RestoreNet:
Improving prairie restoration outcomes through a regional network of replicated experiments

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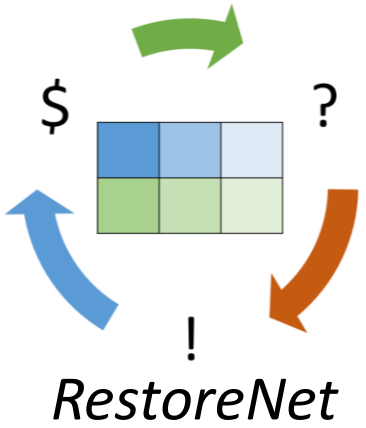
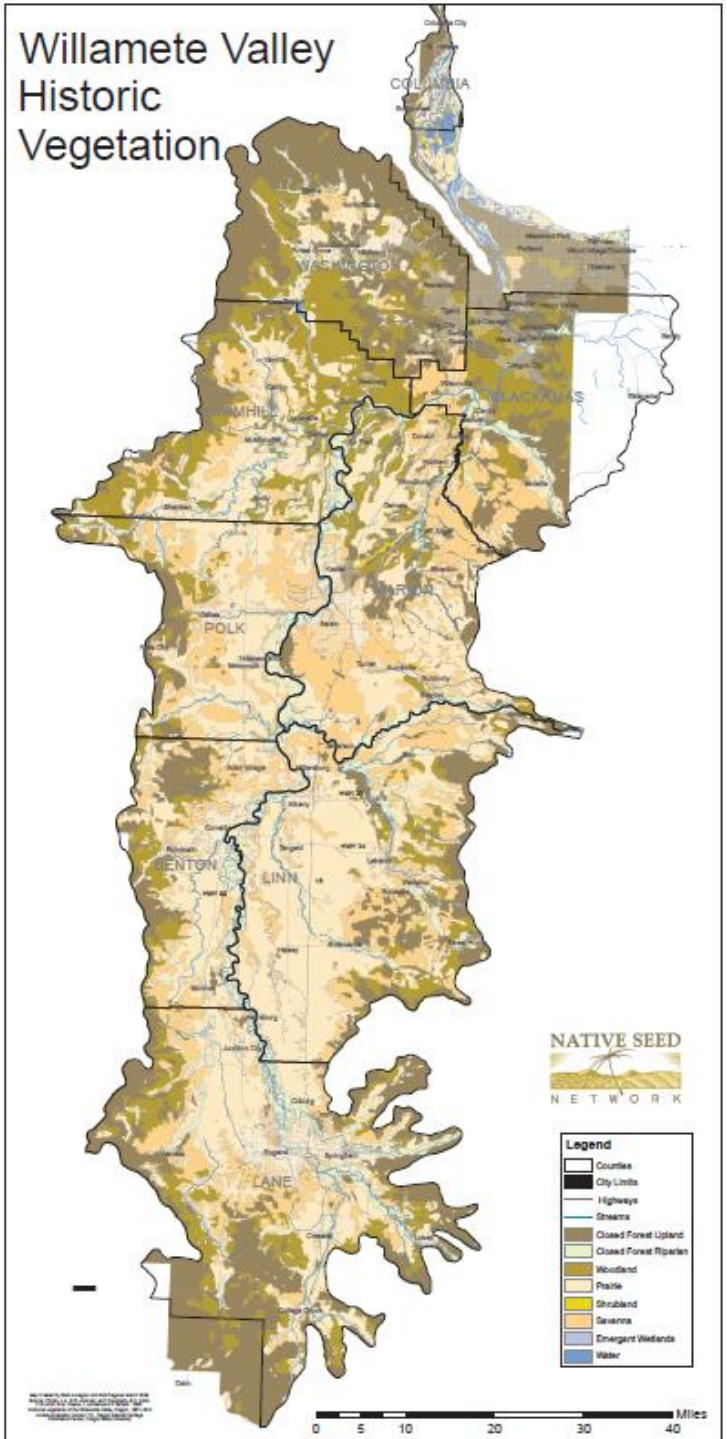
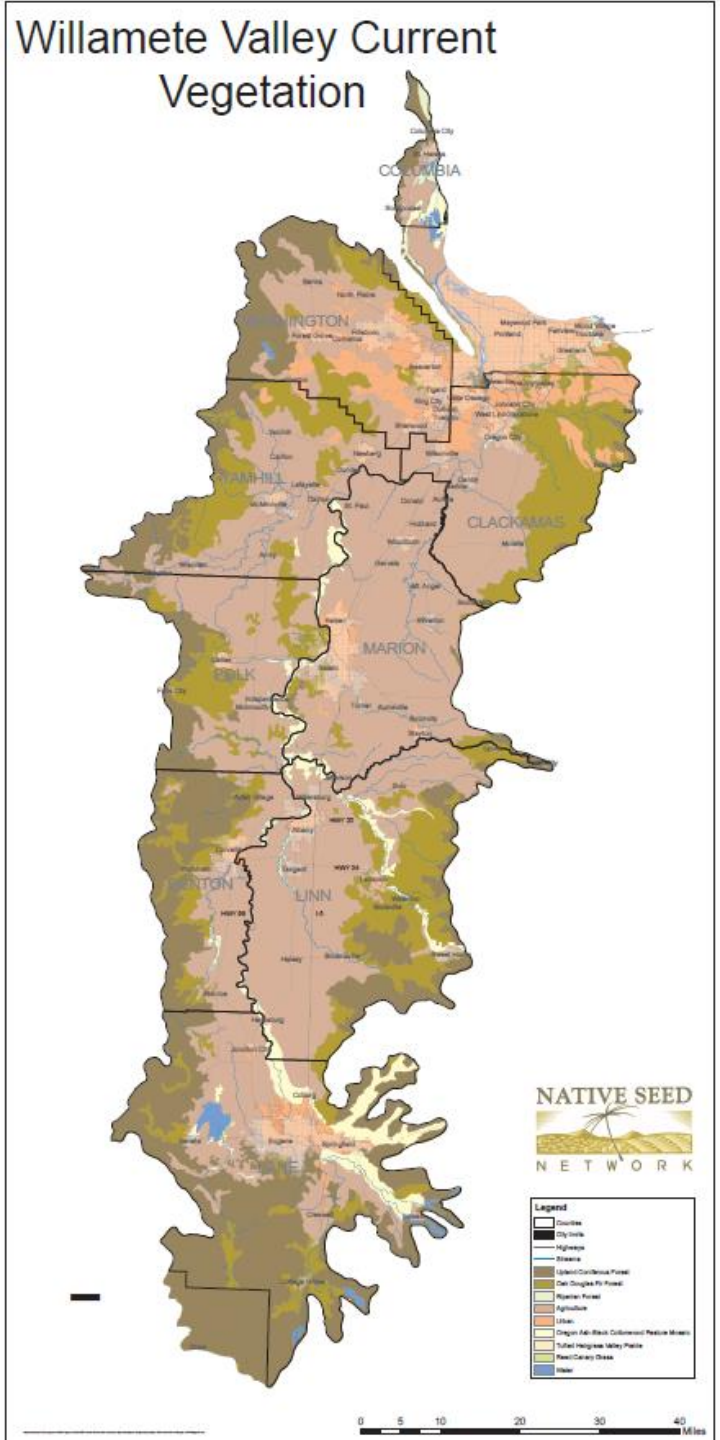



