Fall 2015 Newsletter

From the Director

Ed Guerrant at ASE Symposium

Another summer fades into autumn, and after a very dry October, the rains may finally be starting. It has been a busy summer, and despite some challenges, we are moving forward.

We were fortunate again this summer to have a Conservation and Land Management Intern. This great program, run by the Chicago Botanic Garden and largely funded by the Bureau of Land Management (BLM), places many interns each year in a variety of positions, mostly in the west with the BLM and other conservation minded organizations. Like Isaac Sandlin in 2014, Lindsey Riibe spent much of the spring and summer collecting seeds in Harney County, in eastern Oregon. *(See Lindsey's posts on the CLM Internship Program Blog.)* She made over 50 very large seeds collections (some in the tens of thousands of seeds each). She, like Isaac, focused on common species that are important to sage grouse for food and cover. Many of the seeds will go to governmental agencies for use in restoration and research, and the RS Berry Seed Bank will also end up with what for us are very large samples. Last year, for instance, our share amounted to almost five million seeds, distributed among 55 collections!

We were fortunate also to be able to have two high school interns for the summer, Sophie Lynch and Amira Smith, through Saturday Academy's Apprenticeships in Science and Engineering (ASE) program. This was the 19th year that we have had one to three summer conservation interns through ASE, and once again, we hit the jackpot with wonderfully competent students to assist us in our work. One of our 2014 ASE interns, Maxine Hood (currently attending Wellesley College), who went to Camas High School, inspired a fellow student, Fan Liu, to contact us. Ms. Liu is well into a project that might be a year or more in duration. She is conducting a 'move-along' germination study, where seeds from a large number of collections are subjected to a series of

MAKING A DIFFERENCE

VOLUNTEERING

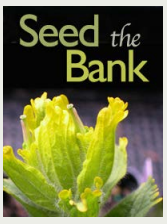
Your support helps us to do our best work.

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

MAKE A GIFT TODAY

GIVE

Have you included or considered including the Rae Selling Berry Seed Bank in your estate plans? If so, or if you would like to learn more, please contact Scott Shlaes, Director of Development for Sustainability Initiatives at (503) 725-2998 or shlaes@pdx.edu



Stay up-to-date with the Seed Bank on our Facebook page!

conditions simulating seasonal changes.

Sophie, Amira and Fan in lab

At a larger scale, Kris Freitag is focusing on developing a citizen science program that will involve everyday people from around the state in ways that will be of benefit to them, to us, and to all who are interested in conserving our state's vulnerable plant species. This is something we've wanted to do for many years, and with her hard work, it is moving toward become a reality.

Visiting Japanese scientists with PSU's John Christy; L-R: Noriyasu Suzuki, Dr Yuki Midanagi and Tomoki Ono

At an even larger scale, first at the Berry Botanic Garden, and now here at PSU, our local and regional work continues to attract an international following. Recently, we were pleased to meet with a trio of Japanese scientists from the Natural History Museum and Institute of the Chiba Biodiversity Center. The botanist of the group, Dr. Yuki Mikagagi is exploring the possibility of opening a seed bank of their own.

I am wrapping up a long project developing a flexible computer based tool to assist the BLM in prioritizing species for collection from among a large list of vulnerable species in Oregon and Washington (read more below). In closing, and as always, we thank all the volunteers who generously donate their time assisting us in moving our important work forward.

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ASE Interns' Seedy Summer

Amira Smith and Sophie Lynch

ASE Intern Amira Smith

Amira Smith and **Sophie Lynch** were our high school interns this summer through Saturday Academy's Apprenticeships in Science and Engineering. Here they speak about their time with the seed bank:

Amira

The most important knowledge that I acquired this summer was perspective. Before I could only relate science to what was in the dusty old textbooks from ten years ago. Not only does the Rae Selling Berry Seed Bank show you how every piece is part of a whole, but it shows you how all your actions in and out of the Seed Bank are part of a much larger whole. Some of my fondest memories are during lunch time where I would have the chance to hear about all the amazing things Ed, Kris, and all the volunteers and grad students did that got them to this point in their life.

