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Station #13

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 602502

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Environmental Restoration	4. Related EDT No.: N/A
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1	WHC-SD-EN-TI-216		0	Vegetation Communities Associated with the 100-Area and 200-Area Facilities on the Hanford Site	4	1/2	1	

16. KEY

Impact Level (F)	Reason for Transmittal (G)		Disposition (H) & (I)	
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2	1	Cog.Eng. J.A. Stegen	J. Amarada	1/14/94	H6-02	Central Files (2)			L8-04	3	
2	1	Cog. Mgr. R.P. Henckel		1-14-94	02						
		QA									
		Safety									
		Env.									
3		EPIC ~~(2)~~ (1)			H6-08						
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Part 1

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ALPHABETICAL LIST OF PLANT NAMES

Forbs (genus species)	Common Name	Family
Achillea millefolium	yarrow	ASTERACEAE
Amaranthus albus	white pigweed	AMARANTHACEAE
Ambrosia acanthicarpa	bur ragweed	ASTERACEAE
Amsinckia spp.	fiddleneck	BORAGINACEAE
Astragalus spp.	milkvetch	FABACEAE
Balsamorhiza careyana	Carey's balsamroot	ASTERACEAE
Calochortus macrocarpus	sagebrush mariposa lily	LILIACEAE
Capsella bursa-pastoris	shepherd's purse	BRASSICACEAE
Centaurea spp.	knapweed	ASTERACEAE
Chaenactis douglasii	hoary aster	ASTERACEAE
Cirsium vulgare	bull thistle	ASTERACEAE
Comandra umbellatum	bastard toadflax	SANTALACEAE
Conyza canadensis	horseweed	ASTERACEAE
Crepis atrabarba	slender hawksbeard	ASTERACEAE
Cymopteris terebinthinus	turpentine spring parsley	APIACEAE
Descurainia pinnata	western tansymustard	BRASSICACEAE
Draba verna	spring whitlowgrass	BRASSICACEAE
Equisetum spp.	horsetail	EQUISETACEAE
Erigeron filifolius	threadleaf fleabane	ASTERACEAE
Erigeron poliospermus	cushion fleabane	ASTERACEAE
Erigeron pumilus	shaggy fleabane	ASTERACEAE
Erigeron spp.	fleabane	ASTERACEAE
Eriogonum niveum	snow buckwheat	POLYGONACEAE
Eriogonum sphaerocephalum	rock buckwheat	POLYGONACEAE
Erodium cicutarium	storksbill	GERANIACEAE
Grindelia columbiana	Columbia River gumweed	ASTERACEAE
Heterotheca villosa	hairy golden-aster	ASTERACEAE
Holosteum umbellatum	jagged chickweed	CARYOPHYLLACEAE
Lactuca serriola	prickly lettuce	ASTERACEAE
Lepidium perfoliatum	clasping pepperweed	BRASSICACEAE
Lomatium grayi	Gray's desertparsley	APIACEAE
Lupinus pusillus	low lupine	FABACEAE
Machaeranthera canescens	hoary aster	ASTERACEAE
Melilotus alba	white sweetclover	FABACEAE
Microsteris gracilis	pink microsteris	POLEMONIACEAE
Oenothera pallida	pale eveningprimrose	ONAGRACEAE
Orobanche fasciculata	clustered broomrape	OROBANCHACEAE
Penstemon acuminatus	sand beardtongue	SCROPHULARIACEAE
Phlox longifolia	longleaf phlox	POLEMONIACEAE
Plantago patagonica	indian wheat	PLANTAGINACEAE
Rosa woodsii	Wood's rose	ROSACEAE
Salsola kali	Russian thistle	CHENOPODIACEAE
Sisymbrium altissimum	Jim Hill's tumblemustard	BRASSICACEAE
Sphaeralcea munroana	Munro's globemallow	MALVACEAE
Townsendia florifer	showy Townsend-daisy	ASTERACEAE
Tragopogon dubius	yellow salsify	ASTERACEAE
Trifolium repens	white clover	FABACEAE
Verbascum thapsus	common mullein	SCROPHULARIACEAE

ALPHABETICAL LIST OF PLANT NAMES (cont)

Grasses (genus species)	Common Name	Family
Agropyron dasytachyum	thickspike wheatgrass	POACEAE
Agropyron spicatum	bluebunch wheatgrass	POACEAE
Agropyron sibericum	Siberian wheatgrass	POACEAE
Bromus tectorum	cheatgrass	POACEAE
Elymus spp.	wildrye	POACEAE
Festuca octoflora	slender sixweeks	POACEAE
Oryzopsis hymenoides	indian ricegrass	POACEAE
Poa sandbergii	Sandberg's bluegrass	POACEAE
Sitanion hystrix	bottleneck squirreltail	POACEAE
Sporobolus cryptandrus	sand dropseed	POACEAE
Stipa comata	needle-and-thread grass	POACEAE

Shrubs (genus species)	Common Name	Family
Artemisia tridentata	big sagebrush	ASTERACEAE
Chrysothamnus nauseosus	gray rabbitbrush	ASTERACEAE
Chrysothamnus viscidiflorus	green rabbitbrush	ASTERACEAE
Grayia spinosa	spiny hopsage	CHENOPODIACEAE
Lycium halimifolium	matrimony vine	SOLANACEAE
Purshia tridentata	antelope bitterbrush	ROSACEAE

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1.0 INTRODUCTION AND PURPOSE

The Hanford Site, Benton County, Washington, lies within the broad semi-arid shrub-steppe vegetation zone of the Columbia Basin. Thirteen different habitat types on the Hanford Site have been mapped in *Habitat Types on the Hanford Site: Wildlife and Plant Species of Concern* (Downs et al. 1993). In a broad sense, this classification is correct. On a smaller scale, however, finer delineations are possible.

This study was conducted to determine the plant communities and estimate vegetation cover in and directly adjacent to the 100 and 200 Areas, primarily in relation to waste sites, as part of a comprehensive ecological study for the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) characterization of the 100 and 200 Areas. During the summer of 1993, field surveys were conducted and a map of vegetation communities in each area, including dominant species associations, was produced. The field surveys consisted of qualitative community delineations. The community delineations described were made by field reconnaissance and are qualitative in nature. The delineations were made by visually determining the dominant plant species or vegetation types and were based on the species most apparent at the time of inspection. Additionally, 38 transects were run in these plant communities to try to obtain a more accurate representation of the community. Because habitat disturbances from construction/operations activities continue to occur in these areas, users of this information should be cautious in applying these maps without a current ground survey. This work will complement large-scale habitat maps of the Hanford Site.

Information on root depth has also been included. Although the vegetation within most of the exclusion areas around the reactors and on the cribs and burial grounds is sparse to nonexistent, some radiological control zones are vegetated by deep-rooted plants. Plants have the potential to uptake radionuclides and other contaminants, and deep-rooted plants may be an especially significant pathway of contaminant transport throughout the ecosystem. Plants have been designated as deep rooted if the root system of that genus has been shown to exceed 150 cm (Klepper et al. 1985). Although rooting depth is primarily a function of heredity, it can also be a product of the environment in which the plant grows. Specific environmental conditions may cause this depth to vary from plant to plant within a species. Nutrient availability, oxygen supply, soil moisture content, osmotic pressure, soil temperature, pathogens, soil pore size, and soil compaction may cause variations in root depth (Foxx et al. 1984a).

2.0 SAMPLING TECHNIQUE

Preliminary surveys of the 100 and 200 Areas were conducted within and immediately outside the fence line to characterize vegetated versus nonvegetated areas. A qualitative ground survey was conducted in vegetated areas to determine possible vegetation communities and the appropriate placement of transects so that each community could be more accurately characterized. A plant community is an aggregation of plants having a unity of taxonomic composition with relatively uniform distribution and density. The vegetated areas were then surveyed and percent of shrub cover measured.

One-hundred-meter transects were placed in vegetated areas outside radiologically controlled zones. Appendix A provides a summary of transect locations. A 0.2- by 0.5-m modified Daubenmire plot was used to estimate cover. A plot was placed every 5 m along the right side of each 100-m transect. Plant species and their respective percent of cover within each plot were visually measured and recorded. Percent of cover was determined separately for each species overlapping the plot regardless of where individual plants were rooted. Because the canopies of different species are commonly interlaced and those of different stature overlap, the sum of coverage for a stand commonly exceeds 100% (Daubenmire 1968).

Dominant species, the species having the highest average percent of cover within the Daubenmire plots, were determined. Additionally, a survey was conducted to identify plants that were not located in the Daubenmire plots but occurred in the vicinity of the transect. Appendix B provides a list of plants recorded at each site during ground-truthing surveys. Data were not collected in radiation zones, but information from areas with similar vegetation was extrapolated to characterize these waste sites. Vegetation maps were developed from transect data, ground-truthing information, and existing aerial photographs.

The shrub height and percent of cover data have been included to present a better description of the plant community. A 10- by 10-m plot was surveyed at 25-35 m, 50-60 m, and 75-85 m along each 100-m transect to determine shrub height and percent cover. The longest diameter and extreme shoot height from ground level was measured for each shrub. The amount of shrub cover was calculated using estimates of diameter obtained in these plots. In some cases, this may have overestimated the cover, but the majority of the shrubs measured were *Chrysothamnus nauseosus*, which tend to have a spherical shape.

3.0 RESULTS

Using transect data, existing aerial photographs, and ground-truthing information, maps of vegetative cover have been generated for the 100 and 200 Areas. These include disturbed/vegetated and disturbed/nonvegetated areas. Disturbed nonvegetated areas consist mainly of facilities and waste sites. Vegetation in these areas was sparse to nonexistent. If there was more than 10% total cover, areas were classified as disturbed/vegetated areas. The landscaped areas around buildings have not been included in the map because they are not relevant in this study.

It is important to note that this study was conducted over a short time span (June through September). Depending on the length and time of the growing season, the density of plants and community composition will inevitably vary. Many of the species recorded are annuals, and their density may vary considerably from year to year. Changes can be due to weather influences on the setting of seed, conditions necessary for germination, or fungal destruction of seeds and seedlings (Daubenmire 1968). Additionally, widespread use of herbicides for vegetation control, particularly in waste sites, will have a distinct effect on plant density in and around these areas. The information in this document should be used as general information; for more up-to-date information on a particular waste site, surveys should be conducted.

