Ripping Compacted Soils
+
Surface Roughening and Imprinting
Using Sheep and Mechanical Imprinters

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Lessons Learned

- Rip all compacted areas. Cross-rip it to ensure the sub-soils are really broken up. It does no good to have the top 6 inches loose only to have the roots hit a hardpan.
- Imprint a rough texture into the topsoil (without recompacting it) to trap broadcast or dropped seed, create vegetation microsites, hold moisture, and slow erosion.
- If you are in a weed area and expect to spray, plant grasses first and inter-seed with shrubs and forbs after the weeds have been controlled.

To allow for deep rooting, cross-rip the subsoils first. Replace the topsoil and loosen it if it was compacted.

Sheep
Roughening, Mulching, Fertilizing, and Seeding

Small Gathering Pipeline predominately covered in halogeton – not ripped and due to excessive compaction reduced cover with grass or native forbs

O'Toole Sheep Reclamation

(SE¼SW¼ Sec 32, T12N, R97W, CO)

Panoramic Photo of Questar Gas Producing Wellsite (SE¼SW¼ Sec 32, T12N, R97W, CO) – Sheep were used to imprint seed mix (Page 6) and provide organic matter and humus to the reclaimed soil surface. The site was ripped by a motor grader and the seeds broadcast and then the sheep were brought on to the fenced location and fed alfalfa to help set the seed and provide nitrogen in the form of urea and organic matter in the fall of 2008. The area experienced excellent moisture in the forms of rain and snow during the critical germination and seedling growth period of the plants. Barley was incorporated in the seed mix to provide a first year cover crop and will eventually disappear from the site while providing much needed plant litter as organic matter. The photo is of the first growing season in 2009 (photo date 7-08-09). The next slides have various photos of the ground, plants, litter and individual parts of the location approximately one year later.

Photo Date 7-08-09. View shows the annual barley as well as some invasive weeds typically found in irrigated crop agriculture. Halogeton is still evident but greatly reduced due to the excellent available moisture competition created by the perennial grass and barley plants. Also notice the small patches of bare ground where the weed species are relegated. The perennial grass species are much smaller in stature and fairly indiscernible without close-up photography