I started this internship without knowing seed banks even existed and now looking back, the amount of knowledge I have acquired is more than what I learn

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OTHER LINKS

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Amira at South Prairie

in a year-long science class. One of the most important lessons I learned this summer, was how critical it is to keep records. Some of the seed samples date back to 1983, and without the amazing record system the Seed Bank has, we would not be able to conduct germination trials today. Getting the opportunity to travel to different field sites and explore the native plants in each of those areas gave me a broader understanding of how critical the work that the Rae Selling Berry Seed Bank does is, and how my future endeavors can help contribute to the worldwide plant conservation effort.

Sophie

ASE Intern Sophie Lynch

My name is Sophie Lynch, and through Saturday Academy's Apprenticeships in Science and Engineering Program, I was able to spend my summer as an intern at the Rae Selling Berry Seed Bank. I feel remarkably lucky to have had this opportunity, especially considering that before I applied, I had no idea what a seed bank was! It was one of many things I learned over the summer. Before my internship, I knew only a handful of the local forest plants by name: now, I found myself cleaning, weighing, and packaging seeds from across the Northwest. Gazing through the dissecting scope, I got an up-close look at an amazing range of plant diversity. In a textbook, biodiversity is an abstract concept. Cleaning tan, pear-shaped *Eriogonum* seeds one moment and striped, paper-thin *Lomatium* seeds the next: that makes diversity real. An added bonus: after copying down dozens of scientific names, I actually remember some of them!

Seed drawing by Sophie Lynch

When I wasn't cleaning seeds, I was entering data for Western lily germination trials or seed collecting trips. For one data entry project, I looked up the owners of different natural areas: this took a lot of sleuthing, which I enjoyed. But though I loved working in the lab, my favorite parts of the summer were undoubtedly the collecting trips. During our trips to Catherine Creek State Park and Gifford Pinchot National Forest, we gathered the seeds of native forest and prairie plants. Learning seed collection protocols - and what kind of data to collect along with the seeds - was invaluable experience, and exploring these beautiful natural areas only reinforced the importance of what we were doing back in the lab. I hope my career will let me protect places like these, and I'm grateful to the Seed Bank for giving me the skills to get started.

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How long DO they last in the Seed Bank?

High school volunteer intern **Fan Liu** took on the task of running a

germination test on taxa from the seed bank; a selection is profiled here. This helps us determine the viability of stored seed, as well as conditions needed for germination. We are grateful for Fan's generous gift of time this year--close to 200 hours and still counting!

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Cimicifuga elata var. *alpestris*, tall bugbane. This tall summer bloomer has recently been recognized to be more closely related to baneberry, and so has been renamed *Actaea elata*.

Gentiana setigera, Mendocino gentian, so-called because it can be found in NW California as well as SW Oregon wet meadows, often in association with *Darlingtonia californica*, the "cobra lily."

The endemic Willamette Valley daisy, *Erigeron decumbens* var. *decumbens*. Currently known only by the two-part species name, it is endangered due to the intense agriculture and development pressure in the Valley.

Penstemon peckii, Peck's penstemon, found on the east slope of the Cascades, is highly restricted in its distribution. (These are typical *Penstemon* seeds, though of a different species.)

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Citizen Science Program Coming to Berry

Kris Freitag

Rare pale larkspur
Delphinium leucophaeum

Dating back at least to 1900, when the Audubon Christmas Bird Count began, there is a rich tradition in America of average citizens voluntarily joining forces to gather scientific information about the natural world. With proper training, it is clear that large amounts of solid scientific information can be and have been gathered.

