NATIVE FORB SEEDING TRIALS ON RECLAIMED BENTONITE LANDS IN THE BIG HORN BASIN

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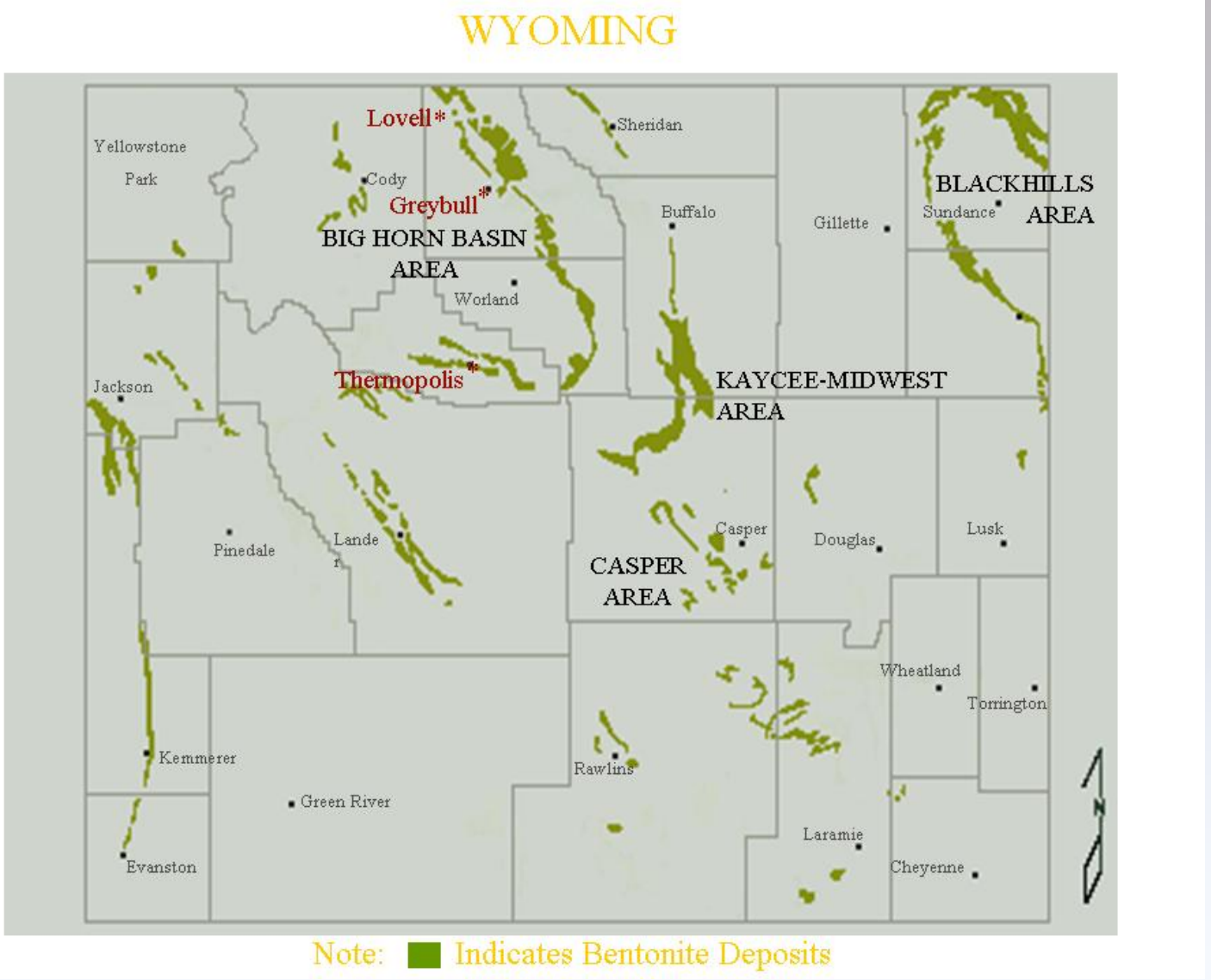
Participants:

- **U.S. Bureau of Land Management: State Office and Cody District Office;**
- **M.I. Swaco;**
- **Wyo-Ben, Inc.;**
- **Bentonite Performance Minerals**



Taken from Wyoming Mining Association and Matt Call, Wyo-Ben, Inc.

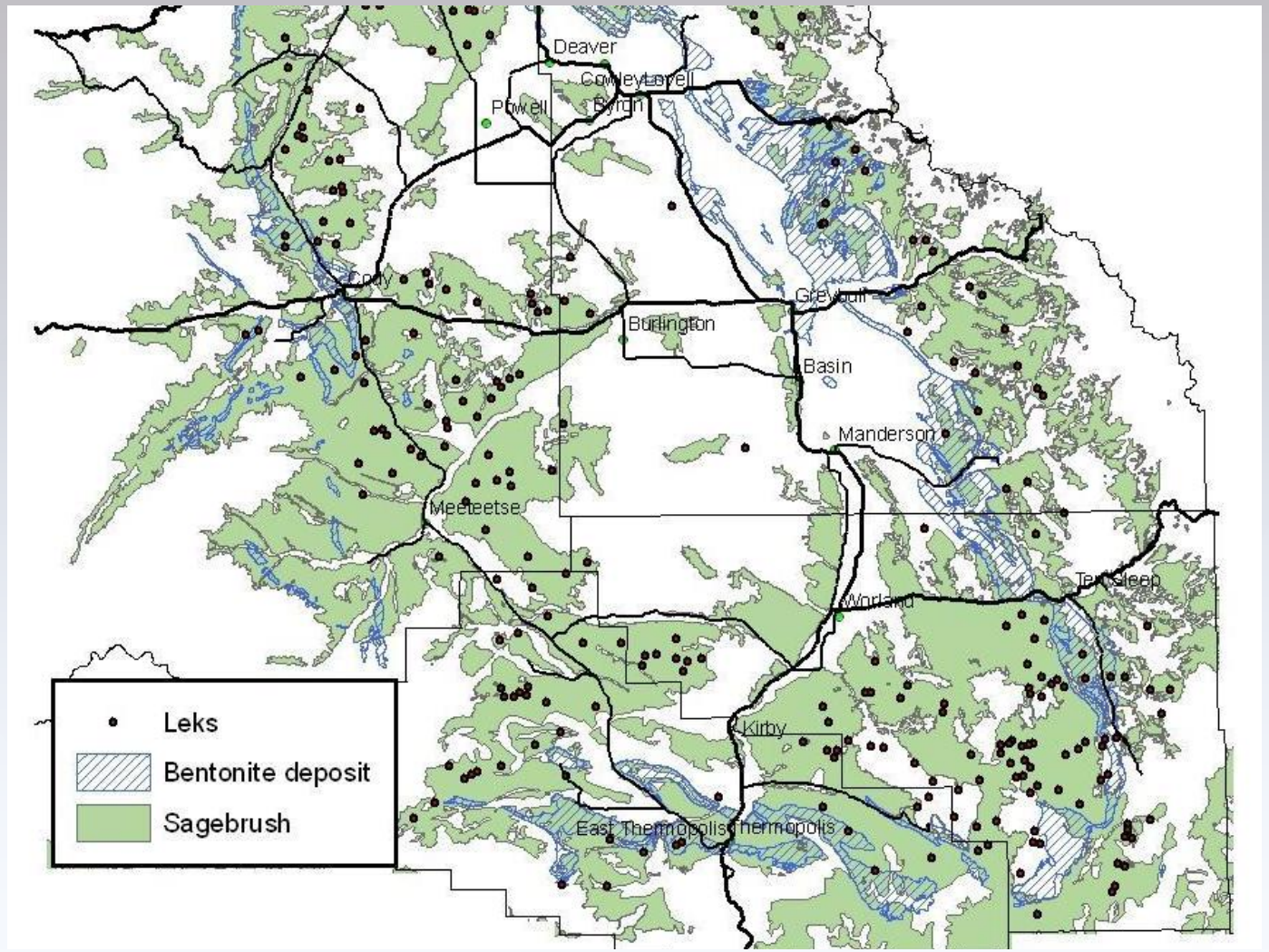
The Bighorn Basin located in north-central Wyoming has some of the largest deposits of quality bentonite throughout the world (Schuman et al. 1985).

