

Douglasia



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Journal of the
WASHINGTON NATIVE PLANT SOCIETY

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



About This Issue

by Walter Fertig

“Hindsight is 20/20” is a proverb that is sure to take on added meaning in a few years as we look back on all the crazy events of 2020. From the coronavirus to economic calamity and social reckoning, it is easy to feel that the world is spinning out of control.

In these turbulent times, the power of nature to inspire and provide comfort is more important than ever. With that in mind, we present the Fall/Winter issue of *Douglasia*. In this issue, you can accompany Richard Ramsden on a joyous flower-spotting expedition, explore the world of big-headed sedges and fireweeds with Kathy Darrow, and learn about native plants that attract caterpillars from Regina Johnson. If you are curious about research on native species restoration in sand dunes, Steven Link has you covered with our second scholarly paper. And if you are still uncertain just what makes a plant a plant, I have ten tidbits to help you out.

I will close with a quote I like from Terry Tempest Williams, which sums up how we can all benefit from nature in these dark days: “To be whole. To be complete. Wildness reminds us what it means to be human, what we are connected to rather than what we are separate from.”



Farewell

by Andrea Cummins

This issue marks my last as Editor of *Douglasia*. It has been an unfortunately short, but always enjoyable ride. I will be moving to the mid-Atlantic region at the end of the year, and it doesn't seem appropriate to have a *Douglasia* editor on the other coast so will pass the torch onward. I have very much enjoyed working with many of you — either as contributors, fellow editors, or committee members — and am proud of the quality of the publication we have created together. Thank you so much for giving me the opportunity! I will continue with my membership in WNPS from afar, and look forward to watching and reading about all of the happenings here at home.

Best wishes in 2021!



On the cover: Giant camas (*Camassia leichtlinii*), spring gold (*Lomatium utriculatum*), harsh paintbrush (*Castilleja hispida*), and sea blush (*Plectritis congesta*) dominate the blooming spring flora on a little-visited island in the San Juans. PHOTO: PETER ZIKA

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President's Message: The View from Here

by Van Bobbitt

Dear WNPS Members,

This is my last message as President of the WNPS Board of Directors. Before writing this, I reviewed the first President's Message I wrote in February 2019. In that one, I laid out my priorities. Here they are along with brief comments on progress:



- **Determine how to wisely utilize the generous bequest from the estate of Joe and Margaret Miller.** Progress: The Board voted to use a small portion of the bequest to hire a consultant to help WNPS develop a strategic plan to guide WNPS through the next five years. The new strategic plan is completed and about to be implemented.
- **Encourage vibrant chapters.** Progress: I had lots of enthusiasm for this but got distracted by other duties. Don Schaechtel offered a series of orientations for chapter chairs last fall. The new strategic plan includes an operational strategy to build leaders and provide resources to strengthen chapters, so look for more action on this front.
- **Make Native Plant Appreciation Week a better tool for promoting wider enthusiasm for native plants.** Progress: Led by Gail Sklar and assisted by Terri Knoke, the NPAW Committee made great progress. Native Plant Appreciation Week was expanded to Native Plant Appreciation Month (NPAM). Terri produced a webinar and a guide on how to organize NPAM events. And this Committee quickly adapted to the pandemic to offer a well-attended series of virtual events for NPAM.
- **Encourage all members to consider taking a leadership role in WNPS.** Progress: We have brought several members to positions of leadership. The Nominations and Governance Committee is excited about members who have accepted new leadership positions this fall: directors-at-large, committee chairs, and officers. We are still looking for a new board Treasurer to start October 2021. Let me know if you're interested!

Much of 2020 involved reacting to the COVID-19 pandemic — the key takeaway is that WNPS adapted to COVID; we were not paralyzed by it. We held our first virtual state board meeting and offered an extensive menu of webinars. This summer, an ad hoc committee developed COVID-19 risk management resources, which are now on the WNPS website. This fall, chapter plant sale representatives met to improve efforts to hold on-line plant sales.

Another major issue that WNPS dealt with this year was diversity, equity, and inclusion. The conversation actually started in November 2019, when a speaker at a chapter meet-

ing requested WNPS's nondiscrimination statement. We found that we didn't have one. The executive committee approved a nondiscrimination statement that is now posted on our website. This issue received greater attention when WNPS drafted a racial justice statement in response to the killing of George Floyd. I urge you to check out the WNPS's diversity, equity, and inclusion page at wnps.org/dei. This is a small step, but our new strategic plan includes an operational strategy to "Become a More Inclusive Organization."

Finally, the strategic planning process highlighted the importance of partnerships to more effectively carry out the WNPS mission. We will work to enhance our partnerships with complementary organizations; however, I believe the most important partnership is the one between WNPS chapters and the state organization. Our organization is built on the concept of strong chapters that respond to local needs. It also depends on a state organization and staff that support the chapters.

For example, WNPS's Zoom capacity allows chapter meetings to reach audiences of up to 500, and it enables chapters to share their presentations with members throughout the state. Since April, the WNPS website has become the repository for a growing list of recorded presentations that are available to all free of charge.

To make up for lost revenue from Botany Washington and Study Weekend, the WNPS state office is organizing fee-based virtual workshops. This revenue supports the organization as a whole and provides members with higher-level learning opportunities during the pandemic.

One of the most important ways the state organization supports chapters is through policies that ensure the organization is fiscally responsible, follows laws that govern our non-profit status, protects WNPS from liability risks, and much more. WNPS is fortunate to have a Business Manager, Denise Mahnke, who has years of experience in the non-profit sector, who understands the complex issues related to managing non-profits organizations, and who is eager to help chapters navigate these issues.

It has been a pleasure to serve WNPS as your president for the past two years. I now look forward to supporting your new president, Keyna Bugner, as WNPS implements its new strategic plan.



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Ten Things That Make a Plant a Plant (Or Not)

by Walter Fertig

Life was a lot simpler in Greece in the fourth century BC. Or should I say our classification of living things was a lot simpler. Aristotle, the leading philosopher and naturalist of ancient Greece, developed the first simple classification scheme for living creatures. If an organism moved and ate things, it was an animal. If it could not move or ingest stuff, it was a plant.

In the ensuing centuries, advances in science (especially chemistry, microscopy, and genetics) have greatly improved our understanding of the complexity of life. Modern taxonomists recognize multiple kingdoms of life and base their classifications on phylogenetic (evolutionary) relationships among living things. Yet Aristotle's simplistic dichotomy remains an influential worldview among the lay public. Even introductory botany classes and university biology departments often continue to treat the plant kingdom in a broad sense to include fungi, algae, lichens, and other plant-like organisms, along with "true" green plants.

So what exactly makes a plant a plant? The following curated list identifies the key features that distinguish green plants from other plant-like (and not so plant-like) organisms.

1. Plants make their own food (except for the ones that don't!).

Although unknown to Aristotle, plants differ from animals in that they can make their own food via photosynthesis. Taking a few basic ingredients (water, carbon dioxide, and other chemical nutrients in the soil) and adding some sunlight, plants create simple sugars that are the building blocks of more complex foods. The ability to create their own food is called autotrophy ("self-nourishment") in contrast to animals that can only feed themselves by consuming pre-made food (heterotrophy). This, of course, is why plants are the base of the food chain and the most important organisms on the planet! (Sorry, zoologists.) Some soil microbes and bacteria in deep ocean vents where sunlight does not reach can produce their own food using energy from chemical reactions (so-called chemo-autotrophy), but such organisms are not real plants (as will be elucidated later).

The ability to conduct photosynthesis is dependent on light-absorbing pigments found in specialized organelles within cells called chloroplasts. The best known of these pigments is chlorophyll, which absorbs light energy in the blue and red spectra, but actually reflects energy in the green spectrum (which is why plant leaves look green). All photosynthetic plants and plant-like organisms have chlorophyll a, but only "true plants" have chlorophyll b. A variety of algae and photosynthetic bacteria utilize other pigments, such as chlorophyll c, bacteriochlorophyll, carotenes, and biliproteins, which harvest light energy from other spectra and impart characteristic colors, such as red



Ghostpipe (*Monotropa uniflora*) is a true plant which lacks chlorophyll. PHOTO: MARK TURNER

(red algae), brown (brown algae and kelp), or blue (blue-green algae or cyanobacteria).

A small number of plants have lost the ability to produce their own food and behave more like some fungi in parasitizing other organisms for their nutrition. Usually these plants are easy to spot because their cells lack chlorophyll and any green pigmentation. A common example is ghostpipe (*Monotropa uniflora*) which appears pure white when alive due to the absence of any pigment and refraction of light within its cells (ironically, these same plants turn jet black when dried and pressed!). Ghostpipe is still considered a plant because it is descended from true plants that once possessed chlorophyll and were photosynthetic.

Aristotle was on to something in noting that plants don't move. Since they can make their own food, plants don't need to expend the energy moving about to find or catch pre-formed food like most animals do (as always there are exceptions, but sessile animals like sponges or clams have to occur in places where food will pass them by, such as underwater). But because they cannot move, plants are stuck growing wherever their seeds or spores landed — which may not always be the optimal location for light, water, or nutrients.

2. Plants have cell walls made of cellulose.

Another important difference separating plants and most plant-like organisms from animals is the presence of a thickened cell wall around most cells. The cell wall helps impart structural rigidity and forms a barrier to passage of many compounds between cells and their outside environment. True plants and many groups of algae have cell walls comprised of chains of sugar called cellulose. These chains form tiny, cable-like strands that are exceedingly resistant to destruction. Cellulose is the most abundant organic molecule on Earth and in modified forms produces the wood, fiber, and fuel essential to humanity. Different algae groups have other components to their cell walls, such as silica (diatoms), calcium carbonate (some red algae), or slimy mucilage (cyanobacteria and brown algae). Fungi also have cell walls, but these are comprised of chitin, the same material that forms the hard coating of insect

wings. *Euglena* and some other mobile, single-celled photosynthetic organisms lack cell walls and so are more similar to Aristotle's definition of animals.

3. Plants have eukaryotic cells.

Another discovery that had to await the invention of powerful microscopes was the recognition that there are three main types of cells among living creatures. Plants, animals, fungi, and most algae have the typical cells we all learned about in Biology 101, and are called eukaryotes (literally "true cells"). Such cells have a nucleus that contains chromosomes and the genetic code embedded in their DNA, as well as a variety of organelles that each focus on a particular task, such as mitochondria for fueling the cell, or chloroplasts for photosynthesis. Smaller and much less specialized organisms like bacteria and cyanobacteria have cells that lack an organized nucleus or organelles. These prokaryotic cells still have the functionality of eukaryotic cells, but are about 1/20 their size. An intriguing theory suggests that eukaryotic cells are actually a symbiotic relationship between two or more prokaryotic organisms, with the prokaryotes acting as cellular organelles.

Even more primitive than the bacteria are a diverse group of ancient prokaryotes adapted to extreme environments (salt barrens, thermal areas) called Archaea. These organisms differ in the composition of their cell walls, membranes, RNA, and life history and reproduction. They are so peculiar that taxonomists recognize them as a distinct group (domain) from either prokaryotes or eukaryotes. At the most basic level, living things fall into three main groups: archaea, prokaryotes, and eukaryotes. Aristotle was off by one, and did not realize that at the cellular level, plants and animals actually have more in common with each other than they do with microscopic bacteria or archaea.

4. Algae are a hodgepodge of unrelated plant-like organisms — except for one group which gave rise to the true plants.

Nearly all algae are aquatic and occur in either fresh or salt water. Superficially, they resemble each other by mostly being single-celled or forming filament-like chains, having cell walls, being photosynthetic, and reproducing by spores. Some algae, such as marine kelp and freshwater stoneworts (*Chara*) are



Nereocystis luetkeana (bull kelp). PHOTO: THOMAS MUMFORD

large, multicellular, and plant-like; but these never produce true leaves, stems, or roots with vascular tissue, and algae never have flowers, fruits, or seeds.

Algae and other microscopic or single-celled heterotrophs don't readily fit Aristotle's plant/animal dichotomy, so taxonomists derived a third kingdom for them called Protista. This garbage can group also initially included bacteria, cyanobacteria, and archaea, before their unique cell anatomy was discovered and appreciated. Today the animal-like and plant-like protists are split into at least two dozen separate evolutionary lines that are as distinct from each other as they are from animals and true plants. At least eight main groups of photosynthetic algae are recognized, each characterized by different photosynthetic pigments, food storage products (starches or oils), cell wall composition, and other anatomical traits visible only under the microscope. The green algae (Chlorophyta) are the only algal group with chlorophyll b and cellulose cell walls and thus are considered ancestral to the mosses (bryophytes) and vascular plants (ferns, conifers, and flowering plants).



