Reclamation Success
Best Management Practices

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Objective

Identifying factors necessary for reclamation success at different environmental growing conditions

Economic importance of Native and Nonnative plants

Policies and BMP regarding reclamation

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What are native plants?

Native or indigenous plants occur naturally in a particular region without direct or indirect human actions

These species are adapted to local conditions

- Soil
- Rainfall
- Temperature conditions
- Tolerant to many insects, weeds and diseases

✓ Native plants have evolved in concurrence with other biota in the area, to form a complex network of relationships

Importance of native plants

- Feed and habitat for wildlife
- Reclamation/restoration/recreation (prairie, abandoned mines, oil and gas exploration)
- Forage (warm and cool season grasses)
- Windbreaks
- Soil builders
- Biomass/Bio-fuels/renewable resources
- Carbon sequestration

Importance of native plants

- Erosion control (Warm season grasses, extensive fibrous root systems hold soil and slow runoff)

- Require fewer resources
  - ✓ Water
  - ✓ Fertilizers
  - ✓ Herbicides
  - ✓ Avoids reseeding

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Factors affecting native plant establishment

- Depth of planting (seed too deep/too shallow)
- Planting date
  - Soil temp. optimum for germination
  - Soil moisture b/n field capacity/permanent wilting %age
  - Soil aeration to provide sufficient oxygen
  - Soil problem (Salinity, extreme pH)
  - Anticipated weather patterns
  - Adaptation of crop to soil and climatic conditions

Factors affecting native plant establishment

- Seed viability
- Improper species mixtures
- High/low seeding rates
- Lack of management
- Soil seed contact
- Unknown seed source
- Certified seed shortage

Seed Certification

Recognized classes of certified seed include;

- Breeders Seed
- Foundation Seed
- Registered Seed
- Certified Seed

The most common levels of certification that would normally be available for consumer purchase would be "Certified Seed".

- ✓ Seed certification
- ✓ Reading seed analysis tags
- ✓ Purchasing the best quality seeds available

What are non-natives?

- An "invasive species" is defined as a species that is
  - 1) non-native to the ecosystem under consideration and
  - 2) whose introduction causes or is likely to cause economic or environmental harm to human health. (Executive Order 13112, Appendix 1).

- Invasive species affect the natural habitat and the entire nation in the world
  - Damaged goods and equipment
  - Food and water shortages
  - Environmental degradation
  - Natural disasters
  - Disease epidemics
  - and even lost lives

What are non-natives?

- Some non-native organisms that are intentionally imported escape from captivity or are carelessly released into the environment and become invasive

- One report indicates that the economic cost of invasive species to Americans is an estimated $137 billion every year (Pimentel *et al*. 2000)

- Up to 46% of the plants and animals federally listed as endangered or threatened species have been negatively impacted by invasive species (Wilcove *et al*. 1998).

Uses of exotic plant species

- Non-native plants are used for a specific purpose in the reclamation/restoration project
  - Cover crops (sweet clover(*Melilotus sp.*), alfalfa)
  - Nurse crops
  - Nitrogen fixers
- Shelter and Food for Native Species
- Facilitators for reclamation/restoration
  - ✓ Non-native species that increase structural heterogeneity and complexity of an area are positively correlated with increases in abundance or species richness as long as they are not competitive
  - ✓ Site stabilization for the restoration of native species

Survival and Competitive Factors of Non-Native Plants

- ✓ **Growth Rate**
- ✓ Seed Production
- ✓ Seed dormancy
- ✓ Reproduction method
- ✓ Life cycle

- Intercept the crop's light and shade
- Large root system
  - Extract water and nutrients

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Survival and Competitive Factors of Non-Native Plants

- ✓ **Growth Rate**
- ✓ **Seed Production**
- ✓ Seed dormancy
- ✓ Reproduction method
- ✓ Life cycle

- High seed production increases the likelihood that the weed will remain competitive over time with native populations

