

RAE SELLING BERRY SEED BANK & PLANT CONSERVATION PROGRAM



Fall 2014 Newsletter

From the Director



Ed Guerrant at
Hawaiian Botanical Forum

The last six months have been busy, diverse, and productive, not to mention challenging. As I mentioned in the last newsletter, Kris has reduced her hours, but we have been able to compensate and maintain our productivity in various ways, mostly with a series of excellent interns.

We have been able to accomplish a large part of her anticipated seed collecting activities with a generous "grant" by the BLM to fund a full time collector, Isaac Sandlin, for our work with the Seeds of Success program, which focuses on more common species.

We already had a contract with the BLM to collect seeds, but have been able to magnify its effect by not having to pay salary out of those funds. Isaac, who is officially a Conservation and Land Management Intern with the Chicago Botanic Garden and BLM's program of the same name, has been able to go out more and stay longer than we would have been able to do originally. He has finished his first five-month posting, and is beginning a second that will go through next spring. Read about his summer activities in this newsletter.

Another highlight is that we awarded our first Gilbert and Laurie Meigs Conservation Education Scholarships to Daphne Cissell and Kimberly Hack, who worked spring quarter on our seed bank database. They did wonders to move that project forward.

This was the 18th year we've been able to host one or more high school Conservation Interns through the Saturday Academy's Apprenticeships in Science and Engineering (ASE) Program. The two interns, Maxine Hood and Hannah Fuller, wrote a piece about their time with us that appears below in this newsletter.

I had two notable projects come to fruition in October. One was an invited talk I gave to the first ever Hawaiian Botanical Forum, which I discuss in a longer article, below. And the other was an outplanting of *Arabis hastatula* we did in an augmentation project with the US Forest Service. It is personally satisfying to bring the species full circle from seed collection to reintroduction, as shown here in this image from the site this fall.



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VOLUNTEERING

Your support helps us to do our best work.

Please call Kris at (503) 725-2468 or email kfreitag@pdx.edu if you would like to support our program.

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IN THIS ISSUE

From the Director

No Moss Growing on ASE Interns

Partners and Plants

An SOS Summer in Eastern Oregon

Hawaiian Conservation Sojourn

Berry Volunteers Connect

Making a Difference--Private Support

[Go to top](#)

No Moss Growing on ASE Interns

Maxine Hood and Hannah Fuller



Hannah Fuller (left)
and Maxine Hood

Hello to the Rae Selling Berry Seed Bank community! Our names are Maxine Hood and Hannah Fuller, and this summer we were seed bank interns through [Saturday Academy's Apprenticeships in Science and Engineering](#). Along with the day to day activities of the conservation program, such as processing seeds, making maps and entering data, we had the privilege of participating in a variety of projects during our eight-week assignment. While we didn't do much field work directly for the seed bank, we helped PhD

student Christa von Behren (also a long time Berry volunteer), with her seed dispersal project in urban streams and riparian zones. This was a definite highlight because we got to walk around natural areas in the Portland Metro area and learned a lot about Pacific Northwest plants while helping with vegetation surveys.

We also worked with PSU student and seed bank volunteer Lindsey Riibe on a pilot project studying mosses. Lindsey is studying botany with a special focus on mosses. Our own project was to explore ways to store moss using standard seed bank facilities. Mosses, also called bryophytes, do not have seeds, and it is often assumed that they require different storage procedures. This causes seed banks to hesitate to store mosses. In the process of working on this project, we learned why mosses are ecologically important, why "moss banking" might be called for, beyond just preserving moss diversity. They support further biodiversity by maintaining water and humidity, fertilizing and stabilizing substrates, sheltering microscopic insects and affecting acidity and nitrogen levels.

For our experiment we collected two moss species, *Kindbergia praelonga* and *Orthotrichum lyellii*, from two different locations. We then dried the moss three different ways: a control at room temperature and ambient humidity; in 63% relative humidity using a Dry-Keeper desiccator at room temperature; and at 70% relative humidity in a Dry-Keeper at 5°C. Next, we took the dried moss and froze each sample at three different temperatures: 5°C, 0°C, and -80°C. Each sample was then ground up and put into a Petri dish with a 1:1 ratio of sterile sand and soil. The dishes were placed in a growth chamber with a regime of 8 hours of light a day at 20°C. We used a grid to survey the growing moss and protonemata (moss "seedlings") in each dish and evaluated the results.