Boletus fibrillosus PHOTO: STEVE TRUDELL

5. Fungi may look like non-photosynthetic plants, but they are not.

Fungi also created a problem for the original plant/animal dichotomy because they seemed to combine attributes of both groups. While sessile like plants (with the exception of motile phases of slime molds), fungi are incapable of producing their own food — just like animals. Fungi derive their nutrition by decomposing dead tissues and absorbing nutrients directly into their microscopic, thread-like bodies, called hyphae (these in turn are aggregated into larger tissue blobs called mycelia, which can be seen with the naked eye). Ecologically, fungi are vital for returning nutrients to the soil that would otherwise be tied up in dead bodies. Fungi also partner with most higher land plants to improve the nutrient and water absorption-capacity of roots, forming mycorrhizae (literally fungus-roots). Recent evolutionary studies suggest that fungi are more closely related to animals than plants, lending more support to the notion that they should be treated as their own kingdom, distinct from the true plants.



Hypogymnia imshaugii (forked tube lichen). PHOTO: RICHARD DROKER

6. Lichens are a crazy symbiosis between fungi, green algae or cyanobacteria, and yeasts and are not true plants either.

Lichens create all sorts of problems for plant taxonomists because they represent a collaboration between two or three completely unrelated species (and at least 2 or 3 different kingdoms!). The basic shell of a lichen is composed of one species of fungus — usually an ascomycete. Within its internal tissues, these fungi host and feed off at least one species of green algae or cyanobacteria. The relationship may be more one-sided than we often think, as the algae can live independently of the fungus, but the fungus may not be able to persist without its algae (technically making this parasitism on the part of the fungus). That said, algae protected within a lichen host are often able to persist in dry or exposed sites (like deserts or bare rocks) where they would quickly desiccate if left to their own devices. In 2015, it was discovered that lichens may also host yeasts (a type of fungus) amid their internal cells, making the symbiosis a three-way affair. Taxonomists classify lichens based on their fungal partner, and often the fungi are still able to reproduce sexually by spores. Creating new lichens, however, is more often achieved by asexual propagules or fragmentation of the lichen thallus to ensure that at least some algal cells are incorporated into the new lichen body. While not true plants, lichens are important for binding soil (especially the biological soil crust species of desert environments) and as biological indicators of air pollution.

7. Bryophytes are related to true plants because they produce embryos.

Bryophytes include mosses, liverworts, and hornworts. They are considered the most primitive of the true plants because they lack vascular tissue (xylem and phloem) for transporting water and nutrients. Bryophytes also have an unusual life cycle during which a small, diploid sporophyte stage (represented by the spore-bearing capsule) alternates with the more prominent haploid (green, leafy) gametophyte phase. (For those who have forgotten Bio 101, haploid cells have a single set of chromosomes, while diploid cells have two sets of chromosomes).

Ferns, gymnosperms, and flowering plants also have an “alternation of generations,” but have the sporophyte generation being dominant and the gametophyte reduced to a tiny and moss or algae-like (ferns and fern allies) or contained within seeds or pollen (gymnosperms and flowering plants).

One important trait that bryophytes share with ferns, gymnosperms, and flowering plants is that they produce multicellular embryos as part of their life cycle. An embryo is derived from fertilization of haploid eggs and sperm, thus reconstituting the diploid condition. True embryos are not produced by green algae and their relatives.



Dicranum majus PHOTO: GARY BRILL

Mosses and their kin are often dismissed because of their small stature and dependence on water for sperm to swim from one gametophyte to another for reproduction. In truth, bryophytes can be very drought resistant, even shutting down metabolically until moisture is available again. Due to their small size, they are able to exploit environments that are too shady for vascular plants. Like lichens, bryophytes are important for holding soil and acting as sensitive monitors of air quality.

8. Even though they reproduce by spores, ferns and fern-allies are related to true plants because they have vascular tissue.

Ferns and fern allies (club-mosses, quillworts, and horsetails) are similar to bryophytes in having an alternation of generations life cycle; but differ in having the sporophyte being the more obvious phase and in having vascular tissue for conducting water and nutrients between roots, stems, and leaves. Ferns differ from gymnosperms and angiosperms in that they reproduce by spores rather than seeds and retain a free-living gametophyte phase in their life cycle. Finding gametophytes is difficult because of their diminutive size (3-10 mm) and heart-like or strap-shaped appearance. Sporophytes develop directly from the fertilized embryo contained within the female portion of the gametophyte (called the archegonium, for crossword puzzle enthusiasts!), but quickly obliterate the parent plant as the baby fern grows. As with bryophytes, ferns and their relatives require a film of water for sperm to swim from the male

gametophytes to fertilize an egg. The establishment of new fern plants is directly tied to environments that are favorable to their gametophytes, which may prevent them from growing in some otherwise suitable microsites. Ferns and lycophytes (club-mosses and quillworts) had their heyday in the Carboniferous, and their fossilized remains are important sources of coal, but since the Mesozoic their ecological significance has been displaced by the seed plants.

9. Gymnosperms and angiosperms are true plants that reproduce by seeds.

Aristotle was probably thinking of gymnosperms and angiosperms when he deduced the original plant/animal dichotomy in the fourth century BC. These are the plants most familiar to people because of their dominance of most terrestrial landscapes and their outsized economic significance. Both groups reproduce by seeds, which botanically-speaking, are gametophytes and embryos retained within protective and nutritive parental tissue. Seeds also serve as dispersal units and can remain alive in the soil for years until conditions are right for germination. Gymnosperms, which include cycads, ginkgo, junipers, pines, and their relatives, have seeds that are exposed for part of their development cycle (gymno = naked), rather than being contained within an ovary or later a fruit, as in the angiosperms. The gymnosperms also do not produce true flowers, with protective sepals, colorful petals, and ovules; and have more primitive vascular tissue. Both gymnosperms and angiosperms are so familiar and stereotypical that no one really questions Aristotle's judgment in calling them plants.

10. Whether they are true plants or not, plant-like organisms matter because they play critical environmental roles and bring pleasure to humanity.

Aristotle was clearly wrong in lumping all sessile creatures that don't eat as plants, just as later taxonomists mistakenly placed all photosynthetic organisms into the plant kingdom. We should not be too hard on these scholars though, as they reasoned as well as they could using the knowledge available to them. Taxonomy is not stamp collecting for the very reason

that it is based on science and evidence — taxonomic systems are modified or replaced to fit new data. Our best current information strongly suggests that plant-like organisms fall into multiple evolutionary lines, of which only one (the green algae-bryophyte-fern-gymnosperm-angiosperm clade) includes what science defines as “true” plants. We should be humble and recognize that the current consensus is only as strong as the weakest evidence, and additional refinements will continue to be made well into the future.

Ecologically, true plants and plant-like organisms are vital strands in the food web. Both produce oxygen, absorb carbon dioxide, create and bind soil, and provide habitat for animals. In extreme environments, plant-like groups may be the primary producers and are able to exploit conditions that none of the more “advanced” plants can. Redundancy is one of the hallmarks of healthy ecosystems, and having as many different types of autotrophs contributing to the food chain as possible is vitally important, whether these are true plants or plant-like cousins. Economically, plants and plant-like organisms are the ultimate source of our food and medicines, they provide building materials and industrial products (such as wood, fiber for clothing, and natural rubber), and are the source of our carbon-based fuels.

From an aesthetic perspective, the distinction between plant or plant-like is similarly unimportant if the organisms contribute to our sense of joy or appreciation of nature. Whether we value mushrooms or lichens, algae or seaweed, bryophytes or ferns, or conifer forests or wildflower meadows, should not depend on their evolutionary history or taxonomy. All enthusiasts of green or sessile things need to work together to ensure that there is a place in the natural world for them ... and us.

Walter Fertig is state botanist for the Washington Natural Heritage Program and responsible for rare vascular plants, bryophytes, lichens, fungi, and algae – but not bacteria.



Codriophorus varius PHOTO: GARY BRILL

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Fireweed: Symbol of Resilience

by Katherine Darrow

*On the breeze my fluff is blown; So my airy seeds are sown.
Where the earth is burnt and sad, I will come to make it glad. All
forlorn and ruined places, All neglected empty spaces, I can cover
— only think! — With a mass of rosy pink.*

— Cicely Mary Barker in *Flower Fairies of the Wayside* (1948)



A patch of fireweed gone to seed along Hastings Road in Port Townsend. PHOTO: KATHERINE DARROW

Throughout most of Washington, chances are you've witnessed brilliant displays of hot pink fireweed (*Chamaenerion angustifolium*) blooming or going to seed in late summer and fall, especially along roadsides. These bright spots are often a welcome shot of color amid the many shades of green that dominate highway corridors, especially on the Olympic Peninsula. Also known as rosebay or great willow herb, this plant is one of the few native species of wildflower that thrives in the challenging roadside environment where only the toughest pioneers persist.

In wilder, undeveloped places fireweed is often one of the first plants to appear after natural disturbances. Not only wildfire, but landslides, avalanches, volcanic eruptions, and floods create the open, sunny environment that fireweed prefers.



Fireweed blooming on a lateral moraine in Upper Royal Basin, Olympic National Park. PHOTO: KATHERINE DARROW

Fireweed often leads the march of plant succession at the front of receding glaciers.

Areas that have been dramatically changed by not-so-natural disturbances, such as clear-cut forests, sometimes stimulate exuberant fields of fireweed, as we can easily see on recent cuts on the Olympic Peninsula along Highway 104. Railways, mining sites, and war zones are also commonly colonized by fireweed. Following WWII, parts of England that endured the infamous Blitz bombing campaigns of 1940-41 rapidly grew fields of fireweed, from which the plant earned the nickname "bombweed."

Equally magnificent is the species' widespread distribution around the globe. Fireweed is a circumboreal species, meaning that it is common all around the northern hemisphere, especially at latitudes above 40 degrees north. If you are a world traveler, you may have seen fireweed in any country in Europe, the Himalayas, or in the vast expanse of Russia, as well as across North America. Combined with the ability to thrive in a broad altitudinal range, from sea level to more than 15,000 feet in the Himalayas, fireweed is one of the hardiest pioneering plants on the planet.



Fireweed is protandrous, meaning that the stamens emerge and mature prior to the four-lobed pistils, a strategy to avoid self-pollination. PHOTO: KATHERINE DARROW

Part of fireweed's secret is its prolific seed production. Each of the long narrow fruits (capsules) curls open to release up to 400 tiny seeds, each equipped with a downy parachute. With more than 100 capsules per plant, that multiplies out to more than 40,000 seeds per stem that can travel far and high on the lightest breeze. Multiply this by the number of stems that grow in just one bright patch along the road, and you've literally got a cloud of seeds ready to germinate if they are lucky to land in just the right spot.

The most robust part of the plant though, is a long, deeply rooted, underground stem or



The long thin capsules of fireweed curl open to release hundreds of tiny airborne seeds. PHOTO: KATHERINE DARROW

rhizome. This root system, combined with those of pioneering grasses, sedges and shrubs, are important elements of landscape restoration and help prevent soil erosion. Fireweed can wait out long periods of forest cover and be available to sprout after a fire or other disturbance opens the area up to sun.

This is good news, not only for vehicle-bound travelers whose day might be brightened by a little color in the landscape, but more importantly for wildlife that eat the plants. Bears, moose, elk, and deer are among the many kinds of wildlife that feast on fireweed. Hummingbirds sip its nectar. Some beekeepers will jump at the chance to place hives in a field of fireweed in order to harvest what is considered gourmet honey that commands twice the price of your run-of-the-mill wildflower honey. Although fireweed is not recorded as a major food source for Indigenous people, some northern cultures dry the leaves to brew for tea. Tender leaves and young stems are sometimes harvested as edible greens.

Despite all of these qualities and more, serious gardeners eschew the plant as unruly, bothersome, aggressive, and pernicious, because they aren't easily controlled or contained. I, however, being a not-so-fastidious gardener, welcome their rosy pink masses, airy seeds, and tough rhizomes to my garden as symbols of resilience, cheer, and abundance. In these times, fireweed may be exactly what we need as an emblem of hope for the future.

Katherine Darrow is a natural history writer and botanist living in Port Townsend. She is currently the Vice Chair of the Olympic Peninsula Chapter. This article was previously published in her August 2020 column for the Port Townsend Leader, Nature Notes, which she writes monthly as a representative of WNPS.



2021 WNPS Calendar



2021 Calendar



Washington Native Plant Society

The 2021 WNPS calendar is now available in the WNPS online store, www.wnps.org/store/2021-calendar. The cost is \$12 plus shipping. Order several and make your holiday shopping quick and easy while you support WNPS.

With Apologies to the Fittest

by Anne Laird

A red flash catches a walker's eye
from the deepening green of a waking wood
four steps off from where she stood.

On a three-year maple stump still hard,
but checked, beginning to decompose,
a prickly-leafed mahonia grows.

With spindly stem over creeping moss
that lays a claim to the forest dead
Oregon Grape glows crimson red.

A seed was dropped some autumn ago
by a bird, and the root with winter rain
found a growing crack, a foothold gained.

The walker fears the growing heat
could dry the seedling past tolerance
remembering some she neglected, once.

Against the rules of "let it be"
she shares her water with former tree
in the crack, for the root of a barberry.



