Oak and Pine Prairie Seed Production: 2016 Annual Report

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Report to the Bureau of Land Management
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PREFACE

IAE is a non-profit organization whose mission is conservation of native ecosystems through restoration, research, and education. IAE provides services to public and private agencies and individuals through development and communication of information on ecosystems, species, and effective management strategies. Restoration of habitats, with a concentration on rare and invasive species, is a primary focus. IAE conducts its work through partnerships with a diverse group of agencies, organizations and the private sector. IAE aims to link its community with native habitats through education and outreach.

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Cover photograph: *Elymus glaucus*, *Elymus trachycaulus*, and *Wyethia angustifolia* fields ready to be harvested by Institute for Applied Ecology staff and volunteers at Trillium Gardens in Pleasant Hill, Oregon. *Photo by Lindsay Willrick*.

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Table of Contents

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REPORT TO THE BUREAU OF LAND MANAGEMENT

EXECUTIVE SUMMARY

In 2016, the Institute for Applied Ecology (IAE) continued to coordinate the seed production of three grasses and two forbs. IAE also harvested seed from several mid-elevation production fields maintained by a local grower to use both for restoration purposes and to start new fields elsewhere. A plan to expand and further fund mid-elevation production for the Bureau of Land Management (BLM) and two other partners with restoration sites adjacent to those managed by the BLM was initiated in late 2015, and in 2016 both partners (U.S. Fish and Wildlife Service and The Nature Conservancy) contributed a total of $7,500 to the project.

INTRODUCTION

Restoration of high quality or strategically located upland or foothill meadows in the Cascades Range has become a high priority for the Northwest Oregon District of the Bureau of Land Management (BLM) in recent years. The remaining meadows are islands of native oak and pine habitat, now rare, that are of high importance for wildlife and rare species. Finding ecologically and genetically appropriate seed to put out on these restoration sites can be challenging, as the provenance of most commercially available seed is from Willamette Valley floor sites, and is likely adapted to different habitats and conditions. Diversity in native herbaceous species from foothill habitats are especially difficult to find on the open market, but even most native grass species are not readily available. While at least one grass, *Elymus glaucus* (blue wildrye), is grown commercially through contract for the BLM, a single grass species is insufficient for restoration purposes. Since grasses make up a consistent component of restoration seed mixes, in 2011 the BLM identified three common upland grasses, *Festuca roemeri* (Roemer's fescue), *Festuca californica* (California fescue), and *Danthonia californica* (California oatgrass), to collect from appropriate sites and enter into commercial production. In particular, seed from these fields is intended to support restoration activities at Upper Oak Basin, a site located in the Upper Willamette Resource Area in the Coburg Hills, where a multiyear project to restore Kincaid's lupine habitat is underway, and at any other high priority mid-elevation BLM prairies that receive funding for restoration activities. More recently, the BLM has expanded this production to include an additional grass, *Koeleria macrantha* (prairie junegrass), and two herbaceous species, *Plectritis congesta* (rosy seablush) and *Geranium oreganum* (Oregon geranium). This report details activities that occurred in 2016.

GOAL AND OBJECTIVES

The goal of this project is to produce locally sourced, genetically diverse, mid-elevation native seed for use in restoration of mid-elevation prairie, oak and pine habitats located on lands managed by the BLM and partners. In order to accomplish this goal, the following three objectives were established for 2016:

1. Continue maintaining and harvesting seed from previously established mid-elevation seed production fields
2. Harvest seed from three production fields located at Trillium Gardens, which were adopted from a previous project jointly funded by the BLM, The Nature Conservancy (TNC), and U.S. Fish and Wildlife Service (USFWS)
3. Coordinate expansion of the mid-elevation plant materials production program to include additional species and funding partners

2016 ACTIVITIES

Established seed production field maintenance and harvest

FIGURE 1. *PLECTRITIS CONGESTA* IN BLOOM AT THE CORVALLIS PLANT MATERIALS CENTER IN MAY 2016.

From 2012-2016, IAE subcontracted with Pacific Northwest Natives (PNN) to maintain and harvest seed from production fields of *F. californica*, *D. californica*, and *F. roemeri*. In 2016, *K. macrantha* was added to the suite of fields at PNN and small fields of *G. oreganum* and *P. congesta* (Figure 1) were initiated at the Natural Resource Conservation Service's (NRCS) Corvallis Plant Materials Center (PMC). See Table 1 for a summary of harvests from 2013-2016. Wild seed collection for this project is funded through the Seeds of Success program. IAE continues to collect seed for the next group of high priority mid-elevation species needed for restoration, and once sufficient seed has been collected to start seed production fields for these new species and there is secure funding, new fields will be established.

Danthonia californica

The *D. californica* field was installed in 2012. This field has thrived and now seems to be at peak production, producing about 33 pounds of seed per year. This species can be long-lived in a farm field and may continue to produce this quantity of seed for many years. If more seed is desired, it may be easy to expand the acreage of the current field.

