2014 Revegetation Monitoring

Introduction

The Rocky Flats Site (Site), a U.S. Department of Energy (DOE) 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* (LMS/RFS/S04513) (Revegetation Plan) (DOE 2009), are being met, as well as to determine how these revegetation areas need to be managed.

The success criteria, as stated in the Revegetation Plan, are as follows:

- A minimum of 50 percent of the seeded native species will be present at the revegetation site.
- 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.
- 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:

  $$\text{Relative cover of Species A} = (20 \div 80) \times 100 = 25 \text{ percent}$$

- 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 2014. Each of the locations monitored in 2014 had previously met the success criteria. As part of the long-term stewardship of the Site, revegetation locations are monitored every few years to evaluate the long-term sustainability of the vegetation and the potential successional changes in plant community composition. Seventeen revegetation units selected in their monitoring rotation were sampled in 2014 (Figure 1).

Methods

Semiquantitative revegetation monitoring was conducted during summer 2014. The monitoring method provided in the Revegetation Plan, with some modification, was used. The revegetation areas were divided into units on the basis of geographic features (e.g., roads, streams) or previous building areas. The unit boundaries were the same as had been used for previous sampling efforts.

Within each revegetation unit, sample locations were randomly generated in the Geographic Information System and located on the ground using a GPS unit. Quadrats that measured 50 centimeters by 100 centimeters were used to sample the vegetation at each location. Depending on the size of the area, the number of quadrats sampled in each area varied from 5 to 30. A total of 250 quadrats were sampled in 2014 (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. Species lists were generated for each revegetation unit by combining the quadrat data for that unit.

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 = 76–95 percent (85 percent), 6 = >95 percent (97.5 percent). Total foliar cover, basal vegetation cover, litter cover, rock cover, and bare ground cover were also estimated within each quadrat using the cover class system.

The midpoint value of each cover class was used to calculate the average absolute and relative foliar cover by species across the quadrats sampled for each revegetation unit. The percentage of absolute foliar cover was calculated as the sum of 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 cover values for all species in the same revegetation unit, multiplied by 100. The midpoint values were also used to calculate the average cover at each revegetation unit for basal vegetation, litter, and rock.

Results and Discussion

Table 2 shows the species richness (number of species), a list of species seeded, and the seeded species found growing at each revegetation location in 2014. Species richness ranged from a low of 12 species in unit L54 to a high of 40 species in unit L59. Tables 3, 4, and 5 list the species present at each revegetation location. Eleven different seeded graminoid species had become established and were growing at some locations in 2014. These included slender wheatgrass (*Agropyron caninum = Agropyron trachycaulum*), western wheatgrass (*Agropyron smithii*), big bluestem (*Andropogon gerardii*), little bluestem (*Andropogon scoparius*), sideoats grama (*Bouteloua curtipendula*), blue grama (*Bouteloua gracilis*), buffalograss (*Buchloe dactyloides*), June grass (*Koleria pyrimidata*), Indian grass (*Sorghastrum nutans*), sand dropseed (*Sporobolus cryptandrus*), and green needlegrass (*Stipa viridula*). Two species were established at all 17 locations monitored in 2014: western wheatgrass and blue grama.

In addition to the desirable seeded native species, several noxious weeds were also found at the locations monitored in 2014. These included whitetop (*Cardaria draba*), Canada thistle (*Cirsium arvense*), quackgrass (*Agropyron repens*), downy brome (*Bromus tectorum*), jointed goatgrass (*Aegilops cylindrica*), filaree (*Erodium cicutarium*), diffuse knapweed (*Centaurea diffusa*), bindweed (*Convolvulus arvensis*), St. Johns-wort (*Hypericum perforatum*), Dalmatian toadflax (*Linaria dalmatica*), moth mullein (*Verbascum blattaria*), common mullein (*Verbascum thapsus*), and field sow thistle (*Sonchus arvensis*). Total mean absolute foliar cover of noxious weeds at the various locations ranged from 0.5 percent to 10.5 percent (Tables 3, 4, and 5). Weeds will continue to be managed as needed to reduce noxious weed populations in the revegetation areas and to enable the desired seeded species to become established more quickly and compete with the weeds.

The first success criterion in the Revegetation Plan states that at least 50 percent of the seeded species must be present in an area for it to be considered successful. While this describes an ideal condition, especially for initial revegetation projects, many ecologically healthy areas may not meet this criterion. In 2014, 14 of the 17 locations (82 percent) met this criterion (Table 2). Of the three locations that did not meet this criterion (L41, L34, and L54), small sample sizes may have prevented the less common seeded species from being found in 2014.

Ground cover protection from rock, litter, and current-year live vegetation varied from approximately 77 percent to over 100 percent at the revegetation locations in 2014 (Table 6). 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 second success criterion in 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. All 17 locations met this criterion in 2014 (Table 6).

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. The shaded row in Tables 3, 4, and 5, titled “Total Native Cover,” shows that the total desired species cover meets the third success criterion at all locations in 2014. Nine of the 17 monitored revegetation locations (53 percent) had a single species that constituted greater than 45 percent of the relative cover in 2014 (Tables 3, 4, and 5). All nine of these locations were dominated by western wheatgrass (one of the seeded native species).

To evaluate potential successional change and trajectories in plant community composition, a comparison of past monitoring data was made with the 2014 data for each location (Table 7). Some locations have no data for a specific year because no monitoring was conducted at those locations in that year.

Changes in species richness from 2008 to 2014 varied by location. Of the 17 locations, 8 showed an increase in species richness from the first year of monitoring to 2014 (ranging from 2 to 9 species), 7 showed declines (ranging from a loss of 1 to 8 species), and 2 did not change. Species richness can change due to a variety of reasons. The timing of precipitation events can often influence the vegetation in a given year, sometimes causing a flush of germination from the seed bank. At new revegetation locations, declines are typically due to a decrease in weedy species, with two primary causes. Initially most revegetation locations tend to have a flush of weedy species at the beginning of a project. As the seeded perennial graminoids begin to establish, some of the early successional weedy species are outcompeted and disappear from the

area. An additional factor is the application of herbicides to remove the weedy competition and allow the seeded native graminoid species a better chance to establish.

Total absolute foliar cover has increased at all 17 locations from 2008 to 2014. This means the abundance of vegetation is continuing to increase across these areas; therefore, providing additional soil protection and reducing the potential for surface erosion. The total relative native cover increased at 12 of 17 locations with 15 locations having greater than 50 percent relative native cover. These two measures suggest that a "native" prairie is establishing and is not merely weedy vegetation.

The percentage of seeded species that are present has increased at 10 of the 17 locations since 2008, remained the same at 2 locations, and declined at 5 locations. The seeded native species continue to provide substantial cover at most of these revegetation locations. Table 7 lists the species that contributed more than 5 percent cover at each location from 2008 through 2014 (where data are available). The early dominance by the native, short-lived, cool-season, perennial, slender wheatgrass has given way to an increase in western wheatgrass (a long-lived, native, cool-season species) and other native warm-season species like blue grama, side-oats grama, and buffalograss. The mix of both cool-season and warm-season graminoids is desirable for long-term sustainability.

At location L41, the plant community is dominated by smooth brome (*Bromus inermis*) and sheep fescue (*Festuca ovina*), both undesirable species that were in the imported topsoil that was used for the original revegetation activities at this location prior to site closure (Table 4). They have outcompeted most of the less aggressive, seeded native species and will probably continue to dominate the area in the future particularly because of the abundance these two species in the seed bank. At location L41, the successional trajectory is not necessarily desirable, but without a sustained large input of time, money, and management resources it is unlikely that this trajectory is going to be changed.

The increase of smooth brome is a concern across the Site because it has the ability to outcompete the native graminoids, especially in the environmental conditions present at Rocky Flats. In 2008, smooth brome was documented in 8 of the 15 monitored revegetation locations. In 2014, 10 of the original 15 locations now have smooth brome and the relative native cover of smooth brome is increasing. Previous studies at Rocky Flats have shown that smooth brome circles can increase in size by 35 to over 200 percent over a 3-year period (DOE 2006). Control is challenging because even if a stand of smooth brome can be killed, the seed bank remains and the species begins reestablishment almost immediately.

Table 8 shows which monitoring locations passed or failed specific success criteria in 2014. Regarding the use of the success criteria, the Revegetation 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)

As previously discussed, the three locations that failed the "50 percent or more of seeded species present" criterion are not especially problematic. Two of the locations were dominated by western wheatgrass, a desirable native species, which has potentially reduced the abundance many of the other native seeded species. The third location, while not desirable from a plant

community composition standpoint, is providing good erosion cover for the area. It is also not practicable to try and change the plant community composition at this time given the low chances of long-term success and costs involved. Therefore, no further management actions will be taken at this time.

