

2007 Vegetation Surveys

Introduction

Vegetation monitoring is conducted at the Rocky Flats Site to provide information necessary for management of the natural resources. Objectives of the vegetation monitoring in 2007 were to:

- Identify any new plant species records for the Site.
- Identify and document infestations of selected noxious weeds at the Site to assist with planning of noxious weed control applications.
- Document and track the locations where herbicide applications were conducted in 2007.
- Document where revegetation activities were conducted in 2007.
- Conduct photomonitoring for visual documentation of changes in vegetation establishment at the Site.

Revegetation monitoring conducted to evaluate revegetation success across the Site is reported in another section of the annual report.

Methods

Weed Mapping

Sitewide weed mapping for selected species is a means of identifying high-priority treatment areas, monitoring the distribution of specific noxious weed species, discovering new weed species, and tracking the effectiveness of weed control. Weed mapping at the Site in 2007 was conducted both on foot and from a vehicle; binoculars were used with mapping on foot and from the vehicle. Species were mapped during their flowering periods or when they were most visible. During the summer of 2007, the outer portions of what was previously known as the Buffer Zone (now called the Peripheral Operable Unit [POU]), were transferred to the U.S. Fish and Wildlife Service to become the Rocky Flats National Wildlife Refuge. As a result, sitewide weed-mapping efforts in 2007 focused only on the DOE-retained lands in the center of the Site in what is now known as the Central Operable Unit (COU; Figure 1). The species mapped on a sitewide basis in 2007 included diffuse knapweed (*Centaurea diffusa*) and dalmatian toadflax (*Linaria dalmatica*).

For sitewide mapping, infestation areas were classified into general density categories of high, medium, low, and scattered, based on a subjective interpretation of the extent, visual density, need for control, and aggressive nature of the species. In general, a high-density category indicated that an area was dominated by a nearly solid infestation or very high cover of the species. A medium-density category was used where the infestation provided less cover and was less homogeneous. The low-density category was used where individuals of the species were present in fewer numbers and were not visually dominating the landscape, but were beginning to establish a foothold in the plant community and were in need of control. The scattered-density category indicated a sporadic occurrence of the species. The noxious weed populations and distributions were hand drawn in the field and should not be interpreted as a precise outline of

the distribution of these species. Attempts were made to visit the entire COU, but some infestations may have been missed.

Photographic Documentation

Photographs were taken at selected permanent photo points during the summer of 2007 to document and evaluate any changes resulting from climatic changes, natural resource management, or human activity. Photographs were compared to those taken previously. The time-series photographs can be viewed on the Ecology DVD.

Results and Discussion

Site Flora

The complete list of plant species known to occur at the Site as of the end of 2007 is found on the Ecology DVD. As a result of the 2007 fieldwork, one new record of vascular plant species for the Site flora is reported. Leafy spurge (*Euphorbia uralensis*), a state-listed noxious weed, was found near the shooting range west of the Present Landfill. The population was sprayed in fall 2007 to eradicate the plants. The area will continue to be checked for the next few years, and any plants that are found will be treated to eradicate the population. The following taxonomic name is used at the Site for the new plant species¹:

Family	Scientific Name	Speccode	Common Name
Euphorbiaceae	<i>Euphorbia uralensis</i> Fisch. ex Link	EUUR1	leafy spurge

Voucher specimens of the species will be deposited at the University of Colorado Herbarium in Boulder, Colorado.

Weed Mapping and Weed Control

The 2007 weed distribution maps for diffuse knapweed and dalmatian toadflax are shown in Figures 2 and 3, respectively. Table 1 shows the estimated total acreage and acreage-by-density categories for each species, based on the 2007 maps. The acreage values are only approximate and should not be interpreted as exact areas. In 2007, diffuse knapweed was observed on approximately 460 acres at various levels of infestation. The total area of the COU is approximately 1308 acres. Dalmatian toadflax was mapped on approximately 237 acres at the Site in 2007.

During 2007, approximately 848 acres were treated with herbicides using ground applications. Approximately 468 acres were treated in the POU area and 380 acres were treated in the COU. Diffuse knapweed, dalmatian toadflax, musk thistle (*Carduus nutans*), common mullein (*Verbascum thapsus*), and Canada thistle (*Cirsium arvense*) have been the most significant noxious weed problems. Kochia (*Kochia scoparia*) is also a common problem in the first year or two in some of the revegetation areas. Figure 4 show the locations where herbicide was applied in 2007. Table 2 lists the target species, herbicides and application rates applied at each location, and the approximate timing of the application during the year. (**Note:** At several locations

¹ Plant nomenclature follows that of GPFA (1986), Weber (1976), and Weber (1990) in that order of determination, when feasible. Species were verified at the University of Colorado Herbarium in Boulder, Colorado (COLO).

multiple herbicides are listed for a location. This does not mean that each herbicide was used across that entire location. Rather, depending on site-specific characteristics such as target weed species, the locations of water bodies, soil types, and the professional judgment of the licensed herbicide applicator, different herbicides were used within that location to provide the control needed.)

The herbicide Milestone (active ingredient is aminopyralid) was used to treat several areas at the Site in 2007. This herbicide first became available on the market in 2006. Its advantages include a low application rate, a low environmental impact, and high effectiveness on many target species at the Site. The fact that it can be sprayed to the water's edge also makes it a good tool for controlling Canada thistle and other weedy species that are often present at the edges of ponds and wetlands. Previously, near water these species have been difficult or impossible to control with other methods. Milestone also seems to have at least a 2-year residual effect on preventing the establishment of target species such as diffuse knapweed at the Site.