Bentonite Mining

Large-scale bentonite mining and processing began near Greybull in the early 1950s. More than 21,000 acres have been mined in the Bighorn Basin to date, according to the BLM.

Reclamation Issues:
(1) Greybull-Lovell Area averages ~6-8 inches of annual precipitation.
(2) Soils often high in smectite clay content, often saline, often sodic!

BENTONITE RESERVES in the BHB



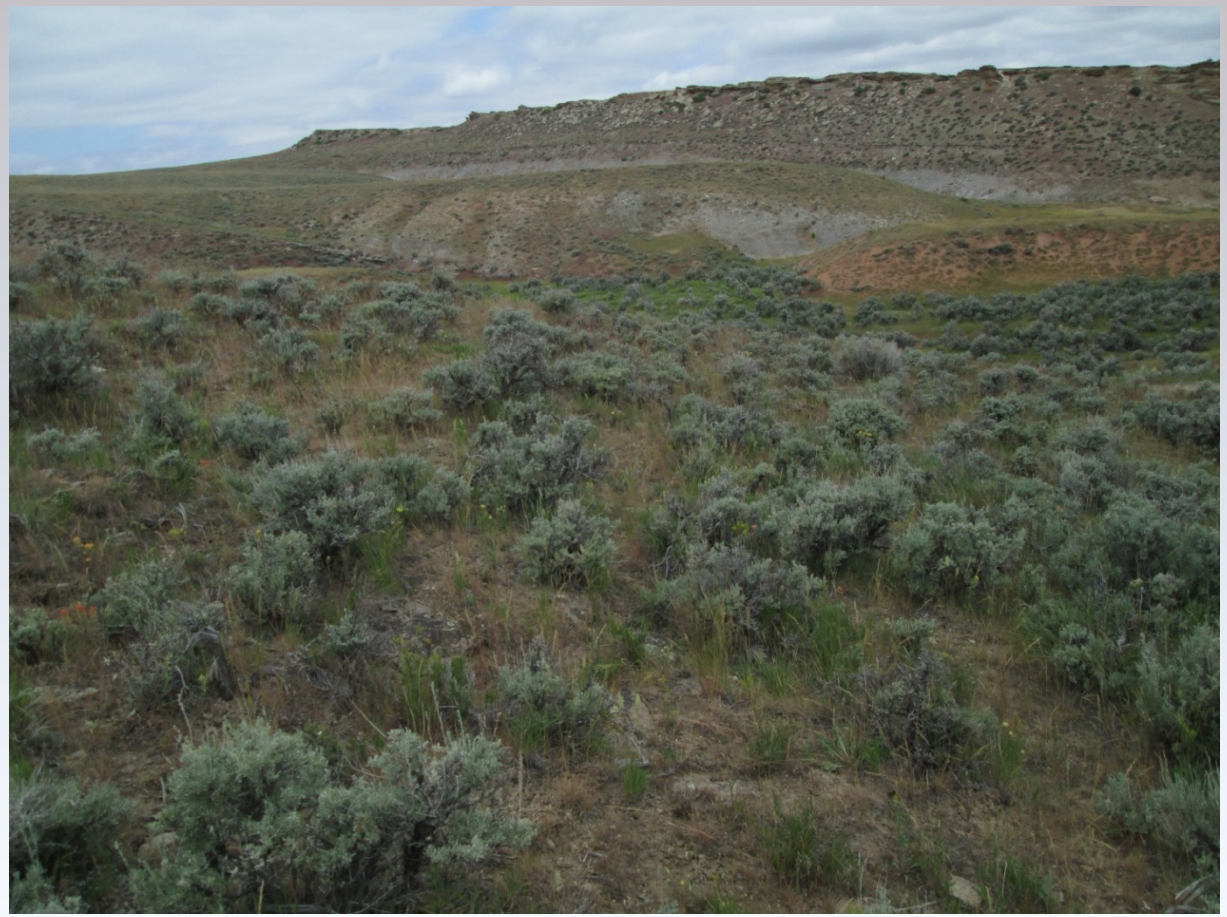
Bentonite deposits, sagebrush habitat and sage-grouse leks within the BHB

***Taken from WGF BHB Sage-Grouse Conservation Plan**

Native forbs are common and important components of most native plant communities (Walker and Shaw, 2005). They function to provide: increased species diversity, increased resilience, enhanced soil stabilization on disturbed sites, competition to invasive species, seasonal food sources, and improved nitrogen availability (legumes). Consequently, it is important to provide forb diversity on reclaimed lands, particularly in sage-grouse breeding habitat (Paige and Ritter 1999).

Forb rich sagebrush communities are vital to the survival of Greater Sage-grouse (Walker and Shaw, 2005; Barnett and Crawford 1994; Beck and Mitchell 1997; Braun et al. 1977; Wallstead 1971)

Juvenile sage-grouse are dependent upon insects and succulent forbs as critical food sources after hatching and until brood dispersal in fall.



Breeding habitats used by pre-laying hens should provide a diversity of forbs high in calcium, phosphorus, and protein; the condition of these areas may greatly affect nest initiation rate, clutch size, and subsequent reproductive success (Barnett and Crawford 1994).

PLANTING & SEEDING ISSUES-NATIVE FORBS*

- Array of fruit and seed types and sizes.
- Appropriate seeding season and depths are variable
- Condition of fruit or seed is important
- Competitive abilities and affecting factors are largely unknown

- Seed availability is limited and $$
- Substantial anecdotal information strongly suggests that forbs should be sown separately or with other species sown in low densities.
- Limited ability to compete with invasive species.
- site preparation practice are not adequate.