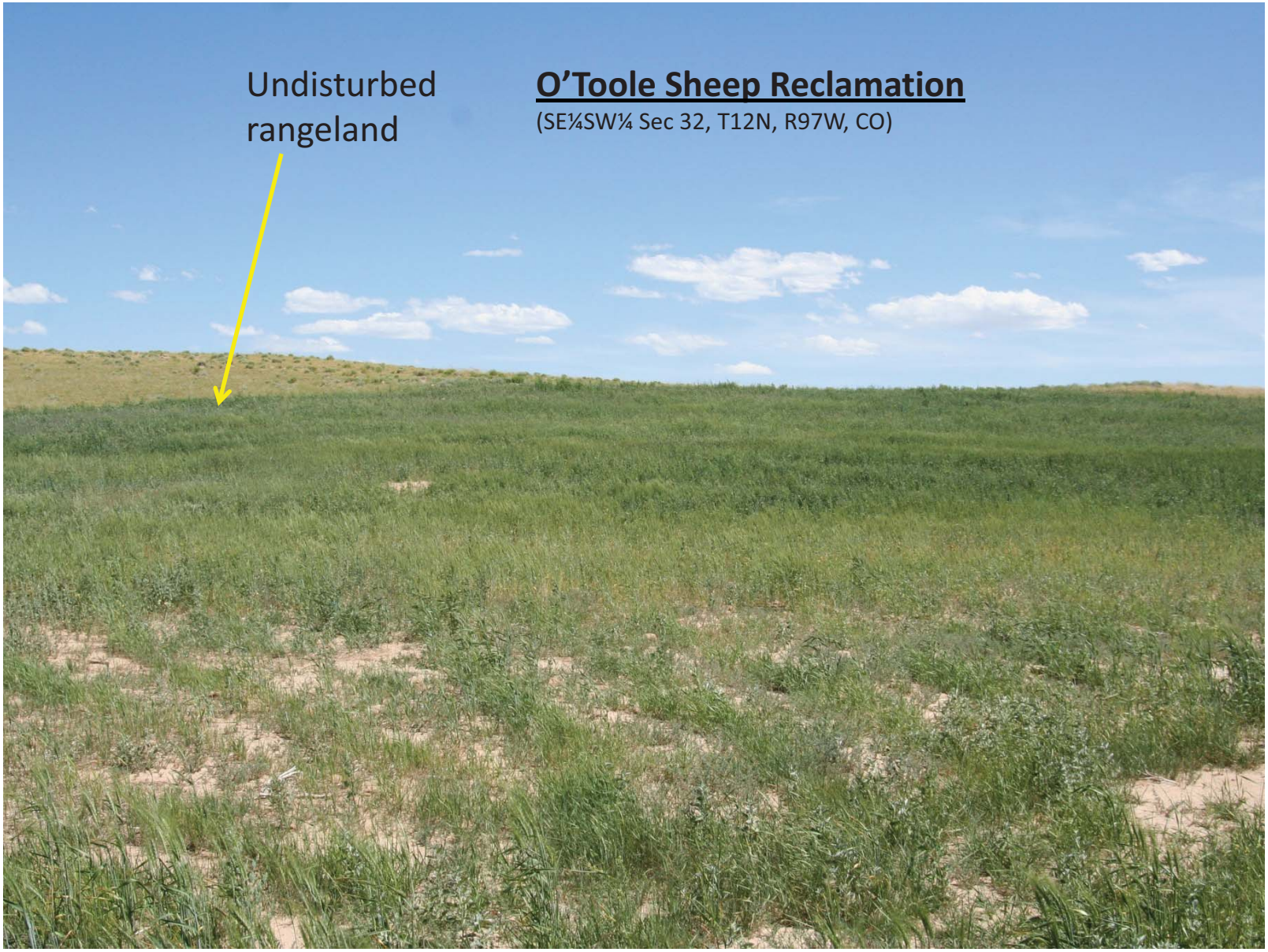
Barley

Halogeton

O'Toole Sheep Reclamation

(SE¼SW¼ Sec 32, T12N, R97W, CO)

Photo 7-08-09. One of the photos used to create the panoramic view above. By enlarging the photo in the PowerPoint main program one can discern from barley, invasive weeds and perennial grass. And compare to undisturbed rangeland