Revegetation Activities

During 2007, several locations where previous revegetation efforts had not been successful were redone. The locations that were redone included areas that were previously roads, parking areas, and building foundations where poor soil and substrate conditions existed after closure. Two other locations were also redone after additional project activities were completed in 2007. Figure 5 shows the locations at the Site where the large-scale revegetation activities were conducted in 2007. A total of 105 acres areas were redone with various soil amendments. Table 3 lists each location and the revegetation activities that were conducted in 2007. A number of other locations were interseeded with the appropriate seed mix to help increase the amount of vegetation cover. Photos from the photomonitoring conducted at these locations in 2007 are found on the Ecology DVD.

Summary

Leafy spurge, a state-listed noxious weed, was documented for the first time at the Site in 2007. Control efforts were initiated to eradicate the species from the Site. The threat from noxious weeds continues to be a high management priority at the Site. Although the amount of acres that the DOE Office of Legacy Management manages at the Site was reduced in 2007 as a result of the transfer of property to the Rocky Flats National Wildlife Refuge, weed control in both the revegetation areas and natural areas remains a high priority. Approximately 848 acres were treated with herbicides in 2007 (in both the COU and POU areas). Diffuse knapweed, dalmatian toadflax, musk thistle, common mullein, and Canada thistle have been the most significant noxious weed problems. Control efforts for some of these species have reduced their abundance over the past several years. Approximately 105 acres had additional soil amendments added to increase the chances for successful vegetation establishment. Photomonitoring continues to document the establishment of the vegetation at the revegetation locations. In general, the vegetation in the COU is looking good. The precipitation received in 2007 helped to germinate and start the establishment of vegetation across the Site. Over the next several years the vegetation should continue to fill in and provide a good protective cover on the soils at the Site.

References

GPFA, 1986. *Flora of the Great Plains*, 2nd printing with 1991 supplement, Great Plains Flora Association, University Press of Kansas, Lawrence, Kansas, 1402 p.

Weber, W.A., 1976. *Rocky Mountain flora, Colorado*, Associated University Press, Boulder, Colorado.

Weber, W.A., 1990. *Colorado flora: Eastern Slope*, University Press of Colorado, Niwot, Colorado.

