

Douglasia



VOLUME 42, NO. 3 Fall/Winter 2018

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.



About This Issue

by Mary Johnson

In a world where there's always plenty of bad news to go around, it's easy to forget that there's also good news out there. That thought occurred to me as I was reviewing the articles for this issue of *Douglasia*.

For example, in her article on protecting the Palouse prairie on Bald Butte, Becky Chaney recounts how a concerned citizen's communication with the WNPS Conservation Committee initiated actions that ultimately helped prevent the building of a cell phone tower on a proposed prairie site. That's good news for Washington's wild places and the people who help protect them.

In another article, the Washington Invasive Species Council reports on the launch of its free WA Invasives app, a tool that enables the public to detect and report any invasive species, whether plant or animal. That's good news for the ongoing effort to eradicate invasive species in Washington State and for the growing numbers of citizen scientists who want to contribute to the cause.

Susan Waters writes about a new approach to the conservation and restoration of plant communities. She uses an analytical tool called network analysis, which looks at the interactions between plants and pollinating insects. That's good news for helping us better understand how these communities work and for those doing the studies.

Rounding out this issue you'll find Jack Nisbet's article on early botanists' encounters with white sand verbena (*Abronia mellifera*), David Giblin's description of two forest walks at Mount Rainier National Park and his article on field-based plant identification using DNA barcoding, Bridget McNassar's article on how to overcome seed dormancy, and Becky Chaney's account of the ongoing restoration work at Dalles Mountain Prairie.

As the late autumn days yield to the colder, darker days that winter ushers in, sit back and enjoy these articles and more in this issue of *Douglasia*.



On the cover:

Indian ricegrass (*Achnatherum hymenoides*), white sand verbena (*Abronia mellifera*), Columbia cutleaf (*Hymenopappus filifolius*), lemon scurfpea (*Psoraleidum lanceolatum*) in the sand below basalt cliffs near Wanapum Dam in Grant County, Washington. PHOTO: MARK TURNER

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President's Message: The View from Here

by Don Schaechtel

Dear Fellow WNPS Members,

I hope you read Ben Legler's article in the last issue of *Douglasia* about the new WNPS plant list database. And even more so, I hope you have had a chance to use one of the nearly 700 lists in the new database format.

We are eager for feedback on your experiences with the plant lists and encourage you to use the database to compile your own lists. Constructing and using plant lists is a great way to learn about native plants and contribute to our knowledge of species distribution. Allow me to suggest some ways you can do this.

Constructing plant lists is a great chapter project. For example, Susan Ballinger, in the Wenatchee Valley Chapter, picks an interesting area to explore, recruits chapter members to help, and then schedules visits every three weeks from spring to fall to see what species the team can find. By the end of the season she has a comprehensive list for that area. I helped with one of these lists. I thought I knew the area well but soon discovered many species I had never seen. We all learned a lot, we had fun, and it was a good excuse to get outside. Perhaps members in your chapter know an interesting place that would make a good plant list project in 2019.



Don Schaechtel. PHOTO: KEVIN FARRELL

Plant lists, by the way, are great tools for documenting native plant species in an area that could be subject to development. In a recent WNPS Conservation Committee comment letter, we were able to include a species list to show that there was not only interest in the area, but also indeed many species of native plants.

If you are a professional botanist or ecologist who develops plant lists in your work, the database can be a great tool for you. The immediate benefit is you will always have the currently accepted scientific name for each species. Plus the database works like a spell-checker to catch those annoying typos that seem inevitably to creep into long species lists. It will flag any species that are potentially out of range so you can double-check the identification. Finally you can download the list in several formats that can be edited into a report.

You can also keep a plant list private so it is not viewable by the public. This may be appropriate if the area is not accessible to the public or if it contains sensitive habitats that shouldn't

be disturbed. You might also want to keep a list private during its formative stages. For example, say you visit an area and then decide you want to start a plant list. You could start the list with what you remember seeing, then make return visits and list additions until you are satisfied that your list is ready for public viewing. You can always do this in a spreadsheet, and then copy and paste your list into the database when you are ready, but you lose the benefit of immediately having the currently accepted names.

Once your list is public, other visitors to the area can become contributors to report new species and your list will grow. Likewise, lists compiled on a chapter field trip or study weekend trip can be made public so others can use the lists and add to them.

And here is a great idea for a winter project: with the publishing this fall of the revised *Flora of the Pacific Northwest*, why not begin learning some of the new species names and families for plants in your favorite areas. You can print the plant list and look species up in the revised flora to see how they fit in the current taxonomy. In the process you'll learn how to separate some of the new genera and species and will be well-prepared for next year's field season.

Whether you are a casual or compulsive user or lister, the plant list database has something for you. Please put it to use and let others know about it. Our chapters enthusiastically funded the project, and we are excited about seeing it in action.

If you aren't one of the many WNPS members already signed up to create and edit lists, you can easily get started by sending an email request to plantlists@wnps.org with "new" in the subject line. Ron Bockelman, WNPS plant lists database manager, will open an account for you and send an email reply with some simple instructions for setting up your password. You can also send feedback and suggestions about the lists to Ron at the same email address.



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A Scent of Honey

by Jack Nisbet

Scottish naturalist David Douglas, employed by the London Horticultural Society to look for promising garden plants, spent much of the year 1826 investigating the interior portion of the Columbia River drainage. In May he used the Hudson's Bay Company's Fort Colville for a headquarters, gathering

Rapids below modern Wenatchee, then made the long Priest Rapids portage before pulling ashore at Fort Walla Walla. On this summer trip around the Big Bend he grew familiar with a late-blooming sand verbena that he had first collected at Celilo Falls the previous summer.

The naturalist had admired the flashy yellow blooms of another sand verbena on beaches around Cape Disappointment at the mouth of the Columbia. This shrub-steppe plant was more modest, with loose umbels of white trumpet flowers, elliptical leaves that formed whorls around the stems, and downy hairs that covered every part of the plant. For Douglas, who liked to engage all his senses while pursuing new finds, white sand verbena only revealed its most compelling trait under cover of darkness: after the sun went down, it emitted a pleasant scent in order to attract pollinating moths. He apparently experienced that scent many times over the summer, because during his journeys he collected the plant from Celilo Falls, around Fort Walla Walla, at the junction of the Snake and Columbia Rivers, and from dunes around Priest Rapids. Back in England, Douglas's mentor William Jackson Hooker dubbed all the specimens *Abronia mellifera*—the genus name means graceful or delicate, and *mellifera* refers to that distinctive odor.

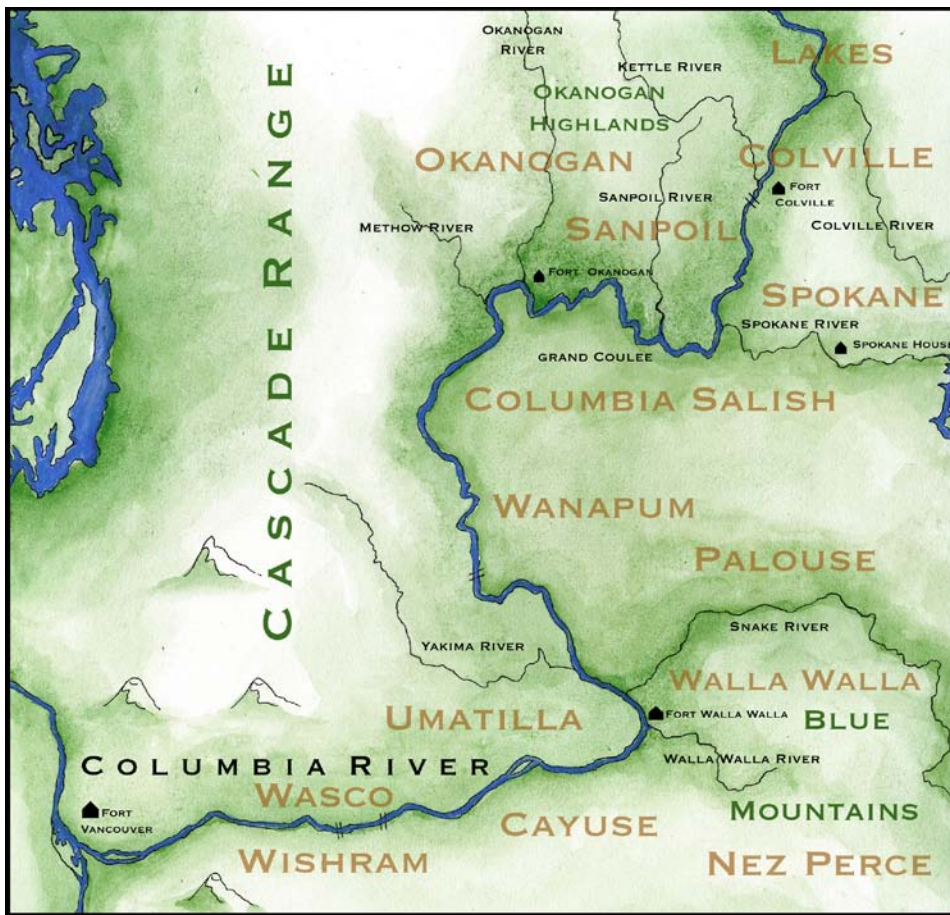


William Jackson Hooker's illustration of white sand verbena (*Abronia mellifera*) published in *Curtis's Botanical Magazine*, new series 3 (1829), plate 2879.

greenery of every description along the Spokane, Colville, and Kettle Rivers. As the weather heated up, his eyes naturally turned to the high country. When Douglas expressed his desire to tackle the Blue Mountains, agent John Dease lent his visitor a canoe and crew of paddlers, who whisked the visitor down the Columbia in early June. Douglas continued to pile up collections as the boat paused at Fort Okanogan and Rock Island



White sand verbena (*Abronia mellifera*) often grows in a rather loose, sprawling fashion. Note the flowers are in umbels. PHOTO: BEN LEGLER



The Columbia Plateau explored by Douglas, showing his interior travels of 1826, along with most of the tribes he interacted with. MAP DRAWN BY EMILY NISBET

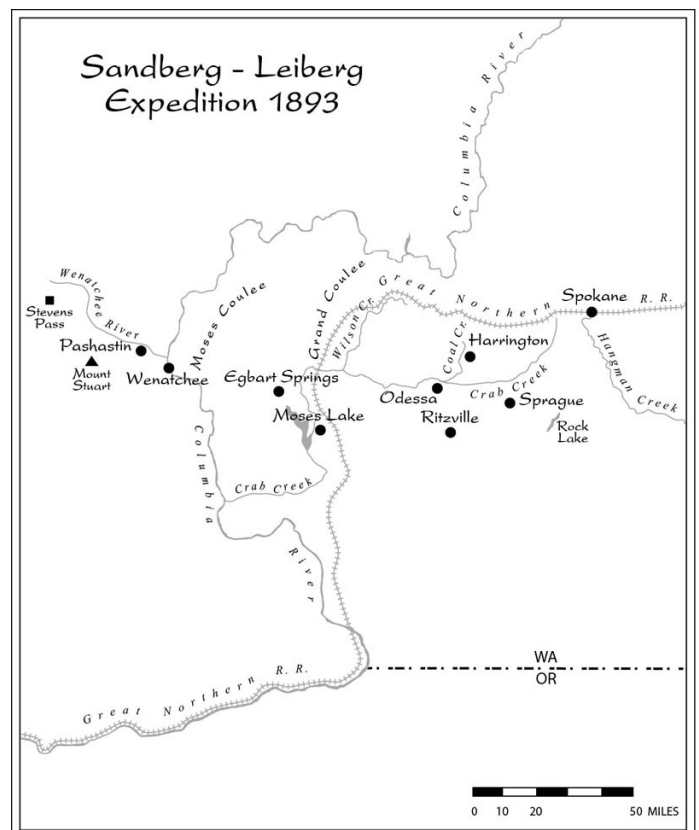
In Hooker's classic *Flora Boreali-americana*, Douglas remarked that he had found the sand verbena to be "abundant throughout the dry sandy deserts of the Interior."

