

2012 Vegetation Surveys

Introduction

Vegetation surveys are conducted at the Rocky Flats Site (Site) to provide information necessary for managing the natural resources. The Site comprises the Central Operable Unit (COU) and Peripheral Operable Unit (POU) (Figure 1). The objectives of the vegetation surveys in 2012 were to:

- Identify new plant species not found at the Site previously.
- Identify and document infestations of selected noxious weeds at the Site to assist with the planning of noxious weed control activities.
- Document and track herbicide applications in 2012.
- Document where revegetation activities were conducted in 2012.
- Conduct photomonitoring for visual documentation of changes in vegetation establishment at the Site.

This section pertains to general vegetation surveys. Revegetation monitoring to evaluate revegetation success across the Site is reported in the revegetation section of the annual report.

Methods

Weed Mapping

Mapping for selected weed species in the COU 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 in the COU in 2012 was conducted both on foot and from a vehicle; binoculars were also used. Weed mapping was conducted when species were flowering or when they were most visible. The species mapped throughout the COU in 2012 included diffuse knapweed (*Centaurea diffusa*) and Dalmatian toadflax (*Linaria dalmatica*). Some species were mapped as fortuitous observations. These included Scotch thistle (*Onopordum acanthium*), leafy spurge (*Euphorbia uralensis*), whitetop (*Cardaria draba*), and Dame's rocket (*Hesperius matronalis*).

For species mapped throughout the COU, 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. Fortuitous observations were not classified into density categories. 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 Site, but some infestations may have been missed.

Herbicide Applications and Revegetation Activities

Maps of herbicide applications and revegetation activities were prepared to show where the subcontractor applied herbicides and where interseeding/revegetation activities took place during 2012. Maps were prepared in the Geographic Information System based on hand-drawn field maps.

Photographic Documentation

Photographs were taken at selected permanent photo points during summer 2012 to document and evaluate 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 or that have been recorded at the Site is available 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 636 species of plants. In 2012, three new records of vascular plant species for the Site flora are reported. The first two on the list below, cudweed (*Gnaphalium wrightii*) and prairie sandreed (*Calamovilfa longifolia*), were collected on the buttress of the Original Landfill. The third species, silver buffaloberry (*Shepherdia argentea*), was planted as part of a habitat enhancement project at the Site in 2013. The following taxonomic names will be used at the Site for the new plant species records¹:

Family	Scientific Name	Speccode	Common Name
Asteraceae	<i>Gnaphalium wrightii</i> A. Gray	GNWR1	Cudweed
Poaceae	<i>Calamovilfa longifolia</i> (Hook.) Schribn.	CALO1	Prairie Sandreed
Elaeagnaceae	<i>Shepherdia argentea</i> (Pursh) Nutt.	SHAR1	Buffaloberry

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 2012 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 2012. The total area of the COU is approximately 1,308 acres. In 2012, diffuse knapweed was observed on approximately 173 acres at various levels of infestation. Dalmatian toadflax was mapped on approximately 116 acres in 2012. Both species showed an increase from the amounts mapped in

¹ Nomenclature follows GPFA (1986), Weber (1976), Weber (1990), Weber and Wittmann (1992), and Weber and Wittmann (2001), in that order of determination. Species were verified at the University of Colorado Herbarium in Boulder, Colorado.

2011. However, annual fluctuations in the abundance of many grassland species are not uncommon, as they respond to changes in temperature, precipitation amounts, timing of precipitation, and other environmental factors. The acreage infested by these species is still less than that found in earlier years.

Additional species that were mapped based on fortuitous observations in 2012 included Scotch thistle, leafy spurge, whitetop, and Dame's rocket. Figure 4 shows the locations of these species as mapped in 2012. No acreages are provided for these species since the map simply shows the general location of the infestations.

During 2012, approximately 266 acres were treated with herbicides at the Site via ground application (Figure 5). Table 2 lists the target species, herbicides used, application rates, and approximate timing of the application during the year. (**Note:** Multiple herbicides are listed at some locations. Depending on site-specific characteristics such as target weed species, the locations of water bodies, soil types, and professional judgment of the licensed herbicide applicator, different herbicides were used within that location to provide the control needed.)

Russian olive (*Elaeagnus angustifolia*) is a non-native tree once commonly planted in the arid west for habitat enhancement and windbreaks. It is now on the Colorado state noxious weed list. While not common at the Site, in recent years it has appeared in many of the revegetation locations as birds or other animals have deposited seeds across the Site. In an effort to control these and not let them develop into seed-producing trees, approximately 200 to 300 seedlings/saplings and small trees were foliar sprayed with Garlon 3A (Triclopyr) in 2012. At the same time, approximately two or three dozen tamarisk (or salt cedar, *Tamarix ramosissima*, also on the state noxious weed list) were sprayed with Garlon 3A at several of the wetland mitigation areas.

Leafy spurge, a state-listed noxious weed, was documented for the first time at the Site in 2007. Those populations continue to be sprayed to control and try to eradicate the species from the Site. Hand control and weed-whacking were also used to control some small patches of Scotch thistle, whitetop, Dame's rocket, leafy spurge, and tamarisk in 2012. No new species of noxious weeds were observed at the Site during 2012.

Biocontrol insects continue to be used at the Site. In 2012, no additional releases of biocontrol insects were made since most of the biocontrols released in the past have now largely spread across the Site. Collections and transplants from other established populations of various biocontrols at the Site may be conducted if needed. Additional biocontrol insects for different weed species may be released as they become available.

