas was a spirited child who showed a strong interest in nature and the out-of-doors. He was apparently impatient with classroom life and left school at the age of ten or eleven, when he began an apprenticeship under William Beattie, head gardener at the Scone Palace. This is where his botanical education began. After a seven-year apprenticeship, he was first employed as a gardener at Valleyfield, the estate of Sir Robert Preston, and then after two years, at the botanical garden in Glasgow, Scotland. At the time, William Jackson Hooker, later director of the Royal Botanic Gardens, Kew, was Professor of Botany at the University of Glasgow, and Douglas took advantage of the opportunity to attend Hooker's lectures in Botany. Douglas must have stood out to the professor because he was invited to join Hooker on botanical excursions through the Scottish countryside. These were an opportunity for Douglas to get a taste for the rewards of botanical field work, and training for the physical and psychological exertions Douglas would later encounter half a world away.



Red currant (*Ribes sanguineum*), Miss Hart (illustrator), S. Watts (engraver), Edwards's Botanical Register, plate 1349, 1830. PHOTO: COURTESY OF BIODIVERSITY HERITAGE LIBRARY

In 1823, Hooker recommended Douglas to Joseph Sabine for a position as a botanical collector. Sabine was Secretary of the Horticultural Society of London, which later became the Royal Horticultural Society. As European explorers, settlers, and traders explored the far reaches of the globe, there was increasing interest in obtaining exotic plants for landscaping gardens and estates. The European flora lacks the diversity of species that are found in other temperate regions such as North America and eastern Asia, and this fact of biogeography helped to stimulate interest in exotic plants among the gardens of Europe. The Horticultural Society, which included among its patrons King George IV, established a network of corresponding members in distant lands, and sponsored expeditions to bring back seeds and plants for garden introductions.

Initial arrangements were made to send Douglas to collect in China—consider how botanical history might have taken a different course had this happened! But political unrest scuttled those plans, and Douglas was sent to the United States, instead. Douglas spent the summer and fall of 1823 traveling along the eastern seaboard, from New York to New Jersey and Pennsylva-

nia, and then through the Great Lakes to Ontario and Michigan. While his primary mission was to gather information and collect propagation material of garden fruits and vegetables, Douglas made extensive observations and collections of the native flora. He also visited with many of the prominent botanists and horticulturists of the time, including Thomas Nuttall and John Torrey, and visited the garden of John Bartram. This expedition was considered sufficiently successful that, upon his return to England, Douglas was assigned to explore the much more wild lands of northwestern North America.

By the 1820s, the Pacific Northwest had been visited by several exploring expeditions, both overland and by sea, including botanical collectors such as Archibald Menzies, Thaddeus Haenke, and Meriwether Lewis. However, the fruits of their labors had been almost entirely pressed and dried herbarium specimens, from which new species were described, and horticultural potential was assessed. Seeds of only a few western species had been obtained, and plants from America were highly valued for planting on large British estates. Douglas was given two primary tasks: explore the hinterlands for new species of plants and collect seeds (in as great a quantity as possible) of any plants with potential as horticultural objects.

On July 25, 1824, the 25-year-old Douglas boarded the Hudson's Bay Company brig, the *William and Ann*, and on the next day the ship departed from London, bound for the Columbia River on the northwest coast of North America. Also on the ship, serving in the capacity of surgeon, was Douglas' good friend and fellow botanist John Scouler. Douglas and Scouler had the opportunity to botanize their way around the world as the ship stopped at numerous ports of call on the long journey across the Atlantic, around Cape Horn, and northward in the eastern Pacific via the Galapagos Islands. Douglas and Scouler are believed to have been the first European botanists to collect plant specimens from the Galapagos Islands, some 11 years before Charles Darwin's celebrated visit to the islands. Although Douglas reported that he collected 175 plant specimens, nearly all of them were destroyed soon after due to incessant rain and a lack of drying space.

The *William and Ann* finally reached the mouth of the Columbia River on February 12, 1825, but because of stormy weather it had to wait for another eight weeks before crossing the infamous Columbia River bar and making landfall. The Columbia bar was a notorious hazard restricting entry to the great river of the west; in fact, only four years later, the *William and Ann* was wrecked on the Columbia bar, and all aboard perished.

So it was on Saturday, April 9, 1825, after a voyage of 8 months and 14 days, Douglas and Scouler stepped ashore at Baker's Bay, on the north side of the Columbia River near the present-day Ilwaco, Washington. Douglas' joy on finally reaching this "promised land" is evident from his journal entry:

On stepping on the shore *Gaultheria Shallon* was the first plant I took in my hands. So pleased was I that I

could scarcely see anything but it. Mr. Menzies correctly observes that it grows under thick pine-forests [sic] in great luxuriance and would make a valuable addition to our gardens....*Rubus spectabilis* was also abundant, both these delightful plants in blossom. (Douglas 1959/1914, p. 102)

For those who know the flora of this region well, it is interesting to see the fascination Douglas held for such commonplace native plants!

At the time of Douglas' arrival, the Hudson's Bay Company was in the process of abandoning Fort George at the mouth of the Columbia River, moving their center of operations to a point 70 miles up the river near the present-day location of Vancouver, Washington. Fort Vancouver, as it became known, was the central hub of Douglas' explorations throughout his years in the Pacific Northwest; as a result, many of his journal observations describe the original conditions of the flora and vegetation of that locale and are useful for comparison with



Columbian tobacco (*Nicotiana quadrivalvis*), Miss Hart (illustrator), S. Watts (engraver), Edwards's Botanical Register, plate 1057, 1827.
PHOTO: COURTESY OF BIODIVERSITY HERITAGE LIBRARY

present-day conditions. Also, many of the seeds Douglas collected and sent back to England came from this area.

Much of the beauty and habitat diversity of the lower Columbia Valley has since been lost due to logging, agriculture, urban development, introduction of non-native species, and changes in flooding patterns. But we get a glimpse of the setting of Fort Vancouver as it was during Douglas' visit from his journal entry:

The scenery from this place is sublime—high well-wooded hills, mountains covered with perpetual snow, extensive natural meadows and plains of deep fertile alluvial deposit covered with a rich sward of grass and a profusion of flowering plants....I cannot pass over the grandeur of *Lupinus polyphyllus* covering immense tracts of low land on the banks of streams....This beautiful plant attains a height of 6 to 8 feet where partly overflowed by water. (Douglas 1959/1914, p. 56–57)

And of the Columbia River Gorge:

From the Grand Rapids [Cascades] to the Great Falls (70 miles) [Celilo] the banks are steep, rocky, and in many places rugged. The hills gradually diminish in

elevation, and are thinly clothed with stunted timber, the shrubs only a few feet high....As far as the eye can stretch is one dreary waste of barren soil thinly clothed with herbage. In such places are found the beautiful *Clarkia pulchella*, *Calochortus macrocarpus*, *Lupinus aridus*, *Brodiaea*, &c. (Douglas 1959/1914, p. 57–58)

Douglas' accommodations at Fort Vancouver were, variously, a tent, a deerskin lodge, and a cedar bark hut. He spent much of the spring and summer of 1825 on day trips out of Fort Vancouver. In the spring he collected and pressed specimens and noted locations to revisit later in the summer to collect seeds. He also made several trips up and down the Columbia River and, later in the summer, up the Willamette Valley into the territory of the Kalapuyans. In his first six months at Fort Vancouver, Douglas collected 499 plant taxa, mostly in sets of 12 to 24 replicates of each collection number.

The observations and species accounts contained in his journal provide a view of the ecological dynamics of a natural landscape, which no longer functions as it did prior to Euro-American settlement. For example, on May 31, 1825, his collection #269 is described as follows:

Fort Vancouver

Established in 1824 on the north bank of the Columbia River, Fort Vancouver was the central hub of the Hudson's Bay Company operations in western North America. Furs, largely trapped by Native Americans, were brought to Fort Vancouver as part of an extensive trade network. The fort included numerous buildings located with a seven-acre area enclosed within a stockade, as well as gardens, orchards, and homes of Company employees located outside the stockade.

The fort was home to a diversity of people from different parts of the Company's trading empire, particularly English, French, Cree, and Hawaiian. Numerous native languages could be heard in and around the fort, and the trade language known as Chinuk Wawa was used as a common medium of communication.

Fort Vancouver was Douglas' home base in the Pacific Northwest on both of his journeys. From this location he would make both day trips as well as extended journeys with Company brigades heading east, south, or north. The fort was a location where he could process and store his collections, prepare them for shipment, and dispatch correspondence back to Britain.

The biological diversity of the immediate area of the fort made it an excellent location for collecting. A series of prairies interrupted the forest extending northward from the shore of the Columbia. Extensive marshes and floodplain habitats were located along the Columbia. Short excursions could be made upstream to the Columbia River Gorge, or south up the Willamette River, all productive locations for botanical collecting. Among the interesting prairie plants Douglas found in the vicinity of Fort Vancouver were columbine (*Aquilegia formosa*), Hooker's balsamroot (*Balsamorhiza hookeri*), farewell-to-spring (*Clarkia amoena*), spring-gold (*Crocodylum multicaule*), ookow (*Dichelostemma congestum*), meadow deervetch (*Hosackia pinnata*), triternate biscuit-root (*Lomatium triternatum*), prairie lupine (*Lupinus lepidus*), cut-leaved microseris (*Microseris laciniata*), sea-blush (*Plectritis congesta*), slender cinquefoil (*Potentilla gracilis*), purple sanicle (*Sanicula bipinnatifida*), and small-head clover (*Trifolium microcephalum*). While a few of these species can still be found in the Portland-Vancouver area, many have been locally extirpated.



Fort Vancouver, Gustav Sohan (illustrator), Major Sarony & Knapp (lithographers), lithograph color, 1855. PHOTO: COURTESY OF LIBRARY OF CONGRESS



Deer horn (*Clarkia pulchella*), Miss Hart (illustrator), S. Watts (engraver), Edwards's Botanical Register, plate 1100, 1827. PHOTO: COURTESY OF BIODIVERSITY HERITAGE LIBRARY



Sagebrush mariposa lily (*Calochortus macrocarpus*), Miss Hart (illustrator), Edwards's Botanical Register, plate 1152, 1828. PHOTO: COURTESY OF BIODIVERSITY HERITAGE LIBRARY

Trifolium sp., annual...this may prove to be *T. microcephalum* of Pursh; abounds in moist soil where wood has been burned; indeed in every place where stronger herbage has been checked it makes its appearance; wild animals, most likely elk, seem fond of it, it being only under brushwood where they cannot get to it that a perfect specimen can be had. (Douglas 1959/1914, p. 125)

His observations were not restricted to natural history. He recorded descriptions of Native American practices and customs that could only be obtained by one who viewed native people as intelligent and resourceful members of a different culture. For example, during his August 1825 trip up the Willamette River, Douglas discovered a small plantation of Columbian tobacco (*Nicotiana quadrivalis*). Columbian tobacco was apparently a Native American cultivar, not occurring in the wild state. Douglas observed that:

The natives cultivate it here....[in] An open place in the wood...where there is dead wood, which they burn, and sow the seed in the ashes. Fortunately I met with one of the little plantations and supplied myself with seeds and specimens without delay. On the way home I met the owner, who, seeing it under my arm, appeared to be much displeased; but by presenting him with two finger-lengths of tobacco from Europe his wrath was appeased and we became good friends. He then gave me the above description of cultivating it. (Douglas 1959/1914, p. 141)

It was also on this summer trip up the Willamette Valley that Douglas first saw seeds of the sugar pine (*Pinus lambertiana*) and was told of its presence in the mountains to the south. During the summer, time not spent exploring was taken up with preparation of herbarium specimens and drying and packaging seeds for shipment back to England.

Douglas must have been warned about the rainy autumn and winter weather of the maritime northwest, but he seems not to have anticipated the reality of traveling in the open at this time of year. From October 2 to November 15, 1825, Douglas journeyed down the Columbia River and up the Washington coast to Grays Harbor, and then up the Chehalis River and then to the Columbia via the Cowlitz River—all during the heavy rains and storms of late autumn. After returning to Fort Vancouver, Douglas (1959/1914) remarked that during this trip he had “experienced more fatigue and misery, and gleaned less than in any trip I have had in the country.” At Fort Vancouver, Douglas’ cedar bark hut was completely inundated



Blue-lily (*Triteleia grandiflora*), W.J.H. (illustrator), Swan (engraver), Curtis's Botanical Magazine, plate 2877, 1829. PHOTO: COURTESY OF BIODIVERSITY HERITAGE LIBRARY

during a heavy rainstorm on Christmas Eve, and he spent the remainder of the winter as a guest of Dr. John McLaughlin in his house at the fort.

Douglas also collected museum specimens of birds and mammals throughout his travels. The severe winter of 1826–27 resulted in the death of numerous livestock, which attracted scavengers to the vicinity of Fort Vancouver, including the California Condor. George Barnston, a Hudson's Bay Company employee and amateur naturalist, described the scene:

One morning a large [condor] specimen was brought into our square, and we all had a hearty laugh at the eagerness of which the Botanist pounced upon it. In a short time he had it almost in his embraces fathoming its stretch of wings, which not being able to compass, a measure was brought, and he found it full nine feet from tip to tip. This satisfied him, and the bird was carefully transferred to his studio for the purpose of being stuffed. (Barnston 1860, p. 208)

The original plan was for Douglas to return to England in 1826. However, Douglas felt that his work was incomplete, and he decided to remain in the Northwest for another year. So, he defied his instructions and prepared to spend the winter at Fort Vancouver before setting out for another season of collecting.

(to be continued in the next issue)

Literature Cited

- Barnston G. 1860. Abridged sketch of the life of Mr. David Douglas, botanist, with a few details of his travels and discoveries. *Canadian Naturalist and Geologist*. 5:120–132, 200–208, 267–278, 329–349.
- Douglas, D. 1959. Journal kept by David Douglas during his travels in North America, 1823–1827: Together with a particular description of thirty-three species of American oaks and eighteen species of *Pinus*, with appendices containing a list of the plants introduced by Douglas and an account of his death in 1834. Antiquarian Press. (Original work published 1914)

Recommended Reading

Note: Numerous biographies of David Douglas recount his life and times, as well as his journal covering the years

California Poppy

With its brilliant orange or yellow flowers, the California poppy (*Eschscholzia californica*) is a familiar sight in the Pacific Northwest, both in gardens and as a wild plant in open grassy places. It is generally a ruderal (i.e., weed-like) species, and in fact may not even be native to Washington. The species was first collected by Archibald Menzies in California in 1792, but was named by the German botanist Adelbert von Chamisso, based on his specimens collected in 1816 at San Francisco, California.



California poppy (*Eschscholzia californica*), Miss Drake (illustrator), S. Watts (engraver), *Edwards's Botanical Register*, plate 1677, 1835. PHOTO: COURTESY OF BIODIVERSITY HERITAGE LIBRARY

A decade later, in August 1825, David Douglas collected specimens and seeds of this poppy growing in the Willamette Valley about 60 miles south of Fort Vancouver. The label on the herbarium specimen he collected in 1825 reads “common on the dry sandy banks of streams on the plains of the River Multnomah [Willamette] and southward to the Spanish territories”.

Douglas' seed collection was the source of the first California poppy plants cultivated in Europe. In fact, it was flowering in the London garden of the Horticultural Society of London by October 1827, the same month that Douglas himself returned to England.