The Revegetation Plan's success criterion regarding dominance by a single species states that "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*)." (Emphasis added)

At each of the locations that failed this last criterion, western wheatgrass provided greater than 45 percent total relative cover. As discussed in previous annual reports, western wheatgrass is a desirable native species that often comprises greater than 45 percent cover on the native undisturbed grasslands in the Rocky Flats area. Another native species, needle-and-thread grass (*Stipa comata*), also is known to have greater than 45 percent cover at some locations at the site. 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 these revegetation areas will be detrimental to long-term wildlife and habitat management.

Based on 2014 monitoring results, no further management actions will be taken at any of the locations. In addition, abundant ground cover is present at each location, thus minimizing the potential for soil erosion. In general, the vegetation has become well established and should be sustainable in the long term.

Summary

Seventeen revegetation units, all of which had previously met the success criteria, were monitored again in 2014. Although the data show that some locations do not specifically meet some of the success criteria, further evaluation determined no additional management actions are required at this time. The establishment and sustainability of the plant communities at these locations continues to stabilize the soil, provide erosion protection, and provide good habitat for wildlife. With the exception of concerns regarding smooth brome, the successional trajectory of the revegetation areas is on track and should result in long-term sustainable native grassland communities at the site. Continued proactive management of noxious weeds using an integrated vegetation management program will aid in that process. Future monitoring will evaluate the sustainability of the grassland communities and successional changes.

References

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

DOE (U.S. Department of Energy), 2006. *Rocky Flats Site Annual Report of Site Surveillance and Maintenance Activities Calendar Year 2005*, DOE-LM/GJ1210-2006, Office of Legacy Management, June.

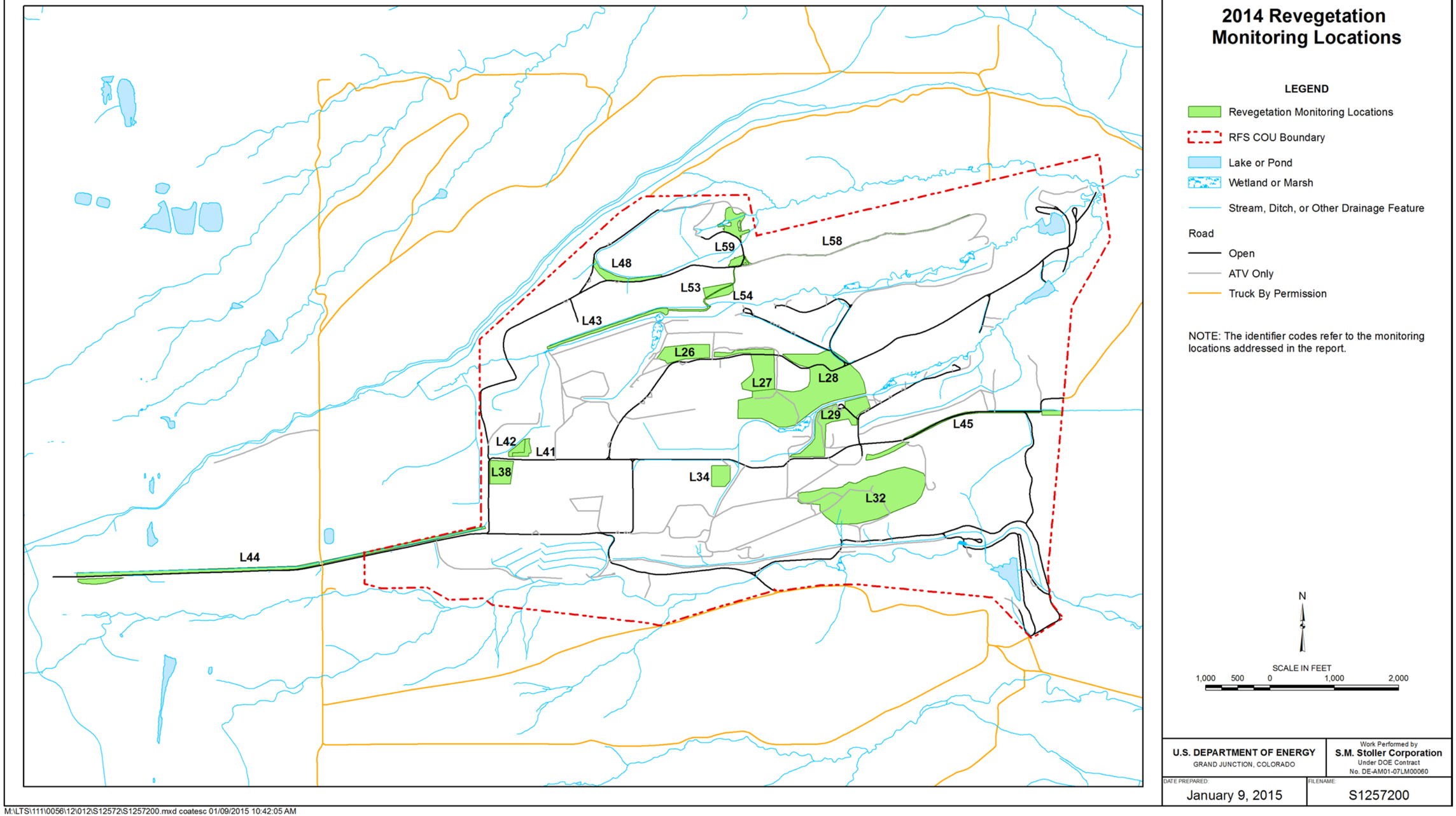

Figure 1. 2014 Revegetation Monitoring Locations

Table 1. Number of Quadrats Sampled per Location in 2014

Location	# Quadrats Sampled
L26	10
L27	15
L28	30
L29	20
L32	30
L34	10
L38	10
L41	5
L42	5
L43	20
L44	20
L45	20
L48	5
L53	5
L54	5
L58	20
L59	20
Total Quadrats Sampled	250
Total Locations Sampled	17

Table 2. Species Seeded By Location and 2014 Total Species Richness Summary

Location	L26	L27	L28	L29	L32	L34	L38	L41	L42	L43	L44	L45	L48	L53	L54	L58	L59
Scientific Name																	
Agropyron caninum	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Agropyron dasystachum	✓			✓	✓	✓		✓		✓				✓	✓		✓
Agropyron smithii	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Andropogon gerardii		✓	✓			✓	✓	✓	✓		✓	✓	✓			✓	
Andropogon scoparius		✓	✓			✓	✓	✓	✓		✓	✓	✓			✓	
Bouteloua curtipendula	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bouteloua gracilis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Buchloe dactyloides	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Koleria pyrimidata		✓	✓			✓	✓	✓	✓		✓	✓	✓			✓	
Sorghastrum nutans		✓	✓			✓	✓	✓	✓		✓	✓	✓			✓	
Sporobolus cryptandrus		✓	✓				✓		✓		✓	✓	✓			✓	
Stipa viridula	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total # Species Seeded	7	11	11	7	7	11	11	11	11	7	11	11	11	7	7	11	7
# Present in 2014	5	7	10	5	5	5	9	4	8	6	7	6	6	5	3	9	6
% Seeded Species Present in 2014	71	64	91	71	71	45	82	36	73	86	64	55	55	71	43	82	86
Total Species Richness in 2014	20	15	32	18	39	25	25	15	18	28	20	18	15	18	12	28	40

Shaded yellow cells mean those species were present in 2014.

Shaded green cells mean the success criterion of >50% of seeded species was met in 2014.

A checkmark indicates that the species was seeded at that location.

