

Conserving *Physaria Lanata* 2013



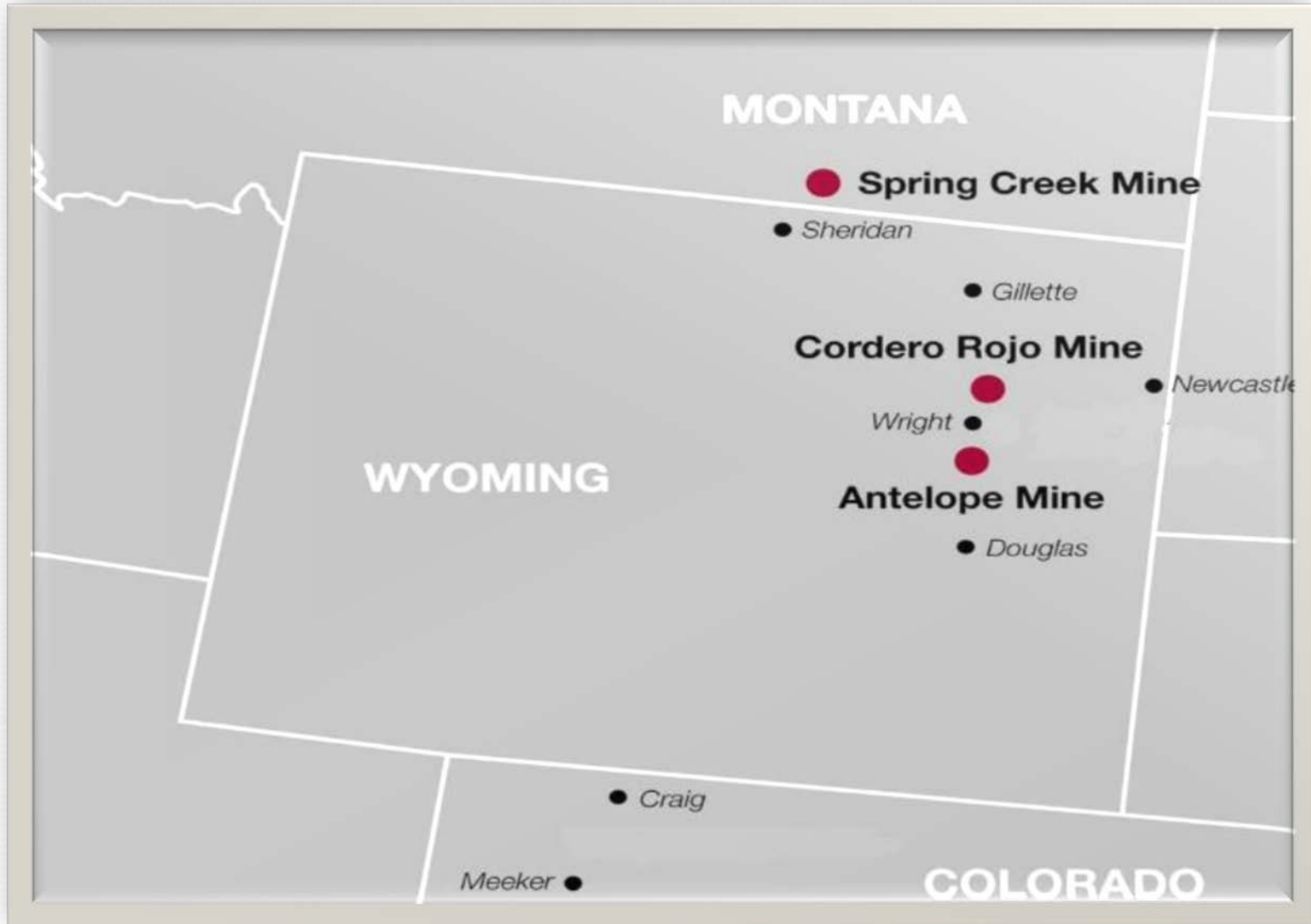
CLOUD PEAK
ENERGY®

Spring Creek Mine

Gabe Johnson (Cloud Peak Energy)

Rich Prodgers (Big Horn Environmental)

Cloud Peak Energy



- Background of *Physaria Lanata*
- Nursery Propagation
- Outplanting
- Lessons Learned

Background



Physaria lanata (A. Nels.) Rydb.