Mahonia nervosa (Dull Oregon-grape). PHOTO: MARK TURNER

Floristic Surveys of Small Islands in the San Juan Islands National Monument

by Peter W. Dunwiddie

The San Juan Islands National Monument (SJINM) was created in 2013 and encompasses a broad diversity of habitats across the San Juan archipelago. Sites within the SJINM range in size from small, isolated rocks that are submerged at high tide to large parcels on ferry-served islands that span hundreds of acres. While plant surveys have previously been conducted on many of the larger sites, most of the small islands have never been inventoried. To increase understanding of the natural resources found within the Monument boundaries, I worked with a small team of volunteers to carry out a detailed floristic survey of all vascular plants occurring on these smaller islands.

I began by compiling a list of almost 60 islands to be included in the survey using a National Monument site catalog together with Google Earth imagery. Islands that appeared to be devoid of terrestrial vegetation, which were comprised largely of rocks submerged at high tides, were excluded. Nearly all of the islands are small, less than 3.3 acres, although two particularly stood out from the others — Patos (205 acres) and Little Patos (15 acres).

To detect and identify all plants on each island, we made three visits that spanned the growing season. This greatly increased the likelihood that we would find and successfully identify all species, from the earliest-blooming spring annuals to late-flowering taxa, such as many *Amaranthaceae*, that are only identifiable when they form fruit in the fall. We developed this approach during previous plant surveys in the San Juan Islands carried out in 2005–2009 in collaboration with the University of Washington Herbarium (Giblin and Dunwiddie 2007) and found it to be particularly effective. Most species were identified when they were observed in the field, but if uncertainties existed regarding their identity, collections were made and studied later at the UW Herbarium. Complete lists of all observed species, including those previously recorded, were compiled during each visit to add greater certainty that the lists represented a comprehensive inventory of all species present.

We began our surveys in October 2017 and continued through September 2018. We accessed most islands by means of a small motorboat capably captained by Steve Ulvi, who managed to land us safely even on the most inaccessible rocky shores. Because they were small, most islands could be inventoried by carefully searching all possible habitats to ensure that all vascular species were recorded. At times this could be challenging, such as where cliffs prevented access, in which case we would occasionally search using binoculars. The larger islands required a different approach, since even after searching for a



An April view of one of the Tift Rocks, a typical small island (0.17 acres) in San Juan Channel. This view illustrates how the presence of several different habitats — in this case beach, upper beach, and shallow-soil/bedrock — supports a larger diversity (44) of species. It also illustrates the threat posed by invasive species. The reddish groundcover is *Sedum album*, probably originating from plantings in green roofs or as landscaping using succulents around private homes on nearby islands. PHOTO: PETER ZIKA

total of 5-6 days, it was impossible to inspect every location, especially in dense, inaccessible thickets. Therefore, such areas were selectively sampled, with efforts made to examine representative examples of all habitats, spending the most time in particularly diverse or unusual habitats where uncommon and unexpected species were more likely to occur.

The number of species per island ranged from 2 to 255, with half of the islands surveyed containing 30 or fewer species. Overall, a total of approximately 368 taxa were recorded, which amounts to about 40 percent of the approximately 850 species that have been reported in the San Juan archipelago. Of this total, 237 (64 percent) are native to the San Juans, with the remainder introduced. Not surprisingly, the most commonly reported species (both native and non-native) are taxa that are typical of bedrock shorelines and salt-spray plant communities, habitats that are common on small islands. We found no threatened or endangered species during the survey. However, several appear to be relatively rare in the islands, including slim-leaf onion (*Allium amplexans*), Howell's triteleia (*Triteleia grandiflora* var. *howellii*), seaside amsinckia (*Amsinckia spectabilis* var. *spectabilis*), and Menzies' silene (*Silene menziesii*).

During our previous surveys in 2005-2009, we documented the flora on 12 islands that now are part of the SJINM. Revisiting these islands provided a unique opportunity to examine how the species composition may have changed during the last 10 to 15 years. Most showed few differences in their floras between the two surveys, but two islands — Posey and Oak — were particularly notable. Both experienced significant changes that have important implications for the management of small islands.

Posey is a Washington State Park island that is extremely popular as a campsite for kayakers and other boaters. Nearly 20 percent of the flora found in the earlier surveys (18 of 80 species) had disappeared, a total that was offset by a nearly equal number (17) of new arrivals, several of which are highly invasive weeds. One of these, tiny bedstraw (*Galium murale*), has not been recorded previously in Washington, and joined two other invasives that were already present, shining geranium (*Geranium lucidum*) and lawn burrweed (*Soliva sessilis*). All three likely arrived on Posey via the boots and camping equipment of visitors. The changes observed on this 0.9-acre island strongly suggests that human activities present a significant threat to its flora through both extirpations and introductions. Trampling may extirpate sensitive species, while various human activities provide unique modes for readily dispersing invasive species. Another island frequently used by campers — Blind Island — showed similarly high numbers of invasive species that were largely absent from other, lesser-used small islands.

Like Posey, Oak Island also exhibited an unusually high rate of species turnover in the last decade. However, in this case Canada geese rather than humans were the agents bringing about significant changes in the flora. No geese were observed nesting on the island in 2006-2009, but by 2018, six nests with



Galium murale, a weedy bedstraw with unusual sausage-shaped fruits (R). The first (and so far only) record of it in Washington was found on Posey Island in 2018, having appeared and proliferated there since the island flora was previously surveyed in 2006-2009.

PHOTO: PETER ZIKA

33 eggs were found. As a result of their concentrated grazing, much of the herbaceous flora had been reduced to scraps.

Similar patterns of vegetation damage were observed on other small islands, where geese were also nesting. It is not widely recognized that resident, nesting Canada geese are not native to the San Juans. Prior to the 1960s, geese were infrequent winter visitors to the islands. A non-migratory population was introduced at that time to support hunting, and nesting was first recorded in the islands in 1986. Since then, their population has increased dramatically in size and distribution, and now they are found nesting on many of the small islands, resulting in increasingly severe impacts to their flora.

In addition to grazing geese, browsing by deer also poses a threat to the native flora in the San Juans. Although their impacts were most evident on sites that are in close proximity to larger islands with substantial deer populations, they were found as well on many seemingly remote small islands. Deer are surprisingly good swimmers and readily make their way across wide channels to visit small islands, frequently resulting

in significant impacts to their flora. Deer populations throughout the islands have likely increased many-fold over the last 100 to 170 years with the disappearance of large predators and as hunting has declined.

Despite these threats, a number of islands in the SJINM receive little human use and have yet to be heavily impacted by geese or deer. The diversity of native plants on these islands can be impressive and visually spectacular, especially when they are in bloom in the spring. These sparse, fragile remnants provide a glimpse into what the historical composition of some of the meadows and rocky balds in the San Juans may have looked like prior to settlement by Euro-Americans.

The biogeography of plants and animals on islands has long fascinated scientists, from Charles Darwin and Alfred Russel Wallace to Robert McArthur and E. O. Wilson. Understanding how species make their way to islands, which species are able to disperse most readily, which are able to survive and reproduce successfully, how endemic species evolve on some islands, and why other species go extinct, are all questions central to the field of island biogeography. Surprisingly, much of the published literature, and many of the theories and models that have been developed to help explain the patterns, have drawn from studies of animals, from Darwin's finches and Galapagos tortoises to lizards, snails, and invertebrates, with relatively fewer studies that have looked at the occurrence and distribution of plants on islands.

The San Juan and Gulf Islands provide an unusual opportunity for island biogeographical studies. This archipelago is comprised of hundreds of islands that vary by several orders of magnitude in size and distance from source populations, all within easy reach of multiple major colleges and universities. We have been compiling comprehensive floras in the San Juans for 15 years, and the SJINM study increases the total number of islands we have surveyed to over 140. As this work continues, we have begun to include larger islands (up to 500 acres), which take much longer to survey. This provides a unique dataset that is being used by several researchers to help answer diverse questions regarding the biogeography of plants in island systems.

Acknowledgements

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Flowerspotting in 2020

by Richard Ramsden

Despite a delay in spring travel due to the Governor's shelter-in-place order and the need to avoid smoke-poisoned skies in late summer, I tried to get out as often as possible to do some flowerspotting in COVID year 2020. I find it gratifying to spot things familiar or new, beautiful or bizarre. Plus the social distancing component is built in: announce to nearly anyone you are headed to the mountains to look at plants and watch how quickly they back away.



A single white-flowered form of *Penstemon fruticosus* among the hundreds of typical lavender/blue. North end of Tronsen Ridge in the Okanogan-Wenatchee National Forest, June 6, 2020. PHOTO: RICHARD RAMSDEN

Tronsen Ridge, in the Okanogan-Wenatchee National Forest north and east of Blewett Pass, was the destination for three trips: late May via Magnet Creek, early June via Ruby Creek, and late June to the upper Naneum area. Magnet and Ruby are to the north at lower elevation where the blooms come earlier; Tronsen Meadows/Naneum are at the 5,800-foot high point to the south where blooms peak later. This year at Naneum, the five-star system had to be scrapped because the floral display was beyond the very best: *Lewisia*, *Penstemon*, *Eriogonum*, *Phlox*, *Castilleja*, *Phacelia*, and *Clematis* were all at their most lavish and profuse. The hundreds of *Anemone oregana* (Oregon windflower) with petals of sapphire blue, were also an unforgettable sight in the woodland.

Among the hundreds of typical lavender/blue-flowered *Penstemon fruticosus* on Tronsen Ridge, there could be found a handful of pink forms and one that was pure white. In *Penstemon*, the flower pigment *blue* is the result of the synthesis of an anthocyanin (Wessinger and Rausher 2015). If the process is intact, the flowers are the normal blue/lavender, if partially functioning then pink/red, and if fully broken there is no color at all (white). Since the anthocyanin is also expressed throughout the plant, the greenness of the leaves will also be a lighter shade in plants lacking the pigment. By spotting this, you can predict if a plant may flower white even when it is not in bloom.

Lewisiopsis tweedyi (Tweedy's lewisia) is very common in areas on Tronsen Ridge, especially where there is a bit of shade. If plants were keyed out by aesthetic rather than technical characteristics, it would key to "Section Most Beautiful" or something like that. Plants can have several to a few dozen 2.5-inch



The *Lewisiopsis tweedyi* oddity. Its flower buds had seemed to morph into leafy plants. Amid open woodland below Naneum Meadows, Tronsen Ridge, June 27, 2020. PHOTO: RICHARD RAMSDEN

flowers colored a soft yellow, suffused with pink or tangerine. In June, you could see hundreds of plants in bloom and thousands of flowers. One bizarre plant did not join Flowerfest. This single specimen appeared to have changed its flower buds into miniature plants. I have never spotted anything like this before and can offer no explanation on how or why this could happen. I do favor the typical beautiful form of the species, though I could imagine that sedge-, grass-, and fern-people might prefer this petal-less variant. It will be interesting to revisit this plant in the future to see if it returns to blooming with flowers or continues flowering with plants.

The Goat Rocks Wilderness, south of White Pass, is another prime area for flowerspotting. One of the two locations I visited included the Berry Patch/Hawkeye Point area in early August. Lupine, western anemone (*Anemone occidentalis*), and



Penstemon procerus is a widespread species that is commonly blue. But a few populations on the west side of Mt Rainier and the Goat Rocks are the exception where they are cream or white, sometimes shaded pink. Above Jordon Basin, 6900 ft, Goat Rocks Wilderness, August 8, 2020. PHOTO: RICHARD RAMSDEN

beargrass (*Xerophyllum tenax*) dominate some of the subalpine slopes along Goat Ridge. Proceeding along this trail, an anomaly may be spotted growing in Jordon Basin: a handful of fleshy-leaved rosettes of *Lewisia cotyledon*. The fact that someone saw fit to transplant these natives of the Siskiyou Mountains to this remote site over 50 years ago is noted in early editions of the *Flora of the Pacific Northwest* (1973). The area is

many times more popular now than in those days and the five or six survivors are slowly being tramped into oblivion.

The *Penstemon procerus* here are another curiosity for the flowerspotter. Populations such as those at Marmot Pass in the Olympics can have thousands of plants, yet every last flower is always blue. In Jordan and Johnson Basins, the flowers of *P. procerus* are all white or cream colored, some with pink throats, and not a single blue is encountered. Colonies of cream forms can also be found in some areas on the west side of Rainier Park to the north. I have yet to see blue and cream forms growing together. Finding a site where both forms might coexist could be the impetus for future flowerspotting trips.

I was able to get up to Nelson Ridge within the William O. Douglas Wilderness north of White Pass in early July. The mats of Hooker's mountain-avens, *Dryas hookeriana*, were all in bloom. This is an excellent ridge to see many old and venerable



A buckwheat from both the dry and the wet sides of the state: *Eriogonum umbellatum* var. *majus*. Grouse Ridge, west side of Mt Baker, North Cascades, July 27, 2020. PHOTO: RICHARD RAMSDEN



This ancient snowy buckwheat, *Eriogonum ovalifolium* var. *nivale*, has mounded up into a three-quarter sphere the size of a soccer ball. High alpine, 7400 ft, Nelson Ridge in the William O. Douglas Wilderness, July 6, 2020. PHOTO: RICHARD RAMSDEN

snowy buckwheats, *Eriogonum ovalifolium* var. *nivale*. Many form tight domes of felted white leaves with some approaching two feet across. At least two plants had grown nearly into spheres with one larger than a soccer ball. Such large specimens must be a century old or more. Among all the broken rocks, these ageless plants exude a peculiar beauty in a setting that seems removed from the grasps of time.