Table 3. Revegetation Locations L26 to L34 Foliar Cover Summary 2014

						L26		L27		L28		L29		L32		L34	
Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)
Alyssum minus (L.) Rothmaler var. micranthus (C. A. Mey.) Dudley	ALMI1	F	N			0.5	0.8	0.2	0.2	0.3	0.3					2.8	3.1
Cardaria draba (L.) Desv.	CADR1	F	N		X									0.1	0.1		
Centaurea diffusa Lam.	CEDI1	F	N		X					1.3	1.6			1.8	2.1	0.3	0.3
Cirsium arvense (L.) Scop.	CIAR1	F	N		X					0.1	0.1			0.1	0.1		
Convolvulus arvensis L.	COAR1	F	N		X			0.5	0.6	0.8	1.0	0.3	0.4	0.4	0.5	0.3	0.3
Erodium cicutarium (L.) L'Her.	ERCI1	F	N		X	0.3	0.4	0.2	0.2	0.3	0.4					0.5	0.6
Hypericum perforatum L.	HYPE1	F	N		X							0.1	0.2				
Kochia scoparia (L.) Schrad.	KOSC1	F	N			0.3	0.4					0.1	0.2				
Lactuca serriola L.	LASE1	F	N			0.3	0.4	0.5	0.6	0.3	0.3	1.0	1.6	0.7	0.8		
Lepidium campestre (L.) R. Br.	LECA1	F	N														
Linaria dalmatica (L.) Mill.	LIDA1	F	N		X	0.3	0.4							0.2	0.2	0.3	0.3
Marrubium vulgare L.	MAVU1	F	N					0.2	0.2								
Melilotus alba Medic.	MEAL1	F	N					2.3	2.8	0.5	0.7			4.8	5.7		
Melilotus officinalis (L.) Pall.	MEOF1	F	N					15.2	18.4	4.9	6.5	1.4	2.3	7.8	9.2		
Plantago lanceolata L.	PLLA1	F	N			0.3	0.4										
Scorzonera laciniata L.	SCLA1	F	N							0.1	0.1						
Sisymbrium altissimum L.	SIAL1	F	N														
Sonchus arvensis L. ssp. arvensis L.	SOAR1	F	N		X												
Tragopogon dubius Scop.	TRDU1	F	N			0.8	1.2			0.1	0.1			0.2	0.2		
Verbascum blattaria L.	VEBL1	F	N		X											0.3	0.3
Verbascum thapsus L.	VETH1	F	N		X	5.0	7.7							0.7	0.8		
Ambrosia artemisiifolia L.	AMAR1	F	Y											0.1	0.1		
Ambrosia psilostachya DC.	AMPS1	F	Y							0.2	0.2			0.1	0.1	0.3	0.3
Artemisia ludoviciana Nutt. var. ludoviciana	ARLU1	F	Y														
Astragalus canadensis L.	ASCA1	F	Y							0.5	0.7						
Aster porteri Gray	ASPO1	F	Y			1.8	2.7										
Asclepias speciosa Torr.	ASSP1	F	Y			0.3	0.4										
Chrysopsis villosa Pursh.	CHVI1	F	Y											3.6	4.2	0.3	0.3
Conyza canadensis (L.) Cronq.	COCA1	F	Y											0.1	0.1	0.3	0.3
Descurainia pinnata (Walt.) Britt.	DEPI1	F	Y														
Erigeron divergens T. & G.	ERDI1	F	Y														
Euphorbia serpyllifolia Pers.	EUSE1	F	Y									0.1	0.2				
Gaura coccinea Pursh.	GACO1	F	Y											0.2	0.2		
Grindelia squarrosa (Pursh.) Dun.	GRSQ1	F	Y			0.8	1.2			0.8	1.0	0.3	0.4	0.3	0.3	0.3	0.3
Helianthus annuus L.	HEAN1	F	Y							0.1	0.1			0.2	0.2		
Linum perenne L. var. lewisii (Pursh.) Eat. & Wright	LIPE1	F	Y														
Liatris punctata Hook.	LIPU1	F	Y											0.5	0.6		
Oenothera villosa Thunb. ssp. strigosa (Rydb.) Dietrich & Raven	OEVI1	F	Y											0.1	0.1		
Penstemon secundiflorus Benth.	PESE1	F	Y														
Plantago patagonica Jacq.	PLPA1	F	Y														
Polygonum ramosissimum Michx.	PORA1	F	Y														
Psoralea tenuiflora Pursh.	PSTE1	F	Y											1.6	1.9	0.3	0.3
Scrophularia lanceolata Pursh	SCLA2	F	Y														
Senecio spartioides T. & G.	SESP1	F	Y														
Silene antirrhina L.	SIAN1	F	Y											0.1	0.1	0.3	0.3
Silene drummondii Hook.	SIDR1	F	Y													0.3	0.3
Sphaeralcea coccinea (Pursh.) Rydb.	SPCO1	F	Y											0.1	0.1		
Spergularia media (L.) Presl.	SPME1	F	Y											0.1	0.1		
Verbena bracteata Lag. & Rodr.	VEBR1	F	Y														
Aegilops cylindrica Host	AECY1	G	N	C	X												
Agropyron cristatum (L.) Gaertn.	AGCR1	G	N	C						0.5	0.7						
Agropyron desertorum (Fisch.) Schult.	AGDE1	G	N	C													
Agropyron intermedium (Host) Beauv.	AGIN1	G	N	C						0.5	0.7	1.9	3.1				
Agropyron repens (L.) Beauv.	AGRE1	G	N	C	X					0.5	0.7						
Bromus inermis Leyss. ssp. inermis	BRIN1	G	N	C		1.5	2.3	10.2	12.3	6.6	8.7	8.1	13.3	18.6	21.8	13.3	14.8
Bromus japonicus Thunb. ex Murr.	BRJA1	G	N	C		0.5	0.8			0.4	0.5			1.5	1.8	0.5	0.6
Bromus tectorum L.	BRTE1	G	N	C	X	3.8	5.8			1.3	1.8	0.1	0.2	0.2	0.2	0.8	0.8

Table 3. Revegetation Locations L26 to L34 Foliar Cover Summary 2014 (cont.)

Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	L26		L27		L28		L29		L32		L34	
						Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)
Dactylis glomerata L.	DAGL1	G	N	C													
Festuca pratensis Huds.	FEPR1	G	N	C													
Poa compressa L.	POCO1	G	N	C		0.3	0.4					0.1	0.2	0.1	0.1	0.3	0.3
Polypogon monspeliensis (L.) Desf.	POMO1	G	N	C										0.1	0.1		
Poa pratensis L.	POPR1	G	N	C												3.8	4.2
Echinochloa crus-galli (L.) Beauv.	ECCR1	G	N	W													
Setaria viridis (L.) Beauv.	SEVI1	G	N	W													
Agropyron caninum (L.) Beauv. ssp. majus (Vasey) C. L. Hitchc.	AGCA1	G	Y	C		6.3	9.7			2.2	2.9	1.4	2.3				
Agropyron dasystachyum (Hook.) Scribn.	AGDA1	G	Y	C													
Agropyron smithii Rydb.	AGSM1	G	Y	C		33.5	51.7	35.5	43.0	35.9	47.3	33.6	55.2	13.1	15.3	48.8	54.6
Aristida purpurea Nutt. var. robusta (Merrill) A. Holmgren & N. Holmgr	ARLO1	G	Y	C										0.5	0.6		
Festuca ovina L. var. rydbergii St. Yves	FEOV1	G	Y	C												1.5	1.7
Hordeum jubatum L.	HOJU1	G	Y	C						0.1	0.1						
Koeleria pyramidata (Lam.) Beauv.	KOPY1	G	Y	C				0.2	0.2			0.1	0.2				
Sitanion hystrix (Nutt.) Sm. var. brevifolium (Sm.) Hitchc.	SIHY1	G	Y	C										0.1	0.1		
Stipa comata Trin. & Rupr.	STCO1	G	Y	C													
Stipa viridula Trin.	STVI1	G	Y	C						0.2	0.2			0.7	0.8	0.3	0.3
Typha latifolia L.	TYLA1	G	Y	C													
Andropogon gerardii Vitman	ANGE1	G	Y	W				1.3	1.6	1.3	1.6			1.3	1.6		
Andropogon scoparius Michx.	ANSC1	G	Y	W						0.1	0.1			0.5	0.6		
Bouteloua curtipendula (Michx.) Torr.	BOCU1	G	Y	W		2.0	3.1	5.3	6.5	1.3	1.8	1.8	2.9	14.9	17.5	1.5	1.7
Bouteloua gracilis (H. B. K.) Lag ex Griffiths	BOGR1	G	Y	W		1.8	2.7	5.3	6.5	9.9	13.0	8.6	14.2	4.0	4.7	9.8	10.9
Buchloe dactyloides (Nutt.) Engelm.	BUDA1	G	Y	W		5.0	7.7	2.2	2.6	3.8	4.9	1.8	2.9	5.1	6.0	1.5	1.7
Distichlis spicata (L.) Greene var. stricta (Torr.) Beetle	DISP1	G	Y	W						0.5	0.7						
Muhlenbergia montana (Nutt.) Hitchc.	MUMO1	G	Y	W													
Sorghastrum nutans (L.) Nash	SONU1	G	Y	W				3.5	4.2	0.6	0.8			0.2	0.2		
Sporobolus cryptandrus (Torr.) A. Gray	SPCR1	G	Y	W						0.4	0.5	0.1	0.2	1.0	1.2	1.5	1.7
Salix exigua Nutt. ssp. interior (Rowlee) Cronq.	SAEX1	S	Y														
Symphoricarpos occidentalis Hook.	SYOC1	S	Y														
Yucca glauca Nutt.	YUGL1	S	Y														
Unknown Species	UNKN																
Moss Species	MOSS	M															
Total Foliar Cover						64.8	100.0	82.5	100.0	76.0	100.0	60.9	100.0	85.3	100.0	89.3	100.0
Total Forb Cover						10.3	15.8	19.0	23.0	10.0	13.2	3.3	5.3	23.6	27.6	6.0	6.7
Total Non-Native Forb Cover						7.5	11.6	19.0	23.0	8.5	11.2	2.9	4.7	16.8	19.6	4.3	4.8
Total Native Forb Cover						2.8	4.2	0.0	0.0	1.5	2.0	0.4	0.6	6.8	8.0	1.8	2.0
Total Graminoid Cover						54.5	84.2	63.5	77.0	66.0	86.8	57.6	94.7	61.8	72.4	83.3	93.3
Total Non-Native Graminoid Cover						6.0	9.3	10.2	12.3	9.8	12.9	10.3	16.8	20.4	23.9	18.5	20.7
Total Native Graminoid Cover						48.5	74.9	53.3	64.6	56.2	73.9	47.4	77.8	41.3	48.4	64.8	72.5
Total Herbaceous Cover						64.8	100.0	82.5	100.0	76.0	100.0	60.9	100.0	85.3	100.0	89.3	100.0
Total Herbaceous Native Cover						51.3	79.2	53.3	64.6	57.7	75.9	47.8	78.4	48.2	56.4	66.5	74.5
Total Herbaceous Non-Native Cover						13.5	20.8	29.2	35.4	18.3	24.1	13.1	21.6	37.2	43.6	22.8	25.5
Total Warm-Season Graminoid Cover						8.8	13.5	17.7	21.4	17.8	23.5	12.3	20.1	27.0	31.6	14.3	16.0
Total Cool-Season Graminoid Cover						45.8	70.7	45.8	55.6	48.2	63.4	45.4	74.5	34.7	40.7	69.0	77.3
Total Noxious Weed Cover						9.3	14.3	0.7	0.8	4.3	5.6	0.5	0.8	3.4	4.0	2.3	2.5
Total Moss 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
Total Shrub 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
Total Native Cover						51.3	79.2	53.3	64.6	57.7	75.9	47.8	78.4	48.2	56.4	66.5	74.5

