





# RECLAMATION APPENDIX

## INTRODUCTION

This appendix gives guidance for appropriate reclamation planning prior to authorization and following surface disturbance. Prior to a surface-disturbing activity taking place, sites would be evaluated on a case-by-case basis and mitigation measures would be prescribed where appropriate. Reclamation planning would be site-specific, project-specific, and incorporate the project's complexity, environmental concerns, post-disturbance land use, and reclamation potential.

As such, the level of detail and complexity required of reclamation planning would be dependent on the nature of the resource being impacted and the extent and complexity of the surface-disturbing activity. Some activities may require a highly detailed Reclamation Plan to ensure that reclamation goals and objectives are achieved, while others may have reclamation measures integrated into the engineering design, permit application, or other comparable project documentation.

In cases where a Reclamation Plan is required, the Bureau of Land Management (BLM) would work with the project proponent or proponents to prepare the Plan. Plans would incorporate program or regulation specific requirements. The Reclamation Plan would be considered complete when the applicable requirements described below have been addressed, the techniques to meet the requirements are described in detail, and the BLM approves the Reclamation Plan. Reclamation Plans would be periodically reviewed (including monitoring and reporting) and modified as needed. Reclamation is considered successful when all applicable requirements described in the approval document for the proposed activity have been addressed onsite and the BLM approves the reclamation.

## RECLAMATION GOALS

The goals for reclamation activities would be consistent with the impacted resources' goals and objectives within this Resource Management Plan (RMP). The short-term goal of reclamation activities includes immediate stabilization of the disturbed area and the creation of conditions needed to meet long-term goals. The long-term goal of reclamation activities is concurrent eventual ecosystem restoration through natural processes, a safe and stable landscape, and achievement of desired conditions described in the RMP.

## RECLAMATION OBJECTIVES

These reclamation objectives would be selected and applied on a site-specific, project-specific basis. Not all reclamation objectives would be appropriate for all surface-disturbing activities, and the project proponents should carefully select reclamation measures based on the characteristics of the site, and surface-disturbing activity. In addition, these objectives are not all inclusive, as specialized experience, evolving technology, and future research may provide additional methodology or refinement of the listed objectives. Where these reclamation guidelines differ from stricter applicable laws, rules, and regulations, those standards replace this policy.

Most landscapes can be reclaimed using established conventional reclamation methods. However, some areas have unique characteristics that make achieving all the reclamation requirements unrealistic (e.g., sensitive soils, sensitive vegetation types, soils with severe physical or chemical limitations, steep slopes). These limited reclamation potential areas may require site-specific measures not addressed in this appendix. For these areas, each project would develop a unique set of requirements for reclamation success.

The reclamation objectives are:

