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Biological Assessment of the Flora and Fauna on the Tracy Collins Property Summer of 1994

Field Work by Junior Ranger BioEcology Crew, Session One
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City of Boulder Open Space Department

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ABSTRACT

The Junior Ranger Bioecology Program of the City of Boulder Open Space Department spent part of their work experience qualitatively assessing plant and animal diversity on the Tracy Collins property south of Boulder. The study primarily focused on qualitative documentation of vegetation, vertebrates (small mammals, reptiles and amphibians), and invertebrates. This report summarizes methods, results, and conclusions from the study. Six tables, two figures, and three appendices are included.

INTRODUCTION

Since 1967 the City of Boulder has been acquiring land surrounding the city as part of its Open Space Program. The purposes for open space are multifaceted including: preservation of land for passive recreation, preservation of natural and scenic areas, preservation of agricultural uses and land suitable for agricultural production, and the utilization of land to shape urban growth.

To more effectively manage the natural resources of open space, the Junior Ranger BioEcology Crew established a Biodiversity Assessment Plot (BDAP) to fulfill the following objectives: .

1) To describe, qualitatively and quantitatively, the natural features of the site, including: soils, vegetation, vertebrates and invertebrates;
2) To make observations about existing land use and management that may be influencing the natural patterns on the site; and,
3) To teach the Junior Rangers about the concepts and elements of biodiversity and to give them experience in interpreting and evaluating the natural features of a site.

STUDY SITE

The study was conducted on 45.82 hectares of land on the Tracy Collins Open Space property (T1S, R70W, Sec. 33, Boulder County, Colorado). Figure 1 shows the study site boundaries on a topographic map of the area. The northwest corner of the plot is located 6.85 km south of the city of Boulder, southeast of the Flatirons Vista trail head, and 558 m, six degrees west of south, from the intersection of Highways 93 and 128.

METHODS

The study was conducted from June 15 to July 8, 1994 by the Open Space Department's Junior Ranger BioEcology Crew in conjunction with Open Space Wildlife Biologist Clint Miller and Plant Ecologist Nina Williams, along with the help of Bryan McCormack from the University of Colorado Museum Entomology Section.

The general site information was recorded by observation of the current and historical land use of the site and its surrounding areas. In addition, a United States Geological Survey Louisville 7.5 minute topographic map provided general physical features including elevation, landforms and surficial water sources. Finally, the soil type was identified by the SCS Boulder County Soil Survey, 1975.

VEGETATION

The vegetative analysis began by delimiting the major habitat types present and mapping them on 1993 orthophotographs. Habitat type was determined based on plant community structure and composition, with the list of Preliminary Habitat Types used for reference (Appendix II). To make a determination of habitat type, the first indicator was the dominant structure of vegetation present, for example, forest, shrubland, or grassland. Physical characteristics were also considered, such as elevation, geologic features, aspect, and proximity to water. The dominant plant species were noted and compared with the written habitat descriptions for a final determination. If a habitat type was discovered that did not fit with any of the preliminary descriptions, a new type was created. Boundaries between habitat types were drawn directly onto the orthophotographs with the following differentiations: a solid line indicated a distinct boundary, a dotted line indicated an indistinct boundary, and a zig-zag line indicated a transitional boundary.

While mapping the various habitat types, it was necessary to assign a number to delimit similar, but spatially separate, areas from each other. For example, the Mixed Grass Prairie (MGP) habitat type occurred in four different locations separated by other habitat types. Each MGP unit had slightly different dominant species, although they all shared the general characteristics of containing a mixture of short, mid, and tall grass species. A Tamaya Technics Inc. Planix 7 electronic planimeter was used to determine the approximate area of each habitat map polygon.

Once the habitat types were mapped, the three dominant trees, shrubs, forbs, grasses, and grasslike plants were recorded in each habitat unit. To determine the three dominant species, five to ten one meter^2 hoops were distributed randomly in each habitat type. Within each hoop, the three dominant forbs, grasses, and grass-like plant species were recorded. Dominance was determined based upon observed canopy coverage of each species in the hoop. The three dominant plant species were tallied from among the hoops for each habitat type. Some units have more than three dominants listed due to ties.

VERTEBRATES

Small Mammals

Species composition of small mammals was sampled in each of five habitat types: 1) Mixed Grass Prairie (MGP), thirty traps running up the northeastern most ridge of the plot; 2) Wet Meadow 1 (WME1) and the Plains Riparian Shrubland (PRS), thirty traps started on the southwestern edge of the wet meadow and ran south up the subsequent drainage; 3) Scarp Woodland (SCW), thirty

traps running north-south along the top of a mesa escarpment; 4) Foothills Shrubland (FSL), thirty traps running north-south along the western edge of FSL1 and FLS2; and 5) Foothills Riparian Forest (FRF), thirty traps starting approximately parallel to the beginning of the WME line and ran south along Coal Creek. One hundred twenty traps were placed nightly for four consecutive nights for a total of 480 trap nights. Traps were set at approximately 1900 and checked at 0630 to 0800 the following days (June 21, 22, 23, and 24, 1994).

Reptiles and Amphibians

Pitfall arrays were the only method used to census reptiles and amphibians. A total of three arrays were placed in different locations and habitat types to get a broad representation of species: 1) WME1; 2) about 60 m south of site one on the edge of FSL2; and 3) along the scarp ridge on the southern border of FSL2. Each pitfall array consisted of two holes 45 cm deep and 25 cm across, approximately 10 m from each other. Pairs of holes were separated by a 4 m long by 20 cm tall fence of aluminum flashing held to metal fence post stakes by wire. The traps, made from PVC pipe sealed closed on one end, were placed in the holes flush with the ground. Plywood squares were then propped against the fencing and placed on small rocks above each pitfall trap to shelter captured animals.

In addition to traps and pitfall arrays, on-location sightings of larger mammals, birds, reptiles, and amphibians were recorded along with descriptions of habitat location and activity.

INVERTEBRATES

Invertebrates were collected using four different methodologies. Sweep nets, dip nets and Lepidoptera nets were used to collect in the following habitat areas: MGP1, MGP4, FSL4, FRF, TRZ, WME1, and Coal Creek (see Table 1 for abbreviation definitions). The invertebrates were stored in a freezer for 1-3 days before pinning and identification to appropriate taxonomic Order. Insects were turned over to the University of Colorado Museum Entomology Section and await positive identification and cataloging. Information will be entered in the Boulder County Invertebrate Database maintained by the museum. In addition, ground-dwelling invertebrates were collected by placing four pitfall trap arrays in the following habitat areas: WME1, SCW, FRF, MGP4. Each array consisted of six pitfall traps set in a 10 meter square area in each of the above habitat types. Pitfall traps include three pieces: 1) a 16 ounce plastic cup; 2) a small plastic collection cup that fits inside the bottom of the larger cup and is partially filled with water; and 3) a plastic funnel. Holes were dug with hand trowels and the pitfall traps placed inside with the top of the cup flush with the surface of the ground. Invertebrates were collected between 1000 and 1430, 24-26 hours after setting the traps on June 21, 22, and 23. The animals were placed in 60% ethanol and stored at the C.U. Museum.

RESULTS

VEGETATIVE ANALYSIS

Eight habitat types were identified and mapped on the site, including Mixed Grass Prairie, Foothills Shrubland, Wet Meadow, Plains Riparian Shrubland, Foothills Riparian Forest, Scarp Woodland, Hawthorn Forest, and Transition Zone (Table 1). The values shown in Table 1 represent an average of at least three planimeter measurements for each habitat type.