*Current and Potential Use of Broadleaf Herbs for Reestablishing Native Communities Scott C. Walker Nancy L. Shaw, 2005

Purpose of Study

Evaluate seeding success using locally collected native forb seed on reclaimed bentonite mined lands in the Bighorn Basin

2013 Seeding looked at 10 species; 9 forbs,1 sub-shrub

Allium textile **Common Name:** Textile Onion
Machaeranthera tanacetifolia **Common Name:** Tanseyleaf Tansyaster
Musineon divaricatum **Common Name:** Leafy Wildparsley
Platyschkuhria integrifolia **Common Name:** Basindaisy
Suaeda moquinii **Common Name:** Mojave Seablite
Astragalus geyeri **Common Name:** Geyers milkvetch
Picrothamnus desertorum **Common Name:** Bud sage
Arenaria hookeri **Common Name:** Hooker's sandwort
Cleome lutea **Common Name:** Yellow Spiderflower
Cryptantha celosioides **Common Name:** Butte candle

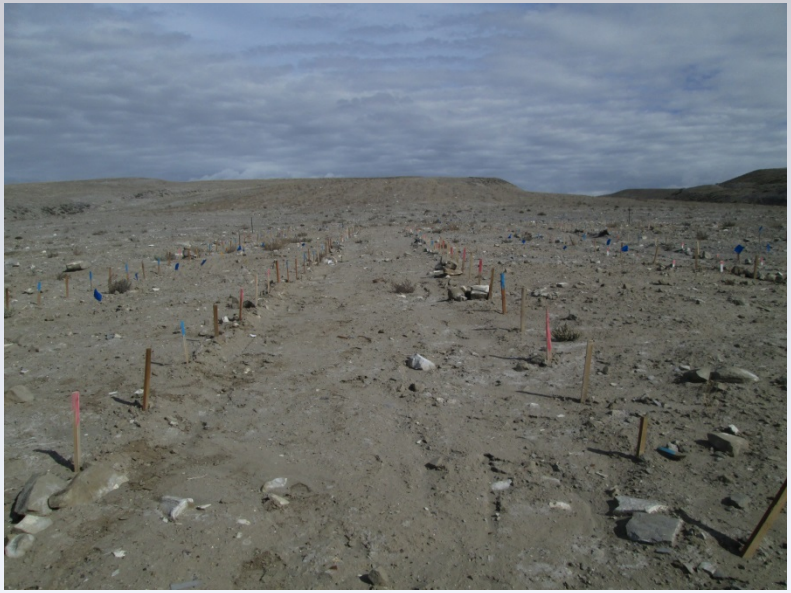
BLM Seeds of Success

- **Promotes collections of seed from native plants. Develops repository of seed from diverse sources to expand genetic diversity and adaptability. Helping to fund this study in the Big Horn Basin. Seed to be used in bentonite reclamation efforts.**

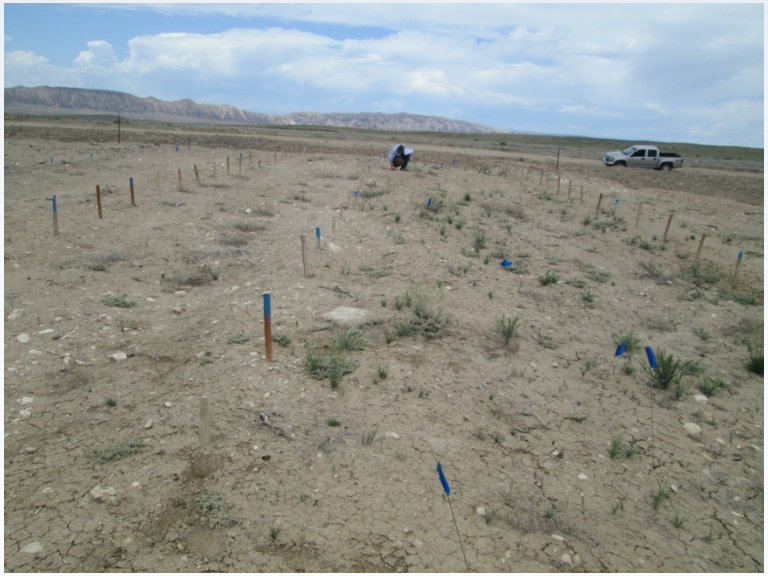
Three study sites

Bridger Plant Material Center

M-I Reclaimed Bentonite Pit



Wyo-Ben Reclaimed Bentonite Pit



- **All Seeded in March 2013**
- **M-I & Wyo-Ben given supplemental water (@ 0.25” ppt) 3 times each in late June-late July.**

Site 1 – Block 1

- Normal size plot (ALTE, MATA, MUDI, PLIN) = 1m x 4.5m
- SUMO= 1mx 3m
- CRCE= 1m x 2m
- ASGE, PIDE = 1m x 1.5m
- ARHO, CLLU = 1m x 1m
- Blue (N) = Null (no treatment) = Hand broadcast
- Orange (T) = Treatment = Drill seeder

