

Douglasia



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Quarterly 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.



SPECIAL ISSUE: WASHINGTON'S RARE PLANTS

Washington Native Plant Society

1976

40th

2016

Anniversary

About This Issue

This issue of *Douglasia* focuses on the rarest plants of Washington. Our intention is to give you a glimpse into this particular aspect of appreciating, studying, and conserving the native plants in the state. Of a native flora of around 2,750 taxa (species, varieties, and subspecies), the Washington Natural Heritage Program has identified 344 that warrant a conservation status of endangered (47), threatened (116), or sensitive (162), or that have apparently been extirpated from Washington (18) but that persist elsewhere. And the rare plant list of Washington includes one state endemic (found only in Washington), pale bugseed (*Corispermum pallidum*), that we consider to be extinct. It was last reported in 1953, from a sandy site near the center of the Columbia Plateau. These categories represent our best assessment of the relative degrees of risk of these species falling off the edge of extinction, of becoming part of the "... something valuable ... being lost" referred to in the Endangered Species Act.

The topics that touch upon rare plants are closely intertwined, and you'll find that these articles overlap in places. Scientific investigation continues to clarify our taxonomic understanding of the species in Washington; inventory and monitoring build our understanding of distribution and abundance. This body of knowledge enables us to develop conservation priorities. Work on the ground is planned and implemented by state and federal agencies, by diverse conservation organizations, and by inspired and committed individuals.

In this issue you'll find a sampling of the rarest species in the state and the diverse habitats they depend on. In the story of rare plants in Washington, the plot may be subtle and take a while to discern. The cast of characters, however, is large, and well described! You'll also read about efforts to conserve the rarest species and the technical challenges as well as the tensions that may arise between preserving existing populations and attempting to establish new ones. And extinction is inextricably part of this story, too.

In assembling this issue, I was reminded of not only the diverse plant species of Washington but also the rich community of people who work on their behalf. I thank the writers who contributed these articles. And right behind them is the broader community of botanists, both living and those no longer with us, who have ventured out into the natural lands of Washington and, observation by observation, built our foundation of knowledge. I was reminded of the curiosity and sense of stewardship that drives this work, of people in laboratories and herbaria and libraries, people whose efforts deepen our understanding. I thought about people in seed banks and nurseries and greenhouses, and all the parts of this large human process that keeps some of the most threatened species alive.

I am especially grateful for the inspired and sustained efforts of volunteers! This work only happens because it is driven by the passion of people who care.

Joe Arnett, Washington Natural Heritage Program Rare Plant Biologist
Guest Editor

Information for Contributors

Members and others are invited to submit material for publication in *Douglasia*. 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: http://www.wnps.org/publications/douglasia/douglasia_contributors.html

Email submissions to Douglasia@wnps.org.

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Front Cover: Showy stickseed (*Hackelia venusta*) in the Wenatchee Mountains. PHOTO: BEN LEGLER

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President's Message: The View from Here

WNPS and the Rare Flora of Washington

Clay Antieau

Dear Fellow WNPS Members,

For most plant enthusiasts exploring a region's flora, rare species are especially intriguing simply because they are not commonly encountered. Adding to that intrigue are the causes for that rarity—highly varied possible reasons or a sheer absence of explanation.

Some rare species may be newly arrived (such as hybrid species) and haven't yet had sufficient time to expand their range. Some rare species may be decadent—moving headlong toward extinction, having struggled through a genetic bottleneck perhaps or with adversely changed environmental conditions or loss of habitat. Others might be specifically adapted for rare habitats or conditions. Still other rare species may be very uncommon at the edges of their global distributions yet abundant elsewhere in their range.

Through its 40-year existence, WNPS has been actively involved in the study, conservation, and appreciation of rare plant species. Without a doubt, Washington's rare flora was on Dr. Art Kruckeberg's mind when he and others gathered in 1976 in Seattle to found the society to support the conservation and stewardship of Washington's native plants and their habitats. A few years earlier—in 1973—he had developed the first list of rare and endangered plants in Washington.

From 1988 to 1990, WNPS led an effort to establish a state Endangered Species Act. Under the leadership of then President Mark Egger, the society hired a lobbyist, drafted legislation, and fought to have that legislation enacted into law. The effort intended to pass legislation similar to the Oregon Endangered Species Act, enacted in 1987. For Oregon's state-listed threatened and endangered species, the act specifies rules “to prevent the serious depletion of any indigenous species” and provides guidelines to recover these species on state lands.

While the effort to legislate a Washington Endangered Species Act ultimately failed, the society and its members have since worked closely with Washington Natural Heritage Program (WNHP) staff in their management of natural area preserves and rare plant and animal species, as well as unique or excellent examples of ecosystems. In 1981 Dr. Kruckeberg helped create WNHP within the Washington State Department of Natural Resources. WNPS has been an

unequivocally strong voice in support of WNHP over the years as that program has periodically faced potential budget cuts or even elimination.

In 1989 the WNPS State Board of Directors vigorously debated the sale of rare native species. From that discussion, the board approved a Policy on Collection and Sale of Native Plants (available on our website). WNPS has also funded numerous research projects, rare plant surveys, and education efforts focused on rare plants and plant communities. Most recently, WNPS was an important contributor and funder in the 2011 publication of the *Field Guide to the Rare Plants of Washington*, edited by WNPS members Pamela Camp and John Gamon. Many of our members also actively participate in the University of Washington's Rare Plant Care and Conservation Program, which provides critically needed information on the status of Washington's rarest plant species.

This special issue of *Douglasia* touches on many other WNPS contributions in the conservation of rare species. I hope you enjoy reading about that work and discovering some of the mystery behind our rare flora. Whether you're a longtime member or just recently joined, take pride in knowing that as a member of WNPS you support the appreciation and conservation of Washington's rare plants and their habitats.

Clay



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

The Washington Natural Heritage Program

by John Gamon

The Washington Natural Heritage Program (WNHP) has been central to rare-plant work in Washington since the program's inception in 1977. Initially the program was a collaborative effort between the Nature Conservancy and five state agencies: State Parks, Department of Natural Resources, Department of Ecology, Interagency Committee for Outdoor Recreation (now the Recreation and Conservation Office), and Department of Game (now the Department of Fish and Wildlife).

But the interest in rare plants in Washington preceded the WNHP. Botanists at the University of Washington, primarily Drs. C. Leo Hitchcock and Art Kruckeberg, led the charge in the early 1970s. Dr. Melinda Denton, curator of the herbarium at the University of Washington at the time, coordinated the development of the first "working list" of rare vascular plants for the state. Academics from colleges and universities around the state and other knowledgeable individuals provided much of the expertise behind the list. Many of these same people were charter members of the Washington Native Plant Society (WNPS), which had formed in 1976.

The fledgling WNHP adopted the list put together by Dr. Denton. The basic premise behind the establishment of the WNHP, and the 80-plus other natural heritage programs in the Western Hemisphere, was that databases of the distribution and abundance of species could provide an objective prioritization of species for conservation.

Shortly after its inception, the WNHP started compiling such a database on the species on the working list. One of the first tasks was to document the species' collection history. At the time, herbaria had not yet entered information from their collections into databases, so gathering information required a lot of correspondence and in-person visits. The staff of the WNHP visited major herbaria around the country, including the Missouri Botanical Garden, Gray Herbarium (Harvard), California Academy of Sciences, Jepson Herbarium (U.C. Berkeley), and the New York Botanical Garden, transcribing herbarium label information from specimens. They also visited herbaria in Washington and neighboring states and provinces. The transcribed information comprised the first version of Washington's rare plant database.

The WNHP also contracted with many botanists, many of whom were WNPS members, to conduct field surveys for the plants on the working list. WNPS members Nelsa and Buck Buckingham, Dorothy and Ralph Naas, Ed Alverson, and Jim

Barrett were among the most prolific in terms of their contribution to understanding which plant species were most rare.

After a few seasons, WNHP staff assigned a statewide status to individual species and published *An Illustrated Guide to the Endangered, Threatened and Sensitive Vascular Plants of Washington* in 1981. This was the first of many iterations of the Washington list of endangered, threatened, and sensitive vascular plant species.

In the same year the state legislature decided to place the WNHP in the Department of Natural Resources (DNR). One of the primary elements of that legislation was the recognition of the value of building a statewide, comprehensive database to help identify places with high conservation value. The program has been a part of DNR ever since.

The WNHP currently has data on 344 species that we consider to be endangered, threatened, or sensitive in the state. Our program botanists have continued to conduct inventories and to monitor rare plants, but a majority of the records have come from individuals outside of the WNHP, primarily from US Forest Service and Bureau of Land Management botanists, from WNPS members, and from other citizen scientists. Volunteers with the Rare Plant Care and Conservation Program have made a huge contribution by revisiting known occurrences for which the database records have gotten out-of-date or were initially imprecise.

The WNHP now manages and maintains records for nearly 4,000 occurrences of rare plants, lichens, and bryophytes. The database is used for a wide range of conservation purposes. WNHP staff use it to identify and design potential natural areas to help conserve rare plant species. The US Fish and Wildlife Service uses the database in decision making that relates to the Endangered Species Act. Other federal agencies use the data in the development and implementation of sensitive species policies. The database is available for use in the environmental review processes for development. County planners, consultants, and developers all have access to the information. Rare plant data are also available to educators and researchers, whether they are curious about the biology of individual species, revising classification at the generic or higher level, or want to better understand how climate change might affect the distribution patterns of our native flora.

The need for a comprehensive database on Washington's rare plant species is ongoing. The role of WNPS members in building and maintaining that database is as important as it was during the early days of the WNHP.

John Gamon has been with the Natural Heritage Program since 1986. He now has management responsibilities for both the Natural Heritage and Natural Areas programs.



The Curiosity and Power of Volunteers

by Heidi Newsome

The Hanford Site, set aside for the production of nuclear weapons, seems like an unlikely place to be important for rare plant conservation. However, the Manhattan Project protected a large area of eastern Washington shrub-steppe habitat, including a total of 127 populations of 30 rare plant species. The importance of this area for biodiversity conservation, including rare plants, was recognized in the 2000 presidential proclamation (Proclamation 7319—Establishment of the Hanford Reach National Monument, June 9, 2000) establishing the Hanford Reach National Monument. Within the proclamation, President William J. Clinton noted, “A large number of rare and sensitive plant species are found dispersed throughout the monument. A recent inventory resulted in the discovery of two plant species new to science,

the Umtanum desert buckwheat [*Eriogonum codium*] and the White Bluffs bladderpod [*Physaria douglasii* ssp. *tuplashensis*].” These new taxa, which occur nowhere else in the world, were discovered by Katy Beck and Florence Caplow, botanists with The Nature Conservancy during a “Biodiversity Inventory and Analysis of the Hanford Site” from 1994 to 1999.

Pursuing a Passion for Rare Plants

Rare plants can be finicky and mysterious, and they often are not the showiest or most beautiful of our native plants. In addition, endemic species can be associated with specific, narrow habitat types, and usually little is known about their life history. These are just some of the reasons why working with these species is not for the faint of heart. But what if your curiosity and gumption combine to motivate you to pursue the challenging work of rare plant conservation and management? And what if the drive to discover the secrets of these declining species becomes a passion?

I have had the profound honor of working in close



Jane Abel studies the *Flora of the Pacific Northwest* while investigating potential areas to plant Umtanum desert buckwheat (*Eriogonum codium*) in the Saddle Mountains on the Hanford Reach National Monument. PHOTO: HEIDI NEWSOME



Jane Abel planting White Bluffs bladderpod (*Physaria douglasii* ssp. *tuplashensis*) on the White Bluffs above the Columbia River, Hanford Reach National Monument. PHOTO: HEIDI NEWSOME

partnership with two such passionate people, who have done amazing work as volunteers for the US Fish and Wildlife Service (USFWS), Mid-Columbia River National Wildlife Refuge Complex. WNPS members Jane Abel and her husband, Keith, have invested many hours focused on the conservation of rare species within the Mid-Columbia River National Wildlife Refuge Complex and in particular on the Hanford Reach National Monument along the Columbia River.

