Prairie Soils for Sustainable Restoration

May 30, 2019
Teresa Matteson
The Walhamette River from a Mountain

Paul Kane, 1810 – 1871
Degradation of (upland) prairies:

- Reduced burning
- Crop lands
- Forage species
- Timber trees, orchards
- Succession to scrub/forest
- Non-native plants
- Urban sprawl
Photograph of vegetation from around 1900
Corvallis with largely deforested skyline
PSSR Goal:
Increase success & sustainability of restoration

Objectives:
• Soil & veg surveys
• Correlate data
• Predictive GIS
To challenge how we see prairies...
1 - Human Resources
3 Counties
• 22 landowners
• 27 remnant sites
• 28 restoration sites

Benton 70
Lane 30
Yamhill 36
136 borings
“This restoration project is empowering, helping us do what we have always wanted to do, which is recreate a place of thriving natural health and beauty, it’s like building a dream.”

Kathleen Dean Moore & Frank Moore, Wren landowners
2 - Soil
Soil Field Data

- Geolocation
- Soil classification
- Site characteristics
- Compaction
Lab Assessments

• Moisture
• pH and EC
• Sikora (lime)
• Total CN
• NO$_3$, P, K, Ca, Mg, Mn, Fe, Cu, Zn, B
• CEC
• Microbial Respiration

Prairie Composite Samples
• Soil enzymes
• Phytophthora screen
3 - Vegetation
Kincaid’s lupine and Fender’s blue butterfly
Vegetation Survey

Vegetation Survey
- Micro / Macro
- PHQC

- Planting Index
- Management Index
Prairie Habitat Quality Calculator (%)

- Structure
- Invasive plants
- Natives
- Pollinator Resources
- Final Score – Average of four criteria

Introducing Greg Fitzpatrick's Point Intercept Frame

https://youtu.be/76O1KHsnYD0
In the presence of ancient beings...
Other native species
Management concerns

- false brome
- scotch broom
- Armenian blackberry
- tall oat grass
More non-native species
• oxeye daisy
• tall fescue
## 4. Data - 133 soil borings

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<th>Prairie ID</th>
<th>Sample ID</th>
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<th>Latitude</th>
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Grouping Analysis

6 groups

Final Critical Habitat for Kincaid’s Lupine

Yamhill map
#2 Boron
6 remnants = high

#4 Microbial Respiration
23 restoration = high

#6 Phosphorus
44 remnants/1 restoration = low
If I had an afternoon – Andy Gallagher

- Web Soil Survey
- Draw a circle around clusters of the remnants
- Extend the circle a mile or so wider
- Locate NRCS map units Dixonville or Jory
- 300 and 700 feet elevation
- Slopes 0 to 20 percent
- Aspect south, southwest, west

Aerial photos
- Pastures
- Openings in forest cover
- Not cropland
### Additional benefit – gold nugget!!

<table>
<thead>
<tr>
<th>Soil Series</th>
<th>PSSR Vegetation Survey Native Species</th>
<th>NRCS OSD Species lists</th>
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</thead>
<tbody>
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<td>Chehuplum</td>
<td>Brodiaea, Poison Oak, Dogbane, California oat grass</td>
<td>annual grasses, wild rose, oak, poison-oak</td>
</tr>
<tr>
<td>Dixonville</td>
<td>Yarrow, Brodiaea (harvest lily), Clarkia, strawberry, Iris tenax, Kincaid’s lupine, Tarweed, navarretia, slender cinquefoil, self heal, rose checker mallow, goldenrod, death camus, dogbane, California brome, sedge, California oat grass, blue wild rye, black berry (native), Oregon oak, poison oak</td>
<td>Oregon white oak, Douglas fir, bigleaf maple, grand fir, western brackenfern, common snowberry, western hazelnut, Pacific poison-oak, and baldhip rose.</td>
</tr>
<tr>
<td>Dupee</td>
<td>Halls aster, strawberry, slender cinquefoil, self- heal, sedge, California brome, California oat grass, rush, serviceberry</td>
<td>Oregon white oak, rose, poison-oak, grasses, and sedges</td>
</tr>
<tr>
<td>Gelderman</td>
<td>Brodiaea (harvest lily), strawberry, Oregon sunshine, Iris tenax, self-heal, slender cinquefoil, rose checkermallow, dogbane, Lotus spp., tarweed, California brome, California oat grass, Roemers fescue, service berry, red flowering currant, manzanita, madrone.</td>
<td>Douglas fir and Oregon white oak with an understory of poison oak, western hazel, common snowberry, and western brackenfern.</td>
</tr>
<tr>
<td>Gellatly</td>
<td>Brodiaea (harvest lily), strawberry, tarweed, slender cinquefoil, self-heal, rose checker mallow, death camas, death camus, dogbane, California brome, California oat grass, blue wild rye, Roemers fescue, rushes (Juncus), wood rush (Luzulu) Oregon oak, poison oak, rose native, serviceberry.</td>
<td>Oregon white oak, Douglas fir, Pacific poison oak, common snowberry, and baldhip rose, and grasses.</td>
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</table>
The inadvertent spread of Phytophthora species from nurseries into native ecosystems can have long-term environmental and economic impacts, as has been seen with Phytophthora ramorum, P. lateralis, P. cinnamomi, P. tentaculata, and other species.
The objective of this study was to estimate the prevalence and species composition of Phytophthora and Pythium in upland prairie restoration sites in western Oregon.

Pythium species were nearly ubiquitous, detected in 46 of the 55 sites.

Phytophthora species were detected, but in only 7 of 55 sites.

There was no clear association between planting history or management practices and pathogen presence.

Results of this study provide a snapshot of the current distribution of Phytophthora and Pythium species in restoration sites in western Oregon and can serve as a baseline for recognizing future introductions.”

~ Parke
Andy Gallagher, Red Hill Soils

We like to think we understand soils and prairies but until we understand them together, interacting and indivisible, we don’t and can’t really know them fully.
THANKS for listening!
Questions?

May 30, 2019
Teresa Matteson