The University of Washington sponsors a program with which many readers may have some acquaintance: Washington Rare Plant Care and Conservation, or "Rare Care," initiated in 2001. The New England Wild Flower Society organized the Plant Conservation Volunteer Corps in 1998. In 2010, the California Native Plant Society founded the Rare Plant Treasure Hunt. What these and other programs have in common is that they rely on the efforts of hundreds of "citizen scientists." Passionate explorers and observers of plants and nature, these are individuals who choose to put their passion to work monitoring the health of rare plant populations, and gathering other kinds of information, increasing our shared body of knowledge.

The Rae Selling Berry Seed Bank & Plant Conservation Program has long considered starting such a program as these three. We have always relied heavily on energetic and knowledgeable volunteers to advance our mission, so it would be a natural progression for us. In fact, the Berry Botanic Garden Conservation Program conducted its own modest version for 10 years in the 1990's: "Partners for Plants." Twice each summer, a different group of volunteers was led by Conservation Biologist Andrea Raven to a National Forest site for a five-day-long research project. The volunteers contributed their time and skill to collect data on rare native species, and in turn learned about scientific methodology, native plants and ecology of the area and other topics presented by Forest Service and Berry personnel.

Partners for Plants volunteers

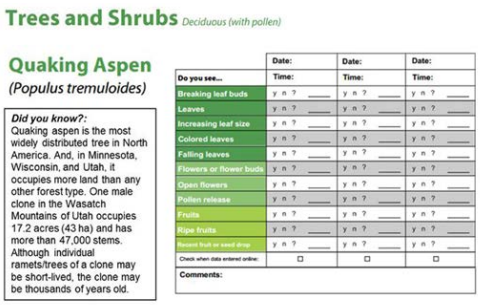
Four years ago, the Native Plant Society of Oregon's (NPSO) "Citizen's Rare Plant Watch (CPRW)" was established by Erin Gray (now at Institute for Applied Ecology). We watched in delight as this wholly volunteer-based program stepped up to take on the task of monitoring Oregon's rare plant populations, bolstering efforts of government agencies and individual plant enthusiasts and botanists. NPSO's Jason Clinch, a staunch supporter from the beginning, eventually took over leadership of the program, leading groups to various sites around the state and submitting collected data to the Oregon Biodiversity Information Center (ORBIC).

Now all agree that it's time for the CPRW to have a more permanent home and funding to enhance its ability to fulfill its mission. **We are working to become that new home.** We are seeking funding to take on this program that has been so ably begun by Erin and Jason and the NPSO. Initially we intend to follow the current model, in which teams of volunteers are led to high-priority sites to assess the condition of plant populations. On-site training

Early spring flowers:
Oemleria cerasiformis

by a knowledgeable organizer has been the rule, although advance training sessions will be held in the future. Priorities will still be determined in collaboration with ORBIC and federal and state land managers. In addition to the population monitoring component, we will be actively recruiting "citizen scientists" to collect phenology data (data about the timing of bud burst, leafing out and such) from a number of common native plants around the state, to assist in our conservation efforts, as well as furthering understanding of climate change impacts.

The term "citizen science" first appeared in the Oxford English Dictionary in June of 2014. Although the term has long been in use, its recent incorporation into perhaps the world's most famous compilation of words and phrases demonstrates its enduring importance. Throughout the centuries, "natural philosophers" have often fulfilled a less formal role than today's scientists, but their observations and conclusions have been of incalculable value. Henry David Thoreau is perhaps the best known historical figure who carefully recorded minute observations--now of great interest to scientists--in his own "backyard." Just so, the amateur scientists of today provide a vital service to professional scientists and society. Deep interest in, even passion for some element of the natural world now reasserts its primacy in an era of proliferating public data collection platforms and often minimal funding for trained scientists. Projects (and associated web sites) such as Nature's Notebook, Project BudBurst, iNaturalist, Zooniverse and Galaxy Zoo allow individuals to be directly involved with formal research projects, or simply to report on the conditions of the ecosystem in which they live.