In 2011, the U.S. Environmental Protection Agency promulgated its *Final National Pollutant Discharge Elimination System (NPDES) Pesticide General Permit (PGP) for Point Source Discharges from the Application of Pesticides*, 76 FR 68750-68756, November 7, 2011. In response to a 2009 U.S. Court of Appeals ruling (*National Cotton Council, et al. v. EPA*), NPDES permits are now required for herbicide applications that result in discharges in or near "waters of the U.S." The ruling, which became effective on October 31, 2011, impacts some of the herbicide applications at the Site.

Revegetation Activities

During 2012, interseeding and revegetation activities were conducted to increase vegetation cover or diversity at several locations (Figure 6). Table 3 lists the activities conducted at each

location. The A-3 dam and Present Landfill (PLF) Pond dam were breached to create more natural flow-through conditions. Disturbed areas were revegetated with native upland and wetland species. Approximately 310 coyote willow (*Salix exigua*) stakes, 49 peachleaf willow (*Salix amygdaloides*) stakes, and 7 plains cottonwood (*Populus deltoides*) poles were installed around the perimeter of the A-3 wetland after the turf reinforcement mat was installed and final normal water levels were reached. No woody plant stakes were installed at the PLF in 2012 because by the time the breach was completed, the woody species had already begun to leaf-out.

After the A-2 pond dam was breached in the winter of 2008/2009 and the water level dropped from its previous elevation, the previous locations where cattails (*Typha* spp.) had grown became infested with Canada thistle (*Cirsium arvense*), a state listed noxious weed. These now upland areas were sprayed in fall 2011 to kill the Canada thistle and were reseeded in 2012 to return the areas to native prairie. Sandy, rocky conditions in Functional Channel 1 (FC-1) (a former borrow pit are used during Site closure) have limited the establishment of vegetation as compared to many other areas at the Site. In an attempt to increase the vegetation density at FC-1, several test plots were set out in fall 2012 to test whether the native graminoid, prairie sandreed, common in sandy soils, would be a good species to interseed into the area. The test plots will be evaluated for the next couple of years. If the species establishes well, it may be interseeded at that time to increase the vegetation cover in the FC-1 area.

As part of a project to enhance habitat on site for wildlife and to increase vegetation diversity, several locations (locations 4, 13, and 14; Figure 6) were interseeded with a shrub mix consisting of four-wing saltbush (*Atriplex canescens*) and rubber rabbitbrush (*Chrysothamnus naueousus*). In spring 2012, potted plant materials of five different shrub and tree species were installed on a hillside in the north-central COU. The species included four-wing saltbush, plains cottonwood, chokecherry (*Prunus virginiana*), coyote willow, and silver buffaloberry. These plants were irrigated for the first growing season using a gravity-fed irrigation system. At the end of the first growing season all of the plants survived. However, several plains cottonwood and chokecherry plants that had been repeatedly browsed (some to the ground) by the deer and elk may not survive through the winter. The coyote willow have done well near the wetter areas. The most suited upland shrub species, however, appear to be the four-wing saltbush and silver buffaloberry, as both did very well this year and did not sustain any browse damage. If future plantings are conducted these latter two species would be the ones of choice.

Volunteer Seed Collections

For the past several years, the Jefferson County Nature Association has sponsored volunteer seed-picking days to provide local ecotype seed and local species, which are not available commercially, for inclusion in the revegetation efforts at the Site and other nearby revegetation projects. In 2012, approximately 14 pounds of forb seed and 9 pounds of graminoid seed were collected by volunteers. The graminoid seed was interseeded at various locations, and the forb seed was used to establish several new forb “nursery” areas. The forb nursery areas are locations where the forb seed is interseeded into a delineated “patch” that is not treated with herbicides. As the forbs establish in these areas, the seed from these plants is expected to spread downwind and further increase the forb diversity in the revegetation areas. Observations in 2012 of several of the original forb nurseries that were established in 2009 showed that various forb species (which were likely in the volunteer-collected seed) are beginning to establish at some of the locations. Some of the species observed were curly-top gumweed (*Grindelia squarrosa*), Porter’s aster (*Aster porteri*), golden aster (*Chrysopsis fulcrata* and *Chrysopsis villosa*), purple prairie clover