Willamete Valley
Historic
Vegetation
COLUMBIA
CLACKAMAS
MARION
POLK
LINN
LANE
NATIVE SEED
NETWORK
Legend
Counties
City Limits
Highways
Streams
Closed Forest Upland
Closed Forest Riparian
Woodland
Prairie
Shrubland
Savanna
Emergent Wetlands
Water
Miles
0 5 10 20 30 40


Willamete Valley Current
Vegetation
COLUMBIA
CLACKAMAS
MARION
POLK
LINN
NATIVE SEED
NETWORK
Legend
0 5 10 20 30 40
Miles

Butterfly conservation

Taylor's checkerspot

Fender's blue

Oregon silverspot

Monarch

English plantain

Kincaid's lupine

Early blue violet

Showy milkweed

Bird Conservation

Western meadowlark

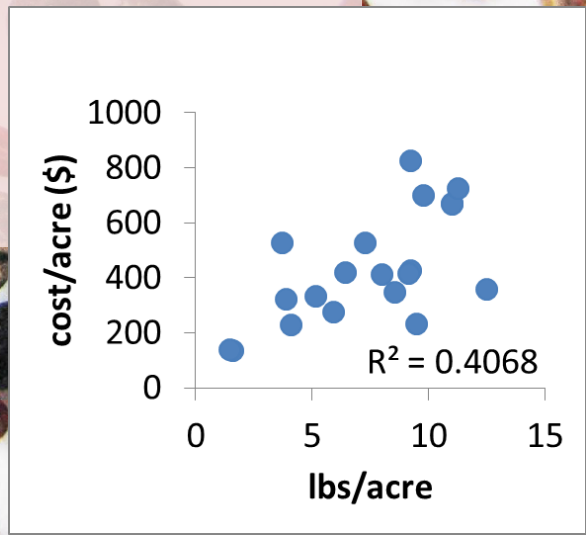
Streaked horned lark

Vesper sparrow

Slender-bill white-breasted nuthatch

Cost of prairie restoration

- Seeds of matrix species:
  - Average cost/acre in 2015-16: **$506** ($333 to $826)
  - Average species diversity: 18 (10 to 27)
- High genetic diversity, cost can go up
- T&E species: cost could double



