

Douglasia



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WASHINGTON NATIVE PLANT SOCIETY

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



About This Issue

by Mary Johnson

When naturalist John Muir took off on one of his walking journeys, he carried a plant press with him. He collected, pressed, dried, and documented plant specimens wherever he roamed. These irreplaceable records of the plants and the world they inhabited at a particular moment in time live on in private collections, universities, and botanical gardens, and have even been found in the attics of Muir's descendants.

More than 100 years later, herbarium collections play important roles in advancing the study of taxonomy, geographic distributions, biodiversity, climate change, and more. The ability to now scan plant specimens to create digital herbaria is expanding access to these collections.

This issue of *Douglasia* takes a closer look at the world of herbaria, their importance, and the people who contribute to them, with a spotlight on the North Cascades National Park Service Complex Herbarium and the UW Bothell Herbarium. As you'll read, herbaria can also play a role in preparing a flora—a reference list of plants in a particular area. You'll even find information on creating your own herbarium.

In this issue's Plant Profile, David Giblin writes about snow buckwheat (*Eriogonum niveum*), possibly Washington's latest flowering native plant—or is it? If anyone knows of a native plant that blooms later than that, David wants to hear from you.

For those interested in the growing list of invasive plants in Washington State, you can learn about two plants being considered for the 2018 noxious weed list.

Plant and animal identification is getting easier thanks to apps that use deep learning, a branch of artificial intelligence. You'll read about three of these apps in the Tech Corner article.

Finally, as the Earth slowly tilts away from the sun and winter arrives, what better time to immerse yourself in an article about Washington's species of native strawberries and plan a late-spring hike next year to find and taste these sweet morsels.

Enjoy these articles and more in this issue of *Douglasia*.



On the cover:

Tim Stetter (l) and Steve Hahn (r) pressing specimens on the flank of Black Peak in 2008 as part of a botanical inventory of North Cascades National Park coordinated by the University of Washington Herbarium at the Burke Museum and the National Park Service. PHOTO: LILY HICKENBOTTOM

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Pamela Camp
Tom Corrigan**
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* 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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Email submissions to Douglasia@wnps.org.

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President's Message: The View from Here

What's Next?

by Clay Antieau

Dear Fellow WNPS Members,

I recently engaged in a group discussion on the future of salmon in the Pacific Northwest. This meeting triggered introspection that, truthfully, left me shaken. Despite many decades of expensive and extensive restoration and conservation efforts, the long-term and short-term trends in Northwest salmon populations are downward. The road to salmon recovery has been, and continues to be, burdened with contention. Meanwhile, the crucial policy drivers underpinning successful salmon recovery go unaddressed: human population growth in Cascadia, unrelenting economic growth, and climate change. The forecasted increase in the human population of Salishland in this century alone is staggering. These numbers and trends do not portend well for the future of salmon—or our wolves, our forests, our grasslands, or Washington's biological heritage in general.



Clay and his dog, Kona, at the channeled scablands of Escure Ranch, Whitman County, Washington. PHOTO: NAOMI CHECHOWITZ

For me, this may be my biggest personal and professional challenge: to feel encouraged that the work I, WNPS, and others are doing matters in the long run.

Despite the conflict I feel over the past and future prospects affecting my Northwest home, I remain positive about the fate of Washington's natural heritage. This is due largely to notable improvements in the cross-discipline integration and use of science, and societal trends toward deeper understandings in biology and ecology. Stronger public appreciation of the science underlying the natural world allows all of us to do our jobs more successfully. These dynamics are producing more multidimensional and multifunctional landscapes beneficial to humans and many other species—and that's energizing.

WNPS has had a role in this. Its citizen scientists have created an important legacy of more than 700 plant lists that document plant diversity throughout the state. Our WNPS Native Plant Stewards have gone forth to spread the word and do many good deeds in the restoration and conservation of native plants and their habitats. Our public programs reach an amazing number of people.

WNPS is much the same as it was when I did my first tour of duty as president in the early 1990s—although more complex. Even some major issues are the same: Mountain goats in the Olympics! Looking back over the last three years and reviewing my performance as president, once again I seek evidence that I've led well. Indeed, we carefully worked through numerous and challenging human resource and financial issues, we've begun to diversify the board of directors, we're thinking creatively about how to use our communication and publication dollars, and we've engaged technological tools that have improved our business systems and enhanced how we interact with the public and our members.

As I step away from my role as president, I want to thank the WNPS leadership team and members of the various executive committees for your dedication to this organization. In particular, I express appreciation to directors Rob Smith, Gary Smith, Bill Brookreson, and Don Schaechtel. They've made this job easier through generous sound advice and significant professional contributions. Finally, I found much joy in working with WNPS staff over these years. Denise Mahnke, Elizabeth Faircloth, Barbara Harrell, Elizabeth Gage, and Barrie Moss—you've taught me much and I'm thankful for the paths we've shared.

I wish Don Schaechtel good luck as he takes on the role of president. WNPS will be in good hands! To all members of WNPS, my hope is you feel encouraged—as I do—that the work you, WNPS, and others are doing matters in the long run—even in the face of a dramatically different and uncertain future. I and my dog, Kona, wish you the best and a life filled with native plants and perpetual discovery!



Dorothy and Ralph Naas: The Amateur Botanists Who Created a Herbarium Collection

by Kathy Murray

Without the passion of a husband and wife collecting team, Dorothy and Ralph Naas, the North Cascades National Park Herbarium (international designation NOCA) would have a far smaller collection.

Although neither was an academically trained botanist, the Naases made some 6,000 plant collections—an enormous undertaking that required many steps after finding and identifying each plant. Plants were dug, roots cleaned, and locations and elevations recorded. Once they had the plants at their home, they pressed each specimen, made labels, and mounted each on acid-free herbarium sheets.

Dorothy was a graduate of Sultan High School. Ralph was from Skykomish. They married in 1933 and settled in Oak Harbor in 1942, where Ralph worked for the construction



Dorothy Naas identifying a plant on Lopez Island circa 1995. PHOTO: PAM CAMP

company that built the naval air station. Twenty-two years later he retired as the base civil engineer. Dorothy was a bookkeeper for Columbia Valley Lumber until she retired in the late 1950s.

After Dorothy took a University of Washington extension course in taxonomy in the 1950s, the couple began collecting plants and creating herbarium sheets. She expanded her knowledge with classes at Skagit Valley College, the University of Oregon, and through correspondence courses, but she never considered herself anything but an amateur botanist. She also received training from George Douglas, a Canadian plant ecologist.

As far as their collecting partnership went, Ralph told an interviewer in 1989, “All I do is dig the plants.” He was also the driver.

Pam Camp, WNPS Fellow and retired Bureau of Land Management botanist, knew Dorothy well. She said Dorothy told her that she and Ralph had been up every valley and on every mountain (accessible) in the North Cascades and adjacent areas cataloging plants for the park. “She had a keen eye and attention to detail that showed in her work.” Pam and others also remember the beauty of Dorothy’s herbarium sheets.

Pam said she lost track of Dorothy for a few years “until I ran into her in 1992 at an Elderhostel retreat at Holden Village.” Ralph had died, ending her active collecting, as Dorothy didn’t have a driver’s license and never had learned to drive. Pam added: “I thought she was too good a botanist to ‘retire’ so I asked if she would volunteer to help catalog and collect plants on BLM lands in the San Juan Islands (Lopez Island). She and her friend Mildred Arnot (who drove) volunteered and collected for three or four years. Mildred, a retired accountant, volunteered at the WTU herbarium and was especially interested in mosses. At that time Dorothy was in her 80s and Mildred in her 70s. Dorothy was petite and frail-looking to my eyes, and



Specimen sheet of slender cinquefoil (*Potentilla gracilis* var. *permollis*), NOCA 8587, created by Dorothy Naas. PHOTO: SAMANTHA RICHERT

I initially was a bit concerned about some of the steep hiking areas on Chadwick Hills. My worry was needless as Dorothy was a tough and seasoned hiker who scaled the steepest parts with relative ease.”

In 1990 the National Park Service dedicated the North Cascades herbarium as the “Naas Herbarium of Vascular Plants” to honor the Naases for their 20 years of collecting for the park and also nominated them for a national Take Pride in America award, which they received the following year. In support of their nomination, North Cascades Park Superintendent John Earnest noted the Naases had “donated over 10,000 hours to the collection of plants for scientific and lay study.” Their efforts resulted in NOCA having 5,400 specimens of more than 1,700 different species, all from the North Cascades ecosystem—the most species of any national park herbarium.

The 33-acre Naas Prairie on Whidbey Island near Ebey’s Landing National Historical Park also honors the Naases. The prairie, part of the larger Admiralty Inlet Natural Area Preserve, protects the golden paintbrush (*Castilleja levisecta*), a plant that Dorothy discovered on the site. *Castilleja levisecta* is threatened in Washington as well as federally listed.

The Naases joined WNPS in 1977. Ralph died in 1991 and Dorothy in 2005 at age 89. They were married 58 years. Their devotion to native plants remains a gift for researchers and native plant lovers alike.

David Giblin, collections manager of the University of Washington Herbarium (WTU), estimates the Naases collected more than 6,000 specimens between 1960 and 2002. Of those, the vast majority are at NOCA; 578 are at WTU, and 535 are in the Pacific Northwest Herbarium at Western Washington University. There are also 277 specimens at the Marion Ownbey Herbarium at Washington State University. All these specimens are available at the Consortium of Pacific Northwest Herbaria online database (www.pnwherbaria.org/data/search.php). The specimens at NOCA are not yet available online.

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Kathy Murray is a retired technical editor. She joined WNPS in 2004 and chaired the WNPS Editorial Board from 2007 to 2016. She is active in the Salal Chapter and writes occasionally for Douglassia.



