

Douglasia



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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 Keyna Bugner

Dear WNPS Members,

Summer is in full swing and chapters and committees are busy hosting events and field trips; WNPS programs are growing and reaching more people. I want to highlight a couple of our programs and the great work they are doing.

The Youth Ecology Education through Restoration (YEER) has just completed their two-year pilot program. Tina Miller, the YEER Advisory Chair, is in the process of completing the draft report which will be available to all members later this summer. Here is an excerpt from that report, which highlights the accomplishments:



The two-year Pilot Program (Fall 2021-Spring 2023) involved 6 schools (3 in Western Washington and 3 in Eastern Washington). A total of 1,414 students, 16 teachers, 24 WNPS or other stewards, and 10 Conservation District, Washington Department of Fish and Wildlife or Land Trust staff. A little over 1.9 acres of area was restored with 56 cubic yards of weeds removed and 4,536 native plants installed. The results were very exciting with many examples where the curriculum and field activities came together for the students to create pride and a sense of accomplishment, elements that are shown to have life-long learning outcomes. WNPS completed a Vision process with an Ad-hoc WNPS members committee with the intent of envisioning YEER as a sustainable WNPS Program. The committee met 3 times between March and May 2023. The focus is to grow slowly and progress alongside the WNPS Stewardship Program. With these things in place, YEER could become a sustainable and scalable program that has the potential to match teachers with WNPS Stewards to do restoration as part of students' science curriculum.

The Stewardship program has also been growing. We continue to work closely with the City of Bellingham to have another steward training. We have also expanded to host train-

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

** Deceased

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

Email submissions to Douglasia@wnps.org.

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ings with the South Sound Chapter and the City of Vancouver. The requests for more trainings keep coming in. If we had the capacity, we could have hosted up to six different steward trainings. After more than 20 years, this program was in need of reflection to prioritize how we can effectively support all the requests for steward trainings. This summer the committee hosted a Stewardship Summit that brought stewards and environmental partners from across the state for a planning session. Many themes emerged, but one of the ideas was the need for additional staff to support the growing demand for steward programs. Look for the final report later this summer.

These programs are two great examples of what WNPS does best: educate people about native plants and inspire them to take action to protect those plants and their ecosystems. Training the next generation of scientists and native plant enthusiasts is what will keep this organization strong. We are also reaching out to new people and forming lasting partnerships with other environmental organizations. We realize that continuing these programs takes dedicated volunteers, additional staff, and contractors to implement the programs. We are looking at how we can increase the staff capacity to support these programs in order to keep them sustainable. Look for more information in the coming months as plans are developed to expand staff capacity.

Feel free to contact me to share your ideas for programs at wnpspresident@wnps.org.

Happy Summer Everyone!



Article references are available on the WNPS website here:
wnps.org/douglasia.

On the cover: Big sagebrush (*Artemisia tridentata*) among a sea of invasive cheat grass (*Bromus tectorum*) and fiddlenecks (*Amsinckia* sp.) at Seep Lakes Wildlife Management Area near Othello, WA at sunset following a brief late-spring thunderstorm.
PHOTO: MARK TURNER

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Choosing Native Plants for Your Home Landscape

by Katherine Darrow

When I returned to my childhood ecoregion in the Puget Trough seven years ago, one of my first goals was to learn the local flora, which is radically different than our previous ecoregion in the Sonoran Desert of Arizona. A second goal was to reclaim the quarter acre of gravel driveway that surrounded the house and create an inviting garden landscape. In my naïve approach to gardening at the time, I declared that anything I would plant or sow must be native. Current occupants of our $\frac{3}{4}$ acre were allowed to remain, including a giant sequoia, a Himalayan cedar, three Lombardy poplars, nine fruit trees, and some lawn, but I wanted to bring back species that might have been here a century ago, before the former titleholders cleared the land to build their new home.

To begin learning what plants were native to my area, I joined the Washington Native Plant Society (WNPS) so that I could mingle with botanists who know the local flora. To better understand principles of gardening and landscaping, I completed eight months of intensive training with the Jefferson County Master Gardener Program. Five years and hundreds of dollars in plants, mulch, water, and deer repellent later, I've managed to increase the number of native plant species growing in our landscape from three to ninety. Sort of. You see, it all depends on how you define "native plant."

In this article, I'll try to answer three questions that anyone who is interested in gardening with native plants might want to think about while planning for their chosen landscape:

- **What** is a native plant?
- **Why** do you want to choose native plants for your landscape?
- **How** can we choose plants for our gardens?

What is a Native Plant?

The first question—"What is a native plant?"—is probably the most difficult to answer. There is a broad spectrum of thought and playful philosophizing around the term "native plant." A vegetation manager at a wildland preserve will have a different perspective than an urban gardener. There are also many written definitions. Back in 2008, a consortium of WNPS members put their heads together to create a definition that is congruent with our conservation-minded goals: "*Washington native plants are those species that occur or occurred within the state boundaries before European settlement based upon the best available scientific and historical documentation.*" (Douglasia, Spring/Summer 2008)

On the other hand, WSU associate professor of horticulture Linda Chalker-Scott comments in her narrative for *Gardening with Native Plants of the Pacific Northwest* (3rd edition) that "... any definition of 'native' is a human construct, not a scientific

one. Nativity doesn't respect geographic boundaries, and is not a fixed condition..."

Whatever mindset you have with respect to your garden, it is helpful to understand the coalition of geography, anthropology, and time to define what plants are native to your region. In our case, the boundaries of Washington were officially established when it became the 42nd state on November 11th, 1889. European settlement dates back to 1792, when Spanish explorer Salvador Fidalgo established a fort at Neah Bay, at about the same time the Vancouver expedition was cruising and exploring around shorelines of the Salish Sea.

Considering geographic change over time, you might like to muse about native vegetation in the distant past or imagine future scenarios. For instance, during the Mesozoic era more than 15 million years ago, there was an entirely different flora on land we now call Washington. Forests in some parts of the state included ginkgos, magnolias, and sassafras, as evidenced in the fossil records. Does that mean that ginkgos (*Ginkgo biloba*) that were planted in downtown Port Townsend could be considered a Washington native? Or that bringing magnolias into our gardens is a way to give a leg up for plant species that might migrate as our climate continues warming over the next century?

With regard to anthropology, it is well known that long before Europeans arrived on the North American continent, Indigenous people traded plant materials from all directions. Some ecologists question the idea that human dispersal of seeds and other plant propagules is considered "unnatural" in some eras but not others.

We could also delve into the etymology of the word "native," which relates to birth, versus analogous terms such as indigenous, aboriginal, and endemic, which imply many more generations of a population or species, long before the Age of Exploration (prior to the 1400s). You might agree with the idea that any seed that germinates and survives where it lands or is planted can claim nativity by birthright, including a lot



Map delineating geographic extent of *Flora of the Pacific Northwest* (Hitchcock et al., 2018).

of plants that are classified as weeds. But let's not go down that rabbit hole!

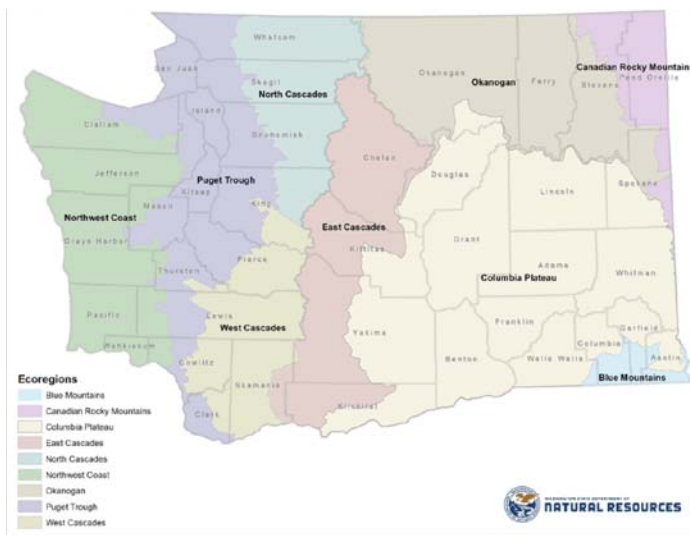
Many gardeners choose the point of view that any plant that is *not* a cultivar or horticultural hybrid is a native plant. Thus, you could claim that any of the ~400,000 plant species on Earth are within your geographic realm. As far as we know, all plants evolved on this planet, although there are theories that introductory spores may have originated from other parts of the universe!

If you share a more ecological perspective on the idea of what is native, you might focus more narrowly to choose only species that are native to the particular ecotype that your garden area occupied prior to development, as described by regional vegetation classification systems. This would be especially important if your landscape is adjacent to any kind of wildland preserve or wetland.

Social constructs aside, every gardener has the authority to choose where to mark their boundaries for what they'll count as part of their own concept of native. Eminent botanist and WNPS co-founder Art Kruckeberg chose a far more inclusive definition of "native" for the botanical garden he and his wife, Mareen, began cultivating in 1958, now owned and managed by the City of Shoreline. Their lovely eclectic garden includes a native plant concept for the PNW that stretches into northern California and southern Idaho. This idea of the PNW extends hundreds of miles further south than the area defined in Hitchcock's *Flora of the Pacific Northwest (Flora)*, reeling in dozens of species such as California Laurel (*Umbellularia californica*) and several species of oak (*Quercus* spp.) that are not considered to be native in Washington or the PNW concept in the *Flora*.

Why Choose Native Plants?

The answer to our second question—"Why choose native plants?"—is also completely up to you as a gardener. Restoration to pre-colonial conditions might be your primary goal, especially if your land connects to precious undeveloped areas. Others hope to attract more birds or pollinating insects with



Ecoregions of Washington State. GRAPHIC COURTESY OF WASHINGTON DEPARTMENT OF NATURAL RESOURCES

native species. Some people wish to re-establish plants of cultural significance to Indigenous people, such as traditional food plants or weaving materials. Education is a priority for many recipients of WNPS grants awarded to support gardens at schools and in municipal landscapes to help teach students and the general public about Washington's native flora.

For me, the desire to include native plants in our garden is more nostalgic and aesthetic. My earliest memories are of playing in the forest at the end of the street in Bellevue, where towering Douglas firs (*Pseudotsuga menziesii*), lush sword ferns (*Polystichum munitum*), and sweet red huckleberries (*Vaccinium parvifolium*) engaged my senses. There is nothing more magical and beautiful to me than the unfurling of a fern frond or glistening orbs of edible wild berries. I also feel that including native plants in a garden is one small way to honor the land that supports us.

How Do We Choose Which Native Plants to Include in our Gardens?

Now for the third question: "How do we choose which native plants to include in our gardens?" There are many tools to assist the eager native plant gardening enthusiast. My favorite is to take a walk (thus avoiding the hard work involved in gardening!). Just go to the nearest undeveloped area or wildland preserve and learn what is growing there. Distinguishing between natives and naturalized (meaning introduced species that now have self-sustaining populations) species may be tricky, but there are lots of field guides and floras to help you, as well as botanical gurus in your local WNPS chapter.

Other extremely useful tools are plant lists posted on the WNPS website (wnps.org/plant-lists). There are more than 800 lists available from commonly-visited state and national parks, preserves and trails throughout Washington. If you wish to know what's growing in your county or a preserve near you, this is a great way to start learning the native plants in your area, and to help generate a list of candidates appropriate for your garden space.

Another favorite tool is the UW Burke Herbarium Image Collection, which has maps and photos of almost every species documented in Washington State. This is helpful if you want to understand the natural distribution of species you might discover at your local garden center or plant sale. Some species are widespread throughout Washington, such as woolly sunflower (*Eriophyllum lanatum*) and Douglas fir (*Pseudotsuga menziesii*). Others are most common to either shady forests west of the Cascades, such as Pacific rhododendron (*Rhododendron macrophyllum*), or are only found in shrubby habitats east of the Cascades, such as the lovely sagebrush violet (*Viola trinervata*).

For a broader understanding of Pacific Northwest or continental flora, USDA Plants Database is my go-to source for understanding where certain species that are labeled "native" are actually growing in the wild. I was disappointed, for instance, when I discovered that the beautiful viburnum (*V. dentatum*) that I purchased from the "native" section of a local nursery

is actually native to eastern North America, but not anywhere near the Pacific Northwest. (Sadly, it did not do well in our landscape.) I was also surprised to learn that black-eyed Susan (*Rudbeckia hirta*) is not considered to be native to Washington, but are very common natives in woodlands and meadows from the Rocky Mountains to the east coast.