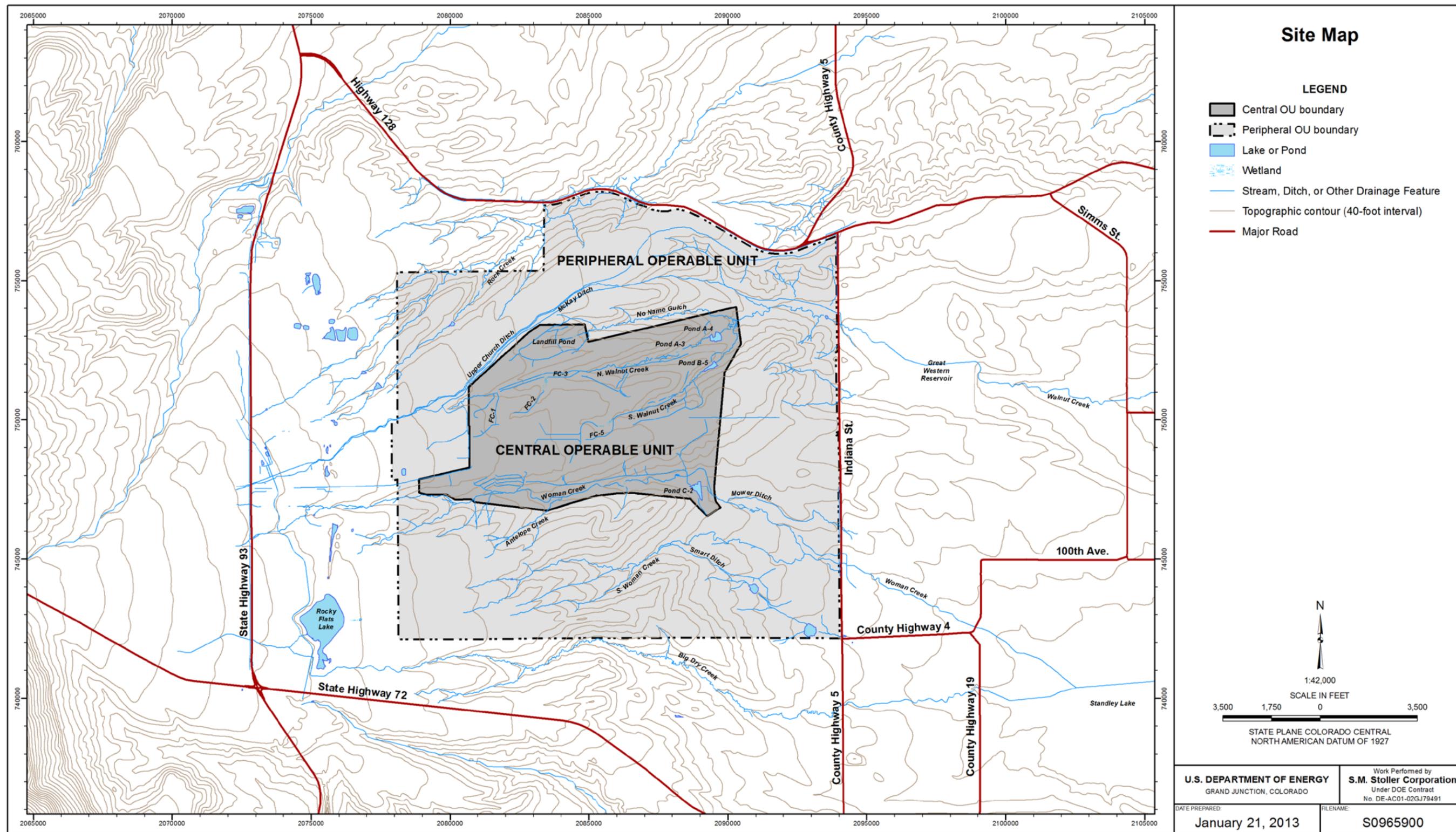
(*Dalea purpurea*), blanket flower (*Gallardia aristata*), western sagewort (*Artemesia campestris*), and orange paintbrush (*Castilleja integra*).

Summary

Managing natural resources at the Site involved various tools in 2012, including weed control and revegetation activities. The threat from noxious weeds continues to be a significant issue at the Site, and weed control in both the revegetation areas and the natural areas remains a high priority within the COU. Approximately 266 acres in the COU were treated with herbicides in 2012 to control noxious weeds and improve the quality of the plant communities. Interseeding was conducted at several locations to continue to increase the vegetation cover and stand density. Shrub seeding and shrub planting projects were begun in 2012 to attempt to increase vegetation diversity at the Site. Photomonitoring continued to document the establishment of vegetation at the revegetation locations. Vegetation establishment has been good and, with proactive management, should be self-sustaining in the long term.

