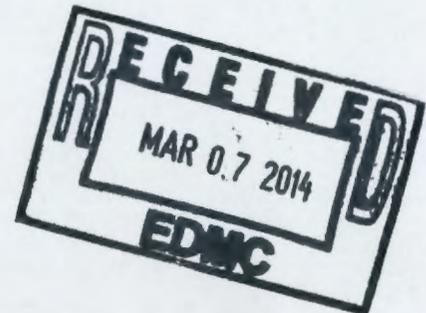


# River Corridor Closure Contract

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## 2012 River Corridor Closure Contract Revegetation and Mitigation Monitoring Report

March 2013



For Public Release

**Washington Closure Hanford**

Prepared for the U.S. Department of Energy, Richland Operations Office  
Office of Assistant Manager for River Corridor



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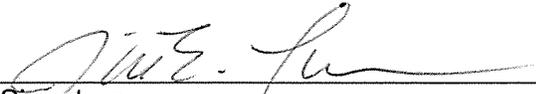
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**Author Name:** D. C. Shaw, J. E. Bernhard, J. G. Lucas

**Approval:** J. E. Thomson, Environmental Services Manager

  
\_\_\_\_\_  
Signature

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**River Corridor  
Closure Contract** 

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**March 2013**

Authors:

**D. C. Shaw**

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## 1.0 INTRODUCTION

This report documents the status of revegetation projects and natural resources mitigation efforts conducted for remediated waste sites and other activities associated with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) cleanup of National Priorities List waste sites at the Hanford Site in Richland, Washington. This report contains the vegetation monitoring data that was collected in the spring and summer of 2012 from the River Corridor Closure Contract's (RCCC) revegetation and mitigation areas on the Hanford Site.

The extent of each revegetation effort varied depending on the surrounding habitat, existing conditions, and future land-use designation of the area. The purpose of monitoring revegetation efforts is to measure the progress of plant succession and to evaluate the success of different planting techniques to improve RCCC site restoration success. Each area will be discussed separately and will include a brief description of the revegetation activities and the results from the 2012 monitoring efforts.

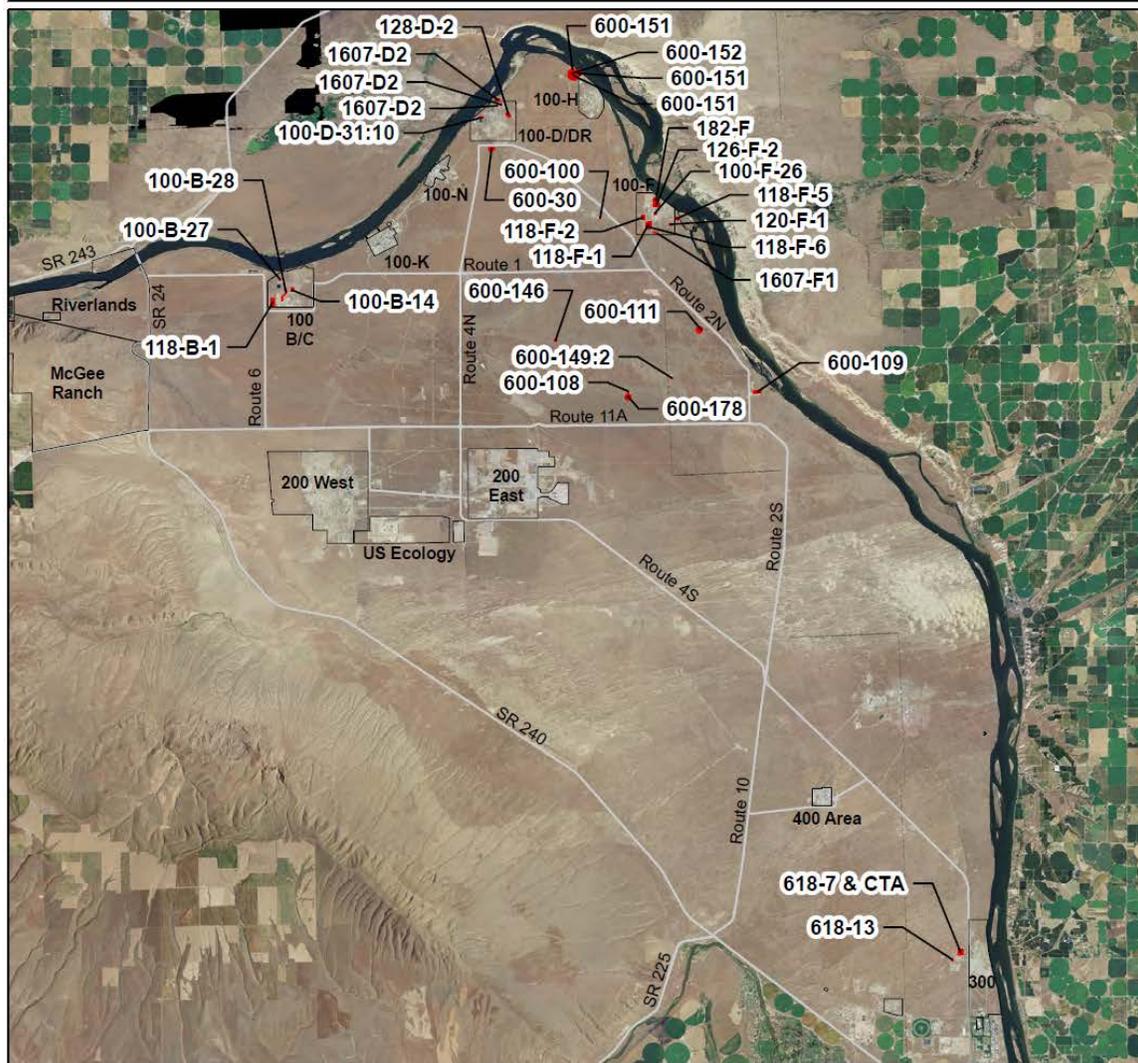
This report provides fifth-year survey results for the revegetated areas at 182-F, 118-F-1, 118-F-2, 126-F-2, 100-F-26, 118-F-5, 100-B-14, and 118-B-1. Fourth-year monitoring was conducted at 118-F-6, 120-F-1, 1607-F1, 618-7, 600-111, and 600-149:2. Third-year monitoring was performed at 618-13, 100-B-27, and 100-B-28. Second-year monitoring was performed at 600-146. First year monitoring was performed at 600-30, 600-100, 600-151, 600-152, 600-108, 600-109, and 600-178 (Figure 1).

Results from previous years' monitoring are provided in reports for each respective year (West et al. 2011, Lindsey and Johnson 2010, Lindsey et al. 2009, Lindsey and Gano 2008). The data tables from 2011, 2010, 2009, and 2008 are in Appendix A of this report.

### 1.1 METHODS USED TO EVALUATE VEGETATION RECOVERY

Monitoring of revegetation and mitigation areas consisted of measuring the canopy cover of all plant species found on the Hanford Site; the frequency of occurrence; and the survival of transplanted sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), and spiny hopsage (*Grayia spinosa*) seedlings. All values were then converted to percentages. Canopy cover and frequency measurements were obtained using the methods described in *Steppe Vegetation of Washington* (Daubenmire 1970). Canopy coverage is defined in Daubenmire (1970) as "the percentage of ground surface included in the vertical projection of a polygon drawn around the extremities of undisturbed foliage of a plant." This method provides a measure of the amount of ground covered by each species. Because it is possible in dense stands of vegetation for species to overlap one another, total measured vegetative cover can exceed 100%. Within each location a series of plot frames (15 to 25 plot frames) were analyzed for the canopy cover of each species present. Frequency is represented as the percentage of occurrences a species is observed within the number of plot frames measured. For example, if a species was represented in 10 out of 25 plot frames, its frequency would be  $10/25 \times 100 = 40\%$ . Species that were observed within a revegetated area, but were not counted in a plot frame were recorded as occurrences and denoted as an "X" in the tables. Since species occurrences hold no numerical value within any particular plot, they are not included in frequency calculations for a site.

Figure 1. Hanford Site Showing Locations of Revegetation Sites.



**Legend**

- Revegetation Sites
- Roads
- Major Environmental Remediation Areas of the Hanford Site

NOTE: Aerial Image, 2011, NAIP.



Path: C:\Hanford\GIS\MapFiles\WCH\HanfordReveg.mxd



**Revegetation Project Areas**

Hanford Site, Benton County, WA

The relative magnitude of a frequency rating in comparison to a canopy coverage rating provides an index of species distribution and its influence within a vegetation community. At sites where shrubs were planted, survival was measured by counting a representative number of plants at the site, determining if the plants were dead or alive, and then calculating the percent survival.

This report uses taxonomic nomenclature from *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973). Some of the plant taxonomic names have been updated and the revised names are provided in Appendix B of this report. Plant identification was conducted using the nomenclature in Hitchcock and Cronquist (1973) and in *Vascular Plants of the Hanford Site* (Sackschewsky and Downs 2001).

The type and extent of each revegetation effort is based on the location of the project and the future land designation of that area. For example, portions of the 300 Area, including the 300-FF-1 Process Ponds and Burial Grounds restoration area, have been designated for future industrial use; therefore, the objective of the revegetation effort is long-term interim stabilization. The *Hanford Site Biological Resources Management Plan* (BRMaP) (DOE-RL 2001) prescribes only seeding native bunchgrasses for interim stabilization to provide habitat, but to avoid unjustified expense and to stabilize the soil surface. At most remedial action sites, the objective of revegetation is to restore the land to vegetative communities dominated by native species that will eventually provide habitat for a diversity of both plant and animal species. Secondary objectives often include using different planting methods and techniques to improve success while incorporating experience and knowledge gained from previous plantings.

Success criteria differ for each site with consideration of varying soil types and microclimatic conditions. For example, sandy areas promote different species with differing recovery rates and plant densities than those found in rocky soils; therefore, the criteria for judging success will be different. All sites will be evaluated based on the plant canopy cover, plant community composition, and survival rates of the planted shrubs. These criteria are detailed in the *Revegetation Manual for the Environmental Restoration Contractor* (McLendon et al. 1997). A revegetation effort will be considered successful if the area is stabilized to prevent erosion and is dominated by recovering stands of native shrubs, forbs, and grasses. Previously, areas identified for future industrial use may have been stabilized with wheatgrass (*Agropyron*) varieties and/or native bunchgrasses because of the potential for future land disturbance, although future prescriptions will only use native species.

According to the Hanford Meteorological Station, the Hanford Site experienced slightly cooler than normal temperatures during the spring (April, May and June) of 2012. Temperatures for the spring months averaged 53.9°F, only 0.1°F below normal (54.0°F). However, total precipitation for the spring months was higher than normal, totaling 2.43 in., with a total precipitation for 2012 (Jan-June) of 4.74 in., 125% of normal (3.78 in.). Of note, June 2012 was the second wettest June on record, totaling 1.51 in. (296% of normal).

## 2.0 300 AREA

Remediation in the 300-FF-2 Operable Unit began in 2004 with the remediation of the 300-8 Aluminum Shavings waste site, and 600-47 and 300-18 waste sites. Remediation at the 618-7 Burial Ground began in 2007 and was completed and revegetated in December 2008. Remediation of the 618-13 Burial Ground was initiated in January 2009 and continued for approximately 2 months. The site was revegetated in January 2010.

### 2.1 618-7 BURIAL GROUND

The 618-7 site was broken down into three areas for monitoring to illustrate variations in vegetative success dependent on present soil conditions. The container transfer area (CTA) was treated as a separate site, and the burial ground was split into the north and south sections. The substrate present on the north section consists of larger, fist-sized cobbles, while the south section received a top dressing of fine-grained soil, salvaged from the CTA area prior to the installation of the CTA. These areas were broadcast seeded with a mixture of native grasses including Sandberg's bluegrass, Indian ricegrass, bluebunch wheatgrass, prairie junegrass, bottlebrush squirreltail, and needle-and-thread grass. In addition, 134 kg/ha (120 lbs/ac) of Triple-16 fertilizer was added to the sites along with 4,480 kg/ha (4,000 lbs/ac) of straw mulch that was spread and crimped into the soil surface. Sagebrush and bitterbrush plugs were then planted into the seeded areas at approximately 1,235 plants/ha (500 plants/ac).

The majority of the planted CTA area was bladed and graveled as part of a project not associated with the RCCC. As such, monitoring was not conducted at that portion of the 618-7 site. Fourth-year monitoring was performed at the remainder of the 618-7 site on May 2, 2012 (Figures 2 and 3). Sagebrush survival remained stable at 83% survival since 2011, with 58.6% of those in bloom. Bitterbrush also remained stable at 25% survival. Sandberg's bluegrass remained the dominant species in both the north and south sections (Table 1), although overall native canopy cover decreased 10.5% in the north and 12.8% in the south. Invasive canopy cover increased 3.6% in the north and 2.1% in the south. Native species diversity increased from 10 in 2011 to 16 in 2012. Sagebrush and bitterbrush were both observed in bloom during 2012 monitoring.

In addition, a Long-billed Curlew (*Numenius americanus*) was observed on the ground at this site, possibly utilizing the open landscape of the site for nesting habitat.

**Table 1. Percent Canopy Cover and Frequency of Occurrence at 618-7 in 2012. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Poa sandbergii</i> (Sandberg's bluegrass)	32.5	44.2	100.0	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	22.1	7.7	96.0	60.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.9	3.2	96.0	88.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	5.0	0.9	60.0	36.0

**Table 1. Percent Canopy Cover and Frequency of Occurrence at 618-7 in 2012. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	2.9	0.2	56.0	8.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.2	2.6	8.0	44.0
<i>Stipa comata</i> (needle-and-thread grass)	0.6	0.1	4.0	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.1	X	4.0	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	1.7	X	48.0	X
<i>Eriogonum niveum</i> (snow buckwheat)	X	0.1	X	4.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	X	0.5	X	20.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	0.2	X	8.0
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.1	--	4.0	--
<i>Artemisia tridentata</i> (big sagebrush)	--	0.2	--	8.0
<i>Descurainia pinnata</i> (western tansymustard)	--	0.1	--	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	--	0.9	--	16.0
<i>Grayia spinosa</i> (spiny hopsage)	X	X	X	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	--	X	--
<i>Achillea millefolium</i> (yarrow)	X	--	X	--
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	X	--	X	--
<i>Erigeron piperianus</i> (Piper's daisy)	X	--	X	--
<i>Machaeranthera canescens</i> (hoary aster)	X	--	X	--
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	--	X	--
<i>Purshia tridentata</i> (antelope bitterbrush)	--	X	--	X
<i>Oenothera pallida</i> (pale eveningprimrose)	--	X	--	X
Crust	12.9	28.2	100.0	100.0
Soil	59.0	63.3	100.0	100.0
Litter	46.6	31.2	100.0	100.0
<b>Total canopy cover (litter not included)</b>	<b>68.1</b>	<b>60.9</b>		
Total Invasive % Cover	27.0	14.0		
Change in Invasive % Cover from 2011	+3.6	+2.1		
Total Native % Cover	41.1	46.9		
Change in Native % Cover from 2011	-10.5	-12.8		

<sup>a</sup> Invasive species

X = Present but not counted in plot frames

-- = Species not observed on site

**Figure 2. Piper's Daisy at the North Portion 618-7 Burial Ground (2012).**



**Figure 3. Sagebrush at the Southern Portion of 618-7 Burial Ground (2012).**



## **2.2 618-13 BURIAL GROUND**

The area disturbed during remediation of the 618-13 Burial Ground was approximately 0.25 ac. The site was broadcast seeded with a variety of native grasses including bluebunch wheatgrass, Sandberg's bluegrass, Indian ricegrass, needle-and-thread grass, and bottlebrush squirreltail, and planted with bitterbrush and sagebrush seedlings in mid-January 2010.

Third-year monitoring of the 618-13 site was conducted in the spring of 2012. Cheatgrass remained the dominant species at 39.3% canopy cover, although it showed a 16.9% decrease from 2011. Native species on the site yielded a total of 26.5% canopy cover with a total of seven native species, slightly up from 2011, while invasive species canopy cover decreased by 21.2% (Table 2). Due to the small size of the site, shrub monitoring transects were not originally established in 2010.

**Table 2. Percent Canopy Cover and Frequency of Occurrence at 600-13 in 2012.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	24.2	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	39.3	93.3
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.5	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.5	20.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.5	20.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	3.2	60.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	1.2	13.3
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.2	6.7
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.3	13.3
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
Crust	17	100
Soil	44	100
Litter	50.5	100
<b>Total canopy cover (litter not included)</b>	72.0	
Total Invasive % Cover	45.5	
Change in Invasive % Cover from 2011	-21.2	
Total Native % Cover	26.5	
Change in Native % Cover from 2011	+0.3	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

---

## 3.0 100 AREA SITES

### 3.1 100-F SITES PLANTED IN 2008

Areas that were revegetated between December 2007 and February 2008, and that were monitored in 2011 include 100-F-26, 118-F-1, 118-F-2, 118-F-5, 118-F-6, 120-F-1, 126-F-2, 182-F, and 1607-F-2. These sites were remediated to meet the objectives for interim closure as established in the *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (RDR/RAWP) (DOE-RL 2005a) and in the *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington* (Interim Action ROD) (EPA 1999). These sites were broadcast seeded with a mixture of native grasses including Sandberg's bluegrass, Indian ricegrass, bluebunch wheatgrass, prairie junegrass, bottlebrush squirreltail, and needle-and-thread grass. In addition, 134 kg/ha (120 lbs/ac) of Triple-16 fertilizer was added to the sites along with 4,480 kg/ha (4,000 lbs/ac) of straw mulch that was spread and crimped into the soil surface. Sagebrush plugs were then planted into the seeded areas at approximately 1,200 plants/ha (500 plants/ac).

#### 3.1.1 118-F-1

Fifth-year monitoring was conducted at the 118-F-1 site in 2012 (Figure 4). Sandberg's bluegrass remained the dominant species, increasing 13 % from 2011 to total 36% canopy cover. Thirteen native species were observed at the site, with native canopy cover increasing 20% from 2011 to total 46%, while invasive cover decreased 11% from 2011 to total 21% (Table 3).

Sagebrush vitality remained consistent at 60% survival from 2011, with 97% of those in bloom. This high survival, combined with a high percentage of blooming shrubs, provides early indication that the sagebrush planting was successful on this portion of the site. In contrast, no shrubs were observed alive on the second transect as of 2009. Heavily compacted soils on that portion of the site are a contributing factor to the poor sagebrush success. This is an excellent example of the necessity of ripping compacted soils prior to initiating revegetation efforts. The remaining portions of the plot would benefit from additional shrub planting efforts.

#### 3.1.2 118-F-2

Fifth-year monitoring was performed at the 118-F-2 site in the spring of 2012 (Figure 5). Sandberg's bluegrass remained the dominant species on the site with 38.7% canopy cover, 18.7% higher than last year. Fourteen native species were observed on the site in 2012, with native cover increasing 18.5% to total 44.5%, while invasive cover decreased 38.4% to total 14.1% (Table 4).

**Figure 4. Compacted Soil at 118-F-1 Waste Site (2010).**



**Table 3. Percent Canopy Cover and Frequency of Occurrence at 118-F-1 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	36.4	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	13.4	84.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	6.4	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	3.0	24.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	4.1	48.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.4	16.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.2	8.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.6	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.2	8.0
<i>Festuca octoflora</i> (slender sixweeks)	0.1	4.0
<i>Artemisia tridentata</i> (big sagebrush)	1.5	20.0
<i>Descurainia pinnata</i> (western tansymustard)	0.1	4.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.1	4.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.1	4.0
<i>Machaeranthera canescens</i> (hoary aster)	0.1	4.0
<i>Chondrilla juncea</i> <sup>a</sup> (rush skeletonweed)	0.1	4.0
<i>Erigeron pumilus</i> (shaggy fleabane)	0.1	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	X	X

**Table 3. Percent Canopy Cover and Frequency of Occurrence at 118-F-1 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Cardaria draba</i> <sup>a</sup> (whitetop)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Centaurea repens</i> <sup>a</sup> (Russian knapweed)	X	X
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X
Crust	23.1	100.0
Soil	43.7	100.0
Litter	55.7	100.0
<b>Total canopy cover (litter not included)</b>	66.4	
Total Invasive % Cover	21.3	
Change in Invasive % Cover from 2011	-11.2	
Total Native % Cover	45.6	
Change in Native % Cover from 2011	+19.5	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Figure 5. Sagebrush and gray rabbitbrush at 118-F-2 at Soil Staging Area (2012).**



**Table 4. Percent Canopy Cover and Frequency of Occurrence at 118-F-2 in 2012.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	38.7	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	8.5	68.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	5.4	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.6	24.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.9	36.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.8	12.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.2	8.0
<i>Achillea millefolium</i> (yarrow)	0.1	4.0
<i>Artemisia tridentata</i> (big sagebrush)	0.8	12.0
<i>Machaeranthera canescens</i> (hoary aster)	0.4	16.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.2	8.0
<i>Descurainia pinnata</i> (western tansymustard)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	X	X
<i>Erigeron pumilus</i> (shaggy fleabane)	X	X
<i>Oenothera pallida</i> (pale eveningprimrose)	X	X
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	X
Crust	26.8	100.0
Soil	60.1	100.0
Litter	44.7	100.0
<b>Total canopy cover (litter not included)</b>	58.6	
Total Invasive % Cover	14.1	
Change in Invasive % Cover from 2011	-38.4	
Total Native % Cover	44.5	
Change in Native % Cover from 2011	+18.5	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

Sagebrush monitoring was also conducted on this site in 2012. Shrub survival remained stable at 12.5% since 2010, although 100% of remaining shrubs were in bloom as apposed to only 33.3% in 2011. Both sagebrush and rabbitbrush recruits were observed during 2012 monitoring.

In addition, a Killdeer (*Charadrius vociferus*) was observed utilizing an open patch of cobbles for nesting on this site (Figure 6). This illustrates the importance of restoring various habitat types throughout the Hanford Site. In most cases, a mix of established native vegetation with open spaces can potentially benefit various wildlife species.

**Figure 6. Nesting Killdeer and eggs at 118-F-2 (2012).**



### 3.1.3 182-F

This site was divided into a north and south area, to distinguish between the backfilled northern plot where the soil is mostly coarse river cobble and the more fine-grained soil on the southern plot. The south plot was used as a staging area and had been invaded by nonnative species prior to revegetation, while the north plot lacked vegetation.

Fifth-year monitoring was performed at the 182-F site on May 9, 2012 (Figure 7). Cheatgrass continued to dominate the site with 53.2% cover in the north section and 72.2% in the south section. Sandberg's bluegrass was the next dominant native grass with cover of Russian thistle remaining low. The south section showed an increase of 30% in native cover, while the north increased 12.5%. Similarly, the south section decreased 20.7% in non-native cover while the north only decreased 10.8%. When compared, the higher success of the south area can likely be attributed to the presence of native topsoil. However, there are still more species, both native and nonnative, present at the north area where the soil has a higher cobble component. This site will continue to provide an interesting comparison between revegetation with cobble versus fine-grained soil substrates. Sagebrush recruitment was observed on both the north and south portions of the site (Table 5).

In past years, biocontrols have been implemented on the Hanford site to combat infestations of noxious weeds. Lesser knapweed flower weevils (*Larinus minutus*) were observed on both the north and south portions of this site feeding on diffuse knapweed. Populations of knapweeds

affected by the weevils appeared to be in poor health with much lower vigor than non-affected individuals.

In addition, multiple bull snakes (*Pituophis catenifer*) were observed sunning in the cobbles present at the southern portion of the site.

**Figure 7. 182-F in 2012.**



**Table 5. Percent Canopy Cover and Frequency of Occurrence at 182-F in 2012. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Poa sandbergii</i> (Sandberg's bluegrass)	25.5	30.1	100.0	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	53.2	72.2	100.0	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	3.2	6.0	93.3	88.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.2	11.5	6.7	60.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	1.5	1.0	26.7	20.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.3	1.1	13.3	24.0
<i>Sporobolus cryptandrus</i> (sand dropseed)	X	0.6	X	4.0
<i>Vicia cracca</i> <sup>a</sup> (bird vetch)	0.0	X	0.0	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X	X	X
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.3	1.9	13.3	20.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	X	0.7	X	8.0

**Table 5. Percent Canopy Cover and Frequency of Occurrence at 182-F in 2012. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Astragalus seccumbens</i> (crouching milkvetch)	0.0	X	0.0	X
<i>Artemisia tridentata</i> (big sagebrush)	X	0.6	X	4.0
<i>Achillea millefolium</i> (yarrow)	X	X	X	X
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.3	0.2	13.3	8.0
<i>Erigeron pumilus</i> (shaggy fleabane)	0.0	X	0.0	X
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.0	X	0.0	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	0.1	X	4.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.8	0.4	33.3	16.0
<i>Artemisia campestris</i> (Pacific sage)	0.3	X	13.3	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.0	X	0.0	X
<i>Astragalus caricinus</i> (buckwheat milkvetch)	X	--	X	--
<i>Chondrilla juncea</i> <sup>a</sup> (rush skeletonweed)	X	--	X	--
<i>Prunella vulgaris</i> (common selfheal)	0.2	--	6.7	--
<i>Festuca octoflora</i> (slender sixweeks)	0.2	--	6.7	--
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	0.3	--	13.3	--
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	--	X	--
<i>Grayia spinosa</i> (spiny hopsage)	X	--	X	--
Crust	65.0	81.2	100.0	100.0
Soil	35.0	18.8	100.0	100.0
Litter	8.8	10.5	100.0	100.0
<b>Total canopy cover (litter not included)</b>	<b>86.3</b>	<b>126.4</b>		
Total Invasive % Cover	59.5	93.0		
Change in Invasive % Cover from 2011	-10.8	-20.7		
Total Native % Cover	26.8	33.4		
Change in Native % Cover from 2011	+12.5	+30		

<sup>a</sup> Invasive species

X = Present but not counted in plot frames

-- = Species not observed on site

### 3.1.4 126-F-2 (183-F) East Clearwell

The 126-F-2 (183-F) east clearwell revegetation was monitored for the fifth year on May 14, 2012 (Figure 8). Sandberg's bluegrass replaced cheatgrass as the dominant species in 2012 with 50.5% canopy cover. Native canopy cover increased 29.7% to total 55.7%, while invasive canopy cover decreased 27.7 % to total 24.8% (Table 6). Monitoring efforts indicate that cobble substrate is not a limiting factor in canopy cover; in addition, 14 out of 19 species present represent native species.

Due to the relatively small size of this revegetation, no sagebrush transect was established on the site. However, sagebrush survival appears to be extremely high at the site. Planted tubelings were seen in bloom during fourth- and fifth-year monitoring. Sagebrush seedlings (recruits) were observed for the first time on this site in 2010. Gray rabbitbrush recruits were also observed on the site in 2012. This, along with the observed high survival rates, is indicative of successful reintroduction of sagebrush to this site.