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, M = Moss, S = Shrub

Cool/Warm Season Categories: C = Cool-Season Graminoid, W = Warm-Season Graminoid

Noxious Weed Category: X = Noxious Weed (listed on October 2013 Colorado State Noxious Weed List)

Yellow shaded cells indicate success criteria were met in 2014.

Blue shaded cells indicate this species provided greater than 45 percent of the relative cover in 2014.

Table 4. Revegetation Locations L38 to L45 Foliar Cover Summary 2014

						L38		L41		L42		L43		L44		L45	
Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)
Alyssum minus (L.) Rothmaler var. micranthus (C. A. Mey.) Dudley	ALMI1	F	N			0.3	0.5	1.0	1.1	0.5	0.7	0.5	0.7			0.1	0.2
Cardaria draba (L.) Desv.	CADR1	F	N		X												
Centaurea diffusa Lam.	CEDI1	F	N		X											3.1	3.9
Cirsium arvense (L.) Scop.	CIAR1	F	N		X												
Convolvulus arvensis L.	COAR1	F	N		X			3.5	4.0								
Erodium cicutarium (L.) L'Her.	ERCI1	F	N		X			0.5	0.6								
Hypericum perforatum L.	HYPE1	F	N		X	0.3	0.5										
Kochia scoparia (L.) Schrad.	KOSC1	F	N							0.5	0.7	0.9	1.3	1.4	1.8	0.8	0.9
Lactuca serriola L.	LASE1	F	N			0.5	0.9			1.0	1.4	1.1	1.6	0.1	0.2	0.3	0.3
Lepidium campestre (L.) R. Br.	LECA1	F	N														
Linaria dalmatica (L.) Mill.	LIDA1	F	N		X											0.1	0.2
Marrubium vulgare L.	MAVU1	F	N														
Melilotus alba Medic.	MEAL1	F	N									0.8	1.1				
Melilotus officinalis (L.) Pall.	MEOF1	F	N			0.3	0.5					4.8	6.9				
Plantago lanceolata L.	PLLA1	F	N														
Scorzonera laciniata L.	SCLA1	F	N									0.1	0.2				
Sisymbrium altissimum L.	SIAL1	F	N													0.1	0.2
Sonchus arvensis L. ssp. arvensis L.	SOAR1	F	N		X												
Tragopogon dubius Scop.	TRDU1	F	N			0.5	0.9							0.1	0.2		
Verbascum blattaria L.	VEBL1	F	N		X							1.4	2.0				
Verbascum thapsus L.	VETH1	F	N		X							0.8	1.1				
Ambrosia artemisiifolia L.	AMAR1	F	Y														
Ambrosia psilostachya DC.	AMPS1	F	Y									0.8	1.1				
Artemisia ludoviciana Nutt. var. ludoviciana	ARLU1	F	Y														
Astragalus canadensis L.	ASCA1	F	Y														
Aster porteri Gray	ASPO1	F	Y			2.8	5.1			1.0	1.4	0.3	0.4	0.1	0.2		
Asclepias speciosa Torr.	ASSP1	F	Y														
Chrysopsis villosa Pursh.	CHVI1	F	Y											0.1	0.2	0.1	0.2
Conyza canadensis (L.) Cronq.	COCA1	F	Y			0.5	0.9					0.4	0.5	0.8	1.0		
Descurainia pinnata (Walt.) Britt.	DEPI1	F	Y					0.5	0.6								
Erigeron divergens T. & G.	ERDI1	F	Y			0.3	0.5			0.5	0.7						
Euphorbia serpyllifolia Pers.	EUSE1	F	Y														
Gaura coccinea Pursh.	GACO1	F	Y														
Grindelia squarrosa (Pursh.) Dun.	GRSQ1	F	Y							0.5	0.7			0.3	0.3		
Helianthus annuus L.	HEAN1	F	Y														
Linum perenne L. var. lewisii (Pursh.) Eat. & Wright	LIPE1	F	Y														
Liatris punctata Hook.	LIPU1	F	Y														
Oenothera villosa Thunb. ssp. strigosa (Rydb.) Dietrich & Raven	OEVI1	F	Y														
Penstemon secundiflorus Benth.	PESE1	F	Y														
Plantago patagonica Jacq.	PLPA1	F	Y							0.5	0.7						
Polygonum ramosissimum Michx.	PORA1	F	Y			0.3	0.5										
Psoralea tenuiflora Pursh.	PSTE1	F	Y														
Scrophularia lanceolata Pursh	SCLA2	F	Y									0.1	0.2				
Senecio spartioides T. & G.	SESP1	F	Y											0.1	0.2		
Silene antirrhina L.	SIAN1	F	Y														
Silene drummondii Hook.	SIDR1	F	Y														
Sphaeralcea coccinea (Pursh.) Rydb.	SPCO1	F	Y														
Spergularia media (L.) Presl.	SPME1	F	Y														
Verbena bracteata Lag. & Rodr.	VEBR1	F	Y														
Aegilops cylindrica Host	AECY1	G	N	C	X												
Agropyron cristatum (L.) Gaertn.	AGCR1	G	N	C		0.3	0.5	0.5	0.6								
Agropyron desertorum (Fisch.) Schult.	AGDE1	G	N	C				3.5	4.0								
Agropyron intermedium (Host) Beauv.	AGIN1	G	N	C		0.3	0.5	0.5	0.6			0.1	0.2				
Agropyron repens (L.) Beauv.	AGRE1	G	N	C	X												
Bromus inermis Leyss. ssp. inermis	BRIN1	G	N	C				35.5	40.8			2.5	3.6			3.0	3.8
Bromus japonicus Thunb. ex Murr.	BRJA1	G	N	C								0.1	0.2			0.1	0.2
Bromus tectorum L.	BRTE1	G	N	C	X	2.5	4.6	0.5	0.6	2.5	3.5	8.4	12.2	3.6	4.8	2.1	2.7

Table 4. Revegetation Locations L38 to L45 Foliar Cover Summary 2014 (cont.)

Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	L38		L41		L42		L43		L44		L45	
						Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)
Dactylis glomerata L.	DAGL1	G	N	C													
Festuca pratensis Huds.	FEPR1	G	N	C		0.3	0.5					1.0	1.5	0.9	1.1		
Poa compressa L.	POCO1	G	N	C		0.3	0.5			0.5	0.7						
Polypogon monspeliensis (L.) Desf.	POMO1	G	N	C													
Poa pratensis L.	POPR1	G	N	C													
Echinochloa crus-galli (L.) Beauv.	ECCR1	G	N	W		0.3	0.5										
Setaria viridis (L.) Beauv.	SEVI1	G	N	W		0.3	0.5										
Agropyron caninum (L.) Beauv. ssp. majus (Vasey) C. L. Hitchc.	AGCA1	G	Y	C		0.8	1.4			0.5	0.7	0.1	0.2			0.1	0.2
Agropyron dasystachyum (Hook.) Scribn.	AGDA1	G	Y	C						0.5	0.7						
Agropyron smithii Rydb.	AGSM1	G	Y	C		3.0	5.6	8.0	9.2	38.0	53.5	32.1	46.6	49.3	64.6	42.6	53.8
Aristida purpurea Nutt. var. robusta (Merrill) A. Holmgren & N. Holmgr	ARLO1	G	Y	C								0.1	0.2	0.1	0.2		
Festuca ovina L. var. rydbergii St. Yves	FEOV1	G	Y	C				28.5	32.8					1.0	1.3	1.6	2.1
Hordeum jubatum L.	HOJU1	G	Y	C								0.8	1.1			0.1	0.2
Koeleria pyramidata (Lam.) Beauv.	KOPY1	G	Y	C						0.5	0.7						
Sitanion hystrix (Nutt.) Sm. var. brevifolium (Sm.) Hitchc.	SIHY1	G	Y	C				0.5	0.6								
Stipa comata Trin. & Rupr.	STCO1	G	Y	C													
Stipa viridula Trin.	STVI1	G	Y	C				0.5	0.6			0.1	0.2				
Typha latifolia L.	TYLA1	G	Y	C													
Andropogon gerardii Vitman	ANGE1	G	Y	W		2.0	3.7							0.8	1.0		
Andropogon scoparius Michx.	ANSC1	G	Y	W		2.0	3.7			3.5	4.9			0.1	0.2		
Bouteloua curtipendula (Michx.) Torr.	BOCU1	G	Y	W		4.8	8.8			7.0	9.9	0.9	1.3	1.0	1.3	0.3	0.3
Bouteloua gracilis (H. B. K.) Lag ex Griffiths	BOGR1	G	Y	W		21.5	39.8	3.0	3.4	3.0	4.2	5.1	7.4	4.1	5.4	2.0	2.5
Buchloe dactyloides (Nutt.) Engelm.	BUDA1	G	Y	W		9.5	17.6	0.5	0.6	6.5	9.2	3.3	4.7	6.8	8.9	16.5	20.8
Distichlis spicata (L.) Greene var. stricta (Torr.) Beetle	DISP1	G	Y	W													
Muhlenbergia montana (Nutt.) Hitchc.	MUMO1	G	Y	W													
Sorghastrum nutans (L.) Nash	SONU1	G	Y	W		0.5	0.9										
Sporobolus cryptandrus (Torr.) A. Gray	SPCR1	G	Y	W		0.5	0.9			4.0	5.6	1.6	2.4	0.3	0.3	6.1	7.7
Salix exigua Nutt. ssp. interior (Rowlee) Cronq.	SAEX1	S	Y														
Symphoricarpos occidentalis Hook.	SYOC1	S	Y														
Yucca glauca Nutt.	YUGL1	S	Y														
Unknown Species	UNKN											0.1	0.2				
Moss Species	MOSS	M										0.8	1.1	5.4	7.0		
Total Foliar Cover						54.0	100.0	87.0	100.0	71.0	100.0	68.9	100.0	76.3	100.0	79.3	100.0
Total Forb Cover						5.5	10.2	5.5	6.3	4.5	6.3	11.8	17.1	3.0	3.9	4.6	5.8
Total Non-Native Forb Cover						1.8	3.2	5.0	5.7	2.0	2.8	10.3	14.9	1.6	2.1	4.5	5.7
Total Native Forb Cover						3.8	6.9	0.5	0.6	2.5	3.5	1.5	2.2	1.4	1.8	0.1	0.2
Total Graminoid Cover						48.5	89.8	81.5	93.7	66.5	93.7	56.3	81.7	67.9	89.0	74.6	94.2
Total Non-Native Graminoid Cover						4.0	7.4	40.5	46.6	3.0	4.2	12.1	17.6	4.5	5.9	5.3	6.6
Total Native Graminoid Cover						44.5	82.4	41.0	47.1	63.5	89.4	44.1	64.1	63.4	83.1	69.4	87.5
Total Herbaceous Cover						54.0	100.0	87.0	100.0	71.0	100.0	68.0	98.7	70.9	93.0	79.3	100.0
Total Herbaceous Native Cover						48.3	89.4	41.5	47.7	66.0	93.0	45.6	66.2	64.8	84.9	69.5	87.7
Total Herbaceous Non-Native Cover						5.8	10.6	45.5	52.3	5.0	7.0	22.4	32.5	6.1	8.0	9.8	12.3
Total Warm-Season Graminoid Cover						41.3	76.4	3.5	4.0	24.0	33.8	10.9	15.8	13.0	17.0	24.9	31.4
Total Cool-Season Graminoid Cover						7.3	13.4	78.0	89.7	42.5	59.9	45.4	65.9	54.9	72.0	49.8	62.8
Total Noxious Weed Cover						2.8	5.1	4.5	5.2	2.5	3.5	10.5	15.2	3.6	4.8	5.4	6.8
Total Moss Cover						0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.1	5.4	7.0	0.0	0.0
Total Shrub 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
Total Native Cover						48.3	89.4	41.5	47.7	66.0	93.0	45.6	66.2	64.8	84.9	69.5	87.7

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, M = Moss, S = Shrub

Cool/Warm Season Categories: C = Cool-Season Graminoid, W = Warm-Season Graminoid

Noxious Weed Category: X = Noxious Weed (listed on October 2013 Colorado State Noxious Weed List)

Yellow shaded cells indicate success criteria were met in 2014.

Blue shaded cells indicate this species provided greater than 45 percent of the relative cover in 2014.

Table 5. Revegetation Locations L48 to L59 Foliar Cover Summary 2014

Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	L48		L53		L54		L58		L59	
						Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)	Absolute Cover (%)	Relative Cover (%)
Alyssum minus (L.) Rothmaler var. micranthus (C. A. Mey.) Dudley	ALMI1	F	N			0.5	0.6	1.0	1.0					0.1	0.2
Cardaria draba (L.) Desv.	CADR1	F	N		X										
Centaurea diffusa Lam.	CEDI1	F	N		X					1.0	1.2	0.1	0.2		
Cirsium arvense (L.) Scop.	CIAR1	F	N		X					3.0	3.6			5.0	6.9
Convolvulus arvensis L.	COAR1	F	N		X			0.5	0.5			0.4	0.5	0.1	0.2
Erodium cicutarium (L.) L'Her.	ERCI1	F	N		X			0.5	0.5	0.5	0.6			0.4	0.5
Hypericum perforatum L.	HYPE1	F	N		X										
Kochia scoparia (L.) Schrad.	KOSC1	F	N									0.3	0.4		
Lactuca serriola L.	LASE1	F	N					1.0	1.0	2.0	2.4	1.8	2.5	1.6	2.3
Lepidium campestre (L.) R. Br.	LECA1	F	N											0.4	0.5
Linaria dalmatica (L.) Mill.	LIDA1	F	N		X							0.5	0.7		
Marrubium vulgare L.	MAVU1	F	N												
Melilotus alba Medic.	MEAL1	F	N			0.5	0.6								
Melilotus officinalis (L.) Pall.	MEOF1	F	N					6.0	6.3			0.9	1.3	3.6	5.0
Plantago lanceolata L.	PLLA1	F	N											0.1	0.2
Scorzonera laciniata L.	SCLA1	F	N												
Sisymbrium altissimum L.	SIAL1	F	N												
Sonchus arvensis L. ssp. arvensis L.	SOAR1	F	N		X									0.1	0.2
Tragopogon dubius Scop.	TRDU1	F	N					0.5	0.5					0.1	0.2
Verbascum blattaria L.	VEBL1	F	N		X			1.0	1.0						
Verbascum thapsus L.	VETH1	F	N		X					3.5	4.1	0.3	0.4	0.3	0.3
Ambrosia artemisiifolia L.	AMAR1	F	Y												
Ambrosia psilostachya DC.	AMPS1	F	Y			0.5	0.6	4.5	4.7	3.5	4.1			1.1	1.6
Artemisia ludoviciana Nutt. var. ludoviciana	ARLU1	F	Y											0.8	1.0
Astragalus canadensis L.	ASCA1	F	Y												
Aster porteri Gray	ASPO1	F	Y												
Asclepias speciosa Torr.	ASSP1	F	Y												
Chrysopsis villosa Pursh.	CHVI1	F	Y									0.1	0.2		
Conyza canadensis (L.) Cronq.	COCA1	F	Y									0.1	0.2	0.4	0.5
Descurainia pinnata (Walt.) Britt.	DEPI1	F	Y							0.5	0.6			0.1	0.2
Erigeron divergens T. & G.	ERDI1	F	Y												
Euphorbia serpyllifolia Pers.	EUSE1	F	Y												
Gaura coccinea Pursh.	GACO1	F	Y												
Grindelia squarrosa (Pursh.) Dun.	GRSQ1	F	Y			1.0	1.3							4.3	5.9
Helianthus annuus L.	HEAN1	F	Y									0.1	0.2	0.8	1.0
Linum perenne L. var. lewisii (Pursh.) Eat. & Wright	LIPE1	F	Y											0.3	0.3
Liatris punctata Hook.	LIPU1	F	Y												
Oenothera villosa Thunb. ssp. strigosa (Rydb.) Dietrich & Raven	OEVI1	F	Y											0.8	1.0
Penstemon secundiflorus Benth.	PESE1	F	Y									0.1	0.2		
Plantago patagonica Jacq.	PLPA1	F	Y												
Polygonum ramosissimum Michx.	PORA1	F	Y												
Psoralea tenuiflora Pursh.	PSTE1	F	Y												
Scrophularia lanceolata Pursh	SCLA2	F	Y												
Senecio spartioides T. & G.	SESP1	F	Y												
Silene antirrhina L.	SIAN1	F	Y												
Silene drummondii Hook.	SIDR1	F	Y												
Sphaeralcea coccinea (Pursh.) Rydb.	SPCO1	F	Y												
Spergularia media (L.) Presl.	SPME1	F	Y												
Verbena bracteata Lag. & Rodr.	VEBR1	F	Y											0.1	0.2
Aegilops cylindrica Host	AECY1	G	N	C	X							2.4	3.4		
Agropyron cristatum (L.) Gaertn.	AGCR1	G	N	C										0.1	0.2
Agropyron desertorum (Fisch.) Schult.	AGDE1	G	N	C										0.1	0.2
Agropyron intermedium (Host) Beauv.	AGIN1	G	N	C		0.5	0.6	3.0	3.1	6.5	7.7			17.3	23.9
Agropyron repens (L.) Beauv.	AGRE1	G	N	C	X									0.1	0.2
Bromus inermis Leyss. ssp. inermis	BRIN1	G	N	C				17.5	18.3			1.4	2.0	5.8	8.0
Bromus japonicus Thunb. ex Murr.	BRJA1	G	N	C		0.5	0.6					0.1	0.2	0.5	0.7
Bromus tectorum L.	BRTE1	G	N	C	X	3.0	3.8	4.5	4.7	1.5	1.8	1.8	2.5	1.1	1.6

