

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 Andrea Cummins

The Summer 2019 *Douglasia* is a celebration of the flora of the Pacific Northwest, and specifically the newly released second edition of the undisputed must-have, worth-the-extra-weight-in-your-pack field guide by the same name. After many years and great team effort, the new edition of the *Flora* was published in October 2018. This much anticipated and needed update has over 1,000 new taxa described, over 1,300 new illustrations, an additional 100 pages of keys, and is only very slightly heavier than the original. I give kudos to the team involved in this enormous undertaking!

Additionally, as a tribute to the new *Flora*, several WNPS members have contributed reviews, recollections, and thoughtful articles about the first edition of the *Flora* and its original co-author, Dr. C. Leo Hitchcock (Cronquist was the other author). Thank you to all who took the time to reflect on how Dr. Hitchcock and the *Flora* have impacted your botanical careers. In compliment, the Summer issue brings in-depth articles on specific species, updates on potential threats to our flora, a final installment of the terrific propagation series, and much more.

And finally, as the new editor who is still learning the ropes of working on *Douglasia*, I would like to thank our production team (Walter, Mark and David), our authors (too many to name here), and Denise for all of the patience, help, and good humor they have shown while I grow into my new role.

Enjoy the summer!



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On the cover:

Scarlet Paintbrush (*Castilleja miniata*) on Grouse Ridge with Mount Baker and the Black Buttes in the background. Grouse Ridge is a Koma Kulshan chapter field trip destination again in 2019. PHOTO: MARK TURNER

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

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Information for Contributors

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

Email submissions to Douglasia@wnps.org.

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President's Message: The View from Here

by Van Bobbitt

Dear WNPS Members,

I have been thinking a lot about the recent UN *Global Assessment Report on Biodiversity and Ecosystem Services*. A 39-page summary of the report was released on May 6. It is sobering reading loaded with statements such as:



- “The rate of global change in nature during the past 50 years is unprecedented in human history.”
- “Human actions threaten more species with global extinction now than ever before.”
- “. . . over 85 percent of wetlands (area) has been lost.”

The report identified and ranked the major drivers that are changing nature. Starting with the most impactful, they are:

1. changes in land and sea use
2. direct exploitation of organisms
3. climate change
4. pollution
5. invasive alien species

Reading reports such as this can be depressing, overwhelming, and make us feel powerless to effect change. But the authors of the report do end on a more positive note: “Nature can be conserved, restored, and used sustainably while simultaneously meeting other global societal goals. . . .”

It won't be easy though. “Transformative changes across economic, social, political and technological factors” will be required.

I encourage you to take a look at the summary of this report. See <https://www.ipbes.net/news/ipbes-global-assessment-summary-policy-makers-pdf>

So how can we help reverse the degradation of biodiversity and ecosystem services forecast by the UN report? To start with, your membership in WNPS makes a positive impact in Washington state. Our mission is all about the “conservation of Washington's native plants and their habitats.” Below are a few examples of how WNPS is addressing some of the issues brought up by the report.

When it comes to “changes in land use” the WNPS Conservation Committee keeps a watchful eye out for projects that would destroy native plant habitats, and often drafts and sends statements opposing such projects to regulatory agencies. At the spring board meeting, the directors voted to accept the Conservation Committee's proposed advocacy statement regarding WNPS's position on climate change.

The WNPS Stewardship Committee trains native plant stewards and works with local municipalities to restore degraded land

to healthy native plant communities that promote greater species diversity and provide increased ecosystem services.

On an individual level, we can make a contribution by helping remove invasive plant species, participating in local ecological restoration efforts, and advocating for “transformative” systemic changes in our economy, society, and politics.

And last, but not least, share your love of native plants with others. As more people observe, appreciate, and understand the value of native plants, they are more likely to demand changes that will protect and enhance overall biodiversity.

“The most important environmental issue is one that is rarely mentioned, and that is the lack of a conservation ethic in our culture.” Gaylord Nelson



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Milkweed:

More Than Just A Pretty Flower

by Sue Kusch, President, Suksdorfia Chapter WNPS

Milkweeds produce some of the most complex and recognizable flowers in North America and offer far more than just unique floral structures.

The more than one hundred species of *Asclepias* are named after the Greek god of healing, Asclepius, perhaps under a mistaken identification of a similar plant from the dogbane family (Apocynaceae). The common name, milkweed, is a reference to the milky secretion found in the stems and leaves. Although endemic to the New World, several species have naturalized in Europe and Asia.

The genus originated in the tropics but has diversified and moved north, settling in as a hardy perennial plant that grows in temperate USDA gardening Zones 3 through 11 and found throughout North America. *Asclepias* species aren't picky about where they plant their feet; they can live in sandy, clay, or rocky soil. This large and varied genus lives in a correspondingly diverse range of landscapes: wetlands, along rivers, in the desert, in mountain meadows, fields, open woodlands, and other sunny spaces of undisturbed land.

Washington State has three native milkweeds, all located on the east side of the Cascade Mountains: showy milkweed (*Asclepias speciosa*), narrow-leaved milkweed (*A. fascicularis*), and Davis' milkweed (*A. cryptoceras*). Ranging from one to four feet tall, the three species are easy to identify by their size, leaves, flowers and fruits.



Honey bee on a milkweed flower. PHOTO: SUE KUSCH

Botanical Description

Milkweed produces flowers in umbels, which are clusters of individual flowers originating from a common point. The flowers are intricately complex, unusual, and unforgettable: five petals that bend back with an addition of a 'hoods and horns'

floral structure that forms the corona. The five hoods each enclose a horn, which is a modified filament of the anther. Nectar is stored in the five hoods and some species have an enticing sweet floral fragrance. Pollen is contained in sacs called pollinia. This arrangement benefits larger pollinators over smaller ones. Pollination for some species depends on pollinator clumsiness rather than cleverness.

Bloom times are dependent on the species, and range from April through September. Pollinators such as the larger species of native bees, wasps, and ants cover the flowers, while various butterflies, moths, and hummingbirds land lightly to gracefully sip the nectar. One of the "milkweed" butterflies, the Monarch (*Danaus plexippus*), relies solely on milkweed species for laying eggs and feeding developing larvae and caterpillars.



Milkweed flowers droop after pollination. PHOTO: SUE KUSCH

After pollination, the flowers form drooping fruits and like the caterpillars that feed from milkweed, the fruit transforms into a botanical version of a chrysalis: a seed pod (called a follicle) that shelters the paper-thin brown seeds attached to silky and buoyant filaments called coma. Upon drying the pod splits open along its only suture, releasing the seed parachutes to either drop below the mother plant, or on a windy autumn day to drift to its own patch of soil waiting to germinate in the spring.

Leaf shapes vary from narrow to broad and generally grow opposite from each other on the stem; in some species leaves may be arranged in a whorled pattern. Some species produce a matted layer of fine hairs on the leaves, while others are hairless.

Milkweed exhibits an important protection against herbivorous grazers: a toxic, white, milky latex exists throughout the stem and leaves, and if ingested in large amounts can be

poisonous to humans and grazing animals. Toxicity levels vary among species, but narrow-leaved species tend to be more toxic than broad-leaved species. Though not listed as a noxious weed in Washington, the potential for poisoning of domesticated sheep and cattle has likely contributed to the elimination of milkweed from agricultural fields.

Davis' milkweed (*A. cryptoceras*) is the shortest of the Washington native milkweeds, grows on sandy or shale hillsides, and is found only in the southeast section of the state. Low-growing and sprawling, with roundish broad leaves, the purple and green flowers make this plant easy to identify as a milkweed. It blooms from April through June.

Narrow-leaved milkweed (*A. fascicularis*) grows in the southeast and south-central sections of Washington State in a variety of habitats. Tolerating both dry and moist locations, it can be found along waterways, in roadside ditches, meadows, open fields, and woods. As the common name indicates, the leaves are narrow and can grow in a whorled pattern. At three feet tall, it is easy to spot in a landscape and when in bloom (June-September); the unique pink and white flowers distinguish it as a milkweed.

Showy milkweed (*A. speciosa*) has the largest distribution in Washington State and is found in meadows, roadsides, fields and open woods, throughout the east side of the Cascade Mountains. This tall beauty can grow up to four feet tall supported by a thick, stout stem that is covered in hairs. The thick and broad leaves grow opposite on the stem and sport a velvety layer of trichomes — hairs on the undersides of the leaves — which may help with protection from frost, heat, wind and herbivorous insects. Bloom time is June through August and the large, aromatic pink and white flowers undeniably live up to the name showy milkweed.

Historical Uses of Milkweed

Indigenous people processed and cooked different parts of the milkweed plant as a food for many years. Milkweeds contain cardiac glycosides that can be toxic to humans when consumed in large amounts. The bitter-tasting glycosides are found throughout the plant and levels of toxicity vary by species.

Additionally, North American indigenous people used many of the milkweed species for medicinal purposes. Some traditional uses include applying the milky latex to warts and using the root, which has the lowest level of cardiac glycosides, to induce vomiting in cases of poisoning.

A milkweed native to the Great Plains and region east of the Rockies, pleurisy root (*A. tuberosa*) serves as a cough remedy and treatment for pleurisy and was listed in the US Pharmacopeia from 1820-1905 and in the National Formulary from 1906-1936.

Milkweed as a Fiber

Like hemp, dogbane, flax, and nettle, the bast fiber of milkweed stems have been used to make cord, rope and fabric for



Milkweed "went to war" when World War II interrupted the supply of imported kapok from Asia, and Americans picked milkweed pods so its floss could be used in life jackets.

thousands of years. The bast fiber is found along the inner bark once the pithy center has been removed. Prepping the fiber for making cordage takes far longer than the actual process of making cordage! The bast fiber can also be spun to make yarn.

Some spinners have attempted to spin the coma (the silky white filaments in the seedpod) but found it is too brittle and should be combined with other natural fibers. In the past, the fibers have been used to make candle wicks. But those filaments are far more useful in other ways: hollow and coated with a natural wax, the buoyant "seed floss" repels water and absorbs oils. During WWII, American children went out to the fields and picked 25 million pounds of pods for manufacturers who extracted the floss and filled life jackets for the US Navy.

Today, milkweeds are grown commercially and the white filaments are used in floating cleanup kits for oil spills and to make insulated winter garments and bedding like pillows. The pods contain oil and wax that are mechanically extracted and used in commerce. The fat-rich seeds are expeller pressed into a rich oil which can be used as a moisturizer. The defatted seeds are ground into a meal and are used to kill nematodes and armyworms.

Milkweed in the Garden

Like some undisciplined gardeners, I succumbed to a seed catalog's photo of the beautiful showy milkweed (*A. speciosa*) in bloom. I ordered the seeds and sowed them into a corner of my L-shaped herb/pollinator bed within my fenced vegetable garden. Shortly after, I mentioned to another experienced gardener that I introduced milkweed to my garden and she responded with, "You may regret that. You know it's invasive." The word invasive raises a high fear factor in a gardener's mind; anyone who has spent hours pulling mint, bamboo, or thistle from an area meant to be shared with other plants understands the power of that word. I searched online for confirmation of her statement and found an occasional reference to it slowly

spreading via its underground stems (rhizomes). Slow spreading is manageable in my garden, so I anticipate a bit of removal here and there each season.

All milkweeds reproduce sexually via an array of pollinators and developing seeds are designed to disperse with help from the wind. Given its alluring fragrance, gorgeous flowers, and its ability to attract a diversity of pollinators, milkweed has easily earned its dedicated and slowly increasing space in my vegetable garden. With any luck, the wind-dispersed seeds will take up residence in my unused pasture. But the best reason to plant native species of milkweeds is to offer nectar to the declining populations of native bees, wasps, moths, and butterflies and to provide habitat and food for the monarch butterfly.

Milkweed's Future

Milkweed species are declining throughout North America because of increased use of herbicides on agricultural fields, encroaching suburban development, and roadside weed management practices. Researchers believe that loss of habitat, and specifically milkweed species, is a contributing factor to the decline in monarch butterfly populations.

There are now several informational online resources to help gardeners, land managers, farmers, and native plant enthusiasts select and manage native milkweed species. Xerces Society, www.xerces.org, a non-profit dedicated to the conservation and protection of invertebrates and their habitats, has created several excellent western milkweed guides and numerous articles about the specialized relationship between monarch butterflies and milkweeds. Another highly informative site is the Monarch Joint Venture, www.monarchjointventure.org, a partnership of federal and state agencies, non-profits and academic programs, that offers habitat information for monarchs, monarch tracking research opportunities, and numerous other pollinator projects. The Western Monarch Milkweed Mapper, www.monarchmilkweedmapper.org, is a collaborative and educational effort to encourage citizens to report sightings of both Monarch butterflies and milkweed species.

This year, consider growing a patch of milkweed in your garden, park yourself in a comfortable chair as close to it as possible, enjoy the evocative scent and practice the science of pollinator observation. There are worse ways to spend a summer morning.

When Sue Kusch is not gardening or seeking native plants, she is researching and writing about plants for her website, <https://plantsnpeople.com>.



Native Plant Gardening Resources

wnps.org/native-gardening

A New Milkweed in Washington

by Walter Fertig

On August 10, 2016 biologist Jeff Heinlen was exploring the banks of the Okanogan River on state Department of Fish and Wildlife lands when he encountered an unusual pink-flowered milkweed that did not seem to match other *Asclepias* species from Washington. Jeff sent some photos of his mystery plant to David Giblin at the University of



Swamp milkweed, *Asclepias incarnata*. PHOTO: ANGELA HASTINGS

Washington Herbarium at the Burke Museum, who recognized it as swamp milkweed, *Asclepias incarnata*. Named for its typical habitat, swamp milkweed resembles the common showy milkweed (*A. speciosa*) but has smaller petals (4–6 mm) that are pink rather than reddish-purple, narrower lance-shaped leaves, and fruit pods lacking warty bumps. Swamp milkweed is native to eastern and central North America but has apparently been introduced sporadically in wetland sites in the northwest, including southern Idaho, and north-central Washington. The plant was observed again in 2017, but was not relocated in 2018.



