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Integrated Disposal Facility Sagebrush Habitat Mitigation Project: FY2007 Compensation Area Monitoring Report

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Prepared for CH2MHill Hanford Group, Inc.
By
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IDF Sagebrush Habitat Mitigation Project: FY2007 Compensation Area Monitoring Report

1.0 Introduction

Mitigation actions for habitat losses associated with the Integrated Disposal Facility (IDF) project, as described in the project Mitigation Action Plan (MAP) (DOE 2006), included a compensatory planting of 116,600 Wyoming big sagebrush (*Artemisia tridentata* ssp *wyomingensis*) seedlings (CHG 2005). Additional activities included the installation of 22 artificial owl burrows. This summary report provides compensation area monitoring results, discusses issues identified, and presents recommendations for the successful completion of mitigation planting activities.

2.0 Background

Development of the site for the IDF disturbed approximately 107 acres of mature sagebrush steppe habitat in the 200E area. According to Hanford site biological resource guidelines (DOE 2001, 2003), compensatory mitigation via habitat replacement was required for this disturbance. Therefore, DOE prepared a MAP (DOE 2006) to define the mitigation actions that would be taken to compensate for the habitat loss at the IDF site, and CH2MHill Hanford Group (CHG) prepared a Mitigation implementation plan (MIP) (CHG 2006) to describe how the MAP would be implemented. The area identified as the IDF mitigation site is located along Army Loop Road south of the Environmental Restoration Disposal Facility (Figure 1). The 106 ha (261 acre) site was divided into four 400 m x 330 m sections on each side of Army Loop road. These sections are divided into two, 200 m x 330 m subsections each. As originally planned, each larger section was to be planted with bare root plants in one subsection, and with pluglings in the other.

All seedlings were derived from locally collected seed and transferred to the growers for the production of both 4-in^3 container-grown pluglings and field-grown bare-root stock. During the growing season, a shortfall of nearly 50,000 seedlings was experienced by the growers. This shortfall resulted in the delivery and planting of 68,600 seedlings (42,600 bareroot and 26,000 pluglings). Planting densities defined in the MAP stipulated 1100 plants/ha (445/ac) (DOE 2006), therefore nominal spacing should be on 3-m (10-foot) centers. Planting was performed by FE&C from February 12 through February 27, 2007. Frozen ground precluded earlier initiation of planting.

As defined in the MAP, compensatory plantings will be monitored annually for 5 years to confirm an established performance criterion of 60% survival (DOE 2006). Time-zero monitoring was conducted shortly after planting to provide a project baseline. This activity established permanent monitoring transects to follow seedling survival and establishment, and to verify that accurate planting densities were achieved. Subsequent first-year (time-one) survival monitoring was conducted during September 2007.

Twenty-two artificial owl burrows were installed in late January/early February 2007. Burrow site inspections for owl activity and entrance obstructions were performed June 8, 2007.

3.0 Methods

3.1 Time Zero Seedling Mapping

Time-zero monitoring was conducted during March 2007 across 10 subsections of the mitigation site (Table 1). A 100-m long x 10-m wide permanent transect (1000 m^2) was established at the center of each subsection to evaluate planting densities and to map seedlings for subsequent annual monitoring. All planted seedlings were identified and mapped within these areas. Seedlings were measured for height and width, and planting quality was evaluated.

Planting quality observations were grouped into eight categories: 1) planted correctly; 2) planted too deep; 3) planted too shallow; 4) obvious air gaps about the roots and crown; 5) correct depth but with multiple plants in hole; 6) planted too deep with air gaps; 7) planted too deep with multiple plants; and 8) planted too shallow with air gaps.

3.2 Time One Survival Monitoring

Time-one monitoring was conducted during September 2007. Each previously mapped seedling was revisited and measures of survival (alive and healthy, alive but sickly, and dead) were determined. Heights and widths were also measured.

3.3 Artificial Owl Burrow Inspection

Visual reconnaissance was conducted on June 8, 2007. Each burrow was inspected for signs of use (prints, castings, etc.) or entrance obstructions and to identify maintenance issues, if any.

