

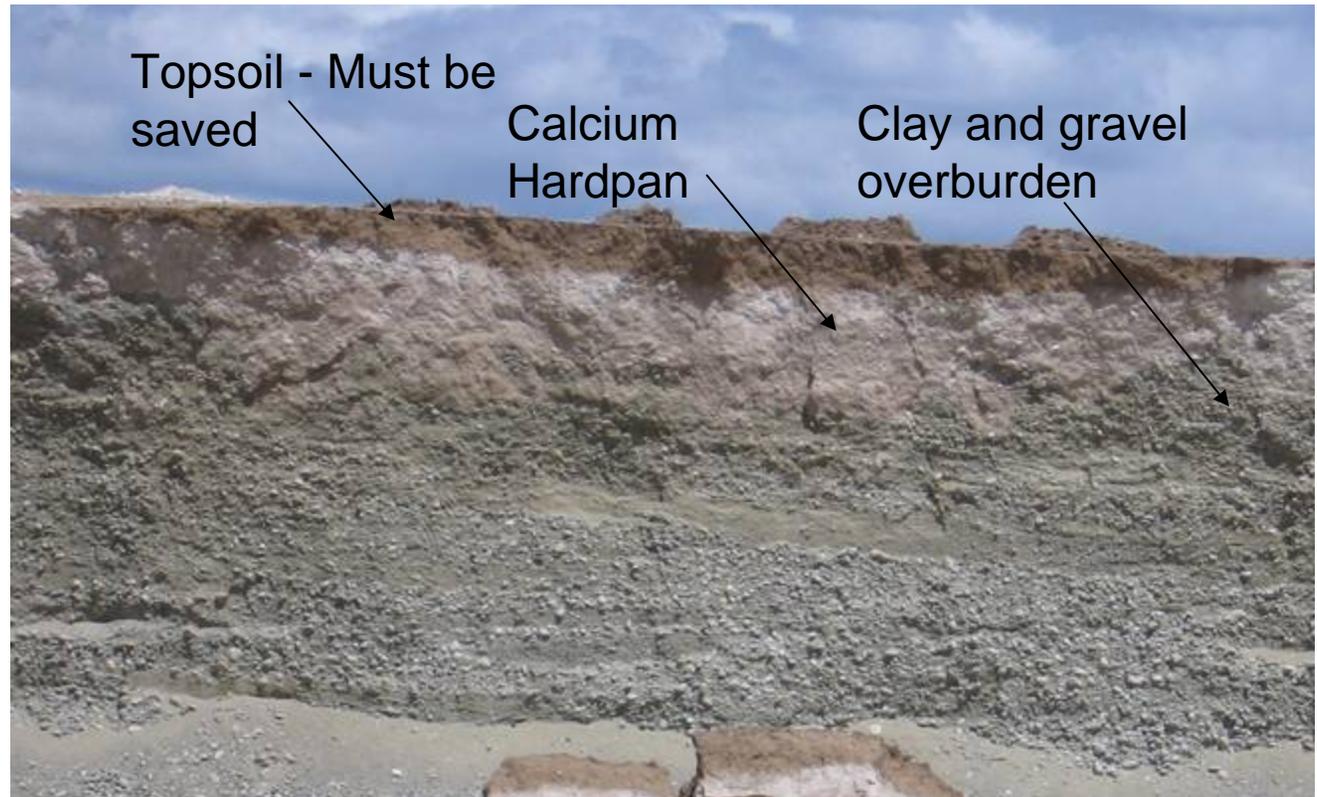
Reclamation Techniques for Northeast Wyoming