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The Flora of Seattle in 1850

by Raymond J. Larson

When the first Euro-American settlers arrived in what is now Seattle in 1851, they encountered a landscape radically different than the one we see today. Although many of the major tree species have persisted in parks, greenbelts, and natural areas, the character of the landscape has been dramatically altered by urbanization and the development of commerce and industry in the intervening years. While the scale of change is unsurprising, figuring out what the landscape looked like before 1851 and what species were commonly present is a diffi-

plant communities that were still in a wild state and found far from the Seattle area. While the major tree species were fairly common to the region as a whole, even they varied considerably in relative abundance and composition from place to place. The more I looked into the subject, the more it became clear how disparate the pre-1851 conditions might have been even within a few miles.

By the late 1990s some authors had begun to explore things on a more local level and this further piqued my interest. Through the Miller Library at the University of Washington Center for Urban Horticulture, I learned that Arthur Lee Jacobsen had been developing a checklist of wild plants in the



View of a typical Seattle area bog. Ronald Bog, located just north of the present day city limits at N 170th Street and Meridian Ave N, ca. 1920-30. The historical bog near Northgate once resembled this scene. COURTESY OF KERN EWING.

cult and time-consuming task. As interest in native plants grew more mainstream in the 1990s and restoration projects became more commonplace in local landscapes, I realized that there were few sources that actually documented what had existed locally or what the landscape as a whole looked like 150 years prior. Trying to piece together more information ultimately lead to my master's program research, which became the subject of my thesis, completed in 2005.

When I first starting looking into this topic in the late 1990s, there were only fragmentary clues recorded for what the original flora would have been in Seattle proper. What information did exist was largely unavailable to a broader audience or difficult to access. Most treatments of native plants for western Washington focused on the region as a whole and referenced

Seattle area (later turned into a book in 2001, *Wild Plants of Greater Seattle: A Field Guide to Native and Naturalized Plants of the Seattle Area*); and this included describing species that were once prevalent in Seattle but had become extirpated over the years. I rediscovered old *Seattle Weekly* features by David Buerge that described landscapes altered and forgotten during the early days of Seattle's modern history. It became apparent that these and other avenues perhaps could be combined into a larger narrative that might begin to create a more detailed picture of the historical landscape.

Building on these ideas, and combining them with my long interest in history, the search began for complementary avenues of research and ones that had not been so well mined. Finding these fragments and bringing together differing resources and

scholarship was something that took several years of digging and synthesis. Fortunately, I was able to develop this project as the subject of my master's thesis. Since then I have added further information and had the good luck to find an interested audience in this topic.

One important and surprisingly accurate source—which fortunately exists for most of the United States—are the US General Land Office (GLO) survey records. These surveys, conducted throughout what is now the city of Seattle between 1855-62, divided the landscape into 6-mile x 6-mile units called townships that were further divided into 36 one-mile squares, termed sections. In addition to measuring and marking the imposed boundaries of these sections in order to open lands for settlement, they provided systematic descriptions of the character of the land, including major tree and understory species. Furthermore, they documented boundaries between distinct vegetation types (e.g., forests versus prairies or wetlands), incidences of fire or other disturbance, general soil types, locations and measurements of any water features, suitability for agriculture, topography, and presence of Native American trails and settlements, as well as any existing Euro-American settlements.

Records of pre-settlement conditions provide one of the few reliable data sources of the early Euro-American settlement era, especially in areas where extensive alteration or disturbance has occurred over time (Curtis 1959). The GLO survey records provided the framework for the addition of other information, including herbarium records, early settlers accounts, historical soil maps, early 20th century research papers and plant lists, dissertations and papers on topics ranging from local public works projects to Native American histories and place names, and many other primary and secondary sources.

So, what did Seattle look like in 1850? One thing that became clear was that the landscape was in the midst of a period of great change even before Euro-Americans began to settle in the area permanently. In 1792, Captain George Vancouver's journals of the HMS Discovery's voyage to Puget Sound already spoke of encountering a changing natural landscape, remarking on abandoned villages and indigenous peoples bearing the marks of introduced diseases that had begun sweeping through the area in the decades before. The great population losses of the time had an effect on the landscape due to the sheer disruptiveness to community structures, traditional places of settlement, and the use of the land.

Robert Boyd's 1999 book, *The Coming of the Spirit of Pestilence: Introduced Infectious Diseases and Population Decline among Northwest Coast Indians, 1774-1874*, was the first detailed statistical analysis of this crisis, which wiped out nearly 60 percent of Puget Salish population during that time. The surveyor's notes and early accounts of the 1850s describe a landscape in which once open spaces were converting to forests of early successional species—changes that seemed to correlate with the population losses. The United States Exploring Expedition, led by Lt. Charles Wilkes, reached Puget Sound in



Quercus garryana grove in Seward Park. Numerous Garry oaks persist along the southern edge of Seward Park, near the shore of Lake Washington. Large Garry oaks can also be found in the upland areas of the adjacent neighborhood. PHOTO: RAYMOND LARSON

1841, and remarked on the abandoned longhouses on the site of what is now Pioneer Square. A healthy and thriving indigenous population for thousands of years had been dramatically and recently disrupted, and the landscape bore witness to that.

Apart from these impacts, the landscape in general was quite diverse in term of habitat and terrain. There were certainly some areas of old-growth forest, but also forests of all ages. There were areas of relative openness, such as parts of the Duwamish valley that were generally free of coniferous species. The Duwamish was a much different river then, with seasonal flooding occurring every year; the waters of the White, Green, Cedar and Black Rivers all combined to empty into the Duwamish in those days. Today there is only the Green, and the old channel has been straightened and reduced for commerce and industry. The soils of the historical Duwamish valley were incredibly rich and supported many riparian species in numbers hard to imagine today. It was not surprising that the second party of settlers to arrive in what is now Seattle set to farming this area immediately in 1851.

There were several major bog systems providing unique habitats for specialized species. Fortunately, many of these were studied and species catalogued by the 1920s before they were mined for peat, drained, used for vegetable farms and nurseries, or otherwise altered. The windswept promontories of Alki, Magnolia and Golden Gardens hosted another unique suite of species, at home in gravelly soils, full exposure, and salt-infused breezes. These largely treeless areas were first described by William Frasier Tolmie of the Hudson's Bay Company from Alki in 1833. He considered this site while scouting for a permanent trading post, and described the land as "flat and dotted with small pines, and the soil was mostly sand...on the prairie where we stood." The indigenous Lushootseed language word for the area was "prairie point."

An area abundant with *Quercus garryana* (Garry oak) occurred at the south side of Seward Park and extended southward along Lake Washington for nearly a mile. The presence

of oaks here is confirmed by surveyor's notes, settler's accounts, and herbarium records. Garry oak was also known from an area around historical Oak Lake in north Seattle, which was botanized in the early 1900s before it was paved over decades later as the city crept north. Seattle was also a land full of seeps, brooks, creeks, and swampy places among the hills and valleys. Most of these have long been diverted to culverts, drained, buried or rerouted, but the early accounts are full of references to them and what grew near them.

Furthermore, I was very interested in what the historic record might confirm about which species were present, as well as which ones were likely absent. Using herbarium records dating back to the 1870s as well as settler's accounts and other sources, I was able to confirm the historical existence and relative abundance of several species that had been in question, such as *Rhododendron macrophyllum* (Pacific rhododendron), *Paxistima myrsinites* (Oregon boxleaf), *Aruncus dioicus* (sylvan goatsbeard), *Castilleja* spp. (paintbrush), *Adiantum aleuticum* (maidenhair fern), *Camassia quamash* (common camas) and *C. leichtlinii* (great camas), *Philadelphus lewisii* (mock orange), *Goodyera oblongifolia* (rattlesnake plantain), *Amelanchier alnifolia* (serviceberry) and many others. Absent from the historical record prior to 1935 were species such as *Oxalis oregana* (wood-sorrel), *Betula papyrifera* (paper birch), *Rhododendron menziesii* (fool's huckleberry), *Corydalis scouleri* (Scouler's fumewort) and several other widely planted and considered native species today.

Overall, I found that it was possible to mine historical records to help account for what a city like Seattle might have looked like in the pre-Euro-American settlement era. This is true not only for Seattle but for any area for which historical records exist; fortunately this is much of the United States. Sources such as the ones I used can provide abundant clues if the time is spent looking for them. These findings can allow for informed decisions concerning restoration efforts and the use of native plants in landscapes. They can also help us understand more about the place we live in and the factors that shaped and continue to shape the landscape today.

Ray Larson is the Curator of Living Collections and the Otis Douglas Hyde Herbarium at the University of Washington Botanic Gardens.

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Where's in a Name?: Washington Plant Name Geography

by Walter Fertig

Deriving unique species epithets can be hard, especially in large genera. Eventually, all the obvious descriptive terms are taken (*albus*, *rubra*, *longifolia*, *pubescens*, etc.), and there are only so many colleagues, luminaries, and benefactors to commemorate (*douglasii*, *fremontii*, *jonesii*, *kruckebergii*, etc.).

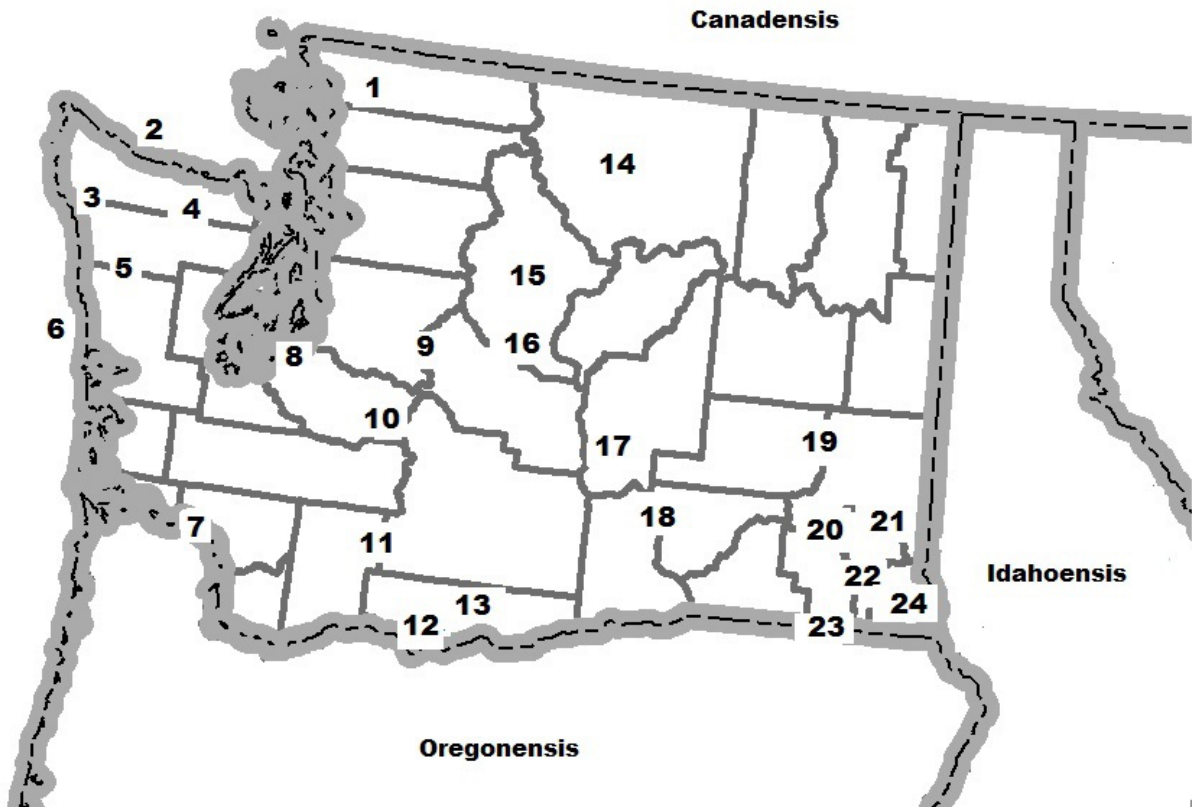
Fortunately, geographic names can come to the rescue of the tongue-tied taxonomist. Such terms may describe general environmental features such as mountains (*montana*), valleys (*vallicola*), or bodies of water (*lacustris*, *riparius*). Vegetation types may be used too, such as forests (*sylvaticus*), meadows (*pratensis*, *campestris*), alpine tundra (*alpinus*), or deserts (*desertus*, *aridus*). Coordinates are also commonly used, for north (*borealis*), south (*australis*), east (*orientalis*), or west (*occidentalis*).

More specific place names are often used to describe the primary range of a species. These can be whole continents (*afrikanus*, *europaeus*), or individual countries (*sinensis* for China, *mexicanus* for Mexico, or *canadensis* for Canada, etc.). Country names can provide a valuable clue for deducing the nativity of



Oxytropis campestris var. *wanapum*. PHOTO: WALTER FERTIG

Washingtonensis



species. For example, dog mustard has the scientific name *Erucastrum gallicum* for its native France.

The epithet *americana* refers to species from the United States or the “Americas” (North, Central, or South). Many states have also been Latinized for use in plant names. Common eastern species often have the name *virginiana* (Virginia), *caroliniana* (North or South Carolina), or *pennsylvanica* (Pennsylvania). Sometimes geographic names describe a region, such as *novae-angliae* (New England), *alleghaniensis* (Allegheny Mountains of Pennsylvania), or *hoodiana* (Mt. Hood or Hood River, Oregon). *Ludoviciana* can refer to the state of Louisiana, but more frequently is used for the western states that were part of the Louisiana Purchase. Louisiana sagewort (*Artemisia ludoviciana*) is a widespread western species that barely enters prairies of northern Louisiana, while the Western broomrape (*Aphyllon ludovicianum*) is completely absent from the Pelican State.

Nearly all of the western states appear in Latinized form as a species epithet (such as *oregana*, *californica*, *idahoensis*, *wyomingensis*, etc.). Some state monikers even function as the name of a genus. Recently the mustard *Smelowskia holmgrenii* was transferred to a new genus, *Nevada*, and *Erodium macrophyllum* has been moved to its own genus, *California*. *Washingtonia* has even been used twice: once for a genus of fan palms of the deserts of southwestern US and Mexico, and formerly for the species of sweet-cicely (now in the genus *Osmorhiza*). In both cases, though, ‘Washington’ probably refers to our first President and not the state, which did not exist when the genus names were created.

