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



About This Issue

by Walter Fertig

As the calendar changes from summer to autumn and the alders in my yard are shedding their leaves without even bothering to change color first, I am reminded of a favorite quote from the naturalist Hal Borland:

Each new season grows from the leftovers from the past. That is the essence of change, and change is the basic law.

Change is the one constant in our lives and in nature. Our lives are constantly changing as we pass from youth to adulthood and old age, and watch powerlessly as our loved ones grow, move on, or depart entirely. Seasons come and go too, in their perpetual cycles of spring rebirth, summer maturation, fall decline, and winter rest, always to be repeated, in predictable ways.

At least this has always been the bargain. Nowadays, though, it seems that change is not so predictable. As we learn in this issue, unpredictable extreme weather events are likely to change the dynamics and composition of our forests in ways that are not easy to forecast. Non-native plants are becoming an increasingly important component of our state's biota and having repercussions on native species and ecosystems that are not readily predictable. Even the names we assign our favorite plants and plant families are changing in strange ways (or so it might seem, but it is all part of the quest for improved scientific knowledge, as David Giblin's article will explain). Seen in this light, change is not so comforting.

There may not be much we can do about the changing of the seasons, or the passing of time, but we can at least do small things to make our world a better place in the short time we have on it. We can take hope in the example of the native plant stewards in Whatcom County, described in the article by Jim Evans, who volunteer their time to improve their community (and build friendships in the process). Or be encouraged by the work of Rare Care staff and citizen scientists in restoring populations of endangered plants (see Stacy Kinsell's article). Or just get outside and appreciate new things about nature, like the crazy life cycle of the seagrasses that inhabit our coastal marine waters (discussed by Sara and Thomas Noland). Change is coming whether we are prepared or not — hopefully this issue of *Douglasia* will provide some ideas on how we might make the best of it.



On the cover: Subalpine Firs (*Abies lasiocarpa*) among Sitka mountain ash (*Sorbus sitchensis*) and Cascade blueberries (*Vaccinium delicosum*) on Cougar Divide in the Mount Baker Wilderness. PHOTO: MARK TURNER

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

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Information for Contributors

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President's Message: The View from Here

by Van Bobbitt

Dear WNPS Members,

WNPS is embarking upon a strategic planning process, and I am excited about it!

I'm sure this statement seems insane to many of you who have endured strategic planning retreats. You might prefer getting a root canal.



Yes, strategic planning includes lots of messy process. It requires listening to people drone on about issues you may not care about. It goes too slowly for action-oriented people. And too often, overly ambitious strategic plans just sit on the shelf collecting dust.

So why am I excited?

- After meeting with two strategic planning consultants, I discovered that the current trend in strategic planning is toward shorter plans that are focused on fewer objectives — preferably three, but no more than five.
- Plans for a three- to five-year period are more effective than ones that cover a five- to ten-year period.
- There is emphasis on getting good data from various stakeholders — members, chapter officers, board members, and partner organizations.
- We will look at peer organizations — environmental organizations in our state and native plant societies in other states — to see what we can learn from them.
- We will conduct interviews with key stakeholders to understand how others see WNPS's strengths, unique role, and opportunities.
- The Ostara Group, the consultants selected to help us develop our strategic plan, put a big emphasis on follow up to make sure the plan is implemented. From my experience, follow through is one of the biggest problems with strategic plans. Once the document is done, people often go back to doing what they did before. We want this plan to be transformational for WNPS.
- This exercise will focus our work for the next five years.

Why are we doing this now?

- WNPS received a bequest from the estate of Margaret and Joe Miller. At last spring's board meeting, directors voted to use a small portion of the bequest to hire a consultant to help us develop a strategic plan that would be transformational for WNPS.
- WNPS began in 1976 and has only had two strategic plans during that time. The Society's first strategic plan was intended to guide WNPS from 1997 to 2001, and the second plan covered the period from 2003 to 2010. There have also been less formal planning efforts over the years.

- The Miller bequest was a gift that enabled us to conduct strategic planning on a more professional level.

Do we need to “transform” WNPS?

- Maybe not.
- My personal view is that the mission created by the founders of WNPS in 1976 is still strong. We should not throw out the strong foundation they provided.
- But the world has changed in 43 years — the threat of climate change, the rate of land conversion that destroys native plant habitats, the speed of species extinction, and the ways we communicate are all drastically different.
- I strongly feel we need to explore more effective methods to achieve WNPS's mission: “To promote the appreciation and conservation of Washington's native plants and their habitats through study, education, and advocacy.”

The goals of our strategic planning process are:

1. Bring the state board, staff, chapters, and members into agreement on the organization's identity and establish three to five priority goals to be accomplished from 2021 through 2025.
2. Strengthen relationships between the state board and chapters.
3. Provide an opportunity for members and stakeholders to meaningfully contribute input that will shape WNPS's future direction.

We will be communicating the progress of our strategic planning to all of you through the e-newsletter, the WNPS website, *Douglasia*, and chapter leaders. I invite and encourage you to participate by sharing your hopes and concerns about WNPS's future direction.



Department of Corrections

In my short article on “A New Milkweed in Washington” in the Summer 2019 *Douglasia*, I mistakenly credited Jeff Heinlen with first discovering *Asclepias incarnata* in the state in August 2016. In fact, Angel McCormick (née Hastings) made the initial discovery, while Jeff revisited the site the following year and sent me a field survey form documenting the new species. My apologies for mixing up the discoverers, and spelling Angel's name incorrectly in the photo credit.

Astute reader Arthur Lee Jacobson noticed that I omitted the name “*pugetensis*” (as in *Prunus* × *pugetensis*) from my article on Latin plant names derived from Washington geographic landmarks in the Summer 2019 *Douglasia*. *Pugetensis* is derived from the Puget Sound, where Jacobson and Peter Zika named a new hybrid cherry in 2007 derived from our native *Prunus emarginata* and the introduced *P. avium*. I neglected to consider hybrids in deriving the roster of geographic species names. A couple of honorable mentions also come from named hybrid taxa: Vancouver (B.C.) for *Leymus* × *vancouverensis* and Multnomah County, Oregon for *Poa* × *multnomae*. — Walter Fertig

Moving the Target: Managing Pacific Northwest Forests in a Changing Climate

by David L. Peterson and Jessica E. Halofsky, School of Environmental and Forest Sciences, University of Washington

Background

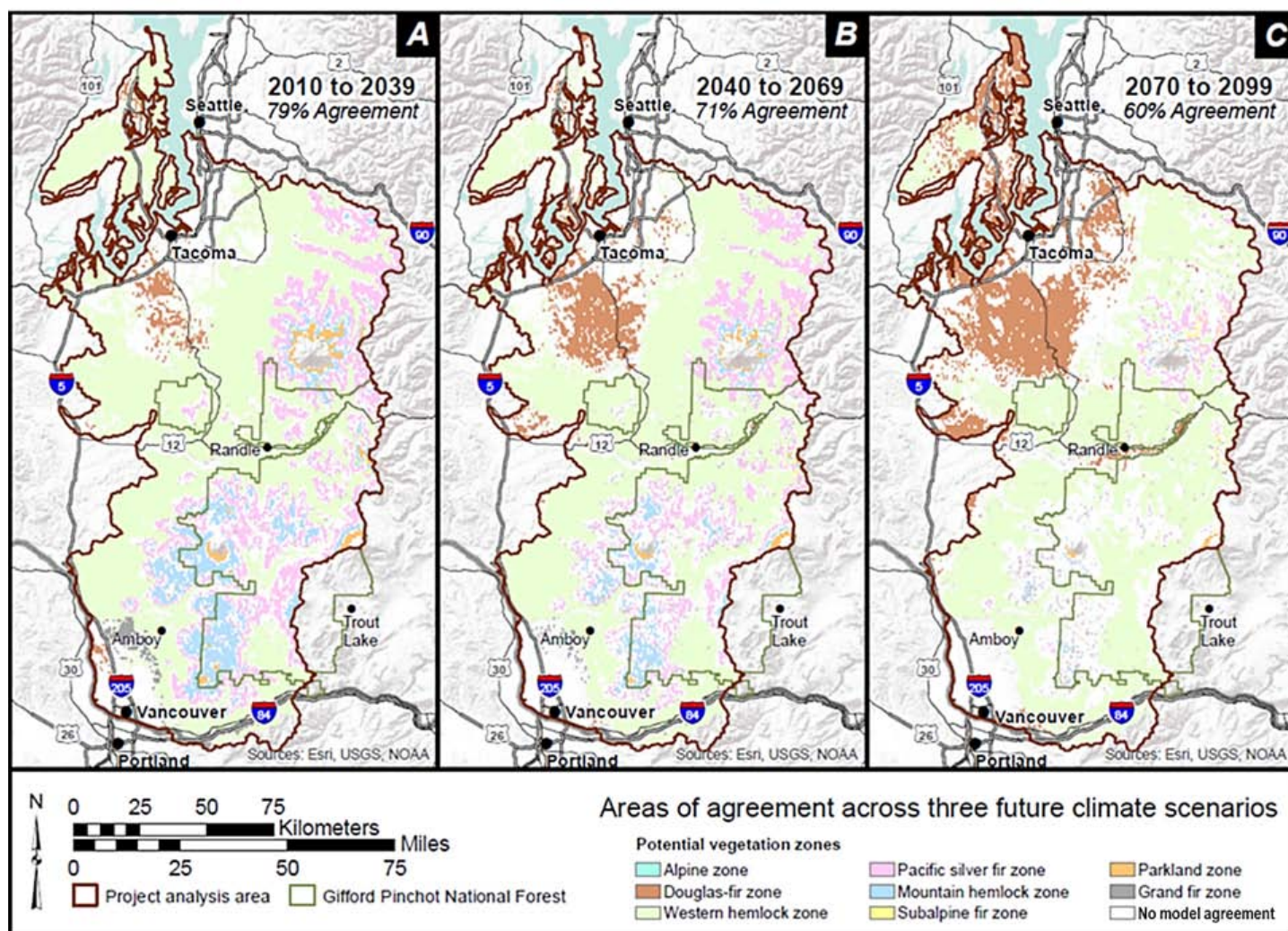
Climate projections for the remainder of the 21st century are sobering in terms of the magnitude and rate of temperature increase (USGCRP 2017). Based on what the paleoecological literature tells us about how vegetation has responded to temperature during the Holocene, we can expect significant shifts in the abundance and distribution of tree species and associated flora in a warmer climate (Davis and Shaw 2001). These shifts will occur by individual species, not plant communities, resulting in new combinations of species across the landscape.

Projections of future vegetation conditions must consider the broad context within which change will occur. First,

over 90% of all primary forests at lower elevation in the Pacific Northwest (hereafter Northwest, referring primarily to Washington and Oregon) have been harvested at least once. Therefore, the current forest landscape is dominated by second-growth forests whose structure and composition may differ from those of primary forests and cannot be considered “natural.” Second, with the exception of wilderness areas, most forest landscapes have been fragmented by timber harvest, agriculture, urbanization, and roads, thus altering connectivity. Third, many forests, especially at low elevation, have a significant complement of non-native plant species, insects, and pathogens. This is particularly true in dry mixed-conifer forests on the east side of the Cascade Range, where cheatgrass (*Bromus tectorum*) has altered the fire regime in dry mixed-conifer forests and woodlands. Finally, fire exclusion has reduced the frequency of fire in most of these forests, altering structure and species composition and elevating fuel loading.

Why Extremes Matter

Most changes in the distribution and abundance of forest plant species will be facilitated by rare but extreme events. Climate change is expected to cause an increased frequency,



Vegetation projections under changing climate for a region in southwest Washington that encompasses the Gifford Pinchot National Forest. Colored areas represent future vegetation changes that occur under multiple climate scenarios (i.e., areas of agreement). Projections were derived from climate-informed state-and-transition simulation models (Hudec et al. 2019). Figure from Hudec et al. 2019.

magnitude, and duration of droughts. This factor alone will test the tolerance of many species, especially on the west side of the Cascades where precipitation and soil moisture are generally higher than on the east side; although trees at the lower elevation ecotone between trees and shrub-steppe on the east side may also incur stress and perhaps mortality. Recently, extensive mortality of western hemlock (*Tsuga heterophylla*) and western red cedar (*Thuja plicata*) in western Washington has been documented (personal observation), presumably the result of dry summers and low soil moisture during 2015–2018. Defoliation and mortality in western hemlock caused by the fungal pathogen *Rhizoctonia* (*Rhizoctonia butinii*) has also been attributed to drought. Much of the mortality in western red cedar and western hemlock appears to be in locations where soil moisture stress is accentuated (well-drained soils, low annual precipitation, high-density stands), but this phenomenon does illustrate that drought effects in westside conifers can occur relatively quickly.

In eastside forests, high temperatures and drought are facilitating increased levels of disturbance. Since 1990, higher temperatures increased soil moisture stress (especially in dense stands), causing mountain pine beetle (*Dendroctonus ponderosae*) outbreaks and extensive mortality in lodgepole pine (*Pinus contorta* var. *latifolia*) and to a lesser extent ponderosa pine (*Pinus ponderosa*) across hundreds of thousands of hectares in the Northwest (and 20 million hectares in western North America). This was an unprecedented, rapid transformation of forest structure and productivity.

The frequency and extent of wildland fire is also expected to increase as the climate continues to warm. Annual area burned has increased since around 1990 in the western United States, including in the Northwest, although the proportion of the landscape burned by high-severity fires has not increased. Tree species that dominate lower elevation, dry forests (ponderosa pine, Douglas-fir (*Pseudotsuga menziesii*)) generally have adaptations that allow them to resist fire and/or propagate following fire. However, fire exclusion in many locations has allowed fuels to accumulate, and what would have been low-intensity surface fires in the past are now often high-intensity crown fires. As with insects, this has resulted in a rapid transformation of forest structure and productivity where crown fires have occurred, although most large fires have a mosaic of fire effects, ranging from low to high severity.