Wyoming Department of Environmental Quality
Land Quality Division
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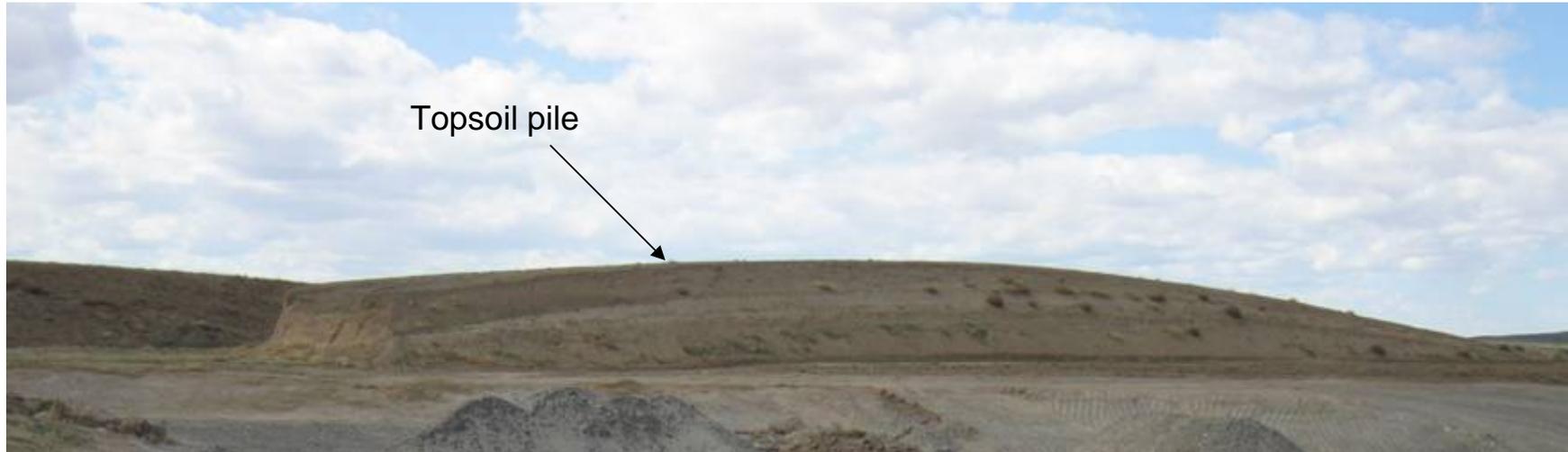
THE VITAL RESOURCE: In addition to having adequate water, one of the most important keys to successful reclamation is properly handling and protecting topsoil throughout the entire life of the operation.

Save all material that supports plants.

- The dark top material is topsoil and is usually 3-12 inches deep, but in water courses it may be 4 feet deep.
- Save all of it and store it in piles away from roads, equipment storage areas, fueling areas, and drainages.
- The white, calcium-rich hard pan, heavy clays, and gravels found below the topsoil can be stored separately as fill.



Topsoil Storage



Topsoil should be stored in piles to prevent erosion. They should be identified by prominently posted signs so people know to protect the soil from loss and contamination.

Low, flat piles allow better aeration of the soil than tall piles. Aeration allows natural soil micro-organisms to survive, which contributes to soil viability and the health of seedlings such as sagebrush

Do not drive or store vehicles or fuel tanks on topsoil piles. This breaks down soil structure, which is vital to seedling survival and proper root growth. Fluids leaking from tanks and vehicles may contaminate topsoil.



Topsoil spreading

- Prior to re-spreading topsoil the surface must be ripped to reduce compaction.
- When re-spreading topsoil, the surface should be disked or harrowed to leave furrows (right). On small sites soil can be spread with a dozer and simply left rough (below).



- Soil furrows and soil roughness shelter seeds from wind and predation by animals, and collect water the seeds need to germinate.
- There are different ideas about roughness discussed on the next page.

How soil roughness should look up close:

On the left, furrows are about one-foot wide, left by a two-foot diameter disk. The soil itself is pretty lumpy.

On the right, the soil has been smoothed to a fine corrugation with a billion-type seeder.

In each case here, and with the dozer-spread topsoil in the previous slide, furrows and hollows are created on the contour to catch snow and water. The soil clumps are small enough for the soil to cover the seeds. Large soil clods prevent good seed-soil contact.



An ATV-mounted screen harrow is being used to prepare the seedbed.
It breaks up soil clods and covers seeds that have been broadcast
either by hand or by an ATV-mounted seeder.



Remember that the seeded surface should not have large dirt clods in it.

