The amphibians in the permit area occupy similar habitats thoughout the region and are unlikely to be effected in any major way by the mining activities.

The only sepcies of high state interest that is likely to occur in the Tract 2 area is the Tiger Salamander. A discussion of the Tiger Salamander is contained in Appendix 3 (Wildlife Study of Trail Mountain Coal Company, page 9).

Reptiles found in the permit area are located in many other similar habitats and their populations will not be adversly impacted by planned activities. UDWR personnel will be notified if any denning sights are discovered during the mine activities in the Tract 2 mine plan area.

Aquatic wildlife - Since there are no perennial streams in the lease area, no impact to aquatic wildlife is expected.

For additional information on the projected impacts of mining on fish and wildlife, see Appendix 1. See also Chapter 10, Tract 2 Permit Application. See Appendix 4 for field studies conducted by the Division of Wildlife Resources (Publication No. 78-16) in the Trail Mountain Area.

10.4 Mitigating Measures to be Employed to Protect Fish and Wildlife

The mine activities associated with the Tract 2 mine plan area should facilitate no adverse impacts to fish and wildlife. Trail Mountain will make significant efforts to educate all employees to the intricate values of the wildlife resources within the Tract 2 mine plan area and adjacent areas. High interest species, critical habitats, and critical life history periods will be emphasized. This will be done by annually incorporating a slide presentation from the UDWR and Mr. Larry Dalton in Trail Mountain Coal's annual retraining. Each employee will be advised not to unnecessarily or without proper permits or licenses harrass or take any wildlife, including young thought to be abandoned. They will be advised not to unnecessarily stop vehicles to view wildlife and

not to leave the road by vehicle within the mine plan area. They will be encouraged to establish a game alert program. They will be advised that they as hunting and recreation users stand to gain the most by preserving and conserving what they have in proximity to their place of work and abode.

The company will maintain the relative inaccessibility of the Tract 2 mine plan area. No additional access roads will be built.

Discharge of fire arms by employees will be prohibited on company-controlled property during working hours.

Should the affects of subsidence damage or destroy ponds in the Tract 2 area the applicant commits to repair, replace or relocate ponds in order to preserve habitat and a water source for wildlife and livestock.

Trail Mountain Coal Company conducts annual subsidence aerial flights to monitor the occurance of subsidence. These flights also provide color and color infrared photos of the area. Trail Mountain Coal Company also conducts ongoing hydrological monitoring of the mine plan area which includes the monitoring of seeps, springs and ponds (man made and natural).

Should the affects of subsidence create surface disturbance, Trail Mountain Coal Company commits to spot revegetation of the distrubed area using approved revegetaiton methods. It should be noted that the Trail Mountain area contains many areas of natural surface sloughing not associated with mining activities.

APPENDIX 1

AQUATIC WILDLIFE

TERRESTRIAL WILDLIFE

MAMMALS

BIRDS

REPTILES AND AMPHIBIANS

SPECIES OF SPECIAL SIGNIFICANCE

THREATENED AND ENDANGERED SPECIES

RAPTORS

10.3.2.1 Aquatic Wildlife and Habitat and Value Determination. The aquatic macroinvertebrate wildlife found on site in Cottonwood Creek listed in Tables 10-1 were taken above the portal and loadout facilities and indicate a healthy stream. The date in Table 10-2 were taken below the portal and loadout facilities and are indicative of an unhealthy habitat (see Figure 10-1).

The stream habitat is considered of critical value to the areas wildlife even though fish do not actually occupy the area of concern. It is a feeder stream to a class 3 fishery in Lower Cottonwood Creek.

10.3.2.2 Terrestrail Wildlife and Habitat and Value Determination. The classes of terrestrail vertebrate wildlife are listed separately by relative abundance status according to season of occupancy by habitat type in Table 10-3 through 10-5. These tables are constructed to accommodate sections 10.3.2.3 Mammals, 10.3.2.4 Birds, and 10.3.2.5 Reptiles and Amphibians. Of the wildlife-habitats present on the mine plan area, riparian habitats, canyon bottomlands, and the high ridges where elk winter are considered by UDWR to be critical value habitats to wildlife and must be protected. The cliffs, talus slopes, mountain brush, and the aspen and conifer forests are considered high priority habitats. Critical habitats are those considered necessary to sustain the existence and perpetuation of one or more species of wildlife during crucial periods in their life cycle. High priority areas are intensive use areas but not restricted in area for the wildlife species of concern.

Table 10-1. List of Macroinvertebrates Found in Cottonwood Creek above Trail Mountain Mine Portal.

A = Abundant - greater than $100/m^2$
C = Common - between 99 and $10/m^2$
U = Uncommon - less than $10/m^2$

	Relative Abundance	Indicator of good stream conditions
Class Turbellaria		
Order Tricladida	A	
Class Crustacea		
Order Ostracoda	U	
Class Insecta		
Order Ephemeroptera		
Familiy Baetidae		
Baetis	A	
Family Heptageniidae		
Cinygmula	C	X
Family Ephemerellidae		
Cphemerella grandis	C	X
Order Plecoptera		
Family Nemouridae		
Amphinemura	C	X
Family Perlodidae		
Isoperla	C	X
Order Trichoptera		
Family Hydropsychidae		
Hydropsyche	A	
Family Limnephilidae		
Hesperophylax	C	
Family Brachycentridae		
Brachycentrus	A	X
Order Coleoptera		
Family Elmidae	U	
Order Diptera		
Family Tipulidae		
Antocha monticola	C	
Dicranota	U	
Holorusia grandis	C	
Eriocera	U	
Family Psychodidae		
Pericoma	U	
Family Chironomidae	U	
Family Empididae		
Hemerodromia	U	

Table 10-2. List of Macroinvertebrates Found in Cottonwood Creek below Trail Mountain Mine Portal.

A = Abundant - greater than $100/m^2$
C = Common - between 99 and $10/m^2$
U = Uncommon - less than $10/m^2$

	Relative Abundance	Indicator of good stream conditions
Class Oligochaeta	U	
Class Arachnida		
Order Hydracarina	C	
Class Insecta		
Order Ephemeroptera		
Family Baetidae		
Baetis	A	
Family Heptageniidae		
Cinygmula	U	X
Order Plecoptera		
Family Perlodidae		
Isogenoides zionensis	U	
Isoperla	U	X
Order Trichoptera		
Family Hydropsychidae		
Hydropsyche	U	
Order Coleoptera		
Family Dytiscidae	U	
Family Elmidae	U	
Order Diptera		
Family Simuliidae	U	
Family Chironomidae	U	

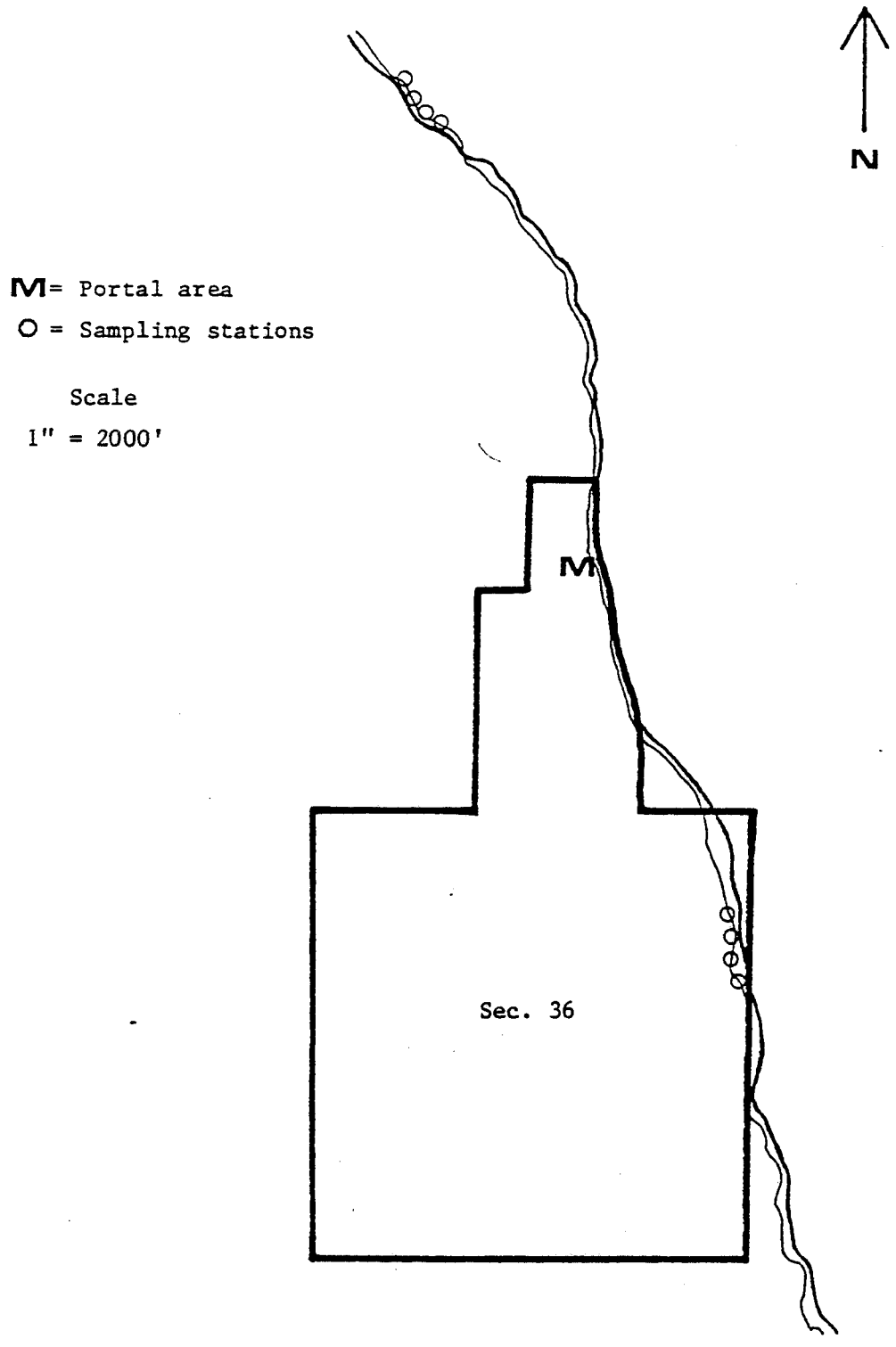


Figure 10-1. Macroinvertebrate Sampling Stations in Relation to Trail Mountain Mine Portal and Loading Facilities (T17S, R6E).

10.3.2.3 Mammals

Table 10-3. Species List and Classification of Mammals whose Published Ranges Overlap the Area Studied for Natomas Trail Mountain Coal Company.

A = Abundant
C = Common
U = Uncommon
Ca = Casual or Rare
R = Permanent Resident
S = Summer Only
W = Winter Only

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Masked Shrew *Sorex cinereus*					UR		
Mirriam Shrew *Sorex mirriami*	UR	UR	UR		UR		
Dusky Shrew *Sorex obscurus*					UR		
Little Brown Myotis *Myotis lucifugus*	CS	US	CS		CS		
Fringed Myotis *Myotis thysanodes*	US	US					
California Myotis *Myotis californicus*	US	US	US				
Small-footed Myotis *Myotis leibii*		US	US		US		
Silver-haired Bat *Lasionycteris noctivagans*					US		
Big Brown Bat *Eptesicus fuscus*					US		
Hoary Bat *Lasiurus cinereus*					US		
Townsend's Big-eared Bat *Plecotus townsendii*	US	US			US		
Brasilian Free-tailed Bat *Tadarida brasiliensis*	US	US	US		US		

Table 10-3.
Page 2

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Nuttall's Cottontail *Sylvilagus nuttallii*	UR		UR		UR		X
Desert Cottontail *Sylvilagus audubonii*	UR						X
Snowshoe Hare *Lepus americanus*		CR		CR			X
White-tailed Jackrabbit *Lepus townsendii*		UR	UR		UR		X
Black-tailed Jackrabbit *Lepus californicus*	CR						X
Least Chipmunk *Eutamias minimus*	AR	UR		CR	CR	X	
Cliff Chipmunk *Eutamias dorsalis*			CR			X	
Uinta Chipmunk *Eutamias umbrinus*	CR	CR			CR	X	
Yellow-bellied Marmot *Marmota flaviventris*		CR	CR		CR	X	
White-tailed Antelope Squirrel *Ammospermophilus leucurus*		CR				X	
Uinta Ground Squirrel *Spermophilus armatus*		AR			AR	X	
Golden-manteled Ground Squirrel *Spermophidus lateralis*		UR			UR	X	
Rock Squirrel *Spermophilus variegatus*					CR	X	
Red Squirrel *Tamiasciurus hudsonicus*				CR		X	
Northern Flying Squirrel *Glaucomys sabrinus*		UR			CR		
Northern Pocket Gopher *Thomomys talpodes*		CR				X	

Table 10-3.
Page 3

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed on Site	High-Interest Species
Great Basin Pocket Mouse *Perognathus parvus*	UR				UR	X	
Western Harvest Mouse *Reithrodontomys megalotis*	UR	UR			UR	X	
Deer Mouse *Peromyscus maniculatus*	AR	AR	AR	AR	AR	X	
Pinyon Mouse *Peromyscus truei*	CR					X	
Desert Woodrat *Neotoma lepida*	CR						
Bushy-tailed Woodrat *Neotoma cinerea*			CR		CR		
Montane Vole *Microtus montanus*				CR	CR		
Porcupine *Erethizon dorsatum*	CR			CR	CR	X	
Coyote *Canis latrans*	CR	CR	CR	CR	CR		X
Red Fox *Vulpes fulva*	CaR				CaR		X
Gray Fox *Urocyon cinereoargenteus*			UR		UR		X
Black Bear *Ursus americanus*				CaR	CR		X
Ringtail *Bassariscus astutus*	UR		UR		UR		
Raccoon *Procyon lotor*	Ca				Ca		
Marten *Martes americana*				CaR			X

Table 10-3.
Page 4

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Ermine *Mustela erminea*		UR		UR			
Long-tailed Weasel *Mustela frenata*	CR	CR	CR	CR	CR		X
Badger *Taxidea taxus*	CR	CR		CR	CR	X	X
Striped Skunk *Mephitis mephitis*	CR	CR	CR	CR	CR	X	X
Mountain Lion *Felis concolor*	UR	UR	UR	UR	UR		X
Bobcat *Lynx rufus*	CR	CR	CR	CR	CR		X
Wapiti or Elk *Cervus elaphus*					CW	X	X
Mule Deer *Odocoileus hemionus*	CR	CR	CR	CR	CR	X	X
Moose *Alces alces*		CaR		CaR			X

10.3.2.4 Birds

Table 10-4. Species List and Classification of Birds whose Published Ranges Overlap the Area Studied for Natomas Trail Mountain Coal Company.

A = Abundant
C = Common
U = Uncommon
Ca = Casual or Rare
R = Permanent Resident
S = Summer Only
W = Winter Only

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Turkey Vulture *Cathartes aura*		US	US				X
Goshawk *Accipiter gentilis*		CR		CR		X	X
Sharp-shinned Hawk *Accipiter striatus*		US		US			X
Cooper's Hawk *Accipiter cooperii*		US		US			X
Red-tailed Hawk *Buteo jamaicens*		CR					X
Swainson's Hawk *Buteo swainsoni*		US					X
Rough-legged Hawk *Buteo lagopus*		UW					X
Golden Eagle *Aquila chrysaetos*		CR	CR	CR	CR	X	X
Bald Eagle *Haliaeetas leucocephalus*	UW						
Prairie Falcon *Falco mexicanus*	UR	UR					X
Peregrine Falcon *Falco peregrinus*		CaR					
Merlin *Falco columbarius*	CaW						X
American Kestrel *Falco sparverius*	CS	CS	CS		CS	X	X
Ferruginous Hawk *Butes regalis*		US		US			X

Table 10-4.
Page 2

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Blue Grouse *Dendragapus obscurus*		UR		CR	UR		X
Ruffed Grouse *Bonasa umbellus*		CR		CR	CR		X
Chukar *Alectoris chuckar*	UR						X
Band-tailed pegeon *Columba fasciata*		CaS			CaS		
Mourning Dove *Zenaidura macroura*	CS	CS			CS	X	X
Yellow-billed Cuckoo *Coccyzus americanus*					CaS		
Screech Owl *Otus asio*					UR		X
Flammulated Owl *Otus flammeolus*		UR		UR			X
Great Horned Owl *Bubo virginianus*	CR	CR	CR	UR	CR		X
Pygmy Owl *Glaucidium gnoma*		UR	UR		UR		X
Spotted Owl *Strix occidentalis*					UR		X
Long-eared Owl *Asio otus*					CR		X
Short-eared Owl *Asio flammeus*		CR					X
Saw-whet Owl *Aegolius acadicus*		UR		UR	UR		X
Poor-will *Phalaenoptilus nuttallii*					CS		

Table 10-4.
Page 3

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Common Nighthawk *Chordeiles minor*	CS	CR			CS		
Black Swift *Cypseloides niger*			CaS				
White-throated Swift *Aeronautes saxatalis*			US				
Black-chinned Hummingbird *Archilochus alexandri*		US			US		
Broadtailed Hummingbird *Selasphorus platycercus*	CS	CS		CS	CS	X	
Rufous Hummingbird *Selasphorus rufus*		CS		CS	CS		
Calliope Hummingbird *Stellula callipe*		CaS		CaS	CaS		
Belted Kingfisher *Megaceryle alcyon*	CaS						
Common Flicker *Colaptes cafer*		CR		CR	CR	X	
Lewis' Woodpecker *Asyndesmus lewis*					CaS		
Yellow-bellied Sapsucker *Sphyrapicus varius*		CR		CR	UR		
Williamson's Sapsucker *Sphyrapicus thyroideus*				CaS			
Hairy Woodpecker *Dendrocopos villosus*		CR		CR	CR	X	
Downy Woodpecker *Denrocopos pubescens*					CR	X	
Northern Three-toed Woodpecker *Picoides tridactylus*				CaR			