There were four units of the Mixed Grass Prairie (MGP) habitat type, which is a broad category describing a mixture of short, mid, and tall grass species generally located on relatively flat terrain. The MGP dominated the site with 31.70 hectares (69.2%). In the combined MGP habitat types, the dominant grasses included western wheat grass (*Pascopyrum smithii*), cheatgrass (*Anisantha tectorum*), Canada bluegrass (*Poa compressa*), blue grama (*Chondrosum gracile*), and buffalo-grass (*Buchloe dactyloides*). Dominant species in the forb category included pepper grass (*Alyssum alyssoides*), knapweed (*Acosta sp.*), horsetail (*Hippochaete sp.*), bindweed (*Convovulus arvensis*), scurf pea (*Psoralidium tenuiflorum*), and western ragweed (*Ambrosia psilostachya*). In addition, there were five shrub species scattered throughout the MGPs (Table 2).

Five units of the Foothills Shrubland (FSL) habitat type were present and constituted 5.91 hectares (12.9%) of the study site. The FSL habitats were areas of non-riparian shrub thickets that were relatively dense with little understory development, and were associated with rocky ridges at this study site. The dominant shrubs in the FSL habitats were hawthorn (*Crataegus sp.*), three-leaf sumac (*Rhus trilobata*), chokecherry (*Padus virginiana*), yucca (*Yucca glauca*), snowberry (*Symphoricarpos occidentalis*), wild rose (*Rosa woodsii*), and serviceberry (*Amenlanchier alnifolia*). Other plants present in the shrublands included three tree species, eleven forb species, six grass species, and one grasslike species.

Two units of the Wet Meadow (WME) habitat type were located on the site, covering 1.23 hectares (2.6%). This habitat type describes highly variable areas that usually include one or more species of rushes and sedges. Dominant grasslike plants at this site included Nebraska sedge (*Carex nebrascensis*), arctic rush (*Juncus arcticus*), spikerush (*Eleocharis palustris*), and sun sedge (*Carex pennsylvanica ssp. heliophila*). Associated plants included four shrub species, five forb species, four grass species, and no tree species.

The Plains Riparian Shrubland (PRS) was a shrub thicket associated with Coal Creek. Dominant shrubs included coyote willow (*Salix exigua*), hawthorn (*Cretaegus erythropoda* and *C. macracantha*), and three-leaf sumac (*Rhus trilobata*). The Foothills Riparian Forest (FRF) was located along the drainage flowing into Coal Creek from the south, and was dominated by narrowleaf cottonwood (*Populus angustifolia*), plains cottonwood (*Populus deltoides*), and peach-leaf willow (*Salix amygdaloides*). Together the FRF and PRS defined the riparian zone of the site and covered 4.03 hectares (8.8%). Including the WME area in this total reveals there are significant numbers of wetland areas on the BDAP (11.4% of the total site).

The Scarp Woodland (SCW) was associated with rocky outcrops along the mesa escarpment and covered 2.20 hectares (4.8%) of the site. It was dominated by ponderosa pine (*Pinus ponderosa*) and scattered hackberry (*Celtis reticula*).

Two new habitat types were designated. The Hawthorn Forest (HAF) habitat covered 0.52 hectares of the site (1.1%) and was a very large thicket of *Crataegus macracantha* and *C. erythropoda* along the banks of Coal Creek. The Transition Zone (TRZ) was thought to be a unique combination of several merging habitat types including the Foothills Riparian Forest (FRF), Foothills Shrubland (FSL), and Mixed Grass Prairie (MGP) and covered 0.23 hectares (0.5%) of the site.

The shrub species were localized to the mesa escarpments, sloped banks and riparian zones. In the seventeen identified habitat units, the most abundant shrubs were *Crataegus macracantha* and *C. erythropoda*, which were found in 10 habitat types, and *Rhus trilobata,* found in nine habitat types.

Forb species showed the highest diversity of all plant forms (forbs = 46 spp., grasses = 17 spp., and grasslike = 5 spp.) and occurred in a broad variety of habitat types.

A list of all species recorded while determining the dominants in each habitat unit was compiled (Appendix I). Although this is not a complete site flora, it is evident that a number of native and non-native species are present throughout the study site. The most abundant exotic plant species were identified on the study site (Table 3). These 17exotic species identified include: knapweed (*Acosta sp.*), pepper grass (*Alyssum alyssoides*), cheatgrass (*Anisantha tectorum*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), bindweed (*Convolvulus arvensis*), hound's tongue (*Cynoglossum officinale*), Russian olive (*Eleagnus angustifolia*), prickly lettuce (*Lactuca serriola*), toadflax (*Linaria genistifolia ssp. dalmatica*), yellow sweetclover (*Melilotus officinalis*), Timothy grass (*Phleum pratense*), English plantain (*Plantago lanceolata*), sulfur cinquefoil (*Potentilla recta*), common dandelion (*Taraxacum officinale*), and salsify (*Tragopogon dubius*).

VERTEBRATE ANALYSIS

Small Mammals

The results from the small mammal trapping are summarized in Table 4. The trapping methods used were selected for a qualitative rather than quantitative analysis, therefore the data presents an indication of the species diversity. Clearly, *Peromyscus maniculatus* is the dominant small rodent in this BDAP.

In addition to small mammals, a number of large mammals were observed on the study site. A coyote (*Canis latrans*) was sighted twice, along with scat and tracks along the riparian zone. Two mule deer (*Odocoileus heminos*) and numerous Eastern Fox Squirrels (*Sciurus niger*) were also seen.

Reptiles and Amphibians

The pitfall arrays did not yield any captures even though they remained set for several weeks.

The sightings that we did have were accidental and were a result of traversing various habitats. Animals observed on the study site between June 18 and July 7, 1994 included one Woodhouses' Toad (*Bufo woodhousii woodhousii*) and one Racer (*Coluber constrictor flaviventris*).

Birds

A fair number of avian species were sighted and in two cases uncommon birds were identified (Table 5). Bird nests were discovered as follows: two vesper sparrow (*Poocetes gramineus*) and two western meadowlark (*Sturnella neglecta*) in MGP1, and three inactive Magpie (*Pica pica*) nests in FSL .

INVERTEBRATE ANALYSIS

Five major invertebrate groups were collected in the pitfall traps (Table 6), and ten major invertebrate groups were collected by more active netting (Figure 2).

DISCUSSION

LAND USE

The impacts of the surrounding land use on this site are numerous. Colorado Highway 93 provides a source of pollution and debris which the prevailing west winds blow onto the site, and traffic noise may impact the wildlife. State Highway 128 to the north and east of the study site also abuts the property. There is a gravel pit and cement factory immediately south and west of the site, with a nuclear facility (Rocky Flats) further south. Power lines cross the property to the north. There are two Open Space trailheads near the site; one to the west (Flatirons Vista) and one to the north (Greenbelt Plateau). This area is currently grazed from April to mid-May in an attempt to control diffuse knapweed.

VEGETATION

The tree species were concentrated in two areas: the mesa escarpments and the riparian corridor. In the Plains Riparian Shrubland an interesting mixture of *Pinus ponderosa, Salix amygdaloides,* and *Psedutsuga menziesii* were found. It should also be noted that the drainage through the Plains Riparian Shrubland was bordered on either side by mesa escarpments that produced steep, rocky banks. The dominance of the two *Populus* species in the Foothills Riparian Forest is typical of the region's riparian zones.

The high forb diversity caused some difficulty in establishing the three dominant species for each habitat unit. The number of hoops sampled was not proportional to the size of the habitat type and, therefore, the sample size did not reflect a consistent percentage of each habitat area. For example, ten hoops were sampled in both MGP1 and MGP4 despite an eightfold discrepancy in the size of the two areas. This means that the dominance counts for MGP1 reflect a better representation

of the overall habitat than do the dominance counts for MGP4. The data given in this report may not reflect the true dominance of the herbaceous plants in the larger habitat types.

Several patterns have emerged that are of importance. First, the grasslike sedges and rushes occurred in localized areas within the wetland habitat types. Second, several species of grass were found to thrive in a variety of habitat conditions: *Anisantha tectorum, Poa compressa,* and *Pascopyrum smithii* were dominant in 10, 11, and 6 of the 16 habitat types respectively. Third, there was a wide dispersal through habitat types of several dominant exotic plant species, most notably *Alyssum alyssoides, Anisantha tectorum, Carduus nutans,* and *Acosta sp.* (Table 3). It is interesting to note that although 46 forb species were recorded, 20 of these were adventive, or exotic, species. For example, cheatgrass (*Anisantha tectorum*) was found in 75%, and dominant in 56%, of the habitat units. Lastly, exotic plant species were found in fifteen of the sixteen habitat types identified. These last two patterns suggests that the BDAP site has been greatly impacted by the previous use of the site and the surrounding anthropogenic disturbances.