All of these digital sources will also let you know whether a plant you have found growing in a forest or meadow near you is introduced or naturalized. For instance, you may find patches of daffodils (*Narcissus pseudonarcissus*), purple foxglove (*Digitalis purpurea*), and woodland forget-me-not (*Myosotis sylvatica*) growing wild in some parks and preserves. But these are all naturalized garden escapes that were introduced from Europe, as are many of our common weedy plants.

In Port Townsend, we are fortunate to have four State Parks within bicycling distance, plus a two-acre remnant of camas prairie in the middle of town. Nearby patches of old growth forest and long stretches of undeveloped shorelines were my first consultants.



The author's garden. PHOTO: KATHERINE DARROW

But alas, my real estate on top of a moraine deposit is nowhere near the shoreline, nor is it likely that it was once prairie. A former resident of the area remembers the Douglas-fir forest, much like my old childhood playground in Bellevue, that she used to visit in the 1970s where our house now sits. Only one of the trees, plus some Oregon grapes (*Mahonia nervosa*) and a few sword ferns remain from that forest. But we've decided that we like our sunshine, especially for the "free" energy generated by rooftop solar panels, so restoring this patch of land to shady forest is not our goal.

With a more realistic vision, I've relaxed quite a bit from my original "purist" plan to plant only natives from our local ecotypes. Plant gifts from enthusiastic gardening friends, nutrient-poor soils, very little shade, and the local deer herd have all conspired to expand my palette to include dozens of non-native cultivars and exotics from every continent (except, of course, Antarctica). My desire for more colorful floral displays induced me to invite oriental poppies (*Papaver somniferum*), lavender (*Lavendula angustifolia*), every *Penstemon* spp. cultivar I can

find, and red hot pokers (*Kniphofia* sp.) to become welcome elements of our garden. (All of these exotics host lots of native insect and avian pollinators, by the way.)

Our collection also includes cultivars of native plants that have been developed and are available at most nurseries. Sea thrift (*Armeria maritima*), shrubby cinquefoil (*Dasiphora fruticosa*), yarrow (*Achillea millefolium*) and kinnikinnik (*Arctostaphylos uva-ursi*) are a few Washington natives that have inspired horticulturists to propagate their personal brand of ornamental garden plant. One of my favorites is a cultivar of showy fleabane (*Erigeron speciosus*) called 'Darkest of All.'

My list of natives also became much broader than what is growing locally to include seaside daisy (*Erigeron glaucus*) and coastal strawberry (*Fragaria chiloensis*) from the outer coast, Barrett's beardtongue (*Penstemon barrettiae*) from the Columbia Basin, and Lewis' monkeyflower (*Erythranthe lewisii*) from mountain streams, which does surprisingly well in a wet patch of our garden.

Whatever your gardening ambitions, WNPS discourages collecting from the wild, where roots and seeds of native plants are necessary to continue their role in a healthy undeveloped ecosystem. However, if there is permission to salvage native plants due to impending development, this is ethically congruent with our conservation mission to preserve and protect the remaining wild places and their flora. Otherwise, it is best to purchase from garden clubs and nurseries that propagate natives professionally, or trade seeds and cuttings with other native plant gardeners.

Katherine Darrow is a member of the Olympic Peninsula Chapter of WNPS, and currently lives in Port Townsend. If you have corrections, questions, or comments about her writing, you can e-mail Kathy at kathydinpt@gmail.com.



Steptoe Butte: a Pristine Palouse Prairie

by Maddy Lucas

When one thinks of Washington state, images of meandering rivers cutting through old-growth forests with mountain peaks looming in the distance typically dominate their mind. Largely forgotten, though, are the drier ecosystems east of the Cascade Range. One such ecosystem is the Palouse, located in southeastern Washington.

Formed by ice age floods over 10,000 years ago, the region is easily distinguishable by miles of rolling hills. If one was to drive here today, they would observe acre upon acre of wheat fields across the landscape. Before European colonizers came to the area, though, you would have found something much different dominating the region – the Palouse Prairie.



Steptoe Butte. PHOTO: MADDY LUCAS

The Palouse Prairie is composed of primarily bunchgrasses, shrubs, and forbes. Species such as sticky geranium (*Geranium viscosissimum*), arrowleaf balsamroot (*Balsamorhiza sagittata*) and Rocky Mountain sunflower (*Helianthella uniflora*) grew among Idaho fescue (*Festuca idahoensis*) and bluebunch wheatgrass (*Pseudoroegneria spicata*), while shrubs like black hawthorn (*Crataegus douglasii*) dotted the landscape.

A handful of rare species call the Palouse Prairie home: Jessica's Aster (*Symphyotrichum jessicae*), broad-fruit mariposa lily (*Calochortus nitidus*), Palouse goldenweed (*Pyrocoma liatrifomis*), Palouse milkvetch (*Astragalus arrectus*) and Spalding's catchfly (*Silene spaldingii*).

While small parcels of land boasting this beautiful mixture of flora can still be found, the number of these sites has diminished significantly in relatively recent times. Currently, less than one percent of native Palouse Prairie remains, causing it to be considered an endangered ecosystem.

Not all hope is lost, though. Steptoe Butte, located north of Colfax, is known for its breathtaking views of the Palouse. At an elevation of just over 3,600 feet, wheat fields can be seen for miles from the top of the butte, which are exceptionally beautiful in the spring when the plants are green. Sunsets are breathtaking sights as golden light shines on the landscape and rolling hills cast shadows to create a unique visual experience.

What many fail to miss, though, is the butte itself. In a hurry to make it to the top to see the views, the treasures of Steptoe Butte are overlooked. To conservation-minded individuals, maybe the most exciting parts of Steptoe Butte are the several hundred acres of Palouse Prairie on the butte. Over 150 acres are owned by Washington State Parks. In addition, roughly 427 acres have historically been owned by private landowners, the acreage being the largest Palouse Prairie remnant known to date.

While the plant species on Steptoe are not necessarily unique to the site (essentially every species can be found elsewhere and generally in a far more accessible fashion), the quality of the prairie is. Most remnant prairie exists because the land is not suitable for farming or it was set aside for a different purpose that did not require as much disturbance, such

as family cemeteries. The high quality of this prairie makes it ecologically-valuable land.

In 2016, the 427 acres of private land on Steptoe Butte were put up for public auction. Kent Bassett, born and raised in Pullman, but currently residing in western Washington, learned about the auction in an email just a month before it was to occur. While Kent was mainly interested in purchasing property along the Snake River, the Steptoe Butte land stood out to him, as he was worried what might happen to it. After making some calls and learning the land could be sold for development, he was concerned.



Geranium viscosissimum, sticky geranium. PHOTO: MADDY LUCAS

“I thought, how can you sell Steptoe Butte? That’s a landmark,” Kent Bassett said. “I didn’t know anything about the native prairie. I just thought it would be a shame to spoil the local landmark.”

In the process of researching potential uses for the Steptoe Butte land, Kent Bassett learned of the prairie, making him even more determined to find a way to prevent the land from being developed.

Again, Kent picked up the phone, this time reaching out to local nonprofits and individuals he thought may be interested in purchasing the land. While everyone Kent spoke with agreed that the site should be preserved and wanted to help in the endeavor, there were two common limiting factors—money and time.

Kent consulted with his late wife, Elaine Bassett, which is when they agreed to do something seemingly unbelievable—they were going to put every effort into purchasing the land on their own dime.

“We decided that this was one environmental battle, relatively small in the grand scheme of things, that did not have to be lost,” said Bassett.

As the day of the auction drew closer, the Bassetts received a phone call from a family located in Pullman, Joan and Ray Folwell. After hearing of the Bassetts’ plan to purchase the Steptoe Butte land and knowing the importance of the prairie located on it, the Folwells wanted to contribute.

“They are wonderful people and were most valuable partners in the sense that Ray knows finances and Joan knows Palouse Prairie,” Kent said.

The Bassetts and Folwells agreed upon the amounts they would each put towards the efforts the night before the auction. While Kent Bassett could not attend the auction to bid, Elaine Bassett could and was accompanied by the Folwells and a few others in support. The bidding went fast and high, higher than the amount Kent and Elaine had agreed with each other on the night prior to the auction.



Lithospermum rudemale, Western stone seed. PHOTO: MADDY LUCAS

“There was just Elaine and another person bidding. It got up to the point where we had agreed that was our limit but Elaine kept on bidding. Finally, after a few more bids, she realized this was getting much higher than what we had agreed to, so she submitted her last bid thinking certainly it would be trumped,” Kent said. “But the other guy did not bid again, so she won it on her last bid. It was the narrowest of victories by the most unlikely buyers.”

For the next several years, the Bassetts and Folwells owned and managed the land, although the end goal was to find a more permanent way to protect it. In late 2021, the land was sold to the Washington State Department of Natural Resources (DNR).

Steptoe Butte is within the jurisdiction of the Southwest Region of DNR. Keyna Bugner, Natural Areas Manager for this region and WNPS President, explains that the department is currently working to decide if the newly-acquired land will be considered a Natural Area Preserve or a Natural Resources Conservation Area. The designation will determine what the land can be used for, including public access.

While the land is protected under DNR’s ownership, the prairie on Steptoe Butte still faces challenges. Primarily, invasive species pose a threat to the land and significant effort has been poured into controlling these. With the help of local nonprofits, conservation efforts are currently underway on the butte.

The Palouse Conservation District (PCD), headquartered in Pullman, began working on Steptoe Butte in 2017 to plant and monitor Spalding’s catchfly (*Silene spaldingii*). This species is designated as a rare species in the state, ranked as Threatened by the Washington Natural Heritage Program and also listed as a federally-threatened species. It is known historically on Steptoe but the species is not thriving as it once was at this location.

Garrett LaCivita, Conservation Planner at PCD, explains that while the reintroductions have been successful on the butte, there are some challenges they face in their efforts, one being herbivory issues caused by rodents.

“The other problem we’ve been having with Steptoe is there is a lot of low creeping rose ground cover,” LaCivita said. “We



Silene spaldingii, Spalding’s Catchfly. PHOTO: MADDY LUCAS

try to plant around those patches but if they spread, they really choke [the catchfly] out.”

In addition to PCD’s work, The Phoenix Conservancy (TPC) is a local nonprofit based out of Pullman participating in conservation efforts on Steptoe. To date, they have participated mostly in invasive species removal on Steptoe Butte, specifically knapweed (*Centaurea* spp.), when the land was privately owned.

Chris Duke, Executive Director of TPC, explains how one of the challenges the prairie faces is members of the public being unaware that it even exists.

“Part of what makes [the Palouse Prairie] so important is that it is so easy to ignore. And it is easy to not see. It is not like a clear-cut—if you take out a patch of Palouse Prairie, it does not leave this gaping wound like a clear-cut,” Duke said. “Like a lot of critically-endangered ecosystems, the biggest thing they all have in common is they are easy to ignore.”

Duke hopes TPC can continue supporting conservation efforts on Steptoe with the permission of DNR and Washington State Parks. In the meantime, he explains the simple way those interested can help support TPC and other nonprofits and agencies actively involved in conservation.

“The biggest way to get involved is to find the people doing the work right now and ask them directly [how to help],” said Duke. “It may not be as simple as going out and pulling weeds for a couple of days—it may be something far more abstract, but in the same way my day-to-day does not look like directly



Erythronium idahoense, Idaho fawn-lily. PHOTO: MADDY LUCAS

going out and pulling weeds on Steptoe, that is not what is needed.”

While stories such as Steptoe Butte are inspiring, it is important to remember that the Palouse Prairie is still an endangered ecosystem that needs help. The simplest way to help support conservation efforts, Duke explains, is to visit the Palouse Prairie itself to understand the beauty and importance of the ecosystem.

“It is now or never. Everywhere we work is teetering on the edge of oblivion,” Duke said. “If you do not go love it now and be part of it in whatever way you can, you will not get the chance and you will never know what you lost.”