Instead, it should have furrows, pits, and/or small-scale hollows across the surface to catch and hold snow and water.

Furrows should be constructed on the contour or perpendicular to the prevailing wind.

Pitting is also a great way to harvest water and shelter seeds.

A tractor-mounted pitter/seeders, shown below, was used in the right-hand photo. It digs hollows on about a two-foot grid. Seeds are then broadcast over the pitted land in the same pass.

Planted at the height of the current drought (2004), the plants in the photo to the right are growing only in the pits.



Pits and pitter



The pitter leaves hollows instead of furrows, thus there is no need to work on the contour. The pitter controls erosion well on roads and hills. Water collects in the pits.

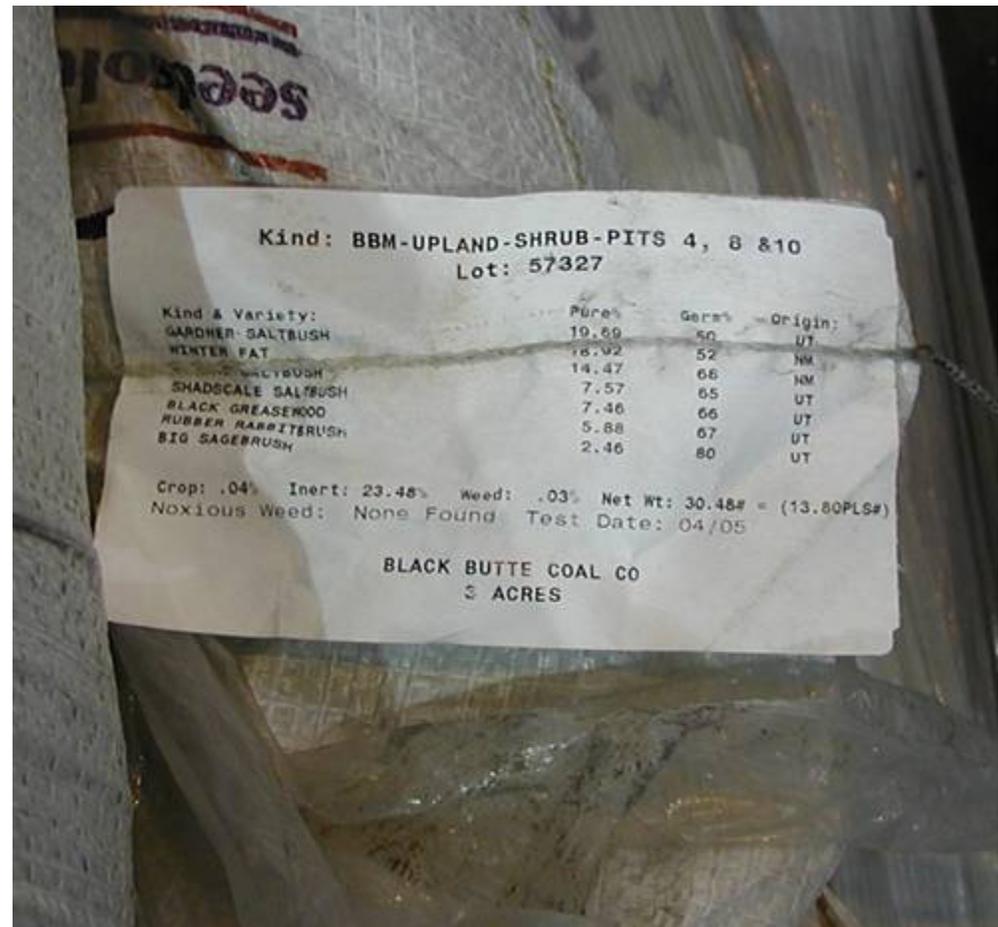
Seeds and Seeding

- Know the plants growing on the site before it is disturbed. Of these plant species, consider using in your seed mix the native species that are desirable, commercially available and have proven reclamation success.
- Native plants are better adapted to our harsh Wyoming climate than introduced species. Introduced (non-native) species may not grow, or will grow too well; spreading, reducing the diversity of your other seeded plant species and disrupting the surrounding ecology.
- When buying seed, choose seed from plants grown within 300 miles of your site for best adaptability. Seed grown in Texas expects to grow in Texas-like conditions!
- Buy from reputable dealers. Cheap seed isn't worth it.
- Seed mixes should reflect the type of plants that grew prior to disturbance. Often this includes 3-5 grass species, 2-3 shrub species and 1-3 forbs (flowers).
- Terms to know when buying seed are discussed below.