Small lab desiccation chamber

When looking at the survival rate of our moss we learned we were almost too good at re-growing it. We realized we couldn't decide on a clear "best" way to store moss, because every dish had at least some growth in it. However, if we had to decide on the best method, it would be 63% relative

Upcoming Events

[Wide World of Seed Banking](#)

OTHER LINKS

[Saving seeds the right way can save the world's plants](#)

[Turning to Darwin to Solve the Mystery of Invasive Species](#)

[Climbing high to save a threatened West Coast plant](#)

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Petri dishes growing
moss fragments

humidity at room temperature and 5°C storage treatment, but just barely. One observation we did make was that the *Kindbergia* species grew a lot more than the *Orthotrichum*, leading us to believe that each species might differ in terms of the best germination procedures.

While our experiment didn't lead to obvious answers, it is definitely a step towards maintaining biodiversity as the seed bank expands its conservation efforts. It was a successful pilot project in support of Lindsey's further research, and it opens many doors with the knowledge that moss banking is possible using standard seed banking procedures.

From this project and this internship we learned an immeasurable amount about seed banking, the scientific process and conserving the beautiful area that we live in. The skills we gained give us a new confidence to dive head first into careers in science. It was priceless to be surrounded by so many people with such passion for botany and conservation. We are so thankful for this awesome opportunity!

[Go to top](#)

Partners and Plants

The Seed Bank is exploring the feasibility of becoming a "Moss Bank" as well, with the help of Dr. Todd Rosenstiel of PSU's Center for Life in Extreme Environments, and Dr. Sarah Eppley. We may someday soon be conserving mosses such as these two that interns Hannah and Maxine studied this past summer.

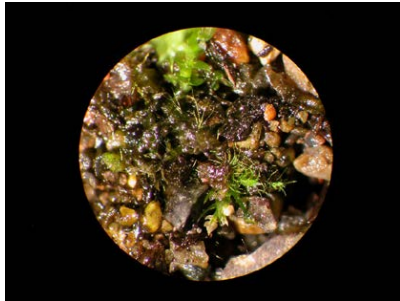
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The moist woods common in temperate zones in many parts of the world are home to both of the species of mosses our interns studied this summer.

Kindbergia praelonga, also called common feather-moss, may be found growing on soil, rotten logs, rocks, or epiphytically on tree

trunks.



The protonema of a moss is like a seedling of a vascular plant, but generally arising from a spore. Our interns grew mosses asexually from fragments, which also produced protonemata. At this stage, they are not very distinctive to the naked eye.

Orthotrichum lyellii, or Lyell's bristle-moss, another common moss, is typically found on deciduous trees. It is relatively drought tolerant.



[Go to top](#)

An SOS Summer in Eastern Oregon

Isaac Sandlin



Eastern Oregon vista

Last spring, I began collecting native plant seeds throughout the sagebrush-steppe ecosystem in the Burns BLM district in eastern Oregon. My position is a partnership between the Bureau of Land Management, the Rae Selling Berry Seed Bank & Plant Conservation Center and the Chicago Botanic Garden.

My collections are made for a federal program known as Seeds of Success, which is the only federally coordinated native seed collection program and is dedicated to promoting resilient ecosystems throughout the United States. Most of the effort is concentrated on BLM holdings, but the program is making inroads outside sagebrush country.

I spend my life divided between two worlds. I live and work here in Portland, where I enjoy all the modern conveniences of city life. Luckily for me, I also get to entirely shed that lifestyle every other week and decamp to the wide-open spaces of Harney County,

one of the least densely populated counties in Oregon.

For those who haven't visited, Harney County is wild country and my daily working life is unpredictable. The landscape unfolds on a profound scale with vistas of ancient lava flows, endless sagebrush, cattle ranches, and blue sky. It is also a land of extremes, and I often find ground conditions the most limiting factor in seed collection. High winds, wildfire, thunderstorms and daily temperature swings in excess of 50°F are normal summer conditions. Though knowing the botany of a given area is critical, I have found that the ability to adapt to evolving ground conditions is just as important.