4.0 Results

4.1 Time zero

Initial monitoring and mapping took place during early March 2007. Summary results are presented in Table 1; this table provides as-mapped data from both north and south of Army Loop road by section, subsection, and seedling type. Information from FE&C indicated that subsection S2-B was only partially planted. Subsections N3-A and S3-B and the entire N4 and S4 sections were not planted. All of the other subsections were supposed to be planted with the same number of plants, and should have had a planting density of 110 plants per 1000 square meters.

4.1.1 Planting densities: 745 seedlings (513 bareroot and 232 plugs) were mapped and evaluated across 6 bareroot and 4 plugling monitoring transects (Table 1). Of the 10 lines monitored, 4 lines had planting densities within or near the specification of 1100 plants per hectare (1290, 910, 1100, and 1050 plants per hectare) and 6 lines fell below or well below specifications (590, 770, 510, 160, 620, and 760 plants per hectare).

4.1.2 Planting quality: 513 bareroots (across 6 lines) and 232 pluglings (across 4 lines) were evaluated. Of all seedlings observed, 67 percent were categorized as planted properly. The most significant problems identified were shallow plantings (14 percent of all seedlings evaluated), seedlings planted to deeply (9 percent) and seedlings left with obvious air gaps about the crown and roots (6 percent). Bareroot plantings exhibited higher percentages of plants falling into unfavorable planting-quality categories with the exception of multiple plants per hole. Of the 232 pluglings monitored, 2 percent had between 2 and 5 seedlings planted per hole. These data are summarized in Table 1.

4.2 Time-one

First-season survival monitoring took place during September 2007. The data are summarized in Table 2 relative to initial planting quality evaluations and first-season condition.

Overall survival (across all lines and seedling types) totaled 19 percent (13 percent categorized as healthy, 6 percent categorized alive with marginal health). Those seedlings that exhibited marginal health were alive but not expected to survive another growing season.

Bare-root survival totaled 21 percent. Plugling survival totaled 14 percent. Of all surviving bareroot and container-grown seedlings, there were no significant differences observed between their relative proportions of healthy to marginal plants.

Based on survival percentages by planting quality category, plants initially evaluated as “planted correctly,” did not show consistently greater survival than those initially planted too deep, but did have somewhat higher survival than those planted too shallow. Bare-root and container-grown seedlings initially identified as “planted too shallow with air gaps,” suffered 100 percent mortality (n=13). Container-grown seedlings initially identified with “obvious air gaps,” and “planted too deep with multiple plants,” also showed 100 percent mortality (n=5, and n=1 respectively) but the numbers of plants in these categories were not sufficient to indicate significance.

4.3 Artificial Owl Burrow Inspection

A visual reconnaissance was conducted on June 8, 2007. Twenty-two burrows were inspected. No signs of use by burrowing owls were observed. Fourteen of the 22 burrows were found clear of obstructions. Two burrows north (numbers 1 and 9), and 6 burrows south (numbers 13, 15, and 19 thru 22) of Army Loop Road were found with entrances obscured or partially obscured by debris, vegetation, and/or wind-blown sand.

5.0 Discussion

A late February planting and sustained winds are the two most likely factors contributing to the low survival of the planted seedlings. Sufficient time may not have been available for roots to become established before spring warm up and the onset of resource competition with surrounding vegetation. The observed survival rates are well below the 60% survival rate performance standard established in the MAP.

The bare root stock required on-site trimming because both the tops and roots were too large to effectively work with in the field. The extra handling and exposure to air likely resulted in reduced vigor and survival of these plants. However, even with the extra handling, bare root survival was marginally better than the pluglings.

Wind speeds during February 2007 averaged 6.9 miles per hour with peak wind gusts of 46 mph on both February 19th and 20th; both of which were planting days. Winds at these levels provide unfavorable planting conditions. Both seedling types are susceptible to low viability and reduced vigor when exposed to drying winds during planting operations. Roots of the bare root plants were dipped in a hydrogel solution prior to pruning; nevertheless, this process resulted in prolonged root exposure to drying winds. In the future consideration should be given to stopping work when winds get above 10 mph.

Planting densities were found to be sporadic. Although, based on the total number of plants planted and the total area covered, the overall density should be correct, we found that 60% of the monitoring transects had plant densities significantly below specifications. Thus, there are likely some significantly over-dense areas that were not in the monitoring transects. Care should be taken during subsequent plantings to ensure a more uniform planting density.