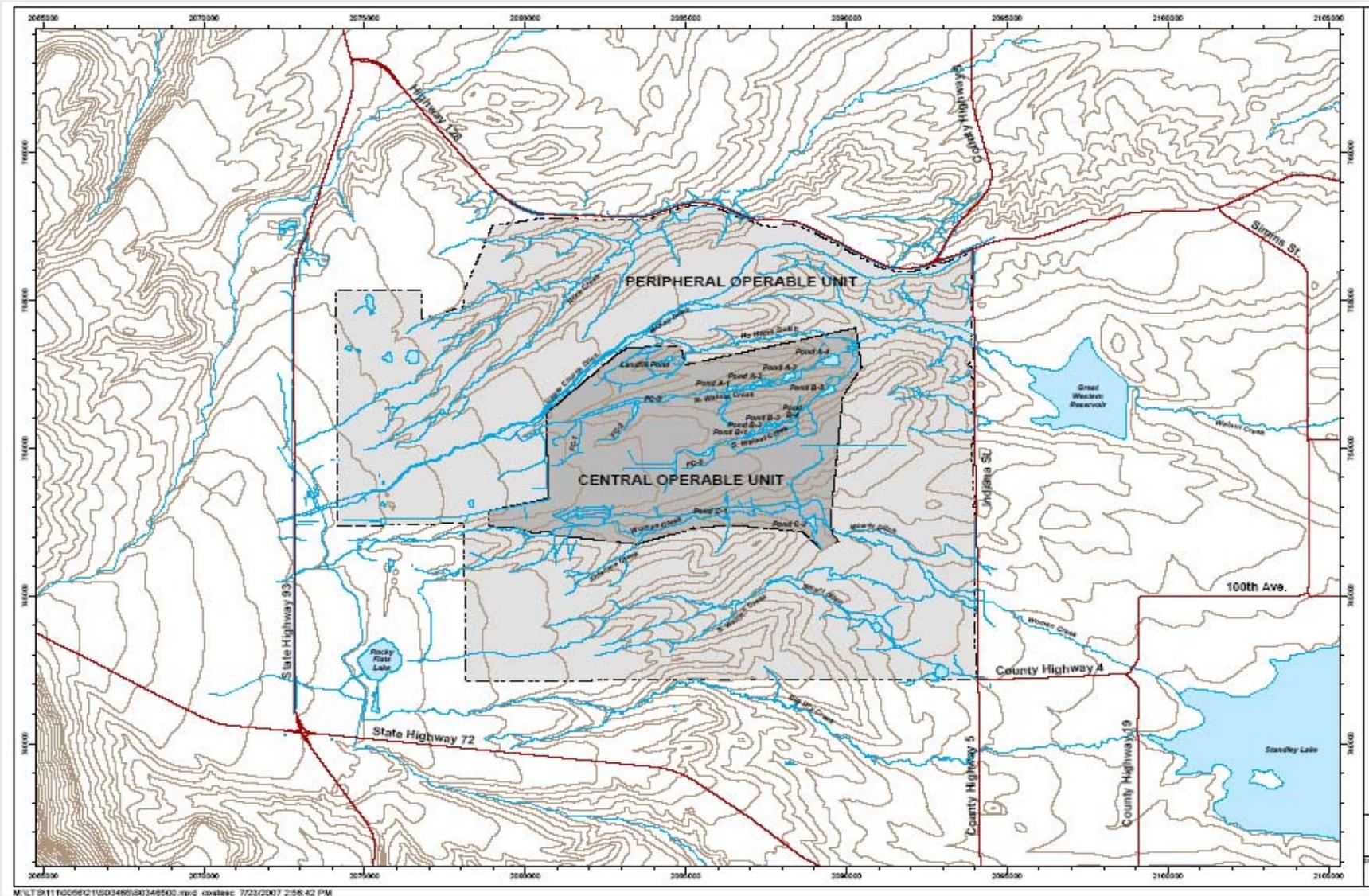


Figure 1. Locations of the Central Operable Unit and Peripheral Operable Units at the Rocky Flats Site.

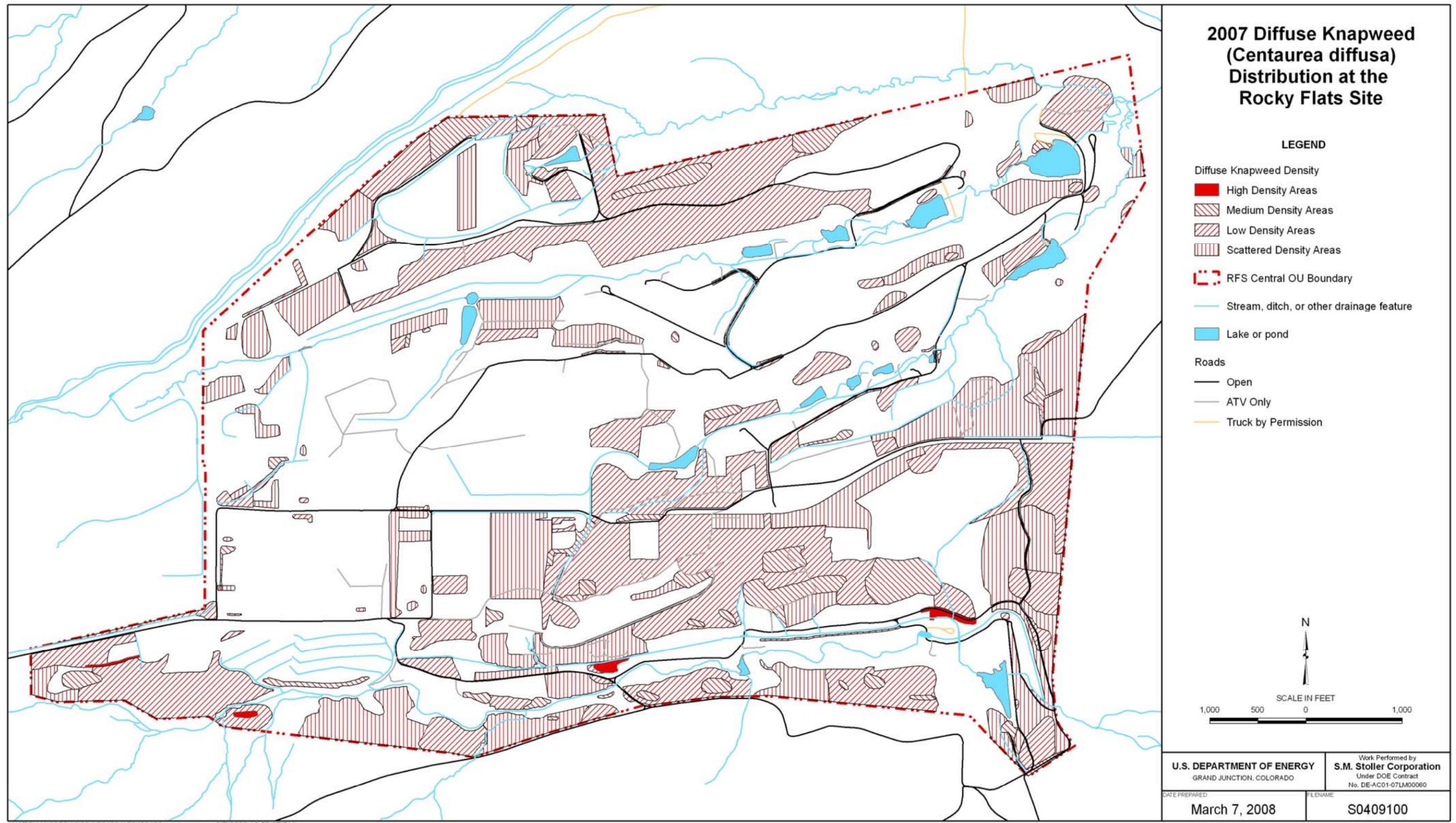


Figure 2. 2007 Diffuse knapweed (*Centaurea diffusa*) Distribution at the Rocky Flats Site.