Much of the area in and around the 100 Area reactor sites and 200 Areas was highly disturbed. Generally, disturbed areas were vegetated with stands of the alien annual grass, *Bromus tectorum*. Other plants that dominated disturbed areas near the 100 Area reactor sites and in the 200 Areas were as follows:

- *Centaurea species*
- *Draba verna*
- *Ambrosia acanthicarpa*
- *Salsola kali*
- *Sisymbrium altissimum*
- *Chrysothamnus nauseosus*

When shrubs invaded *B. tectorum* stands, the predominant invader was the native shrub, *C. nauseosus*. *Agropyron sibericum* is a non-native grass that has been used in the 200 Areas to revegetate and stabilize waste burial grounds. It is the most widely used perennial grass for seeding these grounds because it is more drought tolerant and better adapted to sandy soils than other cultivars commonly used in revegetation mixtures. It has been found to spread away from seeded areas at the Hanford Site and to competitively limit cheatgrass where seeded. It is a persistent resident of disturbed Hanford Site landscapes.

The results for shrub cover differ between the 10- by 10-m and the Daubenmire plots. The reasons for the difference in cover may be due to sampling error, variability within each habitat type, or variability in sampling techniques. The main reason for the difference in sample results is a variability in sampling techniques. The Daubenmire technique uses a small

area (total of 2 m^2 per 100 m transect) and plant coverage is visually estimated. The 10- by 10-m plot technique uses a larger area (300 m^2 per 100-m transect) for sampling, and each plant within the area is individually measured for height and width. Therefore, the estimates derived from data collected from the 10- by 10-m plots better represent shrub canopy cover in the plant community.

A comprehensive list of plants that occur in the 100 Areas and possible shoreline plant community delineations is included in *100 Area CERCLA Ecological Investigations* (Landeen et al. 1993). A complete list of plants known to occur on the Site can be found in *Vascular Plants of the Hanford Site* (Sackschewsky et al. 1992). General habitat types on the Site are described in *Habitat Types on the Hanford Site: Wildlife and Plant Species of Concern* (Downs et al. 1993).

4.0 100-B/C AREA

The 100-B/C Area lies on a flat bench southwest of 100-K Area. It covers approximately 2.33 km^2 (0.93 mi^2). The elevation of the area ranges from around 149 m (490 ft) along the southern border to 131 m (430 ft) near the Columbia River. The average slope across the area is about 1%. Erosion has created a steep embankment that drops approximately 9 m (30 ft) to an elevation of 122 m (400 ft) along the Columbia River (Fitzner et al. 1992). Two types of soils have been identified in and around this area: Ephrata Stony Loam and Burbank Loamy Sand (Hajek 1966).

4.1 VEGETATION COMMUNITIES

Vegetation communities in this area are *B. tectorum/S. kali*, *C. nauseosus/B. tectorum*, and disturbed/nonvegetated areas. In the disturbed/nonvegetated areas, minimal (<5%) cover was provided by plants because these areas are routinely sprayed with herbicide as needed as part of a vegetation control program. Percent of cover calculated from Daubenmire plots is listed in Table 4-1, and a map of the general vegetation communities can be seen in Figure 4-1.

4.2 SHRUB COVER

Shrub cover is mainly provided by *C. nauseosus*. In the *C. nauseosus/B. tectorum* vegetation community, *C. nauseosus* provides approximately 56% cover and has a mean height of 41 cm. In the *B. tectorum/S. kali* vegetation community, *C. nauseosus* provides approximately 3% cover and has a mean height of 56 cm.

Figure 4-1. Vegetation Community Map for 100-B/C Area.

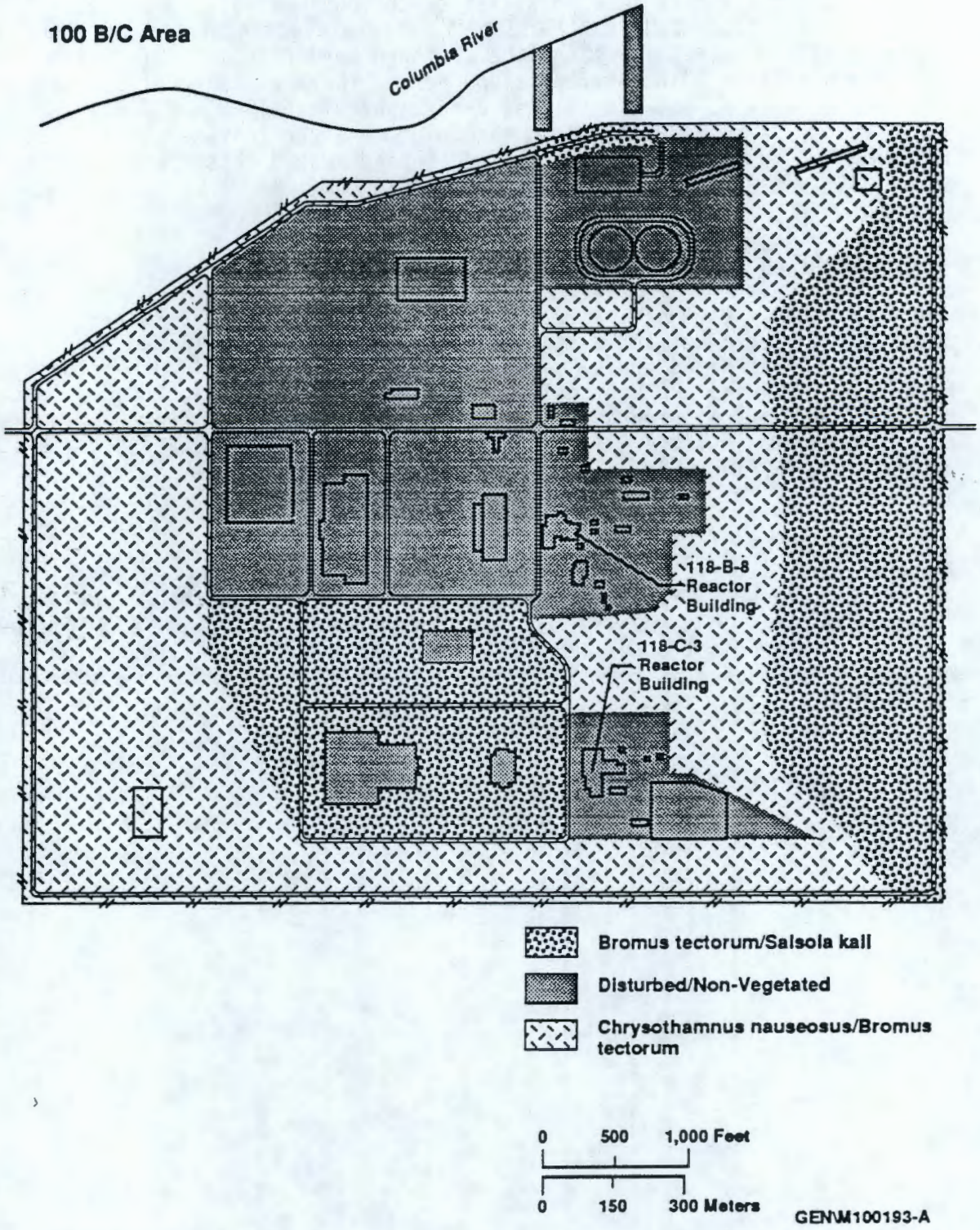

Table 4-1. Vegetation Communities Associated with 100-B/C Area.

SPECIES	ROOT DEPTH[a]	PERCENT COVER
VEGETATION COMMUNITY - *B. tectorum/S. Kali*		
B. tectorum	S[1]	15
S. kali	D[2]	11
C. nauseosus	D[2]	3 *
Draba verna	S	2
Holosteum umbellatum	S	1
Poa sandbergii	S[3]	<1
VEGETATION COMMUNITY - *C. nauseosus/B. tectorum*		
C. nauseosus	D[2]	56 *
B. tectorum	S[1]	12
D. verna	S	2
P. sandbergii	S[3]	2
Sporobolus cryptandrus	S[3]	<1
H. umbellatum	S	<1

* - percent of shrub cover was derived from data collected in 10- by 10-m plots at 25-35 m, 50-60 m, and 75-85 m along the 100 m transect

[a]D - plants with root systems known to exceed 150 cm deep
S - plants with root systems not known to exceed 150 cm deep

[1]Foxx et al. 1984a.
[2]Klepper et al. 1985.
[3]Foxx et al. 1984b.

5.0 100-K AREA

The 100-K Area covers approximately 1.89 km^2 (0.74 mi^2) and is approximately 152 to 305 m (500 to 1000 ft) from the Columbia River. The ground elevation varies from 122 to 152 m (400 to 500 ft) above mean sea level (amsl), with a land surface slope averaging about 5% toward the northwest boundary (Fitzner et al. 1992). Soil in this area has been described as Ephrata Stony Loam, Ephrata Sandy Loam, and Burbank Loamy Sand (Hajek 1966).

5.1 VEGETATION COMMUNITIES

Vegetation Communities in this area are *B. tectorum/P. sandbergii*, *C. nauseosus/B. tectorum*, *C. nauseosus/P. sandbergii/B. tectorum*, and disturbed/nonvegetated areas. In the disturbed/nonvegetated areas, minimal (<5%) cover was provided by plants because these areas are routinely sprayed with herbicide as needed as part of a vegetation control program. Percent of cover calculated from information collected in Daubenmire plots in the vegetation communities is listed in Table 5-1, and a map of vegetation communities is provided in Figure 5-1.

5.2 SHRUB COVER

Shrub cover is mainly provided by *C. nauseosus*. In the *C. nauseosus/P. sandbergii/B. tectorum* vegetation community, the estimated shrub cover is 9% with a mean height of 35 cm. In the *C. nauseosus/B. tectorum* vegetation community, the estimated shrub cover is 12% with a mean height of 76 cm. In the *B. tectorum/P. sandbergii* vegetation community, available shrub cover is minimal (approximately 1 shrub per 100 m) and although no shrubs were recorded in the transect, *C. nauseosus* was present in the general area.