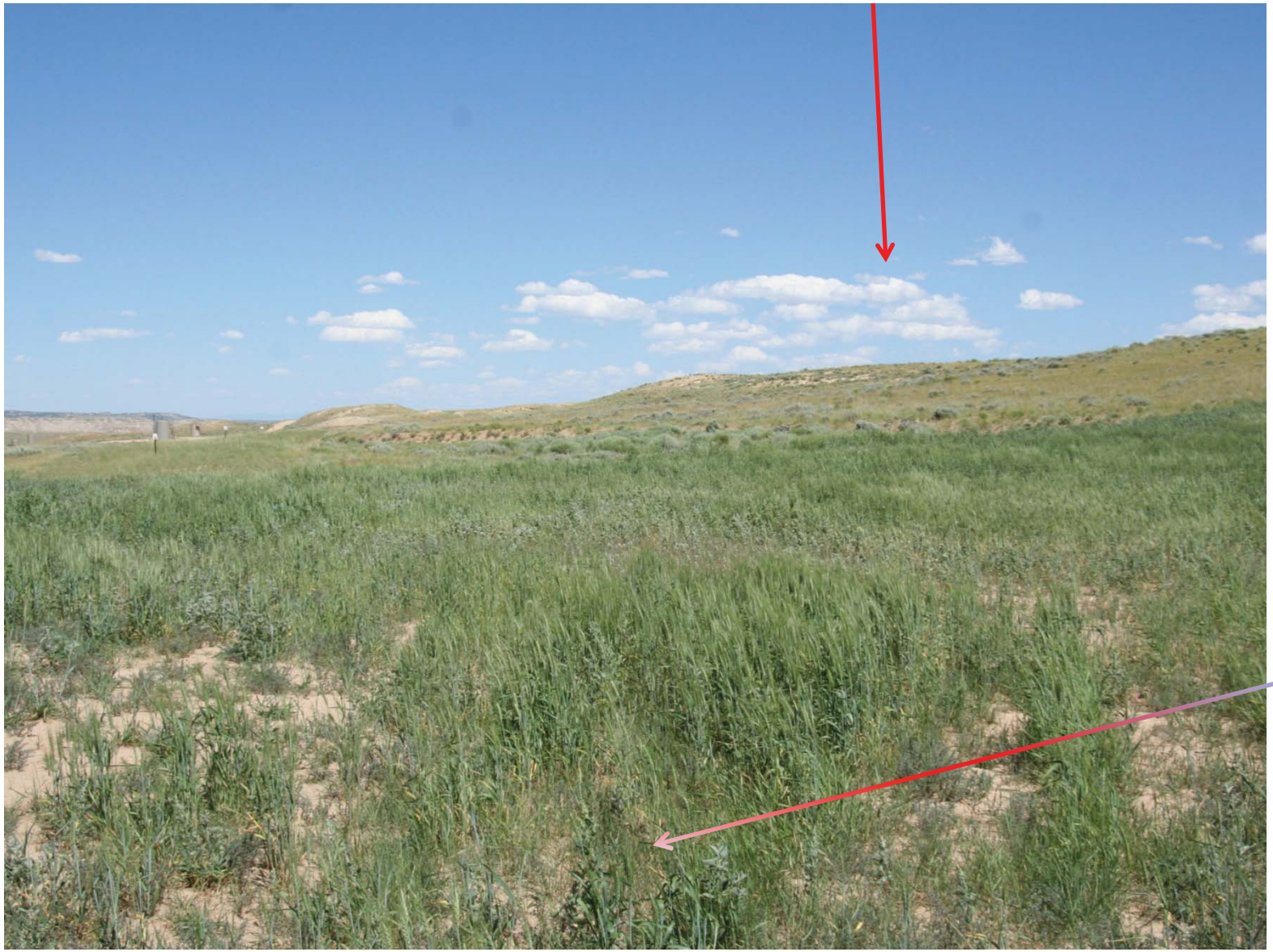


O'Toole Sheep Reclamation

(SE¼SW¼ Sec 32, T12N, R97W, CO)

Undisturbed Rangeland

Photo 7-08-09. Pretty much as above in the previous slide. A part of the panoramic view above.



Lambsquarter

Note halogeton still growing in the compacted area

O'Toole Sheep Reclamation

(SE¼SW¼ Sec 32, T12N, R97W, CO)

Questar Gas Producing Wellsite (same site as above) – **Photo date of 7-16-10** . Much of the barley annual cover crop has been replaced with perennial grass and forb (notice change in color). The site once again had excellent moisture during the cool season plant growth period resulting in a fair representation of the seed mix. The site had received some grazing during the fall of 2009 after the plants had gone into dormancy. The barley was selected by the grazing animal (wild or domesticated). Prodigious amounts of litter was created first by the sheep (legume source) and then later by cattle and wildlife (barley straw source). The following photos show: individual comparison ground surface shots and comparable vista photos that make up the panorama.

O'Toole Sheep Reclamation

(SE¼SW¼ Sec 32, T12N, R97W, CO)

