

## **Appendix J**

### **Disturbed Site Reclamation Monitoring and Success Criteria**



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### DISTURBED SITE RECLAMATION STANDARDS, MONITORING AND SUCCESS CRITERIA

#### 1.0 INTRODUCTION AND SUCCESS CRITERIA

The goal of the following reclamation standards and success criteria is to mitigate anticipated impacts to vegetation, soil and water resources from ground-disturbing activities by re-establishing a self-sustaining, diverse vegetation community composed of species native to the region in sufficient species density and diversity to closely approximate natural, undisturbed vegetation potential.

This Appendix supplements the discussion found in “Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development” (BLM 2006), commonly referred to as “The Gold Book”. All ground-disturbing activities will be subject to these reclamation standards and monitoring requirements. These include resource improvements initiated by BLM, as well as permitted activities such as fluid and solid mineral development activities, including oil and gas development.

BLM is responsible for implementing these standards and compliance with monitoring requirements. Project proponents for all permitted activities will typically perform the reclamation work, and effect on-the-ground implementation. Projects must meet both interim and final reclamation objectives in order to retrieve any associated bonds, or for reclamation to be considered successful. For oil and gas development activities within the Federal Unit atop the plateau, five-year interim criteria must be met in order to have areas released from the total maximum disturbance area for the unit, or in order to move to the next development area. Interim reclamation objectives and success criteria have been split into short-term (two-year) and long-term (five-year) groupings. Two-year criteria are to be met in two or fewer years, while five-year criteria must be met in five or fewer years. For example, five-year criteria may be met in a little as two years, but must be met within five years for reclamation to be considered successful.

#### 1.1 Short-Term (Two Year) Interim Reclamation Objectives and Success Criteria

Interim reclamation refers to those actions taken immediately after cessation of ground-disturbing activities. Interim actions are typically taken to stabilize a portion of a site that is no longer undergoing disturbance while activities simultaneously continue to disturb other portions of the same area. For example, interim reclamation may be conducted in perimeter areas of a natural gas well site when the larger footprint required for the development is reduced in area to that necessary for production. The following interim reclamation success requirements will be used to determine success after two years (two complete growing seasons):

- a. Re-grade the site to approximate pre-disturbance topography to the extent practicable, in order to minimize disturbance, and lessen erosion potential.
- b. Stabilize disturbed soil surface areas to reduce erosion and runoff to or below naturally occurring levels.
- c. With the exception of active work areas, all disturbed soils that remain exposed, unprotected, or unreclaimed for longer than one month will be stabilized as approved by BLM. This may be done through the use of native or sterile non-native seed, or application of a covering such as mulch or matting.
- d. Establish and maintain a healthy and diverse composition of the species naturally growing on the site which will provide for natural plant and community succession.
- e. Prevent establishment of noxious weeds and undesirable plants on the disturbed areas and expansion onto adjacent uninfected areas.

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- f. Restore wildlife habitat and livestock forage.
- g. Reduce visual contrast to meet established visual resource management objectives in all reclaimed areas.

### **1.2 Long-Term (Five Year) Interim and Final Reclamation Objectives and Success Criteria**

Final reclamation will occur when no more ground-disturbing activities are expected to occur. The following interim reclamation success requirements will be used to determine success after five years (five complete growing seasons):

- a. Stabilize the disturbed soil surface to reduce erosion and runoff to or below natural background levels. Flow pattern development will not have resulted in rills deeper than three inches, or spaced closer than on adjacent undisturbed hillsides. Activities do not contribute to pre-existing gullies actively down cutting or head cutting. No slumping or subsidence will occur as a result of surface disturbing activities.
- b. With the exception of active work areas, all disturbed soils that remain exposed, unprotected, or unreclaimed for longer than one month will be stabilized as approved by BLM. This may be done through the use of native or sterile non-native seed, or application of a covering such as mulch or matting.
- c. Re-grade the site to approximate pre-disturbance topography to the extent practicable, in order to minimize disturbance, and lessen erosion potential.
- d. Achieve or exceed the pre-disturbance cover and diversity of native species on the site. Total cover will be at least 80 percent of the reference area and have a similar composition of woody, grass-like and herbaceous species. Frequency of the most dominant species will be at least 80 percent of their relative contribution on the reference site. Vegetative composition and density will include the following: 1) Grass and forb species, by percent cover, 2) Litter accumulation as determined by percent ground cover, 3) Bare ground as determined by percent ground cover, 4) Noxious weed species, by percent cover (with a treatment objective of zero percent relative cover and actual cover of less than five percent), and 5) Soil surface stability as determined by the absence or limited degree of surface erosion and plant pedestals.
- e. State of Colorado A, B, or C listed noxious weeds or other undesirable plant species will be absent (including kochia and Russian-thistle), with an exception for cheatgrass. It may be necessary to treat adjacent infestations of noxious and undesirable species prior to disturbance. If cheatgrass is present adjacent to the disturbed area in overall concentrations of less than 50 percent vegetative cover, the percentage vegetative cover of cheatgrass on the reclaimed site will not exceed five percent. In areas where adjacent lands have greater than 50 percent cheatgrass cover, the percentage cover on reclaimed lands will not exceed 30 percent.
- f. Restore visual quality, reduce visual contrast and enhance aesthetic values to meet visual resource management objectives on all areas of surface disturbance.

