Driftless Prairies: Native Ecosystems

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Seed Sourcing for Restoration in a Changing Climate

I had the opportunity to attend a Seed Sourcing Symposium at the Chicago Botanic Gardens on June 13. It was an important meeting and just the beginning of a very important discussion. The meeting moved from historical aspects of seed sourcing to current day projects to needed future actions. As promised, the day led to more questions than answers. I was surprised to learn organizations, government entities, and large institutions were focusing and directing resources to this topic. I'll provide some highlights from the speakers. Check out the Native Seed Sourcing paper for indepth information on this topic.

Native Seed and Plant Sourcing
Seed sourcing is the process of deciding which native seeds or plants will germinate and survive where you are planting them.

Historically, the native seed zones were created to limit movement of seeds; the goal was to prevent genetic maladaptation. When compared to current climate data, the 1960-1990 data used to create these maps is showing measurable differences. Climate change is happening quicker than we expect. The result is expected to be increases in extremes; for example, heat waves are expected to increase by 60% and increase in duration. Perhaps we need dynamic seed zones rather than the current static ones. Some work has been done to create provisional seed zones for the western part of the U.S.

What used to be "how local is local" has changed to "is local still local." Speakers stressed the need to think ecologically when choosing species and sources. Latitude is an important component of ecologically-relevant seeds, especially as we consider climate change, which cannot be ignored.

Can we rely on adaptive evolution to rescue our wild populations from climate change? Can pollinators keep up with flowering evolution? Research is being done using trees in the northwest but we were cautioned that one species example cannot be extrapolated to another.

Commercial native seed companies were represented. They expressed a need for scientific evaluation of seed genetics. At present, their source identification is on the honor system. Native seed is not sold based on genetic standards; it is seed collected from native populations where no genetic testing of parent material has been conducted. It was emphasized that we are not able to genetically pinpoint a species. There is no historical genetic data on plants. We know genetic material is moved about via insects; we also know it is moved by bacteria and fungi.

Jack Pizzo, a commercial seed producer, used the analogy of Dr. Frankenstein to describe our current restoration practices. We take all these disparate parts with huge variability and put them together to recreate an ecosystem. These puzzle pieces are not static nor are they well studied. What is science and what is opinion when specifications of provenance for projects are written for commercial suppliers? Supply and demand must be considered. Is the demand for certain provenance, which may or may not be "genetically appropriate" keeping up with the economic realities?

A couple of presenters encouraged folks to "poke holes" in current practices. Not as a way to negatively criticize but as a way to "make it better." Playing devil's advocate and rethinking restoration practices is imperative and should be encouraged. Nature isn't static. Nature doesn't have a rote schedule. Neither should we.

The Bureau of Land Management (BLM) has established a National Seed Strategy for Rehabialition and Restoration; the success of this is based on "a nationwide network of native seed

collectors"—from private individuals to organizations. The ultimate goal is to preserve our native seed stock and develop driven seed zones for each plant and tree which can be used for seed transfer. Our current use of serendipity rather than strategy backed with scientific evidence will not create resilient ecosystems. "We need the same forward-thinking management we demand for other natural resources such as timber and oil," states Peggy Olwell, BLM.

While the BLM has initiated the first steps to preserve and protect our native seed sources, they readily admit that making sure the "right seed is in the right place at the right time" is the responsibility of the practitioner. And gaps in getting the information from the scientific community to the practitioner cannot be denied.

Projects already initiated

- Prairie on Farms – Tallgrass Prairie Center has begun a new project to share knowledge of prairie reconstruction and management techniques with rural landowners.
- National Seed Strategy – Their mission is to ensure the availability of genetically appropriate seed to restore viable and productive plant communities and sustainable ecosystems.
- Seed Zone Summit – The northeastern area of the Forest Service will be holding this summit in 2017 to develop seed zones, develop guidelines for their use, and define terminology. The date and location are to be determined.
- Nature Serve has created a Climate Change Vulnerability Index to identify plants and animals most vulnerable to climate change.

