2009 Vegetation Surveys

Introduction

Vegetation monitoring is conducted at the Rocky Flats Site (Site) to provide information necessary for managing the natural resources. The objectives of the vegetation monitoring in 2009 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 the planning of noxious weed control applications.
- Document and track herbicide applications in 2009.
- Document where revegetation activities were conducted in 2009.
- Conduct photomonitoring for visual documentation of changes in vegetation establishment at the Site.

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

Methods

Weed Mapping

Site-wide 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 2009 was conducted both on foot and from a vehicle; binoculars were also used. Site-wide species mapping was conducted when species were flowering or when they were most visible. Other species were mapped as fortuitous observations. 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, Site-wide weed-mapping efforts now focus only on the lands retained by the U.S. Department of Energy (DOE) in the center of the Site in what is now known as the Central Operable Unit (COU; Figure 1). The species mapped on a Site-wide basis in 2009 included diffuse knapweed (*Centaurea diffusa*) and Dalmatian toadflax (*Linaria dalmatica*). Additional species that were mapped based on fortuitous observations included Scotch thistle (*Onopordum acanthium*), Dame's rocket (*Hesperis matronalis*), leafy spurge (*Euphorbia uralensis*), tall mustard (*Cardaria chalepensis*), whitetop (*Cardaria draba*), wild carrot (*Daucus carota*), and tamarisk (*Tamarix ramosissima*).

For Site-wide 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, the high-density category indicated that an area was dominated by a nearly solid infestation or very high cover of the species. The 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 needed 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 2009 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 be at the Site as of the end of 2009 can be found on the ecology DVD. The Site species list includes the complete flora of both the COU and the POU. The vascular flora of the Site consists of 630 species in 84 families and 340 genera. The taxonomic classes of the flora include 5 pteridophytes, 5 gymnosperms, and 620 angiosperms. Seventy-six percent of the flora is composed of native species. The growth habits of the flora include 145 graminoids, 421 forbs, 32 shrubs, 24 trees, 6 cacti, and 2 vines. The plant families that contribute the greatest number of species to the flora are the Asteraceae (108 species), Poaceae (101 species), Fabaceae (34 species), Cyperaceae (31 species), Rosaceae (28 species), Brassicaceae (28 species), and Scrophulariaceae (24 species). The flora of the Rocky Flats area was evaluated in 2009. A scientific journal article, to be published in the August 2010 issue of *Phytologia* (a botanical journal), summarizes this information.

Three new records of vascular plant species for the Site flora are reported. Oakleaf goosefoot (*Chenopodium glaucum*) was found at the dam breach revegetation areas at the A-Ponds (North Walnut Creek) and B-Ponds (South Walnut Creek). It is a native goosefoot commonly found around pond margins on mudflats. It was found growing where some of the pond sediments had been spread in the upland revegetation areas from the dam breach project. The saltmarsh bulrush (*Scirpus maritimus* var. *paludosus)* was found in the FC4 wetland area (western South Walnut Creek). It is a native bulrush found in wetlands. Eaton's penstemon (*Penstemon eatonii*) was found in a revegetation area east of the FC2 wetland (near where the former B771 was located). It is not native to the eastern slope but is a native of the desert southwest and probably came in as a seed mix contaminant. None of these species are considered noxious weeds. The following taxonomic names will be used at the Site for the new plant species records[1]:

[1] Nomenclature follows GPFA (1986), Weber (1976), Weber (1990), and Weber and Wittmann (2001), in that order of determination. Species were verified at the University of Colorado Herbarium in Boulder, Colorado.

Family	Scientific Name	Speccode	Common Name
Chenopodiaceae	*Chenopodium glaucum* L.	CHGL1	Oakleaf Goosefoot
Cyperaceae	*Scirpus maritimus* L. var. *paludosus* (A. Nels.) Kukenth.	SCMA1	Saltmarsh Bulrush
Scrophulariaceae	*Penstemon eatonii A. Gray var. eatonii*	PEEA1	Eaton's Penstemon

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

Weed Mapping and Weed Control

Figures 2 and 3 show the 2009 weed distribution maps for diffuse knapweed and Dalmatian toadflax, respectively. Table 1 shows the estimated total acreage and acreage-by-density categories for each species, based on the mapping data from 2007 through 2009. The total area of the COU is approximately 1,308 acres. In 2009, diffuse knapweed was observed on approximately 425 acres at various levels of infestation. Dalmatian toadflax was mapped on approximately 462 acres at the Site in 2009. Both species showed an increase in acreage compared to the 2008 mapping data. Much of this is likely due to the above-normal precipitation in spring and early summer of 2009.

Additional species that were mapped based on fortuitous observations in 2009 included Scotch thistle, Dame's rocket, leafy spurge, tall mustard, whitetop, wild carrot, and tamarisk. No acreages are provided for these species since the polygons simply show the general location of the infestations. Figure 4 shows the locations of these species as mapped in 2009.