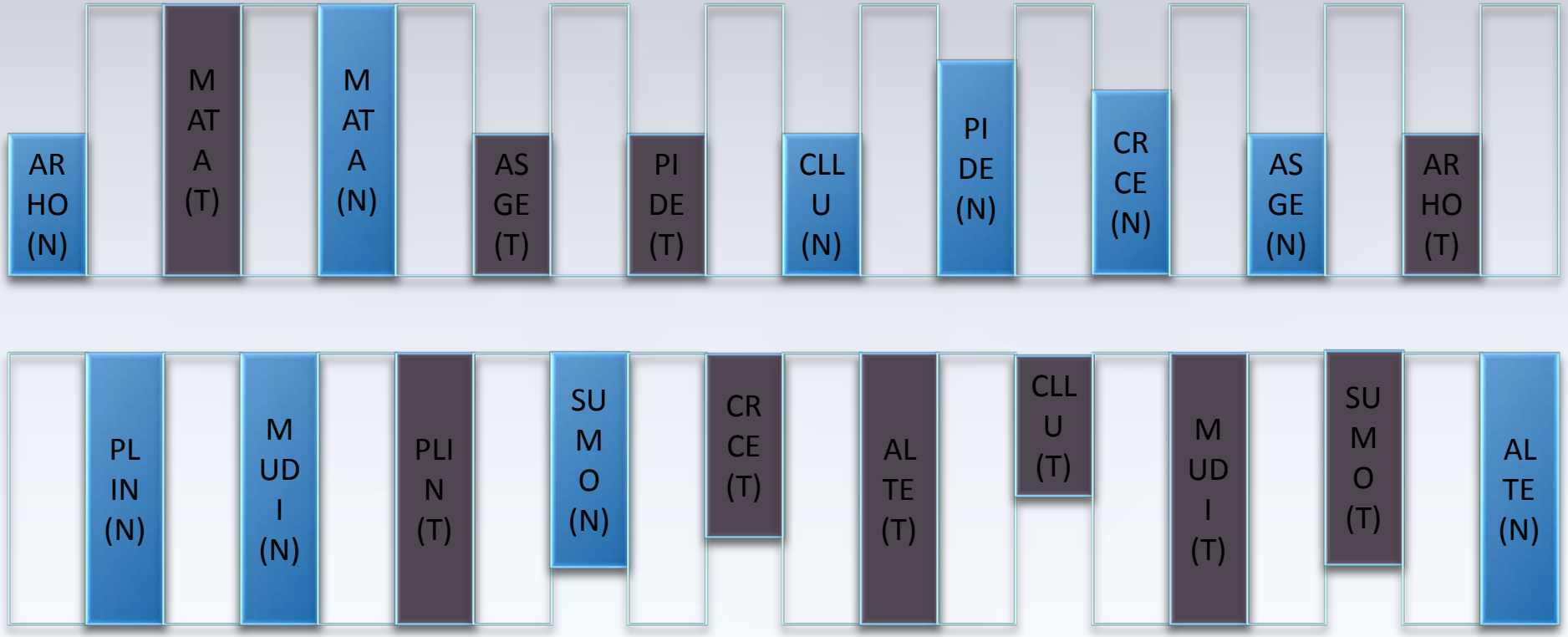


Figure 1: Average sand, silt and clay content of surface (0-5cm) soils at each seeding trial site.

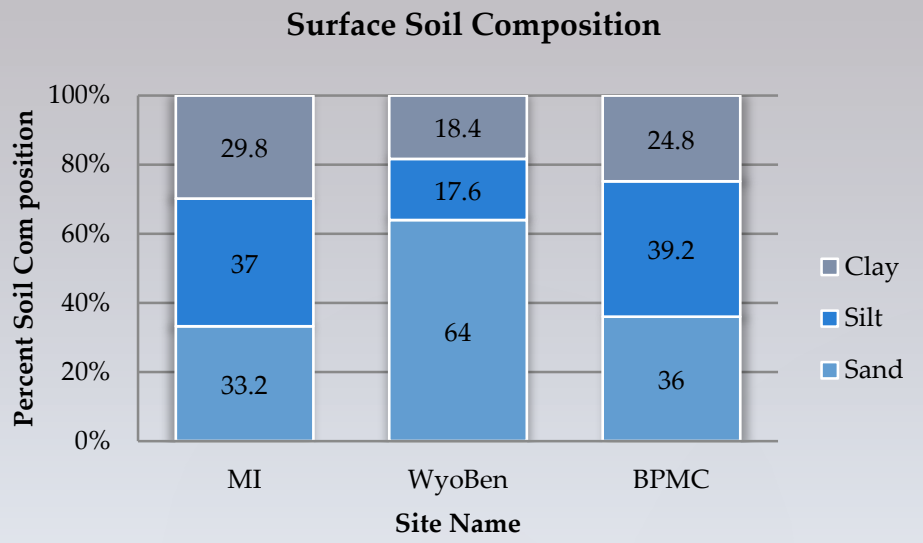
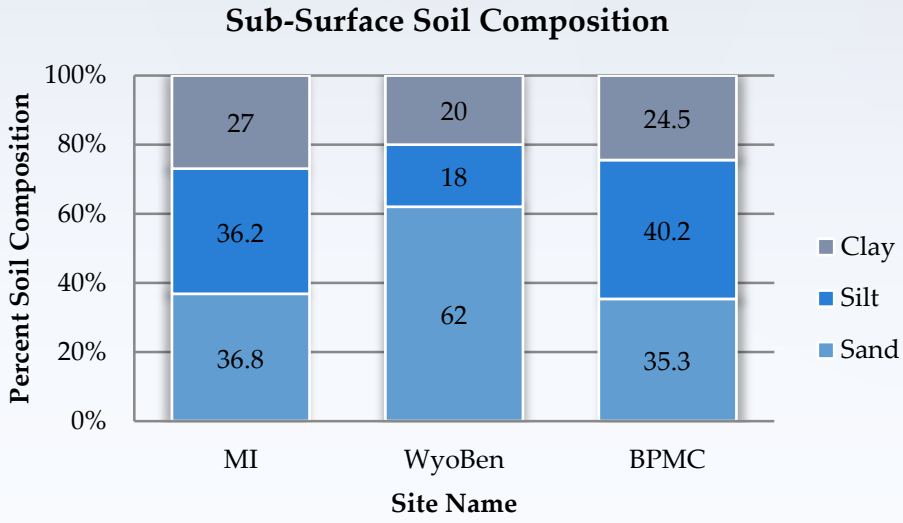
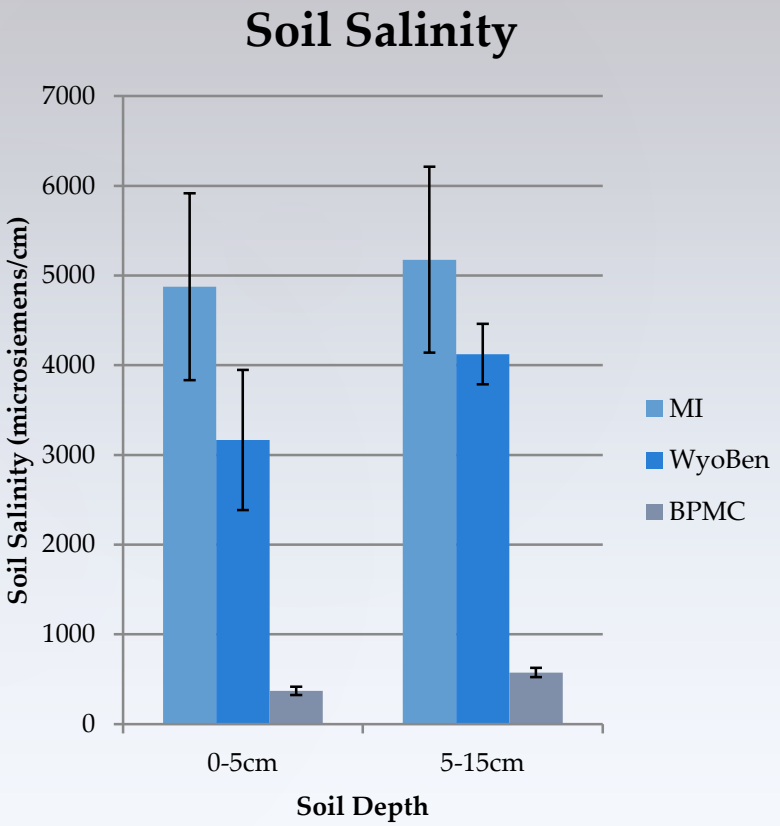


Figure 2. Average sand, silt and clay content of sub-surface (5-15 cm) soils at each seeding trial site.