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Survival and Competitive Factors of Non-Native Plants

- ✓ **Growth Rate**
- ✓ Seed Production
- ✓ Seed dormancy
- ✓ Reproduction method
- ✓ Life cycle

- Ensures that the weed will survive in the field for years
- To reappear at competitive levels when the dormancy is broken

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Survival and Competitive Factors of Non-Native Plants

- ✓ Stand Establishment Under Stress
- ✓ Uniformity of Stand
- ✓ Seedling Vigor
- ✓ **Reproduction method**
- ✓ Life cycle

- Seed and vegetative parts
  - Seed viability
  - Seed dormancy
  - Seed numbers
- Vegetative reproduction
  - Perennial weeds
  - From stolons, rhizomes, bulbs, aerial bulblets, corms, tubers or tap roots

Survival and Competitive Factors of Non-Native Plants

- ✓ Growth Rate
- ✓ Seed Production
- ✓ Seed dormancy
- ✓ Reproduction method
- ✓ Life cycle

- Weeds that germinate faster
- Grow rapidly

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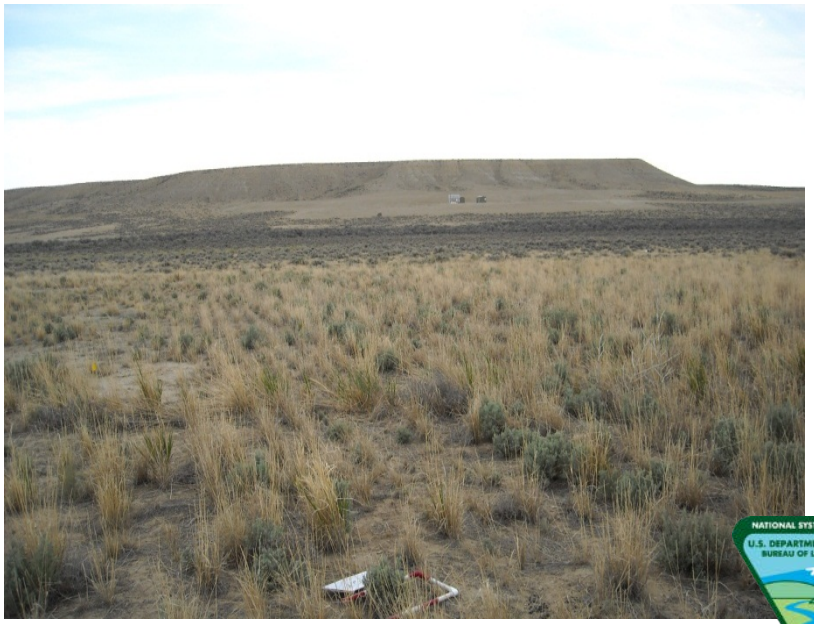
Russian thistle in Pinedale WY area

- Picture taken 2010

(Jonah Energy)

- Picture taken 2012

(Jonah Energy)



Russian thistle in Pinedale, Jonah Field

- Picture taken in 2007

Jonah Energy/Mesa area

- Picture taken 2010

Jonah Energy/Mesa area

Reclamation/Restoration

- What is Land Reclamation?
  - The process of improving disturbed land (soil, vegetation, water) to achieve functions of the land similar to predisturbed condition or for a specified land use plan.

- What is Ecosystem Restoration?
  - The process of manipulating an ecosystem (soil, vegetation, water and wildlife) to achieve composition, structure and function similar to the predisturbed condition.