During 2009, approximately 355 acres were treated with herbicides at the Site via ground application (Figure 5). Table 2 lists the target species, herbicides used, application rates and the approximate timing of the application during the year. (**Note:** Multiple herbicides are listed at some locations. 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.)

In 2007, a small patch of leafy spurge, a State-listed noxious weed, was documented for the first time at the Site. This patch was sprayed in 2007 to control its spread. In 2008, two additional small patches of leafy spurge were found in the northern COU. Because these new patches of leafy spurge had already started going to seed when they were discovered, the seedheads were cut off, bagged, and sent to the landfill for burial. These three locations plus an additional location that was discovered were sprayed with Plateau herbicide in 2009 to control the infestations. Hand-control and weed-whacking were also used to control some small patches of Scotch thistle, tall mustard, and whitetop in 2009.

Biocontrol insects continue to be used at the Site. At a location in the eastern COU, stem-mining beetles (*Mecinus janthinus*), were released several years ago to help control Dalmatian toadflax. The beetles have established and continue to help control the species at this location. In 2009, approximately 35 individual beetles were collected and transplanted to a location west of the OLF in the hopes of establishing another population there. Collections and transplants from other established populations of various biocontrols at the Site may continue to be made to further establish populations elsewhere across the Site. Additional biocontrol insects for different weed

species may be released as they become available. The integrated weed management approach at the Site continues to address noxious weed issues through mapping and the use of various control methods.

Revegetation Activities

During the winter and early spring of 2009, interseeding was conducted on approximately 48 acres at the Site where vegetation cover was still sparse (Figure 6). At most of these locations, the seed was broadcast using an all-terrain-vehicle broadcast seeder, and the ground was harrowed to cover the seed. The above-average precipitation during the spring and early summer caused abundant germination of the seed at most of these locations, and the plants were starting to become establish by the end of 2009. At several other locations, extra soil leftover from other projects on Site was spread over approximately 1.5 acres that had very poor soil conditions (rock, roadbase, old parking areas, or roads) to increase the chances of revegetation success. Revegetation activities were also conducted where an Xcel Energy pipeline project disturbed the land on Site (approximately 0.3 acres). During fall 2009, fertilizer was spread on, and disced into these areas, and then seed was broadcast there, and the ground was harrowed (Figure 6). Erosion controls were installed where appropriate. After the dam breach project in the winter of 2008 and 2009, approximately 6.5 acres of disturbed areas around the dams (both inside and outside the Preble's meadow jumping mouse protection areas) were seeded and erosion controls were installed (Figure 6).

Approximately 56 acres were revegetated during 2009. In general, the vegetation in the COU is doing well. The above-average precipitation early in the growing season in 2009 increased the abundance of vegetation in the revegetation areas this year. Monitoring information from the revegetation areas is presented in another section of the annual report. The ecology DVD includes photos of the photomonitoring conducted at these locations in 2009.

Summary

Managing natural resources at the Site involved various tools in 2009, including weed control and revegetation activities. The threat from noxious weeds continues to be a high management priority at the Site. Although the number of acres that DOE's Office of Legacy Management manages at the Site was reduced in 2007, by the transfer of property to the Rocky Flats National Wildlife Refuge, weed control in both the revegetation areas and the natural areas remains a high priority within the COU. Approximately 355 acres in the COU were treated with herbicides in 2009 to control noxious weeds. Biocontrols were moved to help control Dalmatian toadflax. Additional areas were interseeded, and some locations had soil and soil amendments applied to improve the stands of desirable vegetation. Photomonitoring continued to document the establishment of vegetation at the revegetation locations. 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

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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.

Weber, W.A. and R.C. Wittmann, 2001. *Colorado Flora: Western Slope*, 3rd edition, University Press of Colorado, Niwot, Colorado.