In the Willamette Valley today, this species is common on open gravel bars along the Willamette River, and these populations may be native populations. On the other hand, roadside or ruderal populations in the Willamette Valley and in western Washington are likely descended from garden plants originally cultivated in Europe and then brought to Pacific Northwest gardens. Thus, the wild plants in western Washington, where the species is not believed to be native, would be descended from plants native to Willamette Valley in a roundabout way, via the seeds Douglas collected in 1825 and sent to England.



California poppy (*Eschscholzia californica*), Herbarium Hookerianum 1867. Specimen held at the Royal Botanic Gardens, Kew. PHOTO: COURTESY OF ROYAL BOTANIC GARDENS, KEW

1823–27, which is available for download from the Biodiversity Heritage Library (<https://www.biodiversitylibrary.org/bibliography/19661>). Harvey's biography is the most thoroughly researched and completely referenced work and has been a primary source for this essay. An hour-long 2013 documentary film, *Finding David Douglas*, can be viewed on YouTube (https://www.youtube.com/watch?v=1l8zfxLXt_8).

Douglas D, Davies J. 1980. *Douglas of the Forests, a Biography of David Douglas*. University of Washington Press.

Harvey AG. 1947. *Douglas of the Fir, A Biography of David Douglas, Botanist*. Harvard University Press

Hooker WJ. 1904–1905. A brief memoir of the life of David Douglas, with extracts from his letters. *The Quarterly of the Oregon Historical Quarterly*. 5:223–271, 325–369 (1904); 6:76–97, 206–227, 288–309, 417–449 (1905), under the title *Literary remains of David Douglas, botanist of the Oregon country*. (Original work published 1836)

Mitchell AL, House S. 1999. *David Douglas: Explorer and botanist*. Aurum Press.

Morwood W. 1973. *Traveler in a Vanished Landscape; the life and times of David Douglas, Botanical Explorer*. C.N. Potter.

Nisbet J. 2009. *The Collector: David Douglas and the natural history of the Northwest*. Sasquatch Books.

Nisbet J. 2012. *David Douglas: A naturalist at work*. Sasquatch Books.



The Remarkable Parasitic Vascular Plants of Fort Townsend State Park

by Fred Weinmann

Our (i.e., my wife Ann and I) story begins in 2003 when we moved to a home adjacent to Fort Townsend State Park (Park) near Port Townsend on the Olympic Peninsula. In our first spring we discovered the parasitic plant species Hooker's ground cone or little ground cone (*Kopsiopsis* (*Boschniakia*) *hookeri*) while rooting around among the salal (*Gaultheria shallon*) in our yard. As we began to spend a good deal of time in the adjacent park running, walking, and botanizing, we noticed that this species occurred in several locations. Our research at that time informed us that this species was on the State's "watch list" as it was not clear how common or rare the species was. Over the next two years we began to notice that ground cone along with several other species of parasitic vascular plants were quite common in the Park. All of these except the ground cone were mycoheterotrophs, the most common being ghost pipe (*Monotropa uniflora*) and spotted coralroot (*Corallorhiza maculata*).

By 2005 we were becoming convinced that the diversity and density of parasitic vascular plants in the Park was quite unusual. At this point we began to supplement our anecdotal observations with some mapping of individual records. For example, in 2005 we recorded 22 locations of *K. hookeri* (some were single plants and others were 30–50 individuals). We submitted these records

to the Washington State Natural Heritage Program (WNHP). Soon after, the species was removed from the Watch List. We have no idea if our records contributed to its removal. (Note: While further botanizing in the green spaces of the Quimper Peninsula, we found that *K. hookeri* occurred quite regularly around the Peninsula. Sightings included Fort Worden State Park, Anderson Lake State Park, a roadside ditch along Discovery Road, and several reports from friends' back yards. The Quimper Peninsula seems to be a bit of an epicenter for the species.) We became so enamored with the parasitic plants of the Park that we prepared a color brochure called *The Plants of Fort Townsend State Park: A Unique Ecosystem*. The term "unique" was used with some trepidation and perhaps some naïveté. Beginning in 2005 and continuing through 2024, we began to increase our attention to mapping locations and numbers of individual records for several mycoheterotrophs and the parasitic, *K. hookeri*.

The Park

Fort Townsend State Park is a serene place, a quiet place with big trees and lonely trails. The Park lands have been in public ownership since the mid 1850s when a Civil War era fort was established. The Park was established in 1953 as Old Fort Townsend Park when the land was transferred to Washington State by the US Department of the Interior. The park occupies 400 acres within the Quimper Peninsula adjacent to Port Townsend

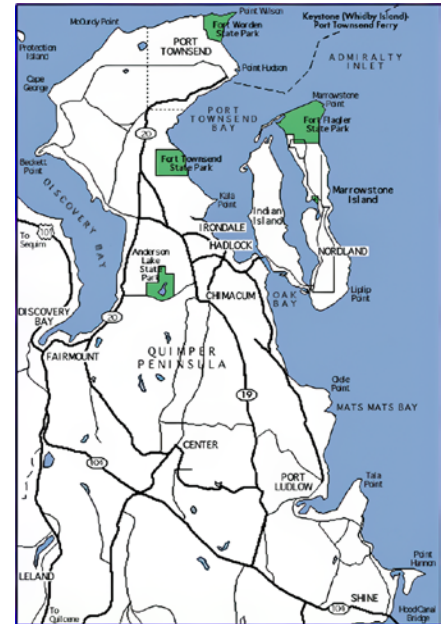


Figure 1: Quimper Peninsula with state parks colored green.

Bay in northeast Jefferson County just two miles southwest of the city of Port Townsend (Figure 1). The Park includes mostly forested land and about a mile of marine shoreline. Its timber has never been commercially harvested. The Park varies in elevation from sea level to about 250' above sea level. Major disturbances to the Park have been a forest fire, which swept through the area about 150 years ago, and wind storms (Columbus Day storm of 1962, for example), which have periodically blown down many of the largest trees in the Park. The resultant forest is a mixed stand ranging from 50 to over 300 years old.

In its present condition the Park represents a rare example of a mature Douglas-fir/western redcedar/hemlock forest with a dominant understory of Pacific rhododendron (*Rhododendron macrophyllum*) and evergreen huckleberry (*Vaccinium ovatum*). Its rare and unusual features were first documented by the WNHP (Chappell 1993). This rare forest type has a designa-

tion of G2 or *Globally Imperiled* by the WNHP. Washington State Parks has given the Park their highest forest value designation as a “Natural Forest Area.”

There are approximately five miles of forested trails in the Park. To date we have recorded over 250 vascular plant species. Very few species not native to Washington are found within the forested areas of the Park. The closed canopy, big trees, and lack of non-native species creates a pristine ambiance.

Parasitic Plant Diversity and Abundance

While I find the existence of parasitic vascular plants to be of immense botanical and evolutionary interest, they attract minimal interest in terms of cultural significance, either historically or in modern times. They are not eaten by people and few other animals as far as I am aware. They do not contribute significantly to forest structure or seem to provide any other important ecological contribution. Ethnobotanical studies make little mention of these unusual plants. Turner et al. (1990) provides an exhaustive list of plants utilized by native peoples. *Monotropa uniflora* is mentioned as a plant thought to indicate where mushrooms would appear in the fall. No other parasitic plants are mentioned. None of the species are of interest to gardeners or horticulturists. These species are so unusual that they are simply included under a category called “Oddballs” in the popular field guide to Northwest plants by Pojar and MacKinnon (1994). As botanists we will need to be content with investigating the interesting history, relationships, and lifestyle of these evolutionary anomalies.

Included in this article is a discussion of one parasitic and eight mycoheterotrophic species that have been recorded in the Park. These species inhabit the forest understory and represent three plant families: Ericaceae, Orobanchaceae, and Orchidaceae. There is a large variation in their frequency and distribution; however, if one walks the right trails in late May or early June, all of these species can be seen on a two mile walk. While the mycoheterotrophs are certainly tapped into the underground mushroom mycelia, there is little information regarding which species of fungi are the host plants. While this has been investigated on a limited basis, there is no assurance that the same species would host the same mycoheterotroph across its range. The following species are discussed, listed in the order they appear in the table in the next column.

For the less common species we have noted location and date on a Park trails map. For the more common species, we have simply noted that they are much more frequent than in any other place we had botanized on the Quimper Peninsula, Olympic Peninsula, or the state of Washington. In 2024, we conducted a more rigorous inventory of the parasitic species of the park. Once a month in April, May, and June we recorded individual plants for each species along the five miles of wooded trails. Except for a few late season observations these records were georeferenced. For 2024, we recorded 118 records of parasitic species in the Park. Some of the individual records had 20 or more stems at a site while others were individual stems.

Scientific name	Common name	Family
<i>Kopsiopsis hookeri</i>	Hooker's ground cone	Orobanchaceae
<i>Corallorhiza maculata</i>	spotted coralroot	Orchidaceae
<i>Corallorhiza mertensiana</i>	Merten's coralroot	Orchidaceae
<i>Hemitomes congestum</i>	gnome plant	Ericaceae
<i>Monotropa uniflora</i>	ghost pipe	Ericaceae
<i>Monotropa hypopitys</i>	pinemap	Ericaceae
<i>Pyrola aphylla</i>	leafless wintergreen	Ericaceae
<i>Pteropora andromedeae</i>	pinemap	Ericaceae
<i>Allotropa virgata</i>	candy stripe	Ericaceae

***Kopsiopsis hookeri*:** Hooker’s ground cone is a parasitic plant presumed to be nurtured by the roots of salal. The ground cone penetrates the roots of the host plant and forms a brownish haustoria the size of a small huckleberry. This provides the surface area necessary for absorption of nutrients. We have found this species in many areas where there are no salal plants within 20 feet of the ground cone. However, there are always other shrubs of the Ericaceae in the area, typically Pacific rhododendron and evergreen huckleberry. While we have not excavated the forest floor to examine this situation, we suspect *K. hookeri* is somewhat flexible in selecting a host plant.



Hooker's ground cone (*Kopsiopsis hookeri*). PHOTO: FRED WEINMANN

Hooker’s ground cone has occurred in the Park every year since 2003. Its abundance has varied widely over the years. We recorded a high of 22 sites in 2005 and a low of 7 sites in 2009. Our more rigorous inventory from 2024 recorded 15 sites (Fig-

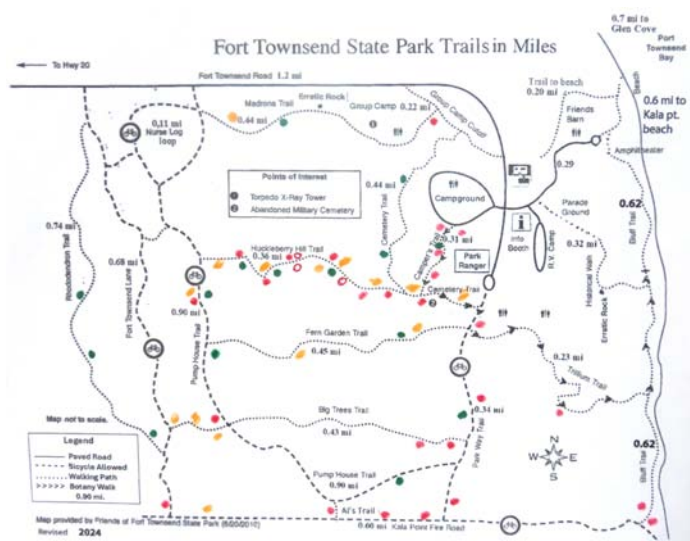


Figure 2: 2024 inventory data for *Corallorhiza maculata* (red dot, 28 sites), *C. mertensiana* (red circle, 3 sites), *Hemitomes congestum* (yellow dot, 15 sites), *Kopsiopsis hookeri* (green dot, 15 sites).

ure 2). In hundreds of hiking miles with other botanists and by ourselves on the Olympic Peninsula and across the state, we encountered *K. hookeri* only occasionally.

***Corallorhiza maculata*:**

Spotted coralroot is a commonly occurring species in Washington State forests. We have recorded it widely across the Park every year with apparent year to year fidelity to its locations. While we have not routinely censused individual occurrences, the species seems to be similar in frequency year to year. The 30 records noted in 2024 are shown in Figure 2.



Spotted coralroot (*Corallorhiza maculata*). PHOTO: ANN AND FRED WEINMANN

***Corallorhiza mertensiana*:**

Merten's coralroot has been seen erratically over many years, typically retaining fidelity to the same locations each year it is observed, sometimes having just one or two stems. In 2023 and 2024, a group of plants was found that had over 20 stems. Two other locations with just a few stems were also seen in 2024 (Figure 2).



Merten's coralroot (*Corallorhiza mertensiana*). PHOTO: ANN AND FRED WEINMANN

***Hemitomes congestum*:**

Occurrence of the gnome plant, while spatially and chronologically erratic, has been seen in every year of our observations. For example, in 2007 we recorded nine sites, in 2009 seven sites, in 2022 one site, in 2023 two sites, and in 2024 our careful inventory recorded 15 sites (Figure 2).



Gnome plant (*Hemitomes congestum*). PHOTO: ANN AND FRED WEINMANN

***Monotropa uniflora*:**

Ghost pipe is reported from many areas across Washington, mostly at low to moderate elevations. As with pinesap (*M. hypopitys*), *M. uniflora* tends to appear in the same locations from year to year while the numbers of plants will be quite variable. Along with *C. maculata*, ghost pipe is the most widespread of the mycoheterotrophs in the Park. Our 2024 inventory censused 32 widely dispersed observations (Figure 3).



Ghost pipe (*Monotropa uniflora*). PHOTO: FRED AND ANN WEINMANN

***Monotropa hypopitys*:**

Pinesap is widespread in WA state forests from low elevation to subalpine areas. It is one of the most regular and widespread of the mycoheterotrophs of the park. We have not recorded individual observations over the years, however, anecdotally it appears that *M. hypopitys*, while varying somewhat in frequency year



Pinesap (*Monotropa hypopitys*). PHOTO: FRED AND ANN WEINMANN

to year, locations of occurrence tend to be similar each year. We believe that our 2024 inventory of 12 sites represents a typical year for this species (Figure 3).

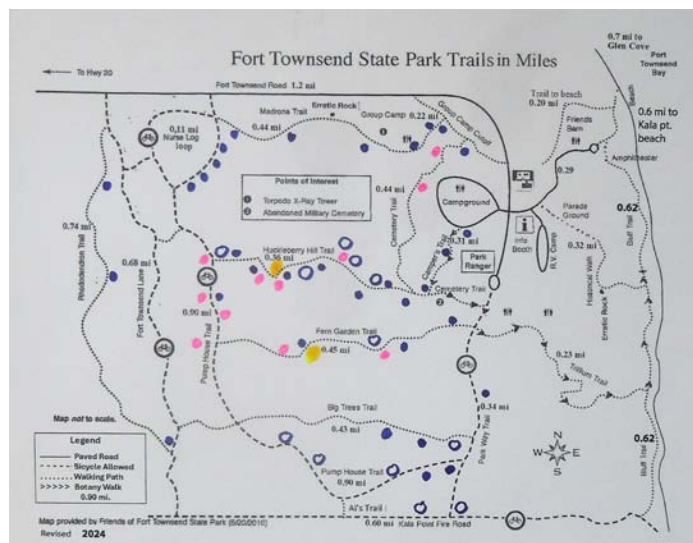


Figure 3: 2024 inventory data for *Allotropa virgata* (yellow circle, 2 sites), *Monotropa uniflora* (blue dot, 32 sites), *M. hypopitys* (blue circle, 12 sites), *Pyrola aphylla* (pink circle, 11 sites).

