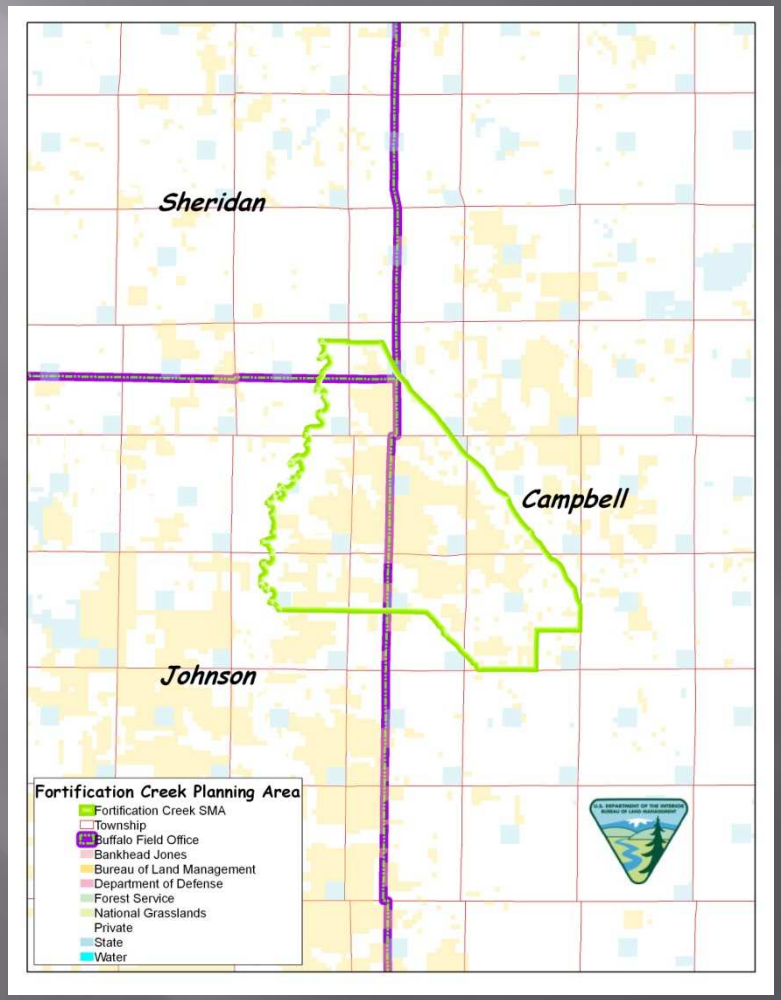
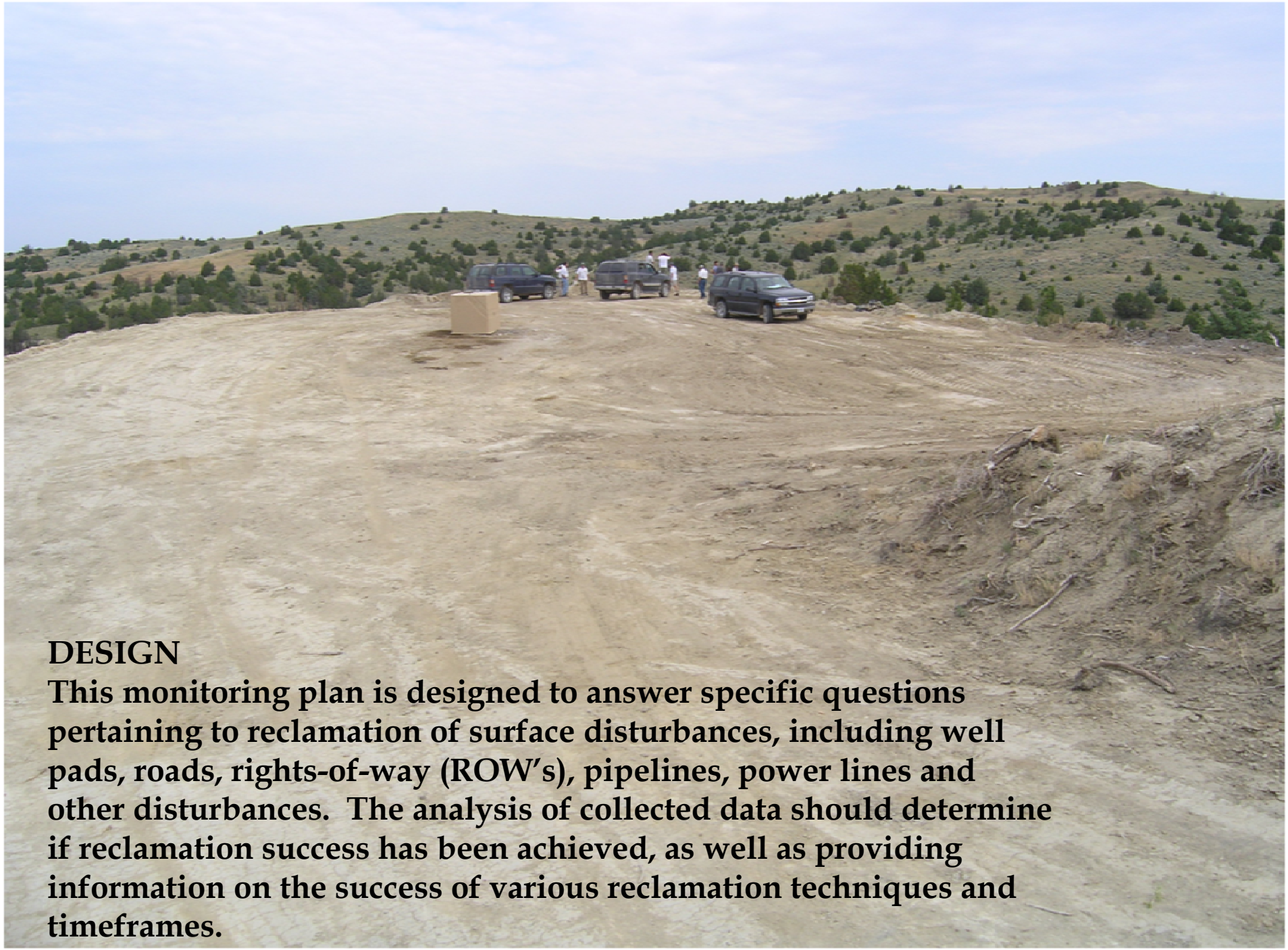
Fortification Creek Reclamation Monitoring Plan