**Figure 8. Sagebrush and Gray Rabbitbrush Growing on 126-F-2 (2012).**



**Table 6. Percent Canopy Cover and Frequency of Occurrence at 126-F-2 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	50.5	93.3
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	20.8	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.2	86.7
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.2	46.7
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.5	20.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.8	33.3
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	1.2	46.7
<i>Machaeranthera canescens</i> (hoary aster)	0.3	13.3
<i>Artemisia tridentata</i> (big sagebrush)	1.7	33.3
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.2	6.7
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.2	6.7

**Table 6. Percent Canopy Cover and Frequency of Occurrence at 126-F-2 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.0	40.0
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Astragalus seccumbens</i> (crouching milkvetch)	X	X
<i>Erigeron pumilus</i> (shaggy fleabane)	X	X
<i>Erigeron poliospermus</i> (cushion fleabane)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X
<i>Collomia tenella</i> (diffuse collomia)	X	X
Crust	10.7	100.0
Soil	50.7	100.0
Litter	60.2	100.0
<b>Total canopy cover (litter not included)</b>	80.5	
Total Invasive % Cover	24.8	
Change in Invasive % Cover from 2011	-27.7	
Total Native % Cover	55.7	
Change in Native % Cover from 2011	+29.7	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

### 3.1.5 100-F-26 Pipelines

Fifth-year monitoring was performed at the 100-F-26 site on May 14, 2012. Monitoring showed an increase of 19.1% native canopy cover and a 29.7% decrease in nonnative canopy cover. (Table 7) In 2011, cheatgrass was the dominant species overall in regards to canopy cover and frequency; however, Sandberg's bluegrass increased substantially to 42.7% canopy cover to represent the dominant species. Native cover increased 19.1% to total 50.3 %, while invasive cover decreased 29.7% to total 28.3%.

No sagebrush monitoring transect was established on the site. Although thin in some areas of the site, sagebrush has become established. Sagebrush and gray rabbitbrush recruits were observed on the site in 2012 (Figure 9).

**Table 7. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	42.7	93.3
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	23.0	93.3

**Table 7. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	3.0	86.7
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	2.5	33.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.7	26.7
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	1.3	53.3
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.8	33.3
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.3	13.3
<i>Festuca octoflora</i> (slender sixweeks)	0.2	6.7
<i>Achillea millefolium</i> (yarrow)	1.2	13.3
<i>Artemisia tridentata</i> (big sagebrush)	1.0	6.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.5	26.7
<i>Machaeranthera canescens</i> (hoary aster)	0.5	20.0
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	X	X
<i>Erigeron poliospermus</i> (cushion fleabane)	X	X
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	X
<i>Erigeron pumilus</i> <sup>a</sup> (shaggy fleabane)	X	X
Crust	16.2	100.0
Soil	44.5	100.0
Litter	63.3	100.0
<b>Total canopy cover (litter not included)</b>	<b>78.7</b>	
Total Invasive % Cover	28.3	
Change in Invasive % Cover from 2011	-29.7	
Total Native % Cover	50.3	
Change in Native % Cover from 2011	+19.1	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Figure 9. 100-F-26 (Top: Sagebrush at Early Stage; Bottom: Sagebrush [2012]).**



### **3.1.6 118-F-5 Burial Ground**

The 118-F-5 site was separated into two monitoring areas, the burial ground and the soil staging area (SSA), so that a comparison can be made between the contrasting soil types at the two areas. The burial ground was backfilled with coarse cobble from a local borrow area, while the SSA's substrate is native topsoil. The same revegetation effort was performed at both sites.

Fifth-year monitoring was conducted at the 118-F-5 site on May 14, 2012 (Figure 10). Both areas increased in total native and invasive canopy cover, although invasive species still remain dominant with 71.3% canopy coverage at the burial ground and 80.2% canopy coverage at the SSA. Most sites covered under the 2012 monitoring have exhibited high canopy coverage of Sandberg's bluegrass; however, populations of Sandberg's bluegrass remains low at 118-F-5, representing only 1.3% at the burial ground and 1.7% at the SSA. Although native cover saw increases at both sites, total native cover remains low representing only 7% at the burial ground

and 10.7% at the SSA. Despite differences in topsoil substrate, both sites seem to parallel each other in terms of total canopy coverage, although differences in species diversity are notable between the two monitoring areas (Table 8).

Shrub survival was monitored at one transect on the SSA and one transect on the burial ground. Although 86% of remaining sagebrush at the SSA were in bloom, sagebrush survival remained low on both sites with 17% on the SSA and 28% on the burial ground. In addition, 11 spiny hopsage plants were recorded on the SSA monitoring transect in 2008. Only one of those hopsage plants remained alive during 2012 monitoring. Although species diversity and originally planted shrub survival appears to be low, sagebrush and gray rabbitbrush recruits were observed on the site in 2011 and 2012, suggesting the site is naturally regenerating.

**Figure 10. 118-F-5 (Top: Sagebrush [2011]; Bottom: Sagebrush [2012]).**



**Table 8. Percent Canopy Cover and Frequency of Occurrence  
at 118-F-5 in 2012. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
<i>Poa sandbergii</i> (Sandberg's bluegrass)	1.3	1.7	53.3	33.3
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	67.2	65.5	100.0	93.3
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	3.3	8.8	100.0	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	2.3	0.3	26.7	13.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.7	4.2	26.7	66.7
<i>Artemisia tridentata</i> (big sagebrush)	1.3	1.5	20	26.7
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.2	1.2	6.7	13.3
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.2	0.2	6.7	6.7
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.5	X	20.0	X
<i>Achillea millefolium</i> (yarrow)	X	1.3	X	20
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	1.8	X	40
<i>Plantago patagonica</i> (Indian wheat)	X	0.5	X	20
<i>Machaeranthera canescens</i> (hoary aster)	0.5	--	20.0	--
<i>Sphaeralcea munroana</i> (Munro's globemallow)	0.2	--	6.7	--
<i>Festuca octoflora</i> (slender sixweeks)	0.7	--	26.7	--
<i>Chrysothamnus viscidiflorus</i> (green rabbitbrush)	X	--	X	--
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	--	X	--
<i>Erigeron pumilus</i> (shaggy fleabane)	X	--	X	--
<i>Chondrilla juncea</i> <sup>a</sup> (rush skeletonweed)	X	--	X	--
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	--	1.5	--	26.7
<i>Microsteris gracilis</i> (pink microsteris)	--	1.3	--	20.0
<i>Machaeranthera canescens</i> (hoary aster)	--	0.7	--	26.7
<i>Ambrosia acanthicarpa</i> (bur ragweed)	--	0.3	--	13.3
<i>Grayia spinosa</i> (spiny hopsage)	--	X	--	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	--	X	--	X
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	--	X	--	X
<i>Eriogonum niveum</i> (snow buckwheat)	--	X	--	X
<i>Agoseris heterophylla</i> (mountain dandelion)	--	X	--	X
<i>Chenopodium leptophyllum</i> (slimleaf goosefoot)	--	X	--	X
Crust	14.2	17.8	100.0	100
Soil	32.2	16.3	100.0	100.0
Litter	69.2	82.8	100	100.0
<b>Total canopy cover (litter not included)</b>	<b>78.3</b>	<b>90.8</b>		
Total Invasive % Cover	71.3	80.2		

**Table 8. Percent Canopy Cover and Frequency of Occurrence at 118-F-5 in 2012. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
Change in Invasive % Cover from 2011	+2.8	+7.2		
Total Native % Cover	7.0	10.7		
Change in Native % Cover from 2011	+4.2	+4.7		

<sup>a</sup> Invasive species

X=present but not counted in plot frames

### 3.2 2009 REVEGETATION AT 100-F

The 118-F-6, 120-F-1, and the 1607-F1 waste sites were revegetated in November 2008 and planted with Sandberg’s bluegrass, Indian ricegrass, bluebunch wheatgrass, prairie junegrass, bottlebrush squirreltail, and needle-and-thread grass. In addition, 134 kg/ha (120 lbs/ac) of Triple-16 fertilizer was added to the sites along with 4,480 kg/ha (4,000 lbs/ac) of straw mulch that was spread and crimped into the soil surface. Sagebrush, hopsage, and bitterbrush plugs were then planted into the seeded areas at approximately 1,200 plants/ha (500 plants/ac).

#### 3.2.1 118-F-6 Burial Ground

The 118-F-6 revegetation was monitored for the fourth year on May 15, 2012. Sandberg’s bluegrass remained as the dominant species on the site representing 21.1% canopy cover. Cheatgrass occurrences continued to decrease for the second consecutive year, dwindling to only 0.9% canopy cover. Overall canopy cover has also steadily decreased from 2010, with native canopy cover decreasing 7% and invasive cover decreasing 16.4%. Nine native species were observed on the site compared to only seven nonnatives (Table 9).

Shrub monitoring showed sagebrush survival continuing to decrease from 50% in 2011 to 48% this year (Figure 11). Of the 11 antelope bitterbrush recorded along the original transect, none remained alive in 2011. Overall shrub survival of originally planted shrubs is at the low end in terms of meeting restoration goals. However, numerous sagebrush and gray rabbitbrush recruits were observed in 2012, indicating that a portion of the site is self-restoring and may not need any additional support.

**Table 9. Percent Canopy Cover and Frequency of Occurrence at 118-F-6 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg’s bluegrass)	21.1	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	0.9	36.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	8.2	96.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.6	4.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.2	8.0
<i>Descurainia pinnata</i> (western tansymustard)	0.1	4.0

**Table 9. Percent Canopy Cover and Frequency of Occurrence at 118-F-6 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.1	4.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	X	X
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	X	X
Crust	32.9	100.0
Soil	70.7	100.0
Litter	27.2	100.0
<b>Total canopy cover (litter not included)</b>	31.2	
Total Invasive % Cover	9.3	
Change in Invasive % Cover from 2011	-16.4	
Total Native % Cover	21.9	
Change in Native % Cover from 2011	-7.0	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Figure 11. Sagebrush Transect on 118-F-6.**



### 3.2.2 120-F-1 Glass Dump

Vegetation monitoring was performed at 120-F-1 site for the fourth year on May 9, 2012 (Figure 12). Native species canopy cover increased 24% while invasive canopy cover decreased 67%. Cheatgrass remained the dominant species on site at 46%. The native topsoil was stockpiled and redistributed across this site, providing a seed source and good soil to provide for this high species diversity. High native diversity is anticipated at this site. Another contributing factor is the adjacent native habitat to this site, showing the importance of minimizing impacts and maintaining intact habitat in remediation areas. Planted sagebrush were observed as occurrences on this site; however, due to the small size no monitoring transect was established. Sagebrush recruits were observed on site during monitoring (Table 10).

**Figure 12. High Percentage of Introduced Species at 120-F-1 (2011).**



**Table 10. Percent Canopy Cover and Frequency of Occurrence at 120-F-1 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	34.3	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	45.8	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.5	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.5	60.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.3	13.3
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.2	6.7
<i>Achillea millefolium</i> (yarrow)	0.3	13.3

**Table 10. Percent Canopy Cover and Frequency of Occurrence at 120-F-1 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	0.3	13.3
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.2	6.7
<i>Plantago patagonica</i> (Indian wheat)	1.3	53.3
<i>Phlox longifolia</i> (longleaf phlox)	0.2	6.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.7	26.7
<i>Microsteris gracilis</i> (pink microsteris)	1.3	53.3
<i>Epilobium paniculatum</i> (tall willowherb)	0.2	6.7
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.3	13.3
<i>Diodia</i> <sup>a</sup> (buttonweed)	0.2	6.7
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	X	X
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Balsamorhiza careyana</i> (Carey's balsamroot)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Chrysothamnus viscidiflorus</i> (green rabbitbrush)	X	X
<i>Oenothera pallida</i> (pale eveningprimrose)	X	X
<i>Agoseris heterophylla</i> (mountain dandelion)	X	X
<i>Lomatium macrocarpum</i> (bigseed desertparsley)	X	X
<i>Astragalus sclerocarpus</i> (stalked pod milkvetch)	X	X
Crust	29.5	100
Soil	32.5	100
Litter	59.5	100
<b>Total canopy cover (litter not included)</b>	89.8	
Total Invasive % Cover	50.7	
Change in Invasive % Cover from 2011	-66.6	
Total Native % Cover	39.2	
Change in Native % Cover from 2011	+24.4	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

### 3.2.3 1607-F1 Septic Tank

Fourth-year vegetation monitoring was performed at the 1607-F1 site on May 15, 2012 (Figure 13). Sandberg's bluegrass continued to increase in canopy cover from 14% in 2009 to 36%, although cheatgrass was the dominant grass on the site at 59% cover. Total native canopy cover reached 41%; an increase of 23%, while invasive canopy cover decreased 14.9% to total 79.8% (Table 11).

The sagebrush monitoring performed at the site showed 58% survival rate, which actually increased from the previous year, likely indicating an error in field observation. Although this represents a significant drop from initial monitoring, it has become stable with 79% of the surviving shrubs in bloom, 46% higher than the previous year. Shrub survival is still meeting restoration goals at this time. Subsequent monitoring efforts will show if the blooming shrubs begin to generate recruits at the site.

**Figure 13. Sagebrush at 1607-F1, Reactor in Background (2011).**



**Table 11. Percent Canopy Cover and Frequency of Occurrence at 1607-F-1 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	34.5	80
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	58.8	100
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	1.5	60
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.0	6.7
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.8	40
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	17.7	73.3

**Table 11. Percent Canopy Cover and Frequency of Occurrence at 1607-F-1 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
Sitanion hystrix (bottlebrush squirreltail)	1.2	13.3
Sporobolus cryptandrus (sand dropseed)	2.5	6.7
Sphaeralcea munroana (Munro's globemallow)	1.2	13.3
Erigeron pumilus (shaggy fleabane)	1.0	6.7
Chrysothamnus nauseosus (gray rabbitbrush)	X	X
Achillea millefolium (yarrow)	X	X
Grayia spinosa (spiny hopsage)	X	X
Machaeranthera canescens (hoary aster)	X	X
Centaurea repens <sup>a</sup> (Russian knapweed)	X	X
Verbena bracteata (bigbract verbena)	X	X
Crust	7.2	86.7
Soil	13.8	100
Litter	84.7	100
<b>Total canopy cover (litter not included)</b>	121.2	
Total Invasive % Cover	79.8	
Change in Invasive % Cover from 2011	-14.9	
Total Native % Cover	41.3	
Change in Native % Cover from 2011	+23.1	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

### 3.3 100-B/C SITES PLANTED IN 2008

In December 2007 and January 2008 the 100-B-14, 118-B-1, and 118-C-1 sites were revegetated. These sites were remediated to meet the objectives for interim closure as established in the 100 Area RDR/RAWP (DOE-RL 2005a) and in the Interim Action ROD (EPA 1999). These areas were broadcast seeded with a mixture of native grasses including Sandberg's bluegrass, Indian ricegrass, bluebunch wheatgrass, prairie junegrass, bottlebrush squirreltail, and needle-and-thread grass. In addition, 134 kg/ha (120 lbs/ac) of Triple-16 fertilizer was added to the sites along with 4,480 kg/ha (4,000 lbs/ac) of straw mulch that was spread and crimped into the soil surface. Sagebrush plugs were then planted into the seeded areas at approximately 930 plants/ha (400 plants/ac).

#### 3.3.1 100-B-14 Pipelines

Fifth-year monitoring was performed at the 100-B-14 site on April 24, 2012 (Figure 14). Cheatgrass, although decreased 5% still remains the dominant species with respect to canopy cover at this site, recorded at 48% canopy cover (Table 12). Overall, canopy cover totaled 91%, although both native and invasive canopy cover decreased since 2011 monitoring. As expected in 2011, native species are becoming more prevalent on this site. Fourteen native species were observed on the site this year, up from six in 2011.

Two sagebrush transects were established on this site in May 2008. First-year survival counts in May 2009 determined shrub survival on transect T1 to be 7% and T2 to be 65%. Monitoring in 2012 showed shrub survival at T1 remaining consistent at 7% with 100% of remaining shrubs in bloom, and T2 remaining consistent at 65% with 44% of remaining shrubs in bloom. In January 2010, 560 sagebrush seedlings were planted across the 100-B-14 site within areas where shrub distribution was visually sparse to compensate for low shrub survival estimated on transect T1 in May 2009. Many sagebrush recruits of varying ages were observed in 2012. Gray rabbitbrush also seems to be filling in the site.

**Figure 14. 100-B-14 (Left: Spiny Hopsage and Sagebrush; Right: Bunchgrasses; Bottom: Sagebrush [2012]).**



**Table 12. Percent Canopy Cover and Frequency of Occurrence at 100-B-14 in 2012.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	28.6	96.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	47.5	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.5	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	4.5	44.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.1	44.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	3.3	56.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.4	16.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	2.1	44.0
<i>Artemisia tridentata</i> (big sagebrush)	0.2	8.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.2	8.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.1	4.0
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.1	4.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.1	4.0
<i>Epilobium paniculatum</i> (tall willowherb)	0.2	8.0
<i>Machaeranthera canescens</i> (hoary aster)	0.2	8
<i>Chorispora tenella</i> (blue mustard)	0.1	4
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Erigeron poliospermus</i> (cushion fleabane)	X	X
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Chaenactis douglasii</i> (hoary falseyarrow)	X	X
<i>Erigeron piperianus</i> (Piper's daisy)	X	X
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	X	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	X
<i>Festuca octoflora</i> (slender sixweeks)	X	X
Crust	3.8	100
Soil	46.8	100
Litter	48.6	100
<b>Total canopy cover (litter not included)</b>	91.2	
Total Invasive % Cover	55.1	
Change in Invasive % Cover from 2011	-17.8	
Total Native % Cover	36.1	
Change in Native % Cover from 2011	-3.5	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

### 3.3.2 118-B-1 Burial Ground

On April 25, 2012, fifth-year monitoring was performed at the 118-B-1 site (Figure 15). This site is separated into two monitoring areas, the SSA and burial ground, so that differences can be observed. The SSA has soil with a greater proportion of fine-grained material than the burial ground; and because the same planting treatment was performed on each site, the different soil types can be compared in terms of the vegetative community it supports over the 5 years of monitoring. The SSA was not monitored in 2011 as it was used to support remedial activities at 100-C-7:1. However, monitoring data showed it was not on target to meet restoration goals.

A sagebrush monitoring transect was established on the 118-B-1 Burial Ground in May 2008. Shrub survival estimates in April 2011 estimated shrub survival at 40% with 90% of those plants blooming. To compensate for reduced sagebrush survival on the burial ground, 1,350 sagebrush seedlings were planted on the burial ground within areas that had visually reduced shrub densities in January 2010. Sagebrush recruits of various ages were observed on the site in 2011 and 2012 (Figure 15). Although survival rates are down slightly, recruits were observed, and blooming percentages of surviving shrubs were very high. We expect to see more recruits in the following years and survival rates to stabilize.

Sandberg's bluegrass remains the dominant species on the burial ground at 48% canopy cover, followed by cheatgrass (Table 13). Canopy cover of bluebunch wheatgrass continues to grow, now representing 8.5%. Sandberg's bluegrass along with the other planted grasses observed on the site is expected to result in the continued depression of the presence of Russian thistle on the site. Native cover decreased slightly, totaling 62%, while invasive cover decreased 34% to total 27%. Nine native species were observed on site in 2012, as opposed to seven in 2011.

### 3.3.3 118-C-1 Burial Ground

Fifth-year monitoring could not be conducted at 118-C-1 in 2011 as it was also used as a stockpiling area for 100-C-7 and 100-C-7:1 remedial action.

## 3.4 100-B/C SITES PLANTED IN 2009

In December 2009 through February 2010 the 100-B-27 and 100-B-28 sites, along with several other small sites, were revegetated. These sites were remediated to meet the objectives for interim closure as established in the 100 Area RDR/RAWP (DOE-RL 2005a) and in the Interim Action ROD (EPA 1999). These areas were broadcast seeded with a mixture of native grasses including Sandberg's bluegrass, Indian ricegrass, bluebunch wheatgrass, bottlebrush squirreltail, and needle-and-thread grass. In addition, 134 kg/ha (120 lbs/ac) of Triple-16 fertilizer was added to the sites along with 4,480 kg/ha (4,000 lbs/ac) of straw mulch that was spread and crimped into the soil surface. Sagebrush and spiny hopsage plugs were then planted into the seeded areas at approximately 1,235 plants/ha (500 plants/ac).

**Figure 15. 118-B-1 Burial Ground (Left: Sagebrush Recruit [2011]; Right: Overview [2011]; Bottom: Overview [2012]).**



**Table 13. Percent Canopy Cover and Frequency of Occurrence at 118-B-1 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	47.7	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	23.9	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	1.9	76.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	8.5	32.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.1	4.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.1	4.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.2	8.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	4.6	48.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.1	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.1	4.0

**Table 13. Percent Canopy Cover and Frequency of Occurrence at 118-B-1 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Artemisia tridentata</i> (big sagebrush)	0.7	8.0
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.1	4.0
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.3	12.0
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	X	X
<i>Erigeron poliospermus</i> (cushion fleabane)	X	X
<i>Chaenactis douglasii</i> (hoary falseyarrow)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
Crust	7.8	100.0
Soil	32.4	100.0
Litter	74.1	100.0
<b>Total canopy cover (litter not included)</b>	<b>88.3</b>	
Total Invasive % Cover	26.7	
Change in Invasive % Cover from 2011	-34	
Total Native % Cover	61.6	
Change in Native % Cover from 2011	-3.7	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

### 3.4.1 100-B-28 Sodium Dichromate Transfer Pipeline

Third-year revegetation monitoring was performed at the 100-B-28 site on April 23, 2012 (Figure 16). The site is dominated by Sandberg's bluegrass at 64% with a 100% frequency rate; 26% higher canopy cover than in 2011. Only 6 of the 17 species observed in 2012 were native, although native species continue to out-compete invasive species, consisting of 71% canopy cover compared to invasive cover at 34% (Table 14). Native species are expected to continue to do well and diversify as the site matures.

A shrub monitoring transect was established in 2010 to provide a reference for shrub survival across the plot. Planted sagebrush and spiny hopsage tubelings were recorded along the transect. Sixty-seven sagebrush and 36 hopsage were recorded along the 100-m (328.1-ft) long transect. Sagebrush survival was recorded at 60%, while hopsage was recorded at 46% survival. Survival for all planted shrubs is at 59%, with 51% of those in bloom. Interestingly, only sagebrush were in bloom, indicating that the hopsage are farther behind in maturity.

**Figure 16. 100-B-28 Sodium Dichromate Transfer Pipeline in 2011.**



**Table 14. Percent Canopy Cover and Frequency of Occurrence at 100-B-28 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	63.8	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	27.7	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.5	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	6.2	80.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.3	53.3
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.3	13.3
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.5	20.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.5	20.0
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	0.2	6.7
<i>Ranunculus testiculatus</i> <sup>a</sup> (bur buttercup)	0.2	6.7
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.8	33.3
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Purshia tridentata</i> (antelope bitterbrush)	0.2	6.7

**Table 14. Percent Canopy Cover and Frequency of Occurrence at 100-B-28 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	X
Crust	65.3	100.0
Soil	10.5	100.0
Litter	30.5	100.0
<b>Total canopy cover (litter not included)</b>	104.3	
Total Invasive % Cover	33.5	
Change in Invasive % Cover from 2011	-7.8	
Total Native % Cover	70.8	
Change in Native % Cover from 2011	-25.9	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

### 3.4.2 100-B-27 Sodium Dichromate Spill

Third-year monitoring at the 100-B-27 site was conducted on April 24, 2012 (Figure 17). While conducting the initial vegetation monitoring on the site, seed germination on the western portion was significantly lower than the eastern portion. The eastern portion of the site was planted on February 10, 2010, while the western half of the site was planted on February 25, 2010. An evaluation of the western portion of the site in September 2010, found that the original planting had poor survival; therefore, the site was replanted in fall 2010. Native grasses dominated both areas in 2011 and continue to dominate in 2012, with Sandberg's bluegrass at 21% canopy cover on the east and 23% on the west. Eight native species were observed on the site in 2012, and native species canopy cover continues to dominate nonnative cover by around 29% (Table 15).

An 82-m (269-ft)-long shrub monitoring transect was established on the eastern portion of the site, and a 99-m (324.8-ft)-long transect was established on the western portion post rectification in April 2011. Sagebrush survival on the east side was unable to be monitored in 2012 due to missing transect markers. The western transect showed an 85% survival rate for sagebrush and a 73% survival rate for spiny hopsage. In addition, one spiny hopsage was observed in bloom.

**Figure 17. 100-B-27 Sodium Dichromate Spill Site (2012) (Top: Western Portion Rectified [2012]; Bottom: Western Portion Rectified [2010]).**



**Table 15. Percent Canopy Cover and Frequency of Occurrence at 100-B-27 in 2012. (2 Pages)**

Species	% Cover East	% Cover West	% Freq of Occ East	% Freq of Occ West
<i>Poa sandbergii</i> (Sandberg's bluegrass)	21.0	23.2	100.0	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	8.8	5.7	100.0	93.3
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.2	4.8	86.7	93.3

**Table 15. Percent Canopy Cover and Frequency of Occurrence  
at 100-B-27 in 2012. (2 Pages)**

Species	% Cover East	% Cover West	% Freq of Occ East	% Freq of Occ West
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	17.5	8.8	93.3	60.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.8	2.2	33.3	53.3
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.2	0.0	6.7	0.0
<i>Artemisia tridentata</i> (big sagebrush)	0.2	0.3	6.7	13.3
<i>Descurainia pinnata</i> (western tansymustard)	0.3	0.3	13.3	13.3
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.5	1.0	20.0	40.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.2	0.2	6.7	6.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.7	9.7	33.3	66.7
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	0.2	0.3	6.7	13.3
<i>Grayia spinosa</i> (spiny hopsage)	0.2	X	6.7	X
<i>Ranunculus testiculatus</i> <sup>a</sup> (bur buttercup)	--	0.2	--	6.7
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	X	X	X	X
<i>Hordeum hystrix</i> <sup>a</sup> (Mediterranean barley)	--	X	--	X
<i>Astragalus sclerocarpus</i> (stalked pod milkvetch)	--	X	--	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	--	X	--	X
Crust	13.2	16.8	100.0	100.0
Soil	44.5	39.7	100.0	100.0
Litter	64.7	65.0	100.0	100.0
<b>Total canopy cover (litter not included)</b>	<b>53.7</b>	<b>56.7</b>		
Total Invasive % Cover	12.7	14.2		
Change in Invasive % Cover from 2011	-17	+2.7		
Total Native % Cover	41.0	42.5		
Change in Native % Cover from 2011	-9.0	+3.8		

<sup>a</sup> Invasive species

X=present but not counted in plot frames

## 4.0 600 AREA SITES

Remedial actions at waste sites within the 100-IU-2 Operable Unit were initiated in 2008. The remedial action objectives and goals were established by the U.S. Environmental Protection Agency and the Washington State Department of Ecology, in concurrence with the U.S. Department of Energy, Richland Operations Office, and documented in the Interim Action ROD (EPA 1999). The sites were excavated to the extent required to meet specified soil cleanup levels, the contaminated materials were disposed of at the Environmental Restoration Disposal Facility (ERDF), and the sites were backfilled and contoured to match the adjacent area in December 2008. These areas were broadcast seeded with a mixture of native grasses including Sandberg's bluegrass, Indian ricegrass, bluebunch wheatgrass, prairie junegrass, bottlebrush squirreltail, and needle-and-thread grass. In addition, 134 kg/ha (120 lbs/ac) of Triple-16 fertilizer was added to the sites along with 4,480 kg/ha (4,000 lbs/ac) of straw mulch that was spread and crimped into the soil surface. Sagebrush and bitterbrush plugs were then planted into the seeded areas at approximately 1,235 plants/ha (500 plants/ac).