Pyrola aphylla:

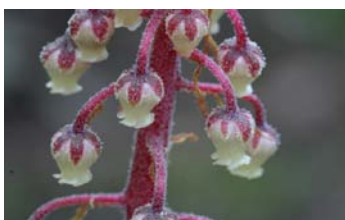
Leafless pyrola appears regularly in several locations in the Park (Figure 3). The 11 records in 2024 are more than seen in most years; however, this may be due to our greater diligence during our 2024 inventory. Interestingly, the common pink pyrola (*P. asarifolia*) occurs along the access road to the park and has typical roundish dark green leaves. Apparently, *P. asarifolia* as well as other species of *Pyrola* and related genera such as *Chimaphila* spp. function as mixotrophs. (Note: Hitchcock (2018) notes that plants which key to *P. aphylla* could be leafless forms of *P. asarifolia* or *P. picta*).



Leafless pyrola (*Pyrola aphylla*).
PHOTO: ANN AND FRED WEINMANN

Pterospora andromedea:

Pinedrops is a tall, easily recognizable plant. It has proven to be the least common of the parasitic plants in the Park. In our experience this species is observed quite commonly at a wide range of elevations in western Washington and across the state. We have seen it at just two



Pinedrops (*Pterospora andromedea*). PHOTO: ANN AND FRED WEINMANN

locations in the Park for several years at each location. We did not record the species during our inventories conducted in 2024. See Figure 4 for recorded locations and years of occurrence.

Allotropa virgata:

In our experience, candystripe occurs regularly in montane areas of western Washington but is not common at low elevation. The occurrence of *A. virgata* in the Park is erratic, both chronologically and spatially. We have recorded the species at ten different locations over twenty years with two locations in 2024. It will occur in the same location for several years only to disappear. Once gone from a site it has never reappeared at the same



Candystripe (*Allotropa virgata*).
PHOTO: ANN AND FRED WEINMANN

Terminology

Biologists and ecologists have developed a plethora of terms (over 20 at last count) to describe the nutritional sources for various kinds of organisms. Several of these terms are relevant to this article about parasitic vascular plants.

Parasite(ic): Organisms that live by “stealing” nutrition directly from other living organisms. Partial or complete parasitism is fairly common in the plant family Orobanchaceae. In this article we are considering the species, *Kopsiopsis hookeri*.

Heterotroph(ic): Organisms that rely on other organisms for their nutrition. This includes essentially all animals, all the fungi, most bacteria, archaea, and protists and a few species of vascular plants.

Autotroph(ic): Organisms that produce their own organic nutrition from inorganic materials, most typically via photosynthesis. This includes green plants, algae, and a few photosynthetic and chemosynthetic bacteria.

Mixotroph(ic): Plants that rely on both photosynthesis and parasitism for their nutrition. This includes several common species in our flora. For example, the genus *Chimaphila* and some species of *Pyrola*.

Mycoheterotroph(ic): Vascular plants that have abandoned a photosynthetic lifestyle and rely for their nutrition by tapping into the underground mycelia of fungi. For our purposes these plants are in the families, Ericaceae and Orchidaceae. (This term of six or seven syllables has gone mainstream. It was used in a clue on the popular TV show, Jeopardy, where the answer was something like “these organisms provide nutrition to plants that do not photosynthesize called mycoheterotrophs”; and the correct response was “what are fungi”).

site. Figure 4 illustrates the locations where we have recorded the species and the years of occurrence.

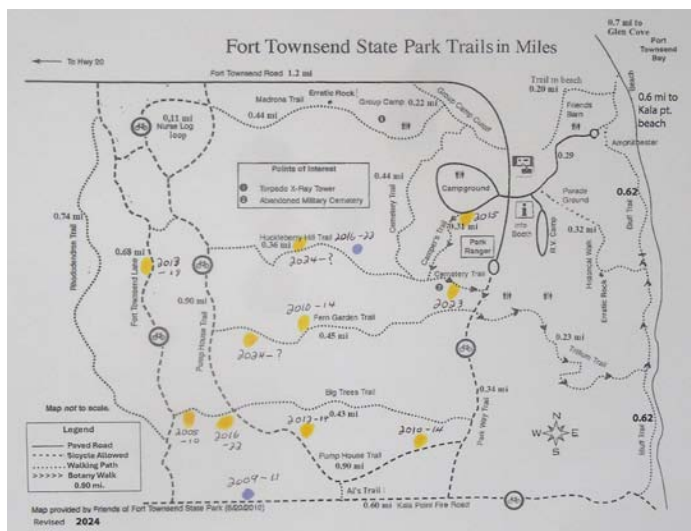


Figure 4: Twenty years of records with years of occurrence for *Allotropa virgata* (yellow dots) and *Pterospora andromedea* (blue dots).

Comparison With Other Local Green Spaces

Just to gain some objective insight regarding the parasitic flora of the Park relative to other local green spaces, we did some inventorying in nearby forests. Each inventory is based on a five-mile walk on forested trails in late May or early June of 2024, the peak flowering time for the parasitic plants in our immediate area. All of the sites inventoried are regularly botanized, densely forested preserved lands within 20 miles of Port Townsend. Locations inventoried, date of inventory and number of records for each species are shown below:

Anderson Lake State Park: 410 acres, 3 June, 10 miles south of Port Townsend, *C. maculata* (2); *P. aphylla* (1)

Gibbs Lake County Park: 300 acres 30 May, 15 miles south of Port Townsend, *M. uniflora* (3); *C. maculata* (2)

Fort Flagler State Park: 1451 acres, 4 June 2024, Marrowstone Island, *M. uniflora* (3); *C. maculata* (1)

Miller Peninsula State Park: 2000 acres 7 June, 20 miles west of Port Townsend, *M. uniflora* (4); *M. hypopitys* (1); *P. aphylla* (1); *C. maculata* (11); *K. hookeri* (3)

Cappies Woods and Trails: 315 acres, 5 June, within the city of Port Townsend, *C. maculata* (9); *C. mertensiana* (2)

Allotropa virgata and *H. congestum* were not seen at any of the locations. Our results clearly demonstrate a typically sparse occurrence of these parasitic species in regional green spaces.

Broader Geographic Comparisons

To make a broader geographic comparison I reviewed 97 plant lists from the WNPS web site representing 11 counties across the Olympic Peninsula and western Washington. I chose lists that had at least 100 species, were forested, were not exclusively at high elevation, and are likely to be well-botanized.

All nine species discussed in this article were recorded in widely variable numbers. On most of the lists three to five parasites were reported. The most frequently recorded were *Corallorhiza maculata*, *Monotropa uniflora*, and *M. hypopitys*. Seven lists had six or more parasites listed, four of them on the Olympic Peninsula. Areas that stand out as hotbeds of parasitic diversity include Mt. Walker, where the same nine species that occur at the Park have been reported. The rare parasitic species pine broomrape (*Aphyllon pinorum*) has also been documented at Mt. Walker; the Upper Dungeness Trail where seven of the nine species have been reported; Mt. Rainier (with a total of 893 species) where seven of the nine have been reported plus the mycoheterotroph fringed pinesap (*Pleuricospora fimbriolata*). Species other than the nine reported for the Park appeared occasionally on the lists. These include, for example, members of the genus *Aphyllon*, striped coral root (*Corallorhiza striata*) and a few reports of phantom orchid (*Cephalanthera austini*). Occurrence of the Park's nine parasitic species on 97 Western Washington plants lists with percentage is below:

- *Allotropa virgata* 25/26%
- *Corallorhiza maculata* 54/56%
- *C. mertensiana* 32/32%
- *Hemitomes congesta* 7/7%
- *Kopsiopsis hookeri* 8/8%
- *Monotropa uniflora* 38/39%
- *M. hypopitys* 44/45 %
- *Pterospora andromedea* 21/22%
- *Pyrolla aphylla* 5/5%

Why Such High Incidence of Parasites in Fort Townsend State Park?

Figure 5 is a composite of our parasitic plant inventories in 2024. Each dot represents either a single stem or multiple stems of a species. If separate plants were within 30–40 feet of each other the group was recorded as a single record. In other words, these are widely separated individual records. The most immediately striking impression while hiking in the Park is the

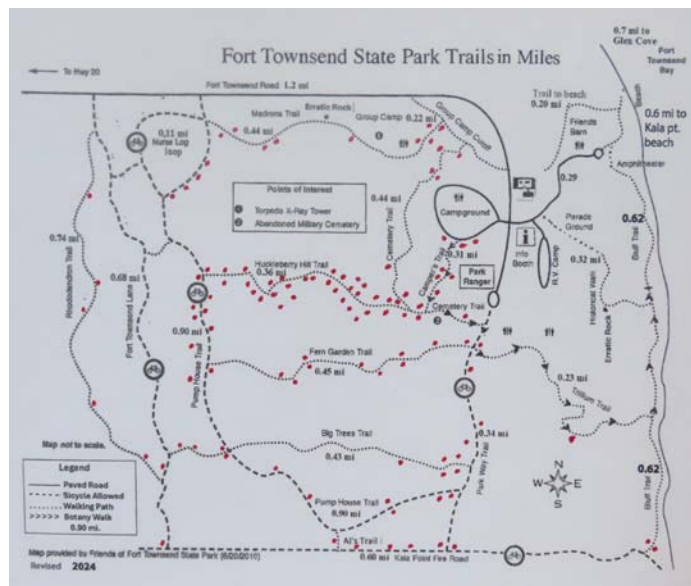


Figure 5: Composite of all records of parasitic plants in 2024 (118).

very low light conditions. The low light is the result of a tightly closed canopy. An obvious result of this situation is a very spare-understory community throughout much of the park. Presumably this provides a positive competitive situation for parasitic plants that do not require sunlight for their nutrition. In exploring forested areas contiguous with the Park, as well as multiple other forested parks and preserves in the region, we have not noticed any comparable situations. Another unusual aspect of the Park is the historical absence of any commercial harvest. Does this qualify the Park as a unique situation with respect to parasitic plants? It would seem so. I am not familiar with any other low elevation area with comparable diversity and abundance of parasitic plants. For whatever reason, the Park provides a delightful opportunity to see several unusual plants with easy access, close to an urban center. If you are so inclined, I suggest a “walk in the park” in mid May to late June being sure to include Huckleberry Hill trail on your route.

Acknowledgements

Beginning in 2003 Ann Weinmann accompanied me on dozens of botanizing walks in the Park. Her intense interest and careful observation exceeded mine as she became the inspiration for this project. Thank you. I have enjoyed immensely all the walks I have had with companions from the Washington Native Plant Society and the people of the greater Port Townsend community. Their company and keen observations are greatly appreciated.

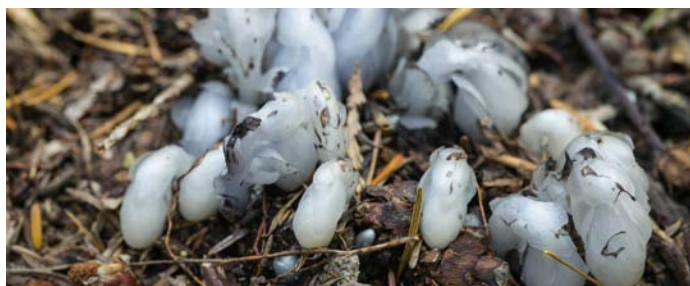
Literature Cited

Chappell C. 1993. Washington State Parks Natural Forest Inventory: Fort Townsend State Park. Report.

Pojar J, MacKinnon A. 1994. Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia and Alaska. Lone Pine Publishing.

Turner NJ, Thompson LC, Thompson TT, York AZ. 1990. Thompson Ethnobotany: Knowledge and Usage of Plants by the Thompson Indians of British Columbia. Royal British Columbia Museum.

Fred Weinmann is an itinerant volunteer botanist. He likes (or at least respects) all plants. His favorite organization is the Washington Native Plant Society, where he has been a member since 1976. Questions regarding this article are encouraged. Send to fweinmann112@gmail.com.



Ghost pipe (*Monotropa uniflora*) blossoms emerging from soil at Fort Townsend State Park. PHOTO: MARK TURNER

A Conservation Assessment of the Globally Rare Washington Endemic Taxon *Oxytropis campestris* var. *wanapum*: Wanapum Crazyweed

by Mark Darrach and Katy Beck



Lavender-flowered Wanapum crazyweed plant, 15 May 2024. PHOTO: AIDAN HERSH

We received a plant conservation research grant from the WNPS to conduct a comprehensive conservation assessment of the Washington endemic plant Wanapum crazyweed (*Oxytropis campestris* var. *wanapum*). Wanapum crazyweed is a showy, caespitose, perennial plant in the legume family (Fabaceae). In typical years, it blooms from May to early June. It is known from a single eight km long, narrowly linear population on the east-west trending ridge of the Saddle Mountains in Grant County. The elevation of the population ranges from 550 m to 740 m. Approximately 70% of the population is on a privately owned and actively grazed cattle ranch. The remainder of the population is on two unfenced, non-contiguous Bureau of Land Management (BLM) parcels. In addition to assessing population numbers, we investigated other aspects of Wanapum crazyweed’s natural history including: pollination ecology, life history, seed set, associated plant species, and threats to the population and its habitat.

Wanapum crazyweed has showy pale lilac, purple to fuchsia flowers. The Washington Natural Heritage Program (WNHP) lists it as endangered and globally rare. It was described by Elaine Joyal in 1990 (Joyal 1990) and is one of 12 varieties of field crazyweed (*O. campestris*) in North America. In Washington, there are four varieties of field crazyweed, three of which are of conservation concern (WNHP 2024a). Wanapum crazyweed differs from the other Washington varieties in that it has purple to pink flowers, is considerably more robust, and has a greater number of leaflets that tend to be involute (rolled

inward) (Welsh 2023). In addition, it departs from all other varieties of the species in the region in that it grows primarily on a carbonate substrate in very xeric shrub-steppe habitat. It is anticipated that Wanapum crazyweed will be elevated to full species rank on further taxonomic review.

Habitat



Typical Wanapum crazyweed habitat, 14 May 2024. PHOTO: KATY BECK AND MARK DARRACH

Wanapum crazyweed is found in the cold desert landscape east of the Washington Cascade Mountains, where precipitation averages approximately 18–23 cm per year (WRCC 2023). Its habitat is situated on an exposed, high ridgetop in the arid Lower Columbia Basin Ecoregion, east of the Columbia River in central Washington. Wanapum crazyweed plants are confined to north-facing aspects just over the crest of the Saddle Mountains. It is almost completely restricted to a thick calcrete soil horizon and the nearly flat to steep slopes immediately adjacent to it. Frequent desiccating high velocity winds are a defining feature of the Saddle Mountains ridge where the plants occur.