The USFWS is the designated manager of the monument, working with the US Department of Energy to manage it as a unit of the National Wildlife Refuge System (NWRS). The



Jane Abel (background) and her husband Keith (foreground) planting White Bluffs bladderpod (*Physaria douglasii* ssp. *tuplashensis*) on the White Bluffs above the Columbia River, Hanford Reach National Monument. PHOTO: HEIDI NEWSOME



Umtanum desert buckwheat (*Eriogonum codium*) growing in flats. PHOTO: JANE ABEL

mission of the NWRS is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. The managing wildlife biologist must have a thorough knowledge of the biota of the monument, including the plants, animals, insects, mollusks, fungi, and all of the abiotic factors affecting them, including soils, hydrology, weather, climate, chemistry, and their numerous interactions. This is clearly a challenging—bordering on the impossible—and sometimes a thankless task! Volunteers provide a needed resource and expertise managing the resources that belong to all.

Thankfully Jane Abel, a plant enthusiast with a combination of intelligence, drive, and devotion, came to my aid. Jane's love of plants has been lifelong. "By the time I was 9 years old I was transplanting native plants from the woods behind our house, into my mother's flower garden," she says. She was a perfect fit to help move my projects forward.

Starting Out – Home Grown

I had begun experiments in 2005, partnering with Joe Arnett, the Washington Natural Heritage Program (Department of Natural Resources) rare plant botanist, to try to germinate and grow seedlings of *E. codium* and *P. douglasii* ssp. *tuplashensis*.

One of the goals of the Comprehensive Conservation Plan for the Hanford Reach National Monument is: "Throughout the life of the CCP, maintain and, where possible, expand the populations of endangered, rare and sensitive plant taxa." The conservation goal associated with propagating and establishing a new location of these rare plants was to decrease the vulnerability of the extant population to any one catastrophic event (for example, severe weather, wildfire, and so on).

In 2009, Jane began assisting in monitoring the extant populations of these species. By 2010, we had collected native seed for her to attempt to germinate and grow. "I don't remember how or when I blurted out, 'I will grow these for you!,'" Jane says. "It was almost shocking to me that there wasn't more of an attempt to grow native plants and try to colonize them on the Hanford Monument, but slowly I realized that commercial growers were able to produce the common woody shrub-steppe plants in large quantities, but it would not be profitable for them to grow "fussy endemics" that require fine-tuned growing conditions and some odd concoction of specialized soil."

The first task that Jane took on was to develop her own soil medium, based on information from the literature and observations of both plants in their natural setting. Both *E. codium* and *P. douglasii* ssp. *tuplashensis* grow in unique soils—



Outplanting of White Bluffs bladderpod (*Physaria douglasii* ssp. *tuplashensis*). PHOTO: KEITH ABEL

the *E. codium* on bare, rocky basaltic ridgelines and *P. douglasii* ssp. *tuplashensis* on caliche (calcium deposits). Keith built tables in their yard for the seedlings to grow and develop on. Jane closely cared for and observed the plants, watering using a light, organic fertilizer and providing a shade cloth during summer heat to promote seedling development.

According to Jane, *E. codium* has been one of the more challenging plants to grow. “At first I had difficulties finding the right components for a fast-draining soil mix, and next there was pot size,” she says. “Too big and it would be impossible for volunteers to chip through rocks and dig a hole for planting; too small and the roots would overheat on the growing tables in July and August. The solution was smaller pots, enclosed in thick wooden boxes to protect the roots and for when the temperatures continue upward in summer.”

When summer heating of the roots was apparently harmful to the plants, deeper pots were suggested. Keith subsequently built the wooden box frames to further insulate the small plastic pots from sun and heat. In her first attempt in 2011, Jane germinated 60 seeds and developed 42 seedlings of *E. codium* for outplanting. In 2013 she germinated over 200 seeds and developed 187 seedlings of *P. douglasii* ssp. *tuplashensis*!

Field Results and Gaining New Information

From 2010 through 2015, Jane grew 569 seedling *E. codium* starts. We have outplanted them in eight areas on the Hanford Reach National Monument and monitored their survival. Survival after four years (2015) was 24 percent. Although we have not documented any reproduction in the field from seedling plants, several have flowered. We have discovered how to successfully germinate and propagate this species, and how to grow seedling plants. We have also learned that *E. codium* can be successfully pollinated in a garden setting in north Richland (away from its natural location) and produce viable seed. We have evaluated several planting sites and learned that this species will not persist in loamy soil and that some rocky component of the soil seems required for establishment. We used GIS analysis of soil and elevation to identify potential planting areas, and we determined that these variables are important for determining installation sites. We also noted that initial establishment after one growing season may not indicate that the seedlings have established, as we had additional mortality after the first, second, and third growing seasons; monitoring over several seasons is required for this long-lived perennial species. This is truly remarkable information to glean from determined volunteers with an interest in plants!

From 2013 to 2015, Jane also grew 856 seedling *P. douglasii* ssp. *tuplashensis* starts. We have outplanted them in two areas on the Hanford Reach National Monument and monitored their survival. As of 2016, survival of outplanted seedlings is an average of 12 percent. However in this species we have documented seedling production and establishment from our plantings. Our plantings have produced 105 seedlings! We have again discovered how to successfully germinate and propagate this species, and how to grow seedling plants. We have compared outplanting in fall versus spring seasons for this species and documented flowering, seeding, and reproduction from our outplanted starts!

“While we have had great difficulty in getting *Eriogonum* seedlings to establish, it was so thrilling to discover that our *Physaria* had actually started to reseed on its own!” says Jane. “I made a very loud squeal and dropped all of the equipment when I turned around and faced a large clump of healthy blooming *Physaria* during our survey.” Again, a truly remarkable conservation action accomplished with the power and dedication of volunteers.

An Ongoing Dedication

In addition to raising the seedlings, Jane and Keith have assisted in the back-breaking work of installing these plants in rocky and inhospitable areas. Along with additional volunteers, they have also taken multiple trips to water the seedlings as they are getting established and have assisted in

monitoring annually to help document the success of these projects. Jane calls the little plants her “babies” and has expanded her work in growing rare plants of the region to include coyote tobacco (*Nicotiana attenuata*), Wormskiold’s northern wormwood (*Artemisia campestris* var. *wormskioldii*), Columbia yellowcress (*Rorippa columbiae*), and Western false dragonhead (*Physostegia parviflora*).

In December 2013 both *E. codium* and *P. douglasii* ssp. *tuplashensis* were listed as threatened under the Endangered Species Act. Conservation and management actions, such as those that have been ongoing at the Hanford Reach National Monument, will be critical to development and implementation of recovery plans for both species.

Jane and Keith’s enthusiasm, concern, devotion, and passion for the work of conserving native plants, especially for those that are rare and declining, have kept me going on these projects. I could not have done this work without them! The USFWS could not have accomplished as much without the time, energy, enthusiasm, and devotion that these special volunteers have provided. They have truly made an impact for conservation of the flora of Washington State.

Heidi Newsome has a master’s degree in Wildlife Science from Oregon State University. She has worked as a professional wildlife biologist for the US Fish and Wildlife Service on national wildlife refuges in the Pacific Region for the last 19 years. Please contact her at Heidi_Newsome@fws.gov.

JD



White Bluffs bladderpod (*Physaria douglasii* ssp. *tuplashensis*) growing in flats. PHOTO: JANE ABEL

Showy Stickseed (*Hackelia venusta*)

by Lauri Malmquist and Joseph Arnett

Showy stickseed (*Hackelia venusta*) is a quintessential narrow endemic species and one of the rarest plants in Washington. Its known range is limited to about 40 acres of a steep hillside in the Wenatchee Mountains, and the global population size, based on the most complete and careful census to date, is likely between 500 and 600 individuals. In that 2012 count, 577 plants were recorded within 45 sub-areas of one slope. The habitat for *H. venusta* is steep, sliding, granitic sand, on cliffs and in dry, open forest at around 1,500 feet. *Hackelia venusta* is an exceedingly beautiful plant, with large showy white petals—hence, the name. Occasional individuals have petals washed with blue.

Hackelia venusta was first described as *Lappula venusta* by Charles Piper in 1924, based on a collection by Otis from the same area in 1920; in 1929 Harold St. John moved this species into the genus *Hackelia* (Hitchcock et al. 1959). Gentry and Carr published a monograph on the genus *Hackelia* in 1976, and their circumscription of showy stickseed included a single known (at that time) population of high-elevation blue-



Showy stickseed (*Hackelia venusta*). PHOTO: LAURI MALMQUIST

flowered plants from 15 miles away. In the years since, several additional populations of the high-elevation plants have been discovered; recent information on these populations is included in Arnett (2007, 2011). These high-elevation plants are smaller with bright blue flowers, now known from four populations between 5 and 15 miles away. Their habitat is alpine talus at over 7,000 feet. These plants were described as a new species in 2013 and named Taylor's stickseed, *H. taylori*, in honor of the late Ronald J. Taylor, professor of botany at Western Washington University (Harrod et al. 2013).

H. venusta was listed as endangered under the Endangered Species Act in 2002 (US Fish and Wildlife Service 2002). A recovery plan was published in 2007 (US Fish and Wildlife Service 2007), and a variety of conservation efforts have been carried out by the US Forest Service (USFS), the Washington Natural Heritage Program, US Fish and Wildlife Service, and the University of Washington Rare Care Program from the mid-90s to the present. Monitoring, inventory, and mapping of the entire population took place from 2004 to 2011.

In 1994 and 1996, experimental outplantings of *H. venusta* were made in three locations. Through the years the number of living plants at each planting gradually declined, and by 10 years later only one site had any living plants. Although most of these plants eventually disappeared, at least one surviving plant and a seedling were observed as recently as 2012.

Experimental outplantings were implemented by the USFS in 1994, although none resulted in the establishment of a new population. Another outplanting was implemented in 2015, and 2016 monitoring indicates little mortality. The in situ (original, wild) population does not appear to be declining and has responded well to fire. Monitoring is ongoing for all populations with the hope we can at least maintain and preserve this beautiful, rare endemic.

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A showy stickseed (*Hackelia venusta*) seedling surviving at a planting site 16 years later. Though few original plants survived after this many years, the seedling demonstrated that reproduction was at least occasionally successful. PHOTO: JOE ARNETT

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Lauri Malmquist studied at Central Washington University and has worked in the Botany Department in the Wenatchee River Ranger District since 1992. She was a member of the California Native Plant Society when she moved to Washington. She joined WNPS when the Wenatchee Valley Chapter was founded in the early 90s.

Joe Arnett studied plant systematics at Western Washington University and has been a member of WNPS since 1983. He is currently the Washington Natural Heritage Program rare plant botanist and is a regular contributor to Douglasia.



The Interagency Special Status/Sensitive Species Program (ISSSP): A Federal Program Working to Implement Rare Species Conservation

by Kelli Van Norman

The attention of people who appreciate the natural world is easily drawn to rare plants. We are fascinated by the complexity and variation in their life cycles, intrigued by their origins and patterns of distribution, and attracted to their beauty. Because of this we may be motivated to conserve them, but actually implementing projects often requires working through bureaucratic processes that can be complicated and challenging.

Anyone familiar with federal land management knows there are competing “multiple use” mandates required by law. Multiple use requires the agencies to strike a balance between differing values such as grazing, timber, recreation, clean water, clean air, wildlife, fish, and botanical resources.