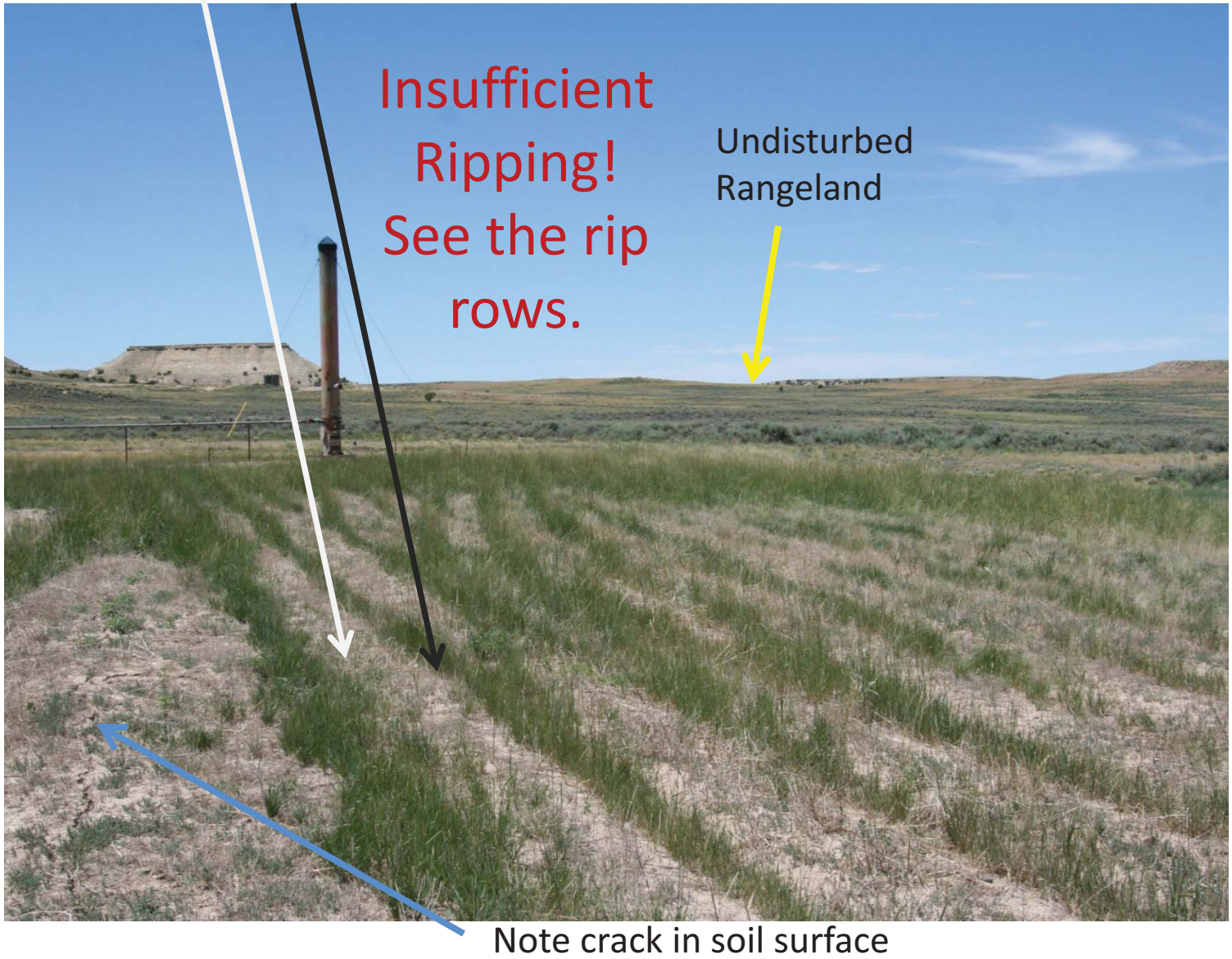


Photo date of 7-16-10 . Questar site viewing West North West showing the high compaction zones with grass/halogeton mix and between the rows of grass and barley. The part of the location may also have had more clay not allowing the sheep hooves to be as effective in breaking down the soil. **Ripping may as not been as effectively implemented here either.** Anyplace that compaction is not an issue the grass is growing!

Seeds used in the reclamation on all the sites include: Shadscale and Gardner's Saltbush, Indian Ricegrass, Thickspike, Western and Slender Wheatgrass; Squirreltail, Great Basin Wildrye, Lewis Blue Flax and Rocky Mountain Bee Plant

Photo date of 7-16-10. Questar location viewing east south east also a part of the panoramic photo. Foreground shows approximately 20% Barley and the balance perennial grass. Note the color change moving upslope. That area is predominately perennial grass and forb. Close-up ground photos follow.