Some taxonomic groups are easier to survey in broad qualitative terms than others. In surveying the dominant vegetation, the hoop method presents the problem of obtaining equal samples of all areas. Relating the number of hoops sampled as a factor of habitat area size will ensure sample sizes that equally represent the habitat and provide a basis for comparison. Despite some of the problems experienced with this BDAP, we were still able to make several generalizations about the BDAP as a whole.

VERTEBRATES

Small Mammals

Deer mice (*Peromyscus maniculatus*) were found in all of the major habitat types sampled for small mammals. In addition, voles (*Microtus sp.*) were captured in the Wet Meadow habitats, while in the Scarp Woodland the highest number of *P. maniculatus* were captured along with Mexican woodrats (*Neotoma mexicana*). Trap success of *P. maniculatus* was relatively high (10-30%), which suggests that a fairly large population is established on the Tracy Collins property. In two similar studies on nearby mixed grass prairies and *Pinus ponderosa* forests the trap success of *P. maniculatus* was <5% in 1993 and <8% in 1992 (Open Space Junior Ranger BioEcology research, previously unpublished 1992 and 1993). Small mammal trapping conducted in May and September would serve to complete the list of small mammals present on this study site.

Reptiles and Amphibians

A more extensive herpatological survey during the summer of 1992 that included this property turned up greater quantitative data, but only identified one more species than was observed by the BioEcology Crew (Dale and Merritt, 1993). In addition to Woodhouses' Toads (*Bufo woodhousii woodhousii*) and Racers (*Coluber constrictor flaviventris*), the 1992 survey located northern leopard frogs (*Rana pipiens*) in this area. Careful searching of the area for these species

would be needed to determine if their diversity had changed over time.

Birds

It is difficult to assess the actual importance of the sightings in relation to specific habitat types because they were not the result of a controlled survey. Except for nests found in MGP1 and FSL we were unable to accurately identify the relationships between the habitat type and the birds sighted (i.e. feeding, stopover points, shade, or breeding).

INVERTEBRATES

In the Mixed Grass Prairie a greater diversity and number of invertebrates were caught by sweep netting (Figure 1) versus the pitfall trapping (Table 4), while the numbers are more even for the other habitat areas (Table 4). This suggests that in the Mixed Grass Prairie one is more likely to find invertebrate species on the grasses and plants themselves rather than on the ground. The relatively low representation of the order Orthoptera (14 individuals) is probably due to the later seasonal maturation of these insects than actual lack of abundance. The pitfall data (Table 4) also shows a greater representation of two predatory classes of arthropods (Arachnida and Diplipoda).

CONCLUSION

These preliminary findings suggest that further research into several areas could be of value: 1) the ability of the native vegetation to recover from the infiltration of exotic species; 2) a more scientific study of the bird species and their relationship to the BDAP; and 3) if grazing is to continue on the site, the best way to protect the riparian corridor surrounding Coal Creek and other wetland areas in the meadows and draws while providing cattle access to a water supply.

This study provided the Natural Resource Division of the City of Boulder's Open Space Department a partial list of the biota found on 46 hectares of land on the Tracy Collins property. It is a starting point for further ecological studies that may be conducted when management decisions regarding this and adjacent properties is concerned. The biodiversity assessment will provide some guidance for the formation of more detailed and sophisticated research projects on this Open Space land. This survey should be complemented by similar studies conducted during different seasons, as well as a more comrehensive assessment of all the plant species located on the site.

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Table 1. Habitat types identified within the Tracy Collins study site, City of Boulder Open Space, Boulder, CO. 1994.

Habitat Types Identified of Total	Abbreviations	Total Hectares	Percent
Mixed Grass Prairie 1	MGP1	3.43	7.5%
Mixed Grass Prairie 2	MGP2	0.14	0.3%
Mixed Grass Prairie 3	MGP3	1.65	3.6%
Mixed Grass Prairie 4	MGP4	26.48	57.8%
Mixed Grass Prairie Totals		31.70	69.2%
Foothills Shrubland 1	FSL1	0.90	2.0%
Foothills Shrubland 2	FSL2	3.51	7.7%
Foothills Shrubland 3	FSL3	0.33	0.7%
Foothills Shrubland 4	FSL4	0.33	0.7%
Foothills Shrubland 5	FSL5	0.84	1.8%
Foothills Shrubland Totals		5.91	12.9%
Wet Meadow 1	WME1	0.80	1.8%
Wet Meadow 2	WME2	0.43	0.9%
Wet Meadow Totals		1.23	2.7%
Plains Riparian Shrubland	PRS	0.85	1.9%
Foothills Riparian Forest	FRF	3.18	6.9%
Riparian Zone Totals		4.03	8.8%
Scarp Woodland	SCW	2.20	4.8%
Hawthorn Forest	HAF	0.52	1.1%
Transition Zone	TRZ	0.23	0.5%
Site Totals		**45.82**	100%

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Table 2. Dominant plant species found on the Tracy Collins Study Site, City of Boulder Open Space, Boulder, CO. 1994.

	Trees	Shrubs	Forbs	Grasses	Grasslike
Mixed Grass Prairie 1			*Alyssum alyssoides*	*Chondrosum gracile*	
			Psoralidium tenuiflorum	*Buchloe dactyloides*	
			Acosta sp.	*Anisantha tectorum*	
Mixed Grass Prairie 2		*Crataegus sp.*	*Acosta sp.*	*Anisantha tectorum*	
		Padus virginiana	*Alyssum alyssoides*	*Pascopyrum smithii*	
			Psoralidium tenuiflorum	*Buchloe dactyloides*	
Mixed Grass Prairie 3		*Rhus trilobata*	*Ambrosia psilostachya*	*Poa compressa*	
		Symphoricarpos occidentalis	*Alyssum alyssoides*	*Anisantha tectorum*	
		Crataegus sp.	*Convolvulus arvensis*	*Buchloe dactyloides*	
Mixed Grass Prairie 4		*Symphoricarpos occidentalis*	*Psoralidium tenuiflorum*	*Pascopyrum smithii*	*Carex pennsylvanica*
		Rosa woodsii	*Acosta sp.*	*Buchloe dactyloides*	
			Hippochaete sp.	*Poa compressa*	
Foothills Shrubland 1		*Rhus trilobata*	*Ambrosia psilostachya*	*Chondrosum gracile*	*Carex pennsylvanica*
		Yucca glauca	*Heterotheca villosa*	*Anisantha tectorum*	
		Rosa woodsii	*Hypericum perforatum*	*Poa compressa*	
Foothills Shrubland 2	*Pinus ponderosa*	*Crataegus sp.*	*Hypericum perforatum*	*Andropogon gerardii*	*Carex pennsylvanica*
	Sabina scopulorum	*Rhus trilobata*	*Heterothea villosa*	*Poa compressa*	
	Pseudotsuga menziesii	*Amelanchier alnifolia*	*Gutierrezia sarothrae*	*Anisantha tectorum*	
Foothills Shrubland 3		*Rhus trilobata*	*Heterothea villosa*	*Pascopyrum smithii*	*Carex pennsylvanica*
		Yucca glauca	*Psoralidium tenuiflorum*	*Stipa comata*	
			Helianthus annuus	*Chondrosum gracile*	
Foothills Shrubland 4		*Crataegus sp.*	*Cynoglossum officinale*	*Anisantha tectorum*	*Carex pennsylvanica*
		Padus virginiana	*Acosta sp.*	*Poa compressa*	
		Rhus trilobata	*Alyssum alyssoides*	*Pascopyrum smithii*	
Foothills Shrubland 5		*Rhus trilobata*	*Achillea lanulosa*	*Pascopyrum smithii*	*Carex pennsylvanica*
		Crataegus sp.	*Ambrosia psilostachya*	*Andropogon gerardii*	
		Symphoricarpos occidentalis	*Liatris punctata*	*Anisantha tectorum*	
Wet Meadow 1		*Symphoricarpos occidentalis*	*Verbascum thapsus*	*Schizachyrium scoparium*	*Carex nebrascensis*
		Crataegus sp.	*Carduus nutans*	*Critesion jubatum*	*Juncus arcticus*
		Rosa woodsii		*Poa compressa*	*Carex pennsylvanica*
Wet Meadow 2		*Rosa woodsii*	*Cichorium intybus*	*Poa compressa*	*Carex nebrascensis*
		Rhus trilobata	*Taraxacum officinale*	*Poa agassizensis*	*Juncus arcticus*
			Psoralidium tenuiflorum	*Critesion jubatum*	*Eleocharis palustris*
Plains Riparian Shrubland	*Pinus ponderosa*	*Rhus trilobata*	*Glycyrrhiza lepidota*	*Poa compressa*	*Carex nebrascensis*
	Salix amygdaloides	*Salix exigua*	*Acosta sp.*	*Pascopyrum smithii*	*Carex pennsylvanica*
	Pseudotsuga menziesii	*Crataegus sp.*	*Heterothea villosa*	*Buchloe dactyloides*	*Juncus arcticus*