The habitat and thus the approximately eight km-long Wanapum crazyweed population is narrowly linear and separated into several polygons that have gaps of varying size between them. Slopes range from less than 5% to 100%, with an estimated average slope of 35%. Though the width of the population ranges from 1–75 m wide, the estimated average width is approximately five m. The highest concentrations of plants occur in areas with sandy soils that have calcrete fragments. After surveying the length of the population, we have concluded that Wanapum crazyweed is strongly associated with calcareous substrates and should be considered a calciphile (preferring calcium-rich soils).

Vegetation Community and Plant Species Associates

Overall, the vegetation community that includes Wanapum crazyweed is in good to excellent ecological condition. Though vegetation cover is relatively sparse, the community has surprisingly high vascular plant diversity. Dominant shrub species include: slender buckwheat (*Eriogonum microthecum*), snow buckwheat (*E. niveum*), rock buckwheat (*E. sphaerocephalum*), and purple sage (*Salvia dorrii*). Dominant forb species include:

Carey's balsamroot (*Balsamorhiza careyana*), bastard toadflax (*Comandra umbellata*), Modoc hawkbeard (*Crepis modocensis*), bigseed biscuitroot (*Lomatium macrocarpum*), Snake River cryptantha (*Oreocarya spiculifera*), and Whited's penstemon (*Penstemon eriantherus* var. *whitedii*). Dominant grass species include: bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg's bluegrass (*Poa secunda* ssp. *secunda*) and Indian ricegrass (*Eriocoma hymenoides*). In general, the percent cover of non-native plant species in the Wanapum crazyweed population is quite low; typically, much less than 5%. The most common weed is cheatgrass (*Bromus tectorum*). Wanapum crazyweed seems to require high-quality, ecologically intact habitat with low vegetation cover and minimal competition. It grows with four other plant species of conservation concern (WNHP 2024b).

Population Surveys

A comprehensive census of Wanapum crazyweed plants occurred on May 14 and 15 and June 13, 2024. Life stages tallied included: juvenile (germinated in 2024), vegetative (nonflowering adult), flowering adult, or dead. A total of 2,009 plants were tallied. Of these, 1,629 plants were flowering adults (81%), 325 were vegetative (16%), and 55 were seedlings (3%). Prior to our survey, the only other complete census of the entire population was conducted in 2002 by WNHP botanists. A total of 7,119 plants were tallied during that 3-day survey. The 2,009-plant total tallied in 2024 represents a 72% decline in population numbers over a 22-year period. From an ecological standpoint, it is not entirely clear what factor or suite of factors are causing this dramatic and concerning decline.

We were surprised that we only observed two dead Wanapum crazyweed plants during the entire survey. We surmise a combination of factors to be at play: 1) dead plants were difficult to spot while surveying; 2) most dead plants break off at the root crown and blow away; or 3) perhaps 2024 was a year of unusually low plant mortality. It is likely that plant mortality fluctuates from year to year. An examination of the roots and root crown of one of the recently dead plants suggests that it was possibly several decades old, as there appeared to be numerous yearly leaf whorls emerging along its root crown.

We observed an array of corolla colors in the population ranging from lavender, pale lavender, and pink, to distinctly fuchsia-colored flowers on some plants. Several varieties of field crazyweed, including Wanapum crazyweed, may be polychromatic, meaning



Fuchsia-flowered Wanapum crazyweed plant, 14 May 2024. PHOTO: KATY BECK AND MARK DARRACH

that the flowers in a population are rarely all one color (Welsh 2023).

BLM Long-term Monitoring Study

The BLM Spokane District initiated a long-term monitoring study on Wanapum crazyweed in 1992 (BLM 1992–2005). A permanent 100 m x 20 m transect was established within which all plants were permanently marked with aluminum tags. Monitoring occurred eight more times from 1993 to 2005. A number of specific measurements were made during the course of the study to quantify plant mortality, new plant recruitment, plant size, and inflorescence, flower, and fruit productivity.

Beginning with 123 plants in 1992, a total of 134 plants were monitored during the 13-year study period. By 2005, 54 plants died and 15 seedlings (newly germinated plants) were recruited. Overall, this represents a 39% population decline in 13 years; with accelerating increases in plant mortality during the last few monitoring efforts. Of the 15 seedlings located within the transect, only one seedling survived more than two years. In 2024, we carefully searched the transect area and found a total of 52 plants, of which two were seedlings. This represents a 62% decline from the 138 plants tagged in the transect.

During the 13-year survey period, the average diameter of plants did not vary greatly from one monitoring period to the next. In contrast, the percentage of adult plants that were flowering (as opposed to vegetative) fluctuated widely, ranging from a low of 46% to a high of 93%. Measures of inflorescence, flower, and fruit productivity also varied dramatically from one monitoring period to the next. We assume this variability is related to the relative favorability of seasonal temperatures, moisture conditions, and pollinator availability. Unusually warm and dry conditions typically result in fewer successful seedlings and lower flower, fruit, and seed production.

Pollinator Study

A pollinator study was performed by Washington State University master's student Aidan Hersh, using aerial netting and direct capture of specimens. On May 14 and 15, a total of 29 insects were collected from Wanapum crazyweed plants. All insects visiting plants or flowers were collected, although some insects may have been visiting for purposes other than pollination. Of the 29 insect visitors, 18 were the bee species *Osmia integra*. This medium-sized bee was the most observed floral visitor by a significant margin. Behavioral observations showed individual bees collecting pollen from multiple Wanapum crazyweed plants in a row, suggesting floral constancy, a crucial part of successful pollination. In addition, *Osmia integra* was the only insect that clearly and purposefully manipulated the flower to extract and collect pollen. *Osmia integra* is considered a nectar and pollen generalist, but with a preference for Fabaceae species (Gordon 2003, Rightmyer and Griswold 2010). As with other taxa in the legume family (Hämmerle et al. 2024), Wanapum crazyweed apparently relies entirely upon an obligate cross pollination via insects.



Osmia integra pollinating a Wanapum crazyweed flower, 14 May 2024. PHOTO: KATY BECK AND MARK DARRACH

Seed Predation, Seed Set, Dispersal and Germination Data

While surveying, we observed that developing seeds within pods on most plants had been almost entirely devoured by medium- to large-sized insects or small mammals. Plants that had been subject to this pre-dispersal seed predation thus produced very low numbers of seeds. The sides of the developing pods appeared to have been chewed from the outside so that the seeds could be consumed. While levels of pre-dispersal seed predation were very high during 2024, the presence of 55 seedlings (3% of the surveyed population) indicates that high levels of pre-dispersal seed predation may not occur every year. This also suggests the presence of a viable seed bank.

To get a baseline evaluation of seed set, we looked at 43 pods from seven inflorescences that had not been subject to pre-dispersal seed predation. The pods had an average of 11 ovules per pod, of which an average of six ovules (52%) had developed into apparently viable seeds.

Wanapum crazyweed seeds are likely dispersed by strong winds, gravity, and precipitation, all of which move seeds within the narrow band of suitable sandy, rocky habitat. Because suitable Wanapum crazyweed habitat is restricted to

such a narrow band, it is likely that many seeds are transported to unsuitable habitat peripheral to the population. It is possible that insects like harvester ants might help disperse seeds by gathering and caching them. It is unknown how many Wanapum crazyweed seeds become part of the seed bank and how long these seeds are viable. Post-dispersal seed predators, including rodents, ants, and birds, likely consume a portion of the ripened seeds after the pods dehisce.



Wanapum crazyweed fruiting pods with pre-dispersal seed predation, 13 June 2024. PHOTO: KATY BECK AND MARK DARRACH

In most cases the 55 seedlings we tallied were adjacent to mature plants. This suggests that seed dispersal distances are most probably quite limited. Plant distribution within the population ranges from tight clusters of many plants to occasional plants that are widely separated from their nearest neighbors. Suitable habitat in the narrow band along the ridge has a number of long gaps of unoccupied, yet seemingly suitable habitat. These areas may be unoccupied due to limited propagule dispersal distances, localized internal extirpations, or other undetermined factors.

Discussion and Conclusions

This field-based study provides a broad-scale view of the present conservation status of Wanapum crazyweed and assesses threats to its continued existence. These plants face an array of factors contributing to their steep decline. Many of these factors have most probably compounded over the last several decades. The Wanapum crazyweed population decreased from 7,119 plants in 2002 to 2,009 plants in 2024, representing a dramatic 72% decrease in plant numbers over a 22-year period.

Currently, approximately 70% of the plants are growing on private, unprotected land. This highlights the urgent need for further work and the enactment of immediate conservation measures.

Threats

Threats to the Wanapum crazyweed population are varied and include episodic pre-dispersal seed predation, wildfire, recreation impacts, cattle grazing, weed invasion, and climate change.

Our 2024 field observations clearly indicate that pre-dispersal predation of seed pods and seeds resulted in greatly reduced numbers of viable seeds. Though the primary seed predator(s) is likely a large insect, it remains unknown which agent is responsible and how frequently this level of predation occurs.

The rapid increase of catastrophic landscape-scale wildfires across the western United States and in shrub-steppe ecosystems of the interior Columbia Basin is well-documented (Shinneman and McIlroy 2016, Higuera and Abatzoglou 2021). Climate change coupled with the landscape-scale takeover of the invasive annual grass species cheatgrass, is driving an increase in the frequency, extent, and severity of wildland fire in Washington's shrub-steppe (WDFW 2024). Cheatgrass alters the fire regime by increasing the frequency and intensity of wildfires. Though there is no evidence of a recent wildfire directly within the Wanapum crazyweed population, several large wildfires have extensively burned adjacent areas in recent years. Currently, two relatively small areas within the population likely have sufficiently abundant amounts of cheatgrass to carry a wildfire. Because Wanapum crazyweed buds perennate above or at the ground surface, they have no adaptation to surviving fire and cannot be expected to survive a fire event.

Because a portion of the Wanapum crazyweed population is accessible by motorized vehicles, low levels of camping, sightseeing, paragliding and, particularly, off-road vehicle use occurs in the vicinity. Vehicle use and recreation in the area runs a risk of starting a devastating wildfire, especially during the dry summer season. Off-road vehicle use within the confines of the adjacent private ranch land is also apparent.

There are no fences around either of the BLM parcels that have Wanapum crazyweed plants, thus hundreds of plants and associated high-quality habitat are left completely unprotected from cattle trespassing from the directly adjacent, actively grazed ranch. Additionally, some portions of the Wanapum crazyweed population on the private ranch are trampled and grazed by cattle. Field observations indicate that once shrub-steppe habitat has been ecologically degraded by grazing, wildfire, weed invasion, or a combination of these disturbance types, the overall quality of the habitat rapidly declines and is difficult to impossible to restore.

Ongoing climate change is also a probable factor in the overall decline in Wanapum crazyweed population numbers. The climate in the lower Columbia Basin has trended toward

higher average temperatures and drought during the last several decades (WDOE 2024). Hot, dry spring weather conditions typically result in fewer successful seedlings of many plants. Year-to-year differences in inflorescence, flower, and fruit set per plant are directly correlated with climate (winter and spring temperatures and precipitation). Cyclic variations in types and numbers of pollinators and predators are also influenced by seasonal weather conditions. Climate change predictions for eastern Washington are that temperatures are projected to continue to warm, summer precipitation will decline, and the frequency and severity of wildfires is expected to increase (WDOE 2024).

Recovery

The effective recovery of Wanapum crazyweed will require a focus on the protection of occupied and adjacent occupiable habitat. Excluding wildfire from the population will be particularly critical. Recovery strategies should also include: installation of fencing around the two BLM parcels, purchasing or trading privately owned portions of the population, and out-planting to suitable unoccupied locations both within the existing area and off-site.

Gratitude

We have much gratitude for our time spent studying this gorgeous plant in its remarkable landscape setting. We would like to thank the WNPS for providing funds to support our travel costs. We would also like to thank Aidan Hersh for his pollinator expertise and botanist Molly Boyter from the BLM Spokane Office for assisting us with fieldwork. And as always, thanks are due to Tsuga the amazing Bernese Mountain Dog.

Literature Cited

- Bureau of Land Management (BLM). 1992–2005. *Oxytropis campestris* var. *wanapum* yearly monitoring reports. Unpublished reports. Spokane District.
- Gordon DM. 2003. Life history and nest biology of the mason bee *Osmia* (*Acanthosmioides*) *integra* Cresson in coastal dunes (Hymenoptera: Megachilidae). *The Pan-Pacific Entomologist*. 79(1):45–53.
- Hämmerle L, Halavka D, Kiehn M, Pany P, Lampert P. 2024. Interacting with legumes—Teaching about pollination and adaptations using functional flower models of Fabaceae. *The American Biology Teacher*. 86(4):205–212.
- Higuera PE, Abatzoglou JT. 2021. Record-setting climate enabled the extraordinary 2020 fire season in the Western United States. *Global Change Biology*. 27: 1–2.
- Joyal E. 1990. New variety of *Oxytropis campestris* (Fabaceae) from the Columbia Basin, Washington. *Great Basin Naturalist*. 50(4):373–377.
- Rightmyer MG, Griswold T. 2010. Description of a new species of *Osmia* (Hymenoptera: Megachilidae) from southwestern North America, with a redescription of the enigmatic species *Osmia foxi* Cameron. *Zootaxa*. 251:26–46.
- Shinneman DJ, McIlroy SK. 2016. Identifying key climate and environmental factors affecting rates of post-fire big sagebrush (*Artemisia tridentata*) recovery in the northern Columbia Basin, USA. *International Journal of Wildland Fire*. 25(9):933–945.
- Washington Department of Fish & Wildlife (WDFW). 2024. Climate change. <https://wdfw.wa.gov/species-habitats/climate-change#changes>. Accessed 6 November 2024.
- Washington Natural Heritage Program (WNHP). 2024a. Washington vascular plant species of conservation concern. www.dnr.wa.gov/publications/amp_nh_vascular_ets.pdf. Accessed 6 November 2024.
- Washington Natural Heritage Program (WNHP). 2024b. *Oxytropis campestris* var. *wanapum*. In: Online Field Guide to the Rare Plants of Washington. <https://www.dnr.wa.gov/NHPfieldguide>. Accessed 30 Sept 2024.
- Washington State Department of Ecology (WDOE). 2024. Observed trends and future projections. <https://apps.ecology.wa.gov/publications/documents/1201004e.pdf>. Accessed 6 November 2024.
- Welsh SL. 2023. *Oxytropis*. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 25+ Vols. New York and Oxford. Vol. 11, part 2, pp. 557–583.
- Western Regional Climate Center (WRCC). 2023. Climate of Washington State. <https://wrcc.dri.edu>. Accessed 6 November 2024.
- Katy Beck has been a rare plant botanist for more than 40 years. Though her botanical wanderings have ranged from the Mojave Desert north to the Alaskan tundra, her heart likes the magical shrub-steppe of Eastern Washington. She is also dedicated to documenting lichen diversity in Eastern Washington.*
- Mark Darrach is a professional botanist and field geologist researching the flora of western North America. His primary research interests are in conservation botany of rare vascular plants, the taxonomy of the Perennial North American clade (PENA) of Apiaceae subfamily Apioideae with an additional focus on mentoring younger field botanists and fund raising for biodiversity science.*