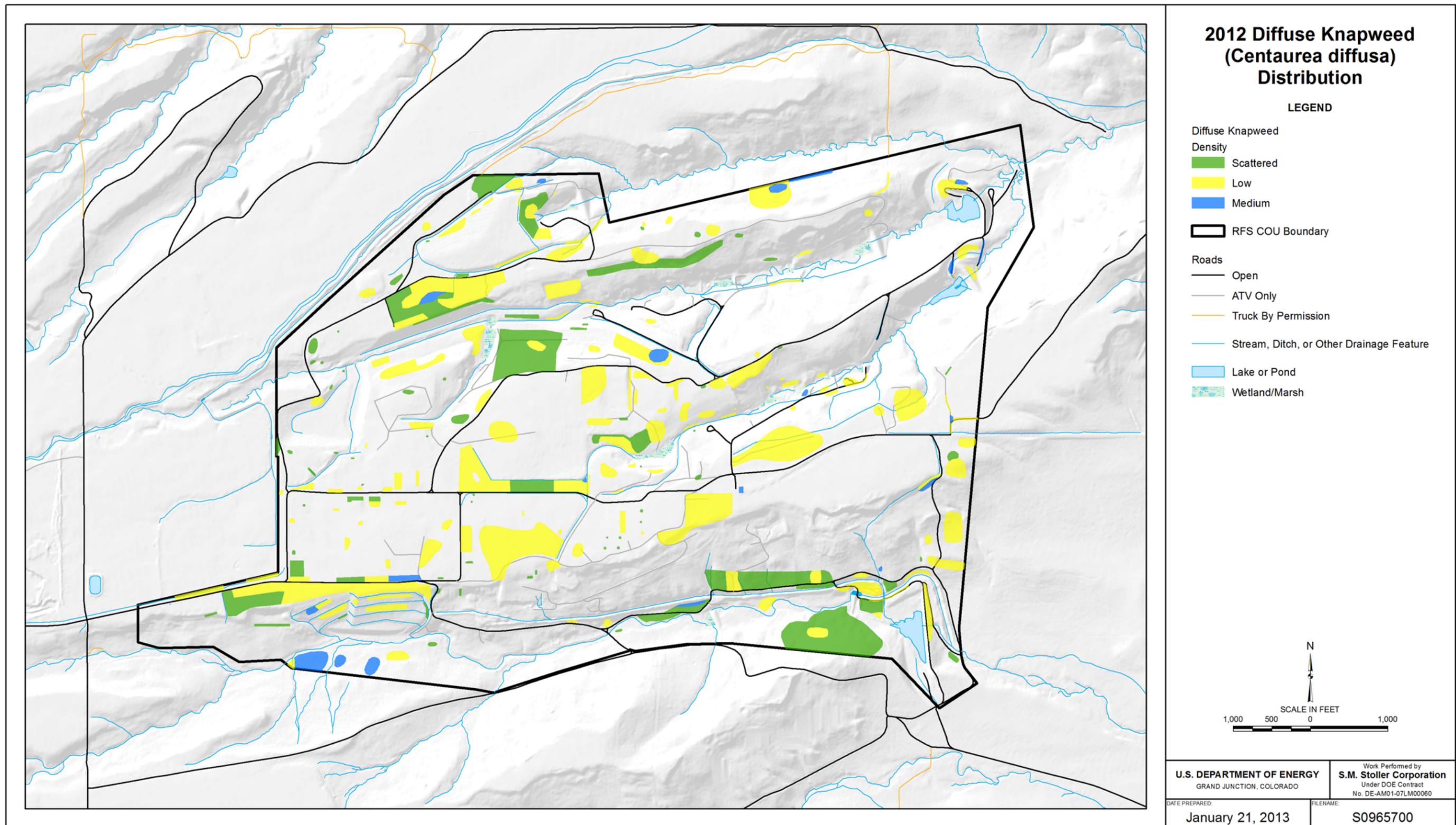
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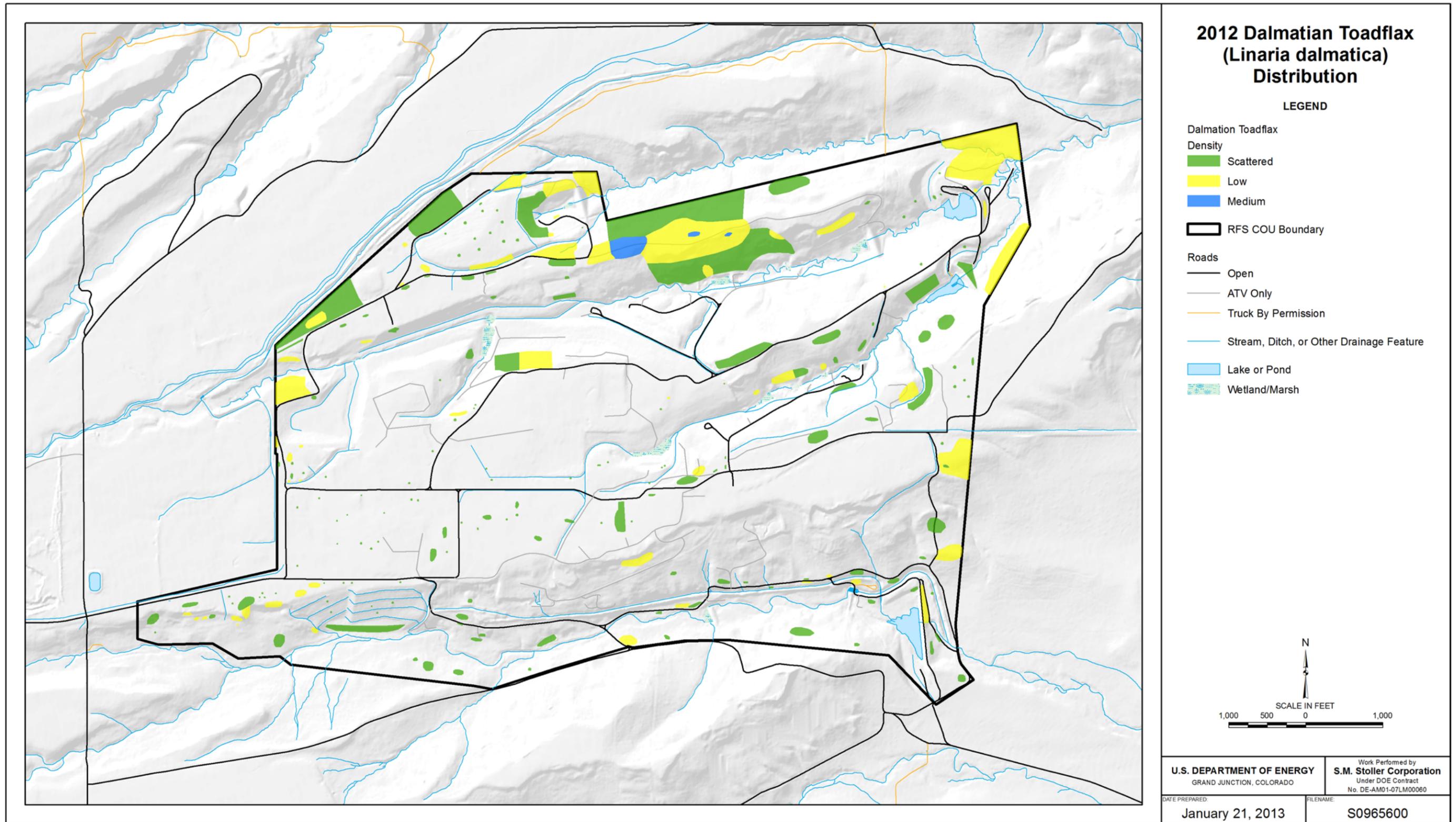
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Figure 1. Rocky Flats Site Map