North Cascades National Park Service Complex Herbarium

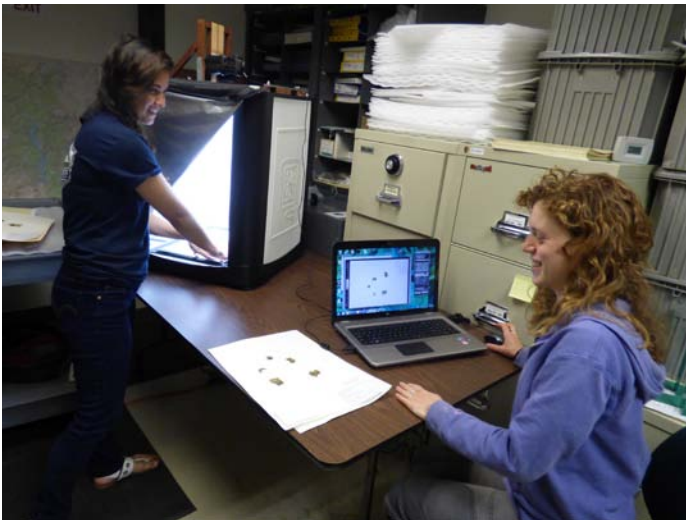
by Samantha Richert

The earliest specimens in the North Cascades National Park Service Complex Herbarium (NOCA) date to 1970, when Dorothy and Ralph Naas began a decades-long journey of collecting, as volunteers, in the newly designated park lands. The Park Complex manages North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area. As a result, the herbarium includes specimens of vascular plants, lichens, mosses, and fungi from all four biomes of the Cascade Range: temperate rainforest, subalpine, alpine, and ponderosa pine ecosystems. The Naases prepared and identified approximately half of the 9,000 specimens in NOCA park units. Their checklist, field notes, and maps are preserved in the Park Complex’s archives. In 1990 Dorothy and Ralph received national recognition from the US Department of the Interior for their exceptional dedication to documenting the gorgeous biodiversity of the North Cascades.



Samantha Richert, museum curator, North Cascades National Park, and intern Jacqueline Meyer, environmental studies student at the University of Central Florida, with a herbarium specimen sheet. All sheets are maintained in climate-controlled conditions. PHOTO: KATHY MURRAY

In 2002 botanists from the University of Washington Herbarium (WTU) began a series of forays that resulted in increasing the collections for both NOCA and WTU. These forays often included park research staff and always resulted in



Interns Jacqueline Meyer and Eve Bernhard digitizing herbarium specimens. PHOTO: NATIONAL PARK SERVICE

duplicate specimens, with one specimen stored on long-term loan to WTU and the matching specimen retained by NOCA. NOCA is largely stored at the Marblemount Curation Facility close to the west entrance of the park. Due to the difficulty of accessing Marblemount from the east side of the park, a series of reference specimens is also kept at the Golden West Lodge for use by staff in Stehekin.

The NOCA herbarium supports the plant-based resource management activities of the park, including monitoring the after-effects of forest fires, the health of the park's subalpine and forest plant communities, native plant revegetation efforts, and invasive plant control. The collection is also available for consultation by researchers as well as the general public. Because the collection is funded and maintained by the National Park Service, whose mission is to preserve natural and cultural resources for the "enjoyment, education and inspiration of this and future generations," park staff strongly believes that the resource should be available to all.

The curation facility is in a remote location, so meeting the goal of open access to the collection can be difficult. To address

the issue, in summer 2017 we began working toward including the collection on the Consortium of Pacific Northwest Herbaria website (www.pnwherbaria.org). The first step was digitizing the vascular plant collection at Marblemount.

This project has been a true partnership effort. WTU provided the digitization equipment and technical support. An intern to assist with the project was funded by the North Coast and Cascades Network Research Learning Center, which is a National Park Service function that supports research and public science communication. The NOCA Revegetation Program lent high school student workers and college interns to help with the hands-on digitization process. This crew of students worked with the NOCA museum curator to image 8,600 vascular plant specimens and another 1,000 specimens from the San Juan Island National Historical Park Herbarium. The high-quality specimen images and their accompanying label data will be available on the Consortium website later this fall. Lower quality but more easily browsable images will be available at the National Park Service Web Catalog, which features museum collections from across the National Park Service (<https://museum.nps.gov>).

The NOCA herbarium also includes approximately 2,700 lichen, fungi, liverwort, and bryophyte specimens that have not yet been imaged. We would like to make these collections available online as well and are looking for volunteers with macro photography experience and camera equipment that are interested in working on the project. If you are interested in volunteering to image the nonvascular collection or would like a tour of the collection, contact Samantha Richert (Samantha_Richert@nps.gov, 360-854-7343). If you contact her by phone, be aware that the Marblemount phone lines can be erratic, and phone messages can be difficult to understand.

Samantha Richert has a master's degree in museology (museum studies) from the University of Washington and began working for the National Park Service in 2009. She is the curator of the North Cascades National Park Museum.



The vegetative mapping team examining *Carex* specimens prior to fieldwork. PHOTO: NATIONAL PARK SERVICE

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Personal Plant Collections — A Home Herbarium Contributes to Knowledge and Inspiration

by Pam Camp

A herbarium at home has become a source of much personal pleasure as well as a labor of love. What started as a reference collection, used when I worked on projects where access to a university or regional collection was limited, has turned into a collection of about 2,000 specimens housed in the four herbarium cabinets I maintain at home. I collected most of these specimens in Washington, where I worked as a botanist for 30 years, while others come from six other Western states and British Columbia.

My botany career started when my passion and curiosity about plant biology was ignited by Professor Art Holmgren through a plant taxonomy class at Utah State University. The field outings, where he introduced us to a diversity of plants and entertained us with engaging stories about plant behavior and ecology, and the microscope lab work, where we explored the subtle complexity and beauty of the flower parts, hooked me on a whole new world to explore. As a work-study student in the Utah State University herbarium, I learned not only the importance of herbarium collections, but also how to process dried pressed plants into archival herbarium specimens.

Although I earned both a BS degree from Utah State University in 1979 and an MS degree from the University of Nebraska in 1990, my mastery of the art and science of identifying plants came mainly from years of field collecting and identification work.

My first collections were from remote areas of Colorado and Wyoming in 1976. I was employed for the summer as part of a field crew looking at the plants and animals on land being considered for oil shale development.

During the summer of 1977 and spring of 1978, I was employed to document the flora of the southern part of Capitol Reef National Park in southern Utah. During the summer of 1978, I collected plants in Albion Basin, outside of Salt Lake City while working for the US Forest Service.

Over those three summers, I collected and processed over 800 plant species, specimens of which were deposited in the herbaria of both Utah State University and the National Park Service. Some leftover duplicates were salvaged and became the start of my personal herbarium—an approach to field work that stayed with me through the years.

In 1979, I moved to Spokane to start work as a botanist for the Bureau of Land Management (BLM). This was a new position for the district, and my initial focus was on creating a reference set of herbarium specimens. Several summers were spent starting those collections, which are part of the BLM collections now housed in Wenatchee. I donated duplicate specimens to the Washington State University and University of Washington herbaria, along with some of my own personal collections.

As my job became more supervisory and administrative, collecting days became more and more limited. It was during these years that I started collecting on vacations and travels in other regions. My objectives shifted slightly to target more comprehensive collection of particular taxonomic groups such as milk-vetch (*Astragalus*), composites (*Asteraceae*), and buckwheat (*Eriogonum*), and filling in informational gaps about plant ecology and distribution.

Since 2009, when I retired from the BLM, I have continued collecting and curating my personal plant collections. For me this is a labor of love, driven by curiosity and my ongoing desire to contribute understanding about our native plants.

Pam Camp worked as a botanist for the Bureau of Land Management primarily working with rare and endangered plants and community restoration. She retired in 2009 after 30 years. She became a WNPS fellow in 2016.



Specimen of hot-rock penstemon (*Penstemon deustus*) from Pam Camp's personal herbarium. This is a duplicate specimen that Pam donated to the University of Washington Herbarium, Burke Museum. The specimen label information and image are available online as part of the Consortium of Pacific Northwest Herbaria database (www.pnwherbaria.org). PHOTO: COURTESY OF THE UNIVERSITY OF WASHINGTON HERBARIUM

UW Bothell Herbarium: Humble Roots, But You Have To Start Somewhere

by Sarah Verlinde

The University of Washington Bothell Herbarium provides a record of plants occurring in the campus wetland and north King and Snohomish Counties. As the vegetation changes through time in the wetland, this herbarium will form a reliable record to help researchers understand biological and habitat changes in one of our region's preeminent floodplain restoration projects.

"You do what?" This is the usual question someone asks me after I tell them what I enjoy most about my job. "What is that?" and "Why?" are usually the next two questions. I love it when people ask me questions related to our native plants.

I asked the same questions three years ago; I had no idea what a herbarium was, even though I grew up surrounded by plants, with one parent a landscaper and both parents master gardeners. I used homegrown herbs for medicine, made a



Tyson Kemper and Sarah Verlinde standing next to the UW Bothell Herbarium cabinet, with specimens and tools. PHOTO: MARC STUDER

pressed tree collection for a class in junior high school, and worked as a florist for 15 years. But it wasn't until I was a junior in college (and in my thirties) that I first heard about the discipline of herbaria.

That fateful introduction came through Caren Crandell, a lecturer at the University of Washington (UW) Bothell, who incorporates a herbarium section into her wetland ecology class and teams with Tyson Kemper, who manages the collection. It was during her class that I had a herbarium tour and was tasked with starting my own collection. Up to this point, I hadn't seriously thought about plants as a career and thought my days spent with flowers were long gone. I was more interested in the biological interactions with water quality. But the process of collecting, identifying, and preserving plants was challenging, detailed, and brought peace. I was hooked.