Table 5. Revegetation Locations L48 to L59 Foliar Cover Summary 2014 (cont.)

Scientific Name	Speccode	Growth Form	Native	Cool/Warm Season	Noxious Weed	L48 Absolute Cover (%)	L48 Relative Cover (%)	L53 Absolute Cover (%)	L53 Relative Cover (%)	L54 Absolute Cover (%)	L54 Relative Cover (%)	L58 Absolute Cover (%)	L58 Relative Cover (%)	L59 Absolute Cover (%)	L59 Relative Cover (%)
Dactylis glomerata L.	DAGL1	G	N	C		3.5	4.5								
Festuca pratensis Huds.	FEPR1	G	N	C											
Poa compressa L.	POCO1	G	N	C				4.0	4.2						
Polypogon monspeliensis (L.) Desf.	POMO1	G	N	C											
Poa pratensis L.	POPR1	G	N	C				7.5	7.9						
Echinochloa crus-galli (L.) Beauv.	ECCR1	G	N	W											
Setaria viridis (L.) Beauv.	SEVI1	G	N	W											
Agropyron caninum (L.) Beauv. ssp. majus (Vasey) C. L. Hitchc.	AGCA1	G	Y	C								5.9	8.4	1.1	1.6
Agropyron dasystachyum (Hook.) Scribn.	AGDA1	G	Y	C											
Agropyron smithii Rydb.	AGSM1	G	Y	C		9.5	12.2	2.0	2.1	52.5	62.1	2.0	2.9	17.4	24.1
Aristida purpurea Nutt. var. robusta (Merrill) A. Holmgren & N. Holmgr	ARLO1	G	Y	C								1.1	1.6		
Festuca ovina L. var. rydbergii St. Yves	FEOV1	G	Y	C										0.1	0.2
Hordeum jubatum L.	HOJU1	G	Y	C										0.1	0.2
Koeleria pyramidata (Lam.) Beauv.	KOPY1	G	Y	C											
Sitanion hystrix (Nutt.) Sm. var. brevifolium (Sm.) Hitchc.	SIHY1	G	Y	C								0.1	0.2		
Stipa comata Trin. & Rupr.	STCO1	G	Y	C								0.3	0.4		
Stipa viridula Trin.	STVI1	G	Y	C				28.0	29.3	9.0	10.7			0.1	0.2
Typha latifolia L.	TYLA1	G	Y	C										0.8	1.0
Andropogon gerardii Vitman	ANGE1	G	Y	W		8.0	10.3					4.0	5.7	0.9	1.2
Andropogon scoparius Michx.	ANSC1	G	Y	W								1.9	2.7		
Bouteloua curtipendula (Michx.) Torr.	BOCU1	G	Y	W		21.0	26.9	7.5	7.9			12.8	18.3	1.1	1.6
Bouteloua gracilis (H. B. K.) Lag ex Griffiths	BOGR1	G	Y	W		3.5	4.5	3.0	3.1	1.0	1.2	5.4	7.7	0.8	1.0
Buchloe dactyloides (Nutt.) Engelm.	BUDA1	G	Y	W		25.0	32.1	3.5	3.7			21.9	31.4	3.4	4.7
Distichlis spicata (L.) Greene var. stricta (Torr.) Beetle	DISP1	G	Y	W											
Muhlenbergia montana (Nutt.) Hitchc.	MUMO1	G	Y	W		0.5	0.6								
Sorghastrum nutans (L.) Nash	SONU1	G	Y	W								2.9	4.1		
Sporobolus cryptandrus (Torr.) A. Gray	SPCR1	G	Y	W		0.5	0.6					1.3	1.8	0.1	0.2
Salix exigua Nutt. ssp. interior (Rowlee) Cronq.	SAEX1	S	Y											0.8	1.0
Symphoricarpos occidentalis Hook.	SYOC1	S	Y											0.1	0.2
Yucca glauca Nutt.	YUGL1	S	Y									0.1	0.2		
Unknown Species	UNKN														
Moss Species	MOSS	M													
Total Foliar Cover						78.0	100.0	95.5	100.0	84.5	100.0	69.8	100.0	72.1	100.0
Total Forb Cover						2.5	3.2	15.0	15.7	14.0	16.6	4.6	6.6	20.4	28.2
Total Non-Native Forb Cover						1.0	1.3	10.5	11.0	10.0	11.8	4.1	5.9	11.9	16.5
Total Native Forb Cover						1.5	1.9	4.5	4.7	4.0	4.7	0.5	0.7	8.5	11.8
Total Graminoid Cover						75.5	96.8	80.5	84.3	70.5	83.4	65.0	93.2	50.9	70.5
Total Non-Native Graminoid Cover						7.5	9.6	36.5	38.2	8.0	9.5	5.6	8.1	25.0	34.7
Total Native Graminoid Cover						68.0	87.2	44.0	46.1	62.5	74.0	59.4	85.1	25.9	35.9
Total Herbaceous Cover						78.0	100.0	95.5	100.0	84.5	100.0	69.6	99.8	71.3	98.8
Total Herbaceous Native Cover						69.5	89.1	48.5	50.8	66.5	78.7	59.9	85.8	34.4	47.7
Total Herbaceous Non-Native Cover						8.5	10.9	47.0	49.2	18.0	21.3	9.8	14.0	36.9	51.1
Total Warm-Season Graminoid Cover						58.5	75.0	14.0	14.7	1.0	1.2	50.0	71.7	6.3	8.7
Total Cool-Season Graminoid Cover						17.0	21.8	66.5	69.6	69.5	82.2	15.0	21.5	44.6	61.9
Total Noxious Weed Cover						3.0	3.8	6.5	6.8	9.5	11.2	5.4	7.7	7.1	9.9
Total Moss Cover						0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Shrub Cover						0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.9	1.2
Total Native Cover						69.5	89.1	48.5	50.8	66.5	78.7	60.0	86.0	35.3	48.9

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, M = Moss, S = Shrub

Cool/Warm Season Categories: C = Cool-Season Graminoid, W = Warm-Season Graminoid

Noxious Weed Category: X = Noxious Weed (listed on October 2013 Colorado State Noxious Weed List)

Yellow shaded cells indicate success criteria were met in 2014.

Blue shaded cells indicate this species provided greater than 45 percent of the relative cover in 2014.

Table 6. Basal Cover Summary at Revegetation Locations 2014

Location	Basal Vegetation Cover (%)	Litter Cover (%)	Rock Cover (%)	Total Ground Cover (%)*
L26	2.5	66.5	27.5	96.5
L27	5.7	83.7	4.5	93.8
L28	5.4	76.3	10.6	92.3
L29	4.4	75.9	7.3	87.5
L32	4.5	75.8	7.5	87.8
L34	6.3	80.3	7.3	93.8
L38	12.5	41.8	39.3	93.5
L41	10.0	85.0	5.0	100.0
L42	5.0	53.0	47.5	105.5
L43	3.8	59.4	31.0	94.1
L44	6.3	60.0	21.1	87.4
L45	6.9	67.0	28.3	102.1
L48	17.0	52.0	43.0	112.0
L53	12.5	87.5	1.0	101.0
L54	7.5	92.5	0.0	100.0
L58	8.8	40.6	49.8	99.1
L59	4.4	59.5	13.5	77.4
Mean	7.2	68.0	20.2	95.5

* 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 2014.

