

2010 Revegetation Monitoring

Introduction

The Rocky Flats Site (Site), a U.S. Department of Energy facility, is located near Golden, Colorado. For nearly 40 years during the Cold War, the facility produced nuclear weapons components and was an integral part of the United States' nuclear weapons program. In the early 1990s, the facility was shut down, and cleanup and closure activities began. As part of the cleanup and closure, the buildings, roads, and other infrastructure in the Industrial Area were removed. Approximately 650 acres were disturbed during cleanup activities, which were completed in fall 2005. The disturbed areas were revegetated to prevent erosion and sedimentation of the Site streams and to meet water quality standards. Reestablishment of native plant species is also beneficial to wildlife and provides desirable vegetation and ground cover adjacent to the Rocky Flats National Wildlife Refuge. As part of the revegetation process, monitoring is conducted to determine whether success criteria, as stated in the *Rocky Flats, Colorado, Site Revegetation Plan* (Revegetation Plan; DOE 2009) are being met as well as to determine how these revegetation areas need to be managed.

The success criteria from the Revegetation Plan are:

- The revegetation site will have a minimum of 30 percent relative foliar cover of live desired species (seeded or nonseeded native species). Relative cover is defined as the percentage of cover of a given species divided by the total amount of vegetation cover present. Example: Species A has 20 percent absolute cover, and total vegetation cover (all individual species cover values summed) is 80 percent.
Relative cover of Species A = $(20 \div 80) \times 100 = 25\%$.
- The revegetation site will have a minimum of 70 percent total ground cover that comprises litter cover, current-year live vegetation basal cover, and rock cover.
- A minimum of 50 percent of the seeded native species will be present at the revegetation site.
- No single species will contribute more than 45 percent of the relative foliar cover (except in areas where dominance by a single species is appropriate for long-term wildlife and habitat management objectives).

This report summarizes the revegetation monitoring results for data collected during 2010.

Methods

Semiquantitative revegetation monitoring was conducted during the summer of 2010 to evaluate the establishment of vegetation at locations across the Site. The monitoring method provided in the Revegetation Plan was used with some modification. The revegetation areas were divided into units on the basis of geographic features (e.g., roads, streams) or previous building areas (e.g., 700 Area, 400 Area). Twenty-five revegetation units were sampled in 2010 (Figure 1). Units that met success criteria in previous years were not monitored. Within each revegetation unit, sample locations were randomly generated in the Geographic Information System and located on the ground using a Global Positioning System for monitoring. Quadrats measuring 50 centimeters by 100 centimeters were used to sample the vegetation at each sample location.

Depending on the size of the area, the number of quadrats sampled in each area varied from 5 to 30. A total of 440 quadrats were sampled in 2010 (Table 1). At each quadrat, both species richness and species cover were assessed. A species was listed as present for a quadrat if any part of the plant was located within or overhung inside the quadrat boundary. Foliar cover was estimated for each species using the following cover class system and midpoints (in parentheses): 1 = <5 percent (2.5 percent), 2 = 6–25 percent (15 percent), 3 = 26–50 percent (37.5 percent), 4 = 51–75 percent (62.5 percent), 5 = 75–95 percent (85 percent), 6 = >95 percent (97.5 percent). Basal vegetation cover, litter cover, rock cover, and bare ground cover were also estimated within each quadrat using the cover class system.

Species lists were generated for each revegetation unit by combining all the quadrat data for that unit. The midpoint value of each cover class was used to calculate the average absolute and relative foliar cover by species across all the quadrats sampled for each revegetation unit. The percentage of absolute foliar cover was calculated as the sum of all cover values for a species in a revegetation unit divided by the number of quadrats sampled in that unit. Relative foliar cover was calculated as the sum of all cover values for a species in a revegetation unit divided by the sum of all cover values for all species in the same revegetation unit, multiplied by 100. The midpoint values were used to calculate the average cover at each revegetation unit for basal vegetation, litter, rock, and bare ground.

Results and Discussion

Table 2 shows the total species richness (number of species) found at each revegetation location and a list of species seeded. Species richness in 2010 ranged from a low of 11 species in unit L40 to a high of 32 species in unit L55 (the “L” is not shown for each location in Figure 1). Tables 3 through 5 show the list of species present at each revegetation location. The wide range in the number of species present is attributable to a number of factors, including how long ago the area was revegetated, the size of the location, the number of quadrats sampled in the location, the degree of disturbance in the area prior to revegetation, and the management actions (e.g., weed control) that have been conducted in the area. Fourteen different seeded graminoid species had become established and were growing at some locations in 2010. Table 2 lists the species that were seeded at each revegetation location and the number of seeded species found growing there in 2010. These included slender wheatgrass (*Agropyron caninum* = *Agropyron trachycaulum*), thickspike wheatgrass (*Agropyron dasystachyum*), western wheatgrass (*Agropyron smithii*), big bluestem (*Andropogon gerardii*), little bluestem (*Andropogon scoparius*), side-oats grama (*Bouteloua curtipendula*), blue grama (*Bouteloua gracilis*), buffalo grass (*Buchloe dactyloides*), Canada wildrye (*Elymus canadensis*), junegrass (*Koeleria pyramidata*), switchgrass (*Panicum virgatum*), Indian grass (*Sorghastrum nutans*), sand dropseed (*Sporobolus cryptandrus*), and green needlegrass (*Stipa viridula*). Only western wheatgrass was established at all 25 locations. Several noxious weeds were also found in the revegetation areas. These included downy brome (*Bromus tectorum*), filaree (*Erodium cicutarium*), diffuse knapweed (*Centaurea diffusa*), Canada thistle (*Cirsium arvense*), chicory (*Cichorium intybus*), Dalmatian toadflax (*Linaria dalmatica*), and bindweed (*Convolvulus arvensis*). Downy brome averaged approximately 6.7 percent cover across all the sites combined, and the remainder of the weed species together averaged approximately 2.2 percent. Weeds will continue to be managed as needed to keep noxious weed populations down in the revegetation areas and enable the desired seeded species to become established more quickly and compete with the weeds.

Slightly different seed mixes were used at the revegetation locations depending on the year they were seeded and the slope position. According to a success criterion in the Revegetation Plan, at

least 50 percent of the seeded species must be present in an area for it to be considered successful. Table 2 lists each revegetation location, species in the seed mix, number of species seeded, number of species observed at the location in 2010, and percentage present at the location in 2010. Twenty one locations (84 percent) had 50 percent or more seeded species present in 2010 and have thus met this success criterion (Table 6). One unit, L41, has failed to meet this criterion for the past 3 years (including 2010), even though it was seeded in 2002 and is the oldest revegetation unit within the Central Operable Unit. A major cause of the low percentage of seeded species present is that this was one of the few locations where topsoil was brought in as a test for the first revegetation effort after one of the initial buildings was taken down during closure. As a result, the non-native graminoid species that were present in the seed bank (sheep fescue [*Festuca ovina*], smooth brome [*Bromus inermis*], and intermediate wheatgrass [*Agropyron intermedium*]) now dominate the area. Additionally, the soil texture of unit L41 is quite different from Rocky Flats Alluvium, which is present elsewhere on the pediment at the Site. The xeric seed mix was designed for the typical rocky pediment surfaces at the Site; many of the species in the mix typically do not thrive in this finer-textured soil type and have never established. Because many of the species in the original seed mix have not established, it is unlikely that this area will ever meet the criterion of 50 percent seeded species present. If the species in the mesic seed mix (all of which were also in the seeded xeric seed mix) that would typically grow in this soil type at the site were used for comparison, five of seven seeded species (71 percent) are present, and the area would meet the criterion. Therefore, unit L41 will be considered to have met this criterion, since it is unlikely that it ever will achieve success using the original seed mix as a basis. This increases the number of units to 22 (88 percent) that met this criterion in 2010.