Nature's Notebook phenology data form

Our need for the efforts of attentive, concerned individuals is greater than ever. It is clearly time to increase our collective ability to monitor our state's rapid changes, using the rich resource provided by individuals passionate about plants and all facets of natural history. Institutions from the Bureau of Land Management to the Oregon Department of Agriculture to the Oregon Flora Project recognize the value of such a program as Citizen's Rare Plant Watch. Conservation professionals around the state have stated their support for this transition from a wholly volunteer based program to a component of our well-respected conservation program. We are excited to take this very timely step, and are actively seeking the needed funding. As always, we welcome our readers' comments, questions and offers of help during this time, so please stay tuned for future developments!

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How do we prioritize collections?

Ed Guerrant

Thelypodium eucosmum, *arrow-leaf thelypody, is only found in Oregon*

This essay builds on my article in the Spring 2013 e-newsletter, which begins... "Say you have an ark. Which species do you save? ...Will you pick the rarest, the largest, or the smallest? The strongest or the weakest? The most beautiful...or just the tastiest?" In this piece, I will focus on a narrower question: Once you have a list of species to consider, how do you go about prioritizing them for collection?

It is this question that is driving one of my current projects. I am in the process of developing a flexible numerical ranking system that will assist the Bureau of Land Management (BLM) to prioritize collection activities. The BLM Oregon/Washington State Director's list of Special Status Species includes 23 federally listed, threatened or endangered species and an additional 613 species listed in Oregon and/or Washington. The prioritization project is part of an interagency effort that involves the US Forest Service, which, together with the BLM, manages significant portions of Oregon and Washington.

The BLM's challenges are considerable, in part because it has multiple, often conflicting mandates that include many ground disturbing activities that could harm vulnerable species, such as mining, oil and gas drilling and cattle grazing. It is charged by law to manage the land in such a way as to assist in recovery of listed species and to minimize the need for listing of additional species under the Endangered Species Act.

I am aware of, and am building on at least two other efforts to develop explicit strategic frameworks for prioritizing seed collection of rare plants. One focuses on rare plants of New England, and the other, the state of Washington. Both of these approaches have done an excellent job of identifying critical factors to consider, which can be put into three broad categories.

The first category of questions is whether the species can be collected and stored at all. Most temperate species, like those in Oregon and Washington, have seeds that can survive being dried and stored frozen. These are referred to as orthodox seeds. Other species have seeds that cannot survive being dried to the point where they can be frozen, which are referred to as recalcitrant seeds. Fortunately, almost all of the species of seed plants on the BLM list have orthodox seeds. (Fern spores are another matter, and our understanding of how best to store them is much less well developed than is our understanding of seed storage.) The second broad category of factors to consider concerns the rarity and legal status of species, as well as what ex situ samples are currently represented in a seed bank. The third set of factors, which only the New England approach addresses, is focused not on species per se, but on individual populations.

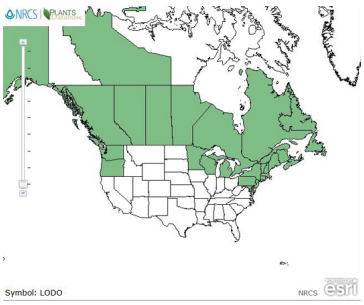
The New England and Washington approaches identify many key factors to consider, assign a numerical value to each, and add them up. The result is a single prioritized list, with lower values having higher priority. The approach I'm developing

Erigeron peregrinus, *subalpine fleabane, is found only in Oregon and Alaska*

builds on the strengths of these approaches, and attempts to address some of what I consider to be significant limitations. The range of numerical values assigned to each particular factor varies considerably, resulting in a hidden weighting that gives some factors more impact than others on the ranking. For example, in the New England approach, several factors represent the proportion of one thing or another, but a proportion necessarily limits the range of values from zero to one. Other factors, such as the number of populations known, or the number that are in ex situ collections can range from one up to approximately 150. The maximum total ranking without these two factors is 36, so the final ranking is influenced very strongly by the number of populations. The other limitation I've identified is that the previous two approaches result in a single, static list of priorities in which the relative impact of various factors cannot easily be teased apart.