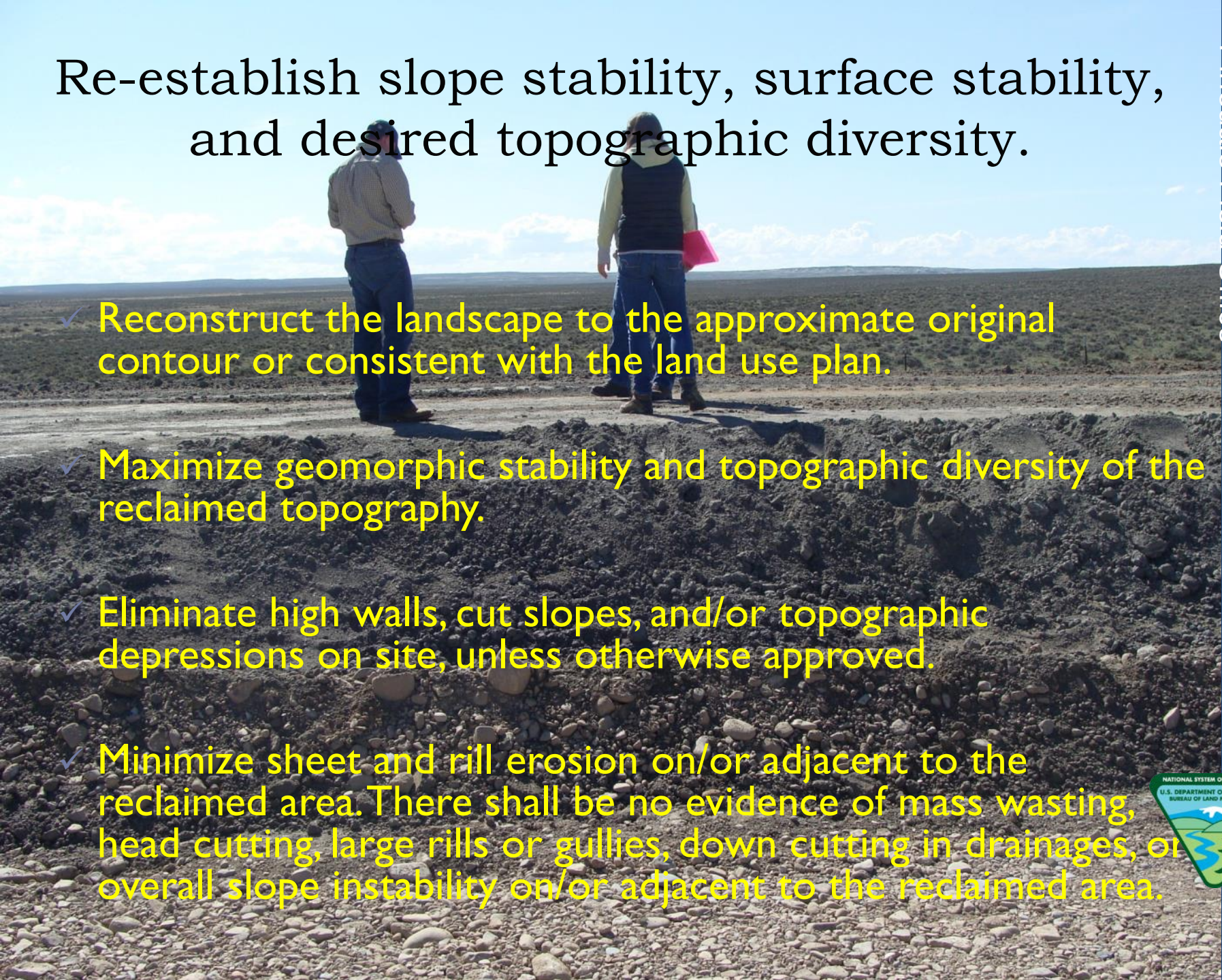
RECLAMATION REQUIREMENTS BLM's Policy

- **Manage all waste materials:**
  - ✓ Segregate, treat, and/or bio-remediate contaminated soil material.
  - ✓ Bury only authorized waste materials on site.
  - ✓ Ensure all waste materials moved off-site are transported to an authorized disposal facility.

Ensure subsurface integrity, and avoid sources of ground and surface water contamination.