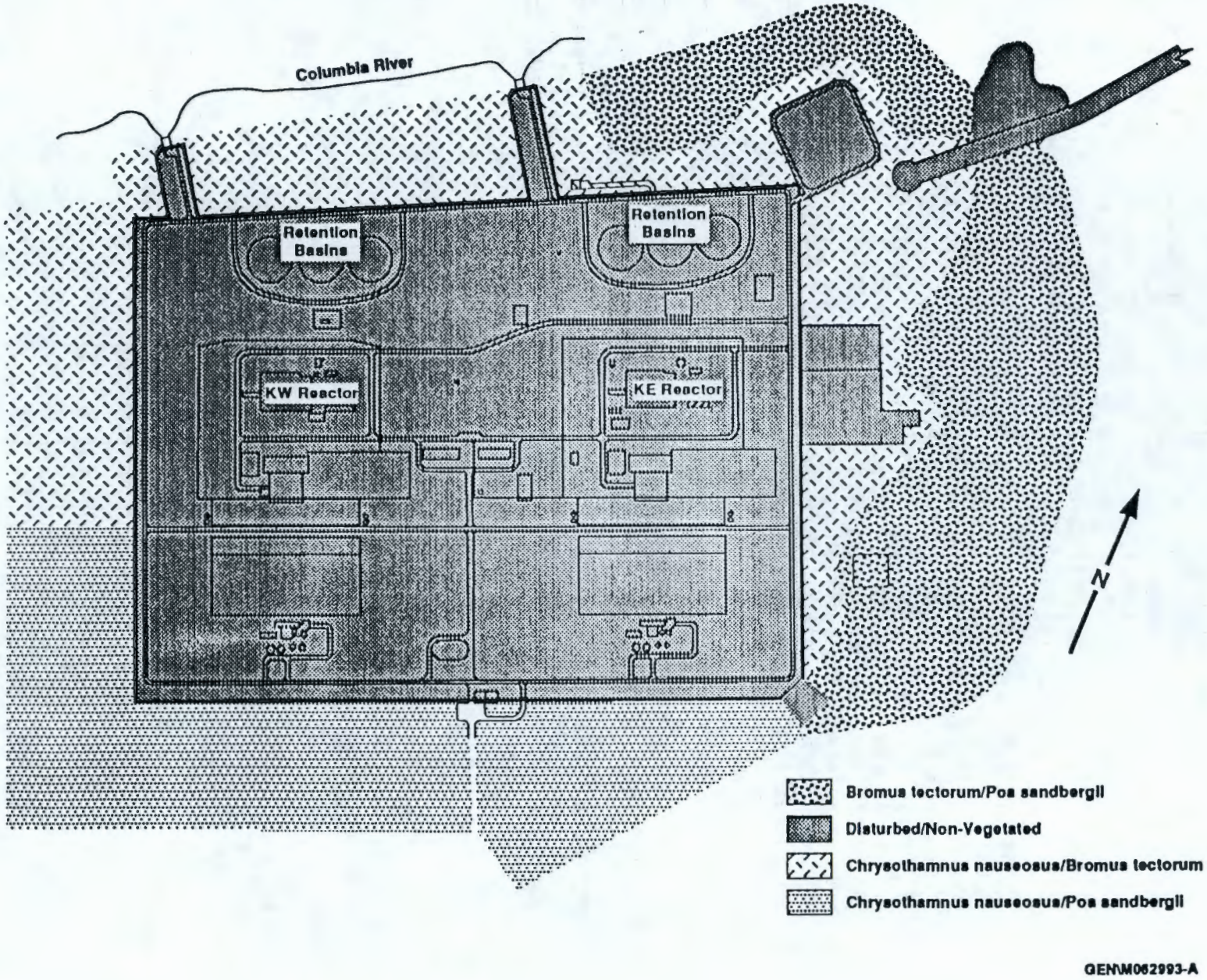

Figure 5-1. Vegetation Community for 100-K Area.

Table 5-1. Vegetation Communities Associated with 100-K Area. (sheet 1 of 2)

SPECIES	ROOT DEPTH[a]	PERCENTAGE COVER
VEGETATION COMMUNITY - *C. nauseosus/P. sandbergii/B. tectorum*		
C. nauseosus	D[2]	9 *
P. sandbergii	S[3]	9
B. tectorum	S[1]	9
H. umbellatum	S	4
D. verna	S	2
Erodium cicutarium	Unknown	1
S. kali	D[2]	<1
Machaeranthera canescens	S[2]	<1
VEGETATION COMMUNITY - *B. tectorum/P. sandbergii*		
B. tectorum	S[1]	58
P. sandbergii	S[3]	5
D. verna	S	4
Sisymbrium altissimum	Unknown	<1
H. umbellatum	S	<1
S. kali	D[2]	<1

Table 5-1. Vegetation Communities Associated with the 100-K Area.
(sheet 2 of 2)

SPECIES	ROOT DEPTH[A]	PERCENTAGE COVER
VEGETATION COMMUNITY - *C. nauseosus/B. tectorum*		
B. tectorum	S[1]	42
C. nauseosus	D[2]	12 *
D. verna	S	6
P. sandbergii	S[3]	3
H. umbellatum	S	1
S. kali	D[2]	<1
S. altissimum	Unknown	<1
Amsinckia spp.	Unknown	<1

*. - percent of shrub cover was derived from data collected in 10- by 10-m plots at 25-35 m, 50-60 m, and 75-85 m along the 100-m transect

[a]D - plants with root systems known to exceed 150 cm deep
S - plants with root systems not known to 150 cm deep

[1]Foxx et al. 1984a
[2]Klepper et al. 1985
[3]Foxx et al. 1984b

6.0 100-N AREA

The 100-N Area covers 650 acres, with the 100-D Area on the northeast boundary and the Columbia River on the northwest boundary. Elevation ranges from 119 m (390 ft) amsl at the Columbia River to approximately 135 m (450 ft) amsl on the east side of the area. The area is surrounded by hummocky terrain, which is perhaps the result of catastrophic flooding associated with Pleistocene glaciation (Fitzner et al. 1992). Areas between the hummocks contain large boulders several feet in diameter and Ephrata Sandy Loam underlain with gravel (Hajek 1966).

6.1 VEGETATION COMMUNITIES

Vegetation communities in this area are *B. tectorum/P. sandbergii*, *C. nauseosus/B. tectorum*, *B. tectorum/Centaurea species*, *B. tectorum/H. umbellatum*, and disturbed/nonvegetated areas. In the disturbed/nonvegetated areas, there was minimal (<5%) cover provided by plants because these areas are routinely sprayed with herbicides as needed as part of a vegetation control program. Percent of cover calculated from information from Daubenmire plots for the vegetation communities is listed in Table 6-1 and a map of the general vegetation communities is provided in Figure 6-1.

6.2 SHRUB COVER

Shrub cover is mainly provided by *C. nauseosus*. In the *B. tectorum/Centaurea species* vegetation community, *C. nauseosus* provides approximately 9% cover and has a mean height of 46 cm. In the *C. nauseosus/B. tectorum* vegetation community, the average shrub cover is 18% with a mean height of 46 cm. In the *B. tectorum/P. sandbergii* and *B. tectorum/H. umbellatum* vegetation communities, available shrub cover is minimal (approximately 1 shrub per 100 m); therefore, no shrubs were recorded in the transect although *C. nauseosus* was present in the general area.

Figure 6-1. Vegetation Community Map for 100-N Area.

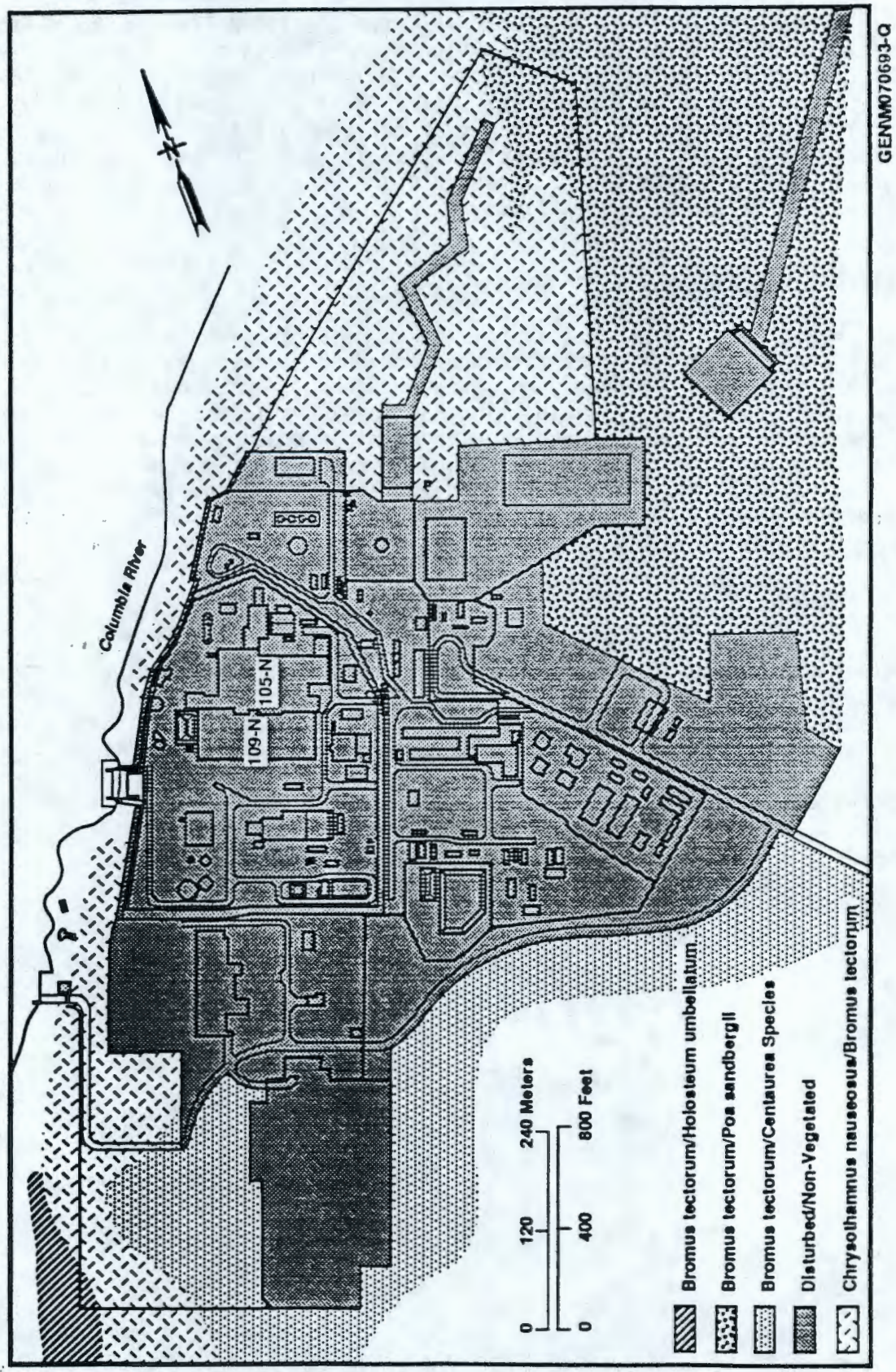

Table 6-1. Vegetation Communities Associated with 100-N Area. (sheet 1 of 2)