The approach I'm developing for the BLM seeks to address both of these limitations. First, all factors were assigned numerical values on a scale of one to ten, with ten being the most vulnerable, or highest priority. Because the entire list of species, factors and their values are in a series of spreadsheets, the effects of differential weighting of variables can easily be explored. Given that each factor has the same potential range of values, it is simple to increase or decrease the relative importance of each factor to see what effect it has on the final outcome. This approach also offers the advantage that one or more factors at a time may be removed to examine the effect on the overall list. We can also begin with a small subset of factors, chosen as the most important, and then add in additional factors to see how the ranking changes. Another, perhaps seemingly trivial difference is that the final value of all factors taken together is the mean value of all factors rather than the sum. This is because not all species have values assigned to all variables. In this way, species for which we do not have information on all factors are not skewed by the occasional factors that would have implicitly a value of zero.

Lobelia dortmanna, *water lobelia, is relatively common*



Lobelia dortmanna *range map*

We are in the process of assembling information on all of the known populations of the 636 Sensitive and Strategic Species in Oregon and Washington, as well as all seed samples we have of any of these species. This includes overall geographic distribution - and some rare species have remarkably large overall distributions, even if the number of populations is not particularly large - as well as who owns or manages the land on which populations occur. All else being equal, should the Oregon and Washington BLM give a higher priority to those species whose distributions are limited to Oregon and/or Washington than

those that also have populations in other states? So too, should the BLM prioritize more highly those species whose populations are limited to BLM lands than those that also occur on lands managed or owned by other entities, and does it make a difference what those entities are? These are just a few of the considerations that must be considered.

I was fortunate recently to have had the opportunity to present a talk about this approach to a meeting of BLM botanists from Oregon and Washington, along with the head conservation botanist from the BLM National Office. The botanists noted that my approach, like that of the New England and Washington groups, treats each known population as being equivalent to one another. The same can be said of ex situ samples. It is certainly true that neither all populations nor stored seed are of equal conservation value.

The tools and approach I'm developing have, I think, moved the ball forward, but there is still much to do. Ideally, this will be the first somewhat static generation of a much more sophisticated, database driven, dynamic tool that can be updated continuously as new and more detailed information becomes available.

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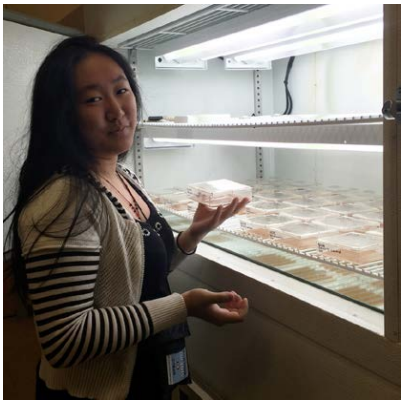
Berry Volunteers Connect

Volunteer high school intern **Fan Liu** has been helping us virtually since the end of last school year, and we are grateful for her very generous contribution of time and energy, as well as her vivacious and creative presence. She wrote this very evocative poem based on her experiences here at the lab:



Volunteer Fan Liu

Rows of Hope

Softly napping among friends (and foe!)
The capsule of hope resides,
In bags in bags in boxes on shelves,
Embracing the life-giving cold.

Wordlessly, peacefully, and painfully still,
The capsule of time remains dreaming:
Of flowers in patches, in fields full of green!
While he waits for his own time to grow.

One day it all changes, he's pulled from his crib,
And placed in a box with his brothers.
He counts - there are five - of seeds in a row
And three rows just like it beside him.

And suddenly, strangely, he feels a sensation,
This feeling of water, he's shocked that it's here!
The box's new warmth is refreshingly familiar,
He's safe: the wrath of the wild has yet to enter.

For weeks upon weeks upon months (upon years),
The capsules of life lie in wait while they grow.

He drinks, he puffs, and feels a new stirring,
Until the day comes when he knows he could burst!