Seed Considerations – Seed Tags

- Analysis tags: Each seed bag should be labeled with a tag listing the seed's origin, germination percentage and date of germ test, percent by weight of pure seed vs. other crop seed, weed seed, inert matter, and number and kind of restricted noxious weeds. A basic seed tag, shown to the right, is white.
- Certified seed: Certified seed (i.e. Bluebunch wheatgrass, *Goldar* variety) must meet high purity and germination standards, and have a low weed content - usually less than 0.25%. If a particular *variety* of seed is required, use certified seed. *
- Certified seed is marked with a blue tag. If you want to be sure it's certified seed in a seed mix, request the blue tag for each certified component in the mix.*
- Request an analysis tag with each bag of seed as each may be slightly different.



* source of information: Wind River Seed – <http://www.windriverseed.com/Certseed.htm>

More Seed Considerations

- Seed Origin – For best results, seed should come from plants grown at an elevation and latitude similar to the site to be seeded. Generally this is within 300 miles. “Source identified” seed is certified to come from the locality listed, and each source identified species will have a yellow tag.* Once again, you may need to request the yellow tags.
- Older seed or seed stored in a hot or moist environment will have a lower germination rate than properly stored, fresh seed. Some seeds (e.g. sagebrush) have naturally low germination rates. Germination test results should be on the seed tag.*
- Seeding Rate – You can seed by the pound or by the square foot. In either case, rates for broadcast seeding are generally twice the amount applied by a drill seeder. The DEQ/LQD recommends seeding between 40 and 90 seeds per square foot, or 14 to 28 PLS pounds per acre. PLS is described on the next page.
- source of information: Wind River Seed - <http://www.windriverseed.com/Certseed.htm>



Photo: Rocky Mt bee plant, Big Horn Basin

Bulk Seed vs. Seed Sold by the PLS Pound

- Pure Live Seed (PLS) vs. Bulk Seed: When buying by the PLS pound you pay only for the live seed, not for the inert material in the bag: chaff, weed seeds, etc. When buying bulk seed you buy by the sack and the cost per sack is often lower. Which is a better deal?
- To determine whether PLS or bulk costs are lower: Multiply the purity percentage by the germination percentage of the seed lot to get PLS per lb. in the bag.
- Example:*
- Lot A = 98% pure x 95% germination, = 93.1% pure live seed (PLS)
- Lot B = 89% pure x 92% germination, = 81.9% PLS
- Now divide the seed cost per pound by the PLS percentage to determine the PLS cost:
- Lot A: \$5.00 lb. / .931 = \$5.37 per PLS pound
- Lot B: \$4.75 lb./ .819 = \$5.80 per PLS pound

Buying by the PLS pound is often less expensive!

* source of information: Wind River Seed - <http://www.windriverseed.com/PLS.htm>

Some Plant Species to AVOID (the ones to remember come next)

- The species listed below can often be purchased at the co-op or nursery for a “good price.” They will survive too well, and will out-compete more desirable native plants used by wildlife and livestock.
- **Smooth brome** – non-native, spreads in low-lying or moist areas. Becomes unpalatable sooner than many of the native species.
- **Crested wheatgrass** – non-native, spreads even in dry sites, out-competes, only palatable for short period in spring for livestock and wildlife
- **Yellow sweetclover** – no need to plant, comes in on its own.