Tyson is the lead gardener at UW Bothell. He purchased a herbarium cabinet from wetland surveyors, who participated in the early part of the restoration process of the UW Bothell/Cascadia College North Creek wetlands. He moved the cabinet around campus, trying to keep it out of the way, and together with Caren inspired students to contribute specimens. When the Sarah Simonds Green Conservatory was completed in 2013 next to the wetlands, the cabinet finally had a home.

During my senior year at UW Bothell, I decided to work on the herbarium collection as an independent project. At the time, the cabinet was pretty empty—my inventory revealed about 100 specimens collected over 10 years. With the help of a few friends, after three months we doubled that number. I had so many collections and so few presses. I had to make a large press (five-feet tall) that I could close by myself. I spent a few weeks training with Eve Richenbaker at the Otis Douglas Hyde Herbarium, a UW Seattle herbarium that focuses on collecting horticultural plants mostly from the Washington Park Arboretum. I especially enjoyed gluing specimens on the paper with the volunteer team, which consisted of four to six retired women who had been volunteering together for over 20 years. It was like being part of a sewing circle, but instead of stuffing cabinets full of quilts that you can never throw away, we were collecting beautiful scientific evidence. (By the way I'm a quilter and sewer, and after making about 25 quilts, I decided it was time to find a new hobby.)

After my key card for the lab expired almost a year later, I wanted to continue to volunteer, but there were legal and liability issues. So Carolyn Brennan, assistant vice chancellor of research, hired me for two hours a week so I could continue my work and also manage the small volunteer team. After six months and one herbarium tour with her, I was hired full-time



Volunteer Ashley Shattuck collecting cattails at Skagit Delta. PHOTO: CHRISTIE CALDWELL

at the Office of Research, where I help with grants administration AND continue to grow the herbarium collection and team.

Circling back to the initial questions, I like to describe a herbarium as a plant facility that functions as three things: plant lab, library, and museum—all in one. The preserved plants are stored in cabinets—at the UW Bothell Herbarium specimens are organized alphabetically, first by family, and then by genus and species. Once plants are preserved, the herbarium holds them in its collection indefinitely. Like a museum, the herbarium manages the specimens as historic records. Similar to a library, there is often one of everything, and researchers at herbaria across the globe can borrow specimens for research.

A herbarium also functions as a lab for students and researchers. Students can use the specimens to help improve their plant identification skills and as an extension to their classroom learning. Scientists can use the samples for taxonomic studies, often using plant tissue to extract DNA and protein samples. At UW Bothell there are faculty who are ecologists but studied in other parts of the country. When they arrive on campus and start teaching a class in the wetlands, the collection is there for them to use and learn about the local flora.



Plant press. PHOTO: MARC STUDER

The collection may be small now, but I have big plans. I recently connected with the University of Washington Herbarium (WTU), where David Giblin and Ben Legler helped us set up an online database. The entire collection will be online and photographed, hopefully by the end of fall. The UW Hyde Herbarium donated 30 cases of specimens this year, which should bump us into the low thousands when we finally get through them all. Later this year, we are going to apply to be recognized as an official herbarium with the Index Herbariorum, an international directory of 3,400 herbaria managed by the New York Botanical Garden.

My favorite part of the program is working with the volunteers. Every Saturday morning, rain or shine, an amazing team arrives to contribute to the herbarium. When people ask me if herbaria are dead, I usually reply, “No, they’re just not well funded.” I know these students and volunteers are not coming out to hang out with me on a weekend morning, but I found there is something valuable in the process. Because of this value, I don’t think the discipline will ever die.

I try to tailor the program to the needs of each volunteer. When one of my students needed a challenge, I had him collect a grass for his first collection. We had to trek down to WTU to compare specimens because we didn’t yet have the species in our collection. He’s still with us a year later so I didn’t scare him off, and not surprisingly we are working on a grass project together.

Tours are always provided, donations are welcomed, and most of all, volunteers are needed. If you are a WNPS Native Plant Steward surveying in North King County or Snohomish County, we want to partner with you and house some of the plants you find.

Sarah Verlinde is a launch specialist working with new programs, centers, and grants administration at the UW Bothell Office of Research. You can contact her at severlin@uw.edu and 425-352-3795.



Pacific ninebark (*Physocarpus capitatus*) collected from the UW Bothell restored campus wetlands. PHOTO: SARAH VERLINDE

Classes at UW Bothell such as Pacific Northwest Plants, Plant Ecology, and Ecological Methods also use the herbarium. Our undergraduate students engage in research as soon as we can plug them in. The herbarium is a great place to start their hands-on learning. In addition to science classes, we have history, art, and even video game design classes that tour the herbarium.

The Flora of Oregon: The Role of Herbaria in Preparing Floras

by Linda Hardison

Imagine one room that contains all the plant diversity of a vast region—a space filled with the inhabitants of rocky mountaintops and boggy estuaries, delicate fern fronds, and rugged pine cones. Visitors to this room can take a journey not only through space, but also time—touching flowers that blossomed over a century ago in meadows now claimed by urban development.

This magical room is, of course, a herbarium. Part museum and part library, a herbarium is a collection of dried pressed plants, each preserved on a sheet of archival paper and typically accompanied by information about the specimen's source. A herbarium may focus deeply on a particular geographic area or broadly with collections from every continent. The specimens collectively provide an account of a region's plant life and serve as a portal to understanding the natural history of that place.

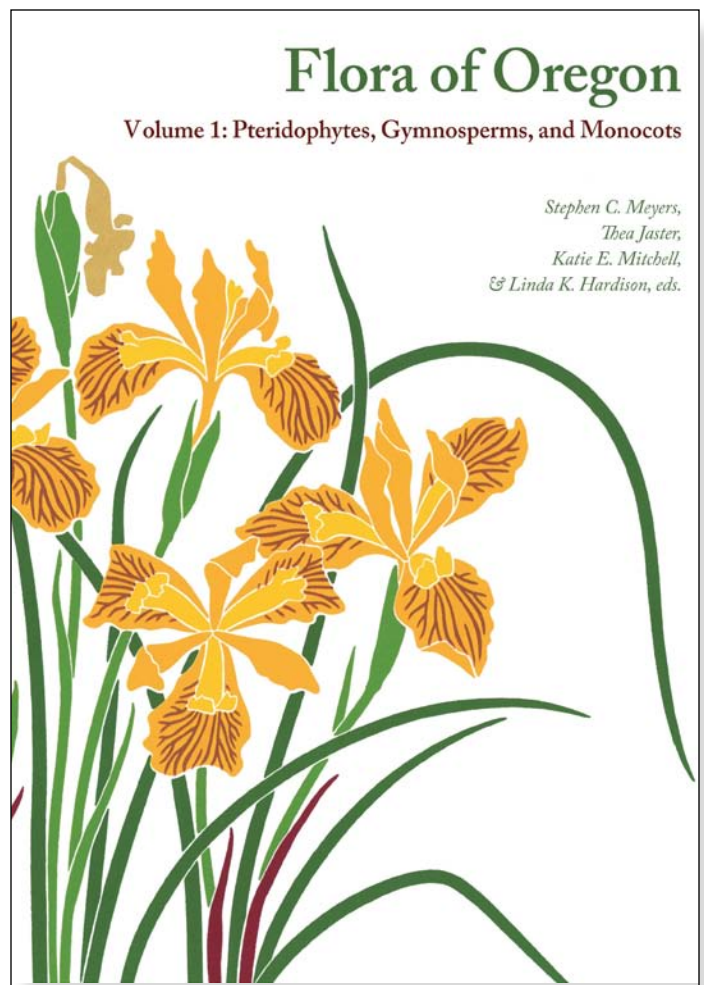
A guidebook is needed to fully appreciate and apply this treasure of information; floras serve this role. A flora is a comprehensive reference about the plants of an area—itemizing the species that occur there, describing each one in detail, and providing a means to identify them. A flora also provides the context in which the plant species occur by describing their habitat, ecology, and distribution.

Herbaria and floras are synergistic. The raw material of a flora is the information obtained from herbarium specimens and the details on their labels. Through the process of writing floristic treatments, specimens are carefully examined, their identification confirmed, and nomenclature (scientific names) updated. These curatorial steps ensure that the latest scholarly research is reflected in the identification of each specimen examined. This in turn strengthens the value of the herbarium to all users.

Oregon's Herbaria and Flora

The catalyst for preparing a new flora for the state of Oregon was the closing of the University of Oregon Herbarium (ORE) in 1993 and the subsequent merging of the estimated 110,000 sheet collection with that of the OSU Herbarium (OSC). Aaron Liston, director of the herbarium, hired the late Scott Sundberg to manage this formidable task. Sundberg, an Oregonian who had botanized throughout much of the state, had long wanted to prepare a flora to update Peck's 1961 *A Manual of the Higher Plants of Oregon*. He saw the herbarium integration as his opportunity, as a personal initiative outside his employment for the integration task, to embark on such a project.

With the merger of the ORE and OSC collections, OSC became the state's most comprehensive collection of Oregon specimens. Additionally, as integration proceeded, every herbarium sheet would be examined. Sundberg used this process



Volume 1 of the *Flora of Oregon* has been published. Volumes 2 and 3, comprising approximately 3,620 dicot taxa, will be published in summer 2018 and 2020, respectively.

as an opportunity to evaluate which species had been collected and to note which plant groups needed curation. Preparation of a new *Flora of Oregon* had begun and the Oregon Flora Project (OFP) was formed to achieve that monumental goal.

Flora of Oregon—The First Step

The first step in preparing a flora was straightforward: develop a checklist of the species, subspecies, and varieties (taxa) that occur in the state. Sundberg connected with botanists throughout the state and with the Native Plant Society of Oregon to assemble existing species lists for given areas. Comparing these lists to the herbarium collections served to confirm the list entries and to document taxa that were not included.