Following his usual practice, Douglas also sent back viable seeds from his discovery, so that nurserymen could experience the results for themselves. As soon as they had one season of tenuous sprouts to show for their efforts, *Curtis's Botanical Magazine*, which served as a catalog for enthusiasts, published a description under the common name of Honey-smelling Abronia, "The blossoms have a powerful honey-like smell in the evening," declared the author. "By Mr. Douglas it was introduced into the garden of the Horticultural Society, where it flowered in the summer of 1828. At present it is very rare: but being easy of cultivation, and thriving luxuriantly in sandy peat, it may be expected soon to form a valuable addition to our flowering borders." A handsome color plate (see illustration on previous page), executed by Hooker himself, accompanied the article. The future director of Kew Gardens pictured the plant in bud, flower, fruit, and seed. He emphasized the distinctive five-winged fruits, which when sliced in cross-section look like delicate dancing stars.

Other botanists who skirted the Columbia Basin during the first half of the nineteenth century, including Lewis and Clark, Harvard's Thomas Nuttall, and the German Karl Geyer, missed the blooms of the sand verbena that Douglas found so abun-

dant. Three decades after it appeared in *Curtis's Botanical Magazine*, naturalist J. G. Cooper encountered the sand verbena on a single occasion while surveying a proposed trans-Pacific railroad route across Washington Territory. "Collected in flower on the sandy desert south of the Columbia, near Walla-Walla, and noticed nowhere else," wrote Cooper of his find. The date he recorded was an eyebrow-raising November 12, confirming that the dune dweller could handle all the severe weather the Basin had to offer.

Over the next half-century, collecting botanists who filtered into eastern Washington's shrub-steppe confirmed David Douglas's observations. An anonymous contributor picked sand verbena out of a sand bank at Celilo Falls in 1880. Wilhelm Suksdorf found it near White Bluffs in mid-summer of 1884 and across from the Dalles in Klickitat County not long after that. Louis Henderson grabbed specimens from drifting sand along the Columbia and in dry, sandy fields near the Yakima Valley.



The 1893 Sandberg-Leiberg Expedition wound its way from Spokane west to Stevens Pass, collecting plants at many familiar Columbia Plateau locations along the way. MAP DRAWN BY JOE GUARISCO



The individual flowers of white sand verberna (*Abronia mellifera*). Note the long, narrow tubes that form the majority of each flower's overall length. PHOTO: BEN LEGLER

Then in 1893, John B. Leiberger, a Swedish immigrant based in Idaho's Lake Pend Oreille, and J. S. Sandberg, a collector and fellow Swede from Minnesota, signed on for a US Department of Agriculture plant survey meant to take a more careful measure of the region. Their assignment was to determine the eastern and western boundaries of the subarid, treeless portion of the Columbia Plain (also called the Columbia Basin or Columbia Plateau) and to make as nearly as possible a complete botanical collection along the way. In order to accomplish that, the pair wrangled two horses and a farm wagon from Spokane west to Stevens Pass between May and early September.

As the team worked their way toward Wenatchee in mid-July, Leiberger collected David Douglas's honey-scented sand verberna in sand dunes at the mouth of Moses Coulee and again near a camp they made on Rock Island. Even as he pressed these specimens, he noted an unusual cultural connection that he later explained in a letter to a friend. "I found on our trip this summer 'kitchen middens' in the Columbia valley with all the old litter accompanying them," he wrote, referring to numerous archaeological sites and disused tribal campgrounds that he had rolled past in his wagon. "On and around them, noteworthy in a botanical way, grew an *Abronia* which seemed to have been introduced by these ancient dwellers purposely or otherwise and spread from their old camping grounds."

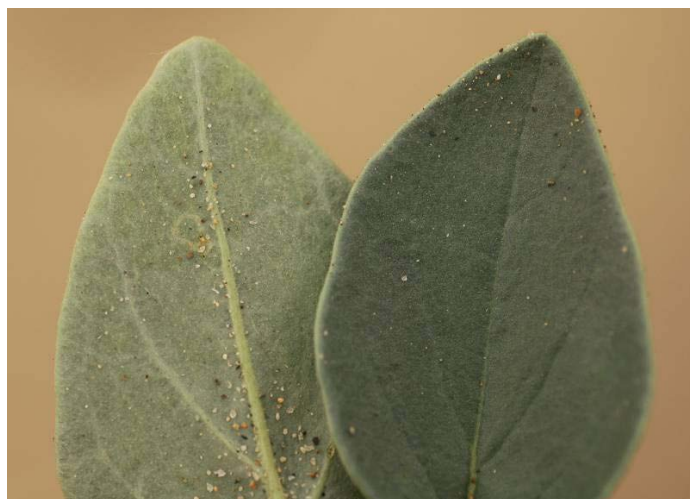
This slight human connection, which Leiberger did not mention in either his daybook or his expedition report, begs for some explanation. Was it by mere chance or direct intention that the sand verberna thrived around the ancient campsites? Did people encourage it to grow around them simply to enjoy its pleasant smell in the evening? Could the fleshy leaves have provided ticking for bedclothes? Were some aspects of the sand verberna employed for medicinal uses? Or could there have been a deeper bond between plant and people that has drifted away with the years?

The showier prairie snowball (*Abronia fragrans*) is a native white sand verberna with an even stronger fragrance. Its range is centered in the Southwest but extends in odd leaps east to

Texas and north all the way to Montana. Southwest peoples continue to use all parts of the plant for an astonishing variety of purposes that include foods, medicines, perfumes, lotions, decorations, and spiritual aids. A look at the disjunct county range maps on the USDA Plant Profiles website at least raises the possibility that human cultivation might have extended its territory.

John Leiberger was a man of his time as far as the tribes were concerned, perfectly capable of ignoring their presence around his lakeside homestead and at first dismissive of their skill at living in a difficult country. But as time went on, he learned to pay attention to their actions, writing a descriptive paper about Lake Pend Oreille petroglyphs, sending a pair of folded cedar bark baskets back to a friend in Washington DC, and trading for an assortment of edible and medicinal plants whenever he crossed paths with people on their annual rounds.

During a pair of later plant surveys around southern Oregon's Klamath Lake, he watched women gather the seeds of yellow pond lily and roast them until they cracked like corn before pounding them into flour that formed a dietary staple. When a colleague Leiberger traveled with in 1896 compiled a Klamath ethnobotany that topped 90 species, he was suitably impressed. "Your list is much larger than I thought would be the case. It should be a most valuable addition to our knowledge of the aboriginal tribes," Leiberger wrote in admiration. "If a botanist could spend a year, at least, at each of the Indian agencies west of the Missouri, what a vast fund of interesting information could be obtained." Indeed. And if Leiberger had asked people he met about the sand verberna growing around old campsites in the Columbia Basin, we might understand a tiny bit more about the landscape today.



The upper and lower leaf surfaces of white sand verberna (*Abronia mellifera*). Note how the glandular-pubescent hairs trap particles of sand from the plant's growing environment. PHOTO: BEN LEGLER

Sand verberna collections taken during the early twentieth century cover a broad swath across the region. Some herbarium specimens seem to follow the Columbia upstream from Hood River to Wallula Gap and White Bluffs; others track Ice Age Flood routes from Spokane County through Cow Creek along

the Cheney-Palouse Scablands to Lyons Ferry on the Snake River. The word “sand” occurs on almost every collection sheet, but over time the dune systems that played across the shrub-steppe have gradually disappeared, taking with them an entire suite of plants tied to that constantly shifting habitat.

Today sand verbena hangs on wherever it can, in places like Juniper Dunes National Monument and the extensive dune system tucked into the central portion of the Hanford Nuclear Reservation. Almost all of Washington’s twenty-first century herbarium specimens have come from the stretch of the Columbia running from Vantage downstream past the mouth of Crab Creek to the Priest Rapids site where David Douglas collected them. Most regional plant books give its common name as white sand verbena, and as far as I can tell it does not appear on any modern ethnobotanical list. To place this species in a slightly different light, it seems like the least a modern traveler can do is to pause in the evening for a deep whiff of the air whenever there are dunes on the horizon, and to call it by something closer to the name Douglas preferred: honey-scented sand verbena.

Jack Nisbet is a Spokane-based writer whose books include an award-winning biography of David Douglas. His newest title, The Dreamer and the Doctor, traces the unlikely journeys of John Leiberger and his physician wife Carrie.



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There are many other ways you can make a charitable gift through estate planning—consult your lawyer or financial planner. For more information, call the WNPS office: 206-527-3210.

Learn all the ways you can support WNPS: www.wnps.org/donate

A New Tool in Conservation of Prairies and Other Plant Communities: Plant-Pollinator Network Science

A new approach explores the effects of restoration by looking at interactions between plants and pollinating insects

by Susan M. Waters, PhD, Center for Natural Lands Management

The beautiful glacial outwash prairies of South Puget Sound are among the rarest ecosystems in the United States. Their charismatic spring bloom and the rarity of some of the species they support have made remaining prairie fragments the focus of many conservation and management efforts. Some efforts have been very successful: restoration is increasing native plant diversity on multiple preserves, and plants that were once rare can now be found in abundance in some places.

But as we continue to learn more about community ecology, there may be new ways to evaluate the success of restoration beyond enumerating plant species and their persistence. Specifically, there is increasing interest in understanding how

ecological communities are structured and how the many interactions between community members (predator and prey, pollinator and pollinated, pathogen and host) affect a community's resilience and the context within which individual species interact. In the South Sound, we are using an analytical tool called network science to explore such community structures and their application to restoration and conservation.

Restoration of South Puget Sound Prairies

Agriculture, development, fire suppression, and invasion have taken a heavy toll on our prairies, and at last estimate only about 3 percent of their original extent remains functional native prairie (Crawford and Hall 1997). In recent years, conservation science practitioners, land managers, and native plant lovers have painstakingly developed and implemented techniques to restore these prairies. First, volunteers and botanists collect native seed from a few extant populations, and native seed farms amplify the amount of seed by growing it out and harvesting more. Meanwhile, land managers prepare sites by removing non-native plants and returning the historically common ecological disturbance of fire through prescribed burning. Eventually, they sow in native seed or plant seedlings. The process is iterative and ongoing.

These years of restoration have led to a visually glorious uptick in native floral diversity. (If you haven't been to Glacial Heritage Preserve—or even if you haven't been in the past 5



The restored prairie at Glacial Heritage Preserve hosts diverse native plants. PHOTO: SUSAN WATERS

insect that contacted a floral reproductive organ. Then we used information about the visitors to each plant to construct and analyze plant-pollinator networks.