Some needs that were discussed

- Commercial seed producers need to unite and create a native seed organization that represents the interests of those producing, sourcing, and planting native seeds. At present, there is no political voice or educational component for this industry.
- We need direct funding for plants in our federal, state, and local budget. The BLM has no direct funding for plants at present.
- We need educational forums to connect the science to the practitioner. This is often lamented in restoration but was specifically noted with regard to seed sourcing and understanding of “genetically appropriate” plant materials.

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Seeds of Discovery

Seeds are fabulous fascinating aspects of flowers. There are no two alike, even among similar genera. They vary in size, shape, color, transportation method, germination method, and the list can go on. They are an important life source for plants, birds, insects, and mammals. With such an important element, why don’t we know more about what the seeds of the Driftless Area look like?

I began a collection of seeds and was determined to figure out how to create images of them that would further the curiosity of folks and further our knowledge of these seeds. I had no idea how this would come about but I was willing to try many options. The camera would work with the larger seeds, at least for creating an image of what the naked eye would see. I bought a microscope and although I could see much of the intricacies of the seeds, I wasn’t able to capture that in a

quality photo. Dr. Dan Young, an entomologist at UW Madison, allowed me to use their Auto Montage equipment. This microscope creates various images at different planes, then merges these images together to create one clear, 3-dimensional image. Even this didn't create the detail I wanted. Talking with some friends who work in nano technology, they suggested a Scanning Electron Microscope (SEM) and said that UW allowed the general public to rent these. In my quest to find out how to make that happen, I was introduced to Dr. Yan Wu at UW-Platteville.

Dr. Wu and I exchanged numerous e-mails about the costs and how the SEM would work. Although their price was $10 per hour, which is very reasonable, I realized this project would require thousands and thousands of dollars. I had to pause with that reality. This was a dream but it was only a hobby, too! Dr. Wu came up with the perfect solution…apply to the Pioneer Academic Center for Community Engagement (PACCE) program to fund this and allow the Engineering students to do the imaging as a learning experience. We wrote the grant together and it's been in place for 2 semesters now. It's been a great partnership!!!

On April 3, 2014, the college of Engineering, Math, and Science held their 43rd annual expo. This is where various aspects of the college are highlighted to middle school and high school students by using fun and creative methods. For example, the seed project was a demonstration of nano technology. A seed image was also used for the Science as Art contest where students took nanotech-related images to create art.