Of course, there are laws specifically for the purpose of conservation. The US Fish and Wildlife Service may list a species as threatened or endangered under the federal Endangered Species Act (ESA). It’s a high bar; in the state of Washington, we only have 12 federally listed vascular plant taxa. Three of them occur on US Forest Service (USFS) or Bureau of Land Management (BLM) lands: showy stickseed (*Hackelia venusta*), Wenatchee Mountains checker-mallow (*Sidalcea oregana* var. *calva*), and Spalding’s silene (*Silene spaldingii*). Though acquiring funding for studying plants or implementing conservation projects on their behalf is always difficult, the ESA-listed species receive much attention and financial support.

But there are hundreds of other vascular plants in Washington, not listed under the ESA, that are imperiled by land use, climate change, invasive species, and other threats. What about those species? Both the USFS and BLM have policies to avoid actions that lead to loss of species viability or that might lead to listing under the ESA. These rare species policies, referenced in the agencies’ National Environmental Policy Act (NEPA) documents, have been in place since the 1980s. From these, the two agencies have developed sensitive species lists, which may sound familiar to many Washington botanists (see Table 1 on the next page).

Table 1. The number of species on the joint USFS and BLM lists in Washington (July 2015). ISSSSP updates the Regional Forester's and BLM State Director's Special Status Species lists approximately once every three years.

	All Species*	Vascular Plants	Bryophytes	Lichens	Fungi
Sensitive	331	210	3	9	0
Strategic	269	99	39	28	8

*The USFS and BLM lists include vascular plants, bryophytes, lichens, fungi, and fish and wildlife (vertebrates, invertebrates).

In the Pacific Northwest we are unique in that our region is the only one in the nation to have an interagency USFS and BLM sensitive species program at the regional level. Luckily both agencies cover the same geographic area: Washington and Oregon. Our interagency program is known as the Interagency Special Status/Sensitive Species Program (ISSSSP), initiated by the USFS and BLM's leadership in 2004.

Focusing on species that are not listed under the ESA but that are considered rare or imperiled, the ISSSSP was intended to enhance USFS and BLM sensitive species' programs, including incorporating the Northwest Forest Plan's survey and manage species. We were given funding to work on special status species with instructions to

- Reconcile inconsistencies in agency list criteria and policies.
- Assess the feasibility of interagency geospatial databases.
- Develop range-wide conservation and inventory tools.

The ISSSSP now maintains a common sensitive species list across both agencies for Washington, as well as for Oregon. We use criteria based on the global and state ranks maintained by NatureServe in cooperation with Natural Heritage Programs.

We have also developed common criteria and a list of

another group of rare species referred to as strategic species (see Table 1). These species have significant information gaps that would make it difficult for our field biologists and botanists to clearly understand their suitable habitat or distribution, analyze potential project impacts, or know how to manage them to mitigate for project impacts. Field units don't have to provide management or analysis for these species. However, to learn more about these species, we do require locations of strategic species to be documented in our corporate databases and shared with the Washington Natural Heritage Program. Many strategic species are poorly known (that is, distribution, habitat, threats, or taxonomy), so their conservation status is unclear.

The USFS and BLM lands comprise 21 percent of all Washington lands. The USFS manages more than 8.6 million acres in the mountainous areas while the BLM manages scattered parcels totaling just over 434,000 acres, mostly east of the Cascades. There are seven national forest units in Washington including the Columbia River Gorge National Scenic Area and numerous offices in small and large communities. Usually the USFS in Washington has around 20 permanent botanists. The BLM operates out of two offices in Spokane and Wenatchee and has two permanent botanists.

Much of the work the agency botanists do involves writing NEPA analyses. They support various management activities such as timber sales, prescribed burns, recreation development, and stream restoration. Some of them work mainly on invasive species control. Most find it refreshing when they receive ISSSSP funding to actually do rare species conservation. This support enables agency botanists to review complicated taxonomy, monitor rare plant populations, develop conservation plans, prepare educational materials, and do other similar necessary and rewarding work.

The ISSSSP developed an important conservation assessment tool that provides species-specific information and management guidance for resource managers. Assessments summarize research, compile known site information for Washington and Oregon, assess habitat and threats, provide species and habitat management guidelines, identify information gaps, and suggest research, inventories, or



Pale blue-eyed grass (*Sisyrinchium sarmentosum*). This is one of many rare plant species, not federally listed under the Endangered Species List, for which ISSSSP has funded research. PHOTO: JOE ARNETT

monitoring to address those gaps. For example, Kathy Ahlenslager from the Colville National Forest authored a comprehensive moonwort (*Botrychium* species) conservation assessment in 2007. More recently, Cheryl Bartlett from the Olympic National Forest has worked with Wendy Gobble from Rare Plant Care and Conservation (Rare Care) on a conservation assessment for Quinault fawn-lily (*Erythronium quinaultense*), and Kelly Baraibar from the Okanogan-Wenatchee National Forest has been working on a conservation assessment for black snake-root (*Sanicula marilandica*). Conservation strategies, such as the one for pale blue-eyed grass (*Sisyrinchium sarmentosum*), include similar information as a conservation assessment, but also direct how to manage specific sites.

The ISSSSP has funded numerous projects to fill knowledge gaps. These have included inventories to determine species distributions, development of habitat and risk models using landscape-scale parameters available in geographic information systems, field validation of habitat models, and population-specific monitoring. We have supported Rare Care, whose many volunteers frequently monitor rare plant populations on federal lands. If the botanists have questions about species that are newly added as sensitive, they can submit a proposal for ISSSSP funding. For example, whitebark pine (*Pinus albicaulis*) was added as a sensitive species several years ago when it became a candidate for federal listing. The botanists looked at the data and realized they did not have precise knowledge of where the populations were located, so they have since been working to fill that gap. It's also great when we can provide benefits for multiple sensitive species; Andrea Ruchty Montgomery is trying to restore golden chinquapin (*Chrysolepis chrysophylla*) habitat on the southern Gifford Pinchot National Forest, which would also benefit the golden hairstreak butterfly. Both of these are USFS sensitive species.

There are quite a few "special" habitats that are home to rare or uncommon species. These are the places that agency botanists, WNPS members, and the general public enjoy. Our thanks go to the WNPS membership for the many plants lists, the Research and Inventory Committee's grants, the numerous hikes and educational activities, and their advocacy for native plants and public lands.

More information about the ISSSSP is available at www.fs.fed.us/r6/sfpnw/issssp/.

Kelli Van Norman studied forest science at Oregon State University and has been a member of WNPS since 2001. She is the regional inventory and monitoring coordinator for the Interagency Special Status/Sensitive Species Program (ISSSSP) for Oregon/Washington BLM and Region 6 US Forest Service in Portland. Contact her at kvannorm@blm.gov.



The Face of Extinction: Pale Larkspur (*Delphinium leucophaeum*)

by Joseph Arnett, South Sound Chapter

As biologists, we view biodiversity through the lens of evolutionary change; new and more adaptive forms arise and replace earlier ones. Genetic variation is the product of mutation and recombination. Natural selection applies pressure to this variation, and genetic change occurs within a population. If forms are sufficiently distinct, we may recognize them as separate species.

In plants, speciation occurs in different and sometimes complex ways. The process may involve changes in chromosome numbers or other intrinsic barriers to genetic exchange, like chemical incompatibilities between a stigma and exotic pollen. There may be extrinsic barriers too like phenology, geography, or the behavior of pollinators. This process may occur quickly as in situations where hybrids become self-fertile and genetically isolated from the parental species; more often it involves gradual adaptive change and isolation over long periods of time and distance from the parental species.

So new species arise. And we expect that every species, eventually, will become extinct. Species may evolve into new ones, or they may die out. Extinction is inherently a part of the process of evolutionary change. Species arise and they disappear, gradually or suddenly; they may be of short or of extremely long duration. Extinction can seem quite abstract. As biologists we strive for objectivity, to observe without bias; the power of our scientific method is to facilitate or achieve a degree of detachment.

But as human beings, our feelings are more complex, and the time frames of human lives are generally much narrower than those involved in speciation, or in extinction. This has been brought home to me through the past few years as I have watched pale larkspur (*Delphinium leucophaeum*) gradually disappear from Boistfort Prairie in Lewis County. *Delphinium leucophaeum* is also found in the Willamette Valley, where it is listed as endangered under the Oregon Endangered Species Act.

In Washington it is known only from the Boistfort occurrence, where it was first discovered by Cathy Maxwell in 1987. At that time she estimated that nearly 1,000 plants were present in the valley, in eight small patches along about a mile of roadside. Roadsides and the narrow strip between road maintenance and farmed fields are sometimes the sole



Pale larkspur (*Delphinium leucophaeum*) from Boistfort Prairie, Washington. PHOTO: JOE ARNETT

remnants of native vegetation in heavily impacted habitats like prairies.

About 10 years ago there was a hopeful finding: a few patches of *D. leucophaeum* in a pasture away from the road on land owned by organic farmers who cared about the plants. But these less threatened patches were small, and the roadside plants were declining steadily.

My feelings as I have watched the decline of this species have been painful and personal. I have a sense of something irreplaceable, and something that happens to be quite beautiful, in my eyes, being lost. For me, *D. leucophaeum* has assumed the face of extinction. And this “thing” that is being lost is a living species, not just an object, but something much more, the product of a long process within larkspurs and within the prairies they inhabit. I also have twinges of guilt; this is happening on my watch. My profession is to watch and to pay attention and document change. Sometimes my job is also to respond and work on behalf of conservation. In this case, so far, I am coming up with a sense of failure.

I have been monitoring *D. leucophaeum* for 11 years. It has steadily declined in Washington since Cathy first discovered it; patches disappeared; counts of plants went down. As I watched the decline, I was like the frog in the pot of water where the heat increases so gradually that the frog never jumps out. I learned that the species was also rare in Oregon. I knew

that action was needed if the species was going to continue to exist. I knew we should collect seed and try to establish populations away from the road. But I had other priorities, and this one never led to action. Then, this year, the population plummeted.

Of 47 plants in 2014, the largest remaining patch in the state was in a short piece of right-of-way where the fence jogged a few feet farther from the road. This year that whole population disappeared. A new gravel driveway had been built right through it, and the whole area had been weed-whacked down to stubble. I could not find a single plant. Then I went back to the one other remaining roadside patch that I knew of, where a few plants had remained in 2014. I could not find a single plant there either.

Then I walked out to the back pasture with Mary Mallonee, the farmer who owns it, to the only patch of *D. leucophaeum* in Washington that is not growing along a road. We could find only three plants. These are the only individuals of this species that I know of remaining in Washington. Mary volunteered to collect seed, but her efforts were not successful. I contacted Wendy Gibble at the Miller Seed Vault, which is a repository for seeds of rare species in Washington; no, they did not have any seed from *D. leucophaeum*.

But the story is not over, and there remains a glimmer of possibility. Ed Guerrant, the director of the Rae Selling Berry Botanic Garden seed bank wrote back that, yes, they have several accessions of *D. leucophaeum* from Boistfort—1,628 seeds from 29 plants. Ed also said that some of this seed could be made available for establishing a seed increase project and that Portland State University may have the facility to germinate the seeds and establish plants. Sierra Smith, who manages the nurseries in Washington for the Center for Natural Land Management (CNLM), has suggested that if someone were able to germinate seeds and get plants started, CNLM has the facility to nurture these plants and produce a much larger quantity of seed. And there are a few protected areas in southwest Washington prairies where *D. leucophaeum* could be established in native prairie habitat.