### 4.1 600-111 CRITICALITY MASS LABORATORY

Fourth-year revegetation monitoring was done at the 600-111 site on May 9, 2012 (Figure 18). Sandberg's bluegrass remained the dominant species in 2012, with 57% canopy cover and 100% frequency of occurrence. Native canopy cover increased 18% on the site to total 58%, while invasive species cover decreased 25% to total 10% (Table 16).

The shrub monitoring transect established in 2009 was evaluated for survival during the May 9, 2012, site visit. Of the sagebrush and hopsage monitored, sagebrush survival dropped to 30% while hopsage remained stable at 80% from 2011. Of the remaining sagebrush, 50% are blooming. Surviving sagebrush appears to be very healthy, ranging from 3080 cm in height. In addition, many sagebrush recruits were observed during monitoring.

### 4.2 600-149:2 SMALL ARMS RANGE

Fourth-year monitoring was conducted at the 600-149:2 site on May 2, 2012 (Figure 19). Sandberg's bluegrass remained the dominant species at 59% cover and 100% frequency, although it did experience a 27% decrease from 2011. Overall native species dominated canopy cover with 60% compared to invasive canopy cover at 2.7% (Table 17). Both native and invasive cover decreased from 2011. Only five native species were observed on the site this year; however, with the adjacent mature landscape, the site is expected to see an increase in native diversity as the site matures. Sagebrush recruitments were also observed on the site, not from the seedlings planted as they are not yet blooming but from the shrubs surrounding the site. Due to the size of the site, there was no sagebrush transect originally established.

**Figure 18. 600-111 Site of Former Criticality Mass Laboratory (2011)  
(Top: Planted Sagebrush and Grasses [2011 Monitoring];  
Bottom: End of Sagebrush Transect [2011]).**



**Table 16. Percent Canopy Cover and Frequency of Occurrence at 600-111 in 2012.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	57.0	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	6.3	93.3
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	1.5	60.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.2	6.7
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.7	33.3
<i>Agropyron dasytachyum</i> (thickspike wheatgrass)	0.2	6.7
<i>Achillea millefolium</i> (yarrow)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Descurainia pinnata</i> (western tansymustard)	X	X
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	X	X
<i>Chorispora tenella</i> (blue mustard)	X	X
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	X	X
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Agropyron cristatum</i> <sup>a</sup> (crested wheatgrass)	X	X
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	X	X
Crust	36.0	100.0
Soil	36.0	100.0
Litter	56.2	100.0
<b>Total canopy cover (litter not included)</b>	<b>67.2</b>	
Total Invasive % Cover	9.5	
Change in Invasive % Cover from 2011	-24.5	
Total Native % Cover	57.7	
Change in Native % Cover from 2011	+17.5	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Figure 19. Sagebrush on 600-149:2 Small Arms Range (2011).**



**Table 17. Percent Canopy Cover and Frequency of Occurrence at 600-149:2 in 2012.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	58.8	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	2.0	80.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	0.7	26.7
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.2	13.3
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.2	6.7
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	X	X
Crust	42.2	100.0
Soil	42.2	100.0
Litter	63.3	100.0
<b>Total canopy cover (litter not included)</b>	63.0	
Total Invasive % Cover	2.7	
Change in Invasive % Cover from 2011	-27.3	
Total Native % Cover	60.3	
Change in Native % Cover from 2011	-28.5	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

4.2.1 600-146

Second-year monitoring was conducted at the 600-146 site on May 30, 2012. Since first year monitoring was not conducted at the site the first spring following revegetation, a comparison is not feasible. However, results from the 2012 monitoring will give insight as to the direction and progression of the site. Of the 18 species present on the site, 10 are native. Sandberg's bluegrass is the dominant species representing 37% canopy cover, with cheatgrass (30%) and Russian thistle (17%) close behind. Total native canopy cover represents 41%, while invasive cover represents 48% (Table 18). As there are plenty of natives present on site, weedy species such as Russian thistle should steadily decline as the native species continue to establish.

**Table 18. Percent Canopy Cover and Frequency of Occurrence at 600-146 in 2012.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	36.5	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	29.5	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	17.3	86.7
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.3	13.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.2	6.7
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.2	6.7
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.2	6.7
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	3.0	53.3
<i>Microsteris gracilis</i> (pink microsteris)	0.2	6.7
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	0.2	6.7
<i>Centaurea repens</i> <sup>a</sup> (Russian Knapweed)	0.3	13.3
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Cryptantha pterocarya</i> (wingnut cryptantha)	X	X
<i>Cleome lutea</i> (beeplant)	X	X
<i>Erigeron pumilus</i> (shaggy fleabane)	X	X
<i>Taeniatherum caput-medusae</i> <sup>a</sup> (medusahead)	X	X
Crust	11.2	100.0
Soil	19.8	100.0
Litter	81.5	100.0
<b>Total canopy cover (litter not included)</b>	<b>88.2</b>	
Total Invasive % Cover	47.7	
Total Native % Cover	40.5	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

#### 4.2.2 100-D Sites

In 2011/2012, the following waste sites in the 100-D Area were revegetated: 128-D-2, 600-30, and 628-3. These sites were remediated to meet the objectives for interim closure as established in the 100 Area RDR/RAWP (DOE-RL 2005a) and in the Interim Action ROD (EPA 1999).

The sites were backfilled with pit-run gravel and then revegetated by broadcast seeding with native grass seeds including Sandberg's bluegrass, sand dropseed, needle-and-thread grass, bluebunch wheatgrass and bottlebrush squirreltail. Upon the completion of seeding, the entire area was mulched with 4480 kg/ha (4000 lbs/ac) of straw and crimped into the soil surface to prevent wind erosion. Upon completion of crimping, the sites were planted with sagebrush at approximately 1,482 plants/ha (600 plants/ac). In addition, water was applied to this site at 28,070 liters/ha (3,000 gal/ac).

First-year monitoring was conducted at the 600-30 on May 22, 2012 (Figure 20). This site already has a high density of Sandberg's bluegrass at 53% canopy cover, followed by cheatgrass (26%) and Russian thistle (23%). Total native cover represented 65% while invasive cover was at 67%. For first year monitoring, results indicate this site has high species diversity, with 29 species observed, of which 18 are native (Table 19).

A 100-m transect was established on the site, consisting of 59 living sagebrush.

**Table 19. Percent Canopy Cover and Frequency of Occurrence at 600-30 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	52.9	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	26.3	84.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	23.1	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	6.8	76.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	11.6	64.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.8	32.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	1.3	32.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.8	12.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.2	8.0
<i>Achillea millefolium</i> (yarrow)	2.1	28.0
<i>Artemisia tridentata</i> (big sagebrush)	0.8	12.0
<i>Chaenactis douglasii</i> (hoary falseyarrow)	0.1	4.0
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.1	4.0
<i>Machaeranthera canescens</i> (hoary aster)	0.4	16.0
<i>Eriogonum niveum</i> (snow buckwheat)	0.1	4.0
<i>Microsteris gracilis</i> (pink microsteris)	0.2	8.0
<i>Eriogonum vimineum</i> (broom buckwheat)	0.6	4.0
<i>Mentzelia albicaulis</i> (whitestem blazingstar)	0.1	4.0

**Table 19. Percent Canopy Cover and Frequency of Occurrence at 600-30 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	1.6	8.0
<i>Plantago patagonica</i> (Indian wheat)	0.2	8.0
<i>Sphaeralcea munroana</i> (Munro's globemallow)	0.1	4
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.3	12
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Balsamorhiza careyana</i> (Carey's balsamroot)	X	X
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	X	X
<i>Chenopodium leptophyllum</i> (slimleaf goosefoot)	X	X
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	X
<i>Galium aparine</i> (Cleavers)	X	X
Crust	2.4	100
Soil	32.6	100
Litter	69.4	100
<b>Total canopy cover (litter not included)</b>	<b>131.5</b>	
Total Invasive % Cover	66.8	
Total Native % Cover	64.7	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Figure 20. Sagebrush transect at 600-30 (2012).**



### 4.2.3 100-H Sites

In 2011/2012, waste sites 600-151 and 600-152 were revegetated in the 100-H Area. These sites were remediated to meet the objectives for interim closure as established in the 100 Area RDR/RAWP (DOE-RL 2005a) and in the Interim Action ROD (EPA 1999).

The sites were backfilled with pit-run gravel and then revegetated by broadcast seeding native grass seeds including Sandberg's bluegrass, sand dropseed, needle-and-thread grass, bluebunch wheatgrass and bottlebrush squirreltail. Upon the completion of seeding, the entire area was mulched with 4480 kg/ha (4000 lbs/ac) of straw and crimped into the soil surface to prevent wind erosion. Upon completion of crimping, the sites were planted with sagebrush at approximately 1,482 plants/ha (600 plants/ac). In addition, water was applied to the site 28,070 liters/ha (3,000 gal/ac).

First-year monitoring was conducted at the 600-151 site on May 24, 2012 (Figure 21). Results indicated cheatgrass to be the dominant species representing 44% canopy cover, followed by Sandberg's bluegrass at 31%. Currently, native canopy cover is low, only representing 36% compared to invasive canopy cover at 95% (Table 20). This is likely due to the high amount of invasive cover directly adjacent to the site.

A 100-m transect was established on the site, consisting of 60 living sagebrush (Figure 21).

First-year monitoring was conducted at the 600-152 site on May 24, 2012 (Figure 22). Sandberg's bluegrass dominates the site at 60% canopy cover, followed by cheatgrass and tumble mustard. Total invasive and native canopy cover is comparable, with invasive representing 78% and native at 71% (Table 21). This site is in close proximity to 600-151 and suffers from a high amount of invasive cover adjacent to the site, in addition to compacted soils.

A 100-m transect was established on the site, consisting of 40 living sagebrush (Figure 22).

**Figure 21. Sagebrush transect at 600-151 (2012).**



**Table 20. Percent Canopy Cover and Frequency of Occurrence at 600-151 in 2012.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	31.0	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	43.7	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	10.8	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	4.0	60.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	14.0	80.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	10.5	73.3
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.3	13.3
<i>Artemisia tridentata</i> (big sagebrush)	0.3	13.3
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	13.8	40.0
<i>Descurainia sophia</i> <sup>a</sup> (herb sophia)	1.3	20.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.7	26.7
<i>Chenopodium leptophyllum</i> (slimleaf goosefoot)	X	X
<i>Chenopodium album</i> <sup>a</sup> (lambsquarters)	X	X
<i>Achillea millefolium</i> (yarrow)	X	X
Crust	3.2	93.3
Soil	45.3	100.0
Litter	55.5	100.0
<b>Total canopy cover (litter not included)</b>	130.5	
Total Invasive % Cover	94.5	
Total Native % Cover	36.0	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Figure 22. Compacted Soils and Shrub Transect at 600-152 (2012).**



**Table 21. Percent Canopy Cover and Frequency of Occurrence at 600-152 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	60.3	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	35.0	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	14.3	93.3
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	6.2	80.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	26.2	93.3
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	2.2	20.0
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	0.5	20.0
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Descurainia pinnata</i> (western tansymustard)	0.2	6.7
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.2	6.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	3.8	53.3
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
Crust	2.5	100.0
Soil	29.0	100.0
Litter	71.8	100.0
<b>Total canopy cover (litter not included)</b>	149.0	
Total Invasive % Cover	77.8	
Total Native % Cover	71.2	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

#### 4.2.4 IU 2 and 6

In 2011/2012, the following waste sites in the IU 2&6 Area were revegetated: 600-108, 600-178, 600-109, and 600-100. These sites were remediated to meet the objectives for interim closure as established in the 100 Area RDR/RAWP (DOE-RL 2005a) and in the Interim Action ROD (EPA 1999).

The sites were backfilled with pit-run gravel and then revegetated by broadcast seeding with native grass seeds including Sandberg's bluegrass, needle-and-thread grass, bluebunch wheatgrass, prairie junegrass and bottlebrush squirreltail. Upon the completion of seeding, the entire area was mulched with 4480 kg/ha (4,000 lbs/ac) of straw and crimped into the soil surface to prevent wind erosion. Upon completion of crimping, the sites were planted with sagebrush at approximately 1,482 plants/ha (600 plants/ac). In addition, water was applied to the site at 28,070 liters/ha (3,000 gal/ac).

First-year monitoring was established at the 600-108 site on May 16, 2012 (Figure 23). Bluebunch wheatgrass was the dominant species on site, consisting of 24% canopy cover, followed by cheatgrass at 23% cover (Table 22). This site is located at the south base of Gable Mountain and is surrounded by mature vegetation. The site also has a south aspect. Thirty-four species were present on site during 2012 monitoring, 28 of which were native species. This is likely due to the pre-existing seed-bank from the adjacent landscape. It will be interesting to see how species diversity changes as the site progresses from an early seral stage into a mature site. Species diversity will likely decrease as the site matures and early seral species are outcompeted by bunchgrasses and native shrubs.

A 50-m transect was established on this site, consisting of 53 living sagebrush, 6 spiny hopsage, and 6 antelope bitterbrush.

**Figure 23. Shrub Transect at 600-108 (2012).**



**Table 22. Percent Canopy Cover and Frequency of Occurrence at 600-108 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	4.3	96.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	22.5	96.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	4.2	68.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	24.2	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.2	8.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.1	4.0
<i>Achillea millefolium</i> (yarrow)	0.3	12.0
<i>Artemisia tridentata</i> (big sagebrush)	2.9	76.0
<i>Descurainia pinnata</i> (western tansymustard)	0.3	12.0
<i>Purshia tridentata</i> (antelope bitterbrush)	0.1	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.5	20.0
<i>Grayia spinosa</i> (spiny hopsage)	0.1	4.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.7	68.0
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.2	8.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.6	24.0
<i>Eriogonum niveum</i> (snow buckwheat)	0.3	12
<i>Cryptantha circumscissa</i> (matted cryptantha)	0.1	4
<i>Polygonum aviculare</i> (prostrate knotweed)	0.2	8
<i>Festuca octoflora</i> (slender sixweeks)	0.1	4
<i>Cryptantha scoparia</i> (desert cryptantha)	0.1	4
<i>Astragalus sclerocarpus</i> (stalked pod milkvetch)	0.2	8
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.1	4
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Microsteris gracilis</i> (pink microsteris)	X	X
<i>Mentzelia albicaulis</i> (whitestem blazingstar)	X	X
<i>Gilia leptomeria</i> (Great Basin gilia)	X	X
<i>Phacelia linearis</i> (threadleaf phacelia)	X	X
<i>Chenopodium leptophyllum</i> (slimleaf goosefoot)	X	X
<i>Oenothera pallida</i> (pale eveningprimrose)	X	X
<i>Kochia scoparia</i> <sup>a</sup> (kochia)	X	X
<i>Cryptantha pterocarya</i> (wingnut cryptantha)	X	X
<i>Cryptantha leucophaea</i> (gray cryptantha)	X	X
<i>Cymopterus terebinthinus</i> (turpentine springparsley)	X	X
<i>Chorispora tenella</i> (blue mustard)	X	X
Crust	4	100
Soil	27.3	100

**Table 22. Percent Canopy Cover and Frequency of Occurrence at 600-108 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
Litter	62.3	100
<b>Total canopy cover (litter not included)</b>	63.3	
Total Invasive % Cover	27.2	
Total Native % Cover	36.1	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

First-year monitoring was established at the 600-178 site on May 16, 2012 (Figure 24). This site is located directly adjacent to 600-108 and shares the same boundaries. The 600-178 site represents the lower, flatter, and slightly more compacted portion of the two sites. Bluebunch wheatgrass was the dominant species at this site, representing 18% canopy cover. Thirty-four species were observed on site during spring 2012 monitoring, 27 of which were native. Total canopy coverage consisted of 31% native cover and 16% invasive cover (Table 23).

A 50-m transect was established at this site, consisting of 40 living sagebrush, 1 antelope bitterbrush, and 16 spiny hopsage.

**Figure 24. Shrubs and Bunchgrasses at 600-178 (Lower Area) and 600-108 (Upper Area) (2012).**



**Table 23. Percent Canopy Cover and Frequency of Occurrence at 600-178 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	4.4	96.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	11.1	96.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	3.6	68.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	18.0	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.6	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.2	8.0
<i>Achillea millefolium</i> (yarrow)	0.9	36.0
<i>Artemisia tridentata</i> (big sagebrush)	2.3	72.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.1	4.0
<i>Balsamorhiza careyana</i> (Carey's balsamroot)	0.4	16.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.9	76.0
<i>Epilobium paniculatum</i> (tall willowherb)	0.1	4.0
<i>Machaeranthera canescens</i> (hoary aster)	0.3	12.0
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.2	8.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	1.0	40.0
<i>Eriogonum niveum</i> (snow buckwheat)	0.6	24.0
<i>Mentzelia albicaulis</i> (whitestem blazingstar)	0.1	4.0
<i>Polygonum aviculare</i> <sup>a</sup> (prostrate knotweed)	0.4	16.0
<i>Phlox longifolia</i> (longleaf phlox)	0.1	4.0
<i>Gilia leptomeria</i> (Great Basin gilia)	0.1	4.0
<i>Phacelia linearis</i> (threadleaf phacelia)	0.1	4.0
<i>Oenothera pallida</i> (pale eveningprimrose)	0.1	4.0
<i>Astragalus sclerocarpus</i> (stalked pod milkvetch)	0.1	4.0
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Cryptantha circumscissa</i> (matted cryptantha)	X	X
<i>Triticum</i> (wheat)	X	X
<i>Amaranthus albus</i> <sup>a</sup> (white pigweed)	X	X
<i>Chaenactis douglasii</i> (hoary falseyarrow)	X	X
<i>Microsteris gracilis</i> (pink microsteris)	X	X
<i>Astragalus caricinus</i> (buckwheat milkvetch)	X	X
<i>Cryptantha pterocarya</i> (wingnut cryptantha)	X	X
Crust	1.1	44.0
Soil	29.5	96.0
Litter	65.2	100.0

**Table 23. Percent Canopy Cover and Frequency of Occurrence at 600-178 in 2012. (2 Pages)**

Species	% Cover	% Freq of Occ
<b>Total canopy cover (litter not included)</b>	46.7	
Total Invasive % Cover	15.5	
Total Native % Cover	31.2	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

First-year monitoring was established at the 600-109 site on May 16, 2012 (Figures 25 through 27). Sandberg’s bluegrass represented the dominant species at this site with 30% canopy cover, followed by bluebunch wheatgrass (16%) and tumble mustard (14%). Total canopy cover consisted of 47% native cover and 28% invasive cover (Table 24).

A 100-m transect was established at this site, consisting of 44 living sagebrush and 2 spiny hopsage.

**Figure 25. First year growth on 600-109 (2012).**



**Figure 26. A herd of Elk cross over the 600-109 Site at First Light (2012).**



**Figure 27. Artificial Rain Applied to the 600-109 site to Compensate for Dry Soil Conditions (2012).**



**Table 24. Percent Canopy Cover and Frequency of Occurrence at 600-109 in 2012.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	29.8	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	9.0	88.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.7	52.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	15.8	92.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	13.8	92.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.1	4.0
<i>Achillea millefolium</i> (yarrow)	0.1	4.0
<i>Artemisia tridentata</i> (big sagebrush)	0.1	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.1	4.0
<i>Grayia spinosa</i> (spiny hopsage)	0.2	8.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.8	32.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.1	4.0
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.1	4.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	1.5	20.0
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	0.3	12.0
<i>Amaranthus</i> <sup>a</sup> (pigweed)	0.1	4.0
<i>Sonchus oleraceus</i> <sup>a</sup> (common sowthistle)	0.2	8.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	X	X
<i>Triticum</i> <sup>a</sup> (wheat)	X	X
Crust	1.8	100.0
Soil	34.0	100.0
Litter	67.9	100.0
<b>Total canopy cover (litter not included)</b>	<b>74.8</b>	
Total Invasive % Cover	27.8	
Total Native % Cover	47.0	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

Second year monitoring was established at the 600-100 site on May 22, 2012. The site was revegetated in the winter of 2011/2012, although monitoring was not established. The site consists of deep, sandy soils. Sandberg's bluegrass and Russian thistle were the dominant species on this site, both representing 15% canopy cover. Total native cover consisted of 27% while invasive cover represented 32% (Table 25).

**Table 25. Percent Canopy Cover and Frequency of Occurrence at 600-100 in 2012.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	15.3	93.3
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	13.8	93.3
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	15.2	93.3
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.2	53.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	2.7	13.3
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	10.3	86.7
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.2	6.7
<i>Taeniatherum caput-medusae</i> (medusahead)	X	X
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	X
<i>Oenothera pallida</i> (pale eveningprimrose)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
Crust	2.3	93.3
Soil	65.8	100.0
Litter	35.0	100.0
<b>Total canopy cover (litter not included)</b>	<b>58.8</b>	
Total Invasive % Cover	31.8	
Total Native % Cover	27.0	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

### 4.3 SUMMARY

The Hanford Site, prior to disturbance, consisted of a complex ecosystem whose heterogeneous landscape was ultimately shaped and contoured by climate, natural disturbance regimes, time, and various other factors. As it exists today, much of the landscape is in repair, restoring from human induced disturbances that have reduced nature's ability to heal and restore itself to a naturally-functioning ecosystem. Without disturbance, in time ecosystems will eventually repair and return to a natural state. However, with the introduction of invasive species, unnatural fire regimes, and other deterrents, the natural process is largely slowed. Through revegetation activities, our goal is essentially to jumpstart the process. As described throughout this report, this is accomplished via planting and seeding of native vegetation, in addition to site prep and other techniques.

Revegetation activities have been commencing for well over a decade here on the Hanford Site. In this time, various techniques have been implemented during revegetation activities. To some degree, we have been able to hone the revegetation process through trial and error. Factors such as soil/substrate moisture and composition, adjacent topography and species composition, application rates, seasonal timing for planting, and proper planting/seeding techniques all have an influence on the success of a particular revegetation site. It is for this reason that our

baseline revegetation procedures may be altered from one site to another. It is important to realize that habitats within a landscape differ from one another dependent on various factors. Not all plants grow in the same soil or climatic conditions. A prescription that is successful for one site may not work for another.

Through past experiences and knowledge gained through the revegetation process, we are leading Hanford's landscape in the right direction. In only a few years, we have restored many of Hanford's disturbed sites back to a functioning natural state providing vital habitat for numerous species.

## 5.0 REVEGETATION MITIGATION

In 2003, the ERDF began Phase III expansion to construct disposal cells 5 and 6. Construction of the new cells occurred entirely within the disturbed footprint of the ERDF fence. However, an area south of the perimeter fence was impacted by placement of the overburden pile. The *Revised Mitigation Action Plan for the Environmental Restoration Disposal Facility* (DOE-RL 2005b) was updated to develop appropriate mitigation strategies for this and future expansions.

At the time of the initial construction of the ERDF in 1995, a majority of the 4.1-km<sup>2</sup> (1.6-mi<sup>2</sup>) area was dominated by mature sagebrush and late successional grasses and forbs, and considered high-quality, Level III habitat, as defined in BRMaP (DOE-RL 2001). Compensatory mitigation actions conducted for the construction of ERDF cells 1 through 4 were based on a replacement ratio of 3:1 as appropriate for Level III sagebrush habitat. The large fire in the summer of 2000 burned most of the 4.1-km<sup>2</sup> (1.6-mi<sup>2</sup>) area identified for future ERDF expansion. Although the area has started to recover, it is no longer dominated by an overstory of sagebrush and no longer fits the definition of Level III habitat. Late successional grasses and forbs are still present; however, live mature sagebrush is sparse and the area now meets the definition of Level II habitat. However, since the understory of grasses and forbs are still intact and a small component of sagebrush still exists, some level of mitigation/rectification was needed. The Mitigation Action Plan (DOE-RL 2005b) determined that the appropriate mitigation ratio for the area south and east of ERDF would be 1:1. Construction activities at ERDF and impacts from expanding Borrow Pit 30 to supply gravel required that approximately 20 ha (50 ac) of mitigation be performed.

To maximize the effectiveness of the mitigation effort, sagebrush was planted on 25 ha (62 ac) that included four 4-ha (10-ac) islands separated by 100 m (328 ft) in February 2007. Each island was planted at a density of 1,000 plants/ha (400 plants/ac). The areas between the islands were planted at a density of 444 plants/ha (180 plants/ac) in an area south of ERDF that straddles the Army Loop Road (Figure 28). This configuration takes advantage of the Army Loop Road, which could serve as a fire break or natural location to fight a fire if one should threaten this area.



(Figure 29). Burrowing owl pellets were observed for the first time during the spring of 2011, indicating burrowing owl activity. The nest boxes were inspected and maintained in March 2012. No burrowing owl activity was observed during this visit. One occupied natural burrow was located northeast of the nest boxes next to Army Loop Road on the same day as the inspection, indicating presence of the owls in the area.

Third-year monitoring of mitigation for disposal cells 5 and 6 that was conducted in 2009 of the sagebrush transects planted along the Army Loop Road yielded survival of 22% and 36%. To compensate for the low shrub survival, 7,200 sagebrush seedlings were planted in January 2010 at the same time as the mitigation for planting of 31,100 seedlings for the construction of the ERDF disposal super cell 9 and expansion and use of Pit 30. The rectification planting along with the super cell 9 mitigation planting were installed along the north side of the BC Cutoff road (Figure 30). First-year monitoring of the super cell 9 mitigation monitoring transects had mixed results. The sagebrush seedlings planted between November 30 and December 3, 2009, just before an extended period of freezing temperatures and frozen ground had dismal survival, estimated less than 5% survived and is considered a complete loss. Shrubs planted after January 4, 2010, were monitored by vendor with plant survival ranging from 10% to 62%. To compensate for the reduced shrub survival within super cell 9 mitigation planting and construction of ERDF disposal cell 10, an additional 56,500 seedlings will be planted in the fall of fiscal year (FY) 2011 north of the BC Cutoff road. The previously monitored plants plus all new installations will be monitored for survival in 2012.