Reclaimed Sites; Year 1

Average number of plants per m2 on broadcast subplots in Year 1.

	WyoBen	MI	2 Site Average
ALTE	0.37	0	0.19
ARHO	0.33	0	0.17
ASGE	0.67	0.44	0.56
CRCE	7.34	7.35	7.35
MATA	31.2	15	23.1
SUMO	1.43	0.89	1.16

Average number of plants per m2 on drilled subplots Yr 1.

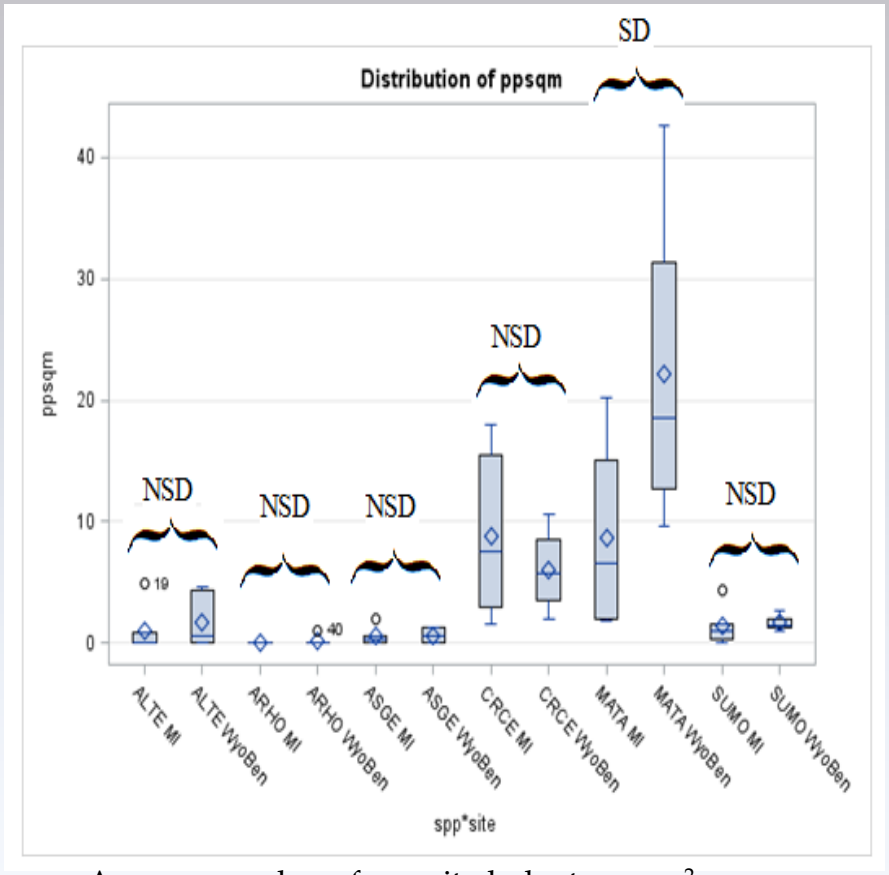
	WyoBen	MI	2 Site Average
ALTE	3.04	2.44	2.74
ARHO	0	0	0
ASGE	0.67	0.67	0.67
CRCE	4.66	6.89	5.76
MATA	13.19	2.44	7.82
SUMO	1.89	1.89	1.89

Broadcast seeded Machaeranthera tanacetifolia subplot at the Wyo-Ben reclamation site in mid July. Note that several plants are beginning to open flowers.

Drill seeded *Cryptantha celosioides o*n the Wyo-Ben site. These plants are considered annual/biennial/short lived perennial. Between ½ and 1/3 of those on the Wyo-Ben site flowered the first summer after seeding.

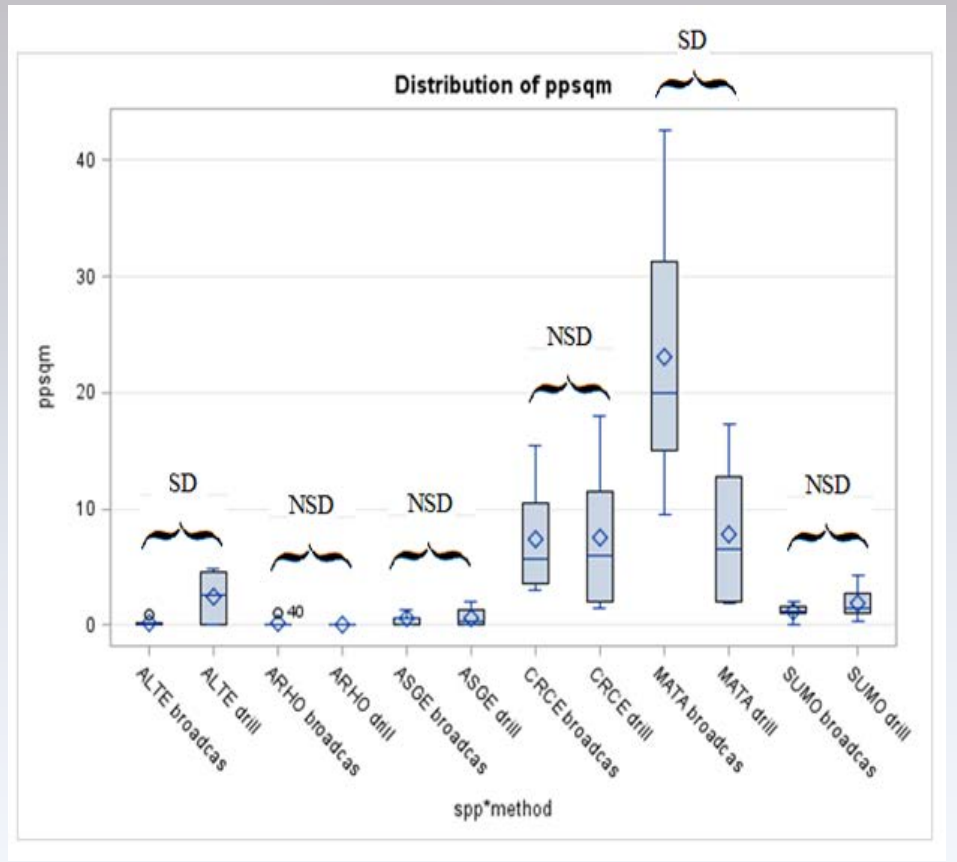
Broadcast seeded *Suaeda moquinii* on the MI site

Species by Site



Average number of recruited plants per m^2 across each species and location in Year 1, when seeding methods are combined.