As this point these are just ideas, possibilities, a string of “ifs.” None of these plans yet has commitment behind them. But there is the possibility that with the right combination of skills, and with sufficient motivation, the face of *D. leucophaeum* will continue to grace southwest Washington prairies. Many of us feel that this is something worth working for.

Joe Arnett studied plant systematics at Western Washington University and has been a member of WNPS since 1983. He is currently the Washington Natural Heritage Program rare plant botanist and is a regular contributor to Douglasia.

Joe Arnett

What Plant Conservationists Have Learned from 1,500 Volunteer Reports

by Wendy Gobble, Central Puget Sound Chapter

On a soggy July day last summer, 11 curious botanists and native plant enthusiasts ventured into a unique “bouncing bog” in the Colville National Forest. The bog was known to the Forest Service district botanist, Kathy Ahlenslager, from previous survey work, and a possible rare sedge had been reported. Roundleaf sundew (*Drosera rotundifolia*), buck-bean (*Menyanthes trifoliata*), and marsh cinquefoil (*Comarum palustre*) were abundant in the bog, as were two common sedges, silvery sedge (*Carex canescens*) and woollyfruit sedge (*C. lasiocarpa*).

Along with Kathy that day were two other Forest Service staff, Joe Arnett of the Washington Natural Heritage Program (WNHP), and Rare Plant Care and Conservation (Rare Care)

volunteers and staff, who spread out to see what other interesting plants were hidden in the bog. It didn't take long to spot the delicate stems of the rare sedge, sparse-flowered sedge (*Carex tenuiflora*), scattered among clumps of *C. canescens*. After keying the plant to confirm its identity, we spent a little time making notes about the population, carefully documenting the plant community and site characteristics, estimating the number of stems and mapping the perimeter of the population with a handheld GPS unit. This information was compiled into a report, one of 15 provided to the Forest Service as part of Rare Care's annual monitoring weekend.

Rare Care's monitoring weekends started in 2007 as part of our rare plant monitoring program. The program, founded in 2001, addresses the urgent need for updated information on native rare plant populations in Washington State (see *Douglasia* 3(3), Summer-Fall 2008 for more background on the rare plant monitoring program and Rare Care). Involving volunteers in the monitoring of rare plant populations was a proven model that Dr. Sarah Reichard, Rare Care's founder, brought to Washington State.



Rare Care volunteers Paul Slichter, Julia Bent, and Sue Wheatley fill out monitoring reports in camp during Rare Care's monitoring weekend in the Wenatchee Mountains. PHOTO: JENNIFER YOUNGMAN



Seely's silene (*Silene seelyi*) was the focus of Rare Care's second monitoring weekend and one of Rare Care's first focus species. PHOTO: JENNIFER YOUNGMAN

The initial approach for the program was to prioritize populations for monitoring based on how long it had been since their records were last updated with WNHP. As the program developed, it became apparent that it also provided an effective means to focus on individual species and ecosystems that are of conservation concern but not receiving much attention from public agencies. And it is leading to the discovery of new populations as volunteers gain familiarity with local rare species and more readily spot them when they are out hiking or botanizing. These additional benefits allow for an improved understanding of species distributions and assessment of their status by WNHP and federal agencies. The program also brings these species to the attention of land managers who are charged with protecting their populations.



Rare Care volunteers Jason Clinch, Marilee Henry, and Jeff Thorson key out diffuse stickseed (*Hackelia diffusa* var. *diffusa*) in the Klickitat Wildlife area. PHOTO: JULIE BRESNAN



Volunteers documenting new populations of Suksdorf's desert-parsley (*Lomatium suksdorfii*) and Barrett's beardtongue (*Penstemon barrettiae*) at the Klickitat Wildlife Area. PHOTO: JANKA HOBBS

Rare Care's first two monitoring weekends demonstrated the value of focusing on individual species and led to a modification to our approach for selecting populations for monitoring. Our first monitoring weekend arose in part because of a request we received from the US Fish and Wildlife Service (USFWS) to update information on the basalt daisy (*Erigeron basalticus*), at that time a candidate species for the Endangered Species Act (ESA). With 19 staff and volunteers working together over three days, we visited all known occurrences and developed the information USFWS needed to make a determination for not listing this species.

For our second monitoring weekend, we focused on Seely's silene (*Silene seelyi*), a local endemic species occupying granitic cliffs in the Leavenworth area. Of the 22 occurrences known for this species, all but three contain fewer than 100 individuals, making this species particularly vulnerable to decline. At the time of the monitoring weekend, most of the occurrences had not been monitored since the mid-1980s. In June 2008, 24 monitoring weekend participants visited 13 occurrences and successfully relocated all of them.

Although it was relatively easy to tackle these narrowly distributed endemic plants, we realized that we had the ability

to take a similar approach with other species because Rare Care volunteers were spread out across the state. Therefore in 2008 Rare Care started designating focus species—species in which we would attempt to monitor all occurrences on public lands over a 5-year period. *Silene seelyi*, the target of our second monitoring weekend, was designated as one of our first focus species. We also started with species that volunteers had already been monitoring in the previous few years, such as black lily (*Fritillaria camschatensis*), Thompson's clover (*Trifolium thompsonii*), and water howellia (*Howellia aquatilis*).

An emphasis on focus species provides WNHP and the Interagency Special Status/Sensitive Species Program with a more complete benchmark on the status of sensitive species in the state. Ted Thomas, science advisor at the USFWS, noted, "Rare Care has been a huge positive gain for assisting the Natural Heritage Program and federal agency requirements (BLM, USDA Forest Service, National Resources Conservation Service, US National Park Service) for assessing threatened species before moving forward with on-the-ground projects." For instance, Rare Care's Spokane volunteers took the lead to monitor *Howellia* (listed as threatened under the ESA) at Turnbull National Wildlife Refuge. The volunteers received training from the refuge's biologist, Mike

Rule, on the protocols for surveying *Howellia*, a shallowly rooted aquatic plant. Over five years, the volunteers searched among cattail (*Typha* spp.) and reed canarygrass (*Phalaris arundinacea*) to document its persistence in more than 30 ponds on the refuge. Their findings suggest that the abundance of this species at Turnbull NWR is stable.

Rare Care's monitoring weekends also provide an opportunity to focus on ecosystems rich in rare native plants. Two monitoring weekends were spent in the Wenatchee Mountains, focusing on the Teanaway River area and Naneum Creek drainage. In addition to revisiting known occurrences of rare plants, we conducted surveys for regional endemic species (those that were not currently tracked by WNHP) to assist Joe Arnett with his review of Wenatchee Mountain endemics. With approximately 20 people participating each weekend, we were able to cover a lot of ground, revisiting known occurrences of rare plants and looking for new populations.

While we did not find any new populations of rare plants in the Teanaway River drainage, which is not surprising given how intensively the area has been botanized, Rare Care volunteers did stumble across a number of new populations of rare plants in the Naneum Creek drainage. For instance, Rare Care volunteers Paul Slichter, Ellen Kuhlmann, and Barry Wendling discovered a population of Brewer's cinquefoil (*Potentilla breweri*) on Table Mountain, and several new populations for tall agoseris (*Agoseris elata*) and sticky goldenweed (*Pyrrocoma hirta* var. *sonchifolia*) were also documented.

Another region of the state yielding new discoveries is in Klickitat County. In 2011 we visited the Klickitat Wildlife Area for Rare Care's monitoring weekend. Rare Care volunteers had already been monitoring a number of rare plant populations in the area since 2008 when Rare Care conducted a volunteer training session in White Salmon. Volunteers in the Columbia River Gorge area quickly became familiar with the local rare plants of the area, and by the time our monitoring weekend arrived, these volunteers knew by sight many of the rare plant species that might be found in the Klickitat Wildlife Area. As a result, our survey results yielded nine new populations for rare plants such as Barrett's beardtongue (*Penstemon barrettiae*), common bluecup (*Githopsis specularioides*), Bolander's linanthus (*Leptosiphon bolanderi*), long-bearded sego lily (*Calochortus longebarbatus* var. *longebarbatus*), and Suksdorf's desert-parsley (*Lomatium suksdorfii*).

The discoveries made in Naneum Creek and the Klickitat Wildlife Area underscore one of the key contributions of the rare plant monitoring program. As volunteers become familiar with these rare species, the potential for discovering previously undocumented populations grows. In some cases, these discoveries may suggest that a species is more widespread than



Barrett's beardtongue (*Penstemon barrettiae*).

PHOTO: BEN LEGLER

previously thought, potentially serving to remove the species from WNHP's sensitive species list. In most cases, however, it does not change the species status, but it brings these plants to the attention of the land managers responsible for protecting them. At the Klickitat Wildlife Area, the work of Rare Care volunteers is playing a vital role in management activities. Wildlife Manager Susan Van Leuven commented, "I was able to use Rare Care data sheets to compile a list of rare plants deserving of special management attention (land use, weed control, and so on) to put in the wildlife area management plan, which is nearly ready for review. Later I want to make a plan for our own use for protecting specific sites. Rare Care has been the main source of this important material."

Since the program started in 2001, Rare Care has trained over 400 volunteers from regions across the state. Volunteers have logged more than 33,000 hours monitoring rare plant populations, producing over 1,500 reports for land managers. Over 100 new populations have been discovered that were not previously recorded in WNHP's database. As of 2016, Rare Care has designated 26 focus species for which we are conducting statewide inventories. Given the limited resources available for plant conservation, it is clear that volunteer contributions are critical to effectively managing rare species and can fill a gap in the inventory work completed by professional botanists and public agencies.

Wendy Gible is a program manager with the Washington Rare Plant Care and Conservation program.

Wendy Gible

Dr. Sarah Reichard Leaves a Lasting Legacy in Plant Conservation and Horticulture

by Wendy Gibble, Central Puget Sound Chapter

Sarah Reichard, director of the University of Washington Botanic Gardens and the Rare Plant Care and Conservation program (Rare Care), passed away on August 29, 2016 at the age of 58 while leading a botanical tour in South Africa.

Sarah was a leader in the conservation of plant biodiversity, internationally known for her work on the biology and spread of invasive plants, and working locally on the conservation of rare native plants.

Sarah started her academic career as a research assistant professor at the University of Washington's College of Forest Resources in 1997. Growing up in New Orleans and Seattle, Sarah always knew she wanted to become a professor and follow in the footsteps of her mother, a plant geneticist at Wake Forest University. It was her father, however, who was the gardener and instilled in Sarah her love of plants. After completing her PhD at the University of Washington, Sarah did her post-doctoral research in Hawai'i on assessing the



Sarah Reichard, 1957–2016. PHOTO: JENNIFER YOUNGMAN

potential of invasiveness of introduced plants. Her research on predicting invasiveness gained Sarah international recognition, and she continued her work on invasive plants throughout her career as a faculty member at the UW School of Environmental and Forest Sciences.

Sarah was very active in public policy and outreach. She served on a number of national and international committees, including serving for 15 years on the International Union for the Conservation of Nature's Invasive Species Specialist Group and 6 years on the Federal Invasive Species Advisory Committee. She was a vocal advocate for invasive species control on the local level as well, serving on the State Noxious Weed Committee since 1997 and helping to establish the Pacific Northwest Invasive Plant Council and its citizen science program aimed at early detection of invasive plants species. She was also an active participant and supporter of the local horticultural community and botanic gardens, serving on boards and panels in support of local organizations.

Sarah's commitment to connecting people to the study and appreciation of plants was unique among academics. She was known for taking on more than the typical share of graduate students, shepherding them through school and helping launch their careers through her many national contacts. She also worked to bridge the gap between science and the public. Her founding of Rare Care exemplifies this to the core.