In late July, I went flowerspotting at Grouse Ridge and the Skyline trail on the west side of Mt Baker, Whatcom County. The enumeration of all the pretties and rarities could go on and

on. However, worth mentioning since it is usually a dry-side genus, one oddity to spot is a buckwheat: *Eriogonum umbellatum* var. *majus*. It grows in flat compact mats with small leaves of green, brown, gold, and silver; the flower heads are cream with bronze highlights on short stems. Of the entire genus, Kruckeberg warns “gardeners on the wet side of the mountains may despair of ever being successful with these temperamental plants (Kruckeberg and Chalker-Scott 2019). Despondent growers of buckwheats may be assured that this one is found on the dry *and* wet sides of the mountains and is very easygoing, even vigorous, in a Seattle garden. *E. majus*, also known as *E. subalpinum* (Schneider 2017) is one of 41 described *umbellatum* varieties. According to the *Flora of North America*, it is widespread in the Rockies from Colorado to Idaho and notes that those in the Washington Cascades “are often markedly different” (Reveal 2005). I believe these North Cascade plants may be different enough to warrant yet another taxon. I would suggest var. *cascadia-borealis*, faux Latin for “of the Cascades of the North” or perhaps var. *erytrophembieschyllos*, simply a concretion of random and difficult syllables. At least I think that is how botanists come up with names.

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Richard Ramsden lives and works in Seattle, WA. Besides flowerspotting in the nearby mountains, he also enjoys gardening with many unusual and beautiful native plants.



Effect of Shading on Native Plant Seedling Establishment and Long-term Survival on a Dune in the Columbia Basin

by Steven O. Link¹

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Abstract

The ability to increase native species richness using greenhouse grown seedlings is generally thought to be improved by hardening the plants before installing in the field. The need to acclimatize greenhouse seedlings to high light by shading, when planting in the late spring, was assessed. Fifteen species were installed on a dune and covered by shade cloth and compared with seedlings without shade cloth. While three species had a significant loss of green tissue there was no effect of shading on survival of any of the species. It can be concluded that hardening greenhouse grown plants by shading is not necessary under the conditions of the test.

The ability to increase species richness was assessed after 12 years. Bitterbrush (*Purshia tridentata*) and big sagebrush (*Artemisia tridentata*) survival was 90% and 80%, respectively. Snow buckwheat (*Eriogonum niveum*) and needle and thread grass (*Hesperostipa comata*) survival was 14% and 10%, respectively. *Hesperostipa comata* was not observed naturally occurring in the study area so its addition to the flora increased the species richness of the habitat.

Keywords: Dune restoration, hardening, shading, species richness, long-term survival



Figure 1. Arrangement of shaded and unshaded plots in June 2007.
PHOTO: STEVEN O. LINK

Introduction

With habitat loss and invasive species pressure there is interest in increasing the number of native plant species (Stevens 1994) in at-risk landscapes. This is often done by installing greenhouse grown seedlings. In the Columbia Basin, seedling installation is usually done in the fall and winter, which requires hardening of plants taken from a greenhouse (Jacobs and Landis 2009, Link 2017). Hardening prior to installation in the fall is done to acclimate them to drier and more variable conditions, and prepare them for the cold by inducing dormancy (Jacobs and Landis 2009). If supplemental water is available, the planting window is wider and such plants may be installed in the summer. Taking plants directly from the greenhouse to the field in the summer will expose them to high light stress that may weaken them, as is observed with garden plants (Whitman and DeJohn 2009). Bainbridge (1994) indicates that native plants should be hardened by gradually increasing exposure to full sun. Jacobs and Landis (2009) suggest minimal or no shading for plants that will be exposed to full light. There appears to be little experimental information on the effects of shading on the success of transplanting native plants from a greenhouse directly to the field.

The hypothesis tested in this study was that greenhouse-grown plants transplanted directly to the field in late spring, with supplemental water, would not be affected by shading.

Because species differ in their sensitivity to shading (Flores and Jurado 1998), testing was done on several shrub, forb, and bunchgrass species. The species occur in sandy soil habitats in the Pacific Northwest, but not all were naturally present in the

Species	Common Name	Plants in Each Plot
<i>Achillea millefolium</i>	yarrow	5
<i>Agoseris grandiflora</i>	big flower agoseris	5
<i>Agoseris heterophylla</i>	annual agoseris	5
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	big sagebrush	1
<i>Elymus elymoides</i>	squirreltail	5
<i>Eriogeron filifolius</i>	threadleaf fleabane	3
<i>Eriogeron linearis</i>	desert yellow fleabane	3
<i>Eriogonum niveum</i>	snow buckwheat	5
<i>Erysimum capitatum</i>	sanddune wallflower	3
<i>Hesperostipa comata</i>	needle and thread grass	2
<i>Machaeranthera canescens</i>	hoary tansyaster	2
<i>Oenothera pallida</i>	pale evening primrose	1
<i>Phlox longifolia</i>	longleaf phlox	5
<i>Poa secunda</i>	Sandberg's bluegrass	4
<i>Purshia tridentata</i>	antelope bitterbrush	1

Table 1. Number of plants of each species in each plot.

study area. This allowed for an examination of long-term survival to determine if it was possible to increase the number of species in the test habitat. Many species have been installed previously (Stevens 1994, Cabin et al 2002, Link et al. 2011, Link 2017). However, Link et al. (2011) found that Sandberg's bluegrass (*Poa secunda*), starvation cholla (*Opuntia polycantha*), and needle and thread grass (*Hesperostipa comata*) did the best after three years. Of six species installed in fine sand in a vineyard, Link (2017) found bitterbrush (*Purshia tridentata*) did the best in the fourth growing season. Species can vary in the number of years it takes to become established and to flower, with *P. tridentata* taking up to six years (Stevens and Monson 2004).

In this study, survival after 12 years was examined, which may be long enough to draw conclusions about the likely outcome of attempting to sustainably increase native species richness through intentional planting.

Methods

The study was done in Richland, Washington (46° 01' 13.41" N, 119° 01' 56.54" E, 71 m elevation) on a dune slope adjacent to a new home (Fig. 1). The study design had two treatments (shaded and unshaded) with five replicates. Each replicate plot had 50 seedlings installed distributed among 15 species (Table 1). Each plot was a 1.5 m x 1.5 m square. Plots were established in a line with alternating shaded and unshaded plots (Fig. 1). Permanent plot corners were marked with rebar. Shade was created by draping shade cloth over PVC piping and placing PVC tubes over the rebar (Fig. 1). The stands were about 30 cm tall. Percent light transmission was determined by converting the picture (Fig. 1) to gray scale and using the Digital Color Meter (Version 5.13, Apple) application to determine light intensity values of pixels of shaded and adjacent brighter sands without shade. Light transmission through the shade cloth was $70 \pm 2\%$ ($n=3$) of that without shade cloth.

Fruits and seeds of 15 species (Table 1) were collected in Benton County, Washington and stored in paper bags at room

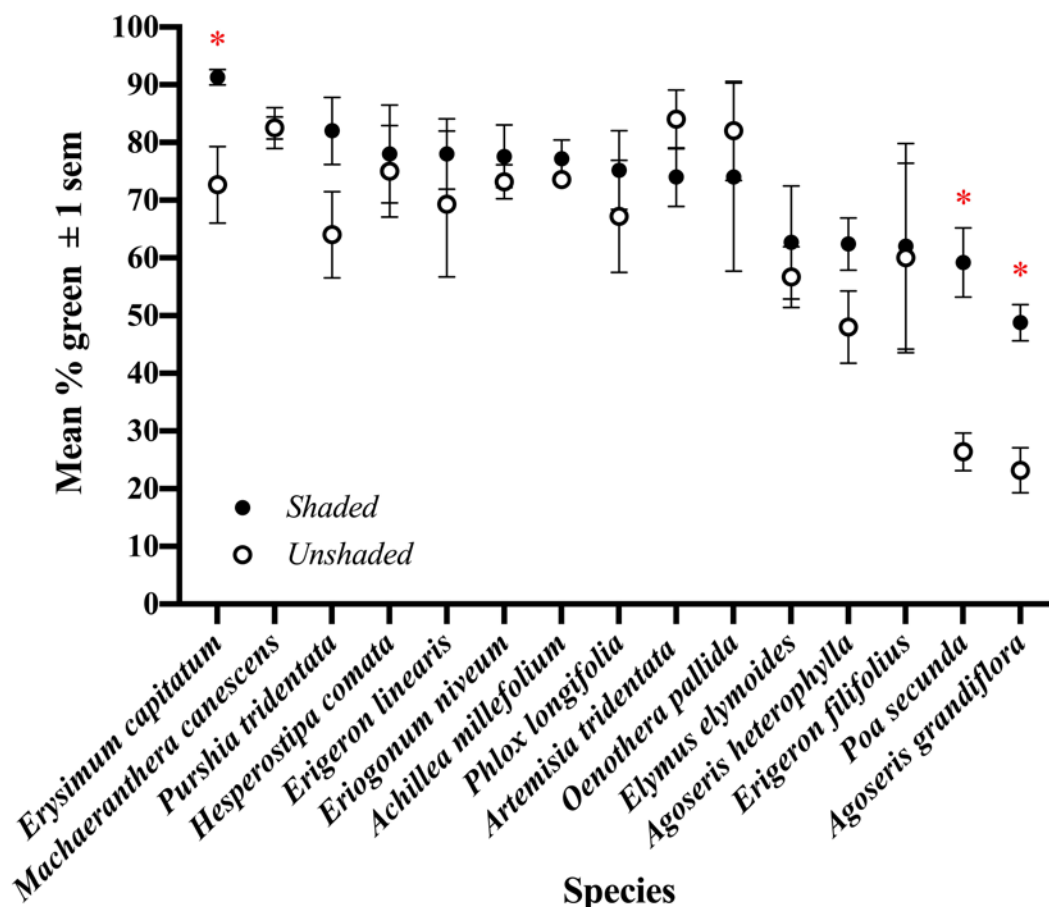


Figure 2. Effect of shading on % green tissue two weeks after transplanting. The red asterisk indicates a significant difference.

temperature. Seed was cleaned using various screens, fans, and tweezers.

Plants were grown in the Washington State University Tri-Cities native plant greenhouse. Seeds were germinated in flats and seedlings transplanted into 164 ml (10 inch³) Ray Leach Cone-tainer cells filled with 46.1% Miracle-Grow potting soil with slow release fertilizer, 46.1% sand, 3.8% perlite, and 3.8% vermiculite. Plants were also fertilized with Scott Miracle-Gro Nursery Select (20N:20P2O5:20K2O). Fertilizer was dissolved as 4.93 ml (0.3 inch³) solid in 3.78 l (1 gal.) water and then was poured at a rate of 7.6 liters over 400 plants every two weeks. Lighting was supplemented with 400 W metal halide grow lights. Plants were irrigated for 15 minutes, 3 times daily with an overhead misting system.

Plants were taken from the greenhouse and installed using dibbles on May 30 and 31, 2007. Plants were watered in and then watered by the adjacent homeowner's automated turfgrass irrigation system for the first summer. Shade cloth was removed on July 13 and then percent green and percent survival of each species was determined. Percent green was visually estimated for each plant. Survival was assessed again in late July of 2008 and 2019.

The effect of shade cloth on percent green and percent survival was analyzed using JMP software (SAS Institute 2019). Percent green and percent survival data were arcsine

transformed before statistical analysis using the following calculation:

$$\text{arcSin} \sqrt{\frac{\% \text{ response}}{100}}$$

Means and standard error bars are presented using untransformed data. Multiple range comparisons were done using the Tukey-Kramer HSD test (SAS Institute 2019). Error terms are one standard error of the mean (sem). Statistical significance was set at $\alpha = 0.05$.

Results

Two weeks after planting there was a significant reduction in percent green tissue of plants installed in direct sun compared with shading in three species (Fig. 2). Lumping all plants in each plot ($n = 50$) revealed a significant ($p < 0.0001$) reduction in percent green tissue in direct sun (60 ± 2.0) compared with shading (71 ± 1.7).

There was no significant effect in 2007 ($p = 0.3938$) or 2008 ($p = 0.8430$) of shading on survival of any species, thus data were lumped within years (Fig. 3). In 2007, the lowest survival was 70% for two species, with *P. secunda* significantly lower than 10 other species (Fig. 3). In 2008, survival of 10 species was above 67% and they were not significantly different from each other. Four species had survival less than 30% and were not significantly different from each other (Fig. 3) but had significantly lower percent survival than the other species. In 2019, survival of *P. tridentata* and *Artemisia tridentata* (Fig. 4) was the greatest and they were not significantly ($p = 0.3434$) different from each other (Fig. 3). There was no significant change in survival for *P. tridentata* ($p = 1.000$) or *A. tridentata* ($p = 0.1679$) from 2008 to 2019. In 2019, *E. niveum* and *H. comata* survival was significantly ($p < 0.0001$) lower than in 2008 and they were not significantly ($p = 0.3018$) different in 2019. Both were significantly lower ($p < 0.0001$) than *P. tridentata* and *A. tridentata* in 2019. All other species failed to survive.

