Unknown and unprotected

the imperiled genetic resource of native plant populations on roadsides and private lands

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ABSTRACT

The Willamette Valley has lost almost 99% of its native prairie habitat. The most vulnerable populations of native plants are on roadsides and unprotected private lands. Collection of seed from these populations is therefore imperative, not only to ensure these genetics are not lost but to develop a supply of genetically diverse native plant material for restoration of prairie ecosystems in the Willamette Valley. Although debate continues among restoration professionals as to the appropriateness of mixing seed sources, acceptance is growing in the Valley that this is desirable within an ecoregion. The hope is that diverse, established populations for restoration will have a better chance of survival over the long term.

Boyer L. 2011. Unknown and unprotected: the imperiled genetic resource of native plant populations on roadsides and private lands. Native Plants Journal 12(3):276–284.

KEY WORDS

prairie remnants, roadside vegetation management, diverse seed accessions, habitat restoration, Willamette Valley prairie seed

NOMENCLATURE

USDA NRCS (2011)
Delphinium oreganum OFP (2011)

Photos by Lynda Boyer

Willamette Valley oak savanna and prairie habitats are among the most endangered in North America, harboring 175 species at risk of extinction, some of which occur nowhere else on earth (Oregon Natural Heritage Program 1983; Noss and others 1995; Macdonald 2000). Intense development of the Willamette Valley since its settlement in the 1850s by Euro-Americans has reduced prairie and savanna habitat to less than 2% of its original extent. Most biologists fear that it will disappear altogether if no preventative action is taken.

Current research data show 469 native Willamette Valley prairie plant species of which more than 300 are forbs (Alverson 2008). The Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington addresses 5 forbs listed as Threatened and Endangered and 6 of Conservation Concern (USFWS 2010). Without comprehensive protection efforts among various stakeholders, habitat destruction and fragmentation will cause many more species to be listed.

SEED NEEDS AND LOCAL SOURCES

Between 405 and 607 ha (1000 and 1500 ac) of Willamette Valley prairie habitat are being restored each year by agencies, nonprofits, and private landowners (Smith 2010). A handful of seed growers and vendors provide farm-increased seed for these projects, but it may be of limited genetic diversity due to the original seed collections. For example, they may have been collected from only one site or from a few small populations. If all restoration projects used the same narrow accessions, the potential for inbreeding depression could adversely impact their persistence on a site over the long term as climate change and (or) pest and disease pressure occurs.

Seed provided to, or collected by, growers comes from the few remaining prairie patches and remnants in the Willamette Valley. These populations have many issues that growers and the restoration community need to carefully consider. Sites are usually small, often fragmented, potentially inbred, or on private land unknown to biologists. Many are on roadsides where maintenance needs and lack of money override the need to protect and enhance these populations. A mile-long roadside prairie remnant near Silverton, Oregon, hosts 18 native grasses and forbs including *Lomatium dissectum* (Nutt.) Mathias & Constance (Apiaceae) (fernleaf biscuitroot) (Figure 1A). The remnant is sequestered between a county road and a creek and is only 6.1 to 9.1 m (20 to 30 ft) wide. In 2010, part of the site was sprayed with herbicide and numerous plants sustained heavy damage (Figure 1B, 1C). The county is aware of the site but it is not signed for any special management. These roadside remnants provide precious seed resources and critically important habitat for native pollinators and beneficial insects (Figure 2A, 2B, 2C) living in a biological desert of low-diversity agricultural crops. Protection and enhancement of these sites plays an important role in our efforts to conserve native pollinators.

Figure 1. Roadside prairie remnant near Silverton, Oregon (A); a section of the remnant, post-herbicide application (B); damage, or possibly death, of a *Lomatium dissectum* (Nutt.) Mathias & Constance (Apiaceae) (fernleaf biscuitroot) from the herbicide application (C).