The *Flora of Oregon* covers the approximately 4,670 native and naturalized (that is, nonnative) vascular plants of the state that grow outside of cultivation. Therefore, each taxon (a species, subspecies, or variety; plural, taxa) must be confirmed as having established itself in the wild. Herbarium records tell us which taxa historically have been observed and collected, but more current records require documentation from multiple observations and sources to confirm that a taxon is not a waif (a nonnative documented but not persisting over the long-term) or an isolated plant that escaped from cultivation. A concurrent

search of literature, herbarium records, and unvouchered observations is done to assess whether a taxon is native or exotic.

The final—and the most complex—element of creating the Oregon Vascular Plant Checklist is to clearly define the taxonomic concept (the suite of characteristics and information that define a taxon) and nomenclature for each taxon. The OFP tracks plant nomenclature in nine primary floras (our “standard references”) whose treatments cover Oregon. We link all synonyms (different published names for the same taxon) from these references to the accepted scientific name and further indicate discrepancies or partial overlap in designations for a taxonomic concept.

The task of developing the checklist proved to be a demanding and rigorous process that was not completed until 2010. The result is an up-to-date assessment of the plant taxa that

from the Bureau of Land Management in 2001 launched a project to database a specimen record of each taxon from each Oregon county. This substantially expanded the initial databasing efforts of OSC and was the initial data set for the Oregon Plant Atlas.

The OFP chose to not limit its flora-writing initiative to paper books. The OFP website (<http://oregonflora.org>) became an equally important way to present our floristic data. Locality information is georeferenced and presented in an interactive mapping tool; color field photographs convey plant habits and habitats to augment line drawings and herbarium specimen images.

Our redesigned Oregon Flora website, which will be launched in early 2018, uses a Symbiota relational database software platform to present a digital, interactive *Flora of Oregon*. Profile pages will present images, maps, and synonymy

Agoseris grandiflora* (Nutt.) Greene var. *grandiflora

Common names: large flowered agoseris

Origin: native

Voucher: OSC, most recently collected in 2010.

FN - 19:330, accepted, in Oregon; JPM2 - 235, accepted, in Oregon (implied).

Synonyms:

***Agoseris laciniata* (Nutt.) Greene**

FN - 19:334, synonym for *Agoseris elata*, in Oregon; PEK - 860, accepted, in Oregon (explicit)

***Agoseris plebeja* Greene**

FN - 19:330, synonym for *Agoseris grandiflora* var. *grandiflora*, in Oregon; PEK - 860, accepted, in Oregon (explicit)

***Agoseris grandiflora* (Nutt.) Greene var. *leptophylla* G.I. Baird**

Common names: big-flower agoseris

Origin: native

Voucher: OSC, most recently collected in 2011.

FN: 19:330, accepted, in Oregon, Published in *Sida* 21: 267. 2004; JPM2 - 235, accepted, in Oregon (implied); Plant Names Project, 2004-present - , given distribution: collected in Washington.

An example from the online Oregon Vascular Plant Checklist of the Oregon Flora Project, showing the two varieties, synonyms, common names, origin, and so on for large-flowered agoseris (*Agoseris grandiflora*).

have been documented to occur in the state, their nativity, their taxonomic circumscription, and their synonymy. It is updated annually and published on our website, <http://oregonflora.org/checklist.php>. The checklist provides the necessary foundation for a complete floristic treatment of the state and is a guide for curating the herbarium collections to reflect current knowledge.

A Digital Flora

It became clear to Sundberg that a robust database would be needed to manage the voluminous information that went into a floristic project. A relational database was developed in Paradox software, and Microsoft Access was used as a front-end (user interface) for data entry forms and querying tools. The organizing principle of OFP data is the taxonomic concept—regardless of the name it is given. Each concept is assigned a number and crosswalk tables link that number to the concept’s associated features. The OFP has outgrown several database platforms and currently manages data in a MySQL database while retaining the Access front-end.

With a suitable infrastructure in place, large-scale databasing of herbarium specimen label data became practical. Funding

for each taxon. A mapping module based on a geographic information system expands our ability to include other types of data (for example, soils, precipitation, and ultimately other organisms) in the analyses of plant distribution. Morphological character states of taxa, carefully parsed from existing *Flora of Oregon* treatments or recorded from specimens and the literature, drive a powerful interactive key, making OFP data more accessible and useful to a wider audience.

Through its capture, analysis, and synthesis of plant specimen data, OFP is an important partner of OSC. The OFP provides ready access to the information held within specimens and brings context to the information. Synergistically, the “guidebook” function this modern flora provides is built on the rich data set about Oregon’s plants that are stored in that magical room—the herbarium.

Linda Hardison is the director of the Oregon Flora Project and an assistant professor in the Department of Botany and Plant Pathology at Oregon State University. You can reach her at hardisol@science.oregonstate.edu.



Summer's Promise: Washington's Delicious Wild Strawberries (*Fragaria*)

by T. Abe Lloyd

Nothing is daintier in appearance and taste than wild strawberries (*Fragaria* – Rosaceae). They are universally recognized and relished. Even those terrified that everything in nature is out to sting, bite, or otherwise poison them, will stop to admire a patch of wild strawberries in a sunny glade and venture a taste. This article covers how to differentiate the species found in Washington and provides interesting notes on their history and traditional use.

About 24 strawberry species are found throughout the world, mostly in temperate climates in the Northern Hemisphere, but a variety of our coastal strawberry (*Fragaria chiloensis*) is also found in Patagonia. In North America, Oregon is the center of diversity, where five taxa are found. Here in Washington, we have three species and a naturally occurring hybrid.

The origin of the name “strawberry” is uncertain but theories include the practice of cultivating the berries on beds of straw or the straw-like appearance of the runners. I’ll even take the liberty to speculate that straw was used to floss the seeds from early harvesters’ teeth. The genus name *Fragaria* comes from the Latin *fraga*, fragrance, and *aria*, possession, referring to the sweet-smelling fruit.

The Species

Just like their garden relative, our strawberries spring from a perennial rootstalk each year and spread by runners or “stolons.” The leaves comprise three leaflets with saw-toothed margins, and the flowers have five white or sometimes pinkish petals surrounding 20–25 yellow stamens and numerous yellow pistils. To distinguish the species, pay close attention to the color, shape, and texture of the leaves, and the height and number of flowers or fruit per inflorescence.

In writing these descriptions, I drew heavily from published species descriptions, keys, and figures, including the WTU Image Collection, *Flora of the Pacific Northwest* (Cronquist and Hitchcock 1973), and Kim Hummer’s article, “The Discovery and Naming of the Cascade Strawberry” (Hummer 2015). I tested these features against several years of observing the species in the wild. In an effort to help the forager as much as the botanist, I emphasize features that are discernible when the plants are in fruit.

Beach strawberry (*Fragaria chiloensis*) has thick, glossy, dark green leaves that bulge upward between the lateral veins. The leaves also have a netlike pattern of fine veins. The stolons, petioles, and leaf stalks are all usually reddish and hairy. The middle leaflet has a distinct stalk, and the end of the leaflet is truncated abruptly, giving it a flat or broadly curved outline such that the terminal serration is usually smaller than the



Beach strawberry (*Fragaria chiloensis*) plant (top) and fruit (bottom).
PHOTO: T. ABE LLOYD

serrations on either side. Plants usually hug the ground closely in compact units, with flowers that are about the same height as the leaves. The seeds (achenes) are partially sunken into the fleshy receptacle and usually have persistent styles. Like the name suggests, beach strawberries are always found in close proximity to the ocean from Alaska to Chile.

Chilean specimens were the first to be collected by Europeans in an interesting case of government-sponsored plant theft. In 1712, the French explorer Amédée-François Frézier landed in a Spanish-controlled port in Chile to spy on their operations. After mapping their defenses, he spotted large fruited strawberries being cultivated by the Spanish and made off with five plants, which were later planted in France. The fruit, Frézier exclaimed, “are usually as large as a whole walnut, and sometimes as a small egg” (Sturtevant 1919). Perhaps it was destiny because Frézier’s last name is derived from the French word “fraisier” for strawberry!

Even though it was 113 years later, the early Pacific Northwest botanist David Douglas similarly characterized *F. chiloensis* as “large and very fine” fruit that “may be found to be worth cultivating” (Douglas 1914).

Virginia strawberry (*F. virginiana*) leaves are the same shape as *F. chiloensis* (stalked terminal leaflet that is truncated on the tip and a terminal serration that is smaller than the neighboring serrations). However, *F. virginiana* leaves are thin,



Virginia strawberry (*Fragaria virginiana*) in flower. PHOTO: T. ABE LLOYD

blue-green to light green, and do not bulge between the lateral veins. In addition, the stolons, petioles, and flower stalks are generally green instead of red. Flowers are about the same size as *F. chiloensis* (slightly smaller to the practiced eye), and are also on stalks that are about the same height as the leaves, but are often borne on a branched inflorescence with several other flowers (versus singly on *F. chiloensis*). The fruit are difficult to distinguish from *F. chiloensis*, being of the same size and shape. They also have the same habit of holding their seeds in slightly sunken hollows of the receptacle, but they have deciduous styles, and like the flowers, are often borne on a branched inflorescence with other strawberries. *Fragaria virginiana* is more common in the mountains and east of the Cascades crest where they grow in open woods. However, they are also found in lowlands west of the Cascades crest, such as in the San Juan Islands and Puget Trough prairies.

Garden strawberry (*F. × ananassa*) is a hybrid of *F. virginiana* and *F. chiloensis*, two species with similar features and an overlapping range in some areas. This vigorous cross was the original ancestor of most cultivated strawberries worldwide. The leaves are not quite as thick, shiny, and dark green as *F. chiloensis*, but they do bulge slightly between the lateral veins and may have reticulate venation. I identify *F. × ananassa* by the combination of the following two features: leaves that look like *F. chiloensis* but with a branched inflorescence like *F. virginiana*.