Join the WNPS Botanical Conversation

Find the WNPS website: www.wnps.org

Botanical Rambles - the WNPS blog and eNEWS

Subscribe: www.wnps.org/blog

LIKE us on Facebook

www.facebook.com/WashingtonNativePlants

JOIN the Facebook Group

www.facebook.com/groups/WashingtonNativePlants/

Follow us on Instagram

[washingtonnativeplants](https://www.instagram.com/washingtonnativeplants)

Follow us on X

[@WNPSociety](https://twitter.com/WNPSociety)

JOIN the WNPS Discussion Group

WNPSDiscussionGroup+subscribe@groups.io

JOIN the Native Plant Steward Discussion Group

wnpsstewards+subscribe@groups.io

JOIN the WNPS Native Plant Steward Monthly eNews

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



APRIL 2025 NATIVE PLANT APPRECIATION MONTH

EXPLORING BIODIVERSITY: EXERCISES IN COMMUNITY SCIENCE

<https://www.wnps.org/wnps-annual-events/npam>

Exploring Biodiversity: Exercises in Community Science 2025 Native Plant Appreciation Month Speaker Series

April 1—On using iNaturalist with Catherine Chang

Catherine Chang—iNaturalist Board Director

<https://www.wnps.org/events/npam-kick-off-using-inaturalist-with-catherine-chang>

April 10—Community Science in Cascadia—A 2-Part Program

Meadowwatch—Dr. Berry Brosi

Cascadia Butterfly Project—Dr. Regina Rochefort

<https://www.wnps.org/events/community-science-in-cascadia-a-2-part-program>

April 15—Filling the Gap: Contributions to Rare Plant Conservation through
Community Science

Wendy Gible, Rare Care, Associate Director, Center for Urban Horticulture, University of Washington

<https://wnps.org/events/plant-conservation-through-citizen-science-in-rare-care>

April 22—Five-needle Pine Citizen Science Monitoring in the North Cascades,
Washington

Dr. Aaron Wells—AECOM Technical Services

<https://www.wnps.org/events/five-needle-pine-citizen-science-monitoring-in-the-north-cascades>

April 20–April 30—Get out and Bio Blitz with WNPS using iNaturalist

Find more information on our Native Plant Appreciation Month Webpage

<https://www.wnps.org/wnps-annual-events/npam>

Branching Out: The Five-Needle Pine Community Science Pilot Project in the North Cascades

by Aaron Wells

Introduction

Whitebark pine (*Pinus albicaulis*), a high-elevation five-needle pine found across western North America, including Washington State, was recently listed by the US Fish and Wildlife Service as a threatened species under the Endangered Species Act (USFWS 2022). Whitebark pine is a keystone species in the subalpine ecosystems where it occurs, meaning other species in an ecosystem depend on it to such a degree that if removed, the ecosystem would change drastically. There are many threats to whitebark pine, including pests and disease, climate change, and wildfires.



Whitebark pine branch near Cutthroat Pass, North Cascades, Washington. PHOTO: AARON F. WELLS

Other five-needle pine species are also in decline across western North America. For instance, Goeking and Windmuller-Campione (2021), in their assessment of five-needle pines throughout the western United States, found that both whitebark and limber pine (*P. flexilis*) exhibited increased levels of mortality that occurred faster than the growth of surviving trees. Similarly, western white pine (*P. monticola*), another pine native to Washington State, is also in decline due to a combination of pests and pathogens, fire suppression, and logging (Mee-Sook et al. 2011).

The recent threatened listing of whitebark pine and the decline in other five-needle pines highlights the urgent need for data on the location and status of five-needle pine populations across western North America. Most federal and state land management agencies have programs to capture forest data. For instance, the US Forest Service (USFS) Forest Inventory and Analysis (FIA) program is a long-term monitoring program that provides the information needed to assess America's forests. However, crowd-sourced data from community science projects is emerging as an important supplemental source of informa-

tion for conservation and biodiversity research (Bonney et al. 2009, de Sherbinin et al. 2021).

Community Science

Community science is when the public, both scientists and non-scientists, voluntarily contributes to scientific research. The advantages of community science data include its free availability, the established infrastructure for storing observations (such as iNaturalist), and being crowd-sourced; the amount of data collected primarily depends on individuals' awareness and willingness to get involved. Disadvantages of community science data include sometimes low-quality data, unstructured observations (i.e., lacking statistical rigor), and observations skewed spatially towards roads and trails, i.e., easy access areas (Callaghan et al. 2019, Di Cecco et al. 2021).

To leverage the power of community science while minimizing the downsides of gathering information on five-needle pines, I employed a three-pronged approach of outreach, education, and engagement. The project website (<https://elfin-woodecology.org/the-whitebark-pine-project/>) addresses education. To address engagement, a five-needle pine community science monitoring pilot project was initiated through a grant from the Washington Native Plant Society (WNPS) to gather data on the status of five-needle pines. The pilot project aimed to engage the community through outreach and volunteer recruitment for data collection, establish a robust study design, develop field methods for monitoring five-needle pine populations in line with USFS FIA protocols, and ultimately collect, analyze, and report the monitoring data.

Study Area

In July 2023, the community science monitoring program field surveys were launched in the North Cascade mountains to assess the status of whitebark and western white pines, aim-

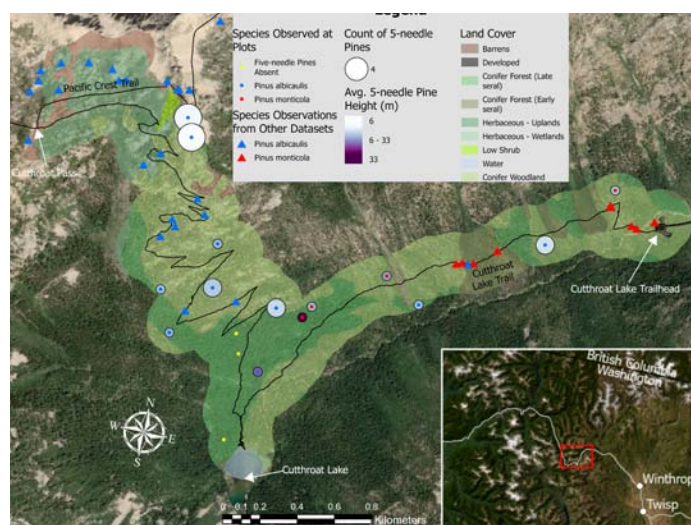


Figure 1. Five-needle pine community science monitoring study area, land cover mapping, count, average height, and species of five-needle pines observed at field plots during the monitoring effort and additional observations from community science (iNaturalist) and herbarium records; Cutthroat Creek drainage, Okanogan-Wenatchee National Forest, WA. Base imagery from Environmental Systems Research Institute base map (Maxar Vivid from July 21, 2023).



Representative photos of whitebark pine. Clockwise from upper left: tree crown, bark of a mature tree, seed cone, and a branch and needles. Whitebark pine occurs in subalpine forests and is adapted to exposed slope positions. Whitebark pine has a mutualistic relationship with Clark's nutcracker. The nutcrackers tear apart the cones to get at the seeds, leaving little of the cone intact, and then cache the seeds on windswept slopes and ridges; the seeds that the nutcrackers don't eat sprout into seedlings. PHOTOS: AARON F. WELLS

ing to collect baseline data and establish a model for similar programs across the western United States. The study area for the pilot project was in north-central Washington State in the Cutthroat Creek valley, located in the North Cascades approximately 23 miles west-northwest of Winthrop, WA (Figure 1). This glacially carved valley contains abundant montane and subalpine conifer forests and alpine tundra, and encompasses an ideal range of habitats for the two five-needle pines that occur in Washington State: western white pine and whitebark pine.

Methods

The first step to implementing the pilot study was to recruit volunteer community scientists. Outreach efforts included providing information on the project website, contacting the Okanogan chapter of the WNPS, posting in the Methow Valley News, utilizing social media, networking through friends, and engaging with the local USFS Range District. The field study design began by delineating the land cover types along a half-mile-wide buffer of the Cutthroat Lake Trail into nine land cover classes (Figure 1). This mapping informed a study design that placed field plots across two late seral land cover classes

(forest and woodland) and three elevation ranges corresponding to montane, subalpine, and alpine environments.

The pilot project employed a simplified version of the USFS FIA methods to collect data primarily focused on attributes that community scientists could easily record. Data attributes recorded in the field included environmental characteristics such as elevation, slope aspect (the compass direction a slope faces) and gradient (steepness of a slope in degrees), and vegetation structure data focused only on five-needle pines to streamline the process. Collaborations with USFS FIA personnel helped refine the data attributes. Three field teams, each consisting of two to three members and each with at least one person experienced in botany, were organized to collect data on five-needle pines. At each plot, the teams measured 10 meters in all cardinal directions, searching for five-needle pines. If none were found, the teams radiated up to 25 meters from the center to locate them. The teams also recorded dominant plants in various strata and collected data using a digital form created using the Fulcrum app. The data were imported into a PostgreSQL database following field surveys, and a data quality control review was completed.

Results

Field surveys conducted on July 1–2 and July 23, 2023, collected data from 17 plots. Twenty-six individual five-needle pine trees, two of which were dead, four saplings, and 26 seedlings were observed across 14 plots, while five-needle pines were absent from three plots. The small sample size calls for a cautious interpretation of results but highlights the potential of community-science data in assessing five-needle pine conditions.

Whitebark Pine

For whitebark pine, 20 live and two dead trees, four saplings, and 23 seedlings were recorded (Table 1). White pine blister rust (*Cronartium ribicola*), a non-native rust introduced to North America from Asia in the early 20th century, was the leading cause of death and damage to whitebark pine in the study area. Whitebark pine showed the highest density in the upper stratum, while larger trees were found in middle elevations, correlating with slope positions that receive high solar radiation. The size-class distribution of live whitebark pine in the



White pine blister rust on a whitebark pine trunk near Cutthroat Pass. The rust has a complex life cycle that includes a secondary host species – currants (*Ribes*) and kills the trees by forming cankers just under the bark that eventually completely encircle the tree (termed “girdling”) which stops the flow of water and nutrients between the roots and the needles.

PHOTO: AARON F. WELLS

study area did not fit the typical reverse-J size class distribution of healthy, naturally regenerating forests due to the low number of saplings and relatively low number of seedlings observed relative to tree-sized whitebark pine (Figure 2). The observed pattern could be due to the low sample size; however, this may be worthy of further investigation to determine if the trend is real and significant and what might be the cause. Second-year seed cones were observed on five of the 20 live tree-sized whitebark pines.

Western White Pine

Western white pine was found only in the lowest elevation stratum, including four trees, no saplings, and three seedlings (Table 1). Western white pines generally exhibited greater height and diameter than whitebark pines in the same elevation range, although an outlier in height was noted. The non-overlapping range of tree heights are likely due to differing physiological and life history traits of whitebark pine and western white pine. Silvicultural studies of western white pine indicate that its average height is significantly taller than that of whitebark pine, and that the growth rate is greater for western white pine (Burns and Honkala 1990).



Representative photos of western white pine. Clockwise from upper left: tree crown, branch and needles, seed cones on the ground, and cones in a treetop. Western white pine occurs in lower elevation forests in sheltered slope positions. The long narrow cones of western white pine are distinct from those of whitebark pine which has roundish cones that are purplish when young and are about the size of a tennis ball or slightly smaller. PHOTOS: AARON F. WELLS

Plant Communities and Five-needle Pines

Eight plant communities were sampled during the field effort (Table 1), the three most common of which were Subalpine Fir / Thinleaf Huckleberry Forest, Pacific Silver Fir / Cascade Azalea Forest, and Mountain Hemlock–Pacific Silver Fir / Cascade Azalea Forest (see Table 2 for scientific names). A total of 25 plant species were observed across all communities, the most common of which were evergreen needleleaf trees (Table 2). Five-needle pines were most commonly observed in plant communities dominated or co-dominated by subalpine fir (*Abies lasiocarpa*) and subalpine larch (*Larix lyallii*) and less

Plant Community	Life Stage	Scientific Name	Observations
Mountain Hemlock - Pacific Silver Fir / Cascade Azalea Forest	Tree	<i>P. albicaulis</i>	1
Mountain Hemlock - Subalpine Fir / Cascade Bilberry - Pink Mountain-heath Woodland	Tree	<i>P. albicaulis</i>	1
	Seedling	<i>P. albicaulis</i>	8
Pacific Silver Fir - (Western Hemlock) / Thinleaf Huckleberry / Sidebells Wintergreen Forest	N/A	N/A	0
Pacific Silver Fir - Mountain Hemlock / Thinleaf Huckleberry / Rough-fruit Berry Forest	Tree	<i>P. albicaulis</i>	1
Pacific Silver Fir / Cascade Azalea Forest	Tree	<i>P. monticola</i>	2
Subalpine Fir / Thinleaf Huckleberry Forest	Seedling	<i>P. monticola</i>	3
	Seedling	<i>P. albicaulis</i>	12
	Tree	<i>P. albicaulis</i>	11
	Tree	<i>P. monticola</i>	2
Subalpine Larch / Cascade Bilberry - Western Moss-heather Woodland	Tree	<i>P. albicaulis</i>	4
	Sapling	<i>P. albicaulis</i>	1
	Seedling	<i>P. albicaulis</i>	2
Whitebark Pine - Subalpine Fir / Grouse Whortleberry / Hitchcock's Smooth Woodrush Woodland	Tree	<i>P. albicaulis</i>	2
	Sapling	<i>P. albicaulis</i>	3
	Seedling	<i>P. albicaulis</i>	1

Table 1. Five-needle pine observations by plant community and life stage. Plant community names from Ramm-Granberg et al. (2021) with supplemental information from the lead author on whitebark pine associations known to occur east of the Cascade Range in Washington State (T. Ramm-Granberg, personal communications, May 10, 2023). See Table 2 for scientific names.

Growth Form	Scientific Name	Common Name	Number of Plots Observed At
Evergreen Needleleaf Tree	<i>Abies amabilis</i>	Pacific silver fir	5
	<i>Abies lasiocarpa</i>	subalpine fir	10
	<i>Picea engelmannii</i>	Engelmann spruce	1
	<i>Pinus albicaulis</i>	whitebark pine	10
	<i>Pinus contorta</i> var. <i>latifolia</i>	Rocky Mountain lodgepole pine	5
	<i>Pinus monticola</i>	western white pine	4
	<i>Pseudotsuga menziesii</i>	Douglas-fir	4
	<i>Tsuga mertensiana</i>	mountain hemlock	6
Deciduous Needleleaf Tree	<i>Larix lyallii</i>	subalpine larch	2
	<i>Larix occidentalis</i>	western larch	1
Low Shrub	<i>Rhododendron albiflorum</i>	Cascade azalea	4
	<i>Vaccinium deliciosum</i>	Cascade bilberry	3
	<i>Vaccinium membranaceum</i>	thinleaf huckleberry	12
	<i>Vaccinium myrtillus</i>	dwarf blueberry	1
Dwarf Shrub	<i>Arctostaphylos nevadensis</i>	pinemat manzanita	4
	<i>Cassiope mertensiana</i>	western moss heather	2
	<i>Paxistima myrsinites</i>	Oregon boxwood	5
	<i>Phyllodoce empetriformis</i>	pink mountain-heath	7
Forb	<i>Chimaphila umbellata</i>	pipsissewa	1
	<i>Eremogone capillaris</i>	slender mountain sandwort	2
	<i>Luetkea pectinata</i>	partridge foot	1
	<i>Rubus lasiococcus</i>	dwarf bramble	1
Graminoid	<i>Carex rossii</i>	Ross' sedge	8
	<i>Luzula hitchcockii</i>	smooth woodrush	1
Fern	<i>Pteridium aquilinum</i>	bracken fern	1

Table 2. The list of plant taxa observed at five-needle pine citizen science field plots. Field teams were arranged such that at least one person with some field botany experience was on each team. The field teams used the iNaturalist Seek application to aid in plant identification. In addition, field teams recorded photos of plants at each plot, which were later checked for accuracy by the project scientist, providing additional confidence in the identifications.

frequently observed in associations dominated or co-dominated by Pacific silver fir (*A. amabilis*) (Table 1).