**Figure 29. Burrowing Owl Nest Box Maintenance (Left: Before Maintenance; Right: Burrowing Owl Pellets; Bottom: Owl Nest Entrance After Maintenance [2011]).**



**Figure 30. ERDF Mitigation Sagebrush Planting North of BC Cutoff Road (January 2010).**



## 6.0 BAT MITIGATION PROJECTS

Bat mitigation projects have been conducted at two reactor sites, 105-D/DR and 105-F, to mitigate for roosting habitat that was lost as a result of the Interim Safe Storage (ISS) projects at these reactors. The purpose of the ISS projects was to remove all of the ancillary structures from the reactor buildings, seal all penetrations, and install new steel roofs to prevent intrusion from animals. Ecological reviews conducted prior to the initiation of these projects identified the presence of multiple bat species utilizing the reactors as maternity roosts, where they rear their young. These bats are listed as Washington State priority species at communal roosts and breeding areas and require mitigation according to the BRMaP (DOE-RL 2001). The mitigation projects conducted at the reactor sites included establishing the process water tunnels at 100-D Area as alternative roost sites and installing artificial roost boxes at 105-F Reactor. A third mitigation project was initiated at the 183-F clearwell in July 2007 to begin investigating a colony of more than 2,000 bats that were using the facility. The facility was slated for eventual demolition, so a mitigation plan was needed to determine the path forward for this facility and the bats occupying it.

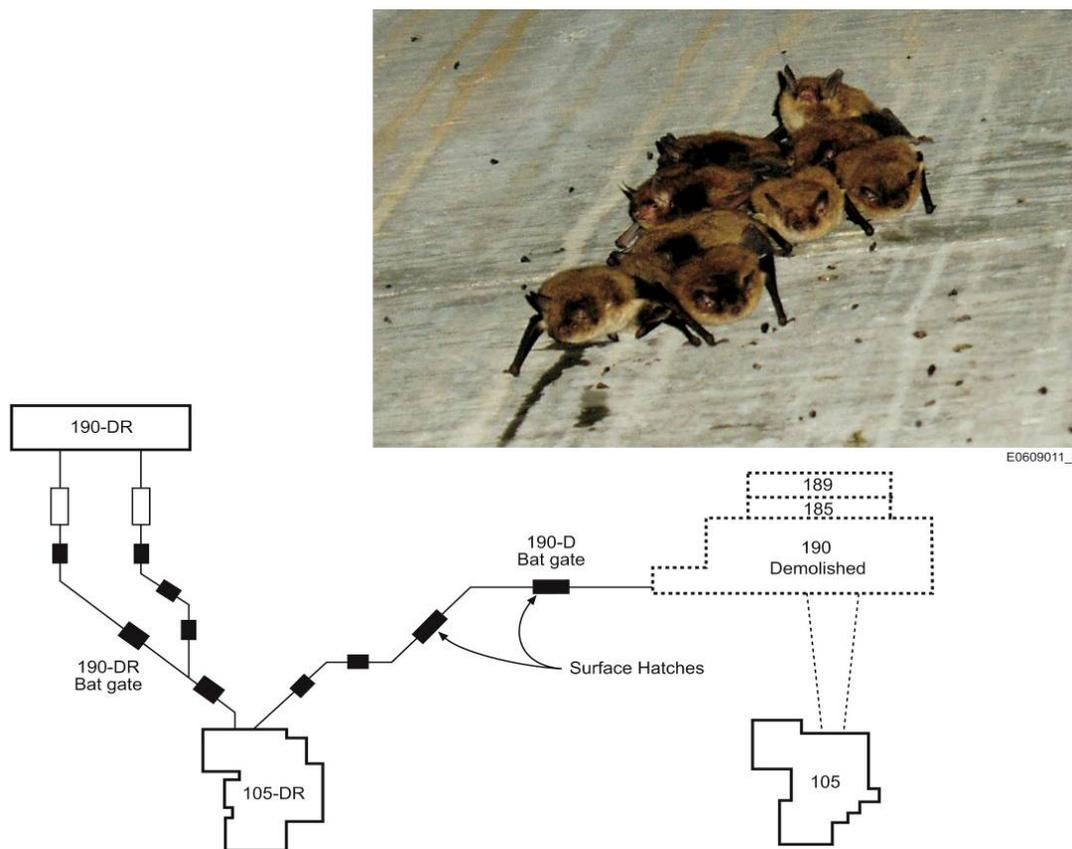
### 6.1 BAT MITIGATION AT 190-D AND –DR PROCESS WATER TUNNELS

A bat mitigation project at 100-D Area was initiated when a suspected maternity roost was discovered in one of the process water tunnels connected to the 105-DR Reactor. The ISS project plan included isolating the tunnels from the reactor, which would eliminate the bats' access to the tunnels and cause the loss of the maternity roost. Approval and concurrence from the DOE-RL in CCN 060625, "Mitigation for Loss of Bat Habitat in the 105-DR Reactor Facility" (DOE-RL 1998), provided direction to maintain bat access and mitigate for roosting habitat that would be lost as a result of ISS. Alternate accesses were provided on both tunnel systems that entered the 105-DR valve pit by installing bat gates on access hatches (Figure 31). One tunnel originated at the 190-D Water Pump House, as a redundant water supply, and two tunnels originated from the 190-DR Water Pump House that come together just west of the valve pit. The original purpose of these tunnels was to provide the primary cooling water supply for the 105-DR Reactor (Figure 32). The noncontaminated process water tunnels are built with a zig-zag design to allow for expansion of the piping. Each straight leg of the tunnels contains a surface hatch to provide access in case a pipe section had to be replaced. These surface hatches provide the actual roost sites for the bats because of the solar heating of the hatch covers, providing a favorable site to rear young. The bat gates were placed over hatches on both tunnel systems. The gate on the 190-D tunnel was installed in fall 1998 and the gate on the 190-DR tunnel system was installed in fall 1999.

**Figure 31. 190-DR Bat Gate.**



**Figure 32. 190-D/DR Tunnel System.**



Monitoring of bat roosting began in July 1999. The gate on the 190-D tunnel had been installed and the tunnels were still accessible from the reactor valve pit. There were approximately 19 bats observed in the 190-D tunnel and 36 in the 190-DR tunnels. No inspection of the tunnels was made during 2000; however, a small number of bats were observed emerging from the gates in August 2000, approximately 1 hour after sundown, which verified that they had found the bat gate entrance and were continuing to use the tunnels. No observations were made during 2001.

The 190-D tunnel has not been entered since the reactor valve pit was backfilled because there is no walk-in access available. However, video recording of the emergence from the bat gate at the 190-D tunnel, using an infrared video camera, allowed for an estimation of the population using this structure. On July 7, 2010, approximately 340 individuals were observed exiting through the bat gate. This number is much higher than the 30 to 40 individuals that have been counted previously using manual counting techniques. This now represents a very sizable colony, but the relationship between this colony and the colony at the 190-DR tunnels is not well understood. The 190-DR tunnels were accessible from the 190-DR north valve house (at the west end of the tunnel) until 2005 when the valve houses were demolished along with the 190-DR facility. At the completion of the demolition project, a walk-in door was provided in the south tunnel where it connected to the valve house. Inspections of the 190-DR tunnels have been conducted from 2002 to 2005, and the number of bats roosting in the hatches was counted. The numbers counted were as follows: 107 in 2002, 99 in 2003, 98 in 2004, and 97 in 2005. A second inspection was made on July 27, 2005, and a total of 170 bats were counted.

The bats appeared to roost at all the hatches except the ones where the bat gates are located. Often the majority of the population would roost in the same hatch, which would contain several small clusters of mothers with their young and contain from 5 to 50 individuals.

In July 2006, it was discovered that someone had placed chicken wire over the entrance to the 190-DR bat gate during the previous winter, which prevented the bats from flying through the gate and roosting in the tunnel. The chicken wire was immediately removed and the tunnel was again inspected for bats on September 21, 2006. There were about 20 bats found roosting as individuals and small clusters. Because the roost site in 190-DR was not available to the bats for most of the summer of 2006, the bat gate on 190-D tunnel was monitored for emerging bats on August 9, 2006, and 25 to 35 bats were counted emerging from the tunnel. The bats would often circle the bat gate and occasionally go back in, making it difficult to get an accurate count.

In 2007, mist netting was performed at the 190-DR process water tunnel in order to capture bats. This was done in conjunction with other bat monitoring activities going on the 183-F clearwell. The purpose was to determine which species were present and to determine genetic relationships of the bats at the 100-D Area site to bats of the same species in the 183-F clearwell. Morphometric measurements and deoxyribonucleic acid (DNA) samples were collected to definitively determine the species and any genetic relationships between the two sites. The species present in the 190-DR tunnel are Yuma myotis (*Myotis yumanensis*), as determined by morphometrics, acoustic analysis, and DNA analysis. Eighteen bats were captured on August 28, 2007, and four on September 11, 2007. The population was a mix of adults and juveniles, and only three individuals were males. On September 13, 2007, a team entered the 190-DR tunnels to do a visual inspection of the bats present. Video and still photographs were taken of the bats within the roost, and 108 bats were counted on the video. Several clusters of 10 to 25 bats were observed, indicating the hatches were again being used as a maternity roost.

A walkdown was performed to assess the number of bats using the roost on September 22, 2008. The total number of bats observed in the 190-DR tunnel was 67.

Monitoring in 2009 included entry into the 190-DR tunnel on September 16, 2009, to videotape bats and capture individuals. The video photography is used to count the total number of bats using the structure, and captured individuals are assessed to determine species, sex, age, and reproductive status. During the entry, two nulliparous adult females (individuals that have never given birth), two parous adult females (individuals that have given birth), and three nulliparous juveniles were captured. The presence of juveniles shows that this site remains a viable maternity roost. A total of 77 bats were observed in the 190-DR tunnel, with 63 of them (roosting in several clusters) observed in one of the hatches, indicating the site is still functioning as a maternity roost. This number is up slightly from the number recorded in 2008, but is not near the 170 recorded in July 2007. The differing numbers may be due to the timing of the monitoring, a shift of the maternity colony to another facility, a reduction in population, or other unknown factors.

Monitoring of the 190-DR tunnel in 2010 was delayed until September 27 (Figure 33). A total of 32 bats were observed during the walkdown. Due to the late timing of this walkdown, it is not known whether a larger colony is still using the facility. One nulliparous female and two males were captured and hand released.

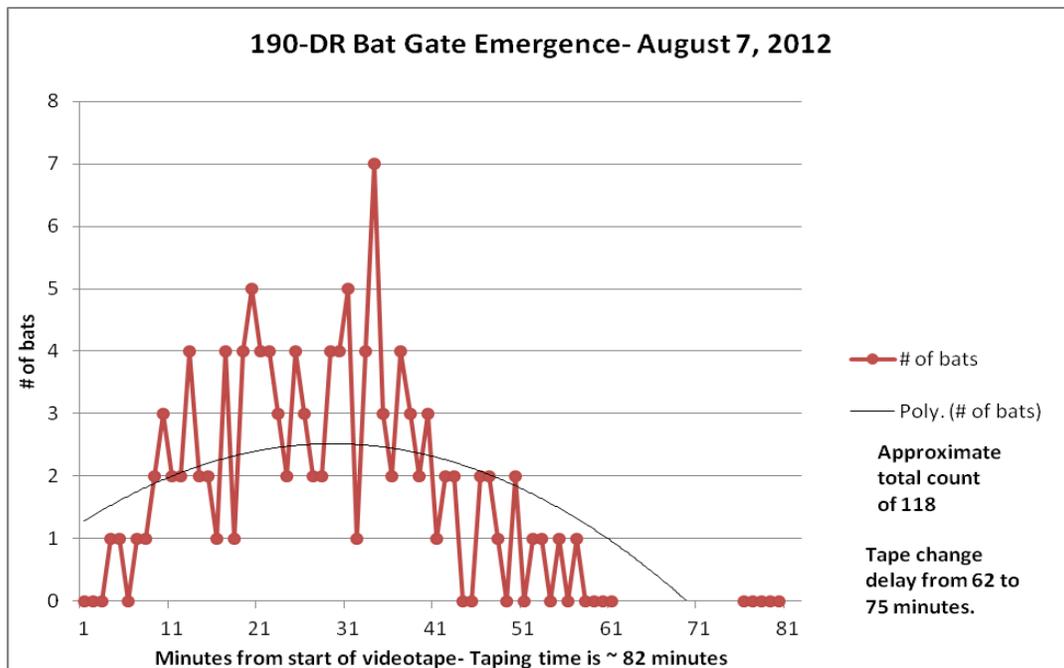
No monitoring was conducted during the 2011 season.

In 2012, video monitoring (with infrared lights) of the 190-DR pipe tunnel bat gate occurred on August 7, and approximately 118 bats (*Yuma myotis*) were counted during emergence (Figure 34). The number appears to be consistent with previous year counts.

**Figure 33. Yuma Myotis Observed in the 190-DR Tunnel on September 27, 2010.**



**Figure 34. Bat Emergence Count at 190-DR (2012).**



A mist netting session was conducted at the 190-D bat gate on August 7, 2012, to monitor the Yuma myotis maternity colony at that location. One juvenile Yuma myotis was captured during mist netting. The captured bat was in good condition, having normal body weight and no wing damage. The presence of a juvenile bat emerging from this roost site would indicate this site is still functioning as a maternity colony.

A remediation project was planned to remove the steel pipes within the two tunnel systems beginning in late October 2011. In 2012, it was decided that no removal of piping in the 190-D pipe tunnel would occur based upon historical process data. The potential removal of piping in the 190-DR tunnel has been deferred to final action decisions for the 100-D Area at this time.

## **6.2 BAT MITIGATION AT THE 183-D WATER TREATMENT PLANT**

The 183-D Water Treatment Plant is scheduled for demolition beginning in FY2013. The project will demolish the Headhouse, the flocculation basins, the filter building, and one of the clearwells. In preparation for demolition, a bat survey was conducted at the facility to determine whether bats were using any part of the facility as roosting habitat. The work was started in spring 2009 and was completed in March 2011 (Lindsey et al. 2011). The study concluded that Yuma myotis were likely using the headhouse for a night roost and that it was very likely that an undiscovered maternity roost existed somewhere within part of the facility that was inaccessible. Also, a maternity colony of pallid bats (*Antrozous pallidus*) was observed emerging from a crack in the cinder block on the south wall of the headhouse. Because pallid bats are listed by the state of Washington as a Priority Species, mitigation is required according to BRMaP (DOE-RL 2001) to maintain the viability of the colony.

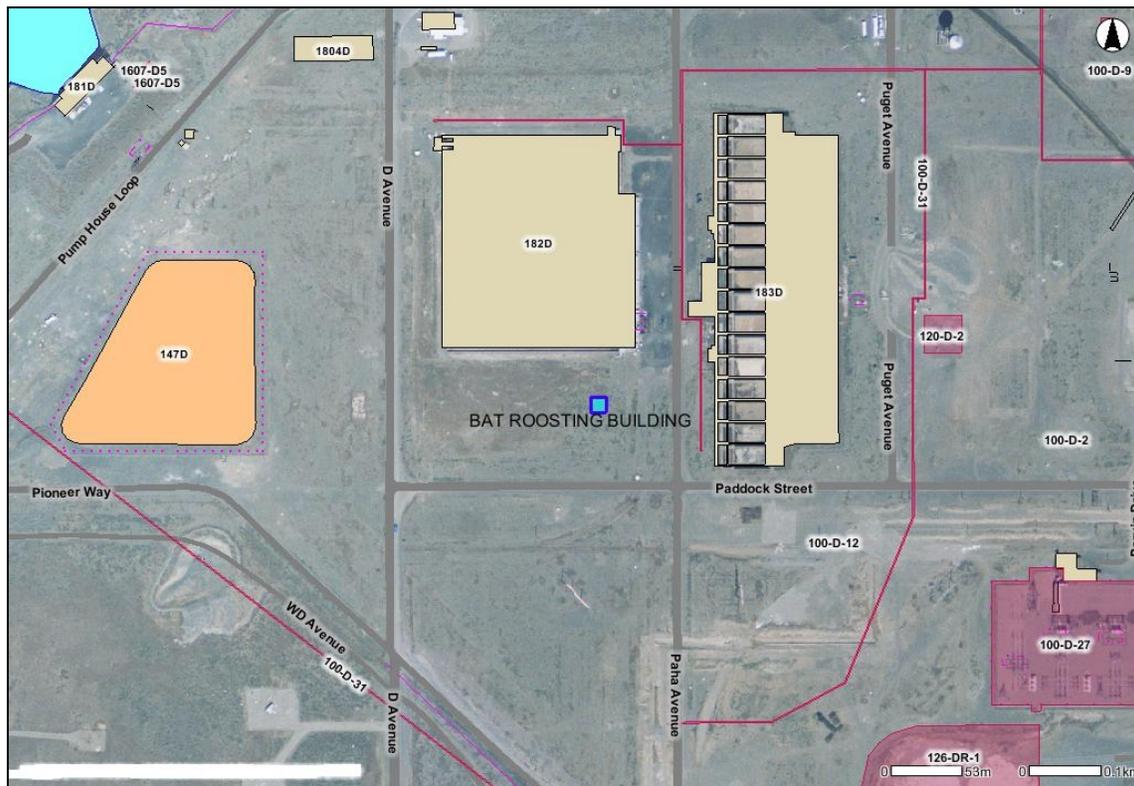
To mitigate for habitat that will be lost by the demolition of the facility, the north clearwell and associated flume and suction well will be preserved, in addition to the construction of an alternate roost site (114-D) near the headhouse (Figures 35 and 36). This mitigation effort provides no net loss to the roosting habitat. The alternate roost construction was completed in September 2011 and is expected to provide suitable habitat for the pallid bat maternity colony, but it is unknown whether it would be a suitable replacement for the Yuma myotis. Leaving one of the clearwells in place will be critical, as the Yuma myotis are known to night roost in the clearwell. The clearwell and artificial bat roost will be monitored in future years.

The artificial roost was monitored during spring and summer of 2012. On October 2, 2012, approximately 3 to 5 myotis bats, most likely Yuma myotis, were observed roosting inside the 114-D roost structure near the roof, between the ceiling roost partition wood frame and the concrete wall. No apparent pallid bat use of 114-D has been observed yet, as would be indicated by visual observation of bats or guano.

Figure 35. 114-D Artificial Bat Roost at 100-D Constructed in 2011.



Figure 36. Artificial Bat Roost Location at 100-D.



### 6.3 BAT MITIGATION AT 100-F REACTOR

Bats had been observed on several occasions roosting inside the 105-F Reactor building during the initial phases of the ISS project, which began in FY2000. In spring 2003, a maternity colony of pallid bats was observed in the upper areas of the reactor building. Other species (*Myotis* sp.) were also observed in the reactor. The 105-F Reactor had served as both a communal roost and a breeding area for these bat species; therefore, mitigation efforts were initiated to remove the bats from the building unharmed and provide an alternate roosting habitat.

As the new roof was being completed in August 2003, steps were taken to remove the bats from the building to prevent them from being trapped inside. The main ground-floor entrance to the building was left open to serve as the only access to the building. After a week of acclimation to the new access, a piece of plywood with three 5-cm (2-in.) slots cut in it was placed over the door to narrow the entrance. The slots were fitted with landing boards mounted on the inside of the door to allow the bats to land and crawl out. The first night after the board was installed, the narrowed entrance was observed to ensure the bats could get out. The slotted door was left in place for 1 week, and on September 8, 2003, exclusion netting was installed loosely over the slotted door and stapled to the top and sides so the bats had to crawl through the slots and out the bottom of the netting to get out. Once out, they could not get back in.

Alternative roosts were provided by installing eight commercially-made bat roosts (Figure 37). Bat boxes designed to house pallid bats were installed on the east side of the building (boxes 1 and 2), the south side (boxes 4 and 6), the west side of the building (box 7), and one on a utility pole approximately 50 m (164 ft) north-east of the building (box 8). Two boxes designed for *Myotis* bats were installed on the south side of the building (boxes 3 and 5).

Follow-up surveys confirmed that the pallid bats were utilizing the boxes mounted on the building. Because of the difficulty of counting bats inside the boxes, it is impossible to get an exact count; however, it was estimated that the colony contained approximately 30 individuals in September 2003 using box number 1 exclusively. Very few *Myotis* bats were observed roosting in bat boxes designed for them (boxes 3 and 5).

The following spring the pallid bats returned from winter hibernation to use the boxes on the reactor. During 2004, they continued to primarily use box 1 on the northeast side of the building, but by the end of the summer, they had used all of the pallid bat boxes on the reactor building (1, 2, 4, 6, and 7) but had not used the one mounted on the utility pole (8). *Myotis* continued to infrequently use boxes 3 and 5, but not as a maternity colony.

In 2006, the pallid bats began returning to the roost site at 105-F Reactor in April. Fresh pallid bat guano was observed under the boxes on April 11, 2006. During the spring months (April and May) the bats appeared to prefer the roosts on the south side of the building, probably because these sites were the warmest. As the summer progressed, they appeared to prefer boxes 1 and 2 on the east side of the building. On August 3, 2006, all boxes were inspected for the presence of bats. Boxes 1 and 2 appeared to have approximately the same number of bats present (judged by how many could be counted by looking into the entrance from below). The emergence of bats from box 2 was observed and a total of 41 bats were counted. Assuming box 1 had approximately the same number of individuals present; the population could have been as high as 80 individuals. This is a substantial increase since the mitigation project began in 2003 when the population was estimated to be approximately 30.

Due to the excavation of waste sites around the 105-F Reactor Building, no surveys or counts were conducted at the bat houses in 2007. Visual inspections, as well as acoustic surveys and the presence of bat guano confirmed that the pallid bats did return in 2007.

On September 25, 2008, mist netting was conducted at the 105-F Reactor to determine if the roost site was still active. Pallid bats were observed in 3 of the 8 boxes (boxes 2, 7, and 8). Nine pallid bats and one *Yuma myotis* were captured in two nets. All of the pallid bats were female and some appeared to have given birth this year, indicating this is still a successful maternity colony. One of the bats captured was a recapture of an individual that was banded in September 2006.

Monitoring for 2009 was performed at 105-F Reactor on August 31. Two mist nets were placed near the reactor, and two infrared video cameras were set up to record emergence at two of the seven bat boxes. Two nulliparous juvenile pallid bats were captured in the mist nets, showing that this site remains an active and successful maternity colony. One of the individuals was light tagged, which consists of attaching a small glo-stick to the bat to allow the bat to be identified in flight. The calls of the bat were recorded, as intended, but the bat was also observed entering the eave of the 105-F Reactor roof. This shows that bats may potentially be using the eaves of the 105-F Reactor roof for roosting habitat. There is still evidence, in the form of guano, that bats are using the bat houses around the different sides of the reactor. A video camera was placed on bat box 2 and 4 to record emergence for 1 hour. No bats were observed exiting box 2, however, between 19 and 34 pallid bats were observed using box 4. Over the hour, bats were observed entering and exiting the box, making an exact count impossible.

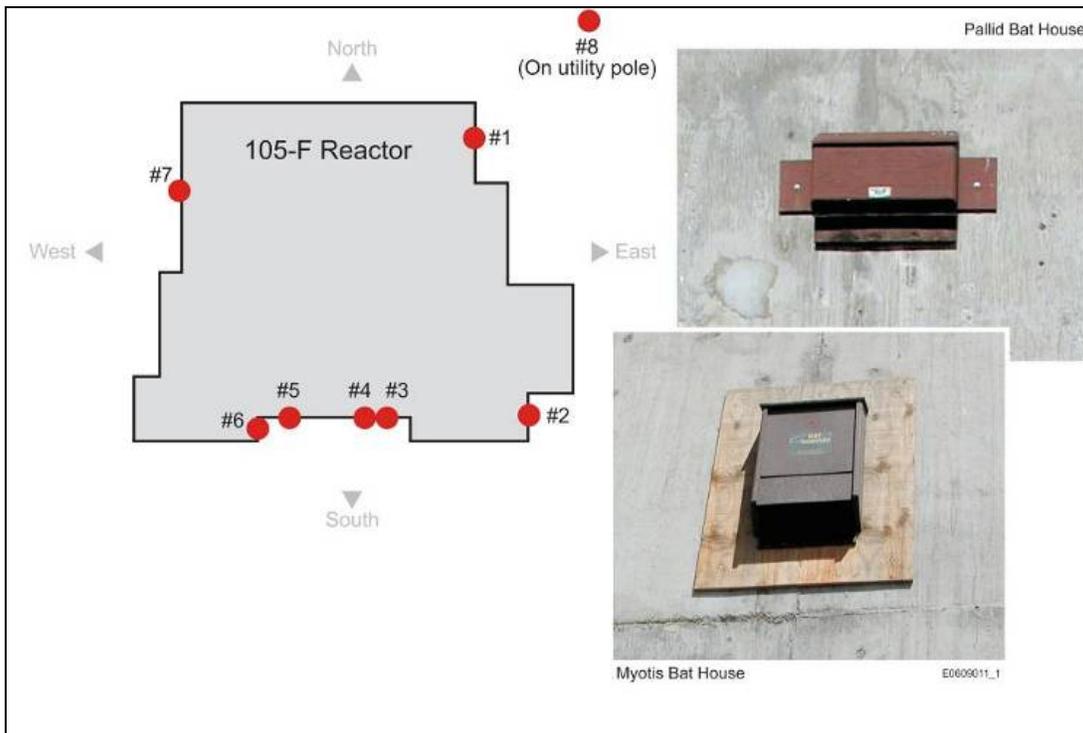
During monitoring at the 105-F Reactor, acoustic detectors were being used to record bat echolocation calls. Many pallid bat calls were recorded including several “social calls,” which the bats are using for communication rather than navigation. These “social calls” are diagnostic of pallid bats and are often the only way to tell their calls from the calls of big brown bats (*Eptesicus fuscus*). In addition, one *Yuma myotis*, one western small-footed myotis (*Myotis ciliolabrum*), and five western pipistrel (*Pipistrellus hesperus*) calls were recorded on August 31, 2009. This shows the high level of bat activity in the area included multiple species, which is another indication of how ideal the area is for supporting bats.

Between 53 and 76 pallid bats were recorded exiting one of the bat boxes at the 105-F on June 16, 2010. It becomes difficult to accurately count the number of individuals using a specific box, due to individuals exiting and returning to the boxes throughout the night. Due to the many roosting areas available to the pallid bats in this area, including eight bat boxes and the whole reactor, it is not possible to accurately assess population size. On August 17, 2010, a triple-high mist net was deployed near the 105-F Reactor. Four pallid bats were captured, all were observed to be nulliparous juvenile females in good condition.

One mist-net session was conducted at 105-F on June 22, 2011, no bats were captured; however, many were observed emerging from the bat boxes. There was evidence in the form of fresh guano beneath all bat boxes that the pallid colony is very healthy and using all boxes.

Mist netting for pallid bats, using two nets at 105-F occurred on July 24, 2012. Five pallid bats were captured during this session, consisting of three juvenile females, one adult lactating female, and one adult parous female (Figure 38). All captured bats were in good condition (e.g., normal body weight and good wing condition). The captured juveniles and lactating and parous females would indicate this site is still functioning as a maternity colony.