Table 10-4.
Page 4

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Eastern Kingbird *Tyrannus tyrannus*					CS		
Western Kingbird *Tyrannus verticalis*		US			CS		
Willow (Traill's) Flycatcher *Empidonax traillii*					CS		
Hammonds Flycatcher *Empidonax hammondii*				US			
Dusky Flycatcher *Empidonax oberholseri*					CS		
Gray Flycatcher *Empidonax wrightii*	CaS						
Western Flycathcer *Empidonax difficilis*		CS		CS	CS		
Western Wood Pewee *Contopus sordidulus*		CS		CS	CS		
Olive-sided Flycatcher *Nuttallornis borealis*		US		US	US		
Violet-green Swallow *Tachycineta thalassina*	US					X	
Tree Swallow *Iridoprocne bicolor*	US					X	
Barn Swallow *Hirundo rustica*			CS				
Cliff Swallow *Petrochelidon pyrrhonota*			CS				
Purple Martin *Progne subis*		US		US			
Gray Jay *Perisoreus canadenis*				CS		X	

Table 10-4.
Page 5

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Steller's Jay *Cyanocitta stelleri*	CR	CR		CR		X	
Scrub Jay *Aphelocoma coerulescens*					CR	X	
Black-billed Magpie *Pica pica*	CR	CR		CR	CR	X	
Common Raven *Corvus corax*	CR					X	
Pinon Jay *Gymnorhinus cyanocephala*	CR				CR	X	
Clark's Nutcracker *Nucifraga columbiana*				CR		X	
Black-capped Chickadee *Parus atricapillus*	CR	CR		CR	CR	X	
Mountain Chickadee *Parus gambelii*				CS	CW	X	
Plain Titmouse *Parus inormatus*	UR				UR		
Common Bushtit *Psaltriparus minimus*	UR	UR			UR		
White-breasted Nuthatch *Sitta carolinensis*	UR	CR	UR	CR			
Red-breasted Nuthatch *Sitta canadensis*			CR				
Brown Creeper *Certhia familiaris*	CW	CS		CS	CS		
House Wren *Troglodytes aedon*		CS			CS		
Rock Wren *Salpinctes obsoletus*			CR				

Table 10-4.
Page 6

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Catbird *Dumetella carolinensis*					CS	X	
Sage Thrasher *Oreoscoptes monanus*					CS		
Robin *Turdus migratorius*	CR	CS		CR	CS	X	
Hermit Thrush *Hylocichla guttata*		CS			CS		
Swainson's Thrush *Hylochichla ustulata*		CS		US	CS		
Veery *Hylocichla fuscescens*					US	X	
Mountain Bluebird *Sialia currucoides*	CS				CS	X	
Townsend's Solitaire *Myadestes townsendi*					CS		
Blue-gray Gnatcatcher *Polioptila caerulea*	CS	CS		US	CS		
Golden-crowned Kinglet *Regulus satrapa*	UW			US	UW		
Ruby-crowned Kinglet *Regulus calendula*				US	UW		
Northern Shrike *Lanius excubitor*	UW				UW		
Loggerhead Shrike *Lanius ludovicianus*	CS					X	
Starling *Sturnus vulgaris*	CR				CR	X	
Solitary Vireo *Vireo solitarius*	US	US			US		

Table 10-4.
Page 7

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Warbling Vireo *Vireo gilvus*		CS			CS	X	
Orange-crowned Warbler *Vermivora celata*		CS			CS		
Virginia's Warbler *Vermivora virginiae*	US				CS		
Yellow Warbler *Dendroica petechia*		CS			CS	X	
Audubon's Warbler *Dendroica auduboni*					CS	X	
Black-throated Gray Warbler *Dendroica nigrescens*	CS	CS			CS		
Mac Gillivray's Warbler *Oporornis tolmiei*					CR		
Yellowthroat Warbler *Geothlypis trichas*					US		
Yellow-breasted Chat *Icteria Virens*					CS	X	
Wilson's Warbler *Wilsonia pusilla*				CS	CS		
American Redstart *Setophaga ruticilla*		CaS			CaS		
Western Meadowlark *Sturnella neglecta*	CR					X	
Bullock's Oriole *Icterus bullockii*					US		
Western Tanager *Piranga ludoviciana*		CS		CS			
Black-headed Grosbeak *Pheucticus melanocephalus*	CS	CS		CS	CS		

Table 10-4.
Page 8

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
Lazuli Bunting *Passerina amoena*					CS		
Evening Grosbeak *Hesperiphona vespertina*					US		
Cassin's Finch *Carpodacus cassinii*	US	US		US			
House Finch *Carpodacus mexicanus*					US		
Pine Grosbeak *Pinicola enucleator*		US		US			
Black Rosey Finch *Leucosticte atrata*	UW						
Pine Siskin *Spinus pinus*		CS		CS			
American Goldfinch *Spinus tristis*					CS		
Lesser Goldfinch *Spinus psaltria*					US		
Red Crossbill *Loxia curvirostra*				US			
Green-tailed Towhee *Chlorura chlorura*	US				CS	X	
Rufous-sided Towhee *Pipilo erythrophthalmus*					US		
Junco *Junco hyemalis*	UW	CS		CS		X	
Tree Sparrow *Spizella arborea*					UW		
Chipping Sparrow *Spizella passerina*		CS		CS	CS	X	

Table 10-4.
Page 9

	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed On Site	High-Interest Species
White-crowned Sparrow *Zonotrichia leucophrys*		CS		CS			
Fox Sparrow *Passerella iliaca*					US		
Song Sparrow *Melospiza melodia*					US		

10.3.2.5 Reptiles and Amphibians

Table 10-5. Species List and Classification of Reptiles and Amphibians whose Published Ranges Overlap the Area Studied for Natomas Trail Mountain Coal Company.

A = Abundant C = Common U = Uncommon Ca = Casual or Rare R = Permanent Resident S = Summer Only W = Winter Only	Pinyon-Juniper	Grass-Aspen	Cliff	Mixed Conifer	Mixed Mt. Shrub	Observed on Site	High-Interest Species
Fence Lizard *Sceloporus undulatus*	US				US	X	
Sagebrush Lizard *Sceloporus graciosus*	CS		CS		CS	X	
Mountain Short-haired Lizard *Phrynosoma douglassi*	CS	CS	CS		CS		
Rocky Mountain Rubber Boa *Charina bottae*					US		
Wandering Garter Snake *Thamnophis elegans*	CS	US			CS	X	
Western or Yellow-bellied Racer *Coluber constrictor*	US				US		
Striped Whipsnake *Masticophis taeniatus*	US				US		
Gopher Snake *Pituophis melanoleucus*	CS				CS		
Milk Snake *Lampropeltis triangulum*	US				US		
Utah Mountain Kingsnake *Lampropeltis pyromelana*	US				US		
Night Snake *Hypsiglena torquata*					US		
Midget Faded Rattlesnake *Crotalus viridus*	CS	US			US		
Western Spadefoot Toad *Scaphiopus hammondi*		US			US		
Woodhouse's Toad *Bufo woodhousei*		US			US		

10.3.3 Species of Special Significance

Table 10-6. Game Animals in the Environs of Trail Mountain Mine. Emery County, Utah.

Nuttall's Cottontail *Sylvilagus nuttallii*
Desert Cottontail *Sylvilagus audubonii*
Snowshow Hare *Lepus americanus*
Black Bear *Ursus americanus*
Mountain Lion *Felis concolor*
Bobcat *Lynx rufus*
Mule Deer *Odocoileus hemionus*
Moose *Alces alces*
Wapiti or Rocky Mountain Elk *Cervus elaphus*
Bandtail Pigeon *Columba fasciata*
Mourning Dove *Zenaidura macroura*
Blue Grouse *Dendragapus obscurus*
Ruffed Grouse *Bonasa umbellus*
Chukar *Alectoris chukar*

10.3.3.1 Threatened and Endangered Species

Table 10-7. Endangered Species of the Environs of Trail Mountain Mine, Emery County, Utah.

Bald Eagle *Haliaeetus leucocephalus*
Peregrine Falcon *Falco peregrinus*

10.3.3.2 Raptors

Table 10-8. Raptors of the Environs of Trail Mountain Mine, Emery County, Utah.

Turkey Vulture *Cathartes aura*
Goshawk *Accipiter gentilis*
Sharp-shinned Hawk *Accipiter striatus*
Cooper's Hawk *Accipiter cooperii*
Red-tailed Hawk *Buteo jamaicensis*
Swainson's Hawk *Buteo swainsoni*
Rough-legged Hawk *Buteo lagopus*
Golden Eagle *Aquila chrysaetis*
Bald Eagle *Haliaeetus leucocephalus*
Prairie Falcon *Falco mexicanus*
Peregrine Falcon *Falco peregrinus*
Merlin *Falco columbarius*
American Kestrel *Falco sparverius*
Screech Owl *Otus asio*
Flammulated Owl *Otus flammeolus*
Great Horned Owl *Bubo virginianus*
Ferruginous Hawk *Butes regalis*

Table 10-8
Page 2

Pygmy Owl
Glaucidium gnoma

Spotted Owl
Strix occidentalis

Long-eared Owl
Asio otus

Short-eared Owl
Asio flammeus

Saw-whet Owl
Aegolius acadicus

Pursuant to UMC 817.97 (c), Trail Mountain Coal Company provides the following documentation confirming that the power transmission line that services the Trail Mountain mineste is designed in accordance with guidelines for raptor protection is set forth in manuals approved by the UDOGM and USFWF. (see Appendix 10-7)

APPENDIX 2

WILDLIFE HABITAT RANKING

Table 2. Ranking of wildlife value per legal section of land on coal producing lands in Utah. Crucial-critical (1), sections are the highest valued followed in respective order by high-priority (2), substantial value (3) and limited valued (4) sections.

BOOK CLIFFS

T.	R.	Section	Rank
12	8	1-36	1
12	9	2,4-12,14,16-18,31-35	1
		1,3,13,15,19-30,36	2
12	10	2-11,13-17,19-27	1
		1,12,18,28-36	2
12	11	16-28,33-35	1
		1-15,29-32,36	2
12	12	19,27-30,32-34	1
		1-18,20-26,31,35,36	2
13	8	1-3,5-16,19,20,22-24,28-31	1
		4,17,18,21,25-27,32-36	2
13	9	1-11,14,15,17,18,28,29,31-35	1
		12,13,16,19-27,30,36	2
13	10	1,2,6	1
		3-5,7-36	2
13	11	14-16,21-28,34-36	1
		1-13,17-20,29-33	2
13	12	4,19,30,31,[illegible]	1
		1-3,5-18,20-29,32-35	2
13	13	1-36	2
14	13	1-36	2
14	14	33	1
		1-32,34-36	2
15	14	1-21,23-26,28-36	2
		22,27	3
16	14	24-26,35,36	1
		1-23,27-34	2
16	15	3,10,11,14,23-25,29-33	1
		1,2,4-9,12,13,15-22,26-28,34-36	2
17	14	1,12,13,24,25,36	1
		2,3,10,11,14,15,22,23,26,27,34, 35	2
17	15	4-9,16-22,27-34	1
		1-3,10-15,23-26,35,36	2
18	14	1,27	1
		2,3,10-15,22-26,34-36	2
18	15	4-10,15-18	1
		1-2,11-14,19,21-25,30-32	2
		3,20,26-29,33-36	3

HENRY MOUNTAINS

T.	R.	Section	Rank
27	9	1-36	1
30	9	25,32-36	3
		19-24,26-31	4
30	10	20-29,32-36,	1
		19,30,31	3
31	8	1,7,12,13,18,19,24,25,30,31,36	3
		2-6,8-11,14-17,20-23,26-29,32-35	4
31	9	4-9,16-21,28-33	3
32	8	30,31	2
		1,6,7,10-15,18,20-29,33-36	3
		2-5,8,9,16,17,19,32	4
32	9	1,12,13,24,25,35,36	1
		2-11,14-23,26-34	3
33	8	6-8,12-14,17-20,22-36	2
		1-4,9-11,15,16	3
		5,21	4
33	9	1-3,9-17,20-28,34-36	1
		7,18,19,29-32	2
		4-6,8,33	3
34	8	1-3,10-13,15	2
		14	3
34	9	3	1
		2,5-11,13,14,16-19	2
		1,4,12,15,20-24,26-28	3
		25,29-36	4
34	10	1-23,26-30,32-34,36	2
		24,25,35	3
		31	4

KAIPAROWITS PLATEAU

T.	R.	Section	Rank
33	1	26,27,34-36	1
		25,33	2
		19-25,29-32	3
33	2	29,31-33	1
		19-21,29-30	3
34	1	1-3,10-14,24	1
		4-9,15-23,25-36	2
34	2	4-7,17,18,20,21,28,29	1
		8,9,16,19,30-33	2
35	2W	3-10,16-19	1
		2,11,14,15,20-23,27-32	2
		1,12,13,24-26,33-36	3

KAIPAROWITS PLATEAU (CONTINUED)

T.	R.	Section	Rank
35	1	1-34	2
		35-36	3
35	2	4-9,16-20,25	2
		21-24,26-36	3
35	3	30-32	2
		19-29,33-36	3
36	3W	1-3,10-12,14,15	2
		13	4
36	2W	1-6,8-12	3
		7,13-18,22-27,34-36	4
36	1W	36	1
		1,24-26,35	2
		2-23,27-34	3
36	1	4-9,19-36	2
		1-3,10-18	3
36	2	30,31	2
		1-29,32-36	3
36	3	5,8,17,20,21,27,28,33-35	2
		1-4,6,7,9-16,18,19,22-26,29-32, 36	3
37	1W	1,2,11-14,23-26,35,36	2
		3-10,15-22,27-34	3
37	1	1-36	2
37	2	6,7,12,13,17-20,24,25,29-32,36	2
		1-5,8-11,14-16,21-23,26-28, 33-35	3
37	3	1,2,6-9,12,15-23,25-36	2
		3-5,10,11,13,14,24	3
37	4	20,21,28-33	2
		19	3
38	1W	1-3,11-14	2
		4-10,15-18	3
38	1	1-18,22-27,34-36	2
38	2	17	1
		1,4-9,12,13,16,18-21,24,25,28-33, 36	2
		2,3,10,11,14,15,22,23,26,27,34, 35	3
38	3	1-36	2
38	4	2-36	2
		1	4
38	5	19-22,26-36	2
		23-25	4
39	1	1-18,22-27,34-36	2
39	2	1,2,4-9,11-20,22-36	2
		3,10,21	3
39	3	1-36	2
39	4	1-36	2
39	5	1-36	2
40	2	1-36	2
40	3	1-36	2
40	4	1-36	2
40	5	1-36	2
40	6	4-9,16-21,28-33	2
41	2	1-30	2
		31-36	3
41	3	31-36	1
		1-21,29,30	2
		22-28	3
41	4	31-36	1
		1-17,20-28	2
		18,19,29,30	3
41	5	31-33	1
		1-9,11-14,18,23-26,35,36	2
		10,15-17,19-22,27-30,34	4
42	1W	13-36	1
		4,9	2
		1-3,5-8,10-12	4
42	3	1-36	1
42	4	1-36	1
42	5	2-36	1
		1	2
43	3	1-11,14-18	1
		12,13	4

WASATCH PLATEAU NORTH

T.	R.	Section	Rank
12	6	1-26,29,31,34-36	1
		27,28,30,32,33	2
12	7	1-15,17-36	1
		16	3
12	8	1-36	1
13	6	1,2,5-8,10,13,17-20	1
		3,4,9,11,12,14-16,21-36	2
13	7	1-4,9-17,19,22-26,31,32,35,36	1
		5-8,18,20,21,27-30,33,34	2
13	8	1-3,5-16,19,20,22-24,28-31	1
		4,17,18,21,25-27,32-36	2

WASATCH PLATEAU NORTH (CONTINUED)

T.	R.	Section	Rank
14	6	28-33	1
		1-27,34-36	2
14	7	1,4-6,9,12,13,16	1
		2,3,7,8,10,11,14,15,17-36	2
15	6	4-6,10-15,22-24	1
		1-3,7-9,16-21,25-36	2
15	7	32-36	1
		1-31	2
15	8	9,15,20-22,27-29,32,33	1
		1-8,10-14,16-19,23-26,30,31,34-36	2
16	6	11,13,14,16,20-26,28,29,31-33,35, 36	1
		1-10,12,15,17-19,27,30,34	2
16	7	1-5,9-16,21-28,34-36	1
		6-8,17-20,29-33	2
16	8	4,7,9,17-21,28-31	1
		1-3,5,6,8,10-16,22-27,32-36	2
17	6	4-9,11-14,16-22,24-35	1
		1-3,10,15,23,36	2
17	7	1,2,7,12,18,19,25,30	1
		3-6,8-11,13-17,20-24,26-29,31-36	2
17	8	5,6,16,19	1
		4,7-9,17,18,20,21,28-33	2
18	6	1-3,10,11,13-15,22-27,34-36	1
		12	2
18	7	4,5,7-11,13-17,19-27,29-32,34-36	1
		1-3,6,12,18,28,33	2
19	6	1-3,10-15,22-27,34-36	1
19	7	1-3,5,23,27-34	1
		4,24-26,35,36	2

WASATCH PLATEAU SOUTH

T.	R.	Section	Rank
20	5	20-29,31-36	1
		19,30	2
20	6	19-36	1
21	4	1-3,10-15,19-36	1
		4-9,16-18	2
21	5	1-36	1
21	6	4-9,16-21,28-33	1
22	3	1-3,10-15,22-27,34-36	1
22	4	1-4,9-16,21-28,33-36	1
		5-8,17-20,29-32	2
22	5	1-20,22-24,29-30	1
		21,25-28,31-36	2
23	3	1,12,13	1
		2,3,10,11,14,15,22-27	2
		34-36	3
23	4	2-4,6-11,14-18,20-29,31-36	1
		1,5,12,13,19,30	2
24	4	2,4-9,16-18	1
		1,3,10-15	2

This Table represents a summation of work published in 1977 as a "Ranking of Wildlife Values on Federal Coal Lands". Robert W. Scott performed the work as a Division of Wildlife Resources employee under contract (No. 14-16-006-3125) for the U.S. Fish and Wildlife Service. Scott's procedure ranked habitat use areas as critical, high-priority, substantial and limited value for select ~~individual~~ species of high interest. Afterwhich the individual values were evaluated per legal section of land and a cummulative value was determined.

the state of Utah. Crucial-critical (C) habitats are the highest valued followed in respective order by high-priority (H), substantial value (S) and limited valued (L) habitats.