Characteristic	Sensitive Species	Resilient Species
Production of seeds and other propagules	Low	High
Seed dispersal or vegetative propagation	Low	High
Tolerance of low soil moisture	Low	High
Tolerance of high air temperature	Low	High
Tolerance of wildfire	Low	High
Competitive ability	Low	High
Environmental tolerance	Narrow	Broad
Genetic diversity	Low	High

Table 1. Characteristics associated with plant species that will be sensitive or resilient to a warmer climate.

After disturbance-caused mortality occurs across large landscapes, the competition begins among plant species to occupy and persist on the site. The frequency and magnitude of disturbance events will determine how and where plant assemblages, perhaps novel in our experience, will be reorganized over time. It has been suggested that fire refugia may provide opportunities for some systems and species to persist in a warmer climate, but it is likely that the effects of a warmer climate and disturbances will be so pervasive that no landscapes will be immune.

Vegetation Response to Climate Change: An Educated Guess

A number of assessments of the effects of climate change on forest vegetation have been conducted for the Pacific Northwest (Halofsky et al. 2011, Littell et al. 2014, Kerns et al. 2017, Case et al. 2019, Hudec et al. 2019). These assessments are typically based on simulation modeling of vegetation and on evaluation (mostly expert opinion) of the resilience of individual species to a warmer climate. Some studies have also used paleoecological evidence to inform projections of future vegetation. Based on these assessments, we anticipate that productivity will decrease in nearly all forests, the result of increasing water deficits in drier summers. A notable exception is subalpine forests, which are energy limited rather than water limited, and may have higher productivity.

In general, vegetation assessments project that species that are tolerant of dry soils will expand their distribution and abundance. For example, ponderosa pine may become more dominant on the east side of the Cascades, whereas Douglas-fir may become more dominant on the west side. But there are many characteristics that determine how species may respond to a warmer climate (Table 1). Species that produce large numbers of seeds or propagules and can disperse them widely will be tolerant of an environment with more disturbance, particularly fire. Therefore, we expect that “weedy” species and those associated with disturbed environments (pioneer species) will be able to regenerate successfully. Tolerance of low soil moisture and high air temperatures will be critical for tree seedlings, especially in exposed conditions following disturbance.

As noted above, wildfire is expected to occur more frequently and across larger areas, especially in eastside forest

ecosystems. Plant adaptations to fire (thick bark, sprouting, heat-resistant perennating tissues, etc.) will allow species to persist through disturbance events (Table 1). It will be critical for species to be competitive following fire and other disturbances in order to attain dominance in the post-disturbance environment. Tolerating the wide range of conditions prevalent near the soil surface is a highly desirable trait for seedlings, but is also important for mature trees, given that climate is projected to be more variable in future decades. Finally, high genetic diversity generally confers benefits to plant species under changing physical conditions and environmental bottlenecks. Given that Northwest tree species have survived periods of variable climate for millennia, most of those species should be sufficiently competitive in a permanently warmer climate, albeit with some change in their distribution and abundance.

If disturbances increase as expected, younger-aged forests may dominate some landscapes. Subalpine forests may persist indefinitely in the absence of fire or other disturbances, but if fire does occur it will cause extensive mortality, opening the landscape for potential establishment by species that currently dominate lower elevations.

Vegetation assessments have noted that riparian areas, wetlands, and groundwater-dependent systems are expected to change rapidly (Lee et al. 2015, Dwire and Mellmann-Brown 2017), especially if summer precipitation is lower, as projected. These systems depend on persistent, high water tables and high soil moisture for most of the year, and are occupied by many species that require that moisture. Bogs and similar systems may be especially vulnerable.



Whitebark pine, which has experienced mortality from white pine blister rust for decades, may be more susceptible to mountain pine beetles in a warmer climate. PHOTO: JENNIFER BECK, NATIONAL PARK SERVICE.

Species that are already under stress will also be vulnerable. For example, whitebark pine (*Pinus albicaulis*) populations have been in decline from white pine blister rust (*Cronartium ribicola*) for decades. In recent years, mountain pine beetles (*Dendroctonus ponderosae*) have caused additional mortality, because a warmer climate has allowed the beetles to reproduce at higher elevations (Bentz et al. 2013) where warming minimum temperatures have decreased beetle mortality previously

caused by cold temperatures (Weed et al. 2015). This trend is expected to continue and put additional stress on whitebark pine populations.

Despite the apparent geographic specificity of maps generated by vegetation models, it will be difficult to accurately project altered distribution and abundance of species in a warmer climate. Climate in the late 21st century may have no analog in the past, and models represent only certain aspects of the life history and physiology of plant species, and rarely represent competition. Therefore, model projections should be considered coarse-resolution estimates of what may occur in the future.

Building Resilient Forest Ecosystems

Moving the Target

Ecological restoration has been institutionalized in forest management on public lands, and to some extent on private lands, throughout the Northwest. This has occurred in two ways. First, implementation of the Northwest Forest Plan in 1994 required the following on 10 million hectares of federal lands: (1) preservation of old forests, (2) management to encourage growth of additional old-forest structure to ensure habitat for northern spotted owls (*Strix occidentalis caurina*) and marbled murrelets (*Brachyramphus marmoratus*), and (3) protection of aquatic habitat. This policy eliminated most logging and created a new focus on creating structures in maturing forest that are typical of old forests (multi-storied stands, canopy gaps, down wood, large trees near streams). Realistically, this management is mostly passive while we wait for forests to mature and self-thin, but it is essentially a massive restoration program.

Second, there is an imperative for society, and forest management in particular, to address the issues of high fuel loads, dense forest stands, and increased extent of crown fires in lower elevation, eastside forests. The consensus restoration trajectory is to reduce the intensity of future fires by: (1) reducing stand densities through removal of understory trees (typically grand fir (*Abies grandis*) and Douglas-fir), thus preventing propagation of fire from the ground to the canopy, and (2) reducing small-diameter surface fuels mechanically, manually, or with prescribed fire. These actions are intended to encourage a return to more open forests, minimal fuels, and low-intensity fires that occurred prior to around 1900, thus avoiding crown fires and facilitating fire suppression where desired. This management approach is typically referred to as “dry forest restoration.”

Historical reference conditions as described above have traditionally been the target (or trajectory) for restoration policies and programs. Aiming for the “historical range of variability” may move conditions in a positive direction, but will not be sufficient to maintain species and functional ecosystems in a much warmer climate that persists for decades to centuries. A more appropriate target is “future range of variability” in terms of climate and disturbance regimes (Millar et al. 2007, Keane et al. 2018).

A New Management Paradigm

Uncertainty about future range of variability is high, but we can almost certainly anticipate higher temperatures, more extremes in temperature and precipitation, more droughts, less snow (below around 2,000 meters elevation), longer growing seasons, and more frequent disturbances. These conditions provide a basis for shifting to “climate-informed” management. Fortunately, most best practices currently used in sustainable forest management are focused on improving forest vigor and reducing stressors, so fine-tuning practices and on-the-ground priorities should preclude the need to greatly transform management.

Although restoration has been institutionalized in policy and practice, a more viable strategy for forest management in a warmer climate is building resilience in forest ecosystems across large spatial and temporal scales. The assumption of steady-state conditions are replaced with projections of a different and more variable future climate and its implications for disturbance. There is no formula for how to do this, but there are overarching strategies based on best practices, ecological theory, and recent guidance on climate change adaptation (e.g., Keane et al. 2018).



Eastside Pine prior to harvesting (2002) Strata - E2G (approx. 300+ Trees Per Ac.)



Stand conditions before (top) and after (bottom) a dry forest restoration treatment in the Lassen National Forest in northern California. Reducing stand density and hazardous fuels in dry forests will likely increase resilience to wildfire and drought in a changing climate. PHOTOS: U.S. FOREST SERVICE.

Think long term — Most current forest management focuses on establishing a stand under the assumption of a historical climate. Regeneration is critical, perhaps the most critical phase of sustainable forest management, but the climate that

will exist several decades in the future will affect the productivity and vigor of the mature stand as well. This is especially important on public lands where the long-term goal is often to create old-forest habitat. Managers of private lands where timber production is the goal may have the benefit of thinking *only* 40–50 years ahead when the current stand is harvested. They also have more options to modify management practices with each future rotation.

Focus on function — A reality of a rapidly changing climate with more disturbances is that it will be impossible to protect all species in all places. This does not necessarily mean that extinction will occur, but that local extirpation could become common. Managed relocation of species may be worth trying in some cases, but the scientific basis for this practice is largely untested.

A more durable approach is to focus on maintaining ecosystems that retain most of the biophysical properties of what one would consider a “functional” forest. This includes characteristics such as productivity, growth, photosynthesis, respiration, decomposition, down wood, and biogeochemical cycling, as well as desired structural and compositional habitat features. These properties of functionality can exist despite a change in the distribution and abundance of species. For example, if an eastside forest previously dominated by Douglas-fir becomes dominated by ponderosa pine, it could still function well, albeit with a likely change in associated flora and fauna.

Accommodate disturbance — The scale and magnitude of future wildland fire will be too great to resist, although fire suppression is likely to remain a dominant policy for the foreseeable future. Policies that focus on making forests resilient to fire through stand density management and fuel reduction will be successful only if they are accompanied by a public mandate for implementation and by budgets that are sufficient to greatly increase the area treated in eastside forests. Accommodating fire and other disturbances in westside forests is more challenging and may not be tractable given normal fuel accumulations and the low risk of fire occurrence, although expansion of programs that prevent human-caused ignitions may help. In addition, practices such as stand density management can be used more assertively to maintain forest vigor.

Diversify, diversify, diversify — Diversification of forest structure at all spatial scales will improve resilience to a warmer climate and increasing disturbance. This “hedge your bets” strategy helps ensure that specific fires, insects, and pathogens will not rapidly alter a huge portion of a given ecosystem, and that a significant portion of the landscape will remain unaffected. Forest stands can be diversified by using multiple tree species and genotypes, and by planting and thinning at variable spacings. For example, rather than planting all trees of a given species from the local seed zone, one could plant from multiple seed zones, including from farther south and/or lower elevation. Implementing diversification strategies successfully across large landscapes and regions will require collaboration among federal, state, tribal, and private land managers. Political

boundaries should not be a barrier to building resilience if all parties can agree on objectives.

Manage by experiment — Managing for resilient forests in an era of climate change is new territory. Most forest managers on both public and private lands have been trained in forest practices that do not include a warmer climate and associated risks. However, managers are now starting to use climate change projections and adaptation options to modify existing practices or develop new practices that are not “in the manual.” Managing by experiment at different spatial and temporal scales should be encouraged as a means of exploring options that will increase resilience. Failures should not be punished, but used as opportunities for learning and adjustment. Long-term monitoring of the effectiveness of climate-informed practices will provide feedback to the normal process of adaptation management in forest ecosystems.

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Recognizing Naturalized Flora in Wild Landscapes of Washington

by Katherine Darrow

In the state of Washington, there are more than 1,000 introduced non-native taxa that are not considered to be noxious weeds, but have become naturalized members of our flora. Learning to recognize these neo-natives contributes to a better understanding of plant geography in the Pacific Northwest.



Common checker mallow (*Malva neglecta*) PHOTO: BEN LEGLER

Common checker mallow (*Malva neglecta*) holds a special place in my heart for being the first plant species that I keyed out on my own during a field botany course in my second year of college. As my first collection of the 50 herbarium specimens that were required to be identified and mounted for the class, common checker mallow helped inspire me to pursue a career in botany. Back in the day, which was way back in 1978, the dichotomous key I was using did not mention that this species was introduced or exotic or non-native. It merely noted that it is “a very common weed.” But later, when I learned that this plant is an “alien,” a term that was added to the species description in subsequent editions of *A Colorado Flora* (1987 & 2012), I internalized a certain disregard for this plant and others in the same category. This in some instances developed into “xenophytobia” (Stromberg & Chew 2002), a condition that many native plant fans develop when confronting massive habitat restoration projects.

I was taught that the presence of an alien species — also termed exotic, non-indigenous, introduced, or non-native — meant that wherever it was growing had been intruded upon, disturbed, defiled. These species were uninvited and needed to be eradicated. This plant, no matter how lovely, with its delicate pink striped flowers, graceful, sturdy lobed-leaves and perfect

mandala of seeds, was among the wretched that, in most gardens, would be pulled up by its roots and left to rot in the compost heap or doused with herbicide. If it were found creeping into a wildland area or preserve, it would be tagged aggressive, invasive — or worse, noxious — a legal term that makes a plant a target for extermination.

Over the years, my attitude towards non-natives has mellowed. Today, I prefer the term naturalized, a more benign word for any introduced species that has overcome reproductive barriers to disperse and multiply without human assistance. Reproducing and moving into new territory is, after all, what all living things are naturally doing their best to achieve.

The definition of naturalized includes three main factors: geography, dispersal method, and time. Naturalized plants have been introduced to a defined region, either intentionally or unintentionally, by humans that have colonized an area. In the Pacific Northwest, this would be any introduced species that has reproduced in our region since about 1850. Some environmental philosophers have come up with the label “neo-natives,” since once a species has naturalized, each new generation in an established population will have been conceived and germinated in the expanded territory.