Festuca californica

The *F. californica* field was installed in 2012. In fall 2015, this field was removed from production because it lost a high number of plants and the grower was frustrated with the sparse nature of a mature stand of this species. It is an oak edge/understory bunchgrass, and the vegetative portion of each plant fills a large amount of space, but produces few inflorescences (making the species labor-intensive with relatively low yields). IAE proposed using G1 seed from the production field's previous year's harvest to plant a new field, but the grower decided to not grow this species again. Since it has high restoration value at many of the BLM's mid-elevation restoration sites, particularly at the BLM's Twin Prairie and Upper Oak Basin restoration sites, IAE started *F. californica* plugs in the fall of 2016 using seed harvested in 2015. The intent is to use these plugs to establish a small field at the IAE farm. It can be difficult to maintain successful fields of this species as it does not respond well to traditional farming logistics, such as planting in the open sun in a tilled area. At the IAE farm, the *F. californica* field will be established in a shadier, upland spot near the edge of an oak woodland, in hopes that it will respond

better to conditions similar to its native habitat of upland dry slopes on the edges of oak and pine woodland/oak savannah. One half pound of G1 seed was reserved for this effort, and any remaining seed will be stored in IAE's temperature and humidity-controlled seed cooler for use to establish future farm fields if the current production trial proves successful.

Festuca roemeri

The *F. roemeri* field was established in 2012. This field lost a lot of plants in early 2016 and may need to be replanted. If this occurs, it would be preferable to use G1 seed from the current field's previous year's harvest (when 26.5 pounds was harvested). In 2016, this field yielded only 1.1 pounds of seed. This species can be difficult to grow and maintain from wild seed and seems to be more successful after one generation in production. Because of the poor production in 2016, the grower will only charge for maintenance of the field for that year, and will not charge for seed harvesting and cleaning.

Koeleria macrantha

The *K. macrantha* field was planted with winter-grown plugs in the spring of 2016 and is not expected to produce seed until 2017. The plants established well and the field looked healthy in 2016. The field should produce its first small harvest in 2017, but it will likely not reach peak production for a couple of years.

Geranium oreganum

Plugs of *G. oreganum* were started at the PMC in fall/winter 2015, and were intended to be transplanted to a field at the PMC in fall 2016. However, in 2016 the NRCS terminated the Memorandum of Understanding (MOU) between the PMC and IAE, and IAE no longer has the option of partnering with the PMC to grow native seed for partners there. Given this change, IAE decided to use the already-grown *G. oreganum* plugs to establish a seed production field at the IAE farm. Plugs will be transplanted in 2017, and although there may be a small harvest the first year, the newly established field is more likely to have its first harvest in 2018.

Plectritis congesta

Mini plugs of *P. congesta* were grown at the PMC in early 2016 and transplanted to a small seed increase field at that facility in early spring of that year. The field produced approximately one pound of seed in 2016, and this G1 seed, as well as G1 seed harvested from a previously established field at Trillium Gardens, will be used to start a new field at the IAE farm in 2017. We expect a harvest in 2017.

TABLE 1. MID-ELEVATION PRODUCTION FIELD SEED HARVESTS 2013-2016.

Species	Field size (ac)	2013 seed yields (lbs)	2014 seed yields (lbs)	2015 seed yields (lbs)	2016 seed yields (lbs)
Danthonia californica	0.1	0	8.6	33.5	33.0
Festuca californica	0.25	0	0.1	10.5	Failed
Festuca roemeri	0.29	11.5	20.0	26.5	1.1
Geranium oreganum	0.1	NA	NA	NA	0
Plectritis congesta	0.1	NA	NA	NA	1.0

Trillium harvest

FIGURE 2. *ELYMUS TRACHYCAULUS* DRYING UNDER A HOOP HOUSE AT TRILLIUM GARDENS IN 2016.

In fall 2014, the opportunity arose to adopt previously established fields of several species of mid-elevation grasses and forbs. Prior to 2014, these fields had been contracted by TNC at Trillium Gardens nursery (Trillium) in Pleasant Hill, Oregon. The fields were started in 2008 using wild-collected seed from several mid-elevation sites in the Coburg Hills east of Eugene, with the goal of developing appropriate plant materials for use in restoration projects in the same area. See the 2014 annual report for this project (Getty 2015) for more details regarding the history of these fields. After a cost analysis and discussion about restoration and plant materials objectives, it was decided that IAE would adopt these fields for one year, and perform all field maintenance (including fertilizing and weeding), and seed harvest and cleaning. As a result, Trillium did not charge for the use of the land where the fields resided, and the cost of IAE harvesting and cleaning the seed produced by these fields was lower than the cost of contracting an additional year of production through Trillium. In the future there may be opportunities to expand the mid-elevation seed production efforts at Trillium to include more species. However, it is very likely that any future agreements with Trillium would require IAE to perform much of the necessary weeding and other field maintenance activities. In spite of this, Trillium has the farming infrastructure, including irrigation and drying areas, that may make this option well worth the effort. IAE staff will continue to discuss future seed production options at Trillium with Trillium's owner, the BLM, and other partners.