Ecological Association	Wildlife Habitats											
	Riparian and Wetland	Desert Scrub	Pasture and Fields	Urban or Parks	Cliffs and Tallus	Sagebrush	P-J Forest	Shrubland	Aspen Forest	Ponderosa Forest	Parkland	Spruce-fir Forest
					LOWER SONORAN LIFE ZONE							
Warm Desert	This ecological association does not exist in the Southeastern Region											
					UPPER SONORAN LIFE ZONE							
Cold Desert	C(H^1,S^2)	S	S	S	H							
					TRANSITION LIFE ZONE							
Submontane	C(H^1,S^2)		S	S	H	S	S	S				
					CANADIAN LIFE ZONE							
Montane	C(H^1L^2)		S	L	S				S	S	S	S
					HUDSONIAN LIFE ZONE							
Montane	H(S^1,L^2)				S							S
					ALPINE LIFE ZONE							
Montane	This ecological association does not exist in the Southeastern Region											

This Table represents a summation of effort where by numerical values were assigned as a ranking per high interest specie to each wildlife habitat. The numerical values were as follows: critical, 1; high-priority, 2; substantial, 3; and limited, 4. Once the individual values were assigned they were then summed and a mean calculated, for each wildlife habitat. A mean value lying between 1.0 and 1.8 was ranked as critical; a value between 1.9 and 2.3 was ranked as high-priority; a value between 2.4 and 3.4 was ranked as substantial; and a value between 3.5 and 4.0 was ranked as limited.

1. Habitat ranking value for species associated with the riparian-wetland type that represents just the wet meadow situation.
2. Habitat ranking value for species associated with the riparian-wetland type that represents just the dirt bank situation.

Figure 1. Key for mapable, high-value habitat use areas for wildlife.

Wildlife Use Areas	Use Area Ranking		
	Substantial-Value	High-Priority[2]	Crucial-Critical[2]
		Aquatic Use Areas	
Stream Sections and Lakes[1]	[s-cw-2-4-yl]	[h-cw-2-3-yl]	[c-cw-2-1-yl]
		Terrestrial Use Areas	
Wetlands, Riparian Zones, Seeps and Springs			
Bison	Herd Distribution s-b-yl		Winter Range c-b-wt 12-1 to 4-15 Summer Range c-b-su 4-15 to 11-30

[1] Streams: The first letter (c) identifies one of the four use areas ranking--c, crucial-critical; h, high-priority; s, substantial value; l, limited value. The second group of letters (cw) identifies the primary type of fishery for which a water is managed--cw, cold water fishery; ww, warm water fishery; ng, non-game fishery. The first number (2) identifies the stream section. The second number (3) identifies one of the six stream classes defined by Utah Division of Wildlife Resources for Utah's State Water Plan. The last letters (yl) identify a need for a yearlong protection of this water.

[1] Lakes: Notations are the same as stream sections except the numeral that identified stream section has been replaced with the name of the body of water.

Game fish species that inhabit the stream sections or lakes are identified on the map overlays.

[2] The dates given for various use areas or activities of terrestrial wildlife identify when a species is normally present or participating in an activity and also denotes the period when protection from disturbance is needed.

Figures 1. Continued

Wildlife Use Areas	Use Area Ranking		
	Substantial-Value	High-Priority[2]	Crucial-Critical[2]
Bighorn Sheep Desert (dbs) Rocky Mountain(mbs)	Herd Distribution s-dbs-yl s-dbs-yl	Tallus Slopes (ewes and lambs) h-dbs-yl 1-1 to 12-31 Mesa Tops-- 1 mile radius (rams) h-dbs-yl 1-1 to 10-31	Rutting Season (tallus slopes) c-dbs-rt 11-1 to 12-31 Lambing Season (tallus slopes) c-dbs-la 5-1 to 6-15
Black Bear	Population Distribution s-bb-yl Entire Area		
Cougar	Population Distribution s-c-yl Entire Area		
Elk	Herd Distribution s-c-yl	Winter Range h-e-wt 11-1 to 5-15 Summer Range h-e-su 5-16 to 10-31	Winter Range c-e-wt 11-1 to 5-15
Mountain Goat	Herd Distribution s-mg-yl		
Moose	Herd Distribution s-m-yl		Yearlong c-m-yl 1-1 to 12-31
Mule Deer	Herd Unit s-d-yl Herd Unit 35	Winter Range h-d-wt 11-1 to 5-15 Summer Range h-d-su 5-16 to 10-31	Winter Range c-d-wt 11-1 to 5-15 Summer Range c-d-su 5-16 to 10-31
Pronghorn Antelope	Herd Distribution s-pa-yl	Yearlong Range h-pa-yl 1-1 to 12-31	Winter Season c-pa-wt severe snow conditions Fawning Season c-pa-fa 5-12 to 6-20

Figure 1. Key for mapable, high-value habitat use areas for wildlife.

Wildlife Use Areas	Use Area Ranking		
	Substantial-Value	High-Priority[2]	Crucial-Critical[2]
Terrestrial Use Areas			
Abert Squirrel	Population Distribution s-as-yl		Nest Trees c-as-wt 1-1 to 12-31
Band-tailed Pigeon	Summer Distribution s-btp-su	Intensive Use Area h-btp-su 4-15 to 10-15	Breeding Season c-btp-bs 5-15 to 8-15
Blue Grouse	Population Distribution s-bg-yl	Brooding Area h-bg-b 6-1 to 8-15	Breeding Territory and Nesting (Mountain brush zone) c-bg-btn 3-15 to 6-15 Winter Range (mature, high elevation stands of Douglas fir) c-bg-wt 12-1 to 2-28
California Quail	Population Distribution s-cq-yl		Croplands and Riparian Zones c-cq-yl 1-1 to 12-31 Nesting Season c-cq-n 4-15 to 5-30
Chukar	Population Distribution s-ck-yl		Winter Range c-ck-wt 12-1 to 2-15 Nesting Season c-ck-n 4-1 to 5-30
Cottontail Rabbit Mountain cottontail found above 7,000 feet elevation. Desert cottontail found below 7,000 feet elevation.	Population Distribution s-mc-yl s-dc-yl		Nesting Season c-mc or dc-n 4-1 to 7-31

Figure 1. Continued

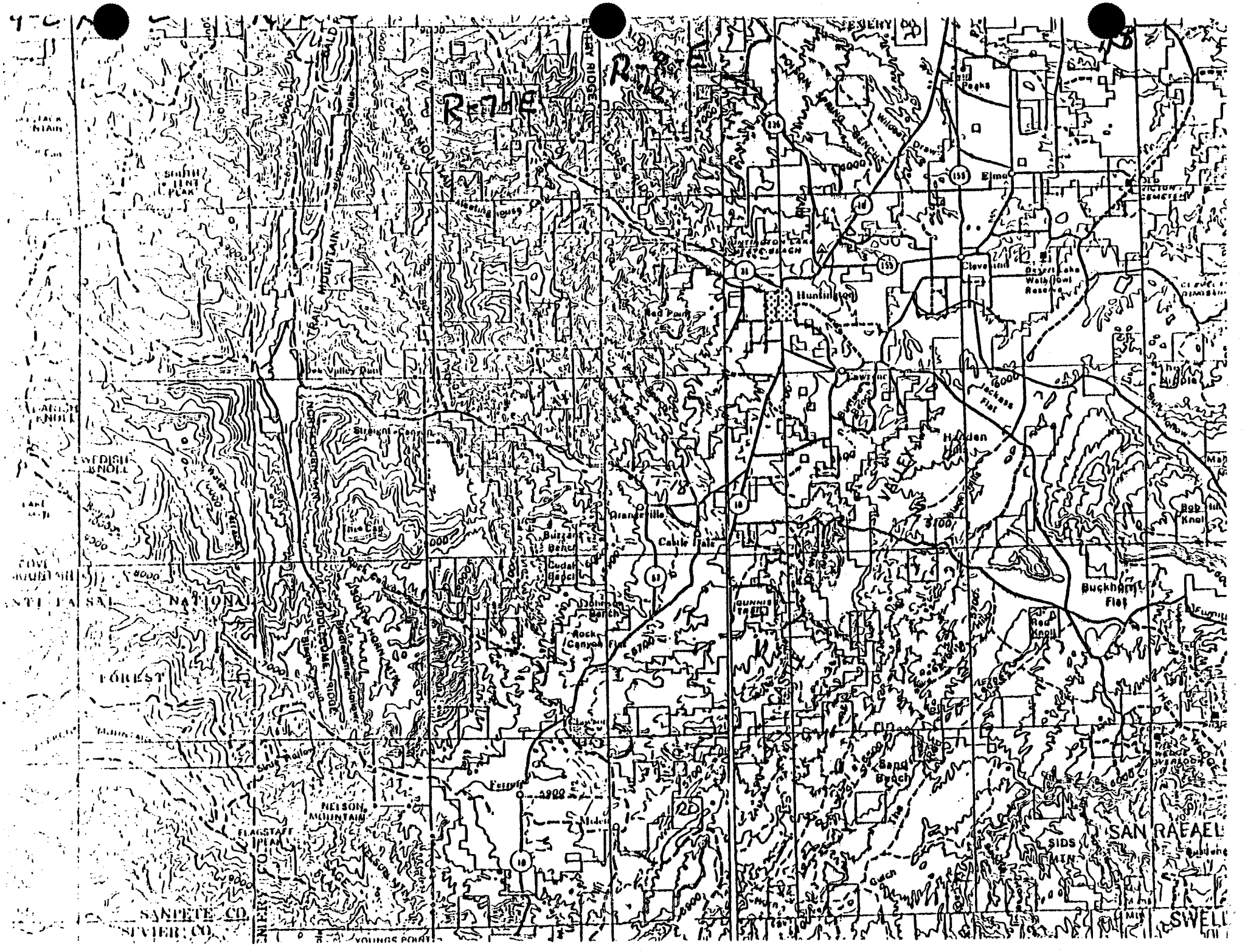
Wildlife Use Areas	Use Area Ranking		
	Substantial Value	High-Priority[2]	Crucial-Critical[2]
	Terrestrial Use Areas		
Gambel Quail	Population Distribution s-gq-yl		Riparian Zones c-gq-yl 1-1 to 12-31 Nesting Season c-gq-n 4-15 to 5-30
Merriams Turkey	Population Distribution s-mt-yl	Winter Range h-mt-wt 12-1 to 3-31 Summer Range h-mt-su 6-1 to 11-30	Display and Nesting Area c-mt-n 4-1 to 5-30 Roost Trees (0.5 mile radius buffer zone) c-mt-rt 1-1 to 12-31
Mourning Dove	Population Distribution s-du-su Entire Area		Nesting Season c-du-n 5-1 to 8-31
Pheasant Ring-necked White-winted	Population Distribution s-rnp-yl s-wp-yl		Croplands and Adjacent Riparian and Wetlands c-rnp or wp-yl 1-1 to 12-31 Nesting Season c-rnp or wp-n 5-15 to 7-15
Ruffed Grouse	Population Distribution s-rg-yl	Summer Range (0.25 miles each side of stream courses) h-rg-su 3-11 to 11-30	Brooding Areas (0.25 miles each side of stream courses) c-rg-b 6-1 to 8-15 Winter Range (clone of mature male Aspen near stream) c-rg-wt 12-1 to 2-28 Drumming Log c-rg-dr

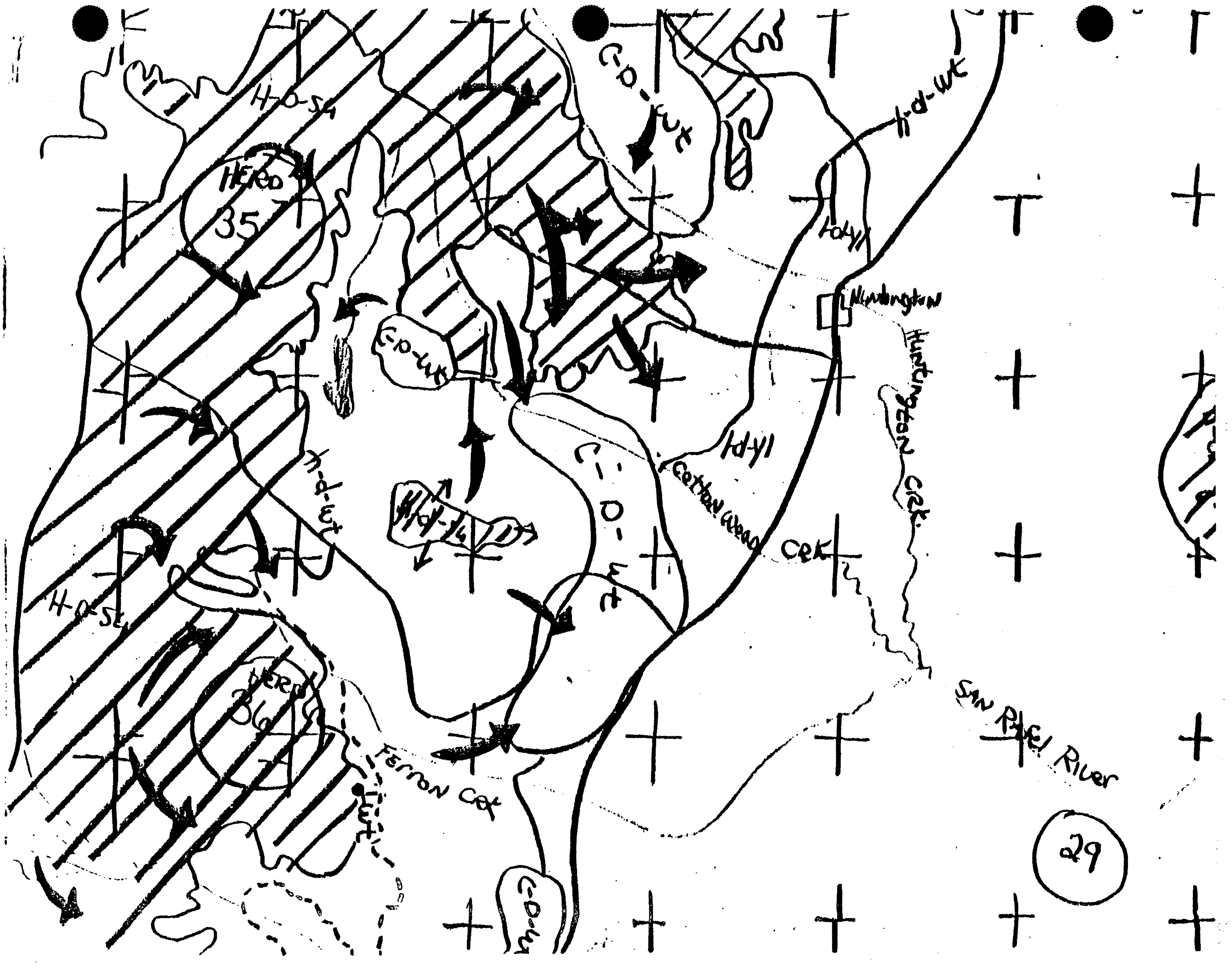
Figure 1. Continued

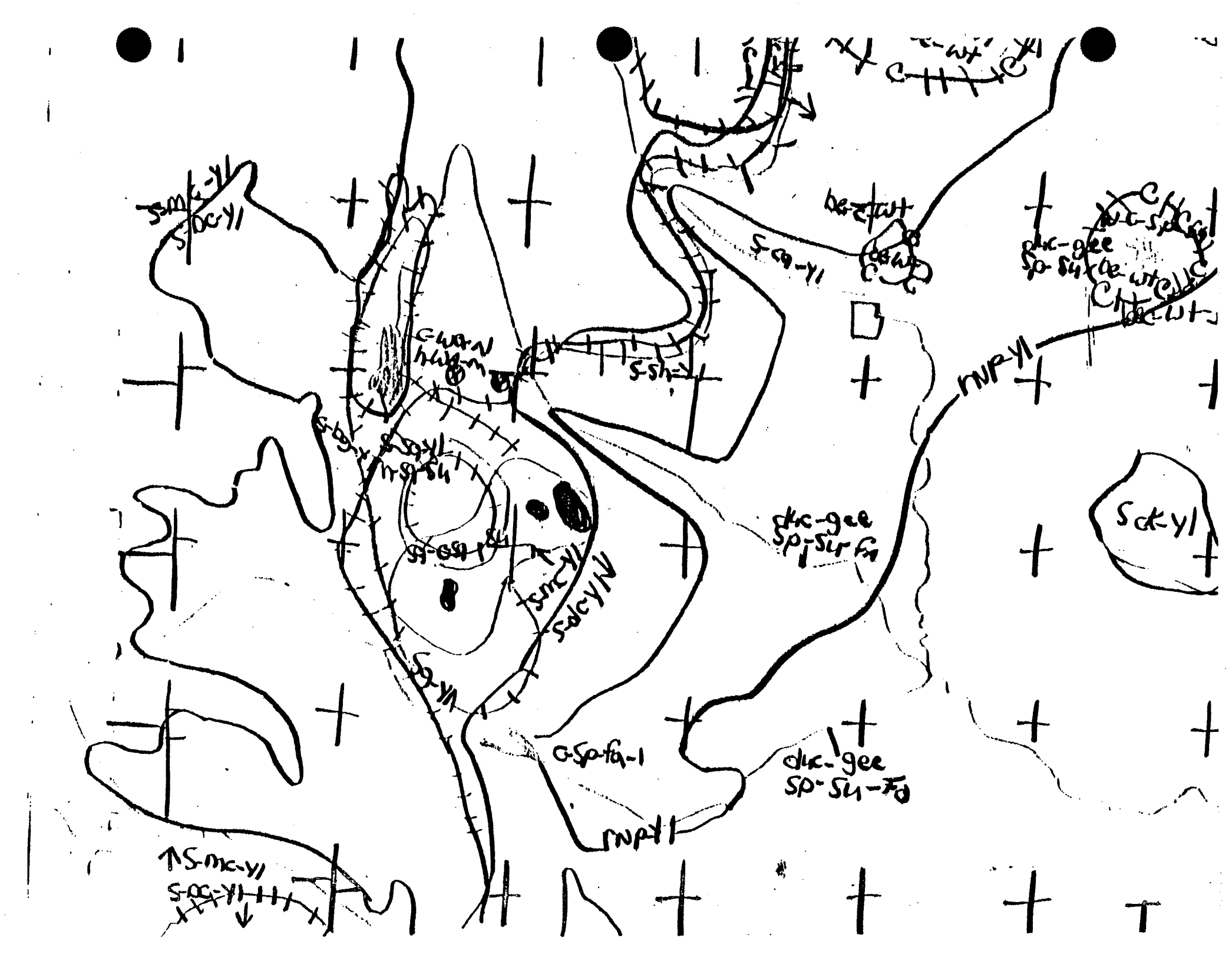
Wildlife Use Areas	Use Area Ranking		
	Substantial Value	High-Priority[2]	Crucial-Critical[2]
		Terrestrial Use Areas	
Sage Grouse	Population Distribution s-sa-yl	Summer Range s-sa-su 8-16 to 11-14	Strutting Grounds and associated brooding area c-sa-st,b 3-15 to 8-15 Winter Range c-sa-w 11-[illegible] to 3-14
Snowshoe Hare	Population Distribution s-sh-yl		Nesting Season (spruce-fir and lodgepole pine forests) c-sh-n 4-1 to 8-15
Waterfowl	Population Distribution (all wetlands, stream courses, ponds and lakes) s-wa-yl	Peak Migration (all wetlands, stream courses, ponds and lakes) h-wa-m 3-15 to 5-15 (spring) 8-15 to 10-15 (fall) Brooding and Mounting Season (all wetlands, stream courses, ponds and lakes) h-wa-bm 7-16 to 8-15	Nesting Season c-wa-n 3-15 to 7-15