Some Plant species adapted to loamy-heavy soil textures in Northeast Wyoming

S = sod-forming, B = bunchgrass*

Grasses

Slender wheatgrass - B
Streambank wheatgrass – S
Thickspike wheatgrass – S
Western wheatgrass – S
Bluebunch wheatgrass – B
Basin wildrye – B
Alkali sacaton – B
Bottlebrush squirreltail – B
Blue grama – B

Shrubs and Subshrubs

Wyoming big sagebrush
Serviceberry
Bitterbrush
Rubber rabbitbrush
Winterfat
Fringed sage

***Bunchgrasses** grow in clumps with bare areas between. They create less competition for shrubs than **sod-forming grasses**, which spread by underground and surface roots and are useful for erosion control.

Plants adapted to Sandy or Clayey soils in Northeast Wyoming

Grasses

Shrubs

Adapted to sandy sites

(The grasses will also grow on loamy sites)

B = bunchgrass

Indian ricegrass – B

Needleandthread grass – B

Sand dropseed – B

Prairie Junegrass – B

Prairie sandreed – B

Silver sage

Woods rose

Adapted to clayey sites

Prefer dry conditions:

Alkali sacaton - B

Bottlebrush squirreltail - B

Green needlegrass - B

Gardner saltbush

Four-wing saltbush

Tolerate flooding

Great basin wildrye -B

Silver sage

Post-Seeding: Mulching reduces water and soil loss due to heat and wind.



- Straw mulch can be used after seeding. The straw should be weed free and crimped into the soil. Any piles of straw should be spread.

The slide to the left shows a strip of seeded, mulched land with germinating grasses.

The slide below is a close-up of crimped mulch. This holds the mulch in place despite wind and rain.



- Cover crops, consisting of a small grain such as barley or oats may be used when it is too late in the spring to seed the permanent mix. The permanent mix is seeded into the stubble in the spring or fall.

Successful reclamation



Dave Johnston Mine, Douglas, WY

- Depends largely on rain. But good soil salvage, seedbed preparation, and seeding techniques can produce good results even in drought years.
- Water harvesting, loosening of compacted soils to allow root penetration, good seed-soil contact, and use of adapted seeds will give you an edge when reclaiming lands.

Your reclamation goals ...

affect whether you try to grow grasslands, shrublands, or weeds. Careful planning from excavation to reclamation will help you reach your goals.



A Dozen Rules for Reclamation

1. Save all topsoil that supports any sprigs of vegetation, even if it is rocky or thin, and store it in a manner that protects it from wind, water, and careless drivers.
2. Do not mix topsoil with deeper layers or with surface material that is barren. Good topsoil that supports thick vegetation should be stored separately from topsoil that supports thin or scraggly vegetation.
3. Rip all surfaces that had significant traffic or weight placed on them to relieve compaction, such as roads, drill pads, and parking areas. Rip to 2 feet.
4. Spread topsoil over the disturbed surface and blend and feather it into the surrounding native lands, Use a disk, ripper, or other method to leave contour furrows or pits on the surface. This roughness will hold water in the soil and help prevent erosion.
5. Use a mixture of seeds that are native and adapted to the local climate and soil type. Suggested species and mixes are found on pages 14 and 15 of this handout.
6. Plant seed after the first frost and before Spring rains (October – April) for best germination and survival. Don't seed on frozen ground, but just-thawed ground allows for shallow seeding and good seed contact. Planting in summer requires supplemental water, and seedlings may not develop strong enough root systems to survive to the next growing season.
7. Drilling and broadcast seeding are both acceptable: When drill seeding, plant seed ¼" to ½" deep on the contour. When broadcast seeding, double the drill seed application rate.
8. Small-seeded shrubs, such as sagebrush, should be sown separately on the surface in low or sheltered areas that collect snow, soil and have little wind.
9. Do not run or store trucks or equipment on fresh reclamation to avoid compaction and fuel spills.
10. Mulch holds in soil moisture and keeps drying winds at bay. Cover crops can be used if it is not an appropriate time to seed the permanent seed mix. Be careful with irrigation because it can create shallow roots – these are ill suited to withstand dry summer conditions once irrigation ceases.
11. Control weeds on all disturbed lands throughout the life of the project. The county Weed and Pest can advise on noxious species and control methods.
12. If your seeding is not successful in 3 growing seasons, begin the process at # 4 again.