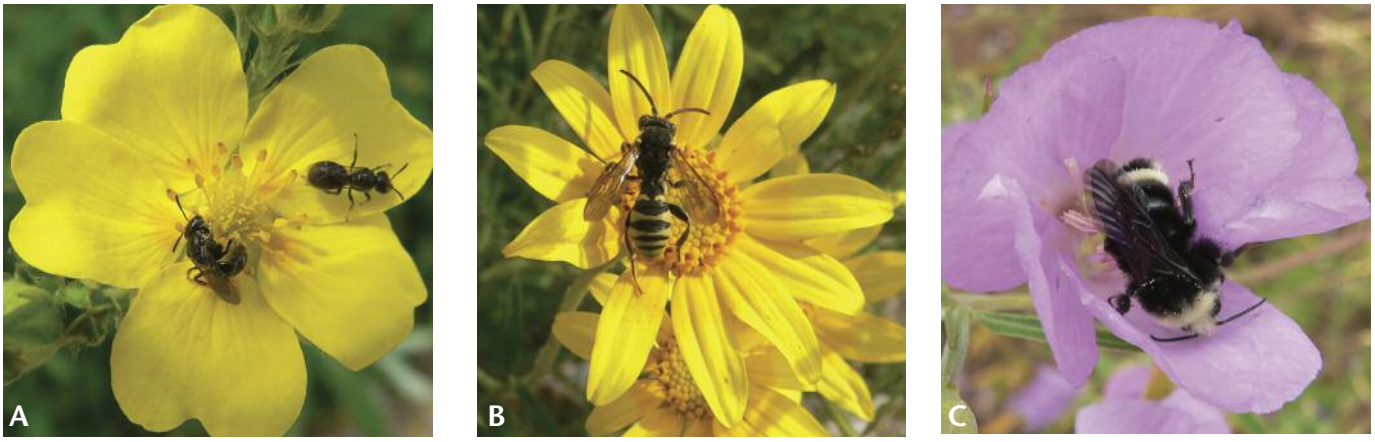

Figure 2. Small native, solitary bees on *Potentilla gracilis* Douglas ex Hook. (Rosaceae) (slender cinquefoil) (A); wasp on *Eriophyllum lanatum* (Pursh) Forbes var. *lanatum* (Asteraceae) (common woolly sunflower) (B); yellow-faced bumble bee on *Clarkia amoena* (Lehm.) A. Nelson & J.F. Macbr. (Onagraceae) (farewell to spring) (C).

Roadside and small, private property prairie remnants are the most vulnerable to plant loss. Restoration professionals and native plant enthusiasts need to make a concerted effort to collect seed from these sites. Prairie remnants along state highways persist due to native seed and plants that survived the initial road construction. These sites often have low soil fertility, low nonnative species cover, and are mowed in the fall, all of which allow these prairie species to thrive. A robust population of *Lupinus albicaulis* Douglas (Fabaceae) (sicklekeel lupine) exists on the cut bank of a state highway near Salem, Oregon (Figure 3). Prairie remnants have also persisted adjacent to cropland or creeks and rivers. If remnant areas have not been overtaken by invasive shrubs, they can host many native prairie plants.

Figure 3. A population of more than 75 individuals of *Lupinus albicaulis* Douglas (Fabaceae) (sicklekeel lupine) on the cut bank of a state highway near Salem, Oregon.

Native annuals and even some short-lived perennials historically relied on periodic burning to maintain their presence in the ecosystem. Activities such as road construction, ditching, tilling, grading, and even herbicide use before native seed germination are modern factors that allow reemergence of certain native prairie species. The native "weed" seedbank is exposed, and the low amount of cover is ideal for species such as *Lupinus polycarpus* Greene (Fabaceae) (smallflower lupine), *Collomia grandiflora* Douglas ex Lindl. (Polemoniaceae) (grand collomia), *Epilobium densiflorum* (Lindl.) Hoch & P.H. Raven (Onagraceae) (denseflower willowherb), and *Lupinus rivularis* Douglas ex Lindl. (Fabaceae) (riverbank lupine). Their persistence at a site can be short-lived, however, due to continued disturbance or revegetation of the site by nonnative perennials. I have collected from numerous sites where the population is present for only a few years. In the summer of 2010, a new roadside population of *Collomia grandiflora* was identified (Figure 4A, 4B). Sometime in the past, the landowner must have sprayed out the pasture species between the fence and the ditch, which opened up the site for this native annual in the seedbank. Lack of subsequent spraying has allowed the population to persist, at least for now. The owner graciously gave me permission to collect seed. Collection from these sites is crucial due to their often ephemeral nature.