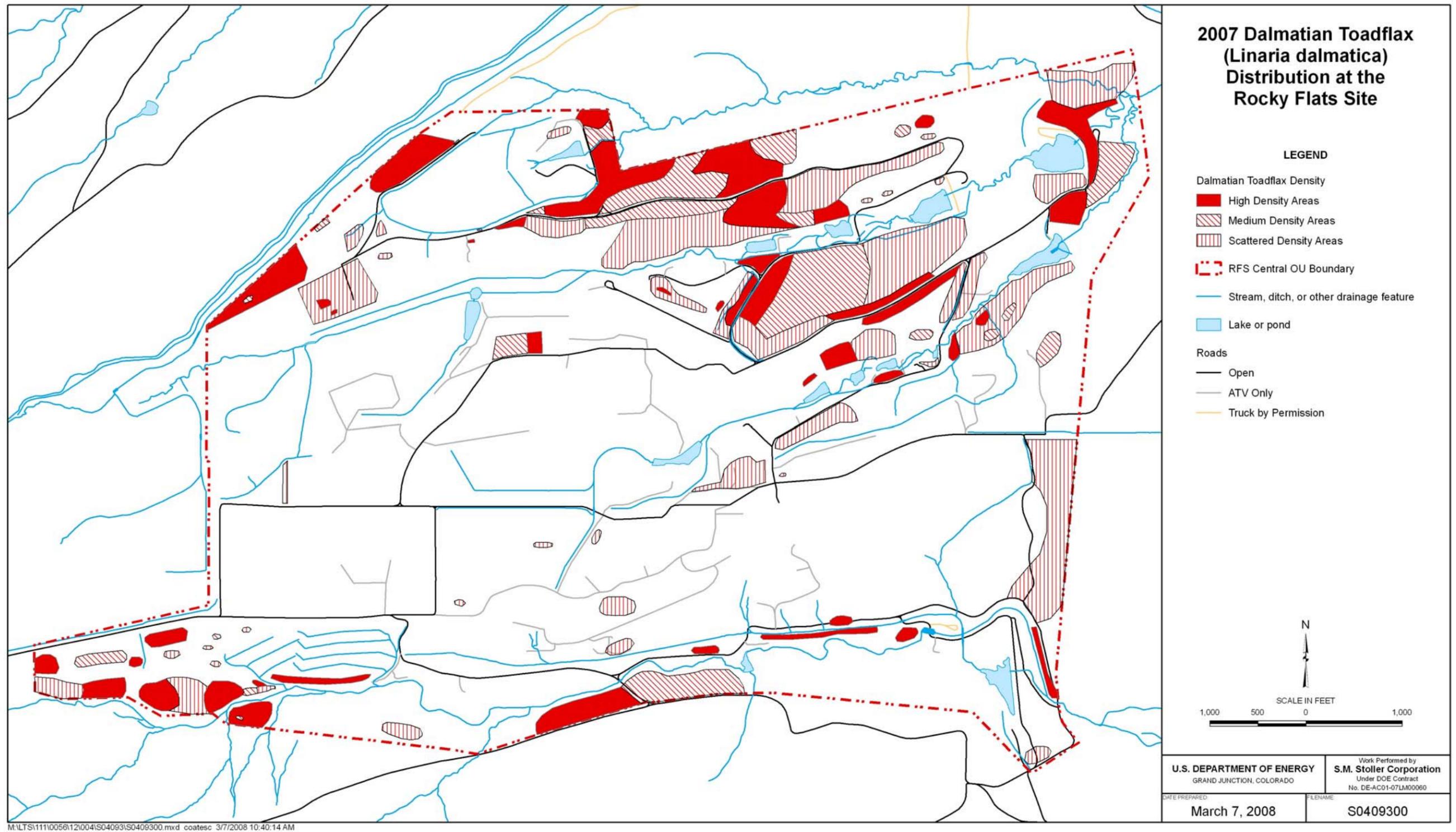
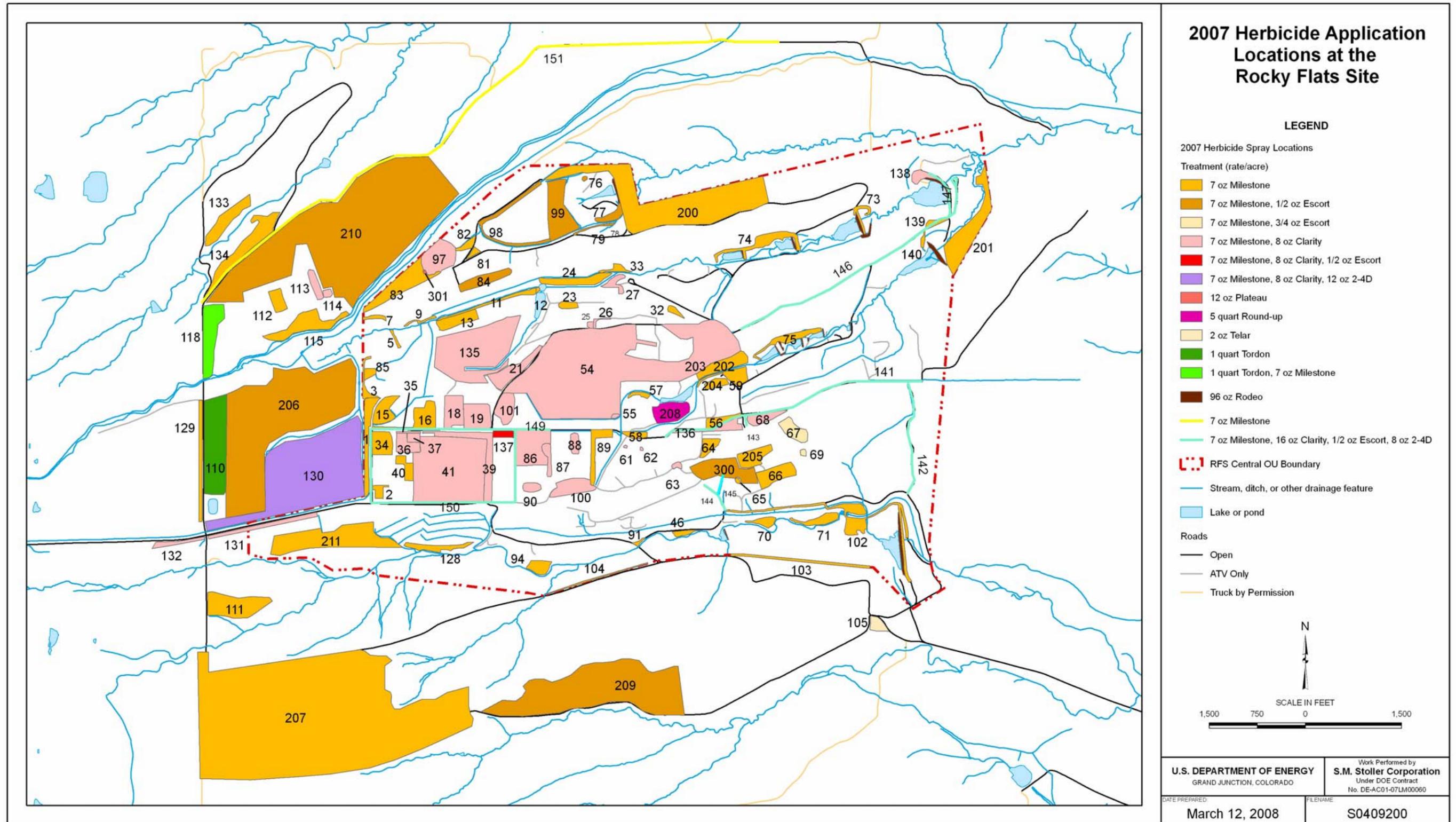