Fortification Creek Planning Area





DESIGN

This monitoring plan is designed to answer specific questions pertaining to reclamation of surface disturbances, including well pads, roads, rights-of-way (ROW's), pipelines, power lines and other disturbances. The analysis of collected data should determine if reclamation success has been achieved, as well as providing information on the success of various reclamation techniques and timeframes.

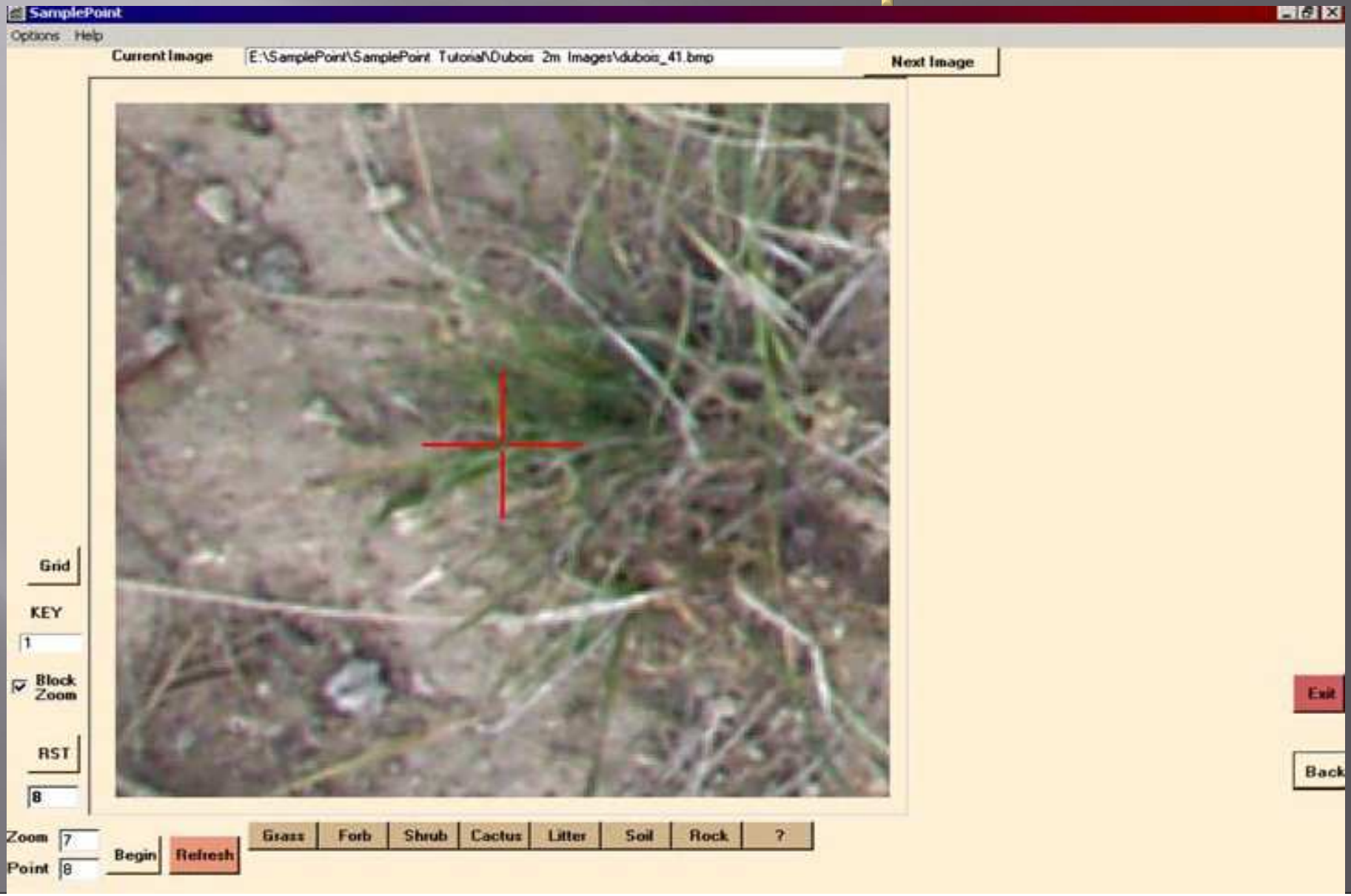
Monitoring methods

- When ascertaining if reclamation success criteria have been met, the BLM will be evaluating basal cover, canopy cover, species diversity, and soil stability to make their determination. The operator may use any BLM approved monitoring method to examine reclamation success. However, BLM will utilize image-based monitoring with SamplePoint software for vegetation (see section V—BLM Monitoring Methodology), line intercept method and soil surface factor (SSF) method for site stability to determine when reclamation standards have been met. BFO-BLM strongly encourages the use of this protocol. Qualitative ocular estimates are not an approved BLM methodology.

SamplePoint

- BLM will employ image-based photo monitoring, utilizing the SamplePoint software developed by the USDA Agricultural Research Service (ARS) to monitor basal cover on reclaimed sites. SamplePoint is a manual image-analysis program designed to facilitate vegetation cover measurements from nadir digital images of any scale. Operating essentially as a digital point frame, the software loads images, places classification points on the image, and stores classification data to a database as the user classes each point. Functional use is not limited to vegetation classification. Although developed to measure canopy cover of vegetation, a reasonable estimate of basal cover can also be determined using this method.

Screenshot of SamplePoint.



SamplePoint

- This method was chosen because it is time-effective, cost-effective, and utilizes the best available science. Data analysis can be done in the office, at any time of the year. This monitoring method also provides a visual confirmation of the quantitative data gathered. The results gained from this type of sampling are comparable to those gained from more traditional monitoring sources such as the line-intercept methods.