Sagebrush steppe

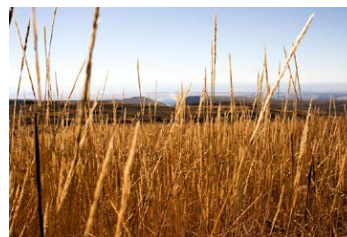
The federal government is the single largest landowner in Harney County, with over 60% of the land area in the county, almost 4 million acres, currently managed by the Bureau of Land Management. I scour these vast land holdings looking for healthy populations of our most common, and some not-so-common native plant species. Though the funding for this project is intended primarily to increase available stock for greater sage grouse habitat research, I collect whatever native species are ripe and accessible on a given day.



Seed collections drying

Once collected, my seeds are dried, cataloged and sent to the federal seed cleaning facility in Bend. When fully cleaned, they are sent to the Western Regional Plant Introduction Station in Pullman, WA, where they will be accessioned into the national collection. If the count of a given collection comes to at least 10,000 apparently viable seeds, then the Rae Selling Berry Seed Bank will receive the excess for local storage.

I am grateful to have had this unique experience over the past six months, and look forward to participating in the project next year. I was recently granted a five month extension on my internship, and hope to be back in the spring to help next year's intern discover more intact populations out east.



Eastern Oregon grasses

[Go to top](#)

Hawaiian Conservation Sojourn

Ed Guerrant

Ever since I spent my eighth grade year on the island of Oahu, I have had a soft spot in my heart for our nation's 50th state, Hawaii. I have been back many times, including a



*Ed with fellow restorationists
above Makua Valley in 1999*

three month stint as an undergraduate college student collecting ferns on the Big Island of Hawaii. But it was only after I participated in a three year planning process as a consultant (for of all organizations, the US Army!), helping to develop restoration plans for some 40 endangered species that I

came to appreciate how unique and wondrous the Hawaiian flora is. I also came to understand just how vulnerable the native Hawaiian flora is—with some 90% of the native species found nowhere else in the world! The plant conservationist in me aches for this terribly assaulted native flora, in what is sadly but correctly referred to as the Endangered Species Capital of the World.

Of some 1200 native plant species, 111 have already become extinct, 5 exist only in ex situ situations. Another 231 species each have 100 or fewer individuals in the wild, and 97 of these have 20 or fewer! With less than 1% of the nation's land area, Hawaii has over 40% of federally listed threatened or endangered species (366), with another 48 that have been proposed as threatened or endangered. It is in this context that I feel fortunate to have been invited to participate in the inaugural Hawaiian Botanical Forum in October, at which I presented one scientific talk and conducted two workshops. A lot of great work has been done in the last fifteen years, and despite the dire situation, there are real reasons for hope and optimism.

You can get a flavor of what is going on with plant conservation in Hawaii from the [Hawaiian Botanical Forum web site's](#), "Post Forum Resources" page. It contains pdf versions of most of the talks. Two of my favorites were presented by Chipper Wickham and Rob Robichaux. The accompanying slideshows alone powerfully conveyed their stories. Chipper, Director of the National Tropical Botanical Garden, gave a broad historical overview of plant conservation in Hawaii. He comes from an old Hawaiian family, and his talk was leavened with personal stories of his grandmother teaching him about plants and how things were when she was young. Rob Robichaux gave an inspiring talk about his work and that of the Hawaiian Silversword Foundation to restore not only rare species, but whole native plant communities on the Big Island. Where once there were fewer than 1000 individuals of the Mauna Loa silversword, there are now tens of thousands. It is well worth the time to visit the Botanical Forum web page and view some of the slideshows.



*Mauna Loa silversword
Argyroxiphium kauense
Image: J Jacobi, USFWS*

One of the most interesting and rewarding parts of my trip was catching up with a number of people with whom I worked as a consultant some fifteen years ago. They are certainly not out of the woods yet, but they have made significant strides in the recovery of many species. I was fortunate also to be able to visit the conservation facilities at Lyon Arboretum, as well as the US Army rare plant restoration facility at Schofield Barracks. Following are some pictures and stories of particular plants and what is being done to

restore them.