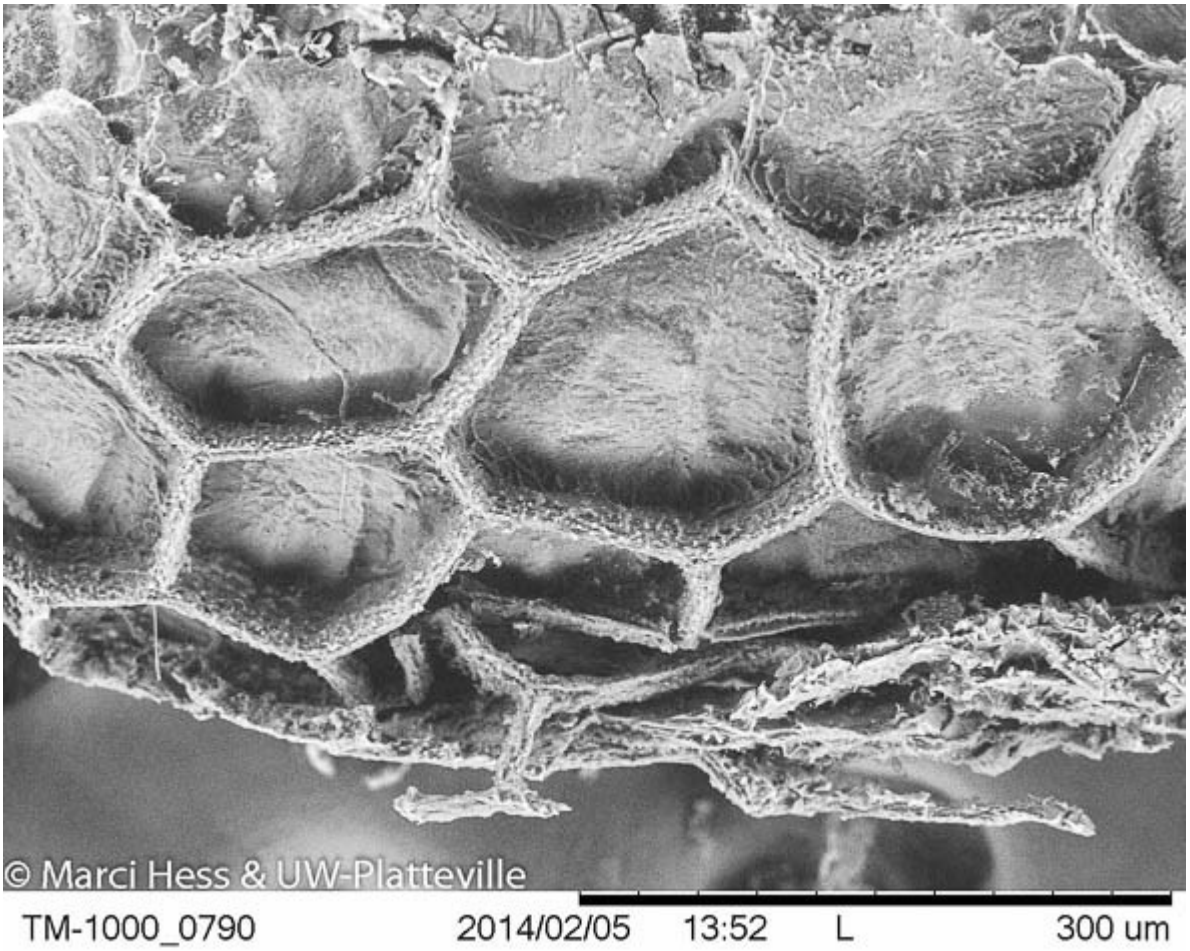
James Waldschmidt standing beside one of the posters created for the seed project.

Paige Hagen thought a feature of Rattlesnake Master (Eryngium yuccifolium) looked like a rose. She colored this and entered it into the Science as Art contest.