We found that approximately one-third of the plants were incorrectly planted (Table 1). It is likely that this also contributed to the low survival rates observed, and measures should be taken during subsequent planting efforts to ensure that more of the plants are planted correctly. However, because there was not a consistent difference in survival between correctly and incorrectly planted plants, the results also indicate that something other than planting quality or seedling type contributed to the relatively high mortality rate. Other plantings conducted on the Hanford site during the same time period (using 4-in^3 container-

grown seedlings supplied by different growers) experienced similar low survival. The likely explanations are late season planting and less than optimal soil moisture conditions.

The openings of artificial owl burrows should be cleared of sand and loose vegetation. Once these structures are discovered by owls in the area, increased usage will likely be observed.

6.0 References

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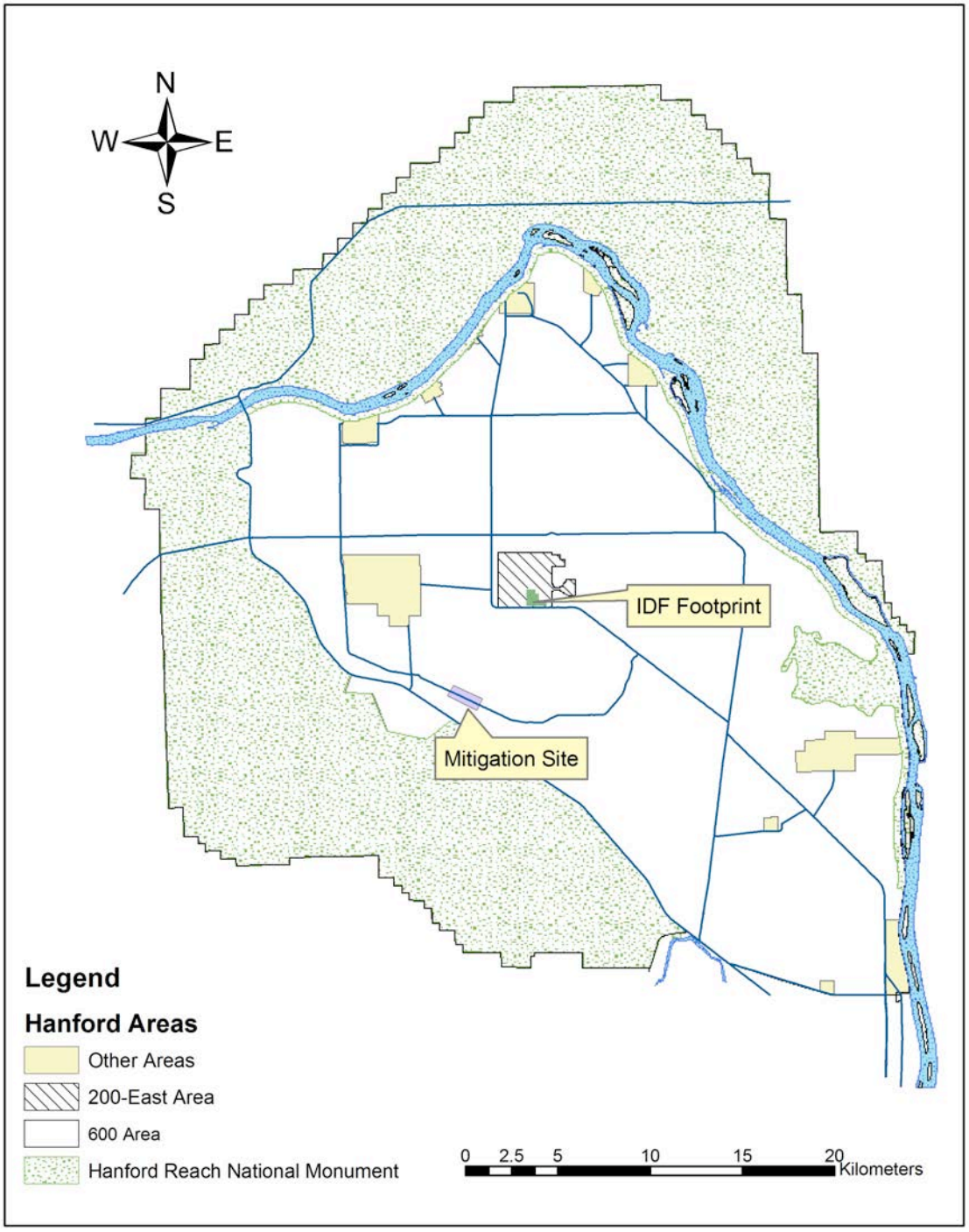
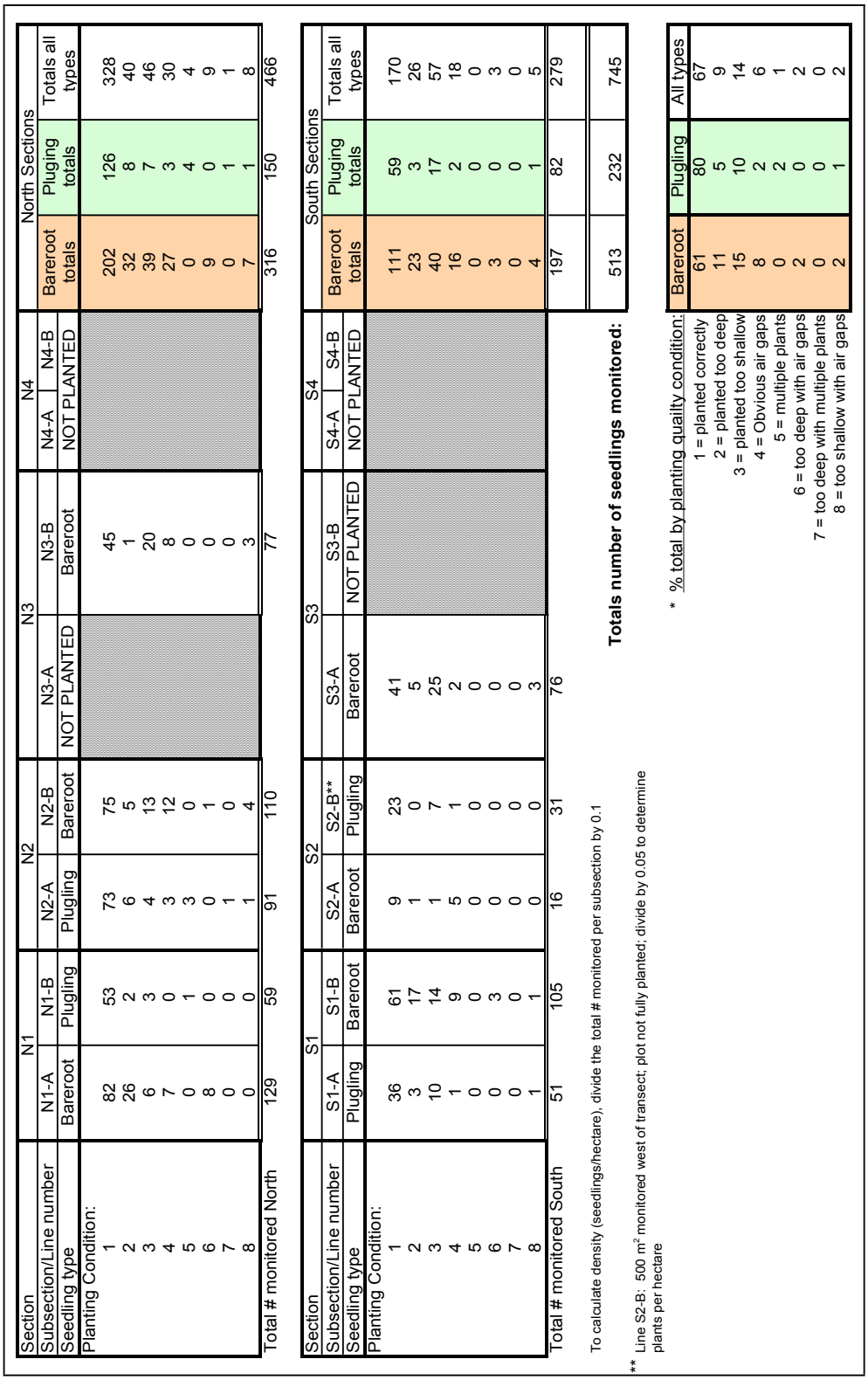


Figure 1. Location of the Integrated Disposal facility and the compensatory mitigation site.