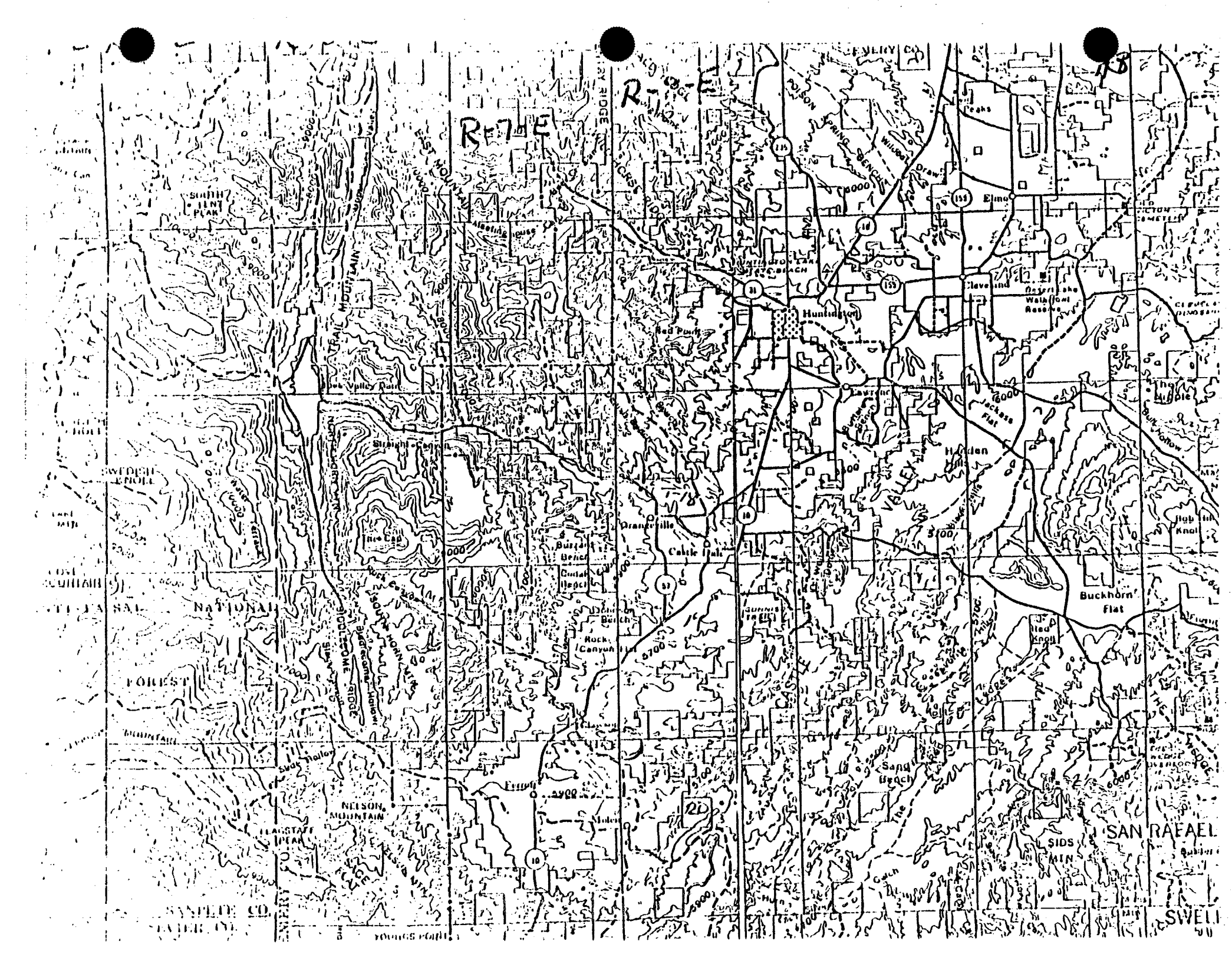
Figure 1. Key for mapable, high-value habitat use areas for wildlife.

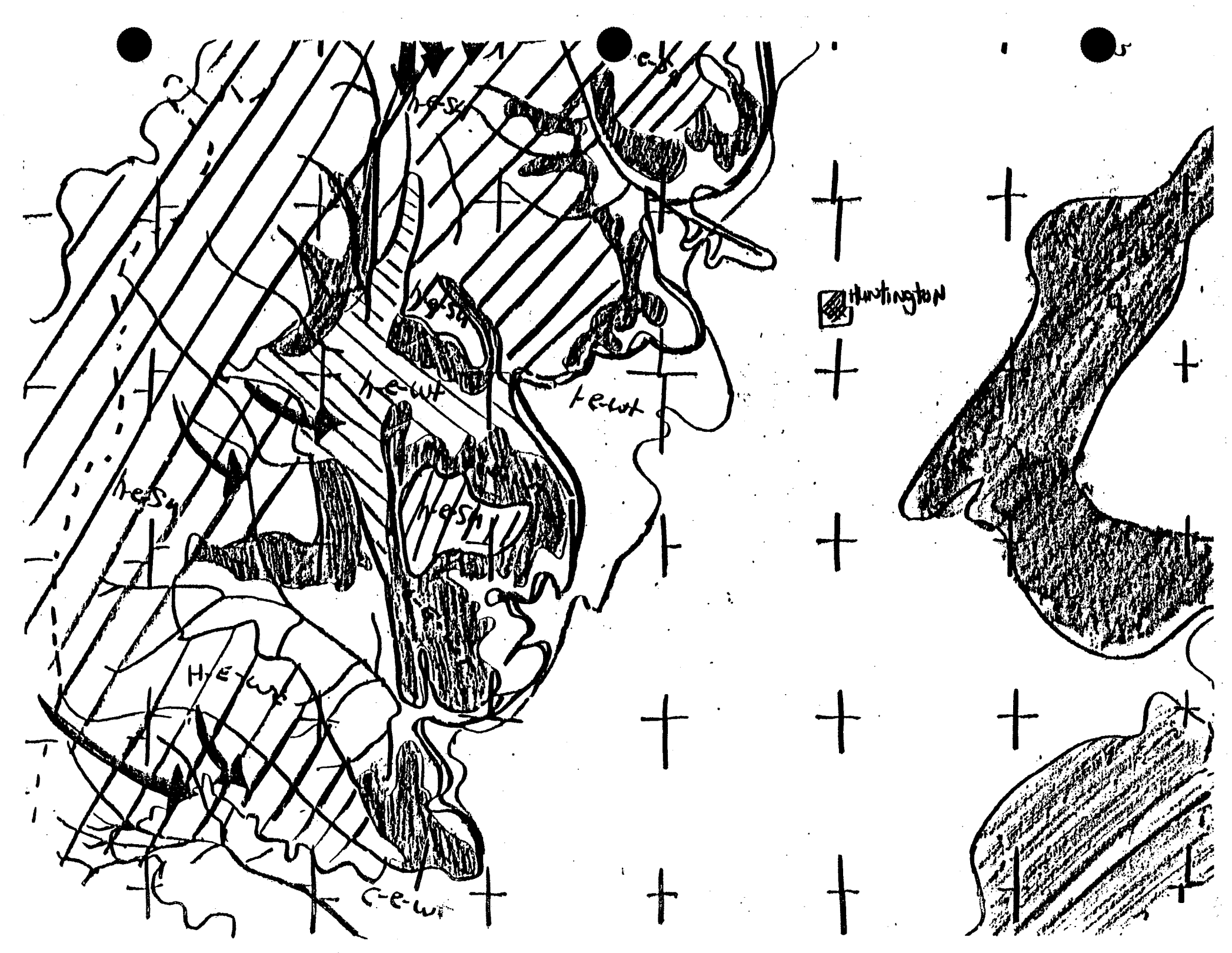
Wildlife Use Areas	Use Area Ranking		
	Substantial-Value	High-Priority[2]	Crucial-Critical[2]
	Terrestrial Use Areas		
Vultures, Accipiters, Buteos (Hawks only), Herriers, Osprey, Merlin, American Kestrel and Owls	Population Distribution (The entire area provides habitat ~~use areas for~~ several species.)	Breeding Territory Surrounds an aerie site	Aerie Site Species specific symbols identified on map-protection needed in 0.25 mile radius buffer zone when in use.
Golden Eagle (common year-around resident)	Population Distribution (The entire area provides habitat use areas for this species.)		Aerie Site ⊘ 2-15 to 6-15
Bald Eagles	Winter Distribution (Entire area between ~~11-15 and 3-15~~ each year)	Winter Concentration h-be-wt 11-15 to 3-15	Roost Tree ⧗ 11-15 to 3-15
Cliff Nesting Falcon			Aerie Site ⊘ 3-1 to 6-30

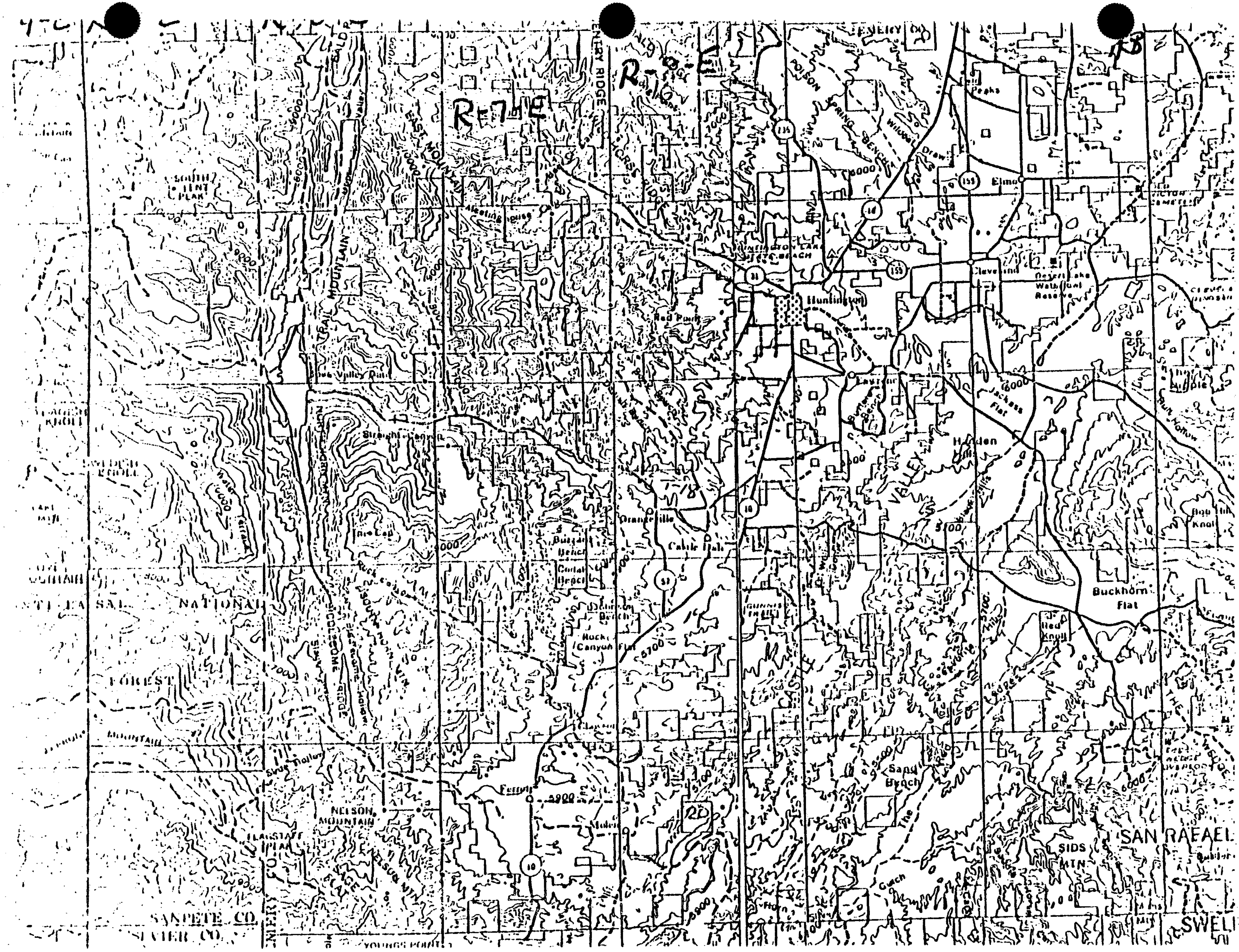

Huntington
Elmo
Cleveland
Castle Gate
Buckhorn Flat
Hiawatha
Price
SAN RAFAEL
SWELL
NATIONAL FOREST
NELSON MOUNTAIN
SANPETE CO.
SEVIER CO.


H-D-St
HERD 35
C-D-wt
Cp-wt
H-d-wt
Hdyl
Huntington
Huntington Crk.
Cottonwood Crk
C-D-wt
HERD 36
Ferron Crk
SAN RAFEL River



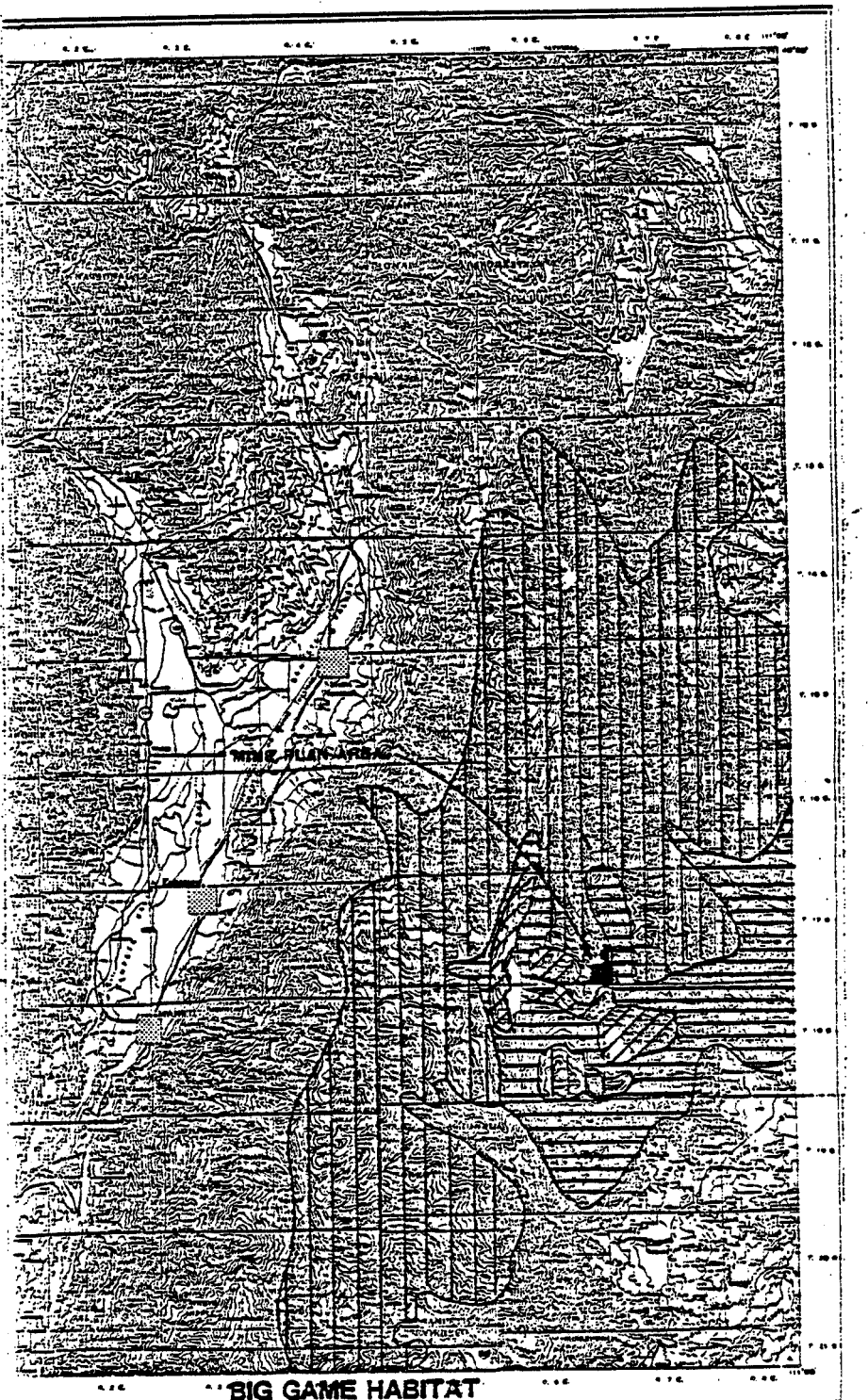

R7E
R8E
R9E
R10E
SOUTH TENT PEAK
TRAIL MOUNTAIN
EAST MOUNTAIN
Huntington
Cleveland
Elmo
Lawrence
Orangeville
Castle Dale
Red Point
Jackass Flat
Buckhorn Flat
Hidden Valley
NATIONAL FOREST
NELSON MOUNTAIN
FLAGSTAFF PEAK
Emery
Sand Wash
SAN RAFAEL SWELL
SANPETE CO.
EMERY CO.