P. didymocarpa (Hook.) Gray var.
lanata A. Nels.

“WOOLY TWINPOD”

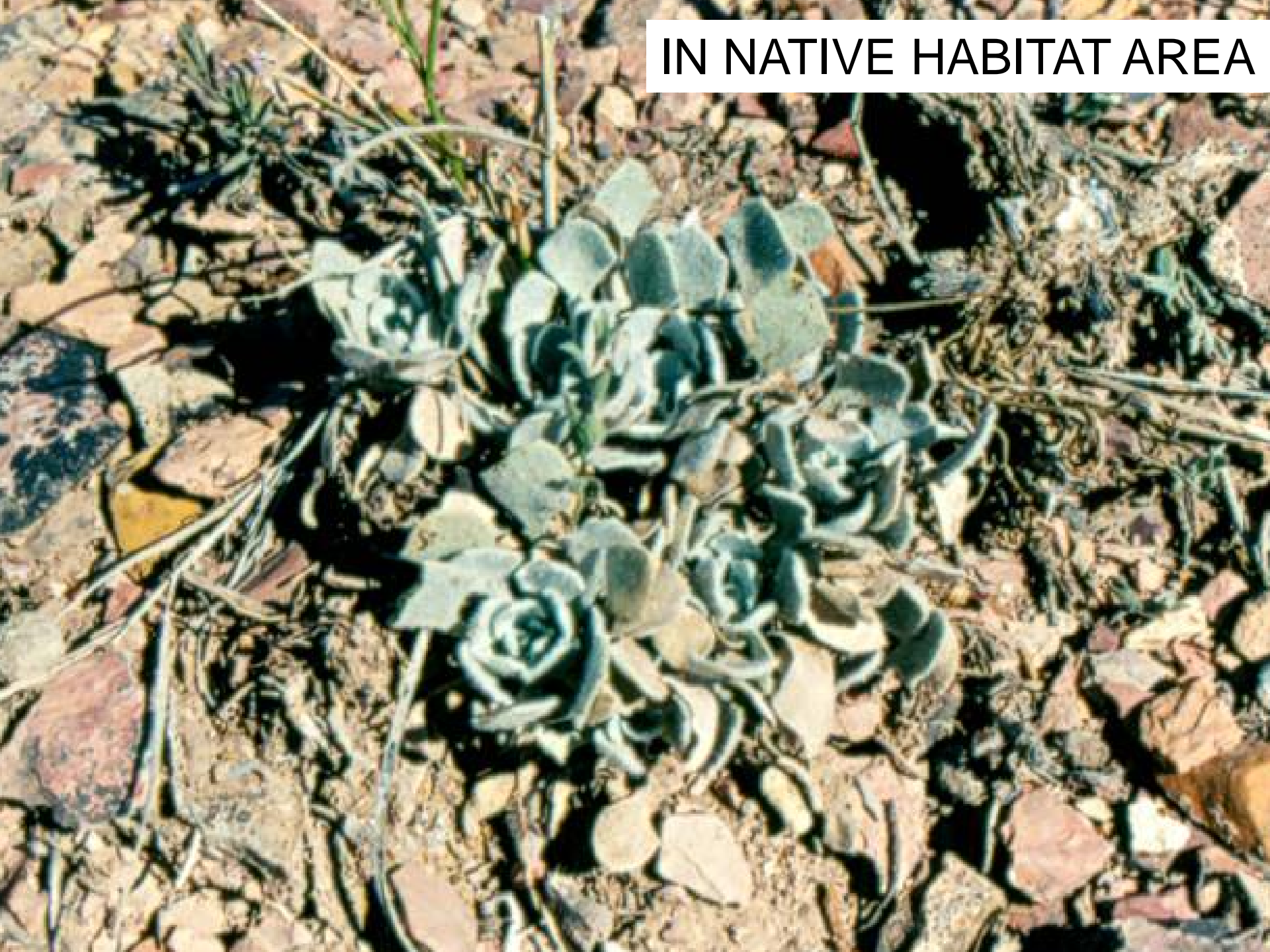
“LITTLE MUSTARD”

