Precision Restoration

Using innovative technology to overcome ecological barriers to restoration of sage-steppe

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1. The Nature Conservancy
2. USDA–Agricultural Research Service
3. Presenter

Outline

- Restoration challenges in sage-steppe.
- Borrowing concepts and technology from agriculture. Precision Agriculture is “fertile” ground to borrow from.
- Examples of Precision Restoration delivering results.

Sage-steppe challenge

Establishing native bunchgrasses

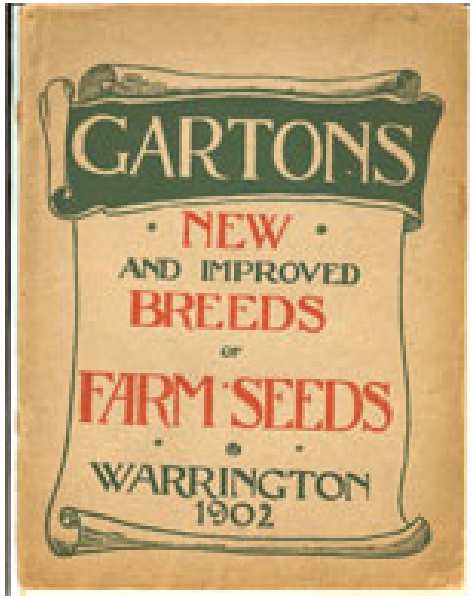
- Difficult to achieve “on-demand”