Discussion

Moving plants directly to the field from a greenhouse resulted in a loss of some green tissue compared with shaded plants in three species, but had no effect on survival. It appears that, under the conditions of the study, the need to acclimate or harden these species by shading is not needed. It is possible, but not studied, that native plants are naturally more tolerant of being moved into high light, dry, and windy conditions than are common garden plants that need hardening in similar conditions (Whitman and DeJohn 2009).

The other finding is that it was possible to sustainably establish some species and increase species richness in the area. Four of 15 species remained after 12 years. *Purshia tridentata* and *A. tridentata* were the most successful and now dominate the planting areas. The large shrubs are found elsewhere on the dune along with *E. niveum*. *Hesperostipa comata* was not found on the dune and is the one addition to the flora of the study area. Pale evening primrose (*Oenothera pallida*) is common near the

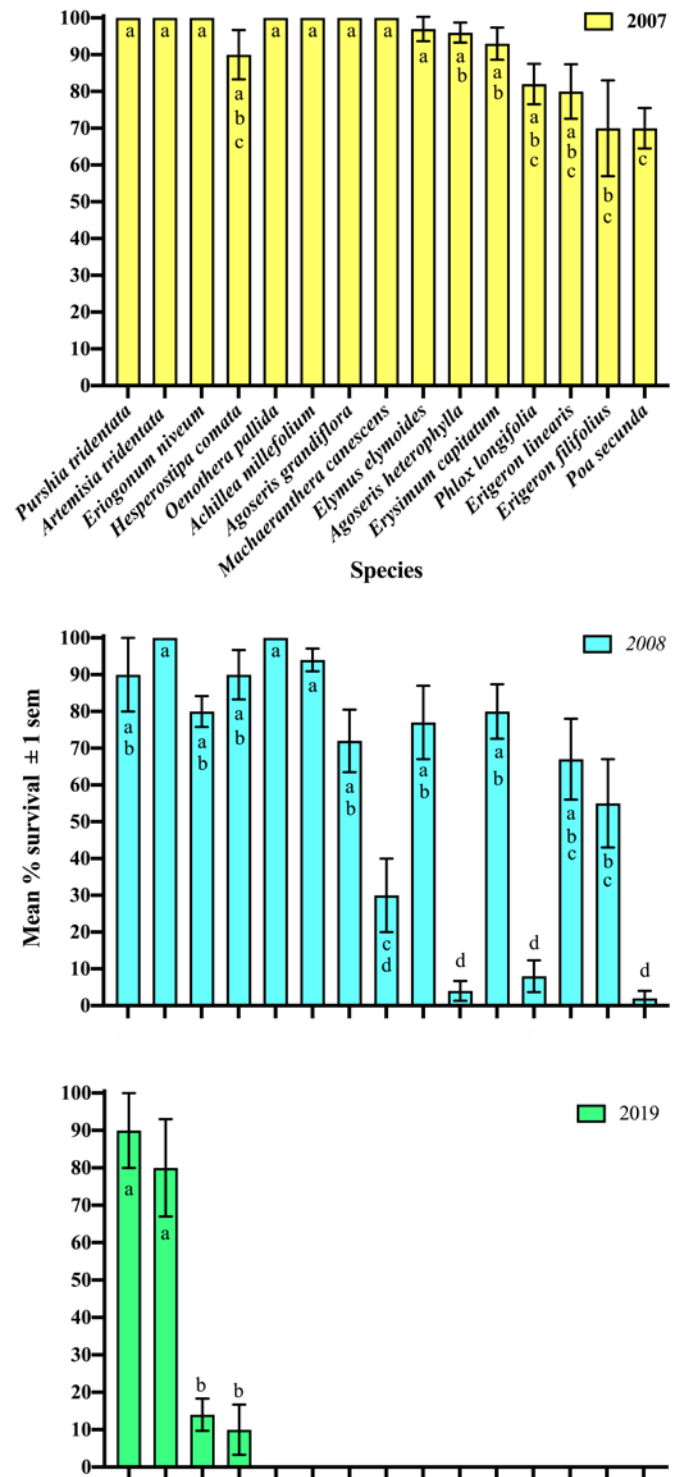


Figure 3. Mean % survival $\pm$ 1 sem ($n = 10$) where means with differing letters are significantly different within years.

study plot, but none established. Hoary tansyaster (*Machaeranthera canescens*) is found on the slope, but as a biennial, would not have been found in 2019. There were no volunteers of any planted species. The rest of the species have been recorded in similar habitats (Giblin and Legler 2019), but all failed. These species were not observed on the dune during the study.

Long-term survival of *P. tridentata* was 90%, which is higher than in other studies (Everett et al. 1980 – 76%, Johnson and



Figure 4. Plots in 2019 with *P. tridentata* along the tops and *A. tridentata* along the bottoms of the plots. PHOTO: STEVEN O. LINK

Okula 2006 – 36%, Link et al. 2011 – 40%, Link 2017 – 53%). This particular dune habitat may have been very conducive to high survival compared with the other studies. *Purshia tridentata* was common in patches on the dune. It is also possible the initial irrigation led to higher survival as was observed by Ferguson (1972). The plants also may have received extra water from the irrigated property two meters uphill.

Survival of *A. tridentata* transplants is often high and above 80% (Stevens 1994) as in the current study. While *A. tridentata* naturally exists on the dune slope, there are few plants. Adding eight more *A. tridentata* to the habitat has increased the likelihood that the species can naturally increase although no volunteers were observed.

Conclusion

Under the conditions of this study, it can be concluded that hardening of greenhouse grown native plants by shading is not necessary for the test species. Eliminating hardening can reduce cost and time when moving greenhouse-grown plants to the field. It was possible to increase species richness of the dune, but the increase was for only one species and may not be permanent. The successful and large shrubs may have reduced the likelihood that other installed species would survive. Further research needs to be done on species with low success or that failed.

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Fascinating Fasciated Ball Cacti

by Ron Bockelman



Normal and crested forms of *Pediocactus nigrispinus*. PHOTO: DIXIE DRINGMAN / LISA WEIGEL

Our regionally endemic *Pediocactus nigrispinus* does not always look like a ball cactus. On extremely rare occasions it can exhibit bizarre growth patterns known as “fasciation.” In crested forms growth at the top of the plant simply becomes horizontal rather than upward. Monstrose (an old usage of the term monstrosity) forms display a very contorted pattern, and it is easy to see why these plants are sometimes called brain cactus or snake cactus. Intermediate versions of these forms also occur.

Fasciation is an uncommon, abnormal growth pattern in plants where the growing tip (apical meristem) becomes elongated horizontally (the normal direction of elongation is vertical). This growth pattern produces strange looking flattened, ribbon-like, crested, or elaborately contorted tissue.

Fasciation can occur in various plant parts and is known from many species, including several cactus genera. Hormonal, genetic, bacterial, fungal, viral and environmental



intermediate form of *P. nigrispinus*. PHOTO: DIXIE DRINGMAN / LISA WEIGEL



Monstrose form of *Pediocactus nigrispinus*. PHOTO: DIXIE DRINGMAN / LISA WEIGEL

factors have been suggested, but no one knows the cause(s) for sure.

Ron Bockelman is a Central Puget Sound Chapter member who is studying *P. nigrispinus* at Wild Horse Wind Farm as a retirement project. Please email him at ron.bockelman@hotmail.com if you find a fasciated cactus.



WNPS Fall Fundraising Campaign is Underway

What about WNPS is special for you? Is it reading about the native flora of Washington in *Douglasia*? Or perhaps it is meeting others in your area who share your passion for native plants. Or maybe it is being able to download a plant list prior to your next hike. Or maybe programs, plant sales, field trips, or...?

Please consider giving to WNPS, as we depend on member contributions to operate our chapters and office, and fund the things that make WNPS special for you. Member dues do not quite fund the Society's operational expenses. Your fall contributions are vital for helping the Society continue to support native plant research, education, conservation, and stewardship. Members recently received a fall fundraising campaign letter in the mail. Thank you if you have already responded! If you haven't, please consider giving to WNPS. There are several ways you can do that:

Online: www.wnps.org/donation/make-a-donation

By mail: Send your check, payable to WNPS at 6310 NE 74th St., Suite 215E, Seattle, WA 98115

From an IRA account: If you take required minimum distributions from your IRA, contact your IRA custodian to make a “Qualified Charitable Contribution” to WNPS.

Thank you in advance for your support!



A Happy Recognition: Bighead Sedge, Guardian of the Dunes

by Katherine Darrow

"I would like to know the grasses and sedges, and care. Then my least journey into the world would be a field trip, a series of happy recognitions." Annie Dillard, in *Pilgrim at Tinker Creek*

Learning to identify sedges "is the botanical equivalent of climbing Mount Everest," according to Arthur Lee Jacobson, author of *Wild Plants of Seattle*. But there is one sedge that is as easy to recognize as a walk on the beach.



A phalanx of bighead sedge. PHOTO: KATHERINE DARROW

At Fort Worden State Park in Port Townsend, along the sand dunes near Point Wilson, the bighead sedge (*Carex macrocephala*) is one of the most distinctive sedges anywhere in North America. Solidly anchored into the sand by long underground stems (rhizomes), the giant spiny flower heads sometimes grow in neat rows, guarding the dunes like a phalanx of soldiers armed with spiked clubs. This is not a part of the beach where you would want to go barefoot.

If you take a closer look, you will notice that among the spiked heads there are slender, softer heads growing from the same graceful arcs of leaves. These are the male or pollen-bearing flower heads. The spikey ones are female or seed-bearing, with built-in defense from predators. Most sedges are wind-pollinated, so there is no need for showy petals, nectar, or scent that would attract pollinators.

But why should anyone *care* about sedges?

To help answer this question, I visited with plant guru and wetland ecologist Dr. Fred Weinmann who regularly leads field trips in pursuit of these enigmatic members of our flora. In early June this year, Fred and three other intrepid sedge-lovers spent the day canoeing on Gibbs Lake and hiking around the Quimper Peninsula south of Port Townsend. "We found seventeen species of *Carex* that day," he boasts. "At first they may all look alike, but once you learn to recognize them, each sedge is beautiful and unique."



Bighead sedge on sand dunes at Fort Worden State Park in Port Townsend. PHOTO: KATHERINE DARROW

"We've made 15-hour trips around the state in search of sedges. I think the most we've found in one day is around 50," says Weinmann. That's about 30 percent of the 153 species of *Carex*, a group of sedges commonly called true sedges, that grow in the wild in Washington.

Dr. Weinmann spent part of his career in the study and recognition of sedges, which are some of the primary plant species that grow in wetlands. In 1974, as a botanist with the Army Corps of Engineers, he joined a team of scientists to craft definitions of wetlands that would make it easier to recognize these critical habitat areas in order to protect them. He is also co-author of a field guide titled "*Wetland Plants of the Pacific Northwest* (1984)" a pocket guide that includes 59 plant species that are wetland indicators. Seven of those species are in the sedge family.

Although sedges are often dominant plants in wetlands, they are equally common in drier upland areas all the way up to the alpine tundra. The dense networks of roots formed by sedges are an important part of what binds meadow, streamside,

and estuarine soils together and are therefore a critical part of the foundation for healthy ecosystems. Sedges also provide food for many kinds of wildlife, from insects to waterfowl, bison, and bears.



Male (left) and female (right) spikes of bighead sedge. PHOTO: KATHERINE DARROW

The sedge family goes far beyond *Carex* to include papyrus (*Cyperus papyrus*), tule (*Schoenoplectus acutus*), and bulrushes (*Bolboschoenus* and *Scirpus* spp). Many of these plants continue to be used by cultures around the world to thatch roofs and to make baskets, mats, boats, sandals, sails, ropes, fish traps and even whole islands to live on. Most famously, the pith of papyrus stems was used as long as 4,000 years ago to make a kind of delicate writing paper that was made into scrolls, long before books were invented. Some of the world's most influential documents were scribed on papyrus, including some of the Dead Sea Scrolls. Biblical scholars believe that the tiny boat that the prophet Moses was found in as an abandoned infant was made of papyrus stems.

The stems and roots of many types of sedge are also edible, including the sweet white tubers of Chinese sedge (*Eleocharis dulcis*), also known as water chestnut. In a pinch, you could even use the razor sharp edge of some sedge leaves to shave with.

Fortunately, in Washington, you don't need to spend all day or travel far to find a sedge. But if you want to learn just one that is unforgettable, find a beach along the west coast of Washington or in Puget Sound and look for the spectacular bighead sedge.

Keep calm and *Carex* on!