Physa = bellows, the inflated pod

didymocarpa = double fruit

lanata = tangle of woolly hairs

IN NATIVE HABITAT AREA



- 1993 Discovered in Pit #4 during baseline studies
 - Status: SU “possibly peril”
 - Conservation measure not required
- 2001 Mining started in Pit #4
 - Status Changed to: S1 “at risk, imperiled”
 - Conservation measures not required

- In 2006 mining was approaching a native scoria steep slope area containing *Physaria Lanata* plants.
- During the summer of 2006 Rich Prodggers recommended some of the native plants be voluntarily transplanted to a safe donor site for propagation.
 - The objective: create a self sustaining population of *Physaria* in Mine Reclamation.



- 1) Fall 2006: Transplant 50 native plants from Pit #4 to a long term safe “donor site” at the mine:
 - Noticed Plant Characteristics
 - Plants few and localized (niche specialist)
 - Not a competitor
 - Seed production = erratic & sparse
 - Thus generating a sustainable population from 50 donor plants was highly unlikely.
 - **Perfect candidate for cloning!**



WEST FACING STEEP SCORIA SLOPE - LITTLE COMPETITION



14/2006

FLAGGED FOR EASY IDENTIFICATION

- Used
 - 5-Gallon High-Caliper Smartpots
 - Mixed Native Scoria with RTI's AM 120 for the "potting soil".
- High Level of Care
 - Only used plants > 7 inches from bunch grasses taken to preserve roots
 - Using two people, Dug out from up hill and carefully set into Grow bag
 - Watered them and placed in final location same day at the Donor Site.

MAKING "POTTING SOIL"







MINIMIZE ROOT LOSS



NOTE: SPARSE GROUND COVER





GREAT CARE

SMALL AND FRAGILE



0/14/2006



CAREFULLY WATERED



GROW BAGS PLACED IN DIVOTS AT DONOR SITE



- Then Waited Until Spring 2007 at the Donor Site
 - Abundant Fruit > 2 times normal production
 - Worst looked better than the best native plants at the donor site.
 - Only three plants were missing; none showed signs of being herbivory (eaten).

SPRING 2007 GOT FRUIT?



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JULY 2007 HERBIVORY!



JULY 2007 COMPETITION!



- July 2007
 - Three plants taken to SMK Plants in Billings MT for Tissue Culture Micropropagation.
 - Goal was to raise **2,000 plants** in “stubby cell containers” then outplant them into reclamation.
 - **Also Harvested seed from the remaining plants. Wind River Seed was kind enough to clean them for us.**