Much has been written about the paradigms and values inherent to the concept of naturalization of non-human species, with considerable discourse on the anthropological and political implications to the science of invasion ecology and weed management (Jacobson 2008, Marris 2011, Mastnak et al. 2014, Pearce 2015). No matter what your views are on the subject of neo-natives and the idea of “novel ecosystems” (Hobbs et al. 2013, see sidebar), human influence on biodiversity and species distribution via disturbance and introductions is increasing at a rate that roughly parallels the dramatically rising global human population. These members of our regional flora are here to stay for a long while, whether they are deep in what is left of our old growth forests, on remote beaches, in prairie remnants, or as part of the vast complexes of rural and urban habitats that most humans now call home.

Naturalized Species on the Rise

One of the most interesting statistics from the summary of species in the 2nd edition of *Flora of the Pacific Northwest* is that 722 of the 1,054 new taxa are exotics, or naturalized non-natives. This represents 69% of the increase in taxa added to the updated *Flora*. Exotics comprise 27% of the documented flora overall (Hitchcock & Cronquist 2018, p. xxvii). This summary does not include, however, what may number in the thousands of taxa being introduced and cultivated in horticultural and agricultural situations in the region, but have not (yet) become naturalized.

Of the 5,335 vascular plant taxa (species and distinct varieties or subspecies) recorded for the Pacific Northwest (Hitchcock & Cronquist et al. 2018), 3,943 taxa are known from Washington. Of those, 1,215, or 31% are non-native intro-

duced taxa, including waifs (Weinmann, et al. 2002+). More than 390 taxa, or ~48% of naturalized species in Washington have been documented for more than a century. Since the year 2000, nearly 200 more exotics have been catalogued. In the 2018 alone, five new records have been added. This far outpaces any new discoveries of native plants in our region.

For beleaguered botanists already wrestling with changes in nomenclature, the addition of so many non-native species may be regarded as either a boon or a blessing, depending on your perspective. With nearly 25% more taxa (both native and introduced) represented in the region overall, we have a dramatic increase in biodiversity, which might be considered a positive change. However, if you consider exotic taxa to be a detriment to the regional ecology, this may be a serious problem. Many of the exotics we are most familiar with are Class B and Class C noxious weeds. In Washington, however, only 153 species have been officially listed in this category in 2019 (WANWCB 2019), which is only about 13% of the total number of naturalized species.

This leaves us with more than 1,000 naturalized plant taxa that aren't considered noxious pests in most habitats. Indeed, where many of these species have taken root and thrive, it is the setting, not the plant that is noxious; "wastelands" such as mine tailings, fallow fields, industrial areas, railroad and shipping yards are some examples. Some of the species that have not been declared noxious, such as creeping buttercup (*Ranunculus repens*), sea rocket (*Cakile maritima* and *C. edentula*), two species of dandelion (*Taraxacum officinale* and *T. erythrospermum*), and four species of poppy (*P. argemone*, *P. dubium*, *P. rhoeas*, and *P. somniferum*) are easy to recognize. Learning to identify naturalized non-native species is a worthwhile challenge for anyone studying a local flora, even though it is the primary mission of WNPS "to promote the appreciation and conservation of Washington's native plants and their habitats." (<https://wnps.org>)

How to learn the naturalized introduced species:

Look for the asterisk: If you are exploring an area in Washington that is covered by one of over 700 WNPS Plant Lists archived on-line (<https://www.wnps.org/plant-lists>), natural-



Corn poppy (*Papaver rhoeas*), East Beach, Marrowstone Island, Jefferson County, Washington. PHOTO: KATHERINE DARROW

ized or introduced species are indicated on these lists with an asterisk. Most regional field guides and keys have an indicator either in the description or other code. Rather than ignoring these species as interlopers, look for them and learn them in the field.



European sea rocket (*Cakile maritima*), North Beach, Port Townsend, Washington. PHOTO: KATHERINE DARROW

Study the Big 8: Eight plant families account for more than 55% of the naturalized taxa in Washington (numbers and percentages are compiled from list of all taxa in each family, including species, varieties, and subspecies):

- Amaranth Family (Amaranthaceae): 34 or ~48% of all amaranths in Washington
- Sunflower Family (Asteraceae): 129 or ~29% of asters
- Mustard Family (Brassicaceae): 67 or ~38% of mustards
- Chickweed Family (Caryophyllaceae): 49 or ~47% of chickweeds
- Pea Family (Fabaceae): 73 or ~34% of legumes
- Mint Family (Lamiaceae): 34 or ~61% of mints
- Grass Family (Poaceae): 149 or ~44% of grasses
- Rose Family (Rosaceae): 78 or ~45% of roses

Besides being some of the largest plant families in our region as well as globally, these groups also happen to include the majority of cultivars used for horticultural and agricultural purposes in North America. If you encounter an unknown in one of these families, there's a good chance it could be a garden escape or naturalized species.

Study the Speciose 16: Both inside and outside the Big 8 plant families, certain genera are replete with naturalized species in Washington:

- bromes (*Bromus* spp.), Poaceae; 15 naturalized of 26 total brome taxa in Washington
- knapweeds (*Centaurea* spp.), Asteraceae; 14 of 14
- cotoneasters (*Cotoneaster* spp.), Rosaceae; 16 of 16
- spurges (*Euphorbia* sp.), Euphorbiaceae; 11 of 16
- crane's bills (*Geranium* spp.), Geraniaceae; 10 of 13
- hawkweeds (*Hieracium* spp.), Asteraceae; 10 of 13
- St. John's-worts (*Hypericum* spp.), Hypericaceae; 9 of 12
- peppergrasses (*Lepidium* spp.), Brassicaceae; 12 of 18

- toadflax (*Linaria* spp.), Plantaginaceae; 5 of 5
- cherries & plums, (*Prunus* spp.), Rosaceae; 16 of 18
- raspberries and blackberries (*Rubus* spp.), Rosaceae; 9 of 20
- docks (*Rumex* spp.), Polygonaceae; 9 of 15
- nightshades (*Solanum* spp.), Solanaceae; 8 of 8
- clovers (*Trifolium* spp.) Fabaceae; 20 of 42
- speedwells (*Veronica* spp.), Plantaginaceae; 15 of 21
- vetches (*Vicia* spp.), Fabaceae; 10 of 12

Watch Horticultural Trends: Garden centers and nurseries are excellent places to peruse for current and future naturalized species. All sixteen naturalized *Cotoneaster* spp., for instance, are still sold in many garden centers. Plants that are marketed as replacements for turf or for use in high traffic areas, such as flagstone walkways, are often rapid colonizers susceptible to becoming garden escapes. Japanese mazus (*Mazus pumilus*) and hairy rupturewort (*Herniaria hirsuta*) are two

examples. Those marketed as groundcovers have similar traits, such as creeping Jenny (*Lysimachia nummularia*), and numerous stonecrops (*Sedum* spp.). Check out the grasses — fountain grass (*Pennisetum setaceum*), which is native to eastern Africa, has recently become popular in Pacific Northwest garden centers. In many parts of the southwestern U.S., this species has become naturalized, but is still considered a waif in Washington. Beardtongue (*Penstemon* spp.) cultivars have also become very popular. So far, only one introduced species of *Penstemon*, Palmer's penstemon (*P. palmeri*), is reported in northeast WA where it is used in roadside restoration seed mix, but is not considered fully naturalized yet.

Walk On the Not-so-wild Side: Our WNPS botanical forays tend to focus on wildlands and preserves where we have the best chance of visiting our beloved natives. To best familiarize yourself with naturalized species, however, you may want

A Lexicon of Naturalized Plant Species

Some of the most common terms used to describe non-native plant species are listed here. In *Flora of the Pacific Northwest* (Hitchcock & Cronquist et al. 2018), one of our guiding manuals in the study of native plants here in Washington, several terms related to naturalized plants that are commonly used in species descriptions are defined:

Adventive: Introduced but not naturalized, or only locally established.

Introduced: Intentionally or unintentionally brought in from another area; not native.

Naturalized: Well established but originally introduced from another area.

Ruderal: Weedy, growing in waste places.

Waif: A non-native plant that doesn't or only occasionally establishes self-sustaining populations; (a.k.a. casual alien).

From *The Jepson Manual of Higher Plants of California* (Hickman 1993) we can glean a few more terms:

Aggressive: Growing or spreading rapidly or invasively, outcompeting other plants, difficult to control.

Alien: Not native; introduced purposely or accidentally into an area.

Native: Occurring naturally in an area, not as either a direct or indirect consequence of human activity; indigenous, not alien.

Weed: A generally alien, generally undesired (sometimes attractive) plant, often adapted to disturbed places, often aggressive, occurring in or near settlements, in fields or gardens, along roadsides, and in relatively undisturbed communities of native plants. (Interestingly, this definition is included in the 1993 first edition, but was deleted from the 2012 second edition (Baldwin et al. 2012). The 2012 edition does, however, retain the above terms.)

Other related terms used in botanical contexts:

Exotic: alternate term for alien or introduced, usually referring to species from other continents, islands or distant geographic regions.

Feral: alternate term for garden escape; species that have lapsed into a wild form from a domesticated or cultivated condition (Pysek et al. 2004)

Garden escape: a cultivated plant that has become naturalized after being introduced to an area via horticulture or agriculture

Invasive: a naturalized species that produces reproductive offspring, often in very large numbers, are capable of dispersal over large distances from the parent populations, and thus have the potential to spread over a large area. (Pysek et al. 2004) (Some authors have adopted Pysek's suggestion that native species exhibiting similar characteristics might be called 'expansive.')

Neo-native: an introduced species that has established naturally reproductive populations in a region post-colonization

Non-indigenous: alternate term for alien or introduced; not originating from the reference area.

Novel ecosystem: a system of abiotic, biotic, and social components (and their interactions) that, by virtue of human influence, differs from those that prevailed historically, having a tendency to self-organize and manifest novel qualities without intensive human management. (Hobbs et al. 2013)

Noxious weeds: invasive, non-native plants that threaten agricultural crops, local ecosystems, or fish and wildlife habitats. (WSN-WCB 2019)

Wild: not cultivated; used to describe both native and naturalized species (Jacobson 2008)

Xenophytophobia: the fear and loathing of non-native plant species (Stromberg & Chew 2002)

to make a point of visiting disturbed areas or focusing on flora near trailheads. Roadsides, canals, ditches, lawns and pathways in agricultural, urban and suburban areas offer ample opportunities to mingle with the neo-natives.

Is it Naturalized or Native?

When we encounter a previously undocumented plant species in the field, be it found in a wildland or habitat heavily influenced by human disturbance, we may need to determine whether or not it is naturalized or a waif, versus a rare native or range expansion from nearby populations. If you have mastered the art of using dichotomous keys, finding a plant species



Baby blue-eyes (*Nemophila menziesii*), Mt. Walker, Olympic National Forest, Washington. PHOTO: KATHERINE DARROW

you've never seen, don't recognize, or are flummoxed to key out might be what most excites you. A new species discovery, whether personal or one that contributes to the regional flora is what keeps us motivated to learn more. Upon such fortune, and the possibility of publication and sub-cultural fame, solving this puzzle requires determining three primary factors that define nativity:

1. Where is the nearest other population of this plant?

Finding the nearest population may be as simple as walking another mile or going around the block. But if the nearest population turns out to be in the Himalayas, this may seem to be an impossible journey. However, you can first take a look at where you are. Are you thirty miles into a wilderness area on the Olympic Peninsula? Or are you walking on trails through a previously clear-cut forest on the outskirts of a new suburban development? The latter opens up the entire world of possibilities, quite literally, given the brisk trade in plants and seeds by garden enthusiasts and horticulturists (Reichard & White 2001). In this case, you may want to find the nearest farm or garden and take a peek at what is growing there. For instance, populations of corn poppy (*Papaver rhoeas*), and creeping St. John's-wort (*Hypericum calycinum*), both introduced from Eurasia, are spreading along East Beach on Marrowstone Island in Jefferson County. The nearest populations of these garden escapes are in home landscapes on the bluffs above, and thus

the most likely source of seeds and plants tumbling down as the bluffs slump.

2. How did it get here?

How an unusual plant arrived at a site is usually a tougher question. Could seeds have drifted in on their own during a storm, or washed up on the shore during a king tide? Or might someone have planted them for a pet's grave? On a mountain summit that can be reached both by road and a hiking trail, tire treads, horse hooves, hiking boots as well as the muddy feet of birds or squirrel caches increase the possibilities. At the summit of Mt. Walker in Olympic National Forest, local botanists had a flurry of excitement when a few individuals of baby blue-eyes (*Nemophila menziesii*), a native of California and southwest Oregon, were found blooming there in spring of 2018. Upon further sleuthing, we also found a scattering of four other annuals (*Nemophila maculata*, *Erysimum cheiri*, *Layia platyglossa*, *Gilia tricolor*) in the same area that had never been documented in Washington as native. The likely source was a guerrilla gardener sprinkling a packet of "wildflower seeds." These plants have not self-sown, so only enjoyed a brief glory as botanical waifs.

3. How long has it been growing here?

Here in the Pacific Northwest, colonization by non-indigenous people did not get going until the mid 1800s. Keep in mind that this factor changes dramatically geographically; back east in Virginia, Europeans began colonizing more than 400 years ago. The life form and size of the population are the best clues to how long the species has been at any location. Are you looking at a small grove of California laurel (*Umbellularia californica*) in a remote forest patch on the Olympic Peninsula? Or are your mystery plants, as we found on Mt. Walker, a few annuals growing among the manzanita? The bay trees are most likely offspring that have naturalized with the help of squirrels and jays following ornamental plantings in the area, as is occurring in Pierce County, WA, but if there are older trees it is possible that you've stumbled upon a relict or disjunct population. The annuals we found on Mt. Walker were extremely sparse and localized, which were clues to their probable origins, but if they had been part of a sizeable population that was dispersing viable seed, they might have been naturalized in that location, rather than mere waifs. The key to naturalization, in any case, is that the plants are reproducing and dispersing on their own. They've gone wild.