Ten Things You Always Wanted to Know About Sagebrush (But Were Afraid to Ask)

by Walter Fertig

Sagebrush is one of the most widely distributed and iconic plants of the American West, and yet also one of the least understood and appreciated. In the interest of increasing the SIQ (Sagebrush Intelligence Quotient) of our readers, *Douglasia* offers the following ten sagebrush factoids:



Big sagebrush (*Artemisia tridentata*), Seep Lakes Wildlife Management Area, Othello, WA. PHOTO: MARK TURNER

1. Not all “sages” are sagebrush.

True sagebrush belongs to the genus *Artemisia*, a group of more than 100 species in the sunflower family (Asteraceae) distributed across northern Asia, Europe, North America, and South America. The common name sage comes from the aromatic foliage that resembles culinary sage (see factoid # 3) and its relatives in the genus *Salvia*, which are all in the mint family (Lamiaceae). Pioneers traveling across the western prairies and deserts applied the term “sage” somewhat indiscriminately to a number of shrubby species that had bluish-green herbage, inconspicuous flowers, or odoriferous leaves. For example, purple sage is the mint *Poliomintha incana* and white sage the chenopod relative *Krascheninnikovia lanata* (Amaranthaceae). The Latin name for sagebrush comes from Artemisia, queen of Caria (in modern Turkey) in the 4th Century BC, who was an amateur botanist and herbalist. She in turn was named after Artemis, the Greek goddess of the moon, wild animals, vegetation, hunting, chastity, and childbirth (quite the multi-tasker).

2. There isn’t just one kind of sagebrush in North America, there are 77!



Threetip sagebrush (*Artemisia tripartita*) foliage. PHOTO: MARK TURNER

Dr. Leila Shultz, sagebrush maven from Utah State University and author of the *Artemisia* treatment in the *Flora of North America* (2006) accepts 51 species and 18 subspecies of *Artemisia* and *Picrothamnus* (bud sagebrush, traditionally

included in *Artemisia*) in North America north of Mexico. More recently, the genus *Sphaeromeria* (chicken-sage) has been lumped into *Artemisia* based on molecular data, adding eight more species to the total. Washington State has 28 native sagebrush taxa (21 full species and seven varieties) and four introduced species. Only nine of the 28 taxa from Washington are shrubs, while the remainder are annual or perennial herbs (often called sageworts or mugworts, to distinguish them from the shrubby sagebrushes). Within the sunflower family, sagebrushes are most closely related to yarrow (*Achillea*), ox-eye daisy (*Leucanthemum*), tansy (*Tanacetum*) and other members of the Anthemideae tribe.

3. If the recipe calls for “sage”, don’t add sagebrush!

Culinary sage (*Salvia officinalis*) is the spice used for seasoning foods with a sage smell. Native Americans did not cook with sagebrush but did use it as a medicinal plant. Most often it was used as a tea or poultice to treat colds, fever, or toothache, or to induce vomiting (an outcome most chefs are not looking for!). Branches were also burned to purify the air.

4. Sagebrush really is a flowering plant.



Big sagebrush (*Artemisia tridentata*) blossoms nearly hide among the foliage. PHOTO: MARK TURNER

Individual sagebrush flowers are quite tiny (1.5–3 mm), lack showy petal-like rays, and are brownish green. Like other members of the sunflower family, the flowers are aggregated into

small heads, each enclosed in a cup-like involucre of greenish gray leaf-like bracts (phyllaries). These flower heads are themselves arranged in branching, panicle-like flower stalks (inflorescences) that often jut out well above the foliage. The flowers are designed for wind pollination. Nearly all sagebrush species flower in late summer or early fall (the exception being bud sagebrush, *Artemisia spinescens*, of the Great Basin and Colorado Plateau, that flowers in mid-spring). Wind-pollinated plants typically produce large quantities of very small pollen that waft through the breeze to randomly reach receptive stigmas on other plants. Many people with fall hay fever are allergic to pollen of sagebrush or ragweed (*Ambrosia* species).

Old flowering stalks typically persist for nearly a year and are useful for distinguishing some species. Sagebrush can produce large crops of tiny seeds each fall, which can be spread long distances by wind gusts, or more frequently fall near the parent plant. Unlike many composites, sagebrush seeds lack a feathery or hairy pappus to aid in wind dispersal (the exception is *Artemisia papposa* of southeast Oregon and adjacent Nevada and Idaho, which has a shallow fringe of pappus-like scales atop the achenes).

5. Some sagebrush species and subspecies can be identified by their unique leaf chemistry.

Scientists have discovered that the presence of coumarin in leaf tissues can be used to differentiate some sagebrush taxa based on fluorescence of twigs placed in water under ultraviolet light. The higher the concentration of coumarin, the brighter the sample will fluoresce, while specimens without coumarin won't fluoresce at all. Presence of coumarin is also correlated with palatability. Those taxa with high concentrations generally are favored over those without (one exception is Wyoming big sagebrush, *Artemisia tridentata* subsp. *wyomingensis*, which does not fluoresce, but is one of the tastier taxa for animals).

All sagebrushes get their distinctive sage aroma from chemical compounds such as terpenes and sesquiterpene lactones. The intent of these chemicals is to reduce herbivory by insects and large mammals (including livestock). But not all chemicals are the same – their quantity and type directly influences the palatability of sagebrush foliage. Sage grouse and mule deer preferentially forage on sagebrush species with lower concentrations of these compounds. The amount of leaf chemicals differs between plants based on genetics but can also vary seasonally and even from morning to evening.

6. Big sagebrush produces two different kinds of leaves.

Like most shrubby sagebrushes, big sagebrush (*Artemisia tridentata*) is evergreen, but individual leaves may be relatively short-lived. Overwintering leaves last for about a year and are short and typically clustered. These are capable of undergoing photosynthesis at low winter temperatures. Longer, ephemeral leaves are formed in the spring and occur singly on the stems. These leaves are shed when hot, droughty conditions occur in the summer, as their larger surface area makes them more prone



Big sagebrush (*Artemisia tridentata*) foliage in late May. PHOTO: MARK TURNER

to water loss. Overwintering and ephemeral leaves usually have three lobes across their tip, while leaves associated with flowering stalks are often unlobed (entire). Leaf shape (elongate vs. bell-shaped) and length are used for distinguishing big sagebrush subspecies but can often be extremely variable on the same plant.

The distinctive bluish-green color of big sagebrush and other shrubby species comes from the dense mat of hairs that cover most of its foliage. These hairs reflect some sunlight and provide shade to the leaf and stem surface, keeping them cooler and reducing water loss through transpiration. The hairs may also interfere with herbivory by insects.

Sagebrush can be completely defoliated and survive. During severe drought, big sagebrush can shed all of its leaves to reduce water stress from evaporation. While the plants may appear to be dead, they can sprout new leaves the following year if drought conditions are abated. Big sagebrush does not survive after a fire, however, and is not able to resprout from its roots. The related silver sagebrush (*Artemisia cana*) is able to resprout if burned.

7. Not all sagebrushes occur in typical sagebrush communities.

Big sagebrush, threetip sagebrush (*Artemisia tripartita*) and stiff sagebrush (*A. rigida*) are commonly found in prototypi-

cal “sagebrush” habitats in dry basins, scablands, and lower montane slopes across much of eastern and central Washington. Prairie sagebrush (*A. ludoviciana*) occurs widely from lowlands to montane meadows, often associated with big sagebrush communities. Some native sagebrushes are adapted to moist habitats along streams and rivers. Silver sagebrush can be a community dominant on terraces with a high water table in mountain foothills. The critically-endangered Northwest endemic, Wormskiold’s northern wormwood (*A. campestris* var. *wormskioldii*), is restricted to sandy or cobblestone shores along the Columbia River, which are now largely inundated by reservoirs or which no longer have natural flooding cycles. Several herbaceous *Artemisia* species are adapted to disturbed habitats created by humans, including the native species biennial wormwood (*A. biennis*) and tarragon (*A. dracunculus*), as well as non-natives, like mugwort (*A. vulgaris*) and absinthe (*A. absinthinum*). A few herbaceous taxa are also adapted to talus slopes and tundra in the alpine to upper montane zones in western Washington, including boreal wormwood (*A. norvegica* subsp. *saxatilis*), forked wormwood (*A. furcata*), and Michaux’s mugwort (*A. michauxiana*).



Prairie sage (*Artemisia ludoviciana*) near Copper Pass on the Okanogan National Forest. PHOTO: MARK TURNER

8. Big sagebrush produces two kinds of roots.

Like many aridic shrubs, big sagebrush grows deep taproots up to 20 feet long. In general, root depth is 3-4 times greater than the height of the plant and varies depending on the depth and rockiness of the soil. Big sagebrush also produces lateral roots

that radiate out from the plant a short distance below the soil surface. These roots are especially effective at capturing surface moisture following rain or snowmelt. The range of big sagebrush strongly correlates with areas where precipitation comes mostly from snow. This accounts for the rarity or absence of sagebrush vegetation in grass-dominated ecosystems such as the Great Plains where most precipitation comes as summer rain.

The presence of lateral roots and competition for water may help explain the natural spacing of sagebrush and the gaps that form between plants. In the past, range managers suspected that sagebrush leaves and roots exuded chemicals into the soil that inhibited growth of competing plants (a condition called allelopathy). Scientific analysis of leaf and soil chemicals, however, provides no basis for this assumption. In fact, grass and forb species are more likely to grow under the canopy of sagebrush where they are partly protected from herbivores and provided shade (which also keeps the soil moister). Rather than inhibiting other plants, sagebrush acts as a nurse plant that improves the probability of seedling survival.

9. Big sagebrush produces wood and annual growth rings, just like trees.

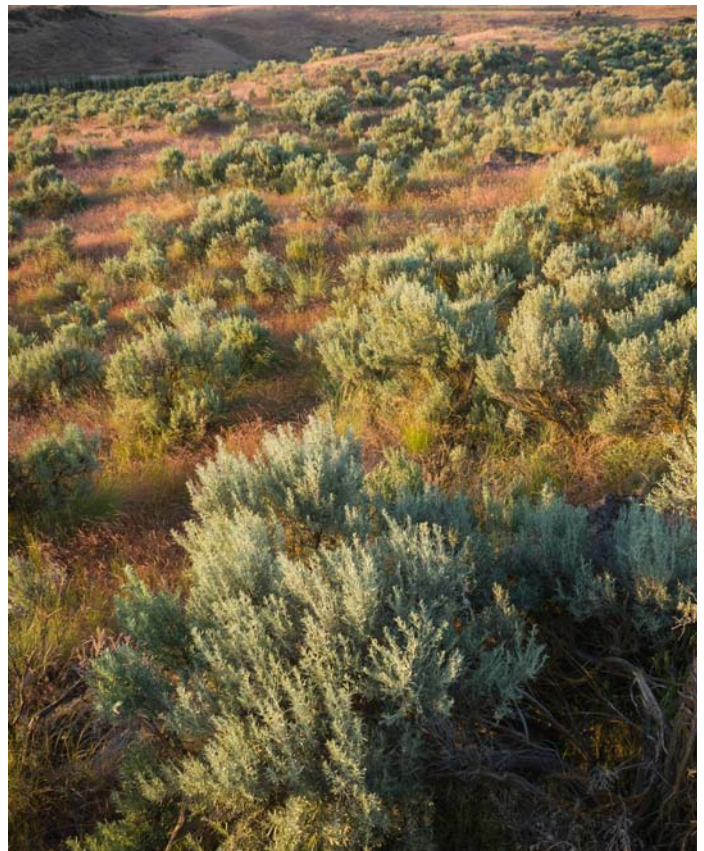


Slender hawkbeard (*Crepis atriobarba*) at the base of a big sagebrush (*Artemisia tridentata*). PHOTO: MARK TURNER

Although not especially thick, the main stems of big sagebrush regularly grow a new ring of woody tissue (water-

conducting xylem) each year. These growth rings reflect climatic conditions, with thicker rings produced during wetter years and thin rings during times of drought. Patterns in the annual production of rings can be used to date the age when a sagebrush plant became established and to assess variations in past climate. Researchers studying age rings within sagebrush populations typically find that shrubs are of similar ages, suggesting that seedling establishment is infrequent and episodic. They have also found that stem size does not reflect age – large sagebrushes attain their size because they grow in favorable environments and not because of their longevity.

10. Contrary to what you may have heard, sagebrush is quite valuable to wildlife for food and shelter.



Low hills at Seep Lakes Wildlife Management Area near Othello dotted with big sagebrush (*Artemisia tridentata*). PHOTO: MARK TURNER

As discussed under # 5, aromatic chemicals in sagebrush foliage are designed to reduce herbivory, but many animals (especially mule deer and sage grouse) are able to tolerate sagebrush browse, and in fact rely on it extensively in their diet.