c-k
h-st
h-st
h-e-wt
t-e-wt
h-st
h-st
H-E-wt
c-e-wt
Huntington


R-7-E
R-8-E
Huntington
Cleveland
Elmo
Lawrence
Orangeville
Castle Dale
Ferron
Moore
Buckhorn Flat
Jackass Flat
Huntington Lake State Beach
Desert Lake Waterfowl Reserve
Straight Canyon
Rock Canyon Flat
Red Knoll
Sand Bench
SIDS MTN
SAN RAFAEL
SWELL
NELSON MOUNTAIN
SANPETE CO
SEVIER CO
EMERY CO
NATIONAL
FOREST
EAST MOUNTAIN
TRAIL MOUNTAIN
HORN MTN
Meetinghouse
Poison Spring Bench
Wildcat Draw
Rock Canyon
Cottonwood Creek
Flagstaff Peak
YOUNGS POINT
Dog Knoll
Buzzard Bench
Sage Flat
Hunter Creek
Hadden
Horn Slide Canyon

STATE OF UTAH

LAND OWNERSHIP AND PUBLIC MANAGEMENT



BIG GAME HABITAT

LEGEND

PUBLIC LAND
PRIVATE LAND
STATE LAND
NATIONAL FOREST
CRUCIAL MULE DEER RANGE
HIGH PRIORITY MULE DEER RANGE

SU WC

A | B | C |
D | E | F | G | H |
I | J | K | L | M |
N | O | P | Q | R |

June 1986

WILDLIFE RESOURCES STUDY

OF

TRAIL MOUNTAIN COAL COMPANY

APPENDIX 3

WILDLIFE RESOURCE STUDY OF TRAIL MOUNTAIN

state of utah

DIVISION OF WILDLIFE RESOURCES

DOUGLAS F. DAY
Director

EQUAL OPPORTUNITY EMPLOYER

1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

May 22, 1981

Reply To SOUTHEASTERN REGIONAL OFFICE
455 West Railroad Avenue, Box 840, Price, Utah 84501
(801) 637-3310

Natomas Trail Mountain Coal Company
Trail Mountain Mine
Orangeville, Utah

Dear Sirs:

I want to take this opportunity to extend thanks for the assistance personnel at your mine have provided our staff in becoming familiar with existing and planned surface facilities on the area encompassed by Natomas Trail Mountain Coal Company's Trail Mountain Mining Project. I believe that you will find the enclosed information helpful at filing a mine and reclamation plan.

In response to your request for wildlife resource information (UMC 783.20) the attached map, data and comments are provided. The wildlife resource information is consistent with the formal guidelines for acquisition of fish, wildlife and habitat information provided your Company by Utah's Division of Oil, Gas and Mining. In instances where your Company was required to provide for study beyond existing information, such findings need be merged with our report.

Please note that the enclosed wildlife plan (UMC 784.21) represents our recommendations; Utah's Division of Oil, Gas and Mining is the regulatory authority for approval of the mining and reclamation plan. Implementation of the recommended wildlife plan should assist the Company in compliance with performance standards UMC 817.97.

Thank you for an opportunity to assist your Company in complying with the State's permanent program for coal mining and reclamation and the resultant protection of Utah's wildlife resources. If the Division can be of any further service, please coordinate with our Regional Resource Analyst (Larry Dalton, phone 801-637-3310) as appropriate.

Sincerely,

John Livesay

John Livesay, Supervisor
Southeastern Region

JL:LBD:gp

Attachment

cc: Darrell Nish
Clark Johnson
Cleon B. Feight

RECEIVED JUN 1 1981

UMC 783.20; FISH AND WILDLIFE RESOURCE INFORMATION
NATOMAS TRAIL MOUNTAIN COAL COMPANY, TRAIL MOUNTAIN MINING PROJECT

General Wildlife Resource Information--All Species of Vertebrate Wildlife

The mine plan area encompasses a portion of the Wasatch Plateau in Emery County, Utah. This area drains into the Straight Canyon-Cottonwood Creek drainage and on into the San Rafael River, which flows into the Green River and ultimately into the Colorado River at a point upstream from Lake Powell. Generally speaking, the Wasatch Plateau is encompassed by cold desert (upper Sonoran life zone), submontane (Transition life zone) and montane (Canadian, Hudsonian and Alpine life zones) ecological associations. These life zones could be inhabited on occasion and during different seasons of the year by about 364 species of vertebrate wildlife--14 fish species, 6 amphibian species, 18 reptile species, 242 bird species and 84 mammal species. It is interesting to note that 83 percent of these species are protected.

The mine plan area itself is represented by the Transition and Canadian life zones and provides habitat for approximately 245 species of wildlife--8 fish species, 6 amphibian species, 17 reptile species, 140 bird species and 74 mammal species. Sixty-one of these species are of high interest to the State of Utah.

The Division Publication No. 78-16 "Species List of Vertebrate Wildlife That Inhabit Southeastern Utah" is appended (Appendix A) to this report since it represents a low level of study for the wildlife species listed. It identifies those species having potential to inhabit the region as well as those inhabiting the environs of the mine plan area. Appendix A also identifies which species are considered to be of high interest for the habitats and local area represented.

High interest wildlife are defined as all game species; any economically important species; and any species of special aesthetic, scientific or educational

significance. This definition would include all federally listed, threatened and endangered species of wildlife.

A ranking and display of wildlife habitats and use areas relative to high interest species of vertebrate wildlife has been developed (Table 1 and 2 and the attached map). Critical wildlife use areas followed in respective importance by high-priority, substantial value and limited value wildlife use areas require various levels of protection from man's activities and developments. Wildlife habitats and use areas are ranked as being of critical or high-priority value to wildlife should be protected from surface disturbance, subsidence impacts and human or industrial disturbance. This can be accomplished through development and implementation of a wildlife plan.

Critical wildlife use areas are "sensitive use areas" necessary to sustain the existence and perpetuation of one or more species of wildlife during crucial periods in their life cycles. These areas are restricted in area and lie within high-priority wildlife use areas. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 1 or 2 are classified as being critical. Biological intricacies dictate that significant disturbances cannot be tolerated by the members of an ecological assemblage on critical sites. Professional opinion is that disturbance to critical use areas or habitats will result in irreversible changes in species composition and/or biological productivity of an area.

High-priority wildlife use areas are "intensive use areas" for one or more species of wildlife. "Intensive use areas" are not restricted in area and in conjunction with limited value use areas form the substantial value distribution for a wildlife species. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 3 are classified as being of high-priority. In addition, wildlife use areas where surface disturbance or

underground activities may result in subsidence that could interrupt underground aquifers and result in a potential for local loss of ground water and decreased flows in seeps and springs should be considered as being of high-priority to wildlife.

Substantial value wildlife use areas are "existence areas" for one or more species of wildlife. "Existence areas" represent a herd or population distribution and are formed by the merging of high-priority and limited value wildlife use areas for a species. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 4 are classified as being of substantial value.

Limited value wildlife use areas are "occasional use areas" for one or more species of wildlife. "Occasional use areas" are part of the substantial value wildlife use area for a species. All stream sections, reservoirs, lakes and ponds identified by Utah Division of Wildlife Resources as Class 5 or 6 are classified as being of limited value.

MAPPING

Vegetation and Wildlife Habitats

It is recommended that the Company's primary effort be placed on identifying species of vegetation in each wildlife habitat within the various wildlife use areas for purposes of reclamation. The Division does not have site specific information relative to vegetation types at the mine plan area. However, there are nine wildlife habitats present--riparian or wetland types, cliffs and tallus, sagebrush, pinion-juniper forest, shrubland, aspen forest, ponderosa forest, parkland and spruce-fir forest. The Company should identify each of these habitat associations on appropriately scaled maps.

It is believed that if satisfactory reclamation is achieved and man's disturbance does not continue or become a factor, that most species of wildlife dis-

placed from the mine plan area will return. Without doubt, the key to success for enhancing or restoring wildlands will be development of habitats so that the postmining condition as compared to the premining condition will have similar species, frequency and distribution of permanent plants in each vegetative type this will allow for natural plant succession. Additionally, other habitat features that represent the various life requirements for local wildlife must be provided.

Wildlife Use Areas

The enclosed map displays mapable, high value use areas for high interest wildlife on or adjacent to the mine plan area. This display includes stream sections and bodies of water, if any, utilized by high interest fish species. Also displayed are know seeps, springs, wetlands, and riparian zones. Note that there are high interest wildlife distributions that are so broad that they cover the entire map and therefore are not illustrated. However, all vertebrate species of high interest wildlife and their distributions are discussed in the following narrative.

Water

Due to demands of state and federal coal mining regulations, the Company will probably be required to identify and appropriately monitor all surface waters for potential impacts from subsidence. This information should be correllated with the wildlife use area information due to the value of water to wildlife.

FISH AND WILDLIFE INVENTORY

Aquatic Use Areas

Macrophytes

From a position of the aquatic wildlife resource it is believed that there is no practicality for information relative to macrophytes to be addressed by the mine permit application; such information is not generally available.

Macroinvertebrates

The results from studies of macroinvertebrates may be required for purposes of determining need for stream buffer zones (UMC 817.57) in stream sections supporting biological communities. Since historic impacts from this mine's operation are evident in Cottonwood Creek data relative to macroinvertebrates as a pollution index or a forage base for fishes or other predators dependent upon the aquatic resource need be presented.

Note, impact avoidance procedures that would protect the integrity of the aquatic resource need to be included with the mine permit application. Of importance would be facility designs and operational plans that will preclude further impacts on this stream and identification of procedures that will be utilized to keep any form of coal sediments or other pollution from entering Cottonwood Creek and ultimately reaching Straight Canyon Creek. Snow removal is a significant contribution of sediments to local riverine systems. Deposition of coal particles in the aquatic system could have a variety of negative impacts on invertebrate and fish populations.

The results from long-term studies of macroinvertebrates in Cottonwood Creek would be of value for the Company to demonstrate when impacts that resulted from accumulations of coal and other sediments in this creek have ceased. Other sediments have resulted from encroachment of the road upon Cottonwood Creek. These accumulations of sediments will likely continue until coal particles cease to enter the creek and the encroachment problems eleviated.

Studies relative to macroinvertebrates if desired or needed, must be conducted by a qualified, private consultant.

Fish--Species Occurrence and Use Areas

Aquatic habitats associated with the mine plan area support three species of game and five species of nongame fish; all of which are protected. Of these fish, four species have been determined to be of high interest to Utah (Appendix A and

reference the Division Publication No. 78-16).

The yellowstone cutthroat trout is an introduced species. It annually spawns between early May and mid-July. Most populations are sustained through natural reproduction; hatching is usually completed by mid-July.

The rainbow trout is an exotic species. Within Utah there are several different strains of this species. Generally speaking they spawn from mid-March through June; hatching is normally completed by late June. It is important to note that natural reproduction by this species is almost non-existent, since it is managed as a stocked population. This management scheme has resulted since their catchability is higher than other trout and the life expectancy of hatchery fish is short.

The brown trout is an exotic species. Its spawning period begins as early as mid-October and is normally completed by late December; hatching of eggs begins in the spring and is usually completed by late May. Most populations are sustained through natural reproduction and supplemental plantings of fingerling brown trout.

The spawning period represents a crucial period for maintenance of trout populations; spawning areas are ranked as being of critical value. Such areas are characterized by clean, gravel zones that are at least six inches deep. These zones must also be covered by a minimum of six inch deep water flowing at a velocity of not less than one foot per second. These physical parameters are necessary for optimum spawning success.

Once the cutthroat or rainbow trout have spawned their eggs incubate in the redds approximately 30 to 50 days--water temperatures ranging from 45 to 50 F. Brown trout eggs incubate throughout the winter which lasts approximately 100 to 150 days--water temperatures ranging from 35 to 40 F. During this crucial period water temperature affects the rate of embryonic develop--the warmer the water the more quickly incubation is completed. It is also during this period

that ongoing sedimentation can result in suffocation of the eggs. Flucuations in stream flow also negatively affects incubation; wherever practicable, maintenance of a constant flow of water during the spawning period enhances reproductive success.

The mottled sculpin is a native species. It annually spawns in the spring between February and May. All of their populations are sustained through natural reproduction. The spawning period represents a crucial period for maintenance of sculpin population; spawning areas (nest) are ranked as being of critical value. Such areas for sculpin are characterized as a nest scooped out beneath a stone or other submerged object. Spawning areas must have clean, gravel or rubble zones. Both the adult fish attend and defend the nest. They are known to spawn in water temperatures ranging from 45 to 48 F.

The reach of Straight Canyon Creek that receives flow from Cottonwood Creek and lies proximal to the project area (stream section 2) is ranked as being of high-priority to Utah's cold water fishery management program and is a Class 3 fishery. It supports natural reproduction of self-sustaining cutthroat and brown trout populations. Occasionally, fingerling transplants of both of these species supplement the population. Some of the trout in this stream section are hatchery planted, catchable sized rainbow trout. Section 2 of Straight Canyon Creek is also inhabited by speckled dace, mottled sculpin and mountain, bluehead and flannelmouth suckers.

Although there are no fish in Cottonwood Creek, its flow of water is of great value for reproductive success of spawning trout in section 2 of Straight Canyon Creek for which it is a tributary water. Additionally, drift of macroinvertebrates from this stream represent an important contribution of forage to trout and other fishes in Straight Canyon Creek.

If project operations are planned or develop that would alter, destroy or discharge polluting effluents into any perennial waters, appropriate state and federal permits, a mitigation plan and results from high level studies of the

salmonid fishery resource, if any, would be required of the Company. Achievement of mitigation would demand detailed studies of stream velocity correclated to flow, representatives of the stream channel profile, gradient, pool-riffle ratio, substrata types identifying percent representation of each type and surface water information required for SMC 779.16.

If modification of flows is anticipated, instream flow requirements must be considered to meet the needs of the existing fisheries, "biological community" and maintenance of existing riparian or wetland zones. Such baseline information would allow for development of mitigation or reclamation plans that would allow for avoidance, lessening or mitigation of impacts to the fishery and maintenance or re-establishment of unique habitat types. This baseline information is not generally available and would necessitate the services of a qualified private consultant and/or contracting Utah's Division of Wildlife Resources since special permits would be required.

It is important to note that no species of fish having relative abundances so low as to have caused them to be federally listed as threatened or endangered inhabit the mine plan or adjacent areas. The endangered humpback chub, bonytail chub and Colorado squawfish inhabit the Green and Colorado Rivers. Additionally, the humpback (razorback) sucker also inhabits those rivers; it is likely that this species will one day be federally listed as threatened. It is not believed that implementation and operation of the Company's project will impact any of these species.

Terrestrial Use Areas

Wildlife Habitat Types

Of the nine wildlife habitat types present on the mine plan area wetlands and riparian habitats are ranked as being of critical value to all wildlife. Such zones are normally associated with drainage bottoms (ephemeral or intermittent), or perennial streams (UMC 700.5), seeps and springs within the upper Sonoran,

Transition and Canadian life zones. Cliffs and their associated tallus areas that lie within the upper Sonoran and Transition life zones are ranked as being of high-priority value to all wildlife. When compared to all other wildlife habitats the aforementioned situations are considered to represent unique habitat associations (Table 1).

Riparian and wetland areas are highly productive in terms of herbage produced and use by wildlife as compared to surrounding areas. Experience has shown that as much as 70 percent of a local wildlife population are dependent upon riparian zones. Cliffs and tallus are of special importance to many high interest wildlife. These unique habitat types must be identified in the permit application and protected due to their high value for all wildlife.

Quantitative (acreage) and qualitative (condition, successional stage and trend) data concerning the wildlife habitats in each ecological association should be included as part of the mine permit application. It is important to note that each legal section of land represented by the mine plan and adjacent areas has been ranked as to its value for the total wildlife resource. Sections 24, 25, 26, and 35 of Township 17 South Range 6 East have been ranked as being of critical value to wildlife. This is also true for Sections 19 and 20 of Township 17 South Range 7 East. Sections 23 and 36 of Township 17 South Range 6 East have been ranked as being of high-priority value to wildlife. This is also true for Section 36 of Township 17 South Range 7 East. These rankings were developed through an analysis of cumulative values for use areas of individual wildlife species inhabiting each legal section of land (Table 2).

Amphibians--Species Occurrence and Use Areas

S-ix species of amphibians, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that all of these species inhabit the project area (reference the Division Publication No. 78-16). Only one species of the amphibians inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

The tiger salamander is a yearlong resident animal of the project area. The substantial value use area for the adult form is represented by any moist underground site or any similar habitat such as inside rotten logs, cellars or animal burrows. Such sites can be found within any wildlife habitat extending from the cold desert (upper Sonoran life zone) through the submontane (Transition life zone) and into the montane (Canadian life zone) ecological association. The larva form, often referred to as a mud-puppy, is a gilled animal that must remain in water within the above described ecological associations. It is interesting to note that the larva may fail to transform into an adult, even after their second season, and they can breed in the larva condition.

Once the larva is transformed into the adult form the animal is primarily terrestrial. Salamanders do migrate to water in the spring for breeding and may remain there during much of the summer. Such an intensive use area would be ranked as being of high-priority value to the animal. In September the newly transformed animals leave the water to find suitable places to spend the winter.