Table 7 summarizes the timing and revegetation techniques used for revegetation at each location. For the locations that did not meet this criterion in 2010, factors that may explain why many of the seeded species have not become established include inadequate or uneven initial seeding, poor soil conditions, competition from the more aggressive graminoid species in the seed mix, and drought. The monitoring method may also contribute to the lack of seeded species present, because the measure is based solely on the species list generated from the quadrat sampling. Given the small size of the total area measured on the ground through the quadrat method, it is possible that more of the seeded species are present at the revegetation locations but are simply outside the “footprint” of the randomly located quadrats in 2010. In 2011, additional observations beyond the “footprint” of the quadrats may be made.

Ground cover protection from rock, litter, and current-year live vegetation varied from 62 percent to over 100 percent at the revegetation locations in 2010 (Table 8). The occasional values over 100 percent are the result of the class system used for estimating cover, which estimates cover values into a range and uses the midpoint of the cover class for analysis. The Revegetation Plan states that a minimum of 70 percent total ground cover comprising litter cover, current-year live vegetation basal cover, and rock cover is to be present to help prevent erosion. Nineteen of the 25 locations (76 percent) met this criterion in 2010 (Tables 6 and 8).

The third success criterion states that a minimum of 30 percent relative cover of desired species must be present, and the fourth criterion states that no single species should constitute more than 45 percent of the total relative cover. Tables 3 through 5 summarize the foliar cover data by location for 2010. The shaded row, titled “Total Herbaceous Native Cover,” at the bottom of each table shows the percentage of cover of desired species at each location. The values that are higher than 30 percent at each revegetation location are shaded, indicating that these locations have met this success criterion. Total relative vegetation cover of desired (native) species was

greater than 30 percent at 100 percent (25) of the locations monitored in 2010 (Table 6). Six of the 25 revegetation locations (24 percent) had a single species that constituted greater than 45 percent of the relative cover in 2010 (Tables 3–5). Four of these locations were dominated by western wheatgrass, one of the seeded native species. At the other two locations, buffalo grass and slender wheatgrass provided greater than 45 percent of the relative cover. Four of these locations—L7, L26, L44, and L45—failed to meet all four success criteria solely because they each had a single species that covered greater than 45 percent of the area (Table 6). At each of these locations the dominant species was western wheatgrass (62, 69, 46, and 57 percent total relative cover, respectively). Regarding the use of the success criteria, the Plan states:

“Success criteria and monitoring are an important component of a revegetation project. . . . *These success criteria are provided as initial guidance; however, common sense combined with scientific data must be applied to final evaluations to determine whether further management actions are required*” [emphasis added].

Additionally, the Revegetation Plan’s success criterion regarding dominance by a single species states that “[n]o single species will contribute more than 45 percent of the relative foliar cover (*except in areas where dominance by a single species is appropriate for long-term wildlife and habitat management objectives*)” [emphasis added].

Western wheatgrass is a desirable native species. At locations that fail only this last criterion, and otherwise have a good stand of vegetation, several questions are worth considering:

- Is the dominance of these areas by a single species (with greater than 45 percent relative foliar cover) detrimental to long-term wildlife and habitat management?
- Is the dominance by these species likely to change in the future?
- Is there any other reason not to pass these four locations in 2010, just because they failed this last criterion?

One way to answer the first question is to evaluate the dominance of relative foliar cover of native species on the undisturbed native grassland areas of the Site. Do native species account for greater than 45 percent of the cover at some locations on the native grasslands? Monitoring in 2009 at two reference locations in native grassland used for Preble’s meadow jumping mouse mitigation monitoring showed that western wheatgrass provided, respectively, 54 and 59 percent relative foliar cover (Table 9; Original Landfill [OLF] and A-Ponds reference areas). At TR06, a xeric grassland monitoring location, data collected over multiple years showed that needle-and-thread grass (*Stipa comata*), a native grassland species, consistently provided greater than 45 percent relative foliar cover (Table 9). Because it is not uncommon for some of the native graminoid species to dominate the foliar cover at some locations, it is unlikely that the dominance of western wheatgrass at revegetation areas L7, L26, L44, and L45, will be detrimental to long-term wildlife and habitat management.

Relative foliar cover of different species and overall vegetation cover also fluctuate in response to environmental conditions, such as temperature and the amount and timing of precipitation. Table 9 shows some of this fluctuation for western wheatgrass at TR02 and TR04 (both mesic grassland monitoring locations) and the OLF revegetation area, for needle-and-thread grass at TR06 and TR11 (mesic grassland monitoring locations), for Japanese brome (*Bromus japonicus*) at TR11, and for overall foliar cover at TR02. Annual fluctuations in species cover are common in response to changing environmental conditions. Although locations L7, L26, L44, and L45, were dominated by species with greater than 45 percent cover in 2010, this may change over

time as environmental conditions change. Given the evidence that dominance by a single species occurs on the native prairie, and annual fluctuations in foliar cover are common, there is no practical reason these locations cannot be considered to have passed all four criteria in 2010. David Buckner, an ecologist under contract with the U.S. Environmental Protection Agency (EPA), conducted revegetation monitoring for EPA at Rocky Flats in 2009 and 2010. He noted similar conditions in the revegetation areas they sampled and has no concerns for areas with greater than 45 percent cover by a single species. In the 2010 report, he states, “The single sample showed that western wheatgrass comprised half of the cover, and though slightly in excess of the 45% DOE criterion, it is not likely that this represents a problem situation. Many native stands on finer-textured soils ‘naturally’ have as much western wheatgrass as is present here, or more” (EPA 2010).

Table 6 and Figure 1 show which revegetation locations monitored in 2010 met or failed to meet the criteria listed. Sixteen of the 25 locations (64 percent; approximately 105 acres) met all four criteria in 2010 (including locations L7, L26, L41, L44, and L45, for the reasons described above). These areas have established good stands of vegetation that should be sustainable in the future. Areas that did not meet success criteria in 2010 need more time. A good stand of vegetation often takes 4 to 6 years to become established. Of those revegetation units that did not pass in 2010, units L1, L2, L3, L23, and L57 were reworked with additional soil amendments in either 2007 or 2008. Thus, they are only in their second or third year of revegetation. At units L21, L55, and L56, the soil conditions are very poor, and it has taken longer for the vegetation to establish. Additional seeding at these units along with unit L40 should help to increase vegetation cover.

Original Landfill (OLF) Revegetation Summary

The OLF (unit L39, Figure 1) is one of two landfills at the Site. The vegetation at the Present Landfill met success criteria in 2009 and was not monitored in 2010 as part of this monitoring effort. The OLF was revegetated during Site closure, and vegetation is monitored as part of the overall revegetation monitoring and as specified in the Monitoring and Maintenance Plan (M&M Plan) for the OLF. In addition to this monitoring the M&M Plan requires qualitative quarterly vegetation surveys that are reported in the quarterly and annual Rocky Flats Legacy Management Reports.

Total species richness in 2010 was 23 species (Tables 2 and 4). Table 2 lists the species that were seeded at the OLF. The percentage of seeded species present in 2010 was 86 percent. Thus, this criterion was met in 2010. The species observed in 2010 included slender wheatgrass, western wheatgrass, side-oats grama, blue grama, buffalo grass, and green needlegrass. Ground cover protection from rock, litter, and current-year live vegetation averaged 84 percent (Table 8), exceeding the success criterion of 70 percent. The percent relative cover of desired species on the OLF in 2010 was 88 percent, exceeding the required 30 percent (Table 4). None of the species present on the OLF contributed more than 45 percent of the total relative cover and thus met this criterion. In 2010, all four success criteria were met on the OLF (Table 6).

Across most of the OLF the revegetation has been successful. At some localized areas where soil was recently disturbed during maintenance or repair activities, the vegetation is still somewhat sparse. Quarterly vegetation surveys are conducted on the OLF and will continue in accordance with the M&M Plan. However, because the success criteria have been met this year, annual vegetation monitoring per the Plan will not be continued in the future. Instead, the OLF may be

incorporated into a multiyear monitoring rotation to document the long-term successional changes on the revegetation areas at the Site.