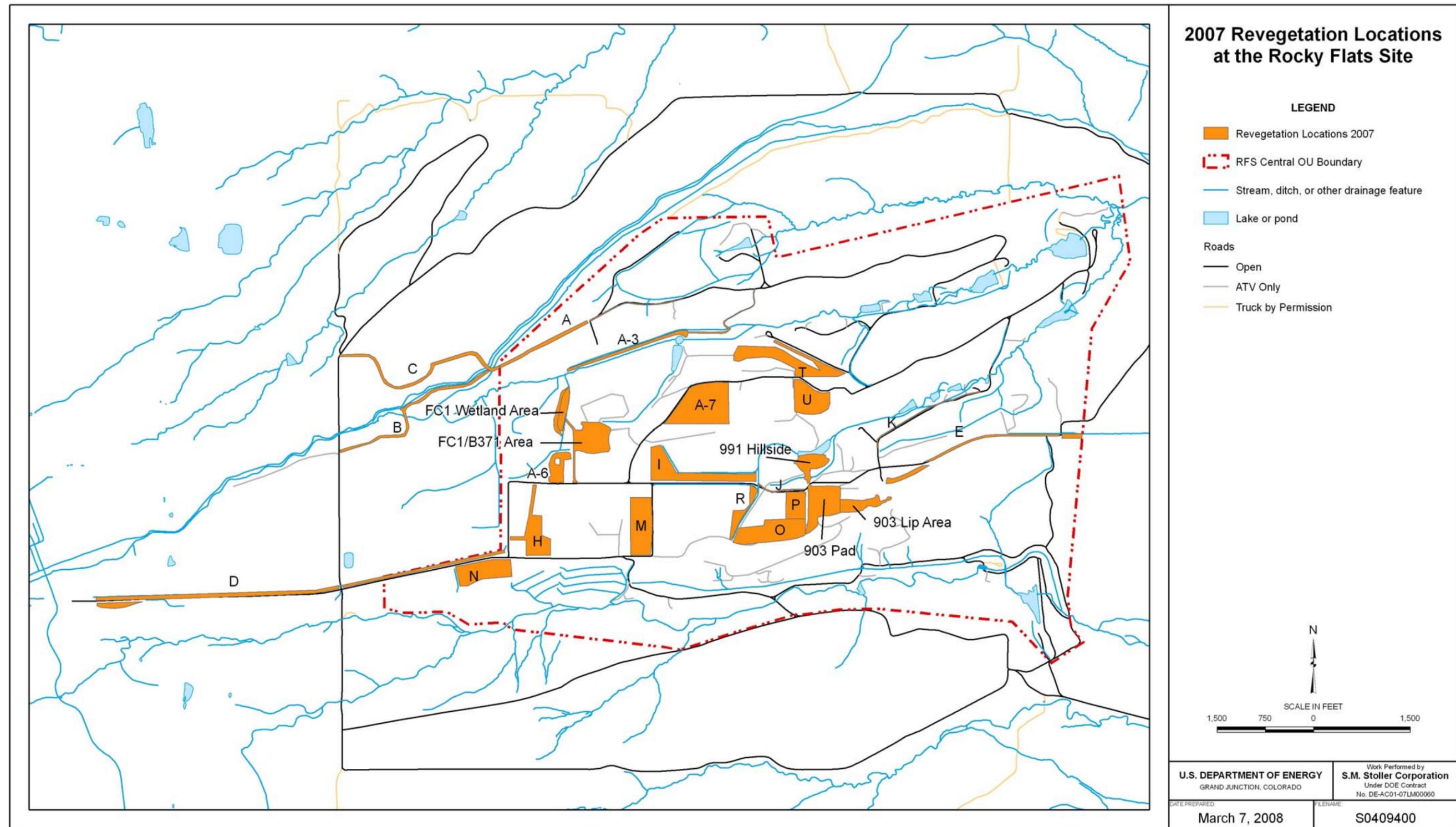