Lathyrus holochlorus (Piper) C.L. Hitchc. (Fabaceae) (thinleaf pea), a native perennial and federal Species of Concern,

Figure 4. Newly identified population of *Collomia grandiflora* Douglas ex Lindl. (Polemoniaceae) (grand collomia) along a fence near Aumsville, Oregon (A); seed head of *Collomia grandiflora* almost ripe for seed collection in late July (B).

persists in scattered hedgerows and is extremely vulnerable to loss by land-use decisions that do not consider management of the wildflower populations. In the summer of 2010, I identified a new site near Silverton, Oregon, with at least 50 individuals (Figure 5A, 5B). Sadly, populations that have persisted for hundreds of years can be wiped out in one season when a landowner decides, for example, to farm to the road or to sell the land for housing. A population identified in 2000 near Silverton was destroyed in 2008 when the farmer took out the hedgerow (Figure 5C).

ROADSIDE VEGETATION MANAGEMENT AND IMPACTS TO NATIVE PLANTS

Roadside vegetation in the Willamette Valley and adjacent foothills is managed by many different agencies; key players include the Oregon Department of Transportation (ODOT), county public works departments, the USDI Bureau of Land Management (BLM), and the USDA Forest Service (USFS). State and federal agencies have policies and procedures to manage for listed plant species, as do some counties. Many agencies, however, lack policies to protect and enhance native species. This makes seed collection from roadsides all the more urgent.

Under provisions of state and federal endangered species acts (ESA), ODOT is mandated to protect, track, and monitor species ranked Threatened and Endangered (T&E). Preconstruction botanical surveys are coordinated with the designer to avoid impacts to populations or to mitigate impacts when they are unavoidable. To avoid and minimize impacts during routine maintenance, sites are signed and managed as Special Management Areas (SMAs) for the benefit of the plants and, by default, the associated species (S Gisler 2010). ODOT is not mandated to track, protect, manage, or mitigate for the loss of native plants that are not listed under the ESA, including Species of Concern or other special status plants. If regional botanists have the training and tenacity, however, they try to identify and to mitigate impacts to these populations as well.

Protection of non-listed plant species rarely occurs. The most common reasons cited are a lack of 1) funding; 2) a mandate; 3) statewide information and guidance on priority species; and 4) a clear definition of what constitutes significant native plant sites (Trask 2011). In addition, ODOT biologists often lack the expertise to identify areas of botanical significance. Fortunately, ODOT is beginning to address this issue by cooperating in the Oregon Conservation Strategy in partnership with other agencies. This partnership will help to develop a set of guidelines to protect areas of botanical significance and, possibly, help to prevent future listings under the ESA, which once enacted involve costly consultation and mitigation (S Gisler 2011; Trask 2011). Shippey (2010) suggests that the existing signage system (used with SMAs) could eventually be used to help manage these areas as well. Currently 2 SMAs protect and manage native plant sites in the Columbia River Gorge used for seed collection. I have been asked to submit locations of important roadside prairie remnants, and I hope this will start a concerted effort toward coordinated management of these populations. Many roadside prairies I have identified on state highways are not mowed until late in the summer or in

early fall because of their remoteness. These populations benefit enormously because mowing occurs after seed set and reduces competition from woody vegetation. Figure 6A shows a species-rich prairie remnant at the convergence of a county and a state road north of Scio, Oregon. It contains 28 prairie species on less than 0.1 ha (0.25 ac), one of which is a federal Species of Concern, *Delphinium oreganum* Howell (Ranunculaceae) (Willamette Valley larkspur). Because the vegetation is managed by 2 agencies, it is vulnerable if not signed. Figure 6B shows another, larger remnant prairie east of Sublimity, Oregon, mowed in late fall by ODOT. It contains a smaller number of native species but the populations are large.