Insights in Restoration

As expected, sites with more years of restoration actions had higher floral diversity overall, as well as higher native floral



A queen California bumble bee (*Bombus californicus*) visits harsh paintbrush (*Castilleja hispida*) at Tenalquot Prairie Preserve. PHOTO: ZACH SCOTT

diversity. Happily, pollinator diversity generally increased with floral diversity. Even more interestingly, the *composition* of pollinators also changed with restoration: flies dominated at low-restoration sites, while more bee groups were represented at higher-restoration sites.

In addition to changes in diversity and composition, we also saw changes in network structure—that is, how plants and pollinators were interconnected—in response to restoration. Several of those changes were interesting. First, we found that both pollinators and plants were more specialized at more-restored sites in terms of their interactions: they had fewer partners on average. That suggests a hypothesis that plants might be better pollinated at highly restored sites, since it increases the chances that a given pollinator arrives bearing pollen from the same plant species as the one it's visiting. Second, we found that some metrics tentatively associated with “resilience” (Tylianakis et al. 2010) increased as restoration progressed. Finally, we found that notorious non-native plants played very different roles in restored versus unrestored sites, showing up as “hubs” that supported many types of pollinators in unrestored sites but becoming much more peripheral in sites that were more florally diverse.

Insights in Species Conservation

In terms of conservation of individual species, we were most interested in two plants, golden paintbrush (*Castilleja levisecta*) and harsh paintbrush (*C. hispida*). These are two of the three perennial native host plants for a federally endangered butterfly, Taylor's checkerspot (*Euphydryas editha taylori*), that inhabits South Puget Sound prairies. (The third is the non-native lance-leaved plantain, *Plantago lanceolata*). They are called “host plants” because they host the eggs and larvae of the butterfly. Taylor's checkerspot adults will only lay eggs on these host plants, and their larvae must feed on these host plants to gain

defensive chemicals that make them toxic to their predators (Kuussaari 2004). Having these plants in Taylor's checkerspot habitat is an important part of recovering the butterfly, because without them, the adult butterfly is unlikely to lay eggs, and the larvae, if hatched, will starve. Consequently, both plants are of conservation concern because of the butterfly. In addition, golden paintbrush is itself listed as federally threatened. Both golden and harsh paintbrush have been restored to prairie preserves, and we wanted to know how they were connected to pollinators and other plants.

We found that both paintbrush species were mostly visited by bumble bees. Both species had low rates of visitation and a low diversity of visitors compared to other species, such as camas. Harsh paintbrush, in particular, was very little visited. We know from other projects that both paintbrushes require pollinator visits to produce seed, raising the question of whether the harsh paintbrush is successfully reproducing in the restoration sites.

Using networks allowed us to detect indirect interactions between plants via their pollinators. For example, at one preserve, we observed only two pollinator species visiting golden paintbrush all season. One pollinator, the California bumble bee (*Bombus californicus*), was only observed nectaring on one other plant besides the paintbrush. What was the plant? A later-blooming forb, heal-all (*Prunella vulgaris* var. *lanceolata*). This is a great example of an “invisible” indirect interaction between plants, mediated by a pollinator, which is probably positive for both plants. Since the two plants never bloomed simultaneously at this site, the heal-all wasn't competing with the golden paintbrush for pollinator attention. On the contrary, the heal-all provided nectar to support the bumble bee later in the season, without which the bumble bee population visiting golden paintbrush the following year could be diminished.

Once we realized how important bumble bees were to the two paintbrushes, we used networks to crudely simulate what might happen if we were to have a year when there was low or no bumble bee activity: we simply rebuilt the networks leaving out the bumble bees. (This exercise comes with big caveats,



A leafcutter bee visits cutleaf silverpuffs (*Microseris laciniata*) at Glacial Heritage Preserve. PHOTO: ZACH SCOTT

because it makes the unwarranted assumption that other pollinators will visit the same flowers regardless of whether or not bumble bees are there as possible competitors. While that almost certainly isn't true, it allows us to explore a hypothetical worst-case scenario, that is, no compensation by other pollinators for the bumble bee loss.) We saw that the loss of bumble bees would indeed lead to losing some plants at some preserves—specifically, golden and harsh paintbrush, the very plants we're interested in! While we aren't expecting to lose bumble bees any time soon, this allows us to be especially tuned in to the fact that bumble bees are really important for the native paintbrushes. Since the paintbrushes themselves are very important to Taylor's checkerspot butterfly, we find that caring about butterflies means caring about plants means caring about bees.

We look forward to exploring plant communities of all kinds using this new analytical tool. In 2018, we used this approach at several new sites, including a large Portland landfill undergoing restoration. We hope insights from networks can help develop important conservation questions that may not have been considered previously and lead to new studies that help us understand the plants, pollinators, and ecological communities we love.

Susan Waters is the rare species ecologist at the Center for Natural Lands Management in Olympia, Washington. Her research focuses on how prairies and their rare species respond to restoration.

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- Research described in this article was supported by the Washington Fish and Wildlife office of the US Fish and Wildlife Service (USFWS) under award number F16AC00696. Special thanks to Ted Thomas of USFWS for support of this project. The views and conclusions contained in the document are those of the authors and should not be interpreted as representing the opinions or policies of the US Government.

Washington Native Plant Society Research and Inventory Committee

Solicitation for Grant Proposals

The Research and Inventory Committee is soliciting proposals that advance the aims of the Washington Native Plant Society—"projects that extend our knowledge of the biology of native species or that inventory the flora of an understudied area, which help to conserve native plants. Special consideration will be given to proposals investigating the oak or shrub-steppe ecosystems, or invasive species. Another priority is to support research efforts of graduate students and to help develop the careers of botanists with interests in native plants."

To receive full consideration, proposals should be submitted by January 15 of each year. Proposals should request no more than \$1,000 to \$1,500 except in unusual circumstances. The committee will review the proposals and a decision will be made after the first round of awards. In general, half of an award is paid when the proposal is funded and the second half is paid when the project has been completed and a final report has been submitted.

Proposals should be about 4 to 8 pages in length and should include the following information:

- **Introduction.** Objectives and significance of the proposed research.
- **Methods.** A brief description of study areas, species, techniques, data collection, and analysis.
- **Timetable.** In general, research and reports should be completed with 2 years
- **Budget.** Personnel, equipment, and supply costs
- **Products.** What will result from the proposed research? We expect, at minimum, a project report and a brief account for publication in *Douglasia*, the journal of the society.
- **Curriculum vitae** of all project personnel.

Members of the Research and Inventory Committee will rate the proposal based on (1) appropriateness of the project to the aims of WNPS, (2) adequacy of proposed methods to the project's aims, (3) researcher's experience in the types of research proposed, and (4) importance of the research in relation to the funds requested.

For consideration, please submit an electronic copy of your proposal to Pamela Camp, chair: pacamp@nwi.net

SUBMISSION DEADLINE: January 15, 2019

Become a First Detector and Report Invasive Species

by the Washington Invasive Species Council

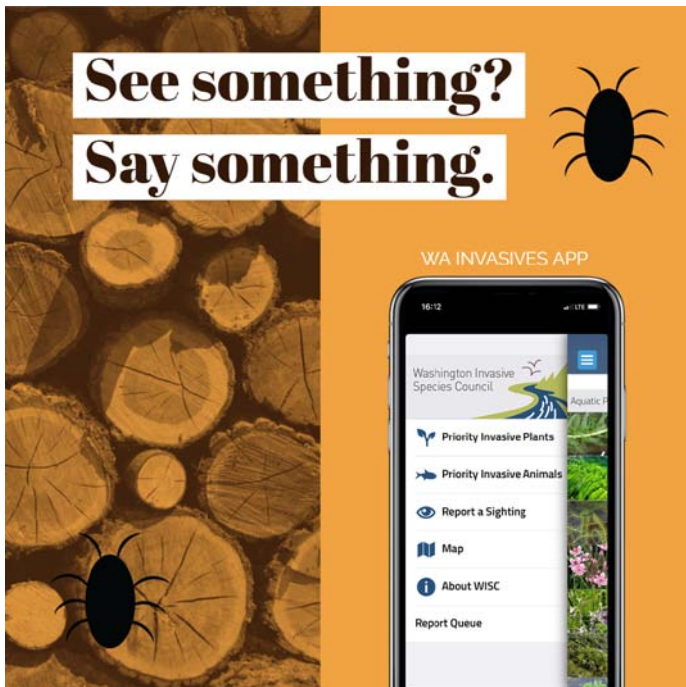


PHOTO: WASHINGTON INVASIVE SPECIES COUNCIL

To help combat the \$1.3 billion threat invasive species pose to Washington State's economy every year, the Washington Invasive Species Council is inviting Washington Native Plant Society members to the frontlines of its work to detect invasive species by reporting occurrences on the newly improved WA Invasives app.

This free app enables anyone to report a plant or animal by collecting photographs, geographic coordinates, and sighting information. Users can also collect data offline, when cellular

service isn't available, such as when recreating in the backcountry. The app also acts as a digital field guide.

"Invasive species damage land and waterways, harm local economies, ruins crops, weaken roads and other infrastructure, limit recreation, and harm human health and wildlife," said Justin Bush, executive coordinator of the Washington Invasive Species Council. "Left unmanaged, they will change the very way of life and the availability of experiences and resources critical to life in Washington State."

The Washington Invasive Species Council, researchers, and land managers are asking for help in preventing these damages by providing a tool for the public to use to identify and report invasive species they find.

"You don't have to be a biologist, entomologist, pathologist, or botanist to help us detect invasive species," said Bush. "Simply be aware of your surroundings. Learn the signs and symptoms of invasive species, and then snap a photo and report anything you suspect might be a problem."

"Our research has shown that an educated and alert public have found and reported 33 of all the new invasive insect pests recorded in Washington State over the last twenty-five years," said Todd Murray, agriculture and natural resources unit director with Washington State University Extension.

In 2016 entomologists from the Washington State Department of Agriculture and Washington State University published an article in *The American Entomologist* that retold the story of how each new insect pest was discovered in Washington State.

"What we found was that participants in invasive species education and outreach programs were significant contributors to all the new detections and reports of new invasive insects. Citizen science really works," Murray said.

In managing invasive species, the council's first priority is to prevent species from being introduced or spreading further within Washington. Early detection is the key to success.



Feral swine (*Sus scrofa*). PHOTO: US DEPARTMENT OF AGRICULTURE

Feral swine (*Sus scrofa*) (https://invasivespecies.wa.gov/priorities/feral_swine.shtml) and scarlet lily leaf beetle (*Lilioceris lili*) (https://invasivespecies.wa.gov/priorities/scarlet_lily_beetle.shtml) are two invasive species that will have significant impacts to native plants in Washington if not stopped. Happily, both problematic species are not yet widespread across Washington—but state managers need help to keep it that way.

Feral swine, whether descended from European boar or feral domestic pigs gone wild, threaten shorelines and wetlands and degrade water quality, harming other wildlife and the state's investment in habitat restoration. Feral swine's digging and rooting also threaten crops such as potatoes, grapes, pears, apples, cherries, hay, wheat, grain, and hops. The value of potentially affected crops and livestock in Washington State is \$8.5 billion, which does not include the economic values of native plants on natural lands.