The tiger salamander breeds from March through June and is sexually mature after one year. The male deposits a small tent-shaped structure containing a myriad of sperm on the pool bottom. During courtship the female picks up this structure in her cloaca; then the eggs are fertilized internally before or just at the time they are laid. The eggs, singly or in small clusters, adhere to submerged vegetation; after 10 to 12 days they hatch. Obviously, a critical period for maintenance of the population is when breeding salamanders, eggs or their larva are inhabiting a water.

Post-embryonic development of a salamander's larval form progresses at a pace somewhat controlled by water temperature; in some cold waters the larva may not transform into an adult and drying up of a pool may hasten the process.

Migration to or from water usually occurs at night, during or just after a rain storm. When inhabiting terrestrial sites the tiger salamander is most active

at night, particularly on rainy nights, from March through September.

Larva, when small feed on aquatic invertebrates and become predacious to the point of cannibalism when they are larger. Food items for adults include insects, earthworms and occasionally small vertebrates.

No amphibians have relative abundances that are so low to have caused the animal to be federally listed as a threatened or endangered species.

Reptiles--Species Occurrence and Use Areas

Eighteen species of reptiles, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that seventeen of these species inhabit the project area (Reference the Division Publication No. 78-16). Only two species of the reptiles inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

The Utah milk snake is a yearlong resident animal of the project area. Its substantial value use area encompasses all wildlife habitats extending from the upper Sonoran (cold desert life zone) through the submontane (Transition life zone) and into the montane (Canadian and possibly Hudsonian life zone) ecological associations. Although its use area spans a multitude of habitats, the animal is extremely secretive, mostly nocturnal and is often found inside or under rotten logs, stumps, boards, rocks or within other hiding places. At night they can be found in the open where they hunt for small rodents, lizards and other small snakes. Occasionally, the milk snake may take small birds or bird eggs.

The milk snake may live beyond twenty years and it becomes sexually mature during its third spring season. After mating, which occurs during spring or early summer when they are leaving the den, female milk snakes produce clutches which average seven eggs. The eggs are secreted in a moist warm environ and then abandoned; incubation lasts 65 to 85 days. The site where an individual snake has

deposited its clutch of eggs is of critical value to maintenance of the species.

The Utah mountain kingsnake is a yearlong resident animal of the project area. Its substantial value use area encompasses all wildlife habitats extending from the submontane (Transition life zone) into the montane (Canadian and possibly Hudsonian life zones) ecological association. Little is known concerning this animal except that it frequents areas of dense vegetation and that it is often found near water. Its life history and food habits parallel that described for the Utah milk snake.

To date snake dens, which are protected and of critical value to snake populations, have not been identified on or adjacent to the project area. It is important to note that inventory for such has not been attempted. If the Company at some later time discovers a den it should be reported to the Utah Division of Wildlife Resources. If a den(s) is currently known, its location must be included with the permit application.

No reptiles have relative abundances that are so low to have caused the animal to be federally listed as a threatened or endangered species.

Birds--Species Occurrence and Use Areas

Two hundred forty-two species of birds, all of which are protected, are known to inhabit the biogeographic area in which the mine plan and adjacent areas are located. It is probable that one hundred fourty of these species inhabit the project area (Reference the Division Publication No. 78-16). Twenty-nine species of the birds inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

Ducks commonly known as waterfowl are not known to utilize the project area, but may on occasion or during different seasons of the year make limited use of the riparian area. All of these species are of high interest to the State of Utah (Appendix A). Generally speaking, the riparian and wetland habitats encompassed

by the project and adjacent areas provide substantial valued habitats for waterfowl. Each species has different life requirements and makes various uses of the riparian and wetland habitats.

For those waterfowl that nest locally, the period March 15 through July 15 is ranked as being of crucial value to maintenance of the population. Following incubation, which dependent upon the species may vary between 20 and 28 days and extend up until mid-August, the riparian and wetland habitats represent a high-priority brooding area. Additionally, the wetland habitat (large open water areas or dense marshland, none of which exist on the project area) is of high-priority for seclusion and protection of adult waterfowl during their flightless period when they moult. Males may begin the moult in early June and both sexes and the young are capable of flight by mid-August.

The project and adjacent areas provides substantial valued habitat for a multitude of raptors--turkey vulture, bald and golden eagles, four species of falcons (prairie, American and arctic peregrine falcons and American kestrel), five species of hawks (goshawk, sharp-shinned, Cooper's, red-tailed and Swainson's hawks) and seven species of owls (barn, screech, flammulated, great horned, pygmy, long-eared and saw-whet owls). Many of these species are of high federal interest pursuant to 43 CFR, 3461.1 (n-1). All of these species are of high interest to the State of Utah (Appendix A).

Realistically, nesting habitat does not exist on the project or adjacent areas for many of these species. However, if a species were to nest on or adjacent to the project area, it would have a specific crucial period during which the aerie would need protection from disturbance; this period of time lies between February 1 and August 15. Generally speaking, aeries represent a critical valued site and need protection from significant or continual disturbance within a one-half kilometer radius of the nest. This consideration need only be implemented during

the period of time that the nest is occupied. Species specific protective stipulations for aeries are available from the Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service.

The current level of data relative to site specific use of the area by raptors is unsatisfactory. Likely, there are aeries that have not been identified. Many of these species are highly sensitive to man's disturbances. Therefore, it is recommended that intensive surveys be initiated on the mine plan and adjacent areas for determination of locations for raptor aerie territories. Such data needs to be merged with information provided within this report.

Golden eagles are a common yearlong resident of the mine plan area. There are no known active aerie territories associated with the project. (Note, an aerie territory is utilized by one pair of eagles but may contain several nest sites).

It is believed that aerie territories for eagles may exist on the project area. This belief is based upon the fact that suitable nesting habitat is widespread on the mine plan area and throughout the local area. It is important to note that the regularity of golden eagle observations and the fact that their status is common has resulted in documentation of mostly opportunistic observations of aerie territories.

An active golden eagle nest site is extremely sensitive to disturbance within a one-half kilometer radius. This buffer zone is ranked as being of critical value to maintenance of the eagle population when the bird is actually utilizing the aerie; that period of time is normally between April 15 and June 15. The radius for a buffer zone may need to be increased to one kilometer if a disturbance were to originate from above and within direct line of sight to the eagle aerie.

To date there are no known high-priority concentration areas or critical roost trees for golden eagles on the project area. The mine plan and adjacent

areas have been ranked as being of substantial value to golden eagles.

The northern bald eagle is an endangered winter resident (November 15 to March 15) of the local area. To date there are no known high-priority concentration areas or critical roost trees for this species on or adjacent to the project. The mine plan area has been ranked as being of substantial value to wintering bald eagles. Note that no bald eagles are known to nest in Utah, however, historic data documents nesting activity by these birds in the State. There is no known historic evidence of the northern bald eagle nesting on the mine plan or adjacent areas.

The American peregrine falcon (relative abundance is endangered) and the prairie falcon (relative abundance is common) are yearlong residents of the mine plan and adjacent areas. Each of these species utilizes cliff nesting sites. To date there are no known aerie sites for cliff nesting falcons on the project area. However, suitable nesting habitat for the prairie falcon is widespread. Suitable nesting habitat for the American peregrine falcon cannot be found on the mine plan and adjacent areas. Since existence on the area by prairie falcons would not be unlikely, the project area has been ranked as being of substantial value to this cliff nesting falcon. However, the project area only is ranked as being of limited value to peregrine falcons.

For each falcon their aerie site while being utilized and a one-half kilometer radius would be ranked as being of critical value to maintenance of their populations. The falcon's period of use at the aerie site spans the spring and early summer period--prairie falcon, April 15 to June 30; peregrine falcon, March 1 to June 30.

The level of data relative to site specific use of the project area by cliff nesting falcons (not including the kestrel) is unsatisfactory and there could be aeries that have not been identified. Therefore, it is recommended that intensive surveys be initiated on the area for determination of locations for cliff falcon

aerie sites.

The endangered arctic peregrine falcon is a winter resident (November 15 through March 15) of the local area. This species has not been observed to utilize the environs on or adjacent to the mine plan area, however, its occasional presence would not be unlikely. Therefore, the project area is ranked as being of limited value to this species.

The blue grouse is a yearlong resident of the project area. Adult birds prefer open stands of conifers. During winter the blue grouse feeds exclusively upon needles and buds of douglas-fir and spruce trees. Thus, this wildlife habitat (spruce-fir forest) is ranked as being of critical value to over-winter survival of the population during the crucial period of December through February.

Blue grouse annually exhibit what has been termed a reverse vertical migration. That is, during the spring months, they migrate from the high elevation spruce-fir habitat to lower elevation sagebrush, pinion-juniper or shrubland habitats. This movement is caused by a need of the birds to feed on early developing vegetation. Such movement also facilitates successful breeding, nesting and brooding of their young. Then as the year progresses, they move to the higher elevations.

The males are polygamous and will set up and defend territories for booming and breeding activities against other breeding males. Such territories are critical to maintenance of the population during the crucial period of mid-March through mid-June.

After breeding the female develops a nest site which is secreted on the ground; the nest is of critical value to maintenance of the blue grouse population. Upon hatching, which occurs in late May and early June, the young accompanied by the hen immediately leave the nest. The young blue grouse while being brooded rely heavily on insects for their protein needs during the first several months

of development. The adult bird also shifts its diet during this period to include a high proportion of insects. Brooding areas are ranked as being of high-priority value to blue grouse. The crucial period extends from hatching into mid-August.

As summer progresses into the fall season the grouse consumes large quantities of berries.

The ruffed grouse is a yearlong resident of the project area. These grouse are usually found in the continum of habitats extending from aspen to shrubland types. But, during winter they often roost in dense stands of conifers. Generally speaking ruffed grouse prefer habitats lying with 0.25 mile of a stream course; such areas are ranked as being of high-priority value to their population. During winter the ruffed grouse feeds exclusively upon staminate aspen buds. Thus, this wildlife habitat (aspen forest) is ranked as being of critical value to over-winter survival of the population during the crucial period of December through February. During the remainder of the year their diet shifts to include a wide variety of plant and insect material.

Ruffed grouse do not exhibit any type of seasonal migration.

The males are polygamous and will set up and defend territories against other breeding males. The focal point for breeding activity is the drumming log; all such logs are ranked as being of critical value to grouse since they represent sites of historical use. Such territories are critical to maintenance of the population during the crucial period of early March through May.

After breeding the female develops a nest site which is secreted on the ground and deep within an aspen grove; the nest is of critical value to maintenance of the ruffed grouse population. Upon hatching, which occurs in late May and early June, the young accompanied by the hen immediately leave the nest. The young ruffed grouse while being brooded rely heavily on insects for their protein needs during the first several months of development. The adult bird

also shifts its diet during this period to include a high proportion of insects. Brooding areas are ranked as being of high-priority value to ruffed grouse. The crucial period for brooding extends from hatching into mid-August.

The band-tailed pigeon is a summer resident of the project area. This bird is seldom observed to utilize the Wasatch Plateau, but when observed the species is only represented by a single bird, pairs or even less frequently a small flock. Since the band-tailed pigeon's use of the Wasatch Plateau is best described as "occasional", the environs associated with the project are only ranked as being of limited value to the bird. Nesting birds secret their nest in trees within the spruce-fir wildlife habitat. Peak on-nest activity occurs in late July and early August.

Mourning doves normally inhabit the project and adjacent areas, which represents a substantial valued use area for these birds, between May 1 and September 15 each year. They nest throughout most of this period and each pair produces two clutches. The pinion-juniper and riparian habitats are ranked as being of high-priority value for nesting. Locally, mourning doves show two peaks in on-nest activity--early July and early August. Successful nesting activities and any water sources are critical to maintenance of the mourning dove population.

The yellow-billed cuckoo is a summer resident of the project area. This bird only nests in the riparian wildlife habitat, therefore, such areas are of critical value to maintenance of this species. Little is known concerning the yellow-billed cuckoo. Its nest is represented by a frail, saucer shaped structure of twigs and is always placed in bush or tree.

The black swift is a summer resident of the Wasatch Plateau. The montane ecological association represents the swift's substantial valued use area. Normally, the bird is associated with a small flock that represents a colony. Black swifts are usually observed soaring as pairs and they feed upon flying insects. A colony's nests are scattered along percipitous terrain where the nest is often

secreted behind a waterfall. Such a moist habitat is not known to exist on the project area. Cliff and tallus wildlife habitats are ranked as being of high-priority value to the black swift. There is evidence that pair bonds are long lasting and that a nest may be utilized in successive years.

The belted kingfisher is a yearlong resident of the project area. It is found only along riverine systems and its substantial value use area extends from the cold desert through the submontane and into the montane ecological associations. Therefore, the riparian wildlife habitat represents a high-priority valued use area for this bird. It feeds exclusively upon fish. The kingfisher's nest is always secreted within a burrow along stream banks, thus, dirt bank habitats along riparian areas are of critical value to this bird.

The pileated woodpecker is a species having high federal interest pursuant to 43 CFR 3461.1 (n-1). The spruce-fir and aspen wildlife habitats of the montane ecological association represent this birds substantial valued use area. It is important to note that the pileated woodpecker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the bird is known to exist, it is a yearlong resident with a relative abundance considered to be rare.

The Williamson's sapsucker is another species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Typically, the substantial valued use area for this species is the spruce-fir habitat of the Hudsonian life zone in the montane ecological association. Therefore, the spruce-fir habitat of the Canadian life zone on the project site would only represent the substantial valued use area for the yellow-bellied sapsucker. The yellow-bellied sapsucker is a yearlong resident of the environs associated with the project area and it has a relative abundance considered to be common. Where as the Williamson's sapsucker has never

been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the Williamson's sapsucker is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

The Lewis woodpecker is also another species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Its substantial valued use area is represented by riparian habitats characterized by cottonwood stands and ponderosa forests. These habitats do not exist on the project site. It is important to note that the Lewis woodpecker has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where the bird is known to exist, it is a summer resident or only a transient. Its relative abundance is unknown.

The purple martin is a summer resident known to inhabit the environs of the biogeographic area that surrounds the project site. In Utah its substantial valued use area is represented by open spruce-fir, aspen or ponderosa forest habitats of the montane ecological association. The purple martin feeds on flying insects and may secret its nest within any suitable above-ground cavity.

The western bluebird is an uncommon summer resident known to inhabit the environs of the biogeographic area that surrounds the project site. Where as the mountain bluebird is a common yearlong resident of the area. Both birds are cavity nesting species. The western bluebird nests from the pinion-juniper habitat of the submontane ecological association up into the lower forest habitats within the Canadian life zone of the montane ecological association. The mountain bluebird utilizes the same continum of habitats for nesting, but also extends its nesting use across the Canadian and Hudsonian life zones and into the Alpine life zone. During winter both species show elevational and longitudinal migrations; they then utilize all habitats associated with the cold desert ecological association. Therefore, the substantial valued use area for each species spans a

broad continum of habitats. It is important to note that trees with cavities located on the project area can be of critical value to bluebirds.

Grace's warbler is a species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Its substantial valued use area is shrublands and associated ponderosa forest habitats of the submontane and montane ecological associations. This bird's nest is built twenty or more feet above ground in a ponderosa tree. It is important to note that the Grace's warbler has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where it is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

Scott's oriole is also a species having high federal interest pursuant to 43 CFR 3461.1 (n-1). Its substantial valued use areas are riparian habitats characterized by cottonwood stands and the continum of habitats extending from the pinion-juniper forest into shrublands of the submontane ecological association. The oriole's nest is characterized as a grassy pouch and is hung in a tree. It is important to note that the Scott's oriole has never been documented to utilize the environs of the biogeographic area that surrounds the project site. In areas of the State where it is known to exist, it is a summer resident with a relative abundance considered to be uncommon.

Mammals--Species Occurrence and Use Areas

Eighty-four species of mammals, of which 25 percent are protected, are known to inhabit the biogeographic area in which the project and adjacent areas are located. It is probable that seventy-four of these species inhabit the project area (Reference the Division Publication No. 78-16). Twenty-six species of the mammals inhabiting the project area have been determined to be of high interest to the State of Utah (Appendix A).

The red bat is a summer resident of the biogeographic area that surrounds the project site. The animal roosts in wooded areas (riparian woods and pin-

ion-juniper forests) of the submontane ecological association. Such areas represent this animals substantial valued use area. An occasional individual has been known to utilize caves; those individuals could hibernate and remain over winter.

The western big-eared bat is a yearlong resident of the biogeographic area that surrounds the project site. This animal roosts and hibernates within caves, mine tunnels or suitable buildings located in the pinion-juniper, shrubland and low elevation spruce-fir habitats of the submontane and montane (Canadian life zone) ecological association. Such areas represent this bats substantial valued use area.

The snowshoe hare is a yearlong resident of the biogeographic area that surrounds the project site. Its relative abundance has been determined to be limited, since its substantial valued use area is restricted to the spruce-fir and nearby aspen and riparian habitats of the montane (Canadian and Hudsonian life zones) ecological association. Such areas are ranked as being of high-priority value to the animal during its breeding season which spans the period between early April and mid-August.

The cottontail rabbit (mountain cottontail inhabits sites lying between 7,000 and 9,000 feet in elevation and the desert cottontail inhabits sites lower than 7,000 feet in elevation) is a yearlong resident of the biogeographic area that surrounds the project site. The entire project area represents a substantial valued use area for cottontails. Their young are born between April and July. This is a crucial period for maintenance of the cottontail population.

The northern flying squirrel is a yearlong resident of the biogeographic area that surrounds the project site. Currently, its relative abundance is unknown. Its substantial valued use area is restricted to spruce-fir or other mixed conifer habitats of the montane (Canadian and Hudsonian life zones) ecological association.

This specie is the only nocturnal squirrel in Utah. The flying squirrel may build its nest within an old woodpecker hole or it may build an outside nest of leaves, twigs and bark. Mating occurs twice in each year--February through March and June through July. Afterwhich, two to six young are born after a gestation period of 40 days--April through May and August through September. These periods are of crucial value to maintenance of their populations. During winter flying squirrels are gregarious; 20 or more have been known to den together.