Technology

- Rangeland drills
- Seed storage

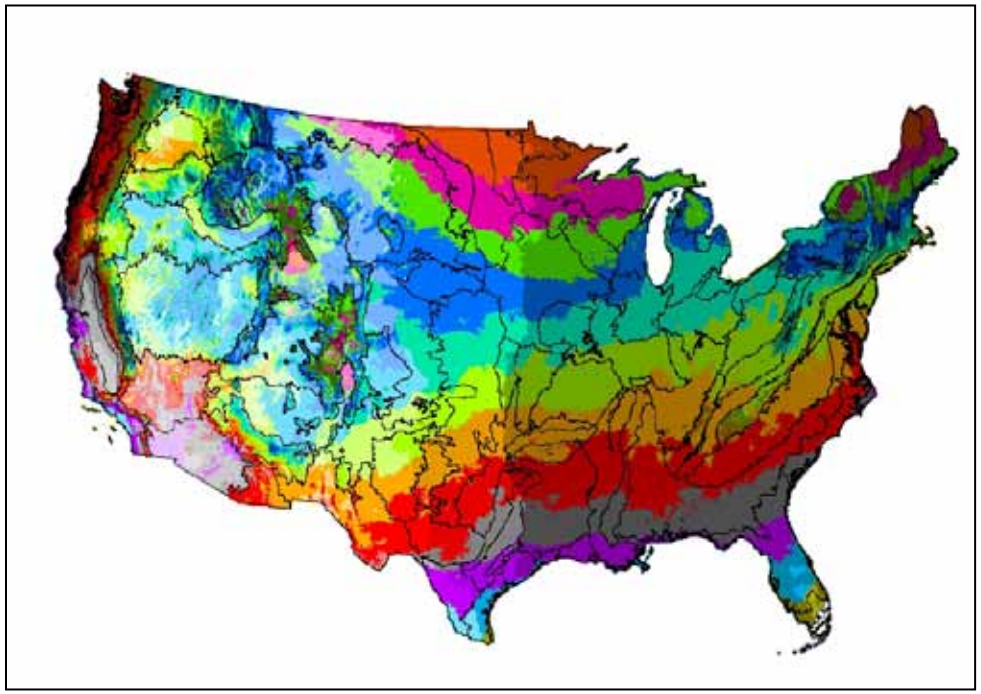
Plant Science

- Materials, sources
- Seed zones



SEEDS OF SUCCESS

GREAT BASIN Native Plant PROJECT



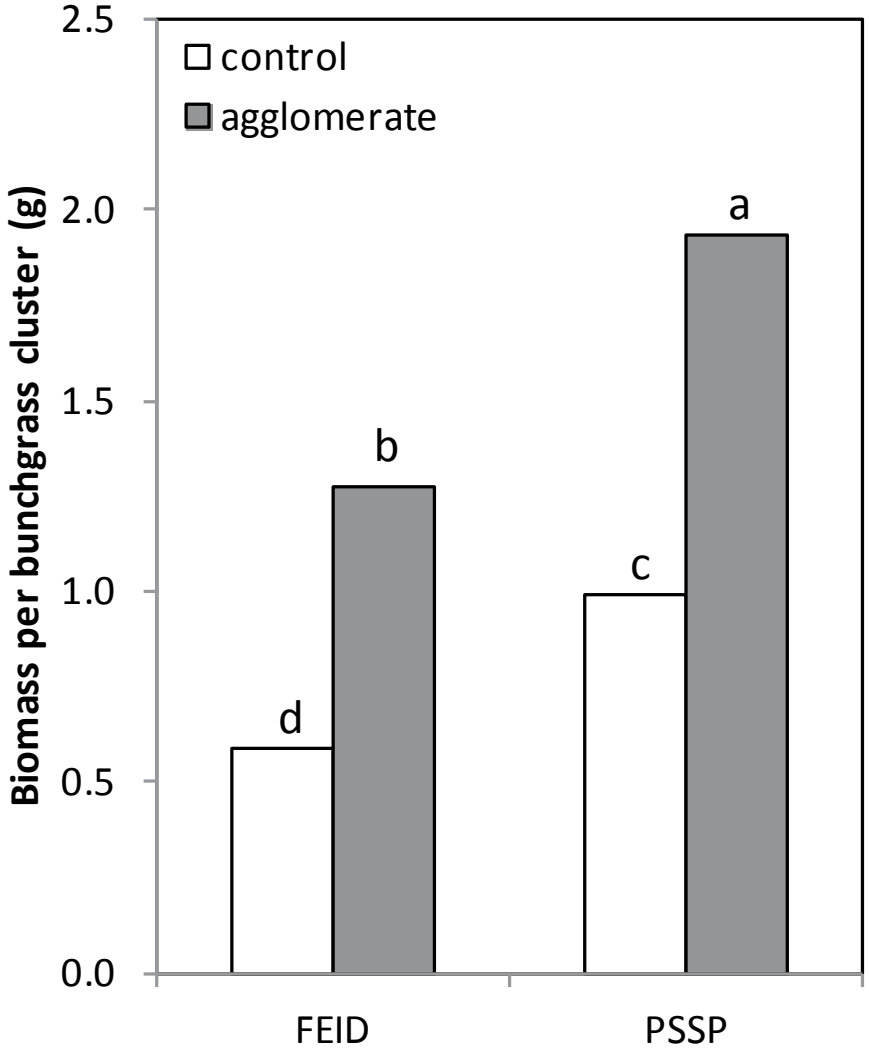
Precision Agriculture

plant ecology + GIS + technology => cost-effective practices

What does industrial farming and sage-steppe seeding have in common?

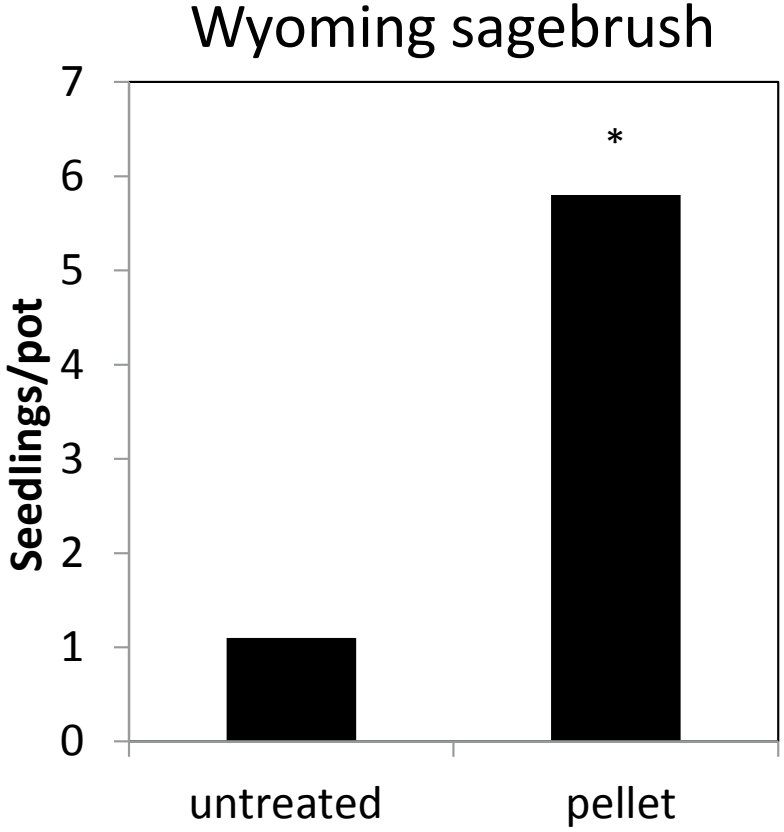
- Failure is expensive.
  - Ecological
  - Economic
  - Social
- Challenges are numerous and variable in space/time.
  - soil crusting
  - freezing temperatures
  - competition from weeds
  - drought & desiccation
  - soil water repellency
  - saline and sodic soils
  - improper planting depth
  - predation
  - infertile soils
- Cost-effective deployment of technology makes a difference
  - examples