Relatively few plant species have a Latinized derivation of the name “Washington” as part of their species name. These include *Festuca washingtonica*, *Claytonia washingtoniana*, *Erythranthe* (*Mimulus*) *washingtonensis*, and *Penstemon washingtonensis*. Ironically, the beautiful Washington lily (*Lilium washingtonianum*) does not actually occur natively in Washington, but can be found in Oregon and California. By contrast, derivations of “Oregon” (such as *oregana*, *oreganum*, *oregonense*, etc.) appear in the Latin names of at least 25 species from Washington, including taxa of *Agrostis*, *Anemone*, *Erigeron*, *Heterotheca*, *Lupinus*, *Oxalis*, *Perideridia*, *Sedum*, *Sidalcea*, and *Sullivantia*.

About two dozen geographic place names in Washington State have been used as genus names or for specific epithets. Often these localities are at or near the spot where the type specimen was first collected. Some of the place names are now obscure, or are only found in synonymy. A few do double duty, being named originally for a person or group of people, but now also commemorate a place. Examples include *douglasii* for David Douglas (also Douglas County), or *salishii* for the Salish Nation (but also the Salish Sea).

Use the accompanying map and legend to find a place name near your town that has been given botanical immortality!

Key to Map of Washingtonensis

1. *sororia* (Twin Sisters): *Sabulina*
2. *fucensis* (Strait of Juan de Fuca): *Juncus*; now a synonym of *J. gerardii*

3. *ozettensis* (Ozette): *Corallorhiza maculata* var.
4. *olympica* (Olympic Mountains): *Arabis*, *Castilleja parviflora* var.
5. *quinaultense* (Quinalt): *Erythronium*
6. *pacifica*, *pacificum*, *pacificus* (Pacific Ocean): *Bromus*, *Circaea alpina* var., *Claytonia multiscapa* ssp., *Conioselinum*, *Corispermum*, *Cuscuta*, *Bromus*, *Potentilla anserina* var.
7. *columbiae*, *columbiana*, *columbianus* (Columbia River or “Columbia” as meaning the Northwest in general): *Aconitum*, *Allium*, *Arabis sparsiflora* var., *Arctostaphylos*, *Astragalus*, *Frasera albicaulis* var., *Lewisia*, *Lilium*, *Lomatium*, *Oxytropis campestris* var., *Rhododendron*, *Rorippa*, *Salix exigua* var., *Valeriana*, *Wolffia*; also genus *Columbiadorea* (*hallii*)
8. *tacomensis* (Tacoma): *Calamagrostis*
9. *cascadensis* (Cascade Range): *Boechera*, *Cryptogramma*, *Draba* (synonym of *D. praealta*), *Luzula*, *Micranthes nelsoniana* var., *Salix*; also genus *Cascadia* (*nuttallii*; or *Saxifraga nuttallii*)
10. *rainierensis* (Mt. Rainier): *Pedicularis*; also genus *Rainiera* (*stricta*)
11. *paddoensis* (Mt. Paddo, better known today as Mt. Adams): *Boechera*, *Carex breweri* var. (synonym of *C. engelmannii*)
12. *bingenensis* (Bingen): *Lupinus* (synonym of *L. sulphureus* var. *subsaccatus*)
13. *klickitatense* (Klickitat County): *Lomatium* (recently split from *L. grayi*)
14. *okanoganense*, *okanoganensis* (Okanogan Mountains): *Crataegus*, *Talinum* (synonym of *Phemeranthus sediformis*)
15. *chelanensis* (Chelan County): *Erigeron* (synonym of *E. leibergii*), *Penstemon glandulosus* var.
16. *wenatchense* (Wenatchee Mountains): *Cirsium edule* var.
17. *wanapum* (Wanapum): *Oxytropis campestris* var.
18. *tuplashensis* (White Bluffs — from Sahaptin language): *Physaria douglasii* var. (synonym is *Lesquerella*)
19. *palousense*, *palousensis* (Palouse): *Astragalus* (synonym of *A. arrectus*), *Cirsium* (synonym of *C. brevifolium*)
20. *serpentinum* (Snake River): *Lomatium*
21. *wawawaiensis* (Wawawai): *Elymus*
22. *garfieldensis* (Garfield County): *Lupinus* (synonym of *L. polyphyllus* var. *prunophilus*)
23. *caeruleomontana* (Blue Mountains): *Draba* (synonym of *D. densifolia*)
24. *asotinensis* (Asotin County): *Astragalus*, *Lupinus sericeus* var.



Flora of the Pacific Northwest, 2nd Edition

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

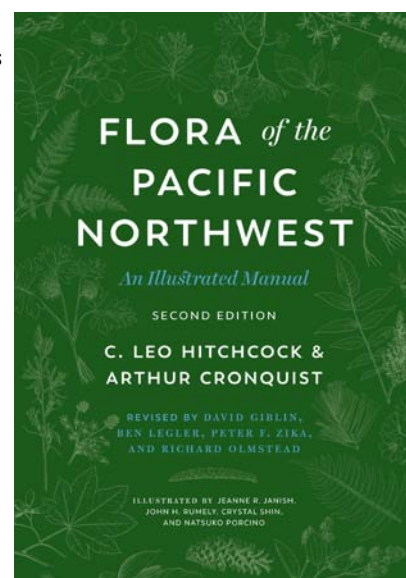
Project Background

Among the first things that I did when arrived in Seattle in 1995 for graduate school was to join the Washington Native Plant Society and to purchase a copy of Hitchcock and Cronquist's one-volume *Flora of the Pacific Northwest*. A few years earlier I had been working at the New England Wildflower Society near Boston, where we used *Gray's Manual of Botany*, so joining the local native plant organization and having a copy of the regional flora made my new surroundings feel more familiar.

I returned to the Herbarium as Collections Manager in 2002, and among the many things that I was interested in doing was updating *Flora of the Pacific Northwest* (*Flora*, hereafter). Fortunately, Herbarium Curator Dick Olmstead counseled against it. Instead, together with Ben Legler, we pursued a series of funding sources (mostly National Science Foundation) to database and create online access to the Herbarium's Pacific Northwest vascular plant specimens. As part of this work, by 2012 we had built the Consortium of Pacific Northwest Herbaria, a single online database for over 2 million specimens held at nearly 40 Pacific Northwest herbaria.

Running parallel to this digitization effort, Herbarium staff and affiliates had been doing extensive field work across the Pacific Northwest since the inception of the Annual Herbarium Foray by Dick Olmstead in 1996. Herbarium Research Associate and prolific plant collector Peter Zika arrived in the Seattle area in the late 1990s and gathered specimens across the region. Ben Legler and I collected extensively across Washington with financial support from Herbarium donors, federal agencies, and the Washington Native Plant Society. Along the way we made critical connections and built partnerships with botanists and organizations across the Pacific Northwest.

With 10 years of foundation work completed, in 2012 we approached the University of Washington Press about revising *Flora of the Pacific Northwest* (they own the copyright to the book) and the idea was enthusiastically received. The late Don Knoke (one-time field assistant and frequent hunting partner of



Leo Hitchcock, Arthur R. Kruckeberg WNPS Fellow, and Herbarium volunteer) made a \$25,000 donation to get the project started. We subsequently received a \$50,000 grant from the Elisabeth C. Miller Foundation, \$50,000 from the U.S. Forest Service and U.S. BLM, and \$100,000 from Chris Davidson and Sharon Christoph. Other donors, organizations (including the Washington Native Plant Society), and agencies brought the total project funding to just over \$500,000. Full-time work on the project began in 2013 and culminated in a printed version published in October 2018.

Why Revise the *Flora*?

When the original *Flora* came out in 1973, vascular plant taxonomic knowledge had changed only incrementally over the prior few decades. With the inception of DNA-based systematics studies in the 1980s, significant parts of the original *Flora* quickly became outdated (e.g., genera assigned to the Scrophulariaceae turned out to be placed in more than half a dozen other families; the Liliaceae was found to be composed of nearly a dozen families; and species in the grass genus *Agropyron* would end up mostly assigned to other genera). This isn't a criticism of the scholarship that created the original *Flora*, but rather a clear example of how any flora is a snapshot of what is known at the time of publication.

Producing the 2nd Edition *Flora*

A core team of botanists (Ben Legler, Peter Zika, David Giblin, Genevieve Walden, and Mark Darrach), illustrators (Crystal Shin and Natsuko Porcino), and layout staff (Maria Yousoufian and Sara Legler) worked at the Herbarium between 2013 and 2017. Colleagues collaborating remotely from across the Pacific Northwest wrote treatments (Ed Alverson, Dick Brainerd, Noel Holmgren, Peter Lesica, Nick Otting, Barbara Wilson) and provided illustrations (Linda Vorobik). A comprehensive list of authors and illustrators can be found at the project website: (<http://www.pnwherberia.org/florapnw/treatment-summary.php>). Producing the book was truly a regional effort and reminded us of how fortunate we are to have such a strong community of outstanding botanists.



Botanists and illustrators working on the *Flora* 2nd edition in the University of Washington Herbarium. (l to r: Genevieve Walden, Peter Zika, Crystal Shin, Charlotte Ricker, and Ben Legler). PHOTO: DAVID GIBLIN

The changes between the 1st and 2nd editions of the *Flora* are extensive. We added a regional map and plant family index on the inside covers, and an expanded introductory section (the 1st edition had two pages!). We also added 1,054 new taxa*, 1,300 new illustrations, and about 100 pages of keys. Table 1 summarizes important changes between the two editions. Most notably perhaps are the increases in the numbers of families and genera, along with a near doubling of the non-native taxa now documented in the region.

Going Forward with a “New” *Flora*

As mentioned above, a printed flora is a snapshot of what is known at the time of printing (actually, about a year before the time of printing due to the time involved with copyediting and final layout). While we will be able to make corrections to any minor errors/typos in the first print run (5,000 copies) of the 2nd edition *Flora*, updating taxonomy, nomenclature, newly described species, and identification keys are not possible due to layout and production expenses.

Our first step for tracking changes to the *Flora* 2nd edition was to create an Errata/Updates page (<http://www.pnwherberia.org/florapnw/errata.php>). Our next step will be to create a page on the project website where we can post pdf versions of revised treatments (e.g., the genus *Mahonia* (Oregon grape) was

	<i>Flora</i> , 1st edition	<i>Flora</i> , 2nd edition	Change	% Change
Families	129	159	30	23.3
Genera	826	1,141	315	38.1
Species	3,555	4,818	1,263	35.5
Infraspecies	726	517	-64	-4.6
Native Taxa	3,559	3,891	332	9.3
Exotic Taxa	722	1,444	722	100
Total Taxa	4,281	5,335	1054	24.6

Table 1. Summary of major changes between the editions of *Flora of the Pacific Northwest*. *The term taxa refers only to terminal taxa, also called minimum-rank taxa, consisting of subspecies and varieties along with those species that lack subspecies or varieties. Thanks to Ben Legler for compiling these numbers.

recently proven as separate from *Berberis* (barberry)), requiring a new genus key for Berberidaceae, new descriptions for these two genera, and different species combinations. We hope to have this resource up and running by the end of 2019.

All of us on the project are deeply grateful to the outstanding financial support provided by WNPS, its chapters, and its members. The support was not just financial—a large number of members provided invaluable copyediting help during the final stages of the project. See the acknowledgements section in the book for a full list of supporters.

We hope that we have put the necessary pieces in place to ensure that our regional flora, and the only flora to cover all of Washington, never goes too far out of date ever again. You can find out more about the *Flora*, 2nd edition on the project website: <http://www.pnwherberia.org/florapnw.php>.

How to cite the new *Flora*:

C.L. Hitchcock and A. Cronquist. 2018. *Flora of the Pacific Northwest: An Illustrated Manual*, 2nd Edition. Edited by D.E. Giblin, B.S. Legler, P.F. Zika, and R.G. Olmstead. University of Washington Press, Seattle, WA. 936pp.



The *Flora of the Pacific Northwest*, 2nd edition, is also available in epub format for use on Android tablets and iPads. The epub is in fixed rather than flowing format due to the extensive indentations associated with the keys. Users can navigate the book by swiping between pages, using the search bar, or tapping on hyperlinked page numbers in the index.

Travels with Hitchcock and Cronquist

by Ed Alverson

I still have a very clear memory of the early fall day, some number of decades ago, when I purchased my copy of the first edition of *Flora of the Pacific Northwest*. As I hold it in my hands today, field worn, re-bound, and fragrant from the various plant sprigs that have been archived between its pages, I think back to the time when this object, which has been a companion for so much of my life, was a pristine new book.

I was just about to start my first systematic botany class as a college undergraduate, and true to that age in life (I was still a teenager), I had no idea really of how ignorant I actually was—at least in regard to botany. One immediate impression I had, thumbing through the book's pristine pages, was that this was without a doubt the authoritative document on the Pacific Northwest flora. Not just a bible of our flora, but The Bible.



Ed Alverson, August 1980, dwarfed by *Veratrum californicum* (corn lily) near Split Rock in Skagit County. Photo taken shortly after he started work doing native plant surveys for WNHP and purchased his first copy of *Flora*.

At the same time, I felt that I was entering a foreign land and encountering a foreign language, of which I only had a very passing familiarity. Of course, I knew what a Douglas-fir tree (*Pseudotsuga menziesii*) was, and a sword fern (*Polystichum munitum*), as these were familiar plants in the neighborhood of my youth. But most of the names that appeared in the *Flora*—families, genera, species—were completely new and mysterious to me. Where could one find them, and why did they exist? These were great mysteries, yet to be revealed.

As with learning any foreign language, it took time and effort to learn the vocabulary and get an intuitive feel for how to use the book to identify plants. The following winter seemed interminably long, as I waited for the coming spring's new growth, and the opportunity to get out in the field and use the *Flora*. And I really did use it in the field on class trips, as the book is designed to be used, as well as in the lab. But it also worked the other way. Working through the keys, I encountered references to many interesting-sounding plants, species that I would like to see. Where and how could one find them if they were not encountered on random hikes in the mountains or in the woods? Where could a person find a calypso orchid (*Calypso bulbosa*)? A western larch (*Larix occidentalis*)? Kruckeberg's holly fern (*Polystichum kruckebergii*)? Thus the aspect of the botanical treasure hunt was introduced to my life.