Beaver are yearlong inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area is restricted to riparian and adjacent aspen habitats (those located within 100 meters of the riparian zone) in the cold desert, submontane and montane (Canadian life zone) ecological associations. These animals construct a conical shaped lodge in which a family group lives throughout the year. The lodge is of critical value to maintenance of the beaver population. One litter of kits is produced each year; they are born between late April and early July after a gestation period of 128 days. Kits and yearlings coinhabit the lodge with the adult pair. When they attain 2 years of age they are forced to leave; females can breed at 2.5 years of age. Due to the animals dependency upon flowing water and the associated riparian vegetation, the riparian wildlife habitat is ranked as being of critical value to beaver populations.

The red fox is a yearlong inhabitant of the biogeographic area that surrounds the project site. The substantial valued use area for the red fox would include all wildlife habitats extending from the cold desert through the montane (Canadian life zone) ecological associations. Almost nothing is known of their population dynamics. Without doubt a crucial period for this specie is when they are caring for young in the den. Dens while being inhabited are a critical use area.

The gray wolf is a historic inhabitant of the biogeographic area that sur-

rounds the project site. Currently its relative abundance is so low that the animal is listed as endangered with extinction. The wolf's substantial valued use area would be represented by any remote habitat in any ecological association.

Black bears are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area is represented by all natural wildlife habitats (excluding the pasture and fields and urban or parks types) extending from the submontane into the montane (Canadian and Hudsonian life zones) ecological associations. These animals go into a semi-hibernation during winter. During this crucial period, which may last from December through March, the animal secrets itself in a den in order to conserve body energy reserves. The young are born in the den during January or February. Dens while being inhabited represent a critical valued use area for bears.

Many of the members of the family mustelidae are known to inhabit the biogeographic area that surrounds the project site. They are all protected and classified as furbearers--short-tailed and long-tailed weasles, mink, wolverine, marten, badger, striped and spotted skunks. Additionally, raccoon and muskrat, although not furbearers, are also inhabitants of the biogeographic area that surrounds the project site. All of these species are of high interest due to their value in the fur market.

The substantial valued use area for short-tailed and long-tailed weasles, mink, muskrat and raccoons is the riparian habitat. Weasles, which are inhabitants of the project site, do make some use of other habitats that are proximal to riparian zones. Muskrats and raccoons are restricted to riparian habitats of the cold desert and submontane ecological association; thus, they are not found on the project area. The long-tailed weasle can be found from the cold desert up into the montane (Canadian and Hudsonian life zones) ecological associations. The short-tailed weasle and mink populations extend their use from the submontane into the montane ecological association. It is important to note that the weasle

is restricted to the Canadian life zone; where as the mink utilize the Canadian and Hudsonian life zones.

The substantial valued use area for marten and wolverine is the montane ecological association. The marten does not utilize the Alpine life zone but the wolverine can be found at that elevation. Both species could be found in the environs of the project site.

The substantial valued use area for badger and skunks span all wildlife habitats other than dense forests in the cold desert, submontane and montane (Canadian life zone) ecological associations. Skunks show some afinity for habitats proximal to water. Skunks and badgers are dependent upon a suitable prey source.

A crucial period for maintenance of all furbearers, raccoons and muskrat populations is when they have young in a nest, den or lodge. Such sites are critical for reproductive success.

Bobcat, Canada lynx and cougar are known to inhabit the biogeographic area that surrounds the project site. For all of these species a crucial period for maintenance of their population is when the female has her young secreted at a den site. Such sites are of critical value when being utilized. It is also crucial to their survival that a female accompanied by young not be killed or harassed.

The substantial valued use area for bobcats extends from the cold desert through the submontane and into the montane (Canadian life zone) ecological association. The bobcat is normally associated with percipitous terrain, but has been observed in every wildlife habitat within the aforementioned ecological associations. Their primary prey source is represented by small mammals and birds or any other small animal they can catch. It is important to note that bobcats occasionally do kill the young of big game animals.

The substantial valued use area for the Canada lynx is restricted to the

Canadian and Hudsonian life zones of the montane ecological association. Normally, this cat would only be expected to utilize riparian and forested wildlife habitats. The lynx is similar in predation habits to the bobcat.

The substantial valued use area for the cougar (locally known as mountain lion) extends from the submontane into the montane (Canadian and Hudsonian life zone) ecological association. Due to the dependency of the cougar upon mule deer as a prey source, a ranking of the lion's seasonal distribution parallels that of the deer.

Mule deer are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats extending from the cold desert through the submontane and montane ecological associations. In some situations deer show altitudinal migrations in response to winter conditions. There are, however, habitats where deer reside on a yearlong basis (see attached map).

Migration of mule deer from summer range to winter range is initiated during late October; probably, the annual disturbance of the fall hunting season coupled with changing weather conditions is the initial stimulus. The onset of winter weather reinforces the deer's urge to migrate and continued adverse weather keeps the deer on the winter range.

A portion of the project site represents winter range for mule deer herd Unit 35. Winter ranges for mule deer are all ranked as being of high-priority value to the animal; these areas are usually inhabited between November 1 and May 15 each year. During winters with severe conditions the higher elevation portion of the winter range becomes unavailable to deer due to snow depth. Traditionally, some restricted portions of the winter range have shown concentrated use by the deer; these sites are ranked as being of critical value. It is important to note that all of the canyon bottoms associated with the project are of critical value to deer. Critical valued sites must be protected from

man's disturbance when the deer are physically present on the range.

Deer begin their migration back to summer range during mid-May and remain there throughout October. Summer ranges on the project area represent deer herd Unit 35. They are ranked as being of high-priority value to mule deer. In instances where extent of summer range is the major limiting factor for a deer herd, those summer ranges are ranked as being of critical value.

There are ranges that support mule deer on a yearlong basis. Most of these ranges are of limited value to deer. However, there are some areas supporting yearlong use that are ranked as being of high-priority value to deer. There are no yearlong ranges for mule deer on the project site.

Mule deer fawn during the month of June. The continum of wildlife habitats extending from the pinion-juniper through the shrubland and into the aspen type probably represents the fawning area. All riparian areas are of critical value for fawning and maintenance of the deer population. To date no specific areas showing annual use for fawning are known. It is probable that such areas exist; they would be ranked as being of critical value to deer. It is important to note that June represents a crucial period for maintenance of deer populations.

Agriculture areas that are bisected by the access route to the project area are utilized yearlong by mule deer. Their use is sometimes intensified during the winter and spring periods.

Moose are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats in the montane ecological association except those associated with the Alpine life zone. In some situations moose show altitudinal migrations in response to winter conditions. There are, however, habitats where moose reside on a yearlong basis (see attached map).

Migration of moose from summer range to winter range is initiated during late November; probably, changing weather conditions is the initial stimulus.

The onset of winter weather reinforces the moose's urge to migrate and continued adverse weather keeps the animal on the winter range.

The project site represents substantial valued, yearlong range for the Southeastern Utah moose herd--Joe's Valley drainage. Seasonal use areas for moose proximal to the project have not yet been established. On a regional basis winter ranges for moose that are characterized as riparian habitats are ranked as being of critical value, where as the remainder of the winter ranges are ranked as being of high-priority value to the animal. Winter ranges are usually inhabited by moose between December 1 and May 15 each year. During winters with severe conditions the higher elevation portion of the winter range becomes unavailable to moose due to snow depth. Critical valued sites must be protected from man's disturbance when the moose are physically present on the range.

Moose begin their migration back to summer range during mid-May and remain there throughout November. Summer ranges are ranked as being of high-priority value.

Moose calf during late May and June. Calving takes place in the riparian or adjacent forest habitats. Generally speaking, all riparian areas that have demonstrated preference for use by moose are of critical value for calving and maintenance of their population. To date no specific areas proximal to the project and showing annual use for calving are known. If such areas did exist, they would be ranked as being of critical value to moose. It is important to note that June represents a crucial period for maintenance of moose populations.

Rocky mountain elk are inhabitants of the biogeographic area that surrounds the project site. Their substantial valued use area spans all wildlife habitats

extending from the submontane through the montane ecological association. Elk do not show as strong of altitudinal migration as mule deer do in response to winter conditions, but they do migrate to wintering areas (see attached map).

Migration of elk from summer range to winter range is initiated during late October; probably, the annual disturbance of the fall hunting seasons coupled with changing weather conditions is the initial stimulus. The onset of winter weather reinforces the elk's urge to migrate and continued adverse weather keeps elk on the winter range.

A portion of the project site represents winter range for the Manti elk herd--Unit 12. Winter ranges for elk are all ranked as being of high-priority value to the animal; these areas are usually inhabited between November 1 and May 15 each year. During winters with severe conditions some portions of the winter range becomes unavailable to elk due to snow depth. Traditionally, some restricted portions of the winter range have shown concentrated use by the elk; these sites are ranked as being of critical value. The high ridges associated with the project are critical winter ranges for elk. Critical valued sites must be protected from man's disturbance when the elk are physically present on the range.

Elk begin their migration back to summer range during mid-May and remain there throughout October. Summer ranges on the project area support the Manti elk herd--Unit 12; they are ranked as being of high-priority value.

Elk calf during the month of June. Their preferred calving areas are best described as aspen forests with lush understory vegetation. All riparian areas on the summer range are of critical value for calving and maintenance of the elk population. To date no specific areas showing annual use for calving are known. It is probable that such areas exist; they would be ranked as being of critical value to elk. It is important to note that June represents a crucial period for maintenance of elk populations.

Currently, there are no other known high interest wildlife species or their habitat use areas on or adjacent to the project area. It is not unreasonable to suspect that in the future, some additional species of wildlife may become of high interest to the local area, Utah or the Nation. If such is the case, the required periodic updates of project permits and reclamation plans can be adjusted and appropriate recommendations made.

SPECIES LIST OF VERTEBRATE WILDLIFE
THAT INHABIT SOUTHEASTERN UTAH

APPENDIX 4

SPECIES LIST OF VERTEBRATE WILDLIFE

THAT INHABIT SOUTHEASTERN UTAH

APPENDIX A

SPECIES LIST OF VERTEBRATE WILDLIFE

THAT INHABIT SOUTHEASTERN UTAH

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Douglas F. Day, Director

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The status and population trend for individual species is a product of the experience of the authors and others who have professional experience with the wildlife resource in southeastern Utah.

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TABLE OF CONTENTS

	Page
INTRODUCTION	1
SPECIES LIST	3
Fishes	3
Amphibians	6
Reptiles	8
Birds	14
Mammals	48
SUMMARY OF HIGH INTEREST SPECIES	67
LITERATURE CITED	68

LIST OF TABLES

Page

Table 1. List of Game Species and Region of Inhabitation within Utah 63
Big Game 63
Fishes 63
Furbearers 64
Migratory Game Birds 64
Small Game - Mammals 65
Small Game - Upland Birds 66

Table 2. Classification of the 466 Species of Vertebrate Wildlife. 67

SPECIES LIST OF VERTEBRATE WILDLIFE THAT INHABIT SOUTHEASTERN UTAH

Utah is believed to be inhabited by 734 species of vertebrate wildlife. Four hundred forty-five of these species are protected: 2 amphibians, 2 reptiles, 26 mammals, 58 fish and 357 birds. One hundred of the protected species are game species: 10 species of big game; 20, fish; 10, furbearers; 43, migratory game birds; 5, small game mammals; and 12, upland, small game birds. Table 1 provides a comparison of inhabitation by game species between Utah Division of Wildlife Resource's five regions.

Southeastern Utah is inhabited by 466 species of vertebrate wildlife in six biogeographic areas (Table 2). Three hundred forty-three of these species are protected: 2 amphibians, 26 mammals, 38 fish and 277 birds. Seventy-nine of the protected species that inhabit southeastern Utah are game species: 9 species of big game; 13, game fish; 9, furbearers, 35, migratory game birds; 4, small game mammals; and 9, upland, small game birds.

Southeastern Utah has been divided into six biogeographic areas. Each area allows an overlap of wildlife species that inhabit contiguous low and high elevation areas. This procedure was utilized to reduce any controversy that would normally arise from a "sharp line" drawn on a map.

A- Wasatch Plateau extending east from Skyline Drive to Highway 10 and bounded on the north by Highway 6 and on the south by Interstate 70.

B- West Tavaputs Plateau including all drainages into the Price River drainage from Soldier's Summit east along Reservation Ridge and including the drainages into Argyle, Nine Mile and Minnie Maud creeks; bounded on the east by the Green River and south and west by Highway 6.

C- East Tavaputs Plateau bounded on the east by the Colorado-Utah state line; on the south by Interstate 70; on the west by the Green River and on the north by Uintah-Ouray Indian Reservation and the Uintah-Grand county line.

D- San Rafael Swell and San Rafael Desert bounded by Highway 6 on the north; Highway 10 on the west; the Green River on the east and the Emery-Wayne county line on the south.

E- Henry Mountains and Burr Desert bounded on the north by Emery-Wayne county line; the Green and Colorado rivers on the east; Lake Powell on the south and Capitol Reef National Park and the Waterpocket Fold on the west.

F- Mountains and deserts of Grand and San Juan counties south of Interstate Highway 70 and north of the San Juan River bounded on the east by the Utah-Colorado border and on the west by the Green and Colorado rivers and Lake Powell.

Each species is listed by common name followed by the generic and specific nomenclature. The status for each species was determined by the authors after evaluation and consultation from several sources. The listing for mammals was developed from Sparks (1974), Burt and Grossenheider (1976) and Durrant (1952). The primary sources consulted in compiling the bird list were Behle and Perry (1975) and Hayward et al. (1976) although, Peterson (1969), Robbins et al. (1966) and Udvardy and Rayfield (1977) were also used.

Holden (1973), Bailey et al. (1970), Eddy (1969) and Sigler and Miller (1963) were consulted for preparation of the list of fishes.

The status of reptiles and amphibians was determined through discussion with local herpetologists. The phylogenetic listing is after Stebbins (1966). Tanner (1975) was consulted for species inhabiting Utah.

The following code letters are given for each species to describe its status.

K Status unknown - It is believed that these species are present, but little is known of their population dynamics.
C Common - These species are widespread and abundant.
U Uncommon - These species are widespread, but not abundant.
R Rare - These species are seldom identified during any one year.
O Occasional - These species are periodically identified during a long term period--10-50 years.
A Accidental - Distribution for these species does not normally include this area. Sightings are as far between as 50 to 100 years.
E Endangered - These species are endangered with extinction or extirpation from wildland in Utah.
T Threatened - These species are threatened with becoming endangered in Utah.
L Limited - These species are common but restricted to a particular use area or habitat type in Utah.
X Extirpated - These species have disappeared from wildland habitats in Utah.
P Protected - These species are protected by state or federal laws in Utah.
N Nonprotected - These species are not protected by any laws in Utah.

The following terminology is used to describe the seasonal status for avian species.

Transient - These species pass through southeastern Utah twice a year during their migratory travels.

Resident - These species occur yearlong in southeastern Utah.

Summer Resident - These species breed in southeastern Utah and migrate elsewhere for the winter.

Winter Resident - These species breed elsewhere but winter in southeastern Utah.

Note, the species marked with an asteric (*) are of high interest to the State and those marked with an exclamation mark(!) have potential to inhabit the environs of the project area. *(High interest species are those defined as being of economic importance from either a consumptive or non-consumptive perspective, or having special aesthetic; scientific; educational or ecological significance.)*

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Fishes -- 38 species in southeastern Utah				
Family Clupeidae				
Threadfin Shad (Dorosoma petenense)	E,F	L-P	Stable	Lake-pelagic areas
Family Salmonidae				
* Cutthroat Trout (Salmo clarki)	A,B,D,F	C-P	Stable	Lakes-rocky shores, deep pelagic water; river-pools, riffles, and overhanging banks
* Rainbow Trout (Salmo gairdneri)	A,B,E,F,	C-P	Stable	Lake-littoral and pelagic areas rivers-pools, riffles, overhanging banks
* Brown Trout (Salmo trutta)	A,B,E,F	C-P	Stable	Lake-pelagic and littoral areas rivers-pools, riffles, and overhanging banks
* Brook Trout (Salvelinus fontinalis)	A,F	L-P	Stable	Lake-pelagic and littoral areas
Family Esocidae				
* Northern Pike (Esox lucius)	E,F	L-P	Unknown	Lake-littoral areas with submerged trees and brush
Family Cyprinidae				
Longfin Dace (Agosia chrysogaster)	E,F	K-P	Unknown	Unknown
Carp (Cyprinus carpio)	A,B,C,D,E,F	C-P	Stable	Lakes-littoral areas; quiet water areas in rivers, ponds, sloughs, creeks, and irrigation ditches
Utah Chub (Gila atraria)	A,B	L-P	Abundant	Irrigation ditches, ponds, sloughs, creeks, rivers, and lakes

ecies	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Leatherside Chub (Gila copei)	A,E	C-P	Stable	Pool and riffle areas
* Humpback Chub (Gila cypha)	B	E-P	Decreasing	Eddies and backwaters
* Bonytail Chub Gila elegans)	B,C,F	E-P	Decreasing	Main channels of large rivers
Roundtail Chub (Gila robusta)	B,C,D,E,F	C-P	Stable	Riffles and stagnant backwater
Red Shiner (Notropis lutrensis)	B,C,D,E,F	C-P	Increasing	Riffles, pools, backwaters, and eddies
San Shiner (Notropis stramineus)	F	C-P	Increasing	Riffles, pools, backwaters, and eddies
Fathead Minnow (Pimephales promelas)	B,C,D,E,F	C-P	Stable	Pools and backwaters
* Colorado Squawfish (Ptychocheilus lucius)	B,C,D,E,F	E-P	Decreasing	Slow waters, eddies, backwaters and large pools
* Longnose Dace (Rhinichtys cataractae)	A	K-P	Unknown	Pools and riffles
Speckled Dace (Rhinichtys osculus)	A,B,C,D,E,F	C-P	Stable	Pools and riffles
Redside Shiner (Richardsonius balteatus)	A,B,D	C-P	Stable	Lakes, creeks and rivers
Family Catostomidae				
White Sucker (Catostomus commersoni)	E,F	U-P	Unknown	Unknown
Bluehead Sucker (Catostomus discobolus)	A,B,C,D,E,F	C-P	Unknown	Pools, riffles and lakes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Flannelmouth Sucker (Catostomus latipinnis)	B,C,D,E,F	C-P	Stable	Pools and riffles
! Mountain Sucker (Catostomus platyrhynchus)	A	L-P	Stable	Pools and riffles
* Humpback Sucker (Xyrauchen texanus)	B,C,D,E,F	R-P	Decreasing	Large rivers with strong currents
Family Ictaluridae				
* Black Bullhead (Ictalurus melas)	B,C,D,E,F	C-P	Stable	Pools, quiet water and lakes
* Yellow Bullhead (Ictalurus natalis)	E,F	R-P	Stable	Quiet water areas and lakes
* Channel Catfish (Ictalurus punctatus)	B,C,D,E,F	C-P	Stable	Pools, riffles, quiet water areas and lakes
Family Cyprinodontidae				
Plains Killifish (Fundulus kansae)	F	R-P	Stable	Quiet water areas
Family Poeciliidae				
Mosquito fish (Gambusia affinis)	F	R-P	Stable	Quiet water areas
Family Cottidae				
!* Mottled Sculpin (Cottus bairdi)	A	C-P	Stable	Rocky riffles and pool areas
Family Percichtyidae				
* Striped Bass (Morone saxatilis)	E,F	C-P	Increasing	Lake-pelagic areas
Family Centrarchidae				
Green Sunfish (Lepomis cyanellus)	B,C,D,E,F	C-P	Stable	Quiet backwaters and lakes
* Bluegill (Lepomis macrochirus)	E,F	C-P	Stable	Lakes-littoral areas with rocky shores and submerged brush

