

## **Appendix C**

### **2009 Revegetation Success Monitoring**

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**2009 Revegetation Success Monitoring**

**Central Nevada Test Area  
Corrective Action Unit 417  
UC-1 Central Mud Pit**

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## 1.0 Introduction and Purpose

The UC-1 Central Mud Pit (CMP), located within Corrective Action Unit 417 at the Central Nevada Test Area in Hot Creek Valley, was reclaimed in 2000. During reclamation, the hydrocarbon-containing drilling muds and other associated materials within the mud pit were covered with clean soil. In fall 2000, the constructed soil cover was seeded with a mix of native plant species, and in spring 2001, it was planted with 5,000 vegetation transplants. A fence was installed around the perimeter of the mud pit, enclosing an area approximately 2 hectares (5 acres) in size. Adjacent disturbances outside the fence to the south and west and a small area across the diversion channel to the southwest, totaling 1.5 hectares (3.7 acres), were also seeded in 2000.

Ecologists monitored the success of the revegetation effort annually between 2001 and 2007. Results of these monitoring efforts have been documented in U.S. Department of Energy, National Nuclear Security Administration and Office of Legacy Management, post-closure inspection and monitoring reports (Anderson 2005 and 2006; U.S. Department of Energy 2007). Revegetation reached success criteria on the CMP and its perimeter areas in 2006 (Anderson 2006). The purpose of vegetation monitoring after 2006 is to ensure that plant cover remains healthy and continues to meet the success criterion and that soils remain stable, in accordance with post-closure monitoring requirements.

## 2.0 Monitoring Methods

Because the revegetation effort on the CMP cover was considered successful in 2006, the revegetation monitoring methods used since then are less quantitative and intensive than those used prior to the achievement of success. First, simple observations of plant health are made, and second, a comparison of vegetation cover in the CMP area with vegetation cover in a nearby, undisturbed area are made. Vegetation cover is measured semiquantitatively by making visual estimates in 1-meter-square sampling quadrats. Quadrats are located randomly throughout the sampled areas by choosing a direction and then pacing a random number of steps. Ten quadrats are placed on the CMP cover, ten are placed in the perimeter area outside the CMP fence, and ten are placed in the undisturbed area north of the site.

This report contains common names of the plant species identified in the field. The scientific names associated with the common names are listed in Attachment A. Photographs are in Attachment B.

## 3.0 Results and Recommendations

Vegetation on the CMP cover, in the revegetated area outside the CMP fence, and in a native, undisturbed area north of the cover was assessed on June 23, 2009. Plants within the revegetated areas, within and outside the fenced area, and in the native, undisturbed area appeared to be healthy. From July 1, 2008 through June 30, 2009, annual precipitation totaled 7.44 inches. Between January 2009 and May 2009, the area received a total of 3.92 inches (Figure 3–7 in the *Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area Surface, Hot Creek Valley, Nevada*).

The revegetation effort on and adjacent to the CMP cover is considered successful when the total plant cover equals or exceeds 70 percent of total plant cover in the native, undisturbed area (Anderson 2005, 2006). Table 1 summarizes the plant species and cover percentages found within ten random quadrats in the native, undisturbed area. In 2009, total plant cover in the native, undisturbed area averaged 18 percent; hence, the success criterion for revegetated areas in 2009 is established at 13 percent. A general view of the native, undisturbed area is shown in Attachment B in photograph 1, and a typical sampling quadrat is shown in photograph 2.

*Table 1. Vegetation Cover (Percent) in Native, Undisturbed Area*

Species/Quad	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
<b>Shrubs</b>										
Big sagebrush	15	8	9	3	28	12	5	9	25	7
Thread snakeweed	0	0	1	1	0	0	0	0	0	10
<b>Grasses</b>										
Bottlebrush squirreltail	0	0	0	0	0	0	0	0	0	2
Galleta grass	2	5	3	7	2	6	7	6	0	1
Needle-and-thread grass	3	0	0	0	0	0	0	0	3	0
<b>Total Plant Cover</b>	<b>20</b>	<b>13</b>	<b>13</b>	<b>11</b>	<b>30</b>	<b>18</b>	<b>12</b>	<b>15</b>	<b>28</b>	<b>20</b>
Litter	5	5	6	5	20	4	8	5	15	10
Rock	55	65	66	64	35	55	65	65	42	45
Bare Ground	20	17	15	20	15	23	15	15	15	25

Other species observed: Mormon tea, spiny hopsage, spiny horsebrush.