**Figure 37. Top: Location of Bat Boxes Placed at 105-F Reactor; Bottom: Female pallid bat captured at the 105-F Reactor During 2010 Monitoring.**



**Figure 38. Pallid Bat Captured July 7, 2012.**



#### **6.4 183-F CLEARWELL MATERNITY COLONY**

A bat habitat mitigation project began at the 183-F clearwell during summer 2007. Preliminary counts estimated the population at over 2,000 individuals, making this colony one of the largest in the state of Washington at the time. Because the clearwell is a maternity roost, it is considered a Priority Habitat by the Washington State Department of Fish and Wildlife. This colony was studied because the clearwell structure was slated to be demolished and a mitigation plan needed to be developed to prevent significant impact or loss of the maternity colony. Information needed in order to advise on mitigation actions included determining the bat species present, and the habitat conditions that make the clearwell such an attractive and successful roost site. Roost sites with this many individuals are unusual, and it was important to understand how the facility was being used to determine the potential impacts from the various endstate options.

A combination of morphological measurements, acoustic analysis of echolocation calls, and DNA analysis was performed on bats collected during 2007 and 2008, and these data were used for species determination. The initial morphological measurements and acoustic analysis indicated that the colony is composed of Yuma myotis. Results from the DNA analysis of skin tissue samples confirmed the identification as Yuma myotis.

The results of the bat study at the 183-F clearwell showed that the facility is very complex and is suitable for bat roosting in many locations during different times of the year. The building supports one of the largest maternity colonies of bats in the state, and may also support some level of winter activity. For these reasons, the project report stated that the preferred mitigation

for the site would be to leave the clearwell and flume in place, and to place signs and fencing around the facility to prevent unauthorized entry (Gano et al. 2009).

In January 2009 the U.S. Department of Energy sent a letter to Washington Closure Hanford staff stating that they intend to maintain the 183-F clearwell and flume long term. In order to allow the colony to thrive, they instructed Washington Closure Hanford to install passive human-access restrictions to the facility including signs and fencing. The fencing and signage were constructed in April 2009.

Mitigation monitoring was performed at the 183-F clearwell and flume during August 2009. Two mist nets were set up near the clearwell hatch, and infrared cameras were placed at the clearwell hatch and flume entrance to count emergence. A total of eight Yuma myotis and one western small-footed myotis were captured in the mist nets. There were five nulliparous female Yuma myotis and three parous female Yuma myotis; all individuals were adults. The western small-footed myotis was a nonreproductive adult male. When released, the western small-footed myotis was seen entering the clearwell through the open hatch. This was the first evidence of a second species using the clearwell. Adult males do not typically roost with a congregation of females, so this is not an indication that a second species is using the facility as a maternity roost.

In 2009, video monitoring was performed for 1 hour at the clearwell hatch and 1 hour at the flume entrance beginning at the start of the emergence. A total of 2,367 bats were counted over 62 minutes of emergence at the 183-F clearwell hatch. The emergence was observed to continue for 15 minutes following the end of the video. The polynomial average was extracted out to estimate the remainder of the emergence, and the total emergence was estimated to include 2,640 individuals. Approximately 120 bats were observed exiting the flume entrance.

No mist netting was performed at the clearwell in 2010. Emergence counts were performed at the site using an infrared video camera on June 16, 2010, and again on August 17. A total of 3,539 bats were observed emerging from the facility on June 16, and 3,637 were observed emerging on August 17. These numbers represent the largest population recorded to date at this facility and confirm the clearwell as the largest known colony of bats in the state of Washington.

Monitoring at the clearwell in 2011 consisted of one mist-net session on August 23, 2011, and two emergence counts of 4,114 and 3,777 (videotaping with infrared lighting) on June 22 and August 23, 2011, respectively (Figure 40). These counts compared with 2009 and 2010 indicate the colony is continuing to grow. The reason for the slight drop in the August count, of approximately 300, could be from several possibilities. The expectation was that the number would be up to some degree from recruitment of new offspring into the population. It could be that some of the bats may have already begun to disperse. Another possibility is that some may have been roosting in the flume (which was not monitored during this session). Whatever the cause, the colony continues to remain strong and increasing from year to year.

The mist-net session captured 30 Yuma bats (Figure 39). A total of 27 females were captured (12 adults and 15 juveniles); and of the adult females, 7 were post-lactating and five were nulliparous. A total of three males were captured (1 nonreproductive adult and 2 juveniles). All bats captured appeared to be in good condition, with no observed health issues.

The 2011 monitoring information shows that the roost continues to support a large maternity colony.

On July 24, 2012, a mist netting session was conducted at 105-F to monitor the pallid bat colony at reactor. Besides pallid bats being caught, 31 Yuma myotis were captured in the same nets, consisting of 11 juvenile males, 16 juvenile females, 2 adult females, 1 adult lactating female, and 1 adult nulliparous female. The Yuma bats were likely from the nearby 183-F clearwell maternity colony. All captured bats (Figure 41) were in good condition (e.g., normal body weight and good wing condition). The captured juveniles and lactating female would indicate this site is still functioning as a maternity colony.

Video monitoring (with infrared lights) of the 183-F Yuma myotis colony also occurred on July 24, 2012, and 6,627 Yuma myotis (Figure 42) were counted during emergence. Compared with the previous year counts, this is the largest count to date. The 183-F maternity colony appears to be healthy and growing.

The importance of monitoring colonies is heightened with the emergence of white-nose syndrome (WNS) in the eastern United States. It is important that baselines can be established prior to any impacts from WNS, and that any emergence of WNS can be quickly identified. The monitoring of this colony, as well as the other colonies that have been identified, will continue to be reported on in this document in coming years. This information can be used for comparison from year to year to determine if there are any changes in the condition of the bats or the status of the colonies.

Figure 39. Yuma myotis captured August 23, 2011, from 183-F (Top and Bottom).



Figure 40. Bat Emergence Counts at 183-F (2011).

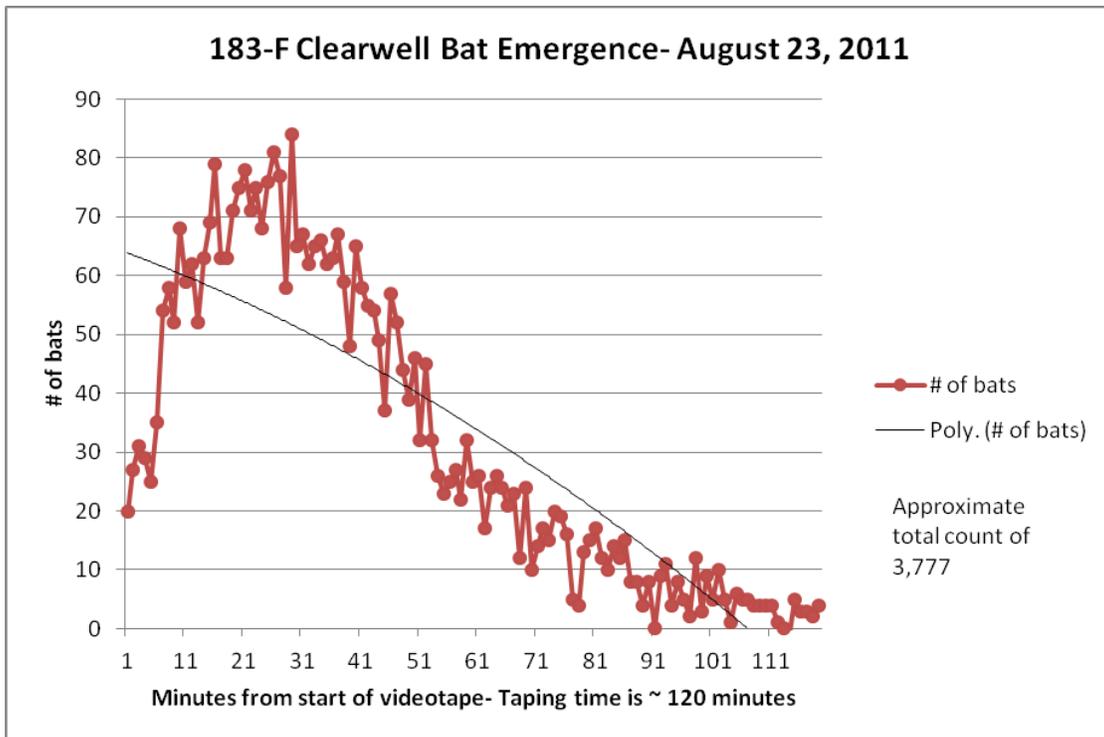
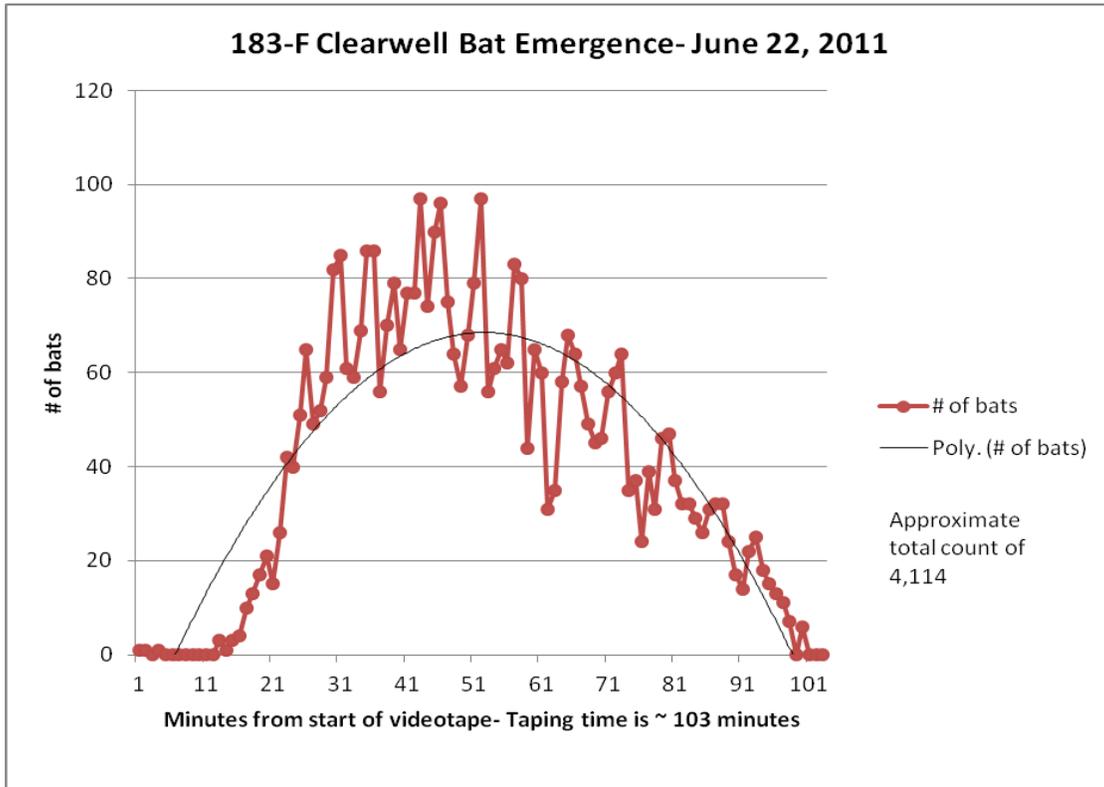
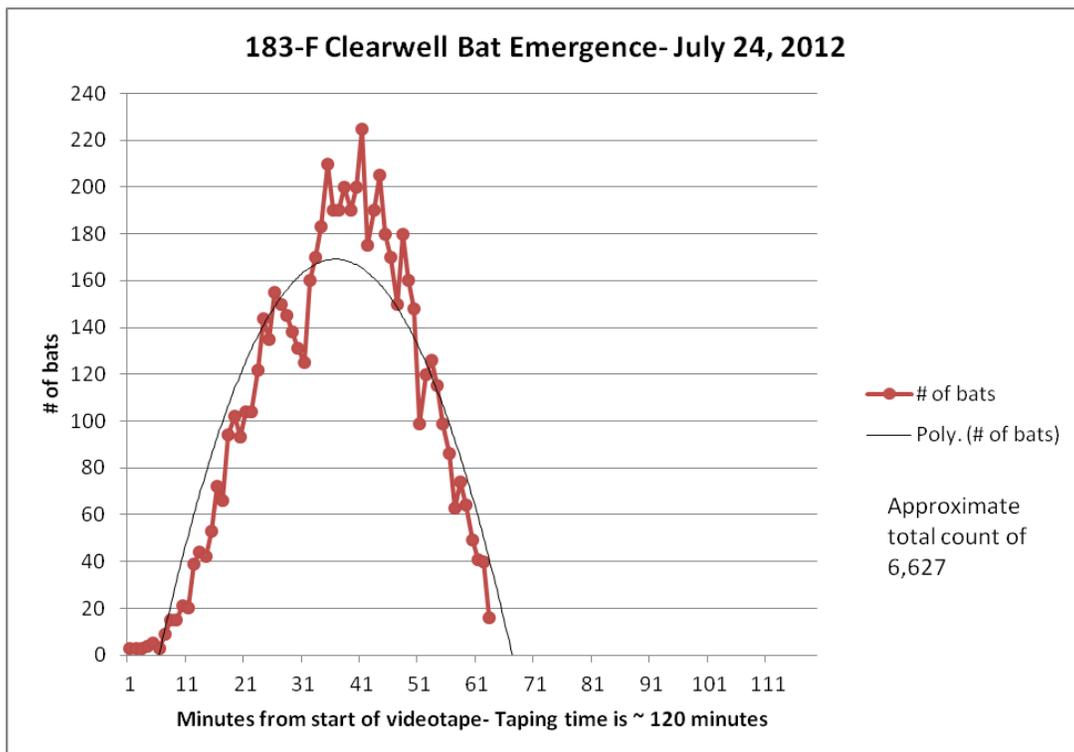


Figure 41. Yuma Myotis Captured July 24, 2012.



Figure 42. Bat Emergence Count at 183-F (2012)



## 7.0 SNAKE MITIGATION

In November 2005, remediation of a portion of the 128-B-3 Burn Pit excavated an area containing several large boulders. The void spaces between the boulders contained an active snake hibernaculum (den), which several rattlesnakes were brought to the surface during the excavation of the burn pit debris.

Snake hibernacula often contain mixed species of snakes. In the Columbia Basin, species such as the western rattlesnake (*Crotalus viridis*), gopher snake (*Pituophis catenifer*), yellow-belly racer (*Coluber constrictor*), and potentially the striped whipsnake (*Masticophis taeniatus*) often den together for the winter (Larsen 1997). Though not often popular with the general public, snakes play an important role in a healthy ecosystem by keeping small mammal and insect populations in check. They also serve as a prey species for higher trophic species such as coyotes and raptors. The Hanford Site provides suitable habitat for this species and it has been recorded on site on very rare occasions. Because the striped whipsnake will den with rattlesnakes, and because denning sites are critically important to maintaining healthy snake populations, it is important to preserve these sites (Larsen 1997).

By the time the hibernaculum at the 128-B-3 site was discovered, it was too late to preserve the site; it had been destroyed during the excavation. However, as the remediation continued, a mitigation plan was developed to reconstruct the hibernaculum. The clean boulders were segregated and stockpiled until the site was cleared for backfilling in fall 2006. The boulders were then pushed back into the excavation, forming several void spaces that could potentially be used by snakes. In addition to re-creating a habitat for snakes, the void spaces were expected to provide habitat for numerous other species including deer mice (*Peromyscus maniculatus*), bushy-tailed woodrats (*Neotoma cinerea*), Nuttall's cottontail rabbits (*Sylvilagus nuttalli*), porcupines (*Erethizon dorsatum*), and possibly even coyotes (*Canis latrans*).

The site has been monitored for wildlife usage by searching the site for tracks and scat each spring since 2007. Evidence of Nuttall's cottontail, North American porcupine, and bushy-tailed woodrat usage has been observed but no snakes have been seen. Because of the secretive nature of snakes, it is difficult to determine their presence. The most efficient method to determine whether a location is being used by snakes is to set up a specialized snake trap.

During April 2010, the site was monitored using a drift fence in association with funnel traps to determine if snakes have found the reconstructed hibernaculum. Snakes will typically enter hibernacula in late September to October timeframe and leave around mid- to late April. Monitoring was performed in the spring when snakes are typically found leaving winter hibernacula for summer foraging areas. The drift fence was placed along one side of the boulder pit, as the purpose of this monitoring is to determine whether snakes are using the location, not to conduct a complete inventory.

Approximately 36.6 m (120 ft) of silt fencing was placed (staked) around the north side of the hibernaculum on April 13, 2010 (Figure 43). The bottom 5 cm (2 in.) of the fence was dug into the soil to prevent snakes from going under the fence. Four funnel traps (Row and Blouin-Demiers 2006) were placed down the length of the fence. Snakes leaving the hibernaculum would encounter and move along the fence, potentially going into the funnel traps. The drift fence trap was open for five trap-nights and closed/removed on April 22, 2010.

**Figure 43. Monitoring at the 128-B-3 Snake Den.**



No snakes were captured during this study's trapping period. The purpose of this monitoring was to assess the effectiveness of this artificial snake den in replacing the previously existing snake habitat. Continued monitoring will help to determine the extent of use by snakes, if any, at this mitigation site.

In August 2011, a snake hibernaculum was constructed at Waste Information Data System (WIDS) site 600-109 (Figure 44) to take advantage of available materials. This project does not replace an impacted den site at this waste site. This hibernaculum is built in an east-west orientation with a southern aspect, and is approximately 12 m (40 ft) long and 1.5 m (5 ft) deep. It is constructed of cobbles and boulders. The rock was placed in a manner to create void spaces down to the 1.5 m (5 ft) depth to provide adequate winter hibernation conditions (above 0 °C), but also provides pathways near the surface and openings for spring time sunning and emergence. This constructed den site will be monitored for use in subsequent years.

A snake hibernaculum mitigation project of similar design, but using smaller diameter rock, was constructed at WIDS site 600-3 in fall 2011 to mitigate for a western rattlesnake den that was discovered in March 2010 during remediation operations at 600-3. A second hibernaculum of the same design was constructed at WIDS site 600-109 (Figure 45) during fall 2011 also. No monitoring of these two sites occurred during 2012.

Figure 44. 600-109 Snake Hibernaculum.

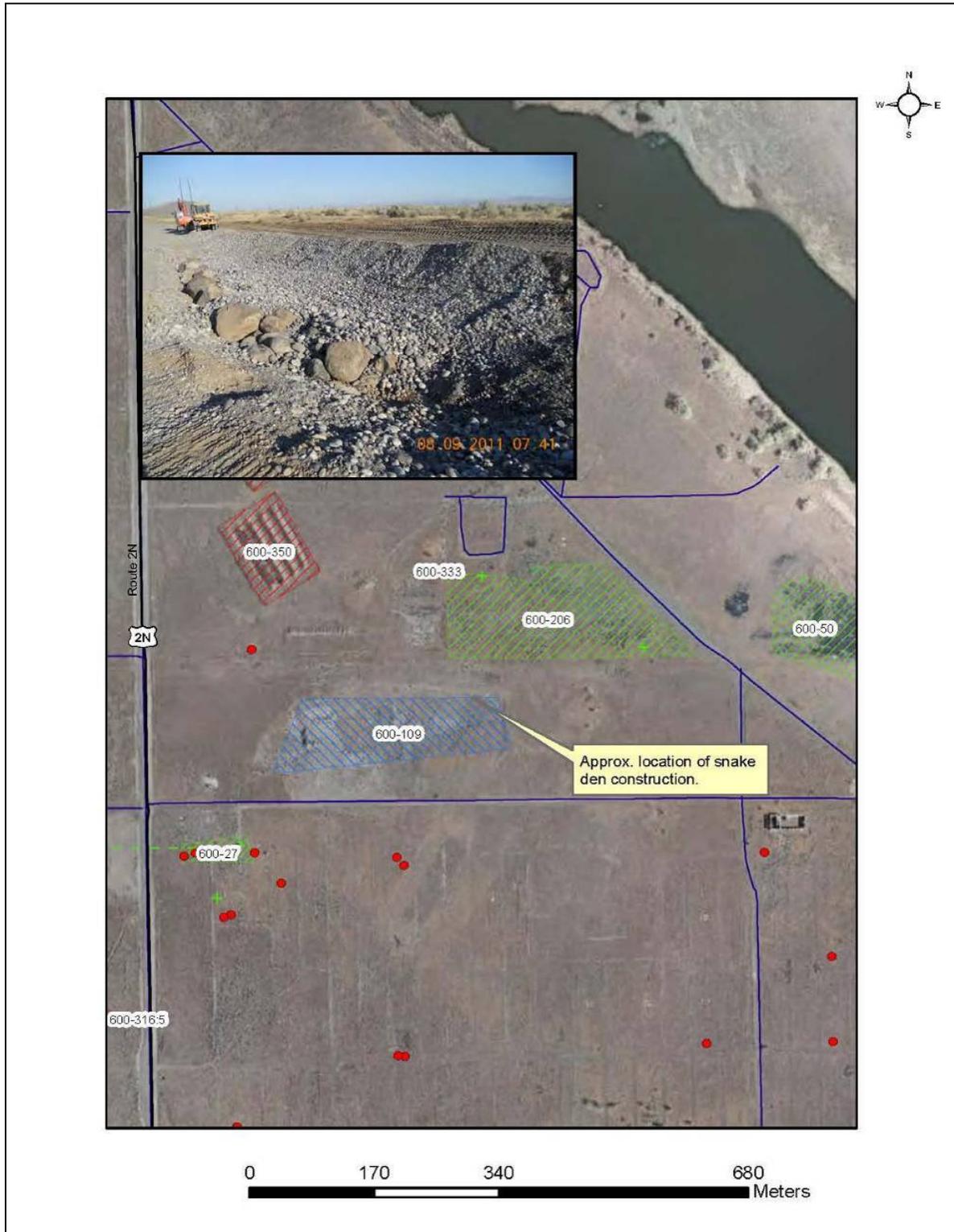
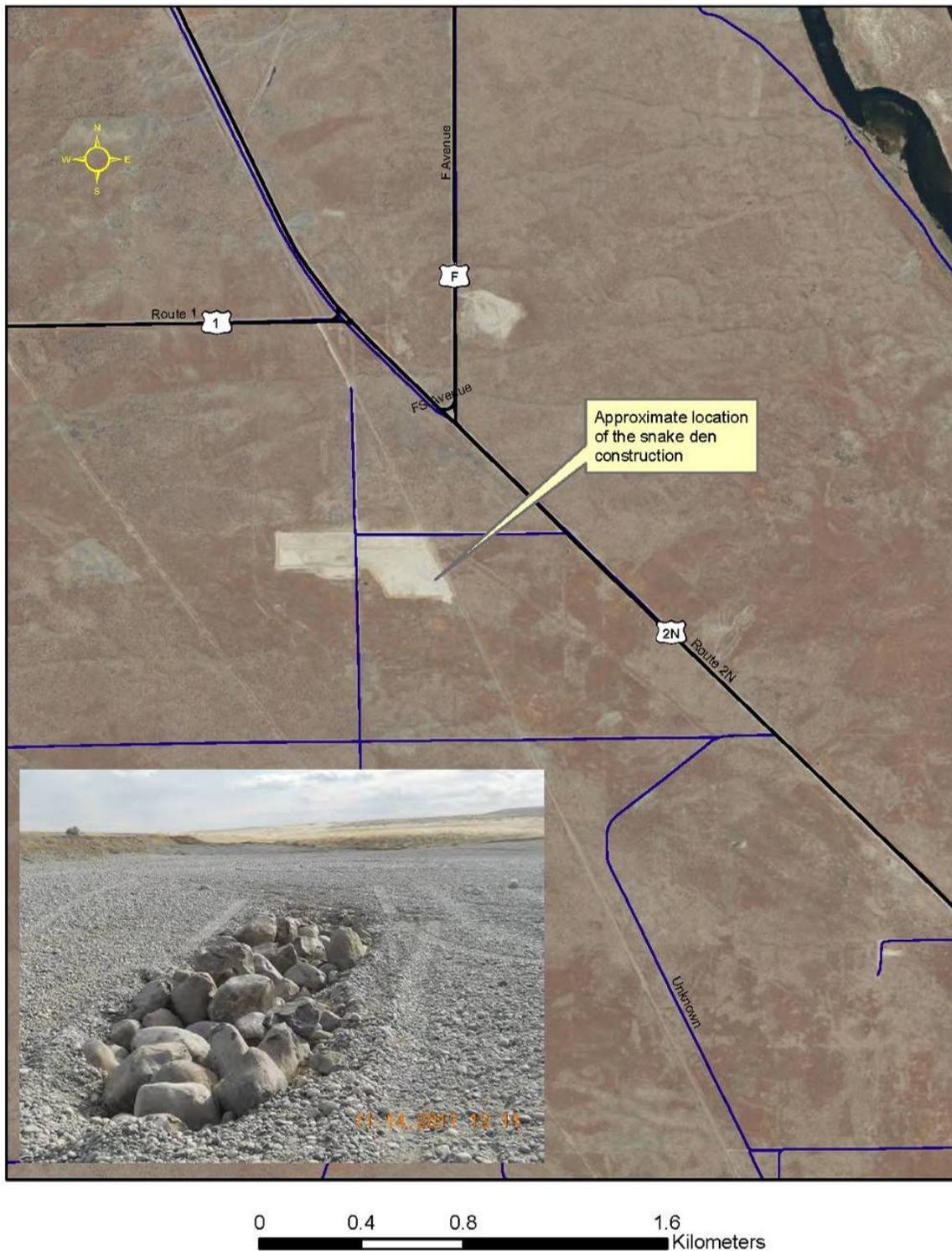


Figure 45. 600-109 Snake Hibernaculum



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**APPENDIX A**  
**2008 - 2011 REVEGETATION MONITORING RESULTS**



## APPENDIX A

### 2008 - 2011 REVEGETATION MONITORING RESULTS

**Table A-1. Percent Canopy Cover and Frequency of Occurrence at 618-7 in 2011.**

Species	% Cover North Cobble	% Cover South Topsoil	% Freq of Occ North Cobble	% Freq of Occ South Topsoil
<i>Poa sandbergii</i> (Sandberg's bluegrass)	42.3	58.4	96.0	96.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	13.6	8.0	96.0	88.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	8.6	2.3	92.0	92.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	4.9	0.8	76.0	32.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	4.0	0.2	60.0	8.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.9	--	36.0	--
<i>Grayia spinosa</i> (spiny hopsage)	0.2	X	8.0	X
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.1	0.1	4.0	4.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.1	0.6	4.0	24.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.1	X	4.0	X
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.1	0.2	4.0	8.0
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.1	--	4.0	--
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	0.0	--	0.0	--
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	--	0.1	--	4.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	--	0.7	--	8.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	--	0.1	--	4.0
<i>Achillea millefolium</i> (yarrow)	X	--	X	--
<i>Artemisia tridentata</i> (big sagebrush)	X	0.1	X	4.0
<i>Machaeranthera canescens</i> (hoary aster)	X	--	X	--
<i>Oenothera pallida</i> (pale evening primrose)	--	X	--	X
Crust	2.0	5.9	100.0	100.0
Soil	70.6	61.4	100.0	100.0
Litter	24.0	32.1	100.0	100.0
<b>Total canopy cover (litter not included)</b>	75.0	71.6		
Total Invasive % Cover	23.4	11.9		
Total Native % Cover	51.6	59.7		
Change in Native % Cover from 2010	+23.3	+5.9		