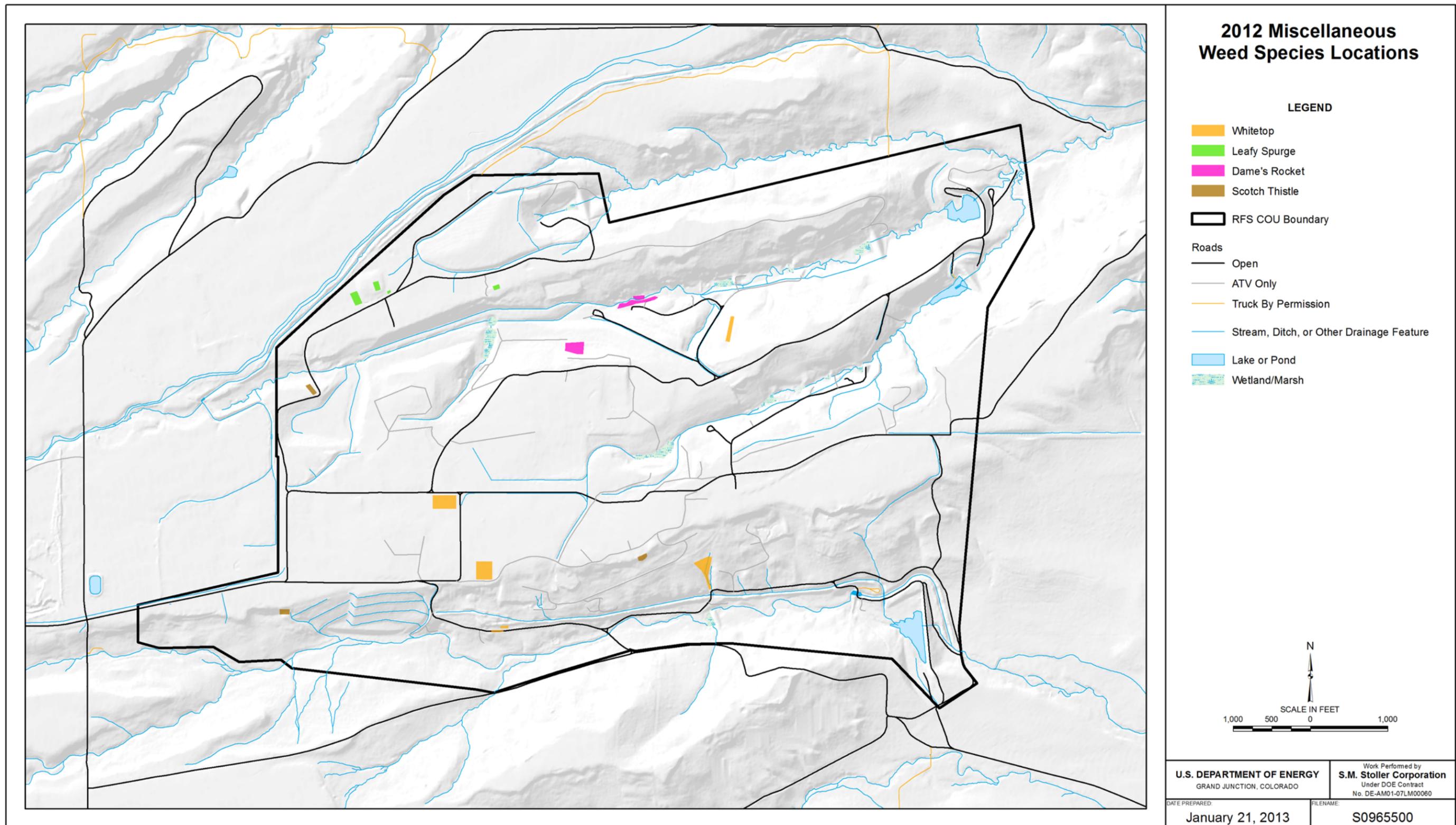
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Figure 2. 2012 Diffuse Knapweed (*Centaurea diffusa*) Distribution