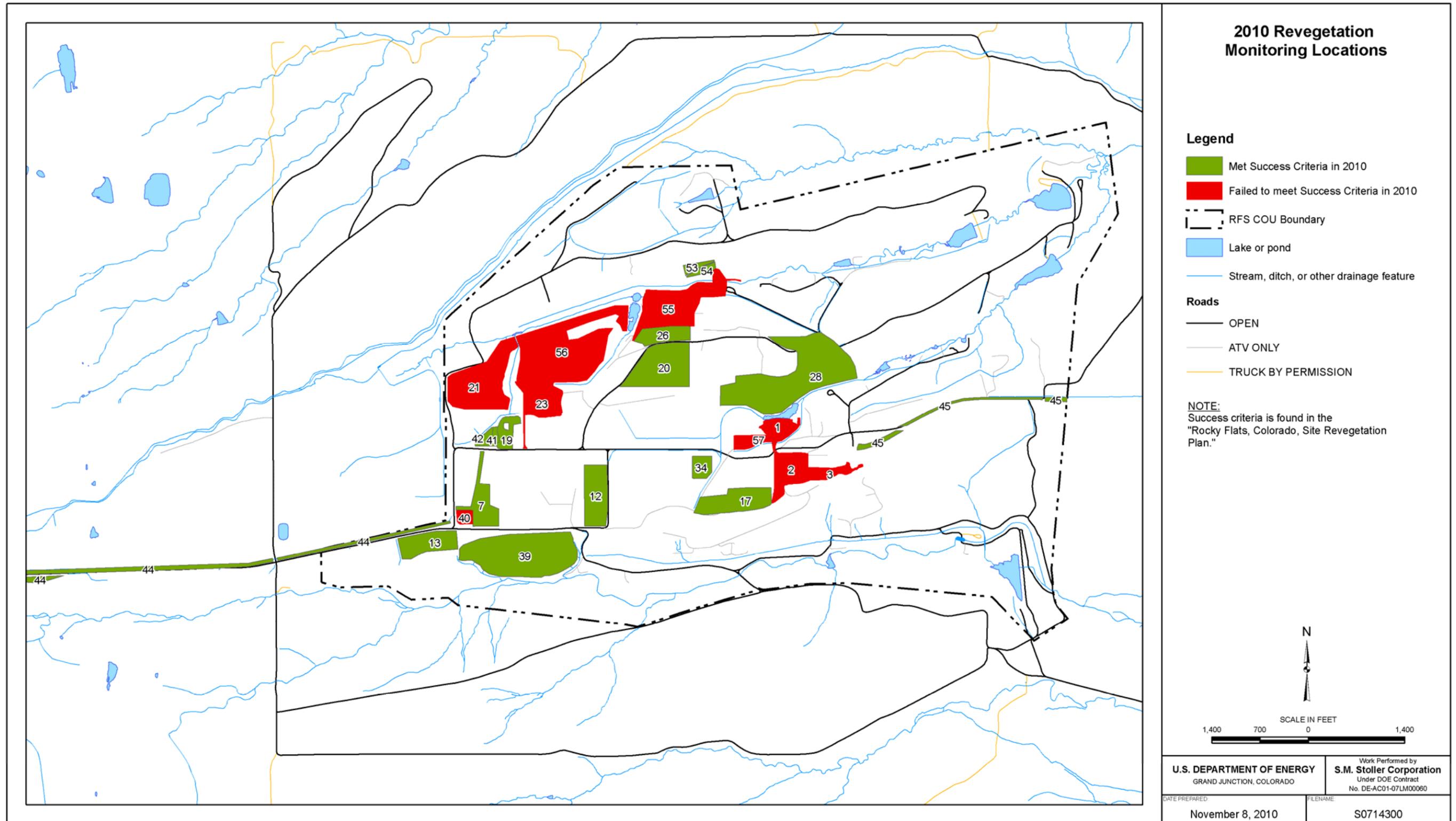
Summary

Monitoring was conducted at 25 revegetation monitoring units at the Site during 2010. Results indicate that the vegetation has become well established at 64 percent of the revegetation locations. At the other locations, additional establishment is needed to meet the success criteria. The revegetation areas will be managed to help control undesirable species and assist in the establishment of desired species at the Site.

References

DOE (U.S. Department of Energy), 2009. *Rocky Flats, Colorado, Site Revegetation Plan*, LMS/RFS/S04513, Office of Legacy Management, Grand Junction, Colorado, January.

EPA (U.S. Environmental Protection Agency), 2010. *Report of Findings Revegetation Assessment, Rocky Flats Site, Jefferson County, CO*. Prepared by ESCO Associates Inc., October.



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Figure 1. 2010 Revegetation Monitoring Locations.

Table 1. Number of Quadrats Sampled Per Location in 2010

Location	# Quadrats Sampled
L1	20
L2	20
L3	15
L7	20
L12	20
L13	20
L17	15
L19	20
L20	20
L21	30
L23	20
L26	10
L28	30
L34	10
L39	30
L40	5
L41	5
L42	5
L44	20
L45	20
L53	5
L54	5
L55	30
L56	30
L57	15
Total Quadrats Sampled	440
Total Locations Sampled	25

Table 2. Species Seeded By Location and 2010 Total Species Richness Summary

	Location	L1	L2	L3	L7	L12	L13	L17	L19	L20	L21	L23	L26	L28	L34	L39	L40	L41	L42	L44	L45	L53	L54	L55	L56	L57
	Seed Mix	M	X	X	X	X	X	X	X	X	X1	X	M	X	X2	M	X	X2	X	X	X	M1	M1	M	X	X
Family	Scientific Name																									
Graminoids																										
POACEAE	Agropyron caninum	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
POACEAE	Agropyron dasystachum	X											X		X	X		X				X	X	X		
POACEAE	Agropyron smithii	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
POACEAE	Andropogon gerardii		X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X					X	X
POACEAE	Andropogon scoparius		X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X					X	X
POACEAE	Bouteloua curtipendula	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
POACEAE	Bouteloua gracilis	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
POACEAE	Buchloe dactyloides	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
POACEAE	Elymus canadensis										X															
POACEAE	Koeleria pyramidata		X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X				X	X
POACEAE	Panicum virgatum										X															
POACEAE	Sorghastrum nutans		X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X					X	X
POACEAE	Sporobolus cryptandrus		X	X	X	X	X	X	X	X	X		X			X		X	X	X					X	X
POACEAE	Stipa viridula	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Forbs																										
ASTERACEAE	Achillea millifolium																					X	X			
ASTERACEAE	Gallarida aristata														X			X								
ASTERACEAE	Liatris punctata														X			X								
ASTERACEAE	Ratibida columnifera														X			X				X	X			
LINACEAE	Linum lewisii (L. perenne)														X			X				X	X			
	Total # Species Seeded	7	11	11	11	11	11	11	11	11	13	11	7	11	15	7	11	15	11	11	11	10	10	7	11	11
	# Present in 2010	5	11	7	6	10	8	8	9	7	10	5	6	8	8	6	5	5	8	6	6	5	5	6	9	5
	% Seeded Species Present in 2010	71	100	64	55	91	73	73	82	64	77	45	86	73	53	86	45	33	73	55	55	50	50	86	82	45
	Total Species Richness in 2010	14	24	19	13	19	26	17	25	23	32	21	21	28	25	23	11	18	13	29	14	18	14	32	25	18

Recalculated using Graminoids only (calculated only at locations where forbs were seeded)

Total # Species Seeded															11							7	7			
# Present in 2010															8							5	5			
% Seeded Species Present in 2010															73							71	71			

Seed Mixes: X = Xeric Seed Mix, X1 = Variation on Xeric Seed Mix, X2 = Variation on Xeric Seed Mix, X3 = Variation on Xeric Seed Mix, M = Mesic Seed Mix, M1 = Variation on Mesic Seed Mix.

Yellow shaded cells mean the success criterion of >50% of seeded species was met in 2010.

Blue shaded cells mean the species was present at this location in 2010.