Sarah initially started Rare Care as a research program, and in the earliest days she and her graduate students worked on recovery of endangered plants, such as golden paintbrush (*Castilleja levisecta*), showy stickseed (*Hackelia venusta*), and Wenatchee Mountain checker-mallow (*Sidalcea oregana* var. *calva*). However, she had a larger vision for this program. Through her work and familiarity with public gardens, Sarah realized that Rare Care and the University of Washington Botanic Gardens (then known as the Center for Urban Horticulture) could fill a greater role in conserving rare plants in Washington State. In 2000 UW Botanic Gardens became a Participating Institution of the Center for Plant Conservation (CPC)—a network of botanic gardens working collaboratively to conserve endangered plants by providing scientific and technical expertise—largely as a result of Sarah's initiative.

Rare Care's two core programs, the rare plant monitoring program and the seed bank in the Miller Seed Vault, build on the association with CPC and Sarah's commitment to engaging the public in plant conservation. The rare plant monitoring program was modeled after the New England Wild Flower Society's New England Plant Conservation Program, which she learned about through her work with botanic gardens. After joining the CPC network, Sarah received a gift from the Miller Charitable Foundation to build a seed vault for ex

situ conservation. Through these two programs, volunteers play a vital role in conserving Washington's rare plants by contributing their time and expertise to collecting information on rare plant populations and collecting seeds for the ex situ collection.

Sarah served as UW Botanic Gardens Director from 2011 until her death, tirelessly advocating for the collections at the Washington Park Arboretum, the public education and outreach programs, and the involvement of UW students in all aspects of the programs. She saw the potential for the Center for Urban Horticulture and the Arboretum to be transformative spaces, supporting unique programs and collaborations such as the Fiddleheads Forest School and The Music of Trees. Her dedication to the UW Botanic Gardens spanned the entirety of her professional career and exemplified her passion for conserving plant biodiversity, educating students about plants, and cultivating an appreciation of plants in the public. Her legacy continues on through the work and collections of the UW Botanic Gardens.

Wendy Gobble studied invasive plants in the South Puget Sound Prairies at University of Washington. She is program manager of the UW Botanic Gardens Rare Care program and has been a WNPS member since 2004. Contact her at wjgobble@uw.edu.



WNPS Research Grant Proposals Deadline: 15 January 2017

The WNPS Research and Inventory Committee funds research that extends knowledge of native species, inventories the flora of understudied areas, and helps conserve native plants. Special consideration is given to proposals investigating the oak or shrub-steppe ecosystems or invasive species. These grants also support research by graduate students and botanists with interests in native plants. Typical awards are \$1000–\$1500. Specific submission requirements and examples are at www.wnps.org/research/research.html. Submit proposals electronically to Pamela Camp, chair, pacamp@nwi.net.

Rare Plants and the Excitement of Discovery

by Jeff Walker

One of the great joys in my life, both professionally and personally, is finding a rare plant species. In my 20 years as a botanist, I have had the good fortune to encounter several rare plant species in the Pacific Northwest. The hunt has taken me across the state, from observing prairie cordgrass (*Spartina pectinata*) during a stroll on the cobbly shores of the Grand Ronde River to monitoring populations of golden paintbrush (*Castilleja levisecta*) on the dry bluffs of Whidbey Island, and from designing a restoration project to avoid impacts to Ute ladies'-tresses (*Spiranthes diluvialis*) on the banks of the Columbia River to a chance meeting with Thompson's wandering daisy (*Erigeron peregrinus* var. *thompsonii*) on the west side of the Olympic Peninsula. I look back fondly on each one of these experiences. In addition, these encounters taught me to keep my eyes open and to tread lightly, because you never know where and when you might happen upon a rare species.

The journey started with my first job out of college, working for the Bureau of Land Management (BLM) in Oregon. I conducted rare plant surveys in proposed timber sale units. I still remember my first discovery of an undocumented rare plant site. It was late spring in 1997 on a steep riparian slope in Oregon's Coast Range. The target was tall bugbane (*Cimicifuga elata*), a species tracked by both the BLM and the state of Oregon.

The field crew had a good search image for the plant's preferred habitat in our survey area: steep north-facing riparian slopes with bigleaf maple (*Acer macrophyllum*) and sword fern (*Polystichum munitum*). We also knew that a look-alike, baneberry (*Actaea rubra*), grew commonly in the neighborhood. The two species can look very similar when only leaves are available, but they are wildly different in fruit. *Cimicifuga elata* offers a drab, dry capsule and *A. rubra* a bright red, fleshy (and poisonous!) berry.

We knew we had to be vigilant, as *C. elata* often fails to flower in the shady forests of the Coast Range. But botanists are an observant lot, and my BLM mentors told me to look closely at the leaf nodes. *Actaea rubra* always has glabrous (free from hair) leaf nodes, but *C. elata* can have short hairs at the nodes. Those short hairs were a lifeline for the field identification of this plant.

Once we entered the preferred steep riparian habitat, we slowed down. A quick scan did not reveal any tall flowering



Tall bugbane (*Cimicifuga elata*). PHOTO: TOM KAYE

individuals, so we began a more meticulous search. We moved slowly across the slope, carefully investigating under each *P. munitum* while hanging on to them for support. I have often praised the tensile strength of *P. munitum* fronds!

Eventually, we came to a deer trail heading straight down the slope to the creek. We observed a couple of small, suspicious plants on either side of the trail. They were low to the ground, so care was needed on the loose soil to be able to get close enough to look at the leaf attachments with a hand lens. Behold—fuzzy nodes!

After the initial excitement waned, a complete survey of the slope was completed. A dozen plants were observed, including a couple of browsed flowering plants. The habitat was fairly common and the plant population was somewhat small, and the species is not the most uncommon, but this *C. elata* location is memorable for me. It was my first rare plant find.

Over the years after this first discovery, it continues to be a treat when rare plants are part of my work. Sometimes the discovery of a rare plant site is purposeful, like my first encounter with *C. elata*. At other times, the discovery is quite accidental. Like sitting next to Oregon goldenaster



Tall bugbane (*Cimicifuga elata*). PHOTO: TOM KAYE



Texas toadflax (*Nuttallanthus texanus*) PHOTO: JOE ARNETT

(*Heterotheca oregona*) on a lunch break along the White River or observing Texas toadflax (*Nuttallanthus texanus*) during a bathroom break at the edge of a grassy bald.

And still at other times, the discovery is delayed. A rare species might be the one thing that is unfamiliar in an area. Or it can look very similar to a common species. If there are enough individuals in a population, I have brought specimens home to subject them to an array of keys, scopes, and, in some cases, experts at the local herbarium. At times the gratification of a confirmed identification might be delayed. However, the anticipation can also be rewarded with a range extension or a new county record!

Even after doing this work for two decades, there is still excitement in finding something unfamiliar. And the possibility that the unfamiliar plant might be something unusual. And perhaps even something rare.

Jeff Walker received a Botany degree from the University of Washington. He manages the natural resource team for an environmental consulting firm and is based in Seattle.



Washington Native Plant Society 2017 Calendar Now Available



The 2017 WNPS Calendar, featuring Washington's native flora, with photos by society members can be purchased at local chapter meetings and in the WNPS online store. A committee from the Koma Kulshan chapter, led by WNPS Vice President Mark Turner, selected the photos and wrote the captions.

Proceeds benefit both WNPS chapters and the society as a whole. The calendar and monthly photos can be viewed in the WNPS online store at www.wnps.org/store/products.html. Online purchases are \$10 plus shipping. The calendar is an educational gift that shares the mission of WNPS "to promote the appreciation and conservation of Washington's native plants and their habitats through study, education, and advocacy."

Golden Paintbrush (*Castilleja levisecta*): The Road to Recovery of a Threatened Species

by Peter W. Dunwiddie and Theodore B. Thomas

To plant enthusiasts and nature lovers who have frequented the prairies of western Washington and Oregon over the last two decades, golden paintbrush (*Castilleja levisecta*) is a species whose status has undergone a dramatic transformation. In the mid-1990s when it first became the focus for intensive study and conservation efforts, it was extremely rare across the region. It had been extirpated entirely from Oregon and persisted in less than a dozen sites in Washington and British Columbia, with a total global population probably numbering around 15,000–20,000 plants.

Despite intensive searching throughout the species' historical range in Oregon and Washington, only a couple of small new populations were found, and detailed monitoring of the known populations revealed a precarious picture. Most consisted of only a few hundred individuals or less, several appeared to be in precipitous decline, and a couple winked out entirely before they could be conserved.

Yet today, the species is widespread and abundant, existing in over 40 sites across its entire historical range and now numbering around a quarter of a million individuals. The remarkable turnaround in the status of this species not only makes *C. levisecta* a poster child for successful conservation efforts in the Pacific Northwest but also provides important lessons for how efforts to conserve a single species can be carried out in ways that galvanize conservation of an entire ecosystem.

Castilleja levisecta was federally listed as a threatened species in 1997 after various surveys and studies highlighted its extremely rare status and a need for aggressive, proactive conservation to ensure its long-term survival and reverse the long-term decline of the species. This listing under the US Endangered Species Act was critical for several reasons.

First it stimulated the US Fish and Wildlife Service (USFWS) to provide consistent, substantial funding over many years to acquire and protect key sites and initiate a diversity of research efforts necessary to begin to understand the biology, genetics, reproduction, and ecology of the species. Often supported by USFWS funds, many graduate students directed their studies toward numerous aspects of *C. levisecta*



Golden paintbrush (*Castilleja levisecta*). PHOTO: JOE ARNETT

natural history, providing a wealth of knowledge and growing expertise that has stimulated and sustained its conservation.

This increased funding was essential for developing and maintaining ongoing management of many sites to enhance their suitability for sustaining viable paintbrush populations. The USFWS funding supported much of the production of seedlings for outplanting and the development of nurseries to specifically produce large quantities of pure *C. levisecta* seed for restoration efforts, as well as the studies to evaluate the suitability of potential recovery sites.

Finally, the USFWS played a key role in facilitating collaboration and cooperation among many partners in Washington and Oregon, elements that were essential for paintbrush recovery across its entire historical range. The USFWS supported numerous meetings and field trips that



A dense stand of golden paintbrush (*Castilleja levisecta*) on Whidbey Island. These plants seeded themselves in from a nearby planting. PHOTO: JOE ARNETT

were a key aspect in exchanging information, experience, and lessons learned, as well as helping to develop the relationships among individuals and organizations that allowed for the sharing of seed, materials, equipment, and other resources.

From the outset, *C. levisecta* recovery has focused on three main elements.

- Save existing wild populations by seeking to secure legal protection for the sites, combined with identifying, reducing, or removing (where possible) the primary threats to the species at each site.
- Augment the number of individuals in these existing populations by planting and implementing the required management to enhance seedling survival and sustain the population via natural reproduction.
- Identify new, potentially suitable sites and establish new populations in them.

Because there were so few extant sites left to serve as a guide, the last element has proven challenging. Early efforts focused on identifying new sites that matched the physical environment

and vegetative composition of the sites where wild populations remained. However, our subsequent experience revealed that these new sites may not be representative of the sites where *C. levisecta* historically thrived best. We have hypothesized that optimal sites may have been relatively productive, deep-soil prairies, most of which were converted to agriculture long ago. The species has persisted today in a few relatively marginal, remnant sites that were unsuitable for agriculture.

One key thread consistent with all these recovery efforts has been an emphasis on restoring the overall health and integrity of potential recovery sites. This has included enhancing their biodiversity by planting diverse native prairie species, controlling invasive noxious weeds, and restoring or maintaining key ecological processes like fire and pollinators. These actions sometimes were supplemental to fostering key elements that enhanced their suitability for *C. levisecta*, such as establishing host plants for the hemi-parasitic paintbrush and ensuring that fire or other disturbance that helped enhance paintbrush reproduction occurred as appropriate. But this approach resulted in overall improvements in the viability and resilience

of the native prairies, regardless of the ultimate success (or not) of the *C. levisecta* recovery efforts at a particular site.