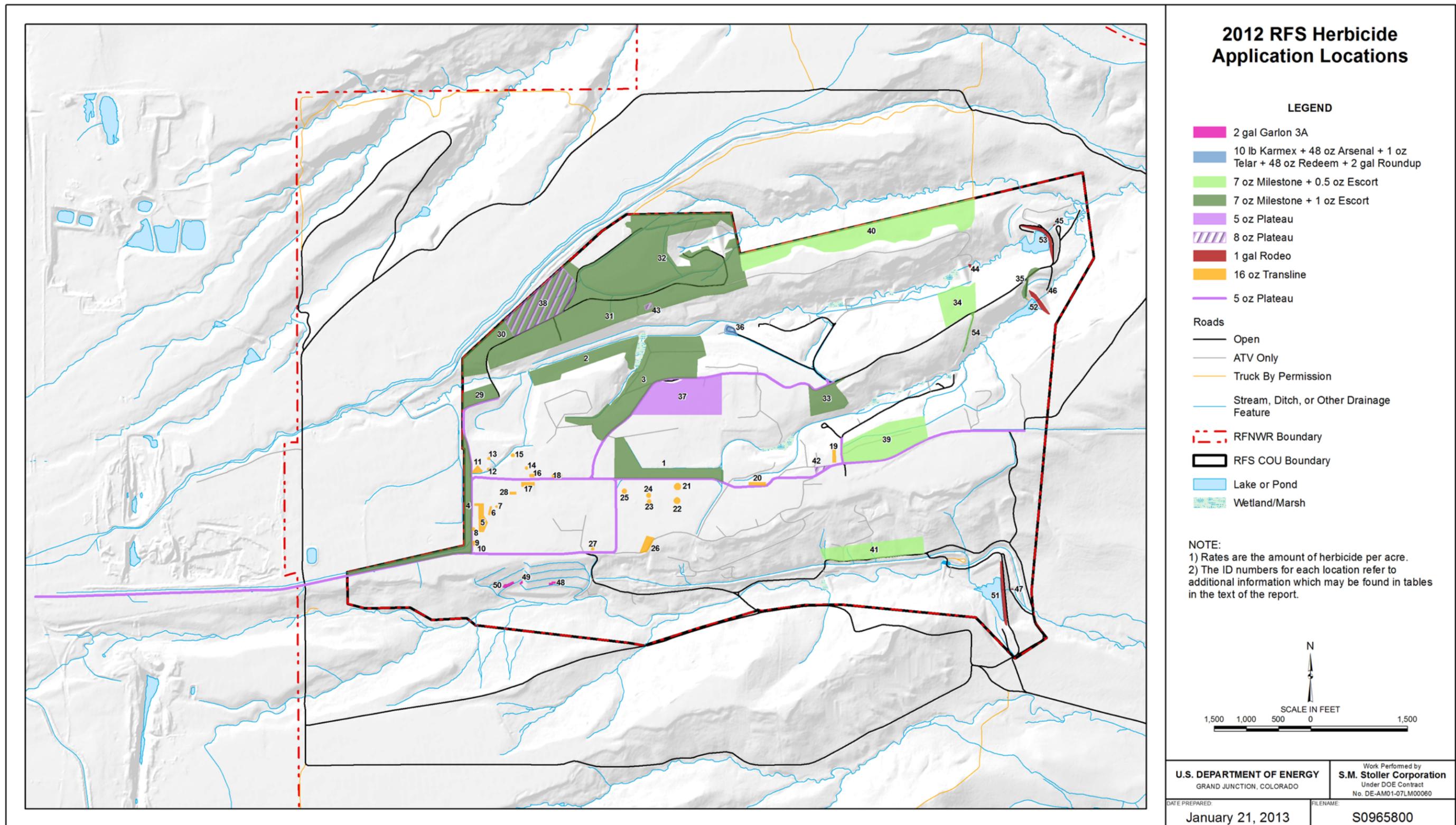
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Figure 3. 2012 Dalmatian Toadflax (*Linaria dalmatica*) Distribution



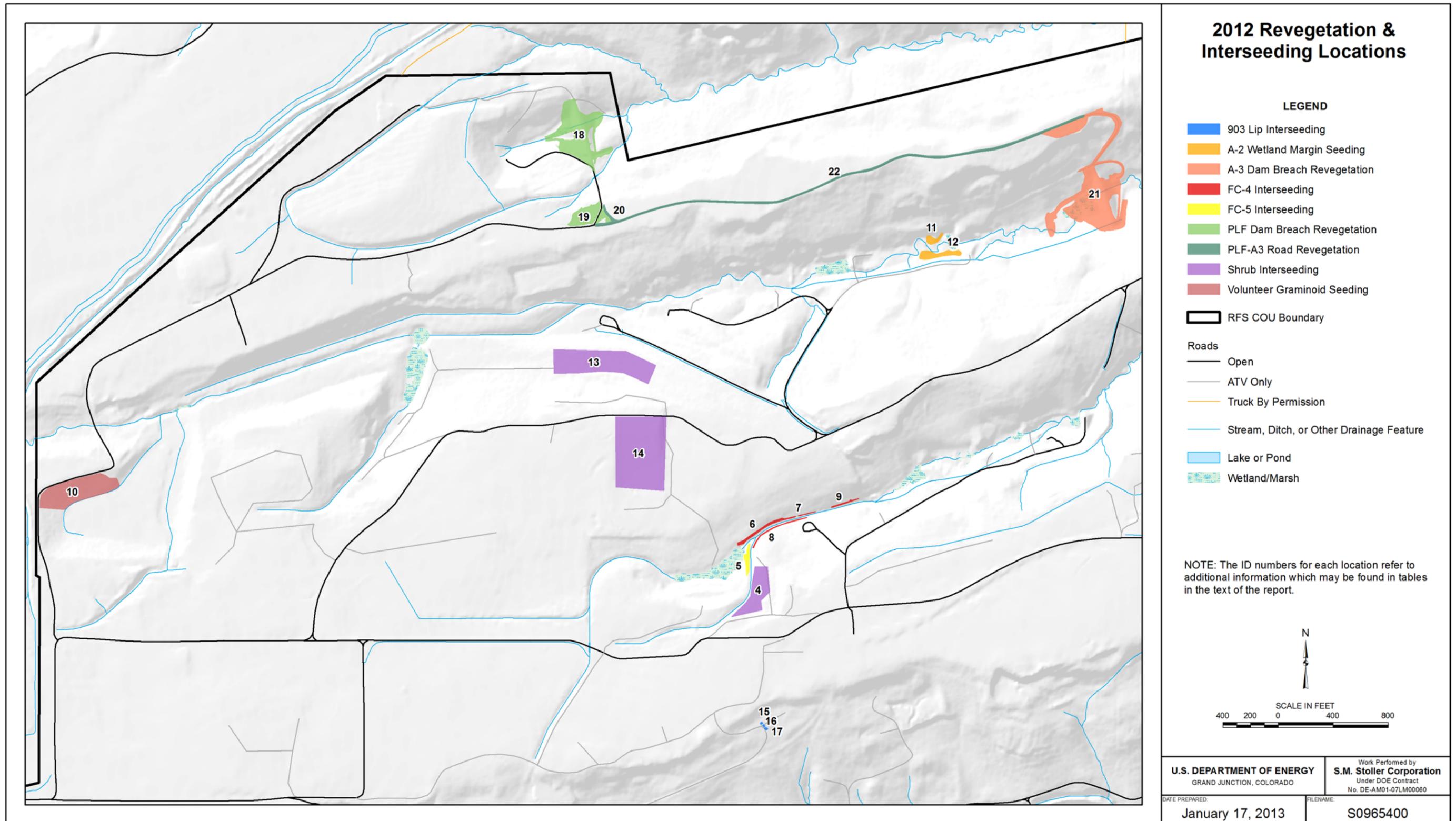
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Figure 4. 2012 Miscellaneous Weed Species Locations