On the CMP cover, total plant cover averaged 23 percent (Table 2) in 2009. This compares favorably to the 18 percent average cover estimated in 2007 and to the 2009 success criterion of 13 percent. Whereas the native, undisturbed area is dominated by sagebrush, the CMP cover is dominated by a variety of shrubs, including sagebrush. Grass cover on the CMP is somewhat less than that on the native, undisturbed area. Photographs 3–5 in Attachment B show views of the CMP cover vegetation, and photograph 6 shows a typical sampling quadrat.

Total vegetation cover in revegetated areas peripheral to the fenced site averaged 14 percent (Table 3), which is comparable to the 15 percent cover estimated in 2007 and to the 13-percent success criterion. As in previous years, the vegetation had been noticeably grazed. The ground was covered in rabbit and antelope/deer scat, and only a trace of grass was found overall. Photographs 7–10 show general conditions in this area, and photograph 11 shows a typical sampling quadrat.

Revegetation of the CMP cover and perimeter area continues to be considered successful, especially given the paucity of precipitation in the last 1.5 years. Table 4 compares total, shrub, grass, and forb cover in the three sampled areas.

Table 2. Vegetation Cover (Percent) on the CMP Cover

Species/Quad	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
<b>Shrubs</b>										
Big sagebrush	0	0	15	0	0	8	0	0	3	0
Douglas rabbitbrush	0	0	0	0	2	0	0	0	0	0
Rubber rabbitbrush	0	0	0	12	10	0	0	0	17	3
Fourwing saltbush	0	4	0	8	2	1	1	0	3	5
Thread snakeweed	21	40	5	1	10	10	8	12	0	12
<b>Grasses</b>										
Indian ricegrass	0	0	0	0	0	0	0	2	0	4
Galleta grass	4	0	0	0	0	3	0	0	0	0
<b>Forbs</b>										
Western sticktight	0	0	trace	0	0	0	0	0	0	0
Unknown forb	0	0	trace	trace	0	0	0	0	0	0
<b>Total Plant Cover</b>	<b>25</b>	<b>44</b>	<b>20</b>	<b>21</b>	<b>24</b>	<b>22</b>	<b>9</b>	<b>14</b>	<b>23</b>	<b>24</b>
Litter	15	30	15	10	8	10	8	14	15	15
Rock	30	15	35	34	40	34	45	40	31	31
Bare Ground	30	11	30	35	28	34	38	32	31	30

Other species observed: aster, bottlebrush squirreltail, cheatgrass, halogeton, miniature woollystar, Nelson globemallow, tumble mustard.

Table 3. Vegetation Cover (Percent) in CMP Perimeter Area

Species/Quad	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
<b>Shrubs</b>										
Big sagebrush	0	0	0	8	0	0	0	5	0	0
Douglas rabbitbrush	0	0	0	0	0	0	0	0	5	0
Rubber rabbitbrush	0	0	0	0	0	0	20	0	0	7
Fourwing saltbush	0	3	30	19	0	0	0	0	trace	0
Thread snakeweed	0	0	0	0	0	0	0	0	0	18
<b>Grasses</b>										
Bottlebrush squirreltail	0	0	1	0	0	0	0	0	0	0
Cheatgrass	1	0	0	0	0	0	0	0	0	0
<b>Forbs</b>										
Halogeton	7	0	0	0	5	2	0	0	0	0
Miniature woollystar	0	0	2	0	0	trace	0	0	2	0
Russian thistle	0	0	0	0	0	0	0	0	trace	0
Boraginaceae, unknown species	0	0	0	0	0	3	0	0	0	0
Unknown forb	trace	0	0	0	2	0	0	0	0	0
<b>Total Plant Cover</b>	<b>8</b>	<b>3</b>	<b>33</b>	<b>27</b>	<b>7</b>	<b>5</b>	<b>20</b>	<b>5</b>	<b>7</b>	<b>25</b>
Litter	5	7	17	8	13	10	25	8	40	10
Rock	12	40	20	30	45	50	25	45	25	30
Bare Ground	75	50	30	35	35	35	30	42	28	35

Other species observed: wild buckwheat, common groundsel, flixweed, Indian ricegrass, Nelson globemallow, evening primrose, tumble mustard.