Table 3. Revegetation Locations L1 to L19 - Foliar Cover Summary 2010

Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	L1		L2		L3		L7		L12		L13		L17		L19	
						Absolute Cover (%)	Relative Cover (%)														
<i>Alyssum minus</i> (L.) Rothmaler var. <i>micranthus</i> (C. A. Mey.) Dudley	ALM1	F	N									0.3	0.4	1.3	2.1	0.6	1.1	2.0	4.2	2.0	3.3
<i>Camelina microcarpa</i> Andr. ex DC.	CAMI1	F	N																		
<i>Centaurea diffusa</i> Lam.	CEDI1	F	N		X					0.2	0.4					0.1	0.2	0.3	0.7	0.1	0.2
<i>Cirsium arvense</i> (L.) Scop.	CIAR1	F	N		X																
<i>Cichorium intybus</i> L.	CIIN1	F	N		X																
<i>Convolvulus arvensis</i> L.	COAR1	F	N		X	0.3	0.5	0.9	2.1	3.0	7.7									0.1	0.2
<i>Dyssodia papposa</i> (Vent) Hitchc.	DYPA1	F	N					0.1	0.3												
<i>Erodium cicutarium</i> (L.) L'Her.	ERC1	F	N		X									0.3	0.4	0.6	1.1	0.2	0.3		
<i>Kochia scoparia</i> (L.) Schrad.	KOSC1	F	N			2.9	5.9	1.3	3.1	0.5	1.3	1.5	2.5	1.8	2.9	0.4	0.6	0.5	1.0	1.5	2.5
<i>Lactuca serriola</i> L.	LASE1	F	N													0.3	0.4			0.5	0.8
<i>Linaria dalmatica</i> (L.) Mill.	LIDA1	F	N		X	0.1	0.3									0.1	0.2				
<i>Melilotus alba</i> Medic.	MEAL1	F	N													0.8	1.3				
<i>Melilotus officinalis</i> (L.) Pall.	MEOF1	F	N					0.3	0.6	1.2	3.0	0.1	0.2					1.2	2.4		
<i>Plantago lanceolata</i> L.	PLLA1	F	N			0.1	0.3			1.0	2.6			0.1	0.2	1.3	2.2				
<i>Polygonum arenastrum</i> Jord. ex Bor.	POAR1	F	N																	0.1	0.2
<i>Polygonum convolvulus</i> L.	POCO2	F	N																		
<i>Salsola iberica</i> Senn. & Pau.	SAIB1	F	N							0.2	0.4										
<i>Scorzonera laciniata</i> L.	SCLA1	F	N																		
<i>Sisymbrium altissimum</i> L.	SIAL1	F	N																		
<i>Taraxacum officinale</i> Weber	TAOF1	F	N																		
<i>Tragopogon dubius</i> Scop.	TRDU1	F	N					0.1	0.3												
<i>Verbascum thapsus</i> L.	VETH1	F	N		X											0.4	0.6				
<i>Ambrosia artemisiifolia</i> L.	AMAR1	F	Y					0.1	0.3	0.2	0.4					0.1	0.2				
<i>Ambrosia psilostachya</i> DC.	AMPS1	F	Y													0.1	0.2				
<i>Astragalus canadensis</i> L.	ASCA1	F	Y																		
<i>Aster porteri</i> Gray	ASPO1	F	Y													0.1	0.2				
<i>Asclepias viridiflora</i> Raf.	ASV1	F	Y							0.2	0.4										
<i>Chrysopsis fulcrata</i> Greene	CHF1	F	Y																	0.1	0.2
<i>Chrysopsis villosa</i> Pursh.	CHV1	F	Y																		
<i>Dalea candida</i> Michx. ex Willd. var. <i>oligophylla</i> (Torr.) Shinners.	DACA1	F	Y																		
<i>Descurainia pinnata</i> (Walt.) Britt.	DEPI1	F	Y																	0.1	0.2
<i>Erigeron strigosus</i> Muhl. ex Willd.	ERST1	F	Y																		
<i>Euphorbia serpyllifolia</i> Pers.	EUSE1	F	Y													0.1	0.2				
<i>Grindelia squarrosa</i> (Pursh.) Dun.	GRSQ1	F	Y																	0.6	1.0
<i>Helianthus annuus</i> L.	HEAN1	F	Y			0.1	0.3	0.4	0.9	0.2	0.4										
<i>Linum perenne</i> L. var. <i>lewisii</i> (Pursh.) Eat. & Wright	LIPE1	F	Y																		
<i>Polygonum ramosissimum</i> Michx.	PORA1	F	Y																		
<i>Spergularia media</i> (L.) Presl.	SPME1	F	Y																		
<i>Talinum parviflorum</i> Nutt.	TAPA1	F	Y					0.3	0.6												
<i>Verbena bracteata</i> Lag. & Rodr.	VEBR1	F	Y									0.3	0.4	0.1	0.2	0.3	0.4				
<i>Agropyron cristatum</i> (L.) Gaertn.	AGCR1	G	N	C																	
<i>Agropyron desertorum</i> (Fisch.) Schult.	AGDE1	G	N	C												0.8	1.3				
<i>Agropyron intermedium</i> (Host) Beauv.	AGIN1	G	N	C																	
<i>Bromus inermis</i> Leyss. ssp. <i>inermis</i>	BRIN1	G	N	C		4.0	8.3	0.9	2.1	3.3	8.5							1.3	2.8	0.1	0.2
<i>Bromus japonicus</i> Thunb. ex Murr.	BRJA1	G	N	C				0.1	0.3			0.3	0.4								
<i>Bromus tectorum</i> L.	BRTE1	G	N	C	X	0.1	0.3	1.1	2.8	0.2	0.4	2.4	3.9	11.8	19.7	7.9	13.6	3.2	6.6	13.8	22.9
<i>Dactylis glomerata</i> L.	DAGL1	G	N	C										0.1	0.2						
<i>Festuca pratensis</i> Huds.	FEPR1	G	N	C																0.8	1.3
<i>Lolium perenne</i> L. var. <i>aristatum</i> Willd.	LOPE1	G	N	C																0.4	0.6
<i>Poa compressa</i> L.	POCO1	G	N	C		0.1	0.3							0.1	0.2	0.4	0.6			0.9	1.5
<i>Polyogon monspeliensis</i> (L.) Desf.	POMO1	G	N	C																	
<i>Poa pratensis</i> L.	POPR1	G	N	C				0.1	0.3							0.8	1.3				
<i>Triticum aestivum</i> L.	TRAE1	G	N	C																	
<i>Eragrostis pilosa</i> (L.) Beauv.	ERPI1	G	N	W																	
<i>Setaria viridis</i> (L.) Beauv.	SEVI1	G	N	W				0.3	0.6												
<i>Agropyron caninum</i> (L.) Beauv. ssp. <i>majus</i> (Vasey) C. L. Hitchc.	AGCA1	G	Y	C		20.4	42.1	13.4	32.7	13.2	33.8	15.4	25.5	19.9	33.3	14.5	25.1	6.5	13.5	4.3	7.1
<i>Agropyron dasystachyum</i> (Hook.) Scribn.	AGDA1	G	Y	C																	
<i>Agrostis scabra</i> Willd.	AGSC1	G	Y	C																	
<i>Agropyron smithii</i> Rydb.	AGSM1	G	Y	C		19.0	39.3	16.4	40.1	7.3	18.8	37.5	62.2	16.5	27.7	23.4	40.4	19.2	39.8	26.3	43.8

Table 3. Revegetation Locations L1 to L19 - Foliar Cover Summary 2010 (cont.)

Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	L1		L2		L3		L7		L12		L13		L17		L19	
						Absolute Cover (%)	Relative Cover (%)														
Aristida purpurea Nutt. var. robusta (Merrill) A. Holmgren & N. Holmgr	ARLO1	G	Y	C																	
Elymus canadensis L.	ELCA1	G	Y	C																	
Festuca ovina L. var. rydbergii St. Yves	FEOV1	G	Y	C														0.2	0.3	0.1	0.2
Hordeum jubatum L.	HOJU1	G	Y	C						0.2	0.4	0.1	0.2	0.3	0.4			0.3	0.7	0.1	0.2
Juncus bufonius L.	JUBU1	G	Y	C																	
Koeleria pyramidata (Lam.) Beauv.	KOPY1	G	Y	C				0.1	0.3					0.4	0.6	1.9	3.2	1.2	2.4	0.1	0.2
Scirpus pungens Vahl	SCPU1	G	Y	C																	
Stipa viridula Trin.	STV11	G	Y	C		0.1	0.3	1.0	2.4	1.0	2.6	0.3	0.4	0.1	0.2	0.4	0.6	1.8	3.8	0.1	0.2
Andropogon gerardii Vitman	ANGE1	G	Y	W				0.1	0.3											0.3	0.4
Andropogon scoparius Michx.	ANSC1	G	Y	W				0.1	0.3					0.1	0.2						
Bouteloua curtipendula (Michx.) Torr.	BOCU1	G	Y	W				0.4	0.9	2.0	5.1	0.1	0.2	4.3	7.1	0.4	0.6	2.5	5.2	1.1	1.9
Bouteloua gracilis (H. B. K.) Lag ex Griffiths	BOGR1	G	Y	W		0.1	0.3	0.1	0.3	0.3	0.9	0.1	0.2	1.1	1.9	1.9	3.2	0.8	1.7	2.9	4.8
Buchloe dactyloides (Nutt.) Engelm.	BUDA1	G	Y	W		0.9	1.8	3.0	7.3	4.7	12.0	2.0	3.3	0.6	1.0	0.4	0.6	5.5	11.4	3.4	5.6
Juncus torreyi Cov.	JUTO1	G	Y	W																	
Muhlenbergia montana (Nutt.) Hitchc.	MUMO1	G	Y	W																	
Panicum virgatum L.	PAV11	G	Y	W																	
Sorghastrum nutans (L.) Nash	SONU1	G	Y	W				0.1	0.3	0.3	0.9			0.8	1.3						
Sporobolus cryptandrus (Torr.) A. Gray	SPCR1	G	Y	W				0.3	0.6					0.1	0.2	0.1	0.2	1.5	3.1	0.3	0.4
Spartina pectinata Link	SPPE1	G	Y	W		0.1	0.3														
Festuca species	FES1																				
Unknown species	UNKN																				
Populus deltoides Marsh. ssp. monilifera (Ait.) Eckenw.	PODE1	T	Y																		
Salix amygdaloides Anderss.	SAAM1	T	Y																		
Total Foliar Cover						48.4	100.0	40.9	100.0	39.0	100.0	60.3	100.0	59.6	100.0	57.9	100.0	48.2	100.0	60.0	100.0
Total Forb Cover						3.5	7.2	3.4	8.3	6.5	16.7	2.1	3.5	3.5	5.9	5.3	9.1	4.2	8.7	5.3	8.8
Total Non-Native Forb Cover						3.4	7.0	2.6	6.4	6.0	15.4	1.9	3.1	3.4	5.7	4.5	7.8	4.2	8.7	4.4	7.3
Total Native Forb Cover						0.1	0.3	0.8	1.8	0.5	1.3	0.3	0.4	0.1	0.2	0.8	1.3	0.0	0.0	0.9	1.5
Total Graminoid Cover						44.9	92.8	37.5	91.7	32.5	83.3	58.1	96.5	56.1	94.1	52.6	90.9	44.0	91.3	54.8	91.3
Total Non-Native Graminoid Cover						4.3	8.8	2.5	6.1	3.5	9.0	2.6	4.4	12.0	20.1	9.8	16.8	4.5	9.3	15.9	26.5
Total Native Graminoid Cover						40.6	84.0	35.0	85.6	29.0	74.4	55.5	92.1	44.1	74.0	42.9	74.1	39.5	82.0	38.9	64.8
Total Herbaceous Native Cover						40.8	84.2	35.8	87.5	29.5	75.6	55.8	92.5	44.3	74.2	43.6	75.4	39.5	82.0	39.8	66.3
Total Herbaceous Non-Native Cover						7.6	15.8	5.1	12.5	9.5	24.4	4.5	7.5	15.4	25.8	14.3	24.6	8.7	18.0	20.3	33.8
Total Warm-Season Graminoid Cover						1.1	2.3	4.4	10.7	7.3	18.8	2.3	3.7	7.0	11.7	2.8	4.8	10.3	21.5	7.9	13.1
Total Cool-Season Graminoid Cover						43.8	90.4	33.1	81.0	25.2	64.5	55.9	92.7	49.1	82.4	49.9	86.2	33.7	69.9	46.9	78.1
Total Noxious Weed Cover						0.5	1.0	2.0	4.9	3.3	8.5	2.4	3.9	12.0	20.1	9.1	15.8	3.7	7.6	14.0	23.3
Total Tree Cover						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Absolute Cover = The percentage of the number of hits on a species out of the total number of hits possible.
 Relative Cover = The percentage of the number of hits on a species out of the total number of vegetation hits.
 Native Categories: Y = Native, N = Non-Native, NA = Not Available
 Growth Form Categories: F = Forb, G = Graminoid, T = Tree
 Cool/Warm Season Categories: C = Cool-Season Graminoid, W = Warm-Season Graminoid
 Noxious Weed Category: X = Noxious Weed (listed on May 2006 Colorado State Noxious Weed List)

Yellow shaded cells indicate success criteria were met in 2010.

Blue shaded cells indicate this species provided greater than 45 percent of the relative cover in 2010