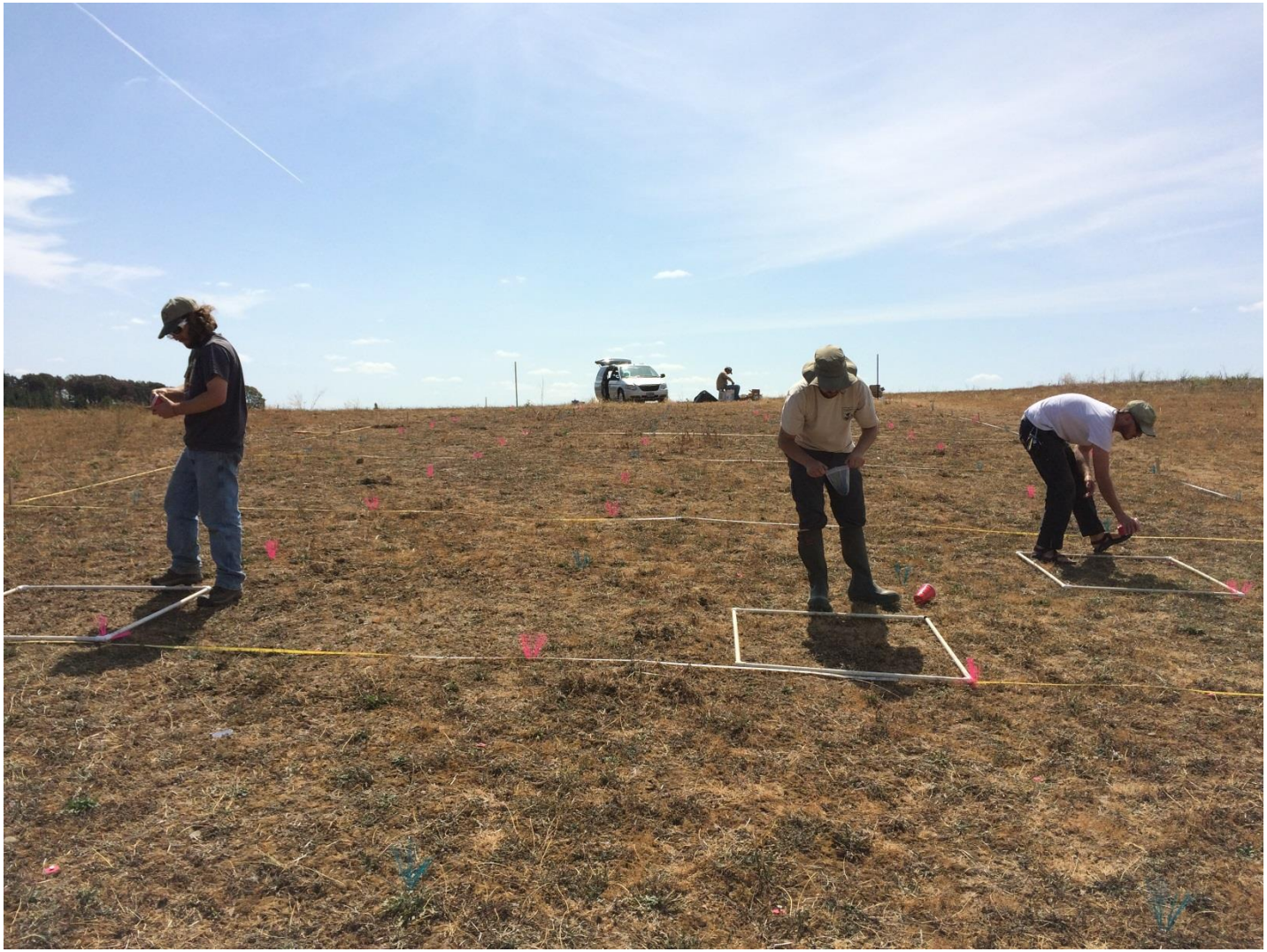
Some lessons already learned

- Weed community affects success
- The effect of restoration methods differs between sites and years
- Mycorrhizae can have substantial effects
- Seeding date matters
- Soil conditions affect which species establish

Can these lessons be used to make restoration outcomes predictable or treatments prescriptive?