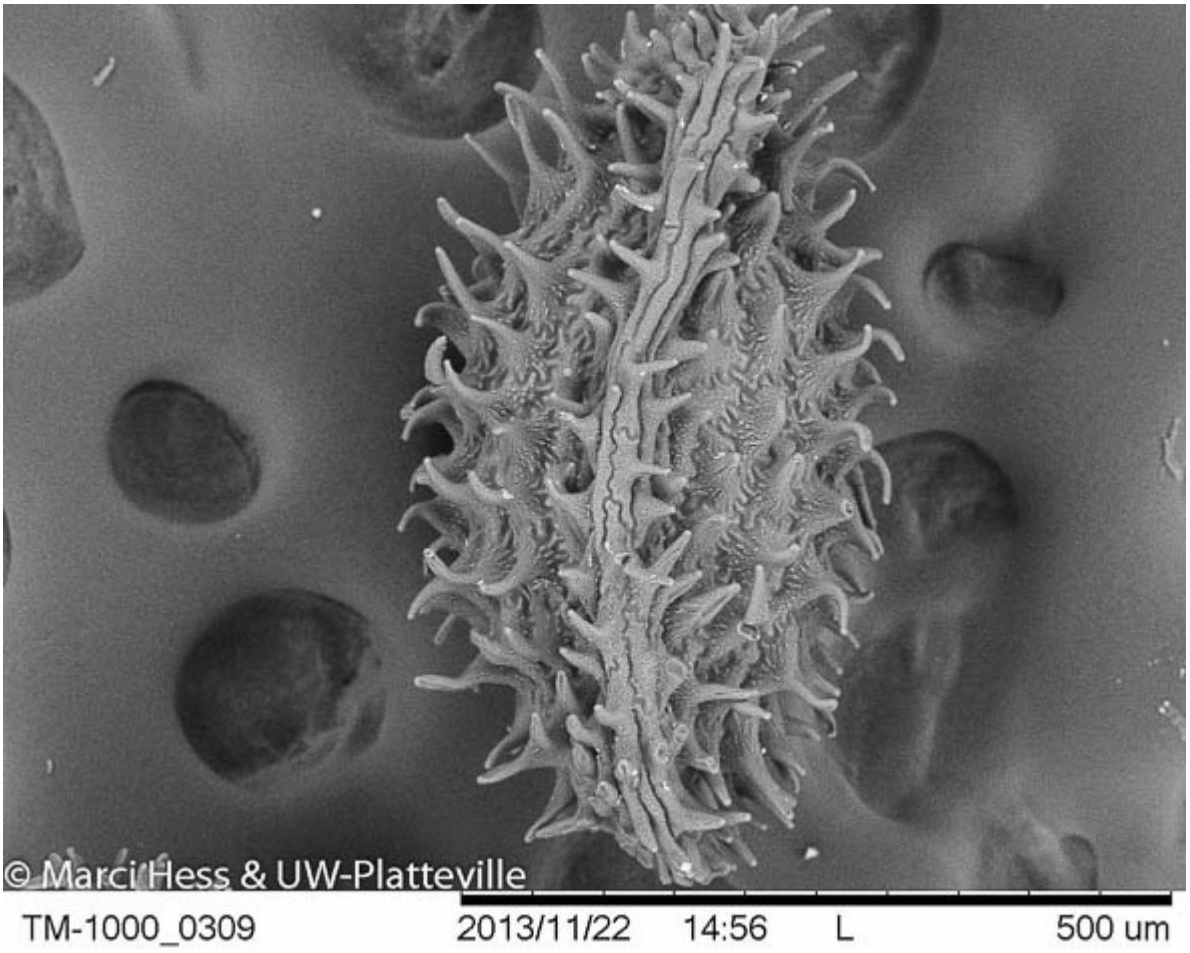
As we've moved through this project we realize there is much more to be discovered than we originally thought. The designs and patterns of these seeds have a story to tell. Why do some seeds have elaborate structures and others do not? What purpose do these structures serve? Are there symbiotic relationships happening with these seeds and if so, how do those relationships benefit the seed? I hope these images will be a source of inspiration to someone; I hope they assist someone with their research into native plants; and I hope they provoke curiosity that will expand what we know about our native plants.

Dr. Yan Wu talking to the students about the seeds and how they are imaged. Each container on the table has one of the seeds that are pictured on the posters.