- SamplePoint software can be downloaded at no cost at: http://www.ars.usda.gov/services/software/download.htm?softwareid=246

Line-intercept

- Well locations

- Each well location will be sampled using 4 transects 100 feet long, with a reading every foot. Transect lines should be oriented North, South, East and West of the well bore or, in the case of constructed pads, the transect lines may radiate from the well bore to the pad corners. Using a straight, fine wire, such as a pin flag, carefully lower the wire so that it is perpendicular with the ground surface or straight up and down and at each 1 foot interval along one side of the tape, record hits on field form. Optical sighting devises such as a laser pointer may also work well. Only basal vegetation will be recorded. If foliage is encountered, insert wire through foliage and record hit at ground surface (bare ground, litter, grass etc). The process of random start with a systematic process should over time record representative samples from the entire area.

Line-intercept

- Linear disturbance

- Linear features will be similarly monitored by selecting representative portions consisting of a minimum of one monitoring location every ¼ mile or change of ecological site (as defined by NRCS soil survey), whichever comes first. Specific monitoring locations may be modified as approved by the BLM Authorized Officer. Additionally, multiple pipeline rights-of-way will be monitored by each "linear layer" based on date of disturbance/reclamation. Pipeline operators will provide a reclamation monitoring plan detailing how each pipeline company will comply with reclamation monitoring criteria.
- Monitoring will consist of a minimum of four 100'transects run from disturbed edge to disturbed edge, with a reading every two feet
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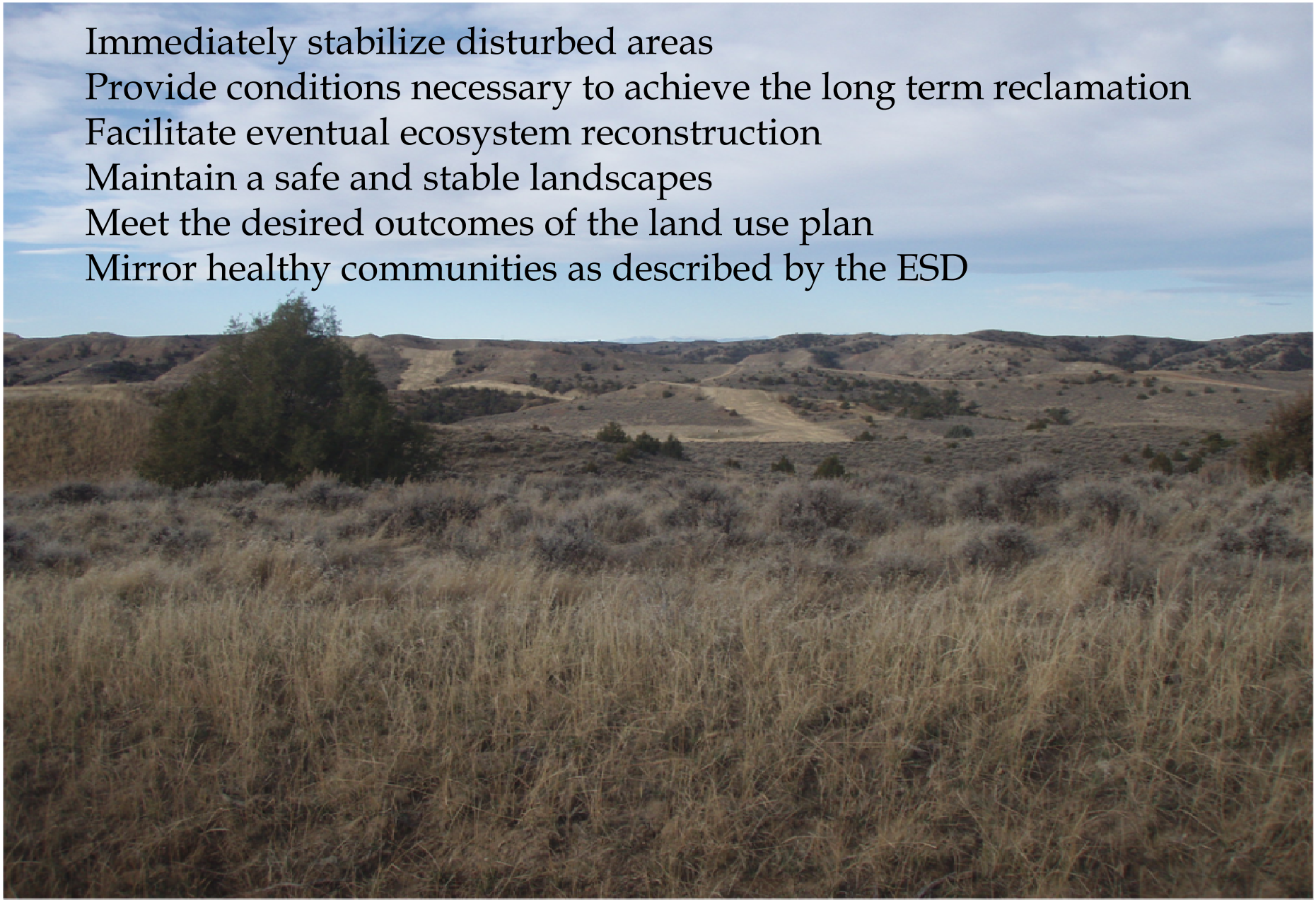
Soil Surface Factor (SSF)