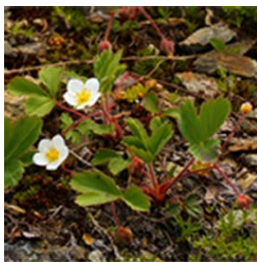
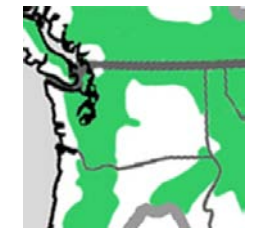
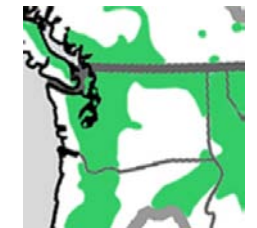
Woodland strawberry (*F. vesca*) has thin, light green leaves that bulge prominently between the lateral veins. The terminal leaflet is barely stalked and narrows to a distinct point such that the terminal serration usually extends further than those adjacent to it. Flowers are generally half as wide as *F. chiloensis* and are found on branching stalks that are longer than the adjacent leaves. The achenes are attached superficially on



Garden strawberry (*Fragaria × ananassa*) plant (top) and fruit (bottom). PHOTO: T. ABE LLOYD



Woodland strawberry (*Fragaria vesca*) plant (top) and fruit (bottom). PHOTO: T. ABE LLOYD

Strawberry Conspectus					
		<i>Fragaria chiloensis</i>	<i>Fragaria virginiana</i>	<i>Fragaria</i> × <i>ananassa</i> (<i>F. virginiana</i> × <i>F. chiloensis</i>)	<i>Fragaria vesca</i>
LEAVES	Tip of terminal leaflet	Equal to or shorter than adjacent serrations	Equal to or shorter than adjacent serrations	Equal to or shorter than adjacent serrations	Longer than adjacent serrations
	Upper leaf surface	Dark green, leathery , shiny, hairy around the margins; slightly bulged between lateral veins	Green to blue green, thin, rarely hairy; not bulging between lateral veins	Dark green but not usually shiny; bulging between veins intermediate	Light green, thin, sparsely hairy; strongly bulged between lateral veins
	Lower leaf surface	White, strongly hairy, reticulate veins	Light green, strongly hairy	White, strongly hairy, faintly reticulate veins	Lighter green, hairy
	Petiolule (stalk)	Terminal leaflet on short petiolule	Terminal leaflet on short to long petiolule	Terminal leaflet on short to long petiolule	Three leaflets come together at one point
					
FLOWERS	Flower size	Large (12–16 mm)	Medium to large (11–15 mm)	Medium (10–14 mm)	Small (6–11 mm)
	Inflorescence	Unbranched , but multiples may arise from the base of each plant; flowers at or below the top of leaves	Branched; flowers at or below top of leaves	Branched; flowers at or below top of leaves	Branched; flowers above leaves
					
FRUIT	Fruit	Calyx erect; achenes sunken into receptacle; fruit spherical	Calyx erect; achenes sunken into receptacle; fruit spherical	Calyx erect; achenes sunken into receptacle; fruit spherical	Calyx spreading ; achenes perched on receptacle; fruit usually pointed on tip and longer than wide
					
HABITAT/RANGE	Habitat	Coastal areas	Subalpine west of the Cascades crest and open woodlands east of the Cascades crest; becoming coastal in southern Oregon and southward	Where ranges overlap or in landscaping	Open woodlands
				Not applicable	

the fleshy receptacle and usually have persistent styles. Plants have a tall, lanky appearance and spread aggressively by runners. *Fragaria vesca* is common in moist woodlands at low- to mid-elevations, chiefly west of the Cascades crest in Washington but requires ample sun to produce fruit. The species epithet *vesca* is a Latin word that means “thin and tapering,” which aptly describes the leaves.

Harvest and Preparation

Harvesting wild strawberries is usually a surprise affair. For example, in late May last year I was biking down a country road with my car-free Ski to Sea relay team on our way home from a prerace campout. We were traveling slowly because of the canoers, who were towing their canoe on a bicycle trailer, and I was studying the roadside for tiger lilies (*Lilium columbianum*), which are hard to spot before they flower. The spring air was warm, and we were content to coast, chat, and dream of the ice cream stand a few miles ahead. That’s when Matt shouted “STRAWBERRIES!” We slammed on the brakes and fell to our knees on the mossy roadside. There they were, perfect jewels of scrumptiousness scintillating in the sun. What they lacked for in size, they made up for in flavor, and oh, they smelled SO good.



Even when naturalized, garden strawberry (*Fragaria × ananassa*), the hybrid between beach strawberry (*F. chiloensis*) and Virginia strawberry (*F. virginiana*), can still be a good producer. PHOTO: T. ABE LLOYD

I’m at a loss to recommend much in the way of technique, other than to say that two taste better than one, and a handful will make you smile in your sleep.

Fragaria vesca separate easily from the hypanthium (structure formed by the fusion of sepals, petals, and anthers), but *F. chiloensis* and *F. virginiana* need a delicate pinch between the thumbnail and forefinger to free them.

Fragaria chiloensis and *F. vesca* usually ripen from May to July and *F. virginiana* ripens about a month later.

Ethnobotany

All of our strawberry species are prized fruit eaten fresh by every indigenous culture in the Pacific Northwest that shares

the plants’ extensive and overlapping ranges. These plants have names in all of these languages, but where multiple species are found within a cultural area, they are recognized as different types but referred to by a single name. Though small, delicate, and juicy, they were dried for future use by the Puyallup, Nisqually, Skokomish (Gunther 1973), Upper Skagit (Theodoratus 1989), Nlaka’pamux (Teit 1930), and possibly the Blackfoot (Johnston 1970). Reagan (1934) summarizes the importance of strawberries to the Quileute and Hoh, who “highly prize this berry and annually scour the whole country for it. It is eaten raw and also stewed.” It was preserved by wrapping the fruit in skunk cabbage leaves and burying in a swamp.

Beyond food, the leaves are harvested in late spring and brewed into a sweet tea by many indigenous groups. A decoction of the leaves is also a traditional diarrhea remedy, and the powdered leaves are a common disinfectant. Long ago, the Nlaka’pamux occasionally placed the leaves in their armpits as a deodorant (Teit 1930).

The cultural significance of strawberries is deeply embedded in a few indigenous languages. For example, the fifth month in the Shuswap calendar (Palmer 1975) and seventh month of the Stl’atl’imx calendar (Turner 1992) are named after strawberries, and the Klallam sometimes used their word for strawberry as a term of endearment (Fleisher 1980).

Among a few groups, such as the Nuxalk, strawberries are especially prized among children (Turner 1973). No wonder, since with their keen eyes, low stature, and constant curiosity, kids are perfectly engineered strawberry monsters.

Strawberry plants require sunlight to set fruit, and in forested environments they grow well after fires have opened up the canopy. The Coast Salish (Turner 1999) and probably others, burned patches every few years, which stimulated fruit production and likely kept out trees.

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Plant Collecting

by Joe Arnett

(Editor's note: The following article has been adapted from *A Botanical Primer: A Systematic Introduction to Vascular Plant Identification* by the author.)

People who are aware of the vulnerability of nature are conservative about collecting plants, and this is a good thing. There are many areas, especially in parks and on private land without permission, where collecting plants is inappropriate or illegal. Collecting is especially inappropriate if the plant is vulnerable because of its rarity.

That said, collecting specimens is a fundamental part of studying plants, and herbarium specimens comprise the most rigorous documentation of the presence and distribution of species. Often there is not enough time in the field to identify every species that is seen, and collection allows the option of looking at a plant again later, perhaps even with the advantages of a dissecting scope or a herbarium full of specimens for comparison. The best description is no substitute for looking at the plant itself; this is evident to anyone who has tried to identify a plant from a description or work through a technical key from memory or notes. Properly prepared and mounted specimens with all parts of the plant intact are best, but even a leaf between the pages of a book or a sprig of an unknown plant stuck in an envelope and dried is quite durable and can convey a great deal of information. A specimen that is properly dried and stored can eventually be added to a herbarium and reexamined many years after it is collected. However, a plant placed in the refrigerator in a plastic bag, with the intention of identifying it later, will likely last only a few days before it turns to black mush. I speak from experience!

The first step in making a useful collection is to take notes: it is essential to record the date and location of a collection, preferably on the paper in which it is pressed. Unlabeled specimens generally end up in the trash. My experience supports the old saying that “a little faded ink is better than the best memory.” Other details that cannot be determined later from the dried specimen may also be useful—things like flower color, which may change during drying, or habitat characteristics and associated species.

The best specimen is morphologically representative of the population it was collected from and includes reproductive structures, such as flowers or fruit in flowering plants, cones in gymnosperms, spores in ferns, and strobili in fern allies (for example, horsetails). Herbarium specimens of herbaceous plants generally include the whole plant, and some species cannot be readily identified without the roots. However, taking only a portion of a plant may be more appropriate under some circumstances, leaving the plant alive and in place. The collector needs to exercise discernment and use the digging tool only

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Specimen sheet of woodland strawberry (*Fragaria vesca* var. *bracteata*), WTU-V-019613. PHOTO: CONSORTIUM OF PACIFIC NORTHWEST HERBARIA

Malta Starthistle (*Centaurea melitensis*) and Small-Flowered Jewelweed (*Impatiens parviflora*) under Consideration for the 2018 State Noxious Weed List

by Wendy DesCamp

Every year the Washington State Noxious Weed Board updates the state noxious weed list. These updates can include additions, removals, and reclassifications of already listed species. For the 2018 noxious weed list, the proposed changes will be voted on at the November 2017 State Weed Board meeting, after a public hearing, and will take effect January 1, 2018.

A number of plants are being considered for addition to the 2018 list. Two of the species are the Malta starthistle (*Centaurea melitensis*) and small-flowered jewelweed (*Impatiens parviflora*). These nonnative plant species are causing concern among land managers, are invasive in other states, and have established populations in Washington.