Some recent findings

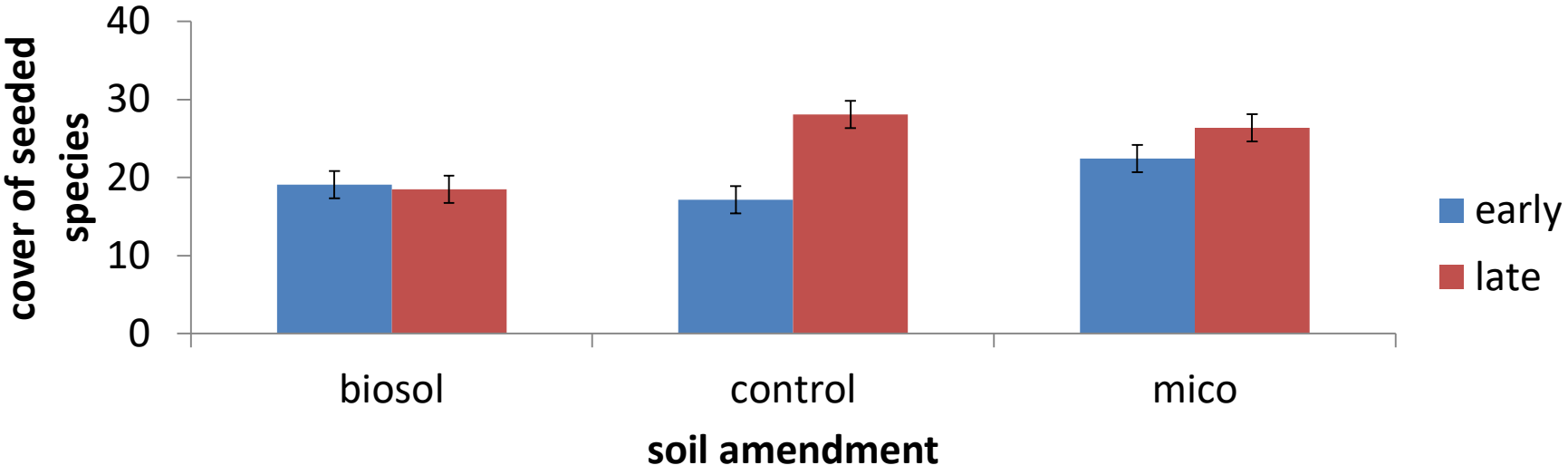
Seed bed experiment at Ankeny National Wildlife Refuge