Although the main elements of *C. levisecta* recovery have remained largely constant, there have been significant changes over time to the strategies and actions we have employed as experience demonstrated which approaches were most successful. For example, initial efforts to establish or augment populations focused particularly on outplanting nursery-grown plugs. Although this practice continues in some areas, it is a costly, time-consuming, and labor-intensive process. Therefore at many sites we are increasingly focusing on sowing *C. levisecta* seed (along with seed from other native prairie plants) in sites that have been carefully prepared to enhance seed germination and survival. This strategy has become possible only since about 2011, when nursery-grown seed became available in sufficiently large quantities. As a result, populations of 10,000 to more than 100,000 plants have been established relatively quickly in several particularly suitable sites. These large populations create an added benefit because they produce enough seed to sustain themselves and also have provided seed for restoration at other sites.

Identifying the elements that are most critical to render a site suitable for supporting a viable *C. levisecta* population sometimes is relatively straightforward. It may be obvious that encroaching shrubs or trees need to be controlled. Grazing by deer, rabbits, or voles on flowering stems may be quite evident, and limiting their impacts may be imperative. Native species that can serve as host plants may be conspicuously lacking and may need to be planted to increase their abundance. Invasive weeds may be extensive and must be controlled to reduce competition with *C. levisecta*. At other sites, however, key threats may be more difficult to discern. Similarly, devising ways to abate these threats or otherwise enhance site suitability may present challenges of variable difficulty. Trees can be cut, shrubs can be mowed, but excluding deer or voles, conducting burns on a regular basis, or establishing diverse native host plants often can be difficult. Ongoing research is essential to devise and refine management strategies that efficiently and effectively address these myriad restoration challenges.

The road to *C. levisecta* recovery has not been linearly upward. The droughts of 2014 and 2015 may have cumulatively resulted in significant drops in many *C. levisecta* populations and has forced us to consider more carefully which sites may be most suitable for this species in light of future climate changes. It is noteworthy that despite intensive efforts at most of the extant natural populations, many have not increased greatly in size. Instead most of the increase in overall *C. levisecta* abundance is largely accounted for by the establishment of new populations.

Recent work has demonstrated that *C. levisecta* can serve as a primary food plant for larvae of the endangered Taylor's checkerspot, a butterfly that once thrived and shared many lowland Puget Sound prairies with *C. levisecta*. This connection affords an unusual opportunity for building on the gains made recovering one rare species to simultaneously enhance the recovery of another. But the potential synergies this situation offers are not as simple as "plant more golden paintbrush, support bigger populations of Taylor's checkerspots." In most sites where checkerspot recovery is underway, *C. levisecta* has been absent, and the butterflies are feeding on harsh paintbrush (*C. hispida*) or lance-leaf plantain (*Plantago lanceolata*). Both species present challenges to *C. levisecta* recovery. The two paintbrush species have been shown to hybridize readily with each other, thereby jeopardizing the genetic integrity and long-term recovery of *C. levisecta* populations growing in the same site. The plantain is a non-native species that can be quite aggressive in some sites and may compete with paintbrush and other native prairie species.

Despite such concerns the future is bright for the continued spread of *C. levisecta* across the prairies, coastal bluffs, and rocky balds of the Puget Lowlands. Furthermore, as paintbrush populations once again become reestablished, ongoing conservation management of these sites will also bring with it the restoration and enhancement of their overall biodiversity, resulting in a cascade of benefits to the prairie ecosystems in the Pacific Northwest.

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Rare Plants of the Southwest Washington Prairies and Their Connection to Oregon's Willamette Valley

by Ed Alverson

One of the interesting aspects of native plant exploration is the study of plant distributions. While analysis of rarity is often based on political boundaries (such as state boundaries), plants are more likely to reflect natural ecological boundaries. This is certainly true along Washington's southern border, which for much of its length is formed by the Columbia River. There is little reason to expect that a plant growing on one side of the river would not also grow on the other side.

In fact, as we explore southwest Washington in more detail, we conclude that the floras of certain counties in southwest Washington represent a natural extension of Oregon's Willamette Valley. Climatically, the interior counties of southwest Washington (Clark, Cowlitz, and Lewis) experience warmer temperatures in the summer than counties around Puget Sound, where temperatures are moderated by water. The low-elevation valleys of southwest Washington have experienced little or no glaciation in contrast to the Puget Sound region, which was glaciated as recently as 15,000 years ago. As a consequence, the soils of southwest Washington are typically substantially more weathered, and clay soils are

common, in contrast to the relatively young and often very gravelly soils of the Puget Sound region.

When the first American settlers arrived in the Willamette Valley in the mid-1800s, prairie, savanna, and oak woodland dominated the vegetation, occupying about two-thirds of the region's landscape (Christy and Alverson 2011). Most of the regionally endemic plants are associated with these habitat types. Prairie and oak woodlands were often the first places that were settled, since farming could begin without having to clear the giant fir trees. The town of Camas in Clark County and streams named Lacamas Creek in both Clark and Lewis Counties speak to the historic presence of prairie vegetation in this area. However in both the Willamette Valley and southwest Washington, the original prairies have declined in extent by 90–98 percent. In many areas you have to look carefully to find native prairie plant species; often the only remaining habit for them is along roadsides and small remnants such as in the corners of fields or other areas not easily cultivated.

Rare prairie plants associated primarily with Willamette Valley prairies have long been known from southwest Washington, including severally globally imperiled species. Kincaid's lupine (*Lupinus oregonus*), was documented from Lewis County as early as 1970. Listed as federally threatened in 2000, subsequent surveys (some done by bicycle!) by Washington Natural Heritage Program staff in the 2000s identified several new populations on roadsides and small prairie remnants (Caplow and Miller 2004, Arnett 2010). *Lupinus oregonus* is an upland prairie species and is ecologically



Woollyhead clover (*Trifolium eriocephalum* var. *eriocephalum*). PHOTO: ED ALVERSON



Native perennial geranium (*Geranium oregonum*). PHOTO: ED ALVERSON



Elegant tarweed (*Madia elegans*). PHOTO: ED ALVERSON



Giant penstemon (*Penstemon hesperius*).
PHOTO: ED ALVERSON



Snapdragon skullcap (*Scutellaria
antirrhinoides*). PHOTO: ED ALVERSON



Vinegar weed (*Trichostema lanceolatum*).
PHOTO: ED ALVERSON

important as a larval food plant for the endangered Fender's Blue butterfly. In Oregon it is found in nearly every Willamette Valley county and to the south in the Umpqua drainage of Douglas County. Pale larkspur (*Delphinium leucophaeum*) has white flowers but is otherwise morphologically similar to the purple-flowered Nuttall's larkspur (*D. nuttallii*). Also a globally imperiled species, *D. leucophaeum* known in Washington from one small remnant in Lewis County, which was originally discovered by Cathy Maxwell in the 1980s (see the article The Face of Extinction in this issue). The remainder of its range is in a few small prairie remnants and herbaceous balds in the Portland area. Hairy-stemmed checker-mallow (*Sidalcea hirtipes*), is a tall checker-mallow found along a few roadsides in Clark and Lewis Counties and was described as a new species by Hitchcock in 1957 (Hitchcock and Kruckeberg 1957). In Oregon, *S. hirtipes* grows on coastal bluffs and prairies, but the Washington plants show morphological affinities to meadow checker-mallow (*S. campestris*), a Willamette Valley endemic not known from Washington. Additional taxonomic research on this complex is probably warranted, as the populations in southwest Washington may be taxonomically distinct from other named taxa.

Several important discoveries of rare Willamette Valley endemics—all first state records—were made in southwest Washington in the 1990s. In 1991 Clay Antieau collected Nelson's checker-mallow (*S. nelsoniana*) in Cowlitz County. This is yet another globally imperiled checker-mallow, a species of wet prairies and ash swale wetlands, primarily in the

central Willamette Valley; it was federally listed as threatened in 1993. Also in 1991 in Lewis County, Cathy Maxwell collected the thin-leaved peavine (*Lathyrus holochlorus*). This species is found primarily at the edges of oak woodlands in the Willamette Valley and presumably was originally most abundant in oak savanna. Then in 1994 Phil Gaddis found a large population of the endangered Bradshaw's lomatium (*Lomatium bradshawii*) in a wet prairie remnant in Clark County. This yellow-flowered species, which was federally listed in 1988, is otherwise restricted to tufted hairgrass (*Deschampsia cespitosa*) wet prairies in Marion, Benton, Linn, and Lane Counties in the central and southern Willamette Valley.

One of the most remarkable stories of botanical obscurity and rediscovery is the giant penstemon (*Penstemon hesperius*). Morton Peck first described the species in 1932, based on his collection from a wet meadow in the Tualatin River drainage, southeast of Portland. In 1945 this species was accepted by the monographer of penstemon, David Keck, who pointed out that the species was actually first collected by David Douglas in 1826 in swampy and flooded land on the north side of the Columbia River between Fort Vancouver and Cascade Locks (Keck 1945). However Arthur Cronquist, in preparing the penstemon treatment for volume 4 of *Vascular Plants of the Pacific Northwest* (1959), chose to submerge this taxon within the widespread Rydberg's penstemon (*P. rydbergii*).

This is where things were left until 2008, when a small remnant population of *P. hesperius* was discovered on the

Tualatin National Wildlife Refuge in Washington County, Oregon. Subsequently, a couple more populations were discovered in the vicinity of the Tualatin River. Seeds were collected from remnant populations and seedlings have since been successfully planted at several publicly owned natural areas southwest of Portland. Then in 2014 a small population of *P. hesperius* was located by Carlo Abbruzzese and David Wilderman of the Washington Department of Natural Resources in the Lacamas Prairie Natural Area Preserve in Clark County. This is the same site that supports a large population of *L. bradshawii*, and a larger population of giant penstemon was located in 2016. After more than 180 years, this species had been rediscovered in Washington!

A number of additional typical Willamette Valley native prairie species that are very rare in Washington, though more common elsewhere, are known from Clark, Cowlitz, or Lewis Counties. These include Oregon coyote-thistle (*Eryngium petiolatum*) (in vernal pools) and Oregon yampah (*Perideridia oregana*) (on herbaceous balds), and smooth goldfields (*Lasthenia glaberrima*) (also in vernal pools), Hall's aster (*Symphotrichum hallii*) (in wet and dry prairies), and mule's-ears *Wyethia angustifolia* (in wet and dry prairies). The smooth goldfields was most recently collected in southwest Washington in 1928, though it has been collected more recently in Klickitat County. Though globally secure, the native perennial geranium, Oregon geranium (*Geranium oreganum*), is a regionally declining species of prairies and oak savannas in the Willamette Valley. It has been collected one time in Washington, in Clark County near Lacamas Creek, by G. N. Jones in 1943. Though the Washington Natural Heritage Program listed it as extinct in Washington, I have a hunch that this species might still be found in Washington if one were to search for it.

Lastly, because Fort Vancouver in present-day Clark County was the center of the British trading network in the early 1800s, many early botanists (including Douglas) used Fort Vancouver as a base for exploring more remote regions. As a result, many early collections used by early botanical authorities to describe new species were collected from the vicinity of Fort Vancouver. The fort itself was located in a prairie on the north bank of the Columbia River, and a series of prairies or "plains" extended inland to the north. Fort Vancouver is the type locality for two globally rare prairie species, golden paintbrush (*Castilleja levisecta*) and white-top aster (*Sericocarpus rigidus*), which have somewhat wider geographic ranges, both extending from the Willamette Valley north to Vancouver Island and adjacent islands in southwestern British Columbia and northwestern Washington. Neither species is known to be extant in Clark County, however.