Centaurea melitensis

Centaurea melitensis is an annual starthistle in the Asteraceae (composite family) that begins as a basal rosette of lobed leaves, with the terminal lobe usually the largest and rounded at the tip. Stems can grow up to one meter (3.3 feet) tall, though plants are often shorter, with a simple to branched growth habit; the stems also have a winged appearance due to decur-



The basal rosette of Malta starthistle (*Centaurea melitensis*). PHOTO: JOSEPH M. DITOMASO



The flowerheads of Malta starthistle (*Centaurea melitensis*) with purplish-tipped spines on its bracts and yellow disk flowers. IMAGE: FRANCO FOLINI; SOURCE: WIKIMEDIA COMMONS

rent leaf bases (the petiole extending downward along the stem), and are woolly with loose, dense, gray hairs.

The spiny flower heads of *C. melitensis* resemble those of yellow starthistle (*C. solstitialis*) in that they are solitary or in clusters of two or three, with each head composed of yellow disk flowers. The main involucre bracts (modified leaves that enclose the flowers and form the head) have a slender, central spine at the tip, 5 to 12 mm long (about 1/4 to 1/2 inch), and are often purplish to brownish. At the base of this central spine are short lateral spines, usually in three to four pairs, with the upper pair near the middle of the central spine. In contrast, *C. solstitialis* flower heads have central spines that are 11 to 22 mm long and are straw-colored.

Though noted as being less aggressive than *C. solstitialis*, *C. melitensis* has invaded large areas of California, displacing native plant species and even impacting Lyon's Pentachaeta (*Pentachaeta lyonii*), an endangered sunflower. Populations also occur, though in smaller numbers, in Oregon and British Columbia. *Centaurea melitensis* is suspected of producing "chewing disease," which poisons horses, but as yet its toxicity has not been confirmed experimentally.

Centaurea melitensis is native to the Mediterranean region, from southern Europe and northern Africa. Plants thrive in open, disturbed habitats such as grasslands, creek beds, fields, pastures, roadsides and waste places, as well as in undisturbed

communities such as pine-oak woodlands, chaparral, coastal dunes, and bluffs. *Centaurea melitensis* is thought to have been introduced to California by the Spanish missionaries in the late eighteenth century.

The earliest record of *C. melitensis* in Washington is from a specimen collected by Wilhelm Suksdorf in June 1881 (WS 138787) on Suksdorf Farm, at Bingen, on the Columbia River. Since then, all other records of *C. melitensis* in Washington State, except two, are from 1939 or earlier. The first more recent record is from a collection in Klickitat County along State Highway 14, on a steep rocky bank, in 1985 (WTU 337883). In 2016, *C. melitensis* was collected near the peak of Eagle Cliff on Cypress Island in Skagit County (WTU 409303).

Impatiens parviflora



Profile of small-flowered jewelweed (*Impatiens parviflora*) flower showing spur. PHOTO: ALEX J. WRIGHT

Native to parts of Asia, *Impatiens parviflora* (Balsaminaceae, jewelweed family) is a widespread, invasive annual in Europe. Plants have fibrous roots and are glabrous (lack hairs) or have sparse stalked glands on the upper stems and inflorescence. Plants can vary significantly in height depending on the environment, growing up to about one meter tall. Leaves are alternately arranged with short petioles, and the blades are ovate to elliptic, 4 to 20 cm long (about 1.5 to 8 inches) by 2 to 9 cm wide (about 1 to 3.5 inches), and have serrated margins. The uppermost leaves are typically the largest. *Impatiens parviflora* inflorescences occur in upper leaf axils, comprising clusters of 3 to 12 flowers.

The flowers are small, 0.6 to 1.8 cm long (about 1/2 to 3/4 inches), pale yellow, and have a short, straight spur. Flower color, size, and spur shape differentiate it from other *Impatiens* species. The fruit is a capsule with one to five seeds that explodes upon dehiscence (drying).

How *I. parviflora* was originally introduced to North America is unknown. Possibly it was introduced as an orna-



Small-flowered jewelweed (*Impatiens parviflora*) populations growing in King County. PHOTO: ALEX J. WRIGHT

mental species, though it does not have large, showy flowers. *Impatiens parviflora* grows in shaded places with dry to moist soils. Plants prefer shade to part shade, though they can survive in open sites. They grow in a wide range of habitats including forests, forest edges and paths, riverbanks, and disturbed and cultivated sites, and lesser so in open sites, including railway embankments, open roadsides, and rock outcrops.

Impatiens parviflora is able to dominate the herb layer of forests where it invades, forming large, dense monospecific (single species) stands. Its growth traits, including a short life cycle, cleistogamous (self-pollinating without opening) and chasmogamous (opening for self- or cross-pollination) flowers, high seed production, long flowering period, fast growth of seedlings, and high tolerance to light conditions, allow it to successfully invade a variety of habitats.

There are only two known locations of *I. parviflora* growing in Washington. Both populations are in King County, with one that was discovered in 2013 near the Woodland Park Zoo. The second population, found in the northeast part of the county in 2016, was dense, consisting of well over 1,000 plants. So far, there is only one documented population of *I. parviflora* in Oregon, collected in 2013 in Portland. There are a small number of collections from southern British Columbia, primarily from the Vancouver area.

Wendy DesCamp is the Education Specialist for the Washington State Noxious Weed Control Board. Contact her with any questions about noxious weeds at wdescamp@agr.wa.gov.



Centaurea melitensis and *Impatiens parviflora*

Have you seen these species in Washington? The Washington State Noxious Weed Control Board is interested in any information about additional populations. Please contact us with any information and questions. Also, visit our website to find out more about these species and the changes to the noxious weed list for 2018. <https://www.nwcb.wa.gov/>

Snow Buckwheat (*Eriogonum niveum*), Possibly Washington's Latest Flowering Native Plant

by David Giblin, University of Washington Herbarium, Burke Museum

In Washington we are fortunate to have a wealth of buckwheat (*Eriogonum*) diversity within our borders. By my estimates there are 20 species and an additional 13 varieties (33 taxa in total) that occur here. But that represents a small percentage of the overall diversity found in the genus *Eriogonum*. According to the *Flora of North America*, there are a total of 250 *Eriogonum* species in North America and Mexico, 224 of which (comprising about 450 taxa) occur in North America north of Mexico (www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=112045).

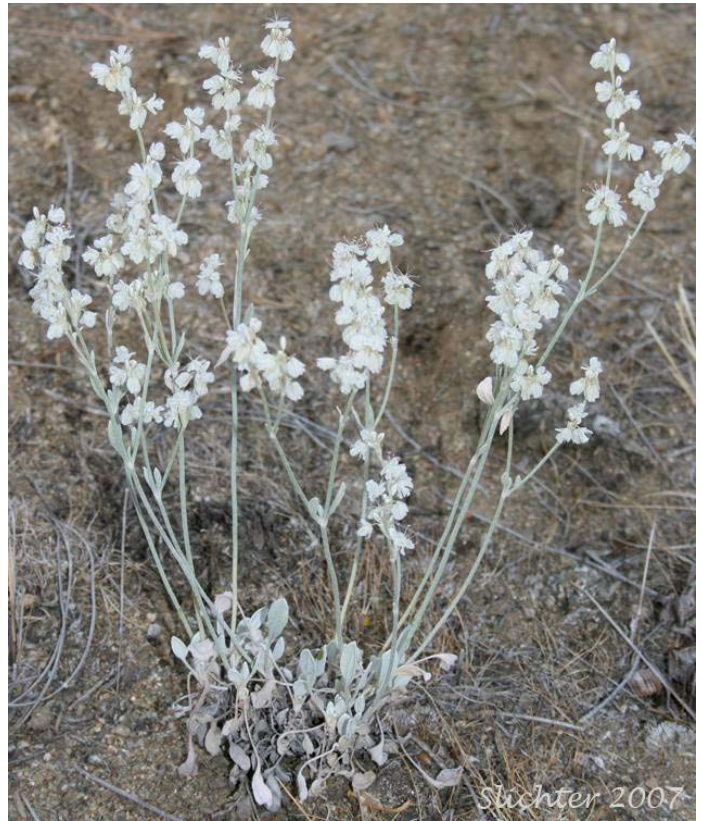
Eriogonum belongs to the family Polygonaceae, which is a large family containing both native and introduced species in Washington. These include some of our most popular alpine wildflowers like bistort (*Bistorta bistortoides*) and mountain-sorrel (*Oxyria digyna*), as well as some of our worst weeds like Japanese knotweed (*Fallopia japonica*) and curly dock (*Rumex crispus*).

Among Washington's *Eriogonum*, thyme-leaved buckwheat (*E. thymoides*) of the sagebrush and lithosols is the first to flower, sometimes as early as late March. The latest flowering *Eriogonum*, and what I am proposing as Washington's latest flowering native species, is *E. niveum*, perhaps aptly titled the snow buckwheat. This species ranges east of the Cascades crest from south-central British Columbia to central Oregon, and eastward to west-central and southwestern Idaho.

Plants of *E. niveum* are modest in size, reaching a maximum height of about 2 feet. The majority of the leaves are found at the base of the plant and are densely hairy, giving the plant an overall gray or white appearance. I'm guessing that this is how it got its common name, as opposed to blooming at the same time that it snows.

Alternatively the common name may refer to the small, snow-white flowers that cover the open and rather diffuse inflorescences.

The flower of any *Eriogonum* species defies the rule that petals in multiples of three belong to the monocots. Look closely and you'll find two whorls of three identical-looking tepals and nine sta-



Plant of snow buckwheat (*Eriogonum niveum*) showing cluster of basal leaves and diffuse, open inflorescence. PHOTO: PAUL SLICHTER

mens—sounds like a monocot. Polygonaceae flowers in general are the exception that proves the rule that you can't just look at one feature to determine if something is a monocot or dicot. Tepals in multiples of three are the default in the Polygonaceae. The seeds, of course, have two cotyledons, making it a dicot.