In addition to these risks, feral swine can carry more than 30 diseases and parasites, posing a risk to livestock, pets, wildlife, and even people. Feral swine can contaminate livestock feed, and in some cases, even prey upon small livestock and wildlife.



Scarlet lily leaf beetle (*Lilioceris lili*). PHOTO: WASHINGTON STATE UNIVERSITY

Another threat to Washington may be less charismatic, but presents a big risk to industry and native plants. The scarlet lily beetle is a bright red beetle native to Europe and Eurasia that has now been found in the Puget Sound region of Washington State.

Scarlet lily beetle is a pest to lily species and threatens native lilies here in Washington. The lily beetle can complete its life cycle on true lilies (*Lilium* spp.) and fritillaries (*Fritillaria* spp.).

Download the App

To play an active role in protecting Washington's economy and natural resources from invasive species, download the WA Invasives app today.



Apple iOS version: <https://itunes.apple.com/us/app/wa-invasives/id826772026?ls=1&mt=8>

Android version: <https://play.google.com/store/apps/details?id=com.bugwood.wainvasives>

“Being alert to new species and recognizing the signs of impacts of invasive species is step one,” said Greg Haubrich, state noxious weed control coordinator with the Washington State Department of Agriculture. “The second step is reporting what is being seen, to trigger a rapid response when management costs are low and complete eradication can be achieved.”

To find opportunities for additional trainings in invasive plants, animals, insects, pathogens, and first-detector resources, visit the Washington Pest Watch web page (https://invasivespecies.wa.gov/council_projects/wapestwatch.shtml), which features educational posters, brochures, webinar recordings, and trainer presentations.

The council, established by the Washington State Legislature in 2006, provides policy-level direction, planning, and coordination for combating harmful invasive species throughout the state and preventing the introduction of others that may be potentially harmful. Learn more about the council on its website: https://invasivespecies.wa.gov/priorities/feral_swine.shtml.



Fairy slippers (*Calypso bulbosa*) at Washington Park in Anacortes might be seen during the 2019 Study Weekend (top photo), and Pacific rhododendron (*Rhododendron macrophyllum*) should be plentiful (bottom photo). For more information on the 2019 Study Weekend, please refer to page 23. PHOTOS: BARBARA KIVER

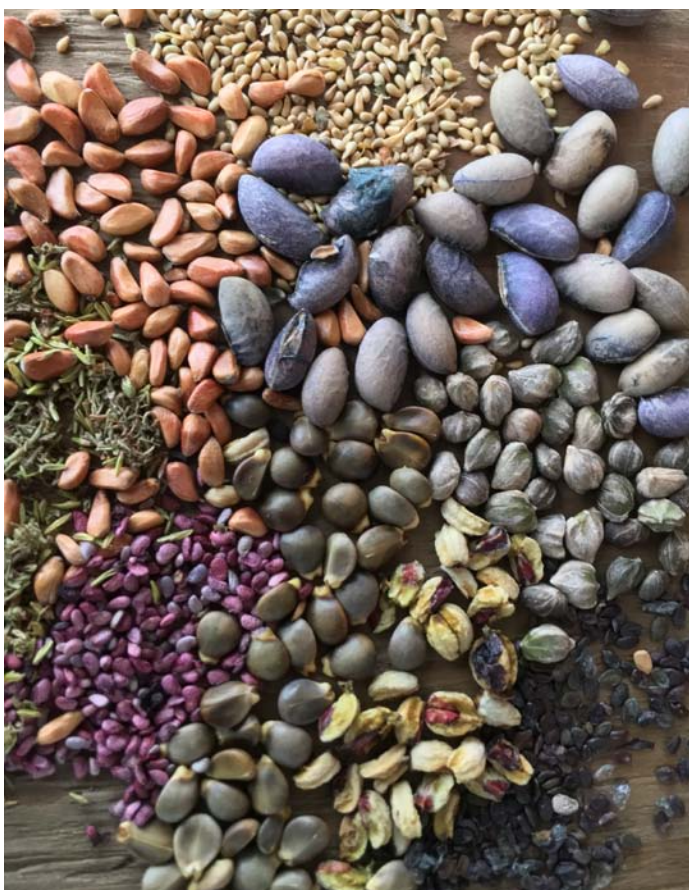
Growing Natives from Seed: Simple Seed Propagation Methods for Native Plants

Part 3: Seed Dormancy and How to Overcome It

by Bridget McNassar

I can't help but think of William Blake's invitation that we "see a world in a grain of sand" when I consider the beautiful and complex world that lies within a seed. Hidden from view in each of these seemingly lifeless bits waits a living embryonic plant and most of the materials it needs to grow into a seedling, able to survive years until the proper moment to begin its magical transformation. When the time is right, water entering the seed rehydrates the living cells inside and sets off a chain of chemical changes, starting with the breakdown of stored nutrients and the synthesis of new materials so plant growth can begin. The work of facilitating the process of germination is fascinating and both endlessly satisfying and frustrating.

Along with the great amount of plant diversity existing on earth comes a great diversity of germination mechanisms: each of these little seed-worlds is a bit different inside and will go through a somewhat different process to transform into a germinated seedling.



Along with the diversity that exists in seed size and shape, the germination process and timeline can vary quite a bit from species to species. PHOTO: BRIDGET MCNASSAR

What Is Seed Dormancy?

The first step in starting your favorite native from seed is learning what you can about any dormancy it may have.

Seed dormancy is a sort of suspended animation state for plants, a physiological condition in which some force in the tiny seed world is preventing it from germinating, even in ideal conditions. Dormancy evolved as a way to prevent seeds from germinating at inopportune times (such as the middle of winter or during summer drought conditions) and is one of the secrets to seed plants' success on earth. But, as propagators, we want our seeds to germinate when we want them to germinate! In order to accomplish this, we need to know how to overcome dormancies.



A small tray lined with sandpaper along with a handheld sander can be used to gently scarify seeds with external dormancy to prepare them to take up water. PHOTO: BRIDGET MCNASSAR

Dealing with External Dormancy

All seeds have a protective covering; in some species this outer coat is what keeps a seed dormant, a condition referred to as external dormancy. The seed coat prevents water and gases from moving into the seed, and germination can't begin. In such a case, a treatment called scarification is in order, which involves breaking or weakening the seed coat so that water can enter. This can happen naturally in extreme temperatures or fire, or by the seed traveling through an animal's digestive system.

Some examples of species that I scarify before sowing are salmonberry (*Rubus spectabilis*), red elderberry (*Sambucus racemosa*), and lupines (*Lupinus* spp.). An easy method we use to scarify small amounts of seed in the nursery at Oxbow Farm & Conservation Center is to place them in a small box lined with sandpaper and lightly rub them with another piece of sandpaper. I recommend looking at your seeds first with a hand lens, rubbing a little bit with sandpaper, and then looking again to ensure that you are rubbing away some of the seed coat, but not destroying the seeds. An alternate method, which we use for mountain balm (*Ceanothus velutinus*), involves soaking seed briefly in hot water.

Dealing with Internal Dormancy

Many times, even if water can enter a seed easily, germination is prevented by something deep down inside the seed-world. This kind of dormancy is referred to as internal dormancy, and includes the morphological and physiological subgroups. Morphological dormancy generally happens because the tiny embryo inside the seed is not fully developed and needs more time to grow inside the seed before it is ready to germinate. In physiological dormancy, there are chemical inhibitors present inside the seed that need to be inactivated or overcome in order for germination to begin.

In the Pacific Northwest, a large proportion of our species have seeds that exhibit physiological dormancy, and they need a cold, moist period in which to overcome those inner chemicals preventing germination. If you think about it, this makes sense; it is the seed's way of assuring that it doesn't germinate until after winter is over. Many of our local species need somewhere between 30 to 90 days of this cold treatment.

You can give your seeds a cold, moist period in a few simple ways at home, a process called stratification. First, you'll need to get your seeds wet by soaking them for a few hours or overnight. Once soaked, keep the seeds moist by mixing them with a small amount of inert moist media (vermiculite, perlite, sand, or peat all work well; just make sure they are moist, but not dripping wet) and keep them in a zip-top bag in the fridge for the required number of days before bringing them out to sow. Be sure to label the bag with the species and the start-and-end dates. Alternatively, you can use a moist (but not dripping) paper towel. Fold your seeds up inside of it, and then place the

paper towel in a zip-top bag in the fridge. In either case, check the seeds once every couple of weeks to make sure they are still moist and not germinating. You can bring them out to sow once they have been stratified for the required number of days or if you see them germinating earlier.

At Oxbow, we place our seeds in mesh paint-strainer bags (found at the hardware store), soak them overnight, and then layer the bags of seed in buckets of moist peat moss in a refrigerator. Keep in mind that you'll need to determine when you'd like to sow your seeds, and then work backward to the date to start the treatment. For example, if I want to sow in March and my seeds need 90 days of moisture and cold, I'll need to start the stratification process in December.

You can also simply sow your seeds in containers in the fall and leave them outside, but keep them protected from animals and extreme weather (an unheated greenhouse or next to a building under the eaves both work well). As long as the seeds stay moist, they should get their cold treatment naturally over winter and germinate in the spring. It is a little more difficult to keep track of what is going on with your seeds with this method, but it is definitely less fussy.

See the resources listed below to find information about dormancy type and stratification recommendations for some native Washington species. As you try things, keep good records. You'll want to remember exactly what you did, both for germination successes and failures.

In Part 4, we'll talk about some more specialized dormancy situations and what to do when the dormancy type is unknown for the species you want to grow.

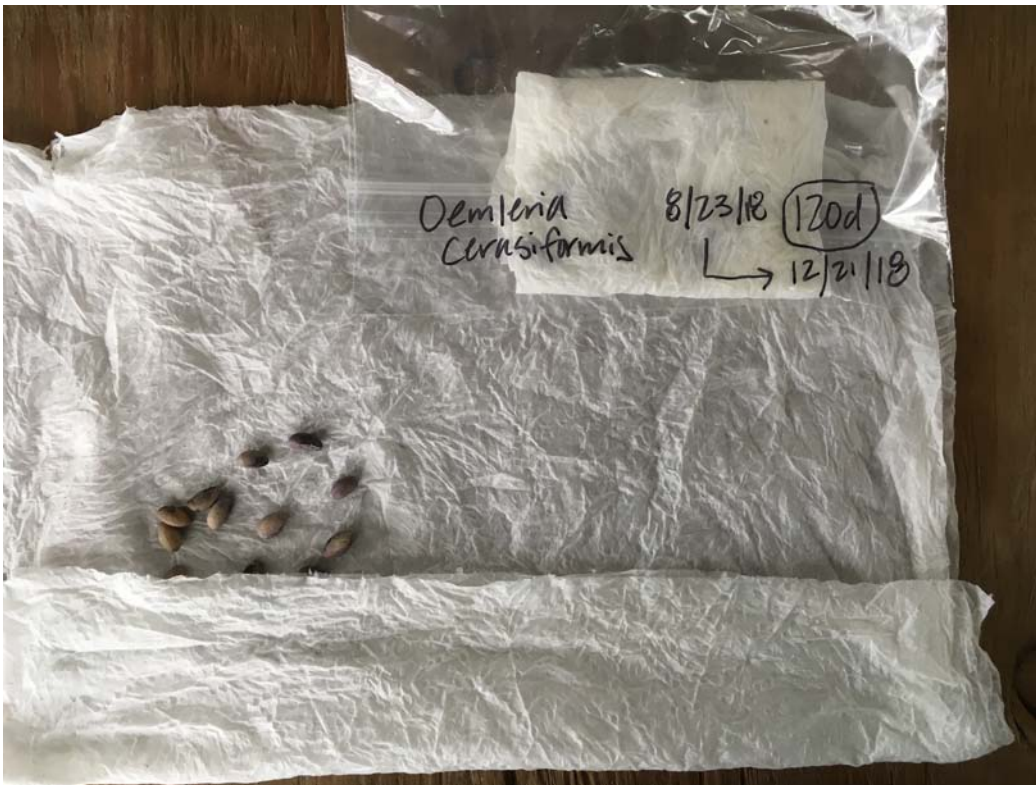
Resources

Suggestions for dormancy breaking for specific plant species:

Cullina, William. 2000. *The New England Wildflower Society Guide to Growing and Propagating Wildflowers of the United States and Canada*. Boston: Houghton Mifflin.