Table 4. Revegetation Locations L20 to L40 - Foliar Cover Summary 2010

Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	L20		L21		L23		L26		L28		L34		L39		L40	
						Absolute Cover (%)	Relative Cover (%)														
Alyssum minus (L.) Rothmaler var. micranthus (C. A. Mey.) Dudley	ALMI1	F	N			0.3	0.4	0.5	1.7	0.3	0.4	0.3	0.5	1.3	1.8	4.3	5.9	0.1	0.2	2.0	5.4
Camelina microcarpa Andr. ex DC.	CAMI1	F	N									0.3	0.5			0.3	0.3				
Centaurea diffusa Lam.	CEDI1	F	N		X					0.6	1.1			2.5	3.6	0.3	0.3	0.1	0.2		
Cirsium arvense (L.) Scop.	CIAR1	F	N		X			0.1	0.3					0.7	1.0						
Cichorium intybus L.	CIIN1	F	N		X																
Convolvulus arvensis L.	COAR1	F	N		X									0.3	0.5	2.0	2.8				
Dyssodia papposa (Vent) Hitchc.	DYPA1	F	N																		
Erodium cicutarium (L.) L'Her.	ERC11	F	N		X	0.1	0.2	0.1	0.3	0.1	0.2			0.6	0.8	0.3	0.3				
Kochia scoparia (L.) Schrad.	KOSC1	F	N			1.0	1.6	0.1	0.3	3.1	5.5	0.3	0.5					0.1	0.2		
Lactuca serriola L.	LASE1	F	N			2.3	3.6			3.9	6.8										
Linaria dalmatica (L.) Mill.	LIDA1	F	N		X							1.5	3.0								
Melilotus alba Medic.	MEAL1	F	N			0.8	1.2							1.5	2.1						
Melilotus officinalis (L.) Pall.	MEOF1	F	N			7.8	12.3	3.3	11.2	0.5	0.9			16.5	23.6	4.0	5.5	3.4	9.4		
Plantago lanceolata L.	PLLA1	F	N															0.5	1.4	2.0	5.4
Polygonum arenastrum Jord. ex Bor.	POAR1	F	N					0.1	0.3												
Polygonum convolvulus L.	POCO2	F	N									0.5	1.0								
Salsola iberica Senn. & Pau.	SAIB1	F	N																		
Scorzonera laciniata L.	SCLA1	F	N							0.3	0.4										
Sisymbrium altissimum L.	SIAL1	F	N			0.1	0.2														
Taraxacum officinale Weber	TAOF1	F	N					0.1	0.3			0.3	0.5			0.3	0.3				
Tragopogon dubius Scop.	TRDU1	F	N			0.1	0.2							0.1	0.1	0.3	0.3				
Verbascum thapsus L.	VETH1	F	N		X					0.1	0.2			0.1	0.1	1.8	2.4	0.1	0.2		
Ambrosia artemisiifolia L.	AMAR1	F	Y																		
Ambrosia psilostachya DC.	AMPS1	F	Y									1.5	3.0	0.1	0.1						
Astragalus canadensis L.	ASCA1	F	Y					1.6	5.4												
Aster porteri Gray	ASPO1	F	Y			0.3	0.4	0.1	0.3			0.3	0.5					0.1	0.2		
Asclepias viridiflora Raf.	ASV11	F	Y																		
Chrysopsis fulcrata Greene	CHFU1	F	Y					0.1	0.3												
Chrysopsis villosa Pursh.	CHV11	F	Y																		
Dalea candida Michx. ex Willd. var. oligophylla (Torr.) Shinners.	DACA1	F	Y																		
Descurainia pinnata (Walt.) Britt.	DEPI1	F	Y																		
Erigeron strigosus Muhl. ex Willd.	ERST1	F	Y																		
Euphorbia serpyllifolia Pers.	EUSE1	F	Y					0.1	0.3												
Grindelia squarrosa (Pursh.) Dun.	GRSQ1	F	Y			0.1	0.2	0.3	0.9	0.4	0.7	0.3	0.5	0.8	1.2	0.8	1.0			1.0	2.7
Helianthus annuus L.	HEAN1	F	Y			0.1	0.2							0.1	0.1						
Linum perenne L. var. lewisii (Pursh.) Eat. & Wright	LIPE1	F	Y					0.2	0.6							0.5	0.7				
Polygonum ramosissimum Michx.	PORA1	F	Y			0.1	0.2			0.1	0.2	0.3	0.5								
Spergularia media (L.) Presl.	SPME1	F	Y																		
Talinum parviflorum Nutt.	TAPA1	F	Y																		
Verbena bracteata Lag. & Rodr.	VEBR1	F	Y			0.1	0.2			0.1	0.2										
Agropyron cristatum (L.) Gaertn.	AGCR1	G	N	C						0.1	0.2			0.6	0.8	0.3	0.3				
Agropyron desertorum (Fisch.) Schult.	AGDE1	G	N	C										1.0	1.4						
Agropyron intermedium (Host) Beauv.	AGIN1	G	N	C										0.5	0.7						
Bromus inermis Leyss. ssp. inermis	BRIN1	G	N	C				0.1	0.3			0.3	0.5	0.3	0.4	0.8	1.0				
Bromus japonicus Thunb. ex Murr.	BRJA1	G	N	C				0.3	1.1	0.1	0.2	0.8	1.5	0.3	0.5	0.5	0.7				
Bromus tectorum L.	BRTE1	G	N	C	X	8.6	13.7	0.1	0.3	10.1	17.8	0.3	0.5	2.8	4.1	2.5	3.5	0.1	0.2		
Dactylis glomerata L.	DAGL1	G	N	C										0.1	0.1						
Festuca pratensis Huds.	FEPR1	G	N	C																0.5	1.4
Lolium perenne L. var. aristatum Willd.	LOPE1	G	N	C																	
Poa compressa L.	POCO1	G	N	C		0.8	1.2	0.2	0.6			0.3	0.5			0.3	0.3				
Polyogon monspeliensis (L.) Desf.	POMO1	G	N	C																	
Poa pratensis L.	POPR1	G	N	C																	
Triticum aestivum L.	TRAE1	G	N	C																	
Eragrostis pilosa (L.) Beauv.	ERPI1	G	N	W																	
Setaria viridis (L.) Beauv.	SEVI1	G	N	W												1.5	2.1				
Agropyron caninum (L.) Beauv. ssp. majus (Vasey) C. L. Hitchc.	AGCA1	G	Y	C		13.4	21.2	5.8	19.8	18.4	32.4	1.3	2.5	3.8	5.4	11.8	16.3	9.1	25.0	2.0	5.4
Agropyron dasystachyum (Hook.) Scribn.	AGDA1	G	Y	C																	
Agrostis scabra Willd.	AGSC1	G	Y	C				0.1	0.3												
Agropyron smithii Rydb.	AGSM1	G	Y	C		25.8	40.8	4.7	16.0	15.8	27.8	34.5	69.0	20.5	29.3	28.5	39.4	9.3	25.5	3.5	9.5

Table 4. Revegetation Locations L20 to L40 - Foliar Cover Summary 2010 (cont.)

Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	L20		L21		L23		L26		L28		L34		L39		L40	
						Absolute Cover (%)	Relative Cover (%)														
Aristida purpurea Nutt. var. robusta (Merrill) A. Holmgren & N. Holmgr	ARLO1	G	Y	C														0.1	0.2		
Elymus canadensis L.	ELCA1	G	Y	C				1.2	4.0	1.1	2.0										
Festuca ovina L. var. rydbergii St. Yves	FEOV1	G	Y	C				0.2	0.6												
Hordeum jubatum L.	HOJU1	G	Y	C						1.0	1.8			0.2	0.2					0.5	1.4
Juncus bufonius L.	JUBU1	G	Y	C														0.1	0.2		
Koeleria pyramidata (Lam.) Beauv.	KOPY1	G	Y	C		0.3	0.4	0.1	0.3	0.1	0.2	0.5	1.0			0.3	0.3	0.3	0.7		
Scirpus pungens Vahl	SCPU1	G	Y	C														0.1	0.2		
Stipa viridula Trin.	STV11	G	Y	C		0.1	0.2			0.1	0.2	2.0	4.0	0.1	0.1	0.3	0.3	0.7	1.8		
Andropogon gerardii Vitman	ANGE1	G	Y	W				0.3	1.1					0.5	0.7			0.3	0.9		
Andropogon scoparius Michx.	ANSC1	G	Y	W				0.5	1.7									0.3	0.9	3.0	8.1
Bouteloua curtipendula (Michx.) Torr.	BOCU1	G	Y	W		0.4	0.6	1.9	6.6			1.5	3.0	1.3	1.8	1.8	2.4	2.9	8.0		
Bouteloua gracilis (H. B. K.) Lag ex Griffiths	BOGR1	G	Y	W		0.5	0.8	4.4	15.2	0.4	0.7	1.5	3.0	13.1	18.7	7.8	10.7	2.5	6.9		
Buchloe dactyloides (Nutt.) Engelm.	BUDA1	G	Y	W				1.8	6.0			2.0	4.0	0.4	0.6	1.5	2.1	5.0	13.8	21.0	56.8
Juncus torreyi Cov.	JUTO1	G	Y	W				0.1	0.3									1.3	3.4		
Muhlenbergia montana (Nutt.) Hitchc.	MUMO1	G	Y	W				0.3	0.9												
Panicum virgatum L.	PAV11	G	Y	W				0.8	2.9												
Sorghastrum nutans (L.) Nash	SONU1	G	Y	W														0.1	0.2		
Sporobolus cryptandrus (Torr.) A. Gray	SPCR1	G	Y	W		0.1	0.2							0.1	0.1	0.3	0.3			1.0	2.7
Spartina pectinata Link	SPPE1	G	Y	W																	
Festuca species	FES1																				
Unknown species	UNKN					0.1	0.2													0.5	1.4
Populus deltoides Marsh. ssp. monilifera (Ait.) Eckenw.	PODE1	T	Y					0.5	100.0												
Salix amygdaloides Anderss.	SAAM1	T	Y															0.1	100.0		
Total Foliar Cover						63.1	100.0	29.6	200.0	56.8	100.0	50.0	100.0	69.9	100.0	72.3	100.0	36.4	200.0	37.0	100.0
Total Forb Cover						13.1	20.8	6.4	22.1	9.5	16.7	5.3	10.5	24.5	35.0	14.5	20.1	4.3	11.9	5.0	13.5
Total Non-Native Forb Cover						12.4	19.6	4.2	14.3	8.9	15.6	3.0	6.0	23.5	33.6	13.3	18.3	4.3	11.7	4.0	10.8
Total Native Forb Cover						0.8	1.2	2.3	7.7	0.6	1.1	2.3	4.5	1.0	1.4	1.3	1.7	0.1	0.2	1.0	2.7
Total Graminoid Cover						49.9	79.0	22.7	77.9	47.3	83.3	44.8	89.5	45.4	65.0	57.8	79.9	32.0	88.1	31.5	85.1
Total Non-Native Graminoid Cover						9.4	14.9	0.7	2.3	10.4	18.3	1.5	3.0	5.6	8.0	5.8	8.0	0.1	0.2	0.5	1.4
Total Native Graminoid Cover						40.5	64.2	22.0	75.6	36.9	65.0	43.3	86.5	39.8	57.0	52.0	72.0	31.9	87.8	31.0	83.8
Total Herbaceous Native Cover						41.3	65.3	24.3	83.4	37.5	66.1	45.5	91.0	40.8	58.4	53.3	73.7	32.0	88.1	32.0	86.5
Total Herbaceous Non-Native Cover						21.8	34.5	4.8	16.6	19.3	33.9	4.5	9.0	29.1	41.6	19.0	26.3	4.3	11.9	4.5	12.2
Total Warm-Season Graminoid Cover						1.0	1.6	10.1	34.7	0.4	0.7	5.0	10.0	15.3	21.9	12.8	17.6	12.4	34.2	25.0	67.6
Total Cool-Season Graminoid Cover						48.9	77.4	12.6	43.3	46.9	82.6	39.8	79.5	30.1	43.0	45.0	62.3	19.6	53.9	6.5	17.6
Total Noxious Weed Cover						8.8	13.9	0.3	0.9	11.0	19.4	1.8	3.5	7.0	10.0	6.8	9.3	0.3	0.7	0.0	0.0
Total Tree Cover						0.0	0.0	0.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	100.0	0.0	0.0