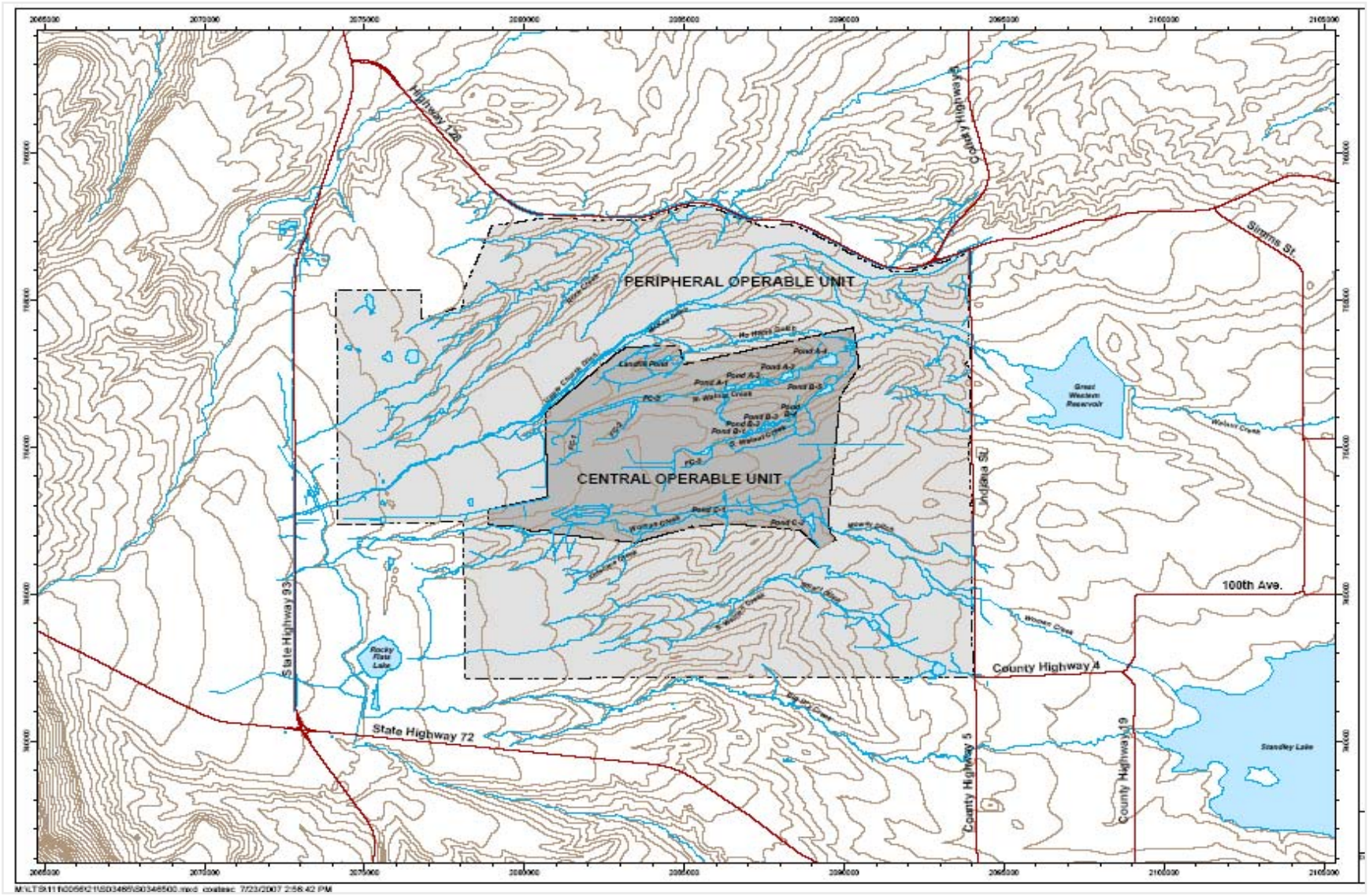

Figure 1. Locations of the Central Operable Unit and Peripheral Operable Units at the Rocky Flats Site.