Among the crown jewels of the Hawaiian plant conservation community are the [University of Hawaii Lyon Arboretum's Micropropagation and Seed Conservation Laboratories](#).

Micropropagation can more or less be seen as growing plants in test tubes. Among the advantages of micropropagation is that whole plants can be grown from very little initial material. It is also a great way to rescue inadequate embryos in damaged or immature fruit. For plants that have resisted other germination or propagation methods, micropropagation can literally be a life saver.



Kokia cookei
Image: GD Carr

Perhaps the most endangered plant I know about is *Kokia cookei*. Known originally from only 3 plants on the island of Molokai, it was thought extinct in the 1950s. Another individual was found, but in 1978 it was lost in a fire. Fortunately a cutting had been made and grafted to another endangered relative, *Kokia kauaiensis*. Thus the last "wild individual" was, in fact, only a shoot system of stems and leaves, with no roots. That's where the situation stood for many years, but Nellie Sugii and others at Lyon Arboreum were able to coax immature seeds to germinate, and they now have plants with roots in culture.

Not quite as desperate, the last wild plant of *Cryptocarya oahuensis* at least had its own root system as well as stems, leaves and even flowers. Fortunately, it produced fruits in 2013, and the folks at Lyon Arboretum were able to grow 45 plants that were scheduled to be reintroduced into the wild shortly after the conference, in late October. Pictured is Dr. Marian Chau, the new head of the Seed Conservation Lab.



Cryptocarya oahuensis



Marian Chau and
C. oahuensis



Stenogyne kaneoana,
Dr. Lauren Weisenberger
& Matt Kier

In the last fifteen years the [US Army Natural Resources Program](#), which operates out of Schofield Barracks on Oahu, has enormously advanced the conservation of Hawaii's most endangered plants. I toured their greenhouse facilities with Matt Kier and Dr. Lauren Weisenberger, shown here with a vigorously growing specimen of *Stenogyne kaneoana*, which is known in the wild from only three far-flung individuals, all of which are now dead.

Fortunately, they have cuttings from two of the plants, and these are growing in their greenhouse. Although the species produces large flowers, mature fruits have never been seen in nature. Apparently its native pollinator--presumably a bird--is extinct. The reintroduced plants are doing well, except that to produce seeds they must be hand pollinated, a problem in the long term.





Eugenia koolauensis flower

As if the problems were not great enough, fifteen years ago there were several populations with hundreds of individuals, including seedlings and immature plants, of the endangered *Eugenia koolauensis*. A pathogenic rust arrived on Oahu in 2006, which has now infected all wild populations, and the numbers of plants have been reduced by more than half and are dropping rapidly. They are working now to develop better seed storage protocols for this species, which may provide a bridge until a cure for the rust is found.

Among my favorite native Hawaiian plants are the very diverse group of lobelia relatives, which includes the genus *Cyanea*. When I was there fifteen years ago, I was privileged to see a surreal scene of the **last remaining *Cyanea superba* in the wild**. It was surrounded by a small barbed wire fence enclosure about the size of a two car garage, just outside of which were the skeletal remains of a feral pig caught by a snare. Like palms, *Cyanea* plants have a single stem with a crown of leaves and flowers at the top. A net had been tied around the stem about 8-10 feet above ground—to catch any immature fruits that might fall—and the stem below was shingled with a solid layer of large snap traps for rats. The plant has since died. Fortunately, fruits had been collected from the three plants originally in the enclosure by the **Oahu Plant Extinction Prevention (PEP) Program**. The folks at Lyon Arboretum and the US Army's Natural Resources Program (USANRP) germinated many of the seeds, which were then outplanted in the area by the USANRP and now there are hundreds of them growing.

In comparison, *Cyanea crispa* is practically common. Shown here in flower in the Lyon Arboretum rare plant greenhouse, there are fewer than 50 remaining individuals known in the wild, but the folks at Lyon have germinated and grown many and are restoring them to the wild. They are also storing seeds in the Lyon Seed Bank.