And over the coming years, the *Flora* was my constant field companion on botanical treasure hunts, even finding room in my backpack (I was young and the weight was not a consideration, apparently). But the more I learned, the more I realized that the *Flora* was not actually the authoritative Bible I had originally taken it to be. Botanists were beginning to publish additional research that led to different taxonomic interpretations. New species were described, and species were being found in our region that had not previously been documented as part of our native flora. I began to photocopy revised keys, taken from various publications, and fold them into the *Flora* in an effort to keep it current. And I actually made my own

botanical discoveries, and even published my own new species. Ultimately, with the incessant pace of botanical discoveries, this became a losing cause—thus my gratitude for the publication for the 2nd edition of the *Flora*.

That is the great thing about the 2nd edition of *Flora of the Pacific Northwest*—it is a collaborative effort from a great community of botanists, and thus encompasses the discoveries of numerous botanical treasure hunters. It truly contains the collective botanical wisdom of many field seasons of experience across our region's landscape, on the part of many minds, that have individually and collectively focused on the breadth of our flora.

Change sometimes makes our lives difficult, or at least less convenient. How am I to flip the *Flora* open to the treatment of, for example, the Apiaceae (Parsley family), when my deeply ingrained intuition is telling me it should be in the middle of the book? For now the Apiaceae is the very last family of Dicots, placed after the Asteraceae, which always used to be the last Dicot family. I fear it will be some time before my synapses will be able to make the new connections that will be necessary to take me straight to the back of the book when I want to get to the Apiaceae. On the other hand, it is exciting to see that the 2nd edition of the *Flora* treats 61 species of *Lomatium*, where the 1st edition treated only 40. It is worth the effort to look for *Lomatium* in a different part of the book!

Still, this is not the final word on our flora. In fact, I have come to realize that finality is a mirage, for the *Flora* was out of date the moment it was published last fall. This is, of course, not a comment on the quality of the work by the authors and editors, but simply a reflection of how science works—new data and new hypotheses invariably affect the way we see and understand the world. Thus, there will be a need for a new generation of botanical explorers to keep the effort going, and develop the knowledge that will be needed when it is time—hopefully sooner than 40 years from now—to publish a 3rd edition of *Flora of the Pacific Northwest*.

Ed Alverson has been an Oregon resident for more than 30 years, but considers himself to be a citizen of the greater Cascadia region, having lived in Washington during his youth and college years. Currently he lives in Eugene and works as the Natural Areas Coordinator for Lane County Parks, where he helps to implement habitat conservation strategies in publicly owned prairies, savannas, and forests. He's been a member of WNPS for his entire adult life, and been a contributor to Douglasia over pretty much that entire time span, going back to my first article in 1980, when "Doug" was the editor!



Find the Latest Updates to the *Flora*

<http://biology.burke.washington.edu/herbarium/waflora/checklist.php?Category=Updates>

Book Review

Flora of the Pacific Northwest: An Illustrated Manual, Second Edition

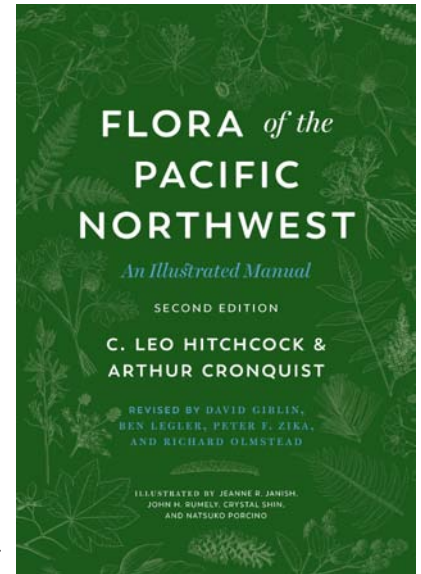
by C. Leo Hitchcock and Arthur Cronquist
Edited by David E. Gibling, Ben S. Legler, Peter F. Zika, and
Richard G. Olmstead

Review by Fred Weinmann

In the fall of 1966, I landed in Seattle as a new graduate student in the University of Washington Department of Botany. All new graduate students who had not had a course in Pacific Northwest flora were required to enroll in Botany 313. This was essentially a renumbering of Botany 113 to the 300 level, which made it possible for graduate students to receive credit for the course. The professor was Dr. C. Leo Hitchcock, Dr. Hitchcock to us and Hitchy to his friends and colleagues. Hitchy's teaching assistant was Pat Kern, later to become Dr. Patricia Holmgren, a co-author of the *Intermountain Flora*. Pat was a big help to us in understanding the "Hitchcock" method.

Our text for the class was *A Manual of the Higher Plants of Oregon* by Morton Peck published in 1961 with no illustrations. When Hitchcock was not teaching the class he was fully occupied with production of his magnum opus, a five volume work, *Vascular Plants of the Pacific Northwest*. These volumes were published between 1955 and 1969 in collaboration with co-authors Arthur Cronquist, Morton Ownbey, and J.W. Thompson. Botany 313 provided three important benefits: first, from a 50-year perspective and the most important, was that I met Ann, my now wife of over 50 years; secondly I was able to meet and study with C. Leo Hitchcock, and thirdly I was introduced to the flora of the Pacific Northwest.

It would be seven more years before the one volume, *Flora of the Pacific Northwest: An Illustrated Manual* was published—thus was born the 1st edition in 1973. This single volume was co-authored by C. Leo Hitchcock, the most renowned botanist ever in the Pacific Northwest, and Arthur Cronquist, the most renowned botanist of his era in the United States. This uniquely formatted volume of 730 pages was condensed from the five volumes that totaled 2,988 pages in 8.5 x 11 inch format. The





Hitchcock botany class mired in summer field work, ca. 1948. PHOTO: PATRICIA HOLMGREN, NEW YORK BOTANICAL GARDEN

single volume, in 8 x 10 inch format, not only included all the species treated in the five volumes, but also diagnostic illustrations alongside the keys and descriptions. Naturally the print is smaller and the size of the illustrations reduced in the one volume edition. This work is an amazing product, the first of its kind with its combination of keys, text, and illustrations. Hitchcock referred to it as the “field manual” but it is, in fact, a comprehensive flora of the PNW.

C. Leo Hitchcock was always mindful of the interest and enthusiasm of amateur botanists who were inquisitive and deeply interested in plants, but were not in an academic setting. In fact, in Hitchy’s introduction to his class he made a point of emphasizing that anybody with a sincere interest, a lot of patience, and who is a good observer could become an expert botanist. A particular example of this attitude is explicitly expressed by Hitchcock in the introduction to the 1st edition where he states: *“Although both authors of the manual dislike the idea of listing coined common names, the senior member feels that he can correctly gauge the nomenclatural desire of the average amateur botanist who (hopefully) will use it, and that space will not be wasted by listing such translations. He is responsible for the insertion of at least one genuine contrived “common” name for almost every species recognized.”*

Subsequent to publication of the 1973 1st edition, the *Flora* was reprinted 11 more times, often “with corrections” with a final printing in 2001. The book cover, sans dust jacket, was at first beige, then powder blue, then dark blue. These books had but one structural flaw—with normal field use the glue would give out. Eventually there came a need for duct tape and rubber bands to hold the book together. My book is on its third binding. Needless to say, the 1st edition became a classic in the lexicon of northwest botany.

Fast forward to 2012. David Giblin, Collections Manager, at the Burke Museum Herbarium (the official designation of the herbarium is WTU) had the courage to believe a new edition to the classic first volume could be completed. David solicited the assistance of multiple colleagues in the botanical community. And so the project began.

Just six years later, we have the 2nd edition *Flora*. The book is green with a green dust cover. The pages are 7 x 10 inches. It has 882 pages compared to 730 pages in the 1st edition. The book weighs in at 1,783 gms (3 lbs 14 oz) compared to 1,662 gms (3 lbs 10 oz) for the 1st edition. I suppose if one could carry the 1st edition in their backpack, they might also carry the 2nd edition; however, too many years have passed for me to do so.

The introduction provides an interesting description of the process for completing the project and a summary of its contents. While the principal editors are listed on the front cover, it is clear that multiple authors contributed taxonomic and nomenclatural treatments of various plant families or even parts of families. A complete list of authors associated with plant groups is included.

There is far too much information in the 2nd edition to provide a summary of its contents, but I can offer a few particulars. For example, the 2nd edition includes 5,545 taxa (the term taxa includes all unique plant names including those identified as varieties or subspecies) compared to 4,415 taxa in the 1st edition. The often asked questions is: How many new plant names are included or how many name changes are there? It is not easy to describe the “additions and change in names” between the 1st and 2nd editions. This is because a name change or new name can derive from several sources. It could be due to a taxonomic split within a genus, a range extension of a species, discovery of a species not previously known from the area, discovery of a species new to science, or a nomenclature update/correction.

From an overall perspective, about 60% of the plant names in the new edition are not described (or not described under the same name) in the 1st edition, thus leaving only about 40% of the accepted names of the 1st edition remaining in the 2nd edition. The new edition includes a net increase of 1,330 taxa. Of these, approximately 400 taxa represent additions to our flora. Of the additions, nearly 300 are exotic species arriving from around the world by various human-mediated vectors. Most of the other additions represent range extensions of native plants previously not known from the book’s geographic coverage, and a few species have been discovered as new to science. In the introduction, the authors provide a more detailed discussion of the major taxonomic and nomenclatural differences between the 1st and 2nd editions. Also see the companion article in this issue of *Douglasia* which describes in more detail the changes and revisions included in the 2nd edition.

One of the most helpful inclusions in the new edition is a map delineating boundaries of the geographic area covered by the *Flora*. All during the long life of the 1st edition there was discussion (at least among amateur botanists) about the specific boundaries of the region covered by the *Flora*. I have heard the opinion that Hitchy intended the boundaries to be fuzzy, but have not seen or heard proof of that. I for one appreciate the clearly mapped boundaries.

The format of the 1st edition, unique for its time, is retained in the 2nd edition. This is a tribute to the insight of Hitchcock and Cronquist in terms of including illustrations and the alphabetical organization of the generic descriptions. The editors of the 2nd edition have included a quite extensive discussion on the “Organization and Format” of the flora. This will surely be helpful for users. For example, it is clearly stated that the first character in a key couplet is generally the most diagnostic and should be treated as such. This was also true of the 1st edition but not stated in the introduction (although Hitchcock taught us that such is the case). Also explained is the logic of the many abbreviations used, a necessary approach considering the massive amount of information contained in a single volume.

We are indebted to the editors of the 2nd edition for their foresight, energy, perseverance, and botanical expertise. These individuals are to be congratulated. We should also recognize that this new volume represents a remarkable coalescence of the botanical community to assist with the project. For example, the introduction acknowledges over 20 authors who prepared the text material for various groups of plants. While these authors received some compensation, they were more likely contributing their time and talent out of dedication to the project. An additional cadre of volunteers provided technical review and proofreading. All of this contributed to getting each word, each semicolon, each period, each comma, each space, and each indent correct. Similar collaboration is true for the project funding. Over 25 organizations and 110 individuals provided funding for the project. It was a monumental effort. I also commend those who managed to coordinate the efforts of all the contributors. Well done! The 2nd edition of “Hitchcock and Cronquist” is truly a product of the Pacific Northwest community of botanists, both professional and amateur. I cannot offer any nitpick criticisms of the 2nd edition, but I am waiting to see how well the glue holds the volume in one piece.

One last connection to the past. As mentioned above, Hitchy was very supportive and appreciative of amateur botanists. I believe Dr. Hitchcock would be proud to know that the 2nd edition of his “field manual” is dedicated to Don Knoke. As well as being Hitchy’s close friend, and a friend to many of us, Don was one of the longest-term, most dedicated, and most knowledgeable botanists ever to undertake field work in the Pacific Northwest. We will remember him whenever we open the *Flora* or whenever we encounter *Lomatium knokei* (page 651 in the *Flora*).

Fred Weinmann joined the Washington Native Plant Society in 1976. Since then he has been a frequent leader of botanizing field trips. He is past chair of the Central Puget Sound Chapter, the state Board of Directors and the Olympic Peninsula Chapter of the WNPS.



Plant Lists Galore

Find a list of plants you might see on your next hike at
wnps.org/plant-lists.

Sowing Seeds in Helen Engle’s Memory

by Anna Thurston



Helen Engle. PHOTOGRAPHER UNKNOWN

Helen Engle, a staunch advocate for the natural environment and long-time member of the Washington State Native Plant Society, passed away March 11, 2019 at age 96. Helen was not just an active WNPS member, she was a neighbor, a mentor, a mother, and a friend.

In addition to her years as a registered nurse at Tacoma General Hospital, Helen’s commitment and sense of wonder were clearly rooted in the web of Nature. Over many decades these qualities were supported by her family and members of her extended community. *All* are people who regularly attended gatherings at her home, or countless planning meetings often coordinated by Helen throughout the Puget Sound.

The open-view home where Stan and Helen Engle resided with seven children demonstrates Helen’s love of Nature. The University Place home wraps around a planting island allowing light indoors while further inviting views of the wooded lawn and garden beyond. Outside, one is always welcomed with Stan’s artistic seating, tea service, and Helen’s art. Although the Engle home and garden is now situated on a busy street corner, inside one was removed from the noisy world beyond. Helen often said, “the garden worked out its own design. . . .” Inside and out, every nook was used to frame Helen’s and her family’s art.

In one of the area's first "Backyard Wildlife Sanctuaries" and certified as an "Important Bird Area" by the Audubon organizations she co-founded, Helen's friends and family would watch bushtits, chickadees, hummers, wrens, towhees, owls, hawks, and Steller's jays feeding and nesting year-round. Birders also caught glimpses of migrating warblers, orioles, flycatchers, and more at numerous feeders, or using the varied landscape. Even shy pileated woodpeckers were drawn to trees purposefully girdled for bug attraction.

Different from the garden, Helen employed the family home as a meeting place for savvy negotiations. Many know the Engle home as the "pot-luck place", or "that cool house" where groups of 100+ people gathered annually for grilled wild salmon, great food, weddings, lawn dancing, and meetings among lots of friends.

"Helen was always kind, full of wisdom, and welcoming of anyone and everybody." Ryan Mello, Tacoma City Council Member, Executive Director Pierce Conservation District, and past Cascade Land Conservancy Executive.