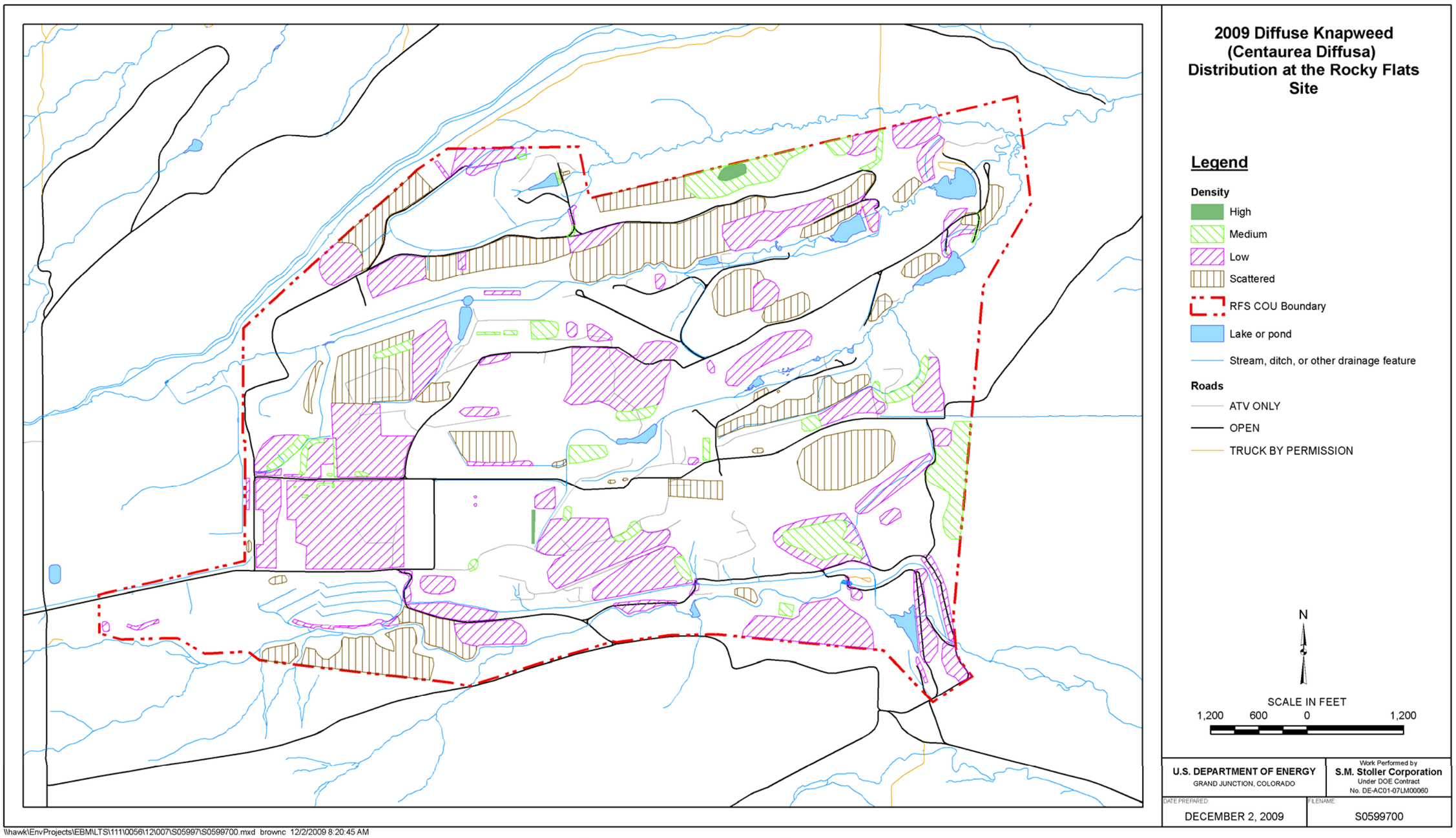

Figure 2. 2009 Diffuse Knapweed (*Centaurea diffusa*) Distribution at Rocky Flats.