Add to neo-native knowledge

Many other scenarios could present puzzles for the curious botanist. Solving them could require much more in-depth analyses, such as inspecting fossil and pollen records, archaeological research of pre-historic settlements, perusing historical documents such as early expedition journals, DNA analysis, and developing an understanding of species' reproductive biology, geographic distribution, and dispersal mechanisms through long-term observation (Fertig 2011).

Becoming familiar with our naturalized flora is a rewarding way to hone your botanical chops, and to contribute to a better understanding of human influences on biodiversity. Learning about these new members of our vegetation communities can also help you develop knowledge about global plant geography and human history. So, before you yank up the weeds, take the time to peer at their flowers and seeds with your hand lens; photograph them, observe pollinators, herbivores and other critters that interact with them. Contribute well-documented specimens to your local herbarium. Your observations, photos and collections are valuable information in the dynamic geography of Washington's flora.

Resources

Convention of Biological Diversity, Glossary of Terms: <https://www.cbd.int/invasive/terms.shtml>

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Washington State Noxious Weed Control Board (WSNWCB): www.nwcb.wa.gov/noxious-weeds-faq

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WNPS Fall Fundraising Campaign is Underway

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

Please consider giving to WNPS, as we depend on member contributions to operate our chapters and office, and fund the things that make WNPS special for you. Our mission is to promote the appreciation and conservation of Washington's native plants and their habitats through study, education, and advocacy. Your donations build the capacity to make that happen.

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

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

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

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

Thank you in advance for your support!

Seagrass

by Sara and Thomas Noland

Along the shores of the Salish Sea grows a botanical marvel that is easy to overlook — the seagrasses. The casual observer may only notice seagrass during an exceptionally low tide, when the long green fronds are exposed to air. However, seagrass beds are invaluable to the ecology of coastlines worldwide.

Seagrasses comprise approximately 60 species that grow along the marine shores of every continent except Antarctica. The five most common seagrasses of the Pacific Northwest belong to the family Zosteraceae. They include the native common eelgrass or seawrack (*Zostera marina*) and nonnative dwarf or narrow-bladed eelgrass (*Nanozostera japonica*). Perhaps less well known are the three species of surfgrass found in our region: Scouler's surfgrass (*Phyllospadix scouleri*), Torrey's surfgrass (*P. torreyi*) and toothed surfgrass (*P. serrulatus*). They are all rhizomatous with narrow, elongated leaves.



Common eelgrass (*Zostera marina*) with fish. PHOTO: JOHN WILLIAMS

Common eelgrass (*Z. marina*) is probably the species best known to Puget Sound residents, inhabiting quiet bays where it roots in muddy or sandy sediments. It ranges from the Gulf of California to the Bering Strait. Common eelgrass has dark emerald green, strap-like, veined leaves that can reach over 3 feet long. The optimal depth range for common eelgrass is from mean lower low water down to about 6 feet deep (it can extend a few feet higher or grow deeper depending on site conditions) (PSEMP and DNR 2015). Even when common eelgrass is submerged and invisible to the casual beachwalker, its papery, dried fronds tangled in a line of beach wrack attest to its presence below the waves. The Washington State Department of Natural Resources monitors common eelgrass annually at sites across Puget Sound; their monitoring reports and mapping data are available at <https://www.dnr.wa.gov/programs-and-services/aquatics/aquatic-science/nearshore-habitat-eelgrass-monitoring>.

As its name suggests, dwarf eelgrass (*N. japonica*) is smaller than common eelgrass, with narrow leaves up to around six inches long. Dwarf eelgrass occurs from Humboldt Bay in California north to the Strait of Georgia in Can-

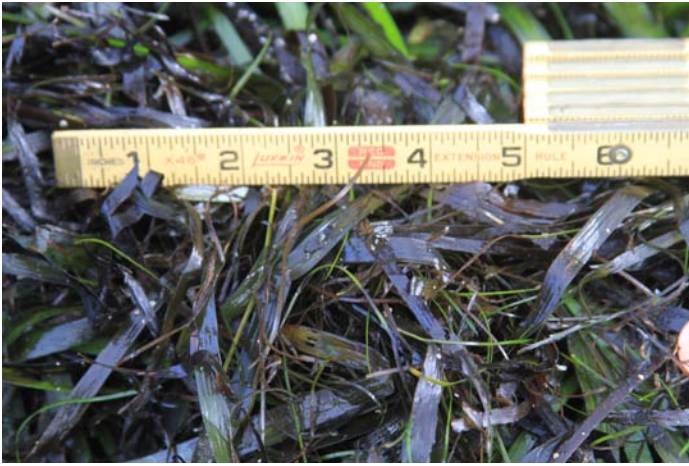


Narrow blades of dwarf eelgrass (*Nanozostera japonica*) with wide, dark brown common eelgrass blade. PHOTO: THOMAS NOLAND

ada, and it is present in much of Puget Sound (PSEMP and DNR 2017). It is thought to have been brought to Washington from Japan in the early twentieth century with imported oyster stock. In Puget Sound, dwarf eelgrass typically colonizes shorelines above the low tide zone favored by common eelgrass, although the two species can overlap on gently sloping beaches or mudflats. Dwarf eelgrass spreads through aggressive rhizomes and can form vast monocultures.

As with other invasive species, the full ecological implications of dwarf eelgrass are still being studied (Bulthuis 2013). On the positive side, this nonnative species provides food for waterfowl such as black brant and for some types of isopods, as well as new areas of intertidal vegetation where epiphytes and invertebrates can grow. However, dwarf eelgrass may be changing shoreline ecosystems by slowing currents, trapping sediments, and thereby raising the level of the sediment surface. Dwarf eelgrass meadows retain water on the beach as the tide recedes, thus altering the natural wetting and drying cycles of the beach and possibly changing the types of creatures that can live there. The species also has economic impacts on shellfish growing, reducing the number and quality of shellfish and making it harder to harvest them in areas where dwarf eelgrass has infested shellfish beds (Bulthuis 2013).

Surfgrasses (*Phyllospadix* spp.) are typically brighter green than common eelgrass and inhabit exposed, rocky shores with more wave energy than the quiet areas preferred by common eelgrass. Scouler's surfgrass (*P. scouleri*) has the widest range of the three surfgrass species, from Sitka, Alaska to Baja California. Torrey's surfgrass (*P. torreyi*) ranges from Vancouver Island to Baja California but is most abundant south of Monterey, California. Toothed surfgrass (*P. serrulatus*) is restricted to areas from central Oregon north to Kodiak, Alaska (Wyllie-Echeverria et al. 2007). Differences in roots, leaf size and shape, spathes, and especially flowers can be used to tell the three surfgrass species apart. Where the surfgrass species occur together, toothed surfgrass tends to be highest on the shore (still not very high, only a few feet above mean lower low water), with Scouler's



Beach wrack with narrow blades of dwarf eelgrass (*Nanozostera japonica*) mixed with wider common eelgrass (*Zostera marina*).
PHOTO: THOMAS NOLAND

surfgrass in the middle zone and Torrey's surfgrass in deeper water (Phillips 1979).

One of the marvels of seagrasses is that they are flowering plants that have evolved to live submerged in marine waters. In a way they are similar to marine mammals whose ancestors originated in the sea, colonized land eons ago, and then returned to the sea, retaining vestiges of their terrestrial heritage. Returning to the sea may have allowed the seagrasses to escape competition from other plants or herbivory from insect pests, but it also required unique adaptations. For example, the intensity and wavelength of light that reaches seagrass leaves underwater is different from light passing through the air, creating challenges for photosynthesis. High levels of salinity and exposure to waves are additional stressors. Both the metabolic systems and the structure of seagrasses have evolved to deal with these conditions (Wissler et al. 2011). Scientists recently completed a full genomic

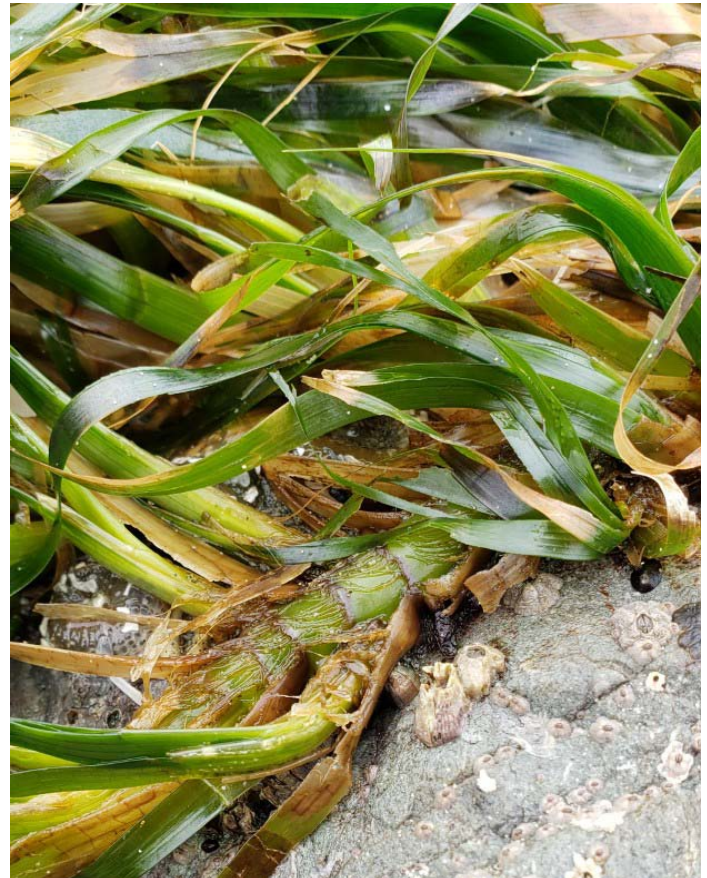


Surfgrass with kelp and rocks. PHOTO: BEN LEGLER

sequence for common eelgrass, revealing details about the genetic evolution that allowed this species to colonize the sea (Olsen et al. 2016).

Another unique challenge for the seagrasses is completing pollination in the water (known as hydrophily). Our na-

tive common eelgrass, *Z. marina*, is monoecious (male and female flowers on the same plant). In Puget Sound, flowering shoots are most abundant in July and August. Pollination occurs both on the water surface and underwater. "Rafts" of long pollen grains form at low tide and are carried across the surface by wind and currents until they are caught in the feathery stigmas of female flowers. Pollen can also move on underwater currents, although this appears to be less important than surface pollination (Cox, et al. 1992). Locally, common eelgrass seeds mature and are released from the plant around late August to the middle of October (Phillips et al. 1983). Common eelgrass also spreads by rhizomes that grow laterally or break off and float to new sites.



Surfgrass (*Phyllospadix*) rhizomes on rock. PHOTO: BROOKE K. SULLIVAN

The *Phyllospadix* species are dioecious (male and female flowers on separate plants). Their pollen also moves on the surface or under the water (Cox, et al. 1992). Fruits disperse from the parent plant between April and October, depending on latitude. As the fruits drift along the bottom, their two densely bristled "wings" catch on the branches of marine algae. The algae provide an attachment surface as well as cover for seedlings during low tides. These seagrass species can also spread asexually through rhizomes.

Recently, researchers found that a species of Caribbean seagrass (*Thalassia testudinum*) can be pollinated by zooplankton and invertebrates (van Tussenbroek et al. 2012). It will be interesting if one day a living pollinator is discovered for our local seagrass species as well.

Over a century ago, naturalist R.E. Gibbs (1902) wrote about the geological significance of *Phyllospadix* in protecting shorelines from erosion and trapping drifting materials to form beaches. Seagrasses have in fact been called ecosystem engineers: they filter and retain sediment, protect shorelines from wave erosion; and in some situations, they can sequester carbon.

Seagrass also creates a complex habitat for many other creatures. Each blade of eelgrass is like a miniature garden, fuzzy with a covering of epiphytic algae and invertebrates. As the waves tear away pieces of the grassy blades or even entire plants, the detritus contributes carbon to the food web. Eelgrass provides food and refuge for crab larvae, and adult crabs eat the seeds of surfgrass. Juvenile salmon find food and cover in seagrass meadows, and forage fish lay their eggs on the grassy blades. One study in the Skagit River delta found Chinook salmon, Pacific herring, and shiner perch to be more abundant in eelgrass than in unvegetated areas (Rubin et al. 2018). Black brant feast on eelgrass as they store up energy for migration, and great blue herons find abundant food in eelgrass meadows (Moore and Black 2016; Mumford 2007).

With climate change, sea level rise, and the growth of human population along the West Coast, seagrass beds are under stress. Human activities in the water—such as dredging, boat grounding and anchoring, and overwater construction—are a direct impact, but what we do on land also affects seagrass by contributing polluted stormwater and excess nutrients to the sea.

Seagrass ecosystems are disappearing worldwide. Total populations in Puget Sound appear stable, but there are local declines (Shelton et al. 2017; PSEMP and DNR 2017). Declines in common eelgrass populations are happening largely in south-central Puget Sound and near the San Juan Islands. Problems such as poor water quality, eelgrass wasting disease, an overabundance of green macroalgae, and changes in flow patterns across river deltas appear to be major causes (Puget Sound Partnership 2019). Scientists, agencies, and citizens are working to better understand these species, protect important seagrass beds, regulate activities that impact seagrass, and improve restoration methods. We hope that sharing what we know about these amazing marine plants will help in some small measure in these efforts.