SPECIES	ROOT DEPTH[a]	PERCENTAGE COVER
VEGETATION COMMUNITY - *C. nauseosus/B. tectorum*		
B. tectorum	S[1]	26
C. nauseosus	D[2]	18 *
D. verna	S	13
Centaurea spp.	Unknown	3
H. umbellatum	S	1
S. kali	D[2]	<1
P. sandbergii	S[3]	<1
S. altissimum	Unknown	<1
Ambrosia acanthicarpa	D[2]	<1
VEGETATION COMMUNITY- *B. tectorum/Centaurea species*		
B. tectorum	S[1]	30
Centaurea spp.	Unknown	10
C. nauseosus	D[2]	9 *
H. umbellatum	S	6
D. verna	S	2
Erodium cicutarium	Unknown	2
S. kali	D[2]	<1

Table 6-1. Vegetation Communities Associated with the 100-N Area.
(sheet 2 of 2)

SPECIES	ROOT DEPTH[a]	PERCENTAGE COVER
VEGETATION COMMUNITY - *B. tectorum/P. sandbergii*		
B. tectorum	S[1]	54
P. sandbergii	S[3]	16
D. verna	S	8
H. umbellatum	S	8
S. altissimum	Unknown	5
Plantago patagonica	Unknown	3
S. kali	D[2]	2
Amsinckia spp.	Unknown	<1
Tragopogon dubius	Unknown	<1
VEGETATION COMMUNITY - *B. tectorum/H. umbellatum*		
B. tectorum	S[1]	49
H. umbellatum	S	10
Centaurea spp.	Unknown	7
D. verna	S	3
Amsinckia spp.	Unknown	2
S. altissimum	Unknown	1
E. cicutarium	Unknown	<1
Achillea millefolium	Unknown	<1
S. kali	D[2]	<1

* - percent of shrub cover was derived from data collected in 10- by 10-m plots at 25-35 m, 50-60 m, and 75-85 m along the 100 m transect

[a]D - plants with root systems known to exceed 150 cm deep
S - plants with root systems not known to exceed 150 cm deep

[1]Foxx et al. 1984a
[2]Klepper et al. 1985
[3]Foxx et al. 1984b

7.0 100-D AREA

The 100-D Area is located approximately 2.4 km (1.5 mi) east-northeast of the 100-D Area and covers approximately 2.6 km^2 (1.0 km^2). It is situated on an essentially flat, semi-arid bench immediately southeast of the Columbia River. The elevation of the land surface near the center of the area is approximately 142 m (466 ft) amsl, with land surface sloping to the northeast (about a 1% gradient) to an elevation of approximately 134 m (440 ft). A steep embankment of about 18 m (60 ft) is present at the river's edge along the northwestern margin of the unit (Fitzner et al. 1992). Soils in this area include Ephrata Stony Loam, Burbank Loamy Sand, Rupert Sand, and Ephrata Sandy Loam (Hajek 1966).

7.1 VEGETATION COMMUNITIES

Vegetation communities in this area are *B. tectorum/S.kali*, *C. nauseosus/B. tectorum*, and disturbed/nonvegetated areas. In the disturbed/nonvegetated areas, there was minimal (<10%) cover provided by plants because these areas are routinely sprayed with herbicide as needed as part of a vegetation control program. Percent of cover calculated from information from Daubenmire plots for the vegetation communities is listed in Table 7-1, and a map of the general vegetation communities is provided in Figure 7-1.

7.2 SHRUB COVER

Shrub cover is mainly provided by *C. nauseosus*. In the *C. nauseosus/B. tectorum* vegetation community, *C. nauseosus* provides approximately 21% cover and has a mean height of 49 cm. In the *B. tectorum/S. kali* vegetation community, available shrub cover is minimal (approximately 1 shrub per 100 m); therefore, no shrubs were recorded in the transect although *C. nauseosus* was present in the general area.

Figure 7-1. Vegetation Community Map for 100-D Area.

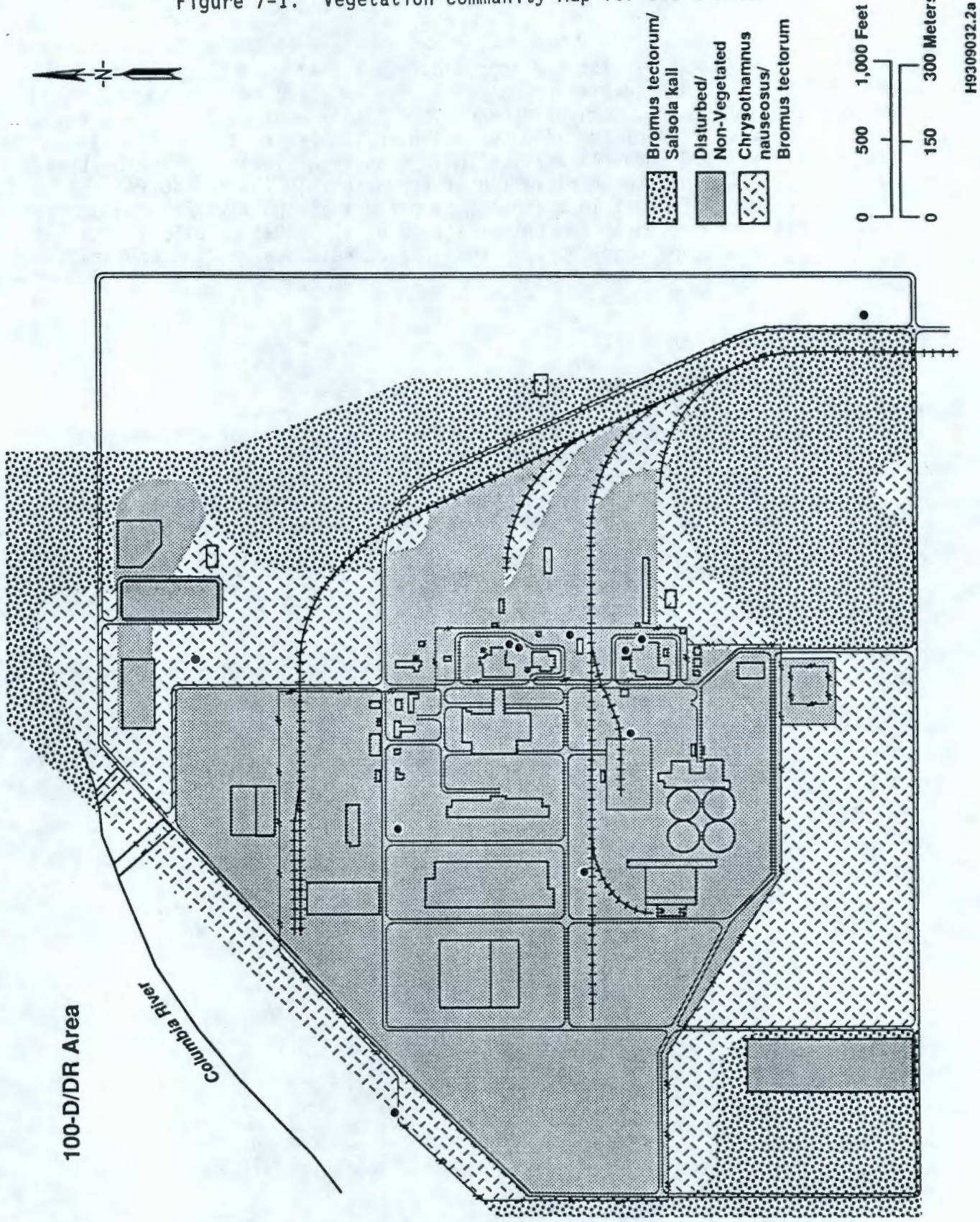

Table 7-1. Vegetation Communities Associated with the 100-D Area.

SPECIES	ROOT DEPTH[a]	PERCENT COVER
VEGETATION COMMUNITY - *B. tectorum/S. kali*		
B. tectorum	S[1]	32
S. kali	D[2]	10
H. umbellatum	S	8
S. altissimum	Unknown	7
Amaranthus albus	D[3]	1
M. canescens	S[2]	<1
Sphaeralcea munroana	D[3]	<1
D. verna	S	<1
VEGETATION COMMUNITY - *C. nauseosus/B.tectorum*		
C. nauseosus	D[2]	21 *
B. tectorum	S[1]	9
S. kali	D[2]	7
D. verna	S	2
H. umbellatum	S	<1
P. sandbergii	S[3]	<1
S. altissimum	Unknown	<1
Amsinckia spp.	Unknown	<1
S. munroana	D[3]	<1

* - percent of shrub cover was derived from data collected in 10 x 10 m plots at 25-35 m, 50-60 m, and 75-85 m along the 100 m transect

[a]D - plants with root systems known to exceed 150 cm deep
S - plants with root systems not known to exceed 150 cm deep

[1]Foxx et al. 1984a
[2]Klepper et al. 1985
[3]Foxx et al. 1984b

8.0 100-H AREA

The 100-H Area covers 5.86 km^2 (2.26 mi_2) and is on a semi-arid bench, with elevation ranging from 116 to 140 m (380 to 460 ft) amsl (Fitzner et al. 1992). At least two different types of soil, Burbank Loamy Sand in and around the area and river-wash along the shoreline, have been identified in this area (Hajek 1966).