At age 74, Helen's résumé revealed that over the prior thirty years she had served as founding member, trustee, board member, citizen advisor, and/or committee member to at least one new organization every year. Prominent among these are Tahoma Audubon (celebrating its 50th Anniversary), the Mountaineers (in both Tacoma and Seattle), the Washington Department of Fish and Wildlife Advisory Council, and stints under the leadership of Governors Dan Evans, John Spellman, and Congressman Norm Dicks.

The Nature Center at Snake Lake in Tacoma owes its presence, in part, to Helen Engle. Although the group defending this watershed was unsuccessful in closing Tyler Street, the group convinced the Washington State Department of Transportation to span State Highway 16 across Snake Lake, instead of using cut-and-fill, as had originally been proposed. Consensus was reached between WDOT and concerned citizens at the Engle house.

The vision of what is now Tacoma's Ruston Way was also influenced by Helen, who gave testimonies promoting the rights of all people to have access to the water while supporting salmon recovery and wildlife. Her suggested parkway trail along the bluff and multiple uses of the shoreline was chosen instead of private waterfront ownership by citizens and businesses, blocking the public from access to the Puget Sound.

Over many years, Helen also helped put Northwest Trek on the map. By working with Tahoma Audubon, encouraging studies, and working with the Hellyer family, Tacoma Metro Parks eventually agreed to manage the 720-acre wildlife park.

Although each of the projects with which Helen was involved included many people, she is cited as the key facilitator who propelled each group to their successes. One notable project changed minds at the Ports of Olympia and Tacoma, and among Commissioners in Pierce and Thurston Counties, thus

preventing construction of a deep-water port on the Nisqually Delta. Here, developers had been eyeing the river outlet for projects such as a garbage dump or an aluminum mill. It was Helen's collaboration of concerned citizens and environmentalists that helped protect the last remaining wild delta—an important stopover for migratory birds and native wildlife—to create what is now known as the Billy Frank Jr. Nisqually National Wildlife Refuge.

"The thing that always stood out about Helen was her steadfastness to the cause, her enormous energy, her intellect and her ability to educate, to motivate, and to coordinate people to work on important environmental problems." Fred Tobiason, Professor Emeritus of Chemistry at PLU, a charter member of Tahoma Audubon, and motivated naturalist who'd been through many crusades with Helen.

Helen operated with these approaches: "optimism rules, collaboration pays, as do courtesy and humor. Avoid confrontation, and instead nurture communications and the things you have in common. Know your opponent and thank them rather than cursing the process. Share your beliefs and aim to understand your opponent's. Be willing to debate without getting your feelings involved. Talk about what's good and aim for lofty goals. Be sure to back up your position with good science. With two to three people anyone can take on any issue. Define your issue, create a mission statement, make a letterhead, get your message out to other groups with similar interests to form a coalition, and reach out to as many people as you can."

Even Helen's use of computers, well into her 90's, illustrated continued. Helen's electronic signature (*47° Latitude North; 122° Longitude West; Puget Sound Country; USDA Zone 7, Sunset Zone 5*) quietly asked her correspondents to connect with Nature where they are and to work with it from there.

Helen held lifetime memberships with the National Audubon Society, the Olympic Park Associates, the Washington Native Plant Society, and Issaquah Alps Trails Club. She was a decades-long member of the Mountaineers, Washington Environmental Council, Sierra Club, Wilderness Society, Defenders of Wildlife, Federation of Western Outdoor Clubs, and a founding member of the UW Arboretum Foundation Tacoma-Peninsula Unit #98.

Helen was also a founding member of the National Parks Fund, People for Puget Sound, Wildlife & Recreation Coalition, Washington Wilderness Coalition, Puget Sound Alliance, Mt. Rainier National Park Associates, Nisqually Basin Land Trust, and the Washington Environmental Political Action Committee. She was a member and supporter of several "Friends of . . ." organizations including Citizens for a Healthy Bay, the Foothills Rails-to-Trails Coalition, Washington Outer Coast Marine Sanctuary Coalition, Nisqually Reach Nature Center, Padilla Bay-Breazeale Interpretive Center and the Tacoma Metro Parks Tacoma Nature Center.

Helen has been recognized by many organizations. Her awards are simply too numerous to list without leaving off one

or another that is as important as the rest. She always advocated for natural resources, outdoor recreation, wildlife, and environmental education. Topics that interested her included wastewater treatment, forest management, whales, urbanization of grasslands, public policy, and grant making.

Roxy Giddings recalls that even on her deathbed, Helen was active. During a visit with Helen barely a week before her passing, Helen had to have a political button that Roxy was wearing. Recalling the book club that they both enjoyed, Roxy noted how avidly Helen could read; a total of 53 books in the last 5 years!

“Helen was the epitome of the ‘Think globally, act locally’ philosophy. Kris Schoyen

Without the support of all the people in her circle, in the past, and in the future, the legacy that Helen Engle leaves us is but a memory. This tribute invites each reader’s continued community-building and the kind of actions that Helen Engle so deftly demonstrated. She has left a prodigious list of noteworthy legacies, but more important are the seeds she has left us to continue sowing.

Anna Thurston operates Advanced Botanical Resources, and Sacred Nature Designs. She established the Native Plant Salvage Alliance serving Pierce County, lead WNPS’s South Sound Chapter for 7 years, and for 3 years coordinated both Tahoma Audubon’s Birdathon fundraiser, and the Tacoma Mountaineers Alpine Scrambles course.



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

Part 5: Sowing Native Seeds

by Bridget McNassar

If you’ve been learning about growing natives from seed, you know that it can sometimes be a long journey. The adventure begins with the love of a plant, a desire to know it better and bring more into the world, likely leading to some researching about how to grow it. You may have participated in collecting and cleaning the seed, learning about its type of dormancy and any special tricks to increase germination rates, and performed some treatments to get it ready to sow. And now, the exciting moment of sowing has arrived! You’ve done all you can, and you turn the seed loose to fulfill its destiny!

The previous four parts to this series have introduced the concepts of collecting, cleaning, and dormancy-breaking. In this fifth and final installment, I’d like to offer some considerations for sowing your seeds.

Timing of Sowing

Most Pacific Northwest native species can be sown throughout the cool spring temperatures experienced in the region, so aiming for March–April is ideal. Some species germinate more readily in the colder weather of late winter, so it is prudent to have these seeds ready to sow earlier. Clues from plants may help determine this: for example *Oemleria cerasiformis* (osoberry), is one of our earliest bloomers in the spring, and its seeds tend to germinate quite early—often late February—so they are always sown by late January. The same holds true with seeds of many of our spring ephemeral bulbs such as *Camassia* (camas), *Erythronium* (fawn lily), and *Fritillaria* (chocolate lily). And of course, as mentioned in previous articles, some seeds can be sown in the fall, giving them the option to germinate at the time best for them.



Germination of native plants often comes after a long journey working with your seeds for many months. PHOTO: BRIDGET MCNASSAR

Once you’ve decided when you’d like to sow the seeds of a species, then work backward to make sure you get the ball rolling early enough for seeds to be ready at the desired sow date. Generally, you should begin by cleansing and rinsing your seeds, which can simply be done by allowing them to soak in water for 24–48 hours, changing the water every few hours. This important step helps remove any pathogens that may be on the surface of the seed, helps leach out germination inhibitors, and allows the seed to begin taking up water—the trigger which jumpstarts our quiescent seed into action.

If your species needs scarification (see Pt 3 in Fall/Winter 2018), this can be done before soaking your seed. Following these steps, begin any stratification (see Pts 3 and 4 in Fall/Winter 2018 and Spring 2019), giving yourself enough time to get to your ideal sow date in the spring. If you are fall sowing, you should still do the cleansing/rinsing and scarification steps prior to sowing. One example of a species with a series of treatments that I grow at Oxbow Farm & Conservation Center is thimbleberry (*Rubus nutkanus*). I begin in September, scarifying and rinsing the seed (collected in June/July), then give it 60 days of a warm, moist treatment, followed by 120 days cold,

moist treatment, so that it is ready to sow in February in our unheated greenhouse.



For species for which you are unsure about germination rates, or are slower growers, a seedling flat may be a better option than sowing into individual containers. PHOTO: BRIDGET MCNASSAR

Choosing Containers and Media

A wide variety of containers can work for starting seeds, but a few considerations may be of help. Container depth is important to consider as deeper containers drain more rapidly, and thus may be more appropriate for moisture-sensitive plants such as kinnickinnick (*Arctostaphylos uva-ursi*). Additionally, quicker-growing trees and shrubs may do better in deeper, individual containers that allow adequate room for root development. Smaller herbaceous and/or slower growing plants, such as huckleberries (*Vaccinium* spp.), can be sown into small flats, where they can grow for many months, until they need to be transplanted into individual containers. In order to avoid exposing your tender seedlings to pathogens, be sure that you have thoroughly cleaned any previously-used containers.

Many potting mixes exist specifically for starting seeds, and most work just fine. Using a peat- or coir-based mix is ideal because the small particle size holds water well and allows for good contact with small seeds. Most mixes include bark, perlite, vermiculite and/or sand, which allow for aeration and faster drainage. You can add more perlite and/or sand for species that prefer drier soils. Some mixes also have small amounts of fertilizer or compost added, which should be at a lower rate than general potting soil—always double check that your mix is specifically for starting seeds.

Tips and Techniques for Sowing

Now the culminating event, where you finally tuck the seeds in for germination. Fingers crossed! In preparation for sowing, fill your containers and wet the media to get rid of any large air spaces. In flats, I like to evenly spread seeds out and then cover them with a layer of media; if I'm using individual containers, I like to make a small depression to place 2-5 seeds in, then lightly cover back up. Seeds should be only about as deeply

buried as their diameter. Keep in mind that smaller seeds have less energy stored inside them, so sowing them too deeply can result in a seedling dying on its way up to the surface. The tiniest seeds, such as yarrow (*Achillea millefolium*), and fringe cup, (*Tellima grandiflora*), can be sown on the surface. I just rough up the surface of the media first, so the seeds can settle into little nooks and still have good contact with the soil, but not be covered.

Once the seeds are sown, they should be tamped down so that they are nice and snug in the potting mix, and not sitting next to any large air pockets that will dry them out. I give them a thorough, but gentle, watering with a mist nozzle, so the seeds don't float around. After the first watering, cover your seeds to protect them from drying out while still allowing light to pass through, as many seeds need light to germinate. I do this using spun polyester row cover cloth, typically used for growing veggies. You can also use a thin layer of vermiculite or granite grit on top of your seeded containers. From this point on, you'll need to pay close attention that the top layer of soil containing the seeds remains moist; drying out at this point could kill the germinating plant or at least cause very slow germination or a return to dormancy. Be sure also to protect your seeds from animals, heavy rain, and deep freezes.



Once seeds are sown, a cover of remay/floating row cover can help keep seeds moist, and protect from some pests and extreme temperatures. PHOTO: BRIDGET MCNASSAR

Monitoring and Care After Sowing

Now comes the hard part: waiting for germination. Keep in mind that some species will germinate soon after sowing, and within a week or two all will be germinated. Others may take a month or more to begin germinating, and some seeds may continue to germinate for multiple months. Be patient, keep them moist, and keep checking. Once your seedlings are up, photosynthesizing and growing, they will use more water. You can apply a liquid fertilizer at a lower rate once seedlings get their true leaves. If planted in flats, seedlings can be carefully transplanted into individual containers to allow for good root development once they begin to get crowded.

Keeping Good Records

As you experiment, the best way to replicate your successes and avoid repeating your failures is to keep thorough notes. Some things I find helpful to record include: all treatments done to the seed; dates of sowing, germination start, and end; amount of seed used; and number of seedlings germinated.

I hope you find (and enjoy) your connection to natives deepening as you witness their earliest stages. Good luck with all your growing endeavors, and thank you for working to bring more natives back to our landscape!

Resources with more information about sowing native seeds:

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Oregon sunshine (*Eriophyllum lanatum*) readily self-seeds in the garden, as do Cascades penstemon (*Penstemon serrulatus*) and Scotch bluebells (*Campanula rotundifolia*). The background shrub in this Bellingham garden is golden currant (*Ribes aureum*). PHOTO: MARK TURNER

Lily Leaf Beetle: A New Invader That May Attack More Than Just Your Garden Plants

by Maggie Freeman and Chris Looney, Washington State Department of Agriculture

Washington State is home to 26 native species of Liliaceae (in the strict sense) in many genera, including *Calochortus*, *Clintonia*, *Fritillaria*, *Lilium*, *Prosartes*, and *Streptopus*. These lovely and often subtle plants can be found blooming in the spring and summer in nearly every Washington habitat: moist woodlands, grasslands, sagebrush slopes, high montane forests, and alpine meadows. Among these are plant species of special concern, including the long-bearded mariposa lily (*Calochortus longebarbatus* var. *longebarbatus*), the sagebrush mariposa lily (*Calochortus macrocarpus* var. *maculosus*), the broad-fruit mariposa lily (*Calochortus nitidus*), and the black lily (*Fritillaria camschatcensis*) (WNHP 2018). Besides extensive habitat degradation and loss, these vulnerable plants face a new threat — the lily leaf beetle, *Lilioceris lili* (Scopoli).



Lily leaf beetle larvae feeding communally on the leaf of an Asiatic lily. As the larvae feed they cover their backs with a layer of their own excrement. This is thought to protect them from generalist predators and desiccation. PHOTO: MAGGIE FREEMAN

The lily leaf beetle is an introduced Eurasian pest of true lilies (*Lilium*) and fritillaries (*Fritillaria*). Larvae and adults are voracious feeders and can destroy native and cultivated lilies in places where they lack control. Defoliation is frequently complete, causing immediate loss of aesthetic value, and even plant death within a few years. The lily leaf beetle has been documented feeding on at least 87 species of *Lilium*, five species of *Fritillaria* and one species of *Cardiocrinum* (Salisbury 2008).

The beetle was first found in North America in Montreal, Canada, in 1943 (Lesage 1983). After several quiet decades the beetle began to spread rapidly, appearing in several northeastern states and provinces in the early 1990s (Ernst et al. 2007). The beetle has continued to expand, with records now from ten

provinces and 14 states (Cappuccino 2017). Washington's first records of the beetle date from 2011, when four separate infestations were discovered in Bellevue (Murray et al. 2016). There are now over 20 confirmed populations, and the pest continues to expand into gardens and commercial operations.