Section	N1		N2		N3		N4		North Sections		
Subsection/Line number	N1-A	N1-B	N2-A	N2-B	N3-A	N3-B	N4-A	N4-B	Bareroot totals	Pluging totals	Totals all types
Seedling type	Bareroot	Plugling	Plugling	Bareroot	NOT PLANTED	Bareroot	NOT PLANTED				
Planting Condition:											
1	82	53	73	75		45			202	126	328
2	26	2	6	5		1			32	8	40
3	6	3	4	13		20			39	7	46
4	7	0	3	12		8			27	3	30
5	0	1	3	0		0			0	4	4
6	8	0	0	1		0			9	0	9
7	0	0	1	0		0			0	1	1
8	0	0	1	4		3			7	1	8
Total # monitored North	129	59	91	110		77			316	150	466

Section	S1		S2		S3		S4		South Sections		
Subsection/Line number	S1-A	S1-B	S2-A	S2-B**	S3-A	S3-B	S4-A	S4-B	Bareroot totals	Pluging totals	Totals all types
Seedling type	Plugling	Bareroot	Bareroot	Plugling	Bareroot	NOT PLANTED	NOT PLANTED				
Planting Condition:											
1	36	61	9	23	41				111	59	170
2	3	17	1	0	5				23	3	26
3	10	14	1	7	25				40	17	57
4	1	9	5	1	2				16	2	18
5	0	0	0	0	0				0	0	0
6	0	3	0	0	0				3	0	3
7	0	0	0	0	0				0	0	0
8	1	1	0	0	3				4	1	5
Total # monitored South	51	105	16	31	76				197	82	279

To calculate density (seedlings/hectare), divide the total # monitored per subsection by 0.1

** Line S2-B: 500 m^2 monitored west of transect; plot not fully planted; divide by 0.05 to determine plants per hectare

Totals number of seedlings monitored: 513 232 745

* % total by planting quality condition:

	Bareroot	Plugling	All types
1 = planted correctly	61	80	67
2 = planted too deep	11	5	9
3 = planted too shallow	15	10	14
4 = Obvious air gaps	8	2	6
5 = multiple plants	0	2	1
6 = too deep with air gaps	2	0	2
7 = too deep with multiple plants	0	0	0
8 = too shallow with air gaps	2	1	2

Table 1. Time Zero Monitoring Summary -- Data are presented as they appeared both north and south of Army Loop Road by Section, Subsection, Seedling Type, and Planting-quality Condition*

Plant Type	Time-zero Planting Quality Codes[1] (1 through 8)	Number of Seedlings in Code (counts by code)	Time-One Condition: Healthy (% of total)	Time-One Condition: Sickly (% of total)	Time-One Condition: Dead (% of total)	FY2007 Survival[2] (%)
Bareroot	1	313	17	8	76	24
	2	55	15	9	76	24
	3	79	9	3	89	11
	4	43	16	5	79	21
	5	0	--	--	--	--
	6	12	8	8	83	17
	7	0	--	--	--	--
	8	11	0	0	100	0
Bareroot Total:		n=513	14%	7%	79%	**21%**
Pluglings	1	185	10	5	85	15
	2	11	18	0	82	18
	3	24	0	8	92	8
	4	5	0	0	100	0
	5	4	25	0	75	25
	6	0	--	--	--	--
	7	1	0	0	100	0
	8	2	0	0	100	0
Plugling Total:		n=232	9%	5%	86%	**14%**
Time One Combined Percentages:		n=745	**13%**	**6%**	**81%**	**19%**

(1) Planting Quality Codes
1 = planted correctly
2 = planted too deep
3 = planted too shallow
4 = obvious air gaps
5 = multiple plants
6 = too deep with air gaps
7 = too deep with multiple plants
8 = too shallow with air gaps

(2) Total Survival
combined healthy + sickly

Table 2. FY07 Bareroot, plugling and total seedling survival and first-year condition by planting quality.