In Washington you'll find *E. niveum* growing in sagebrush desert, generally at lower elevations. I collected it once in mid-October in Franklin County, and it was nowhere near done flowering. It may very well be in flower now. You're probably thinking, "how come I've never seen this plant?" Mostly it's because it starts flowering in September when most people are thinking about larches, collecting chanterelles, or things other than wildflowers.

Here are the criteria for calling this species our latest flowering native:

- The bloom period has to start late (that is, it can't be something that just blooms year-round like *Campanula rotundifolia*).
- It can't be just an aberrant set of flowers outside of the usual bloom period (think nonnative *Magnolia* and *Malus* [crabapples]).

Email me (dgiblin@uw.edu) if you think you know of something that blooms later that meets the above criteria. I'm curious to know, and I'll share responses in a future article.

David Giblin is collections manager at the University of Washington Herbarium, Burke Museum, where he researches the Pacific Northwest flora. He is a regular contributor to *Douglasia*.



Flower of snow buckwheat (*Eriogonum niveum*) showing three broad outer tepals, three narrow inner tepals, nine stamens, and three stigmatic lobes.

PHOTO: G. CARR

Emerging Technologies Help with Plant and Animal Identification

by David Giblin

Whether or not we like it, technological advances in computing power, software, digital cameras, and smartphones are converging to make the identification of plants and animals faster and easier. The application of deep learning, a branch of artificial intelligence, is making these efforts possible.

Some groups of organisms lend themselves well to digitally based identifications, most notably birds and mammals. This has to do in large part with the relatively low diversity of these groups (birds about 10,000 species; mammals about 5,500) compared to vascular plants (about 350,000) and insects (over 1 million).

For birders, Cornell Laboratory of Ornithology has produced Merlin (<http://merlin.allaboutbirds.org/>), which allows you to compare your bird to a database native in the app (that is, you don't need to be connected to the Internet) for identification purposes. Incredible. This works for about 1,500 bird species in North America and Europe.

Recently, iNaturalist developed an online tool for uploading your cellphone images to a database for the identification of, well, just about anything. Here is a link to an article about this development: <https://baynature.org/article/identify-anything-anywhere-instantly-well-almost-newest-inaturalist-release/>. As far as I know this tool works only for North American species. Microsoft has also released an app with collaborators in China for field-based identification of wildflowers there (www.microsoft.com/en-us/garage/profiles/flower-recognition/).

The difference between the Merlin, iNaturalist, and Microsoft apps is that with the latter two you need an Internet connection to submit your images for identification. A massive database with strong computational power churns to produce a tentative identification based on a warehouse of accurately identified images. Very neat, but often people are in areas where there is no Internet access. Nevertheless, these apps are a major step forward.

In the botanical world there has been a similar effort to use deep learning to assist with the identification of hundreds of millions of vascular plant specimens held in herbaria worldwide. Truth be told, there are probably more new species to be discovered in herbarium cabinets around the world than there are in unexplored places (www.pnas.org/content/107/51/22169.full). An interesting article about the herbarium specimen identification project, both successes and limitations, was recently printed in the journal *Nature*: www.nature.com/news/artificial-intelligence-identifies-plant-species-for-science-1.22442. This work wouldn't have been possible without a nearly two decades-long,



An iNaturalist record of Muir's Hairstreak (*Callophrys muiri*) on a species of *Ceanothus* in California. PHOTO: ICOSAEDRON, www.inaturalist.org/photos/3376197, CC BY 4.0

international effort to image herbarium specimens from collections around the world.

What to make of all this? I don't fear these developments because we need all the help we can get in documenting diversity and its distribution. There are too few knowledgeable and expert practitioners capable of accurately identifying the world's biota. The absence of knowledge about the world's biodiversity means that it is overlooked, undocumented, and consequently unprotected. I don't fear technology in this context. What I fear most is ignorance about biodiversity and what that ignorance leads to.

The Merlin, iNaturalist, and Microsoft apps and other emerging technologies like them are helping to add to our knowledge and further the conversation about our planet's biodiversity.

David Giblin is collections manager at the University of Washington Herbarium, Burke Museum, where he researches the Pacific Northwest flora. He is a regular contributor to Douglassia.



"Some people worry that artificial intelligence will make us feel inferior, but then, anybody in his right mind should have an inferiority complex every time he looks at a flower."

—Alan Kay, American Computer Scientist

Study Weekend 2018

Rainbows of Wildflowers: Celebrating the Botanical Diversity of the Columbia Gorge

Hosted by the Suksdorfia and South Sound Chapters, May 4–6

The Suksdorfia and South Sound chapters invite you to attend a fun weekend studying wildflowers in the Columbia Gorge. The incredible diversity of the area's flora results from the effects of the Missoula floods, drastic climatic differences between the wet west-side forests (with annual rainfall of over 100 inches) and east-side deserts (with only 10 inches of rainfall), and elevations that range from near sea level in the wetlands of the Columbia River to alpine meadows at over 4,000 feet.

Together these factors result in diverse habitats to explore: wetlands, oak woodlands, grasslands, steep basalt cliffs, high plateaus and meadows, and arid sagebrush-steppe. The many microhabitats allow for an unprecedented variety of wildflower species in the Gorge, including at least 13 endemics.

The study weekend features two keynote dinner speakers and 26 hikes that showcase the many diverse habitats. Several mini-programs are also being considered.

- **Friday evening:** Carlo Abbruzzese, Pacific Cascade Region natural areas manager for the Department of Natural Re-

sources, will discuss the preservation and restoration of the Oregon white oak (*Quercus garryana*) forest and Willamette Valley wet prairie in two Clark County natural areas. He will also describe some of the rare species that are protected at these two sites, as well as the successes and failures in trying to restore these sensitive habitats.

- **Saturday evening:** Dr. Susan Kephart, professor of biology at Willamette University, will explain species boundaries, including plant-pollinator interactions and herbivory, and how molecular, ecological, and morphological tools help us



Puget balsamroot (*Balsamorhiza deltoidea*), lupine (*Lupinus* spp.), and other wildflowers in the Tom McCall Nature Preserve in Oregon. PHOTO: DON HARDIN

understand plant evolution and systematics. She often links science to community restoration and conservation efforts with study systems that include milkweeds (*Asclepias* spp.), campion (*Silene* spp.), and camas lilies (*Camassia* spp.).

Hikes include visits to a broad selection of habitats in the Gorge available at this time of the year and will be led by both local hike leaders and some of the best botanists from across the state.

You can stay at the Best Western Hotel in Hood River, Oregon (just across the Columbia River from the former home of the famed botanist Wilhelm Suksdorf), where rooms are being offered at discounted prices, or choose from a list of alternative accommodations in the area. Other activities include excursion train rides and visits to fine wineries, museums, and amazing waterfalls.

Online registration opens mid-January at the WNPS website (www.wnps.org). Early registration is recommended in order to have the widest choice of field trips. To register by mail, please contact the WNPS office (wnps@wnps.org; 206-527-3210) to receive print packet information.



Suksdorf's paintbrush (*Castilleja suksdorfii*). PHOTO: DON HARDIN

Conservation Activity

by Becky Chaney

Goats, digs, monuments, logging, reservoirs, ports, bogs, acquisitions, and quarantines: WNPS advocacy is driven by our membership. During my tenure as conservation chair our actions have resulted in a few wins, a few losses, and many continuing concerns.

Some of our wins include the following:

- Hooven Bog, an overlooked rural peat fen, was acquired by Snohomish County in 2014. Protection of the bog and its three rare plant habitats is under the care of Scott Moore, county employee and longtime WNPS member.
- Steep slopes in the Issaquah Alps were threatened by development. After acquisition by King County, WNPS members under the leadership of WNPS member Janet Wall conducted a comprehensive plant survey.
- A Whidbey Island ruling determined that habitats and plants, not just animals, are protected statewide by the Growth Management Act, an important determination.
- Last year, six invasive species, including butterfly bush (*Buddleja davidii*) and yellow archangel (*Lamium galeobdolon*), were added to the Washington State Noxious List.

WNPS added its voice and expertise in advocating for all these actions, thereby strengthening native plant and habitat biodiversity in Washington State.

During the last year, three chapters have worked on advocacy with the Conservation Committee.

- The Salal chapter pressed for state funding to preserve beloved trees on Blanchard Mountain. Although disagreement over the Washington Supreme Court's ruling on water rights, the Hirst Decision, stopped the approval of the 2017 Capital Budget and consequently the funds for this purchase, it's still possible the trees will be saved.
- The South Sound chapter encouraged the Washington Department of Fish and Wildlife to purchase 745 acres of the West Rocky Prairie, also known as the Maytown site, currently owned by the Port of Tacoma. This area includes rare native outwash prairie, oak stands, wetlands, and endangered species.
- The Central Washington chapter signed a WNPS letter urging the full retention of the Hanford National Monument and support for the 26 other national monuments under

federal review. Although Hanford was dropped from consideration, Interior Secretary Ryan Zinke is reported to have recommended shrinking the botanically significant Cascade Siskiyou National Monument rather than to eliminate its protection altogether.

Many additional WNPS conservation actions have been taken individually and with other organizations. These include a successful WNPS request of the manager of the San Juan Islands National Monument to take additional time to ensure that the benefits of the Iceberg Point field school outweigh potential adverse vegetation impacts of the project; a joint letter



Hooven Bog in Snohomish County. PHOTO: SCOTT MOORE

with 39 other environmental organizations expressing concern over whether the Icicle Strategy, proposed for the Alpine Lakes Wilderness, is compliant with the Wilderness Act and adequately protects the Enchantment Lakes region; and the now approved Washington State Department of Natural Resources 4,700 acre expansion of Natural Resource Conservation Areas at Dabob Bay and Devils Lake. A 2017 work in progress (as of this writing) includes a continued push for eradication of nonnative mountain goats within Olympic National Park and a review of the newly proposed Resilient Federal Forest Act of 2017 (H.R. 2936).