Discussion

By adopting a three-tiered approach—outreach, education, and engagement—volunteer community scientists formed a dedicated team to collect valuable data in the pilot study area. This initiative fostered a sense of community and environmental stewardship and offered participants a unique opportunity to connect with their natural surroundings. The study identified successful strategies, particularly in digital data collection, which streamlined the process, improved data quality, and facilitated easier integration into a centralized database. Fulcrum software was utilized to collect data; however, alternative platforms such as ESRI Survey123 could be used for future community science monitoring applications. The effectiveness of combining experienced volunteers with a professional scientist ensured a strong knowledge base within field teams, further supported by technological aids such as iNaturalist Seek and the Merlin app for species identification.

Selecting an appropriate study area was also crucial, and the Cutthroat Creek Valley demonstrated favorable attributes, including accessibility to five-needle pine habitats. The insights gained from this pilot project can inform future community science initiatives and also demonstrated the cost-effectiveness of community science monitoring of five-needle pines; for instance, the budget for the pilot project was approximately \$1,500 (<\$100 per plot) much less than traditional inventory and monitoring studies.

One challenge of the community science monitoring approach employed in this pilot study was recruiting a project team, and recommendations are provided in the full report to facilitate volunteer recruitment for future community science monitoring. The pilot project also highlights the need to balance detailed field protocols with volunteer engagement. Feedback indicated some fatigue with recording data on smartphones, prompting suggestions for team collaboration to share the responsibility of recording data. An additional challenge is collecting sufficient data for statistically significant analysis,

with future monitoring efforts recommended to conduct power analyses for optimal sample sizes. This report highlights the dual role of community science in gathering data and raising awareness about five-needle pines, pointing to potential improvements in methodology and volunteer involvement for effective monitoring initiatives.

This pilot study also highlights the potential benefits and challenges of scaling up community-science efforts in the future to monitor five-needle pine populations. Advantages include improved outreach, larger sample sizes, and lower costs relative to traditional natural resource inventory and monitoring efforts, which can enhance data collection and complement official monitoring efforts. However, challenges such as staffing, coordination, funding, and managing a centralized database arise with increased scale. A collaborative approach involving local educational institutions, non-profit organizations, and state and federal agencies could expand participation and enhance project management, making community science a valuable tool for conservation initiatives.

Overall, this pilot study highlights the promising role of community science in ecological monitoring, emphasizing strategic planning, community engagement, and technological integration as key components for success as such initiatives expand to more regions. One potential application of the community science approach to inventorying and monitoring five-needle pines is the Whitebark Pine Ecosystem Foundation's whitebark pine-friendly ski area program (whitebarkfound.org/our-work/ski-area-certification). A community-science approach could be employed to inventory and map five-needle pines, thus providing a cost-effective approach to collecting this vital baseline data and meeting some of the critical requirements of the whitebark pine-friendly ski areas certification process.

Conclusions

Whether at the local scale or scaled up, a community science approach

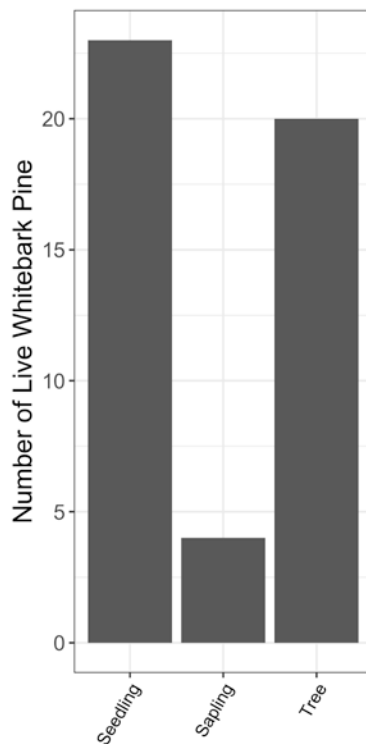


Figure 2. Bar chart showing the count of live whitebark pine by size class. The size-class distribution of live whitebark pine in the study area did not fit the typical reverse-J size class distribution of healthy, naturally regenerating forests. Tree populations with a reverse-J size class distribution exhibit a decreasing number of stems as tree size increases (i.e., fewer mature trees, and more seedlings and saplings), contributing to a sustainable population over time (Goeking and Windmuller-Campione 2021).

to five-needle monitoring holds the potential to be an essential component of five-needle pine science and conservation. Local-scale efforts can raise awareness of five-needle pines in local ecosystems and provide important insights into the status of five-needle pine populations. They could also serve as an “early warning” system for threats to five-needle pines in local ecosystems. At the regional and inter-regional scale, five-needle pine community science monitoring could exponentially increase awareness of the plight of five-needle pines and serve as an essential supplement to official forest inventory and monitoring datasets such as FIA.

The full-length report summarizing the results of the pilot study is available to download at elfinwoodecology.org/five-needle-pine-citizen-science-monitoring-project.

Literature Cited

- Bonney R, Cooper CB, Dickinson J, Kelling S, Phillips T, Rosenberg KV, Shirk J. 2009. Citizen Science: A Developing Tool for Expanding Science Knowledge and Scientific Literacy. *BioScience*. 59 (11): 977–984. <https://doi.org/10.1525/bio.2009.59.11.9>
- Burns RM, Honkala BH, tech. coords. 1990. *Silvics of North America: 1. Conifers; 2. Hardwoods*. Agriculture Handbook 654. US Department of Agriculture, Forest Service, Washington, DC. vol.2, 877 p. Available at: https://www.srs.fs.usda.gov/pubs/misc/ag_654/table_of_contents.htm. Accessed January 18, 2025.
- Callaghan CT, Rowley J, Cornwell W, Poore A, Major R. 2019 Improving big citizen science data: Moving beyond haphazard sampling. *PLoS Biol*. 17(6): e3000357. <https://doi.org/10.1371/journal.pbio.3000357>
- de Sherbinin A, Bowser A, Chuang T-R, Cooper C, Danielsen F, Edmunds R, Elias P, Faustman E, Hultquist C, Mondardini R, Popescu I, Shonowo A, Sivakumar K. 2021. The Critical Importance of Citizen Science Data. *Frontiers in Climate*. 3:650760. doi: 10.3389/fclim.2021.650760
- Di Cecco GJ, Barve V, Belitz MW, Stucky BJ, Guralnick RP, Hurlbert AH. 2021. Observing the Observers: How Participants Contribute Data to iNaturalist and Implications for Biodiversity Science. *BioScience*. 71 (11): 1179–1188. <https://doi.org/10.1093/biosci/biab093>
- Goeking SA, Windmuller-Campione MA. 2021. Comparative species assessments of five-needle pines throughout the western United States. *Forest Ecology and Management*. 496: 119438.
- Mee-Sook K, Richardson BA, McDonald GI, Klopfenstein NB. 2011. Genetic diversity and structure of western white pine (*Pinus monticola*) in North America: a baseline study for conservation, restoration, and addressing impacts of climate change. *Tree Genetics & Genomes* (2011). 7:11–21.
- Ramm-Granberg T, Rocchio FJ, Copass C, Brunner R, Nielsen E. 2021. Revised vegetation classification for Mount Rainier, North Cascades, and Olympic national parks: Project summary report. Natural Resource Report NPS/NCCN/NRR—2021/2225. National Park Service, Fort Collins, Colorado. Available at: <https://doi.org/10.36967/nrr-2284511>. Accessed February 17, 2024.
- USFWS (U.S. Fish and Wildlife Service). 2022. Endangered and Threatened Wildlife and Plants; Threatened Species Status with

Section 4(d) Rule for Whitebark Pine (*Pinus albicaulis*), 87 FR 76882 (effective January 17, 2023). 50 CFR 17. Available online: <https://www.federalregister.gov/d/2022-27087>

Aaron Wells is a PhD vegetation ecologist and project manager with AECOM Technical Services (<https://aecom.com/aecom-technical-services/>) and is a member of the WNP, Okanogan Chapter.



Notes from the Field:

A Summer Looking for Rare Plants on Mount Rainer

by Erik Ertsgaard

Reprinted with permission from the Rare Plant Press, a newsletter of the Rare Care Program at the University of Washington Botanic Gardens.



Author getting a closer look at an alpine plant. PHOTO: ALISON MUNAYLLA-BOHORQUEZ

In the summer of 2024, I had an internship with the Washington Rare Plant Care and Conservation (Rare Care) program at University of Washington Botanic Gardens to document rare plant populations at Mount Rainier National Park, and I am excited to share what we found! The internship opportunity sprung from a collaboration between Rare Care and the National Park Service to confirm and improve the accuracy of rare plant records within Mount Rainier National Park's boundaries. For the National Park Service, this work provides vital spatial information about rare plants to inform management decisions. It's also a special chance to document the plants of one of the state's most unique habitats: the most prominent mountain in the Lower 48.

In June, my field partner for the summer, Park Service intern Alison Munaylla-Bohorquez, and I started with a list of 34 species of varying ecosystems and levels of rarity. By September, we visited 17 of those species across 35 sites in every corner of the park. Of those 17 species, we confirmed 14 to be species of conservation concern and three to be misidentified common

species. We synthesized these data into a map dataset so that the park knows where not to build new campgrounds, trails, or fire lines and which habitats are especially valuable to preserve. Not only was it a productive summer scientifically, but it also included tremendous personal development as a botanist and student of these landscapes.

In lieu of in-depth findings from our season on Tahoma, the Indigenous name for the mountain, here are some highlights that encapsulate the joys of our season:

- Yellow coralroot (*Corallorhiza trifida*) was our first find of the season. Joined by project supervisors Wendy Gible and Beth Fallon, we located this mycoheterotrophic orchid of mature forest edges in a roadside ditch!
- Howell's violet (*Viola howellii*) is a small violet native to the Pacific Northwest lowland meadows and rocky outcroppings. Before we identified it, from a characteristic spur pouch and tuft of hair on its stigma, the violet hadn't been recorded in the park since 1935.

- King's crown (*Rhodiola integrifolia*) is a charismatic, dioecious (separate male- and female-flowering plants) succulent that has been frequently documented by recreational botanists along one of the more popular subalpine trails in the park. By recording its presence, we hope our data serve as one of many reasons for park officials to discourage off-trail use.



A female King's crown (*Rhodiola integrifolia*). PHOTO: ERIK ERTSGAARD

- Strickland's umbrella-wort (*Tauschia stricklandii*) became a frequent sight for us despite being a near-endemic to the park. One of my favorite excursions was to Grand Park, an eerily-flat field that stretched for miles with thousands of *Tauschia*.
- Sweetgrass (*Hierochloa odorata*) is a personal favorite of mine, being the titular species of one of my favorite books, *Braiding Sweetgrass*, by Robin Wall Kimmerer. Finding this species was great practice in grass identification, a gorgeous trip into the wet meadow it inhabits, and a good reminder of the Indigenous histories of stewardship on this mountain that must be defended today.



A field of Strickland's umbrella-wort (*Tauschia stricklandii*) stretching as far as the eye can see. The stems are only a few inches tall so you likely can't see it in between the grasses here, but earlier in the summer this whole meadow is ablaze with its yellow blooms. PHOTO: ERIK ERTSGAARD

- Alpine whitlow-grass (*Draba aureola*) is an enigmatic plant that can survive at the brink of a typical plant's tolerance at elevations of up to 11,800' yet is globally quite rare and is only found in these extreme conditions on high Cascade mountains. We found it at 8,600' tucked under a rock on a high ridge where it had previously been reported. Our discovery of this camouflaged plant was very satisfying and exactly 110 years after it was first recorded!



The dark velvet color of Alpine whitlow-grass (*Draba aureola*) made for an arduous search among the similarly-colored boulders of this high alpine area. PHOTO: ERIK ERTSGAARD

I will carry this summer's botanical adventures long into my career, and I hope our work will help sustain these rare plants long after my career. More will come from Mount Rainier National Park's partnership with Rare Care, so stay tuned!

Erik Ertsgaard is an early-career botanist and plant ecologist who spent the last field season as a Rare Care Intern in Mount Rainier National Park. In between field seasons, Erik spends his time at the University of Washington Herbarium (WTU) and serves as the chair of the WNPS Research & Inventory Committee.

The Washington Rare Plant Care and Conservation (Rare Care) program at UW Botanic Gardens is dedicated to the conservation of rare native plants.



Bringing Back Biodiversity: Students Restore Native Plants to Twin Rivers Ranch Preserve

by Liz Burton-Crow

Excited chatter dances along the breeze as 60 science students from Griffin Middle School make their way down the path to Twin Rivers Ranch Preserve, located at the head of Oakland Bay near Shelton in Mason County. This is no ordinary field trip, and these are no ordinary students. For the next seven weeks, they are officially restoration ecologists in the field surveying native plants and increasing biodiversity at this 125-acre conservation area that was once a grazing pasture for cattle.

Working Together for Conservation's Future

A late September day marks the first of two field trips hosted through a partnership between Griffin Middle School, WNPS, and Capitol Land Trust (CLT). These organizations combined their complimentary skills to co-deliver WNPS' Youth Ecology Education through Restoration (YEER) program, empowering more than 300 Griffin Middle School students to plant a whopping 1,065 native plants to date.

Such efforts are not only a win for the ecosystem at Twin Rivers Ranch Preserve, but they are also beneficial to an emerging cohort of young people newly educated to care for the environment.

"Learning outdoors is much better for them," explains one Griffin Middle School counselor. "It's great to get them putting into practice what they learn in the classroom."

It would seem today's restoration ecologists agree, with student Adalynne observing, "Whenever I imagine how a field trip is going to be, it always ends up being better."

Just as it takes many partnerships to conserve land in the first place, it takes strong partnerships to build a community who can carry conservation work forward. Twin Rivers Ranch Preserve was conserved by CLT in 2010 because of the two estuaries, wetlands, and forests located on the property. Now, the incredible property occasionally hosts outdoor experiences that connect people to the work of conservation—as well as the benefits.

WNPS volunteer Patricia says, "Partnering with CLT



Quality planting is key to a successful restoration project. Students receive a planting demonstration from WNPS volunteer Heidi before planting their own. PHOTO: LIZ BURTON-CROW

in the YEER program introduces the idea of land conservation and restoration to our youth. Having a positive experience in nature on conservation lands at a young age will hopefully motivate these young people to support land conservation and restoration efforts in their futures. Not to mention inspiring them to seek out nature experiences, which can improve their physical and mental wellbeing.”