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Sara and Thomas Noland are naturalists who enjoy exploring the beaches, forests, and drylands of Washington. They are especially interested in how plants and animals live in challenging environments such as the intertidal zone. Both graduated from the University of Washington zoology program in the 1980s.



A Cautious Closer Look at Stinging Nettle

Tormenting, Nutritious, Knotty

by Frank Knight, South Sound Chapter

***Urtica dioica* L. Stinging Nettle**

Nettle Family: URTICACEAE with ~45 genera worldwide.

Urtica, from Classic Latin *uro*, to burn. The introduced Eurasian subspecies *U. dioica* ssp. *dioica*, is dioecious (male and female flowers on separate plants), which differs from our native subspecies *U. dioica* ssp. *gracilis*. The taller, slenderer (*gracilis* means slender) plants are monoecious (separate male and female flowers on the same plant). The female flowers of our native subspecies hang in panicles from the upper axils of opposite, coarsely-toothed leaves, with the male flowers forming further down the stem. Both subspecies are wind-pollinated and can thrive in disturbed habitats like farmyards and roadsides.



Pendant female flowers of native stinging nettle (*Urtica dioica* ssp. *gracilis*). PHOTO: MARK TURNER

Naturalized or native is of little comfort for those who've been stung. The 3-foot tall stems and accompanying leaves are armed with hollow, brittle-tipped hairs supplied with formic acid from basal glands — miniature hypodermic needles delivering the same acid into the skin as painful ant bites.

Sharing their memorable nettle stories with a smile, most initiated hikers recall stepping off a lowland trail wearing shorts; humorous in retrospect but excruciating at the time. A luckier few brush by a nettle with just the back of their hand.

The moist, rich habitats where *Urtica* thrives provide it with a wealth of minerals, vitamins, and anti-oxidants. Mild cooking heat dissolves stinging hairs; and the colloquial term “Indian spinach” barely suggests its great importance to Northwest indigenous peoples — who used it for spring tonics and teas, potherbs, and medicines for many common ailments. Nettle's linen-like stem fibers were essential in cordage-making for snares, duck traps, and fish nets.

So come spring when you are itching to hike to find ephemeral wildflowers, carefully skirt lowland nettles. But do consider gathering young shoots with gloves on your way home for a soothing cup of nettle tea.



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The Challenges of Achieving Nomenclatural and Taxonomic Stability

by David Giblin, University of Washington Herbarium, Burke Museum

This article originally appeared in the Friends of the University of Montana Herbarium Newsletter.

In October 2018, the UW Herbarium published a 2nd edition of Hitchcock and Cronquist's one-volume *Flora of the Pacific Northwest* (*Flora*, hereafter). Because 45 years had passed since its original publication, the 1st edition *Flora* was less than 50% up-to-date in terms of its names (nomenclature) and classifications (taxonomy). Any professional tool with less than 50% reliability needs replacement.

When I look at the taxonomic changes between the 1st and 2nd edition *Flora*, I believe that our understanding of Pacific Northwest vascular plant diversity has improved over the past 45 years. For example, the molecular evidence is incontrovertible that *Penstemon* (Plantaginaceae) does not share a direct common ancestor with *Scrophularia* (Scrophulariaceae), and that what we called Liliaceae in the 1st edition *Flora* is actually more than half a dozen families, including Liliaceae, each with a unique evolutionary history. I have to confess to not yet memorizing which genera belong to which newly recognized families in this group, but I will, and in so doing will have a better understanding of family diversity and generic relationships. Promoting such improved understanding was a priority for producing the 2nd edition *Flora*.

I believe that taxonomic changes from molecular systematics research are bringing me closer to the truth. I first need to clarify that by "truth" in this statement I mean a more accurate characterization of plant evolutionary relationships. For example, molecular studies have clearly demonstrated that *Mimulus* is native almost exclusively to Australia, with only two North American species (native to the Northeast, but one introduced in the Pacific Northwest). To ignore the evolutionary uniqueness and endemic origin of *Erythranthe* and *Diplacus* (genera in the 2nd edition *Flora* segregated out of *Mimulus* and placed in the Phrymaceae not Scrophulariaceae) in western North America because it requires learning new names seems to fall short of our responsibility to communicate accurately the true diversity of our flora.

I should add that some taxonomic changes based on molecular systematics have been incorrect and have obscured our understanding of evolutionary relationships. Some molecular-based studies with less robust results have resulted in taxonomic and nomenclatural changes that may be reversed over time (e.g., splitting the genus *Mitella* (miterwort) into several genera). Such scenarios generate frustration among field botanists and ecologists tasked with quantifying and communicating about vascular plant species richness or diversity. While

I share the pain of these frustrations, I see this exasperation as an unavoidable consequence of the scientific process in general (hypothesis testing) and the exercise of systematics in particular (data interpretation). On balance, however, I believe most of the new changes have been correct far more often than not.

At the heart of this frustration and exasperation is the fact that naming things (nomenclature) and classifying things (taxonomy) make competing demands. Addressing nomenclatural stability, we could decide to have a stable naming system for entities (e.g., family, genus, species) that did not change (e.g., field botanists decide to call all monkeyflowers *Mimulus* because everyone knows what a monkeyflower looks like). However, over time nomenclature and taxonomy would diverge such that communication among field botanists, systematists, and university instructors would break down.

Regarding taxonomic stability, I wish there was an easy way to sort out the good and not-so-good taxonomic changes resulting from molecular-based studies that ultimately result in nomenclatural whiplash. Because molecular-based studies are an objectively-based scientific process that involves subjective data interpretation, the notion of a probability threshold for "accepting" the results is unlikely to garner support in the scientific community. In fact, an article published in *Nature* proposing a taxonomic governing body (Garnett and Christidis 2017) was roundly criticized by taxonomists across organismal disciplines worldwide (Thomson et al. 2018).

I think that over the last 35 years, molecular-based studies have introduced more taxonomic stability than instability to our understanding of the Pacific Northwest flora. I'm also reasonably confident that the majority of taxonomic and nomenclatural changes that needed to be made for our flora have been made, at least at the rank of family and genus. Consequently, nomenclatural and taxonomic stability for most elements in the Pacific Northwest flora is nearly at hand. Additional studies will solidly confirm or reject those instances where the data are currently weak (e.g., *Mitella*). Enduring the recent upheavals will benefit future communication about taxonomic relationships. Of course, this is small comfort to those of us who have been learning new names and classification for the past few decades. For me, if at the end of such efforts I had a truer understanding of the evolutionary relationships among elements of our flora, then I believe the effort would be worthwhile.

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Black Canyon: A Most Remarkable Springtime Destination

by David Giblin, University of Washington Herbarium, Burke Museum

One of the great things about my job is that I get to visit beautiful areas around Washington to document the diversity and distribution of the state's flora. Equally great is that my work connects me with professional and amateur botanists who share my interest in our wild-growing plants. So, I'm always intrigued when one of my colleagues sends me suggestions of a new destination to see wildflowers. This past spring Gary Brill sent me an email containing photos that he had taken on a hike to Black Canyon along the border of Kittitas and Yakima



PHOTO: GARY BRILL

counties. Black Canyon? Never heard of it. After seeing Gary's photos, I knew I had to go.

What makes this destination most remarkable is the richness of wildflowers, ease of the grade (about 1200 feet elevation gain over 4 miles), the diversity of habitats (sagebrush steppe, quaking aspen riparian corridor, Ponderosa pine forest open meadows, and lithosol-rimmed ridgelines), the absence of other hikers (if solitude is a priority for you), and a wealth of bird life. Who knew that you could have a place like this all to yourself on a beautiful weekend day in early June?

By early June most of us think that the wildflower show in the shrub-steppe is largely over, but not so at Black Canyon. The exposures vary from south- to east- to west-facing, so this creates variability in when different species come into bloom. My wife Julie and I found lots of *Lupinus sulphureus* var. *subsacatus* (the blue-flowered Bingen lupine), *Lewisia rediviva* (bit-terroot), and *Eriogonum thymoides* (thyme-leaved buckwheat) in full-flower along the trail. Near the end of the hike where the grade reaches the ridgeline, we encountered the largest displays



PHOTO: GARY BRILL

of *Phlox speciosa* (showy phlox) that I have ever seen. These were broken up by patches of *Balsamorhiza careyana* (Carey's balsamroot), lupines, and *Triteleia grandiflora* (Douglas' brodiaea), making for splendid scenes that could keep a photographer busy for quite a while.

There are plenty more species to find along the hike – there is an excellent species list at the online WNPS Plant List database (<https://www.wnps.org/plant-lists/county?Yakima>). That list counts over 230 species, of which nearly 190 are native. The thoroughness of the list can be attributed mostly to the late Don Knoke, who often visited Black Canyon as part of the Audubon Society's annual Memorial Day weekend campout (probably best to avoid going that weekend if you're looking for solitude).

If you're planning to go, anytime from early May to early June should work well. Note that Black Canyon is accessed from the gravel portion of the N. Wenas Road, which is passable with any vehicle. The road north into Black Canyon from the N. Wenas Road is not really maintained, so if you're in a 2-wheel drive you'll probably want to park below where this road ultimately ends. That is what we did with my 2-wheel drive pickup truck, and it added about ¼ to ½ mile to our walk, but that means you get to walk through the best shrub-steppe portion of the hike. The land is managed by the Washington Department of Fish and Wildlife, so you'll need either one of their access passes or a Discover Pass (annual federal lands pass does not work here). You can also find additional information about this hike at the Washington Trails Association website (<https://www.wta.org/go-hiking/hikes/black-canyon>).

If you haven't been to Black Canyon before, you really should put it on your list of places to go. It will not disappoint.



In Memoriam: Jim Riley

by Terri Knoke, member-at-large

There was a subtle change in the deep woods this summer: a dear friend and colleague, Jim Riley, passed away on June 24, 2019 at his home in Randle, Washington at the age of 79.

Jim was a long-time supporter and one of our most valued and respected members. Jim served as State Board Director from 1985 to 1996. He was well-loved for his role as Field Trip Leader for South Sound and Central Chapters, his yearly organization of the WNPS backpack, and his *Douglasia* column: "The Lichen Corner." As a result, in 1997 the Washington Native Plant Society awarded him our highest honor that year at Botany Washington. Jim Riley was made a Fellow of WNPS as a result of his tireless volunteer work and his dedication to the native plants of the Pacific Northwest.

Jim was born on March 12, 1940, to Kenneth and Freida (Gregersen) Riley. He married Dottie Jones on April 20, 1973. Jim joined the U.S. Navy in 1961 and received an honorable discharge in 1963. He joined the Forest Service soon after. He was a member of the Silviculture Department, working with contracts for the Randle/Cowlitz Valley Ranger District of the Gifford Pinchot National Forest. Eventually he became the person in charge of all pre-commercial tree thinning contracts, Christmas tree cutting contracts, and bough contracts for the district.

Jim was known for his talent for thinking outside the box. During his tenure, he figured out that the Forest Service could be paid by the contractors, rather than the Forest Service paying them to thin the trees, if he was allowed to use the thinned noble fir trees for Christmas trees. Thus reversing the cash flow back to the forest.



Brothers Ken Riley (left) and Danny Riley (right), first trip around Mt. Adams, 1976. PHOTO: KEN RILEY

Jim was an experienced hiker and avid backpacker. He backpacked the trail around Mt. Adams for the first time with his brother, Danny Riley, in 1976. Jim went on to complete the circuit around Mt. Adams 16 times, taking with him anyone



Jim Riley in the Goat Rocks Wilderness PHOTO: JUDY ROBERTS

who wanted to make the trip. In 1983, he began the first official WNPS backpack: Goat Rocks Wilderness. In attendance were Phyllis Kronenberg, Marie Hitchman, Norris Cone, Ken Riley, Elroy Burnett, John and Janet Klos, Art and Mareen Kruckeberg, Bruce Richardson, Judy von Kleinschmidt, and Warren Tanaka as well as Jim's two small dogs, Doobie and Penny. Jim always took his dogs.

1988, Bob Tokach was transferred to the Randle Ranger District. This was the start of a life-long great friendship: hiking and backpacking, leading WNPS backpack trips, and making the circuit around Mt. Adams many times together. Over the decades, several WNPS members as well as Northwest lichenologists have made that journey around Mt. Adams with Jim and his friend Bob.

At age 55, Jim retired from the Forest Service. Jim immediately dove into lichenology and volunteered for many years in Linda Geiser's U.S. Forest Service Air Resources program in lichenology. He was interested in lichens, wildflowers, and photography at that time, all of which became a focus, especially the lichens.

Jim belonged to the Northwest Lichenologists organization, based out of Oregon State University (OSU), Corvallis. Jim was in the initial cohort of certified lichenologists in 2000. Certified lichenologists are the elite of Pacific Northwest lichenologists. It requires a challenging exam that demands the ability to discriminate among species in the field, identify them in the lab, and recognize the characters and habitats for rare, threatened, and endangered lichens in the region. As of this writing there are only 21 certified lichenologists in California, the Pacific Northwest, and Alaska.

Every year for ten years, Jim and his wife Dottie moved down to Corvallis for three months, living in their fifth-wheel trailer. Jim volunteered full-time and would help with the identifications of the season's USFS Air program lichen biomonitoring collections. Discipline and patience — driven by curiosity, were Jim's tools. And he used them well. He created the database that has now grown to over ten thousand surveys and 150,000+ records; most of these vouchers are being accessioned at OSU. His extensive knowledge of lichens and his valued friendship will be sorely missed by his cohort.