- Numerical expression of surface erosion activity caused by wind and water as reflected by soil movement, surface litter, erosion pavement, pedestalling, rills, flows patterns, and gullies. Values vary from 0 for stable erosion condition to 100 for a severe condition. Soil Surface Factor is outline in BLM Technical Note #346, Erosion Condition Classification System.

Soil Surface Factor (SSF)

Erosion Control Classification System values	
SSF	***Class***
1-20%	Stable
21-40%	Slight
41-60%	Moderate
61-80%	Critical
81-100%	Severe

GOALS



Immediately stabilize disturbed areas
Provide conditions necessary to achieve the long term reclamation
Facilitate eventual ecosystem reconstruction
Maintain a safe and stable landscapes
Meet the desired outcomes of the land use plan
Mirror healthy communities as described by the ESD

OBJECTIVES

- Restore a disturbed area to a state containing sufficient biotic and a biotic resources to continue its development and interactions without further assistance or subsidy.

- Demonstrate resilience to normal ranges of environmental stress and disturbance. Achieving this level of ecosystem function requires the establishment of self-sustaining, desirable vegetative cover over the reconstructed landform. Reclamation is complete once the disturbance area is considered stable and functioning to allow optimum production of vegetation, control of undesirable species, conservation of water and control of erosion.

SUCCESS CRITERIA

- **Native Grasses: Reclaimed sites must have a minimum of 3 native perennial grass species within the overall data summary established in the distance area, 1of which must be a bunchgrass species.**
- **Native Forbs: The average density or frequency of forbs must be a minimum of 3 native forb species within the overall data summary.**
- **Native Shrubs: The average density or frequency of forbs must be a minimum of 2 native shrub species within the overall data summary.**
- **Weeds: Sites must be free from all species listed on the Wyoming or Federal noxious weed list. All state and federal laws regarding noxious weeds must be followed. Other highly competitive invasive species such as cheatgrass will not exceed 5%.**
- **Plant Vigor: Plants must be resilient as evidenced by well-developed root systems, flowers, and seed heads. All sites must exhibit the sustainability of the above desired attributes after the removal of external influences (i.e., irrigation, fencing, matting, etc.).**

SUCCESS CRITERIA

Specific Guidelines

- Reclamation success criteria are based on the Ecological Site Descriptions (ESDs) for the Northern Great Plains as defined by the Natural Resources Conservation Service (NRCS). A separate standard applies to each ESD. The data contained within the NRCS's ESDs pertain to historical climax systems. The success criteria for reclamation were derived by taking 65% of the numbers listed in the ESDs. This would be equivalent to a rangeland in a mid-seral stage, or within the "good" condition class.