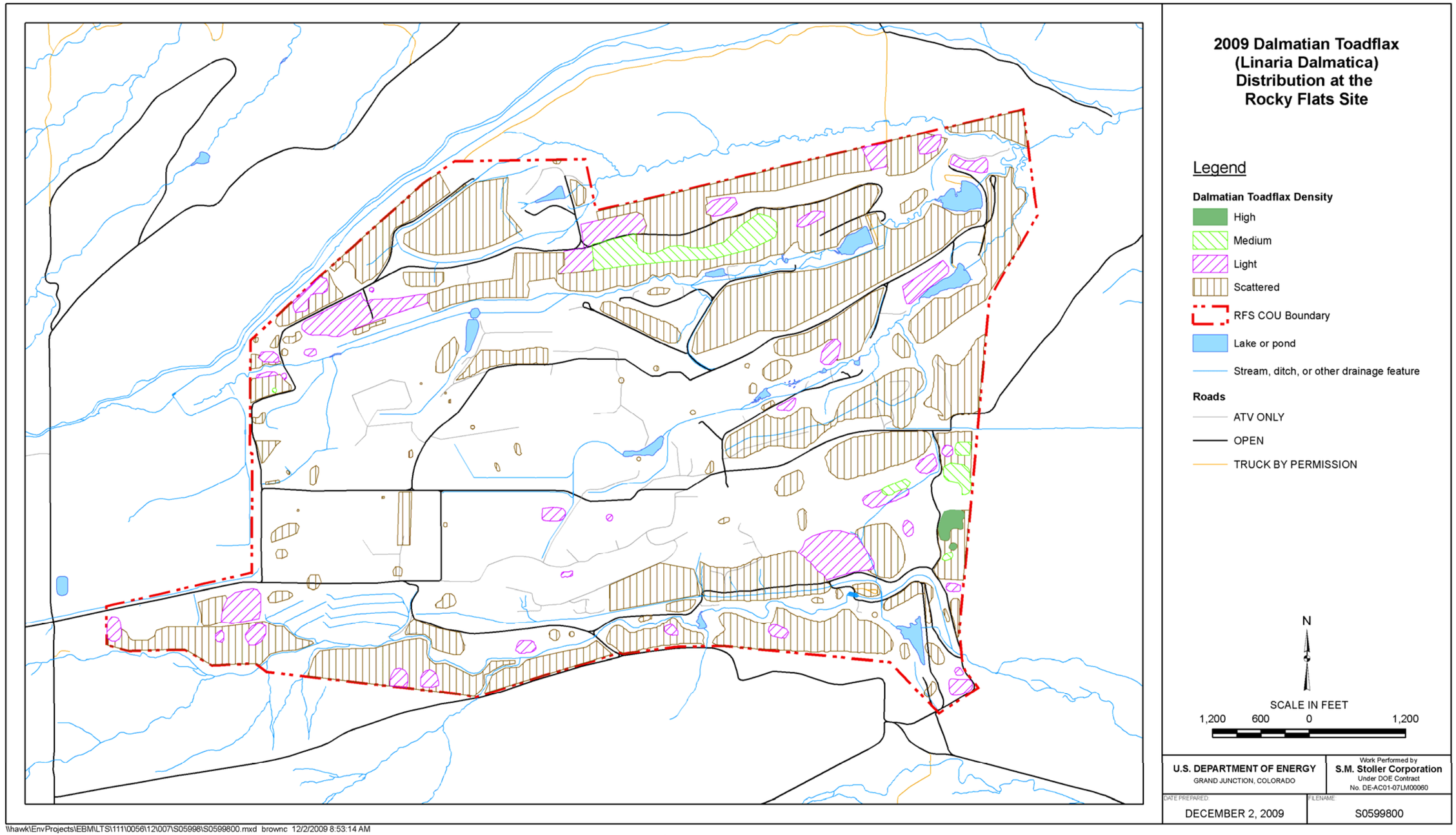

Figure 3. 2009 Dalmatian Toadflax (*Linaria dalmatica*) Distribution at Rocky Flats.