Many state departments of transportation are reseeding and planting roadsides with native species. ODOT has, thus far, been hesitant to implement this on a broader scale. Some of the concerns expressed have been that 1) it would attract wildlife, which would be a safety hazard; 2) native plants provide inadequate short-term erosion control; 3) the seed is too costly; and 4) it limits spraying of herbicide for noxious weed control (S Gisler 2010; Trask 2011). These are valid concerns that could be addressed by seeking funding to test regionally appropriate seed mixes on a variety of sites and researching what other DOTs have successfully implemented. ODOT biologists have already developed ecoregion-based native plant lists for roadside landscaping projects (Shippey 2010). They also use natives for extensive wetland mitigation banks.

Many county public works departments lack policies or practices to protect native plants on roadsides. Marion County, though, is a good example of an agency that tries hard to address concerns about native plants even when public safety is its first obligation and budget constraints limit these activities. In 2004, they established a comprehensive set of Best Management Practices (BMPs) that address many roadside vegetation issues including the protection of known populations of listed plants. Lack of funding, however, has prevented any new surveys other than those conducted before construction. They also try to manage for known sites of non-listed native plants as long as safety is not compromised. A good option for landowners who want to protect native plants on the roadsides of their property is a Private Maintenance Agreement with the county. This signage system allows landowners to manage their own vegetation. Marion County also considers using native plants for post-construction revegetation if the site is deemed low maintenance (Beard 2010).

Benton County has taken the lead among Oregon counties to protect remaining prairie habitat as well as listed species of butterflies and plants. In 2011, they will implement a USDI Fish & Wildlife Service (USFWS)–approved Benton County Prairie Species Habitat Conservation Plan. To begin, extensive roadside surveys were conducted for special-status plants and BMPs designed to facilitate their conservation goals by timely mowing. A special signage system similar to ODOT's identifies areas in need of special management. Although their written BMPs do not specifically address protection of non-listed plants, the agency hopes that their vegetation management for the rights-of-way (ROW) will facilitate protection of native plants. ODOT

Figure 5. A newly identified site of *Lathyrus holochlorus* (Piper) C.L. Hitchc. (Fabaceae) (thinleaf pea) near Silverton Hills (A); close-up of the flowering head (B); site of a former population destroyed by the landowner (C).

Figure 6. Small but species-rich prairie remnant north of Scio, Oregon (A). Note the sprayed edge of the prairie close to the road in the bottom left corner of the photo. Large prairie remnant that benefits from a late-fall mowing by ODOT (B).

broadcasts herbicide in the early spring on the gravel edge only to protect the pavement, mows to the bottom of the ditch during the summer, and mows the full ROW during fall or winter. They also control noxious weeds by spot-spraying only. ODOT conducts surveys for listed plants prior to construction but budget constraints have limited seed collections or plant rescues. And, as with Marion County, they consider revegetating post-construction with native seeds and plants (Starha 2010).

Federal agencies that manage roadsides, such as the BLM and USFS, must comply with the Federal ESA and are thereby mandated to survey, protect, and mitigate the loss of listed plant species. The BLM has no polices to protect or mitigate the loss of non-listed plants, whereas the USFS does have policies as long as the species are included in the 2001 Northwest Forest Plan. The National Forest Management Act also requires that all desirable native species be represented within each forest. Of all the agencies contacted for this article, the USFS makes the widest-scale use of regionally appropriate natives to revegetate post-construction. The USFS authored the outstanding guide titled *Roadside revegetation: an integrated approach to establishing native plants*, which helps roadside managers use natives in their post-construction project design (Steinfeld and others 2008).