Species by Seeding Method



Average number of recruited plants per m^2 across each site in Year 1, dependent on species and seeding method

Reclaimed Sites; Year 2

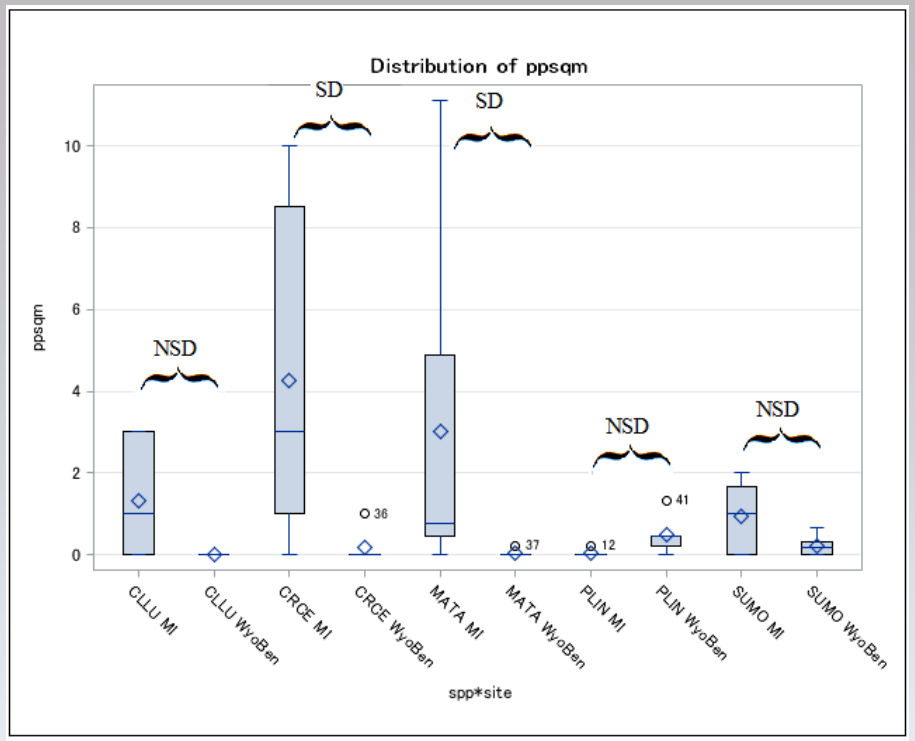
Species	MI	WyoBen	2 Site Average
CLLU	1.00	0.00	0.50
CRCE	3.17	0.33	1.75
MATA	3.85	0.07	1.96
PLIN	0.07	0.67	0.37
SUMO	1.22	0.22	0.72

Average number of plants per m2 on broadcast subplots in Year 2.

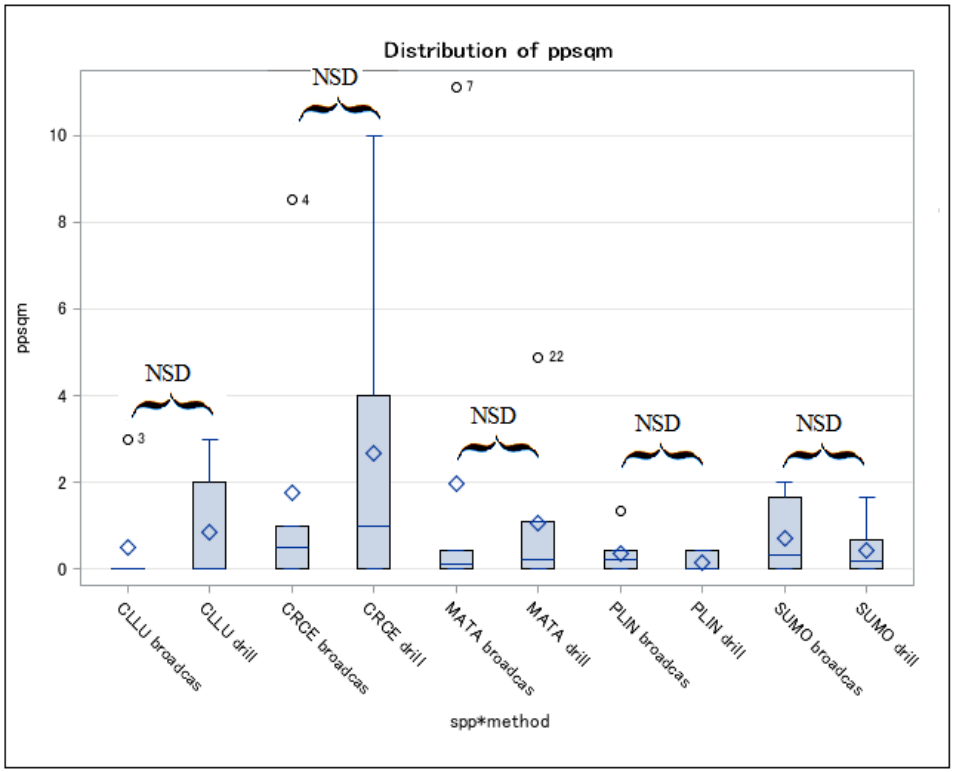
Species	MI	WyoBen	2 Site Average
CLLU	1.67	0.00	0.83
CRCE	5.33	0.00	2.67
MATA	2.15	0.00	1.08
PLIN	0.00	0.30	0.15
SUMO	0.67	0.22	0.44

Average number of plants per m2 on drilled subplots in Year 2.