The arrival of an herbivore in a new environment introduces it to new, potentially suitable food plants. In the eastern states and provinces *L. lilii* has been observed feeding on multiple native lilies (*L. canadense*, *L. michiganense*, and *L. philadelphicum*) which, although not unexpected, is alarming due to the conservation status of these species in many states (USDA NRCS 2019). More surprising was the ability of *L. lilii* to feed upon and complete its lifecycle on rosy twisted stalk (*Streptopus lanceolatus*), an entirely new host genus for the beetle (Ernst et al. 2007). These novel host associations raise questions about what to expect in western North America, including what species of plant this beetle will attack and how far we can expect it to spread. To partially address these questions, we explored the ability of *L. lilii* to feed upon other western Liliaceae and used habitat modeling to estimate its likely range in the Pacific Northwest.

Host Plant Testing

Host plant feeding trials were conducted in eastern North America in the early 2000s to learn which regional genera might be vulnerable to attack by *L. lilii*. Ernst et al. (2007) tested 11 genera in the families Liliaceae (*Lilium*, *Tulipa*, *Erythronium*, *Clintonia*, *Medeola*, *Streptopus*), Smilacaceae (*Smilax*), Melanthiaceae (*Trillium*) Colchicaceae (*Uvularia*) and Asparagaceae (*Maianthemum*, *Polygonatum*). They also tested genera in Asteraceae (*Solidago*) and Apocynaceae (*Vincetoxicum*). Only *Lilium*, *Medeola*, *Polygonatum*, and *Streptopus* proved to be suitable for *L. lilii* larvae to complete their development into adults (Ernst et al. 2007).

After the introduction of *L. lilii* to our region, we conducted feeding trials focusing on western species and genera of Liliaceae



On the left, an adult lily leaf beetle feeds on the petal of *Calochortus tolmiei*. On the right are lily leaf beetle eggs laid on the underside of a *C. tolmiei* leaf. These images show the beetle's ability to utilize this novel host plant as both a food source and an egg laying site. PHOTO:

MAGGIE FREEMAN

ae that were not addressed in previous research. We conducted no-choice feeding and oviposition trials with Columbia lily (*Lilium columbianum*), fairy-bells (*Prosartes hookeri*), chocolate lily (*Fritillaria affinis*), and cat's-ears (*Calochortus tolmiei*). *Calochortus* was of particular interest due to the prevalence of species of conservation concern in western North America – over 40 species and varieties are considered threatened, endangered, or otherwise at risk across the region (USDA NRCS 2019).

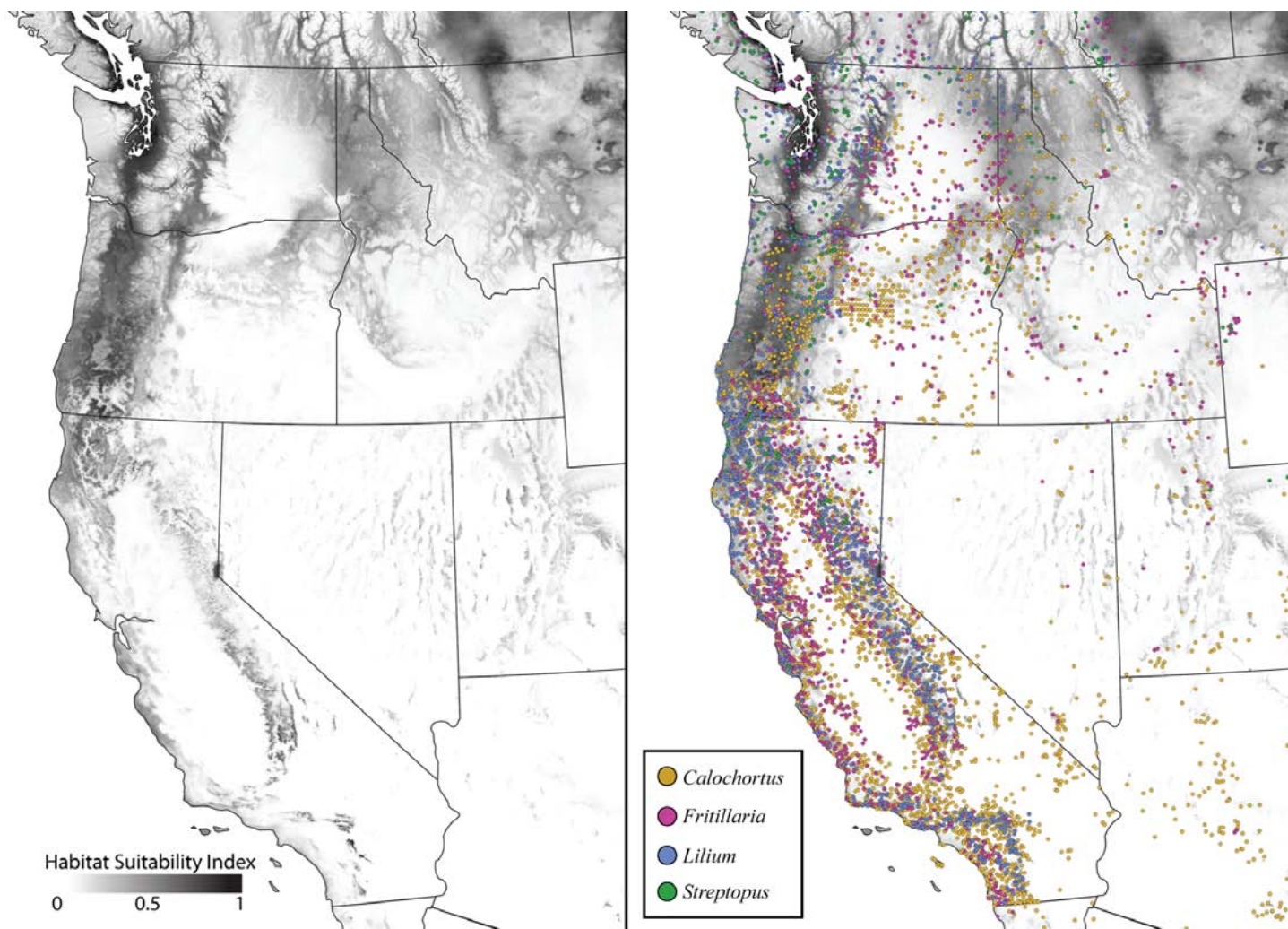
We found that all larvae feeding on *Prosartes hookeri* died within 48 hours, suggesting the genus is unlikely to encompass viable hosts. *Lilioceris lilii* larvae readily fed upon and completed their lifecycles on *L. columbianum*, which we expected. Larval attrition was high on *C. tolmiei*, but several larvae did feed on the leaves and were able to complete their lifecycle. The ability to utilize *Calochortus* is an alarming discovery—unchecked, *L. lilii* feeding could add another significant threat to the many at-risk species in the genus.

We also used multi-choice cage experiments to assess *L. lilii*'s oviposition behavior when preferred and alternative hosts plants are simultaneously available. Species used in this trial were *Calochortus tolmiei*, *Fritillaria affinis*, *Lilium columbianum*, and an Asiatic or Oriental lily as a control (other research indicates that these ornamental lilies are the beetles' preferred food source). Eggs were laid on 100% of the control lilies, 75% of the *Lilium columbianum*, 50% of the *Fritillaria affinis*, and 12.5% of the *Calochortus tolmiei*. This suggests that even if *Fritillaria* and *Calochortus* are not the beetle's preferred host, they may still serve as oviposition sites even when *Lilium* is available. This increases our concern that spreading populations of *L. lilii* may have impacts on native western ecosystems.

Habitat Suitability Modeling

The discovery that *L. lilii* is a bit more open-minded about its food plants led us to wonder how far the beetle might disperse, and if it is likely to overlap with these new host plants in the wild. To delineate the potential limits of *L. lilii* in the Pacific Northwest, we constructed species distribution models for the beetle's native and invaded range (Phillips et al. 2018). These models are based on correlations between species occurrence data and the climatic data at those points, such as temperature and precipitation. We used location data for Europe and Asia shared by collaborators (Orlova-Bienkowskaja, personal communication; Cappuccino, personal communication). We combined these points with climatological data, and used the models to generate habitat suitability scores ranging between 0 (low suitability) and 1 (high suitability). These habitat suitability scores were then projected on North America to predict likelihood of occurrence.

We mapped those results as a gradient of habitat suitability across the study region, and then superimposed location data for species of *Calochortus*, *Fritillaria*, *Lilium* and *Streptopus* gathered from the Consortium of Pacific Northwest Herbaria online database (www.pnwherbaria.org). Our preliminary results indicate that *L. lilii* should be able to establish throughout the



MaxEnt habitat suitability model results for *Lilioceris lili* in the Pacific Northwest. Darker shading indicates higher habitat suitability. The right-hand map superimposes location data of native species of *Calochortus*, *Fritillaria*, *Lilium*, and *Streptopus* over these results.

range of most species of *Lilium*, *Fritillaria*, *Calochortus*, and *Streptopus* in the Pacific Northwest.

Wasps... Slowly... to the Rescue

Our research suggests that many native plant species could be vulnerable to attack by *L. lili*, and that there are no apparent habitat barriers that will prevent the beetle's spread. The negative effects of *L. lili* could be even greater than we think – for example, we were unable to investigate impacts on the genus *Scoliopus* due to the lack of commercially available specimens. Thankfully, there is a solution available which should help mitigate the impacts of this invasive pest.

The Washington State Department of Agriculture (WSDA) has initiated a classical biological control program targeting *L. lili*. We are releasing two species of federally-permitted parasitoid wasps, only 2-10 mm long, that lay their eggs in lily leaf beetle larvae. The larvae devour the beetles, killing them before they can develop into adults. The wasps are bona fide lily leaf beetle specialists, and have starved rather than attack other beetle species in extensive testing (Casagrande and Kenis 2004). The wasps have been released for several years in Connecticut and Rhode Island, where they have successfully reduced lily leaf beetle populations by upwards of 80% (Tewksbury et al. 2005).

While this is a promising solution, these tiny wasps can only spread up to 5 kilometers a year. WSDA will continue to raise and release the wasps, and facilitate their establishment. Even so, it will be many years before they spread throughout our state — and the beetle is likely to spread faster. With limited resources to track and control the spread of *L. lili* into natural areas, plant enthusiasts can help monitor populations of



Diaparsis jucunda (Hymenoptera: Ichneumonidae) laying an egg in a lily leaf beetle larva minutes after its release in Bellevue, WA. PHOTO: MAGGIE FREEMAN

Lilium, *Fritillaria*, *Calochortus*, and *Streptopus* for this new pest. Reporting any observations on our website (bit.ly/wsdallb) can help WSDA target future parasitoid releases.

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- Maggie Freeman is an entomologist with the Washington State Department of Agriculture, and a master's student at Washington State University. Chris Looney is also an entomologist for the Washington State Department of Agriculture, where he manages the WSDA insect collection and entomology laboratory.



Conservation and Climate Change

by Becky Chaney, WNPS Conservation Committee Chair

Climate defines Washington's native plants and their habitats. Pollution and the destruction of native habitats is changing our lives and the world we know. We spill greenhouse gasses into the atmosphere, and turn prairies and forests into pavement and rooftops. Fires blaze, lighting our forests and shrublands while darkening our skies. Heat creeps up our mountainsides melting glaciers and warming alpine meadows. Clouds, overflowing with torrential rains, replace fog and mist. Workers lose jobs, families lose homes, and people struggle to move on. Plants move too, but much too slowly to adjust to the profound changes we've brought on.

In 2013, WNPS first recognized that climate change policy aligns with the WNPS mission to conserve native plants by including climate—along with geography, altitude, hydrology, connectivity, and proximity to human development—in a list of factors of justifiable concern to WNPS. Now the concern over a changing climate is increasingly dire. Ongoing research confirms that as a result of human activity the Pacific Northwest climate is warming, glaciers are receding, streamflow regimes are changing, and heavy rainfall events are becoming more severe. In April 2019 the WNPS Board of Directors approved a Climate Change Policy and added a new Climate Change Principle asserting that these should guide WNPS actions on climate change.

The role of native plant societies in this effort is unique to our collective mission of conserving native plants. The new WNPS Policy on Climate Change promotes policies and actions that address climate change “without simultaneously endangering Washington's native plants and their habitats.” Action on climate change may justify the destruction of native plants and habitats; solar panels may cover the last remnants of Palouse Prairie, wild forests may be replaced with managed

WNPS Climate Principle:

Climate is a significant factor affecting Washington's native plants and native plant habitats. Human actions, including greenhouse gas emissions, are major contributors to local and global climate change. WNPS recognizes the need to identify and enact conservation measures that protect Washington's native plants from climate change. This includes minimizing and mitigating the negative impacts of climate change on native plants and habitats and also includes furthering research on climate change and its effects on Washington's native plants (adopted by the WNPS Directors, April 13, 2019).

plantations, cities may develop all open space. Balancing the need for action with the needs of native plants is critical.

This year's Conservation Grants support three graduate student science projects that will inform native plant conservation efforts that are associated with the impacts of climate change. The projects include research on eelgrass (*Zostera marina*), arrowleaf balsamroot (*Balsamorhiza sagittata*), and plant-microbial association and soil formation. Research will be conducted in the San Juan Island marine, Palouse prairie, and Mt. St. Helens pumice plain habitats, respectively. We are looking forward to future reports on the results of this work. In the meantime, we ask all our members to think globally and act locally, keeping in mind how our actions day-to-day and year-to-year affect the native plants and habitats we love.

Becky can be reached via e-mail at becky@chaney.org. She is always happy to hear your conservation interests, concerns, and comments on these articles. Please include "WNPS Conservation" in the subject line.



Purple Mountain Majesties: How Will Climate Change Affect Mount Rainier's Lupines?

by Meera Lee Sethi

Approximately one out of every two living creatures that has been described by science to date is either a plant or an insect that feeds on plants (herbivore), making insect herbivory the most common type of species interaction on the planet (Futuyama 2009). Relationships between plants and insect herbivores structure every terrestrial habitat, with wide-ranging impacts on biodiversity, distribution range limits, and ecosystem services. Despite this, the statement "My research is on how climate change affects insect herbivory" is almost always followed by a glazed look in the eyes of my conversation partner.