Figure 3. 2007 Dalmatian Toadflax (*Linaria dalmatICA*) Distribution at the Rocky Flats Site.



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Figure 4. 2007 Herbicide Application Locations at the Rocky Flats Site.



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Figure 5. 2007 Revegetation Locations at the Rocky Flats Site.

Table 1. 2007 Noxious Weed Acreage Summary

Species	Density (acres)				Total
	High	Medium	Low	Scattered	
Diffuse knapweed	2.2	41.2	248.8	167.7	459.9
Dalmatian toadflax	77.1	51.0	0.0	109.0	237.1

Table 2. 2007 Herbicide Application Summary

Location	Target Species*	Treatment**	Actual Acreage Treated	Time of Year Treated
1	CEDI1	7 oz Milestone	4.0	Spring 2007 Phase I
2	CEDI1	7 oz Milestone	1.0	Spring 2007 Phase I
3	CEDI1	7 oz Milestone	1.0	Spring 2007 Phase I
5	CEDI1, VETH1, ONAC1	7 oz Milestone	0.7	Spring 2007 Phase I
7	CEDI1	7 oz Milestone	0.8	Spring 2007 Phase I
9	CEDI1, VETH1, CIAR1	7 oz Milestone	0.6	Spring 2007 Phase I
11	CEDI1	7 oz Milestone	1.5	Spring 2007 Phase I
12	KOSC1	7 oz Milestone	0.3	Spring 2007 Phase I
13	CEDI1	7 oz Milestone	3.5	Spring 2007 Phase I
15	CEDI1	7 oz Milestone	2.5	Spring 2007 Phase I
16	CEDI1	7 oz Milestone	3.5	Spring 2007 Phase I
18	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	3.5	Spring 2007 Phase I
19	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	4.0	Spring 2007 Phase I
21	CEDI1	7 oz Milestone, 8 oz Clarity	4.0	Spring 2007 Phase I
23	CIAR1, CEDI1	7 oz Milestone	1.0	Spring 2007 Phase I
24	CIAR1	7 oz Milestone	3.5	Spring 2007 Phase I
25	KOSC1	7 oz Milestone, 8 oz Clarity	0.3	Spring 2007 Phase I
26	CEDI1	7 oz Milestone, 8 oz Clarity	0.3	Spring 2007 Phase I
27	CEDI1, CIAR1, KOSC1	7 oz Milestone, 8 oz Clarity	1.0	Spring 2007 Phase I
32	CEDI1, KOSC1	7 oz Milestone	0.5	Spring 2007 Phase I
33	CIAR1	7 oz Milestone	2.0	Spring 2007 Phase I
34	CEDI1	7 oz Milestone	3.0	Spring 2007 Phase I
35	CEDI1	7 oz Milestone, 8 oz Clarity	0.3	Spring 2007 Phase I
36	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	2.5	Spring 2007 Phase I
37	KOSC1	7 oz Milestone, 8 oz Clarity	1.0	Spring 2007 Phase I
39	CEDI1, CANU1, VETH1	7 oz Milestone, 8 oz Clarity	4.5	Spring 2007 Phase I
40	CEDI1	7 oz Milestone	1.8	Spring 2007 Phase I
41	CEDI1	7 oz Milestone, 8 oz Clarity	23.3	Spring 2007 Phase I
46	CEDI1	7 oz Milestone	0.5	Spring 2007 Phase I
54	CEDI, MEOF1, KOSC1	7 oz Milestone, 8 oz Clarity	72.0	Spring 2007 Phase I
55	ONAC1	7 oz Milestone, 8 oz Clarity	0.3	Spring 2007 Phase I
56	CEDI1	7 oz Milestone	1.3	Spring 2007 Phase I
57	CIAR1	7 oz Milestone	0.8	Spring 2007 Phase I
58	CIAR1	7 oz Milestone	0.8	Spring 2007 Phase I
59	CIAR1	7 oz Milestone	2.0	Spring 2007 Phase I
61	CEDI1	7 oz Milestone, 8 oz Clarity	0.3	Spring 2007 Phase I
62	VETH1, KOSC1	7 oz Milestone, 8 oz Clarity	0.5	Spring 2007 Phase I