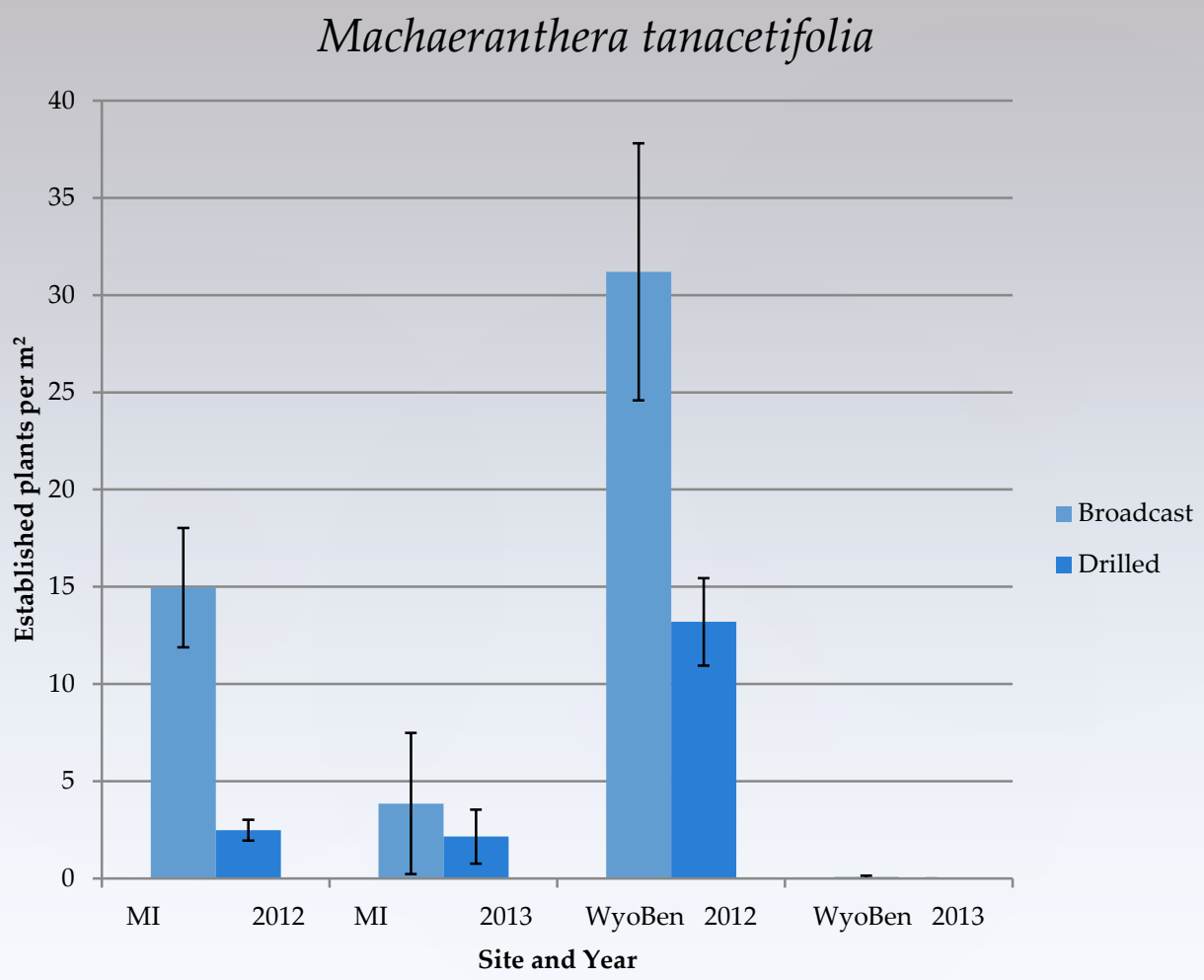
Seeding Trial Year 2



Average number of recruited plants per m² across each species and location in Year 2, when seeding methods are combined.

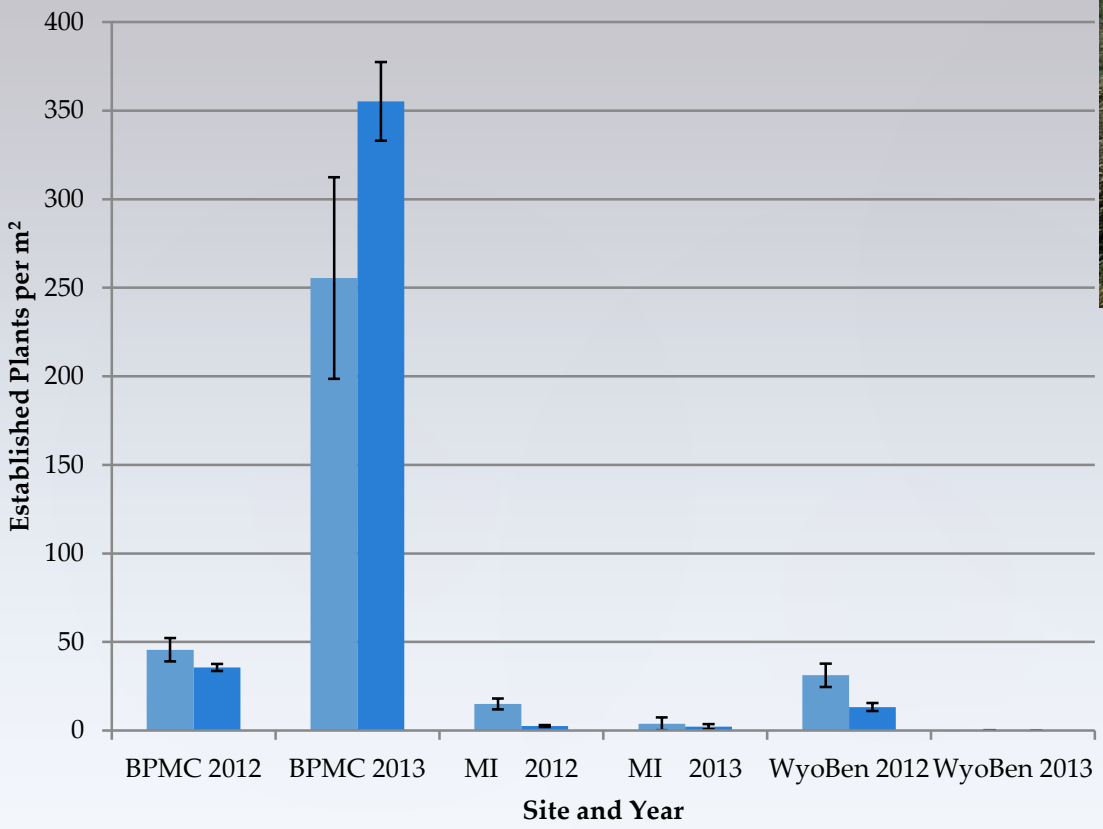


Average number of recruited plants per m² across each site in Year 2, dependent on species and seeding method.