8.1 VEGETATION COMMUNITIES

Vegetation communities in this area are *B. tectorum/S. kali*, *C. nauseosus/P. sandbergii*, and disturbed/nonvegetated areas. In the disturbed/nonvegetated areas, there was minimal (less than 10%) cover provided by plants because these areas are routinely sprayed with herbicide as needed as part of a vegetation control program. Percent of cover calculated from information from Daubenmire plots for the vegetation communities is listed in Table 8-1. A map of the general vegetation communities is provided in Figure 8-1.

8.2 SHRUB COVER

Shrub cover is mainly provided by *C. nauseosus*. In the *C. nauseosus/P. sandbergii* vegetation community, the average shrub cover is 19% with a mean height of 59 cm. In the *B. tectorum/S. kali* vegetation community, the average shrub cover provided by *C. nauseosus* was 1%. No height data was collected for this vegetation community.

Figure 8-1. Vegetation Community Map for 100-H Area.

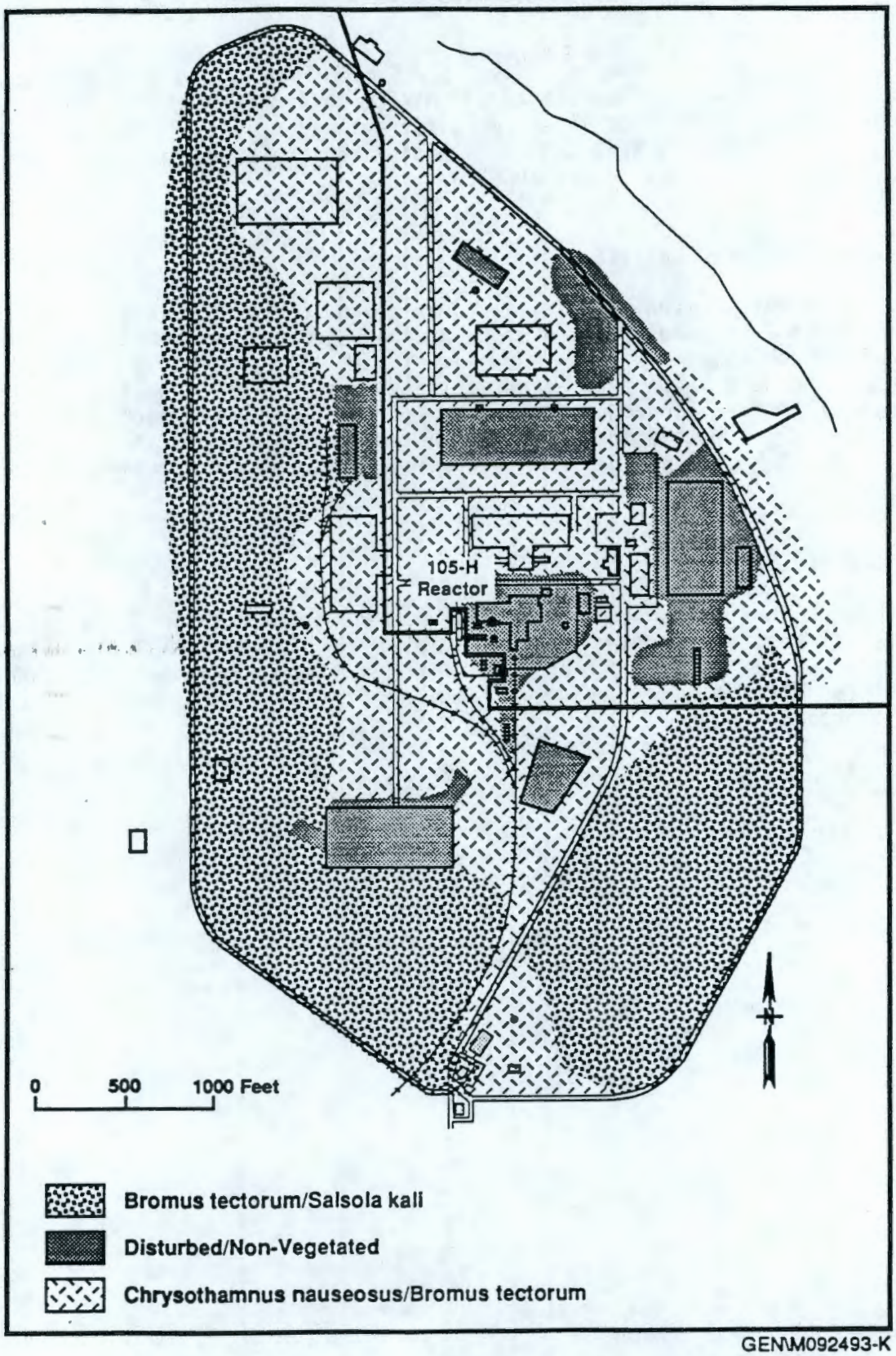

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Table 8-1. Vegetation Communities Associated with 100-H Area.

SPECIES	ROOT DEPTH[a]	PERCENT COVER
VEGETATION COMMUNITY - *C. nauseosus/P. sandbergii*		
P. sandbergii	S[3]	29
C. nauseosus	D[2]	19 *
S. kali	D[2]	6
B. tectorum	S[1]	2
S. cryptandrus	S[3]	<1
M. canescens	S[2]	<1
Centaurea spp.	Unknown	<1
VEGETATION COMMUNITY - *B. tectorum/S. kali*		
B. tectorum	S[1]	13
S. kali	D[2]	9
S. altissimum	Unknown	4
D. verna	S	3
C. nauseosus	D[2]	1 *
H. umbellatum	S	1
P. sandbergii	S[3]	<1
Amaranthus albus	D[3]	<1
Capsella bursa-pastoris	Unknown	<1
Lactuca serriola	S[2]	<1
S. cryptandrus	S[3]	<1

* - percent of shrub cover was derived from data collected in 10- by 10-m plots at 25-35 m, 50-60 m, and 75-85 m along the 100 meter transect

[a]D - plants with root systems known to exceed 150 cm deep
S - plants with root systems not known to exceed 150 cm deep

[1]Foxx et al. 1984a
[2]Klepper et al. 1985
[3]Foxx et al. 1984b

9.0 100-F AREA

The 100-F Area covers approximately 7.4 km^2 (2.9 mi^2) and lies in a broad, essentially flat, semiarid plain on the eastern portion of a bend in the Columbia River. Elevation is approximately 122 m (400 ft) across the entire area. The river bank, which forms the northeast boundary of the area, drops steeply, approximately 9 m (30 ft) (Fitzner et al. 1992). The soils in this area have been identified as Pasco Silty Loam, Burbank Loamy Sand, and Ephrata Sandy Loam (Hajek 1966).

9.1 VEGETATION COMMUNITIES

Vegetation communities in this area are *C. nauseosus/B. tectorum*, *B. tectorum/S. kali*, and disturbed/nonvegetated areas. In the disturbed/nonvegetated areas, there was minimal (<5%) cover provided by plants because these areas are routinely sprayed with herbicide as needed as part of a vegetation control program. Percent of cover calculated from information from the Daubenmire plots for the vegetation communities is listed in Table 9-1, and a map of vegetation communities is provided in Figure 9-1.

9.2 SHRUB COVER

Shrub cover is mainly provided by *C. nauseosus*. In the *C. nauseosus/B. tectorum* vegetation community, the estimated shrub cover is 12% with a mean height of 54 cm. In the *B. tectorum/S. kali* vegetation community, available shrub cover is minimal (approximately 1 plant per 100 m); therefore, no shrubs were recorded in the transect although *C. nauseosus* was present in the general area.

Figure 9-1. Vegetation Community Map for 100-F Area.

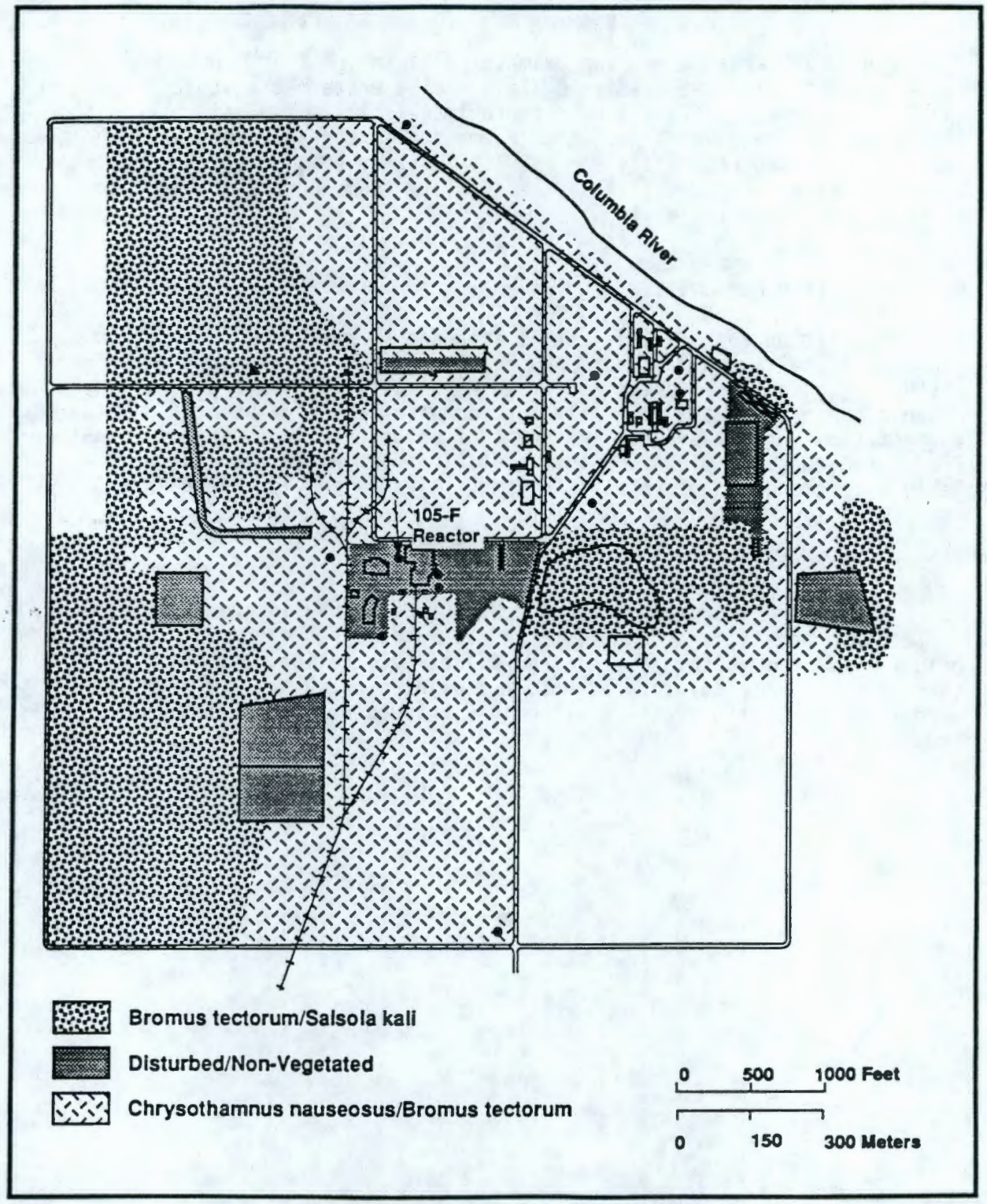

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Table 9-1. Vegetation Communities Associated with 100-F Area.