Sagebrush is an important source of protein for mule deer on their winter range. Greater and Gunnison sage grouse feed almost exclusively on sagebrush from October to April (their gizzards are not adapted for grinding hard seeds like other upland game birds). Sage grouse also rely on sagebrush for nesting cover and feed their chicks insects, grasses, and forbs that grow under the sagebrush canopy. Brewer's sparrows, Sage sparrows, and Sage thrashers are other "sagebrush obligates" because of their reliance on *Artemisia* for hiding cover, nesting sites,

and feeding areas. More than a dozen other bird species are highly dependent on sagebrush and grassland habitats, including Black-throated sparrows, Vesper sparrows, Lark sparrows, Green-tailed towhees, Burrowing owls, Short-eared owls, Long-billed curlews, Sharp-tailed grouse, Prairie falcons, Ferruginous hawks, and Swainson's hawks. At least 16 species of rodents and rabbits feed on sagebrush, as well as hundreds of insect taxa (52 species of aphids alone according to one study).

Big sagebrush is also less responsible for the decline of native grasses and deterioration of range conditions than is often depicted. Anecdotal evidence that sagebrush is significantly more common today than in pre-colonization times in much of the West is not substantiated by historical accounts of pioneers and early photographs. One famous photo used in textbooks for years to illustrate the increase of big sagebrush in the last century actually depicts an area that had been recently burned (and was thus devoid of sagebrush) rather than a site naturally dominated by grasses. Changes in the abundance, density, and composition of native perennial grasses and forbs since European settlement are better explained by past grazing history and changes in climate and fire regimes. Despite decades of removing sagebrush by chaining, thinning, burning, and applying herbicides, sagebrush habitats have rarely been permanently converted to perennial grasslands because the shrubs are better adapted to winter precipitation, drought, and grazing pressure.



Slender awksbeard (*Crepis atrybarba*) among big sagebrush (*Artemisia tridentata*). PHOTO: MARK TURNER

Modern sagebrush systems are being impacted by changes in natural fire frequency from invading annual weeds (such as cheatgrass, medusa head, and ventenata) and conversion to agriculture and urbanization to such a degree that many sagebrush obligate species (such as the sage grouse and pygmy rabbit) are in significant range-wide decline. It is surprisingly difficult to find large expanses of unaltered sagebrush vegetation anymore!

Walter Fertig searches for sagebrush stands in eastern Washington from his base at the Marion Ownbey Herbarium of Washington State University in Pullman.



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The Interconnected Life of the Whitebark Pine

by Steven Clark



Whitebark pine (*Pinus albicaulis*) on the south side of Mount Adams.
PHOTO: PAUL SLICHTER

In late September a solitary hiker meanders up a rise near the treeline in the North Cascades. Our hiker has the rare pleasure of seeing a grizzly bear's rubbing tree. Used and worn like old upholstery, this tree has been visited several times by the same male. On walks our sojourner, under the scold of a red squirrel—so rapid is the chatter that it reminds one of a

woodpecker. Sensing a change, the squirrel darts for cover just as a cold blast of wind bangs up the incline. Our hiker hustles down a slight slope toward a huddle of trees. The hiker's scurrying catches the eye of a Clark's nutcracker who lets out a raspy groan. The hiker hunches down against the dense lower branches of a matted tree. The gnarly tree provides a little respite from the blast. In fact, that stunted little tree provides a little something to the grizzly, the squirrel, the nutcracker and the hiker. The tree is the whitebark pine (*Pinus albicaulis*).

Occasionally, when walking through low elevation forests I'll see the five elegant needles of the western white pine (*Pinus monticola*). Seeing that, I imagine I've seen a close relative to our higher-elevation whitebark pine. But I'd be mistaken. The closest relative to the whitebark pine is actually the Swiss pine (*Pinus cembra*) of Europe. How could it be that a pine from Europe is more closely related to the whitebark pine than our local western white pine?

130 million years ago, earth's land was crushed into two super continents—Gondwana to the south and Laurasia to the north. In the cold northern Laurasia, an ancient pine species diverged into two sister species—our *Pinus albicaulis* and Europe's *Pinus cembra*. As Laurasia split into Europe and North America the sisters were separated in space but less so in their genetic history. The whitebark pine retains the traits that were carved by the evolutionary forces of cold weather. They range from southwest Canada to the Sierra Nevada in California and east to northern Nevada and Wyoming. In Washington, our largest stands of whitebark pine are above 6,000 feet in elevation in the northern reaches of the Cascade and Selkirk Mountain ranges. Unfortunately, whitebark pine is in decline throughout its range.

The needles (actually very thin leaves) are stout and tough and bundled into packs of five. The bark is flaky but in windy



Range of whitebark pine in western states and western Canada. MAP: USFWS

habitats the bark can be polished in such a way that it is reminiscent of madrone—sometimes smooth and rosy-colored. The cones are smaller than western white cones, and they have a purplish hue. These cones are interesting; they have unusually oily, calorie-packed seeds tucked into the base of the scales. The National Park Service reports that whitebark seeds are 51% lipids and 21% proteins. In Washington these seeds (also called pine nuts in the culinary world) are a key part of the fall food sources in high-elevation terrain. In fact, both the grizzly (*Ursus arctos horribilis*) and the red squirrel (*Tamiasciurus hudsonicus*) compete for the exact same seeds.



Whitebark pine (*Pinus albicaulis*) female cones. PHOTO: PAUL SLICHTER

Those seeds are a long time in coming. In the short growing seasons of the high mountains, whitebark pines grow slowly, but they can grow for a long time; the oldest known tree is

1,267 years old and grows in central Idaho. Whitebark pine slowly push their roots deeper and deeper into the thin soils. Slowly, they gain enough photosynthetic capacity to produce cones. They may require 25 to 30 years to begin producing cones. The cones themselves take two years to mature. And peak cone production begins at 60 to 80 years and continues for several hundred more.

Squirrels are cache hoarders. Red squirrels climb the whitebark tree, cut down the cones then land on the ground and proceed to dig out the rich seeds. Then they hide them—often in massive caches of hundreds of seeds. The strategy of squirrels is to cache bunches and not worry too much about *where* they are cached—when the squirrel gets hungry it looks in likely spots and eureka! Often the seeds are there. Grizzlies have a similar strategy.

Grizzlies don't climb trees, but they do indeed look—and sniff—in likely spots. A few weeks after the squirrels cache pine seeds pre-hibernating grizzlies begin sniffing out caches.

Black bears (*Ursus americanus*) also will sniff out the larder of the red squirrels. Robust whitebark cone crops are correlated with higher birth rates for grizzly bears—an impressive reach for a tiny pine seed! Both the squirrels and the bears get significant fall calories from pine seeds, though the squirrel will be forgiven for imagining it had hidden enough to feed a bear! Humans also name whitebark pine as a traditional food. The First Peoples of the US and Canada would make a mash of the pine seeds and cook them in hot ashes—sometimes mixed with service berries.

Whitebark pine don't grow very tall. In exposed high-elevation locales whitebark pine will take on a krummholz (German for “bent wood”) formation. Krummholz trees experience freezing winds that damage the cells that are not protected. Consequently, any shoot that grows away from the mass of the tree loses protection and dies. Shoots that stay below snow or stay



Whitebark pine (*Pinus albicaulis*) showing krummholz growth pattern. at the base of the south lateral moraine for the Mazama Glacier, Yakama Nation lands at Bird Creek Meadows, Mount Adams. PHOTO: PAUL SLICHTER



Orange tips may be evidence of freeze-death of needles that protruded above snow. PHOTO: WALTER FERTIG

within the skirt of the lower branches have a greater chance of surviving. If you imagine ice pruning any limb bold enough to poke above the mass of the tree you end up with a gnarled, low, bent tree—a krummholz tree. John Muir described one such tree in Yosemite as being “...426 years old, whose trunk is only six inches in diameter; and one of its supple branchlets, hardly an eighth of an inch in diameter inside the bark, is seventy-five years old, and so filled with oily balsam, and so well-seasoned by storms, that we may tie it in knots like a whipcord.” On the other hand, if a whitebark pine somehow successfully competes for a spot at lower elevations, it can grow tall. The Oregon champion is 72 feet tall in the Eagle Cap Wilderness. Most of the whitebark pine in higher elevations are much shorter.

One might imagine that germination in a shallow-soiled, windswept habitat would be a challenge. Propagation from seed is possible under these conditions through a mutualistic relationship between whitebark pine and Clark’s nutcracker; the association between these two species is so tight that one would be unlikely to survive without the other. At high elevations, the nutcracker is critically dependent on the pine seeds. The cones don’t deteriorate and release their seeds through decay. The long, strong bill of Clark’s nutcracker pries out the seeds and then the bird buries them. Mind you, the nutcracker doesn’t squirrel them away—jays are more cunning in their strategy. In an amazing piece of evolution, these birds can memorize over 10,000 seed locations each autumn! And while their memory is prodigious, some seeds do go uneaten and that buried hoard becomes the sapling of following years after successful germination. Without the seed caching of the jays, the reproduction of whitebark pine would be next to nonexistent.

The whitebark pine is an impressive, resilient tree but it is in decline. Mountain pine beetles, an ancient companion of whitebark pine, are surviving in higher numbers—perhaps due to reduced winter die-off due to climate warming. When the beetle makes a hole in the bark, a new foe, the white pine blister rust, can kill the tree. Spores of this Asian fungus enter the beetle hole and invade the phloem of the whitebark pine, leading to death. In 2022 the tree was listed as threatened under the Endangered Species Act. There is intriguing genetic

work that is trying to determine whether trees can be bred to have higher than normal resistance to white pine blister rust. Results aren’t definitive yet.

The whitebark pine is 120 million years old. The grizzlies and squirrels and nutcrackers have been in Washington for tens of thousands of years. If you happen to be near the tree line—especially in the Selkirks or the Okanogan National Forest but also as far south as Mount Rainier or Mount Adams, keep an eye open for a gnarled, ancient one. Friend to wildlife and ken to the snow: our hardy, beautiful whitebark pine.

Steven Clark is a biology professor at Clark Community College in Vancouver, WA. He has led efforts to certify Clark’s campus as an affiliate of the Bee Campus USA program. The campus received certification earlier this year in April. Steven also serves on the WNPS State Board of Directors.



Places to Go: Rock Mountain, an Overlooked Peak in the Stevens Pass Area

by David E. Giblin, Ph.D.

University of Washington Herbarium, Burke Museum

Washington is awash in high quality alpine hikes that stretch from the Canadian border in the north to Silver Star Mountain in the south (subject of a future article). It simply is not possible to do all of Washington’s alpine hikes in a single lifetime (unless you are Harvey Manning and Ira Spring—I am neither’s equal). So how does one decide which ones to do? Ease of access is certainly one criterion, which is partially why the hikes at Mount Rainier and Olympic National Parks are so popular (not to mention the accompanying world-class scenery). Outside of the parks there are super-visited destinations like Sauk Mountain, Iron Peak, Ingalls Lake, and countless others. As a city-dweller, nothing is more discouraging than driving over two hours to a trailhead only to find a full parking lot followed by a constant stream of people along the trail. If you cherish solitude while engaging with nature and exerting yourself on the trail, then Rock Mountain may be just the place for you.



Lush riparian area before the start of the climb to the ridgeline.

PHOTO: AVA KLOSS-SCHMIDT

I will say at the outset that this is not an easy trail physically, but I also don't think that it is a difficult trail. So, let's call it overall moderate with one steep section. This description is from the Snowy Creek trailhead, not the US Highway 2 trailhead (that route is for those who are looking for a serious workout and are fine with the added heat of hiking a southern exposure). The Snowy Creek route is nine miles round-trip with 3,600 feet elevation gain (my rule is that 1,000+ feet elevation gain per mile is difficult, so this is well below that). The first half of the trail is through wonderful forest dominated by *Pseudotsuga menziesii* (Douglas-fir) and lush riparian corridor vegetation—also lots of birds, including Hermit Thrush and Western Tanager. The going here is steadily uphill, but nothing onerous.

At about 2.5 miles in, you will come to a small snowmelt creek and to your left (south) will be a massive snowfield (at least in late July 2021). It is a scene of destruction from avalanches pouring down from the steep slopes that surround the southern and western boundaries of this basin. Though it looks like the trail crosses the stream, it doesn't. Bear left here along the broken forest edge and head south on the edge of the snowfield until you find the trail again. You want to go up that big hill to the south-east of where you are looking across the snow basin.