63	CEDI1	7 oz Milestone, 8 oz Clarity	0.3	Spring 2007 Phase I
64	CEDI1	7 oz Milestone	1.5	Spring 2007 Phase I
65	CEDI1	7 oz Milestone	0.3	Spring 2007 Phase I
66	CEDI1, CIAR1	7 oz Milestone	3.8	Spring 2007 Phase I
67	VETH1	7 oz Milestone, 3/4 oz Escort	2.0	Spring 2007 Phase I
68	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	2.0	Spring 2007 Phase I
69	VETH1	7 oz Milestone, 3/4 oz Escort	1.0	Spring 2007 Phase I
70	VETH1	7 oz Milestone	1.0	Spring 2007 Phase I
71	VETH1, CACH1	7 oz Milestone	1.5	Spring 2007 Phase I
73	CEDI1	7 oz Milestone	1.0	Spring 2007 Phase I
74	CEDI1	7 oz Milestone	4.0	Spring 2007 Phase I
75	CEDI1, CIAR1	7 oz Milestone	2.0	Spring 2007 Phase I
76	CIAR1	7 oz Milestone, 1/2 oz Escort	1.0	Spring 2007 Phase I
77	CEDI1	7 oz Milestone, 1/2 oz Escort	1.5	Spring 2007 Phase I
78	VETH1, CIAR1	7 oz Milestone, 1/2 oz Escort	0.3	Spring 2007 Phase I
79	VETH1	7 oz Milestone, 1/2 oz Escort	0.5	Spring 2007 Phase I
81	CEDI1	7 oz Milestone	0.3	Spring 2007 Phase I
82	CEDI1	7 oz Milestone	1.0	Spring 2007 Phase I
83	CEDI1	7 oz Milestone	6.0	Spring 2007 Phase I
84	VETH1, CEDI1	7 oz Milestone, 1/2 oz Escort	4.0	Spring 2007 Phase I
85	CEDI1	7 oz Milestone	0.5	Spring 2007 Phase I
86	CEDI1	7 oz Milestone, 8 oz Clarity	7.5	Spring 2007 Phase I
87	CEDI, KOSC1	7 oz Milestone, 8 oz Clarity	1.0	Spring 2007 Phase I
88	CEDI1	7 oz Milestone, 8 oz Clarity	1.5	Spring 2007 Phase I
89	CEDI1	7 oz Milestone	2.5	Spring 2007 Phase I
90	CEDI1	7 oz Milestone, 8 oz Clarity	1.0	Spring 2007 Phase I
91	CEDI1, CIAR1	7 oz Milestone	0.3	Spring 2007 Phase I
94	VETH1	7 oz Milestone	2.0	Spring 2007 Phase I
97	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	5.0	Spring 2007 Phase I
98	CEDI1	7 oz Milestone, 1/2 oz Escort	5.0	Spring 2007 Phase I
99	CEDI1	7 oz Milestone, 1/2 oz Escort	7.0	Spring 2007 Phase I
100	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	3.5	Spring 2007 Phase I
101	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	3.0	Spring 2007 Phase I
102	CEDI1	7 oz Milestone	7.0	Spring 2007 Phase I
103	CEDI1	7 oz Milestone	2.0	Spring 2007 Phase I
104	CEDI1	7 oz Milestone	0.8	Spring 2007 Phase I
105	CERE1	2 oz Telar	1.0	Spring 2007 Phase II
110	CEDI1	1 quart Tordon	12.0	Spring 2007 Phase II
111	CEDI1	7 oz Milestone	7.0	Spring 2007 Phase II
112	CEDI1	7 oz Milestone	2.0	Spring 2007 Phase II
113	CEDI1	7 oz Milestone, 8 oz Clarity	1.5	Spring 2007 Phase II
114	KOSC1	7 oz Milestone, 8 oz Clarity	0.5	Spring 2007 Phase II
115	CEDI1	7 oz Milestone	5.0	Spring 2007 Phase II
118	CEDI1	1 quart Tordon, 7 oz Milestone	7.0	Spring 2007 Phase II
128	CEDI1	7 oz Milestone	3.0	Spring 2007 Phase II
129	CEDI1	7 oz Milestone	3.0	Spring 2007 Phase II
130	CEDI1	7 oz Milestone, 8 oz Clarity, 12 oz 2-4D	43.0	Spring 2007 Phase II