A Day in the Life of a Student Restoration Ecologist

The group kicks things off with a welcome circle led by WNPS’ Janneke Peterson and CLT outreach and education coordinator, Sarah Croston. Their expert guidance along with WNPS volunteers, parent chaperones, and Griffin Middle School staff underscores that this is not just a youth project but a multi-generational community effort. In fact, parent Adam happened to do some of the GIS work mapping invasive species at this very site.

“Biodiversity” is the word of the day, and the students help define it as well as being the goal of their work here: to increase the biodiversity of their restoration site when they return for planting. They then break into smaller groups to begin an activity called Each One, Teach One, where the students are assigned a native plant species, then teach the others in their group about it.

This is followed by surveying small reference plots where native plants are already well established. “Are these edible?” one student asks while closely examining blue elderberries. “They are if cooked properly,” a chaperone explains, adding they know someone who used to make jam from them.

Numerous native plants including Pacific madrone (*Arbutus menziesii*), sword ferns (*Polystichum munitum*), thimbleberry (*Rubus parviflorus*), and western red cedar (*Thuja plicata*) are identified at the reference sites. In contrast, the restoration site is dominated by non-native pasture grass punctuated with non-native thistle. However, the students find more than just plants at the site, with two praying mantises soon stealing the show. “Well, that was awesome!” exclaims Ellie as she takes a turn holding one of the docile green insects.

For the next several weeks the students engage in a high-quality science curriculum taught by their classroom teachers, including a paper that details their restoration plan. They return in November to put those plans into action.

Upon arriving at Twin Rivers Ranch Preserve for the second time, students grab their work gloves and receive a brief tool safety lesson from Janneke, who then asks about their goal for the day. The students reply that they will be planting native species to increase biodiversity at the site. “How will that help?” Janneke asks. The students identify that once the plants grow, they will provide habitat and food for other species, “A food web!” they enthusiastically say.

Next comes a planting demonstration observed by not only the students but also more than a dozen bald eagles who are here for the chum salmon running up Cranberry Creek, which



After learning about biodiversity, students plant 350 native plants near a creek at Capitol Land Trust’s Twin Rivers Ranch Preserve near Shelton, Washington. PHOTO: LIZ BURTON-CROW

borders today’s restoration area. The demonstration focuses on high-quality planting.

Getting it Done

With that, the students-turned-restoration-ecologists set to work digging holes, planting native species such as tall Oregon grape (*Mahonia aquifolium*), snowberry (*Symphoricarpos albus*), shore pine (*Pinus contorta*), nootka rose (*Rosa nutkana*), and oceanspray (*Holodiscus discolor*), and finally mulching around them. “There, you almost got it, put some elbow grease into it,” one student says encouragingly. Nearby, another informs their partner, “That’s deep enough, we can plant now.” Still others are on the quest for mulch, dutifully shoveled by those already finished planting. As Adalynne fills a wheelbarrow for her classmates, she proudly declares, “I like to push myself to my limits to find out what I’m capable of.” Indeed, the 60 students planted and mulched 350 native plants over the course of the day.

On that note, there is one last thing to do before the students depart for Griffin Middle School, and that is to visit the estuary to view spawning salmon. The students cheer in unison as one gets trapped in shallow water. “Go! Go! Go! Go!” they chant, erupting in joyous applause once the salmon frees itself and heads upstream. “I wish I could lay out here all night and see what happens,” Maggie laments as the group makes their way back toward the buses. “Did you ever think how cool it would be to be a bird seeing all this from above?”

With such soaring sentiments in mind, it is clear that strong partnerships between Griffin Middle School, WNPS, and CLT have not only made a lasting, positive impact upon the landscape, but also on the hearts and minds of the students who have invested in this special place. Since the land is protected in perpetuity, the native plants established through this year’s YEER program can grow and perhaps even shade the future children of the students who contributed so much on these autumn days.

Liz Burton-Crow, PhD is owner/operator of the Nature Imaginarium, a media production company integrating ethics, art, and science to foster connections with the natural world.



WNPS 2024 Donor List

WNPS would like to gratefully acknowledge the following members and supporters, whose generous donations make the programs of WNPS possible, and keep our voice strong on the behalf of native flora and habitats.

Donations and Tributes received in 2024, between January 1 and December 31, 2024.

Donor Tributes 2024

In Memory of Ann Fink of Wenatchee Valley

Anonymous

In Memory of Don and Ruth Knoke & Terri Knoke

Noel Knoke

In Memory of Don Knoke

Katherine and Christopher Finch
Linda Storm

In Memory of Donald King Mackay

Candace Kramer

In Memory of Dr. Ron Taylor

Steve and Jody Caicco

In Memory of Elliot Menashe

Marianne Edain and Steve Erickson

In Memory of Estella Leopold

Wendy McClure

In Memory of Gerold Leslie Buse

Kyoko Elizabeth Tachikawa

In Memory of Glendon P. Carney

Cathy Carney
Krys Carney

In Memory of Joan Airoidi

Michael and Adam Airoidi

In Memory of Joel L. Dodd

Janice Dodd

In Memory of Ken Montgomery

Tom Strid

In Memory of Lou Messmer

Helen M. Hepp

In Memory of Lynn Hendrix

Kay Forsythe

In Memory of my parents Marge and Robert Stolz—who taught me to love nature

Richard Stolz

In Memory of Professor Fred Johnson of the University of Idaho

Art Zack

In Memory of P. Scott Pierce

Ann Pierce
In Memory of Ron Young

Bill Howard

In Memory of Spencer Joly

Linda Martin

In Memory of Terri Knoke

Susan D. Freiberg

In Memory of Willow Oling

anonymous

In Honor of The Columbia Basin and Sagebrush

Bella Roberts

In Honor of Louis Luce's 100th Birthday

Bruce Smith

In Honor of John and Anya

Claire Wilkin

In Honor of Catherine Reed

Garth Reed

In Honor of Sandy F.

Judy Murray

In Honor of Fayla Schwartz

Gail Sklar and Howard Cohen

In Honor of Fred and Ann Weinmann

Linda Storm

In Honor of Suzane Simard

Lynn Maser

In Honor of my mother, Diana Widrig Durden, a Washington State native and plant lover

Merideth Dolan

In Honor of Julie Allen

Monica Van der Vieren

Endowment Gifts

Gary Smith and Jean Yee
Peg Pearson
Helen Roberts

Estate Gift Recognition

Arlene Bell
Elliot Menashe

WNPS Patrons—\$5,000 or more

Becky and Dave Bechtold
Will Bloch
Cathy Carney
Jim and Birte Falconer
Peter Mason
Gary Smith and Jean Yee

WNPS Sustaining Donors—\$1,000 or more

Anonymous
Ted Alway and Patricia Ortiz
Maggie and John Bell-McKinnon
Scott and Susie Blackstock
Ron and Sue Bockelman
Bonhoffer Botanical Gardens
Allan Borden and Norma Kimmse-Borden
Marilyn Boysen
Franja Bryant
Sylvia Burges
Cliff and Pauline Cantor
Krys Carney
Catherine Conolly and Rodney Brown
Derby Canyon Natives -Melissa Asher
Merideth Dolan
Virginia Lee and William Ellis
Robert and Kris, Nellie, Maggie Faucett
Bob and Judy Fisher

360 Fundraiser - University of Washington
Heather Gordon
Alicia Graves
Thor Hanson and Eliza Habegger
Alan and Donna Hargus
David Hoenig and Lili Bowers
Bill Horder
Julie Kinder
Babs Klee and Ralph Pease
Noel Knoke
Chris Mealy and Ara Jane Olufson
Patricia Otto
Robert and Anne Outlaw
Dr. Linda S. Park
Flavio Protasio-Ribeiro Donald B. and Ann K. Schaechtel
Linda Storm
Kyoko Elizabeth Tachikawa
Suzanne and Marc Tomlinson
Fred and Ann Weinmann
Bryan and Chris White
Gina Ylitalo and David Nelson

WNPS Friends—\$500-\$999

Sharon Baker and Richard Droker
Judy and Annie Bendich
Dr. Julia Bent
James and Barbara Brink
Keyna Bugner
Sylvia Burges
Joan Christ and Tom Everill
Ellen W. Chu
Steven Clark and Cherie Kearney
John H Conley
Ted Crovello
Scott and Kathy Dennis
Marc and Wendy DesCamp
David Giblin and Julie Monahan
Melanie Ito
James Jensen
Lucie Johns
Julie Kane
Rich Layman and Lesley McGalliard
Casey Leigh and William Gilmartin
Laura Lundgren
Mimi Margulies
Diane McKenzie
Bonnie Orr
Kurt Reidinger
Mary Scheibler
Kevin Schoenfelder
Cindy and Rob Shurtleff
John Sims and Patricia Espedal
Gail Sklar and Howard Cohen
Richard Stolz
Marcia Stone
Curtis Sundquist
Mikki Symonds and Flint Orr
Donovan Tracy

WNPS Friends—\$250-\$499

Sharon and Dwight Bergquist-Moody
Carl and Debbie Berkowitz
Van Bobbitt and Sharon Wilson
Nancy and Dan Bowen-Pope
Sandra Bowman
Janis Burger
Steve and Jody Caicco

Megan Cathey
A. J. Cavalieri
Jessica Chai and Jerome Wong
Mark Darrach
Chris and Mary Diorio
Mary-Ellen Diorio
Dawn Dockter and David Onstad
Barbara Downward and Rick Hemmen
Marianne Edain and Steve Erickson
Martha Ellis
Alison and Bill Engle
Heidi Epstein
Kay Forsythe
Susan D. Freiberg
Mary Sue Gee
Rochelle Giddings
Jill Golden
Go Natives! Nursery – Don Norman
Dodie and Paul Gray
Jason Greenspan and Michael Gentile
Habitat Restoration Specialists, LLC – Derek Beauchemin
Jeraldine Hallberg and Frank Lacey
Helen M. Hepp
Robert Hogfoss
Catherine Hovanic and William Brookreson
Laura Hudson and Rob Sims
Inland Waters Landscape Services
Joan Knowles and Howard Dawson
Karen Kornher
Howard Langeveld
Susan Lattomus
Sarah Lawrence and David Lai
Sharon Leishman
Jaisri Lingappa and Patrick Tompkins
Russell Maier and Sara Cate
Jim and Christy Messmer
Rita and Bob Moore
Carolynne Myall and Sydney Chambers
Wendy Nichols
Peter F. and Sandy O'Connor
Nancy Paine
Michele Peltonen
Dan and Fran Post
Laura Potash
Rebalance Environmental Consulting
Helen Roberts
Thomas Rogers
Stephen and Hazel Roos – love of my life
Karen Ruppert
Mary Ann and Steve Simmons
Julie Snyder
Diane and Greg Stone
George Thornton and Lee Miller
John Tolonen and Margaret Morris
Daniel Tufford
Nathan Ulrich
Barbara Watanabe-Chun
Sue Wickham
Bruce Williams and Gro Anna Buer
Carolyn Wright
Gerry Zyfers

WNPS Friends—\$100-\$249

Ann and Knut Aagaard
Joseph and Megan Albrecht
Anthony Allison
Lyle Anderson
Stuart Anderson
Suzanne and Marvin Anderson
Kelvin Andrews
Virginia Arnon
Michelle Asire and Bruce Hoffman
Darrel Baker
Christa Balk
Susan and Paul Ballinger
Lenore Barkan and Ronald Urban
Bill Bauer
Shawn Baz
Martha Beard
Shannon Beasley-Bailey
Linda Becker and Peter Costantini
Kathryn A. Beck
Lauren and Rebecca Becnel
William and Barbara Beer
Peggy Behrendt and Erika Springer
Doug Benoliel
David Bernstein
Karen Berntsen
Janet Bird
Phil and Marilyn Bird
Suzette Birrell
Blue Skies Bakery
John Bolivar
Sandra Bonetti and Bruce Spiller
Celeste Botha
Katherine Bourbonais and Donald Ramsey
Mall Boyd
Carol Boyer
Paul Brallier and Nancy Feagin
Margaret Bridge
Barbara Broderick
Leesa Broker
Melinda Bronsdon
Anne B Brownlee
Carolynne Bryant-Dowdy
Lys Burden
Thomas and Carol A. Burke
Michael Burns
Cindy Burton
Margaret Bushnell
Sue N. Butkus
Sally Cahill
Ruth Callard and Nancy Helm
Susan L. and Eric Carlson
Mickie Chamness and Duane Horton
Rebecca and Martin T. Chaney
Gabriela Chavarria
Chelan-Douglas Land Trust
Yvonne Chen
Howard Coleman
Janet Coles and Kathy Carsey
Betsy Cooper
Lucy Copass
John P Cordell
Dawn Cori
Cowiche Canyon Conservancy
Christopher Cox and Jessica Kocian
Lars Crabo
Barbara Crook
Nancy Daar
Esther and Dan Darrow
Janet Davis
John and Mary Davis

Cheryl and Ralph Dawes
Sandra De Ment
Mary De Vany
Paul Decker
Craig and Deborah Dexter
Jeanine and Jeffrey Dickman
Sue Dickson
Cynthia Dillion
Darrell Dobson
Janice Dodd
Lani and Michael Dodge
Al and Tanya Demarsh Dodson
Dog Woods LLC
Annemarie Dooley
Ruthie and Dean Dougherty
Janelle Downs and Randy Kirkham
Emil Doyle and Susan Plunkett
Francesca Drum
Julia Dyck and Douglas Taylor
Victoria Dye and Douglas Kelt
Stephen Easley
Robert Mark and Diane Eastman
Linda Eaton
Carol Edwards
Karen Edwards
Mark Egger
Jeanne and Mickey Eisenberg
Margaret K. ("Kit") Ellis
Stephen Elston and Marion White
Jane Ely
Heidi Engle and Bruce Lindstrom
Jim Erckmann
Dana Ericson
Jim Evans and Leslie Brown
Shelley Evans
Polly Fabian and Craig Seasholes
Sarah Fairbank
Sylvia Feder
Nancy Field
Ann Fink
Judith Finn
Brenda M L Fong
Mary Foutz
Anne Fox
Don France
Donna Franklin
Joan Frazee
Lorraine Fritsch
Donna Frosthalm
Sarah Gage
Garden Cycles LLC – Steve Richmond
Karen Gardiner
Lona and Jim Gartrell
Bruce Gaumond
Wendy J. Gible
Deborah Giles and Charles Simrell
Kari Gilje
Thurman and Marjorie Gillespy
Robert Girvin
Charles Givens
Tara Grafwallner-Walbrun
William Lyle Graham and Bob Simpson
Sharon Grant and Steve Ghan
John Graves
Great Peninsula Conservancy
Patricia Gritman
Candice Guth and David Pogel
David Hagen
Julia and Lewis Haldorson
Cleveland Hall and Mr. Lafe Lawyer
Dave and Sandy Hanower