SPECIES	ROOT DEPTH[a]	PERCENT COVER
VEGETATION COMMUNITIES - *C. nauseosus/B. tectorum*		
C. nauseosus	D[2]	12 *
B. tectorum	S[1]	10
A. acanthicarpa	D[2]	1
Oenothera pallida	D[3]	<1
S. cryptandrus	S[3]	<1
M. canescens	S[2]	<1
S. kali	D[2]	<1
Trifolium repens	Unknown	<1
S. altissimum	Unknown	<1
P. sandbergii	S[3]	<1
D. verna	S	<1
Lepidium latifolium	Unknown	<1
VEGETATION COMMUNITY - *B. tectorum/S. kali*		
B. tectorum	S[1]	14
S. kali	D[2]	9
S. altissimum	Unknown	2
P. sandbergii	S[3]	<1
O. pallida	D[3]	<1
Amsinckia spp.	Unknown	<1

* - percent of shrub cover was derived from data collected in 10- by 10-m plots at 25-35 m, 50-60 m, and 75-85 m along the 100 m transect

[a]D - plants with root systems known to exceed 150 cm deep
S - plants with root systems not known to exceed 150 cm deep

[1]Foxx et al. 1984a
[2]Klepper et al. 1985
[3]Foxx et al. 1984b

10.0 200-WEST AREA

The 200-West Area covers approximately 23 km^2 (8.9 mi^2) and lies on a terrace known as the 200 Area Plateau. The elevation ranges from 190 to 245 m (623 to 803 ft) amsl. (Fitzner et al. 1992). Soils in the area have been identified as Rupert Sand and Burbank Loamy Sand (Hajek 1966).

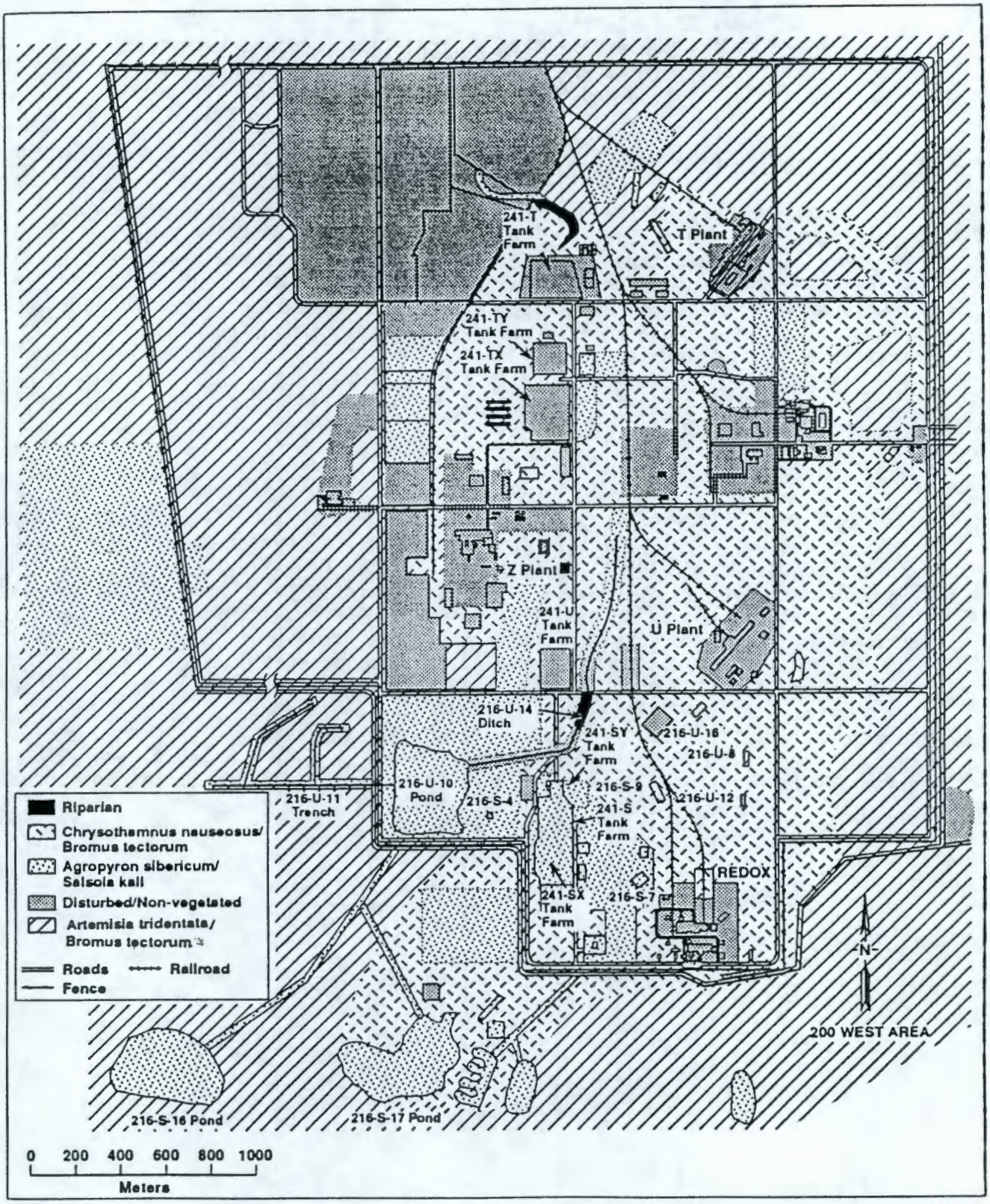
10.1 VEGETATION COMMUNITIES

Vegetation communities in this area are *C. nauseosus/B. tectorum*, *Artemisia tridentata/B. tectorum*, *Agropyron sibericum/S. kali*, riparian, and disturbed/nonvegetated areas. In the disturbed/nonvegetated areas, the percent of cover provided by plants is minimal (<10%) because these areas are sprayed with herbicide as needed as part of the vegetation control program. Percent of cover calculated from information from Daubenmire plots for the vegetation communities is listed in Table 10-1, and a map of the general vegetation communities is provided in Figure 10-1. The riparian community was not surveyed with transects so there is no information on percent of cover.

10.2 SHRUB COVER

Shrub cover is mainly provided by *A. tridentata* and *C. nauseosus*, with small amounts of *Grayia spinosa*, *Purshia tridentata*, *Lycium halimifolium*, and *Chrysothamnus viscidiflorus* also present. In the *C. nauseosus/B. tectorum* vegetation community, *C. nauseosus* provides approximately 7% cover with a mean height of 44 cm. In this vegetation community there is considerable variability in the cover distribution with some areas being heavily vegetated with *C. nauseosus* and some areas having only sparse shrub cover. Most of the waste sites in this vegetation community either have very little vegetation or are vegetated with *S. altissimum*, *S. kali*, and *B. tectorum*. In the *A. tridentata/B. tectorum* vegetation community, the average shrub cover is approximately 0.5% *Chrysothamnus viscidiflorus*, 1% *Grayia spinosa*, and 14% *Artemisia tridentata*. The average shrub height is 44 cm for C. viscidiflorus, 75 cm for G. spinosa, and 84 cm for A. tridentata. In the *A. sibericum/S. kali* vegetation community, shrub cover is virtually absent (approximately 1 plant per 300 m).

Figure 10-1. Vegetation Community Map for 200 West Area.