Absolute Cover = The percentage of the number of hits on a species out of the total number of hits possible.
 Relative Cover = The percentage of the number of hits on a species out of the total number of vegetation hits.
 Native Categories: Y = Native, N = Non-Native, NA = Not Available
 Growth Form Categories: F = Forb, G = Graminoid, T = Tree
 Cool/Warm Season Categories: C = Cool-Season Graminoid, W = Warm-Season Graminoid
 Noxious Weed Category: X = Noxious Weed (listed on May 2006 Colorado State Noxious Weed List)

Yellow shaded cells indicate success criteria were met in 2010.

Blue shaded cells indicate this species provided greater than 45 percent of the relative cover in 2010

Table 5. Revegetation Locations L41 to L57 - Foliar Cover Summary 2010 (cont.)

Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	L41		L42		L44		L45		L53		L54		L55		L56		L57	
						Absolute Cover (%)	Relative Cover (%)																
Festuca ovina L. var. rydbergii St. Yves	FEOV1	G	Y	C		24.0	31.8			0.1	0.2	1.3	2.2			0.5	0.6						
Hordeum jubatum L.	HOJU1	G	Y	C						0.4	0.7	0.3	0.4					2.3	4.2	0.1	0.2	1.3	2.1
Juncus bufonius L.	JUBU1	G	Y	C																			
Koeleria pyramidata (Lam.) Beauv.	KOPY1	G	Y	C														0.1	0.2	0.1	0.2		
Scirpus pungens Vahl	SCPU1	G	Y	C																			
Stipa viridula Trin.	STVI1	G	Y	C		3.0	4.0	3.5	9.1	0.1	0.2			11.5	13.7	21.5	27.6	0.1	0.2	0.6	1.3		
Andropogon gerardii Vitman	ANGE1	G	Y	W																			
Andropogon scoparius Michx.	ANSC1	G	Y	W																0.7	1.4		
Bouteloua curtipendula (Michx.) Torr.	BOCU1	G	Y	W				3.5	9.1	0.1	0.2	0.3	0.4	0.5	0.6	10.5	13.5	2.7	4.8	2.1	4.5	0.3	0.5
Bouteloua gracilis (H. B. K.) Lag ex Griffiths	BOGR1	G	Y	W		6.0	7.9	6.5	16.9	0.6	1.1	0.1	0.2	1.5	1.8	1.0	1.3	3.0	5.4	2.3	5.0	0.2	0.3
Buchloe dactyloides (Nutt.) Engelm.	BUDA1	G	Y	W		3.0	4.0	0.5	1.3	1.5	2.7	4.0	7.0	6.5	7.7	7.0	9.0	4.5	8.2	2.2	4.7	0.7	1.1
Juncus torreyi Cov.	JUTO1	G	Y	W																			
Muhlenbergia montana (Nutt.) Hitchc.	MUMO1	G	Y	W																			
Panicum virgatum L.	PAVI1	G	Y	W																			
Sorghastrum nutans (L.) Nash	SONU1	G	Y	W				0.5	1.3									0.5	0.9				
Sporobolus cryptandrus (Torr.) A. Gray	SPCR1	G	Y	W		1.0	1.3	3.0	7.8			1.4	2.4	4.0	4.8			0.1	0.2	0.2	0.4		
Spartina pectinata Link	SPPE1	G	Y	W																			
Festuca species	FES1					0.5	0.7																
Unknown species	UNKN																						
Populus deltoides Marsh. ssp. monilifera (Ait.) Eckenw.	PODE1	T	Y																				
Salix amygdaloides Anderss.	SAAM1	T	Y																				
Total Foliar Cover						75.5	100.0	38.5	100.0	55.3	100.0	57.5	100.0	84.0	100.0	78.0	100.0	55.2	100.0	46.6	100.0	63.2	100.0
Total Forb Cover						6.5	8.6	3.0	7.8	13.4	24.2	1.5	2.6	27.5	32.7	19.0	24.4	9.2	16.6	18.0	38.6	3.2	5.0
Total Non-Native Forb Cover						6.5	8.6	2.5	6.5	12.6	22.9	1.5	2.6	24.5	29.2	18.5	23.7	7.4	13.4	17.1	36.7	2.3	3.7
Total Native Forb Cover						0.0	0.0	0.5	1.3	0.8	1.4	0.0	0.0	3.0	3.6	0.5	0.6	1.8	3.2	0.9	2.0	0.8	1.3
Total Graminoid Cover						69.0	91.4	35.5	92.2	41.9	75.8	56.0	97.4	56.5	67.3	59.0	75.6	46.0	83.4	28.6	61.4	60.0	95.0
Total Non-Native Graminoid Cover						28.0	37.1	4.5	11.7	3.5	6.3	2.8	4.8	18.0	21.4	8.5	10.9	2.5	4.5	1.0	2.1	1.2	1.8
Total Native Graminoid Cover						40.5	53.6	31.0	80.5	38.4	69.5	53.3	92.6	38.5	45.8	50.5	64.7	43.5	78.9	27.6	59.2	58.8	93.1
Total Herbaceous Native Cover						40.5	53.6	31.5	81.8	39.1	70.8	53.3	92.6	41.5	49.4	51.0	65.4	45.3	82.0	28.5	61.2	59.7	94.5
Total Herbaceous Non-Native Cover						34.5	45.7	7.0	18.2	16.1	29.2	4.3	7.4	42.5	50.6	27.0	34.6	9.9	18.0	18.1	38.8	3.5	5.5
Total Warm-Season Graminoid Cover						10.0	13.2	14.0	36.4	2.5	4.5	5.8	10.0	12.5	14.9	18.5	23.7	10.8	19.6	7.4	15.9	1.2	1.8
Total Cool-Season Graminoid Cover						58.5	77.5	21.5	55.8	39.4	71.3	50.3	87.4	44.0	52.4	40.5	51.9	35.2	63.7	21.2	45.4	58.8	93.1
Total Noxious Weed Cover						5.5	7.3	4.5	11.7	7.6	13.8	1.9	3.3	20.5	24.4	10.0	12.8	1.1	2.0	1.3	2.9	1.2	1.8
Total Tree Cover						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Absolute Cover = The percentage of the number of hits on a species out of the total number of hits possible.
 Relative Cover = The percentage of the number of hits on a species out of the total number of vegetation hits.
 Native Categories: Y = Native, N = Non-Native, NA = Not Available
 Growth Form Categories: F = Forb, G = Graminoid, T = Tree
 Cool/Warm Season Categories: C = Cool-Season Graminoid, W = Warm-Season Graminoid
 Noxious Weed Category: X = Noxious Weed (listed on May 2006 Colorado State Noxious Weed List)

Yellow shaded cells indicate success criteria were met in 2010.