SEED COLLECTION: A ROLE MODEL

In 2005, the Institute for Applied Ecology (IAE) embarked on an ambitious project in partnership with the USFWS to collect seeds of native forb species considered common and widespread from multiple sites within the Willamette Valley ecoregion. The work required extensive grant writing to fund the project (M Gisler 2010). Seed was put into production blocks by the USDA Natural Resources Conservation Service Plant Material Center in Corvallis, Oregon, and with local growers. The harvested seed is used on restoration projects administered by the NRCS and USFWS (Ward and others 2008). Seed collection was conducted during a 3-y period. Private land, public rights-of-way, and prairie remnants on public lands were all key collection targets. Permits or permission were obtained for all collections. IAE notes many advantages and disadvantages with a project of this scope and size. The permitting process was often burdensome, especially with counties that had never processed a request to collect seed. Permit requirements varied among agencies and had to be renewed on an annual basis. IAE staff was never denied access although they, occasionally, had to be persistent if they needed vegetation managers to delay mowing.

The most rewarding part of the project cited by IAE was their ability to perform considerable outreach, educating agencies and landowners of the importance of these plants in the continuing effort to restore rare Willamette Valley prairie habitat. IAE also discovered hundreds of previously unknown roadside native plant populations as well as Wetland Reserve Program sites that had never been identified. Their enhanced native plant database will prove invaluable in efforts to ensure a high level of diversity for future seed collection efforts.

A CALL TO ACTION

Most of the Willamette Valley is privately owned. Prairie patches and remnants on private lands are usually located in the "back 40" and persist only because farmers have not cultivated the land or had livestock graze the area heavily. Hydrology, inaccessibility, or rocky soils limited their agricultural potential. Identification of more of these sites would go a long way toward providing much-needed accessional diversity for restoration stock seed. Many sites have been identified during the last 20 y through efforts conducted by The Nature Conservancy, the

USFWS, IAE, Soil and Watershed Conservation Districts, and local Watershed Councils. The need is urgent as we lose farmland to subdivision and to the more recent conversion to vineyards and Christmas trees. We must step up our educational and public relation efforts to educate landowners on how to identify and protect native plants on their property. More can be done, I believe, through development of federal programs that pay landowners to grow "habitat" as an alternative to agricultural crops.

For roadsides, we must advocate for protection of native plants using existing signs (or developing new ones) to protect these populations from early mowing and herbicide application. Local county governments can adopt the model now in place in Benton County and begin to develop county habitat management plans.

I encourage anyone with botanical interest to peek over fences and carefully observe roadsides during flowering season. If possible, apply for a permit or get permission to collect seed of these plants but be aware that the request might be in conflict with vegetation management. Educating landowners and vegetation managers about the importance of these plants for restoration efforts in the Valley will help gain access. A clearinghouse for this seed has yet to be identified, but most agencies involved with restoration should know how to get seed into the appropriate hands for seed increase.

Figure 7A shows seed increase fields at Heritage Seedlings. We produce seed of more than 85 native Willamette Valley forbs and graminoids, all from native stock seed painstakingly collected from local prairie remnants and roadsides. The most rewarding aspect of this production effort is seeing these native plants thrive on restoration projects throughout the Valley. Figure 7B shows a restored wildflower meadow at an oak savanna near Salem, Oregon. All the native plants shown were established from seed.

Twelve years of surveying and collecting native seed in the Willamette Valley has shown me how vulnerable many species are to destruction. My hope is that by bringing this issue to the forefront, we may reduce that loss and save critically important genetic diversity in already fragmented native plant populations.

Figure 7. Lupinus polyphyllus Lindl. (Fabaceae) (bigleaf lupine), *Sidalcea malviflora* (DC.) A. Gray ex Benth. ssp. *virgata* (Howell) C.L. Hitchc. (Malvaceae) (dwarf checkerbloom), and *Lupinus rivularis* Douglas ex Lindl. (Fabaceae) (riverbank lupine) (A); a restored prairie near Salem, Oregon (B).

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