Native Plant Network. US Department of Agriculture, Forest Service, National Center for Reforestation, Nurseries, and Genetic Resources. "Propagation Protocols" database, accessed August 29, 2018. <https://npn.rngr.net/propagation/protocols>

Propagation Successes, Failures, and Lessons Learned, by Jeanie Taylor, former horticulturalist for Seattle Parks. Available online: <https://rng.org>.



The paper towel method of cold stratification: seeds can be wrapped in a damp paper towel, enclosed in a plastic bag, and kept in the fridge for the necessary length of time to overcome dormancy. PHOTO:

BRIDGET MCNASSAR

net/publications/propagation-and-restoration-strategies/propagation-successes-failures-and-lessons-learned

Seed Germination Information page from Klamath Siskiyou Seeds. Contains many Pacific Northwest species. Available online: <http://klamathsiskiyouseeds.com/wp-content/uploads/2018/04/KSNS-Seed-Germination-Information-Modified.pdf>

More information about seed dormancy and treatment methods:

Bonner, F., and R. Karrfalt (eds). 2008. *The Woody Plant Seed Manual*. Agriculture Handbook 727. Washington, DC: US Department of Agriculture, Forest Service. Available online: <https://rngr.net/publications/wpsm>

Luna, T., K.M. Wilkinson, and R.K. Dumroese. 2009. Pages 133–151 in Dumroese, R.K., T. Luna, and T.D. Landis (eds.), 8: Seed Germination and Sowing Options. (Nursery Manual for Native Plants: A Guide for Tribal Nurseries - Volume 1: Nursery Management. Agriculture Handbook 730. Washington, D.C.: U.S. Department of Agriculture, Forest Service. Available online: <https://rngr.net/publications/tribal-nursery-manual>

Royal Holloway University of London. Website Gerhard Leubner Lab. "The Seed Biology Place" Accessed August 15, 2018. <http://www.seedbiology.de/index.html>

Bridget McNassar is the manager of the native plant nursery at Oxbow Farm & Conservation Center (www.oxbow.org) in Carnation, WA. You can contact her at bridget@oxbow.org.



Assessment

by J. Dan Paquette

The trees are the view.
Cones and needles of full-blown hemlocks
intermittently scrub the pane.

The trees are the sound.
They're rushing towards us through the pasture.
Air imposes on both twig and foliage.

The trees are the shadows.
The street light moves maples onto the porch.
The leaves laugh easily on the walls.

On the earth's reserves, the trees go easy.
Sunlight, a few nutrients, water, CO₂ . . .
You might assess the virtues of *your* species.

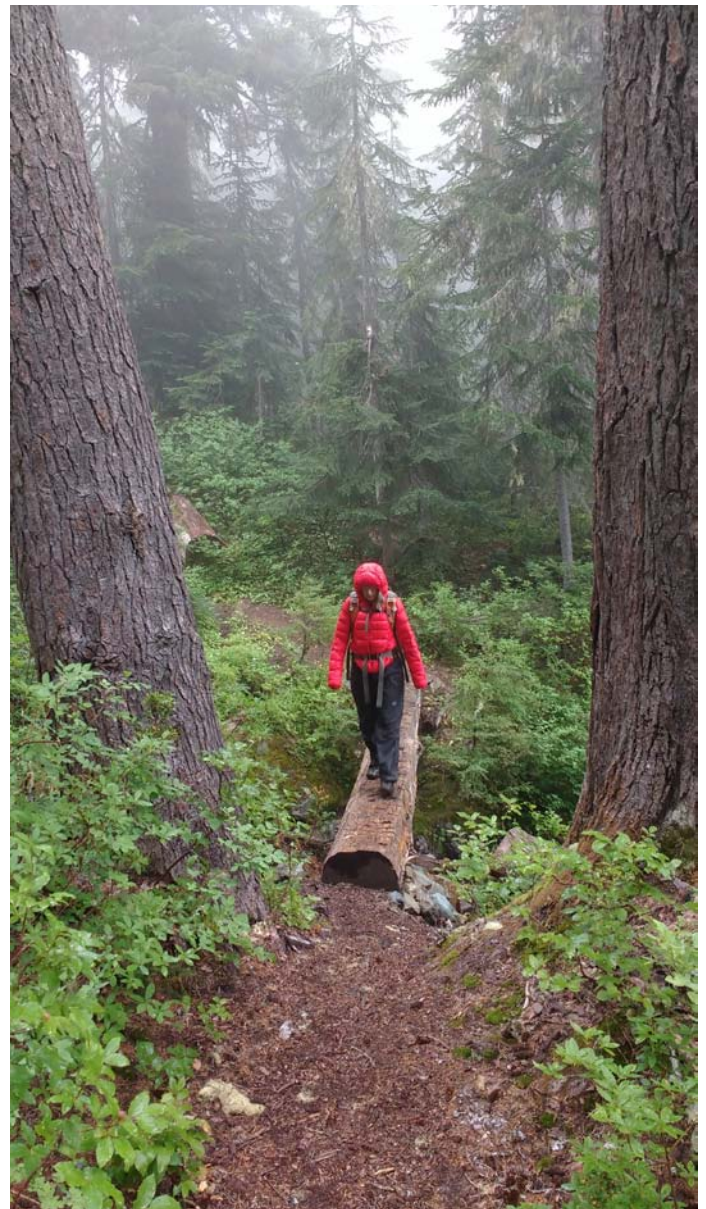
Dan Paquette is a member of the Okanogan Chapter and also the current chair of the Central Puget Sound Chapter. Much of his poetry can be found in the book Litany of the Plants authored under the pen name "J. Dan Paquette."

Places to Go

Alone In a Crowd: Experiencing Mount Rainier's Ancient Forests

by David Giblin, University of Washington Herbarium, Burke Museum of Natural History and Culture

Most of the articles in the Places to Go series direct readers to destinations rich in wildflowers and often with a commanding view of the surrounding landscape. Those are my favorite destinations, which explains my bias in recommendations. However, over the past year or so I have done two forest walks at Mount Rainier National Park that left an enduring impression on me due to the subtle pleasures that come from walking nearly in solitude in woodlands untouched by the hands of humans.



Julie Monahan crossing a small creek intersecting the Eastside Trail.
PHOTO: DAVID GIBLIN

Mount Rainier National Park was established in 1899 as the country's fifth national park. Notably, none of the park's forests were commercially logged prior to establishment. I find this remarkable considering the expanse of gigantic trees that cover most of the park.

In my experience, a drive along the Stevens Canyon Road from Paradise to Ohanapecosh gives visitors the best feel for just how large and inaccessible Mount Rainier's forests are. Fortunately, there are a few trails along this route and nearby Highway 123 that allow entry into a sliver of these ancient woodlands.

The Stevens Canyon Trail starts just west of Box Canyon, which is about halfway between Paradise and the Ohanapecosh entrance. Box Canyon itself is a spectacular area, with cascading glacial meltwater and commanding views southward. The trail heads downward for a little less than a mile and a few hundred feet elevation loss before intersecting with the Wonderland Trail. From here it is a gentle upward walk along Stevens Creek under a tall forest canopy, past a few waterfalls, and occasionally coursing along the creek's clear waters (it drains snowfields rather than glaciers). The riparian zone is a mix of boulders and tall black cottonwood (*Populus trichocarpa*) trees, both of which can tolerate the violence of the spring runoff from the massive snowfields above. The occasional views of Stevens Canyon above and Mount Rainier further beyond are delightful. In all likelihood, you will have the place to yourself as my wife, Julie, and I did on a sunny, warm Saturday in early June when subalpine meadows were still covered in snow. It is best as an out-and-back hike.

Perhaps even less traversed is the Eastside Trail to Cayuse Pass accessed off Highway 123 from the Owyhigh Lakes trailhead. Once again, it's a short (0.4 miles) descent to a forested riparian zone (Deer Creek). A series of cascading waterfalls line the path downward. Once at the base of the valley you encounter the intersection with the Eastside Trail along with massive hemlocks (*Tsuga heterophylla*) and Douglas-firs (*Pseudotsuga menziesii*). Take a right here to head toward Cayuse Pass (3 miles one way).

The aura of the trail is a mix of primeval and timelessness; beneath some of the largest trees are piles of needles 4 to 5 feet tall that surely have accumulated literally over centuries. It is the kind of place that, as happened to us, you might find elk crashing through the forest because of the large gaps between the trees and the occasional avalanche chutes. As to encountering other people, it's not likely, and expect to crawl over, under, and around a few large tree trunks that have fallen over the trail during the past decade or so. To encounter such isolation in such a heavily visited park as Mount Rainier no doubt contributes to the experience. Note that because this trailhead is off Highway 123, you need to either pay entry into the park or have a Northwest Forest Pass.

Further details about the length of and elevation gains for each trail can be found on the Washington Trails Association



Waterfall along Owyhigh Lakes Trail on the way to the intersection with the Eastside Trail. PHOTO: DAVID GIBLIN

website (<https://www.wta.org/>). Both trails can be hiked from late spring (late-May) through early fall (mid-October), though snowfall in any given year can influence these times a bit. These are some of the best forests in Washington, so I hope that you get a chance to visit one or both.

David Giblin manages the University of Washington Herbarium at the Burke Museum of Natural History and Culture, where he studies the vascular plant flora of the Pacific Northwest. He is a regular contributor to Douglasia.



Protecting the Palouse on Bald Butte: A Short Timeline of a Single WNPS Conservation Action

by Becky Chaney, WNPS Conservation Committee Chair

The Palouse prairie, one of Washington's treasured habitats, is found in southeastern Washington and adjacent northern Idaho. It is characterized by soils that are formed of windblown sediment, known as loess, and protected by a cryptobiotic soil crust, a protective top layer that is made up of soil cyanobacteria, lichens, and mosses. The grasses, codominant shrubs, and forbs of the Palouse include both rare plants and uncommon plant associations. Although recognized as a critically endangered ecosystem, knowledge of the Palouse, and even its former or current extent, is limited.



Bald Butte is in the southeast corner of Washington. MAP: CREATED BY BECKY CHENEY USING US DEPARTMENT OF AGRICULTURE BASE MAP

An early description is elegant: "Traveling eastward from a point fifty miles west of the Idaho state line, one passes from a region of scab-land sagebrush through one of rolling hills covered with bunch-grasses. Upon steadily ascending the great Columbia Plateau, the bunchgrasses give way to well-developed prairies, and these in turn, near the Idaho line, to forests of yellow pine, Douglas fir, white fir, tamarack, and cedar." (Weaver 1917).