Table 2 (continued). Dominant plant species found on the Tracy Collins Study Site, City of Boulder Open Space, Boulder, CO. 1994.

	Trees	Shrubs	Forbs	Grasses	Grasslike
Foothills Riparian Forest	*Populus angustifolia*	*Crataegus sp.*	*Trifolium repens*	*Poa compressa*	*Carex microptera*
	Populus deltoides	*Salix exigua*	*Hippochaete sp.*	*Bouteloua curipendula*	*Juncus longistylus*
	Salix amygdaloides	*Prunus americana*	*Tragopogon dubius*	*Poa agasizensis*	*Eliocharis palustris*
Scarp Woodland	*Pinus ponderosa*	*Rhus trilobata*	*Delphinium sp.*	*Poa agassizensis*	*Carex pennsylvanica*
	Celtis reticula	*Ribes cereum*	*Achillea lanulosa*	*Schizachyrium scoparium*	
		Oreobatus deliciosus	*Penstemon virens*	*Bouteloua curipendula*	
Hawthorn Forest		*Crataegus sp.*	*Acosta sp.*	*Anisantha tectorum*	
		Symphoricarpos occidentalis	*Ambrosia psilostachya*	*Poa compressa*	
		Rosa woodsii	*Alyssum alyssoides*	*Andropogon gerardii*	
Transition Zone	*Populus angustifolia*	*Crataegus sp.*	*Trifolium repens*	*Phleum pratense*	*Juncus arcticus*
		Symphoricarpos occidentalis	*Carduus nutans*	*Anisantha tectorum*	
		Prunus americana	*Plantago lanceolata*	*Poa compressa*	

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Table 3. Exotic plant species found on the Tracy Collins Study Site, City of Boulder Open Space, Boulder, CO. 1994.

Exotic Species	MGP1	MGP2	MGP3	MGP4	FLS1	FSL2	FSL3	FSL4	FSL5	PRS	FRF	HAF	WME1	WME2	TRZ
Acosta sp.	X	X	X	X	X			X	X	X		X	X	X	X
Alyssum alyssoides	X	X	X	X		X		X	X			X			
Anisantha tectorum	X	X	X	X	X	X	X	X	X			X		X	X
Carduus nutans			X	X	X			X	X			X	X	X	X
Cirsium arvense			X	X	X			X			X	X			
Convolvulus arvensis	X		X												
Cynoglossum officinale									X		X				
Eleagnus angustifolia					X						X				X
Lactuca serriola													X		
Linaria genistifolia					X				X						
Melilotus officinalis				X									X	X	
Phleum pretense														X	X
Plantago lanceolata														X	X
Potentilla recta					X	X				X		X			
Taraxacum officinale								X						X	X
Tragopogon dubius	X							X	X		X				X

excel: i:\shared\bioeco\bdapveg.xls sheet: BDAP1 Exotics

Table 4. Results of small mammal trapping on Tracy Collins Study Site, City of Boulder Open Space, Boulder, CO. 1994.

Habitat Type	*Peromyscus maniculatus*	*Microtus sp.*	*Neotoma mexicana*	TOTALS
Mixed Grass Prairie	10	0	0	10
Foothills Shrubland	30	0	0	30
Wet Meadow	18	9	0	27
Scarp Woodland	34	0	4	38
Foothills Riparian Forest	25	0	0	25
TOTALS	117	9	4	130

Table 5. Avian species observed on the Tracy Collins Study Site, City of Boulder Open Space, Boulder, CO, between June 18 and July 7, 1994.

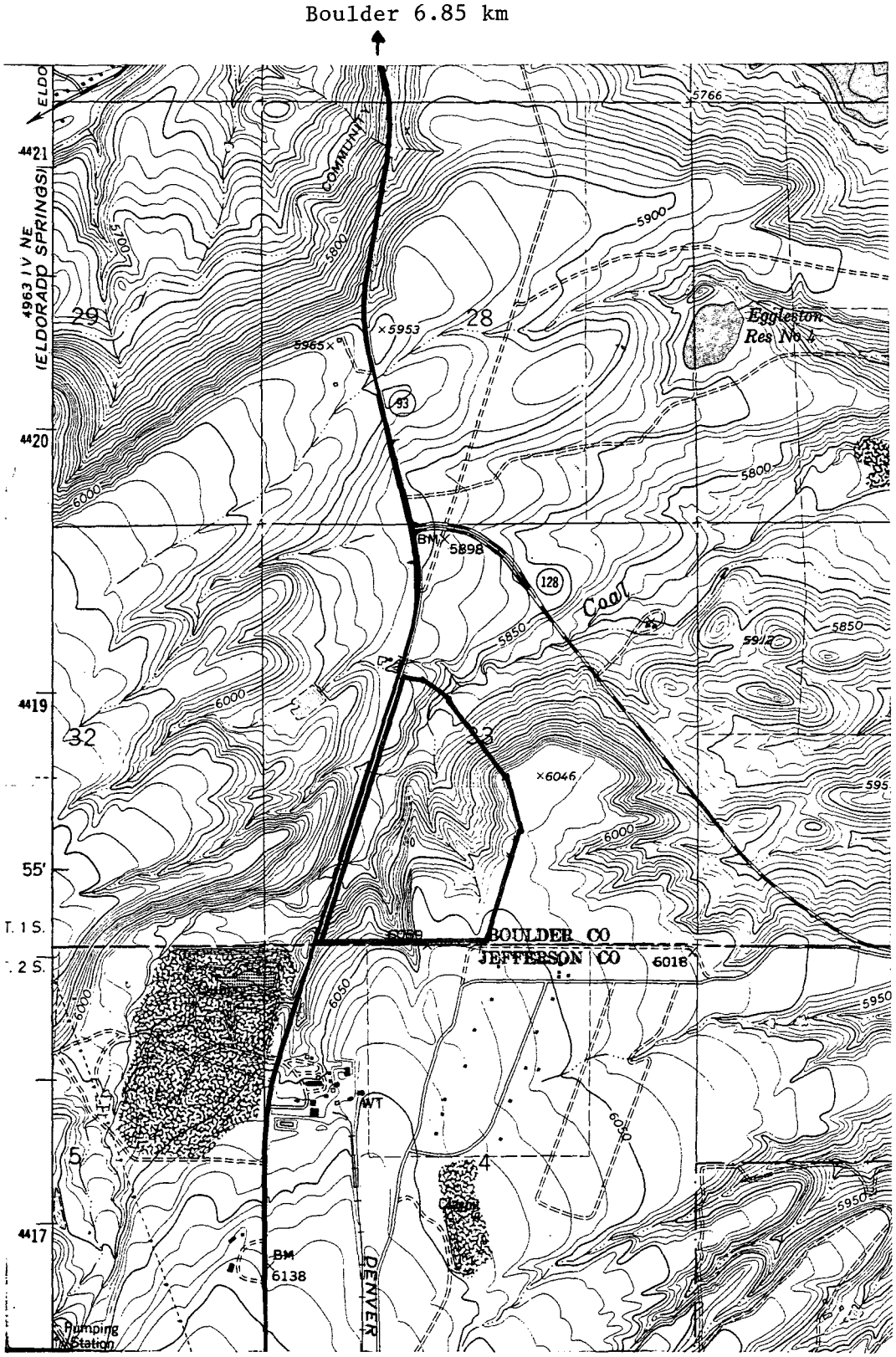
Scientific Name	Common Name	Habitat Type	Abundance*
Aquila chrysaetos	Golden Eagle	MGP	fairly common
Cathartes aura	Turkey Vulture	MGP	fairly common
Pooecetes gramineus	Vesper Sparrow	MGP	common
Sturnella neglecta	Western Meadow Lark	MGP	very common
Zenaida macroura	Mourning Dove	MGP	common
Piranga ludoviciana	Western Tanager	FRF/FSL	common
Bubo virginianus	Great Horned Owl	FRF	fairly common
Ardea herodias	Great Blue Heron	FRF	common
Bombycilla cedrorum	Cedar Waxwing	FRF	uncommon
Pipilo erythrophthalmus	Rufous-sided Towhee	SCW	common
Turdus migratorius	American Robin	SCW	very common
Passerina cyanea	Indigo Bunting	HAF	uncommon
Pica pica	Black-billed Magpie	All	common