View from the saddle just west of Rock Mountain summit. PHOTO: AVA KLOSS-SCHMIDT

Once on the trail again, this is where it gets steep. Fortunately, much of the steep part is in forest understory—lots of *Abies lasiocarpa* (subalpine fir). Emerging from the forest you then head into massive open fields and long switchbacks that take you up to the ridge on the southwest side of Rock Mountain. Here is where the wildflower show really begins, as does the scenery. *Aquilegia formosa* (columbine), *Lilium columbianum* (Columbia lily), *Lupinus latifolius* (broadleaf lupine)—all of the subalpine wildflowers that you would expect. To the north you can see Glacier Peak, Mount Baker, and the North Cascades. The switchbacks make the going easier than the steep forest section you just passed through, but it is still steady upwards.

At the ridgeline and the summit, the views are stupendous—all the way down to Tumwater Canyon and out into the Columbia Basin to the east. For me, the most remarkable view is to the south of Snowgrass Mountain with its broad alpine plain that is really only visible from this vantage point (you can't see



Leo Linder (l) and David Giblin (r) looking north from Rock Mountain summit. PHOTO: AVA KLOSS-SCHMIDT

it from Highway 2). At the summit you'll find a rich display of subalpine and alpine species including *Lewisia columbiana* (Columbia lewisia), *Lomatium brandeegii* (Brandeege's lomatium), *Agoseris glauca* var. *dasycephala* (pale agoseris), *Erigeron aureus* (golden fleabane), *Tonestus lyallii* (Lyall's goldenweed), *Erismum arenicola* (mountain wallflower), *Cherleria obtusiloba* (alpine sandwort), *Sabulina nuttallii* (Nuttall's sandwort), several species of *Eriogonum* (buckwheat), *Castilleja elmeri* (Elmer's paintbrush) and one of my favorites, *Campanula scabrella* (rough harebell).

This is one of the peaks that I surveyed as part of my 50 Peaks Project. My undergraduate colleagues Ava Kloss-Schmidt, Leo Linder and I found a total of 62 species, subspecies, and varieties at the summit area. You can find the full list on the WNPS Plant List database under the title "Rock Mountain summit area" (https://www.wnps.org/plant-lists/list?Rock_Mountain_summit_area) in Chelan County. Sandra Ruffner did a checklist for Rock Mountain based on doing the hike from the Highway 2 trailhead—three times! You can find that list also in the database (https://www.wnps.org/plant-lists/list?Rock_Mountain)—it is a massive list, and accomplishment, that includes 173 species.

My colleagues and I did this as a backpack trip, and it took about three hours to get to the summit, so very doable as a day hike. We did not see another person on the trail or on the summit. We camped in the basin below the peak—magical, if not a bit windy (but hey, at least the wind kept the mosquitoes at bay). For those so inclined to backpack, you can do the adjacent Mount Howard, but there is no trail to the summit.

Rock Mountain is a gem of a destination for those who are looking for isolation, a full day of hiking, a rich flora with interesting finds (*Campanula scabrella* is disjunct in Washington from its core range in Idaho and Montana) and extraordinary views. The road into the trailhead is a little bumpy/washboardy in places, but certainly accessible with a sedan/low clearance vehicle. There is no trailhead pass needed, and there are great directions at the Washington Trails Association (WTA) website: <https://www.wta.org/go-hiking/hikes/rock-mountain-via-snowy-creek>.



Botany Washington 2023: Late Spring in the Methow Valley



Therese Olson with big pine bark. PHOTO: KARI GILJE



Spokane Gulch field hikers. PHOTO: JANKA HOBBS



Lady bugs at Lookout Mountain. PHOTO: JANKA HOBBS



A warm Winthrop welcome for WNPS. PHOTO: DENISE MAHNKE



Lookout Mountain Saturday. PHOTO: THERESE OLSON



Odd twists on a *Lewisia rediviva* on Lookout Mountain. PHOTO: JANKA HOBBS



Climbing on the Spokane Gulch trail near Mazama. PHOTO: KARI GILJE



Spokane Gulch respite on a hot day. PHOTO: JANKA HOBBS



Calochortus lyallii. PHOTO: DON JACOBSON



Lomatium nudicaule. PHOTO: DON JACOBSON



Molly Boyter talking about the silvercrown (*Cacaliopsis nardosima*). PHOTO: KARI GILJE



Spokane Gulch Sunday group. PHOTO: KARI GILJE



Botany Washington 2023 – Winthrop – The Barn. PHOTO: DON JACOBSON

Summer Activities 2023

by Becky Chaney, WNPS Conservation Committee Chair

Spring brings osoberry, Oregon grape, salmonberry and, just as regularly, grants and issues. This is the start of the annual cycle for the WNPS Conservation Committee. Our members meet monthly on Zoom, we take time for a quick comparison of the current state of blooms across Washington, and move on to the business of advocating for native plants and habitats in support of the WNPS mission. Now, the summer solstice having just passed—in the forest the faces of children are smeared with berry juice, arms are bumpy with mosquito bites, abundant vegetation pushes into the trails tripping feet—it is time for an update to all our native plant enthusiasts. Here's a sample of work to date in 2023.

By mid-April, signed contracts were in place for all the 2023 Conservation grants. Awards this year will once again benefit native plants and habitats across the state. An expanded nursery will better grow shade adopted plants for restoration projects in the Tarboo Wilderness. Research supporting healthy reproducing gray oreocarya (*Oreocarya leucophaea*) populations will be completed in south central Washington. (If you're unfa-



Gray cryptantha (*Oreocarya leucophaea*). PHOTO: MARK TURNER

miliar with it, check out the Burke Herbarium image collection's stunning photos of this fragile-looking endemic beauty that survives in Washington's harsher habitats.) Additionally, research assessing the impacts of herbicide on culturally- and ecologically-critical common camas (*Camassia quamash*) is under way. In Spokane and Stevens counties, an experimental incentive program that offers a native plant reward in exchange for invasive plant removal will be implemented. And finally, local youth will help with post-fire restoration of native shrubs within mule deer wintering habitat in the Wenatchee foothills. As the year draws to a close, watch for reports on these WNPS-funded projects!

Once grants are finalized, the Conservation Committee directs its attention to advocacy. Whether member- or agency-initiated, as many issues as possible are addressed. Native plants are such a primary component of healthy habitats that recognition of their importance is increasing. In April a member of the South Sound Chapter, Bonnie Blessing, alerted WNPS that the City of Tumwater was preparing a Habitat Conservation Plan. Committee member Rebecca Evans reached out to better understand her concerns. Consequently, WNPS is encouraging Tumwater to recognize that native landscapes such as prairies and wetlands support the native plant habitats and wildlife that need protection. An additional reminder is included noting that the best available science should inform planning decisions.

Conservation Committee members keep watch for comment requests. Committee member Susan Saul has eyes as quick to spot an advocacy comment opportunity as a rare plant. She forwarded comment notice regarding a proposed Conservation Policy from Washington Department of Fish and Wildlife (WDFW). The agency states that with a 'rapidly developing world' WDFW has a 'myriad of conservation challenges' to address when approaching management solutions. They are asserting that including habitat conservation should be a priority. WNPS supports taking this path and assumes this interest in habitat conservation includes protection of native plants. Additionally, we suggest listing botanizing as a use, along with the other specified uses, so that it would receive consideration during planning.

The world turns, the seasons progress, and, so far, the plants endure. Additional issues crowd in and ongoing issues vie for attention. Every conservation action WNPS takes requires direct office support, review and approval from the WNPS Executive Committee, and Conservation Committee engagement. We depend on the support of our membership to alert us to issues and tell us your concerns—please feel free to reach out.

Thank you to everyone for your ongoing support of WNPS and the work of the Conservation Committee!

Becky can be reached via e-mail at conservation@wnps.org. She is always happy to hear your conservation interests, concerns, and comments. Ideas for conservation-oriented webinars are also welcome.



Turf Wars: Let the Battle Begin

by Kelsey Kelmel, Co-Chair Columbia Basin Chapter

You should kill your lawn. Seriously, murder it. Turn off the sprinklers. Let it die a slow death of dehydration in our ever-record breaking heat or even better, smother it with cardboard and mulch and treat the earthworms to a feast. In fall, dig into its decaying remains and plant a diverse array of native plants. Spend future seasons sipping champagne, chuckling at the wealth you've amassed from switching to drip irrigation. Toast the pollinators and birds as they flock to the resilient oasis you've created over its cold composted corpse. Too dramatic? More dramatic and terrifying is the overwhelming decline in biodiversity we face. The lawn has already declared war. We need to retaliate before it's too late.

Currently, over 40 million acres of the US have been converted to the high-input monoculture crop that is the lawn.¹ That biological dead zone grows by the hour. As lawns have taken over, wildlife habitat has shrunk and pollinator populations have plummeted. The correlation is not coincidence.



A cacophony of color and texture in an established native + waterwise garden at Tapteal Native Plants, a small native plant nursery owned by WNPS Member Ann Autrey in Tri-Cities, WA. Find a native plant nursery near you by checking out the WNPS Native Plant and Seed Sources List (<https://www.wnps.org/native-gardening/sourcing>). PHOTO: KELSEY KEMMEL

Pollinator loss is a direct result of habitat fragmentation and pesticide use, two things the lawn depends on. Pesticides are indiscriminate killers, meaning it's like dropping a mini nuclear bomb. All life forms in its vicinity are negatively affected, not just the intended targets. These detrimental effects are seen in humans as well. The link between pesticide use and cancers is well documented.²

Also, the lawn is a thirst trap. Aside from being a huge time suck in the form of maintenance and mowing, nine billion gallons of water are dumped annually on American lawns³ and they keep demanding more. We're in a drought. Not just any drought, an extreme drought⁴. With that, the flow and quality of our waterways is becoming increasingly unpredictable. Add in the compounding demand from our skyrocketing population, it's unwise to assume our watershed will keep up. Scarcity, price increases and water rationing looms on the smoky horizon. The amount of irrigation, and the whopping utility bills that go with it, could be astronomically less if landscapes were designed with plants adapted to regional precipitation and climate.

Unlike ornamental plants found on nursery shelves, native plants co-evolved alongside the flora and fauna surrounding them. In the process, they've created intricate relationships with these species based on reciprocity. Non-native plants have no such ties but rather are selectively bred to be replicated on a massive scale. Superficial traits like color are valued over biological impact (viable food source for pollinators). By contrast, native plants are genetically varied meaning each generation adapts to be stronger and more resilient than the last. Their inbred horticultural cousins severely lack this adaptability, leaving them more susceptible to variables like droughts, diseases and pests. Those on the other end of the spectrum escape and become ecological terrorists. Pampas grass, bindweed, Bermuda grass, and tree of heaven, to name a few, grew out of the nursery into superweeds, impervious to most methods of control.



A waterwise plot in a public Heritage Garden at Hansen Park in Kennewick, WA. The Heritage Garden Program offers customized plant lists and planting guides with emphasis on native and waterwise flora for residents of participating counties in Eastern WA. Learn more at hgcd.info. Species: gray rabbitbrush (*Ericameria nauseosa*), butterfly milkweed (*Asclepias tuberosa*), blanket flower (*Gaillardia aristata*), lineleaf fleabane (*Erigeron linearis*), purple sage (*Salvia dorrii*) Richardson's penstemon (*Penstemon richardsonii*).

PHOTO: KELSEY KEMMEL



The author's backyard bermuda transformation. Bermuda grass was such a bummer. Thick mulched pathways, no irrigation and digging took care of most of the unwanted bermuda grass. Now, a plethora of fast growing, short lived biennials and annuals are migrating around the gaps while the slower to grow shrubs and perennials fill out. Watching the transitions between seasons and life cycles has been a reminder that nothing is stagnant—life will always find a way. PHOTO: KELSEY KELMEL

Like the lawn, these noxious weeds' goal is to colonize and monopolize the ecosystems they invade. The detrimental effects are felt up the food chain. With our climate becoming ever more volatile and constant attacks by these escaped monocultures, supporting the genetic diversity of native plant communities is vital to build strength and resilience to impending extremes.

There are cities that have vanquished the lawn. The drought-ridden Southwest has mastered the art of xeric, also known as waterwise, gardening and rainwater harvesting. Tucson, Santa Fe, Albuquerque, Phoenix, Las Vegas, even Spokane have turf replacement and greywater programs with financial incentives for residents. Not only are these landscapes waterwise, but they are also stunning representations of the wondrous ecological variety in the US. By escaping the matrix of homogeneous lawns and exposing ourselves to the ecosystem in which we all play a part, the world is expounded for what it truly is: a vibrant web of multifaceted individuals working symbiotically to create and sustain life. It's time we reconnect to that web. Our yards can become our strongest allies in the battle for water savings, biodiversity, climate resilience and survival.