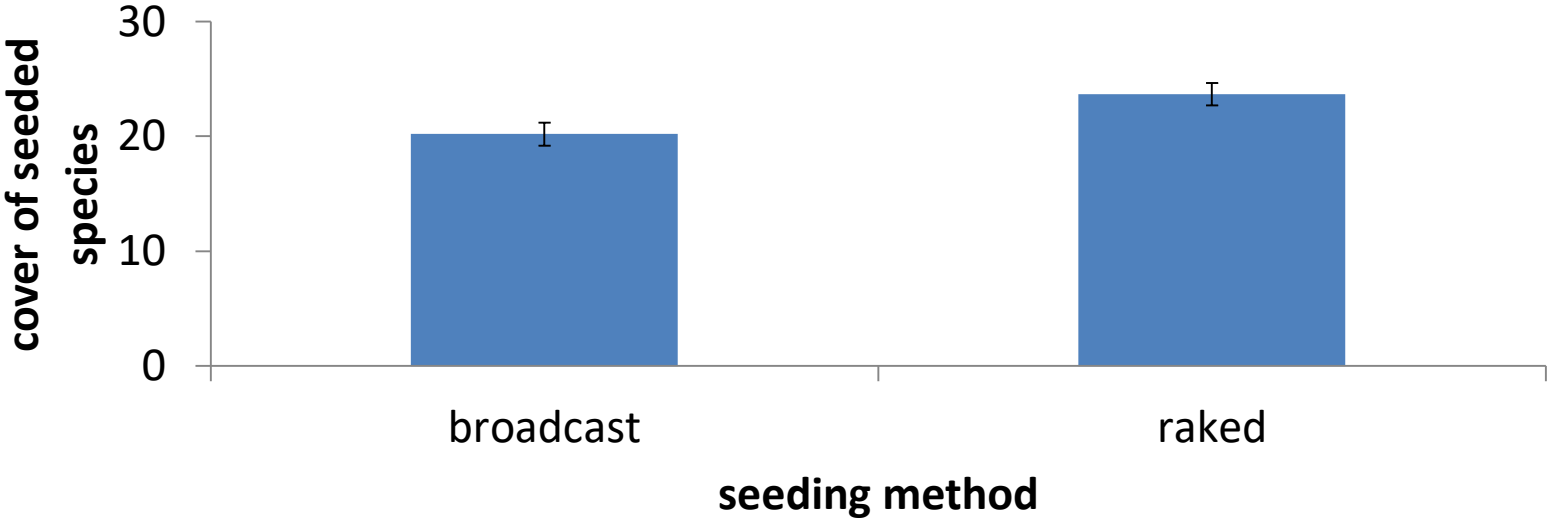


Seeded late, raked

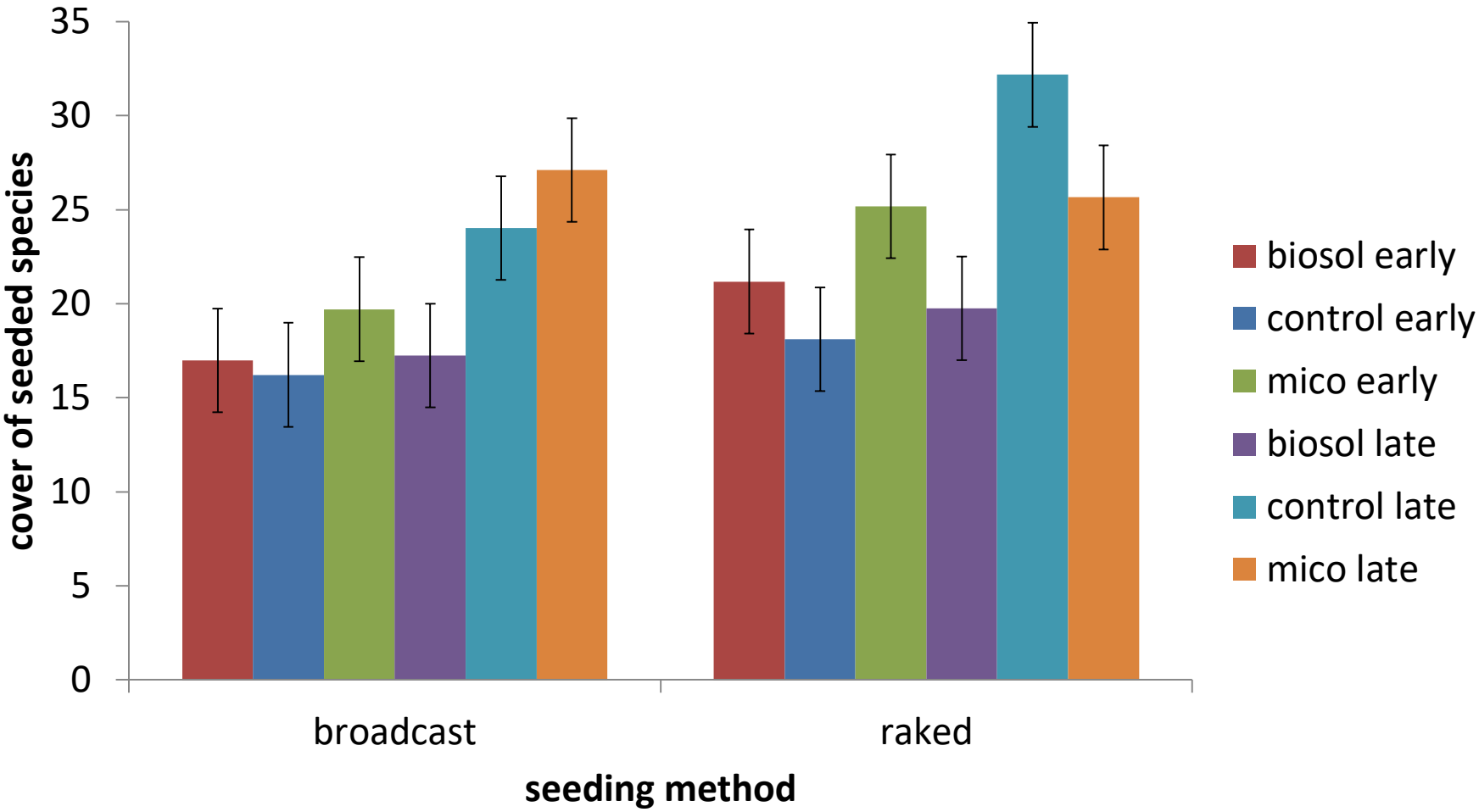
Seeded early, broadcast

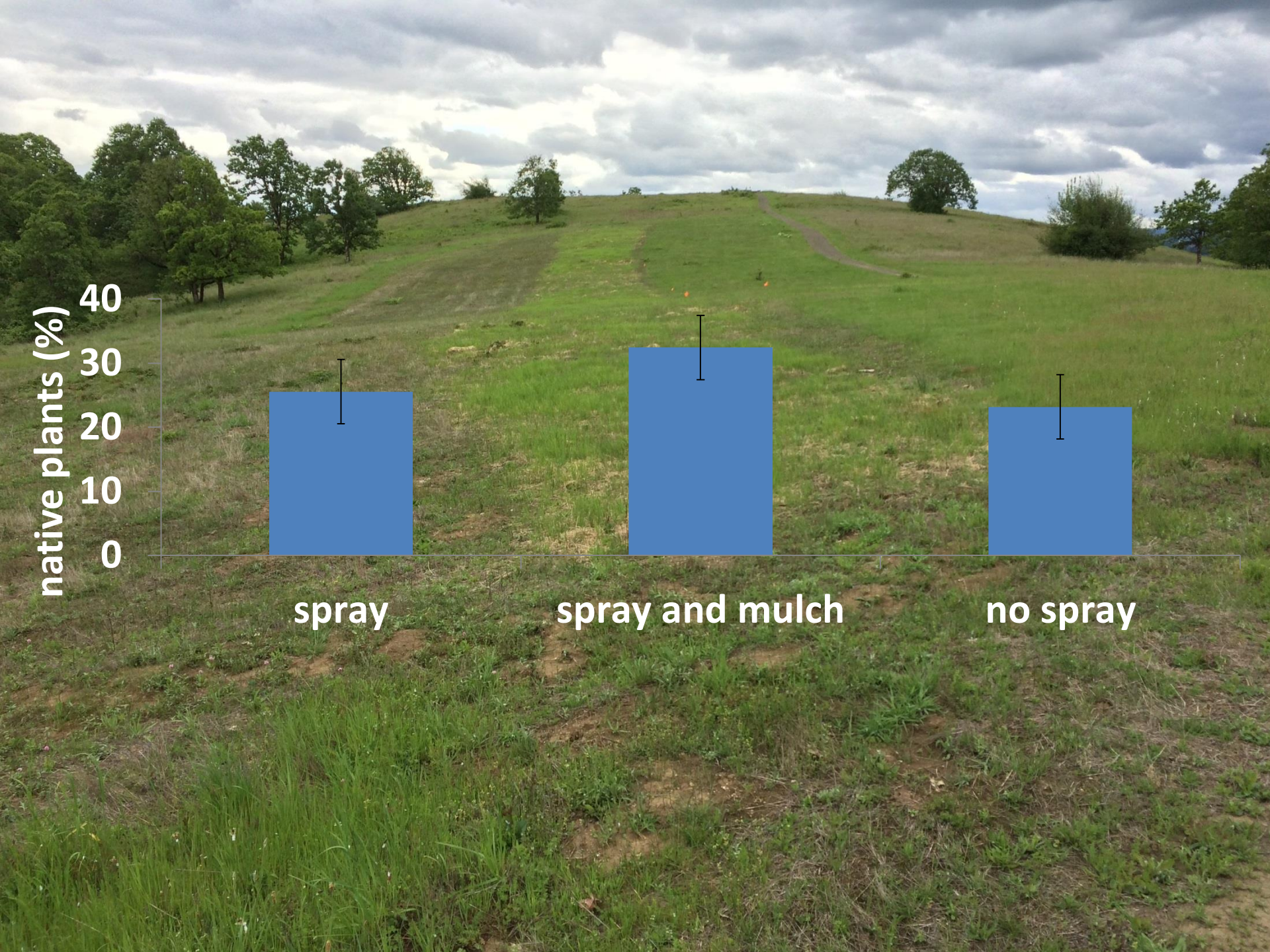
Seed bed experiment 2015-17





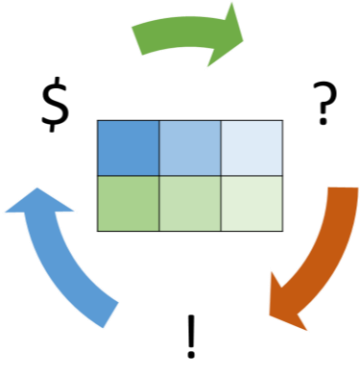
Seed bed experiment 2015-17




native plants (%)
40
30
20
10
0
spray
spray and mulch
no spray

RestoreNet

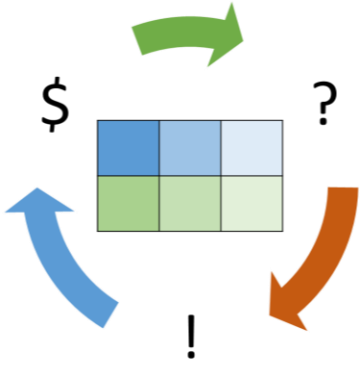
A regional prairie restoration experiment



- Open to participation from anyone
- Experimental plots at planned restorations
  - An easy, inexpensive add-on
- Experimental design standardized across all sites
- Seed mix made available (free or cheap)
- Plot sampling by participants or a specialized crew, depending on skill level
- Strength in numbers
- Cost per site: $300-$900 (seeds, seedbank, soil tests, sampling)

RestoreNet

A regional prairie restoration experiment