Elegant tarweed (*Madia elegans*) was described in 1831 from plants grown in Britain from seeds collected by Douglas. But W. J. Hooker cited specimens collected by John Scouler and Douglas near Fort Vancouver in *Flora Boreali-Americana* (Hooker 1833); it may well be that the seeds Douglas sent back to Britain came from the vicinity of Fort Vancouver. The only other collections of this species from Washington were made in 1908 by Wilhelm Suksdorf in Klickitat County.

There are a number of cases where the type specimen of a species apparently collected at Fort Vancouver represents the only known record from the state of Washington. This is the case, for example, for vinegar weed (*Trichostema lanceolatum*). The common name refers to the strong smell of vinegar that comes from the foliage. George Bentham's description of this new species in 1835 lists several Douglas collections, including one from "near Fort Vancouver." In the Willamette Valley, this species is still found occasionally on herbaceous balds, where it blooms in mid-summer, after most of the surrounding vegetation has turned brown or gone dormant.

Another example is snapdragon skullcap (*Scutellaria antirrhinoides*), which was described by Bentham in 1832. The type specimen was collected by Scouler near Fort Vancouver, where Douglas also collected it. The related narrow-leaved skullcap (*S. angustifolia*) grows east of the Cascades in Washington, but *S. antirrhinoides* grows east of the Cascades only as far north as Oregon. This species also blooms in early summer; I have seen it in the Willamette Valley on dry rocky slopes, and while this habitat does not occur in the immediate vicinity of Fort Vancouver, it may have also been found historically on prairies in well-drained soils.

A third example is woolly-head clover (*Trifolium eriocephalum* var. *eriocephalum*), though another variety, *T. eriocephalum* var. *arcuatum*, occurs in south-central and southeastern Washington, according to Gillette (1971). This species was described by Nuttall in Torrey and Gray's *Flora of North America* (Torrey and Gray 1838), based on specimens collected by Nuttall in about 1835 at Fort Vancouver and in the Willamette Valley. This is the only native perennial clover that grows at low elevations west of the Cascades. In the Willamette Valley *T. eriocephalum* is quite scarce, occurring in scattered small populations in higher quality prairie and oak savanna remnants.

I suspect that like me, many readers tend to think of the I-5 corridor in southwest Washington as "drive by" territory on one's way to more interesting places. But the next time you are driving south on I-5, think of this area as a northern extension of the Willamette Valley, an area that still has numerous interesting botanical tales to tell. Recent discoveries, as well

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Lichen Conservation in Washington

by Jeanne Ponzetti, South Sound Chapter

In the eighteenth century, Linnaeus described more than a hundred species of lichens using the binomial system of nomenclature he applied rigorously to plants. But his heart was not in it: he placed them all in a single genus, *Lichen*, and referred to them as the *rustici pauperrimi* (“poor trash”) of vegetation (Plitt 1919). He and other botanists of the time had no conception of the lichen symbiosis—the internal algal cells were not recognized as separate organisms living within a fungal thallus. Early botanists considered lichens part of the plant kingdom but lumped them with fungi, algae, bryophytes, and ferns, together known as *cryptogams* because they all lack flowers and seeds.

Today lichens are firmly ensconced in Kingdom Fungi, with taxonomy following the fungal symbiont, usually an ascomycete (but see the sidebar on the next page!). Lichens also house an algal or cyanobacterial photosynthetic partner,

or sometimes both. None of the component organisms are currently classified as plants.

There are over 15,000 lichens described worldwide, and within the continental United States and Canada, the tally is over 5,300 species in 720 genera (Esslinger 2015). Although a comprehensive checklist for the state of Washington is lacking, lichenologists have documented 1,074 lichen species from Montana (McCune et al. 2014). The number of species in Washington is likely greater because of the wider variety of habitats and temperatures in the state, including coastal habitats and mild, oceanic climates.

Despite the abundance of lichen-friendly habitats in Washington, many lichens are rare or vulnerable in today's rapidly changing environment. Lichen rarity may be due to habitat loss or alteration, limited range or dispersal ability, high habitat specificity, air pollution, or a combination of these.

For example, the hairlike *Sulcaria spiralifera* is known from the immediate coast of northern California, Oregon, and Washington; it occurs in older Sitka spruce (*Picea sitchensis*) forests at or near sea level, and despite extensive coastal surveys

Rare Plants of the Southwest Washington Prairies and Their Connection to Oregon's Willamette Valley (continued from previous page)

as potential future discoveries, can help to blur some of the boundaries that we take for granted and transport us back in time to see how the present landscape is connected to the past.

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in Washington, only three sites are known in the state (Glavich et al. 2005).

The distinctly fingerlike *Dactylina arctica* grows in arctic tundra and alpine sod. It is at the southern edge of its range here with only two occurrences in the state, but it is more common northward. As the climate warms, this species may disappear from Washington.

Some lichens are widely distributed, yet uncommon or rare where they occur. *Acroscyphus sphaerophoroides*, for example, is a distinctive lichen known from one location in the Washington Cascades, a few locations in Canada and Alaska, and disjunct locations worldwide, including high-elevation regions in eastern Asia, South Africa, and Peru (Joneson & Glew 2003).

Many lichens reproduce solely through asexual propagules or fragmentation. The leafy lichen *Pseudocyphellaria rainierensis* occurs only in the Pacific Northwest in moist or riparian old-growth forests, has narrow humidity and temperature tolerances, and is sensitive to air pollution. It is considered dispersal-limited because it is almost never fertile and relies

Freddy and Alice Have a Roommate

The traditional lichen symbiosis—a fungus (“Freddy fungus”) paired with a photosynthetic partner (“Alice alga”)—was discovered in 1867 by Swiss botanist Simon Schwendener (Honegger 2000). Some lichens house more than one photosynthetic partner, but until recently, all lichens were thought to be composed of one fungal species (usually an ascomycete) in partnership with a photosynthetic symbiont. This notion was shattered when researchers at the University of Montana found a second fungal symbiont: basidiomycete yeasts embedded in the cortex were documented in many species distributed over six continents (Spribille et al. 2016). Despite decades of anatomical research with modern microscopes, the yeasts were detected only by molecular genetic techniques. The full implications of the discovery are not clear at this point, but two things are: the next few years will bring exciting research on the lichen symbiosis, and the schoolchildren of the future will need a new mnemonic device.



Nestled among alpine sod vegetation, the distinctive upright projections of *Dactylina arctica* are inflated, hollow, and yellowish to brownish yellow. PHOTO: BRUCE MCCUNE



Ranging from southern British Columbia to Oregon in the western Cascades, *Pseudocyphellaria rainierensis* is found in moist, old-growth Douglas-fir and western hemlock forests at low to mid elevations. It contains both algal and cyanobacterial photosynthetic symbionts. The isidia and lobules fringing the thallus are its primary means of dispersal. PHOTO: BRUCE MCCUNE

on relatively heavy bundles of fungus and algae (lobules and isidia) or thallus fragments for propagation. The species is currently secure in Washington, but is vulnerable due to the combination of strong habitat specificity, dispersal limitation, and air pollution sensitivity.

Lichen conservation in Washington began in 1996, when the first list of rare lichens for Washington State was developed by a group of local and regional lichenologists. In 1997 the Washington Natural Heritage Program (WNHP) published *Endangered, Threatened and Sensitive Vascular Plants of Washington: With Working Lists of Rare Non-Vascular Species*. This preliminary working list of lichens was designed to elicit comments and sighting reports from naturalists around the state.

In 2003 the first lichen was added to the Washington rare plant list: *Texosporium sancti-jacobi*, a soil crust at the northern edge of its range in central and eastern Washington. This species is known only from scattered locations in California, Oregon, Washington, and southern Idaho. The type specimen,

on which the scientific description of the species is based, was from a population in San Diego that no longer exists. Threats include habitat loss and degradation from conversion to urban, suburban, and agricultural uses; weed invasion; fire; and physical disruption of the soil surface (for example, from grazing animals, off-road vehicles, or mountain bikes).

In 2009 the entire working list of lichens was moved to the WNHP Review List, indicating that WNHP had insufficient information to make rank and status designations for those species. In 2012 a regional nonprofit group, Northwest Lichenologists, took the challenge of supplying that information. With funding from the federal government (US Forest Service and Bureau of Land Management), a committee of lichenologists and ecologists updated the list by gathering database records and recommending state-level rank and status assignments.

The committee assessed aspects of rarity, threats, and trends (when available), focusing on species for which there is reliable occurrence and distribution data—lichens considered difficult

to find or identify were not considered. The committee's recommended lichen ranks have been adopted by WHNP and NatureServe, and the state status recommendations are currently under review by the Department of Natural Resources. There are 83 species listed on the WNHP lichen list; 28 are proposed endangered in Washington, 13 proposed threatened, and 11 proposed sensitive (see the WHNP website for the full list at www.dnr.wa.gov/NHPlists).

These lists are not meant to be static; new information is critical to keeping them useful. The WNHP welcomes reports of any listed lichens and encourages suggestions for changes. Please contact Joe Arnett, WNHP rare plant botanist (joea@dnr.wa.gov), with your information.

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Pauper milk-vetch *Astragalus misellus* var. *pauper*

Washington State Sensitive Species

by Catherine Hovanic, South Sound Chapter

Pauper milk-vetch (*Astragalus misellus* var. *pauper*) was first collected in Washington in 1897 by Charles Vancouver Piper. Piper, who wrote the first *Flora of the State of Washington*, was a professor of botany and zoology at Washington State University at the time of this collection, which became the holotype for the pauper variety of the species. Today it is known only from Washington and is identified as a state sensitive species. A distinct variety, *Astragalus misellus* var. *misellus*, occurs in Oregon.

Astragalus is a large genus of about 3,000 species worldwide that are included in the Fabaceae or legume family. About 40 species occur in Washington. *Asatragalus* is sometimes called locoweed and is predominantly found in dry habitats of



Pauper milk-vetch (*Astragalus misellus* var. *pauper*) flowers. PHOTO: JULIA BENT



Collecting pauper milk-vetch (*Astragalus misellus* var. *pauper*) data. PHOTO: CATHERINE HOVANIC

eastern Washington. Only a few species are found in western Washington counties. *Astragalus* has papilionaceous flowers (having an irregular and butterfly-like corolla) like many members of the legume family and forms a variety of different pods useful in distinguishing the members of this group. Their pubescent leaves are pinnately compound with an odd number of leaflets.

Astragalus misellus var. *pauper* is a small perennial herb with a basal rosette of leaves. Each pinnately compound leaf consists of 11 to 13 tiny leaflets. Individual plants are 7 to 15 cm tall. Their flowers are yellowish-white and bloom early in the spring (March to April) with fruits that mature quickly. *Astragalus misellus* var. *pauper* is best identified and distinguished from other members of the genus by its diminutive size and slightly curved pods reminiscent of a crescent moon that hang from the stem on thin stalks. The low branches holding the pendulous pods are commonly splayed out upon the ground. *Astragalus misellus* var. *pauper* looks similar to threadstalk milk-vetch (*A. speirocarpus*) in that both are fairly diminutive, but the pods of *A. speirocarpus* are tightly coiled and distinctly different. At a site near Roosevelt, Washington, *A. speirocarpus* is common and shares similar habitat but never converges with an *Astragalus misellus* var. *pauper* population.