Blue shaded cells indicate this species provided greater than 45 percent of the relative cover in 2010

Table 6. Success Criteria Evaluation Summary 2010

Location	>30% Relative Cover of Desired Species	>70% Total Ground Cover (Litter, Rock, and Basal Veg Cover)	50% or More of Seeded Species Present	No Single Species With >45% Relative Foliar Cover	PASS/FAIL
L1	PASS	FAIL	PASS	PASS	FAIL
L2	PASS	FAIL	PASS	PASS	FAIL
L3	PASS	FAIL	PASS	PASS	FAIL
L7	PASS	PASS	PASS	FAIL	PASS
L12	PASS	PASS	PASS	PASS	PASS
L13	PASS	PASS	PASS	PASS	PASS
L17	PASS	PASS	PASS	PASS	PASS
L19	PASS	PASS	PASS	PASS	PASS
L20	PASS	PASS	PASS	PASS	PASS
L21	PASS	FAIL	PASS	PASS	FAIL
L23	PASS	PASS	FAIL	PASS	FAIL
L26	PASS	PASS	PASS	FAIL	PASS
L28	PASS	PASS	PASS	PASS	PASS
L34	PASS	PASS	PASS	PASS	PASS
L39	PASS	PASS	PASS	PASS	PASS
L40	PASS	PASS	FAIL	FAIL	FAIL
L41	PASS	PASS	FAIL	PASS	PASS
L42	PASS	PASS	PASS	PASS	PASS
L44	PASS	PASS	PASS	FAIL	PASS
L45	PASS	PASS	PASS	FAIL	PASS
L53	PASS	PASS	PASS	PASS	PASS
L54	PASS	PASS	PASS	PASS	PASS
L55	PASS	FAIL	PASS	PASS	FAIL
L56	PASS	FAIL	PASS	PASS	FAIL
L57	PASS	PASS	FAIL	FAIL	FAIL
% Passing	100	76	84	76	64

Yellow shaded cells indicate all success criteria were met in 2010.

Blue shaded cells indicate all success criteria would be met in 2010 if >45% cover of a single species was removed as criteria. For reasons outlined in the text, these areas are considered to have passed as of 2010.

Green shaded cells indicate all success criteria would be met in 2010 if >50% of seed species present was removed as criteria for this location. For reasons outlined in the text, this area is considered to have passed as of 2010.

Table 7. Revegetation Location Information Table

Location	Original Revegetation Date	Seed Mix*	Original Erosion Control	Additional Revegetation Effort Date	Amendments Added	New Erosion Control
1	Fall 2007	M	Flexterra		Biosol, Mycorrhizal Inoculent	
2	Summer 2004	X	Erosion Matting	Fall 2007	soil (from 991 slump), Biosol, Mycorrhizal Inoculent	Flexterra
3	Summer 2004	X	Erosion Matting	Fall 2007	soil (from 991 slump), Biosol, Mycorrhizal Inoculent	Flexterra
7	Summer/Fall 2005	X	Crimped Straw	Spring 2007	Compost, Biosol, Mycorrhizal Inoculent	Flexterra
12	Summer/Fall 2005	X	Crimped Straw	Spring 2007	Compost, Biosol, Mycorrhizal Inoculent	Flexterra
13	Summer/Fall 2005	X	Crimped Straw	Spring 2007	Compost, Biosol, Mycorrhizal Inoculent	Flexterra
17	Summer 2005	X	Flexterra	Spring 2007	Compost, Biosol, Mycorrhizal Inoculent	Flexterra
19	Summer/Fall 2005	X	Crimped Straw	Fall 2007	Compost, Sustane, Mycorrhizal Inoculent	Flexterra
20	Summer/Fall 2005	X	Crimped Straw	Fall 2007	Compost, Sustane, Mycorrhizal Inoculent	Flexterra
21	Summer/Fall 2005	X1	Flexterra/Crimped Straw			
23	Summer/Fall 2005	X	Crimped Straw	Summer/Fall 2007	Compost, Sustane, Mycorrhizal Inoculent	Flexterra
26	Spring 2005	M	Erosion Matting			
28	Spring 2005	X	Crimped Straw/Erosion Matting			
34	Summer 2002	X2	Hydromulch			
39	Summer 2005	M	Straw/Flexterra/Erosion Matting			
40	Summer/Fall 2005	X	Crimped Straw			
41	Spring 2002	X2	Hydromulch		Topsoil (12")	
42	Summer/Fall 2005	X	Hydromulch			
44	Summer/Fall 2005	X	Crimped Straw	Spring 2007	Compost, Biosol, Mycorrhizal Inoculent	Flexterra
45	Summer/Fall 2005	X	Crimped Straw	Spring 2007	Compost, Biosol, Mycorrhizal Inoculent	Flexterra
53	Winter 2003	M	Hydromulch			
54	Winter 2003	M	Hydromulch			
55	Summer 2005	M	Crimped Straw/Flexterra			
56	Summer/Fall 2005	X	Crimped Straw/Hydromulch			
57	Summer 2005	X	Flexterra	Summer 2008	Compost, Sustane, Mycorrhizal Inoculent	Flexterra/Erosion Blankets

* See Table 2 for specific species in seed mix.

Table 8. Basal Cover Summary at Revegetation Locations 2010

Location	Basal Vegetation Cover (%)	Litter Cover (%)	Rock Cover (%)	Total Ground Cover (%)*	Bare Ground (%)
L1	5.6	47.1	10.0	62.8	41.8
L2	10.0	31.6	20.0	61.6	47.6
L3	8.3	30.0	17.2	55.5	49.2
L7	6.9	56.1	26.0	89.0	19.5
L12	10.0	61.0	22.3	93.3	16.9
L13	4.4	76.5	11.5	92.4	2.3
L17	11.7	43.7	32.0	87.3	27.2
L19	7.4	68.8	17.1	93.3	13.3
L20	5.6	67.6	18.1	91.4	14.5
L21	4.5	14.3	44.3	63.1	41.1
L23	5.0	61.6	16.4	83.0	24.9
L26	3.8	64.0	24.0	91.8	7.3
L28	8.3	60.5	9.4	78.2	25.6
L34	7.5	78.5	11.5	97.5	9.8
L39	9.2	47.8	26.8	83.8	25.4
L40	5.0	38.5	57.0	100.5	7.5
L41	24.0	85.5	1.5	111.0	4.5
L42	12.0	38.0	45.0	95.0	21.0
L44	6.3	44.9	30.1	81.3	23.8
L45	11.1	54.6	19.8	85.5	22.0
L53	7.5	85.0	2.0	94.5	7.5
L54	12.5	76.0	2.5	91.0	12.5
L55	5.8	43.5	14.1	63.4	39.7
L56	5.0	43.3	17.4	65.7	34.6
L57	10.8	66.7	11.3	88.8	14.5
Grand Mean	8.3	55.4	20.3	84.0	22.1

* Numbers greater than 100 are an artifact of the sampling method using a cover class system and midpoints for analysis. The Total Ground Cover value is the sum of the Basal Vegetation Cover, Litter Cover, and Rock Cover.

Shaded cells indicate that the success criteria of >70% total ground cover were met in 2010.

Table 9. Relative Foliar Cover of Selected Species on Native Grasslands at Rocky Flats

Location	Species	1993	1994	1995	1998	1999	2000	2001	2007	2008	2009	2010
TR02	Agropyron smithii	40.5	33.0	31.5		23.5	23.2					
TR02	Total Foliar Cover	68.2	88.0	97.2		77.4	71.6					
TR04	Agropyron smithii	28.6	15.7	19.3		13.7	10.0					
TR06	Stipa comata	61.5	62.4	49.4	50.8			45.7				
TR11	Stipa comata	11.6	8.7	3.2		6.6	12.6					
TR11	Bromus japonicus	3.0	25.8	39.1		19.2	4.5					
OLF Reference Area	Agropyron smithii								21.8	33.4	59.0	33.3
A-Ponds Reference Area	Agropyron smithii										54.2	18.0

These data are from various other studies that have been conducted at Rocky Flats. The sporadic nature of the timing of some studies is a result of the purpose of the individual studies. See the text for more information.