O'Toole Sheep Reclamation

(SE¼SW¼ Sec 32, T12N, R97W, CO)

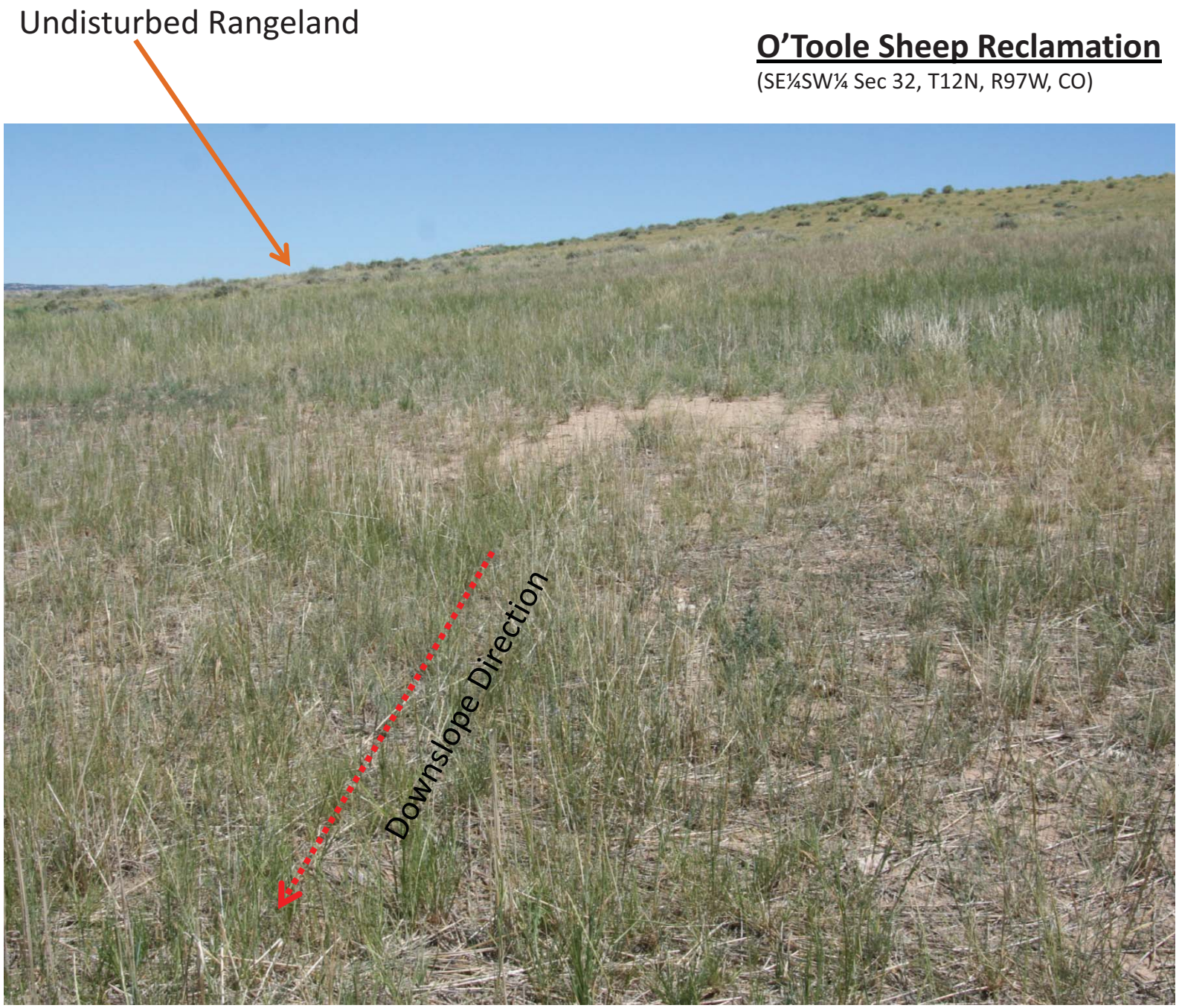


Photo date of 7-16-10. Moving up the slope in the same direction as the previous photo showing the slope, the predominate perennial grass with some blue flax and plant litter all working together in checking any rill erosion on the northern aspect of the location. The predominate grass is Slender Wheatgrass followed up by Western Wheatgrass and Indian Ricegrass.