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-2. Percent Canopy Cover and Frequency of Occurrence at the 618-7 Burial Ground in 2010. (2 Pages)**

Species	% Cover North Cobble	% Freq of Occ North Cobble	% Cover South Topsoil	% Freq of Occ South Topsoil
<i>Poa sandbergii</i> (Sandberg's bluegrass)	22.9	100.0	50.4	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	3.2	68.0	11.4	88.0
<i>Salsola kall</i> <sup>a</sup> (Russian thistle)	8.9	100.0	1.7	68.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	2.5	60.0	1.2	48.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	2.5	60.0	0.9	36.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	2	60.0	0.7	8.0
<i>Artemisia tridentata</i> (big sagebrush)	X	X	0.6	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.7	28.0	0.6	24.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.5	20.0	X	X
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	--	--	0.4	16.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.2	8.0	0.2	8.0
<i>Vulpia myuros</i> <sup>a</sup> (rattail fescue)	0.2	8.0	--	--
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.2	8.0	--	--
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	--	--	0.1	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X	0.1	40
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	--	--	0.1	4.0
<i>Festuca octoflora</i> (slender sixweeks)	--	--	0.1	4.0
<i>Descurainia pinnata</i> (western tansymustard)	--	--	0.1	4.0
<i>Machaeranthera canescens</i> (hoary aster)	--	--	X	X
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	--	--	X	X
<i>Gilia leptomeria</i> (Great Basin gilia)	--	--	X	X
<i>Microsteris gracilis</i> (pink microsteris)	--	--	X	X
<i>Amsinckia lycopsooides</i> (tarweed fiddleneck)	X	X	X	X
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	X	X	X	X
<i>Grayia spinosa</i> (spiny hopsage)	--	--	X	X
<i>Purshia tridentata</i> (antelope bitterbrush)	--	--	X	X
<i>Eriogonum niveum</i> (snow buckwheat)	X	X	--	--
<i>Grayia spinosa</i> (spiny hopsage)	X	X	--	--
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X	--	--
<i>Mentzelia albicaulis</i> (whitestem stickleaf)	--	--	X	X
Biotic crust	0.0	0.0	0.0	0.0

**Table A-2. Percent Canopy Cover and Frequency of Occurrence at the 618-7 Burial Ground in 2010. (2 Pages)**

Species	% Cover North Cobble	% Freq of Occ North Cobble	% Cover South Topsoil	% Freq of Occ South Topsoil
Bare soil	57.9	100.0	47.2	100.0
Litter	33.4	100.0	46.6	100.0
<b>Total canopy cover (litter not included)</b>	43.8		68.6	
Total Invasive % Cover	15.5		14.8	
Total Native % Cover	28.3		53.8	
Change in Native % Cover from 2009	+22.0		+32.8	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-3. Percent Canopy Cover at 618-7 Burial Ground North, South, and CTA in 2009. (2 Pages)**

Species	% Cover North Cobble	% Cover South Topsoil	% Cover CTA
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	8.4	19.3	10.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	3.4	13.2	1.2
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	2.9	7.3	2.1
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	0.3	1.4	0.1
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.3	0.3	0.1
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	0.3	0.2
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	--	0.2	X
<i>Triticum aestivum</i> (wheat)	0.1	--	X
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	--	0.1	--
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	--	0.1	X
<i>Machaeranthera canescens</i> (hoary aster)	--	0.1	--
<i>Chenopodium album</i> <sup>a</sup> (lamb's quarters)	X	0.1	X
<i>Artemisia tridentata</i> (big sagebrush)	--	X	--
<i>Purshia tridentata</i> (antelope bitterbrush)	--	X	X
<i>Nama densum</i> (purplemat)	--	X	--
<i>Gilia leptomeria</i> (Great Basin gilia)	--	X	--
<i>Mentzelia albicaulis</i> (whitestem stickleaf)	--	X	--
<i>Melilotus alba</i> <sup>a</sup> (white sweetclover)	--	X	--
<i>Descurainia pinnata</i> (western tansymustard)	--	X	--
<i>Vulpia myuros</i> <sup>a</sup> (rattail fescue)	X	X	--
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X	X

**Table A-3. Percent Canopy Cover at 618-7 Burial Ground  
North, South, and CTA in 2009. (2 Pages)**

Species	% Cover North Cobble	% Cover South Topsoil	% Cover CTA
<i>Kochia scoparia</i> (kochia)	X	X	X
<i>Chorispura tenella</i> <sup>a</sup> (blue mustard)	X	X	--
<i>Achillea millefolium</i> (yarrow)	--	--	X
<i>Eriogonum niveum</i> (snow buckwheat)	--	--	X
Biotic crust	0.0	0.0	0.0
Bare soil	66.5	66.5	67.7
Litter	28.4	28.4	30.6
<b>Total canopy cover (litter not included)</b>	15.4	42.4	13.7
Total Invasive % Cover	9.1	21.4	10.2
Total Native % Cover	6.3	21.0	3.5

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-4 Percent Frequency of Occurrence at 618-7 Burial Ground  
North, South, and CTA in 2009. (2 Pages)**

Species	Freq. of Occ. % North Cobble	Freq. of Occ. % South Topsoil	Freq. of Occ. % CTA
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	100.0	100.0	80.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	96.0	100.0	48.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	96.0	100.0	64.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	12.0	36.0	4.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	12.0	12.0	4.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	12.0	8.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	--	8.0	X
<i>Triticum aestivum</i> (wheat)	4.0	--	X
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	--	4.0	--
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	--	4.0	X
<i>Machaeranthera canescens</i> (hoary aster)	--	4.0	--
<i>Chenopodium album</i> <sup>a</sup> (lamb's quarters)	X	4.0	X
<i>Artemisia tridentata</i> (big sagebrush)	--	X	--
<i>Purshia tridentata</i> (antelope bitterbrush)	--	X	X
<i>Nama densusum</i> (purplemat)	--	X	--
<i>Gilia leptomeria</i> (Great Basin gilia)	--	X	--

**Table A-4 Percent Frequency of Occurrence at 618-7 Burial Ground North, South, and CTA in 2009. (2 Pages)**

Species	Freq. of Occ. % North Cobble	Freq. of Occ. % South Topsoil	Freq. of Occ. % CTA
<i>Mentzelia albicaulis</i> (whitestem stickleaf)	--	X	--
<i>Melilotus alba</i> <sup>a</sup> (white sweetclover)	--	X	--
<i>Descurainia pinnata</i> (western tansymustard)	--	X	--
<i>Vulpia myuros</i> <sup>a</sup> (rattail fescue)	X	X	--
<i>Lactuca serriola</i> (prickly lettuce)	X	X	X
<i>Kochia scoparia</i> (kochia)	X	X	X
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	X	X	--
<i>Achillea millefolium</i> (yarrow)	--	--	X
<i>Eriogonum niveum</i> (snow buckwheat)	--	--	X
Biotic crust	0.0	0.0	0.0
Bare soil	100.0	100.0	100.0
Litter	100.0	100.0	100.0

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-5. Percent Canopy Cover and Frequency of Occurrence at 618-13 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	56.2	93.3
<i>Poa sandbergii</i> (Sandberg's bluegrass)	24.2	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	7.0	86.7
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	2.3	93.3
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.8	73.3
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.8	33.3
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.3	13.3
<i>Festuca octoflora</i> (slender sixweeks)	0.2	6.7
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	X	X
Crust	4.7	100.0
Soil	41.5	100.0
Litter	52.2	100.0
<b>Total canopy cover (litter not included)</b>	92.8	
Total Invasive % Cover	66.7	

**Table A-5. Percent Canopy Cover and Frequency of Occurrence at 618-13 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
Total Native % Cover	26.2	
Change in Native % Cover from 2010	+1.7	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-6. Percent Canopy Cover and Frequency of Occurrence at 618-13 in 2010.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	14.3	93.3
<i>Salsola kalī</i> <sup>a</sup> (Russian thistle)	11.8	86.7
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	9.8	66.7
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	6.3	86.7
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	4.0	93.3
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.3	53.3
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	1.2	46.7
<i>Artemisia tridentata</i> (big sagebrush)	0.5	20.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.5	20.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.3	13.3
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.2	6.7
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	0.2	6.7
<i>Festuca octoflora</i> (slender sixweeks)	0.2	6.7
<i>Kochia scopar</i> <sup>a</sup> (kochia)	X	X
<i>Purshia tridentata</i> (antelope bitterbrush)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	X	X
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
Biotic crust	0.0	0.0
Bare soil	35.8	100.0
Litter	61.0	100.0
<b>Total canopy cover (litter not included)</b>	50.7	
Total Invasive % Cover	26.2	
Total Native % Cover	24.5	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-7. Percent Canopy Cover and Frequency of Occurrence at 118-F-1 in 2011.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	23.2	92.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	20.7	64.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	8.8	96.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	2.3	52.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.7	12.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.0	20.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.3	12.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.2	8.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.1	4.0
<i>Artemisia tridentata</i> (big sagebrush)	0.1	4.0
<i>Epilobium paniculatum</i> (tall willowherb)	0.1	4.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.1	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Agoseris heterophylla</i> (mountain dandelion)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	X	X
<i>Chondrilla juncea</i> <sup>a</sup> (rush skeletonweed)	X	X
<i>Chaenactis douglasii</i> (hoary falseyarrow)	X	X
<i>Erigeron pumilus</i> (shaggy fleabane)	X	X
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	X	X
Crust	8.7	100.0
Soil	45.0	100.0
Litter	31.6	100
<b>Total canopy cover (litter not included)</b>	58.6	
Total Invasive % Cover	32.5	
Total Native % Cover	26.1	
Change in Native % Cover from 2010	+8.9	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-8. Percent Canopy Cover and Frequency of Occurrence at 118-F-1 in 2010.**

Species	% Cover	% Freq of Occ
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	19.5	92.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	14.0	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	5.2	52.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.9	36.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	1.8	16.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.6	8.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.0	40.0
<i>Artemisia tridentata</i> (big sagebrush)	0.6	4.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.3	12.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.1	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Epilobium paniculatum</i> (tall willowherb)	X	X
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Descurainia pinnata</i> (western tansymustard)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
Crust	0.0	0.0
Soil	56.4	100.0
Litter	36.1	100.0
<b>Total canopy cover (litter not included)</b>	46.0	
Total Invasive % Cover	28.8	
Total Native % Cover	17.2	
Change in Native % Cover from 2009	-6.1	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-9. Percent Canopy Cover and Frequency of Occurrence at 118-F-1 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	26.8	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	12.7	84.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	10.3	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.6	24.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	0.5	20.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.3	12.0

**Table A-9. Percent Canopy Cover and Frequency of Occurrence at 118-F-1 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	0.3	12.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.2	8.0
<i>Descurainia pinnata</i> (western tansymustard)	0.1	4.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.1	4.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.1	4.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
Biotic crust	0.0	0.0
Bare soil	50.3	100.0
Litter	52.3	100.0
<b>Total canopy cover (litter not included)</b>	52.0	
Total Invasive % Cover	28.7	
Total Native % Cover	23.3	
Change in Native % Cover from 2008	+19.6	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-10. Percent Canopy Cover and Frequency of Occurrence at the 118-F-1 Burial Ground in 2008. (2 Pages)**

Species	% Cover	% Freq of Occ
Native Grasses <sup>a</sup>	3.5	100.0
<i>Salsola kali</i> <sup>b</sup> (Russian thistle)	2.8	56.0
<i>Artemisia tridentata</i> (sagebrush)	0.2	8.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Erodium cicutarium</i> <sup>b</sup> (storksbill)	X	X
<i>Bromus tectorum</i> <sup>b</sup> (cheatgrass)	X	X
<i>Lactuca serriola</i> <sup>b</sup> (prickly lettuce)	X	X
<i>Grayia spinosa</i> (hopsage)	X	X
<i>Sisymbrium altissimum</i> <sup>b</sup> (tumble mustard)	X	X
<i>Poa bulbosa</i> <sup>b</sup> (bulbous bluegrass)	X	X
Biotic crust	0	0.0
Bare soil	40.8	100.0

**Table A-10. Percent Canopy Cover and Frequency of Occurrence at the 118-F-1 Burial Ground in 2008. (2 Pages)**

Species	% Cover	% Freq of Occ
Litter	57	100.0
<b>Total canopy cover (litter not included)</b>	6.5	
Total Invasive % Cover	2.8	
Total Native % Cover	3.7	

<sup>a</sup> Includes Sandberg's bluegrass, bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, needle-and-thread grass, and prairie junegrass seedlings.

<sup>b</sup> Invasive species

X = species present but not counted in plot frames

**Table A-11. Percent Canopy Cover and Frequency of Occurrence at 118-F-2 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	20.4	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	16.5	84.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	6.8	96.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	3.5	44.0
<i>Machaeranthera canescens</i> (hoary aster)	1.7	12.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.4	36.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.9	16.0
<i>Achillea millefolium</i> (yarrow)	0.6	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.3	12.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.2	8.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.2	8.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.2	8.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.1	4.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.1	4.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
<i>Descurainia pinnata</i> (western tansymustard)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	X	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X
<i>Chondrilla juncea</i> <sup>a</sup> (rush skeletonweed)	X	X
<i>Chaenactis douglasii</i> (hoary falseyarrow)	X	X
<i>Erigeron pumilus</i> (shaggy fleabane)	X	X

**Table A-11. Percent Canopy Cover and Frequency of Occurrence at 118-F-2 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Phacelia hastata</i> (whiteleaf scorpionweed)	X	X
<i>Erigeron poliospermus</i> (cushion fleabane)	X	X
Crust	1.8	100.0
Soil	54.9	100.0
Litter	26.5	100.0
<b>Total canopy cover (litter not included)</b>	52.9	
Total Invasive % Cover	26.0	
Total Native % Cover	26.9	
Change in Native % Cover from 2010	+11.5	

<sup>a</sup> Invasive species

X = present but not counted in plot frames

**Table A-12. Percent Canopy Cover and Frequency of Occurrence at 118-F-2 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	9.3	100.0
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	4.3	92.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	2.2	48.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	1.9	56.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	1.1	44.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.0	40.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.9	16.0
<i>Machaeranthera canescens</i> (hoary aster)	0.5	20.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.4	16.0
<i>Achillea millefolium</i> (yarrow)	0.4	16.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.4	16.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.3	12.0
<i>Descurainia pinnata</i> (western tansymustard)	0.2	8.0
<i>Agropyron dasytachyum</i> (thickspike wheatgrass)	0.1	4.0
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	0.1	4.0
<i>Festuca octoflora</i> (slender sixweeks)	0.1	4.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.1	4.0
<i>Cryptantha fendleri</i> (Fendler's cryptantha)	0.1	4.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.1	4.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X

**Table A-12. Percent Canopy Cover and Frequency of Occurrence at 118-F-2 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	X	X
<i>Eriogonum vimineum</i> (broom buckwheat)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Vicia cracca</i> <sup>a</sup> (bird vetch)	X	X
<i>Conyza canadensis</i> <sup>a</sup> (mare's tail)	X	X
<i>Cryptantha circumscissa</i> (matted cryptantha)	X	X
Crust	0.0	0.0
Soil	55.0	100.0
Litter	32.5	100.0
<b>Total canopy cover (litter not included)</b>	23.5	
Total Invasive % Cover	8.1	
Total Native % Cover	15.4	
Change in Native % Cover from 2009	-16.8	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-13. Percent Canopy Cover and Frequency of Occurrence at 118-F-2 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	28.1	96.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	22.8	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	6.7	92.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	5.6	52.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	4.8	40.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	2.4	20.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.4	16.0
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	0.4	16.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.2	8.0
<i>Phacelia linearis</i> (threadleaf scorpionweed)	0.1	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.1	4.0
<i>Descurainia pinnata</i> (western tansymustard)	0.1	4.0
<i>Poa bulbosa</i> (bulbous bluegrass)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Lepidium perfoliatum</i> (clasping pepperweed)	X	X

**Table A-13. Percent Canopy Cover and Frequency of Occurrence at 118-F-2 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Cardaria draba</i> <sup>a</sup> (whitetop)	X	X
<i>Phacelia linearis</i> (threadleaf scorpionweed)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
Biotic crust	0.0	0.0
Bare soil	49.3	92.0
Litter	42.1	100.0
<b>Total canopy cover (litter not included)</b>	71.7	
Total Invasive % Cover	39.5	
Total Native % Cover	32.2	
Change in Native cover from 2008	+13.0	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-14. Percent Canopy Cover and Frequency of Occurrence at 118-F-2 in 2008. (2 Pages)**

Species	% Cover	% Freq of Occ
Native Grasses <sup>a</sup>	18.7	96.0
<i>Salsola kalii</i> <sup>b</sup> (Russian thistle)	9.5	88.0
<i>Nama densum</i> (purplemat)	0.1	4.0
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	0.1	4.0
<i>Sisymbrium altissimum</i> <sup>b</sup> (tumble mustard)	2.6	28.0
<i>Lactuca serriola</i> <sup>b</sup> (prickly lettuce)	0.1	4.0
<i>Bromus tectorum</i> <sup>b</sup> (cheatgrass)	4.2	16.0
<i>Poa bulbosa</i> <sup>b</sup> (bulbous bluegrass)	0.2	8.0
<i>Artemisia tridentata</i> (sagebrush)	0.1	4.0
<i>Descurainia pinnata</i> (western tansymustard)	0.1	4.0
<i>Grayia spinosa</i> (Spiny hopsage)	0.1	4.0
<i>Draba verna</i> <sup>b</sup> (spring whitlow)	0.1	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Holosteum umbellatum</i> <sup>b</sup> (jagged chickweed)	X	X
<i>Cardaria draba</i> <sup>b</sup> (whitetop)	X	X
<i>Vicia cracca</i> <sup>b</sup> (bird vetch)	X	X
<i>Lepidium perfoliatum</i> (clasping pepperweed)	X	X
Biotic Crust	0	0.0

**Table A-14. Percent Canopy Cover and Frequency of Occurrence at 118-F-2 in 2008. (2 Pages)**

Species	% Cover	% Freq of Occ
Bare Soil	52.9	100.0
Litter	41.9	100.0
<b>Total canopy cover (litter not included)</b>	35.9	
Total Invasive % Cover	16.7	
Total Native % Cover	19.2	

<sup>a</sup> Includes Sandberg's bluegrass, bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, needle-and-thread grass, and prairie junegrass seedlings.

<sup>b</sup> Invasive species

X = species present but not counted in plot frames

**Table A-15. Percent Canopy Cover and Frequency of Occurrence at 182-F in 2011. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	63.3	55.6	100.0	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	10.0	0.6	53.3	4.0
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	8.8	--	33.3	--
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	3.3	0.3	33.3	12.0
<i>Artemisia tridentata</i> (big sagebrush)	2.8	0.1	46.7	4.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.2	6.3	86.7	96.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	1.0	X	6.7	X
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.7	1.1	26.7	24.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.5	2.3	20.0	32.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.3	1.9	13.3	36.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.2	5.9	6.7	60.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.2	0.1	6.7	4.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.2	0.1	6.7	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	--	0.6	--	4.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.0	42.0	0.0	72.0
<i>Vicia cracca</i> <sup>a</sup> (bird vetch)	--	0.1	--	4.0
<i>Machaeranthera canescens</i> (hoary aster)	--	0.1	--	4.0
<i>Sporobolus cryptandrus</i> (sand dropseed)	X	2.8	X	16.0
<i>Grayia spinosa</i> (spiny hopsage)	X	--	X	--
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X	X	X
<i>Artemisia campestris</i> (Pacific sage)	X	--	X	--
<i>Achillea millefolium</i> (yarrow)	--	X	--	X

**Table A-15. Percent Canopy Cover and Frequency of Occurrence at 182-F in 2011. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	--	X	--	X
<i>Verbena bracteata</i> (big-bract verbena)	--	X	--	X
<i>Astragalus seccumbens</i> (crouching milkvetch)	--	X	--	X
Crust	4.0	10.9	100.0	100.0
Soil	33.3	17.7	100.0	100.0
Litter	64.7	80.3	100.0	100.0
<b>Total canopy cover (litter not included)</b>	93.5	119.9		
Total Invasive % Cover	70.3	113.7		
Total Native % Cover	14.3	3.4		
Change in Native % Cover from 2010	+6.3	-17.1		

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-16. Percent Canopy Cover and Frequency of Occurrence at 182-F in 2010. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	8.8	44.2	93.3	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	4.8	14.5	100.0	84.0
<i>Salsola kalī</i> <sup>a</sup> (Russian thistle)	1.3	2.9	53.3	96.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.5	2.8	60.0	36.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.3	2.7	13.3	32.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	2.2	0.9	20.0	36.0
<i>Sporobolus cryptandrus</i> (sand dropseed)	--	1.5	--	20.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.5	1.4	20.0	16.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.3	1.2	13.3	28.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.8	0.6	33.3	24.0
<i>Festuca octoflora</i> (slender sixweeks)	0.5	0.5	20.0	20.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.3	0.3	13.3	12.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	0.2	X	8.0
<i>Epilobium paniculatum</i> (tall willowherb)	0.2	--	6.7	--
<i>Artemisia campestris</i> (Pacific sage)	0.2	X	6.7	X
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	--	0.1	--	4.0
<i>Achillea millefolium</i> (yarrow)	X	0.1	X	4.0
<i>Artemisia tridentata</i> (big sagebrush)	X	0.1	X	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	--	0.1	--	4.0
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	0.1	X	4.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	--	0.1	--	4.0

**Table A-16. Percent Canopy Cover and Frequency of Occurrence at 182-F in 2010. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Astragalus caricinus</i> (buckwheat milkvetch)	--	X	--	X
<i>Astragalus sclerocarpus</i> (stalked pod milkvetch)	--	X	--	X
<i>Astragalus seccumbens</i> (crouching milkvetch)	X	--	X	--
<i>Chaenactis douglasii</i> (hoary falseyarrow)	--	X	--	X
<i>Descurainia pinnata</i> (western tansymustard)	--	X	--	X
<i>Conyza canadensis</i> <sup>a</sup> (mare's tail)	--	X	--	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X	X	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X	X	X
<i>Verbena bracteata</i> <sup>a</sup> (big-bract verbena)	X	X	X	X
<i>Vicia cracca</i> <sup>a</sup> (bird vetch)	--	X	--	X
<i>Sporobolus cryptandrus</i> (sand dropseed)	X	--	X	--
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	X	--	X	--
Crust	0.0	1.1	0.0	24.0
Soil	24.5	16.8	93.3	100.0
Litter	57.7	72.6	100.0	100.0
<b>Total canopy cover (litter not included)</b>	22.0	74.3		
Total Invasive % Cover	14.0	53.8		
Total Native % Cover	8.0	20.5		
Change in Native % Cover from 2009	-43.7	-9.4		

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

-- Species not observed on site

**Table A-17. Percent Canopy Cover and Frequency of Occurrence at 182-F North and South in 2009. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	44.5	49.3	100.0	88.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	32.5	5.6	100.0	72.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	24.0	19.8	73.3	92.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	10.3	5.9	60.0	24.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.2	6.2	86.7	92.0
<i>Sporobolus cryptandrus</i> (sand dropseed)	1.0	4.1	6.7	32.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.3	1.2	13.3	28.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.7	0.8	26.7	32.0
<i>Festuca octoflora</i> (slender sixweeks)	0.7	0.3	26.7	12.0
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	0.5	0.5	20.0	20.0
<i>Artemisia tridentata</i> (sagebrush)	0.5	X	20.0	X

**Table A-17. Percent Canopy Cover and Frequency of Occurrence at 182-F North and South in 2009. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	--	0.4	--	16.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.3	--	13.3	--
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	0.3	X	12.0
<i>Artemisia campestris</i> (pacific sage)	0.2	X	6.7	X
<i>Descurainia pinnata</i> (western tansymustard)	--	0.1	--	4.0
<i>Verbena bracteata</i> <sup>a</sup> (big-bract verbena)	--	X	--	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	--	X	--	X
<i>Achillea millefolium</i> (yarrow)	X	X	X	X
<i>Astragalus seccumbens</i> (crouching milkvetch)	X	X	X	X
<i>Vicia cracca</i> <sup>a</sup> (bird vetch)	X	X	X	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	--	X	--
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	--	X	--
Biotic crust	1.0	0.3	40.0	12.0
Bare soil	41.8	17.7	93.3	96.0
Litter	57.8	77.0	100.0	100.0
<b>Total canopy cover (litter not included)</b>	117.7	94.5		
Total Invasive % Cover	58.5	64.6		
Total Native % Cover	59.2	29.9		
Change in Native % Cover from 2008	+11.9	-6.1		

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

-- = species not observed on site

**Table A-18. Percent Canopy Cover and Frequency of Occurrence at 182-F North and South in 2008. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
Native Grasses <sup>a</sup>	47.2	35.2	100.0	100.0
<i>Bromus tectorum</i> <sup>b</sup> (cheatgrass)	17.7	33.8	73.3	96.0
<i>Salsola kal</i> <sup>b</sup> (Russian thistle)	1.2	29.4	46.7	92.0
<i>Sisymbrium altissimum</i> <sup>b</sup> (tumble mustard)	0.3	2.4	13.3	56.0
<i>Poa bulbosa</i> <sup>b</sup> (Bulbous bluegrass)	1.3	1.2	20.0	28.0
<i>Draba verna</i> <sup>b</sup> (spring whitlowgrass)	0.2	0.4	6.7	16.0
<i>Artemisia tridentata</i> (sagebrush)	0.2	0.1	6.7	4.0
<i>Erodium cicutarium</i> <sup>b</sup> (storksbill)	--	0.9	--	16.0
<i>Sporobolus cryptandrus</i> (sand dropseed)	X	0.6	X	4.0

**Table A-18. Percent Canopy Cover and Frequency of Occurrence at 182-F North and South in 2008. (2 Pages)**

Species	% Cover North	% Cover South	% Freq of Occ North	% Freq of Occ South
<i>Verbena bracteata</i> (big-bract verbena)	--	0.1	--	4.0
<i>Vicia cracca</i> <sup>b</sup> (bird vetch)	--	0.1	--	4.0
<i>Achillea millefolium</i> (yarrow)	--	X	--	X
<i>Triticum aestivum</i> <sup>b</sup> (wheat)	--	X	--	X
<i>Artemisia ludoviciana</i> (white sagebrush)	X	X	X	X
<i>Centaurea diffusa</i> <sup>b</sup> (diffuse knapweed)	X	X	X	X
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X	X	X
<i>Sphaeralcea munroana</i> (globemallow)	--	X	--	X
<i>Astragalus seccumbens</i> (Columbia milk-vetch)	--	X	--	X
<i>Lactuca serriola</i> <sup>b</sup> (prickly lettuce)	--	X	--	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X	X	X
<i>Astragalus spp.</i>	X	X	X	X
<i>Melilotus alba</i> <sup>b</sup> (sweetclover)	X	--	X	--
Biotic crust	0.0	0.0	0.0	0.0
Bare soil	20.5	16.8	80.0	80.0
Litter	75.8	75.9	100.0	100.0
<b>Total canopy cover (litter not included)</b>	68.0	104.2		
Total Invasive % Cover	20.7	68.2		
Total Native % Cover	47.3	36.0		

<sup>a</sup> Includes Sandberg's bluegrass, bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, needle-and-thread grass, and prairie junegrass seedlings.