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Figure 5. 2012 RFS Herbicide Application Locations



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Figure 6. 2012 Revegetation and Interseeding Locations

Table 1. COU Noxious Weed Acreage Summary (2007-2012)

Species	Density (acres)				Total	% of Total COU
	High	Medium	Low	Scattered		
Diffuse knapweed						
2007	2.2	41.2	248.8	167.7	459.9	35
2008	1.8	20.6	110.0	147.5	279.9	21
2009	1.6	44.6	231.2	147.5	424.9	32
2010	0.1	10.6	155.0	64.3	230.1	18
2011	0.0	2.8	77.1	77.7	157.6	12
2012	0.0	7.6	109.1	56.4	173.1	13
Dalmatian toadflax						
2007	77.1	51.0	0.0	109.0	237.1	18
2008	0	0	54.3	151.8	206.1	16
2009	2.1	16.8	56.5	386.7	462.1	35
2010	0.0	2.1	64.2	101.4	167.7	13
2011	0.0	0.0	19.9	29.0	48.9	4
2012	0.0	2.8	53.8	58.9	115.5	9

The total acreage of the COU is 1308 acres.

Table 2. FY2012 Herbicide Application Summary

Location	Target Species*	Treatment** (Rate/Acre)	Actual Acreage Treated***	Time of Year Treated
1	CEDI1	7 oz Milestone + 1 oz Escort	9.00	Spring 2012
2	CEDI1	7 oz Milestone + 1 oz Escort	9.00	Spring 2012
3	CEDI1, VETH1, VEBL1, CIIN1	7 oz Milestone + 1 oz Escort	25.00	Spring 2012
4	CEDI1	7 oz Milestone + 1 oz Escort	7.50	Spring 2012
5	CEDI1	16 oz Transline	0.97	Spring 2012
6	CEDI1	16 oz Transline	0.07	Spring 2012
7	CEDI1	16 oz Transline	0.02	Spring 2012
8	CEDI1	16 oz Transline	0.04	Spring 2012
9	CEDI1	16 oz Transline	0.04	Spring 2012
10	CEDI1	16 oz Transline	0.02	Spring 2012
11	CEDI1	16 oz Transline	0.22	Spring 2012
12	CEDI1	16 oz Transline	0.01	Spring 2012
13	CEDI1	16 oz Transline	0.03	Spring 2012
14	CEDI1	16 oz Transline	0.03	Spring 2012
15	CEDI1	16 oz Transline	0.05	Spring 2012
16	CEDI1	16 oz Transline	0.06	Spring 2012
17	CEDI1	16 oz Transline	0.23	Spring 2012
18	CEDI1	16 oz Transline	0.13	Spring 2012
19	CEDI1	16 oz Transline	0.20	Spring 2012
20	CEDI1	16 oz Transline	0.26	Spring 2012
21	CEDI1	16 oz Transline	0.19	Spring 2012
22	CEDI1	16 oz Transline	0.16	Spring 2012
23	CEDI1	16 oz Transline	0.06	Spring 2012
24	CEDI1	16 oz Transline	0.08	Spring 2012
25	CEDI1	16 oz Transline	0.09	Spring 2012
26	CEDI1	16 oz Transline	0.67	Spring 2012
27	CEDI1	16 oz Transline	0.03	Spring 2012
28	CEDI1	16 oz Transline	0.09	Spring 2012
29	CEDI1, CIAR1	7 oz Milestone + 1 oz Escort	3.00	Spring 2012
30	CEDI1, VETH1, COAR1, LIDA1	7 oz Milestone + 1 oz Escort	19.00	Spring 2012
31	CEDI1, VETH1	7 oz Milestone + 1 oz Escort	32.00	Spring 2012
32	CEDI1, VETH1, LIDA1, HYPE1	7 oz Milestone + 1 oz Escort	49.00	Spring 2012
33	CEDI1, VETH1, CIAR1	7 oz Milestone + 1 oz Escort	5.25	Spring 2012
34	CIAR1	7 oz Milestone + 0.5 oz Escort	6.00	Spring 2012
35	CEDI1	7 oz Milestone + 1 oz Escort	1.00	Spring 2012
36	Total Kill	10 lb Karmex + 48 oz Arsenal + 1 oz Telar + 48 oz Redeem + 2 gal Roundup	0.50	Spring 2012
37	BRTE1	5 oz Plateau	15.00	Fall 2012
38	EUUR1	8 oz Plateau	12.10	Fall 2012
39	CEDI1	7 oz Milestone + .5 oz Escort	13.00	Fall 2012
40	CEDI1, CIAR1, VETH1	7 oz Milestone + .5 oz Escort	25.00	Fall 2012
41	CEDI1	7 oz Milestone + .5 oz Escort	9.00	Fall 2012
42	EUUR1	8 oz Plateau	0.30	Fall 2012
43	EUUR1	8 oz Plateau	0.20	Fall 2012
44	TYLA1	1 gal Rodeo	0.03	Spring 2012
45	TYLA1	1 gal Rodeo	0.01	Spring 2012
46	TYLA1	1 gal Rodeo	0.01	Spring 2012
47	TYLA1	1 gal Rodeo	0.01	Spring 2012
48	Woody Plants	2 gal Garlon 3A	0.06	Spring 2012
49	Woody Plants	2 gal Garlon 3A	0.03	Spring 2012
50	Woody Plants	2 gal Garlon 3A	0.15	Spring 2012
51	Total Kill	1 gal Rodeo	0.80	Fall 2012
52	Total Kill	1 gal Rodeo	0.50	Fall 2012
53	Total Kill	1 gal Rodeo	0.70	Fall 2012
54	CEDI1	7 oz Milestone + 0.5 oz Escort	0.50	Spring 2012
A	BRTE1, Various other weedy species	5 oz Plateau	0.80	Fall 2012
B	BRTE1, Various other weedy species	5 oz Plateau	4.90	Fall 2012
C	BRTE1, Various other weedy species	5 oz Plateau	1.60	Fall 2012
D	BRTE1, Various other weedy species	5 oz Plateau	3.40	Fall 2012
E	BRTE1, Various other weedy species	5 oz Plateau	4.10	Fall 2012
F	BRTE1, Various other weedy species	5 oz Plateau	0.80	Fall 2012
G	BRTE1, Various other weedy species	5 oz Plateau	2.00	Fall 2012
H	BRTE1, Various other weedy species	5 oz Plateau	0.30	Fall 2012
I	BRTE1, Various other weedy species	5 oz Plateau	1.10	Fall 2012
		Annual Total Acreage Treated	266.42	
		Spring Total Acreage Treated	170.82	
		Fall Total Acreage Treated	95.60	