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Katherine Darrow is a natural history writer and botanist living in Port Townsend. She is currently the Vice Chair of the Olympic Peninsula Chapter. This article was previously published in her June 2020 column for the Port Townsend Leader, Nature Notes, which she writes monthly as a representative of WNPS.



WNPS Email Discussion Group

The WNPS discussion group has recently moved to a new platform, groups.io. The old discussion group will close on December 1 for good. Please consider signing up to receive or share email communication regarding events, job listings, conservation issues, and more. Please join:

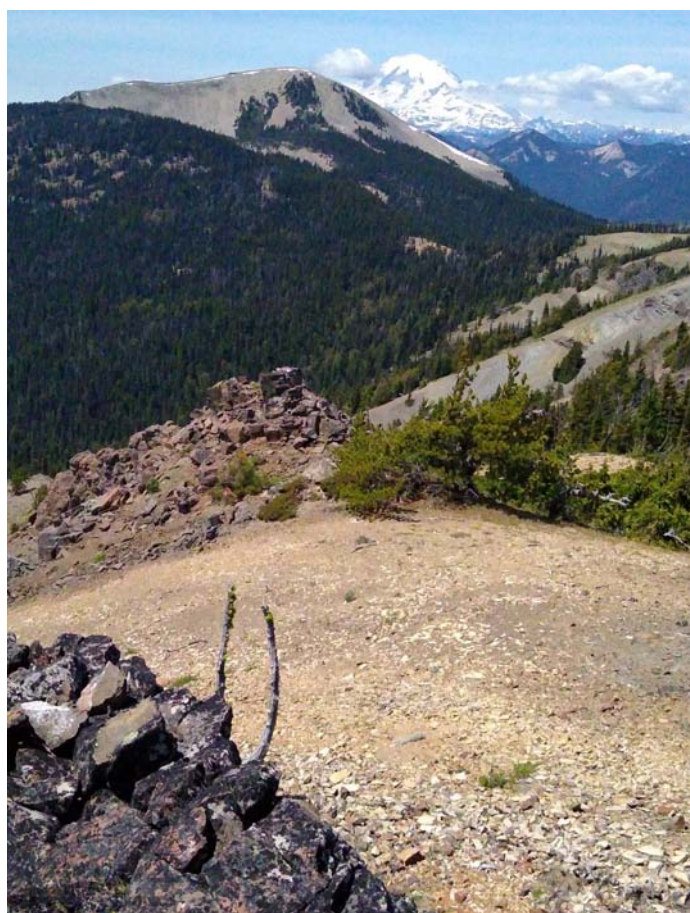
WNPSDiscussionGroup+subscribe@groups.io

This email group is intended for shared timely information for botanists and native plant conservationists. It's an alternative to the WNPS Facebook Group, where members share their plant finds, ask for ID help, and converse socially about native plants.

Burnt Mountain: An Unexpected Gem

by David Giblin, University of Washington Herbarium,
Burke Museum

Through my field work at the University of Washington Herbarium, I have had the opportunity to travel to and collect plants in all of Washington's 39 counties. Additionally, I have committed considerable free time to hiking in places in which I haven't collected. Despite all of these wanderings, I still have a rather lengthy list of destinations that I would like to visit across our state. Nevertheless, I am amazed by the number of places in Washington that I've never been to or never heard of. In an earlier edition of *Douglasia* I wrote of one such place, Black Canyon, and Burnt Mountain falls into the same category.



Looking west from near the Burnt Mountain saddle, with Shellrock Peak in the foreground and Mount Rainier in the distance. PHOTO: DAVID GIBLIN

Burnt Mountain in Yakima County is a rather modest peak at an elevation of 6,586 feet (about the same elevation as Sunrise at Mount Rainier). It sits just north of Rimrock Lake and west of Cash Prairie, a place that I had heard a lot about from the late Don Knoke and was on my radar to visit. In mid-July this year I made the 2.5-mile trek out to Burnt Mountain along the well-worn Ironstone Mountain trail that begins about a mile west of Cash Prairie. Total elevation gain from the trailhead to the saddle below Burnt Mountain is about 500 feet.



Campanula scabrella (rough harebell) at Burnt Mountain. Note the broadly lanceolate, scurfy leaves with entire margins. PHOTO: RICHARD RAMSDEN

The experience was truly remarkable. I couldn't believe that I had never heard of a hike that was easily accessible by 2-wheel drive vehicle (a little bumpy in places), had outstanding views, was not physically demanding, and has perhaps some of the greatest plant diversity per trail mile in Washington. If you haven't been, put this on your calendar for next year.

After a short, flat section the trail descends a few hundred feet — never my favorite way to start a hike. At the end of the descent is an exposed ridgeline that I found speckled in a variety of colors ranging from the light pinks of *Lewisia rediviva* (bitterroot) and *Lewisia columbiana* (Columbia lewisia), to the brilliant reds of *Ipomopsis aggregata* (scarlet gilia), to the bright whites of *Silene oregana* (Oregon catchfly) and *Eremogone capillaris* (mountain sandwort).

The trail ambles along the south-facing aspect of the ridge-line offering outstanding views of Mt. Adams and the Goat Rocks. There are *Allium* (onion) species to be found along the way, and if you hit it right you will find the uncommon, but not rare, *Cordylanthus capitatus* (Yakima bird's-beak), a member of Orobanchaceae family, which is the same family to which the nearby plants of *Castilleja thompsonii* (Thompson's paintbrush) belong.

Towards the end of this ridge, above where the trail enters a forested patch, you will find the first plants of *Astragalus whitneyi* var. *sonneanus* (balloon milk-vetch). *Astragalus* is the most species-rich vascular plant genus (about 3,000 species worldwide, with more than 40 in Washington alone), and its species are notoriously difficult to identify. No problem recognizing this species—it's the one with the bright red, yellow-streaked,

balloon-like fruits that lie on the ground at the tips of the plants' branches. There is plenty more of it on Burnt Mountain itself further along the trail.

The only really steep part of the trail is the section through the woods, but at least you're in the shade and there are patches of lupines and arnica to keep your mind off the trail's pitch. Emerging from the forest, the trail takes a sweeping course along the gravelly, open east slope of Burnt Mountain on its way to a saddle on the south side of the peak. There was a snow field on this slope when I visited, and I was hopeful that I might find *Dicentra uniflora* (steer's head) at its base, but no such luck (still worth a look if you encounter this same snow field).

From the saddle the views open up to the west and north. Mt. Rainier is in view behind the flat, barren ridge leading to Shellrock Peak in the western foreground. To the north lies the barren-looking slopes of Nelson Ridge, with Mt. Aix being the high point there. Looking around you will notice that there is more bare, gravel-like scree around you than plants, and that the scree ranges in color from brown, to green, to light yellow. I'm not a geologist, but my impression is some of the scree is derived in part from serpentine rocks. Serpentine soils limit the growth of most plant species, and those that can tolerate these conditions tend to be small in stature and sparse in density. Whatever the case, don't despair because the area is incredibly diverse despite what one may think at first glance.

Among the first things that I noticed was the abundance of *Ivesia tweedyi* (Tweedy's mousetail). This is the first time that I had seen this species (it's relative *Ivesia gordonii* is much more common here). Walking up the trail to the Burnt Mountain summit, an elevation gain of maybe 100 feet, I came across another species that I had never seen before—*Campanula scabrella* (rough harebell). This low, weakly rhizomatous plant with grayish-green leaves has deep blue flowers just like other *Campanula* species here in Washington, such as the widespread *C. rotundifolia* (harebell) and Olympic Mountains endemic *C. piperi* (Piper's harebell). A notable aspect of *C. scabrella* is that the populations in Washington's Cascades Range represent a



Collomia debilis (alpine collomia) is common along the trail just west of the saddle below Burnt Mountain. PHOTO: RICHARD RAMSDEN

major disjunction (separation) from the main range of the species, which is in central Idaho and western Montana.

Perhaps the most interesting find from my outing was *Oreocarya thompsonii* (Thompson's cat's eye), which has always been considered endemic (restricted in range) to the Wenatchee Mountains. The plants here are sparsely distributed around the Burnt Mountain summit and along the ridgeline that runs south from the saddle. Great stuff.

The trail continues westward from the saddle for several miles to Ironstone Mountain. I went as far as the junction for Shellrock Peak (about another 1.5 miles). The descent from the saddle is about 1,000 feet, and I didn't find anything that I hadn't seen for all of my troubles. However, it is worth descending a little ways to see the different soil colors up close.

The easiest access to the trailhead is from U.S. Highway 12 — the turnoff is just east of Rimrock Lake. There is a great description of the hike and directions to the trailhead on the Washington Trails Association website (<https://www.wta.org/go-hiking/hikes/burnt-mountain>). There was no sign indicating that a Northwest Forest Pass or Federal Lands pass is needed. Unfortunately, there is no plant list on the WNPS Plant List database for this site, so if you go please start one. While you're there you may want to take in nearby Cash Prairie, a massive subalpine meadow.

Late June is probably the earliest that you want to go to avoid running into snow on the trail, and about the third week of July is probably the latest to go before things burn up. If you visit in the middle of the week, you'll likely have the place to yourself — I did.



How to Support Your Local Caterpillars

by Regina Johnson

Recently I read a book that has been making waves in gardening circles — Douglas Tallamy's *Bringing Nature Home*. I believe I can summarize his main points thus: wildlife, including insects and birds, are dependent on suburban gardens for habitat because development and other disturbances have resulted in widespread habitat loss and degradation; and that typical garden plants do not provide food for the insects and other arthropods that form the foundation of the food web for the larger animals like birds and reptiles.

It was an interesting read with some caveats. One, it's written almost entirely for gardeners in the Mid-Atlantic states, relying heavily on his personal observations in his own gardens in Delaware and Pennsylvania, and discussing the non-native garden plants and invasives common in that area. He treats Douglas-fir (*Pseudotsuga menziesii*) as a nonnative! Which it is there, but not for us here. Two, his uses of statistics don't always ring true — his assumptions aren't necessarily valid,



Hydaspe fritillary (*Speyeria hydaspe*) on pearly everlasting (*Anaphalis margaritacea*). Female greater fritillary butterflies lay their eggs near violets, the larval host plant, which is quite a trick since violets tend to be dormant and underground when oviposition happens in late summer. PHOTO: REGINA JOHNSON

and his numbers don't always add up. For instance, he cites the USDA statistic that 41.4% of the land area in the U.S. is in agriculture, and jumps to the conclusion that therefore the rest is urban. I'm pretty sure there are other land use categories besides agriculture and urban! And there are different degrees of urbanization, from the density of Manhattan to typical Washington rural residential. He also cites 'ecologists' as estimating that only 3–5% of the land area in the US is undisturbed, which will depend of course on who the ecologists are, and your definition of undisturbed.

Tallamy wants us all to plant our gardens with native plants because native plants are more likely to support robust populations of insects and other invertebrates. Most of the animals we think of as "wildlife" depend on these insects and other invertebrates for their food supply, either directly, as with birds feeding their nestlings (most birds eat bugs, primarily caterpillars, as nestlings, whatever the adults may eat), or indirectly, with other animals eating insectivores. Basically, insects turn plants into bird and reptile and fish food. He cites anecdotal evidence from his own observations, and research by his college students, that insects, etc., are declining overall (not just butterflies or bees) and believes this is a result of habitat loss through widespread planting of nonnative plants, and the invasion of more natural areas by nonnative plants.

By and large, most insects don't eat nonnative plants; plants have phytochemicals to deter herbivores and only a very few herbivores will be able to eat any particular plant species. Monarch butterflies and milkweeds are a well-known example of this; few animals can eat milkweed other than Monarchs. Speaking strictly for the Mid-Atlantic area, he states that although the Norway maple has been in this country for over 300 years, there are still essentially no insects that eat it here, while native maples support 285 species of Lepidoptera (but-

terflies and moths). And *Clematis vitalba* (old-man's beard), a nonnative weedy vine that is increasingly common here in Washington, supports 40 species of insects in its native range in Eurasia, but only one species in North America (he doesn't say what that one species is though, or how long *C. vitalba* has been here).

You can see the problem, even if his numbers are not 100% correct. He goes so far, in fact, as to compare nonnative plants to statuary — ornamental, but sterile and lifeless. Which is a bit of an exaggeration I think; nonnative plants can still provide shelter, just not much in the way of food. While many ornamentals produce fall berries that are eaten by so many birds, the berries don't do the nestlings any good in spring.

Almost all plants create phytochemicals of one kind or another to deter herbivores, i.e., self-defense. Phytochemicals



Mourning cloak (*Nymphalis antiopa*) on a willow (*Salix* sp.) PHOTO: MELANIE WEISS

are what give plants their flavors and fragrances. These phytochemicals have a variety of effects. Some taste bitter, some bind up the nutrients in your gut so you starve, some poison the nervous system or heart. Digitalis in foxgloves, pyrethrin in chrysanthemums, nicotine in tobacco, salicylic acid in willows, tannins in oaks and conifers are all phytochemicals to deter herbivores. In response, herbivores like insects develop the ability to tolerate or detoxify the particular phytochemicals in a particular group of plants.