The following timeline was taken from a sampling of the emails received or sent over the course of just over a week—from the first message in my inbox to an ending letter of thanks. Ultimately, 12 WNPS leaders provided input that resulted in a positive resolution of the issue to potentially place a cell tower on the Palouse.

Thu 11/9/2017 5:07 PM I receive a forwarded email message from Mickie Chamness, cochair of the WNPS Columbia Basin Chapter. She has been communicating since the previous day with Marilyn Beckett, a resident of Moscow, Idaho. Marilyn has contacted the chapter over concern about a Whitman County Prairie remnant "that may be at risk."

The Whitman County Critical Area Ordinance mentions Palouse Prairie just one time, noting "the habitat known as Palouse Prairie fits within the definition of Eastside Steppe." Eastside Steppe is included in a list of Priority Habitats in Appendix 1. In this roundabout way Section 9.05B.020 of the Whitman County Code, requiring that designated critical areas shall be "managed consistent with best available science," applies to Palouse prairie and nominally ensures that the county meets the minimum requirements of Washington's Growth Management Act (Whitman 2017).

Thu 11/9/2017 5:55 PM Marilyn copies me on a letter further explaining the situation. She indicates that there is an ongoing effort to map Palouse prairie remnants but that until the mapping is complete the areas will not be recognized by the Whitman County planner's office. Alan Thomas, the county's planner, has already signed a Determination of Nonsignificance (DNS) stating an Environmental Impact Statement (EIS) is not required for the proposed construction of a cell tower on Bald Butte. Comments must be submitted by 5:00 p.m. on Thursday, November 16, 2017. WNPS has just under a week to prepare a comment.

The environmental checklist and maps are available. Weis Towers LLC is proposing to build a 299-foot cell tower and associated facilities on private land on the top of a hill above a wheat field, off of Becker Road, near Colton, Washington. The State Environmental Policy Act (SEPA) submission plant list indicates by omission that there are no trees, shrubs, or grasses on the site. A single check indicates other types of vegetation as present and "weeds" is penciled in to clarify. The applicant does not know of any threatened or endangered species or habitats on or near the site. However, the aerial map of the site location shows possibly undisturbed habitat (SEPA 2017).

Thu 11/9/2017 7:43 PM Mickie asks whether the WNPS Conservation Committee can help; she notes she has not seen the site. The primary community concern is light intrusion on a nearby observatory. There is nothing in the checklist to indicate that there is an environmental issue of concern to WNPS except the inconclusive aerial maps. There is Marilyn's assertion that the area is Palouse prairie. Marilyn, a self-proclaimed "product of the Palouse," is initiating a letter-writing campaign asking for an EIS and hopes WNPS will support this effort.

In order to efficiently gather information regarding issues brought to its attention, the WNPS Conservation Committee has developed a set of questions that make up an Information Sheet. Ideally, documentation begins as soon as an issue is identified. The Information Sheet consolidates information such as why the issue supports the WNPS mission, issue background, referrals to supporting documents, comment deadlines, stakeholders, and where to send communications. This information helps the Conservation Committee prioritize issues and ultimately accelerates the process. Marilyn is sent an Information



Bald Butte, Washington. Remaining areas of Palouse prairie are typically adjacent to farmlands. These remnants are potentially threatened when agriculture lands are rezoned to other uses. PHOTO: WASHINGTON NATURAL HERITAGE PROGRAM

Sheet template, she fills it out, and when it is returned we work on researching the gaps.

Sat 11/11/2017 12:24 AM I send the draft Information Sheet and the Bald Butte tower legal notice to the WNPS Conservation Committee. They will review them and let me know whether they agree this is an issue of concern to WNPS. If so, we'll work together to answer outstanding questions and to facilitate action on the issue.

Soon my inbox is filling with committee approvals to proceed and lists of questions. Within hours, Mike Marsh is writing to Joe Rocchio and Rex Crawford to see if the Washington Natural Heritage Program (WNHP) can provide additional information. Discussion about the site, prairies and plants, cell phone reception, observatories, light pollution, and SEPA and EIS flies back and forth across Washington State. Mike emails, "I learned about Palouse prairie as one of seven prairie types when I took grassland ecology at Berkeley in 1957." We are looking through studies and maps. Discussion continues at our monthly online meeting. Over 50 messages are exchanged during the week.

Mon 11/13/2017 10:06 AM Joe writes back letting us know that Palouse milk-vetch (*Astragalus arrectus*) (G2G4 S2) may be in the area. He remembers a roadside assessment done "many years ago" that indicated Bald Butte was a prairie remnant. He concludes that "aerial imagery and roadside views appear to support some areas of decent quality prairie." Joe sends a link to additional research material.

"An Assessment of the Ecological Characteristics and Ecological Integrity of the Palouse Prairie of Washington" ranks various sites, including Bald Butte, that are mapped in the Palouse Atlas, an earlier document compiled by Joseph Arnett and included as an appendix. It also includes a cover photo of Palouse prairie. The photo is of Bald Butte and contrasts the lower wheat with the upper prairie (Crawford and Rocchio 2011).

Palouse milk-vetch is an erect perennial of the pea family. Its page in *Field Guide to the Rare Plants of Washington* identifies it

as a regional endemic that is found in the Palouse and northern Columbia Basin regions of Washington and notes that its habitat has mostly been converted to agriculture. Occurrence dots on the map appear to converge in the area of Bald Butte (Camp and Gamon 2011). Even without a site visit, it is easy to think it may occur on Bald Butte.

The Palouse Atlas notes that portions of Bald Butte may support rare plants and rare/high-quality ecosystems (Arnett 2009). Evaluation of the privately owned area was collected from aerial photography and using roadside binocular surveys (Crawford and Rocchio 2011). An Ecologic Integrity Assessment (as developed by NatureServe and the Natural Heritage Network) was adapted to local conditions by the WNHP, and then used to assess the mapped Palouse prairie remnants appearing in the atlas.

The assessment ranks the overall ecologic condition of the identified remnants using assigned values for key ecological at-



Palouse milk-vetch (*Astragalus arrectus*), a regional endemic of the Lower Snake, Clearwater, and Palouse Rivers in Idaho, and the Palouse and northern Columbia Basin regions of Washington, is found on grassy hillsides such as Bald Butte. PHOTO: RHONDA SCHMIDT

tributes, including the ecological system, vegetation, hydrology, and soils. Bald Butte is identified as Columbia Basin Palouse prairie, a distinct ecological system. It receives a vegetation rank of B and a lower Ecologic Integrity Assessment of CD.

The study notes that when comparing across sites, as is done in this study, the rank of those that are designated Columbia Basin Palouse prairie typically trend low because of the pervasive impact of dryland agriculture. Because physical access to Bald Butte is limited, a full assessment is not available. It's speculated that an onsite inventory at Bald Butte would likely find that portions of the area qualify for designation as Palouse Prairie Ecologic System, and would thereby achieve the highest priority ecologic ranking (S1) available in the WNHP's database (Rocchio 2017).

At some point, I call the Whitman County planner to let him know WNPS is concerned and gathering information about whether the site might be Palouse prairie and preparing

to comment. He indicates this is how the system works; the county publishes the legal notice with the DNS and then a chance to comment is provided.

I prepare the WNPS comment letter. The letter notes that Bald Butte has a unique mix of native flora and scabland that may qualify for mapping as Palouse prairie and warrants consequent consideration under state law.

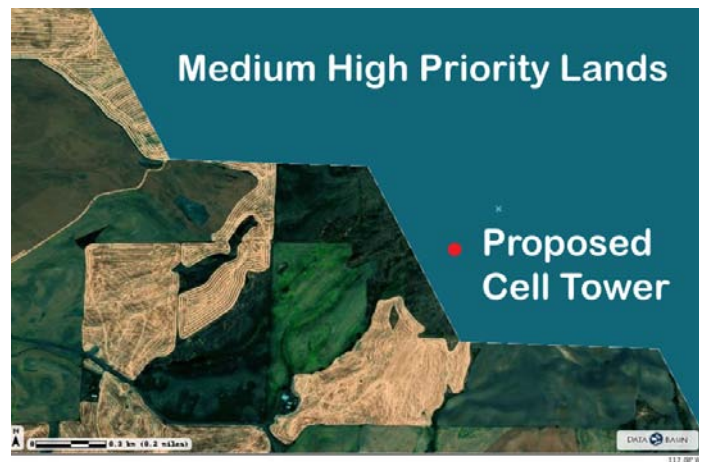
Mon 11/13/2017 7:57 PM Marilyn sends word that the county planner has hired a botanist to do an assessment at Bald Butte. The Conservation Committee continues its work; we have just three days left to submit our comment.

As part of its mission, WNPS is empowered to advocate for native plants and habitats. The first WNPS newsletter states that “taking action to save endangered areas through publicity, persuasion or on occasion legal action” is a WNPS objective (WNPS 1976). Before submitting organization comments, the WNPS Executive Committee reviews all WNPS letters to ensure that WNPS consistently acts within the organization’s mission and that the leadership knows what the organization’s many branches are doing. When a completed Information Sheet accompanies the comment letter, the review can be very quick.

Tue 11/14/2017 2:40 PM Having received the letter in the morning, WNPS President Don Schaechtel replies in early afternoon that a majority of the Executive Committee has sent approval. The letter is submitted to planner Alan Thomson and copied to the Whitman County Commissioners. It is in before the comment deadline!

Still research continues. The Arid Lands Initiative Spatial Conservation Priorities in the Columbia Plateau Ecoregion is an online, interactive mapping program. It identifies priority areas “that best met Arid Lands Initiative goals and objectives” using data provided by partners including US Fish and Wildlife and SAH Ecologia (Arid Lands 2014). Even though the map’s accuracy is intended for regional rather than local analysis, it is interesting to see that the proposed building site is inside one of the priority hexagons, several of which are clustered around Bald Butte.

Fri 11/17/2017 11:34 AM WNPS receives a letter from Whitman County Commissioner Art Swannack. He notes that the commissioners have met with planner Thomson for a briefing. He states “Mr. Thomson has not yet granted an administrative use permit for this application. As required by state law and Whitman county code, he is in the investigative phase of the permit application process and gathering all pertinent facts about the project and its potential impacts in order to determine if it meets Whitman county code. Mr. Thomson has recently received information that the proposed tower location and road is on Palouse prairie remnant habitat, which Whitman county code says must be protected. This may prevent the cell tower’s construction on the proposed site.”



The proposed cell tower, southwest of the Bald Butte summit, is within the blue aerial overlay that indicates the general area of medium high-priority Palouse prairie lands as mapped by the Arid Lands Initiative. The location of the cell tower was determined by matching topography lines between the SEPA submittal and the Arid Lands map. MAP: CREATED USING THE DATA BASIN PLATFORM AND ARID LANDS INITIATIVE SPATIAL CONSERVATION PRIORITIES IN THE COLUMBIA PLATEAU ECOREGION DATASETS

In follow-up phone calls, the latest just prior to writing this article, Alan Thomson confirms that the cell tower application is still on hold. He says the location will change because the preliminary botanical assessment indicates Palouse prairie is present at the proposed cell tower site. Thomson expects to receive a new application for another location on Bald Butte. If that occurs, the botanical evaluation will become part of the record and will be available to the public.