DELICATE



FINE ROOTS



STUBBY CELL



NOTE SCORIA



AT SMK PLANTS

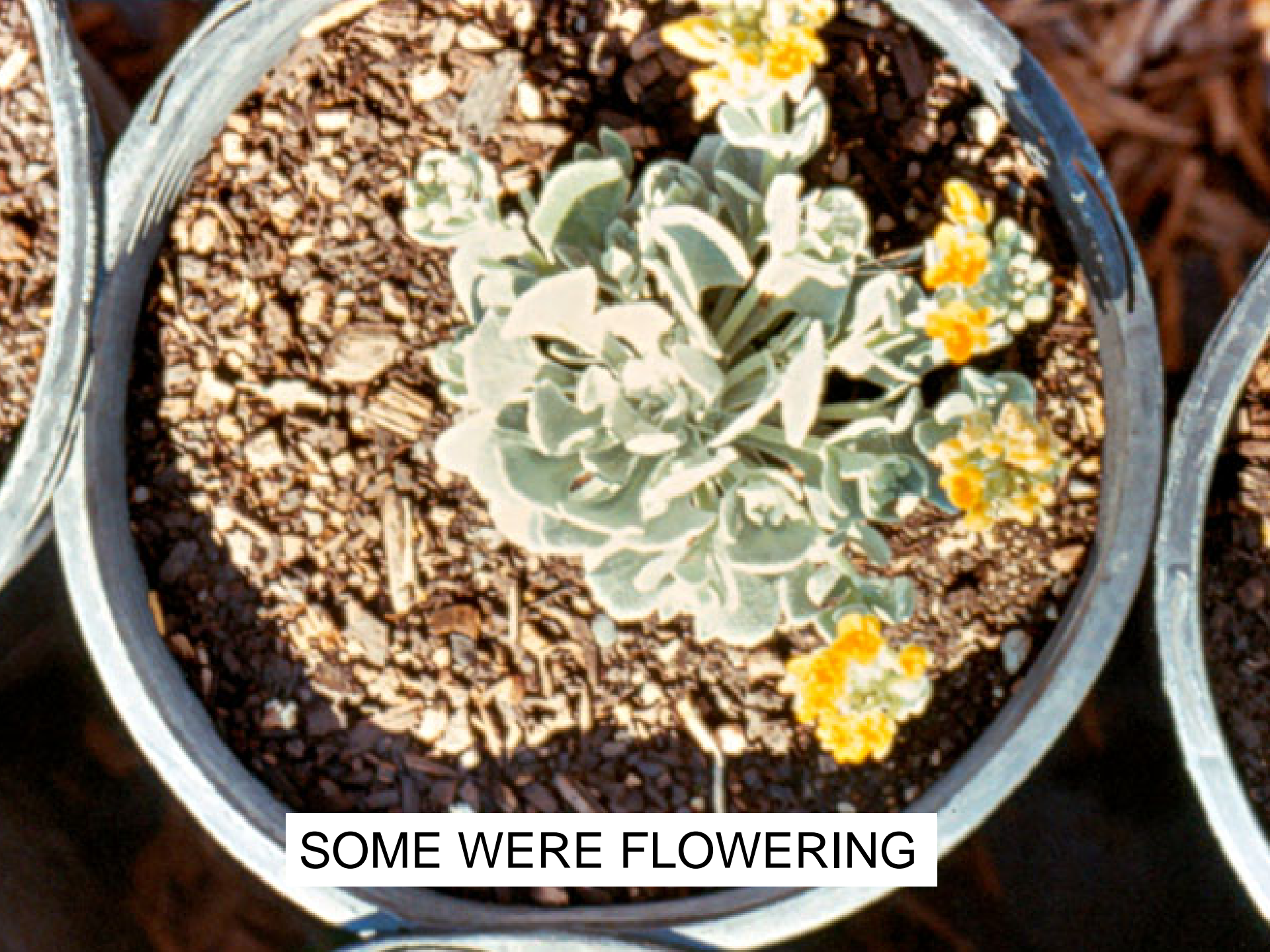
- 2008 Cloning Results
 - Nursery Survival from Cloning ~ 15%
 - This unfortunately did not meet the objective of creating a **sustainable population**.
- Cloning Lessons:
 - Deflasking = It helped to soften the agar in warm water so the soft roots can be removed.
 - Indurate agar was further dried by root extraction and time.
 - Injury = mortality
 - Phy lan has fine, delicate roots

That Leaves the Question:

**??What about the Seed
We collected from
the remaining 45 plants
At the Donor Site??**

- **Saved by the Seed!**
 - From some clones and mainly seed:
Westscape Nursery from Bozeman
MT was able to produced 1,000
stubby cells!
 - About a 90% Survival Rate!





SOME WERE FLOWERING

- **Interesting Note: During the Summer 2008 most of the remaining plants at the Donor Site were gone! (Herbivory? Lifespan?)**
- **Realized we have much to learn about this little mustard.**

- **Fall 2008 48 Plants were Ready for Outplanting into PAR 1H pit-run scoria reclamation.**
- **Learned each plant takes time and patients and digging by hand in pit-run scoria is difficult.**
 - **Desired depth is difficult; need adequate root coverage.**
- **Watered the plants immediately after outplanting.**