Table 4. Comparison of Average Vegetation Cover (Percent)

Sampled Area	Total Plant Cover	Shrub Cover	Grass Cover	Forb Cover
Native, Undisturbed Area	18	12.5	5.5	0
CMP Cover	23	21.5	1.5	trace
CMP Perimeter	14	12	trace	2

Given the success of the revegetation effort at UC-1, it is not necessary to conduct plant cover assessments every year. Inspectors should continue to observe plants in revegetated areas each year and report obvious changes in plant health or cover. If obvious changes are noted, an ecologist or reclamation specialist should visit the site and determine if action is needed; otherwise, vegetation surveys should occur every 2 years.

## 4.0 References

Anderson, D., 2005. *Revegetation Success Monitoring, Corrective Action Unit 417 Central Nevada Test Area—Surface, Hot Creek Valley, Nevada*, included as Appendix to *Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area – Surface, Hot Creek Valley, Nevada For Calendar Year 2005*, DOE/NV-1122, U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Office, April 2006.

Anderson, D., 2006. *Revegetation Success Monitoring, Central Nevada Test Area Corrective Action Unit 417*, included as Appendix C to *Draft Post-Closure Inspection and Monitoring Report for Corrective Action Unit 417: Central Nevada Test Area – Surface, Hot Creek Valley, Nevada*, DOE/NV/25946-168, U.S. Department of Energy, National Nuclear Security Administration, Nevada Site Office, April 2007.

U.S. Department of Energy, 2007. *2007 Revegetation Success Monitoring, Central Nevada Test Area Corrective Action Unit 417, UC-1 Central Mud Pit*, prepared by S.M. Stoller Corporation for U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado.

## **Attachment A**

### **Common and Scientific Names of Plant Species Identified at Central Nevada Test Area**

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**Common and Scientific Names of Plant Species Identified at  
Central Nevada Test Area**

Common Name	Scientific Name
<b>Shrubs</b>	
Big Sagebrush	<i>Artemisia tridentata</i>
Douglas rabbitbrush	<i>Chrysothamnus viscidiflorus</i>
Fourwing saltbush	<i>Atriplex canescens</i>
Mormon tea	<i>Ephedra viridis</i>
Rubber rabbitbrush	<i>Ericameria nauseosa</i>
Spiny hopsage	<i>Grayia spinosa</i>
Spiny horsebrush	<i>Tetradymia spinosa</i>
Thread snakeweed	<i>Gutierrezia microcephala</i>
<b>Grasses</b>	
Bottlebrush squirreltail	<i>Elymus elymoides</i>
Cheatgrass	<i>Bromus tectorum</i>
Galleta grass	<i>Pleuraphis jamesii</i>
Indian ricegrass	<i>Achnatherum hymenoides</i>
Needle-and-thread grass	<i>Hesperostipa comata</i>
<b>Forbs</b>	
Aster	<i>Aster species</i>
Common groundsel	<i>Senecio vulgaris</i>
Evening primrose	<i>Oenothera species</i>
Flixweed	<i>Descurainia sophia</i>
Halogeton	<i>Halogeton glomeratus</i>
Miniature woollystar	<i>Eriastrum diffusum</i>
Nelson globemallow	<i>Sphaeralcea parvifolia</i>
Tumble mustard	<i>Sisymbrium altissimum</i>
Western sticktight	<i>Lappula occidentalis</i>
Wild buckwheat	<i>Eriogonum species</i>

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## **Attachment B**

### **Photographs**

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## Photographs

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*Photograph 1. View SW of native, undisturbed area*



*Photograph 2. Typical quadrat in the native, undisturbed area*



*Photograph 3. View SE of CMP cover vegetation from N entry gate*



*Photograph 4. View S of CMP cover vegetation from N entry gate*



*Photograph 5. View SW of CMP cover vegetation from N entry gate*



*Photograph 6. Typical quadrat on the CMP cover*



*Photograph 7. View E of N perimeter area vegetation*



*Photograph 8. View E of S perimeter area vegetation*



*Photograph 9. View NE of SE perimeter area vegetation*



*Photograph 10. View SSE of arroyo in E perimeter area*



*Photograph 11. Typical quadrat in perimeter area*