Others benefited from Jim's efforts and generosity. In 2019, Jim generously donated his lichen herbarium and associated database to the Oregon State University herbarium. The 1,725 lichen specimens are being accessioned and ultimately added to the publicly available databases at the Consortium for North American Lichen Herbaria CNALH, lichenportal.org/cnalh/) and Consortium of Pacific Northwest Herbaria (www.pnwherbaria.org). He started the herbarium for the Siuslaw National Forest. Jim donated many of his photos of lichens to the U.S. Forest Service, OSU, and the University of Washington Herbarium Image Gallery. His major photo collection, which included many wildflowers, was donated to the University of British Columbia.

Jim Riley was a recipient of the "U.S. Forest Service's Chief's Honor Award," the highest honor given by the U.S. Forest Service. This is a national award that recognizes people working on projects that embody one of the five goals stated in the U.S. Forest Service's strategic plan. One of these goals is building internal capacity to support volunteerism and community service within the agency. The recipients all strive to meet "the greatest good of the greatest number in the long run." Out of

2.6 million people nationwide, only a handful of winners are chosen each year. Jim Riley was one of them.

But those of us who backpacked with Jim Riley will always remember him as someone who we could depend on, someone who always kept his commitments. Every year Jim would plan the backpack trip and send out the itinerary in January. The next time you'd see him he would be at the trailhead, handing out his plant list booklets that he made for each person in the group. There would be four days and three nights of backpacking, camping, scrambling up and down steep slopes looking for plants, and Jim's nightly ritual of checking off the plants we'd seen during the day in our little plant list passports.

For decades, as a stalwart learner and a great teacher, Jim passed on his knowledge to all of us who followed him down the trail. Every year it was a new adventure, a new place full of native plants and mountain blooms. Jim's son Ken came on that first WNPS backpack in 1983 and soon other WNPS members joined him as well. Friends became family, and the annual backpack served as a place to meet new friends and reconnect with the old.

In honor of our dear colleague, Jim Riley, we will continue the tradition that he started 36 years ago. We hope you will join us next year, July 24th through the 27th, 2020 for the Jim Riley Memorial Backpack. His life continues to remind us how important it is to stay committed to personal integrity and dedicated to service. With Jim's passing we've lost a strong voice for the native plants, but the manner in which he chose to live his life inspires us to stay in the chorus and sing.



WNPS backpack to Panjab Creek with Jim Riley, Don Knoke (his last outing), Stu Knoke, Jim Duemmel, Julia Bent, Jim Prichard, Mary Prichard, Linda Swartz, Wendy McClure, Lucie Johns, Lorraine Seymour, Susan Alaynick, Terri Knoke, Ken Riley, Mary Fiddler, Jeanie Grass, Jan Demorest, Steve Moore, Karen Kirkwood and dogs Quila, Missy, and Buster. PHOTO: JIM RILEY

Native Plant Stewards Build Habitat and Community in Whatcom County

by Jim Evans

On a bright spring morning, Janet Murray leads a group of friends and volunteers through second-growth alders and maple along Butler Creek at the Kelsey Conservation Site, a Whatcom Land Trust wildlife reserve near Birch Bay. “Here’s the beaver dam, what’s left of it,” Murray says, pointing to the structure damaged during a winter storm and extreme runoff. “This is where we’ll plant the [red-osier] dogwood and [Pacific] crab-apple. I know that’s one of your favorites,” she adds, sharing a chuckle with one of the team members.

The crew sets to work digging and planting native bare root and potted trees and shrubs in the rich alluvium; chatting and laughing, discussing plant placement and different species’ flooding tolerances, and installing browse protectors — getting the job done in the cool sunshine. One day in the life of a WNPS Native Plant Steward. Nice work if you can get it.

The Kelsey Conservation Site is a 20-acre reserve on former farmland in the Terrell Creek watershed, a focal watershed for salmon recovery work. Terrell Creek, which empties into Birch Bay north of Bellingham, hosts chum, coho, and steelhead salmon along with sea-run cutthroat trout. Butler Creek, with its riparian and upland forests, is part of the support system for those salmon. Janet Murray has been a Volunteer Land Steward for the Whatcom Land Trust at the Kelsey Site since 2012.



Janet Murray laughs with fellow WNPS Native Plant Steward E.J. Jacobs while they discuss native plant restoration along Butler Creek in the Kelsey Conservation Site. Janet, Shannon Crossen, and Melissa Habenicht have enjoyed help from E.J. and other participants in the 2017 Native Plant Stewardship Course in their work at the Kelsey Site. The steelhead, coho, and chum salmon of the Terrell Creek watershed are intimately linked to the quality of riparian habitat and upland buffer these stewards are helping to improve. In the background are western red cedars planted by the Whatcom Land Trust as part of ongoing restoration along the creek. The lower trunks of the cedars are protected by wire cages that discourage browsing by the local black-tailed deer population. PHOTO: JIM EVANS

Janet, an Olympia native, settled down in Bellingham in 2011 after 25 years away from the Pacific Northwest. Long interested in plants and the environment, she was quickly drawn to the Land Trust as a way of acting on her environmental values and as a pathway to becoming integrated into her new home community. “I learned Whatcom County by volunteering with the Land Trust,” she says. Janet was also seeking the opportunity to become intimately familiar with one natural area over time. Kelsey satisfied that yearning.

“Janet has been a dedicated steward to not only Kelsey, but to the land in general,” says Jennifer Mackey, Stewardship Director for the Whatcom Land Trust. “She has been sticking with it despite the overgrown invasive plants and daunting tasks ahead to correct the previous impacts on the property.”

When Janet saw a notice on the Whatcom Land Trust website in 2017 about a WNPS Native Plant Stewardship Course being offered in Bellingham through the Koma Kulshan chapter that fall, she saw an opportunity to learn more about restoration and stewardship of Puget Lowland ecosystems. The 30-hour course, which enjoyed great cooperation and in-kind support from the Land Trust, Bellingham Parks and Recreation, and the Nooksack Salmon Enhancement Association, focused on forest, riparian, and nearshore habitats of northern Puget Sound. While emphasizing the foundational nature of native plants in our ecosystems, these WNPS courses have sought to increase appreciation of the interactions of fish, wildlife, pollinators, and other wild organisms with key plant communities. And the course just happened to include a field tour through the Terrell Creek watershed, where a collaborative of state agencies, local nonprofits, and private landowners were removing fish-passage barriers, restoring stream channels, and replanting riparian areas and upland buffers to improve habitat for salmon runs depleted by a multitude of salmon-unfriendly land uses.

In the course, Janet encountered a community of similarly minded people and became friends with two of the class members in particular: Shannon Crossen and Melissa Habenicht. As the three women got to know each other and recognized their shared interests they started to sit together in class, and soon began to socialize outside of class. It wasn’t long before Shannon and Melissa decided to join Janet out at Kelsey.

Shannon grew up on San Juan Island, but was drawn away for college and career and had only come back to the Northwest in July 2017. Although she was already an accomplished biologist, she saw the Native Plant Stewardship course as a chance to quickly refamiliarize herself with the ecosystems of the region.

Melissa had recently earned a Master of Science degree focused on plant ecology at Western Washington University and was aiming towards a career as a restoration ecologist. She saw the WNPS course as a way to keep building her skills and experience.

Shortly after completing the course, Shannon saw an opportunity to apply for a WNPS Conservation Grant. Shannon

knew her way around grant writing and took the lead on a proposal that was accepted by the WNPS Conservation Committee and awarded to the Kelsey team later in the year. News of their grant acceptance precipitated a flurry of work party organization and ambitious invasive plant removal as the team prepared areas for new plantings. (The plants that the crew were putting in the ground that beautiful spring day had been purchased with these WNPS funds.) With all this activity, the three friends very quickly exceeded the service hour commitments they made at the start of the WNPS course, and each ascended to the lofty status of WNPS Native Plant Steward.

Time passes and life intervenes. Melissa accepted a job with the Center for Natural Lands Management in Thurston County early in 2019, and Shannon's work as an environmental consultant ramped up to the point where she couldn't be as involved as she was. Janet has remained the steady force.

Bill Brookreson, Chair of the WNPS Stewardship Committee, sees Janet, Shannon, and Melissa's work with the Whatcom Land Trust as exactly the kind of outcome WNPS had hoped for when it established the Native Plant Stewardship courses. "They've exhibited a high degree of appreciation and stewardship of the land itself, and they've reached out to the larger community to engage with friends and neighbors, scout troops, home-school kids, and more. And they've helped a terrific community conservation organization to move forward on their landscape-scale goals."

The Land Trust's Jennifer Mackey agrees. "The course, in my mind, not only teaches the attendees, but also gets them out on the land to be inspired and continue learning beyond the course. In their work at Kelsey, Janet and the others have not only applied what they've learned to benefit the natural environment but are also promoting a stewardship ethic to others, and even inspiring others in the community, including project funders. Their work with the WNPS grant opportunity helped to leverage even more restoration efforts on the property."

At the end of that successful spring planting, Janet, Shannon, and others on the planting crew reassemble at a popular watering hole near Janet's Bellingham neighborhood to share stories and discuss next steps at the Kelsey preserve. During a quiet moment, Janet mused over all the work she, Shannon, and Melissa had accomplished since 2017. "It really was the Native Plant Stewardship class that started all of this," she said, "opening our eyes to the possibilities of this site."

Jim Evans is a plant ecologist and educator who lives on Vashon Island. He is a former State Stewardship Program Manager for WNPS and is a member of the WNPS Stewardship Committee.



Restoring Prairies and Forests

by Becky Chaney, WNPS Conservation Committee Chair

Every year WNPS awards grants that further the conservation of Washington native plants by funding projects that restore, improve, or support on-the-ground, native plant ecosystems. These grants typically provide material support for restoration projects. A few focus on increasing the success of restoration projects. Many involve working with other environmental organizations or agencies. Throughout the year, final reports arrive that demonstrate successful project completion. The definition of success is not a simple story of dollars awarded or projects completed, but frequently includes ongoing mentorship, collaboration, and continuing relationships.

In 2017, Aaron Rosenblum, working for the Foster Creek Conservation District, was awarded \$1,300 for a pilot study to determine the best restoration prescriptions for converting wheat fields to shrub-steppe habitat in Douglas County. Beyond findings that will help direct restoration of marginal agricultural land (see his report in this issue), this grant supported WNPS education and outreach efforts. The conservation district's volunteer needs provided an opportunity for WNPS Wenatchee Valley Stewards to get hands-on restoration experience. Increasing coordination with Washington's Conservation Districts across the state could be a key component to expanding interest in native plants. Aaron is now serving on the WNPS Stewardship Committee bringing his expertise fully circle back to WNPS.

An expanding sword fern (*Polystichum munitum*) die off, first reported in 2013 in Seattle's Seward Park, is one of several reported declines of iconic Washington native plants including big leaf maple (*Acer macrophyllum*), Pacific madrone (*Arbutus menziesii*), and western red cedar (*Thuja plicata*). In 2018 University of Washington (UW) student Natalie Schwartz was awarded a WNPS conservation grant to support restoring areas of dead ferns with robust planting stock of regional origin. The primary goal of the project was to gain insight into the physiological mechanisms of die-off and survival for populations of sword fern that were established and planted. Natalie received input from Verdant Consulting Group, Green Seattle Partnership, and EarthCorps for her project. At the January 2019 Central Puget Sound program meeting, Natalie's teacher, UW College of Environmental Studies lecturer Timothy Billo, provided a full report of history and findings to date. WNPS was told that the award of the grant spurred additional interest and funding for this issue.

Natalie reports that her first-year results indicate that drought plays a key role in the decline and recovery of sword fern populations. She notes that after a wetter (and colder) winter, for the first time in years, affected ferns showed signs of improvement and that seedling survival one year following out-planting at the mitigation sites ranged between 75-87%. Rather

than a possible complete die-off of the ferns, there is now hope for the potential recovery of at least some of the affected population. However, this mystery is unresolved; we still don't know the cause of the die-off and observations are ongoing. To document new sites of sword fern decline go to www.inaturalist.org, find the project page, which is under the Community drop-down menu, and search for sword ferns.

Restoration projects include multiple variables and a variety of outcomes. Likewise, grant awards often result in outcomes beyond the stated project purpose. If you have a restoration project that needs funding consider how it can benefit both native plants and WNPS — application information will be available in early 2020. If you would like to discuss possible project options, you are welcome to contact me any time of year.

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



Restoration Prescriptions for WNPS Shrub-Steppe Restoration Pilot Project

by Aaron Rosenblum

Introduction

The Waterville Plateau in Douglas County, Washington was historically covered in an expanse of shrub-steppe habitat. Over the course of the past century, approximately 75 percent of the land area has been converted from natural habitat to agricultural production. Foster Creek Conservation District (FCCD), in cooperation with federal and state agencies and local landowners, has developed a plan to increase the quantity and quality of shrub-steppe habitat in Douglas County. The Multiple Species General Conservation Plan (MSGCP) for Douglas County, Washington uses habitat as a proxy for the recovery of four species of concern in the county: Columbia Basin pygmy rabbit (*Brachylagus idahoensis*), Washington ground squirrel (*Urocitellus washingtoni*), Columbian sharp-tailed grouse (*Tympanuchus phasianellus* ssp. *columbianus*), and greater sage-grouse (*Centrocercus urophasianus*). The MSGCP outlines a process where landowners receive an Endangered Species Act Section 10 incidental take permit in exchange for implementing a variety of conservation actions that will restore and improve shrub-steppe habitat. One of the conservation options available to landowners to receive an incidental take permit is to convert areas of low production wheat back to native shrub-steppe habitat.