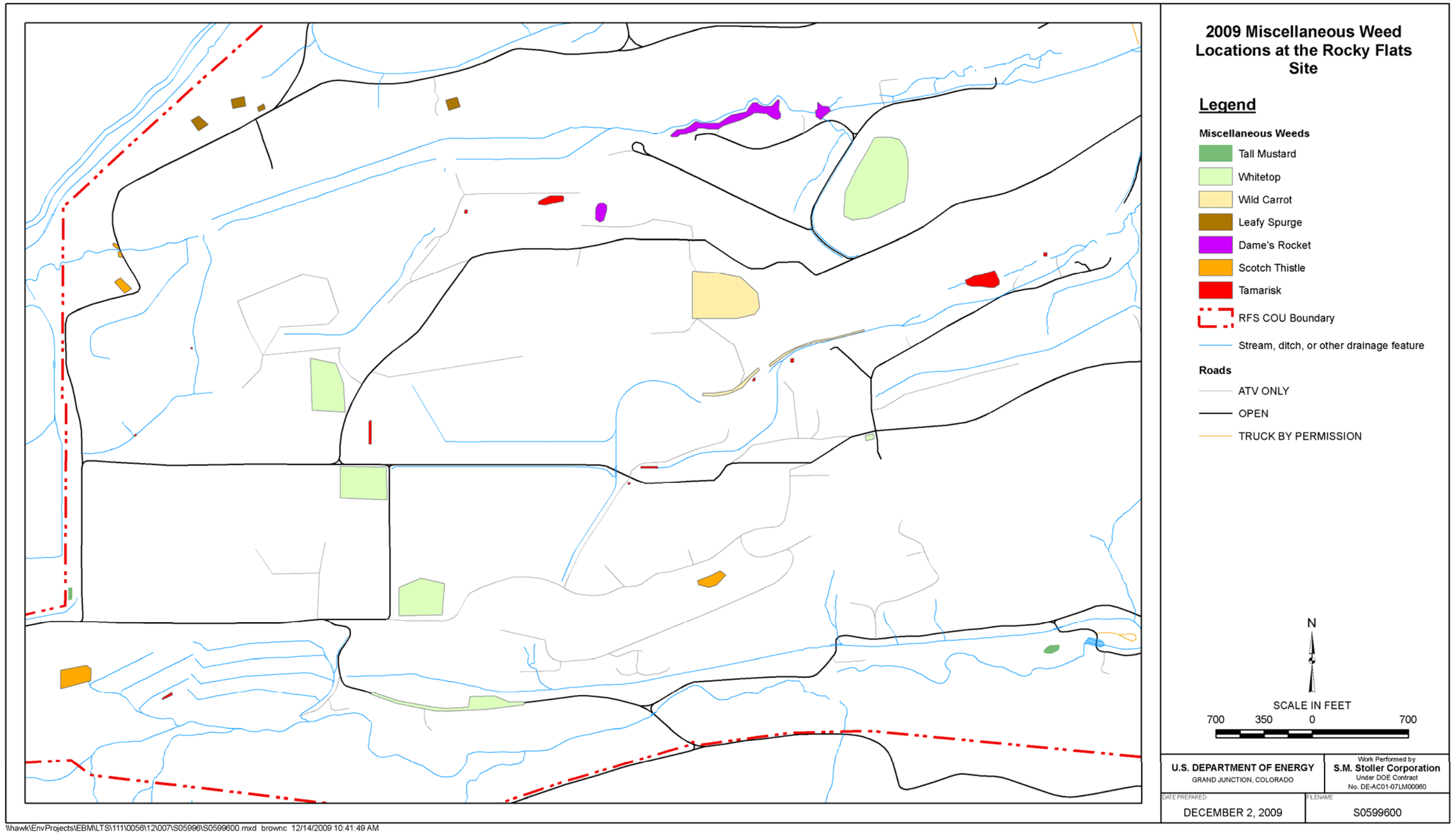

Figure 4. 2009 Miscellaneous Noxious Weed Locations at Rocky Flats.

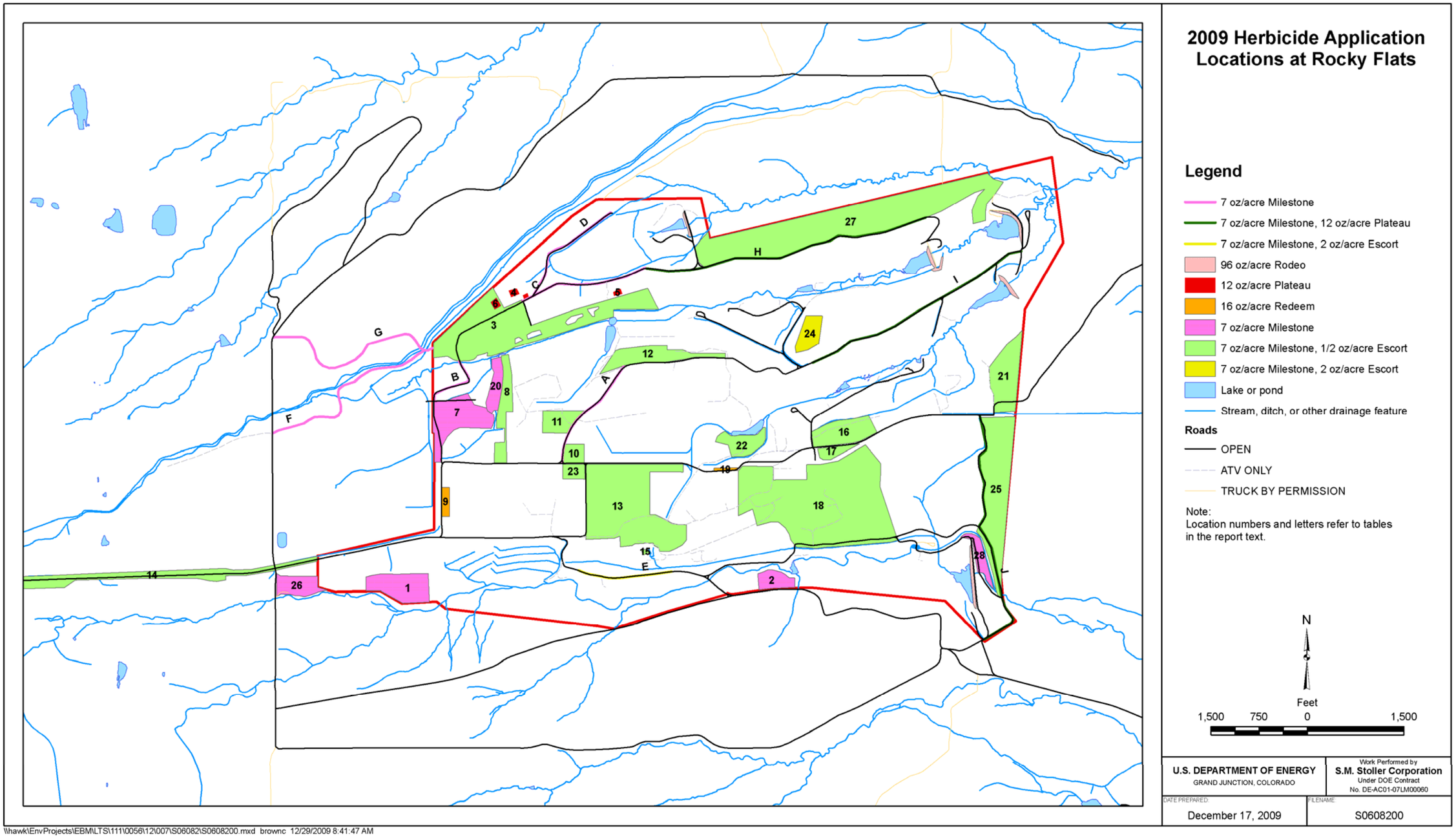

Figure 5. 2009 Herbicide Application Locations at the Rocky Flats Site.