Do it. Go to war with the lawn. Get your landlord onboard. Start small with a native pollinator patch then expand from there. Get involved with local organizations that support native habitat and conservation efforts. Speak up for change in our cities and communities to incentivize waterwise practices and native vegetation. Demand policies that embrace water conservation and holistic land management. Support biodiversity and with it, humanity. Kill the lawn, create life.

A Few Resources

Your local native plant nursery! Check out the WNPS Native Plant and Seed Sources List to find the nursery nearest you (<https://www.wnps.org/native-gardening/sourcing>).

The Heritage Garden Program: Free site evaluations and native garden design for participating counties in Eastern Washington (www.hgcd.info).

Your fellow native plant enthusiasts! Get involved with your local WNPS chapter to organize seed swaps, plant sales or native garden projects!

More Information and Inspiration:

Nature's Best Hope: A New Approach to Conservation that Starts in Your Yard by Doug Tallamy. Check it out from the library or local bookshop.

Follow @pollinatorpartnership <https://www.pollinator.org/>

Use the National Wildlife Federation's Native Plant Finder <https://www.nwf.org/NativePlantFinder/> to discover which plants serve as host plants for native pollinators in your area

Check out City of Spokane's free turf conversion guide: <https://my.spokanecity.org/publicworks/water/water-wise-spokane/spokanescape/>

Sources:

¹'About Pollinators' Pollinator Partnership, <https://www.pollinator.org/pollinators>

²'The Average American Lawn.' The Nature Conservancy, <https://content.yardmap.org/explore/the-average-american-yard/>

³'Pesticide-Induced Disease Database.' Beyond Pesticides, <https://www.beyondpesticides.org/resources/pesticide-induced-diseases-database/cancer>

⁴'Outdoor Water Use in the US.' United States Environmental Protection Agency, <https://19january2017snapshot.epa.gov/www3/watersense/pubs/outdoor.html>

⁵'Current Drought Map' US Drought Monitor, <https://drought-monitor.unl.edu/>

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Bonsai from Native Plants

by Regina Johnson

Paraphrasing Tolstoy: Young trees look alike, but every old tree looks old in its own way. Bonsai is a celebration of old trees. It's the art of miniaturizing trees, inducing young trees to appear older than they are, and displaying the individual characteristics of old trees, all miniaturized in pots for ease of contemplation and admiration.

Robert van Pelt shows the uniqueness of old trees in incredible detail with his publications on old-growth trees, illustrating the architecture of individual trees. Each one is as distinctive as individual people, and tells the story of its life through multiple leaders, scars from fire, lightning, and tree or rock strikes, dead leaders, broken branches, stilt roots, etc.

Especially pre-automobile, people in Chinese and Japanese urban areas did not have access to wild areas, and even now, many urban Chinese don't have the option of hopping in a car and driving to a wilderness area. The Chinese initiated what we now know as bonsai sometime around the 6th century, allowing urban residents to contemplate and appreciate a tree or a miniaturized landscape at close quarters.



Pinus ponderosa is used more often than one might think! This is an "upright" style. Notice the exposed roots. PHOTO: REGINA JOHNSON

The use of locally-sourced plant material is basic to the practice of bonsai. Those 6th Century Chinese artists didn't have access to imported plants. Yet when it comes to species selection, Americans tend to want the same plants they see in the bonsai books and exhibits, which tend to be Japanese plants. And they want to copy the styles and techniques they see in the books. And that's fine, especially for beginners. But the Japanese did not create bonsai out of whole cloth; they adapted it from the Chinese art of penjing, and made it their own with their own plants, styles, techniques, names, ceremonies, and exhibition rules. We can do the same if we like.

Chinese penjing specimens were brought to America in the 19th century, along with Japanese bonsai, but when the Chinese Exclusion Act of 1882 cut off immigration from China, that led indirectly to Japanese bonsai becoming more familiar in the U.S. than penjing. Since part of bonsai is collecting suitable trees wherever they can be found, the early Japanese-American bonsai artists working in California and Washington introduced junipers from California into the bonsai repertoire, as well as other North American and European plants common in the West Coast nursery trade. Similarly, European bonsai artists use a lot of European plants.

Bonsai can be created from nearly any perennial woody-stemmed tree or shrub species that produces true branches and can be cultivated to remain small through pot confinement with crown and root pruning. Some species are popular as bonsai material because they have characteristics, such as small leaves or needles, that make them appropriate for the compact visual scope of bonsai. Coarse foliage makes a plant less appealing at this scale.

What makes an old tree look old? And how to get that in a small tree?

Lots of trunk taper and a flared base. Flaring, exposed roots. Thick, fissured bark. Short, crooked branches that point down, not up. Deadwood. Asymmetrical crown. Broken tops, multiple leaders. Hollow trunks. Study the difference between an old-growth forest and a commercial tree plantation.

Bonsai is a four-dimensional form of sculpture: the regular three dimensions, plus time. The material is a living plant that continues to grow and change. The artistry of bonsai requires not only visualizing the form, but having the horticultural techniques to coax the tree to grow into that form. Each species reacts slightly differently so you have to know each species, primarily how to encourage and manage latent buds. Then there's the care required to keep the tree healthy and maintain its form, or to develop into a new form, similar to knowing how to strike a particular stone to get the desired effect. Soil water content management is critical, much more so than with other potted plants due to the reduced size of the container and root system. Serious bonsai collectors have trouble going on vacation due to the watering needs of their collection.

What makes a species a good candidate? Fine textured foliage and branching, and a tolerance for disturbance to the

roots. Large leaves and long internodes won't look good in a small size (think bigleaf maple, *Acer macrophyllum*); and roots that won't regrow from disturbance, or maintain fine roots near the trunk, won't survive. Most conifers are good, as are broad-leaf trees with smaller leaves and extensive ramification (fine branching), like oaks. Junipers (*Juniperus*), arbovitae (*Thuja*) and hinokis (*Chamaecyparis obtusa*) are favorite subjects due to their very fine textures.

What makes an individual plant a good candidate?

Distorted stunted form, close-in branching, close-in fine roots. Individual character in the trunk and bark. Exposed surface roots. Deadwood. Nursery plants that are too asymmetrical or stunted or deformed for garden use. Plants that have been sheared back or browsed heavily regularly. Trees growing in difficult sites: wetland soil, rock crevices, utility rights of way, old hedgerows, abandoned orchards, gardens and nurseries, road and trail sides. Plants crushed or broken by wind or animal damage, or snow load.



English oaks are popular as subjects in Europe, and our own Garry oak works just as well. Notice the strong exposed roots. PHOTO: REGINA JOHNSON

Where to get these specimens? First off, do not collect old plants from the wild outside of a salvage situation! In the not-so-distant past it was common to collect alpine krummholz for landscaping and bonsai, but this isn't sustainable and is not acceptable. Even in their severely stunted, half-dead form, they are still a vital part of their ecosystem. Don't collect rare or sensitive species from their natural habitat at all. Get permission from property owners before collecting and be prepared to pay for the privilege. One of the more satisfying ways of producing a good bonsai specimen is to propagate one from seed or cuttings, and grow it yourself; or to find that perfect specimen tucked away in a nursery, or on the clearance rack, the one that no one else wants for regular garden use. Bonsai nurseries sell starter plants but these generally are not going to be Washington native species.

Bonsai should look natural, not contrived. The Pacific Bonsai Museum in Federal Way includes a bald cypress (*Taxodium distichum*) that perfectly emulates, in a pot, the natural form of an old-growth specimen of the species in the wild. Not a traditional

Japanese style at all, and it is absolutely stunning, showing a high degree of both artistry and natural history knowledge. Western hemlocks (*Tsuga heterophylla*) with upright, full, rounded crowns may be excellent examples of traditional bonsai techniques and styling, but they don't look like hemlocks, they look like white pines. Personally, I feel that the bonsai specimen should look like the species that it is. This requires studying the species in its natural environment under varying conditions of age and growing conditions. You must know that species before you can imagine a suitable form for it. Then you have to study the specimen you have and determine how best to show off its individuality and tell its life story. That could mean a straight trunk for a bald cypress or a coast redwood (*Sequoia sempervirens*), and a broken irregular crown for a western hemlock (droopy leaders are a feature of young trees, not old ones).

The list of native tree species used in bonsai is longer than you might think: Ponderosa pine (*Pinus ponderosa*), shore pine (*P. contorta*), western and mountain hemlocks (*Tsuga heterophylla* and *T. mertensiana*), yellow and red cedars (*Callitropsis nootkatensis*, *Thuja plicata*), kinnikinnick (*Arctostaphylos uva-ursi*), Engelmann and Sitka spruce (*Picea engelmannii* and *P. sitchensis*), Douglas-fir (*Pseudotsuga menziesii*). What else could be used? Yew (*Taxus*), larch (*Larix*), oak (*Quercus*), vine and Douglas maples (*Acer circinatum* and *A. glabrum*), hazelnut (*Corylus cornuta*), red and evergreen huckleberry (*Vaccinium parvifolium* and *V. ovatum*), birch (*Betula*), hawthorn (*Crataegus*), crabapple (*Malus*), juniper, willow (*Salix*), viburnum (*Viburnum*); other species of these genera are commonly used, so ours might work too. Deer-browsed serviceberry (*Amelanchier alnifolia*) and cascara (*Frangula purshiana*) show their potential as bonsai subjects, with extensive ramification and stunted leaves. Hemlock and red huckleberry in landscape form on a constructed "nurse log" would be fun to try. White rhododendron (*R. albiflorum*) might work—small-leaved forms of rhododendron and azalea are common subjects.

There are two public bonsai gardens in Washington, both well worth a visit from native plant enthusiasts, and the State Fair in Puyallup includes a bonsai display every September. Local bonsai clubs will also host shows of members' collections. The Pacific Bonsai Museum in Federal Way, on the former Weyerhaeuser campus, features works by bonsai masters from around the world, some using locally native plants. Elandan Garden in Gorst, on the Kitsap peninsula, is the work of a single bonsai master (and University of Washington Forestry grad) and contains over 300 specimens from decades of work. Many of his specimens are locally native species.

Regina Johnson is a long-time WNPS member from Olympia where she works as a restoration ecologist for the state. Before that she worked in landscaping and horticulture in the San Francisco Bay Area, where bonsai clubs are more common than native plant society chapters. While she appreciates the artistry of bonsai, she doesn't like making pruning decisions so she only has three of her own (all salvages, one a Callitropsis nootkatensis in "weeping" style).



A Long History of Hybridization in Pacific Northwest Wild Strawberries

by Sebastian Mortimer and Aaron Liston, Department of Botany and Plant Pathology, Oregon State University, Corvallis OR

The garden strawberry (*Fragaria* × *ananassa*), found in home gardens, in grocery stores, and in stalls at farmers markets, is known to be the product of a single hybridization event between two closely related wild strawberry species. This hybridization happened in Europe only a few hundred years ago making the cultivated garden strawberry one of the youngest cultivated crops.

The two wild strawberries were brought to France from opposite hemispheres almost 100 years apart – the first, the Virginia strawberry (*F. virginiana*), from northeastern North America and the other, the beach strawberry (*F. chiloensis*), from southern Chile. Although the individual parents of the garden strawberry traveled thousands of miles before they were crossed, they co-occur along the west coast of North America.

The story of strawberry hybridization does not start with the garden strawberry; the parent species of our garden strawberry are themselves the products of many ancient hybridizations going back more than 1 million years. Today the story continues, and because the fruits of these hybridization events are largely still in existence, we can trace the history of hybridization among both the cultivated and wild strawberries.

There are four distinct species of strawberry (genus *Fragaria*) in the Pacific Northwest (PNW); the beach strawberry, the Virginia strawberry, the Cascade strawberry (*F. cascadiensis*), and the woodland strawberry (*F. vesca*). The beach strawberry, common along the Pacific Coast of North America, occurs from the Aleutian Chain of Alaska to southern California and is rarely found more than ¾ of a kilometer inland. In South America, the range of the beach strawberry extends farther inland from beaches along the coast of Chile to mountain sides of the Argentinian Andes. In Hawai‘i beach strawberry is also found on mountain sides.