Many mammalian herbivores have the ability to at least partially detoxify many different phytochemicals, and rely on eating a varied diet to avoid overloading on any one toxic phytochemical. Most insect herbivores, on the other hand, have the ability to more thoroughly detoxify or sequester a limited range of phytochemicals, so they specialize on plants with those chemicals. Makes sense, since most mammals can move around a lot more than caterpillars, and thus sample a larger variety of plants than caterpillars can.

Besides Monarchs on milkweeds, there's also Checkerspot on paintbrushes (*Castilleja* spp.) and Mourning Cloaks on

willows (*Salix* spp.). A few insect species, like the various Tiger Swallowtails (we have 4 species here), can eat a wide variety of plants, but only about 10% of insect species are considered to be generalists. Some of those generalist caterpillars are feeding on flowers and fruits, which tend to have less in the way of toxic phytochemicals than leaves. Other species that appear to eat a variety of plants are eating plants that share the same phytochemicals. But just being in the same genus isn't enough to make different species of plants edible, as in the Norway maple example above—the nonnative garden sweet violet, *Viola odorata*, is inedible to Greater Fritillary butterflies, which rely on native violets; and the California Sister, which eats the oaks common in California and Oregon, can't eat our native Garry oak (*Quercus garryana*).

So, you should plant more native plants in your garden. To that end I have put together a short list of Washington native plants that are known to be good host plants for our more-common butterfly caterpillars, drawn from the book *Landscaping for Wildlife in the Pacific Northwest*, by Russell Link. Keep in mind that not all butterflies will occur in your area — no Monarchs west of the Cascades (sorry, Seattle), and not all native plants occur in all parts of the state—no bigleaf maples (*Acer macrophyllum*) in eastern Washington (sorry, Spokane). The new *Butterflies of the Pacific Northwest* by Robert Michael Pyle and Caitlin C. LaBar, while a field guide, gives detailed information on the host plants for each species of butterfly described, along with range maps.

Before you go launching into a total reworking of your landscape, you might want to take a look at Eileen Starks' *Real Gardens Grow Natives*. The book covers ecological landscaping



Red admiral (*Vanessa atalanta*) on stinging nettle (*Urtica dioica*). Stinging nettles support many species of Lepidoptera. PHOTO: MELANIE WEISS

principles, designing for wildlife, soil preparation and planting techniques, and wildlife-friendly garden maintenance. Also, recently out from the Xerces Society, is *Gardening for Butterflies*. It's a beautiful and inspiring book, and while not written exclusively for the Pacific Northwest, it does cover our area very well. And, it is exclusive to butterflies, not wildlife in general like the above books, with information on garden design, plant selection, and

garden maintenance — turns out most of our traditional garden maintenance activities are devastating to butterflies and other insects.

Keep in mind this list is for plants that caterpillars eat, not nectar sources for butterfly adults.

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Unique among butterfly fanciers, Regina Johnson's interest in butterflies was sparked by the challenge of catching skippers by hand as a five-year-old. (Everyone else starts with Monarchs.) This led eventually to professions in horticulture and landscaping, and now ecological restoration in the South Puget Sound area, where much of her work focuses on habitat restoration for imperiled but-

Native Plant Host	Caterpillar/Butterfly Species
Maple (<i>Acer</i>): bigleaf, vine, Douglas (<i>A. macrophyllum</i> , <i>A. circinatum</i> , <i>A. glabrum</i>)	Pale and Western Tiger Swallowtail, Mourning Cloak (<i>Papilio eurymedon</i> , <i>P. rutulus</i> , <i>Nymphalis antiopa</i>)
Hawthorn (<i>Crataegus</i>): black, Columbian (<i>Crataegus douglasii</i>)	Pale Tiger Swallowtail, Mourning Cloak, Gray Hairstreak (<i>Papilio eurymedon</i> , <i>Nymphalis antiopa</i> , <i>Strymon melinus</i>)
Cherry (<i>Prunus</i>): bitter, choke (<i>P. emarginata</i> , <i>P. virginiana</i>)	Pale and Two-Tailed Tiger Swallowtail, Spring Azure, Lorquin's Admiral (<i>Papilio eurymedon</i> , <i>P. multicaudata</i> , <i>Celastrina echo</i> , <i>Limentis lorquini</i>)
Willow (<i>Salix</i>): many species	Tiger swallowtails, Lorquin's Admiral, Mourning Cloak, Viceroy (<i>Papilio spp.</i> , <i>Limentis lorquini</i> , <i>Nymphalis antiopa</i> , <i>Limentis archippus</i>)
Ceanothus (<i>Ceanothus</i>): redstem, snowbrush (<i>C. sanguineus</i> , <i>C. velutinus</i>)	Pale Tiger Swallowtail, California Tortoiseshell, Brown Elfin (<i>Papilio eurymedon</i> , <i>Nymphalis californica</i> , <i>Callophrys augustinus</i>)
Oceanspray (<i>Holodiscus discolor</i>)	Pale Tiger Swallowtail, Gray Hairstreak, Spring Azure, Lorquin's Admiral (<i>Papilio eurymedon</i> , <i>Strymon melinus</i> , <i>Celastrina echo</i> , <i>Limentis lorquini</i>)
Pearly Everlasting (<i>Anaphalis margaritacea</i>)	Painted Lady (<i>Vanessa cardui</i>)
Western bleeding heart (<i>Dicentra formosa</i>)	Clodius Parnassian (<i>Parnassius clodius</i>)
Lomatium (<i>Lomatium</i>): many species	Anise and Indra Swallowtails (<i>Papilio zelicaon</i> , <i>P. indra</i>)
Wild buckwheat (<i>Eriogonum</i>): different species	Euphilotes blues, green hairstreaks (<i>Euphilotes spp.</i> , <i>Callophrys spp.</i>)
Lupine (<i>Lupinus</i>): many species	Silvery and Boisduval's Blues, Western Sulphur (<i>Glaucopsyche lygdamus</i> , <i>Icaricia icarioides</i> , <i>Colias occidentalis</i>)
Stinging Nettle (<i>Urtica dioica</i>)	Red Admiral, Painted Lady, Milbert's Tortoiseshell, Satyr Anglewing (<i>Vanessa atalanta</i> , <i>V. cardui</i> , <i>Aglais milberti</i> , <i>Polygonia satyrus</i>)
Kinnikinnick (<i>Arctostaphylos uva-ursi</i>)	Brown Elfin (<i>Callophrys augustinus</i>)
Salal (<i>Gaultheria shallon</i>)	Brown Elfin, Spring Azure (<i>Callophrys augustinus</i> , <i>Celastrina echo</i>)
Bitterbrush (<i>Purshia tridentata</i>)	Brown Elfin (<i>Callophrys augustinus</i>)
Milkweeds (<i>Asclepias</i> spp.)	Monarchs (<i>Danaus plexippus</i>)
Violets (<i>Viola</i>): early blue, stream (<i>V. adunca</i> , <i>V. glabella</i>)	Greater fritillaries, Western Meadow Fritillary (<i>Speyeria spp.</i> , <i>Boloria epithore</i>)
Thistles (<i>Cirsium</i>): any	Painted Lady, Mylitta Crescent (<i>Vanessa cardui</i> , <i>Phycioides mylitta</i>)
Grasses (<i>Poaceae</i>): most any	Common Ringlet, wood nymphs, grass skippers (<i>Coenonympha tullia</i> , <i>Cercyonis spp.</i> , <i>Hesperia spp.</i>)
Pine (<i>Pinus</i>): lodgepole/shore, western white, ponderosa (<i>P. contorta</i> , <i>P. monticola</i> , <i>P. ponderosa</i>)	Pine White (<i>Neophasia menapia</i>)

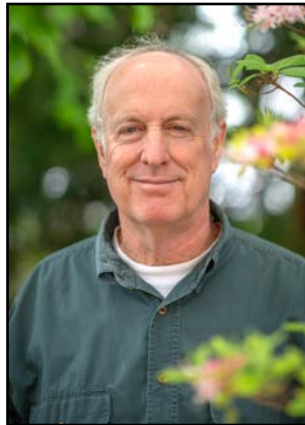
terflies. She has been a member of both WNPS and Washington Butterfly Association for about 10 years.

Adapted from an article originally published in the Washington Butterfly Association newsletter *G'Num* (Volume 18 Number 4, November 2017)



A Guide to Restoring the Little Things that Run the World

A recent UN report predicts that as many as 1 million species will disappear from planet earth because of human activities. Many of these are insects and nearly all species at risk rely on insects. Insects have already declined 45% since 1974. The most alarming part of this statistic is that we don't seem to care, despite the fact that a world without insects is a world without humans! So how do we create beautiful landscapes brimming with life; landscapes that support the pollinators, herbivores, detritivores, predators and parasitoids that run the ecosystems we depend on? Tallamy will remind us of the many essential roles insects play, and describe the simple changes we must make in our landscapes and our attitudes to keep insects on the ground, in the air and yes, on our plants.



Doug Tallamy is a professor in the Department of Entomology and Wildlife Ecology at the University of Delaware, where he has authored 104 research publications and has taught insect related courses for 41 years. Chief among his research goals is to better understand the many ways insects interact with plants and how such interactions determine the diversity of animal communities. His book *Bringing Nature Home: How Native Plants Sustain Wildlife in Our Gardens* was published by Timber Press in 2007 and was awarded the 2008 Silver Medal by the Garden Writers' Association. *The Living Landscape*, co-authored with Rick Darke, was published in 2014. Doug's new book, *Nature's Best Hope*, released by Timber Press in February 2020, is a New York Times Best Seller. Among his awards are the Garden Club of America Margaret Douglas Medal for Conservation and the Tom Dodd, Jr. Award of Excellence, the 2018 AHS B.Y. Morrison Communication Award and the 2019 Cynthia Westcott Scientific Writing Award.

Tallamy will be the Native Plant Appreciation Month featured speaker in April 2021.



Proposed Changes to the 2021 State Noxious Weed List

by Wendy DesCamp

The Washington State Noxious Weed Control Board annually adopts changes to the state noxious weed list. This process is outlined in our state noxious weed law (WAC 16-750-022) and provides opportunities to update the list and address potential new listings. After a public hearing, proposed changes will be voted on by the State Weed Board at their November meeting and subsequently adopted into law for 2021.

Two species are being considered as Class A additions to the 2021 state noxious weed list: Turkish thistle (*Carduus cinereus* M.Bieb.) and hanging sedge (*Carex pendula* Huds.).



Turkish thistle (*Carduus cinereus*) in bloom, growing in the Hells Canyon National Recreation Area, Wallowa County, Oregon. PHOTO: MARK PORTER, OREGON DEPARTMENT OF AGRICULTURE

Turkish thistle, a recently identified thistle native to the eastern Mediterranean and the Irano-Turanian region, is established and spreading in the Hells Canyon National Recreation Area in Wallowa County, Oregon and the adjacent area in Idaho. Originally, the invasive plants were thought to be Italian thistle (*Carduus pycnocephalus* L.), another nonnative *Carduus* species listed as a noxious weed. However, morphological differences from other Italian thistle plants prompted genetic research by Gaskin et al. (2019), which found these plants to be Turkish thistle.

This annual thistle has winged stems and can grow up to four feet tall. Flower heads are compressed, non-spherical, and

single or in loose clusters of two to five. Each purplish flower head is typically on a tomentose (woolly-hairy) stem or may be stemless. Gaskin et al. (2019) provides a botanical description and key to the *Carduus* species of North America.

There are currently no known locations of Turkish thistle in Washington, but it may already occur here because of the close proximity to the Oregon and Idaho populations. Oregon has Turkish thistle listed as a noxious weed, and Idaho added it to its noxious weed list in September 2020.



Hanging sedge (*Carex pendula*) is also called pendulous or drooping sedge due to its long, hanging female spikes. PHOTO: WENDY DESCAMP, WA STATE NOXIOUS WEED CONTROL BOARD

Hanging sedge is a large, clumping, evergreen sedge native to parts of Asia, Europe, and northern Africa. Leaves are long and wide, 0.3–0.8+ inches wide (8–20+ mm), and flowering stems are up to 6.6 feet (2 meters) long and tend to spread out at an angle. Female spikes are long and drooping, 4–12+ inches (10–30+ cm) long and are a key identifying trait.

Introduced as a garden ornamental, hanging sedge escapes and grows in riparian areas, ravines, wetlands, and in parks, along trails, roadsides, and in restoration plantings. The largest number of known naturalized plants is in King County, and has led the King County Noxious Weed Board to list it as a weed of concern in 2020.

Other proposed changes being considered for the 2021 state noxious weed list include updates to Class B noxious weed designations, as well as updating the scientific names of noxious weeds using the Second Edition of the *Flora of the Pacific Northwest* (Hitchcock and Cronquist 2018) as reference.

Find out more about noxious weeds in Washington State by visiting the State Noxious Weed Board website nwcb.wa.gov or by contacting your county noxious weed control board. Reach Wendy at noxiousweeds@agr.wa.gov.