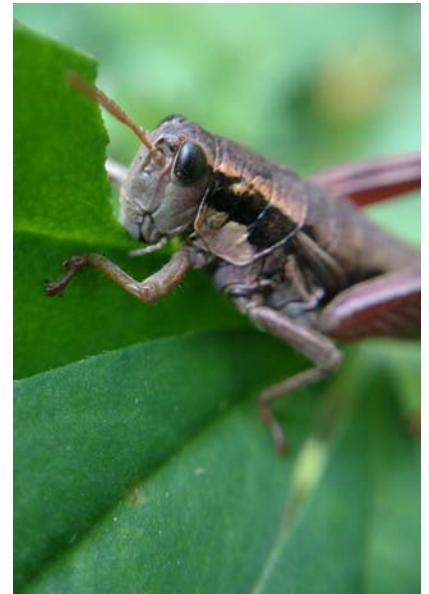
That changed—at least temporarily—after an August 2018 paper in *Science* got a lot of press in mainstream publications



Stalks of subalpine lupine (*Lupinus latifolius* var. *subalpinus*) blooming and fruiting. PHOTO: MEERA LEE SETHI

like *The New York Times*. The paper discussed how we should anticipate large increases in insect herbivory on food crops as our climate changes (Deutsch et al. 2018), because rising temperatures raise the metabolic, reproductive, and survival rates of ectotherms (organisms whose body temperature depends on the environment), such as insects. That week my dad held a newspaper up to his laptop camera during our video chat and told me with some pride that what I study was in the news. It was a rare moment, and one that I savored. But although I started my study of insect herbivory on Mount Rainier expecting to see exactly this pattern, my work over the last three years has demonstrated that mountain ecosystems are more complex—and difficult to predict—than agricultural ones.

Since the summer of 2016, I've been monitoring insect herbivory in the lush, beautiful subalpine meadow habitat on Mount Rainier using a "space-for-time" substitution approach. That means taking advantage of the fact that it gets cooler as you travel up in elevation to look "into the future." If we assume that differences between the way organisms behave in high vs. low-elevation meadows is mostly due to temperature, then what we see at lower elevations can potentially forecast the changes climate warming will bring. In practice, that has meant hiking up and down trails near Paradise and Sunrise every summer, marking hundreds of individual plants, and carefully examining hundreds of thousands of leaves to see the degree of insect herbivory at different sites.



A Cascade timberline grasshopper (*Prumnacris rainierensis*) feeds on a lupine leaf. PHOTO: MEERA LEE SETHI

On average (across nine species and nearly 2,000 feet of elevation), I found that herbivory rates are relatively low: an individual plant is likely to lose about 4.8% of its total leaf area to chewing insects. But that figure hides huge variation among species and elevations. Some species, like alpine aster (*Oreostemma alpinum* var. *alpinum*), hardly ever get chomped on, no matter where you are on the mountain. Others, like subalpine lupine (*Lupinus latifolius* var. *subalpinus*), seem to be adored by almost every chewing insect out there, especially Cascade timberline grasshoppers (*Prumnacris rainierensis*), the dominant herbivore in the meadows. Surprisingly though, grasshopper herbivory on lupines increases with elevation even though temperatures drop—the opposite of what I expected. Some individuals at the very edge of the subalpine habitat lose over 40% of their total leaf area to grasshoppers each season,

which can have enormous impacts on their ability to photosynthesize and reproduce.

I have two ideas about why this is happening: First, plants growing at high-elevation—even lupines, which are nitrogen fixers—have less nitrogen and more carbon in their leaves than low-elevation plants of the same species because high mountain soils are rocky and have less microorganism activity. For insects, this means that high-elevation leaves provide less nutritional value and may provoke what is called “compensatory eating”: insects feed more to meet the same needs. Second, experiments I’ve run in the lab with grasshoppers I’ve collected in the field suggest that high-elevation grasshoppers not only have higher overall feeding rates than their low-elevation relatives, but may also be adapted to speed up their feeding when temperatures warm. Even though I didn’t predict it, this makes sense. If you live in a cold environment, it’s great to be able to ramp up your metabolism to capitalize on heat waves, or even just the warmth you get from basking in the sun. (And it’s easier to find sunny spots at high elevations, because the canopy is far less dense!)

My findings suggest a complex and uncertain future for this important plant-insect interaction, and for the iconic purple wildflowers that blanket Mount Rainier meadows in the summertime. What happens, and whether it’s good or bad for these plants, will depend a lot on what changes come besides increases in temperature. Grasshoppers or lupines or both may migrate to track climate, changing which individuals interact with each other. As trees move into meadows, canopy cover will increase even at high elevations. And of course, it’s possible that natural selection will play a role in determining the eventual outcomes of this relationship. As I progress in my Ph.D. studies, I will continue to work on understanding this story and its broader implications, and am grateful for the support I’ve gotten from WNPS to fund this research!

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Meera Lee Sethi is a Ph.D. student in the Department of Biology at the University of Washington, Seattle; she was awarded a WNPS Research and Inventory Grant in 2017.



Salal: A Short Sketch of a Common Washington Shrub

by Frank Knight



Ripe salal fruit among its leathery leaves. PHOTO: MARK TURNER

Always on the lookout for uncommon plants that we haven’t yet met, we often pass by the most familiar without a second thought. Here is a closer look at an old plant friend:

Salal (*Gaultheria shallon*) honors 18th century Quebec physician Jean-Francois Gaultier. Shallon is likely a misinterpretation of salal’s native tribal name. Two higher elevation species both called wintergreen, *G. ovatifolia* and *G. humifusa*, resemble stunted salal.

An evergreen shrub and member of the heath family (Ericaceae), salal grows in dry to moist lowland woods, often in dense tangles. It has broad, oval, shiny, leathery leaves on zig-zagged stems bearing horizontal racemes of hanging white flowers with red sepals that produce delicious dark-purplish fruits. Find it west of the Cascades from British Columbia through Washington and Oregon and down to southern California.

Northwestern tribes took full advantage of this abundant, sweet, nutritious food source, eating berries fresh or dried with other fruits all winter. When David Douglas first saw salal in 1825, he thought it the finest berry he had ever tasted, although this may have preceded his first experience with huckleberry. Finding useful American plants for British estates was a primary mission of Douglas’ visits here, and its handsome evergreen habit by itself made it worthy of attention. Douglas also felt that the poor, malnourished crofters back home in Scotland would relish the fruit as he did. They did not.

Many modern homeowners here dislike salal, perhaps because of its pervasive commonness. I personally admire its appearance and its formation of weed-excluding pure stands. It is most effective when cleanly trimmed at the boundary of natural vegetation and landscaping. The fruit seems to have caught on today only with those who avoid the skins and seeds by straining for jelly and jam.

So, next time you pass salal by on your way to discover less common botanical treasures, taste a handful of salal berries while imagining the shrub’s usefulness in your home landscaping.



Gardening with Native Plants of the Pacific Northwest 3rd Edition

Arthur R. Kruckeberg and Linda Chalker-Scott. University of Washington Press, Seattle. ISBN: 978-0-295-74415-5

Reviewed by: Richard Olmstead

It was a different time. The first Earth Day was a recent memory. The Clean Air and Clean Water Acts were slowly yielding change. The Endangered Species Act of 1973 drew attention to the impact of our species on others with whom we shared this land. Federal and state governments were beginning to recognize the value of our native flora and fauna to the health and well-being of our environment, as well as the

people who share that environment with them. David Brower is credited with the expression “think globally, act locally,” as the founding motto for Friends of the Earth.

Among those who answered that call was Art Kruckeberg. By that first Earth Day, Art had established his reputation as a botanist through his study of plants and the soils in which they grow, especially the unusual association of plants on serpentine soil, but he had become increasingly interested in the conservation issues confronting our regional flora. Setting aside much of his research, Art began a second career in environmental activism. His wasn't a flamboyant activism, but was an effective activism. While others rallied in the streets and on campus, Art worked behind the scenes to get the state of Washington to enact legislation to establish a network of Natural Area Preserves, and with the Forest Service to set aside Research Natural Areas. In the same year that the Endangered Species Act became law, he developed the first list of endangered plant species in Washington and later lobbied Olympia to create the Washington Natural Heritage Program to manage endangered species in the state. He led the effort to create the Washington Native Plant Society and became the first and longest serving editor of *Douglasia*.

Art Kruckeberg was an extraordinary botanist and an ardent advocate for our native flora, but, at home, he was a gardener. With his wife Mareen, beginning in 1958 he developed a four-acre horse pasture and woodlot into a true botanist's garden. He was influenced by his mentor in the regional flora, C. L. Hitchcock, to experiment with growing native plants, among the many other plants from his home state of California and around the world. From his research and plant collecting trips, he would return with seeds to grow in the garden. In time,

Mareen began the MsK Rare and Native Plant Nursery, which developed a devoted clientele, primarily for native plants. Gardening with native plants was becoming a “thing.”

With a backdrop of increasing environmental awareness, the interest in our native flora grew, and along with it, membership in the Washington Native Plant Society and gardening with native plants. Once again Art was the catalyst that brought together these interests by publishing the first edition of *Gardening with Native Plants of the Pacific Northwest* (1982). *Gardening* was well received from the beginning. Recognized with the Governors Award upon release, it was one of the first examples of a gardening book devoted to native plants published anywhere, and rapidly became the bible for native plant gardeners in our region. Updated and expanded in 1996, the book contained mostly black and white photos and was sprinkled with many of Mareen's wonderful pen and ink drawings, as well as Art's flowery prose in describing the wonders of our native plants in garden settings and speculating on the value of others not in cultivation at the time.

With Art's passing in 2016 at the age of 96, I'm sure many readers thought that there would never be another edition. However, long before Art's age and health precluded his work on the long-planned 3rd Edition, he had arranged with Linda Chalker-Scott and the University of Washington Press to bring his dream to fruition.

The newest version of *Gardening* is much more than an update of the previous volume. The addition of many new species brings the total covered by the book to nearly 1,000! All of the nomenclature is in sync with the recently published 2nd Edition of the *Flora of the Pacific Northwest*. But the most spectacular addition to the book are the beautifully reproduced, full-color photographs of all of the species described in the book.

Missing from this edition are many of Art's original comments about collecting and propagating plants from nature. When the first edition was published, there were no other retail sources. Now, with native plants often available in nurseries and the recognition that harvest of native plants for gardens can harm wild populations, these comments are out of touch with current best practice. Also missing, sadly, are Mareen's pen and ink drawings. Art's original descriptions are preserved in this edition and new descriptions by Sami Gray do a wonderful job of capturing Art's characteristic style. This edition is enhanced by Linda Chalker-Scott's experience in horticultural research through a new chapter on “Garden Science,” which will make us all better gardeners.

There is already a new generation of native plant gardeners who will want copies of this book, but everyone who owns a tattered copy of the original will want a copy of this one, too.

Richard Olmstead is Professor of Biology and Herbarium Curator at the University of Washington. He is the author of the Foreword to the new edition of Gardening with Native Plants.



Have you Started Your Plant Life List?

by Walter Fertig

Truth be told, I started out to be an ornithologist. For my tenth birthday I got a pair of clunky, 7x Sears binoculars and a Peterson field guide. I was quickly hooked on birds and started dutifully checking the box in the index for each new species I saw.

I'm not alone in my affection for birds. In 2016, 45 million Americans either fed birds or traveled away from their home to photograph or observe birds. According to the same US Fish and Wildlife Service study, birders also spent an estimated 5.8 billion dollars on bird seed, field guides, binoculars and spotting scopes, outdoor apparel, gas, and lodging in pursuit of their hobby. This economic boost may actually be significantly higher when taxes and wages associated with retail sales and bird-related travel are included.

Of course, bird-watching offers other rewards beyond economic activity. Spending time outdoors and in the educational pursuit of bird identification can make birders more knowledgeable and appreciative of nature. This often translates into greater concern for the conservation of species and their habitats.

About 2.3 million birders confess to keeping a “life list” or tally of all the bird species they have observed during their life. Birders may also keep track of the number of species they have seen in their yard, town, county, or state. In extreme cases, birders may travel the country to identify as many bird species as possible in one year, the so-called “big year” described in a popular 2011 movie with Hollywood A-listers Steve Martin, Owen Wilson, and Jack Black.

So if birders can channel their listing impulses into socially-acceptable, healthy, outdoor fun that promotes conservation and the economy, why shouldn't plant enthusiasts do the same thing? Isn't it time for “plant-watching” to be recognized as a legitimate pastime?

For starters, there are a lot more plant species to count. Birders travel to remote islands in the Aleutians to view a few Asian stragglers so that they may claim over 700 species on their big year or life list. A plant-watcher could spend the entire year in Mount Rainier National Park and not see all 871 plant species and varieties in the local flora. There are nearly 16,000 species of flowering plants, conifers, and ferns in the United States (and approximately 250,000 worldwide) to keep plant-watchers busy.

Being sessile organisms, plants are quite easy to “watch”—all you need to do is get to them. Of course, not all plants are identifiable year-round, and annuals may not appear at all in drought years. But overall, plant-watching is much simpler than stalking birds (which often can be seen for only a fleeting moment). Plants don't fly off into dense cover or the next



Cushion Buckwheat (*Eriogonum ovalifolium* var. *nivale*) on a rocky ridge above Sourdough Gap with Mt. Rainier on the skyline. PHOTO: MARK TURNER

county while you are fumbling with binoculars or thumbing through Sibley. Also, a plant-watcher does not have to get up in the cold, early hours of the morning to glimpse birds at first light when they tend to be most active. The plant-watcher can sleep in, like other civilized folk.

Plant-watching tends to be less gear-intensive than birding. A good 10x hand lens is a must, of course, as are sensible outdoor clothing and sturdy shoes. A camera is a useful accessory to document a find or confirm its identity later. And a good plant guide or flora is required. Fortunately, there are as many wildflower, tree, and fern guides as there are bird books, and nearly every region has a modern technical key or manual for the more advanced plant-watchers.

Like birding, the basic premise of plant-watching is quite simple: get outside, find some plants, observe their floral or vegetative characteristics, determine their identity, record the names, and repeat. Budding plant-watchers may want to start slow—perhaps in their own backyard or a neighborhood park—to get practice. Trips farther afield will yield more species, as will carefully planned visits to a mix of different habitats. As with learning any new skill, the more you practice at plant identification, the better you become.