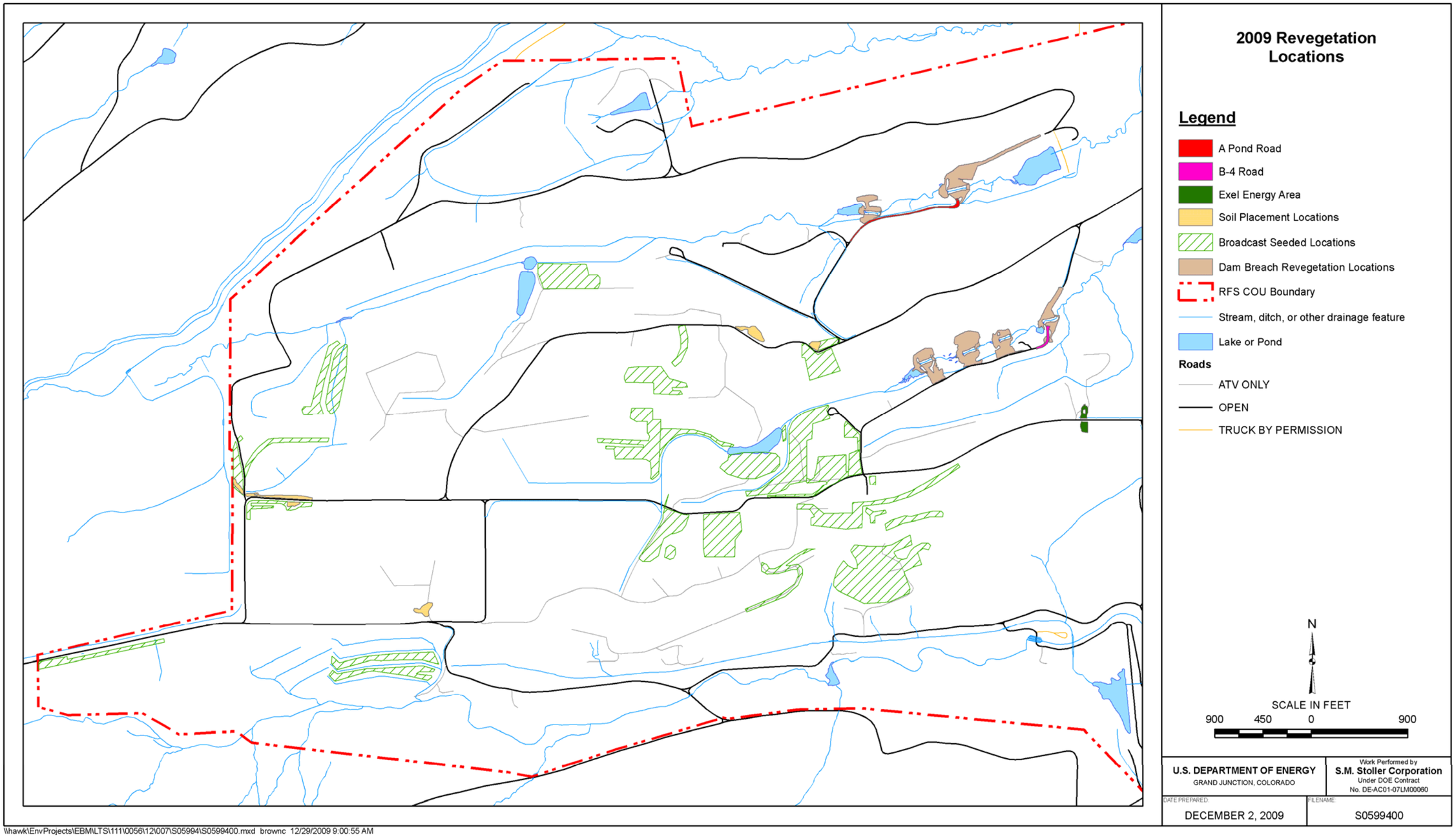

Figure 6. 2009 Revegetation Locations at the Rocky Flats Site.

Table 1. COU Noxious Weed Acreage Summary (2007-2009)

	Density (acres)				
Species	**High**	**Medium**	**Low**	**Scattered**	**Total**
Diffuse knapweed					
2007	2.2	41.2	248.8	167.7	459.9
2008	1.8	20.6	110.0	147.5	279.9
2009	1.6	44.6	231.2	147.5	424.9
Dalmatian toadflax					
2007	77.1	51.0	0.0	109.0	237.1
2008	0	0	54.3	151.8	206.1
2009	2.1	16.8	56.5	386.7	462.1