One day a young girl walks into the chamber,
She checks on the seeds, much like the week before.
As she adds in more water, she sees a new sight:
A seedling, the first soldier, of hope's final fight.

Not unlike the Lorax, we speak for the Seeds.
These rare seeds we keep can fight nature (with ease)
When the world is not hit with the "Humandisease."
Their failures impact our own plans to succeed.

Their homes become ours, their land- our new streets,
The warming of weather, and the loss of our bees
It's time to stop taking, we need some good deeds.
We need to protect our world for these seeds.

Thank you, Fan!

Volunteer Amber Ayers

Amber Ayers, office mate of Berry friend and PhD candidate Christa von Behren at Portland's Environmental Services division, is contributing to the Seed Bank from her precious store of free time. She has begun a Master's program in Urban and Regional Planning (MURP) at PSU. She says: "A colleague recently mentioned the Rae Selling Berry Seed Bank & Conservation Program to me, and I knew I had to get in touch and connect with you and the program. While my future will lend itself towards planning and how it applies to water resource management, my background is in botany, ethnobotany, environmental biology and plant conservation. Plant conservation is a major passion of mine, especially when it comes to rare native species and, most recently, preserving heritage and heirloom varieties of vegetables. As our climate changes, I think this issue, along with dwindling water resources, will become a major priority."

Volunteer McKensie Lui

Purple roses!

McKensie Lui, high school intern at Leach Botanical Garden this summer, joined our interns and volunteered at the lab for a day. Courtney Vengarick of Leach also arranged for the interns to receive a special guided tour at the International Rose Test Garden, where Amira exercised her considerable photographic skill!

We recently gathered to mourn the passing of **Vern Marttala**, long-time Berry friend and volunteer, skilled photographer and passionate botanist. His close friend Chuck Ford delivered a

heartfelt and authentic eulogy at Vern's alma mater, Reed College, for an authentic and heart-driven man.

One of Berry friend and botanist Vern Marttala's many striking photographs

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Making a Difference - Private Support

Private gifts and grants make all the difference in the life of our program. See Citizen Science Program Coming to Berry above, for an exciting new program that needs your support. 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 503-725-2998 or shlaes@pdx.edu.

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Upcoming Events

Oregon Flora Project Celebrates Publication

Linda Hardison of the OFP

Saturday, November 14, 2015
Adair Clubhouse, 6097 NE Ebony Lane, Corvallis
4:00 p.m. - 8:00 p.m.
$35 by November 9

Join **Oregon Flora Project** as they celebrate the publication of ***Flora of Oregon. Volume 1: Pteridophytes, Gymnosperms, and Monocots*** and honor the many people who have supported its development. Hosted by the OFP, the Dept. of Botany & Plant Pathology at OSU and the Native Plant Society of Oregon. This gala event will include a buffet dinner, live music, silent auction and book signing. Hope to see you there!

More details>>

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Urban Ecology and Conservation Brown Bag Series *and* Urban Ecology and Conservation Symposium 2016

Brown Bag Series:
Friday, November 6,
and Friday, December 4, 2015
12:15 - 1:30 p.m.
Metro, 600 NE Grand Ave, Portland, Room 370
Free and open to the public

Rana aurora, *Northern red-legged frog (Image: John Bettaso, USFWS)*

November Brown Bag: Saving a Vanishing Species - How Local Citizens Worked Together to Help Red-Legged Frogs

Speaker: **Jane Hartline**, Sauvie Island Habitat Partnership, with **Sue Beilke**, Oregon Department of Fish and Wildlife

Early this year, an intrepid group of volunteers, under the supervision of biologists from the Oregon Department of Fish and Wildlife and the City of Portland, set up a "shuttle service" to help more than 650 frogs successfully make the journey to the Harborton Wetlands and back. Come hear about this inventive and effective endeavor.