Cyanea crispa



Alvin Yoshinaga, Tim Kroessig & Marian Chau

Twenty years ago, when Alvin Yoshinaga initiated the Seed Conservation Program, it was generally thought that most Hawaiian natives could not easily be stored in seed banks. This was based on the assumption that because they were tropical and many were from moist habitats, they would largely not be able to tolerate desiccation. Undaunted, Alvin, in collaboration with Dr. Christina Walters at the USDA National Center for Genetic Resources Preservation, examined the seed storage behavior of a large number of native Hawaiian

species. To their delight, 75% of the ~725 species of conservation interest (over half the entire flora!) have "orthodox" seeds, meaning they can be dried and stored frozen in conventional seed banks. Another 10% can be maintained by micropropagation; an additional 10% are tree species that can be maintained in botanic gardens. The remaining 5% are still problematic and are the focus of much attention by researchers. Alvin has retired, but the seed lab continues with Tim Kroessig and Marian Chau, who have taken up the reins, moving to provide one more link in the chain of people working to save as many species as possible.

It is ironic that I find so much hope in a situation that on its face is about as bad as it gets for conservation. But as an old US Fish and Wildlife poster proclaims, "'Endangered' means there is still hope."

[Go to top](#)

Berry Volunteers Connect



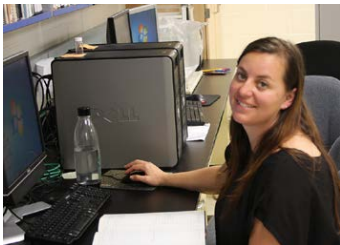
Phyllis Bittinger with intern Isaac

Volunteer **Phyllis Bittinger** has been helping us for a few months, and we are grateful for her regular contribution of time and energy, as well as her pleasant and intelligent presence. She has this to say about what brought her to the seed bank: "I learned about the seed bank when seeking opportunities to volunteer in ways that would benefit nature. It is a short walk from my office on campus to the lab, but they are worlds apart. Working with the seeds is rewarding because I know my efforts contribute to the goals of the Rae Selling Berry Seed Bank."

I am grateful for the opportunity to sustain the mission and vision of the seed bank - focused conservation efforts in Oregon and the Pacific Northwest, expanding to the support of plant conservation on a global level. What can I say? I have passion for saving the world! ;)"

[Go to top](#)

Making a Difference - Private Support



Intern Daphne Cissell

We offer a grateful farewell to our **Gilbert and Laurie Meigs Conservation Education Endowed Scholarship Interns**, who each worked 100 hours this spring to help get our database up and running.

Daphne Cissell is a past Berry Botanic Garden volunteer who is graduated in June from PSU's Environmental Science and Management Department and hopes to work in either water or plant conservation. Daphne says, "I jumped at the opportunity for the internship at the Rae Selling Berry Seed Bank and Plant Conservation Program because of my prior experience with the Garden. I knew that this position would be a way to learn what plant conservation entails from a day to day perspective. Getting a database together takes a lot of work, and I have been learning a lot about the importance of organization and detailed field notes. You never know who will need the information later!"

Kim Hack was thrilled to work as an intern at the Seed Bank and to learn about our research and conservation work. She is grateful to have gained experience in database management during her term. Kim had previously been involved in riparian restoration, field surveying, wildlife tracking and environmental education. After graduating from PSU with an Environmental Science degree next year, she hopes to continue in conservation work.

Private gifts and grants make all the difference in the life of our program. You can go directly to our [giving page](#), or for more information on ways to make a gift, please contact Scott Shlaes, Director of Development for Sustainability Initiatives, at 503-725-

[Go to top](#)

Upcoming Events

River Restoration NW Symposium



Image: Adam Jones PhD

Tuesday-Thursday, February 3-5, 2015
Skamania Lodge in Stevenson, Washington

The Symposium brings together engineers, ecologists, biologists, hydrologists, geomorphologists, regulators, and land managers to share information, foster dialogue on a multi-disciplinary approach to stream restoration and related watershed and river sciences. Attendees will hear from speakers who are moving forward the practice and science of river restoration.