## **2.0 RECLAMATION PLANS**

Reclamation plans will be submitted for BLM review and approval prior to surface disturbing activities. Reclamation plans will be considered as COAs for oil and gas leases and reviewed and approved through activity or project specific planning for other resource management activities. Reclamation plans will address the following requirements in sufficient detail to demonstrate an understanding of the potential reclamation site and activities required to achieve the stated success criteria. These plans will incorporate the following reclamation topics and fully develop appropriate site-specific BMPs for each permitted action and location.

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### 2.1 Site-specific Baseline Information:

- a. Pre-disturbance terrain and contour
- b. Pre-disturbance land use
- c. Seasonal weather patterns
- d. Topsoil depth and other limitations to plant root growth
- e. Vegetation type, dominant species cover, density, and productivity by strata

### 2.2 Reference Site Selection and Documentation:

- a. Appropriate reference sites will be assessed, selected, and characterized following Ecological Suite Inventory (ESI) methods and standards, or an approved equivalent system (see Attachment A for an example).
- b. Reference sites will be approved by BLM prior to a permitted disturbance.

### 2.3 Site-specific Revegetation Plan:

- a. Size of disturbed versus reclaimed area
- b. Proposed surface finish and grades
- c. Proposed topsoil handling and treatment
- d. Proposed seed mix (seeding rate, species, and variety)/plant schedule (container size and off-center spacing)
- e. Treatment of noxious and undesirable species
- f. Proposed seeding/mulching techniques
- g. Ongoing maintenance activities expected
- h. Monitoring plan

### 2.4 Bond Agreement Information (if applicable), or Conditions for Future Activity

Bonds to be held against achievement of reclamation success criteria will be negotiated on a site-by-site basis. In general, the amount of a bond will be considered a percentage of the total reclamation costs for a project sufficient to ensure reclamation success. These costs will be demonstrated in the reclamation plan. Documentation of compliance with bonding requirements sufficient to assure reclamation will also be included as part of the approved reclamation plan.

Future associated development activities may be precluded until successful reclamation is achieved for a given area or project.

## 3.0 RECLAMATION PRACTICES AND STANDARDS

The following practices and standards are intended to be applied simultaneously to all appropriate BMPs to all reclamation sites. Some standards are only appropriate for interim or final reclamation, while others will be used in either situation. Practices and standards are intended to provide direction and clarify BLM's intent for reclamation activities. The intent of BLM's land use planning (RMP) process is to identify standards and objectives to be met on public lands. Specific methodologies are not considered to be activity or implementation level planning decisions and not RMP decisions. As such, practices are provided to clarify BLM's intent for reclamation activities. The following list is not considered to be all-inclusive, but rather is presented to provide a sense of the minimum requirements that will be required to produce acceptable reclamation outcomes. Additional practices may be required, practices may be withdrawn, or practices may be modified during activity, implementation, or project level planning; this may be done without future land use plan (RMP) decisions or amendments. Monitoring and adaptive management practices will be used to refine and clarify needed actions consistent with the goals and objectives of this plan. Reclamation practices and standards are listed below.

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### 3.1 Interim Reclamation Practices and Standards