While extensive information exists on the restoration of shrub-steppe habitat, spatial and temporal variations in biotic and abiotic factors can make restoration success difficult to pre-



Wenatchee Valley Chapter members Bill Deters, Jessica Gonzales, and Don Schaechtel help install restoration test plots at The Nature Conservancy's Moses Coulee Preserve in south central Douglas County PHOTO: AARON ROSENBLUM

dict. The conversion of low production agricultural fields back to native habitat is not a new concept; however, in Douglas County little research has been conducted comparing the success of different restoration activities. This pilot project tested the success of five different restoration prescriptions, Rx # 1–5. The lessons learned and knowledge gained from this project will be applied to future restoration activities undertaken by FCCD.

Site Descriptions

Two sites in Douglas County were selected with the help of local cooperators to establish test plots. The sites can be considered representative of agricultural fields throughout the county in that neither has obvious unique or extraordinary characteristics. Larger scale conversion to habitat is planned or underway at both sites, allowing for additional future comparison.

The first site (TNC) is located on The Nature Conservancy's Moses Coulee Preserve in south central Douglas County. This site was historically used for agricultural production, but has not been in use for approximately 15 years. A previous restoration attempt was made at the site, but was largely unsuccessful due to invasion by cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola tragus*). Some native bunchgrasses, including bluebunch wheatgrass (*Pseudoroegneria spicata*) and Sandberg's bluegrass (*Poa secunda*), persist from the first restoration attempt. To prepare the site, a controlled burn took place followed by an application of a pre-emergent herbicide targeting cheatgrass in the fall of 2017. Broadleaf herbicide was applied in the spring of 2018.

The second site (NE DOCO) is located on a private agricultural field in northeast Douglas County within an area that is concurrently being converted to habitat through a program funded by The Sage Grouse Initiative. Prior to the fall of 2018, the field was managed in a no-till, three-year winter wheat, canola and deferment cycle. Weed control prior to implementation was conducted by the landowner using non-selective herbicides.

Methods

Restoration seed mixes were developed based on information from Ecological Site Descriptions (NRCS), reference areas, WNPS species lists, and Burke Herbarium records specific to north central Washington. Seeds were locally sourced and matched to Douglas County climatic conditions to the extent possible. Where possible, flowering phenology was considered to maximize wildlife/pollinator habitat throughout the year.

Establishment of test plots included the following elements: weed control prior to restoration activities (described above), seed bed preparation through hand raking, broadcast seeding of various mixes at a rate of 20 pounds of pure live seed (PLS)/acre (0.5 pounds PLS per plot), and seed to soil contact enhancement accomplished by walking over the plot after seeding. TNC was established with the help of WNPS Native Plant Steward Volunteers.

Rx #1 “Basic Ecological Site Description” This seed mix is designed to match species compositions found in the Ecological Site Description (ESD) Loamy 9-15 PZ. ESDs are developed by NRCS and are commonly used as a reference by local, state, and federal natural resource practitioners. ESDs provide the historical climax plant community composition. This is the “basic” mix because it contains only four species that are commonly available from local vendors with local genetics. Due to the low diversity and lack of forbs, this mix is the most economical of the prescriptions.

Rx #2 “CRP mix” This seed mix is based on a standard Conservation Reserve Program (CRP) mix for the appropriate rainfall zone in Douglas County. CRP is currently the primary way that agricultural fields are converted to habitat in Douglas County.

Rx #3 “Early Seral” This species mix contains high proportions of early successional species. Early successional species are

disturbance adapted and more readily compete with undesired weed species.

Rx #4 “Sage-grouse” This restoration prescription is designed to reflect quality sage grouse habitat. All forb species are sage grouse preferred forbs as identified by NRCS and the Sage Grouse Habitat Assessment Framework. This is the most expensive seed mix due to the higher percentage of forbs in the seed mix.

Rx #5 “Early + Amendment” This prescription is the same as the “early seral”, but will include biochar being incorporated into the soil prior to seeding. Biochar is a carbon-rich organic material produced during slow exothermic decomposition of biomass at temperatures $\leq 700^{\circ}\text{C}$ under zero oxygen or low oxygen conditions (Lehmann and Joseph 2009). Some studies have shown that Biochar improves soil physical characteristics such as organic matter, bulk density, and soil water holding capacity.

Monitoring Protocol:

For each of the two sites, TNC and NE DOCO, six plots, five prescriptions, and one control were established. For each of the 12 plots, three 0.5m^2 sampling units were randomly chosen using a random number generator. Sampling units were denoted and centered upon their X and Y coordinates in meters (relative to an arbitrary baseline) for each plot. Each sampling frame was permanently established and re-sampled during each subsequent monitoring visit.

For each sampling unit, density of each species was measured by counting the number of individuals rooted within the sampling frame. If species could not be determined (such as in the first spring after seeding), individuals were grouped into functional groups and native vs. non-native categories if possible.

For each sampling unit, percent cover by species was estimated by the observer. Each species was estimated independently

Name	Common Name	1	2	3	4	5	Flower Date
		% PLS in mix	% PLS in mix	% PLS in mix	% PLS in mix	% PLS in mix	
<i>Pseudoroegneria spicata</i>	bluebunch wheatgrass	72	47	35	45	35	June-July
<i>Festuca idahoensis</i>	Idaho fescue	9		5	12	5	May-June
<i>Poa secunda</i>	Sandberg’s bluegrass	9	15.6	35	23	35	April-June
<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	thickspick wheatgrass		20.8				May-July
<i>Artemisia tridentata</i> spp. <i>tridentata</i>	Wyoming big sagebrush	10	1				August-October
<i>Ericameria nauseosa</i>	rubber rabbitbrush			15	5	15	July-September
<i>Lomatium dissectum</i>	fernleaf biscutroot			4	3	4	April-May
<i>Achillea millefolium</i>	common yarrow			6	2	6	May-June
<i>Eriogonum umbellatum</i>	sulfur flower buckwheat				8		June-September
<i>Erigeron speciosus</i>	showy fleabane				2		June-August
<i>Linum lewisii</i>	blue flax		15.6				May-July

Seed mixes used for the pilot study to determine best restoration prescriptions for converting wheat fields to shrub-steppe habitat in Douglas County, Washington, March 2017.

without exclusion by overstory, if it existed. Therefore, total cover may sum to greater than 100 percent. Bare ground and litter cover were also estimated by the observer and were counted if there was no vegetation in the overstory. As above, if species could not be determined, individuals were grouped into functional groups and native vs. non-native categories if possible.

Conclusions

It is difficult to make any sweeping or concrete statements about the data gathered in this study. The sample size was simply too small. However, the purpose of this pilot study was to look for trends or patterns in the data related to the success of five different restoration prescriptions.

The strongest signal observed in the data is the initial success of two seeded species across seed mixes and at both sites. These two species are Sandberg's bluegrass (*Poa secunda*) and common yarrow (*Achillea millefolium*). This trend was especially strong at the TNC site, where the abundance of these two species accounted for the majority of all observed species. Sandberg's bluegrass did not perform quite as well at the NE DOCO site, but was still observed at high densities.

Plots for Rx #s 3, 4, and 5 contained the highest average densities of seeded species at both sites. At the TNC site these densities were essentially equal. At the NE DOCO site, average seeded species densities were higher in Rx #'s 3 and 5 than in 4, but this observed difference may not be significant. These seed mixes contained the largest proportions of early successional species.

Overall, seeded shrub species performed poorly. Only seven rabbitbrush seedlings were observed in sample frames across all plots and sites. This is counterintuitive to what is observed in nature, as rabbitbrush is typically a rapid colonizer of disturbed sites. Sagebrush was observed in promising densities at the TNC site, but only one seedling was observed within all plots at the NE DOCO site. This could be due to differences in soil across the two sites, or it could be due to natural recruitment from mature sagebrush in close proximity to plots at the TNC site.

A few aspects of this pilot study did not work well, or failed to produce observable differences in Rx's. Little to no difference was observed at the biochar amended plots (Rx #5) at either site. Seeded forbs, with the exception of yarrow, were largely absent across all plots at both sites. Based on this, it would be hard to justify the extra investment required to implement Rx #4 on a large scale. However, other forb species, sources, and methods of planting should be investigated.

Restoration prescriptions with the highest proportion of early successional species performed the best on density data gathered the first spring after seeding. This trend is largely due to the success of Sandberg's bluegrass and common yarrow. This knowledge could be used by resource management professionals in Douglas County to inform future conservation actions. Follow up visits to test sites will be necessary in the future to determine if the observed seeded species continue to establish and outcompete invasive weeds.

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Aaron Rosenblum, formerly a Natural Resource Specialist with Foster Creek Conservation District, now works as a Project Manager with the Cascade Columbia Fisheries Enhancement Group. He lives in Cashmere with his wife, son, and the family dog Piper.



WNPS 2020 Calendar



The 2020 WNPS Calendar, featuring Washington's native flora and beautiful places, and member photographers from around the state, is now available for purchase at local chapter meetings or in the WNPS online store.

The annual photo contest and the production of the calendar provides the society with this organization and chapter fundraiser. Consider participating in the 2020 Photo Contest. Find information on how to submit photos and participate on the WNPS website. The calendar gives you and your friends who love Washington's native flora a reminder of the diversity and wonder of our state.

All images in the calendar can be viewed in WNPS online store, www.wnps.org/store/2020-calendar. Your purchase at the store supports the Washington Native Plant Society. The cost online is \$12 plus shipping. Your direct purchase at chapter meetings or events, will support the cost of production and your chapter directly, as chapters receive the profits of the \$10 cost when purchased in person.

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

The Long Game: The Role of Reintroductions in Conserving Washington's Rare Plants

by Stacy Kinsell

It's early on a bluebird summer morning south of Wenatchee, Washington. Wendy Gible makes her way down the south-facing slopes of Colockum Creek Canyon toward scraggly plants of Whited's milk-vetch (*Astragalus sinuatus*). She's loaded with water, five gallons stuffed in her backpack and another gallon in each hand. Joined by fellow water-laden botanists from the Bureau of Land Management (BLM) Molly Boyter and Phil Wickey, they've come to see that some 300 plants outplanted in the fall of 2018 have enough water for taproot development and to get them through the growing season. The land they traverse is designated by BLM as an Area of Critical Environmental Concern (ACEC), and was once covered with big sagebrush (*Artemisia tridentata*), balsamroot (*Balsamorhiza sagittata*), and various bunchgrasses typical of a healthy sagebrush-steppe community. However, two recent fires in the summers of 2013 and 2017 decimated the big sagebrush and left one of the few remaining populations of Whited's milk-vetch to compete with an invasion of cheat grass (*Bromus tectorum*) and tumble mustard (*Sisymbrium altissimum*). Since May of 2013, before the first fire, BLM and the University of Washington Botanic Garden's Rare Plant Care and Conservation Program (Rare Care) have worked in partnership to annually monitor Whited's milk-vetch, a state listed endangered species. Post-fire monitoring data showed the population numbers holding steady; however, seedling recruitment was low. So, a management strategy was implemented to augment the population through the reintroduction of Whited's milk-vetch plants. We refer to these reintroduction events as "outplantings."

Reintroducing new plants to an existing population has become a staple conservation method to support rare plant

populations when in situ conservation, such as threat control or habitat management, have not provided enough protections to prevent extirpation. This ex situ method involves growing plants off site in a lab or greenhouse setting using wild collected seeds from the original population, often referred to as the donor population. It relies on knowledge of the plant's biology and life history as well as keen horticultural skills. As the Program Manager of Rare Care, Wendy Gible has worked with multiple federal and state agencies on the reintroduction of rare and threatened plants in Washington State. Each project follows the guidelines set forth by the Center for Plant Conservation and included an experimental framework. By designing a reintroduction project as an experiment, land managers and Rare Care can probe the unknowns of a species and help fill knowledge gaps.

With Whited's milk-vetch, Rare Care and BLM are exploring the role competition plays in plant establishment and vigor. To investigate this question with our 2018 outplanting, we set up five plots each with three sections. In one section of each plot, weeds were hand pulled and cardboard was placed around the newly planted milk-vetch to suppress spring germination of cheatgrass. In another section, no weeds were removed or barriers placed; and a third section served as our control — no plants were planted and existing vegetation was left in place. Research has shown that reintroductions with larger propagules such as seedlings or plants are generally more successful compared to sowing seeds (Albrecht and Maschinski 2012). However, we also wanted to compare the reintroduced plant's success with that of sowing seeds. So, next to four of the five plots, seeds were sown in a one square meter section.

Reintroduction as a conservation tool is not without its scholarly tussle. Questions of its efficacy have been raised and literature reviews have come to different conclusions about its value. One study called reintroduction generally unsuccessful (Godefroid et al. 2011), a second stated that it could not judge its effectiveness (Dalrymple et al. 2011), and a third reported strong evidence that reintroduction is an important tool for conservation (Guerrant 2012). At issue with these varying conclusions is the project time scales each review considered and how they measured success (Guerrant 2013). Godefroid et al. considered reintroduction projects that had been monitored for four years or less following the initial outplanting. They did not include important demographic benchmarks, such as recruitment, when measuring the success of a project. The Dalrymple et al. review was based on projects with unknown outcomes that, not surprisingly, made it difficult to draw conclusions. While Guerrant used data sets from projects that had been monitored anywhere from four to twenty+ years and included recruitment as a part of how they measured success. Including recruitment outcomes is important. Recently published findings show long-lived perennials can take up to thirty years to recruit the next generation (Albrecht et al. 2019) and premature analyses of reintroduction efforts limit our understanding of success. Therefore, it is likely that the Guerrant study best



Left to right: Tara Callaway (USFWS), Wendy Gible (Rare Care), and Rare Care volunteer Jill LaRue plant Whited's milk-vetch at Colockum Creek ACEC in the fall of 2018. PHOTO: STACY KINSELL

represents the potential promise of this method and is a reminder to us that sometimes it will take decades before we can call an outplanting a success.