FINE ROOTS

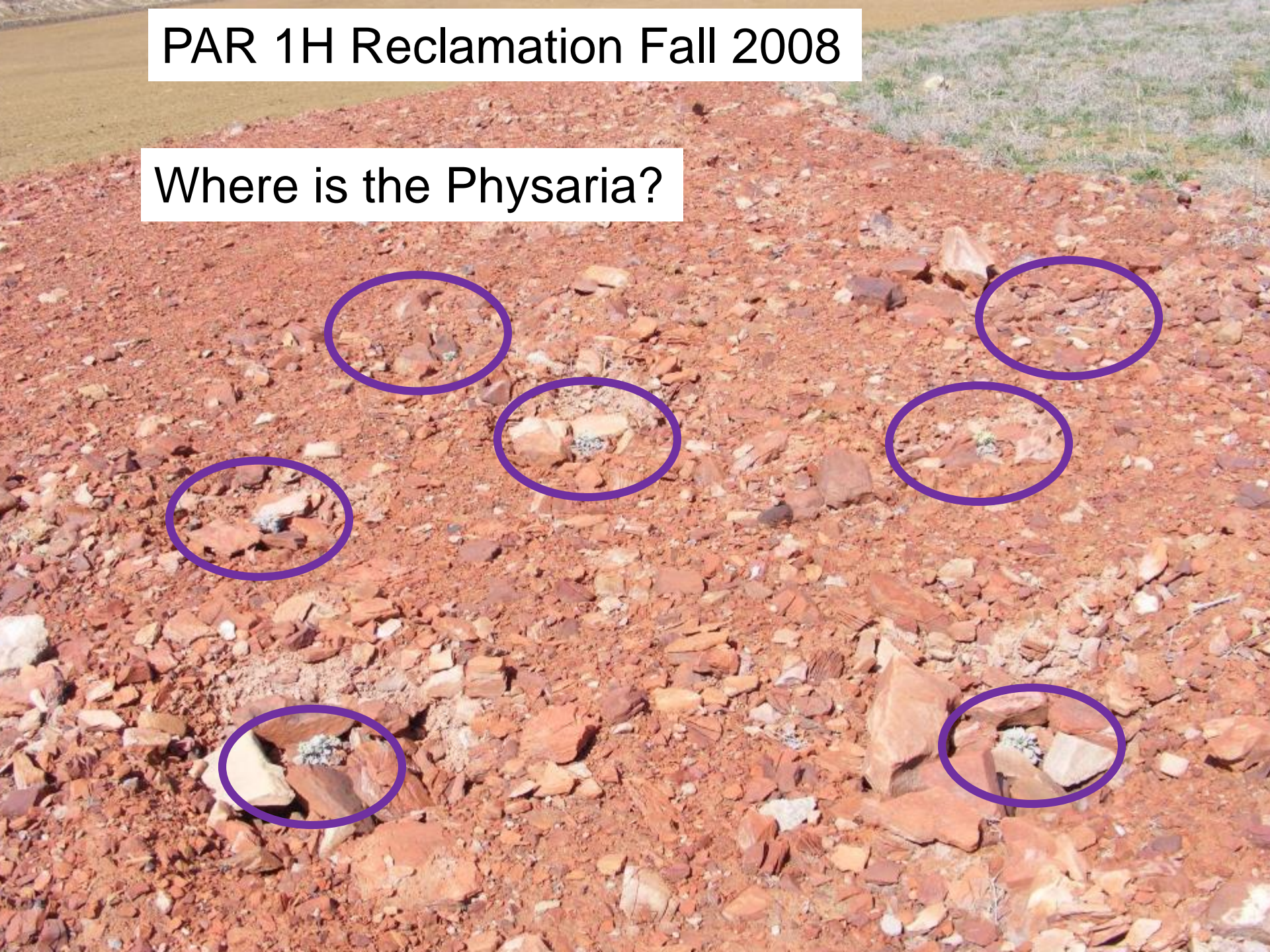


Coarse Scoria Fragments (Substrate is Key)



PAR 1H Reclamation Fall 2008

Where is the Physaria?



- **Checked the PAR 1H outplants in May 2009.**
 - **some had flowered and only one mortality! **We were so Excited!****
 - **Collected the available seed.**
- **Checked them again in 2011; no visible survivors 100% MORTALITY! (Herbivory?, Competition? Lifespan?)**

- **Spring 2009 more plants ready were ready for Outplanting**
 - **905 Plants into pit-run scoria PAR 7A Rec.**
 - **Placed facing different directions.**
 - **Time Savers**
 - **Created divots in scoria using skid steer.**
 - **Placed two plants / divot in most cases**

PAR 7A Typical Scoria Knob in Reclamation



Stubby Cells Ready for Outplanting Spring 2009



NOTE FRESH TOPSOIL APPLICATION AREA NEXT TO OUTPLANTING SITE



WHERE'S THE PHYSARIA?