O'Toole Sheep Reclamation

(SE¼SW¼ Sec 32, T12N, R97W, CO)

Close up of the ground near the place the previous photo was taken showing perennial grass and litter and not much bare ground. Litter is from previous years' cover crop-barley and what was fed to the sheep-alfalfa. Note blooming blue flax in the center of the photo. **Photo date of 7-16-10**

O'Toole Sheep Reclamation

(SE¼SW¼ Sec 32, T12N, R97W, CO)

Another photo in the same vicinity showing both litter and growing grass. The litter is from the last growing season in 2009. and is protecting the ground surface from wind and water erosion. The perennial grass is in the later stages of dormancy as indicated by the light brown color evident in the seed stalks and leaves. **Photo date of 7-16-10**

SE¼ NW¼ Section 32, T12N, R97W, CO. Producing Gas Well Location. First growing season.
July 16, 2010 Photo.

O'Toole Sheep Reclamation

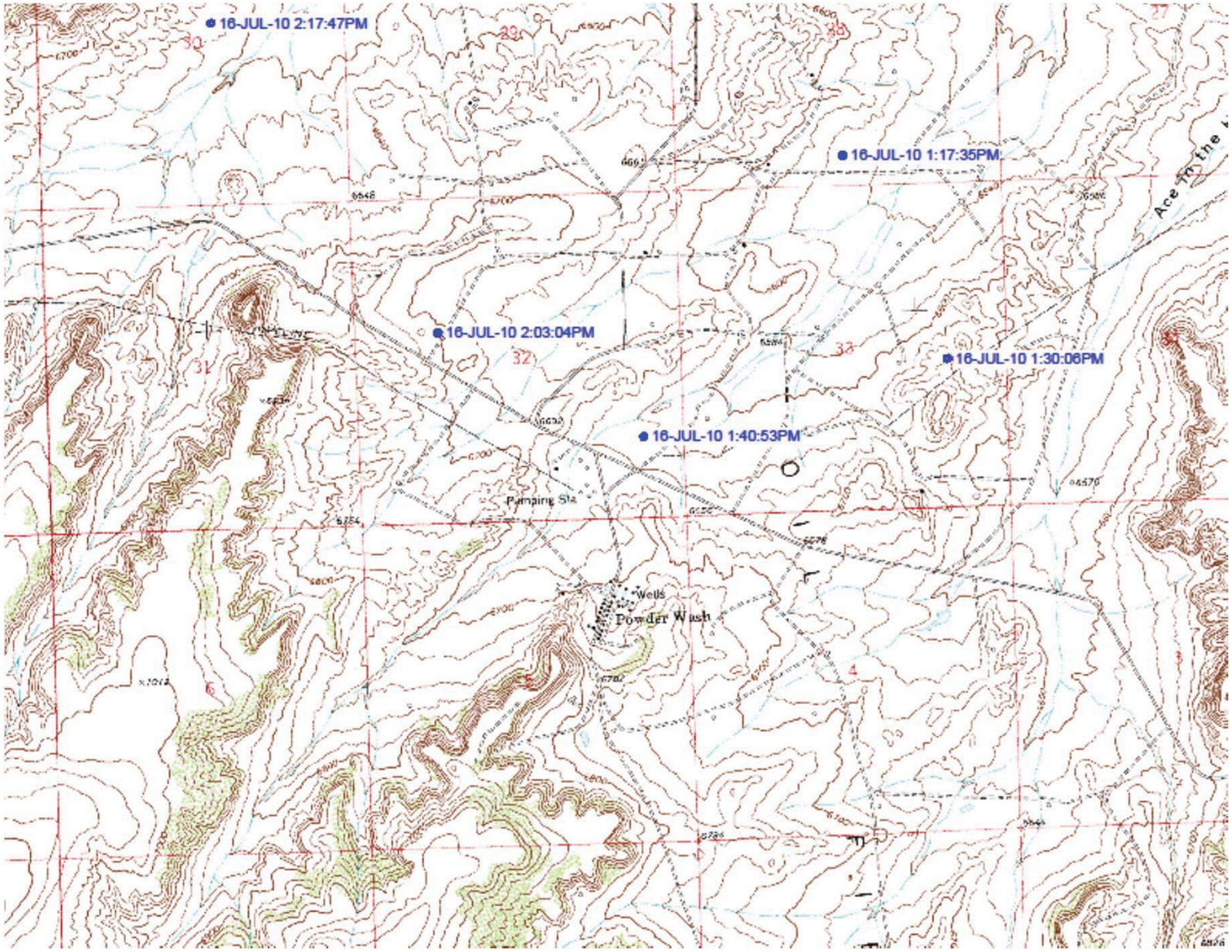
(SE¼NW¼ Sec 32, T12N, R97W, CO)