Topics covered will include aquatic and fisheries biology, geomorphology, landscape architecture, hydrologic and hydraulic engineering, wetland and soil science. This multi-disciplinary meeting includes a unique mixture of practitioners, academics, government staff and tribal/First Nations representatives.

[More details>>](#)

[Go to top](#)

13th Annual Urban Ecology and Conservation Symposium

Monday, February 9, 2015, 8:00 a.m.-6:00 p.m.
PSU, Smith Center Ballroom
Early registration: \$45; Student: \$15;
Volunteer: \$10

The symposium focuses on urban environmental issues and the practical application of related ecological and social science research in the Portland/Vancouver region.



Image: Gobonobo

- Brief presentations and a poster session will give you a taste of what's happening in the Portland/Vancouver region
- Inspiring keynotes from noted researchers and practitioners
- Networking opportunities happening pre-conference (8-9 AM), during lunch, and at the afternoon social hour (4-6 PM)
- Lunchtime discussion groups provide opportunities to share information and further your knowledge

[More details>>](#)

[Go to top](#)

The Wide World of Seed Banking

Saving seeds for future use is as old as human civilization and as timely as today's headlines. Our focus has been on rare and endangered species, but the world of seed banking is far more expansive. It probably began with storing seed for next year's crop, and agricultural plants are likely still the most common focus of seed banks around the world. But recent decades have seen an explosion of seed banking of a much wider array of plants for many different purposes. In this section, we seek to provide a glimpse of the wide and wonderful world of seed banks.

In Our Country: Ira Nelson Horticulture Center

Wildflower seeds of local ecotypes will be collected and processed for storage at the Wildflower Seed Bank to maintain viability and enhance germination. Remnant-collected seeds will be direct-seeded into one to three acre seed plots located at the Model Sustainable Agricultural Complex (MSAC) in Cade, Louisiana. Seed will then be distributed to LaDOTD for planting along roadside right-of-ways.

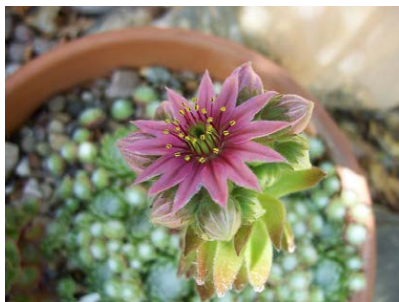


Sweetbay magnolia, Magnolia virginiana
Image: Derek Ramsey/Chanticleer Garden

This statewide project is a collaboration of three universities that will target three eco-regions of the Louisiana. UL Lafayette, University of Louisiana at Monroe (UL Monroe) and Southeastern Louisiana University (SLU) will collect and generate seed from the southwestern, northern and southeastern regions of Louisiana, respectively.

[Continue reading at the Ira Nelson Horticulture Center site>>](#)

[Go to top](#)



Sempervivum funckii var. aqualiense
Image: Stephen Boisvert

In the World: Botanic Garden Meise Seed Bank

The need for plant conservation has never been more evident. Through the effects of climate change, habitat destruction and the spread of invasive alien species, the world's flora faces unprecedented challenges.

It is the role of all responsible botanic gardens to contribute to preserving plant life. National Botanic Garden of Belgium is one of these. Its botanical and horticultural staff contribute to preserving plant life in many key areas that encompass projects based in Belgium and around the world.

At the local level, our ecology staff helped compile the Atlas of the Flora, a comprehensive book detailing the habitat, ecology and distribution of all plants in the of Flanders and Brussels Regions. Amongst the varied projects in the south of Belgium is one aimed at securing a future for the county's only endemic plant, a unique houseleek or sempervivum (*Sempervivum funckii* var. *aqualiense*) which is confined to a single limestone cliff in the Ardennes.

[Continue reading at the Botanic Garden Meise site>>](#)

[Go to top](#)

Stay informed on upcoming events and news by regularly visiting the [Rae Selling Berry Seed Bank web site](#).

This e-newsletter is a publication of the Rae Selling Berry Seed Bank & Plant Conservation Program at Portland State University