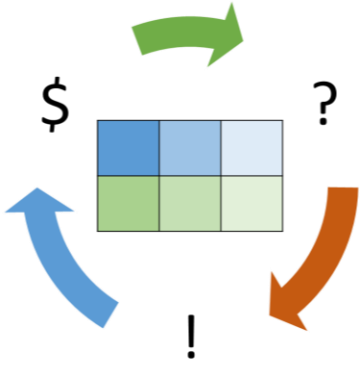


- **Hypothesis**

  Native plant establishment in restorations is a function of:

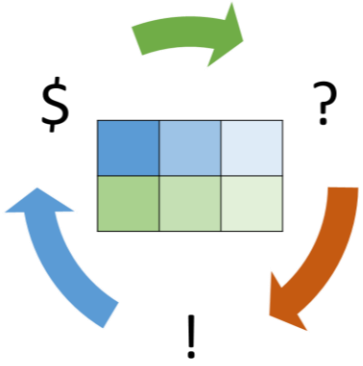
  1. Restoration techniques
     - Broadcast and harrowed seed
     - Soil amendment with mycorrhizae
     - Application of pre-emergent herbicide
  2. Site specific factors
     - Soil nutrient concentrations
     - Soil texture
     - Seed bank of invasive plants
     - Weather
  3. Traits of the species used in restoration

Experiment design
DRAFT



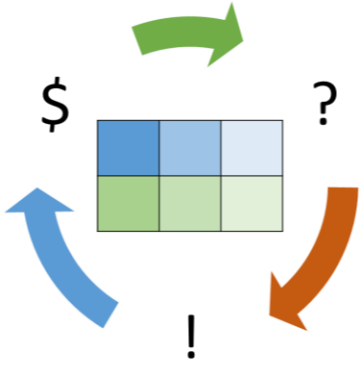
- Treatments (2 x 3)
  - Control
  - Amend with local mycorrhizae
  - Pre-emergent herbicide (e.g., Plateau/Imazapic, applied Jun-Aug)
  - Broadcast or harrowed seed
- Site measurements
  - Seed bank
  - Soil chemistry and texture
  - Weather
- Duration