Photo looking north from center of location. The site is in its 1st Growing season and as compared to the first site in the presentation may have been affected by over-compaction and possibly too much barley straw covering the ground or both factors because there is little difference in the soils or precipitation received by the sites or than the management actions applied.

O'Toole Sheep Reclamation

(SE¼NW¼ Sec 32, T12N, R97W, CO)

Photos that make up a panorama of the site too large to view in PowerPoint. You may take each photo and resize in your program to view details once opened in PowerPoint. Note that amount of litter from straw in the areas. Of note the tall stature plant is Rocky Mountain Bee Plant which takes a healthy shot of precipitation to germinate.

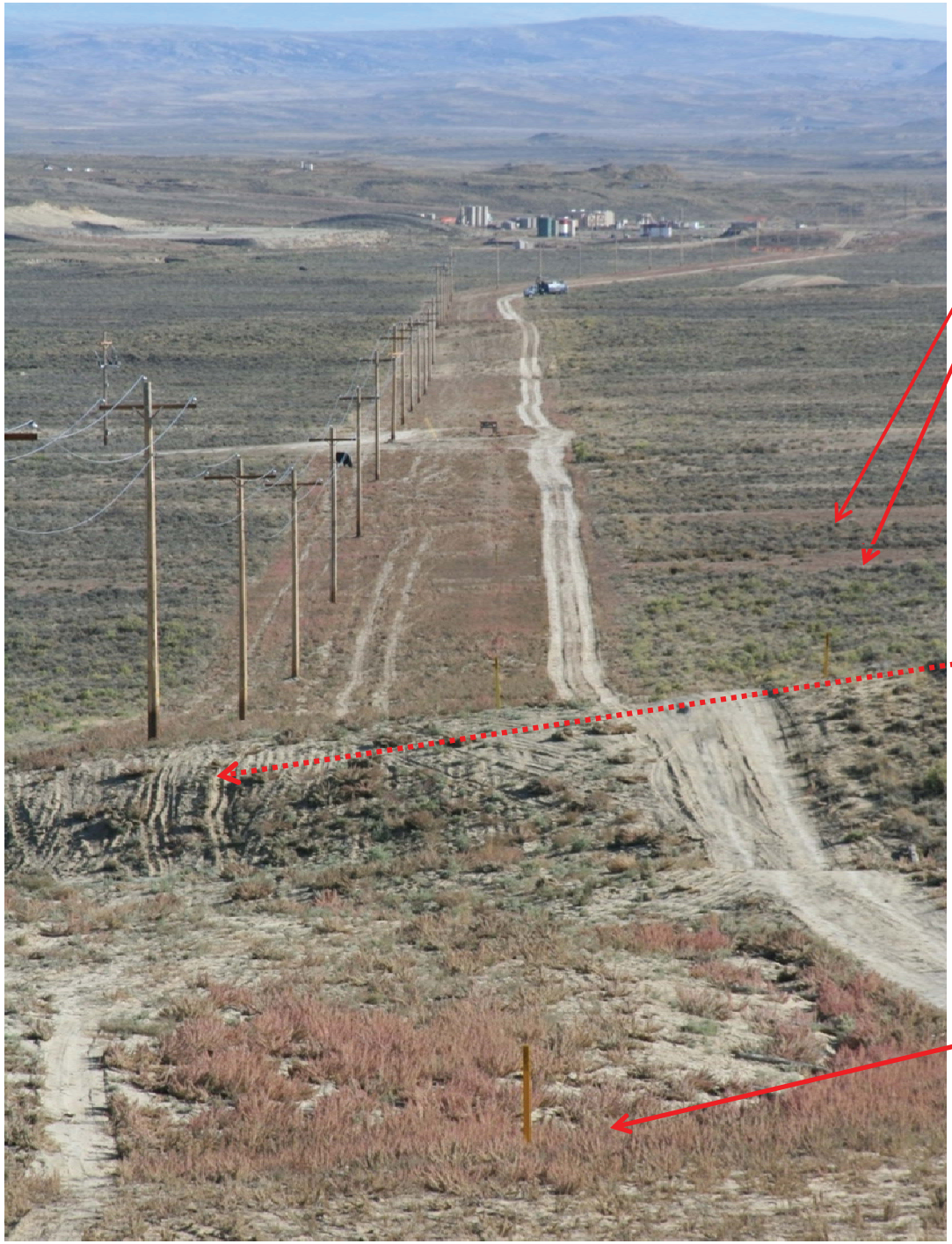


Map of Questar Locations at Powder Wash, CO

Mechanical Imprinting and Seeding

Chris Herold's Imprinter and Seeder

View of a Gas Pipeline infected with Halogeton from adjoining BLM managed lands, and the pipeline has failed a reclamation effort from 2005 due to a seeding failure as well as the influx of halogeton and as well climate may have played a partial role. Photo taken October 3, 2007. New reclamation occurred using mechanical imprinter in November, 2007 and no soil amendments



Halogeton in adjoining BLM Managed rangeland

Note deep furrows resulting from the seed drill used to seed the pipeline

Halogeton-In the pipeline right of way

Eastern Washakie Pipeline replanted in fall of 2007 using imprinting seeder. Photo taken July 28, 2010 in the 3rd growing season showing the total change around from the previous seeding. Slender Wheatgrass, Indian Ricegrass, Basin Wildrye, Western Wheatgrass, Blue Flax, Greasewood, Shadscale and Gardner's Saltbush are evident in the pipeline/utility corridor.