This Washington sensitive species is known only from several eastern Washington counties and is endemic to the state. It is typically found on ridgetops and dry upper slopes in arid sagebrush habitat. The Roosevelt population grows

in the thin rocky soil of a basaltic outcrop and extends down a southwestern slope of cobbly clay loam. Associated species at the Roosevelt site include blue bunch wheatgrass (*Pseudoroegneria spicata*), curly blue grass (*Poa secunda*), serrate balsam root (*Balsamorhiza serrata*), rock buckwheat (*Eriogonum sphaerocephalum*), Gray's biscuitroot (*Lomatium grayi*), purple cushion fleabane (*Erigeron poliospermus*), low pussy toes (*Antennaria dimorpha*), and the ever-present cheat grass (*Bromus tectorum*).

The population I have monitored for two years with the help of my husband, Bill Brookreson, occurs in Klickitat County north of Roosevelt. In 1980 Reid Schuller made the first collection in this area, with an additional collection made by Pam Camp in 1982. The Bureau of Land Management (BLM) contracted with Jim Barrett to survey the population in 1986, and he estimated about 2,000 plants. Over the course of two years, 2015 and 2016, we extended the survey area north by a small extent but did not find any additional populations. The region, however, seems to contain vast potential for suitable additional sites. We also resurveyed the original population to see if it had increased, declined, or was stable. A systematic survey of over 67,500 square meters in 2016 indicates the population has remained stable or has slightly increased. BLM botanist Molly Boyter asked us to specifically look at site fire damage from last year's fire in the Roosevelt area. While we noted additional road grading to the site and along the ridgetop (possibly for fire breaks or fire access), the



Pauper milk-vetch (*Astragalus misellus* var. *pauper*) plant. PHOTO: CATHERINE HOVANIC



Pauper milk-vetch (*Astragalus misellus* var. *pauper*) in bloom. PHOTO: CATHERINE HOVANIC

grading did not reach the population nor did we note any fire damage in the area other than a few scorched junipers, which could have been from the 2015 fire. Otherwise, the site looked untouched since our 2015 pre-fire visit.

The University of Washington's Rare Plant Care and Conservation Program is an outstanding volunteer program, which partners with federal and state agencies to provide rare plant monitoring by trained volunteers throughout Washington. For me it provides a great opportunity to get to places I might not otherwise visit, to see rare plants I might not otherwise have located, and to remain active as a botanist and volunteer. And to ponder "why here and not there" as plants sort themselves out over the ever-variable landscape.

Catherine Hovanic is retired after 17 years in service to the Washington Native Plant Society as executive director. She has a master's degree in botany and strives to refresh her botanical memory on northwest trails and by volunteering for Rare Care.



Navaho Pass Trail

by David Giblin, Central Puget Sound Chapter

In 1981 Dr. Deborah Rabinowitz published her classic paper, "Seven Forms of Rarity." In that article she presents a conceptual framework for classifying different types of rarity, which incorporates the combination of a species' geographic range size, whether it is a habitat generalist or specialist, and whether it occurs in populations that are either dense or sparse. It's a lot to think about, but a great way to examine the different ways that rare species occur on the landscape.

Perhaps one of the best places for us to ponder the seven forms of rarity is the Wenatchee Mountains in central Washington, which is home to the largest number of endemic species in the state. Some of the species there are incredibly rare due to a very small geographic range, a narrow preference of soil type (for example, serpentine), and few populations with only a low number of individuals in each. Other species that only occur in these mountains can be found over relatively large areas in rather large populations. Some others fall somewhere in between, which brings me to the Navaho Pass Trail.

Navaho Pass lies almost smack dab in the middle of the Wenatchee Mountains. Access to the Navaho Pass Trail is up the Teanaway River drainage off the road that follows Stafford Creek (visit <http://www.wta.org/go-hiking/hikes/navaho-pass> for directions for reaching the trailhead). The drive in to the trailhead is beautiful, passing along south-facing slopes with colorful soils containing sparse vegetation. I wanted to stop the car and bushwhack up the slopes to see what was there. I will the next time I return.

The trail itself is a wonderful walk through a mix of ponderosa pine (*Pinus ponderosa*) forest and open meadows. The total distance is 11 miles round-trip with a 3,000-foot elevation gain. I don't recall it feeling either long or steep (I remember trails that feel this way: Mount Pugh, Mount Townsend from the lower trailhead, Shriner Peak). What I do recall is that at about 4 miles in you come across a gray-stoned/pumice meadow covered with mostly Wenatchee desert-parsley (*Lomatium cuspidatum*).

Lomatium cuspidatum is a member of the Apiaceae (parsley family) that has a narrow distribution (Chelan and Kittitas Counties), is a habitat specialist (open, serpentine soils), but occurs in large numbers. Despite its narrow distribution, this species is not on the rare plant list because it is abundant where it grows, and Navaho Pass Trail is a great place to see it.

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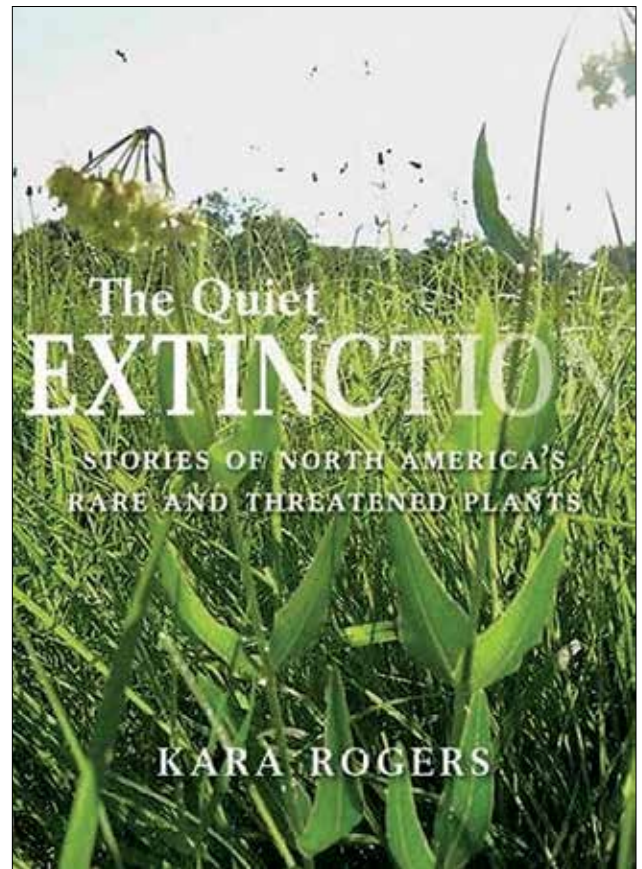
The Quiet Extinction: Stories of North America's Rare and Threatened Plants

Kara Rogers, The University of Arizona Press,
Paperback, 238 pages, \$24.95

*Reviewed by Ellen Kuhlmann, Koma Kulshan
Chapter*

The Quiet Extinction sends the reader deep into the world of rare plants through a detailed exploration of several species: their history, characteristics, ecology, survival challenges, and restoration efforts. Profiled are a few species that may be familiar to WNPS members, such as whitebark pine (*Pinus albicaulis*) and golden paintbrush (*Castilleja levisecta*), as well as many that are likely not, such as parachute penstemon (*Penstemon debilis*), Fickeisen Plains cactus (*Pediocactus peeblesianus* var. *fickeiseniae*), and running buffalo clover (*Trifolium stoloniferum*).

Rogers details the habit and reproductive strategies of each species, its entry into scientific history, and its habitat



Navaho Pass Trail (continued from previous page)

After you marvel at this beautiful plant with waxy blue-green leaves and umbels of dark-purple flowers, you continue on for

another mile to Navaho Pass. Here you'll have outstanding views of Mount Stuart and the Enchantments.



Leaves and inflorescence of Wenatchee desert-parsley (*Lomatium cuspidatum*). PHOTO: BEN LEGLER.

In an average snow year mid-June is a good time to do this hike. You'll see plenty of other wildflowers along the way, some of which may be rare. Maybe some of them will have a different mix of traits that place them in a different category of rarity than *L. cuspidatum*. In any event, it is a great place to visit to think about our native flora and why some species are less common than others.

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.



preferences. Each account shows a different fit between plant and place such that the reader gets a glimpse of life in places as diverse as a steep talus slope, a windswept ridge, and a tallgrass prairie with waving grasses six-feet high. While the species demonstrate a wide variation in form and habitat adaptations, the challenges they face are fairly uniform: habitat loss, predation, disease, and climate change. After reading the book, a reader will be able to easily discuss the threats rare plants face and the various restoration techniques that are used. The author's goal was to forge a connection between readers and rare species and by writing their stories inspire greater awareness and conservation of our natural heritage.

Each chapter largely stands alone allowing the reader to skip around the book if desired. In addition notes and references for each chapter provide resources for anyone wishing to consult the source material. Comprehensive accounts are presented for each rare species using technical language and concepts explained with precision. The result is an accurate presentation of how a species fits into its habitat and responds to various stressors, but this approach can at times make for slow-going through dense prose. For example Rogers details different methods of oil shale mining, surface and in situ re-torting, which is a concern for parachute penstemon (*P. debilis*). In another chapter the evolution of the *Torreya* genus, shown through the fossil record and molecular studies, is used as context for the current restricted distribution of Florida Torreya (*T. taxifolia*).

Rogers excels at presenting a well-rounded look at the past, present, and potential future of these rare species. For example Mead's milkweed (*Asclepias meadii*) was discovered in 1843 by physician Samuel Barnum Mead in Hancock County, Illinois. Her tone is conversational as she relates how prairie flora resisted the plow until steel blades came into use. The reproductive strategies of *A. meadii* are explored, and the reader almost feels like he or she is a part of the conservation crew monitoring *A. meadii* and outplanting seedlings for recovery efforts. Rogers has a PhD in pharmacology and toxicology, which shows when deftly detailing the potential of plants to provide compounds for treating human disease or explaining methods by which genetically modified organisms are created.

Given the complexity and depth with which most information is presented, occasional botanical missteps strike a discordant note. For example Rogers refers to the gymnosperm Jack pine (*Pinus banksiana*) as producing flowers and mischaracterizes the arils of *T. taxifolia* as female cones. These are minor points but suggest that her grasp of botany may not match her expertise in other areas. Rogers also falters in places when attempting to paint a picture with words; for example she writes of how restoring *C. levisecta*



Whitebark pine (*Pinus albicaulis*). PHOTO: BEN LEGLER

will add swaths of yellow to the meadows of Puget Sound. Although *C. levisecta* flowers are bright yellow, the meadows today have considerable amounts of yellow from plants such as buttercups (*Ranunculus* spp.), desert-parsley (*Lomatium* spp.), and Scot's broom (*Cytisus scoparius*). But the sentiment and intent is admirable: to restore what has been lost.

Few books have been written on rare plants that aren't aimed at professional botanists, and Rogers is to be commended for this effort to popularize the plight of rare species. Explaining the concept of rarity and where the line lies between rare or not rare could fill a book in itself and is wisely not addressed in *The Quiet Extinction*. The species profiled are either listed or proposed to be listed as rare under the Endangered Species Act.

Rogers covers the usual arguments for rare species protection: preservation of genetic diversity, economic potential, and inherent value. But she knows that these arguments will not amount to much unless there is a groundswell of support from the public. She believes that the trend is toward awareness and protection of rare plants, and that our actions can ensure that rare species grace our landscapes for future generations. *The Quiet Extinction*, with its stories of plants from throughout North America, illustrates the ingenuity and vastness of our natural heritage, and one can't help but root for the plants profiled within to not only survive but also prosper.

Ellen Kuhlmann has worked for the US Forest Service and Rare Care, and joined WNPS in 1995. She studied fire ecology at Western Washington University and is the coauthor of Trees and Shrubs of the Pacific Northwest.





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“One generation plants the trees, another gets the shade.” – Chinese Proverb

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