Beach strawberry likely arrived in these places by long distance dispersal. A recent study by Hancock and Prince (2021) concluded that the beach strawberry was probably dispersed to South America from North America by Whimbrels (*Numenius phaeopus*) and to Hawai‘i by Pacific Golden-plovers (*Pluvialis fulva*). In contrast, the Virginia strawberry (*F. virginiana*), is endemic to North America. The closest known relative to the beach strawberry, the Virginia strawberry is found from the eastern seaboard to the Washington Cascades and to the interior of Alaska and Northern Canada. The Cascade strawberry is found only in the Oregon Cascades from Mt. Hood south to Crater Lake. Lastly, the woodland strawberry is common

throughout much of North America and Eurasia. Our native subspecies is *F. vesca* ssp. *bracteata*.

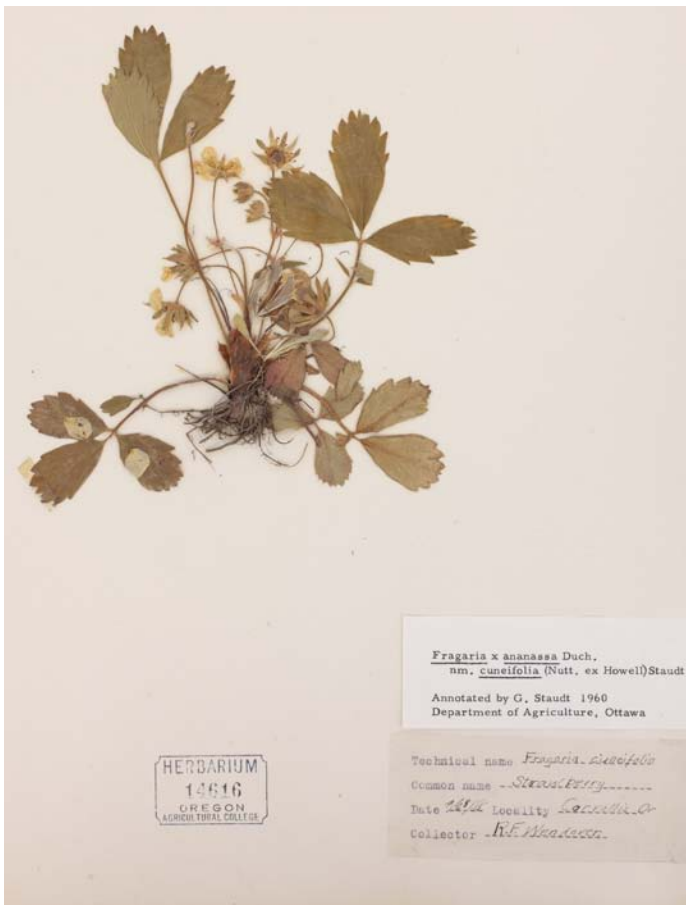
It is likely that the ancestors of all four of our extant native species crossed from Eurasia to North America via Beringia or existed in Beringia during the Pliocene-Pleistocene (Liston et al. 2014) and have subsequently spread to their current ranges. The four species of *Fragaria* present in the Pacific Northwest have interesting genetic and ecological differences.



Beach Strawberry (*Fragaria chiloensis*) near Florence, Oregon. A male (left) and a female (right). PHOTO: SEBASTIAN MORTIMER

Unlike most flowering plants, many wild strawberry species have separate sex individuals (dioecy). All four species have different degrees and sometimes varying degrees of separate sex individuals; beach strawberry populations are primarily composed of males and females, but a few hermaphrodites do exist. The Virginia strawberry displays an interesting east-west gradient where the eastern populations contain primarily females and hermaphrodites and only very few true males, while western populations are more similar to the beach strawberry (i.e., having few hermaphrodites and more males). Not much is known about the sexual ecology of the Cascade strawberry, but limited evidence shows that populations are also made of primarily males and females. The fourth species, the woodland strawberry, is considered entirely gynodioecious, where all population are made up entirely by and hermaphrodites and females. These varying sexual systems may present differing degrees of susceptibility to the detrimental effects of climate due to different resource cost of reproduction between sexes – however limited research has been done on this in wild strawberry.

Our native strawberry species also vary in the number of chromosomes their genomes contain, which is referred to as *ploidy*. The woodland strawberry, *Fragaria vesca* (all subspecies) are the only diploids in North America, having a total of 14 chromosomes (two sets of 7 chromosomes). On the other hand, the beach and Virginia strawberries, both octoploids (four copies of a diploid genome) have 56 chromosomes. The Cascade strawberry, only recently described and previously considered to be included within *F. virginiana* (Hummer, 2012),



A putative Pacific Northwest Natural Hybrid Strawberry (*Fragaria* × *ananassa* ssp. *cuneifolia*) collected in 1915 near Corvallis OR. Identified by strawberry taxonomist G. Staudt in 1960. PHOTO: DORA MULKEY, SPECIMEN HOUSED AT OREGON STATE HERBARIUM [OSC]

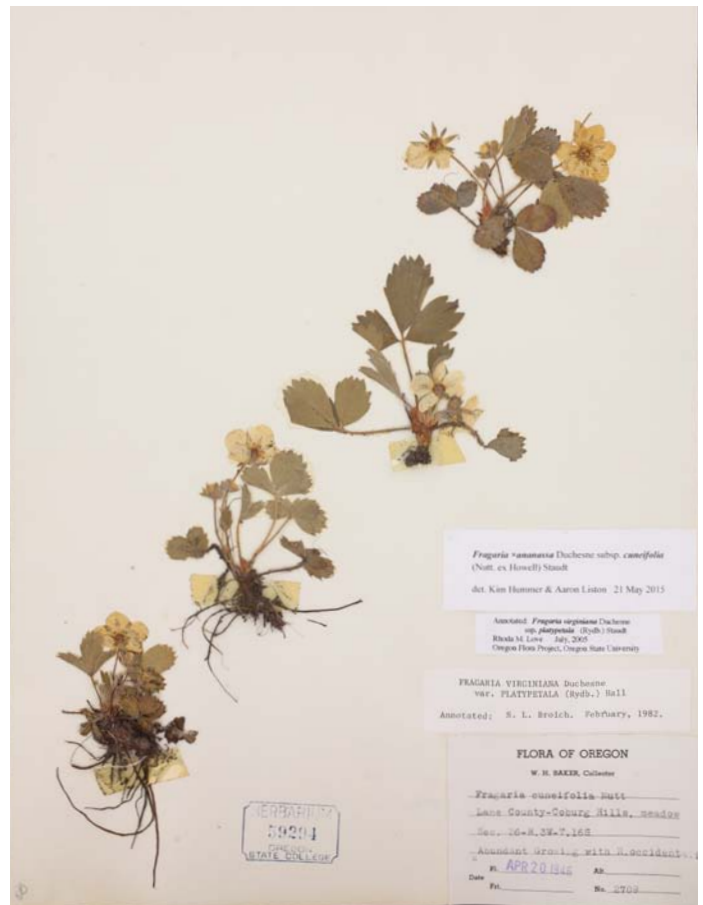
has 70 chromosomes. It is one of only two known decaploid (five copies of a diploid genome) strawberry species – the other is restricted to Iturup, a small volcanic island in the Kuril Islands of Russia north of Japan.

Ancient Hybridization and the Origins of PNW Polyploid *Fragaria*

The beach strawberry, Virginia strawberry, and Cascade strawberry are very closely related and likely share an ancient ancestor that existed in Beringia about 1 million years ago (Dillenberger et al. 2018). These species are considered polyploids since they each have more than one copy of the diploid genome. Although the ancestral relationship of Cascade strawberry, a decaploid, to the octoploids (beach strawberry and Virginia strawberry) remains uncertain, we do know that a combination of hybridization events between *Fragaria iinumae*, two apparently extinct species related to *F. iinumae*, and Virginia strawberry led to the common ancestor of all three PNW polyploid strawberries (Wei et al. 2017, Edger et al. 2019, Liston et al. 2020).

Recent Hybridization involving the Woodland Strawberry (*Fragaria vesca*)

At several sites along the central coast of California, Bringham and Senanayake (1966) documented several hybrids



An octoploid strawberry originally identified as *Fragaria cuneifolia*, then *Fragaria virginiana* var. *platypetala*, and finally as a potential hybrid *Fragaria* × *ananassa* ssp. *cuneifolia*. PHOTO: DORA MULKEY, SPECIMEN HOUSED AT OREGON STATE HERBARIUM [OSC].

between the woodland strawberry (*F. vesca*) and the beach strawberry (*F. chiloensis*) based on morphology and chromosome number. The variable number of chromosomes allowed for early investigation of hybridization between species of strawberry with different numbers of chromosomes because hybrids often have chromosome numbers that are intermediate to their parents. For example, a cross between woodland strawberry and beach strawberry often has 35 chromosomes (Bringham and Khan 1963; Bringham and Senanayake 1966; Senanayake and Bringham 1967). Counting chromosomes gave researchers a rough idea of what role hybridization was playing in the evolution of strawberries, but new whole genome sequencing techniques are allowing for a more in-depth examination of hybridization of the strawberries.

Hybridization and the Cultivated Strawberry

The cultivated garden strawberry, *Fragaria* × *ananassa*, is a product of human mediated hybridization. The strawberry you buy at the grocery store or at the farmers market is one of the most recently domesticated crops – it is only about 300 years old (Lee 1966; Edger et al. 2019). However, the parent species of the cultivated strawberry comes to us on one side as a wild relative from North America (*F. virginiana*) and on the other side as a long cultivated ‘land race’ from South America (*F. chiloensis*).

In the mid-1600s, the Virginia strawberry (*F. virginiana*) was brought from North America to England and remained a little-known garden variety until it was crossed with the beach strawberry (*F. chiloensis*). Five plants of the South American beach strawberry were brought from South America to France almost 100 years later in 1714. These plants likely come from a population with a long history (>1000 years) of cultivation by the Mapuche and the Huilliche people of the region near Concepción, Chile (Finn et al. 2013). In this way, the garden strawberry we eat today is product of one wild relative and one cultivated relative – so, to say the garden strawberry has only been cultivated for 300 years, as I did earlier, is misleading.

Another aspect of the garden strawberry's past is that all five plants taken from South America to France were female, thus we also know the direction of the original cross. The beach strawberry was the maternal parent, and the Virginia strawberry was the paternal parent (Lee 1966; Liston et al. 2014). Finally, the name *Fragaria* × *ananassa* is particularly informative of its own history—the generic name *Fragaria* is derived from Latin, the '×' denotes that it is of hybrid origin, and '*ananassa*' is derived from the word for pineapple, "ananas" in French, "ananás" in Spanish and Portuguese, both originally from "nanas" in Tupi. The reason for this is the beach strawberry cultivated by the Huilliche-Mapuche has a distinctive pineapple fragrance. Recently, a white, pineapple-scented strawberry is being sold as the Hula Berry (<https://hula-berry.com/>). The self-sterile plants

are presumably a selection of female *F. chiloensis*, but this awaits genetic confirmation.

The Elusive Status of the PNW Natural Hybrid Strawberry

The beach strawberry and the Virginia strawberry are readily interfertile as we know from the hybrid origin of the cultivated strawberry (*F.* × *ananassa*). In natural environments, where the ranges of the wild parent species overlap or are in close proximity, strawberry botanists have described what appear to be naturally occurring hybrids. Currently, the name for the presumed natural hybrid between the beach strawberry and the Virginia strawberry is *Fragaria* × *ananassa* ssp. *cuneifolia*, a name that alludes to the cultivated and human-mediated hybrid, since they are derived from a cross between the same parent species. However, this nomenclature can be confusing therefore we will refer to the putative hybrid as *Fragaria* × *cuneifolia*.

At the Oregon State University Herbarium in Corvallis several collections of *Fragaria* × *cuneifolia* have been identified and re-identified at least a couple times as different strawberry taxa. The issue seems to be that there is no consensus on what characteristics define the taxon. This is not surprising because many hybrids have highly variable physical characteristics. Primarily, strawberries identified as *F.* × *cuneifolia* have characteristics that fit descriptions of both potential parent species.