  - 8 years (5 weather years plus 3 sampling years)
  - Results would start accumulating in 2 years
- Sampling
  - 1x1 m sample plots
  - Sampled once per year for 3 years

Experiment design
DRAFT



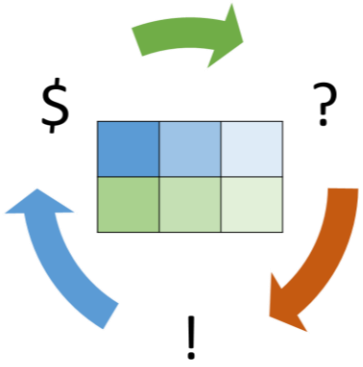
- 1-2 blocks at each study site
- Randomized complete block design (possibly split-plot)
- Sites can be different soil types or land use histories at the same general location
- Treatment plots 2 x 2 m
- 6 plots per block
- No walkways between plots (less maintenance, smaller footprint)
- Space needed at each site: 24 – 48 m^2 (4x6m to 4x12m)
- 100 sites? (20 sites per year for 5 years)
- Oregon, Washington, BC

Block design



	treatments		
Seed method: broadcast vs harrow	control + broadcast	myco + broadcast	herbicide + broadcast
	control + harrowed	myco + harrowed	herbicide + harrowed

Block design (split plot?)