Table 2. FY2009 Herbicide Application Summary

Location	Type of Area	Target Species*	Treatment**	Actual Acreage Treated***	Time of Year Treated
1	Polygon	CEDI1	7 oz/acre Milestone	9.0	Spring 09
2	Polygon	CEDI1	7 oz/acre Milestone	3.0	Spring 09
3	Polygon	CEDI1, CIAR1	7 oz/acre Milestone, 1/2 oz/acre Escort	44.0	Spring 09
4	Polygon	EUUR1	12 oz/acre Plateau	0.2	Spring 09
5	Polygon	EUUR1	12 oz/acre Plateau	0.2	Spring 09
6	Polygon	EUUR1	12 oz/acre Plateau	0.2	Spring 09
7	Polygon	CEDI1, MEOF1	7 oz/acre Milestone	11.5	Spring 09
8	Polygon	CEDI1	7 oz/acre Milestone, 1/2 oz/acre Escort	6.5	Spring 09
9	Polygon	CEDI1	16 oz/acre Redeem	1.3	Spring 09
10	Polygon	CEDI1	7 oz/acre Milestone, 1/2 oz/acre Escort	2.0	Spring 09
11	Polygon	CEDI1, CADR1	7 oz/acre Milestone, 1/2 oz/acre Escort	5.0	Spring 09
12	Polygon	CEDI1	7 oz/acre Milestone, 1/2 oz/acre Escort	9.0	Spring 09
13	Polygon	CEDI1, CIAR1	7 oz/acre Milestone, 1/2 oz/acre Escort	38.0	Spring 09
14	Polygon	CEDI1	7 oz/acre Milestone, 1/2 oz/acre Escort	14.0	Spring 09
15	Polygon	CIAR1	7 oz/acre Milestone, 1/2 oz/acre Escort	0.2	Spring 09
16	Polygon	CEDI1	7 oz/acre Milestone, 1/2 oz/acre Escort	7.5	Spring 09
17	Polygon	CEDI1	7 oz/acre Milestone, 1/2 oz/acre Escort	1.8	Spring 09
18	Polygon	CEDI1	7 oz/acre Milestone, 1/2 oz/acre Escort	62.0	Spring 09
19	Polygon	CEDI1	16 oz/acre Redeem	0.5	Spring 09
20	Polygon	CEDI1, MEOF1	7 oz/acre Milestone	2.5	Spring 09
21	Polygon	CEDI1, ONAC1	7 oz/acre Milestone, 1/2 oz/acre Escort	10.0	Spring 09
22	Polygon	CEDI, MEOF1	7 oz/acre Milestone, 1/2 oz/acre Escort	4.5	Spring 09
23	Polygon	CADR1	7 oz/acre Milestone, 1/2 oz/acre Escort	2.0	Spring 09
24	Polygon	CADR1	7 oz/acre Milestone, 2 oz/acre Escort	3.8	Spring 09
25	Polygon	CEDI1, CIAR1	7 oz/acre Milestone, 1/2 oz/acre Escort	23.0	Fall 09
26	Polygon	CEDI1, CIAR1	7 oz/acre Milestone	5.0	Fall 09
27	Polygon	CEDI1, CIAR1	7 oz/acre Milestone, 1/2 oz/acre Escort	53.0	Fall 09
28	Polygon	CEDI1, CIAR1	7 oz/acre Milestone	2.8	Fall 09
No ID	Polygon	EUUR1	12 oz/acre Plateau	0.2	Fall 09
A	Road	CEDI1	7 oz/acre Milestone	1.5	Spring 09
B	Road	CEDI1	7 oz/acre Milestone	1	Spring 09
C	Road	CEDI1	7 oz/acre Milestone	1.9	Spring 09
D	Road	CEDI1	7 oz/acre Milestone	1.6	Spring 09
E	Road	CADR1	7 oz/acre Milestone, 2 oz/acre Escort	1	Spring 09
F	Road	CEDI1, CIAR1	7 oz/acre Milestone	4.1	Fall 09
G	Road	CEDI1, CIAR1	7 oz/acre Milestone	5.4	Fall 09
H	Road	AECY1, CEDI1	7 oz/acre Milestone, 12 oz/acre Plateau	6	Fall 09
I	Road	AECY1, CEDI1	7 oz/acre Milestone, 12 oz/acre Plateau	4.25	Fall 09
J	Road	AECY1, CEDI1	7 oz/acre Milestone, 12 oz/acre Plateau	3.25	Fall 09
	Riprap Dam Faces	Total Kill	96 oz/acre Rodeo	2.9	Spring 09
			Total Area Treated in 2009	355.4	

* Species Codes: AECY1 = Jointed Goatgrass, CEDI1 = Diffuse knapweed, CIAR1 = Canada thistle, CADR1 = Whitetop, ONAC1 = Scotch Thistle, MEOF1 = Yellow Sweetclover, EUUR1 = Leafy Spurge

** 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.

*** Acreages based on billing statements, not original GPS locations provided to subcontractor.