Morphologically intermediate strawberry (putatively *Fragaria* × *cuneifolia*) from Skagit County, Washington. PHOTO: SEBASTIAN MORTIMER



Big Lake, Oregon. Habitat for *Fragaria cascadiensis* North America's decaploid strawberry. PHOTO: SEBASTIAN MORTIMER

Ongoing Search for PNW Hybrid Populations

Using historical records from databases such as the Consortium of Pacific Northwest Herbaria (www.pnwherbaria.org), iNaturalist (www.inaturalist.org), and communications with local botanists to locate populations, we made many new collections of putative hybrid populations throughout the Puget Sound, San Juan Islands, Olympic Peninsula, and Oregon's Coast Range in the spring of 2021. Through a grant from WNPS I was able to collect and sequence whole genomes of seven individuals from populations of strawberries with characteristics intermediate to *F. chiloensis* and *F. virginiana*.

What did we find? Our genome-wide dataset shows very little evidence of recent hybridization in Washington and Oregon between the two species. Most importantly we found no evidence for the presence of a hybrid species existing in the Willamette Valley, Puget Trough, Olympic Peninsula, or the San Juan Islands. Instead, we found that the strawberries in these areas share a common ancestor with the coastal populations of *F. chiloensis* but are genetically distinct.

We think it may be helpful to think of these populations as a subspecies of *Fragaria chiloensis*. The habitats of these strawberries are distinct from those at the coast — they occur in Puget Trough meadows, bald mountain tops in Oregon's Coast Range and Olympic Peninsula. These habitats are almost like islands in a sea of dense fir and spruce forest where octoploid strawberries don't grow. Many of our visits to sites in the Puget Sound and the San Juan Islands in 2021 revealed small and fragmented populations. In these populations females are almost completely absent. Populations with extreme sex ratio biases may be more vulnerable to extinction in an increasingly hot and arid climate (Hultine et al. 2016). We contend that this is a cause for concern because these mountainous *F. chiloensis* varieties may harbor genetic variation important for conservation and crop improvement.



Restoring Sagebrush is a Top Conservation Priority

by David E. Giblin

University of Washington Herbarium, Burke Museum

Restoring native plant communities in sagebrush habitat is perhaps the greatest conservation challenge in Washington. By sagebrush habitat I am referring to those interior, cold-desert areas typically dominated by *Artemisia tridentata* (big sagebrush), *Purshia tridentata* (bitterbrush), *Ericameria nauseosa* (rabbit-brush), and a suite of annual, biennial, and perennial herbaceous species. There are variants on this theme—some areas are dominated by *Artemisia rigida* (stiff sagebrush) or *Artemisia tripartita* (threetip sagebrush) instead. Development of all types—agricultural, industrial, residential, and recreational—have claimed their respective portions of sagebrush communities such that 95% of their original area in Washington has been eliminated or significantly degraded. Washington is not unique in this regard relative to other western US states, as sagebrush habitat has declined similarly throughout its range. However, Washington is where we live.

When sagebrush habitat declines or disappears so do a whole bunch of other species, and not just plants. Over the past century there has been an overall simplification of the biota across large swaths of Washington's sagebrush lands, and large tracts of these degraded areas are on state-owned lands. Those are our lands, funded and supported by Washington taxpayers.



Looking north from an intact sagebrush plant community to a sea of cheatgrass on a south-facing slope at Ginkgo Petrified Forest State Park in May 2023. PHOTO: DAVID GIBLIN

Our tax dollars also support the maintenance of state roads, bridges, and highways. We would never allow 95% of our roads, bridges, and highways in Washington to be eliminated or degraded. We need to get to a point where the same care and prioritization is placed on native plant communities such as sagebrush habitat.

Climate change and invasive species, primarily *Bromus tectorum* (cheatgrass), have created a fire return cycle (time between fires at any one place) and fire intensity to which species of *Artemisia* are not adapted. Once burned, *Artemisia* shrubs don't come back. Consequently, there are expansive areas once dominated by sagebrush that are now mostly cheatgrass. Many of these thoroughly degraded areas are in flat areas or on south-facing slopes, of which Washington has many given that the Columbia River runs north-south through the middle of sagebrush country here, with many east-west oriented drainages formed by its many tributaries.

As a new arrival in the Pacific Northwest in 1995 I visited Ginkgo Petrified Forest State Park to see the petrified wood collection. The trail off the Vantage Highway coursed through sagebrush. Today it is a sea of cheatgrass, waving in the wind, turning from green to brown in a matter of a few spring weeks. The best view for this scene is from across the highway on the north-facing slope of a marvelous, intact sagebrush community. *Phlox hoodii* (Hood's phlox), *Balsamorhiza sagittata* (arrowleaf balsamroot), *Lupinus saxosus* (rock lupine), and *Microsteris gracilis* (slender phlox), and so many other plants abound among the big sagebrush plants. There is no trailhead sign—just a gap in the highway guardrail across from the petrified wood parking area. A long-abandoned dirt road leads uphill

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across the hillside. If the average person stood in the middle of the Vantage Highway (with no traffic coming, of course) facing the Columbia River and looked left (sea of cheatgrass) and right (sea of sagebrush) the choice would be obvious. The same can be said for the average bird, insect, reptile, and mammal.

Somehow, we need to figure out how we recover/restore/reclaim those seas of cheatgrass into something that resembles the diverse and dynamic plant community that I described above. At Botany Washington in 2019, Dr. Jon Bakker from the University of Washington gave a presentation on restoring sagebrush, and he suggested that in light of climate change perhaps the target should be native grassland rather than sagebrush-dominated communities. That is fine, as it would be an improvement over seas of cheatgrass. So how do we begin to make progress in this direction?

One idea that comes to mind is using agricultural-scale techniques to create pockets of restored sagebrush on state lands. For example, when I travel across central Washington, I see highly-irrigated areas with massive areas of shade cloth used to grow/nurture agricultural crops that otherwise wouldn't have a chance of thriving. Perhaps similar approaches could be used to establish sagebrush shrubs or grassland plants. I'm not a restoration ecologist, but I do know that simply outplanting shrubs and herbaceous plants into degraded meadows is not going to work at scale—too much mortality. We need innovation, experimentation, and a sense of urgency to succeed. It would be nice to see the Washington Native Plant Society play a key role in such an effort.

This spring I was driving through one of the seas of cheatgrass that are common on our state-owned lands in central Washington. I came upon a narrow east-west running draw and got out to explore. As I descended the north-facing slope I was immediately up to my chest in sagebrush, my knees in bluebunch wheatgrass (*Pseudoroegneria spicata*), underfoot (not literally) were a healthy mix of native annual and perennial herbs, and the thin soils of the basalt rimrock at the top of the draw was dotted with bitterroot (*Lewisia rediviva*). Birds flew among the shrubs, and I even crossed paths with both a badger and a bobcat. This is what is possible, and this is what we are missing.

Developing successful methods for converting cheatgrass-dominated lands into something more productive ecologically at scale is desperately needed if we want to recomplexify (my word) our previously sagebrush-dominated public lands.



Douglasia Wants Your Stories!

Submissions for *Douglasia* from WNPS members or other native plant enthusiasts are always welcomed and encouraged. Have something interesting to share? Email douglasia@wnps.org with your ideas or drafts, or go to wnps.org/douglasia for more information.

WNPS 2023 Annual Awards

The 2023 Awards have been nominated and selected by the WNPS State Board of Directors. Please note the following nominees that have been approved by the board to receive awards.

WNPS will present these awards at the 2023 Study Weekend at Mount Baker, later this summer.

Mentzelia Award:

The WNPS Mentzelia Award is presented to a WNPS member who has made a significant contribution to native plant conservation, research or education in Washington State.

Award Recipient – Keyna Bugner, WNPS Board President

Keyna has been a WNPS volunteer at both chapter and state level. In the Central Washington Chapter, she has been a field trip leader and has served as secretary/treasurer since 2015.



In her position with the Department of Natural Resources's Natural Areas Program, Keyna supports native plant conservation daily.

Keyna has served on the WNPS Board of Directors since 2017, chairs the WNPS Human Relations Committee, and is in her third year as Board President.

As president, Keyna has provided calm, gracious, competent leadership during a challenging time. During her presidency, WNPS has grappled with the COVID pandemic, striven to become a more diverse and inclusive organization, worked to develop the organizational capacity to achieve its potential, whether it be with legacy programs (e.g., Native Plant Stewards) or new programs (e.g., Youth Education through Environmental Restoration). As with any leadership position, being WNPS President makes significant demands on one's time, energy, and patience. Keyna has proven up to the demands and challenges of the job.

Award Recipient, Becky Chaney, Conservation Committee Chair

As chair of the WNPS Conservation Committee for many years, Becky has been the leading conservation advocate on behalf of WNPS. She has demonstrated remarkable dedication and passion in advocating for the conservation of Washington's native plants and ecosystems. She chairs monthly meetings of the Conservation Committee, provides



detailed reports on the activities of the Conservation Committee to the WNPS Board of Directors, and contributes regular "Conservation Corner" articles to *Douglasia*.

Outside of WNPS, she contributes to native plant conservation by serving on the King County Noxious Weed Control Board, currently as Board Chair.

Becky interacts with chapter chairs and members who want to bring forward an issue for Conservation Committee action. Through an information sheet template, proponents succinctly explain their issue, its significance for native plants, the action needed, and the deadline. Under Becky's leadership, the Conservation Committee reviews the issues and makes recommendations, which may include letters to be submitted by WNPS or action by the WNPS board. In 2022, WNPS submitted five letters of support for funding for land acquisitions that would conserve native plants, and supported changes to Washington Department of Natural Resources Trust Land Transfer Program to make it easier to conserve critical lands.

Award Recipient, Jim Evans, WNPS Stewardship Coordinator – 30 hour program

Thanks to Jim's work, the WNPS Stewardship program has expanded and reached out to more people and communities. WNPS now offers both the 100-hour program, the Master Native Plant Stewardship Program, and 30-hour Plant Stewardship Programs. It has given us the opportunity to reach out to areas like Vancouver and Spokane with more options. Students in Jim's 30-hour program continue to praise his work and passion for stewardship. This is most evident in his teaching style as he builds new stewards with WNPS.



These programs have brought in a significant number of new members and new energy to chapters. Jim served on the Stewardship Committee as well as acting as a coordinator.

In addition to his work with WNPS, Jim has been very active in restoration work on Vashon Island where he has been a model of what it means to practice stewardship.

Award Recipient, Sue Kusch, Past Chapter Chair, ongoing Newsletter Editor – Suksdorfia Chapter

Sue is an outstanding volunteer, member, and leader for the Chapter. She has edited and published the chapter's electronic newsletter for seven years and was the Chapter Chair for four years. She took on the Chapter at the time of Study Weekend and the tran-



sition from longtime leader Don Hardin. Her environmental leadership has enabled the Chapter to flourish and grow.

WNPS Outstanding Partner:

The WNPS Outstanding Partner Award is presented to an agency, organization, or individual which has made significant contributions to native plant conservation, research or education in Washington.

Nominee – Plantas Nativa, LLC

Since 1994, Plantas Nativa and its proprietor Bay Renaud have been serving the gardening and landscaping community of Whatcom County. They have provided locally- and regionally-sourced native plants for both residential and commercial properties. They also have installed many native plant landscapes and gardens.



Crucially, their focus is on sourcing seed material from wild gathered plants. Each year, Bay collects seeds and then provides them to growers who return young plants to him for sale or use in planting projects.

The plants are used in restoration projects that have included compensatory mitigation, Conservation Reserve Enhancement Program (CREP) projects, and private clients. They have installed over 100,000 plants since 1994. They have installed created wetlands and sub-surface flow wastewater treatment. They can also perform on-site seed collection and cleaning to ensure that plants are site-adapted.

The Plantas Nativa nursery located in Bellingham is an invaluable resource for local gardeners and landscapers who want to incorporate native plants. Bay and his staff are passionate about education and enthusiastically give advice about plant selection and care.

In addition to its 'on the ground' influence, Plantas Nativa serves a vital role in education and connections within the community. It is truly considered an icon in the local native plant and conservation communities. The role of Plantas Nativa as a connector can best be summed up by tributes from those who have worked with them.



WNPS Elections Coming in September

The Nominations and Governance Committee is actively building the slate for the 2023–2024 Board of Directors as well as working on updates to the Bylaws. Voting will be electronic, but a print ballot will be provided by request for those that cannot vote online. Please email info@wnps.org to request a paper ballot, or call (206)527-3210.

Washington Native Plant Society State Board Directory

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(Director's term follows name)

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Woodland strawberry fruit
(*Fragaria vesca*).
PHOTO: MARK TURNER