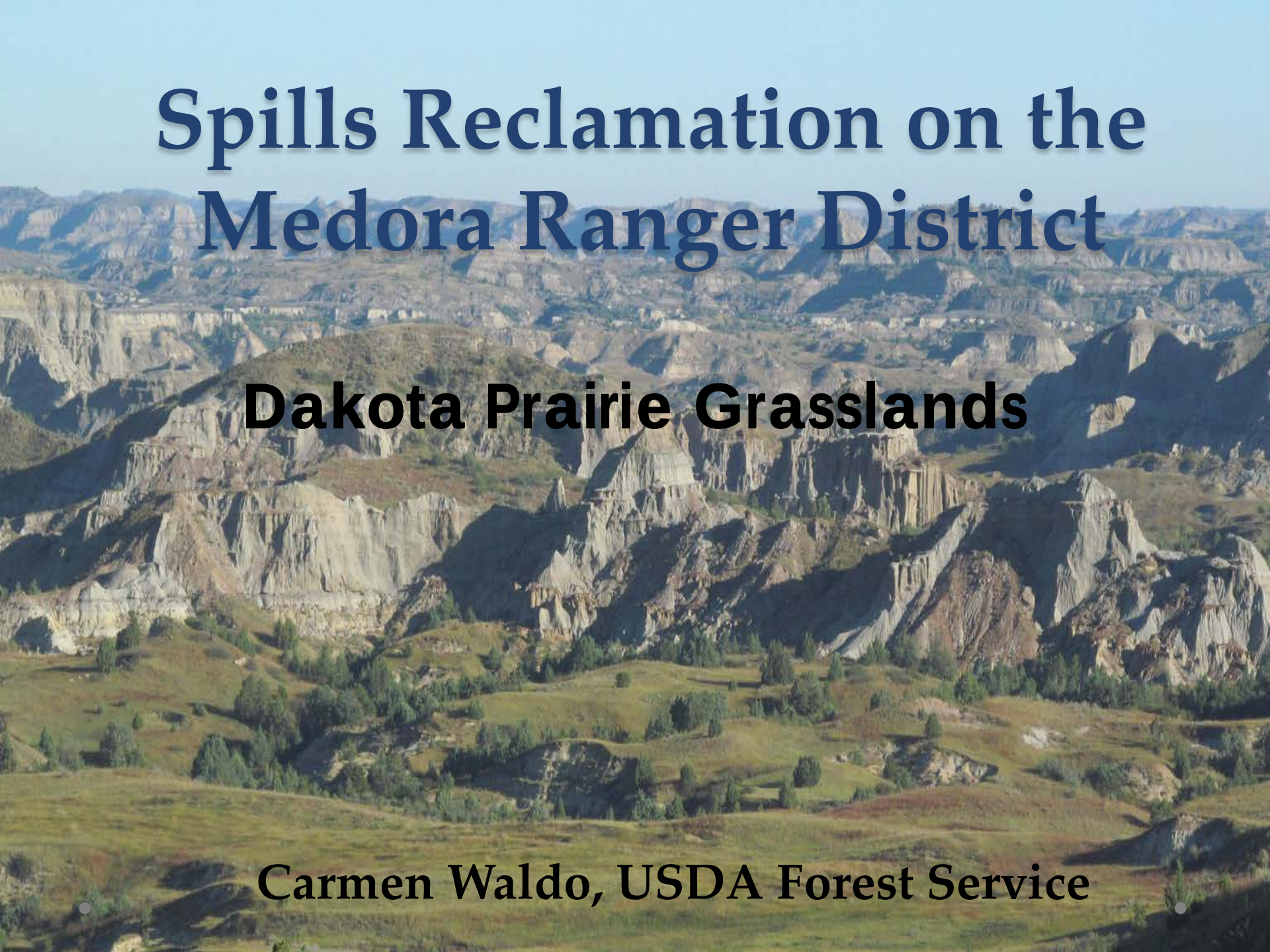
Spills Reclamation on the Medora Ranger District



Dakota Prairie Grasslands

Carmen Waldo, USDA Forest Service

Given: Bad Things Happen

- **"Nature of the business"**
  - **Weather**
  - **Corrosion**
  - **Human error**
  - **Aging infrastructure**
- **How do we respond?**
  - **Fast reporting**
  - **On or off location**
  - **Proximity to sensitive areas**
  - **Availability of crews/resources**

Oil Spills

- Easy to see
- Oil = +$$
- Clean oil

But –

- A little bit of oil goes a long way!