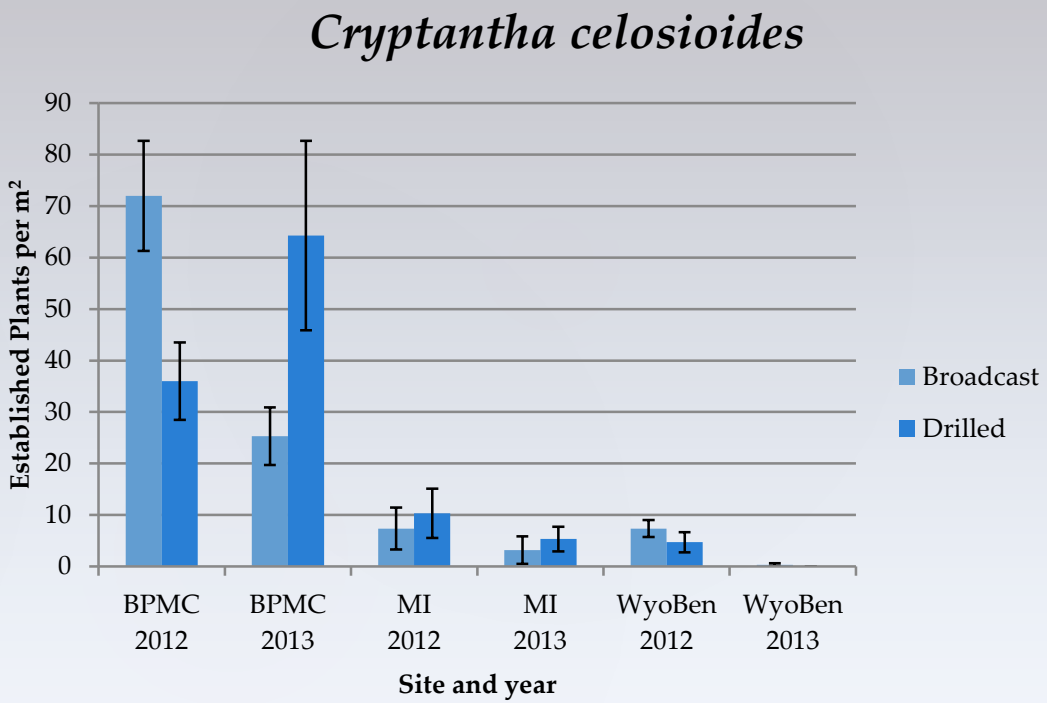
While *M. tanacetifolia* established very well in 2013 (and produced flowers and seeds) it was unable to increase in plant density in 2014.

Machaeranthera tanacetifolia

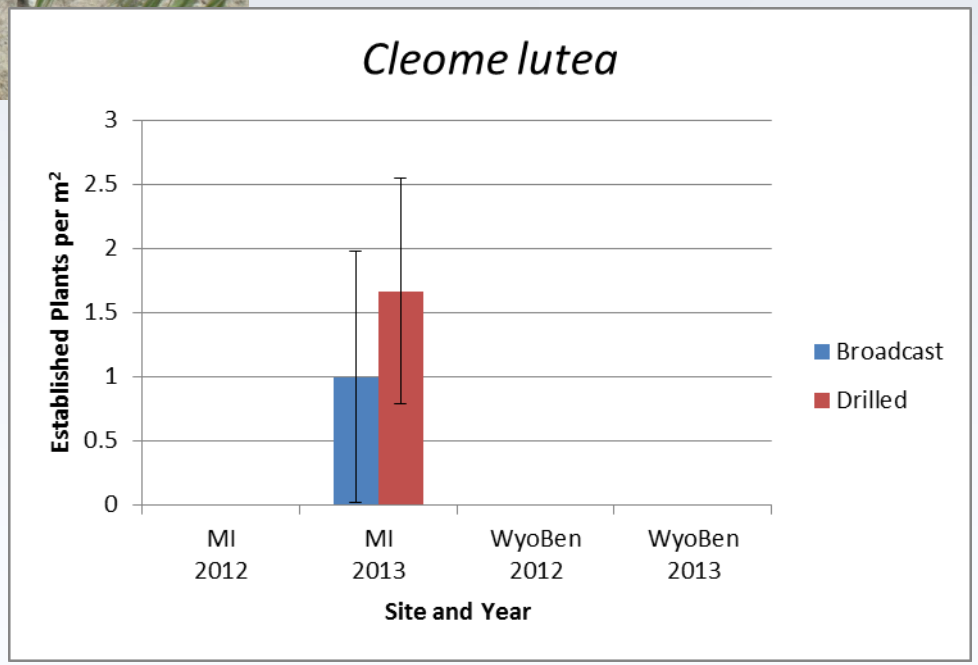


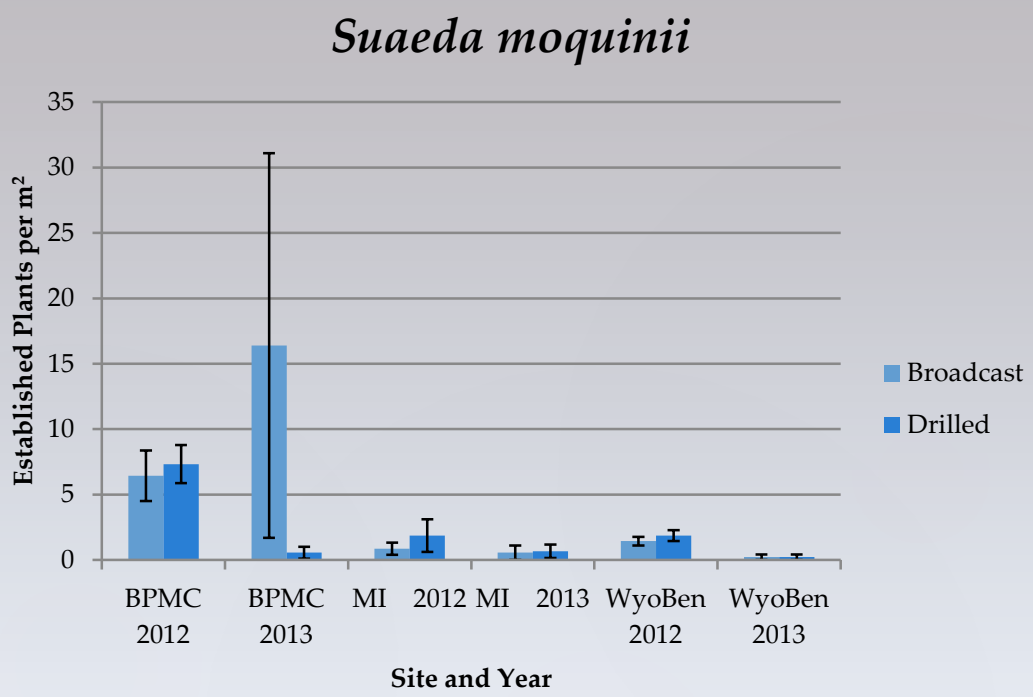
Broadcast

Drilled



While *C. celosioides* established very well in 2013 (and produced flowers and seeds) it was also unable to increase in plant density.


Cleome lutea
Established Plants per m²
3
2.5
2
1.5
1
0.5
0
MI 2012
MI 2013
WyoBen 2012
WyoBen 2013
Site and Year
Broadcast
Drilled



S. moquinii **established well in 2013 (and produced flowers and seeds) but was unable to increase in plant density. However in 2014, broadcast seeded plots showed increased establishment density while drill seeded plots experienced a reduction in the number of established plants. This increase in established plant density on broadcast seeded plots could be the result of successful reproduction or of delayed germination and establishment.** ***S. moquinii*** **is biennial or perennial. It suffers from uneven seed development, and the development of difficult to access seeds attached to the intersection of stem and branches, making mechanical harvest of the seeds very challenging.**

Wyo-Ben Lovell; PLIN

M-I Greybull; HEAN & CLSE

MI July 2014, CRCE

MI July 2014, CLLU

SPCO

MUDI

Questions?

Happy seed collectors