- 1. Ensure subsurface integrity and eliminate sources of ground and surface water contamination.**
  - a. Maintain all erosion or sediment control devices until vegetation is reestablished, site is stabilized, or the devices are no longer needed.
  - b. Fertilizer and soil additives would not be applied where they could adversely impact water quality.
  - c. Water bars are required on 25 percent slopes or greater and will be used as necessary on gentler slopes.
    1. Suggested spacing between water bars would follow the guidelines below:
      - a. for slopes less than 10 percent, the spacing would be at least every 100 to 400 feet,
      - b. for slopes 10 to 19 percent, the spacing would be at least every 75 to 200 feet,
      - c. for slopes 20 to 39 percent, the spacing would be at least every 50 feet,
      - d. for slopes greater than 39 percent, the spacing would be at least every 25 feet, and
      - e. *The Gold Book* (BLM and USFS 2007b) has further guidance and cross-sectional diagrams for water dips that are drivable.
    2. Vary water bar spacing to:
      - a. fit site conditions,
      - b. promptly intercept surface water before the volume of water and velocity increase enough to generate erosion, and
      - c. facilitate drainage toward natural dips, rocky ground, or vegetation to intercept sediment.
    3. Design water bars to:
      - a. be 4 to 6 inches high, but could be deeper depending on site conditions,
      - b. be at a 20 degree angle to the slope and channel water to the downhill side, and
      - c. avoid directing sediment into drainages.
- 2. Reestablish slope and surface stability and desired topographic diversity.**
  - a. Reconstruct the landscape to blend with adjacent contours and to maintain the approximate original contour. However, if the site has stabilized and recontouring would cause additional disturbance, this step may be waived by the authorized officer.
  - b. Maximize geomorphic stability and topographic diversity of the reclaimed topography.
  - c. Disturbed areas would be recontoured to provide proper drainage.
  - d. Eliminate highwalls, cut slopes, or topographic depressions, unless otherwise directed.
  - e. Backfill to prevent surface subsidence. No downward movement of surface material would be evident, and the site would be maintained to correct settling within 1 year of reclamation. See the *Monitoring Appendix* for specific guidelines on subsidence assessment.
  - f. There would be no evidence of slope instability on or adjacent to the site, other than minimal sheet, rill, or wind scour erosion within 1 year of reclamation. Minimize accelerated erosion and sedimentation on or adjacent to the reclaimed area with appropriate erosion and sedimentation control measures immediately following disturbance. See the *Monitoring Appendix* for specific guidelines on erosion assessment.
  - g. Erosion control matting would be unrolled from the bottom toward the top of the slope, placed along the direction of water-flow and loosely over soils with extreme surface roughness, and in compliance with the manufacturer's instructions (Wright 2000).
  - h. Reclaim all roads and trails unless they meet public demand.

- i. The Burned Area Emergency Stabilization and Rehabilitation BLM Handbook H-1742-1 contains further guidance on erosion and sedimentation control Best Management Practices (BMPs).

**3. Reconstruct and stabilize watercourses and drainage features.**

- a. Reconstruct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in the site's naturally functioning basin or, if appropriate, nearby and similar reference basins.
- b. Reconstruct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in the site's naturally functioning system or, if appropriate, nearby and similar reference systems. There would be minimal evidence of streambank erosion and no evidence of active headcutting and channelization (beyond that which already exists) within 1 year of the disturbance.
- c. Upland erosion would be controlled effectively and sediment would not be transported to stream systems.

**4. Maintain the biological, chemical, and physical integrity of the soil resource.**

- a. Identify, delineate, and salvage all topsoil and subsoil based on a site-specific and project-specific soil evaluation. Subsoil or overburden may be used as suitable growth medium if topsoil is not suitable.
- b. When possible, soil would be direct-hauled to similar ecological sites during the reclamation process. If this were not possible, topsoil would be stockpiled separately from subsoil. All stockpiles would be appropriately identified and remain undisturbed until reclamation.
- c. Protect all stored soil material from erosion, degradation, and contamination. Stockpiles would be of a stable configuration. Stockpiles would be located above the high water mark and away from riparian areas, floodplains, wetlands, and other sensitive areas. If stored for more than 30 days, erosion control (e.g., water or tackifier) would be applied immediately. If stored during the growing season, native seed would be applied within 30 days of storage. Stockpiles would be stored near the disturbance. Applied water would not degrade soil quality.
- d. Displaced farmland, whether in production or not, would be reclaimed to original productivity.

**5. Prepare site for revegetation.**

- a. Provide suitable surface and subsurface physical, chemical, and biological properties to support the long-term establishment and viability of the desired plant community as soon as possible following disturbance.
- b. Redistribute soil resources along contours and in a manner similar to the original vertical profile. Incorporate soil material so that it blends in with the adjacent landscape, corresponding to adjacent surface roughness (macro- and microtopography). Avoid scalping more than 1 inch of undisturbed soils when redistributing spoils and salvage piles.
- c. Reduce subsoil compaction to a minimum of 18 inches deep, except in bedrock, prior to redistribution of topsoil. Cross-rip along contours with two passes perpendicular to each other.
- d. Prepare a proper seedbed when environmental conditions are appropriate (Strom et al. 2010):
  1. Replace topsoil unevenly back over subsoil in order to create microsites.
  2. Seed when a weak ball can be formed from soil 2 to 3 inches below the surface.
  3. Clods would be less than 2 inches in diameter.