FIGURE 3. INSTITUTE FOR APPLIED ECOLOGY STAFF HARVESTING *ELYMUS* SEED AT TRILLIUM GARDENS IN 2016.

In 2015, IAE harvested seed from seven Trillium fields: *Elymus glaucus* (blue wildrye), *Elymus trachycaulus* (slender wheatgrass), *Eriophyllum lanatum* (Oregon sunshine), *G. oreganum*, *Iris tenax* (toughleaf iris), *Sidalcea malviflora* ssp. *virgata* (dwarf checkermallow), and *Wyethia angustifolia* (narrowleaf mules ears). In the fall of that year, IAE staff and Americorps volunteers salvaged plants from fields of three additional species: in the fall of that year. One third of the salvaged plants were given to TNC for planting on their own mid-elevation site in the Coburg Hills, and the rest were outplanted at the BLM's Upper Oak Basin site the day after the salvaging efforts occurred.

In 2016, IAE harvested seed from three Trillium fields (*E. glaucus*, *E. trachycaulus*, and *W. angustifolia*), but did not perform any additional plant salvage. The two grasses were harvested by hand using rice knives to cut the stems and carts to move the cut material to an on-site hoop house for drying. Cleaning of *E. trachycaulus* was relatively easy and involved using a screen to hand-thresh the stems, followed by two passes through a table-top screen cleaning machine. The other two species were difficult to clean without a brush machine. In previous years, IAE staff was able to use the brush machine at the PMC's seed cleaning facility; however, with the cancellation of the MOU with the PMC in 2016, IAE did not have access to this facility and was unable to locate another partner in Oregon with the appropriate equipment. In 2017, IAE will send dried and threshed plant material to a partner facility in Washington State for cleaning.

See Table 2 for a list of species in production at Trillium and their yields from 2014-2016.

Elymus glaucus

The perennial *E. glaucus* field continues to be productive and there continues to be value in hand harvesting the seed each year. Trillium Gardens has agreed to let IAE continue to harvest seed from the field in 2017, and will irrigate the field when necessary. However, the field is getting weedy and will require more concentrated maintenance in 2017 in order to encourage high seed yields and maintain a positive relationship with Trillium.

Elymus trachycaulus

Elymus trachycaulus is a short-lived perennial grass, and this field is showing signs of slowing down seed production. IAE harvested 3.3 pounds of seed from this field in 2016 (Table 2), and may harvest seed again in 2017, depending on how well seed develops during the spring. However, the field is becoming sparse and allowing weeds to move in en masse, creating more work than the field is probably worth. Trillium Gardens is open to replanting the field with G1 seed produced by the existing field if IAE and the BLM are willing to commit to maintenance of the new field. IAE will discuss this option with the BLM and other partners in 2017. The old plants would be removed and the field re-sown in the fall of 2017.

Wyethia angustifolia

In the last two years, IAE has successfully harvested a large amount of seed from this field (Table 2). Trillium Gardens plans to keep this field in place for the long term because this species takes at least five years to establish; this field represented a significant investment of time and energy even before the first seed began to appear. IAE has the option of harvesting the seed from this field again in 2017. Whether or not IAE does this will depend on how much more seed partners would like to stockpile for mid-elevation restoration projects. Like the other two fields, the *W. angustifolia* field will need to be weeded heavily in 2017.

TABLE 2. MID-ELEVATION SEED HARVESTED FROM TRILLIUM GARDENS 2014-2016.

Species	**2014 seed yields (under TNC ownership) (lbs)**	**2015 seed yields (under IAE/BLM ownership) (lbs)**	**2016 seed yields (under IAE/BLM ownership) (lbs)**
Elymus glaucus	40	2.4	TBD
Elymus trachycaulus	28	5.4	3.3
Eriophyllum lanatum	10+	21.5	NA
Festuca roemeri	21	0.75	NA
Geranium oreganum	8	1.5	NA
Sidalcea malviflora ssp. *virgata*	18	0.5	NA
Wyethia angustifolia	4	21	TBD

Project coordination with other partners

Both TNC and USFWS own and/or manage properties that are in close proximity to the BLM's Upper Oak Basin site, and TNC is in the process of purchasing another property nearby. USFWS is separately funding a project to meet recovery goals for two federally listed species, Kincaid's lupine (*Lupinus oreganus*) and Fender's blue butterfly (*Icaricia icarioides fenderi*) in the Eugene East Recovery Zone (as part of a larger project that includes Recovery Zones in the Willamette Valley and southwestern Washington), where Upper Oak Basin is located. This effort includes collection and production of Kincaid's lupine seed, as well as production of forb species used for nectar by Fender's blue butterfly.