Table 2. (cont.)

Location	Target Species*	Treatment**	Actual Acreage Treated	Time of Year Treated
131	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	4.0	Spring 2007 Phase II
132	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	2.0	Spring 2007 Phase II
133	CEDI1, CIAR1	7 oz Milestone	4.0	Spring 2007 Phase II
134	CEDI1, CIAR1	7 oz Milestone	8.0	Spring 2007 Phase II
135	MEOF1, CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	28.0	Spring 2007 Phase II
136	CEDI1, KOSC1	7 oz Milestone, 8 oz Clarity	4.0	Spring 2007 Phase II
137	CEDI1, KOSC1, CADR1	7 oz Milestone, 8 oz Clarity, 1/2 oz Escort	3.0	Spring 2007 Phase II
138	CEDI1, CIAR1	7 oz Milestone, 8 oz Clarity	1.8	Spring 2007 Phase II
139	CEDI1, CIAR1	7 oz Milestone	1.0	Spring 2007 Phase II
140	CEDI1, CIAR1	7 oz Milestone	0.8	Spring 2007 Phase II
141	KOSC1, CEDI1	7 oz Milestone, 16 oz Clarity, 1/2 oz Escort, 8 oz 2-4D	3.8	Spring 2007 Phase II
142	KOSC1, CEDI1	7 oz Milestone, 16 oz Clarity, 1/2 oz Escort, 8 oz 2-4D	1.6	Spring 2007 Phase II
143	KOSC1, CEDI1	7 oz Milestone, 16 oz Clarity, 1/2 oz Escort, 8 oz 2-4D	0.1	Spring 2007 Phase II
144	KOSC1, CEDI1	7 oz Milestone, 16 oz Clarity, 1/2 oz Escort, 8 oz 2-4D	0.5	Spring 2007 Phase II
145	KOSC1, CEDI1	7 oz Milestone, 16 oz Clarity, 1/2 oz Escort, 8 oz 2-4D	0.3	Spring 2007 Phase II
146	KOSC1, CEDI1	7 oz Milestone, 16 oz Clarity, 1/2 oz Escort, 8 oz 2-4D	4.2	Spring 2007 Phase II
147	KOSC1, CEDI1	7 oz Milestone, 16 oz Clarity, 1/2 oz Escort, 8 oz 2-4D	0.8	Spring 2007 Phase II
149	KOSC1, CEDI1	7 oz Milestone, 16 oz Clarity, 1/2 oz Escort, 8 oz 2-4D	3.6	Spring 2007 Phase II
150	KOSC1, CEDI1	7 oz Milestone, 16 oz Clarity, 1/2 oz Escort, 8 oz 2-4D	3.1	Spring 2007 Phase II
151	CEDI1	7 oz Milestone	16.0	Fall 2007
200	CEDI1, CIAR1	7 oz Milestone	36.0	Fall 2007
201	CEDI1, CIAR1	7 oz Milestone	9.0	Fall 2007
202	CEDI1, CIAR1	7 oz Milestone	3.5	Fall 2007
203	CEDI1, CIAR1	7 oz Milestone	0.5	Fall 2007
204	CEDI1, CIAR1	7 oz Milestone	2.0	Fall 2007
205	CEDI1, CIAR1	7 oz Milestone	3.5	Fall 2007
206	CEDI1, CIAR1	7 oz Milestone, 1/2 oz Escort	60.0	Fall 2007
207	CEDI1, CIAR1	7 oz Milestone	155.0	Fall 2007
208	Total Kill	5 quart Round-up	3.5	Fall 2007
209	CEDI1, CIAR1	7 oz Milestone, 1/2 oz Escort	46.0	Fall 2007
210	CEDI1	7 oz Milestone, 1/2 oz Escort	93.0	Fall 2007
211	CEDI1, CIAR1	7 oz Milestone	13.0	Fall 2007
300	CEDI1, CIAR1, CACH1	7 oz Milestone, 1/2 oz Escort	6.0	Spring 2007 Phase II
301	EUES1	12 oz Plateau	0.1	Fall 2007
NA	Total Kill	96 oz Rodeo (riprap on dam faces)	3.5	Spring 2007 Phase II
		Total Acreage Treated in 2007	848.1	

* Species Codes: CEDI1 = Diffuse knapweed, KOSC1 = Kochia, CIAR1 = Canada thistle, CADR1 = Tall mustard, CERE1 = Russian knapweed, EUES1 = Leafy spurge, VETH1 = Mullein, MEOF1 = Yellow sweet clover, ONAC1 = Scotch thistle

** Each herbicide listed was not sprayed across the entire area. The first herbicide listed was the primary herbicide used across the entire area. The additional herbicides were used at selected locations within each area to target specific species.

Table 3. 2007 Revegetation Locations*

Location	Acreage	Compost	Biosol/Sustane	Mycorrhizal Inoculent	Seed Mix	Erosion Controls
A	2.1	Yes	Biosol	Yes	Flat Areas	Flexterra
B	2.6	Yes	Biosol	Yes	Flat Areas	Flexterra
C	3.0	Yes	Biosol	Yes	Flat Areas	Flexterra
D	8.2	Yes	Biosol	Yes	Flat Areas	Flexterra
E	3.1	Yes	Biosol	Yes	Flat Areas	Flexterra
H	5.1	Yes	Biosol	Yes	Flat Areas	Flexterra
I	7.1	Yes	Biosol	Yes	Flat Areas	Flexterra/Wattles
J	0.3	Yes	Biosol	Yes	Flat Areas	Flexterra
K	0.6	Yes	Biosol	Yes	Hillside Areas	Flexterra
M	6.8	Yes	Biosol	Yes	Flat Areas	Flexterra
N	5.6	Yes	Biosol	Yes	Flat Areas	Flexterra
O	7.4	Yes	Biosol	Yes	Flat Areas	Flexterra
P	2.9	Yes	Biosol	Yes	Flat Areas	Flexterra
R	1.7	Yes	Biosol	Yes	Flat Areas	Flexterra
T	7.7	Yes	Biosol	Yes	Hillside Areas	Flexterra
U	5.1	Yes	Biosol	Yes	Flat Areas	Flexterra
A-3	2.5	Yes	Sustane	Yes	Hillside Areas	Flexterra/Wattles
A-6	2.4	Yes	Sustane	Yes	Flat Areas	Flexterra/Wattles
A-7	11.2	Yes	Sustane	Yes	Flat Areas	Flexterra
FC1 Wetland Area	1.5	No	No	No	Wetland	Wattles
FC1/B371 Area	6.8	No	Biosol	Yes	Flat Areas	Flexterra/Wattles
903 Lip Area	2.5	No	Biosol	Yes	Flat Areas	Flexterra/Wattles
903 Pad	6.1	No	Biosol	Yes	Flat Areas	Flexterra/Wattles
991 Hillside	2.7	No	Biosol	Yes	Hillside Areas	Flexterra/Wattles
Total Acres	105.0					

* Locations that were revegetated using heavy equipment.

Compost application rate = 40 tons/acre, Biosol application rate = 1000 lbs/acre, Sustane = 540 lbs/acre, Mycorrhizal inoculent = 60 lbs/acre

Flexterra application rate = Slopes (3,500 lbs/acre), Flat areas (3,000 lbs/acre)