- a. Limit surface disturbance to the minimum area necessary by avoiding development of roads, pipelines, and well pads on steep slopes; minimize the potential for surface disturbance through careful planning; grouping facilities to the extent possible; and sharing rights-of-way such as burying pipelines along roadways.
- b. Stockpile topsoil when possible and prudent (not in areas of seleniferous or erosive soils, or in areas with noxious weed populations without pretreatment), following all topsoil salvage and storage BMPs; or if directed by BLM plan for salvage, direct-haul, and application (live handling) of topsoil from a disturbance site to a site undergoing concurrent revegetation.
- c. Minimize the area necessary for construction activities; determine the minimal area needed to facilitate necessary activities, and initiate interim reclamation as quickly as practicable after construction.
- d. Silt fencing will be necessary in areas in proximity to water features such as streams, ponds, and wetlands or in other situations where wind or water erosion may otherwise move sediments into sensitive or valuable surrounding habitat.
- e. Interim reclamation will include recontouring of the disturbed surface to blend with surrounding terrain, spreading salvaged or stockpiled topsoil evenly on areas to be reclaimed, and revegetating with native plants.
- f. Use seed mixes containing native, early-succession species, or species with ability to readily establish quickly in recently-disturbed soil areas. In areas subject to occasional vehicle travel, interim revegetation will include species selected accommodate occasional activity such as vehicle travel, vehicle parking, or temporary staging areas.
- g. Drill seed the disturbed area with a seed mix of species native to the local area at a rate sufficient to achieve site stabilization and achieve desired cover based on reference sites (rate would be doubled for broadcast or hydroseeding where drill seeding is impracticable) following adequate soil preparation that includes removal of weeds and undesirables species, decompaction (“fluffing”) of compacted soil, and harrowing to prepare the seedbed.
- h. Mulching will be required to stabilize soil, maximize moisture infiltration, and improve the chances for revegetation success. Mulch seeded areas with certified weed-free native hay or straw at a rate sufficient to achieve site stabilization and establish native species. If physical conditions preclude this, apply appropriate hydromulch with a non-asphalt tackifier.
- i. Control and eradicate all State of Colorado A-, B-, and C-listed noxious weeds and undesirable species within reclaimed areas. One aspect of reducing the potential for noxious weed establishment is consideration of the sequence and timing of revegetation.
- j. Fencing will be required to limit wildlife and livestock grazing for a minimum of two growing seasons or until plants are sufficiently established to persist under some physical disturbance. Seeded species will be considered established when at least 50 percent of plants are producing seeds. Fencing will be installed after dirtwork, grading, and seeding are completed and prior to livestock turnout on the allotment. The use of less-palatable grasses and forbs or fencing will be used as approved by BLM to limit wildlife and livestock presence along roadways, or other disturbed areas.

### 3.2 Long-Term (Five Year) Interim and Final Reclamation Practices and Standards

- a. Remove all equipment, debris, and surface structures that are not necessary for the intended use of the site. Remaining structures will blend in to the extent possible with the surrounding terrain. Consider the use of natural features such as trees, rock formations, terrain, or berms to conceal

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roads, pipelines, and well pads. Paint structures a color that blends with the surrounding vegetation.

- b. Recontour all disturbed areas to blend with the surrounding terrain to the extent practicable. Areas that have received heavy equipment use such as roads and well sites will be ripped to a depth sufficient to accommodate the establishment of native vegetation similar to the surrounding undisturbed area.
- c. As soon as practicable, spread salvaged or stockpiled topsoil to a uniform depth across all disturbed areas. The surface must blend with the surrounding non-disturbed area. (A rough surface will accommodate broadcast seeding better than a smooth surface.)
- d. Revegetate with native plant species similar in mix and kind to the appropriate reference plant community. The type of cultural material (seeding or planting) used will depend on the attributes of the site and revegetation goals. As needed, utilize a combination of seeding grasses and forbs, and containerized nursery stock shrub and tree planting.
- e. Drill seed the disturbed area with a seed mix of species native to the local area at a rate sufficient to achieve site stabilization and achieve desired cover based on reference sites (rate would be doubled for broadcast or hydroseeding where drill seeding is impracticable) following adequate soil preparation that includes removal of weeds and undesirable species, decompaction (“fluffing”) of compacted soil, and harrowing to prepare the seedbed.
- f. Seed disturbed areas in fall or early winter (depending on elevation) to exploit elevated moisture normally available in winter and spring as an aid in germination and seedling establishment, or as approved by BLM.
- g. Mulching will be required to stabilize soil, maximize moisture infiltration, and improve the chances for revegetation success. Mulch seeded areas with certified weed-free native hay or straw at a rate sufficient to achieve site stabilization and establish native species. If physical conditions preclude this, apply appropriate hydromulch with a non-asphalt tackifier.
- h. State of Colorado A-, B-, or C-listed noxious weeds or other undesirable plant species will be absent (including kochia and Russian-thistle), with an exception for cheatgrass. It may be necessary to treat adjacent infestations of noxious and undesirable species prior to disturbance. If cheatgrass is present adjacent to the disturbed area in concentrations of less than 50 percent vegetative cover, the percentage vegetative cover of cheatgrass on the reclaimed site will not exceed five percent. In areas where adjacent lands have greater than 50 percent cheatgrass cover, the percentage cover on reclaimed lands will not exceed 30 percent.
- i. Plant containerized native shrubs and trees (as appropriate based on the surrounding plant community) when conditions warrant following successful noxious weed control, in natural-appearing groups at a spacing that approximates the structure of local plant communities.
- j. Fencing will be required to limit wildlife and livestock grazing for a minimum of two growing seasons or until plants are sufficiently established to persist under some physical disturbance. Seeded species will be considered established when at least 50 percent of plants are producing seeds. Fencing will be installed after dirtwork, grading, and seeding are completed and prior to livestock turnout on the allotment. The use of less-palatable grasses and forbs or fencing may be required or approved by BLM to limit wildlife and livestock presence along roadways, or other disturbed areas.