Conversations with TNC and USFWS Partners for Fish and Wildlife Program (Partners Program) were initiated in fall 2015 to coordinate increased support and funding for mid-elevation seed production and expand the number of species and amount of seed available for use in mid-elevation restoration projects. In the fall of 2016, the BLM developed an estimation of their restoration seed needs over the next several years, and begin thinking about how to expand production and share costs with other partners. While these conversations are in the early stages, in 2016 TNC did contribute $6,000 to the project by purchasing excess seed (seed not needed by the BLM that year) to support production efforts, and USFWS contributed $1500. In 2017, IAE plans to continue working with partners to identify partner plant material needs and opportunities for increasing mid-elevation native seed production efforts and funding.

BUDGET

In 2016, IAE spent a total of $20,829 on mid-elevation seed production project activities. See Table 3 for a list of project activities and their direct costs in 2016.

TABLE 3. 2016 MID-ELEVATION SEED PRODUCTION BUDGET BREAKDOWN.

Activity	Contract	In-house (IAE)	Total
Program management and coordination		$3,102	$3,102
Production (seed collection and production fields)	$5,500 (invoice pending)	$4,315	$9,815
Supplies & Equipment		$136	$136
Travel		$662	$662
Admin	$1,155	$1,725	$2,880
Total	***$6,655***	***$9,940***	***$16,595***

DISCUSSION

After IAE crews harvested the two grass species at Trillium Gardens, the plant material was laid out to dry under a hoop house on site. The hoop house was a secure venue for seed drying that protected the

material from blowing away while drying in the sun. Access to the hoop house was a crucial part of the seed harvest process in 2016 and we are thankful for Trillium Gardens for allowing us to use the space.

Being able to opportunistically harvest seed from the fields at Trillium has greatly helped increase the availability of mid-elevation seed and plants for use in restoration projects for relatively little cost, as we were able to take advantage of existing fields without having to provide the initial investment in seed collection, field establishment, and early field maintenance. However, Trillium is one hour away from the IAE office, which makes field monitoring and maintenance logistically challenging. IAE staff have learned that the fields get weedy quickly in the spring, and in 2017 we will focus on increasing the time spent caring for these fields to maximize yields and to maintain a positive relationship with the grower.

Sheila Klest of Trillium Gardens continues to be open to working with us and potentially expanding our native plant production at her farm. She has been most concerned with our ability to maintain fields free of weeds, as well as the need to establish clear ownership of the plants in the fields formerly contracted through TNC. She has graciously allowed us to salvage plants, harvest seed, and use sheltered space on the farm for drying seed. As long as we are able to allocate enough resources to care for the fields, as well as pay a reasonable amount for irrigation and any other logistical help, she will likely allow us to continue with our current arrangement for the next several years.

USFWS and TNC are showing increased interest in forming a plant materials partnership to leverage restoration and conservation efforts at sites in the vicinity of Upper Oak Basin, as well as other nearby sites. They were willing to contribute to the project in 2016 and are hoping to help expand production in the future. This will help BLM increase the diversity and abundance of native seed available for their high priority mid-elevation prairie and oak restoration projects while working within a limited annual plant materials budget.

NEXT STEPS

IAE recommends implementation of the following activities for the continued success of this project:

- Continue to maintain the five established contract production fields of *Danthonia californica*, *Festuca roemeri*, *Geranium oreganum*, *Koeleria macrantha*, and *Plectritis congesta*.
- Continue to maintain two to three seed production fields at Trillium Gardens, and harvest and clean seed produced by those fields.
- Provide harvested and cleaned seed to the BLM for use at ongoing restoration projects at Upper Oak Basin and Twin Prairie
- Work with the BLM, TNC and USFWS to identify partner seed needs and ways to coordinate, expand and fund mid-elevation seed production
- Distribute excess seed with TNC and USFWS as approved by the BLM
- Store unused seed at a temperature and humidity-controlled seed storage facility
- Collect seed through the Seeds of Success program, focusing on species (such as annual forbs and western yarrow) and sites that could be useful in future production for the Oak and Pine project.

- Pending funding availability, put the following species into production: *Achillea millefolium* (western yarrow), *Clarkia amoena* (farewell-to-spring), *Clarkia purpurea* (purple godetia), *Madia gracilis* (grassy tarweed), and *Madia elegans* (common tarweed).

REFERENCES

Getty, J.R. 2015. Prairie Seed Production Annual Report 2015. Prepared for the Bureau of Land Management, Northwest Oregon District. Institute for Applied Ecology, Corvallis, Oregon.