The basal rosettes of Spalding's catchfly seedlings ready to be planted. PHOTO: STACY KINSELL

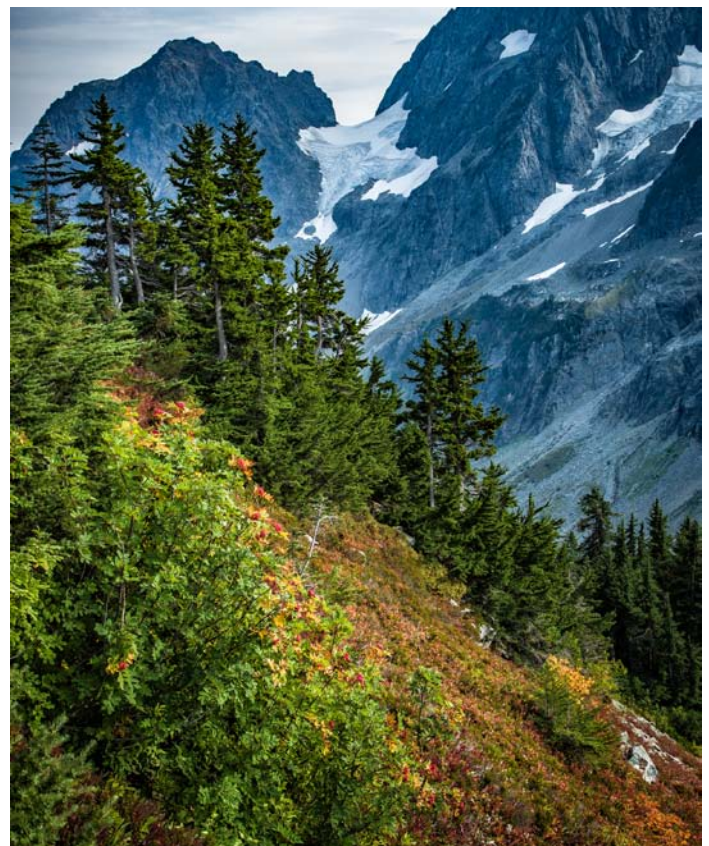
One hundred and sixty miles east of the Whited's milk-vetch, another reintroduction project is underway. The rough-hewn channeled scablands of Turnbull National Wildlife Refuge (NWR) are home to the federally Threatened Spalding's catchfly (*Silene spaldingii*). Growing under butterscotch-scented ponderosa pines (*Pinus ponderosa*) and in swaying grasslands, these sticky plants make quick work of catching all manner of insects on their stems, leaves, and calyces which are profuse with glands. For many years, Rare Care has worked with refuge staff to conserve this tenacious plant. Since 2017, a large reintroduction effort has been underway to bolster population numbers of Spalding's catchfly as a part of the species' recovery plan (USFWS 2007). Over the past two seasons, around 1,500 seedlings have been planted and another 650 plants will be planted this fall. With this reintroduction project, the question being asked is in regard to the relationship between prescribed burns and plant survival. Before the first outplanting in 2017 prescribed burns were conducted at one of the planting sites, while the other sites were left unaltered. Monitoring has occurred each summer and early results show seedlings planted at the burned sites have a higher success rate than those at the unaltered sites.

With each of these reintroduction efforts it is too early to report on successes or failures; but by setting them up as experiments we are already learning a lot, including how to be patient. "Given that failure is permanent while success is not, reintroduction is like Yogi Berra's view of a baseball game: 'it ain't over 'til it's over.'" (Guerrant 2013). As plant conservationists we are in this for the long haul. Success will not be measured in the span of a few years but over decades. Patience and diligent data collection through regular monitoring are necessary to add to the growing body of evidence for this conservation method. Rare Care and its partners will continue this work and look forward to sharing what we learn.

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Stacy Kinsell has worked for Rare Care as the Volunteer and Outreach Coordinator since February 2018 and can be reached at rarecare@uw.edu.



Cascades blueberries (*Vaccinium deliciosum*) and Sitka mountain ash (*Sorbus sitchensis*) bring fall color to Cascade Pass. PHOTO: MARK TURNER

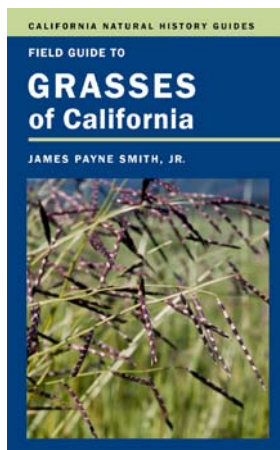
A Trio of Field Guides to Grasses

Book Reviews by Clay Antieau

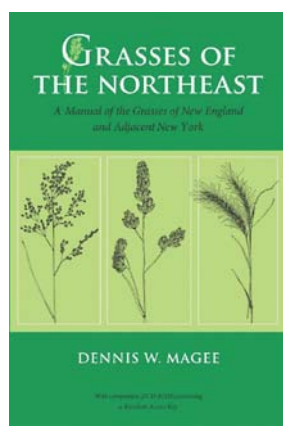
For those of us who have taught grass identification, it's been a tough 30 years. We've had to develop our own teaching materials, create our own field identification guides for the regions in which we've worked, scrounged for informative illustrations, and so forth. Recently, however, we've been blessed by the appearance of published field guides to grasses authored by professional botanists and lifelong grass enthusiasts. Even so, don't be too hasty in discarding your old *Flora of the Pacific Northwest* (Hitchcock and Cronquist (1973), as I explain below.

Notable among these recent publications is *Grasses of California* by James P. Smith, Jr. (2014); *Grasses of the Northeast* by Dennis W. Magee (2014), and *Field Guide to Grasses of Oregon and Washington* by Cindy Roché et al. (2019). Despite their emphasis on grass identification, each is uniquely different.

Smith's effort is written in a light, easy-to-read, and sometimes humorous style. He provides keys of his own creation and informative color photographs often showing the subject in a field setting. Descriptions of genera are arranged alphabetically. His description of where grasses occur and species lists for those ecosystems are particularly useful. Unfortunately, species distribution maps (at least to California ecoregions) are omitted.



Magee's field guide to the grasses of New England and adjacent New York includes keys prepared specifically for this publication and is rich in illustrative line drawings often taken, interestingly, from 1913 and 1950 publications. His descriptions are arranged by a former and more traditional view of grass tribes, which makes the guide challenging to use for those of us who don't find tribes all that useful for identification. He uses county-occurrence



dot maps to illustrate species distributions. The book comes with a DVD with a random-access key based on software created by the Northwest's own Richard Old of XID Services. The DVD is also full of photographs (many by Richard Old), additional line drawings, and photographs of herbarium sheets that are not all that illustrative.

The effort by Roché et al. is remarkable primarily for the superb color macro-photographs created specifically for this publication. As students of grasses know, the "devil's in the details," so the interpreted photographs are especially helpful. The keys

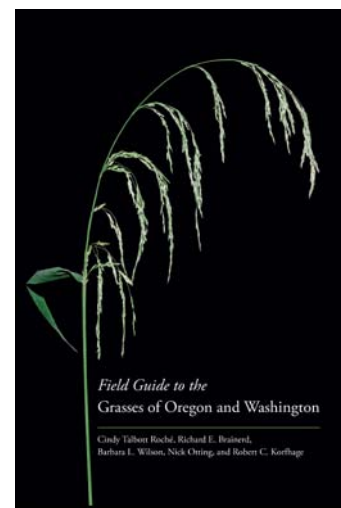
included are essentially the same as provided in Volume 1 of the *Flora of Oregon* (Meyers et al., 2015) and recently revised (2nd edition) of *Flora of the Pacific Northwest* (Hitchcock & Cronquist 2018).

Descriptions of genera are arranged alphabetically. The guide uses dot maps based on herbarium specimens. Unfortunately, these species distribution maps tend to inaccurately depict known distributions of grasses, particularly in Washington. For example, based on my own personal observations, Washington distributions of *Briza minor*, *Bromus inermis*, *Molinia caerulea*, *Sclerochloa dura*, and *Ventenata dubia* are notably inaccurate, to name a few. This deficiency can importantly skew a reader's impression of distribution. Perhaps county-occurrence dot maps would have been a better choice to capture the "has been reported from" occurrences not documented by existing herbarium specimens. *Glyceria maxima*, a noxious species in Washington, is nowhere mentioned. Also, this reader had hoped for at least brief descriptions of the ecosystems in which these grasses occur.

Unfortunately, and no matter how well written they are, field guides to specific plant taxa often feel one-dimensional. While grass identification is certainly important, only the most intensely focused students of grasses will find these field guides able to hold interest for long. Indeed, the most fascinating and practical information is to be found in the biology, evolution, and natural history of grasses. All three field guides will sometimes briefly touch on interesting aspects of these topics (Smith more than the others), but much is left unsaid. That's too bad because there are dramatic and important stories to be told. Why do grasses have predilection to be invasive — and not just invasive, but among the world's most important noxious weeds? What about the endophytic fungi that live, remarkably, within the bodies of grasses? Are grasses evolving rapidly before our very eyes — as suggested by recent research?

Even the emerging systematics of grasses is captivating—who would have contemplated the current "raging" controversy involving *Spartina* and *Sporobolus*?¹ Which leads me to mention

¹ Beginning around 2014, morphological, genetic, and other evidence began to convincingly suggest that the grass subtribe Sporobolinae was undesirably paraphyletic (that is, consisting of the group's last common ancestor but not including all descendants of that ancestor). As a result, a proposal emerged to create a large monophyletic genus *Sporobolus*, including (among others) species previously included in the genera *Spartina*, *Calamovilfa*, and *Sporobolus*. In deploying that proposal, numerous name changes would need to be made in *Spartina* and other genera so affected. As at least one website indicates, the proposed nomenclatural change from *Spartina* to *Sporobolus* has been met variously "with



one other challenge in creating and using field guides to specific plant taxa, as Magee articulately describes (p. xxiii). Plant classification (and the subsequent naming of plant taxa) is increasingly based on molecular data derived from DNA research. While this is critical evidence for understanding evolutionary relationships among plants, newer plant classifications are tending to drift away from morphological and anatomical differences and similarities that are clearly visible. The potential result is, as he puts it, “abandonment of time-honored perspectives and diagnostic criteria that could ultimately lead to a classification system that is impractical and confusing to the field botanist.”

For this reason, both Magee and Smith conserve some of the older classification and naming perspectives better suited to plant identification in the field than are some of the newer ones — even as those old perspectives are no longer considered phylogenetically accurate. That’s the joy of the 1st edition *Flora of the Pacific Northwest*. While its keys are sometimes challenging to use and it no longer reflects the current diversity of grasses in our flora, its “30,000-foot view” — the genus level view — is well-designed for rapid field identification of grasses. For that reason, for my personal use and in my own teaching, I shall not quite yet abandon Hitchcock and Cronquist 1973.

Still, what a great time to be a student of grasses! On the internet and now in published field guides, resources and tools available for the identification and study of grasses have never been more easily available and so richly diverse.

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expressions of surprise, angst, disappointment, disgust, and disbelief” (<https://ncseagrant.ncsu.edu/currents/2019/01/whats-in-a-name-a-lot-it-seems/>). Bortolus et al. (2019) summarize this situation and offer another perspective.

Washington Native Plant Society Research and Inventory Committee

Solicitation for Grant Proposals

The Research and Inventory Committee is soliciting proposals that advance the aims of the Washington Native Plant Society—“projects that extend our knowledge of the biology of native species or that inventory the flora of an understudied area, which help to conserve native plants. Special consideration will be given to proposals investigating the oak or shrub-steppe ecosystems, or invasive species. Another priority is to support research efforts of graduate students and to help develop the careers of botanists with interests in native plants.”

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

Proposals should be about 4 to 8 pages in length and should include the following information:

- **Introduction.** Objectives and significance of the proposed research.
- **Methods.** A brief description of study areas, species, techniques, data collection, and analysis.
- **Timetable.** In general, research and reports should be completed with 2 years
- **Budget.** Personnel, equipment, and supply costs
- **Products.** What will result from the proposed research? We expect, at minimum, a project report and a brief account for publication in *Douglasia*, the journal of the society.
- **Curriculum vitae** of all project personnel.

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

For consideration, please submit an electronic copy of your proposal to the research and inventory committee chair: researchinventory@wnps.org

SUBMISSION DEADLINE: January 15, 2020

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Contents

About This IssueInside Front Cover

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

Moving the Target: Managing Pacific Northwest Forests in a
Changing Climate, *David L. Peterson and Jessica E. Halofsky*.....2

Recognizing Naturalized Flora in Wild Landscapes of Washington, *Katherine Darrow*.....7

Seagrass, *Sara and Thomas Noland*..... 12

A Cautious Closer Look at Stinging Nettle, *Frank Knight* 15

The Challenges of Achieving Nomenclatural and Taxonomic Stability, *David Giblin* 16

Black Canyon: A Most Remarkable Springtime Destination, *David Giblin* 17

In Memoriam: Jim Riley, *Terri Knoke* 18

Native Plant Stewards Build Habitat and Community in Whatcom County, *Jim Evans*20

Restoring Prairies and Forests, *Becky Chaney*.....21

Restoration Prescriptions for WNPS Shrub-Steppe Restoration Pilot Project, *Aaron Rosenblum*.....22

WNPS 2020 Calendar24

The Long Game: The Role of Reintroductions in Conserving
Washington’s Rare Plants, *Stacy Kinsell*.....25

A Trio of Field Guides to Grasses, *Clay Antieau*27

Washington Native Plant Society State Board Directory29



Eelgrass (*Zostera marina*) at low tide along Skagit Bay. PHOTO: MARK TURNER