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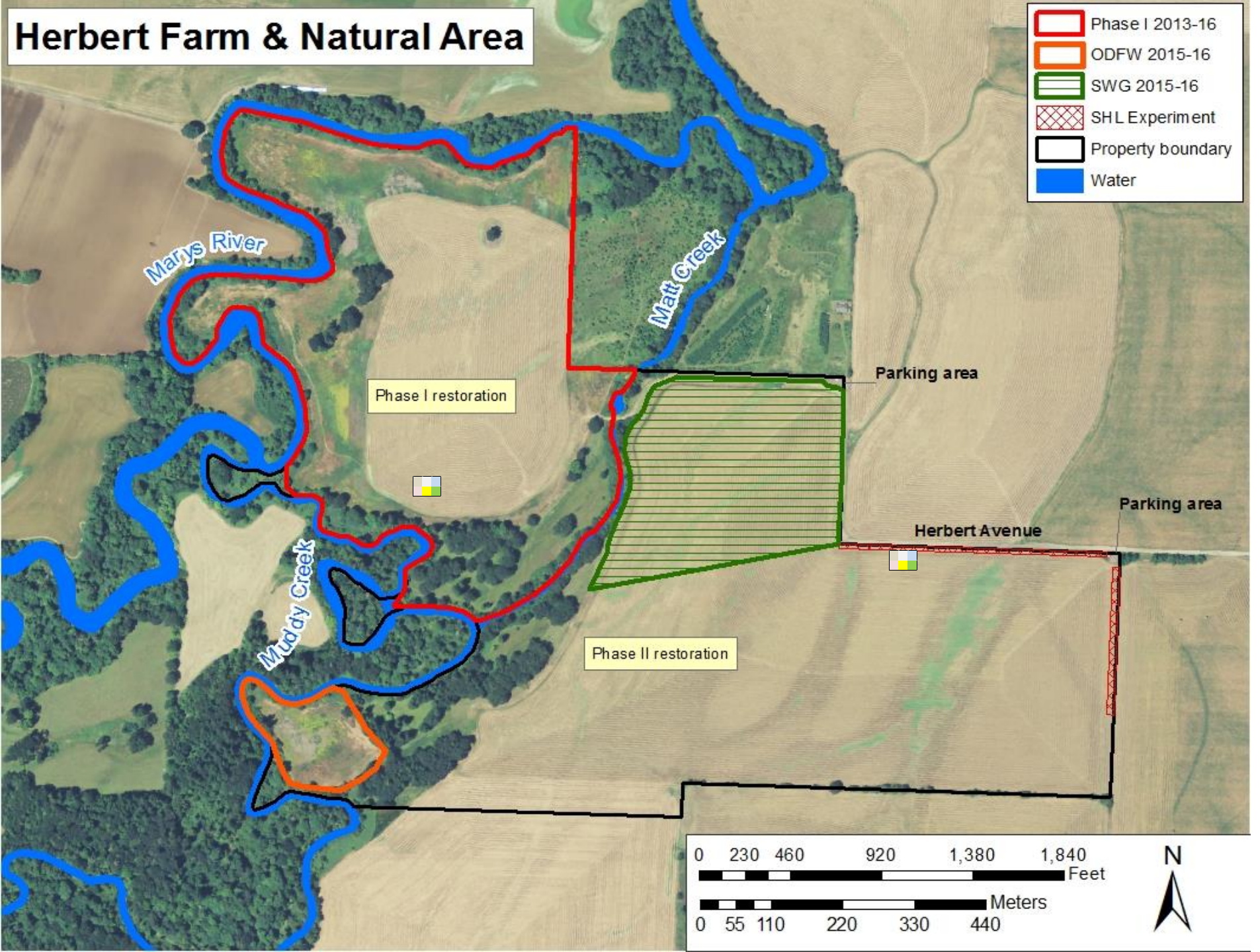
Herbert Farm & Natural Area
Phase I 2013-16
ODFW 2015-16
SWG 2015-16
SHL Experiment
Property boundary
Water
Marys River
Matt Creek
Muddy Creek
Phase I restoration
Phase II restoration
Parking area
Parking area
Herbert Avenue
0 230 460 920 1,380 1,840
Feet
0 55 110 220 330 440
Meters
N