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### 4.0 MONITORING

Annual monitoring and reporting of results will be required for all reclaimed areas. Monitoring will occur annually for either a minimum of five years or until performance standards are obtained, whichever is longer. Monitoring methods and reporting standards will be included in reclamation plans and approved by BLM prior to disturbance. Monitoring methods are outlined below.

#### 4.1 Methods

Monitoring methods will be approved as part of a site reclamation plan, prior to site disturbance. In general, methods must be used that will yield appropriate quantitative measures by which to address success criteria parameters against a reference site.

- a. Plant species composition and cover will be sampled using either point intercept transect or plot sampling at a sufficiency to demonstrate statistical adequacy at the 85 percent level.
- b. Woody species (tree and shrub) density and survivorship will be assessed using plot or belt transect sampling.
- c. Fixed photo points (location to be determined and used during baseline conditions sampling).

#### 4.2 Monitoring Reports

Reports of annual monitoring efforts will be submitted annually to BLM for approval. Each report will address the results of the monitoring in terms of each success criterion and compared to the same parameters for the reference site. Additionally, each report will address the following items:

- a. Text and data to illustrate trends in terms of site conditions against each of the agreed-upon success criteria
- b. Tabulated woody (tree and shrub species) containerized planting survivorship
- c. Tabulated vegetation cover data for planted and seeded herbaceous species
- d. Annotated photographs from fixed photo points illustrating conditions before and after mitigation activities are completed
- e. A figure showing locations of fixed photo points and data sampling locations
- f. A brief discussion of the overall mitigation success, incorporating monitoring data. Problem areas identified during the monitoring session will be discussed and adaptive management remediation activities will be recommended, as necessary.
- g. A description of any adaptive management activities performed since the previous annual report for the site as well as planned actions to be taken if plant establishment efforts are sub-standard or completely fail. For these circumstances, the cause of failure must be stated and how corrective actions will mitigate these causes.

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### ATTACHMENT A: Alternative Approach to ESI Reference Sites Example of a Quantitative Success Sampling Assessment Tool

#### FLORISTIC QUALITY INDEX

##### I. Floristic Quality Indices (after Taft et al., 1997)

1. For the reference species list, assign an index based on the affinity to "natural areas". Individual species assignment range from 0-10 with "10" being considered the highest fidelity to natural areas. This index is termed the coefficient of conservatism (C). General categories for species assignments consist of the following:

X 0-1: Taxa that are adapted to severe disturbance, particularly anthropogenic. Disturbance occurs so frequently that often only brief periods are available for growth and reproduction. Generally considered ruderal species/opportunistic invaders.

X 2-3: Taxa within this category are associated with more stable, though degraded habitat. Generally considered ruderal-competitive species, found in a variety of habitats.

X 4-6: Taxa that have a high consistency of occurrence within a given community type and will include many dominant or matrix species for several habitats. Species will persist under moderate disturbance.

X 7-8: Taxa associated mostly with natural areas but can persist where the habitat has been somewhat degraded. Increases in the intensity or frequency of disturbance may result in reduction in population size, or taxa may be subject to local extirpation.

X 9-10: Taxa exhibiting a high degree of fidelity to a narrow range of synecological parameters. Species within this category are restricted to relatively intact natural areas.

Assignment of the "C" value should be based upon field experience of principal investigators (A-Team), consultation with local or regional plant ecologist/ taxonomists, description of habitat preferences in floristic manuals or published synecological or autecological studies. Values to be assigned should be considered in the context of the defined reference domain (geographic distribution) and range of variability (disturbance gradient) within the HGM subclass of interest.

##### 2. Calculation of the Floristic Quality Index

X Determine the mean coefficient of conservatism ( $\bar{C}$ ) by summarizing all coefficients in the inventory unit (reference site or sample within the reference site) and dividing by the number of taxa (N), or  $\bar{C} = \sum C/N$ .

X Multiply the mean coefficient of conservatism ( $\bar{C}$ ) by the square root of the total number of taxa. The floristic quality index is then indicated by:

$$FQI = \bar{C} (\sqrt{N})$$

*From:*

Taft, J.B., G.S. Wilhelm, D.M. Ladd, and L.A. Masters. 1997. Floristic quality assessment in Illinois; a method for assessing vegetation integrity. *Erigenia* 15:3-95.