- Properly plug all drill holes and other subsurface openings (mine shafts, rat holes, adits etc.).
- Stabilize, properly back fill, cap, and/or restrict from entry all open shafts, underground workings, and other openings.
- Control sources of contamination and implement best management practices to protect surface and ground water quality.

Re-establish slope stability, surface stability, and desired topographic diversity.



- Reconstruct the landscape to the approximate original contour or consistent with the land use plan.
- Maximize geomorphic stability and topographic diversity of the reclaimed topography.
- Eliminate high walls, cut slopes, and/or topographic depressions on site, unless otherwise approved.
- Minimize sheet and rill erosion on/or adjacent to the reclaimed area. There shall be no evidence of mass wasting, head cutting, large rills or gullies, down cutting in drainages, or overall slope instability on/or adjacent to the reclaimed area.

Reconstruct and stabilize water courses and drainage features.

- ✓ Reconstruct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins.

- ✓ Reconstruct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems.

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Maintain the biological, chemical, and physical integrity of the topsoil and subsoil

- Identify, delineate, and segregate all salvaged topsoil and subsoil based on a site specific soil evaluation, including depth, chemical, and physical characteristics.
- Protect all stored soil material from erosion, degradation, and contamination.
- Incorporate stored soil material into the disturbed landscape.
- Soil storage piles to be stored beyond one growing season, should be seeded with appropriate vegetation (native or sterile non-native species).
- Identify stockpiles with appropriate signage.

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Prepare site for re-vegetation.

- Redistribute soil materials in a manner similar to the original vertical profile.
- Reduce compaction to an appropriate depth (generally below the root zone) prior to redistribution of topsoil, to accommodate desired plant species.
- Provide suitable surface and subsurface physical, chemical, and biological properties to support the long term establishment and viability of the desired plant community.
- Protect seed and seedling establishment (e.g. erosion control matting, mulching, hydro-seeding, surface roughening, fencing, etc.)

Establish desired self-perpetuating native plant community.

- ✓ **Establish species composition, diversity, structure, and total ground cover appropriate for the desired plant community.**
- ✓ **Enhance critical resource values (e.g. wildlife, range, recreation, biodiversity, etc.), where appropriate, by augmenting or accelerating restoration of plant community composition, diversity, and/or structure.**
- ✓ **Select genetically appropriate and locally adapted native plant materials (e.g. locally sourced or cultivars recommended for seed zone) based on the site characteristics and ecological setting.**
- ✓ **Use locally sourced and/or collected seeds to the extent possible (local collection and logistics should be included in the Reclamation Plan).**

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Reestablish a complementary visual composition

- Ensure the reclaimed landscape features blend into the adjacent area and conform to the land use plan decisions.
- Ensure the reclaimed landscape does not result in a long term change to the scenic quality of the area.

Manage Invasive Plants

- ✓ Assess for invasive plants before initiating surface disturbing activities.
- ✓ Develop an invasive plant management plan.
- ✓ Control invasive plants utilizing an integrated pest management approach.
- ✓ Monitor invasive plant treatments.

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Federal Policy about Non-Native Plants

Establish desired self-perpetuating native plant community

- Select non-native plants
  - ✓ Short term
  - ✓ Non-persistent (i.e. sterile)
  - ✓ Alternative to native plant materials

Federal Policy about Non-Native Plants

- Ensure the non-natives will not
  - Hybridize
  - Displace
  - Offer long-term competition to the native plants
  - Designed to aid in the re-establishment of native plant communities

Develop and implement a reclamation monitoring and reporting strategy.

- Conduct compliance and effectiveness monitoring in accordance with a BLM approved monitoring protocol.
- Evaluate monitoring data for compliance with the reclamation plan.
- Document and report monitoring data and recommend revised reclamation strategies.
- Implement revised reclamation strategies as needed.

Summary

- ✓ Some important factors to consider for reclamation success
- ✓ Economic importance of Native and Nonnative plants
- ✓ Policies and BMP regarding reclamation

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Questions?