<sup>b</sup> Invasive species

X = species present but not counted in plot frames

-- = species not observed on site

**Table A-19. Percent Canopy Cover and Frequency of Occurrence at 126-F-2 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	41.2	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	22.2	93.3
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	4.8	93.3
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	2.5	66.7
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	2.2	20.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	1.3	20.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.2	46.7

**Table A-19. Percent Canopy Cover and Frequency of Occurrence at 126-F-2 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.2	46.7
<i>Achillea millefolium</i> (yarrow)	0.7	26.7
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.3	13.3
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.2	6.7
<i>Ranunculus testiculatus</i> <sup>a</sup> (bur buttercup)	0.2	6.7
<i>Astragalus succumbens</i> (crouching milkvetch)	0.2	6.7
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.2	6.7
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Plantago patagonica</i> (Indian wheat)	X	X
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	X	X
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	X	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X
Crust	5.0	100
Soil	40.7	100
Litter	39.0	100
<b>Total canopy cover (litter not included)</b>	78.5	
Total Invasive % Cover	52.5	
Total Native % Cover	26.0	
Change in Native % Cover from 2010	+14.5	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-20. Percent Canopy Cover and Frequency of Occurrence at 126-F-2 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	4.7	86.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	3.8	86.7
<i>Poa sandbergii</i> (Sandberg's bluegrass)	3.0	86.7
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	2.3	93.3
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.5	60.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.0	40.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.8	33.3
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.8	33.3
<i>Artemisia tridentata</i> (big sagebrush)	0.5	20.0

**Table A-20. Percent Canopy Cover and Frequency of Occurrence at 126-F-2 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.3	13.3
<i>Machaeranthera canescens</i> (hoary aster)	0.2	6.7
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.2	6.7
<i>Plantago patagonica</i> (Indian wheat)	0.2	6.7
<i>Epilobium paniculatum</i> (tall willowherb)	0.2	6.7
<i>Festuca octoflora</i> (slender sixweeks)	0.2	6.7
<i>Achillea millefolium</i> (yarrow)	0.2	6.7
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.2	6.7
<i>Astragalus seccumbens</i> (crouching milkvetch)	X	X
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
Biotic crust	0.0	0.0
Bare soil	28.7	100.0
Litter	50.7	100.0
<b>Total canopy cover (litter not included)</b>	20.0	
Total Invasive % Cover	8.5	
Total Native % Cover	11.5	
Change in Native % Cover from 2008	-43.5	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-21. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	50.0	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	25.5	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.2	86.7
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.8	40.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.8	40.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.5	60.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	1.3	20.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	1.3	20.0
<i>Artemisia tridentata</i> (big sagebrush)	1.3	20.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.2	13.3
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.7	26.7

**Table A-21. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.5	20.0
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	X	X
<i>Erigeron pumilus</i> <sup>a</sup> (shaggy fleabane)	X	X
Crust	6.3	100.0
Soil	26.2	100.0
Litter	57.7	100.0
<b>Total canopy cover (litter not included)</b>	89.2	
Total Invasive % Cover	58.0	
Total Native % Cover	31.2	
Change in Native % Cover from 2010	+7.2	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-22. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	24.5	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	20.7	93.3
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	8.3	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	5.3	80.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.3	20.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.0	40.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.5	20.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.3	13.3
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.2	6.7
<i>Achillea millefolium</i> (yarrow)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.2	6.7
<i>Festuca octoflora</i> (slender sixweeks)	0.2	6.7
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	X

**Table A-22. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
Crust	0.0	0.0
Soil	42.8	100.0
Litter	50.0	100.0
<b>Total canopy cover (litter not included)</b>	62.8	
Total Invasive % Cover	38.8	
Total Native % Cover	24.0	
Change in Native % Cover from 2008	-30.5	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-23. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	39.5	93.3
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	35.5	93.3
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	34.7	86.7
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	11.0	93.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	8.5	53.3
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	3.0	53.3
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	2.5	6.7
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.3	13.3
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.2	6.7
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	0.2	6.7
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Ranunculus testiculatus</i> <sup>a</sup> (bur buttercup)	0.2	6.7
<i>Descurainia pinnata</i> (western tansymustard)	0.2	6.7
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.2	6.7
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Chenopodium album</i> (lamb's quarters)	X	X
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Melilotus alba</i> (white sweetclover)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
Biotic crust	3.0	20.0
Bare soil	37.8	86.7

**Table A-23. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
Litter	62.5	100.0
<b>Total canopy cover (litter not included)</b>	136.2	
Total Invasive % Cover	81.9	
Total Native % Cover	54.3	
Change in Native % Cover from 2008	+31.2	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-24. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2008. (2 Pages)**

Species	% Cover	% Freq of Occ
Native grasses <sup>a</sup>	22.7	86.7
<i>Bromus tectorum</i> <sup>b</sup> (cheatgrass)	16.2	73.3
<i>Salsola kal</i> <sup>b</sup> (Russian thistle)	16.3	100.0
<i>Festuca octoflora</i> (slender sixweeks)	0.2	6.7
<i>Sisymbrium altissimum</i> <sup>b</sup> (tumble mustard)	0.7	26.7
<i>Chenopodium album</i> (lambsquarters)	0.3	13.3
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Erodium cicutarium</i> <sup>b</sup> (storksbill)	0.2	6.7
<i>Chorispora tenella</i> <sup>b</sup> (blue mustard)	0.2	6.7
<i>Lepidium perfoliatum</i> (clasping pepperweed)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Poa bulbosa</i> <sup>b</sup> (bulbous bluegrass)	X	X
<i>Ranunculus testiculatus</i> <sup>b</sup> (bur buttercup)	X	X
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X
<i>Grayia spinosa</i> (hopsage)	X	X
<i>Centaurea diffusa</i> <sup>b</sup> (diffuse knapweed)	X	X
Biotic crust	0.0	0.0
Bare soil	41.3	100.0
Litter	53.0	100.0
<b>Total canopy cover (litter not included)</b>	56.8	
Total Invasive % Cover	33.5	

**Table A-24. Percent Canopy Cover and Frequency of Occurrence at 100-F-26 in 2008. (2 Pages)**

Species	% Cover	% Freq of Occ
Total Native % Cover	23.3	

<sup>a</sup> Includes Sandberg's bluegrass, bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, needle-and-thread grass, and prairie junegrass seedlings.

<sup>b</sup> Invasive species

X = species present but not counted in plot frames

**Table A-25. Percent Canopy Cover and Frequency of Occurrence at 118-F-5 in 2011. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	60.3	52.3	100.0	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	5.8	4.0	100.0	93.3
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.3	13.0	53.3	73.3
<i>Machaeranthera canescens</i> (hoary aster)	1.3	1.3	20.0	20.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.7	0.5	26.7	20.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	0.5	1.2	20.0	13.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.5	1.2	20.0	46.7
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.2	0.2	6.7	6.7
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.2	2.3	6.7	60.0
<i>Festuca octoflora</i> (slender sixweeks)	0.2	0.5	6.7	20.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.2	0.2	6.7	6.7
<i>Chondrilla juncea</i> <sup>a</sup> (rush skeletonweed)	0.2	X	6.7	X
<i>Microsteris gracilis</i> (pink microsteris)	--	0.7	--	26.7
<i>Ambrosia acanthicarpa</i> (bur ragweed)	--	0.2	--	6.7
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	--	X	--	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	--	X	--
<i>Achillea millefolium</i> (yarrow)	X	X	X	X
<i>Amsinckia lycopsooides</i> (tarweed fiddleneck)	X	1.3	X	20.0
<i>Artemisia tridentata</i> (big sagebrush)	X	0.2	X	6.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	X	--	X	--
<i>Conyza canadensis</i> (mares tail)	X	--	X	--
<i>Grayia spinosa</i> (spiny hopsage)	--	X	--	X
<i>Eriogonum niveum</i> (snow buckwheat)	--	X	--	X
<i>Plantago patagonica</i> (Indian wheat)	--	X	--	X
<i>Chaenactis douglasii</i> (hoary falseyarrow)	--	X	--	X
Crust	5.8	1.2	100.0	100.0
Soil	52.3	43.0	100.0	100.0

**Table A-25. Percent Canopy Cover and Frequency of Occurrence at 118-F-5 in 2011. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
Litter	37.5	35.2	100.0	100.0
<b>Total canopy cover (litter not included)</b>	71.3	79.0		
Total Invasive % Cover	68.5	73.0		
Total Native % Cover	2.8	6.0		
Change in Native % Cover from 2010	-6.2	-2.6		

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-26. Percent Canopy Cover and Frequency of Occurrence at 118-F-5 in 2010. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	22.2	49.3	100	93.3
<i>Salsola kalif</i> <sup>a</sup> (Russian thistle)	5.7	3.6	100	66.7
<i>Poa sandbergii</i> (Sandberg's bluegrass)	3.8	2.9	87	73.3
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	2.8	0.9	80	33.3
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.8	0.5	40	20.0
<i>Amsinckia lycopoides</i> (tarweed fiddleneck)	X	1.4	X	53.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.0	1.4	40	53.3
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	--	1.3	--	46.7
<i>Microsteris gracilis</i> (pink microsteris)	--	0.7	--	26.7
<i>Stipa comata</i> (needle-and-thread grass)	--	0.5	--	20.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.5	X	20	X
<i>Achillea millefolium</i> (yarrow)	X	0.5	X	20.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.3	0.5	13	20.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	--	0.4	--	13.3
<i>Artemisia tridentata</i> (big sagebrush)	0.2	0.2	7	6.7
<i>Machaeranthera canescens</i> (hoary aster)	0.2	0.2	7	6.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.2	--	7	--
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	0.2	X	6.7
<i>Plantago patagonica</i> (Indian wheat)	X	X	X	X
<i>Agoseris heterophylla</i> (mountain dandelion)	X	--	X	--
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	--	X	--
<i>Sporobolus cryptandrus</i> (sand dropseed)	--	X	--	X
<i>Grayia spinosa</i> (spiny hopsage)	--	X	--	X
<i>Agoseris heterophylla</i> (mountain dandelion)	--	X	--	X

**Table A-26. Percent Canopy Cover and Frequency of Occurrence at 118-F-5 in 2010. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	--	X	--	X
<i>Chondrilla juncea</i> <sup>a</sup> (rush skeletonweed)	--	X	--	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	--	X	--	X
Biotic crust	0	0	0	0
Soil	47.5	32.1	100	93.3
Litter	29.5	44.8	100	93.3
<b>Total canopy cover (litter not included)</b>	<b>38.7</b>	<b>0.2</b>		
Total Invasive % Cover	29.7	56.1		
Total Native % Cover	9.0	8.6		
Change in Native % Cover from 2009	+3.7	+3.4		

<sup>a</sup> Invasive species; X=species present but not counted in plot frames

-- = Species not observed on site

**Table A-27. Percent Canopy Cover and Frequency of Occurrence at 118-F-5 Soil Staging Area and Burial Ground in 2009. (2 Pages)**

Species	% Cover SSA	% Cover BG	% Freq of Occ SSA	% Freq of Occ BG
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	75.0	46.3	100.0	93.3
<i>Salsola kalii</i> <sup>a</sup> (Russian thistle)	28.5	21.8	93.3	100.0
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	7.8	--	26.7	--
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	2.7	--	13.3	--
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.8	2.5	40.0	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	0.3	1.5	13.3	26.7
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.3	0.2	53.3	6.7
<i>Microsteris gracilis</i> (pink microsteris)	1.3	--	20.0	--
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.7	0.5	26.7	20.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	--	0.5	--	20.0
<i>Plantago patagonica</i> (Indian wheat)	0.5	--	20.0	--
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	0.3	X	13.3
<i>Artemisia tridentata</i> (big sagebrush)	0.2	0.3	6.7	13.3
<i>Achillea millefolium</i> (common yarrow)	0.3	X	13.3	X
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.3	--	13.3	--
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	0.3	--	13.3	--
<i>Epilobium paniculatum</i> (tall willowherb)	--	0.2	--	6.7
<i>Machaeranthera canescens</i> (hoary aster)	--	X	--	X

**Table A-27. Percent Canopy Cover and Frequency of Occurrence at 118-F-5 Soil Staging Area and Burial Ground in 2009. (2 Pages)**

Species	% Cover SSA	% Cover BG	% Freq of Occ SSA	% Freq of Occ BG
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	--	X	--	X
<i>Grayia spinosa</i> (spiny hopsage)	X	--	X	--
Biotic crust	2.3	2.2	93.3	86.7
Bare soil	27.7	55.3	93.3	100.0
Litter	61.0	39.7	100.0	100.0
<b>Total Canopy Cover (litter not included)</b>	121.2	74.2		
Total Introduced % Cover	116.0	68.8		
Total Native % Cover	5.2	5.3		
Change in Native % Cover from 2008	-13.3	+0.3		

<sup>a</sup> Introduced species.

X = species present but not counted in a plot frame

-- species not observed on site

**Table A-28. Percent Canopy Cover and Frequency of Occurrence at 118-F-5 Soil Staging Area and Burial Ground in 2008. (2 Pages)**

Species	% Cover SSA	% Cover BG	% Freq of Occ SSA	% Freq of Occ BG
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	49.2	13.5	100.0	93.3
Native Grasses <sup>b</sup>	16.0	4.2	100.0	100.0
<i>Salsola kalii</i> <sup>a</sup> (Russian thistle)	3.5	3.8	73.3	86.7
<i>Ambrosia acanthicarpa</i> (bur ragweed)	1.2	--	13.3	--
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.5	0.2	20.0	6.7
<i>Chenopodium leptophyllum</i> (slimleaf goosefoot)	0.3	--	13.3	--
<i>Triticum aestivum</i> <sup>a</sup> (common wheat)	0.3	--	13.3	--
<i>Plantago patagonica</i> (Indian wheat)	0.3	--	13.3	--
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	0.2	0.2	6.7	6.7
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.2	--	6.7	--
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	0.2	--	6.7	--
<i>Astragalus</i> spp.	0.2	--	6.7	--
<i>Microsteris gracilis</i> (annual phlox)	0.2	--	6.7	--
<i>Achillea millefolium</i> (yarrow)	0.2	X	6.7	X
<i>Grayia spinosa</i> (hopsage)	X	X	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	--	X	--
<i>Hackelia diffusa</i> (sagebrush stickseed)	X	--	X	--
<i>Chondrilla juncea</i> <sup>a</sup> (rush skeletonweed)	X	--	X	--

**Table A-28. Percent Canopy Cover and Frequency of Occurrence at 118-F-5 Soil Staging Area and Burial Ground in 2008. (2 Pages)**

Species	% Cover SSA	% Cover BG	% Freq of Occ SSA	% Freq of Occ BG
<i>Artemisia tridentata</i> (sagebrush)	X	0.3	X	13.3
<i>Chenopodium album</i> (lambsquarters)	X	--	X	--
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X	X	X
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	X	--	X	--
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	--	0.3	--	13.3
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	--	X	--	X
<i>Agoseris heterophylla</i> (mountain-dandelion)	--	X	--	X
<i>Machaeranthera canescens</i> (hoary aster)	--	X	--	X
<i>Triticum aestivum</i> <sup>a</sup> (common wheat)	--	X	--	X
Biotic crust	0.0	0.0	0.0	0.0
Bare Soil	46.3	37.2	100.0	100.0
Litter	45.2	50.7	100.0	100.0
<b>Total Canopy Cover (litter not included)</b>	<b>72.3</b>	<b>22.5</b>		
Total Introduced % Cover 2008	53.8	17.5		
Total Native % Cover 2008	18.5	5.0		

<sup>a</sup> Introduced species.

<sup>b</sup> Includes Sandberg's bluegrass, bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, needle-and-thread grass, and prairie junegrass seedlings.

X = species present but not counted in a plot frame

-- = species not observed on site

**Table A-29. Percent Canopy Cover and Frequency of Occurrence at 118-F-6 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	26.9	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	15.2	56.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	8.2	100.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.7	48.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.6	24.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.4	16.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.2	8.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.1	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.1	4.0
<i>Achillea millefolium</i> (yarrow)	0.1	4.0
<i>Descurainia pinnata</i> (western tansymustard)	0.1	4.0

**Table A-29. Percent Canopy Cover and Frequency of Occurrence at 118-F-6 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	X	X
<i>Cardaria draba</i> <sup>a</sup> (whitetop)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
Crust	3.3	100.0
Soil	44.1	100.0
Litter	35.3	100.0
<b>Total canopy cover (litter not included)</b>	54.6	
Total Invasive % Cover	25.7	
Total Native % Cover	28.9	
Change in Native % Cover from 2010	+9.6	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-30. Percent Canopy Cover and Frequency of Occurrence at 118-F-6 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	37.5	96.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	16.9	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	3.2	32.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	2.1	44.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.2	48.0
<i>Agropyron dasytachyum</i> (thickspike wheatgrass)	0.6	24.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.4	16.0
<i>Achillea millefolium</i> (yarrow)	0.1	4.0
<i>Descurainia pinnata</i> (western tansymustard)	0.1	4.0
<i>Artemisia tridentata</i> (big sagebrush)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Purshia tridentata</i> (antelope bitterbrush)	X	X
<i>Balsamorhiza careyana</i> (Carey's balsamroot)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Cardaria draba</i> <sup>a</sup> (whitetop)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	X	X

**Table A-30. Percent Canopy Cover and Frequency of Occurrence at 118-F-6 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
Crust	0.1	4.0
Soil	70.2	96.0
Litter	24.3	96.0
<b>Total canopy cover (litter not included)</b>	62.1	
Total Invasive % Cover	42.8	
Total Native % Cover	19.3	
Change in Native % Cover from 2009	0	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-31. Percent Canopy Cover and Frequency of Occurrence at 118-F-6 in 2009.**

Species	% Cover	% Freq of Occ
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	30.9	92.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	10.4	72.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	8.7	92.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	1.6	44.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.5	40.0
<i>Artemisia tridentata</i> (big sagebrush)	0.1	4.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.1	4.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.1	4.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.1	4.0
<i>Cardaria draba</i> <sup>a</sup> (whitetop)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Purshia tridentata</i> (antelope bitterbrush)	X	X
Biotic crust	0.0	0.0
Bare soil	65.6	100.0
Litter	31.3	96.0
<b>Total canopy cover (litter not included)</b>	53.5	
Total Invasive % Cover	34.2	
Total Native % Cover	19.3	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-32. Percent Canopy Cover and Frequency of Occurrence at 120-F-1 in 2011.**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	72.2	100.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	41.3	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	9.2	100.0
<i>Plantago patagonica</i> (Indian wheat)	3.8	26.7
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.2	86.7
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	1.2	46.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.0	6.7
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.5	20.0
<i>Achillea millefolium</i> (yarrow)	0.3	13.3
<i>Sphaeralcea munroana</i> (Munro's globemallow)	0.2	6.7
<i>Machaeranthera canescens</i> (hoary aster)	0.2	13.3
<i>Microsteris gracilis</i> (pink microsteris)	0.2	6.7
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Balsamorhiza careyana</i> (Carey's balsamroot)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Chrysothamnus viscidiflorus</i> (green rabbitbrush)	X	X
<i>Phlox longifolia</i> (longleaf phlox)	X	X
<i>Oenothera pallida</i> (pale evening primrose)	X	X
<i>Astragalus sclerocarpus</i> (stalked pod milkvetch)	X	X
Crust	4.8	100
Soil	42.8	100
Litter	61.3	100
<b>Total canopy cover (litter not included)</b>	132.2	
Total Invasive % Cover	117.3	
Total Native % Cover	14.8	
Change in Native % Cover from 2010	-20.0	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-33. Percent Canopy Cover and Frequency of Occurrence at 120-F-1 in 2010.**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	27.2	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	9.7	100.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	4.0	93.3
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	2.3	93.3
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	1.7	66.7
<i>Microsteris gracilis</i> (pink microsteris)	1.7	66.7
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.5	60.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.0	40.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.8	33.3
<i>Plantago patagonica</i> (Indian wheat)	0.8	33.3
<i>Stipa comata</i> (needle-and-thread grass)	0.5	20.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.5	20.0
<i>Achillea millefolium</i> (yarrow)	0.3	13.3
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	0.3	13.3
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.3	13.3
<i>Festuca octoflora</i> (slender sixweeks)	0.2	6.7
<i>Oenothera pallida</i> (pale evening primrose)	0.2	6.7
<i>Astragalus caricinus</i> (buckwheat milkvetch)	0.2	6.7
<i>Agoseris heterophylla</i> (mountain dandelion)	0.2	6.7
<i>Descurainia pinnata</i> (western tansymustard)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	X	X
<i>Phacelia linearis</i> (threadleaf phacelia)	X	X
<i>Gilia leptomeria</i> (Great Basin gilia)	X	X
<i>Phlox longifolia</i> (longleaf phlox)	X	X
<i>Chaenactis douglasii</i> (hoary falseyarrow)	X	X
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	X	X
<i>Astragalus sclerocarpus</i> (stalked pod milkvetch)	X	X
<i>Eriogonum niveum</i> (snow buckwheat)	X	X
Biotic crust	0.0	0.0
Bare soil	42.7	100.0
Litter	33.2	100.0
<b>Total canopy cover (litter not included)</b>	<b>53.5</b>	
Total Invasive % Cover	18.7	
Total Native % Cover	34.8	
Change in Native % Cover from 2009	+18.3	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-34. Percent Canopy Cover and Frequency of Occurrence at 120-F-1 in 2009.**

Species	% Cover	% Freq of Occ
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	40.5	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	11.8	86.7
<i>Poa sandbergii</i> (Sandberg's bluegrass)	9.7	93.3
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	6.3	66.7
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	4.0	93.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	2.5	66.7
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	1.5	60.0
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	1.2	13.3
<i>Chenopodium leptophyllum</i> <sup>a</sup> (slimleaf goosefoot)	0.7	26.7
<i>Artemisia tridentata</i> (big sagebrush)	0.5	20.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.3	13.3
<i>Plantago patagonica</i> (Indian wheat)	0.3	13.3
<i>Achillea millefolium</i> (yarrow)	0.2	6.7
<i>Sphaeralcea munroana</i> (Munro's globemallow)	0.2	6.7
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.2	6.7
<i>Polemonium micranthum</i> (annual Jacob's ladder)	X	X
<i>Balsamorhiza careyana</i> (Carey's balsamroot)	X	X
<i>Astragalus sclerocarpus</i> (stalked-pod milkvetch)	X	X
<i>Chrysothamnus viscidiflorus</i> (green rabbitbrush)	X	X
<i>Phlox longifolia</i> (longleaf phlox)	X	X
<i>Astragalus caricinus</i> (buckwheat milkvetch)	X	X
<i>Microsteris gracilis</i> (pink microsteris)	X	X
<i>Stipa comata</i> (needle-and-thread grass)	X	X
<i>Phacelia linearis</i> (threadleaf scorpionweed)	X	X
<i>Oenothera pallida</i> (pale eveningprimrose)	X	X
Biotic crust	0.0	0.0
Bare soil	64.2	100.0
Litter	35.8	100.0
<b>Total canopy cover (litter not included)</b>	79.8	
Total Invasive % Cover	63.3	
Total Native % Cover	16.5	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-35. Percent Canopy Cover and Frequency of Occurrence at 1607-F-1 in 2011.**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	69.5	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	18.2	86.7
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	10.0	80.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	9.5	60.0
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	3.3	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.7	33.3
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.3	13.3
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.2	6.7
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.2	6.7
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	X	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Sporobolus cryptandrus</i> (sand dropseed)	X	X
<i>Erigeron pumilus</i> (shaggy fleabane)	X	X
<i>Astragalus caricinus</i> (buckwheat milkvetch)	X	X
Crust	0.2	100.0
Soil	28.8	100.0
Litter	49.3	100.0
<b>Total canopy cover (litter not included)</b>	112.8	
Total Invasive % Cover	94.7	
Total Native % Cover	18.2	
Change in Native % Cover from 2010	-5.1	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-36. Percent Canopy Cover and Frequency of Occurrence at 1607-F1 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	28.0	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	18.5	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	16.2	100.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	4.3	46.7

**Table A-36. Percent Canopy Cover and Frequency of Occurrence at 1607-F1 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	3.8	60.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	2.2	86.7
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.5	20.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.3	13.3
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.2	6.7
<i>Achillea millefolium</i> (yarrow)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Sphaeralcea munroana</i> (Munro's globemallow)	0.2	6.7
<i>Festuca octoflora</i> (slender sixweeks)	0.2	6.7
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	X	X
<i>Descurainia pinnata</i> (western tansymustard)	X	X
<i>Plantago patagonica</i> (Indian wheat)	X	X
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	X
<i>Verbena bracteata</i> <sup>a</sup> (big-bract verbena)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Astragalus caricinus</i> (buckwheat milkvetch)	X	X
<i>Sporobolus cryptandrus</i> (sand dropseed)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	X	X
Crust	0.0	0.0
Soil	57.0	100.0
Litter	39.5	100.0
<b>Total canopy cover (litter not included)</b>	<b>74.7</b>	
Total Invasive % Cover	51.3	
Total Native % Cover	23.3	
Change in Native % Cover from 2009	+6.8	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-37. Percent Canopy Cover and Frequency of Occurrence at 1607-F1 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	60.2	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	13.8	100.0

**Table A-37. Percent Canopy Cover and Frequency of Occurrence at 1607-F1 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	5.7	93.3
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	4.3	73.3
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	2.0	80.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.5	20.0
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	0.3	13.3
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.3	13.3
<i>Festuca octoflora</i> (slender sixweeks)	0.3	13.3
<i>Conyza canadensis</i> <sup>a</sup> (horseweed)	X	X
<i>Sporobolus cryptandrus</i> (sand dropseed)	X	X
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Sphaeralcea munroana</i> (Munroe's globemallow)	X	X
<i>Verbena bracteata</i> <sup>a</sup> (big-bract verbena)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Poa scabrella</i> (pine bluegrass)	X	X
Biotic crust	0.0	0.0
Bare soil	62.2	100.0
Litter	42.3	100.0
<b>Total canopy cover (litter not included)</b>	87.5	
Total Invasive % Cover	71.0	
Total Native % Cover	16.5	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-38. Percent Canopy Cover and Frequency of Occurrence at 100-B-14 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	52.5	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	34.6	96.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	10.2	84.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	5.8	96.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	2.6	28.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	1.3	32.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	1.2	8.0

**Table A-38. Percent Canopy Cover and Frequency of Occurrence at 100-B-14 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.0	40.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.8	12.0
<i>Artemisia tridentata</i> (big sagebrush)	0.8	12.0
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	0.8	8.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.6	24.0
<i>Festuca octoflora</i> (slender sixweeks)	0.2	4.0
<i>Epilobium paniculatum</i> (tall willowherb)	0.1	4.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Ranunculus testiculatus</i> <sup>a</sup> (bur buttercup)	X	X
Crust	0.1	100.0
Soil	5.5	100.0
Litter	34.2	100.0
<b>Total canopy cover (litter not included)</b>	112.5	
Total Invasive % Cover	72.9	
Total Native % Cover	39.6	
Change in Native % Cover from 2010	+25.4	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-39. Percent Canopy Cover and Frequency of Occurrence at 100-B-14 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	14.5	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	7.8	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	6.1	92.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	3.0	44.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.9	76.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	1.2	48.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.1	44.0
<i>Festuca octoflora</i> (slender sixweeks)	1.0	20.0
<i>Epilobium paniculatum</i> (tall willowherb)	0.8	32.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.7	28.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.5	20.0
<i>Artemisia tridentata</i> (big sagebrush)	0.3	12.0
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	0.2	8.0

**Table A-39. Percent Canopy Cover and Frequency of Occurrence at 100-B-14 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.2	8.0
<i>Chaenactis douglasii</i> (hoary falseyarrow)	0.1	4.0
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.1	4.0
<i>Ranunculus testiculatus</i> <sup>a</sup> (bur buttercup)	0.1	4.0
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Agoseris heterophylla</i> (mountain dandelion)	X	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
Biotic crust	0.0	0.0
Bare soil	39.0	100.0
Litter	51.0	100.0
<b>Total canopy cover (litter not included)</b>	39.6	
Total Invasive % Cover	25.4	
Total Native % Cover	14.2	
Change in Native % Cover from 2009	-1.4	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-40. Percent Canopy Cover and Frequency of Occurrence at 100-B-14 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	15.8	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	10.6	96.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	4.3	76.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	2.4	96.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	2.3	72.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	1.6	64.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.5	40.0
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	0.7	28.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.3	12.0
<i>Chorispora tenella</i> (blue mustard)	0.2	8.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.1	4.0
<i>Centaurea diffusa</i> <sup>a</sup> (tumble knapweed)	0.1	4.0
<i>Artemisia tridentata</i> (big sagebrush)	0.1	4.0
<i>Epilobium paniculatum</i> (tall willowherb)	0.1	4.0

**Table A-40. Percent Canopy Cover and Frequency of Occurrence at 100-B-14 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.1	4.0
<i>Festuca octoflora</i> (slender sixweeks)	0.1	4.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.1	4.0
Biotic crust	0.0	0.0
Bare soil	59.8	96.0
Litter	36.5	96.0
<b>Total canopy cover (litter not included)</b>	40.4	
Total Invasive % Cover	25.1	
Total Native % Cover	15.3	
Change in Native % Cover from 2008	+7.5	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-41. Percent Canopy Cover and Frequency of Occurrence at 100-B-14 South in 2008. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	31.4	100
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	7.3	76
Native Grasses <sup>b</sup>	6.7	76
<i>Artemisia tridentata</i> (sagebrush)	0.1	4
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	1.1	24
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.9	16
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	0.6	4
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	0.1	4
<i>Festuca octoflora</i> (slender sixweeks)	0.1	4
<i>Poa bulbosa</i> <sup>a</sup> (Bulbous bluegrass)	X	X
<i>Epilobium paniculatum</i> (tall willowherb)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	X
<i>Ranunculus testiculatus</i> <sup>a</sup> (bur buttercup)	X	X
Biotic Crust	0	0
Bare Soil	50.8	96
Litter	46.8	88
<b>Total canopy cover (litter not included)</b>	48.3	
Total Invasive % Cover	40.5	

**Table A-41. Percent Canopy Cover and Frequency of Occurrence at 100-B-14 South in 2008. (2 Pages)**

Species	% Cover	% Freq of Occ
Total Native % Cover	7.8	

<sup>a</sup> Invasive species

<sup>b</sup> Includes Sandberg's bluegrass, bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, needle-and-thread grass, and prairie junegrass seedlings.