* Abundance from Boulder Audubon Society Birds of Boulder County Field Check List, Alexander and Gillian Brown, 1989.

Table 6. Invertebrates collected from pitfall traps on the Tracy Collins Study Site, City of Boulder Open Space, Boulder, CO. 1994.

Habitat Type	Order: Coleoptera	Homoptera	Hymenoptera	Class: Arachnida	Diplipoda	TOTAL # OF INDIVIDUALS
Mixed Grass Prairie	4	0	0	0	0	4
Wet Meadow	9	0	22	43	3	77
Foothills Riparian Forest	0	7	48	77	13	145
Scarp Woodland	16	6	47	18	5	92
TOTAL INDIVIDUALS	29	13	117	138	21	318

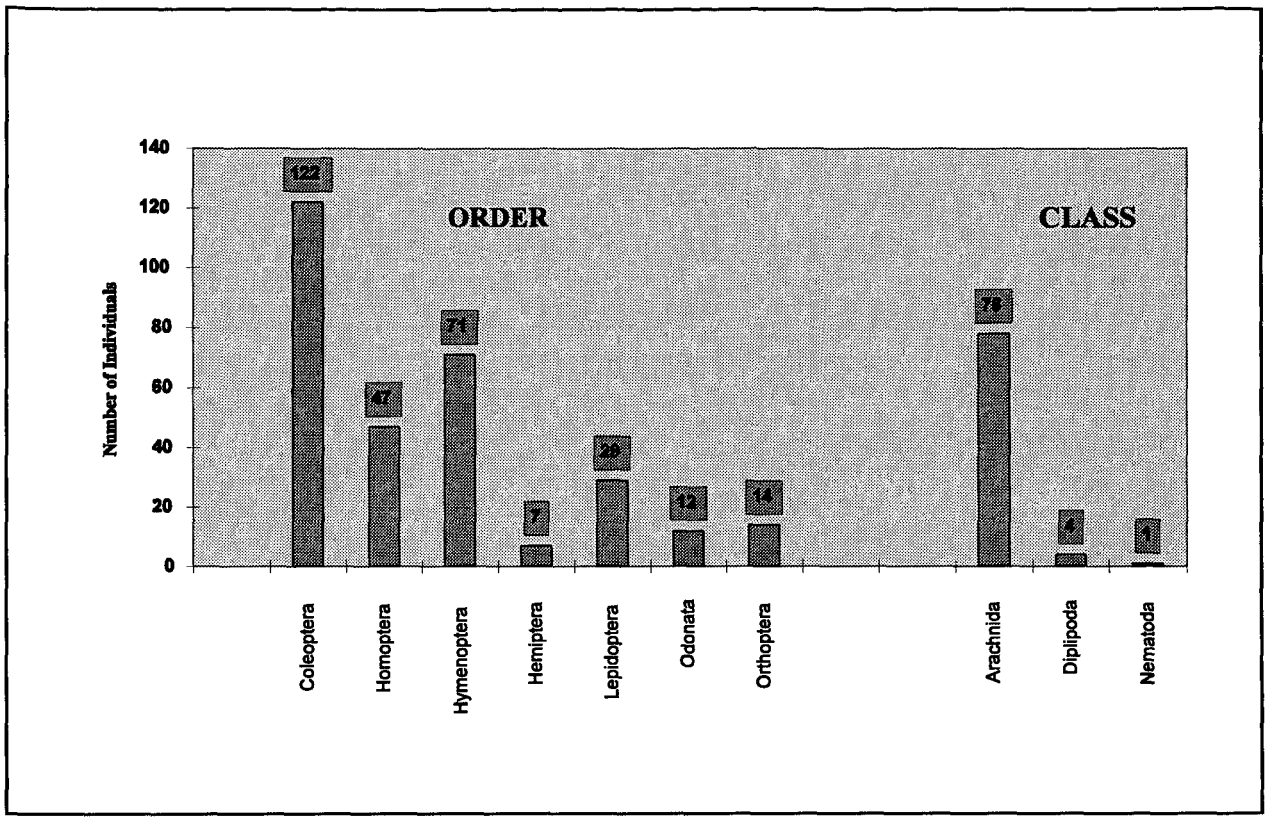
Figure 1. Map of Tracy Collins study site, City of Boulder Open Space, Boulder, CO. 1994.



North ↑

Louisville, Colo. 1965
Photorevised 1979
Scale 1:24000

Figure 2. Invertebrates collected from active netting (dip net, sweep net, or Lepidopteran net) on the Tracy Collins Study Site, City of Boulder Open Space, Boulder, CO. 1994.



APPENDIX I: Tracy Collins Species List
1994

Nomenclature follows Weber (Weber and Wittmann, 1992). Species were observed during the first session (June 13 - July 15, 1994) of the City of Boulder Open Space Junior Ranger BioEcology Program by crew members. **Note:** This is not a complete species list. The species listed below were recorded when randomly distributing a series of one-meter hoops in various habitat types to determine the three most dominant species.

GYMNOSPERMS

CUPRESSACEAE CYPRESS FAMILY

Sabina scopulorum	ROCKY MOUNTAIN JUNIPER	

PINACEAE PINE FAMILY

Pinus ponderosa	PONDEROSA PINE	
Pseudotsuga menziesii	DOUGLAS FIR	

ANGIOSPERMS

AGAVACEAE AGAVE FAMILY

Yucca glauca	YUCCA	

ANACARDIACEAE SUMAC FAMILY

Rhus trilobata	SKUNKBUSH; THREE-LEAF SUMAC	

ASTERACEAE/COMPOSITAE SUNFLOWER FAMILY

Acosta sp.	KNAPWEED	Adventive
Achillea lanulosa	YARROW	
Ambrosia psilostachya	WESTERN RAGWEED	
Antennaria sp.	PUSSYTOES	
Artemisia frigida	FRINGED SAGE; SILVER SAGE	
Artemisia ludoviciana	LOUISIANA SAGE	
Carduus nutans	MUSK THISTLE	Adventive
Cichorium intybus	CHICORY	Adventive
Cirsium arvense	CANADA THISTLE	Adventive
Erigeron flagellaris	TRAILING FLEABANE; DAISY	
Grindelia squarrosa	GUMWEED	
Gutierrezia sarothrae	SNAKEWEED	
Helianthus annuus	COMMON SUNFLOWER	
Heterotheca villosa	HAIRY GOLDEN ASTER	
Liatris punctata	SPOTTED GAYFEATHER; BLAZING STAR	
Lactuca serriola	PRICKLY LETTUCE	Adventive