TYPICALLY PLANTED TWO PER DIVOT



COLLECTING SEEDS AMIDST A SEA OF KOCHIA JUNE 2010



WINDBLOW DIRT ON FINE HAIRS JUNE 2010



FLOWERING JUNE 2010



JUNE 2010 COPIOUS FRUITS, BUT SPENT PARENT
TRANSPLANTED SPRING 2009; SUGGESTS A FUNCTIONAL
ANNUAL OR ONE THAT RELIES ON REGENERATION FROM SEED



INSECT DEFOLIATION PAR 7A JUNE 2010; LITTER OF SEED PODS SHOWN IN BACKGROUND



Par 7A Outplanting Results

- By 2011 fairly high mortality; about 2/3 died.
(??Herbivory, Dust, Competition, Lifespan
each seem to play a factor??)
- Survivors produced good fruit; collected
seed in 2010.
- Project Side Benefit:
 - **Received OSM Excellence
in Reclamation Award in
2009!**

Outplanting



- **During 2010 we only collected seed; no plants ready for outplanting.**

- **In Spring 2011 420 little mustards were ready for outplanting (Focused on areas with less competition.)**
 - **350 Plants into 23 year old reclamation (PAR 1B).**
 - **Again used skid steer and auger to create divots.**
 - **70 Plants into Native scoria area**
 - **Did not use skid steer to create divots.**

NATIVE OUTPLANTING AREA AUG 2011 (USING FLAGS HELPS) CHOSE AREAS WITH LESS GRASS



- **Results from 2011 Outplanting:**
 - **PAR 1B (23 yr old) and Native Area**
 - **Summer 2012 showed survival rate of 2/3.**
 - **Mortality in some cases due to shallow plantings (exposed roots).**
 - **Lower seed/fruit production**
 - **PAR7A in 2009 (Kochia auto-suppressing may have contributed to the mortality in PAR 7A).**

NATIVE OUTPLANTING AREA AUG 2011 (SHALLOW-ROOTS EXPOSED)



PAR 1B OUTPLANTING AREA AUG 2011 (NO KOCHIA)



PAR 1B OUTPLANTING AREA AUG 2011 (LITTLE FRUIT)



PAR 7A NW UNIT SEEDLINGS AMONGST KOCHIA LITTER
AND AUTOSUPRESSED KOCHIA SEEDLINGS SUMMER 2012



Outplanting



- **During 2012 we only collected seed; no plants ready for outplanting.**

- **During Spring 2013 (370) Plants were Ready for Outplanting.**
 - **Focus in QUALITY: Outplanting done by professionals**
 - **(Habitat Management Inc. & Big Horn Environmental)**
 - **All done by hand, no pre divots made.**
 - **Agriform and Agrosoke placed in the hole.**
 - **Excavated soil mixed with Sustane.**
 - **2' x 2' geotextile mat applied around some plants.**

PAR 7A SPRING 2013: CLUSTERED REGENERATION
FOLLOWS CLOSE PROXIMITY SEED DISPERSAL (16 PLANTS
ARE VISIBLE HERE.)



- 1. Initial transplants may produce abundant fruit; must use for seed collection.**
- 2. Maintain seed-collection program at the Nursery.**
- 3. Outplanting into same year reclamation not recommended due to competition from annuals. (Wait ~2 yrs).**
- 4. Do not outplant near dirt roads.**

- 5. Water-in plants is essential and fills voids near roots.**
- 6. Outplant some into reclamation and some into native to spread the risk of local failure.**
- 7. Outplant in the spring when food for herbivores is abundant.**
- 8. Less fertilizer is more (Few granules down the hole vs “teabags”).**

- 9. Place them in “pods” vs concentrated small areas within larger scoria laydown sites. (Clustered Regeneration).**
- 10. Propagation from seed is recommended vs. cloning due to cost and poor survival rates.**
- 11. Use pin flags next to outplanted plants for survival counting; reduces crushing mortality and saves time.**

QUESTIONS?