H9308015.1a

Table 10-1. Vegetation Communities Associated with 200 West Area.
(sheet 1 of 2)

SPECIES	ROOT DEPTH[a]	PERCENT COVER
VEGETATION COMMUNITY - *C. nauseosus/B. tectorum*		
B. tectorum	S[1]	28
C. nauseosus	D[2]	7 *
S. kali	D[2]	4
H. umbellatum	S	3
P. sandbergii	S[3]	2
S. altissimum	Unknown	2
Oryzopsis hymenoides	S[2]	2
Centaurea spp.	Unknown	1
D. verna	S	<1
Festuca octoflora	S[3]	<1
M. canescens	S[2]	<1
L. serriola	S[2]	<1
VEGETATION COMMUNITY - *A. sibericum/S. kali*		
A. sibericum	Unknown	11
S. kali	D[2]	1
B. tectorum	S	<1
VEGETATION COMMUNITY - *B. tectorum/S. altissimum*		
B. tectorum	S[1]	40
S. altissimum	Unknown	7
S. kali	D[2]	3
P. sandbergii	S[3]	2
H. umbellatum	S	2
D. verna	S	<1
Microsteris gracilis	Unknown	<1
M. canescens	S[2]	<1
Tragopogon dubius	Unknown	<1

Table 10-1. Vegetation Communities Associated with 200-West Area.
(sheet 2 of 2)

SPECIES	ROOT DEPTH[a]	PERCENT COVER
VEGETATION COMMUNITY - *A. tridentata/B. tectorum*		
B. tectorum	S[1]	34
A. tridentata	D[2]	14 *
P. sandbergii	S[3]	7
D. verna	S	2
S. altissimum	Unknown	1
S. kali	D[2]	1
G. spinosa	D[2]	1 *
H. umbellatum	S	<1
Balsamorhiza careyana	S[2]	<1
C. viscidiflorus	D[2]	<1 *
Amsinckia spp.	Unknown	<1
Cymopteris terebinthinus	S[2]	<1
M. canescens	S[2]	<1
Astragalus species	Unknown	<1
Phlox longifolia	Unknown	<1
Microsteris gracilis	Unknown	<1
Sitanion hystrix	Unknown	<1

* - percent of shrub cover was derived from data collected in 10-by 10-m plots at 25-35 m, 50-60 m, and 75-85 m along the 100 m transect

[a]D - plants with root systems known to exceed 150 cm deep
S - plants with root systems not known to exceed 150 cm deep

[1]Foxx et al. 1984a
[2]Klepper et al. 1985
[3]Foxx et al. 1984b
[4]Tierney and Foxx 1987

11.0 200-EAST AREA

11.1 VEGETATION COMMUNITIES

The 200 East Area and the area immediately outside the fence line are composed of the vegetation communities: *B. tectorum/S. kali*, *A. tridentata/B. tectorum*, *A. sibericum/P. sandbergii*, riparian, and disturbed/nonvegetated areas. In the disturbed/nonvegetated areas there was minimal (<10%) cover provided by plants because these areas are sprayed with herbicide as needed as part of the vegetation control program. Percent of cover calculated from information from Daubenmire plots for the vegetation communities is listed in Table 11-1, and a map of the general vegetation communities is given in Figure 11-1. The riparian community was not surveyed with transects so there is no information on percent of cover.

11.2 SHRUB COVER

Shrub cover is mainly provided by *A. tridentata* and *C. nauseosus* with small amounts of *G. spinosa*, *P. tridentata*, *L. halimifolium*, and *C. viscidiflorus* also present. In the *A. tridentata/B. tectorum* vegetation community, approximate shrub cover is 26% *A. tridentata* with a mean height of 118 cm. The *B. tectorum/S. kali* vegetation community does contain some *C. nauseosus*, but the shrubs are very sparse (1 per 100 m) and were not recorded in transect data. In the *A. sibericum/P. sandbergii* vegetation community, shrub cover is virtually absent.

Figure 11-1. Vegetation Community Map for 200 East Area.

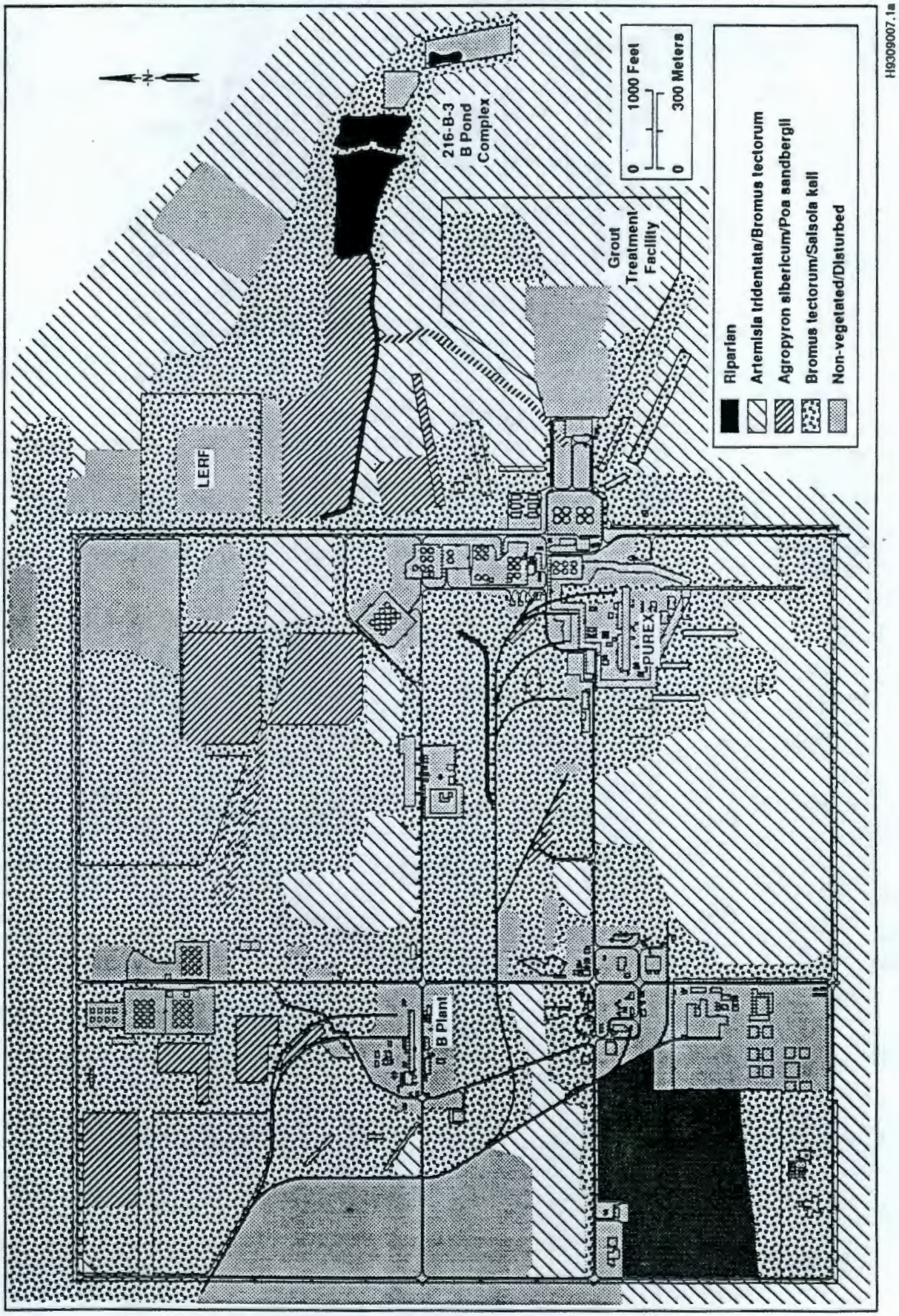


Table 11-1. Vegetation Communities Associated with the 200 East Area. (sheet 1 of 2)

SPECIES	ROOT DEPTH[a]	PERCENT COVER
VEGETATION COMMUNITY - *B. tectorum/S. kali*		
B. tectorum	S[1]	19
S. kali	D[2]	8
Stipa comata	S[2]	2
P. sandbergii	S[3]	2
O. hymenoides	S[2]	2
S. altissimum	Unknown	1
Amsinckia spp.	Unknown	<1
M. canescens	S[2]	<1
H. umbellatum	S	<1
VEGETATION COMMUNITY - *A. tridentata/B. tectorum*		
A. tridentata	D[2]	26 *
B. tectorum	S[1]	14
F. octoflora	S[3]	5
S. altissimum	Unknown	1
L. serriola	S[2]	<1
P. sandbergii	S[3]	<1
S. kali	D[2]	<1
P. longifolia	Unknown	<1
T. dubius	Unknown	<1

Table 11.1. Vegetation Communities Associated with 200 East Area. (sheet 2 of 2)

SPECIES	ROOT DEPTH[a]	PERCENT COVER
VEGETATION COMMUNITY - *A. sibericum/P. sandbergii*		
A. sibericum	Unknown	8
P. sandbergii	S[3]	3
B. tectorum	S[1]	1
S. kali	D[2]	<1
D. verna	S	<1

* - percent of shrub cover was derived from data collected in 10- by 10-m plots at 25-35 m, 50-60 m, and 75-85 m along the 100 m transect

[a]D - plants with root systems known to exceed 150 cm deep
S - plants with root systems not known to exceed 150 cm deep

[1]Foxx et al. 1984a
[2]Klepper et al. 1985
[3]Foxx et al. 1984b

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APPENDIX A

TRANSECT LOCATIONS

Transect Locations - 100 and 200 Areas. (sheet 1 of 2)

AREA	VEGETATION COMMUNITY	TRANSECT NUMBER	LOCATION UTM'S* NAD** 1927
100-K	ChNa/BrTe	1	300630 E; 5168720 N
100-K	BrTe/PoSa	2	302100 E; 5169510 N
100-K	ChNa/PoSa/ BrTe	3	301690 E; 5168720 N
100-N	ChNa/BrTe	4	303800 E; 5172420 N
100-N	BrTe/PoSa	5	304390 E; 5172015 N
100-N	BrTe/CeSp.	6	303270 E; 5171730 N
100-N	ChNa/BrTe	11	303200 E; 5171500 N
100-N	BrTe/HoUm	12	303080 E; 5171590 N
100-F	ChNa/BrTe	27	313100 E; 5170290 N
100-F	ChNa/BrTe	30	312580 E; 5170450 N
100-F	BrTe/SaKa	31	313400 E; 5169530 N
100-H	BrTe/SaKa	32	310580 E; 5174650 N
100-H	ChNa/BrTe	28	313060 E; 5170330 N
100-H	ChNa/BrTe	33	310930 E; 5175020 N
100-D	BrTe/SaKa	34	306810 E; 5173970 N
100-D	ChNa/BrTe	35	305540 E; 5173360 N
100-D	ChNa/BrTe	36	306100 E; 5174680 N
100-BC	BrTe/SaKa	37	296800 E; 5167210 N
100-BC	ChNa/BrTe	38	297800 E; 5166280 N
200-W	ArTr/BrTe	7	302450 E; 5158250 N
200-W	ArTr/BrTe	8	303800 E; 5160620 N
200-W	ArTr/BrTe	9	303805 E; 5160760 N
200-W	ArTr/BrTe	10	304430 E; 5160670 N
200-W	ArTr/BrTe	13	299910 E; 5160030 N
200-W	AgSi/SaKa	14	298300 E; 5156700 N
200-W	ChNa/BrTe	15	299320 E; 5156720

Transect Locations - 100 and 200 Areas. (sheet 2 of 2)