4. A 170-pound person would leave footprints no deeper than half an inch.

**6. Establish a desired, self-perpetuating, native plant community.**

- a. Establish species composition, richness, structure, and total ground cover appropriate for the desired plant community as soon as possible following disturbance. The site would be compared to a reference site or a National Resources Conservation Services (NRCS) Ecological Site Description (<http://www.mt.nrcs.usda.gov/technical/ecs/range/ecosites/>), whichever is appropriate. Multiple treatments may be required before success is achieved. See the *Monitoring Appendix* for specific guidelines on vegetation assessments. Vegetation objectives include:
  1. Within 2 years of reclamation, the site would contain 50 percent of the reference area's vegetative basal cover.
  2. Within 5 years of reclamation, the site would contain 80 percent of the reference area's vegetative basal and canopy cover.
  3. Within 2 years of reclamation, 50 percent of the vegetative cover would consist of desirable species.
  4. Within 5 years of the reclamation, 90 percent of the vegetative cover would consist of desirable species.
  5. Composition would meet reference site conditions within 5 years of the reclamation. For example, structure would be made up of 70 to 75 percent grasses and grass-like species, 5 to 10 percent forbs, and 5 to 10 percent shrubs. A minimum of 25 percent of the shrub component would be the reference site's dominant species.
  6. Monocultures would not be allowed beyond 2 years of reclamation.
  7. The site would not have state- or county-listed noxious weeds within 5 years of reclamation.
- b. Using NRCS ecological sites and soil surveys, select genetically appropriate and locally adapted native plant materials based on the site characteristics and ecological setting whenever possible. Streambanks would be replanted with riparian vegetation following current ecological restoration practices.
- c. Native species are preferred; select nonnative plants only as an approved short-term, non-persistent, alternative to native plant materials (BLM Handbook 1740-2 and Executive Order 13112 of February 3, 1999). Ensure the nonnative species are designed to aid in the reestablishment of native plant communities and will not hybridize, displace, or offer long-term competition to the endemic plants.
- d. Seed sites when environmental conditions are appropriate and as soon as possible following re-contouring and seedbed preparation. Dormant fall seeding is recommended, typically after October 1st, when soil temperatures are less than 40 degrees Fahrenheit (F) at a 2-inch depth (for 10 days or more) and before the ground freezes (Holzworth and Wiesner 2007). Warm season species are more successful when seeded in the spring when soil temperatures are a minimum of 55 degrees F (2007). Spring seeding should take place as early as possible, prior to May 15, on thawed, friable surface soil (2007). If seeding after May 15, complete seeding prior to August 15, and when soil is moist down to 2 feet deep (2007).
- e. Approved seed rates would be specified in pounds of pure live seed (PLS) per acre and be designed to adequately cover the soil upon germination. Seed would be tested to ensure viability and purity (germination or tetrazolium chloride tested by a registered seed analyst within 1 year of receipt). Seed would be certified weed free (BLM 2006a, 2007c, and BLM Manual H-1740-2). Seed would have easily accessible documentation (not seed bag tags), including sources.
- f. Drill or broadcast seed along contours. Broadcast seeding followed by packing with a roller or drag (e.g., chain, harrow) with two passes perpendicular to each other is the preferred method of seeding. Drill seed with a 6-inch row spacing. Bury seed at depths

2.5 to 3 times the diameter of the seed; for small seeds use length rather than diameter (Monsen et al. 2004). Hydroseeding is not recommended, but if approved, the seed should be spread in an initial pass and then covered by a mulch mixture (if needed) in a second pass; the mulch and seed should never be combined in a single pass.