Protection of native plants takes time and work. Help from our members, chapters, the WNPS Conservation Committee members, and office staff is crucial to this effort. As we bring 2017 to a close, I thank everyone that has contributed to this effort, actively or through WNPS membership and contributions, and ask all of you to persist in 2018. It is a pleasure working with you and a joy to live in a state that values its native plants and habitats.

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



Book Review

Intermountain Flora: Vascular Plants of the Intermountain West, U.S.A., Volume 7

Noel H. Holmgren and Patricia K. Holmgren
New York Botanical Garden Press
Hardcover, 303 pages

Reviewed by David Giblin

It was with a sense of bittersweetness that I pulled my new copy of *Intermountain Flora, Volume 7* from my work mailbox. The sweetness, of course, was from the arrival of yet another volume from the flora project that I think has set the standard for how to produce a comprehensive regional flora. The bitterness came from knowing that this was the last of the nine volumes that comprise the complete work (the first was published in 1972). Why volume 7 represents the ninth volume in the series is explained in the text of the book.

The authors of volume 7 are the husband and wife botanical team of Drs. Noel and Pat Holmgren. As many *Intermountain Flora* (IMF) users know, and new readers will learn, Noel is the son of Arthur Holmgren, who co-led the IMF project in its earliest years. Noel received his PhD under Arthur Cronquist, a later IMF project coleader and author, and Pat earned her PhD with C. Leo Hitchcock at the University of Washington.

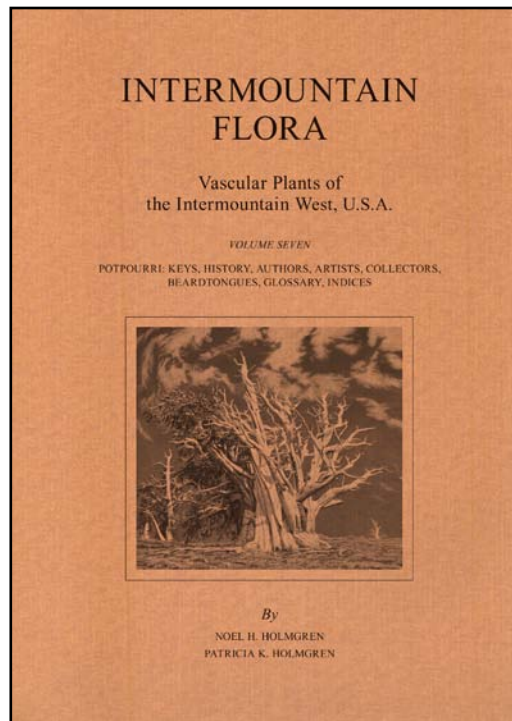
For those unfamiliar with the geographical boundaries of the IMF project, it essentially covers the area between the Rocky Mountains and Sierra Mountains. The southern boundary stretches from northern Arizona to southeast California, and the northern boundary runs from southwestern Wyoming through southern Idaho, and southern Oregon to northeastern California. All of Utah and Nevada are included.

The subtitle of volume 7 is *Potpourri: Keys, History, Authors, Artists, Collectors, Beardtongues, Glossary, Indices*. I agree—aptly named. However, don't be misled by the understated nature of the subtitle. The book is an absolute treasure and a true page-turner for anyone interested in western North America field botany in general and the IMF project in particular. I use the IMF regularly in my work, yet reading this volume made me realize how little I knew about the inspiring origins of the project, the scope of people and personalities involved, and some of the unexpected challenges associated with completing a project that started in 1931!

A major asset of the book is the key written by Noel Holmgren to the plant families represented in the IMF series. Anyone who

has ever written a dichotomous key to anything will appreciate the amount of work that went into this 46-page key. More importantly, like so much content in the IMF volumes, the key serves as a reference and guide for future flora authors tasked with a similar challenge. This key alone underscores one of the many reasons why publishing floras are important and invaluable: they eliminate the need for the next generation of botanists to reinvent the wheel.

The field and herbaria photographs of the people affiliated with the project are additional book highlights. Images of nearly 400 people span 44 pages—a virtual who's who of western North American field botanists over the past 150 years. It is truly inspiring to see the breadth of talent—and personalities—who have in some way contributed to the knowledge contained within the IMF volumes.



For anyone interested in the genus *Penstemon* (beardtongues), Noel Holmgren provides a fully illustrated, updated key to the original 1984 *Penstemon* IMF key that he wrote. The key includes the botanical illustrations from the original version along with new drawings by Bobbi Angell, who has long served as the project's primary illustrator (biography included elsewhere in the book). Several of the species descriptions are followed by anecdotes about how a particular species was first discovered.

The book itself is beautifully composed. The cover features a black-and-white photo (standard IMF cover) of a wonderful oil painting by D. K. Bailey of bristlecone pine (*Pinus longaeva*), which serves as the frontispiece. A tradition in the IMF series is a pair of maps on the pages just inside the front and back covers. The maps are of the IMF geographic

region and floristic divisions and sections.

When I opened the volume I was pleased to find on the inside cover a helpful two-page list of the families included in IMF by volume. I was also pleased to still find the aforementioned maps in the back of the book (as they also are in the other IMF volumes). There is also a cumulative index for the entire IMF series, by both common and scientific names. The photographs throughout are clear and well captioned. The glossary is extensive and likely to answer anyone's botanical terminology query.

My favorite parts of the book are the history of the project and biographies. So many of the people covered I know only through their work, such as specimens, publications, and reputations. To get a broader appreciation for their backgrounds and contributions is truly inspiring. Some of my favorite passages are like this one from the section "Collaboration between Bassett Maguire and Arthur H. Holmgren": "Fieldwork for

the Maguire and Holmgren team began on 5 May in Millard County, Utah, and ended on 8 August in the White Mountains in Inyo and Mono Counties, California.”

Sounds like fun. Sadly, there are few if any opportunities like this for floristic field work in this country today.

There is so much to enjoy and learn from this book that it should appeal to a broad, botanically inclined audience. The volume contains considerably more content than I have space to review here. My only complaint is that my career did not take me in a direction that would have allowed me to participate in this extraordinary project. Three cheers to Noel and Pat for spending the past few years compiling and writing this volume, as it is a wonderful contribution to the body of botanical literature. Volume 7 of the IMF will certainly inspire current and future generations of botanists to collect, become part of a community, and contribute to the knowledge of regional floras.

David Giblin is collections manager at the University of Washington Herbarium, Burke Museum, where he researches the Pacific Northwest flora. He is a regular contributor to Douglasia.



Green rabbitbrush (*Chrysothamnus viscidiflorus*) nestles at the base of sagebrush (*Artemisia tridentata*) on Babcock Bench near Vantage.

PHOTO: MARK TURNER

Washington Native Plant Society Research and Inventory Committee

Solicitation for Grant Proposals

The Research and Inventory Committee is soliciting proposals that foster the goals of the Washington Native Plant Society: “projects that extend our knowledge of the biology of native species or that inventory the flora of an understudied area, which help to conserve native plants.”

Special consideration will be given to proposals investigating the oak or shrub steppe ecosystems or invasive species. Another priority is to support research efforts of graduate students and to help develop the careers of botanists with interests in native plants.

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

Proposals should be about four to eight pages in length and include the following information:

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

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

Submit an electronic copy of your proposal to Pamela Camp, Chair, pacamp@nwi.net.

SUBMISSION DEADLINE: January 15, 2018

2018 WNPS Calendar Now Available



The 2018 WNPS Calendar, featuring Washington's native flora and beautiful places, and member photographers from around the state, can be purchased at local chapter meetings or in the WNPS online store.

Thanks to the support of a talented committee from the Koma Kulshan chapter, led by WNPS board member Mark Turner, the annual photo contest and the production of the calendar provides the society with this beautiful collection as an organization and chapter fundraiser. This committee receives the photos from the membership during the contest, holds a judging event, solicits the highest resolution photos from photographers, and prepares the supporting written content that make up the calendar collection. Consider participating in the upcoming 2018 photo contest. Find information on how to submit photos and participate on the WNPS home page, beginning in November. The calendar gives you and your friends who love Washington's native flora a reminder of the diversity and wonder of our state.

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

This makes for an educational gift that keeps on giving while sharing the mission and intent of the Washington Native Plant Society. Consider this for many on your giving list.



Support Our Work

The Washington Native Plant Society depends on your support to deliver the mission of the society. Your help can make the difference and sustain the impact of WNPS into the future.

Become a Member

Join our community of plant lovers and be the first to learn about the programs in your area. Contact the office or go online at www.wnps.org/join.

Donate Online

You may donate any amount online through our secure website at www.wnps.org/store/donation.html.

Donate through Your Workplace

Workplace giving is an easy way to support WNPS. WNPS is now a member of the Earth Share network.

- Federal employees may donate through the Combined Federal Campaign: CFC # 69374.
- Washington State employees may donate through the Combined Fund Drive: CFD # 0315051.
- King County Employee giving: WNPS agency code #9600.
- Workplace matching gifts: Your employer may offer to match your charitable donations—and help your gift do more. Contact your workplace's charitable giving contact.

WNPS Endowment Fund Giving

Endowment gifts are kept as permanently restricted funds as designated by the donors. This fund provides annual distributions that support the WNPS grant programs in research and plant inventory, conservation, and education. You can make donations the following ways:

- Online at www.wnps.org/suupport/ways.html (and review our Endowment Policy).
- By mail: Please make checks payable to WNPS Endowment Fund.

Make a Planned Gift

Making a gift through your estate is a powerful way to express your values, care for the earth, and ensure a lasting impact. *"One generation plants the trees, another gets the shade."*—Chinese Proverb

Here are examples of how to make a planned gift:

- Name the Washington Native Plant Society in your will.
- Make the Washington Native Plant Society a beneficiary to your IRA or life insurance policy.
- Name the Washington Native Plant Society as the beneficiary of a charitable remainder trust.

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

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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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