SUCCESS CRITERIA

Specific Guidelines

ECOLOGICAL SITE DESCRIPTION	ESD BARE GROUND (ref. sheet)	ALLOWABLE BARE GROUND (80% of ESD)
Very Shallow > 10” Precipitation Zone, Northern Plains	40-50%	48-60%
Shallow Loamy > 10” Precipitation Zone, Northern Plains	40-60%	48-72%
Shallow Sandy > 10” Precipitation Zone, Northern Plains	40-60%	48-72%
Shallow Clayey > 10” Precipitation Zone, Northern Plains	25-40%	30-48%
Loamy > 10” Precipitation Zone, Northern Plains	20-30%	24-36%
Sandy > 10” Precipitation Zone, Northern Plains	20-30%	24-36%
Clayey > 10” Precipitation Zone, Northern Plains	20-30%	24-36%
Lowland > 10” Precipitation Zone, Northern Plains	15-25%	18-30%

ECOLOGICAL SITE DESCRIPTION 65%

ESD: Loamy >10" Northern Plains Precipitation Zone								
%Basal Cover			% Ground Cover			% Canopy Cover		
Grasses	Forbs	Shrubs	Litter	Rock	Bare Ground	Grasses	Forbs	Shrubs
3 to 9	1 to 3	1 to 2	>50	0 to 1	20 to 30	39 to 55	1 to 3	1 or more

ESD: Shallow Loamy >10" Northern Precipitation Zone								
%Basal Cover			% Ground Cover			% Canopy Cover		
Grasses	Forbs	Shrubs	Litter	Rock	Bare Ground	Grasses	Forbs	Shrubs
3 to 6	1 to 3	1 to 3	>20	0 to 5	40 to 60	13 to 20	1 to 3	7 to 10

ESD: Very Shallow >10" Northern Precipitation Zone								
%Basal Cover			% Ground Cover			% Canopy Cover		
Grasses	Forbs	Shrubs	Litter	Rock	Bare Ground	Grasses	Forbs	Shrubs
3 to 9	1 to 3	1 to 2	>30	0 to 4	40 to 60	36 to 46	1 to 3	3 to 7

REPORTING

- Monitoring and reporting will take place annually, with reports due to the BLM by December 31 of each year. BLM projects are required to make annual monitoring reports on all surface disturbances as defined in the Wyoming Reclamation Policy.
- This schedule will allow everyone to track their own success and garner a concerted effort and involvement in timely and efficient restoration. It would also provide a verifiable means to track and review reclamation methods and results.

Example Monitoring Summary Report:

- Once 100 points of data at a transect are collected, the sum of the forb, shrub, grass component is entered by species and life form. Then calculate the percentages of desirable species by life form, add the percentages of all desirable vegetation species of grass, forb, and shrub from your raw monitoring data.
- **Operator:**_____
  Collector:_____
- **Well name/number AND Legal description:**
  _____
- **Coordinates (UTM's):**_____
- **Date:**_____

Example Monitoring Summary Report:

Species	Life form	Raw data from monitoring field sheet (# of hits)	% by life form			% of total desirable vegetation by species
			Forb	Shrub	Grass	
Green rabbit brush	Shrub	1				4.5%
Scarlet globemallow	Forb	1				4.5%
Western wheatgrass	Grass	3				13.6%
Indian ricegrass	Grass	1				4.5%
Bluebunch wheatgrass	Grass	2				9%
Fourwing saltbush	Shrub	1				4.5%
Big sagebrush	Shrub	2				9%
Thickspike wheatgrass	Grass	1				4.5%
Species	Life form	Raw data from monitoring field sheet (# of hits)	% by life form			% of total desirable vegetation by species
Totals		22	4.5%	18%	31%	

Example Monitoring Summary Report:

	Grasses	Forbs	Shrubs	Litter	Rock	Bare Ground	Other (i.e. cactus)
Perennial							
Annual							
Noxious							
Other							
Total (=100)							

Example Monitoring Summary Report:

Erosional Feature	Potentially Present Yes/No	Identified Factors (Form 7310-12)	Possible Factor
Soil Movement			
Surface Litter			
Surface Rock Fragments			
Pedestalling			
Flow Patterns			
Rills			
Gullies			
Column Totals			
Soil Surface Factor Totals			

DATA STORAGE

Pending: Database Development