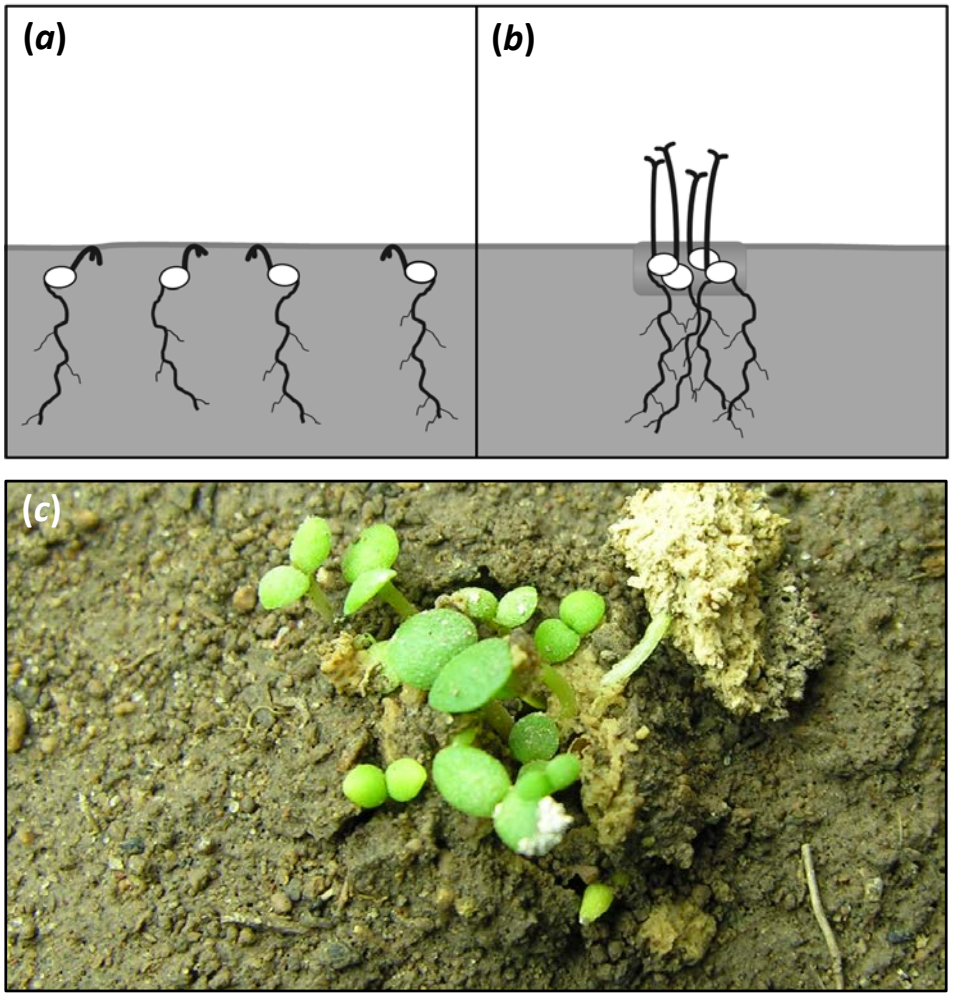
Precision Restoration: example



Madsen et al. 2012

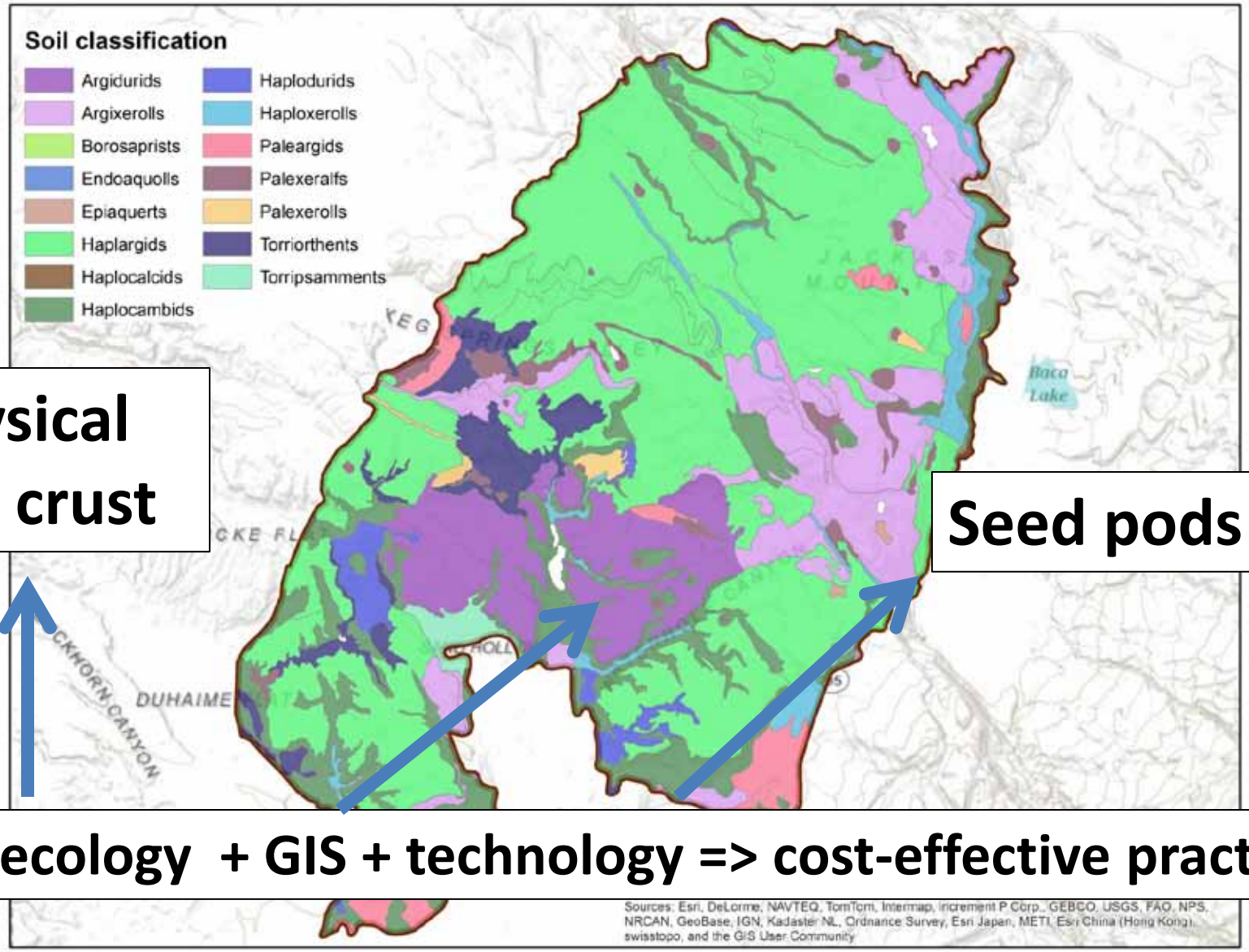
Seed pods/pellets





Madsen et al. 2013

Miller-Homestead fire (2012)
186K acres



Physical soil crust

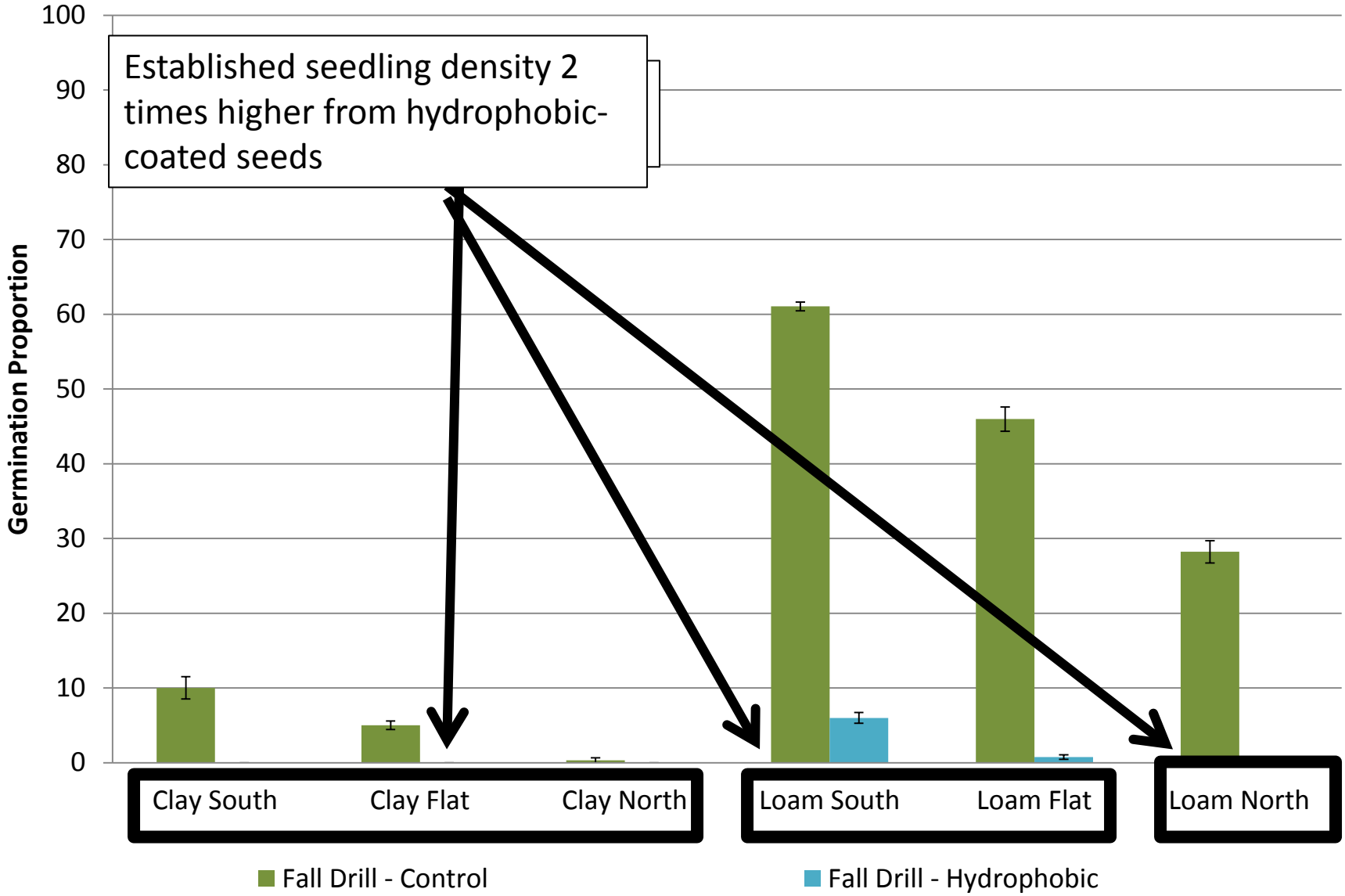
Seed pods

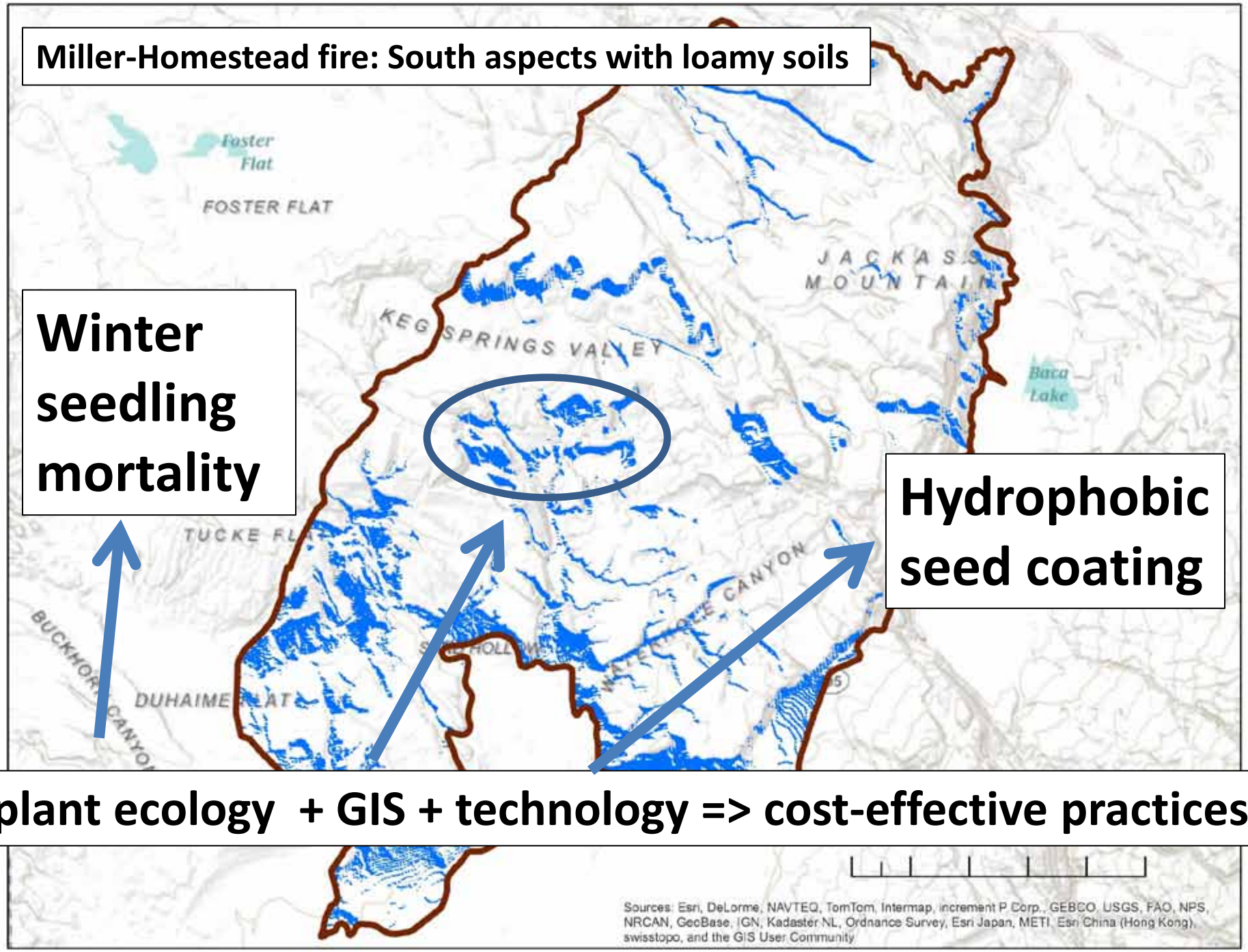
plant ecology + GIS + technology => cost-effective practices

Precision Restoration: example

Boyd and Lemos (2013) have shown that freezing even for short durations can cause significant mortality of germinated but non-emergent bunchgrass seedlings

Bluebunch Winter Germination




Miller-Homestead fire: South aspects with loamy soils
Winter seedling mortality
Hydrophobic seed coating
plant ecology + GIS + technology => cost-effective practices
Foster Flat
FOSTER FLAT
KEG SPRINGS VALLEY
JACKASS MOUNTAIN
Baca Lake
TUCKE FLAT
BUCKHORN CANYON
DUHAIME FLAT
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community

Conclusions

- Rangeland seeding has adopted and benefited from many agronomic concepts and technologies.
- Expecting native seeds to be universally successful “on-demand” is untenable.
- Barriers to successful seeding are heterogeneous, but can be predicted and solutions designed that overcome.
- Precision Restoration envisions using GIS and seed technology to deploy cost-effective sage-steppe restoration seeding.


• Commitment from The Nature Conservancy and USDA-ARS
• Generous funding from the Priscilla Bullitt Collins Foundation
• Excited by potential to engage the Great Basin LCC and additional partners for synergy, collaboration, and shared resources