- g. The recommended drill seeding rate for large-seeded species is 20 pure live seed per square foot (or PLS/ft<sup>2</sup>), and the recommended drill seeding rate for small-seeded species (most seed mixes) is 30 to 40 PLS/ft<sup>2</sup>. Double the drill-seeding rate for broadcast or aerial seeding to a maximum of 80 PLS/ft<sup>2</sup>.
- h. Seed additives are allowed (e.g., rhizobium, mycorrhizae, fungicide, pilling).
- i. If the site does not meet desired roughness following seeding and packing, the site would be scarified or imprinted (e.g., rip, roll, imprint, harrow). Scarify and imprint no greater than several inches deep, along contours (Steinfeld et al. 2007). However, this step in the process would be followed only if necessary, because running equipment over the site would further pulverize and compact the soil.
- j. Rock and woody debris would be replaced along contours and equivalent to pre-disturbance conditions and positioned to blend with adjacent areas. Felled trees would be low-stumped (uphill side no greater than 6-inches above the ground) and removed from drainages. Any excess woody debris would be removed or burned in upland areas.
- k. Protect seed and seedling establishment with appropriate measures. Erosion-control matting and mulch would be biodegradable and certified weed and insect free. Matting would contain holes greater than 2 inches in diameter and a 2-year photodegradation life. Tackifier would be biodegradable. Straw or native hay mulch would be mold- and fungi-free and would be crimped vertically at a rate of 1 to 2 tons per acre, so that 80 to 90 percent of the ground is covered (Wright 2000). Wood mulch is not recommended. All twine associated with straw or hay mulch would be biodegradable, but if it is not, then it would be collected and properly disposed.
- l. The Burned Area Emergency Stabilization and Rehabilitation Handbook, the Integrated Vegetation Management Handbook, and the Native Seed Network website (<http://www.nativeseednetwork.org/>) contain further guidance on revegetation BMPs.

**7. Reestablish complementary visual composition.**

- a. Ensure the reclaimed landscape features blend into the adjacent area and conform to RMP decisions (BLM Manual H-8431).
- b. Ensure the reclaimed landscape does not result in long-term changes to the scenic quality of the area or change the scenic quality rating (BLM Manual H-8410).

**8. Manage invasive species (the same as appears in the *Best Management Practices Appendix*).**

- a. The project area would be inventoried for invasive species on and adjacent to the site before initial activities.
- b. An invasive species management plan would be developed if appropriate.
- c. Invasive species would be controlled using an integrated pest management approach.

**9. Develop and implement a project-appropriate reclamation monitoring and reporting strategy.**

- a. Contain a compliance and effectiveness monitoring protocol in accordance with BLM-approved monitoring methods. Observations would include accelerated erosion and sedimentation, subsidence, revegetation, and invasive species. Observations would be preferably taken in the spring, before livestock are turned onto the reclaimed sites. Subsequent annual inspections would occur at the same vegetative phenological stage as the first inspection.
- b. Evaluate monitoring data for compliance with the reclamation plan.

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- c. Document and report monitoring data detailing vegetation reestablishment, utilization, and site stability to the BLM within 2 months of the on-site inspection. Include in the document:
  1. digital tabulated data and photographs,
  2. shapefiles of global positioning system locations that include all associated data,
  3. a discussion of the existing environment as compared to the objectives,
  4. vegetation data summarized by morphological group (e.g., grass, grass-like, forb, shrub, or tree),
  5. livestock utilization over the past year including species, timing, and duration, and
  6. if any of the objectives have not been met, include in the report an explanation for failing to meet the objective and recommendations for remedial measures where appropriate.
- d. The BLM would evaluate the report and reply back to within 2 months of receiving the report. Site-specific evaluations may be recommended following BLM evaluation of data. The BLM may suggest remedial measures, alter proposed remedial measures, or alter the method or interval for monitoring and reporting.
- e. Implement revised reclamation strategies where appropriate.
- f. Continue the process of monitoring, evaluating, documenting, reporting, and implementing until reclamation goals and objectives are achieved.
- g. In locations where the reclamation goals and objectives have been achieved, and with the written concurrence of the BLM, the monitoring requirement would be removed, and no additional monitoring or reporting would be required.