Saltwater Spills

- Initially, can be difficult to delineate, esp in wet conditions
- Pure loss of $$
- Long term detrimental effects

Saltwater spill scenario

- Pipeline to disposal well

- 12/17/2011

- 60 bbls reported spilled

- 120+ bbls recovered

- Affected surface area:
~165’ x 12’ frozen surface

Decision: 1) Remove contaminated soils

2) Pack floor of trench with clay to prevent downward water migration

3) install catch basin and French drain system to collect water, 1-2% slope following pipeline trench from 2 directions

Catch basin:

- Minimum 14’ diameter

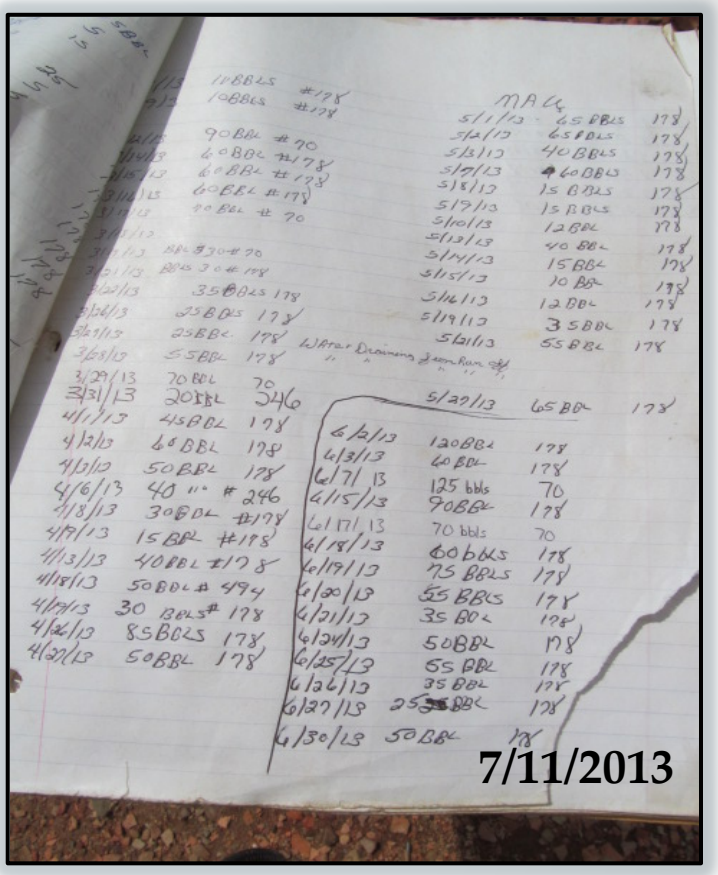
- Bentonite lined bottom

- 2’ pea gravel depth

Reclamation and Monitoring

Clean soils, weed-free topsoil, native seed mixture, 2 x ground water monitoring wells tested every 6 months, 2-3 x week remove water from catchbasin, test water quality every 6 months

Currently



1838 tons of contaminated soils

~450'x6' disturbance to north

~400'x6' disturbance to east

- Company continues to remove water from catchbasin

- Continues to monitor water quality in monitoring wells and natural spring nearby

Saltwater spill scenario

- 3/21/2008
- 100 bbls saltwater
- Mole holes in dike allowed some water to escape containment
- Traveled 288’ in one direction, contained by topography
- Traveled 295’ in another direction down a steep slope, then 150’ in a dry creek bed
- Bioremediation proposal

- **Down the steep slope:**
  - Mininum 1000 gallons of 10% gypsum solution
  - Allow to wash slowly, following track of spill
- **Mid level portion**
  - Est 1200 ft^2 c
  - 1000 lbs agricultural grade gypsum
  - 10 large weed-free straw bales
  - Disc in to a depth approx 6”
  - Erosion control

Comparison photos

Emulsion spill scenario

- Blow-out through flare stack
- 7/15/2011
- 220 bbls brine water; 10 bbls oil
- 780’ private land
- 1330’ USFS surface
- Ended in a stock dam

Initial response:

- Mow the tall grass to enable seeing!

- Grass clippings bagged and properly disposed of

- Drain the stock dam to prevent downstream movement

- Use the stock dam as containment for flushing

Complicating factors:

- Spring water
- Naturally high EC
- Sheen
- Replenishing stock dam

- Solution grade gypsum mixed with fresh water
- Flooded the track of the spill
- Vac'd up in the stock dam
- Re-assess in following years

Less than one year later

Soil conservation

- Spills generate waste material
- Every yard of material removed = a yard of material that must be brought in for replacement

Chimney Butte Environmental landfill

- Opened March 2013
- Has rec'd 146,000 tons
- Total capacity: 9.6 million cubic yards

What we need

Technology

- The ability to distinguish produced water salts from naturally occurring salts in the field
- Quicker turn-around on lab samples
- Standards/guidelines for determining when remediation is a reasonable alternative

Ideas/research

- New ideas for technology/methods of reclaiming produced water spills *in situ*
- Research on long term consequences of using bioremediation methods
- Are there other components of brine water that we aren't taking into consideration?

Basic steps to achieve adequate reclamation

- Cleanup must be adequate
- Segregate soils – conserve soils – replace in order
- Erosion control properly installed
- Seed with approved native weed-seed-free seed mix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Thank you
Carmen Waldo, USFS
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