* Species Codes: BRTE1 = Downy Brome, CEDI1 = Diffuse knapweed, CIAR1 = Canada thistle, CIIN1 = Chicory, COAR1 = Field Bindweed, EUUR1 = Leafy Spurge, HYPE1 = St. Johns-wort, LIDA1 = Dalmatian Toadflax, VEBL1 = Moth Mullein, VETH1 = Common Mullein, TYLA1 = Cattails

** Depending on location specific environmental conditions and which target species were present, one or more of the listed herbicides were mixed together and used in that area.

*** Acreages based on billing statements, not GIS footprints on map.

Table 3. 2012 Revegetation Location Summary

Location	Seeding Date	Acres	Project	Seed Mix	Seeding Method
4	11/30/2011	0.9	Shrub Interseeding	Four-wing Saltbush/Rubber Rabbitbrush	Hand Broadcasting
5	11/29/2011	0.1	FC-5 Interseeding	Mesic seed mix + Switchgrass	Hand Broadcasting
6	11/29/2011	0.1	FC-4 Interseeding	Mesic seed mix + Switchgrass	Hand Broadcasting
7	11/29/2011	0.0	FC-4 Interseeding	Mesic seed mix + Switchgrass	Hand Broadcasting
8	11/29/2011	0.1	FC-4 Interseeding	Mesic seed mix + Switchgrass	Hand Broadcasting
9	11/29/2011	0.0	FC-4 Interseeding	Mesic seed mix + Switchgrass	Hand Broadcasting
10	2/1/2012	1.9	Volunteer Graminoid Seeding	Volunteer collected seed	Hand Broadcasting
11	3/20/2012	0.1	A-2 Wetland Margin Seeding	Mesic seed mix + Switchgrass	Hand Broadcasting
12	3/20/2012	0.3	A-2 Wetland Margin Seeding	Mesic seed mix + Switchgrass	Hand Broadcasting
13	3/20/2012	2.6	Shrub Interseeding	Four-wing Saltbush/Rubber Rabbitbrush	Hand Broadcasting
14	3/20/2012	4.3	Shrub Interseeding	Four-wing Saltbush/Rubber Rabbitbrush	Hand Broadcasting
15	3/20/2012	0.0	903 Lip Interseeding	Mesic seed mix	Hand Broadcasting
16	3/20/2012	0.0	903 Lip Interseeding	Mesic seed mix	Hand Broadcasting
17	3/20/2012	0.0	903 Lip Interseeding	Mesic seed mix	Hand Broadcasting
18	5/24/2012	2.4	PLF Dam Breach Revegetation	Mesic seed mix + Switchgrass/Wetland seed mix	Hand Broadcasting
19	5/24/2012	0.6	PLF Dam Breach Revegetation	Mesic seed mix + Switchgrass/Wetland seed mix	Hand Broadcasting
20	5/24/2012	0.1	PLF Dam Breach Revegetation	Mesic seed mix + Switchgrass/Wetland seed mix	Hand Broadcasting
21	3/29/2012	4.3	A-3 Dam Breach Revegetation	Mesic seed mix + Switchgrass/Wetland seed mix	Hand Broadcasting
22	7/2/2012	1.2	PLF-A3 Road Revegetation	Xeric seed mix	ATV/Hand Broadcasting
Total		19.1			

*Seed mixes are listed in the Rocky Flats, Colorado, Site Revegetation Plan, January 2009.

This can be found at: http://www.lm.doe.gov/Rocky_Flats/SOG.aspx

PAV11 = Panicum virgatum (switchgrass)