December Brown Bag: Changes in the Plant Community of River View Natural Area Following Removal of Invasive Plants

Speaker: **Paulette Bierzychudek**, Professor of Biology, Lewis & Clark College

Hear about a study conducted at River View Natural Area and what it has to say about dealing with invasive species.

14th Annual Urban Ecology and Conservation Symposium

Monday, February 8, 2016, 8:00 a.m. - 6:00 p.m.
PSU, Smith Center Ballroom
Early registration: $45; Student: $15; Volunteer: $10

More details>>

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PSU's School of the Environmnent: Geography & Environment Seminar Series

Thursdays, 4:00-5:00 p.m., next one on October 29, 2015
Cramer Hall 53, Portland State University

Hosted by PSU's **School of the Environment**

October 29: **Nathan McClintock**, Assistant Professor, Toulan School of Urban Studies & Planning: "A comparative geography of urban agriculture: Notes from work in four cities"

November 5: **David Johns**, Adjunct Professor of Political Science, Hatfield School: "The Last Anti-Colonial Fight"
and **Steve Johnson**, Adjunct Professor, Urban Studies & Planning - Urban & Public Affairs: "How the Sixties came to Oregon...and Never Left"

November 12: **Chad Hanson**, PhD, Director, John Muir Project: "Watchdog Science:

Adventures in Conservation Biology"

November 19: **Jason Mark**, Editor, *Earth Island Journal*; incoming Executive Editor, *Sierra*: "Satellites in the High Country: Searching for the Wild in the Age of Man"

December 3: **Elise Granek**, Associate Professor, Environmental Science, PSU: "'Scientific activism': applied research as a driver of change"

More details>>

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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: Red Butte Garden

Utah endemic Maguires primrose, Primula cusickiana *var.* maguirei (*Image: Larry England)*

The **Red Butte Garden Conservation Department** spends much of its time focused on small and inconspicuous desert plants. Every once in a while, someone asks why. The short answer is biodiversity.

What is biodiversity? Biodiversity is the number of different species of plants and animals found within a particular region, or ecosystem. The more diverse an ecosystem, meaning the more plants, animals, insects, and bacteria living within it, the healthier it is. A diverse ecosystem has more resources to draw on that allow it to bounce back from disturbances, adapt to long-term changes, and support the communities within it, wild or cultivated.

What are our goals? We are stewards of the at-risk plants in our region, and protecting them is a key component of Red Butte Garden's mission. We hope to mitigate threats and preserve genetic information so that rare populations may recover in their native habitats, thereby conserving the diversity of our native flora.

Continue reading at the Red Butte Garden site>>

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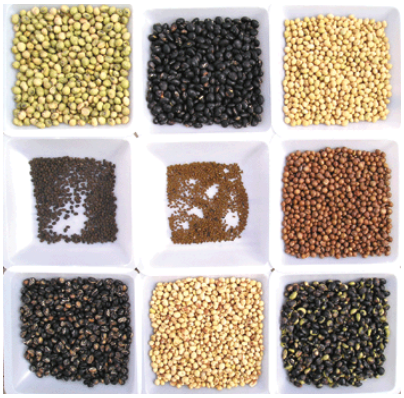
In the World: Navdanya

Navdanya means "nine seeds" (symbolizing protection of biological and cultural diversity) and also the "new gift" (for seed as commons, based on



Crop seeds

the right to save and share seeds In today's context of biological and ecological destruction, seed savers are the true givers of seed. This gift or "dana" of Navadhanyas (nine seeds) is the ultimate gift - it is a gift of life, of heritage and continuity. Conserving seed is conserving biodiversity, conserving knowledge of the seed and its utilization, conserving culture, conserving sustainability.

Navdanya is a network of seed keepers and organic producers spread across 18 states in India. Navdanya has helped set up 122 community seed banks across the country, trained over 5,00,000 farmers in seed sovereignty, food sovereignty and sustainable agriculture over the past two decades, and helped set up the largest direct marketing, fair trade organic network in the country.

Continue reading at the Navdanya site>>

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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

Portland State UNIVERSITY