X = species present but not counted in plot frames

**Table A-42. Percent Canopy Cover and Frequency of Occurrence at 118-B-1 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	57.4	96.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	42.0	96.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	16.3	96.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	5.9	40.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.5	20.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.2	8.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.1	4.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.1	4.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.1	4.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	1.0	20.0
<i>Artemisia tridentata</i> (big sagebrush)	1.7	12.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.2	8.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.1	4.0
<i>Erigeron pumilus</i> (shaggy fleabane)	0.1	4.0
<i>Festuca octoflora</i> (slender sixweeks)	0.1	4.0
<i>Vulpia myuros</i> <sup>a</sup> (rattail fescue)	0.1	4.0
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.1	4.0
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Chaenactis douglasii</i> (hoary falseyarrow)	X	X
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	X	X
Crust	0.7	100
Soil	27.1	100
Litter	69.9	100
<b>Total canopy cover (litter not included)</b>	126.0	
Total Invasive % Cover	60.7	
Total Native % Cover	65.3	

**Table A-42. Percent Canopy Cover and Frequency of Occurrence at 118-B-1 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
Change in Native % Cover from 2010	+39.4	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-43. Percent Canopy Cover and Frequency of Occurrence at 118-B-1 in 2010. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	25.7	6.9	100.0	96.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	19.5	16.3	96.0	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	13.2	14.0	88.0	96.0
<i>Festuca octoflora</i> (slender sixweeks)	3.2	0.7	16.0	28.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	2.3	1.9	36.0	56.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	2.0	1.5	40.0	60.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.7	0.1	28.0	4.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.7	X	8.0	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.3	0.7	12.0	28.0
<i>Epilobium paniculatum</i> (tall willowherb)	--	0.5	--	20.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.4	0.3	16.0	12.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.1	0.3	4.0	12.0
<i>Artemisia tridentata</i> (big sagebrush)	0.1	0.3	4.0	12.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	--	0.3	--	12.0
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	0.2	0.1	8.0	4.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.1	0.2	4.0	8.0
<i>Achillea millefolium</i> (yarrow)	X	0.2	X	8.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.1	--	4.0	--
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	--	0.1	--	4.0
<i>Microsteris gracilis</i> (pink microsteris)		0.1		4.0
<i>Machaeranthera canescens</i> (hoary aster)	X	--	X	--
<i>Layia glandulosa</i> (white-daisy tidytips)	X	--	X	--
<i>Vulpia myuros</i> <sup>a</sup> (rat-tail fescue)	X	X	X	X
<i>Verbena bracteata</i> <sup>a</sup> (big-bract verbena)	--	X	--	X
<i>Sphaeralcea munroana</i> (Munro's globemallow)	--	X	--	X
Biotic crust	0.0	0.0	0.0	0.0
Bare soil	38.1	50.5	100.0	100.0
Litter	55.0	43.7	100.0	100.0

**Table A-43. Percent Canopy Cover and Frequency of Occurrence at 118-B-1 in 2010. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
<b>Total canopy cover (litter not included)</b>	68.6	44.5		
Total Invasive % Cover	42.7	24.1		
Total Native % Cover	25.9	21.1		
Change in Native % Cover from 2009	+4.9	+5.1		

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

-- = species not observed on site

**Table A-44. Percent Canopy Cover and Frequency of Occurrence at the 118-B-1 Burial Ground and Soil Staging Area 2009. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	33.3	31.1	96.0	96.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	10.6	6.4	96.0	96.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	7.4	8.6	68.0	76.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	6.3	7.3	60.0	60.0
<i>Festuca octoflora</i> (slender sixweeks)	1.7	0.3	12.0	12.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.0	2.4	40.0	56.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.8	0.1	12.0	4.0
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	0.7	0.1	8.0	4.0
<i>Vulpia myuros</i> <sup>a</sup> (rattail fescue)	0.1	0.7	4.0	8.0
<i>Melilotus alba</i> <sup>a</sup> (white sweetclover)	X	0.6	X	4.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.3	--	12.0	--
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.3	0.2	12.0	8.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.1	0.3	4.0	12.0
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	--	0.2	--	8.0
<i>Koeleria cristata</i> (prairie junegrass)	0.1	0.1	4.0	4.0
<i>Artemisia tridentata</i> (big sagebrush)	X	0.1	X	4.0
<i>Epilobium paniculatum</i> (tall willowherb)	0.1	--	4.0	--
<i>Centaurea diffusa</i> <sup>a</sup> (tumble knapweed)	--	0.1	--	4.0
<i>Eriogonum niveum</i> (snow buckwheat)	--	0.1	--	4.0
<i>Lepidium perfoliatum</i> (clasping pepperweed)	--	0.1	--	4.0
<i>Agoseris heterophylla</i> (annual mountain dandelion)	--	0.1	--	4.0
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	X	--	X	--
<i>Machaeranthera canescens</i> (hoary aster)	X	--	X	--
<i>Achillea millefolium</i> (yarrow)	X	X	X	X

**Table A-44. Percent Canopy Cover and Frequency of Occurrence at the 118-B-1 Burial Ground and Soil Staging Area 2009. (2 Pages)**

Species	% Cover BG	% Cover SSA	% Freq of Occ BG	% Freq of Occ SSA
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	--	X	--
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	--	X	--
<i>Verbena bracteata</i> <sup>a</sup> (big-bract verbena)	--	X	--	X
Biotic crust	0.0	0.0	0.0	0.0
Bare soil	45.9	64.6	96.0	100.0
Litter	50.4	30.4	100.0	92.0
<b>Total canopy cover (litter not included)</b>	<b>62.8</b>	<b>58.9</b>		
Total Invasive % Cover	42.1	43		
Total Native % Cover	20.7	15.9		
Change in Native % Cover from 2008	+9.4	+1.0		

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

-- = species not observed on site

**Table A-45. Percent Canopy Cover and Frequency of Occurrence at the 118-B-1 Burial Ground and Soil Staging Area 2008. (2 Pages)**

Species	% Cover SSA	% Cover BG	% Freq of Occ SSA	% Freq of Occ BG
Native Grasses <sup>a</sup>	11.0	13.6	76.0	84.0
<i>Salsola kalif</i> <sup>b</sup> (Russian thistle)	4.5	3.8	64.0	72.0
<i>Bromus tectorum</i> <sup>b</sup> (cheatgrass)	1.2	2.0	28.0	24.0
<i>Lactuca serriola</i> <sup>b</sup> (prickly lettuce)	0.1	--	4.0	--
<i>Sisymbrium altissimum</i> <sup>b</sup> (tumble mustard)	0.3	0.6	12.0	24.0
<i>Poa bulbosa</i> <sup>b</sup> (Bulbous bluegrass)	0.2	X	8.0	X
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.1	0.4	4.0	16.0
<i>Festuca octoflora</i> (slender sixweeks)	0.1	0.6	4.0	4.0
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.1	--	4.0	--
<i>Melilotus alba</i> <sup>b</sup> (sweetclover)	0.1	X	4.0	X
<i>Microsteris gracilis</i> (pink microsteris)	X	--	X	--
<i>Chenopodium leptophyllum</i> (slimleaf goosefoot)	X	X	X	X
<i>Erodium cicutarium</i> <sup>b</sup> (storksbill)	X	0.2	X	8.0
<i>Lactuca serriola</i> <sup>b</sup> (prickly lettuce)	X	0.1	X	4.0
<i>Artemisia tridentata</i> (sagebrush)	X	0.3	X	12.0
<i>Amsinckia lycopsoides</i> (fiddleneck)	X	X	X	X
<i>Achillea millefolium</i> (yarrow)	X	--	X	--

**Table A-45. Percent Canopy Cover and Frequency of Occurrence at the 118-B-1 Burial Ground and Soil Staging Area 2008. (2 Pages)**

Species	% Cover SSA	% Cover BG	% Freq of Occ SSA	% Freq of Occ BG
<i>Centaurea diffusa</i> <sup>b</sup> (diffuse knapweed)	--	0.2	--	8.0
<i>Descurainia pinnata</i> (western tansymustard)	--	X	--	X
<i>Chorispora tenella</i> <sup>b</sup> (blue mustard)	--	X	--	X
<i>Hordeum leporinum</i> <sup>b</sup> (hare barley)	--	X	--	X
Biotic crust	0.0	0.0	0.0	0.0
Bare soil	48.8	38.7	92.0	92.0
Litter	50.0	58.6	100.0	100.0
<b>Total canopy cover (litter not included)</b>	17.7	21.8		
Total Invasive % Cover	6.4	6.9		
Total Native % Cover	11.3	14.9		

<sup>a</sup> Includes Sandberg's bluegrass, bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, needle-and-thread grass, and prairie junegrass seedlings.

<sup>b</sup> Invasive species

X = species present but not counted in plot frames

-- = species not observed in area

**Table A-46. Percent Canopy Cover and Frequency of Occurrence at 100-B-28 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	82.7	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	25.3	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	13.0	84.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	9.0	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	2.0	88.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	1.3	72.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.0	64.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.8	60.0
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.7	56.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.5	52.0
<i>Ranunculus testiculatus</i> <sup>a</sup> (bur buttercup)	0.5	52.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.3	48.0
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.3	48.0
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	0.3	48.0
<i>Grayia spinosa</i> (spiny hopsage)	0.2	44.0
<i>Epilobium paniculatum</i> (tall willowherb)	X	X
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	X	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	X

**Table A-46. Percent Canopy Cover and Frequency of Occurrence at 100-B-28 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
Crust	2.2	100.0
Soil	18.0	100.0
Litter	78.2	100.0
<b>Total canopy cover (litter not included)</b>	138.0	
Total Invasive % Cover	41.3	
Total Native % Cover	96.7	
Change in Native % Cover from 2010	+56.2	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-47. Percent Canopy Cover and Frequency of Occurrence at 100-B-27 in 2011. (2 Pages)**

Species	% Cover East	% Cover West	% Freq of Occ East	% Freq of Occ West
<i>Poa sandbergii</i> (Sandberg's bluegrass)	18.5	30.3	100.0	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	4.8	2.8	93.3	80.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	21.3	4.2	93.3	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	24.8	4.0	100.0	93.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	2.3	3.5	60.0	73.3
<i>Grayia spinosa</i> (spiny hopsage)	--	0.2	--	6.7
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	--	0.2	--	6.7
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	--	3.7	--	53.3
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	--	0.7	--	26.7
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	--	0.2	--	6.7
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.2	--	6.7	--
<i>Artemisia tridentata</i> (big sagebrush)	0.2	0.5	6.7	20.0
<i>Descurainia pinnata</i> (western tansymustard)	4.7	--	26.7	--
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.7	--	26.7	--
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	1.2	--	13.3	--
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.7	--	26.7	--
<i>Hordeum leporinum</i> <sup>a</sup> (Hare barley)	0.2	--	6.7	--
<i>Ranunculus testiculatus</i> <sup>a</sup> (bur buttercup)	0.2	--	6.7	--
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	X	--	X	--
<i>Centaurea repens</i> <sup>a</sup> (diffuse knapweed)	X	--	X	--
Crust	0.2	0.0	100.0	100.0
Soil	36.0	20.2	100.0	100.0
Litter	61.5	75.2	100.0	100.0

**Table A-47. Percent Canopy Cover and Frequency of Occurrence at 100-B-27 in 2011. (2 Pages)**

Species	% Cover East	% Cover West	% Freq of Occ East	% Freq of Occ West
<b>Total canopy cover (litter not included)</b>	79.7	50.2		
Total Invasive % Cover	29.7	11.5		
Total Native % Cover	50.0	38.7		
Change in Native % Cover from 2010	+39.1			

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-48. Percent Canopy Cover and Frequency of Occurrence at 100-B-27 in 2010.**

Species	% Cover	% Freq of Occ
Native grasses <sup>b</sup>	10.8	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	0.4	16.0
<i>Salsola kalii</i> <sup>a</sup> (Russian thistle)	1.5	40.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	0.7	28.0
<i>Artemisia tridentata</i> (big sagebrush)	0.1	4.0
<i>Melilotus alba</i> <sup>a</sup> (sweetclover)	0.1	4.0
<i>Chenopodium album</i> <sup>a</sup> (lamb's quarters)	X	X
<i>Agoseris heterophylla</i> (mountain dandelion)	X	X
<i>Bromus japonicus</i> <sup>a</sup> (Japanese brome)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	X	X
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Centaurea diffusa</i> <sup>a</sup> (diffuse knapweed)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
Biotic crust	0.0	0.0
Bare soil	26.5	92.0
Litter	57.8	100.0
<b>Total canopy cover (litter not included)</b>	13.6	
Total Invasive % Cover	2.7	
Total Native % Cover	10.9	

<sup>a</sup> Invasive species

<sup>b</sup> Includes Sandberg's bluegrass, bluebunch wheatgrass, thickspike wheatgrass, Indian ricegrass, needle-and-thread grass, and prairie junegrass seedlings.

X = species present but not counted in plot frames

**Table A-49. Percent Canopy Cover and Frequency of Occurrence at 600-111 in 2011.**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	40.0	80.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	20.0	100.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	9.5	60.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	2.0	80.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	1.7	33.3
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.7	26.7
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Erodium cicutarium</i> <sup>a</sup> (storksbill)	0.2	6.7
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	X	X
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	X	X
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	X	X
Crust	32.0	100.0
Soil	46.8	100.0
Litter	41.2	100.0
<b>Total canopy cover (litter not included)</b>	74.2	
Total Invasive % Cover	34.0	
Total Native % Cover	40.2	
Change in Native % Cover from 2010	+21.9	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-50. Percent Canopy Cover and Frequency of Occurrence at 600-111 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	10.7	100.0
<i>Poa scabrella</i> (pine bluegrass)	8.7	80.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	4.0	93.3
<i>Poa sandbergii</i> (Sandberg's bluegrass)	3.3	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	3.2	93.3
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.3	53.3
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	1.2	13.3
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.0	40.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	0.8	33.3

**Table A-50. Percent Canopy Cover and Frequency of Occurrence at 600-111 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Stipa comata</i> (needle-and-thread grass)	0.7	26.7
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	0.5	20.0
<i>Achillea millefolium</i> (yarrow)	0.5	20.0
<i>Descurainia pinnata</i> (western tansymustard)	0.5	20.0
<i>Gilia leptomeria</i> (Great Basin gilia)	0.5	20.0
<i>Agropyron dasytachyum</i> (thickspike wheatgrass)	0.3	13.3
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.2	6.7
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.2	6.7
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.2	6.7
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	0.2	6.7
<i>Agropyron cristatum</i> <sup>a</sup> (crested wheatgrass)	X	X
<i>Vicia cracca</i> <sup>a</sup> (bird vetch)	X	X
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	X	X
<i>Machaeranthera canescens</i> (hoary aster)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Amsinckia lycopsoides</i> (tarweed fiddleneck)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
Crust	0.0	0.0
Soil	39.0	100.0
Litter	41.2	100.0
<b>Total canopy cover (litter not included)</b>	<b>37.7</b>	
Total Invasive % Cover	19.5	
Total Native % Cover	18.3	
Change in Native % Cover from 2009	-13.2	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-51. Percent Canopy Cover and Frequency of Occurrence at 600-111 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Salsola kalii</i> <sup>a</sup> (Russian thistle)	34.0	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	15.3	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	13.8	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	8.2	100.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	7.8	86.7
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	0.7	26.7
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	0.3	13.3

**Table A-51. Percent Canopy Cover and Frequency of Occurrence at 600-111 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.3	13.3
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	0.3	13.3
<i>Achillea millefolium</i> (yarrow)	0.2	6.7
<i>Artemisia tridentata</i> (big sagebrush)	0.2	6.7
<i>Ambrosia acanthicarpa</i> (bur ragweed)	0.2	6.7
<i>Polemonium micranthum</i> (annual Jacob's ladder)	X	X
<i>Chenopodium leptophyllum</i> <sup>a</sup> (slimleaf goosefoot)	X	X
<i>Melilotus alba</i> <sup>a</sup> (white sweetclover)	X	X
<i>Descurainia pinnata</i> (western tansymustard)	X	X
<i>Lepidium perfoliatum</i> <sup>a</sup> (clasping pepperweed)	X	X
<i>Triticum aestivum</i> <sup>a</sup> (wheat)	X	X
<i>Stipa comata</i> (needle-and-thread grass)	X	X
Biotic crust	0.0	0.0
Bare soil	56.8	100.0
Litter	41.5	100.0
<b>Total canopy cover (litter not included)</b>	<b>81.3</b>	
Total Invasive % Cover	51.3	
Total Native % Cover	30.0	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-52. Percent Canopy Cover and Frequency of Occurrence at 600-149:2 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa sandbergii</i> (Sandberg's bluegrass)	86.0	100.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	13.5	93.3
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	10.0	100.0
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	2.2	20.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	2.2	53.3
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	2.0	80.0
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	1.0	6.7
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	0.8	33.3
<i>Festuca octoflora</i> (slender sixweeks)	0.5	20.0
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	0.2	6.7
<i>Tragopogon dubius</i> <sup>a</sup> (yellow salsify)	0.2	6.7
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.2	6.7

**Table A-52. Percent Canopy Cover and Frequency of Occurrence at 600-149:2 in 2011. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.2	6.7
<i>Achillea millefolium</i> (yarrow)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
Crust	14.0	100.0
Soil	14.0	100.0
Litter	86.0	100.0
<b>Total canopy cover (litter not included)</b>	118.8	
Total Invasive % Cover	30.0	
Total Native % Cover	88.8	
Change in Native % Cover from 2010	+67.1	

<sup>a</sup> Invasive species

X=present but not counted in plot frames

**Table A-53. Percent Canopy Cover and Frequency of Occurrence at 600-149:2 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	10.5	100.0
<i>Poa scabrella</i> (pine bluegrass)	8.7	80.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	5.7	100.0
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	4.0	93.3
<i>Descurainia pinnata</i> (western tansymustard)	2.3	60.0
<i>Draba verna</i> <sup>a</sup> (spring whitlowgrass)	2.0	80.0
<i>Salsola kal</i> <sup>a</sup> (Russian thistle)	1.8	73.3
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	1.5	60.0
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.5	60.0
<i>Holosteum umbellatum</i> <sup>a</sup> (jagged chickweed)	1.3	53.3
<i>Stipa comata</i> (needle-and-thread grass)	1.3	20.0
<i>Achillea millefolium</i> (yarrow)	0.7	26.7
<i>Artemisia tridentata</i> (big sagebrush)	0.3	13.3
<i>Oryzopsis hymenoides</i> (Indian ricegrass)	0.2	6.7
<i>Hordeum leporinum</i> <sup>a</sup> (hare barley)	0.2	6.7
<i>Poa bulbosa</i> <sup>a</sup> (bulbous bluegrass)	0.2	6.7
<i>Plantago patagonica</i> (Indian wheat)	0.2	6.7
<i>Festuca octoflora</i> (slender sixweeks)	0.2	6.7
<i>Chrysothamnus nauseosus</i> (gray rabbitbrush)	X	X

**Table A-53. Percent Canopy Cover and Frequency of Occurrence at 600-149:2 in 2010. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Grayia spinosa</i> (spiny hopsage)	X	X
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	X	X
<i>Eriogonum niveum</i> (snow buckwheat)	X	X
<i>Ambrosia acanthicarpa</i> (bur ragweed)	X	X
Crust	0.0	0.0
Soil	49.8	100.0
Litter	31.0	100.0
<b>Total canopy cover (litter not included)</b>	42.5	
Total Invasive % Cover	20.8	
Total Native % Cover	21.7	
Change in Native % Cover from 2009	-26.7	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**Table A-54. Percent Canopy Cover and Frequency of Occurrence at 600-149 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
<i>Agropyron spicatum</i> (bluebunch wheatgrass)	29.5	100.0
<i>Poa sandbergii</i> (Sandberg's bluegrass)	17.8	100.0
<i>Salsola kali</i> <sup>a</sup> (Russian thistle)	13.7	93.3
<i>Sisymbrium altissimum</i> <sup>a</sup> (tumble mustard)	4.3	73.3
<i>Sitanion hystrix</i> (bottlebrush squirreltail)	1.5	60.0
<i>Bromus tectorum</i> <sup>a</sup> (cheatgrass)	1.2	46.7
<i>Draba verna</i> <sup>a</sup> (spring whitlow)	1.2	46.7
<i>Chenopodium album</i> <sup>a</sup> (lamb's quarters)	0.3	13.3
<i>Melilotus alba</i> <sup>a</sup> (white sweetclover)	0.3	13.3
<i>Plantago patagonica</i> (Indian wheat)	0.2	6.7
<i>Lactuca serriola</i> <sup>a</sup> (prickly lettuce)	0.2	6.7
<i>Chorispora tenella</i> <sup>a</sup> (blue mustard)	X	X
<i>Descurainia pinnata</i> (western tansymustard)	X	X
<i>Vulpia myuros</i> <sup>a</sup> (rattail fescue)	X	X
<i>Artemisia tridentata</i> (big sagebrush)	X	X
<i>Grayia spinosa</i> (spiny hopsage)	X	X
Biotic crust	0.0	0.0
Bare soil	45.8	100.0

**Table A-54. Percent Canopy Cover and Frequency of Occurrence at 600-149 in 2009. (2 Pages)**

Species	% Cover	% Freq of Occ
Litter	50.7	100.0
<b>Total canopy cover (litter not included)</b>	70.2	
Total Invasive % Cover	21.2	
Total Native % Cover	49.0	

<sup>a</sup> Invasive species

X = species present but not counted in plot frames

**APPENDIX B  
NAME CHANGES INCLUDED IN INTEGRATED  
TAXONOMIC INFORMATION SYSTEM**



## APPENDIX B

### NAME CHANGES INCLUDED IN INTEGRATED TAXONOMIC INFORMATION SYSTEM

Name changes included in Integrated Taxonomic Information System.

The following list includes recent name changes for species mentioned in this report. The first name is that used in Hitchcock and Cronquist (1973) and the second is the more recent version.

*Agropyron cristatum* = *Agropyron desertorum*

*Agropyron dasytachyum* = *Elymus lanceolatus* var. *lanceolatus*

*Agropyron spicatum* = *Pseudoroegneria spicata* ssp. *spicata*

*Chrysothamnus nauseosus* = *Ericameria nauseosa* ssp. *nauseosa* var. *nauseosa*

*Cymopterus terebinthinus* = *Pteryxia terebinthina* var. *terebinthina*

*Epilobium paniculatum* = *Epilobium brachycarpum*

*Erysimum asperum* = *Erysimum capitatum* var. *capitatum*

*Festuca octoflora* = *Vulpia octoflora* var. *octoflora*

*Koeleria cristata* = *Koeleria macrantha*

*Microsteris gracilis* = *Phlox gracilis* ssp. *gracilis*

*Oryzopsis hymenoides* = *Achnatherum hymenoides*

*Poa sandbergii* = *Poa secunda*

*Poa scabrella* = *Poa secunda*

*Psoralea lanceolata* = *Psoralidium lanceolatum*

*Ranunculus testiculatus* = *Ceratocephala testiculata*

*Salsola kali* = *Salsola tragus*

*Sitanion hystrix* = *Elymus elymoides* ssp. *elymoides*

*Stipa comata* = *Hesperostipa comata* ssp. *comata*

#### References

Hitchcock, C. L., and A. Cronquist, 1973, *Flora of the Pacific Northwest*, University of Washington Press, Seattle, Washington.



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