Fri 11/17/2017 5:42 PM WNPS receives a thank you from Marilyn. She commends WNPS for “jumping on this and getting a great letter to the planners” and thinks “it is just what they needed to do and what should be done.” She also comments on how this experience directs more attention to native flora, particularly the imperiled Palouse prairie.

WNPS depends on robust relationships with native plant advocates within, and in this case outside of, Washington State. Because this particular project needed a variance due to the height of the cell tower, it was brought to the attention of WNPS. Without the variance, no legal notice would have been required and another remnant of Palouse prairie would have disappeared, largely unnoticed, from the Washington landscape.

What is left of the Palouse prairie is under increasing threat. The remnants mapped in the Atlas typically exist on marginal areas of farmland that are privately owned (Looney and Eigenbrode 2012). These eyebrows of land persist because there has been little economic incentive to plow them under. Now this protection is disappearing. A quick glance at ordinances adopted by Whitman County between 2017 and the first half of 2018 confirms that eight of the ten code updates convert agricultural districts to other zoning such as industrial, commercial, or residential use (Whitman 2018). The remnants are losing the little protection they had.

In 2012 Looney and Eigenbrode concluded: Outreach and education at the county level, perhaps through a mechanism associated with individual permitting, could alert private landowners to these unique biological communities and help emphasize stewardship opportunities and responsibilities. Because of the large number of privately owned remnants, developing comprehensive conservation plans that value and protect private landowners is likely to be a critical aspect of successful future conservation on the Palouse (Looney and Eigenbrode 2012).

Their conclusion seems just as relevant and even more pressing today.

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Washington Native Plant Society 2019 Calendar Now Available



2019 Calendar

Bear grass covers a steep slope on Tolmie Peak overlooking Eunice Lake, Mount Rainier National Park. PHOTO: MARY INGELS

The WNPS calendar for 2019, featuring Washington's native flora and beautiful places, and member photographers from around the state, is now available for purchase at local chapter meetings or in the WNPS online store.

The annual photo contest and production of the calendar serve the society as an organization and chapter fundraiser. Twenty-nine photos are selected, and the photographer for each winning photo receives a free calendar. The calendar gives you and your friends who love Washington's native flora a reminder of the diversity and wonder of our state.

Consider participating in next year's photo contest for 2020. You can find information on how to submit photos and participate on the WNPS website.

The featured photos can be viewed in the WNPS online store, www.wnps.org/store/2019-calendar. Your purchase at the store supports the Washington Native Plant Society. The cost online is \$10 plus shipping. Your purchase at chapter meetings or events will support the cost of production and your chapter directly, because chapters receive the profits of the \$10 cost when purchased in person.

The calendar is an educational gift that keeps on giving, while also sharing the WNPS mission and intent. Consider purchasing it for those on your giving list.



Field-Based Plant Identification Using DNA Barcoding, Coming to a Smartphone Near You?

by David Giblin, University of Washington Herbarium, Burke Museum of Natural History and Culture

For decades scientists have dreamed of a world where you could go into the field with a handheld device, swipe a piece of plant or animal tissue across a screen, and instantly receive a species identification. If you think about it, several steps of this pipeline are already in place. The handheld device would be a smartphone, the instantaneous communication would be high-speed wireless broadband (currently penetrating into rural and wilderness areas at a steady pace), and the identification process would be DNA barcoding (that is, recognizing a species based on the sequence of DNA base pairs [adenine, cytosine, guanine, thymine; A,C,G,T] of a specific region of the genome).

Perhaps the only gap in this processing pipeline is the chemical reaction that needs to take place on your smartphone screen to read the DNA sequence of the sampled organism. Remarkably, now even that step of the process seems to be not so far out of reach.

Scientists from the Royal Botanic Garden, Kew, have developed a portable, handheld, real-time DNA sequencer for use in the field. While still a long way from coming to your smartphone, it is nevertheless an impressive step forward. For those with a deep interest in technology, the underlying principle of this breakthrough is real-time nanopore sequencing, which you can read about here: https://en.wikipedia.org/wiki/Nanopore_sequencing.

In their field study, the Kew researchers were able to accurately distinguish between two species of *Arabidopsis* (*A. lyrata* versus *A. thaliana*) in the United Kingdom's Snowdonia National Park using the handheld device. Before you think that the advancement of such technology will eliminate field botanists sometime in the near future, I would encourage you to consider the broader picture.

Imagine that you are an inspections officer at the Port of Seattle responsible for determining whether fresh plant material imported from South America is a rare, common, or invasive species. There is no way that a person in that position can possibly know the flora of the entire South American continent, there are not floras for this entire area, and there is no

guarantee that the plant material would have the diagnostic characters (for example, flowers) present that are needed for accurate identification upon inspection. A device like this would be a tremendous help in such a situation.

A similar scenario would be a researcher doing botanical surveys in a remote area whose flora is poorly understood. Being able to quickly identify plants would greatly assist with determining conservation priorities for the area or even the identification of species potentially new to science.

I, for one, am particularly excited about the advancement of this technology and see it as another tool available to botanists for accurately identifying species. If you don't share my enthusiasm in this realm, don't worry, there is a tremendous amount of



MinION, from Oxford Nanopore Technologies, is a portable real-time device for DNA and RNA sequencing. PHOTO: OXFORD NANOPORE TECHNOLOGIES: <https://nanoporetech.com/products/minion>

work that needs to be done before this technology could be deployed on any kind of geographic scale. For example, a comprehensive library of DNA barcodes for each species needs to be developed for this whole system to work. I can assure you that funding to develop such a library is currently largely nonexistent outside of commercial crops and invasive species that may threaten commercial crops. I am nevertheless optimistic that 20 years from now a portion of our flora here in Washington will be barcoded and interpretable through this technology.

For more on this story:

Scientists sequence plant DNA in the field to identify species within hours: <https://news.mongabay.com/wildtech/2017/09/scientists-id-plant-species-in-the-field-within-hours/>

Field-based species identification of closely-related plants using real-time nanopore sequencing: <https://www.nature.com/articles/s41598-017-08461-5>

David Giblin manages the University of Washington Herbarium at the Burke Museum of Natural History and Culture, where he studies the vascular plant flora of the Pacific Northwest. He is a regular contributor to Douglasia.



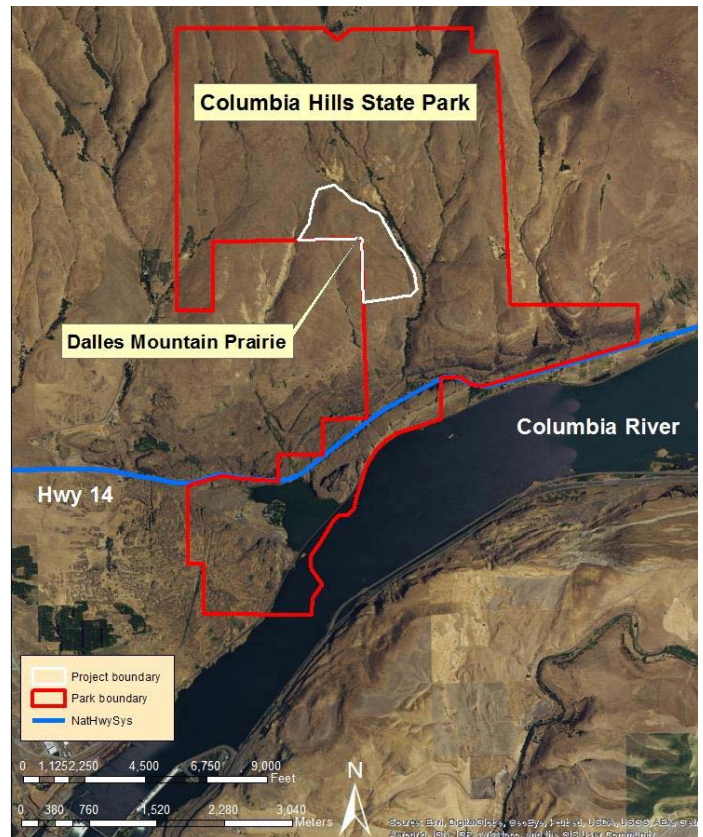
Restoration at Dalles Mountain Prairie, Columbia Hills State Park

by Becky Chaney, WNPS Conservation Committee Chair

The Washington Native Plant Society protects native plants and habitat through conservation or restoration. Outside of Washington's wilderness areas and state lands, conservation preserves bits and pieces of habitat that have, for whatever reason, been overlooked or, preferably, protected. In the best-case scenarios, these conserved habitats include undisturbed life from below the deepest root-tips to above the tallest treetops. Restoration, in contrast, attempts to put back the necessary pieces that recreate a functioning ecosystem aligned with predetermined goals.

Dalles Mountain Prairie, within Columbia Hills State Park, overlooks the Columbia River near Dallesport. Prior to the park's establishment in 1993, the steppe grassland habitat was dramatically altered. Grazing by cattle was followed by cultivation and introduction of non-local grasses. One, a cultivar of Snake River wheatgrass (*Elymus wawawaiensis*) known as Secar was planted as a pasture grass and has formed a monoculture; it now dominates 80 percent of the 180-acre project area (Menke et al. 2017). Secar has thrived and continues to crowd out local native vegetation even after grazing was discontinued under the park's management (Moore and Bahm 2016). In 2008 Steve Van Vleet at Washington State University initiated a controversial prairie restoration project that has reintroduced limited grazing to select plots of the prairie in an attempt to increase native plant diversity.

WNPS members have been observing and actively participating in this project since 2013 (Moore and Bahm 2016). This spring, I was able to walk the site during a WNPS Study Weekend field trip. Abe Lloyd was excited to see an abundance of blue-lily (*Triteleia grandiflora*). Bob Hansen pointed out additional highlights. Along with the ubiquitous, heartwarming arrowleaf balsamroot (*Balsamorhiza sagittata*), we saw Menzies's fiddleneck (*Amsinckia menziesii*); desert-parsleys (*Lomatium macrocarpum*, *L. nudicaule*, and *L. triternatum*); Washington's state grass, bluebunch wheatgrass (*Pseudoroegneria spicata*); and many others. Later, Barbara Robinson expressed her concern that a push by the farmers for expanded grazing, including in the spring, may harm the wildflowers and the ecologic function of the prairie.



Dalles Mountain Prairie (174 acres) is located within the Columbia Hills State Park off of Highway 14. The prairie has been divided into five study pastures in order to assess the impact of different management options on the prairie. Maintaining a "diverse, native-plant-dominated, steppe habitat" is a primary management goal of prairie management according to the draft restoration plan. MAP: INSTITUTE OF APPLIED ECOLOGY

Patterns on the prairie are informative—patches of abundant native diversity where the prairie wasn't cultivated, new invasives appearing along truck tracks from fire-fighting activity in 2015, a typical plant establishment where cattle are watered, and the reduction of Secar on the grazed side of a study plot



WNPS member Bob Hansen scans the study pastures at the Dalles Mountain Prairie before leading the WNPS 2018 Study Weekend field trip. The area on the far side of the fence line is grazed land that is outside Columbia Hills State Park. PHOTO: BECKY CHANEY



WNPS member Sarah Verlinde walks through the silvery Secar (*Elymus wawawaiensis*) in ungrazed Pasture Four on the left side of the fence line. Reduction of Secar on the right side of the line suggests that limited grazing may be a management option that supports the maintenance of steppe habitat in this location. PHOTO: BECKY CHANEY

fence. These informal observations are supported by the discussion in the Institute for Applied Ecology (IAE) 2017 Vegetation Monitoring Summary Report, suggesting that the lower cover of Secar and plant litter is occurring as a result of limited grazing. The report also indicates that within the study area, 2017 coverage by native grasses is 1.5 percent and annual native forbs coverage is less than 10 percent, and that these numbers are similar to those from 2016. Coverage by moss is 8 percent in ungrazed plots as compared to <0.5 percent in grazed plots (Bahm et al. 2017).