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In Memory of Marty Hicks

by Van Bobbitt

Martin “Marty” Hicks, 67, passed away on July 25, 2020, in Las Vegas. Marty had been a member of WNPS since 1978 — 42 years! He was on the WNPS Board of Directors in the 1980s, a lifetime WNPS member, and a consistent annual donor to WNPS.

Marty was born and raised in Spokane. He attended Ferris High School where he was inspired by his science teacher, Al Finley. Marty went on to earn both B.A. and M.S. degrees in biological sciences from what was then Central Washington State College.



Marty was a gifted teacher who taught human anatomy and physiology courses for over 40 years, first at Yakima Valley College, then at Wenatchee Valley College, and finally at the College of Southern Nevada from 1989 to 2014.

In 1990, Marty married Tammie Morden of Wenatchee after a “whirlwind” eight-year romance.

Marty loved native plants both of the Pacific Northwest, as well as his adopted home in the Southwest. In the early 1990s, Marty and Tammie purchased a home in a new development in Las Vegas. Marty argued with the landscapers not to put in a lawn. Instead he planted a garden of desert plants, including a saguaro cactus. At the beginning, this garden looked out of place in a subdivision of irrigated green lawns. But twenty years later, most of those lawns had burned up or were replaced by more appropriate desert gardens.

I met Marty in 1972 while attending Central Washington State College, and we remained close friends until his death. We got to share our love of plants while hiking in the shrub steppe of central Washington, the desert around Las Vegas, or the oak woodlands of Southern California. My favorite botanical excursion with Marty was in December 1979 when we drove down the Baja California peninsula to see bizarre boojum trees — *Fouquieria columnaris*.



WNPS Conservation at Mount Saint Helens

by Becky Chaney, WNPS Conservation Committee Chair
with input from Susan Saul, WNPS Conservation Committee member

Forty years ago last May, Mount St. Helens erupted, drastically altering patterns of renewal, growth, and succession in the area. Scientists flew, literally, to the area to view the landscape and realized almost immediately that rather than completely devoid of life, a hidden vital legacy was lurking, sheltered by snowbanks, lakes, and the earth itself, and ready to move in. Additionally, quickly, whether on hoof or wafted in from the air, species from near and far arrived to fill the voids. The Pumice Plain, the area between the crater and Spirit Lake, was the slowest to renew; sterilized by the blast. The first plant to reappear, prairie lupine (*Lupinus lepidus*) was discovered in 1982, the same year that Congress set aside the Mount St. Helens National Monument for research, recreation, and education.



WSU-Vancouver undergraduate students, Jordan Kronstad and Shawn Preston in 2019, taking soil cores from around willows in a long-term study of simulated nitrogen deposition and exclusion of an invasive stem boring beetle.

Scientists tracking change had enough work to fill a lifetime and beyond. *In the Blast Zone* (Goodrich, Moore, and Swanson 2008) describes both the catastrophe and renewal. *After the Blast: The Ecological Recovery of Mount St. Helens* (Wagner 2020) further describes how the eruption and aftermath have prompted scientists to think in new ways about how life responds in the face of seemingly total devastation. Today, some of these scientists and others following in their footsteps (including Rebecca Evans, a 2019 WNPS grant recipient), are alarmed that their research is at risk.

An existing tunnel drilled through Harry's Ridge to control the water level of Spirit Lake and prevent an outburst flood needs maintenance, including a new intake gate. The U.S. Forest Service, the monument manager, has proposed building a

3.2-mile road across the Pumice Plain, through the middle of the densest and oldest research plots, to the shore of Spirit Lake to accomplish this work. The Forest Service's environmental assessment dismisses concerns about the potential impacts on scientific research.

Washington Native Plant Society (WNPS) has been commenting on the proposed road since 2018, informed by Conservation Committee member Susan Saul who has worked to conserve Mount St. Helens since before the eruption. Currently, Susan is helping coordinate an effort by WNPS, scientists, and other conservation organizations to ensure that work on the tunnel begins only after a full Environmental Impact Statement is completed and comprehensive management of the Spirit Lake basin is considered. The WNPS Conservation Committee supports finding a permanent solution for Spirit Lake management that addresses both public safety and scientific research. Its members are concerned that the current Forest Service approach fails to do so.

Christine Colasurdo, author of *Return to Spirit Lake: Life and Landscape at Mount St. Helens* (2010), speaking to the Forest Service, stated: "We have a gorgeous continuing story of eye-opening wildness and geological rarity. We have a magnificent Cascade Range story with scientists who have devoted their lives and careers to uncovering the Pumice Plains' ecological and geological wonders, stories that have forced biology textbooks to be rewritten. How could this be up for destruction?"

At the time of writing, WNPS is waiting for a signed decision notice from the Forest Service. We are hoping our concerns will be addressed. If not, we will be discussing how to proceed with our environmental partners — the Cascade Forest Conservancy, Washington Chapter-Sierra Club, and the Great Old Broads for Wilderness — along with our WNPS leaders. Updates will be sent to the WNPS E-news.

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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.



Douglas Fir, The Story of the West's Most Remarkable Tree

by Stephen F. Arno and Carl E. Fiedler. Mountaineer Books, Seattle WA, 2020

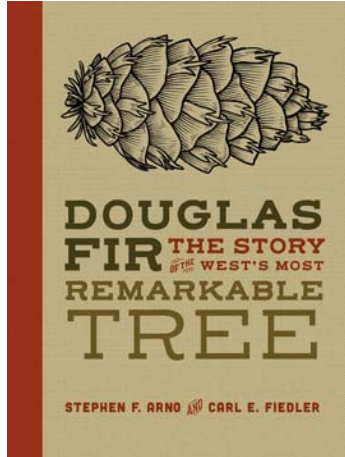
Review by Chris Earle

I confess, I was pleased when the publisher asked me to review this book. I've been reading Steve Arno's stuff ever since about 1980 and he's never done anything that isn't a fun read; even his academic papers are good. Steve is one of the most respected forest and fire ecologists in the West, and it was exciting to see he'd taken on Douglas-fir for a topic. He couldn't have chosen a better co-author either; Carl Fiedler, a deeply experienced fire ecologist, has previously co-authored two books with Steve. Sadly, this will likely be Carl's last, as he is in a losing battle with cancer. There are also some fine drawings by Zoe Keller, and a few photographs.

Douglas-fir is the most important tree in the world, if you judge by economic standards. Its strong timber, rapid growth rate, and broad climatic tolerances have allowed it to become a commercially dominant species in countries around the globe. It's also quite an attractive tree, and a popular horticultural subject. It's surprising, then, that it has rarely been the subject of a popular book; this is the first one I'm aware of that's been published in English (cf. *Le Douglas* by Remy Claire).

Arno and Fiedler briefly consider the tree's international importance (in Chapter 4). Their main focus, though, is on its natural history and importance in the history of western North America, where Douglas-fir reigns supreme in forests found from northern British Columbia in Canada to central Oaxaca in Mexico. They cover this history in an introduction, seven chapters, and a guidebook.

First they gush a little bit, as indeed everyone who writes about this tree tends to do, starting with Archibald Menzies, who made the original collections upon which the species was described in 1792. Arno and Fiedler also explain their personal attachments to the species, in words that will make every reader recall their personal introductions to this key-stone species of the Northwest forests. They then delve into the basics of the species's biology—its discovery and naming, its rapid rise in horticultural popularity, its morphology and geographic distribution, its remarkable size and longevity.



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ity, and varied aspects of its role as an ecological keystone species. This information, although grounded in sound and recent science, is delivered in a flowing and accessible prose reminiscent of the best modern nature writers.

The authors then discuss, in Chapter 2, coastal Douglas-fir. Our Douglas-fir, as distinct from the other three to five species (depending on the taxonomic source) in its genus, is one species (*Pseudotsuga menziesii*) with two very different subspecies — a coastal one (subsp. *menziesii*) that almost defines the wet old-growth forests of Cascadia, and an inland one (subsp. *glauca*) with smaller dimensions but much wider distribution. The treatment of the coastal subspecies provides detailed information on the dimensions and records of “supertrees,” a number of which were taller than any trees now known to survive on the planet.

The authors discuss fundamental ecology of the subspecies, explaining its climatic tolerances and physiological adaptations to that climate, as well as discussing its ecological importance to understory plants and associated wildlife, in particular the threatened spotted owl and marbled murrelet. This is fundamental stuff for anyone who wants to understand the old forests of the Cascadian bioregion, and is explained clearly and not simplistically; although shelves could be filled with fairly recent books about these forests, the explanations by Arno and Fiedler have never been bettered. The book is worth getting just for this chapter (I could say that about every chapter, though).

Chapter 3 provides the same sort of treatment for the inland Douglas-fir, though in this case the treatment must address a much wider ecological scope. Arno and Fiedler do this by focusing on geographies of special interest, such as the northern Rockies, the desert Southwest, and highlands in Mexico. Cumulatively, they do a wonderful job of communicating the vast ecological amplitude of this species, and you would have to wade through hundreds of pages of highly technical and often obscure papers to get this information otherwise.

In Chapter 4, the authors then tackle the economic and cultural role of Douglas-fir in the settlement and development of the West. They use Pope & Talbot, the first big timber company to operate on the shores of Puget Sound, to introduce this story. From there we are shown the whole panoply of traditional Northwest logging—the hardships of life in the logging camps, the timber schooners, the economic role of Douglas-fir in the growth of the Northwest, its importance in World War One ship-building, and further developments that brought us to the spotted owl/old-growth crisis of the 1980s. Arno and Fiedler also drop a variety of spicy tidbits along the way; for example the old fishing

boat John Steinbeck and Ed Ricketts used to tour the Sea of Cortez was made of Douglas-fir. Do you know its final fate? Read the book.

The authors know this tree has roots. Chapter 5 explores its ethnobotany, the varied ways that native peoples have used it throughout its range since pre-Columbian times. The chapter then proceeds to discuss the species’s Euro-American ethnobotany: its importance in construction, mining, railroading, and charcoal production during western history, its role in the modern wood products industry, and the nontimber products

available from this tree. There’s also a review of the species’ importance in global agroforestry. Many specific and memorable examples are included. For instance, the largest clear-span wood building in the world is a blimp hangar in Tillamook, Oregon, built of Douglas-fir in 1942 by the U.S. Navy (it’s now a museum, and worth a visit).

There is then, of course, a chapter (Ch. 6) on fire. Wildfire is Arno and Fiedler’s history and passion; they have written whole books on the subject and I was excited to see their latest views. We learn when Douglas-firs burn, how they burn, where they burn, and how the burns establish the ecological trajectories of forests. We learn how Native Americans managed the forests for fire, and how Euro-Americans have managed them, and the consequences of that management for our current predicament. This sets up the management chapter (Ch. 7): what is the future of these forests?

Here again the authors take an historical approach, showing us how events such as the great fires of 1910 led to laws, policies, and practices that still define forest management in the U.S. They recap the ecological truths that render these practices irrational or counterproductive. And they also introduce the modern cultural changes, such as exurban development and the growth of the wildland-urban interface, that have changed our modern way of life in the forest to something different from what the U.S. experienced in the 19th and 20th centuries. The discussion turns to innovative new programs and policies that seek to reshape how forests are managed to achieve a new concept, sustainability, that involves maintenance of ecologically diverse and economically viable forests, while also reducing the risks of catastrophic fire.

The book concludes with a “Visitor’s guide to North America’s notable Douglas-firs.” It covers dozens of sites, from Alberta to Texas. Some I’ve been to; all sound worth a visit. Certainly, it has the germ of a grand road trip.

I distrust reviews that carefully omit mention of a book’s gaps or flaws. There is a reference list for each chapter, but



Fresh Douglas-fir (*Pseudotsuga menziesii*) cones.
PHOTO: BEN LEGLER

I would have really liked to see footnotes. Any book with this much scientific detail deserves a few footnotes. Also, there is almost no discussion of how these forests are likely to respond to global climate change, although there has been quite a lot of research published on the topic. I thought this omission was serious, as most readers would be interested to hear the authors' thoughts on the subject. I also would have liked to see a bit of pathology—the pests and diseases that afflict Douglas-fir and that can play a major role in the death and renewal of the forests. There was also a strong U.S. emphasis, without addressing history or management in Canada or Mexico, where Douglas-fir is a widespread and important species. Those were my only concerns.

To wrap it up, this is an important book; you'll be seeing it around for many years to come. It provides a wealth of scientific information but is also well written, so much so

that every nature writer I know could benefit from it. It will provide the average *Douglasia* reader with a great deal of engaging information you don't already know about what is, in all likelihood, the one species of tree that you see nearly every day—perhaps, one you have come to think of as a bit boring. It isn't. Perhaps most importantly, this is a fun read, easy to burn through from the intro to the appendix. It would be an excellent choice for a gift book, so buy two copies.

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Dr. Earle is a consulting ecologist, manager of the Gymnosperm Database at www.conifers.org, and has been a WNPS member since 1987. He lives near Olympia.



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Fireweed (*Chamaenerion angustifolium*) seedpods explode in a mass of fluff. PHOTO: MARK TURNER