Oligosporus dracunculus	WILD TARRAGON	
Taraxacum officinale	COMMON DANDELION	Adventive
Tragopogon dubius	SALSIFY, GOATSBEARD	Adventive

BORAGINACEAE BORAGE FAMILY

Cynoglossum officinale	HOUND'S TONGUE	Adventive

BRASSICACEAE/CRUCIFERAE MUSTARD FAMILY

Alyssum alyssoides	PEPPER GRASS	Adventive

CACTACEAE CACTUS FAMILY

Opuntia macrorhiza	PRICKLY PEAR CACTUS	

CAPRIFOLIACEAE HONEYSUCKLE FAMILY

Symphoricarpos occidentalis	SNOWBERRY	

CONVOLVULACEAE MORNINGGLORY FAMILY

Convolvulus arvensis	BINDWEED	Adventive

CYPERACEAE SEDGE FAMILY

Carex pennsylvanica ssp. heliophila	SUN SEDGE	
Carex microptera		
Carex nebrascensis	NEBRASKA SEDGE	
Eleocharis palustris	SPIKERUSH	

ELAEAGNACEAE OLEASTER FAMILY

Eleagnus angustifolia	RUSSIAN OLIVE	Adventive

EQUISETACEAE HORSETAIL FAMILY

Hippochaete sp.	SCOURING-RUSH	

FABACEAE/LEGUMINOSAE PEA FAMILY

Dalea purpurea	PURPLE PRAIRIE CLOVER	
Glycyrrhiza lepidota	WILD LIQUORICE	
Lupinus sp.	LUPINE	
Melilotus officinalis	YELLOW SWEETCLOVER	Adventive
Oxytropis sp.	LOCO-WEED	
Psoralidium tenuiflorum	SCURF PEA	
Thermopsis divaricarpa	GOLDEN BANNER	
Trifolium repens	WHITE DUTCH CLOVER	Adventive
Vicia americana	VETCH	

GERANIACEAE GERANIUM FAMILY

Erodium circutarium	CRANE'S BILL; FILAREE	Adventive
Geranium caespitosum	WILD GERANIUM	

GROSSULARIACEAE CURRENT/GOOSEBERRY FAMILY

Ribes cereum	WILD CURRANT; GOOSEBERRY	

HELLEBORACEAE HELLEBORE FAMILY

Delphinium sp.	LARKSPUR	

HYDROPHYLLACEAE WATERLEAF FAMILY

Phacelia heterophylla	SCORPION-WEED	

HYPERICACEAE ST. JOHNSWORT FAMILY

Hypericum perforatum	ST. JOHNSWORT; KLAMATH WEED	Adventive

JUNCACEAE RUSH FAMILY

Juncus arcticus	ARCTIC RUSH	
Juncus longistylus	RUSH	

PLANTAGINACEAE PLANTAIN FAMILY

Plantago lanceolata	ENGLISH PLANTAIN	Adventive

POACEAE/GRAMINEAE GRASS FAMILY

Andropogon gerardii	BIG BLUESTEM, TURKEYFOOT	
Anisantha tectorum	CHEATGRASS	Adventive
Aristida purpurea	PURPLE THREE-AWN	
Bouteloua curtipendula	SIDEOATS GRAMA	
Buchloe dactyloides	BUFFALO-GRASS	
Chondrosum gracile	BLUE GRAMA	
Critesion jubatum	FOXTAIL BARLEY	
Koeleria macrantha	JUNEGRASS	
Muhlenbergia montana	MOUNTAIN MUHLY	
Muhlenbergia sp.	MUHLY	
Pascopyrum smithii	WESTERN WHEAT-GRASS	
Phleum pratense	TIMOTHY	Adventive
Poa agassizensis		
Poa compressa	CANADA BLUE-GRASS	
Schizachyrium scoparium	LITTLE BLUESTEM	
Spartina pectinata	PRAIRIE CORDGRASS	
Stipa comata	NEEDLE-AND-THREAD	

POLYGONACEAE BUCKWHEAT FAMILY

Eriogonum umbellatum	SULPHUR FLOWER	

ROSACEAE ROSE FAMILY

Amelanchier alnifolia	SERVICEBERRY	
Crataegus macracantha	HAWTHORN	
Crataegus erythropoda	HAWTHORN	

Oreobatus deliciosus	BOULDER RASPBERRY	
Padus virginiana	CHOKECHERRY	
Potentilla recta	SULFUR CINQUEFOIL	Adventive
Prunus americana	WILD PLUM	
Rosa woodsii	WILD ROSE	

SALICACEAE WILLOW FAMILY

Salix exigua	COYOTE WILLOW	
Salix amygdaloides	PEACH-LEAF WILLOW	
Populus angustfolia	NARROWLEAF COTTONWOOD	
Populus deltoides	PLAINS COTTONWOOD	

SCROPHULARIACEAE FIGWORT FAMILY

Linaria genistifolia ssp. dalmatica	BUTTER & EGGS; TOADFLAX	Adventive
Penstemon virens	BEARD-TONGUE	
Verbascum thapsus	GREAT MULLEIN	Adventive

ULMACEAE ELM FAMILY

Celtis reticulata	HACKBERRY

Floristic Summary

Families 27
Genera 78
Species 86
Adventives 21

PRELIMINARY HABITAT TYPES FOR WILDLIFE SIGHTINGS AND TRANSECTS
(September 1993)

The following DRAFT classification represents major habitat types on Open Space that may be encountered while surveying wildlife. In the absence of a comprehensive plant community classification system for Open Space lands, the following habitat types have been adapted from various studies and staff's general knowledge of Open Space habitat types.

The habitat types are meant to be a broad classification of general differences in structure and composition of plant communities. Numerous plant communities and associations can be found within one habitat type.

Wildlife observers are encouraged to comment on the ease/difficulty in using these classifications in the field. Many of these habitat types overlap, and observers should select the **dominant** type associated with the sighting, plot or area surveyed.

Plains are **generally** considered to occur between 4,000 and 6,000 feet, with foothills occurring from 6,000 to 8,000 ft. Both plains and foothills communities can be found outside of these altitudinal boundaries, however. 6,000 feet is roughly the base of the flatirons and hogbacks west of Boulder. Due to the orographic effect of the foothills, plains communities generally begin to develop east of US 36, although there is no steadfast rule and topographic differences such as mesa tops can extend the eastern boundaries of foothills/montane species.

FORESTED HABITAT TYPES

Ponderosa Pine Forest (PPF)
A very broad type including the densely forested areas dominated by ponderosa pine (*Pinus ponderosa*). The understory is variable, depending on canopy cover, soil, aspect, etc. Shrubs and sparse grasses and forbs occur. Boulder's foothills ponderosa pine forests are typically closed canopy, although they were probably more savannah-like in pre fire-suppression times.

Ponderosa Pine/Douglas Fir Forest (PDF)
In the lower montane area, this habitat type is found on north facing slopes. These areas are dominated by ponderosa pine and Douglas fir (*Psuedotsuga menziesii*). These forests tend to occupy cool moist sites. Typical understory species include waxflower (*Jamesia americana*), wild raspberry (*Rubus ideaus* spp. *melanolasius*), as well as sedges (*Carex geyeri*), grasses (*Danthonia spicata, Muhlenbergia montana, Leucopoa kingii*). These stands have typically had complicated histories involving fire, forestry, tree-cutting and other types of disturbance both natural and human-induced.