One of the charms of birding is that the sport is self-regulating; that is all participants are on the honor system in reporting

their finds. The same code should apply to the plant-watcher. Strange reports, such as *Welwitschia mirabilis* (welwitschia) from your neighbor's backyard, will not be taken seriously unless supported by compelling evidence (unless, of course, your neighbor lives in the Namib Desert). Unusual finds, such as populations of rare species, noxious weeds, or new distribution records, should be reported to the local native plant society, state natural heritage program, weed and pest district, or university herbarium. To be considered credible, such records need to be accompanied by suitable documentation—preferably a clear photograph and coordinates of the location—so a knowledgeable person can relocate the plant if necessary. Reports can be corroborated by physical specimens, but this should only be done where collecting is allowed by law or permit (no collecting in national or state parks!) and specimens deposited in a public herbarium, so as not to threaten populations or diminish the enjoyment of plants by others.

There are many ways in which a plant-watcher's observations can benefit science and society. Surprisingly few parks or other protected areas have complete plant species lists. Managers or naturalists associated with these areas would be interested in unusual finds, especially those accompanied by photos and location data. For example, when I lived in southern Utah, we had a cadre of dedicated amateur botanists who added over a dozen new species to the flora of Zion National Park in a five-year period—including some rare species. Several states have launched programs to encourage people to report new locations of aggressive weed species. Other "citizen science" programs include Project Budburst (sponsored by the National Science Foundation), which seeks volunteers to record the earliest dates of flowering for selected plant species in order to study the effects of climate change on phenology. iNaturalist is a website where amateur naturalists can post photos and location information of plants and animals and get help with identifications from a community of like-minded souls.

So why should birders have all the fun? It seems high time to promote the sport of plant-watching. Gardening consistently ranks as one of the five most popular hobbies in the country. In 2015, US consumers spent 29 billion dollars on lawn and garden care. At least 43 million American households have a vegetable garden. There certainly is a large, and mostly untapped, market for plant-watching.

Native plant societies can play an important role in promoting plant-watching. Field trips are a great way to explore nature with fellow plant lovers, especially if led by an accomplished guide. In the off-season, meetings can be used to share photos and identification tips, study herbarium specimens, or plan for future expeditions. The important thing is to get started on a lifetime of botanical discovery!

Walter Fertig is the state botanist with the Washington Natural Heritage Program. He began his plant life list in Connecticut in 1986.



WNPS Annual Awards

Each year, WNPS presents two awards to recognize people and organizations that have made exceptional contributions to native plant conservation, research or education.

The **Mentzelia Award** goes to a WNPS member who has contributed through their work with WNPS. The **Outstanding Partner Award** is presented to an agency, individual, or organization that has made a significant contribution to the conservation, research, or conservation of Washington's native flora.



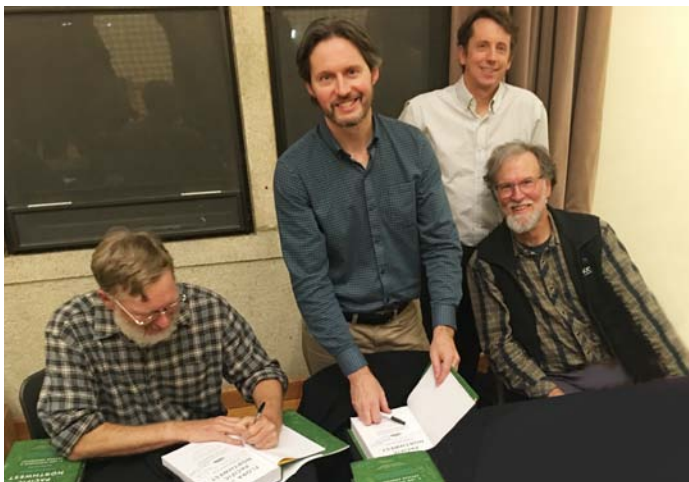
Don Hardin (third from right) on a Suksdorfia chapter field trip.

PHOTO: COURTESY DON HARDIN

This year's **Mentzelia Award** goes to Don Hardin, chair of the Suksdorfia Chapter from 2013 to 2018. Bill Brookreson and Sue Kusch gave the following reasons for nominating Don for this award:

- "The past five years of Don's leadership have been a story of steady success. Membership has grown steadily from the 40 members in 2013 to a current active membership of 120. Attendance at programs has usually filled the White Salmon Library meeting room. Under Don's leadership, the chapter has had a continuous active hiking program with many hikes-filled weeks before the actual event."
- "Don, who is a published author, created a highly informative monthly newsletter for the chapter and built the newsletter subscriber list to over 200 people. Don wrote an array of articles each month describing hikes, seasonal plant reports, fire damaged trails and delightful descriptions of his invasive weed-pulling experiences that included snappy titles like, "Scotch Broom Faces Doom."
- "Hike participants often met Don for the first time on a hike, and though his hiking gait was slow but steady, Don could be relied on for quick plant identification as well as a quick story about the history of a trail. Don has a terrific sense of humor, a delightful smile, and a bit of a mischievous nature. Last year, while hiking with him, we came across a singular balsamroot (*Balsamorhiza sagittata*) and as I looked around for more, I wondered out loud how this one singular plant got its start. Don smiled broadly and said he might know something about that. Guerrilla native plant conservation!"

- “In 2017, . . .there was discussion of simply dropping the 2018 study weekend. With short preparation time and a chapter with limited membership, Don and Suksdorfia joined with the South Sound Chapter to put on the 2018 study weekend. Don worked tirelessly organizing field trips and helping to coordinate facilities, even in the face of some significant health issues.”



University of Washington Herbarium staff (l to r): Peter Zika, Ben Legler, David Giblin, Dick Olmstead. PHOTO: DENISE MAHNKE

The University of Washington Herbarium at the Burke Museum is the winner of this year's **Outstanding Partner Award**. Don Schaechtel supported this nomination with the following points:

- The herbarium staff members have been “terrific partners as co-sponsors of Botany Washington and WNPS workshops.”
- In 2018 the Herbarium published “the revised *Flora of the Pacific Northwest*, which will be a valued resource for our members.”
- “In 2016, Herbarium staff members David Giblin and Ben Legler developed the concept for the plant list database at a time we really needed it. WNPS plant list coordinator Don Knoke had just had a stroke and was unable to continue maintaining the lists. David initially sought a National Science Foundation grant to fund the work, and when it was not accepted, he recommended that WNPS seek a grant from the Garneau-Nicon Family Foundation, which funded illustrations for the revised *Flora*. This grant was accepted at 50% of what we requested, and our chapters donated the rest of the money that was needed to develop the database in 2018.”
- “In just a few months, Ben Legler converted our plant lists into a database format and designed a user-friendly web format that took our 40-year plant list collection into the 21st century. It was ready for the 2018 field season.”

Congratulations to the WNPS Annual Award Recipients.



WNPS Fellow Award Renamed to Honor Art Kruckeberg

The highest accolade given to a member by our society is to be named a Fellow. Therefore, it is fitting that the WNPS Fellow award has been renamed the **Arthur R. Kruckeberg WNPS Fellow**.

Arthur R. Kruckeberg (1920-2016) was a long-time professor of botany at the University of Washington and the first president of WNPS. Last fall, Fred Weinmann proposed that WNPS honor Dr. Kruckeberg by renaming the

WNPS Endowment in honor of Dr. Kruckeberg. It was discovered, though, that the Kruckeberg Botanic Garden Foundation hoped to use the Kruckeberg name on their new endowment. Board member Mark Turner suggested an alternative. WNPS could recognize Dr. Kruckeberg's vast contributions by renaming the WNPS Fellow award in his honor, which the board approved. All existing Fellows will be retroactively named Arthur R. Kruckeberg WNPS Fellows.

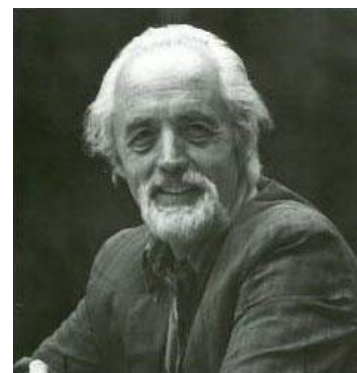
Fred Weinmann, who has been a member of WNPS since its founding in 1976, describes the reasons for memorializing Art Kruckeberg:

“I think we all agree that the major force and significant energy in founding the Washington Native Plant Society came from Dr. Arthur Kruckeberg in 1975-1976. Art was not only our founder. For many years he was our most active member, the primary author of *Douglasia*, and a major contributor to the Society in countless other ways. For nearly 40 years he encouraged and supported participation in our Society by all people interested in plants. In Art's world, if you knew the name of a single plant you were a botanist and needed to belong to the Washington Native Plant Society.”

All **Arthur R. Kruckeberg WNPS Fellows** are listed on the inside front cover of *Douglasia*.



Kruckeberg's sword fern (*Polystichum kruckebergii*) on the Yellow Aster Butte trail in the North Cascades. PHOTO: MARK TURNER



Art Kruckeberg, the first President of the Washington Native Plant Society 1976 - 2016. PHOTO: DR. D. HENDERSON, 1969

Dr. Sarah Reichard: Newest Fellow



Sarah Reichard in the field. PHOTO: WENDY GIBBLE

On October 13, 2018, the Washington Native Plant Society Board of Directors voted to posthumously award **Dr. Sarah Hayden Reichard** the title of **Arthur R. Kruckeberg WNPS Fellow**.

The title of **Arthur R. Kruckeberg WNPS Fellow** is the highest accolade given to a member of our Society. Fellows are chosen based on one or more of the following criteria:

1. Through the actions of this member, a significant and lasting change in the organization has been realized.
2. The member has contributed an extraordinary amount of volunteer time to WNPS.
3. The member has performed an outstanding act and/or been a driving force on behalf of the conservation, education, research, or advocacy of Washington's native flora.
4. Longevity of contribution at state or chapter level.

While Sarah was active in WNPS's Central Puget Sound Chapter during her student days, she is primarily remembered for her work in education and research on behalf of Washington's native plants. She was on the faculty of the School of Environmental and Forest Resources, University of Washington, from 1997 to 2016, and served as director of the UW Botanic Gardens from 2011 to 2016. She passed away unexpectedly in 2016 while leading a botanical tour of South Africa's Western Cape province.

Sarah wrote her Ph.D. thesis on "Assessing the potential of invasiveness in woody plants introduced to North America" and went on to become "a noted scholar in plant conservation

and invasive ecology" (<http://depts.washington.edu/sefsblog/tag/sarah-reichard/>).

Dr. Reichard's Contributions to Native Plant Conservation, Research, and Education include:

- "... founded and served as director of Rare Care, whose citizen science-based model is nationally recognized for its pivotal role in monitoring Washington state's threatened and endangered plant species." (<https://environment.uw.edu/news/2016/09/remembering-dr-sarah-reichard/>)
- "... dedicated to educating children on the importance of nature in their lives and used her position as director to expand (UW Botanic Gardens') role in K-12 education, including establishing hugely successful programs like the Fiddleheads Forest School." (<http://depts.washington.edu/sefsblog/tag/sarah-reichard/>)
- "... was vice president of the Pacific Northwest Invasive Plant Council, held a six-year tenure on the Federal Invasive Species Advisory Committee and served on the Invasive Species Specialist Group of the International Union for the Conservation of Nature." (<https://environment.uw.edu/news/2016/09/remembering-dr-sarah-reichard/>)
- "... co-authored a report for the National Research Council, "Predicting Invasions of Nonindigenous Plants and Plant Pests," co-edited *Invasive Species in the Pacific Northwest*, and authored *The Conscientious Gardener: Cultivating a Garden Ethic*." (<https://environment.uw.edu/news/2016/09/remembering-dr-sarah-reichard/>)
- "... found time to mentor young women entering plant conservation and research fields, a role that many of her former students cite as pivotal to their professional success." (<https://environment.uw.edu/news/2016/09/remembering-dr-sarah-reichard/>)

Nominations for this honor are usually only accepted every five years, with the next call for nominations in 2021. At our board meeting, though, Bill Brookreson moved to make Sarah Reichard a Fellow, out of sequence. The motion passed. I am not sure this has ever happened before. It certainly shows how highly the WNPS regards Sarah.

This award was officially announced at the 2019 Study Weekend banquet on May 18. Sarah Reichard is the first new Fellow to be awarded this title under its new name—the Arthur R. Kruckeberg WNPS Fellow.



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

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Contents

About This IssueInside Front Cover

President’s Message: The View from Here, *Van Bobbitt* 1

Milkweed: More Than Just A Pretty Flower, *Sue Kusch*2

A New Milkweed in Washington, *Walter Fertig*.....4

The Flora of Seattle in 1850, *Raymond J. Larson*5

Where’s in a Name?: Washington Plant Name Geography, *Walter Fertig*.....7

Flora of the Pacific Northwest, 2nd Edition, *David Giblin*.....9

Travels with Hitchcock and Cronquist, *Ed Alverson* 11

Book Review: *Flora of the Pacific Northwest: An Illustrated Manual*, Second Edition, *Fred Weinmann*... 12

Sowing Seeds in Helen Engle’s Memory, *Anna Thurston* 14

Growing Natives from Seed: Simple Seed Propagation Methods for Native Plants,
Bridget McNassar 16

Lily Leaf Beetle: A New Invader That May Attack More Than Just Your Garden Plants,
Maggie Freeman and Chris Looney 18

Conservation and Climate Change, *Becky Chaney*21

Purple Mountain Majesties: How Will Climate Change Affect Mount Rainier’s Lupines?,
Meera Lee Sethi22

Salal: A Short Sketch of a Common Washington Shrub, *Frank Knight*.....23

Book Review: *Gardening with Native Plants of the Pacific Northwest* 3rd Edition, *Richard Olmstead*24

Have you Started Your Plant Life List?, *Walter Fertig*25

WNPS Annual Awards26

WNPS Fellow Award Renamed to Honor Art Kruckeberg27

Dr. Sarah Reichard Newest Fellow28

Washington Native Plant Society State Board Directory29



Narrow-leaved milkweed (*Asclepias fascicularis*),
photographed near Locke Lake in the Columbia Gorge National Scenic Area. PHOTO: MARK TURNER