Jane Hansen
Katharine Harkins
Bonnie Harpel
Jennifer Harrington
John and Marcia Harter
Cyndy Harvey
Beverly and Charles Heebner
Elise Hemenway
Marilee Henry and Jeff Thorson
Amy Hiatt and David Pratt
Susan Hoekstra
Julie Anne Hopkins
Susan Hosticka
Carolyn Houser
Bill Howard
Rick and Peggy Hudson
Janice Humeniuk
David Hutchinson
Tom Hutchinson
James D. Jamison
Divya Jayaraman
Elise Johnson and Liz Knowles
James P. Johnson
Kristen Johnson
Terry and Tony Jongejan
Julia and Jerry Jose
Phyllis Kaiden
Thomas Kelly
Kathy and Alan Kelso
Barbara Kenady-Fish
Daniel Kerlee
Martha Kintner
Jeanne Kleyn and John Black
Dee Ann Kline
Gloria Koch and Dave R. Thompson
Sophie Kong and Ning Li
Candace Kramer
Nancy and Paul Krupin
Linda Kunze and Gordon White
Walter Kushner
Anita Landino
Julie Langabeer
Micki Larimer
Michael Laurie and Diane Emerson
Raymond Law
John A. Lee
Cynthia Lenz
Ellen and Barry Lerich
Milly Lierman
Kristin Lindell
Marli Lintner
Lin Livingston
Dixie and Dave Llewellyn
Walter Lockwood
Will and Breck Longstreth
Donna Lucas
Cynthia Luskus and William Deters
Caitlin and Jenz Lund
Nic Lyons
Steven Macdonald and Rita Altamore
Carol Mack and John Stuart
Erin Mahan and Lucinda Douglas
Lisa Maki
Lynn Marek and Richard Stout
Marcia Martin
Lynn Maser
Richard Mathes
Bonnie R Mayer
Carol and William McClain
Wendy McClure
Tara McGown and Kevin Crozier
Elizabeth McHugh

Bill McJohn
Catherine and Robert Mckee
Marcia Mellinger and Alex McAlvay
Dr. Edgar Meyer
Anne Middleton
Ruth Ann Mikels And Jim Tuttle
Amy Halvorson Miller
Libby Mills
Kris Moberg-Hendron and Lars Hendron
Carol Anne Modena
Steve Moore and Jan Demorest
Frances Murphy
Pamela Murphy
Janet Murray
Mike and Kathy Murray
Christine Mustelier
Jack Mynatt
Stephanie Neill
Jennifer Nerad
John Nestor and Ellen Borison
Christine Neumiller
Genita Nolan
Margaret Jean Noyes
Karen Nussbaum
Julie and Gary O'Donald
Dennis Oliver
Judith P Oliver and Jacob W. Lehman
Barbara and James Orcutt
Jenifer Parsons
Susan Pascal
Dennis Paulson and Netta Smith
Mary and Mark Paxton
Kelsey and Sam Payne
Frank Peale and Sandy Bernhard
Elizabeth Pearson
David Perasso
Thomas and Tana Peterman
Pam and Jim Phillips
Robert Polasek and Joni Blakeslee
Judith Pottmyer and Michael Sackschewsky
Maximilian Press and Matthias Barrett
Pam Pritzl
Ronald Quinn and Barbara Ellis-Quinn
Raj Rakhra
Susan and Zane Rankin
Kim Rasmussen
Ray Redd
Andrew Bay Renaud
Michael S Repko
Timothy Reschly
Kathy Riley
Crilly Ritz
Debbie and Phil Roberts
Marilyn Roderick
Sharon Rodman
Ralph Thomas Rogers
Joe Roop
Abby Rosenthal
Daniel Rosenthal
Randall Rothe and Gwen Carlson
Judith Rubin
Amy Rusev Dawley
Thelma Ryder
Susan M Saul
Bonnie and Caitlin Savo
Maureen and Don Schmitz
Lydia and David Schoen
Richard D. Schroedel
Joanne and Dave Schuett-Hames
Fayla Schwartz and Allegra Klien

Heather Scott
 Trey Scott
 Shelley and Michael Scuderi
 Seattle Garden Club
 Karen Selboe
 David Selk and Terry O'Connor
 Nissa and Tristan Shaffer
 Ashley Shattuck
 Marianne Shaw
 Linda Sheehan
 Mark Sheehan
 Sandy and Julia Shettler
 Joan Simmerman
 Irene Simpson
 Anu and Don Singh-Cundy
 Deborah Smeltzer and David Kingsbury
 Mary Smidt
 Brian and Cheryl Smith
 Bruce Smith
 Heather and Ethan Smith
 Rik Smith and Koren Burling
 Nurith St. Pierre
 Larry and Maureen Stauffer
 Christy and Robin Stebbins
 Robert Steinauer
 Peter Stekel and Jennie Goldberg
 Kate Stenberg
 Heidi Stenner
 Cynthia and Peter Stevens
 Christine and Kevin Stevenson
 Jane Stockert
 Hildegard S Stone
 Prudence Stoudt-McRae
 Jenny Stratton
 Tom Strid
 Brenda Sullivan
 Karen Summers and Bill Hickey
 Mary Swanson and Peter Murray
 Susan Swayne
 Ken Swedberg
 Lene and William W. Symes
 Tacoma Garden Club
 Lucinda Tear
 Lisa Therrell and Richard Haydon
 Hanne Thiede
 Robert Thinnies

Donata and Nathan Thomas
 Theodore Thomas
 A Ruth Thurston
 Brenda Tom
 Barry Trapp
 Tree Swallow Farm
 Mark and Brian Turner
 Craig Tylanda
 Phoebe Tyson
 Shaari and Len Unger
 Monica Van der Vieren
 Sara Van Fleet
 Heather and Russ Van Steenburgh
 Bill and Cate Vanderwilt
 Paula VanHaagen
 Sarah Verlinde-Azofeifa
 Karen Vining
 Marilyn Vogel
 Jeff Walker
 Randena Walsh
 Steve Wang and Kathryn Hamilton
 Janet Warren and Mark Schmidt
 Adam Wayss
 Harriet and David Weber
 Mary Webster
 Jennifer Weddle
 Betsy Weiss and David Clement
 Heather Wendt
 Jane B and Keith Wentworth
 Dorothy Westlund
 Karen Wiese and Carl Wishner
 David Wilderman and Jeanne Ponzetti
 Victor and Katy Wilkens
 Claire Wilkin
 Thane Williams
 Robert and Jill Wilson
 David Wisner
 Fritz Wollett
 Yvonne Wolman
 Sharon and Anthony Zoars
 Karen Zook

WNPS Friends under \$100

Thank you to 1,775 additional donors for your contributions to WNPS

Organization Member Support

BFI Native Seeds LLC
 Biodiversity Nursery
 Bonhoeffer Botanical Gardens
 Buck Lake Native Plant Garden
 Camas Earth Day Society
 Cascade Conservation Properties
 Chelan-Douglas Land Trust
 Chicago Botanic Garden - Lenhardt Library
 Cowiche Canyon Conservancy
 Dennis Kommer Excavating LLC
 Derby Canyon Natives
 Dog Woods LLC
 Eastside Audubon
 Elisabeth C. Miller Library
 Essential Gardeners
 Flourish NW LLC
 Forks Branch Library
 Fourth Corner Nurseries
 French's Farm
 Friends of Camp Gallagher
 Friends of St. Edwards State Park
 Friends of the Columbia Gorge
 Friends of the Little Pend Oreille NWR
 Friends of Port Townsend Golf Park
 Garden Cycles LLC
 Go Natives! Nursery
 Good Year Farms
 Great Peninsula Conservancy
 Habitat Restoration Specialists, LLC
 Highline Botanical Garden Foundation
 Hima Nursery
 Humble Roots Farm and Nursery LLC
 Inland Waters Landscape Services
 Inside Passage Seeds and Native Plant Services
 Jefferson Land Trust
 Kittitas County Conservation District
 Kruckeberg Botanic Garden Foundation
 Linda Andrews Landscape & Design
 Little Bird Gardens
 Local History Room, North Olympic Library System

Methow Valley Interpretive Center
 NatureScaping of SW Washington
 North Olympic Land Trust
 Northwest Anthropology LLC
 Okanogan Highlands Alliance
 Palouse Conservation District
 Plants of the Wild
 Rebalance Environmental Consulting
 Restoration Analytics & Design LLC
 Salish Trees Nursery
 Seattle Garden Club
 Serials Division
 SF Botanical Garden Society
 SHADOW LAKE Nature Preserve
 Shelterbelt, LLC
 Shooting Star Gardens
 Spokane Conservation District
 Susan Camp Tree Farm
 Tacoma Garden Club
 Tapteal Native Plants LLC
 Tree Swallow Farm
 Univ. of Washington Libraries
 WACD Plant Materials Center
 Washington State Library
 Watershed Alliance of SW WA
 Wild Root Landscapes, LLC
 Wildflowers Northwest
 Wildscape Restoration
 Wildscapes Northwest
 Woodbrook Nursery
 WSU Whitman County Master Gardeners

Corporate Donors

Adobe
 Boeing
 Costco
 Google
 GREF (Amazon)
 Intel
 Kroger
 Lumen
 Microsoft Corporation
 Nvidia



Red elderberries (*Sambucus racemosa*) blooming in a woodland understory near Bellingham. PHOTO: MARK TURNER

Washington Native Plant Society State Board Directory

Officers & Elected Directors

(Director's term follows name)

President*

Gail Sklar 2022-2025

wnpspresident@wnps.org

Immediate Past President

Keyna Bugner

pastpresident@wnps.org

Vice-President*

Casey Leigh 2022-2025

vicepresident@wnps.org

Secretary*

Ashley Shattuck 2023-2026

secretary@wnps.org

Treasurer*

Margaret Toth 2024-2027

treasurer@wnps.org

Directors at Large*

(one vote per person)

Jarred Glenn 2024- 2027

director.4@wnps.org

Jim Kling 2022-2025

director.2@wnps.org

Tina Miller 2022-2025

YEERAdvisory@wnps.org

Robert Steelquist 2024-2027

director.6@wnps.org

Steven Clark 2023-2026

director.5@wnps.org

Linda Storm 2023-2026

director.3@wnps.org

Chapter Chairs

(one voting position per chapter)

Central Puget Sound Chapter

Vacant

centralpugetsound@wnps.org

Central Washington Chapter

Keyna Bugner

centralwa@wnps.org

Columbia Basin Chapter

Kelsey Kemel

columbiabasin@wnps.org

Koma Kulshan Chapter

Eric Worden

komakulshan@wnps.org

Northeast Chapter

Mattie Whitney

northeast@wnps.org

Okanogan Chapter

Dana Visalli

okanogan@wnps.org

Olympic Peninsula Chapter

Fayla Schwartz

olympic@wnps.org

Salal Chapter

Kristen Kloc

salal@wnps.org

San Juan Chapter

Bill Engle

sanjuan@wnps.org

South Sound Chapter

Dawn Dockter

southsound@wnps.org

Suksdorfia Chapter

Nate Ulrich

suksdorfiachair@wnps.org

Wenatchee Valley Chapter

Ted Alway

wenatcheevalley@wnps.org

Standing Committees

Conservation Committee

Vacant* Chair

conservation@wnps.org

Becky Chaney

Emil Doyle

Ryan Lefler

Edward Lisowski

Susan Saul

Gail Sklar

Jamie Bails

conservationgrants@wnps.org

Fundraising Committee

Don Schaechtel* Chair

fundraising@wnps.org

Sarah Gage

botanicalrambles@wnps.org

Denise Mahnke

wnps@wnps.org

Editorial Committee

Vacant* Chair

douglasia@wnps.org

Sarah Gage

botanicalrambles@wnps.org

David Giblin – Technical Editor

douglasia_tech@wnps.org

Ellen Kuhlmann

T. Abe Lloyd

Mark Turner – Layout Editor

douglasia_layout@wnps.org

Melissa Islam – Managing Editor

douglasia_editor@wnps.org

Research and Inventory Committee

Erik Ertsgaard* Chair

researchinventory@wnps.org

Kathy Ahlenslager

Elizabeth Binney

Peter Dunwiddie

Richard Olmstead

Eric H. Roalson

Anthony Cavalieri

Education Committee

Janelle Downs* Chair

education@wnps.org

Franja Bryant

Wendy Scherrer

Mark Turner

Mark Watrin

Stewardship Committee

Scott Moore* Chair

stewardchair@wnps.org

Tina Miller, co-Chair

Jarred Glenn

Joe Albrecht

Bernie McKinney

Linda Shephard

Tina Miller

Mattie Whitney

Allan Richardson

Steve Richmond

Janka Hobbs

Gail Sklar

wnpspresident@wnps.org

Executive Committee

Gail Sklar

wnpspresident@wnps.org

Casey Leigh

vicepresident@wnps.org

Margaret Toth

treasurer@wnps.org

Tina Miller

yeeradvisory@wnps.org

Bill Engle

sanjuan@wnps.org

WNPS Ad Hoc Committees**

Communications Committee

Vacant – Chair

Sarah Verlinde-Azofeifa – Website

website@wnps.org

Sarah Gage – Blog

botanicalrambles@wnps.org

Mark Turner

Ashley Shattuck – Instagram

Denise Mahnke

Dylan Mendenhall

Amy Lin, Intern

HR Committee

Keyna Bugner – Chair

pastpresident@wnps.org

Gail Sklar

Janelle Downs

Native Plant Appreciation Month

Gail Sklar – Chair

wnpspresident@wnps.org

Julie O'Donald

Ci Ci Asplund

Denise Mahnke

Savannah Reid

Alaina Kowitz

Linda Storm

Financial Advisory Committee

Margaret Toth – Chair

treasurer@wnps.org

Don Schaechtel

Gail Sklar

Keyna Bugner

Howard Langeveld

Sarah Gage

Denise Mahnke

Governance & Nominations Committee

Casey Leigh – Chair

vicepresident@wnps.org

Keyna Bugner

Denise Mahnke

Don Schaechtel

Steve Clark

Gail Sklar

Awards Committee

Gail Sklar, Chair

wnpspresident@wnps.org

Ashley Shattuck

Linda Storm

Strategic Planning Committee

Heather Wendt – Chair

stewardchair@wnps.org

Gail Sklar

Robert Steelquist

Denise Mahnke

YEER Advisory Committee

Tina Miller – Chair

YEERAdvisory@wnps.org

Janneke Petersen

Keyna Bugner

Janelle Downs

Linda Storm

Don Schaechtel

Denise Mahnke

Mikki Symonds

Margaret Toth

* Denotes a voting position

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

Become an Evergreen Donor

Your pledge of \$5 or more a month can continue to support our mission.

<https://secure.actblue.com/donate/washington-native-plant-society-1>

Douglasia
c/o Washington Native Plant Society
6310 NE 74th Street, Suite 215E
Seattle, WA 98115

Contents

President’s Message: The View from Here, *Gail Sklar*Inside Front Cover

David Douglas, Botanical Explorer: Part 1, *Ed Alverson*2

The Remarkable Parasitic Vascular Plants of Fort Townsend State Park, *Fred Weinmann*7

A Conservation Assessment of the Globally Rare Washington Endemic Taxon
 Oxytropis campestris var. *wanapum*: Wanapum Crazyweed, *Mark Darrach and Katy Beck* 12

Branching Out: The Five-Needle Pine Community Science
 Pilot Project in the North Cascades, *Aaron Wells*..... 18

A Summer Looking for Rare Plants on Mount Rainer, *Erik Ertsgaard*23

Bringing Back Biodiversity: Students Restore Native Plants to
 Twin Rivers Ranch Preserve, *Liz Burton-Crow*24

WNPS 2024 Donor List26

Washington Native Plant Society State Board Directory29

Black cottonwood (*Populus trichocarpa*) blossoms.
PHOTO: MARK TURNER