Ponderosa Pine Savannah/Woodland (PPS)
Intermediate between the ponderosa pine forest and grassland, the savannah is characterized by larger, widely spaced ponderosa pine with a well-developed grassland understory and few shrubs. Typical grasses include: prairie dropseed (*Sporobolus heterolepis*), side-oats grama (*Bouteloua curtipendula*), big bluestem (*Andropogon gerardii*), Canada bluegrass (*Poa compressa*), mountain muhly (*Muhlenbergia montana*). This habitat type was historically a dynamic, fire maintained system.

Plains Riparian Forest (PRF)
Forested areas associated with streams, creeks or occasionally ditches along the plains. Dominated by plains cottonwood (*Populus deltoides*), peach leaf willow (*Salix amygdaloides*), narrowleaf cottonwood (*Populus angustifolia*), crack willow (*Salix fragilis*). Box elder (*Acer negundo*), Russian-olive (*Eleagnus angustifolia*) also present.

Foothills Riparian Forest (FRF)
Riparian areas in the foothills are dominated by narrowleaf cottonwood (*Populus angustifolia*), box elder (*Acer negundo*), chokecherry (*Prunus virginiana*) wild plum (*Prunus americana*) and willows (*Salix sp.*) and other tree and shrub species.Shrub understory can include coyote willow (*Salix exigua*), hawthorn (*Crataegus macracantha* and *C. erythropoda)*, wild plum (*Prunus americana*), leadplant (*Amorpha fruticosa*), and other species.

SHRUB DOMINATED HABITAT TYPES

Foothills Shrubland (FSL)
A general category of foothill shrub thickets not associated with a riparian area. Smooth sumac (*Rhus glabra ssp. cismontana*), skunkbush (*Rhus trilobata*), mountain mahogany (*Cercocarpus montanus*), chokecherry (*Prunus virginiana*) can dominate these areas. Shrublands may be composed of one or more of these species. The shrub canopy is often dense with a relatively undeveloped understory.

Plains Riparian Shrubland (PRS)
Differs from the riparian forest in the absence of a dominant tree canopy. Large shrub thickets associated with streams, creeks or ditches. Coyote willow (*Salix exigua*) and hawthorn (*Crataegus erythropoda and C. macracantha*) are common dominants.

Scarp Woodlands (SCW)
Located on the mesa escarpments are isolated patches of woodlands dominated by ponderosa pine (*Pinus ponderosa*), skunkbush (*Rhus trilobata*), currant (*Ribes cereum*) and mountain mahogany (*Cercocarpus montanus*). Although Boulder's scarp woodlands are small in size and stature, these areas provide important wildlife habitat in areas otherwise dominated by grassland.

GRASSLAND HABITAT TYPES

Tallgrass Prairie (TGP)
Grasslands dominated by big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), yellow Indian grass (*Sorgastrum nutans*), and prairie cordgrass (*Spartina pectinata*). Most of these areas are either irrigated or sub-irrigated and are generally associated with the South Boulder Creek floodplain.

Mixed Grass Prairie (MGP)
Plains grassland with a mix of mid, tall and shortgrass species. Similar to foothills mixed grass but the montane grasses are absent. Little bluestem (*Schizachyrium scoparium*), western wheat (*Agropyron smithii*), blue grama (*Bouteloua gracilis*), side oats grama (*Bouteloua curtipendula*).

Foothills Mixed Grassland (FMG)
Foothills grasslands with a mix of tall, mid and short grass species. This is a broad category of grasslands, and can include big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), mountain muhly (*Muhlenbergia montana*), side oats grama (*Bouteloua curtipendula*), green needlegrass (*Stipa viridula*), etc. Foothills grasslands may extend into the plains region on mesa tops or in other cooler, moister microclimates.

Shortgrass Prairie (SGP)
Plains grassland dominated by blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*). Western wheat present in depressions or clayey soils. Fringed sage (*Artemesia frigida*) a common forb.

WETLAND HABITAT TYPES

Cattail/Bulrush Marsh (CTM)
This community is typically dominated by one or two of the species of cattails (*Typha latifolia* and *T. angustifolia*) and/or bullrushes (*Scirpus lacustris* and *S. acutus*). It forms dense and productive stands, where healthy, and usually leads to the formation of soils rich in organics. This is probably the most common community in the Front Range. Species diversity is usually low due to shading and possibly allelopathic effects (the inhibition of one organism by another via the release of chemicals into the environment). This community may provide many water quality functions that are important in urban, agricultural and industrial areas, including sediment retention, nutrient retention, ground water recharge and flood attenuation.

Wet Meadow (WME)
This habitat type contains several different plant communities including those:

→ of open, flats with very shallow (1-6 inches) standing water in the early summer and a water table at or very near the soil surface during the entire growing season. The community is dominated by this a single species of sedge (*Carex nebraskensis)* although other sedges and rushes (*Carex lanuginosa, C. hystricina, Juncus arcticus*) may also occur.

→ of loamy to clayey soils with neutral to alkali characteristics. This wet meadow community is common as a fringe around the cattails/bullrushes. These sites are dominated by canemaker's rush (*Scirpus americanus*). Although these areas may not appear as wetlands from a distance, *Scirpus americanus* is a true and abundant obligate wetland plant species.

→ of seasonally wet meadows with a long grazing history, as the dominant plant, arctic rush or wire grass (*Juncus arcticus*) is an "increaser", being relatively unpalatable to cattle. The stands may have a variety of associated species.

→ of areas of standing water early in the growing season, drier later in the summer. A number of rushes (*Juncus* species) may occur, including *J. arcticus, J. interior, J. dudleyi* and *J. longistylis.* These stands are usually small and are found in complexes with stands dominated by cattails and bullrushes.

→ of irrigated hay meadows. Redtop (*Agrostis alba*) is usually is the dominant plant species but occurs with timothy (*Phleum pratense*) orchard grass (*Dactylis glomerata*) meadow fescue (*Festuca pratensis*) and other grasses which are all native to Eurasia and have been widely introduced into pastures in our area. A number of herbs including clover *Trifolium* spp. are typically found as well.

→ of irrigated or naturally wet pastures that are either intensively grazed or mowed. These areas are usually dominated by bluegrass (*Poa pratensis*) and clover (*Trifolium* spp.). These are marginally wetlands because the soils are usually

transitional between saturated and not. The plant community is typically dominated by species that can survive in drier conditions. Nevertheless, the soils are usually saturated long enough during the growing season to call them wetlands.

→ of springs, on the margins of sloughs. Prairie cordgrass (*Spartina pectinata*) *Spartina* typically thoroughly dominates this community, although it is common to find a number of other common species as well. Prairie cordgrass is typically found and in some areas may form an organic soil. The stands are usually very productive. This community probably was very common along river floodplains, on the edges of ox-bows and sloughs and in floodplain margins in presettlement times.

→ of disturbed wetland sites where the water table has been artificially lowered by diverting a stream, streams downcutting into their floodplain or other reasons. These areas are usually dominated by reed canary grass (*Phalaris arundinacea*) and Canada thistle (*Cirsium arvense*). This community typically occurs These species are weedy in nature and are very rapid and powerful colonizers of damp, highly organic substrates.

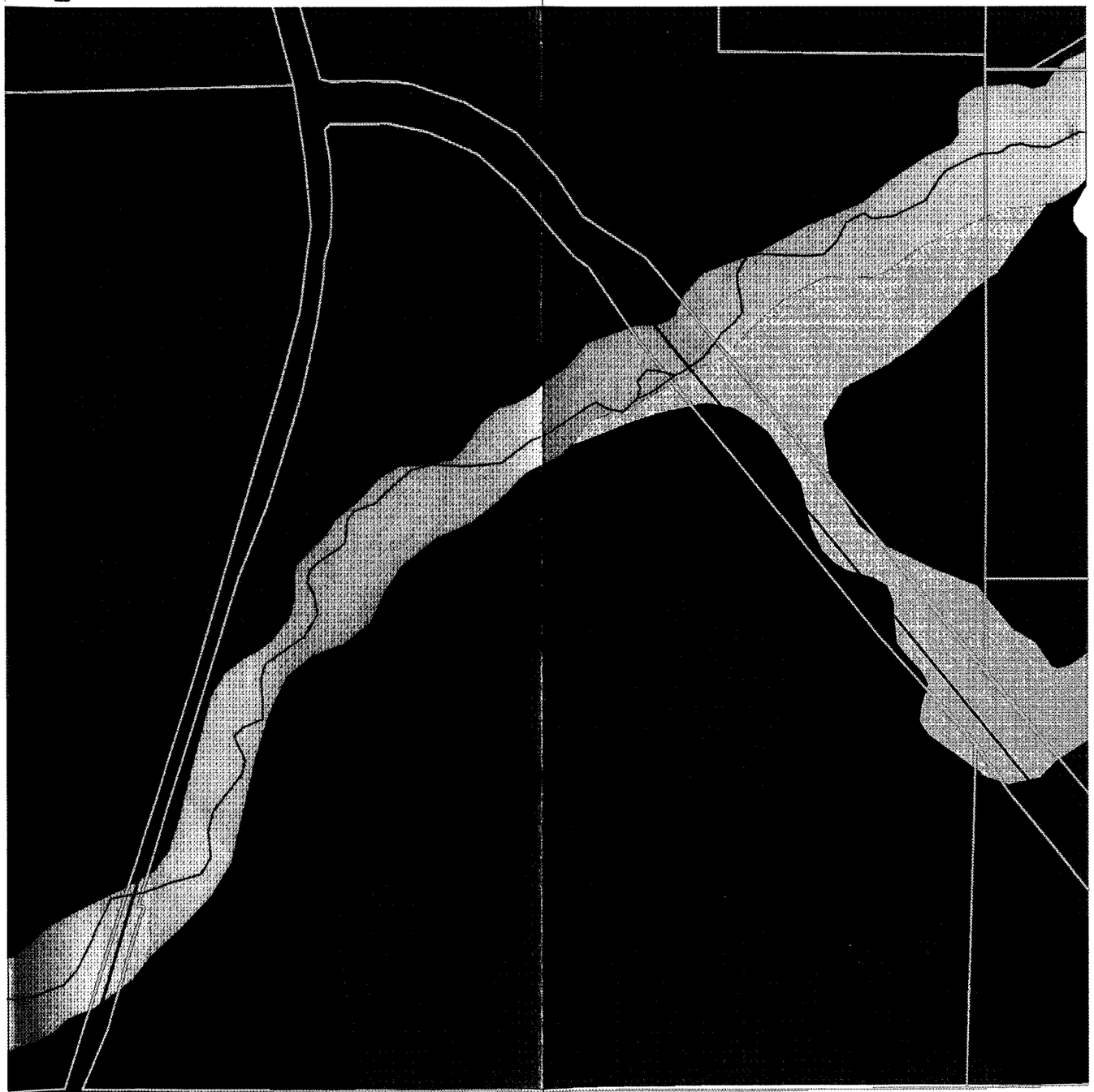
→ of wet spots in irrigated hay meadows dominated by the redtop community. It is very easily identified due to the broad leaf nature of the dominant smartweeds (*Persicaria lapathifolia* and *Persicaria maculata*).

OTHER HABITAT TYPES

Cliffs (CLF)	**Talus -slopes formed of rock debris (TAL)**
Shorelines (SHR)	**Mudflats (MUD)**
Open Water (H20)	**Alfalfa (ALF)**
Cropland (CRP)	**Building/Structure (BUI)**

APPENDIX III.

Tracy Collins Detailed Soils



Roads

H_creek

City of Boulder Open Space

Kutch clay loam
- *KuD*

Nederland very cobbly sandy loam
- *NdB*
- *NdD*

Niwot soils
- *Nh*

Samsil-Shingle complex
- *SeE*

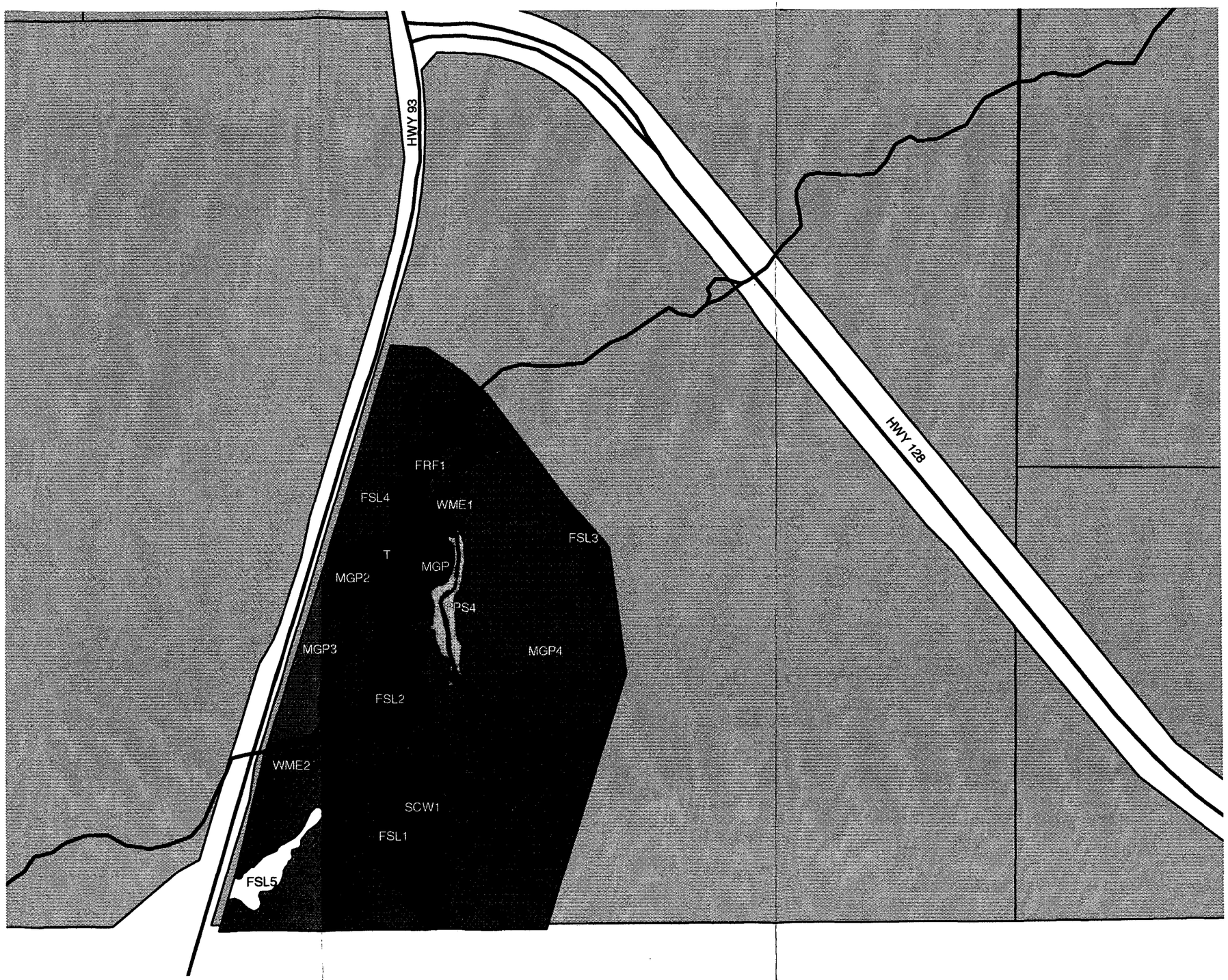
Terrace escarpments
- *Te*

feet

0 300 600

Map produced 6/13/94 by J. Osborne and the GIS Lab.

1994 BDAP Raw Data, Tracy Collins Property



Road
Creek
BDAP 94
FRF1
FSL1
FSL2
FSL3
FSL4
FSL5
HF
MGP
MGP2
MGP3
MGP4
PPS4
SCW1
T
WME1
WME2
City O.S.

N
W
E
S

0 500 1000 Feet

Map digitized by M. Smith, January 1995.