Table 7. Evaluation of Successional Changes in Plant Community Composition at Revegetation Locations

		Location								
		L26	**L27**	**L28**	**L29**	**L32**	**L34**	**L38**	**L41**	**L42**
Species Richness	2008	20	17	30	23	45	25	21	16	15
	2009	14	22	35	28	38	33	28	19	8
	2010	21	ND	28	ND	ND	25	ND	18	13
	2011	ND	ND	ND	ND	49	ND	ND	ND	ND
	2012	ND	ND	ND	ND	24	ND	ND	ND	ND
	2013	ND	ND	ND	ND	37	ND	ND	ND	ND
	2014	20	15	32	18	39	25	25	15	18
Percent Seeded Species Present	2008	57	55	55	71	86	33	91	7	64
	2009	43	82	64	71	86	47	82	20	45
	2010	86	ND	73	ND	ND	53	ND	33	73
	2011	ND	ND	ND	ND	86	ND	ND	ND	ND
	2012	ND	ND	ND	ND	86	ND	ND	ND	ND
	2013	ND	ND	ND	ND	86	ND	ND	ND	ND
	2014	71	64	91	71	71	45	82	36	73
Total Absolute Foliar Cover	2008	39.0	66.7	40.5	48.3	44.5	83.3	38.0	60.5	32.0
	2009	69.8	88.2	58.8	66.1	71.1	111.0	55.0	87.5	48.0
	2010	50.0	ND	69.9	ND	ND	72.3	ND	75.5	38.5
	2011	ND	ND	ND	ND	76.1	ND	ND	ND	ND
	2012	ND	ND	ND	ND	63.3	ND	ND	ND	ND
	2013	ND	ND	ND	ND	64.7	ND	ND	ND	ND
	2014	64.8	82.5	76.0	60.9	85.3	89.3	54.0	87.0	71.0
Total Relative Native Foliar Cover	2008	77.6	79.5	73.3	63.2	50.2	79.6	65.1	52.9	79.7
	2009	84.6	80.2	65.4	74.9	53.6	78.6	80.5	66.3	82.3
	2010	91.0	ND	58.4	ND	ND	73.7	ND	53.6	81.8
	2011	ND	ND	ND	ND	58.9	ND	ND	ND	ND
	2012	ND	ND	ND	ND	71.8	ND	ND	ND	ND
	2013	ND	ND	ND	ND	68.9	ND	ND	ND	ND
	2014	79.2	64.6	75.9	78.4	56.4	74.5	89.4	47.7	93.0
Total Absolute Ground Cover * (Basal Veg, Litter, Rock)	2008	75.5	88.3	45.3	65.6	84.6	83.3	57.5	98.5	63.0
	2009	105.3	97.0	59.3	73.4	88.3	111.0	95.8	120.0	103.0
	2010	91.8	ND	78.2	ND	ND	97.5	ND	111.0	95.0
	2011	ND	ND	ND	ND	90.3	ND	ND	ND	ND
	2012	ND	ND	ND	ND	94.4	ND	ND	ND	ND
	2013	ND	ND	ND	ND	92.1	ND	ND	ND	ND
	2014	96.5	93.8	92.3	87.5	87.8	93.8	93.5	100.0	105.5
Species with 5 percent or greater relative foliar cover	2008	Agropyron smithii (46.8%) Agropyron caninum (18.6%) Poa compressa (9.6%)	Agropyron smithii (60.5%) Agropyron caninum (13.3%) Melilotus officinalis (5.8%)	Agropyron smithii (36.6%) Agropyron caninum (16.9%) Bouteloua gracilis (11.9%) Erodium cicutarium (6.8%) Kochia scoparia (5.3)	Agropyron smithii (32.1%) Bouteloua gracilis (14.5%) Agropyron caninum (13.0%) Melilotus officinalis (11.7%) Bromus inermis (8.0%) Centaurea diffusa (7.5%)	Centaurea diffusa (13.5%) Agropyron caninum (11.2%) Agropyron smithii (10.7%) Buchloe dactyloides (9.6%) Bromus inermis (9.4%) Bromus tectorum (6.0%) Bouteloua curtipendula (5.8%)	Agropyron smithii (60.1%) Bouteloua gracilis (13.8%)	Melilotus alba (19.7%) Agropyron caninum (13.2%) Agropyron smithii (12.5%) Bouteloua curtipendula (10.5%) Buchloe dactyloides (10.5%) Andropogon gerardii (7.9%) Bouteloua gracilis (5.9%)	Festuca ovina (50.4%) Agropyron cristatum (18.2%) Bromus inermis (9.9%)	Agropyron caninum (60.9%) Kochia scoparia (10.9%) Agropyron smithii (6.3%)
	2009	Agropyron smithii (61.6%) Agropyron caninum (15.1%) Buchloe dactyloides (6.8%)	Agropyron smithii (69.9%) Melilotus officinalis (7.4%)	Agropyron smithii (22.3%) Melilotus officinalis (13.3%) Agropyron caninum (12.2%) Bouteloua gracilis (10.6%) Kochia scoparia (7.9%) Bromus inermis (5.4%) Buchloe dactyloides (5.1%)	Agropyron smithii (32.9%) Agropyron caninum (13.4%) Bouteloua gracilis (10.4%) Bromus inermis (8.1%) Bouteloua curtipendula (7.0%) Kochia scoparia (6.6%)	Bromus inermis (28.8%) Agropyron smithii (14.0%) Bouteloua curtipendula (13.2%) Kochia scoparia (5.7%) Buchloe dactyloides (5.0%)	Agropyron smithii (53.4%) Linum perenne (7.9%) Bouteloua gracilis (7.7%)	Agropyron caninum (29.1%) Buchloe dactyloides (20.5%) Bouteloua gracilis (18.6%) Kochia scoparia (6.4%)	Festuca ovina (56.6%) Agropyron cristatum (10.3%) Alyssum minus (8.6%)	Agropyron smithii (49.0%) Agropyron caninum (10.4%) Bouteloua gracilis (9.4%) Bromus tectorum (8.3%) Buchloe dactyloides (7.3%) Bouteloua curtipendula (6.3%) Festuca pratensis (6.3%)
	2010	Agropyron smithii (69.0%)	ND	Agropyron smithii (29.3%) Melilotus officinalis (23.6%) Bouteloua gracilis (18.7%) Agropyron caninum (5.4%)	ND	ND	Agropyron smithii (39.4%) Agropyron caninum (16.3%) Bouteloua gracilis (10.7%) Alyssum minus (5.9%) Melilotus officinalis (5.5%)	ND	Festuca ovina (31.8%) Bromus inermis (19.7%) Agropyron intermedium (9.9%) Bouteloua gracilis (7.9%) Alyssum minus (6.6%) Bromus tectorum (5.3%)	Agropyron smithii (31.2%) Bouteloua gracilis (16.9%) Bromus tectorum (11.7%) Bouteloua curtipendula (9.1%) Stipa viridula (9.1%) Sporobolus cryptandrus (7.8%)
	2011	ND	ND	ND	ND	Bromus inermis (26.2%) Bouteloua curitipendula (14.9%) Buchloe dactyloides (7.1%) Panicum virgatum (6.8%)	ND	ND	ND	ND
	2012	ND	ND	ND	ND	Bouteloua curtipendula (32.8%) Bromus inermis (21.9%) Agrypyron smithii (9.4%) Bouteloua gracilis (8.8%) Buchloe dactyloides (7.9%)	ND	ND	ND	ND
	2013	ND	ND	ND	ND	Bouteloua curtipendula (29.4%) Bromus inermis (24.2%) Agropyron smithii (10.3%) Buchloe dactyloides (8.5%) Stipa viridula (5.7%)	ND	ND	ND	ND
	2014	Agropyron smithii (51.7%) Agropyron caninum (9.7%) Buchloe dactyloides (7.7%) Verbascum thapsus (7.7%) Bromus tectorum (5.8%)	Agropyron smithii (43.0%) Melilotus officinalis (18.4%) Bromus inermis (12.3%) Bouteloua gracilis (6.5%) Bouteloua curtipendula (6.5%)	Agropyron smithii (47.3%) Bouteloua gracilis (13.0%) Bromus inermis (8.7%) Melilotus officinalis (6.5%)	Agropyron smithii (55.2%) Bouteloua gracilis (14.2%) Bromus inermis (13.3%)	Bromus inermis (21.8%) Bouteloua curtipendula (17.5%) Agropyron smithii (15.3%) Melilotus officinalis (9.2%) Buchloe dactyloides (6.0%) Melilotus alba (5.7%)	Agropyron smithii (54.6%) Bromus inermis (14.8%) Bouteloua gracilis (10.9%)	Bouteloua gracilis (39.8%) Buchloe dactyloides (17.6%) Bouteloua curtipendula (8.8%) Agropyron smithii (5.6%) Aster porteri (5.1%)	Bromus inermis (40.8%) Festuca ovina (32.8%) Agropyron smithii (9.2%)	Agropyron smithii (53.5%) Bouteloua curtipendula (9.9%) Buchloe dactyloides (9.2%) Sporobolus cryptandrus (5.6%)

* Values greater than 100 percent are a result of the monitoring protocol that uses the midpoints of the cover class system for analysis.
ND = No Data collected at this location for this year.