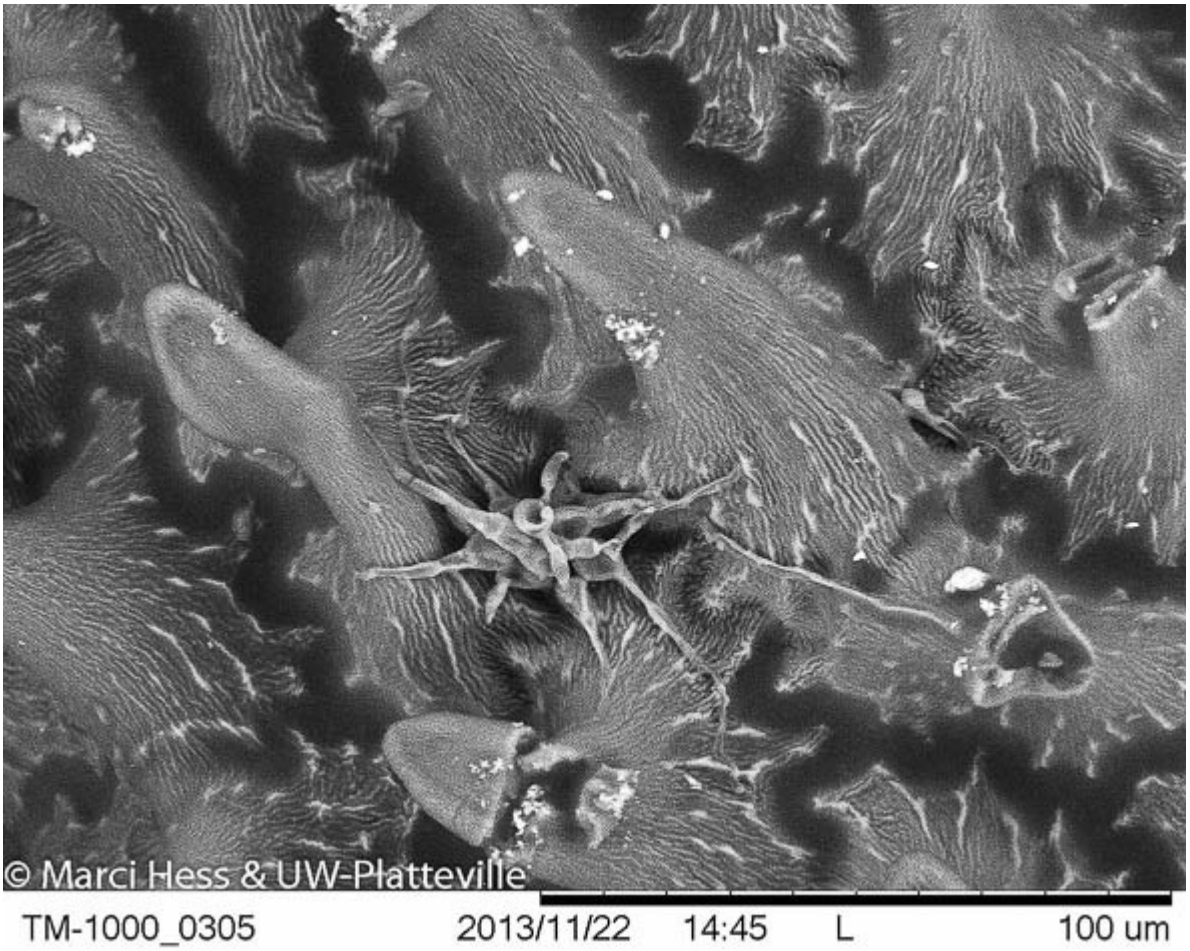
Agalinis aspera – Rough False Foxglove. This is magnified 100x its size. There are 450,000 of these seeds to an ounce.



Agalinis aspera – Rough False Foxglove. This is magnified 250x its size.



Heuchera richardsoni, Prairie alumroot. This is magnified 180x its size. There are 800,000 seeds to an ounce.



Heuchera richardsoni, Prairie alumroot. This is magnified 800x its size. I would love to know what that “feature” is on the seed!

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Collecting and Cleaning Seeds

This is one of my favorite times of the year. Not only is the weather cooling off and the trees are turning into beautiful, vibrant, autumn colors, it's seed collecting time!!! I love, love, love seed collecting. There's something purifying and cathartic about the process; maybe it's in knowing that I'm spreading the "prairie love" by gathering some of the fruits of previous restoration efforts and giving them life in new restoration efforts. Maybe it's because seed collecting is quiet work, unlike the summer of chain sawing and brush cutting. Whatever the case, it's rewarding and gratifying work.
Earlier this month the Green County Garden Club visited for a presentation on collecting and cleaning prairie seed. It was a nice turnout of 14 people on a rainy October evening. The weather didn't present a problem as the whole presentation was done in our oversized garage. Everyone seemed interested and pleased with their new-found knowledge.

Annually, we collect some amount of seed because we are continuously working to improve areas of our prairies and introduce additional diversity. This year, we are collecting in order to overseed the Berry Prairie (3 ½ acres) this winter and for the upcoming 12-acre planting in a couple of years. I'll be glad to get the total amount of seed calculated! To date, we've collected 73 different species of grasses and forbs. We have only a couple of asters that we are waiting on to ripen. Once we have all the seeds clean, we'll weigh them, document what we have, and then sort them into four categories 1) seeds for overseeding, 2) seeds for propagating, 3) seeds to give away, and 4) seeds to store for a year. I'll be excited to see how many pounds of seeds the two of us collected!

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