AREA	VEGETATION COMMUNITY	TRANSECT NUMBER	LOCATION UTM'S* NAD** 1927
200-W	ChNa?BrTe	16	299540 E; 5157520 N
200-W	AgSi/SaKa	18	296500 E; 5155800 N
200-W	BrTe/SiAl	21	299930 E; 5159330 N
200-W	BrTe/SiAl	22	295305 E; 5156895 N
200-E	BrTe/SaKa	17	295480 E; 5155040 N
200-E	ArTr/BrTe	19	306300 E; 5157460 N
200-E	AgSi/PoSa	20	304650 E; 5160030 N
200-E	BrTe/SaKa	23	305200 E; 5159090 N
200-E	ArTr/BrTe	24	304500 E; 5158760 N
200-E	BrTe/SaKa	25	304700 E; 5160040 N
200-E	BrTe/SaKa	26	305900 E; 5159990 N
200-E	BrTe/SaKa	29	307140 E; 5157290 N

ChNa/BrTe - Chrysothamnus nauseosus/Bromus tectorum
BrTe/SaKa - Bromus tectorum/Salsola Kali
AgSi/SaKa - Agropyron sibericum/Salsola Kali
ArTr/BrTe - Artemisia tridentata/Bromus tectorum
BrTe/HoUm - Bromus tectorum/Holosteum umbellatum
BrTe/CeSp. - Bromus tectorum/Centaurea species
AgSi/PoSa - Agropyron sibericum/Poa sandbergii

*Universal Transverse Mercator
**North American Datum

APPENDIX B

PLANT SPECIES RECORDED DURING GROUND-TRUTHING ACTIVITIES

Plant Species Recorded During Ground Truthing - 100-K Area

Forbs

Draba verna
Holosteum umbellatum
Salsola kali
Calochortus macrocarpus
Erodium cicutarium
Tragopogon dubius
Plantago patagonica
Eriogonum sphaerocephalum
Centaurea spp.
Grindelia columbiana
Ambrosia acanthicarpa
Erigeron poliospermus
Erigeron pumilus
Lepidium perfoliatum
Lomatium grayi
Lactuca serriola
Machaeranthera canescens
Balsamorhiza careyana
Sisymbrium altissimum
Achillea millefolium
Sphaeralcea munroana
Amsinckia spp.

Shrubs

Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Artemisia tridentata

Grasses

Poa sandbergii
Stipa comata
Agropyron spicatum
Bromus tectorum
Oryzopsis hymenoides
Sporobolus cryptandrus
Sitanion hystrix

Plant Species Recorded During Ground Truthing - 100-H Area

Forbs

Draba verna
Holosteum umbellatum
Salsola kali
Erodium cicutarium
Tragopogon dubius
Plantago patagonica
Eriogonum niveum
Centaurea spp.
Ambrosia acanthicarpa
Erigeron spp.
Lepidium perfoliatum
Lactuca serriola
Machaeranthera canescens
Balsamorhiza careyana
Sisymbrium altissimum
Achillea millefolium
Sphaeralcea munroana
Capsella bursa-pastoris
Heterotheca villosa
Conyza canadensis
Descurainia pinnata
Melilotus alba
Verbascum thapsus
Amaranthus albus

Shrubs

Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Artemisia tridentata
Grayia spinosa

Grasses

Poa sandbergii
Stipa comata
Bromus tectorum
Oryzopsis hymenoides
Sporobolus cryptandrus
Sitanion hystrix

Plant Species Recorded during Ground Truthing - 100-N Area

Forbs

Draba verna
Holosteum umbellatum
Salsola kali
Erodium cicutarium
Tragopogon dubius
Plantago patagonica
Ambrosia acanthicarpa
Erigeron filifolius
Lactuca serriola
Machaeranthera canescens
Balsamorhiza careyana
Amsinckia spp.
Sisymbrium altissimum
Achillea millefolium
Sphaeralcea munroana
Phlox longifolia
Descurainia pinnata
Verbascum thapsus
Cirsium vulgare
Cymopteris terebinthinus
Plantago patagonica
Calochortus macrocarpus
Penstemon acuminatus
Lomatium grayi
Equisetum spp.
Lepidium perfoliatum

Shrubs

Chrysothamnus nauseosus
Artemisia tridentata
Artemisia dracunculus
Grayia spinosa
Rosa woodsii

Grasses

Poa sandbergii
Stipa comata
Agropyron spicatum
Sporobolus cryptandrus
Sitanion hystrix
Oryzopsis hymenoides
Bromus tectorum
Agropyron dasytachyum

Plant Species Recorded During Ground Truthing - 100-F Area

Forbs

Draba verna
Holosteum umbellatum
Salsola kali
Conyza canadensis
Erodium cicutarium
Tragopogon dubius
Plantago patagonica
Eriogonum niveum
Oenothera pallida
Chaenactis douglasii
Melilotus alba
Verbascum thapsus
Centaurea spp.
Grindelia columbiana
Ambrosia acanthicarpa
Lepidium perfoliatum
Lomatium grayi
Lactuca serriola
Machaeranthera canescens
Balsamorhiza careyana
Sisymbrium altissimum
Achillea millefolium
Erigeron spp.
Sphaeralcea munroana
Amsinckia spp.

Shrubs

Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Artemisia tridentata

Grasses

Poa sandbergii
Stipa comata
Agropyron spicatum
Bromus tectorum
Oryzopsis hymenoides
Sporobolus cryptandrus
Sitanion hystrix

Plant Species Recorded During Ground Truthing - 100-D Area

Forbs

Draba verna
Holosteum umbellatum
Salsola kali
Conyza canadensis
Erodium cicutarium
Tragopogon dubius
Plantago patagonica
Eriogonum niveum
Oenothera pallida
Chaenactis douglasii
Melilotus alba
Verbascum thapsus
Centaurea spp.
Grindelia columbiana
Ambrosia acanthicarpa
Lepidium perfoliatum
Lomatium grayi
Lactuca serriola
Machaeranthera canescens
Balsamorhiza careyana
Sisymbrium altissimum
Achillea millefolium
Erigeron spp.
Sphaeralcea munroana
Heterotheca villosa
Amsinckia spp.

Shrubs

Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Artemisia tridentata

Grasses

Poa sandbergii
Stipa comata
Agropyron spicatum
Bromus tectorum
Oryzopsis hymenoides
Sporobolus cryptandrus
Sitanion hystrix

Plant Species Recorded During Ground Truthing - 100-BC Area

Forbs

Draba verna
Holosteum umbellatum
Salsola kali
Erodium cicutarium
Tragopogon dubius
Plantago patagonica
Eriogonum niveum
Oenothera pallida
Chaenactis douglasii
Melilotus alba
Verbascum thapsus
Centaurea spp.
Ambrosia acanthicarpa
Lepidium perfoliatum
Lactuca serriola
Machaeranthera canescens
Balsamorhiza careyana
Sisymbrium altissimum
Achillea millefolium
Erigeron spp.
Sphaeralcea munroana
Amsinckia species

Shrubs

Chrysothamnus nauseosus
Artemisia tridentata

Grasses

Poa sandbergii
Stipa comata
Bromus tectorum
Oryzopsis hymenoides
Sporobolus cryptandrus
Sitanion hystrix

Plant Species Recorded During Ground Truthing - 200-West Area

Forbs

Draba verna
Holosteum umbellatum
Salsola kali
Erodium cicutarium
Tragopogon dubius
Plantago patagonica
Ambrosia acanthicarpa
Erigeron poliospermus
Erigeron filifolius
Cryptantha leucophaea
Lactuca serriola
Machaeranthera canescens
Sitanion hystrix
Balsamorhiza careyana
Amsinckia spp.
Sisymbrium altissimum
Achillea millefolium
Sphaeralcea munroana
Phlox longifolia
Descurainia pinnata
Verbascum thapsus
Cirsium vulgare
Cymopteris terebinthinus
Plantago patagonica
Calochortus macrocarpus
Penstemon acuminatus
Lomatium grayi
Equisetum spp.
Lepidium perfoliatum
Astragalus spp.
Crepis atrabarba
Lupinus pusillus
Orobanche fasciculata
Comandra umbellatum
Townsendia florifer
Chaenactis douglasii
Trifolium repens
Microsteris gracilis
Melilotus alba
Oenothera pallida

Shrubs

Chrysothamnus viscidiflorus
Chrysothamnus nauseosus
Artemisia tridentata
Grayia spinosa
Lycium halimifolium
Purshia tridentata

Grasses

Poa sandbergii
Stipa comata
Agropyron spicatum
Sporobolus cryptandrus
Sitanion hystrix
Oryzopsis hymenoides
Bromus tectorum
Festuca octoflora
Agropyron dasytachyum
Agropyron sibericum
Elymus sp.

Plant Species Recorded During Ground Truthing - 200-East Area

Forbs

Draba verna
Holosteum umbellatum
Salsola kali
Erodium cicutarium
Tragopogon dubius
Plantago patagonica
Ambrosia acanthicarpa
Erigeron poliospermus
Erigeron filifolius
Cryptantha leucophaea
Lactuca serriola
Machaeranthera canescens
Sitanion hystrix
alsamorhiza careyana
Amsinckia spp.
Sisymbrium altissimum
Achillea millefolium
Sphaeralcea munroana
Phlox longifolia
Descurainia pinnata
Verbascum thapsus
Cirsium Vulgare
Cymopteris terebinthinus
Plantago patagonica
Calochortus macrocarpus
Penstemon acuminatus
Lomatium grayi
Rosa woodsii
Equisetum spp.
Lepidium perfoliatum
Astragalus spp.
Crepis atrabarba
Lupinus pusillus
Orobanche fasciculata
Comandra umbellatum
Townsendia florifer
Chaenactis douglasii
Trifolium repens
Microsteris gracilis
Melilotus alba
Oenothera pallida
Conyza canadensis

Grasses

Poa sandbergii
Stipa comata
Agropyron spicatum
Sporobolus cryptandrus
Sitanion hystrix
Oryzopsis hymenoides
Bromus tectorum
Festuca octoflora
Agropyron dasytachyum
Agropyron sibericum
Elymus sp.

Shrubs

Chrysothamnus viscidiflorus
Chrysothamnus nauseosus
Artemisia tridentata
Grayia spinosa
Lycium halimifolium