Table 7. Evaluation of Successional Changes in Plant Community Composition at Revegetation Locations (cont.)

		Location							
		L43	**L44**	**L45**	**L48**	**L53**	**L54**	**L58**	**L59**
Species Richness	2008	19	28	19	21	12	9	ND	ND
	2009	21	17	14	17	13	16	ND	ND
	2010	ND	29	14	ND	18	14	ND	ND
	2011	ND	ND	ND	ND	ND	ND	ND	ND
	2012	ND	ND	ND	ND	ND	ND	ND	ND
	2013	ND	ND	ND	ND	ND	ND	24	33
	2014	28	20	18	15	18	12	28	40
Percent Seeded Species Present	2008	71	82	27	64	40	57	ND	ND
	2009	71	45	45	64	50	60	ND	ND
	2010	ND	55	55	ND	50	50	ND	ND
	2011	ND	ND	ND	ND	ND	ND	ND	ND
	2012	ND	ND	ND	ND	ND	ND	ND	ND
	2013	ND	ND	ND	ND	ND	ND	73	86
	2014	86	64	55	55	71	43	82	86
Total Absolute Foliar Cover	2008	25.3	31.5	26.4	56.0	49.5	47.5	ND	ND
	2009	49.9	36.5	43.0	63.5	76.5	77.0	ND	ND
	2010	ND	55.3	57.5	ND	84.0	78.0	ND	ND
	2011	ND	ND	ND	ND	ND	ND	ND	ND
	2012	ND	ND	ND	ND	ND	ND	ND	ND
	2013	ND	ND	ND	ND	ND	ND	27.3	40.8
	2014	68.9	76.3	79.3	78.0	95.5	84.5	69.8	72.1
Total Relative Native Foliar Cover	2008	27.7	50.8	46.4	54.5	72.7	68.4	ND	ND
	2009	59.6	77.4	68.3	91.3	71.9	74.7	ND	ND
	2010	ND	70.8	92.6	ND	49.4	65.4	ND	ND
	2011	ND	ND	ND	ND	ND	ND	ND	ND
	2012	ND	ND	ND	ND	ND	ND	ND	ND
	2013	ND	ND	ND	ND	ND	ND	82.1	50.9
	2014	66.2	84.9	87.7	89.1	50.8	78.7	85.8	47.7
Total Absolute Ground Cover * (Basal Veg, Litter, Rock)	2008	82.4	89.6	83.0	60.5	111.5	116.5	ND	ND
	2009	70.5	80.0	70.6	105.0	66.5	56.0	ND	ND
	2010	ND	81.3	85.5	ND	94.5	91.0	ND	ND
	2011	ND	ND	ND	ND	ND	ND	ND	ND
	2012	ND	ND	ND	ND	ND	ND	ND	ND
	2013	ND	ND	ND	ND	ND	ND	84.8	85.5
	2014	94.1	87.4	102.1	112.0	101.0	100.0	99.1	77.4
Species with 5 percent or greater relative foliar cover	2008	Kochia scoparia (50.0%) Agropyron caninum (10.4%) Agropyron smithii (8.9%) Stipa viridula (7.4%) Bromus tectorum (6.9%)	Agropyron caninum (19.8%) Agropyron smithii (19.0%) Kochia scoparia (15.1%) Centaurea diffusa (13.1%) Lactuca serriola (9.1%)	Kochia scoparia (35.1%) Agropyron caninum (28.0%) Agropyron smithii (16.1%)	Melilotus officinalis (33.0%) Bouteloua gracilis (19.6%) Agropyron caninum (12.5%) Agropyron smithii (8.0%) Bouteloua curtipendula (7.1%)	Agropyron smithii (52.5%) Bromus tectorum (10.1%) Alyssum minus (9.1%) Buchloe dactyloides (7.1%) Agropyron cristatum (6.1%) Sporobolus cryptandrus (6.1%) Stipa viridula (6.1%)	Agropyron smithii (44.2%) Bromus tectorum (25.3%) Stipa viridula (14.7%) Sporobolus cryptandrus (7.4%) Agropyron intermedium (6.3%)	ND	ND
	2009	Kochia scoparia (36.8%) Agropyron caninum (36.1%) Agropyron smithii (17.5%)	Agropyron smithii (38.4%) Agropyron caninum (33.2%) Kochia scoparia (12.3%)	Agropyron caninum (41.6%) Agropyron smithii (22.1%) Kochia scoparia (11.9%) Bromus inermis (8.4%) Bromus tectorum (7.3%)	Bouteloua curtipendula (25.2%) Agropyron smithii (22.0%) Agropyron caninum (15.7%) Bouteloua gracilis (11.8%) Buchloe dactyloides (7.1%)	Stipa viridula (27.5%) Agropyron smithii (18.3%) Bouteloua gracilis (17.6%) Alyssum minus (11.8%) Bromus tectorum (5.2%)	Agropyron smithii (40.3%) Agropyron caninum (7.8%) Bouteloua gracilis (7.8%) Erodium cicutarium (7.8%) Stipa viridula (7.8%)	ND	ND
	2010	ND	Agropyron smithii (45.5%) Agropyron caninum (18.6%) Buchloe dactyloides (5.7%)	Agropyron smithii (57.0%) Agropyron caninum (23.0%) Buchloe dactyloides (7.0%)	ND	Bromus tectorum (19.0%) Agropyron smithii (17.3%) Stipa viridula (13.7%) Melilotus officinalis (13.1%) Buchloe dactyloides (7.7%) Alyssum minus (6.0%)	Stipa viridula (27.6%) Melilotus officinalis (17.9%) Bouteloua curtipendula (13.5%) Agropyron smithii (12.8%) Bromus tectorum (9.6%) Buchloe dactyloides (9.0%)	ND	ND
	2011	ND	ND	ND	ND	ND	ND	ND	ND
	2012	ND	ND	ND	ND	ND	ND	ND	ND
	2013	ND	ND	ND	ND	ND	ND	Bouteloua gracilis (19.3%) Buchloe dactyloides (17.9%) Agropyron caninum (14.7%) Bouteloua curtipendula (11.5%) Kochia scoparia (8.7%) Agropyron smithii (6.4%)	Agropyron caninum (19.3%) Agropyron intermedium (17.5%) Agropyron smithii (12.6%) Buchloe dactyloides (8.6%) Bromus tectorum (7.7%) Bromus inermis (5.2%)
	2014	Agropyron smithii (46.6%) Bromus tectorum (12.2%) Bouteloua gracilis (7.4%) Melilotus officinalis (6.9%)	Agropyron smithii (64.6%) Buchloe dactyloides (8.9%) Moss sp. (7.0%) Bouteloua gracilis (5.4%)	Agropyron smithii (53.8%) Buchloe dactyloides (20.8%) Sporobolus cryptandrus (7.7%)	Buchloe dactyloides (32.1%) Bouteloua curtipendula (26.9%) Agropyron smithii (12.2%) Andropogon gerardii (10.3%)	Stipa viridula (29.3%) Bromus inermis (18.3%) Poa pratensis (7.9%) Bouteloua curtipendula (7.9%) Melilotus officinalis (6.3%)	Agropyron smithii (62.1%) Stipa viridula (10.7%) Agropyron intermedium (7.7%)	Buchloe dactyloides (31.4%) Bouteloua curtipendula (18.3%) Agropyron caninum (8.4%) Bouteloua gracilis (7.7%) Andropogon gerardii (5.7%)	Agropyron smithii (24.1%) Agropyron intermedium (23.9%) Bromus inermis (8.0%) Cirsium arvense (6.9%) Grindelia squarrosa (5.9%) Melilotus officinalis (5.0%)

* Values greater than 100 percent are a result of the monitoring protocol that uses the midpoints of the cover class system for analysis.
ND = No Data collected at this location for this year.

Table 8. Success Criteria Evaluation Summary 2014

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
L26	PASS	PASS	PASS	FAIL	PASS
L27	PASS	PASS	PASS	PASS	PASS
L28	PASS	PASS	PASS	FAIL	PASS
L29	PASS	PASS	PASS	FAIL	PASS
L32	PASS	PASS	PASS	PASS	PASS
L34	PASS	PASS	FAIL	FAIL	PASS
L38	PASS	PASS	PASS	PASS	PASS
L41	PASS	PASS	FAIL	PASS	PASS
L42	PASS	PASS	PASS	FAIL	PASS
L43	PASS	PASS	PASS	FAIL	PASS
L44	PASS	PASS	PASS	FAIL	PASS
L45	PASS	PASS	PASS	FAIL	PASS
L48	PASS	PASS	PASS	PASS	PASS
L53	PASS	PASS	PASS	PASS	PASS
L54	PASS	PASS	FAIL	FAIL	PASS
L58	PASS	PASS	PASS	PASS	PASS
L59	PASS	PASS	PASS	PASS	PASS
% Passing	100	100	82	53	

PASS = Considered to have passed based on discussion in report text.