Photos of a Halogeton areas west of and adjacent to the pipeline

On the flat slope of the pipeline. Man in photograph is 6’5” to top of helmet and holding on to a Basin Wildrye plant three (3) years old – seed stalk is over his head-all the green in the photo are Basin Wildrye and the tan colored vegetation is slender wheatgrass and western wheatgrass and Indian Ricegrass. Viewing southwest.

Ground surface at the site the man is standing in previous photo. Litter from the previous two years growth blankets the ground and creates cover for insects and moisture and new grass plants from the rhizomes In foreground) and the new seed source.

Looking North back-up the pipeline/utility corridor from the location last photo was taken.
Virtually no weeds noxious or invasive in the right of way.

Cross sectional view of pipeline looking west. In the foreground the pipeline reclamation and in the background behind the trucks is the halogeton /bare ground area adjacent to the pipeline to the west

Cross sectional views of the pipeline looking east taken as I travel south on the right of way. Over 50% of the vegetation is slender wheatgrass and very minimal weeds.

PowerPoint presentation prepared and photographed by Tim Morrison from the Little Snake River Conservation District

Thanks goes to Patrick O'Toole for taking me out to witness their reclamation successes using sheep and to Chris Herold the inventor and practitioner who has created a machine to imprint seeds and create an environment for plant growth success much the same as a sheep imprint the seed for O'Toole's.

Goats Eating Annual Weeds to Allow Seeded Grass to Become Better Established

Bonus Slide: