

**VEGETATION AND WILDLIFE RESOURCES
OF THE COAL CREEK AREA
IN SOUTH BOULDER COUNTY**

Prepared for:

City of Boulder Parks and Open Space

4459
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INTRODUCTION

Ecological diversity has become more and more of a limited commodity in the Boulder Valley area. Housing developments, industrial parks, highway construction and improvement all require space. These spaces, once occupied by natural communities, have been converted to manicured landscapes, parking lots, and sites that support communities dominated by introduced non-native species.

The City of Boulder has been able, through an aggressive program of land acquisition, to obtain many parcels of open space land that preserve natural assemblages of plants and animals. Even though these sites may not be in pristine condition, they still serve as refuges where the onslaught of development has been held at bay. The simple acquisition of a parcel of land does not necessarily mean that it will be protected from future disturbances associated with development. This is especially true for areas adjacent to highways. New highway construction or re-alignment of existing highways can seriously impact open space areas. This is especially true for the proposed W-470 highway project. The current planning for the W-470 project has the potential for adversely impacting an important parcel of open space in southern Boulder County.

The purpose of this study was to evaluate the ecological resources of City of Boulder open space lands that could be impacted by construction of the proposed W-470 parkway and to evaluate possible impacts related to highway construction, if a major highway were to be constructed within the study area. Specifically, the study area included all of Section 33 and the western half of Section 34 in Township 1 South, Range 70 West. Much of the study area is included in the Flatirons Vista open space parcel. The study area is crossed by two two-lane highways. Colorado Highway 93 crosses the western half of section 33 from north to south, and Colorado Highway 128 diagonally crosses the northeast quarter of Section 33 and the Southwest quarter of Section 34.

EXISTING VEGETATION

Previous Studies

Portions of the study area have been included in earlier vegetation studies. Clark (1974) and Clark et al. (1980) included the central portion of the study area (the portion bounded by Highways 93 and 128 and the Boulder-Jefferson County line) in a study of the vegetation of Rocky Flats. The primary purpose of their study was to map the existing vegetation, prepare descriptions of the vegetation types and examine the relationships between vegetation structure and composition and environmental characteristics. Bunin (1985) mapped the western portion of the study area (approximately the western half of Section 33 bounded on the east by Highway 93) as part of a study of the vegetation on Boulder open space lands. An assessment of the riparian vegetation along Coal Creek was included as part of a study of riparian vegetation in Boulder County conducted by the Boulder County Parks and Open Space and the Boulder County Nature Association (1988). Clark's work (1974 and 1980) included sampling data for 32 sites, most of which were located on properties south of the current study

area. Six of her sampling sites, however, were located in Section 33. Data from those sites have been included in the Appendix to this report.

The vegetation descriptions in these earlier studies are consistent with the interpretations presented in this report. There are some minor differences which are related to both the way in which the vegetation has been evaluated and to changes that apparently have occurred in the vegetation over the past 18 years.

Vegetation Types

The vegetation of the site is composed of a mixture of grassland, shrubland and forest types. Most of the flat, upland portions of the site support a mixed grass prairie vegetation type. The Coal Creek riparian corridor, side slopes and rock outcrops support a mixture of deciduous shrublands, meadows/grasslands, wetlands, deciduous and coniferous forest types. The vegetation of the site is portrayed on the map that accompanies this report. The study area occurs at the intersection of four separate map sheets. All four photo base maps are included with the appropriate portion of the study area. Each of the types is described in the section that follows.

In all, 150 species were observed within the study area (Table 1). The list is based on observations made in March and April. Because it was early in the growing season, it is likely that some species were not yet apparent and were not observed.

Mixed Grass Prairie

The mixed grass prairie type is the most abundant and widespread vegetation type within the study area. This type occurs on flat upland portions of the site as well as on gentle side slopes of varying exposure. The dominant species in this type include buffalo grass (*Buchloe dactyloides*), blue grama (*Bouteloua gracilis*) and western wheatgrass (*Agropyron smithii*). Even though short and mid-grasses occur as the dominant species in this type, there are some patches where tall grass species like big bluestem (*Andropogon gerardi*) and switchgrass (*Panicum virgatum*) are also prevalent. Bunin (1985) mapped several patches of what she described as xeric tall grassland in the western part of Section 33. These patches were not distinguished as part of the current study, but were included as part of the mixed grass prairie type. These sites are very similar to the other grassland sites, except for the presence of the tall grass species.

Bottomland Meadow

The bottomland meadow type occurs in the low areas along Coal Creek, along the small intermittent drainages on the site and also on small depressions in the upland areas. In general these areas tend to be more productive than surrounding prairie areas. Major species include slender wheatgrass (*Agropyron trachycaulum*) and western wheatgrass. Weedy species like Canada thistle (*Cirsium arvense*) and common dock (*Rumex crispus*) also occur in this type. Some of the bottomland meadows are moist enough that they could be considered as wetlands, however wetland areas tend to be spotty and discontinuous within this type.

Table 1. List of species observed on the Northwest Parkway study area.

	PONDEROSA	RIPARIAN	WILLOW	MIXED
	PINE FOREST/ ROCKY RIDGE	FOREST	SHRUBLAND	PLAINS SHRUBLAND
<i>Achillea lanulosa</i>	X			X
<i>Agropyron elongatum</i>				
<i>Agropyron intermedium</i>		X		
<i>Agropyron smithii</i>	X	X		
<i>Agropyron trachycaulum</i>				
<i>Allium cernuum</i>				X
<i>Abyssum minus</i>				
<i>Abyssum alyssoides</i>				
<i>Ambrosia psilostachya</i>	X			
<i>Amelanchier alnifolia</i>	X			
<i>Andropogon gerardi</i>	X			
<i>Antennaria rosea</i>	X			
<i>Arctium minus</i>				
<i>Aristida longiseta</i>				
<i>Arnica fulgens</i>				
<i>Artemisia dracuncululus</i>				
<i>Artemisia frigida</i>				
<i>Artemisia ludoviciana</i>				
<i>Astragalus shortianus</i>				
<i>Astragalus sp. (undet.)</i>				
<i>Astragalus tridactylicus</i>				
<i>Bouteloua curtipendula</i>				
<i>Bouteloua gracilis</i>				
<i>Bromopsis inermis</i>				
<i>Bromus japonicus</i>				
<i>Bromus tectorum</i>				
<i>Buchloe dactyloides</i>	X			
<i>Carduus nutans</i>	X			
<i>Carex heliophila</i>	X			
<i>Carex nebraskensis</i>				
<i>Castilleja sessiliflora</i>				
<i>Celtis reticulata</i>	X			
<i>Centaurea diffusa</i>				
<i>Cerastium arvense</i>	X			
<i>Chrysothamnus nauseosus</i>				
<i>Cichorium intybus</i>				
<i>Cirsium arvense</i>				
<i>Cirsium undulatum</i>				
<i>Clematis ligusticifolia</i>				X
<i>Comandra umbellatum</i>				
<i>Conium maculatum</i>				
<i>Convolvulus arvensis</i>				
<i>Coryphantha missouriensis</i>				
<i>Crataegus erythropoda</i>	X	X		
<i>Crepis sp. (undet.)</i>				

Table 1. List of species observed on the Northwest Parkway study area.

	PONDEROSA	RIPARIAN	WILLOW	MIXED
	PINE FOREST/ ROCKY RIDGE	FOREST	SHRUBLAND	PLAINS SHRUBLAND
<i>Cynoglossum officinale</i>				
<i>Delphinium sp. (undet.)</i>	X			
<i>Dicanthelium oligosanthes</i>				
<i>Drymocallis fissa</i>	X			
<i>Erigeron vetensis</i>				
<i>Equisetum laevigatum</i>				
<i>Eriogonum alatum</i>	X			
<i>Eriogonum umbellatum</i>				X
<i>Erodium cicutarium</i>				
<i>Erysimum asperum</i>				
<i>Euphorbia robusta</i>				
<i>Frasera speciosa</i>	X			
<i>Galium aparine</i>				X
<i>Galium boreale</i>				X
<i>Gaura coccinea</i>				
<i>Gaura parviflora</i>				
<i>Geranium caespitosum</i>	X			
<i>Grindelia squarrosa</i>	X			
<i>Gutierrezia sarothrae</i>	X			
<i>Helianthus rigidus</i>				
<i>Heterotheca villosa</i>				
<i>Hydrophyllum fendleri</i>				X
<i>Hymenopappus filifolius</i>				
<i>Hypericum perforatum</i>	X			
<i>Ipomopsis aggregata</i>				
<i>Iris missouriensis</i>				
<i>Juncus arcticus ssp. ater</i>			X	
<i>Juniperus communis</i>	X			
<i>Juniperus scopulorum</i>	X			
<i>Koeleria macrantha</i>	X			
<i>Lactuca serriola</i>				
<i>Lepidium latifolium</i>				
<i>Lesquerella montana</i>				
<i>Leucocrinum montanum</i>				
<i>Liatris punctata</i>				
<i>Linaria dalmatICA</i>				
<i>Linum lewisii</i>				
<i>Lomatium orientale</i>				
<i>Lupinus argenteus</i>				
<i>Mahonia repens</i>				
<i>Malva rotundifolia</i>				
<i>Melilous officinalis</i>				
<i>Mertensia lanceolata</i>				
<i>Musineon divaricatum</i>				
<i>Nepeta cataria</i>				

Table 1. List of species observed on the Northwest Parkway study area.

	PONDEROSA	RIPARIAN	WILLOW	MIXED
	PINE FOREST/ ROCKY RIDGE	FOREST	SHRUBLAND	PLAINS SHRUBLAND
<i>Nothocalais cuspidata</i>				
<i>Oenothera caespitosa</i>				
<i>Opuntia compressa</i>	X			
<i>Opuntia fragilis</i>				
<i>Opuntia polyacantha</i>				
<i>Orobancha fasciculata</i>				
<i>Oxytropis lambertii</i>				
<i>Panicum virgatum</i>	X			
<i>Penstemon secundiflorus</i>				
<i>Penstemon virens</i>				
<i>Physocarpus monogynus</i>	X			
<i>Pinus ponderosa</i>	X			
<i>Plantago lanceolata</i>		X		
<i>Poa compressa</i>				
<i>Poa pratensis</i>		X		
<i>Podospermum laciniatum</i>				
<i>Populus angustifolia</i>		X		
<i>Populus sargentii</i>		X		
<i>Potentilla gracilis</i>				
<i>Prunus americana</i>	X	X		
<i>Prunus virginiana</i>	X			X
<i>Pseudotsuga menziesii</i>	X			
<i>Pulsatilla patens</i>	X			
<i>Ratibida columnifera</i>				
<i>Rhus trilobata</i>	X			X
<i>Ribes aureum</i>		X		
<i>Ribes cereum</i>	X			
<i>Rosa arkansana</i>	X			X
<i>Rosa woodsii</i>		X		X
<i>Rumex crispus</i>				
<i>Salix amygdaloides</i>		X	X	
<i>Salix exigua</i>		X	X	
<i>Saponaria officinalis</i>		X		
<i>Schedonardus paniculatus</i>				
<i>Schizachryium scoparium</i>	X			
<i>Senecio integerrimus</i>	X			
<i>Senecio tridenticulatus</i>				
<i>Sitanion longifolium</i>	X			
<i>Solidago missouriensis</i>	X			
<i>Spartina pectinata</i>				
<i>Sphaeralcea coccinea</i>				
<i>Sporobolus cryptandrus</i>				
<i>Symphoricarpos occidentalis</i>				X
<i>Symphoricarpos oreophilus</i>	X			X
<i>Taraxacum officinale</i>	X			

Table 1. List of species observed on the Northwest Parkway study area.

	PONDEROSA	RIPARIAN	WILLOW	MIXED
	PINE FOREST/ ROCKY RIDGE	FOREST	SHRUBLAND	PLAINS SHRUBLAND
<i>Thermopsis rhombifolia</i>	X			
<i>Thlaspi arvense</i>				
<i>Townsendia hookeri</i>				
<i>Toxicodendron rydbergii</i>	X			
<i>Tragopogon dubius</i>	X			
<i>Trifolium pratense</i>		X		
<i>Typha latifolia</i>				
<i>Ulmus pumila</i>				
<i>Urtica dioica</i>				X
<i>Verbascum blattaria</i>				
<i>Verbascum thapsus</i>	X			
<i>Vicia americana</i>				
<i>Viola nuttallii</i>				
<i>Yucca glauca</i>	X			
<i>Zygadenus venenosus</i>	X			
Total Number of Species	46	14	3	14

Table 1. List of species observed on the Northwest Parkway study area.

	HAWTHORN	MIXED	BOTTOMLAND	RUSH	DISTURBED
	THICKET	GRASS	MEADOW	SEDGE	AREA
		PRAIRIE		MEADOW	
<i>Achillea lanulosa</i>	X	X			
<i>Agropyron elongatum</i>			X		
<i>Agropyron intermedium</i>					
<i>Agropyron smithii</i>	X	X			X
<i>Agropyron trachycaulum</i>			X		
<i>Allium cernuum</i>		X			
<i>Abyssum minus</i>		X			
<i>Abyssum abyssoides</i>		X			
<i>Ambrosia psilostachya</i>	X	X			
<i>Amelanchier alnifolia</i>					
<i>Andropogon gerardi</i>		X			
<i>Antennaria rosea</i>		X			
<i>Arctium minus</i>	X				
<i>Aristida longiseta</i>		X			
<i>Arnica fulgens</i>		X			
<i>Artemisia dracunculus</i>		X			
<i>Artemisia frigida</i>		X			
<i>Artemisia ludoviciana</i>		X			
<i>Astragalus shortianus</i>		X			
<i>Astragalus sp. (undet.)</i>		X			
<i>Astragalus tridactylicus</i>		X			
<i>Bouteloua curtipendula</i>		X			
<i>Bouteloua gracilis</i>		X			
<i>Bromopsis inermis</i>	X	X			X
<i>Bromus japonicus</i>		X			
<i>Bromus tectorum</i>		X			
<i>Buchloe dactyloides</i>		X			X
<i>Carduus nutans</i>	X	X			
<i>Carex heliophila</i>	X	X			
<i>Carex nebraskensis</i>			X	X	
<i>Castilleja sessiliflora</i>		X			
<i>Celtis reticulata</i>					
<i>Centaurea diffusa</i>	X	X			
<i>Cerastium arvense</i>					
<i>Chrysothamnus nauseosus</i>		X			X
<i>Cichorium intybus</i>		X	X	X	
<i>Cirsium arvense</i>			X		X
<i>Cirsium undulatum</i>		X			
<i>Clematis ligusticifolia</i>	X				
<i>Comandra umbellatum</i>		X			
<i>Conium maculatum</i>	X				
<i>Convolvulus arvensis</i>					X
<i>Coryphantha missouriensis</i>		X			
<i>Crataegus erythropoda</i>	X	X			
<i>Crepis sp. (undet.)</i>		X			

Table 1. List of species observed on the Northwest Parkway study area.

	HAWTHORN	MIXED	BOTTOMLAND	RUSH	DISTURBED
	THICKET	GRASS	MEADOW	SEDGE	AREA
		PRAIRIE		MEADOW	
<i>Cynoglossum officinale</i>	X				
<i>Delphinium sp. (undet.)</i>					
<i>Dicanthelium oligosanthes</i>		X			
<i>Drymocallis fissa</i>					
<i>Erigeron vetensis</i>		X			
<i>Equisetum laevigatum</i>		X			
<i>Eriogonum alatum</i>		X			
<i>Eriogonum umbellatum</i>					
<i>Erodium cicutarium</i>			X		
<i>Erysimum asperum</i>		X			
<i>Euphorbia robusta</i>		X			
<i>Frasera speciosa</i>	X				
<i>Galium aparine</i>					
<i>Galium boreale</i>					
<i>Gaura coccinea</i>		X			X
<i>Gaura parviflora</i>					X
<i>Geranium caespitosum</i>	X				
<i>Grindelia squarrosa</i>		X			X
<i>Gutierrezia sarothrae</i>		X			X
<i>Helianthus rigidus</i>		X			
<i>Heterotheca villosa</i>		X			X
<i>Hydrophyllum fendleri</i>	X				
<i>Hymenopappus filifolius</i>		X			
<i>Hypericum perforatum</i>		X			
<i>Ipomopsis aggregata</i>		X			
<i>Iris missouriensis</i>				X	
<i>Juncus arcticus ssp. ater</i>			X	X	
<i>Juniperus communis</i>					
<i>Juniperus scopulorum</i>					
<i>Koeleria macrantha</i>		X			
<i>Lactuca serriola</i>		X			
<i>Lepidium latifolium</i>					X
<i>Lesquerella montana</i>		X			
<i>Leucocrinum montanum</i>		X			
<i>Liatris punctata</i>		X			
<i>Linaria dalmatica</i>		X			
<i>Linum lewisii</i>		X			
<i>Lomatium orientale</i>		X			
<i>Lupinus argenteus</i>		X			
<i>Mahonia repens</i>					
<i>Malva rotundifolia</i>	X				
<i>Melilotus officinalis</i>					X
<i>Mertensia lanceolata</i>		X			
<i>Musineon divaricatum</i>		X			
<i>Nepeta cataria</i>	X				

Table 1. List of species observed on the Northwest Parkway study area.

	HAWTHORN THICKET	MIXED GRASS PRAIRIE	BOTTOMLAND MEADOW	RUSH SEDGE MEADOW	DISTURBED AREA
<i>Nothocalais cuspidata</i>		X			
<i>Oenothera caespitosa</i>		X			
<i>Opuntia compressa</i>		X			
<i>Opuntia fragilis</i>		X			
<i>Opuntia polyacantha</i>		X			
<i>Orobanche fasciculata</i>		X			
<i>Oxytropis lambertii</i>		X			
<i>Panicum virgatum</i>		X			
<i>Penstemon secundiflorus</i>		X			
<i>Penstemon virens</i>		X			
<i>Physocarpus monogynus</i>	X				
<i>Pinus ponderosa</i>		X			
<i>Plantago lanceolata</i>					X
<i>Poa compressa</i>		X			
<i>Poa pratensis</i>	X		X		
<i>Podospermum laciniatum</i>					X
<i>Populus angustifolia</i>					
<i>Populus sargentii</i>					
<i>Potentilla gracilis</i>	X				
<i>Prunus americana</i>					
<i>Prunus virginiana</i>	X				
<i>Pseudotsuga menziesii</i>					
<i>Pulsatilla patens</i>					
<i>Ratibida columnifera</i>		X			
<i>Rhus trilobata</i>	X				
<i>Ribes aureum</i>					
<i>Ribes cereum</i>					
<i>Rosa arkansana</i>					
<i>Rosa woodsii</i>	X				
<i>Rumex crispus</i>	X		X		
<i>Salix amygdaloides</i>	X				
<i>Salix exigua</i>					
<i>Saponaria officinalis</i>					
<i>Schedonarda paniculatus</i>					X
<i>Schizachryium scoparium</i>		X			
<i>Senecio integerrimus</i>		X			
<i>Senecio tridenticulatus</i>		X			
<i>Sitanion longifolium</i>					
<i>Solidago missouriensis</i>		X			
<i>Spartina pectinata</i>				X	
<i>Sphaeralcea coccinea</i>		X			
<i>Sporobolus cryptandrus</i>		X			
<i>Symphoricarpos occidentalis</i>	X			X	
<i>Symphoricarpos oreophilus</i>					
<i>Taraxacum officinale</i>	X	X	X	X	X

Table 1. List of species observed on the Northwest Parkway study area.

	HAWTHORN	MIXED	BOTTOMLAND	RUSH	DISTURBED
	THICKET	GRASS	MEADOW	SEDGE	AREA
		PRAIRIE		MEADOW	
<i>Thermopsis rhombifolia</i>		X			
<i>Thlaspi arvense</i>	X				
<i>Townsendia hookeri</i>		X			
<i>Toxicodendron rydbergii</i>					
<i>Tragopogon dubius</i>		X			
<i>Trifolium pratense</i>					
<i>Typha latifolia</i>				X	
<i>Ulmus pumila</i>			X		
<i>Urtica dioica</i>					
<i>Verbascum blattaria</i>	X			X	
<i>Verbascum thapsus</i>	X	X		X	
<i>Vicia americana</i>		X			
<i>Viola nuttallii</i>		X			
<i>Yucca glauca</i>		X			
<i>Zygadenus venenosus</i>		X			
Total Number of Species	30	86	11	10	17

Rush/Sedge Meadow

The rush/sedge meadow type occurs in wet locations throughout the study area. These wet meadows occur along Coal Creek and also along the drainages in the southeast part of the study area. The dominant species in this type include baltic rush (*Juncus arcticus* ssp. *ater*) and various species of sedge including Nebraska sedge (*Carex nebrascensis*). All of the areas mapped as rush/sedge meadow are wetlands.

Cattail Marsh

There is only one small cattail marsh within the study area. The dominant species in this type is common cattail (*Typha latifolia*). This type exists under saturated or flooded soil conditions throughout most of the growing season.

Ponderosa Pine Woodland

The ponderosa pine woodland type occurs on thin rocky soils at the southern edge of the study area and also along the rocky north-south ridge in the southern part of the area. The major tree species is ponderosa pine (*Pinus ponderosa*). These small pine stands are in many ways similar to the more extensive ponderosa pine forests of the foothills. Within the study area they serve to increase habitat diversity even though they occupy only a small part of the area. The understory vegetation in this type is rather sparse, however many species may be encountered (Table 1).

Riparian Forest

The riparian forest type occurs as intermittent stands on the bottomland areas along Coal Creek, especially in areas immediately adjacent to the creek. The dominant species include narrowleaf cottonwood (*Populus angustifolia*) and plains cottonwood (*Populus sargentii*). The understory in these woodlands tends to be open and grassy with Kentucky bluegrass (*Poa pratensis*) and Canada bluegrass (*Poa compressa*) occurring as common components of the understory. Golden currant (*Ribes aureum*) commonly occurs in the shrub layer of these woodlands.

Willow Shrubland

The willow shrubland type occurs in the streamside areas along Coal Creek and occupies most of sites that do not support stands of riparian forest. Stands of willow shrubland occur immediately adjacent to the stream and also occur on gravel bars within the stream. The dominant species is coyote willow (*Salix exigua*), which occurs to the near exclusion of all other species.

Mixed Plains Shrubland

The mixed plains shrubland type occurs throughout the study area, however it is most prevalent in the areas around the rock outcrops in the south central part of the site. Shrublands occur on west facing hillsides and in areas with broken topography along the drainages which cross the upland portions of the area. Shrubs occur as the overwhelmingly dominant species in

this vegetation type. The major species include skunkbush sumac (*Rhus trilobata*), chokecherry (*Prunus virginiana*), golden currant, western snowberry (*Symphoricarpos occidentalis*) and hawthorn (*Crataegus erythropoda*).

Hawthorn Thicket

The hawthorn thicket type occurs primarily on the bottomland areas along Coal Creek, but it also occurs on side slopes above the valley floor. Hawthorn, the dominant species, forms dense nearly impenetrable thickets. In general, the shrubs in this type tend to be taller than those in the mixed plains shrubland type. In all, 30 species were observed in this type (Table 1).

Reservoir

There are several small reservoirs within the study area. These sites provide resting sites for waterfowl, however there is limited vegetation development along the shorelines.

Disturbed Areas

The disturbed area type includes the roads and roadside sites within the study area. The major species in these areas tend to be weedy in nature and are mostly species that are indigenous to other regions.

EXISTING WILDLIFE RESOURCES

The discussion presented below is based on three site visits (Feb, Mar, Apr, 1991), past wildlife research experience in Boulder County, and literature review.

The Coal Creek riparian corridor at this location contains a high level of habitat diversity. Habitats consist primarily of thickets, shrubby vegetation, riparian forests, meadows, large rock outcrops, and the open water of Coal Creek. The term riparian, as used here, is meant to include the shrubby, timbered, and rocky habitats that are adjacent to and extend in some places to perhaps 100 yards from the creek. These habitats are important to local wildlife because much of the surrounding upland area is predominantly open, prairie habitat. Although the prairie provides valuable wildlife habitat as well, it is less diverse, lacks open water, and unlike the narrow corridor is a very expansive habitat type. The riparian habitat at this location was evaluated last year relative to its overall importance to wildlife (Keammerer and Stoecker 1991). Of 80 sites evaluated in the Boulder area, this site received a rating of 9 for overall wildlife quality on a scale of 1 to 10.

The Coal Creek riparian habitat is critical to many local wildlife populations. It provides necessary cover and water for a number of species that are usually considered prairie or grassland wildlife, for example sharp-tailed grouse. Sharp-tailed grouse are presently being considered for introduction in the immediate vicinity by the Colorado Division of Wildlife. Although sharp tails do not occur in Boulder County, their required habitats (juxtaposition of prairie and shrubby, riparian habitats) are present at this location. Other attractive and conspicuous wildlife identified in the vicinity that utilize both the shrubby and timbered

habitats as well as the open prairie include the bald eagle, ferruginous, red-tailed, and rough-legged hawks, mourning dove, raven, crow, magpie, and songbirds such as western meadowlarks and mountain bluebirds. Examples of mammals include mule deer and coyotes. Conspicuous and attractive wildlife more strongly restricted to riparian habitats include mallards and other ducks, snipe, shorebirds, herons, kingfishers, and various songbirds, notably swallows, flycatchers, robins and red-winged blackbirds.

Tables 2 and 3 provide listings of birds and mammals identified in the immediate vicinity (<1 mile from the study area) along with a notation indicating primary habitat affinity. These tables also illustrate the fact that riparian habitats tend to have a greater wildlife diversity than drier, upland sites.

POTENTIAL IMPACTS FROM MAJOR HIGHWAY DEVELOPMENT IN THE COAL CREEK VICINITY

Any improvement of existing highways or construction of new highways would adversely affect the existing vegetation and wildlife resources of the site. There are, however, some highway alignments that would be more detrimental than others.

An alignment of highway 470 that avoids coming into close proximity to Coal Creek is preferable to an alignment that would follow along or near the existing highway 93-128 routes. A 93-128 alignment would substantially increase already occurring impacts to wildlife. The potential for increased impacts resulting from additional traffic, higher velocity traffic, and increased highway width can be placed into three categories: 1) more deer road kills; 2) disruption of the Coal Creek wildlife corridor; and 3) additional disturbances to the nearby diverse and productive riparian habitats.

Deer road kills in the 93-128 area have not been a major problem in the past. A wider highway, however would be more difficult for deer to cross. Deer tend not to move across a wide highway quickly, and they often become confused by the expanse of unnatural pavement. Also, a 93-128 alignment would pass through more densely vegetated and broken terrain than, say, an alignment over the mesa that occurs to the southeast. As elaborated below, Coal Creek functions as a movement corridor for many wildlife species, including deer. Deer collisions would be more likely next to Coal Creek, which a 93-128 alignment would cross twice, than along a mesa route. In contrast, deer in open, prairie habitat are more visible to motorists. In prairie areas, there is less cover in close proximity to the highway in which deer can hide and then quickly jump in front of on-coming vehicles.

A 93-128 alignment would disrupt the Coal Creek riparian corridor at two places. Unfortunately, both bridge locations would be in close proximity to the large rock outcrop and the shrubby and timbered habitats that exist along this section of Coal Creek. Habitats downstream of this area tend to be more open and of less value as a wildlife movement corridor. Animals that undoubtedly move along this section of the Coal Creek corridor include a number of larger mammals including deer, coyotes, bobcat and foxes. Some cross over the highways; others move through the existing box culverts, which have earthen or cobble substrates and, because highways 93 and 128 are narrow, are of a relatively short span.

Table 2. Bird species identified in habitats on or near the project location.¹

Scientific Name	Common Name	Habitat Affinities	
		Prairie	Riparian
WATERFOWL			
<i>Anas discors</i>	Blue-winged teal		X
<i>Anas cyanoptera</i>	Cinnamon teal		X
<i>Mergus merganser</i>	Common merganser		X
<i>Anas creca</i>	Green-winged teal		X
<i>Aythya affinis</i>	Lesser scaup		X
<i>Anas platyrhynchos</i>	Mallard		X
VULTURES - HAWKS - FALCONS			
<i>Haliaeetus leucocephalus</i>	Bald eagle	X	X
<i>Accipiter cooperii</i>	Cooper's hawk		X
<i>Buteo regalis</i>	Ferruginous hawk	X	
<i>Aquila chrysaetos</i>	Golden eagle	X	
<i>Falco sparverius</i>	American kestrel	X	X
<i>Circus cyaneus</i>	Northern harrier	X	X
<i>Falco mexicanus</i>	Prairie falcon	X	
<i>Buteo jamaicensis</i>	Red-tailed hawk	X	X
<i>Buteo lagopus</i>	Rough-legged hawk	X	X
<i>Accipiter striatus</i>	Sharp-shinned hawk		X
<i>Buteo swainsonii</i>	Swainson's hawk	X	X
<i>Cathartes aura</i>	Turkey vulture	X	X
GALLINACEOUS BIRDS			
<i>Dendroopus obscurus</i>	Blue grouse		X
<i>Colinus virginianus</i>	Northern bobwhite		X
<i>Phasianus colchicus</i>	Ring-necked pheasant	X	X
CRANES AND ALLIES			
<i>Botaurus lentiginosus</i>	American bittern		X
<i>Nycticorax nycticorax</i>	Black-crowned night-heron		X
<i>Fulica americana</i>	American coot		X
<i>Ardea herodias</i>	Great blue heron		X
<i>Porzana carolina</i>	Sora		X
SHOREBIRDS - GULLS			
<i>Cinclus mexicanus</i>	American dipper		X
<i>Gallinago gallinago</i>	Common snipe		X
<i>Tringa melanoleuca</i>	Greater yellowlegs		X
<i>Tringa solitaria</i>	Solitary sandpiper		X
<i>Charadrius vociferus</i>	Killdeer	X	X
<i>Catoptrophorus semipalmatus</i>	Willet		X

Table 2. (Cont'd) Bird species identified in habitats on or near the project location.

Scientific Name	Common Name	Habitat Affinities	
		Prairie	Riparian
PIGEONS AND DOVES			
<i>Zenaida macroura</i>	Mourning dove	X	X
<i>Columba livia</i>	Pigeon	X	X
OWLS			
<i>Tyto alba</i>	Barn owl		X
<i>Otus asio</i>	Eastern screech owl		X
<i>Bubo virginianus</i>	Great horned owl		X
GOATSUCKERS			
<i>Chordeiles minor</i>	Common nighthawk	X	X
KINGFISHERS			
<i>Ceryle alcyon</i>	Belted kingfisher		X
WOODPECKERS			
<i>Colaptes auratus</i>	Common flicker		X
<i>Picoides pubescens</i>	Downy woodpecker		X
PERCHING BIRDS			
<i>Riparia riparia</i>	Bank swallow		X
<i>Hirundo rustica</i>	Barn swallow	X	X
<i>Parus atricapillus</i>	Black-capped chickadee		X
<i>Pheucticus melanocephalus</i>	Black-headed grosbeak		X
<i>Guiraca caerulea</i>	Blue grosbeak	X	X
<i>Pica pica</i>	Black-billed magpie	X	X
<i>Cyanocitta cristata</i>	Blue jay		X
<i>Dolichonyx oryzivorus</i>	Bobolink		X
<i>Euphagus cyanocephalus</i>	Brewer's blackbird	X	X
<i>Spizella breweri</i>	Brewer's sparrow	X	
<i>Molothrus ater</i>	Brown-headed cowbird	X	X
<i>Hirundo pyrrhonota</i>	Cliff swallow	X	X
<i>Quiscalus quiscula</i>	Common grackle	X	X
<i>Corvus corax</i>	Common raven	X	X
<i>Corvus brachyrhynchos</i>	American crow	X	X
<i>Empidonax oberholseri</i>	Dusky flycatcher		X
<i>Tyrannus tyrannus</i>	Eastern kingbird	X	X
<i>Sturnus vulgaris</i>	European starling		X
<i>Carduelis tristis</i>	American goldfinch		X
<i>Dumetella carolinensis</i>	Gray catbird		X
<i>Ammodramus savannarum</i>	Grasshopper sparrow	X	
<i>Empidonax hammondi</i>	Hammond's flycatcher		X

Table 2. (Cont'd) Bird species identified in habitats on or near the project location.

Scientific Name	Common Name	Habitat Affinities	
		Prairie	Riparian
<i>Eremophila alpestris</i>	Horned lark	X	
<i>Carpodacus mexicanus</i>	House finch		X
<i>Passer domesticus</i>	House sparrow		X
<i>Passerina cyanea</i>	Indigo bunting		X
<i>Chondestes grammacus</i>	Lark sparrow	X	
<i>Passerina amoena</i>	Lazuli bunting		X
<i>Empidonax minimus</i>	Least flycatcher		X
<i>Carduelis psaltria</i>	Lesser goldfinch		X
<i>Melospiza lincolni</i>	Lincoln's sparrow		X
<i>Sialia currucoides</i>	Mountain bluebird	X	
<i>Icterus galbula</i>	Northern oriole		X
<i>Lanius excubitor</i>	Northern shrike	X	X
<i>Agelaius phoeniceus</i>	Red-winged blackbird		X
<i>Vireo olivaceus</i>	Red-eyed vireo		X
<i>Turdus migratorius</i>	American robin		X
<i>Troglodytes aedon</i>	House wren		X
<i>Salpinctes obsoletus</i>	Rock wren		X
<i>Pheucticus ludovicianus</i>	Rose-breasted grosbeak		X
<i>Stelgidopteryx serripennis</i>	Rough-winged swallow		X
<i>Regulus calendula</i>	Ruby-crowned kinglet		X
<i>Pipilo erythrophthalmus</i>	Rufous-sided towhee		X
<i>Sayornis saya</i>	Say's phoebe	X	
<i>Aphelocoma coerulescens</i>	Scrub jay		X
<i>Melospiza melodia</i>	Song sparrow		X
<i>Catharus ustulatus</i>	Swainson's thrush		X
<i>Pooecetes gramineus</i>	Vesper sparrow	X	
<i>Tachycineta thalassina</i>	Violet-green swallow		X
<i>Tyrannus verticalis</i>	Western kingbird	X	
<i>Sturnella neglecta</i>	Western meadowlark	X	
<i>Contopus sordidulus</i>	Western wood-pewee		X
<i>Zonotrichia albicollis</i>	White-crowned sparrow		X
<i>Wilsonia pusilla</i>	Wilson's warbler		X
<i>Xanthocephalus</i>			
<i>xanthocephalus</i>	Yellow-headed blackbird		X
<i>Dendroica petechia</i>	Yellow warbler		X
<i>Dendroica coronata</i>	Yellow-rumped warbler		X
<i>Geothlypis trichas</i>	Common yellowthroat		X
<i>Icteria virens</i>	Yellow-breasted chat		X

¹ Identifications by Open Space personnel, Thompson and Strauch (1987), and Stoecker and Keammerer (present study).

Table 3. Mammal species identified in habitats on or near the project location.¹

Scientific Name	Common Name	Habitat Affinities	
		Prairie	Riparian
RABBITS AND HARES			
<i>Sylvilagus floridanus</i>	Eastern cottontail		X
<i>Sylvilagus audubonii</i>	Desert cottontail	X	
<i>Lepus townsendii</i>	White-tailed jackrabbit	X	
RODENTS			
<i>Eutamias minimus</i>	Least chipmunk		X
<i>Sciurus variagatus</i>	Rock squirrel		X
<i>Tamiasciurus hudsonicus</i>	Red squirrel		X
<i>Thomomys talpoides</i>	Northern pocket gopher	X	X
<i>Perognathus hispidus</i>	Hispid pocket mouse		X
<i>Peromyscus maniculatus</i>	Deer mouse	X	X
<i>Neotoma mexicana</i>	Mexican woodrat		X
<i>Microtus ochrogaster</i>	Prairie vole	X	X
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	X	
<i>Zapus hudsonius</i>	Meadow jumping mouse		X
CARNIVORES			
<i>Canus latrans</i>	Coyote	X	X
<i>Procyon lotor</i>	Raccoon		X
<i>Mephitis mephitis</i>	Striped skunk		X
<i>Lynx rufus</i>	Bobcat		X
HOOFED ANIMALS			
<i>Odocoileus hemionus</i>	Mule deer	X	X

¹ Identifications by Open Space personnel, Dawson (1989), and Stoecker and Keammerer (present study).

The increased amount of total disturbance that can be anticipated along highway 470 will have a greater impact on wildlife utilizing nearby riparian habitats than it would have on wildlife in open, prairie habitats. Disturbances to wildlife from highways are due to both visual as well as auditory stimuli. The large rock outcrop and the shrubby, timbered habitats near the 93-128 junction provide nesting and denning habitat for a number of species. The increased noise and vehicular movement along an enlarged highway in this area would likely result in decreased nesting by raptorial birds, particularly hawks and owls, and less denning and habitat usage by such species as coyotes, foxes, and bobcats.

SUMMARY

The Coal Creek riparian corridor and surrounding prairies constitute an important area for both plant and animal species. The complexity of environments present on the site make it one of the best habitat areas in southern Boulder County. Any type of highway development within the area would likely adversely affect the existing environment and would result in a reduction of the overall biological diversity of the site. The amount of open area surrounding the Coal Creek riparian area suggests that it would not be necessary for a highway to be located in or adjacent to the valley floor. Any potential highway alignment that remains well out in open, prairie habitat is likely to be judged preferable to an alignment that crosses or closely parallels Coal Creek.

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APPENDIX

Appendix Table 1. 1973 species index data from Clark (1977) for sampling sites within study area.

	Sampling Site Number					
	19	21	22	23	28	30
NATIVE COOL SEASON						
PERENNIAL GRAMINOIDS						
<i>Agropyron trachycaulum</i>				23.07		6.36
<i>Aristida longiseta</i>					1.1	
<i>Carex heliophila</i>					6.44	
<i>Carex sp. (undet.)</i>		2.4	3.99			
<i>Koeleria macrantha</i>			0.92		7.96	11.51
<i>Poa compressa</i>	14.77		10.06	58.25	6.14	14.12
<i>Sitanion longifolium</i>				2.02	3.4	
<i>Stipa comata</i>					4.92	
NATIVE WARM SEASON						
PERENNIAL GRAMINOIDS						
<i>Andropogon gerardi</i>					0.55	
<i>Bouteloua curtipendula</i>					5.33	
<i>Bouteloua gracilis</i>					3.31	
<i>Buchloe dactyloides</i>					43.28	
<i>Schizachyrium scoparium</i>					1.27	
NATIVE ANNUAL GRASSES						
<i>Vulpia octoflora</i>					2.76	9.55
INTRODUCED ANNUAL GRASSES						
<i>Bromus tectorum</i>	9.05	23.88	10.76	24.97	5.64	9.21
NATIVE PERENNIAL FORBS						
<i>Achillea lanulosa</i>	3.21		2.47	2.02		2.12
<i>Allium cernuum</i>			0.92			
<i>Ambrosia psilostachya</i>		1.2			4.42	
<i>Arenaria fendleri</i>					2.38	
<i>Arnica fulgens</i>						16.63
<i>Artemisia ludoviciana</i>		2.4	2.63			
<i>Aster falcatus</i>						1.06
<i>Aster sp. (undet.)</i>					0.55	
<i>Campanula rotundifolia</i>		1.35				
<i>Cerastium arvense</i>		1.2	2.84			
<i>Dalea purpurea</i>					0.55	
<i>Drymocallis fissa</i>			1.08			
<i>Eriogonum umbellatum</i>					0.55	
<i>Euphorbia robusta</i>					2.76	
<i>Geranium caespitosum</i>			3.23			
<i>Heterotheca villosa</i>				2.02	4.53	1.06
<i>Hydrophyllum fendleri</i>	5.52					
<i>Lesquerella montana</i>					1.1	
<i>Liatris punctata</i>				2.02	5.47	
<i>Lomatium orientale</i>					4.03	2.12
<i>Oxybaphus linearis</i>					0.55	
<i>Oxytropis lambertii</i>					2.21	
<i>Paronychia jamesii</i>					0.55	

Appendix Table 1. 1973 species index data from Clark (1977) for sampling sites within study area.

	Sampling Site Number					
	19	21	22	23	28	30
<i>Penstemon virens</i>			5.3			
<i>Pulsatilla patens</i>			1			
<i>Rasibida columnifera</i>					1.1	2.12
<i>Vicia americana</i>					0.55	
<i>Viola canadensis</i>	10.07					
INTRODUCED PERENNIAL FORBS						
<i>Cirsium arvense</i>	1.54					
<i>Hypericum perforatum</i>	3.86			4.04	1.44	1.06
<i>Medicago sativa</i>					8.43	
<i>Nepeta cataria</i>	0.77					
<i>Taraxacum officinale</i>	7.25	1.2	0.92			2.12
NATIVE BIENNIAL FORBS						
<i>Erigeron divergens</i>					5.55	
<i>Eriogonum alatum</i>					6.05	
<i>Grindelia squarrosa</i>		4.79			0.55	5.48
INTRODUCED BIENNIAL FORBS						
<i>Carduus nutans</i>	6.48					
<i>Tragopogon dubius</i>						3.18
<i>Verbascum thapsus</i>	0.96					
NATIVE ANNUAL FORBS						
<i>Androsace occidentalis</i>						4.24
<i>Chenopodium leptophyllum</i>					0.55	
<i>Chenopodium sp. (undet.)</i>			0.92			
<i>Draba reptans</i>					1.66	1.06
<i>Galium aparine</i>	5.18			2.02		
<i>Plantago patagonica</i>					2.76	6.36
<i>Silene antirrhina</i>						2.12
INTRODUCED ANNUAL FORBS						
<i>Alyssum alyssoides</i>				2.02	2.76	1.06
<i>Centaurea diffusa</i>					0.55	
<i>Descurainia sophia</i>			0.92			
<i>Helianthus annuus</i>				4.04		
<i>Kochia iranica</i>	0.77					
<i>Lactuca serriola</i>	0.77		1.84	4.04		
<i>Salsola collina</i>		1.2				
<i>Veronica biloba</i>			0.92			
NATIVE SEMI-SHRUBS						
<i>Artemisia frigida</i>			0.92		9.76	3.18
<i>Gutierrezia sarothrae</i>					28.76	1.06
NATIVE SHRUBS						
<i>Crataegus erythropoda</i>	64.09					
<i>Prunus virginiana</i>	3.7					

Appendix Table 1. 1973 species index data from Clark (1977) for sampling sites within study area.

	Sampling Site Number					
	19	21	22	23	28	30
<i>Rhus trilobata</i>		4.94	1.47			
<i>Ribes aureum</i>	4.97					
<i>Ribes cereum</i>		2.4	1.92			
<i>Rosa arkansana</i>	3.74					
<i>Symphoricarpos occidentalis</i>	17.01				69.49	
NATIVE WOODY VINES						
<i>Clematis ligusticifolia</i>	11.04					
<i>Vitis riparia</i>	1.64					
NATIVE TREES						
<i>Pinus ponderosa</i>		76.36	82.81			