Recent management changes at Washington State University and Washington State Parks are changing the points of contact for this project. Ongoing monitoring, which is critical to understanding the relationship between native plant benefits and grazing, has typically been privately funded (Moore and Bahm 2016; Pers. Com., Carolyn Menke 2018). A state parks commitment to providing the funds for this project would help ensure that data collection continues.

WNPS is taking a cautious approach to supporting this project. A 2016 Conservation Grant funded the development of a seeding list that was then reviewed by select WNPS members and will become part of the IAE management plan. Annual hikes guided by WNPS member Bob Hansen, an enthusiastic proponent of the prairie and tireless volunteer, are promoted by WNPS. WNPS strongly supports restoration that promotes native vegetation but also knows that the success of restoration projects requires ongoing vigilance. The dynamic state of our world (climate, invasive species, agency changes,

usage needs) affects project outcomes. A stable funding source for vegetation monitoring at Dalles Mountain Prairie is critical to ensuring that future grazing actually benefits rather than threatens the restoration goals of Columbia State Park.

Becky can be reached via email at conservation@wnps.org. She is always happy to hear your conservation interests and concerns. Please include "WNPS Conservation" in the subject line.

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WNPS Study Weekend 2019

Bays, Bogs, and Balds: Flora of the Puget Sound Lowlands

Hosted by the Salal Chapter, May 17–19, 2019

The Salal Chapter invites you to join other WNPS members in exploring the lowland flora of Skagit and Island Counties, a geologically and climatically diverse area, in prime wildflower season. The base will be the Fidalgo Bay Resort in Anacortes on Fidalgo Island (access by bridge). Anacortes is the jumping off place for ferries to the four largest San Juan Islands and to Vancouver Island, so you may want to plan an extended trip.



Sicklekeel lupine (*Lupinus albicaulis*) at Ebey's Landing, Whidbey Island, with Perego's Lagoon in the distance. PHOTO: BARBARA KIVER

There will be about 30 field trips, 15 each day, many with stunning views. Sites will include beaches, bogs, and balds in Anacortes parks and community lands, Deception Pass State Park (on both Whidbey and Fidalgo), central Whidbey, Samish Island, and mainland areas including Padilla Bay, home of a National Estuarine Research Reserve that manages and protects more than 11,000 acres of intertidal and upland habitat and the second largest eel grass bed in the United States.

Local residents have long worked to protect the area. The land that became Washington Park in Anacortes was donated to the city more than 100 years ago by an early resident. In central Whidbey, the Ebey's Landing National Historical Reserve, which preserves a prairie remnant and a long pristine beach and bluff, was created in 1978 in a cooperative effort by private landowners, Washington State Parks, the National Park Service, and the Nature Conservancy. More recently the Whidbey Camano Land Trust and the Pacific Rim Institute began managing and restoring lands. Golden paintbrush (*Castilleja levisecta*) was the beneficiary of some of these efforts. Once considered extremely rare, it is now widespread in central Whidbey and may be seen on some field trips.

Geography, geology, and precipitation contribute to the diversity of the flora. The climate is moderated by the Strait of

Juan de Fuca, Puget Sound, and the inland bays, Fidalgo and Padilla. Whidbey and Fidalgo Islands also differ geologically—Fidalgo has volcanic rocks that date back 190 million years and surface features carved by the last ice age. Whidbey has considerable glacial till that was dumped as glaciers receded. As for precipitation, the area is relatively dry: Coupeville and Oak Harbor on Whidbey Island average 21 inches of precipitation a year and Anacortes 29 inches.

The Venue

The Fidalgo Bay Resort is owned by the Samish Indian Nation, the successor to the Samish Tribe, a signatory of the 1855 Treaty of Point Elliott. The tribe, which had occupied lands on Samish, Fidalgo, and Guemes Islands, received no land or compensation from the government and was arbitrarily dropped from a list of federally recognized tribes in 1969 (see Additional Information for a summary of the tribe's history and fight for legal recognition). It was not until 2005 that a federal appeals court ruled in the tribe's favor and it subsequently received compensation enabling the purchase of land, including the resort.

The resort, with a conference center, trails, cabins, and RV sites, is currently restoring native vegetation and removing invasive plants. There is a nice rocky beach and access to the Tommy Thompson trail that crosses the bay on an old railroad trestle.

View spoiler alert: Anacortes is a deep-water port near the Strait of Juan de Fuca that provides tanker access to three refineries, and the conference center is literally in the shadow of a refinery, a stark reminder of the need to conserve and preserve.

Programs and Dining

- Friday evening: Samish members will prepare a salmon dinner followed by a presentation by the tribe, "Feeding the Spirit: Native Plants for Food, Culture, and Medicine."
- Saturday evening: After a catered dinner, Joe Rocchio will present, "Hanging on a Thread: The Precarious Nature of Washington's Bogs in the Face of Natural Succession, Climate Change, and Human Stressors." Joe is the senior vegetation ecologist for the Washington Department of Natural Resources.

Lodging and Registration

Study weekend lodging is on your own. The greater Anacortes area (La Conner, Mount Vernon) has a number of options, including hotels, RV sites, camp sites, and cabins. More information is included in the registration materials.

Online study weekend registration opens mid-January at the WNPS website (www.wnps.org). For the best selection of fieldtrips, register early. To register by mail, please contact the WNPS office (wnps@wnps.org; 206-527-3210) to receive a printed registration packet.

Additional Information on the Samish Tribe

<https://www.samishtribe.nsn.us/who-we-are/culture>



Karl, Get Out of the Garden! Carolus Linnaeus and the Naming of Everything

by Anita Sanchez, illustrated by Catherine Stock
Charlesbridge Publishing, 2017
Hardcover, 47 pages, \$17.99
For children ages 7–10

Reviewed by Frank Knight, South Sound Chapter WNPS

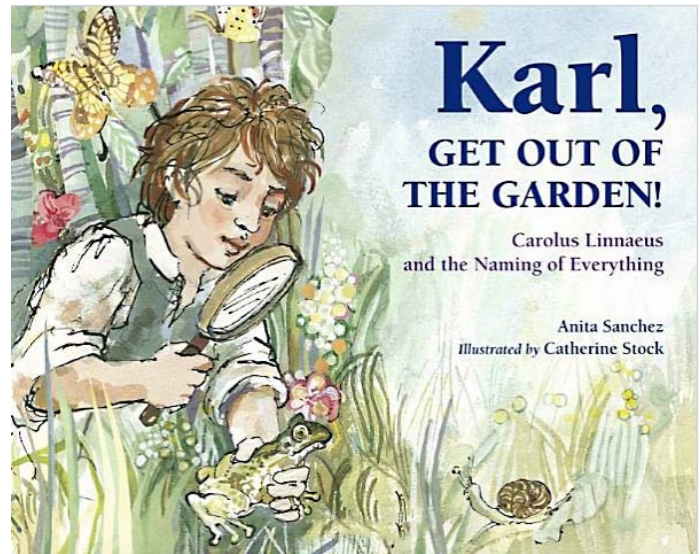
Friend and former colleague Anita Sanchez had sent me photos she made in Linnaeus' garden in Sweden while researching her latest book, so I eagerly awaited a review copy of *Karl, Get out of the Garden*. What I had not expected was my emotional reaction; I found myself a bit teary-eyed comparing young Linnaeus' (1707–1778) childhood with parallels in my own. Karl was nearly obsessed by the diversity of plants and small animals in his father's garden; his mother's admonitions to focus on schoolwork went unheeded. Only the threat of apprenticeship to a cobbler convinced Karl that a medical career with its reliance on healing plants was the better alternative.

A similar fascination with all things natural grew as loosened apron strings broadened my horizons from dooryard to nearby natural areas. My challenges, however, were exponentially simpler: I had only to impatiently await in elementary school the adult natural history field guides, based on Karl's work, just coming on the market after World War II. The many species I was finding had exceeded the contents of my children's guides. By marked contrast, Karl had to not only invent, but gain acceptance for the simple and orderly classification system now bearing his name.

Establishing order from chaos, Linnaeus persisted despite initial resistance from the scientific establishment to gain acceptance for a single genus and often descriptive species name for each plant or animal. Karl himself named more than 10,000 species in Sweden and nearby Lapland, plus those his students eagerly sent him from their extensive explorations in America and around the world. With good humor, he named a beautiful coneflower (*Rudbeckia*), for a favorite teacher, Olaf Rudbeck, and a weed for one of his early detractors.

The biography of the creator of any monumental concept or invention is fascinating, and both Anita and her Swedish-born illustrator Catherine Stock were up to the task. Anita had championed the ignored or reviled in previous works on dandelions and poison ivy. In her eightieth book, Catherine's charmingly colorful illustrations help carry the story, while childlike sketches of bugs and flowers with Karl's words in script personify his growing influence into adulthood.

Words and pictures also convey Karl's frustration in having to learn the long, descriptive Latin names for each organism after deciding which of many authors' plant names might be relevant, depending on whether the describer's bent was



culinary, medicinal, or horticultural. The namer's bias and not the organism itself determined what any living thing might be called.

Karl published *Species Plantarum* (Latin for “*The Species of Plants*”) in 1753, gaining fame and wealth soon afterward. Four years later at age 50 he was knighted by Sweden's grateful King Adolph Frederick, and then adopted his formal name, Carolus Linnaeus. Twinflower, a dwarf perennial shrub in the honeysuckle family—his childhood favorite—bears his name: *Linnaea borealis*.

Tell someone a plant or animal's scientific name and watch eyes glaze and minds tune out. One of Linnaeus's many charmingly inserted quotes in the text reminds us: “If you do not know the names of things, the knowledge of them is lost, too.” But as DNA-sophisticated as we have become, differing local and regional, or even fanciful variety names will always persist and confuse—all resolved by a single Linnaean system binomial of genus and species.

Seven pages of end matter extend the reader's reach far beyond the frequent rereading of Karl's exciting story: his legacy, notes on his family's names, the continual updating of scientific classification, a time-line of his life, annotations, resources for young reader, a bibliography.

Perhaps most important of all is that the book conveys the sense of wonder that Linnaeus felt for everything from whales to beetles to tiny pink flowers to the very end of his long, happy life.

See twinflower in Linnaeus' Coat of Arms and then seek it in cool woods and bogs spring and early summer in western Washington.

South Sound Chapter member Frank Knight is a retired senior environmental educator from New York State, who writes extensively on natural history. This is his second children's book review for Douglasia.



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Brittle pricklypear cactus (*Opuntia fragilis*) above the beach at Ebey’s Landing
National Historical Reserve. PHOTO: MARK TURNER