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Largemouth Bass (Micropterus salmoides)	A,B,C,D,E,F	C-P	Stable	Rivers-quiet water areas; lakes-littoral rocky areas, with submerged brush
* Black Crappie (Pomoxis nigromaculatus)	E,F	C-P	Stable	Lake-littoral zone around submerged brush and trees, and pelagic areas
Family Percidae				
* Perch (Perca flavescens)	F	U-P	Unknown	Unknown
* Walleye (Stizostedion vitreum)	E,F	C-P	Stable	Lake-deep water around rocky bottoms
Amphibians -- 11 species in southeastern Utah				
Family Ambystomatidae				
! * Tiger Salamander (Ambystoma tigrinum)	A,B,C,D,E,F	K-P	Unknown	Quiet water of ponds, reservoirs, lakes, temporary rain pools and streams from arid sagebrush plains to rolling grasslands, mountain meadows and forests
Family Pelobatidae				
! Great Basin Spadefoot Toad (Scaphiopus intermontanus)	A,B,C,D,E,F	C-P	Unknown	Sagebrush flats, pinion-juniper woodlands to high elevations in spruce-fir communities

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Western Spadefoot Toad (Scaphiopus hammondi)	F	K-P	Unknown	Washes, alkali flats, foothills, mountain valleys, in open vegetation and shortgrass, where soil is sandy and/or gravelly
Family Bufonidae				
! Western Toad (Bufo boreas)	A	K-P	Unknown	Desert streams, springs, grasslands, woodlands, and mountain meadows
Red Spotted Toad (Bufo punctatus)	D,E,F,	C-P	Unknown	Open grassland and rocky canyons
! Woodhouse's Toad (Bufo woodhousei)	A,B,C,D,E,F	C-P	Unknown	Grassland, sagebrush flats, woods, desert streams, valleys, flood plains, farms, and city backyards
Great Plains Toad (Bufo cognatus)	C,D,E,F,	C-P	Unknown	Prairies, deserts, quiet water of streams, grasslands and sagebrush plains
Family Hylidae				
! Chorus Frog (Pseudacris triseriata)	A,B,C,D,F	C-P	Unknown	Grassy pools, lakes, and marshes of prairies or mountains

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Canyon Tree Frog (Hyla arenicolor)	E,F	L-P	Unknown	Intermittant or permanent streams with rocky pools in canyons with cottonwoods or other trees
Family Ranidae				
*Bullfrog (Rana catesbeiana)	F	L-P	Declining	Colorado River-usually quiet water where there is thick growth of aquatic vegetation
! Leopard Frog (Rana pipiens)	A,B,C,D,E,F	C-P	Unknown	Springs, creeks, rivers, ponds, canals, reservoirs and wet meadows
eptiles -- 36 species in southeastern Utah				
Family Iguanidae				
∞ *Chuckwalla (Sauromalus obesus)	E,F	L-P	Unknown	Rocky hillsides
! Collared Lizard (Crotaphytus collaris)	A,B,C,D,E,F	C-P	Unknown	Canyons, rocky gullies, mountain slopes and boulder strewn alluvial fans where vegetation is sparse
Leopard Lizard (Crotaphytus wislizenii)	A,B,C,D,E,F	C-P	Unknown	Arid and semi-arid plains with bunchgrass, sagebrush or other low desert shrub communities; avoids dense vegetation
Lesser Earless Lizard (Holbrookia maculata)	F	K-P	Unknown	Washes, sandy stream banks and sand dunes on shortgrass prairi and farmlands

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Eastern Fence Lizard (Sceloporus undulatus)	A,B,C,D,E,F	C-P	Unknown	Forest, woodlands, prairie, brushy flatlands, sand dunes, rocky hillsides and farmlands
Desert Spiny Lizard (Sceloporus magister)	D,E,F	C-P	Unknown	Shadscale deserts, pinion-juniper woodland, willows and cottonwoods.
! Sagebrush Lizard (Sceloporus graciosus)	A,B,C,D,E,F	C-P	Unknown	Variety of habitat types; sagebrush, pinion-juniper, low desert shrub and rocklands
! Tree Lizard (Urosaurus ornatus)	A,B,C,D,E,F	C-P	Unknown	Trees and rocks
! Side-blotched Lizard (Uta stansburiana)	A,B,C,D,E,F	C-P	Unknown	Inhabits a variety of habitat types; sandy washes with scattered rocks and low growing shrubs
Desert Horned Lizard (Phrynosoma platyrhinos)	E	K-P	Unknown	Along washes at the edge of dunes in saltbrush and sagebrush areas
! Short-horned Lizard (Phrynosoma douglassi)	A,B,C,D,E,F	C-P	Unknown	Desert grassland, sagebrush, pinion-juniper, pine-spruce and spruce-fir associations, extending from desert shrub to mountain habitats

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Xantusiidae				
* Utah Night Lizard (Xantusia vigilis)	E,F	L-P	Unknown	Dead clumps of yucca plants and woodrat middens
Family Teiidae				
Plateau Whiptail (Cnemidophorus velox)	F	K-P	Unknown	Mountains in pinion-juniper woodland and lower edges of ponderosa pine forests
Western Whiptail (Cnemidophorus tigris)	A,B,C,D,E,F	C-P	Unknown	Desert shrub communities where plants are sparse and there are open areas for running
Family Scincidae				
Many-lined Skink (Eumeces multivirgatus)	E,F	K-P	Unknown	Shortgrass prairie that extends into the mountains; often vacant lots, city dumps and backyards
Western Skink (Eumeces skiltonianus)	C	K-P	Unknown	Grasslands, woodlands and forests in rocky habitat near streams with abundant cover
Family Boidae				
! Rubber Boa (Charina bottae)	A	C-P	Unknown	Grasslands, woodlands, and forests with rotting logs; often found under rocks and under the bark of fallen or standing dead trees

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Colubridae				
Smooth Green Snake (Opheodrys vernalis)	F	K-P	Unknown	Damp grassy environment
! Striped Whipsnake (Masticophis taeniatus)	A,B,C,D,E,F	C-P	Unknown	Brushlands, grasslands, sagebrush flats, pinion-juniper woodlands and open pine forests
Coachwhip (Masticophis flagellum)	E,F	K-P	Unknown	Utilizes a variety of habitats but avoids dense vegetation; rodent burrows, rocks and branches are used
! Racer (Coluber constrictor)	A,B,C,D,E,F	C-P	Unknown	Meadows, sparse brush and forest openings with semi-arid and moist areas; grassy places near rocks and logs are preferred
Corn Snake (Elaphe guttata)	F	K-P	Unknown	Stream and river bottoms, rocky wooded hillsides, coniferous forests, and farmland with rodent burrows, rocks and logs
! Ringneck Snake (Diadophis punctatus)	A	K-P	Unknown	Moist habitats usually in the mountains or along stream and river bottoms

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Gopher Snake (Pituophis melanoleucus)	A,B,C,D,E,F	C- P	Unknown	Lowlands to high mountains including desert, coniferous

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Black-necked Garter Snake (Thamnophis cyrtopsis)	F	K-P	Unknown	Desert and grasslands
Western Black-headed Snake (Tantilla planiceps)	E,F	K-P	Unknown	Grasslands, woodlands and deserts; often found under rocks and logs
Night Snake (Hypsiglena torquata)	A,B,C,D,E,F	C-P	Unknown	Plains, sagebrush flats, desert and woodlands; often found under rocks and surface litter
Family Crotalidae				
Hopi Rattlesnake (Crotalus viridis nuntius)	E	U-P	Unknown	Prefers rock piles and rodent burrows on grasslands, brushlands, woodlands and forests; avoids sparsely vegetated deserts
Prairie Rattlesnake (Crotalus viridis viridis)	F	U-P	Unknown	Prefers rock piles and rodent burrows on grasslands, woodlands and forests; avoids sparsely vegetated deserts
Midget Faded Rattlesnake (Crotalus viridis concolor)	A,B,C,D,E,F	C-P	Unknown	Prefers rock piles and rodent burrows on grasslands, brushlands, woodlands and forests; avoids sparsely vegetated deserts

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Birds -- 278 species in southeastern Utah				
Order Gaviiformes				
Family Gaviidae				
Common Loon (Gavia immer)	A,B,C,D,E,F	U-P transient and winter resident	Stable	Lakes of coniferous forests, open lakes, reservoirs and bays
Order Podicipediformes				
Family Podicipedidae				
Horned Grebe (Podiceps auritus)	A,B,C,D,E,F	R-P transient and summer resident	Stable	Lakes, ponds and reservoirs
Eared Grebe (Podiceps nigricollis)	A,B,C,D,E,F	C-P summer resident	Stable	Lakes, bays and reservoirs
* Western Grebe (Aechmophorus occidentalis)	A,B,C,D,E,F	K-P summer resident	Unknown	Sloughs, bays and reservoirs and lakes with emergent vegetation for nesting
Pied-billed Grebe (Podilymbus podiceps)	A,B,C,D,E,F	C-P summer resident	Stable	Ponds, lakes, streams and marshes
Order Pelecaniformes				
Family Pelecanidae				
* White Pelican (Pelecanus erythrorhynchos)	A,B,C,D,E,F	L-P transient and summer resident	Stable	Larger shallow bodies of water and large rivers
Family Phalacrocoracidae				
* Double-crested Cormorant (Phalacrocorax auritus)	A,B,C,D,E,F	K-P summer resident	Unknown	Bays, lakes and rivers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Anseriformes Family Anatidae				
* Whistling Swan (Olor columbianus)	A,B,C,D,E,F	O-P winter resident C-P transient	Stable	Lakes, large rivers and fields
* Trumpeter Swan (Olor buccinator)	B,C,D,E,F	R-P transient	Unknown	Lakes and large rivers
* Canada Goose (Branta canadensis)	A,B,C,D,E,F	C-P resident and transient	Increasing	Lakes, bays, marshes, rivers and grainfields
*White-fronted Goose (Anser albifrons)	A,B,C,D,E,F	R-P transient	Stable	Marshes, fields, lakes and bays
*Snow Goose (Chen caerulescens)	A,B,C,D,E,F	U-P transient	Stable	Marshes, grainfields, reservoir, ponds and bays
* Ross' Goose (Chen rossii)	A,B,C,D,E,F	O-P transient	Stable	Marshes, grainfields, prairies, ponds and bays
* Mallard (Anas platyrhynchos)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, irrigated land, grainfields, ponds, rive lakes, bays and reservoi extending from lowlands mountains
*Gadwall (Anas strepera)	A,B,C,D,E,F	C-P resident and transient	Stable	Lakes, ponds, rivers and marshes
* Pintail (Anas acuta)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, grainfields, ponds, lakes and reservoirs

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Ciconiiformes				
Family Ardeidae				
*Great Blue Heron (Ardea herodias)	A,B,C,D,E,F	K-P resident	Unknown	Marshes, shallow reservoirs, rivers, streams, shores and irrigation ditches
Green Heron (Butorides striatus)	B,E,F	R-P transient	Unknown	Marshes, wooded streams, rivers, small ponds and lake margins
Cattle Egret (Bubulcus ibis)	E,F	O-P transient	Unknown	Marshes, lake margins, and irrigated lands
Snowy Egret (Egretta thula)	A,B,C,D,E,F	C-P summer resident	Stable	Marshes, ponds, lake margins and irrigated land
Black-crowned Night Heron (Nycticorax nycticorax)	A,B,C,D,E,F	C-P summer resident	Stable	Marshes, lake margins and shores
Least Bittern (Ixobrychus exilis)	D,E,F	U-P transient	Unknown	Densely vegetated marshes
American Bittern (Botaurus lentiginosus)	A,B,C,D,E,F	U-P summer resident	Stable	Densely vegetated marshe
Family Ciconiidae				
Wood Stork (Mycteria americana)	D,E,F	O-P transient	Unknown	Marshes, ponds and lake margins
Family Threskiornithidae				
*White-faced Ibis (Plegadis chihi)	A,B,C,D,E,F	K-P summer resident	Unknown	Marshes and irrigated land

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*Green-winged Teal (Anas crecca)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, lakes, ponds, rivers and bays
*Blue-winged Teal (Anas discors)	A,B,C,D,E,F	U-P resident and transient	Stable	Ponds and marshes
*Cinnamon Teal (Anas cyanoptera)	A,B,C,D,E,F	C-P resident and transient	Stable	Stock ponds, rivers, marshes and lakes
*American Widgeon (Anas americana)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, irrigated land, ponds, lakes and bays
* Northern Shoveler (Anas clypeata)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, ponds and sloughs
*Wood Duck (Aix sponsa)	A,B,C,D,E,F	R-P transient	Stable	Wooded rivers and ponds
*Redhead (Aythya americana)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes with some deep water, lakes and reservoirs
*Ring-necked Duck (Aythya collaris)	A,B,C,D,E,F	U-P transient	Stable	Coniferous lakes, wooded ponds, marshes and reservoirs
*Canvasback (Aythya valisineria)	A,B,C,D,E,F	C-P transient R-P summer resident	Stable	Marshes, lakes and reservoirs

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*Greater Scaup (Aythya marila)	A,B,C,D,E,F	U-P transient	Stable	Lakes, rivers and ponds
*Lesser Scaup (Aythya affinis)	A,B,C,D,E,F	C-P transient	Stable	Marshes, ponds and lakes
*Common Goldeneye (Bucephala clanguia)	A,B,C,D,E,F	U-P transient	Stable	Lakes and rivers
*Bufflehead (Bucephala albeola)	A,B,C,D,E,F	U-P transient	Stable	Lakes, ponds and rivers
*White-winged Scoter (Melanitta deglandi)	D	O-P transient	Stable	Large lakes and reservoirs. Recorded occurrence at Desert Lake WMA
*Ruddy Duck (Oxyura jamaicensis)	A,B,C,D,E,F	C-P resident and transient	Stable	Marshes, ponds, rivers and reservoirs
*Hooded Merganser (Mergus cucullatus)	A,B,C,D,E,F	R-P transient	Stable	Wooded lakes, ponds, rivers and reservoirs
*Common Merganser (Mergus merganser)	A,B,C,D,E,F	C-P transient U-P winter resident	Stable	Wooded lakes and rivers in summer; in winter, open rivers, lakes and ponds
*Red-breasted Merganser (Mergus serrator)	A,B,C,D,E,F	C-P transient	Stable	Lakes, reservoirs and rivers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Falconiformes				
Family Cathartidae				
!*Turkey Vulture (Cathartes aura)	A,B,C,D,E,F	C-P summer resident	Stable	Usually seen in sky or perched on dead trees, posts, carrion or on groun
!California Condor (Gymnogyps californianus)	A,B,C,D,E,F	X-P	Extirpated	Usually seen in sky or perched on dead trees, posts, carrion or on groun
Family Accipitridae				
!*Goshawk (Accipiter gentilis)	A,B,C,D,E,F	U-P resident	Stable	Mountain woodlands
!*Sharp-shinned Hawk (Accipiter striatus)	A,B,C,D,E,F	U-P resident and transient	Stable	Forests, thickets, scrubоak, desert riparian, mountain woodlands and aspen
!*Cooper's Hawk (Accipiter cooperii)	A,B,C,D,E,F	C-P summer resident and transient. R-P winter resident	Stable	Broken woodlands, dry wooded canyons, riparian areas, pinion-juniper and conifers
!*Red-tailed Hawk (Buteo jamaicensis)	A,B,C,D,E,F	C-P resident	Stable	Open country, woodlands, mountains and deserts
*Red-shouldered Hawk (Buteo lineatus)	C,F	A-P transient	Unknown	Broken woodlands, primarily along lowland rivers and often close to cultivated fields
!* Swainson's Hawk (Buteo swainsoni)	A,B,C,D,E,F	U-P summer resident	Stable	Dry plains and rangeland with hills; open forest or alpine meadows with sparse trees

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Rough-legged Hawk (Buteo lagopus)	A,B,C,D,E,F	C-P winter resident	Stable	Open country, woodlands, deserts and marshes
* Ferruginous Hawk (Buteo regalis)	A,B,C,D,E,F	U-P summer resident R-P winter resident	Stable	Open desert; infrequentl marshes and farmlands are utilized
!* Golden Eagle (Aquila chrysaetos)	A,B,C,D,E,F	C-P resident	Stable	Open mountains, foot-hills, canyons and deser
!*Bald Eagle (Haliaeetus leucocephalus)	A,B,C,D,E,F	E-P winter resident	Increasing	Lakes, rivers and marsh surrounded by open country with available perching sites
*Marsh Hawk (Circus cyaneus)	A,B,C,D,E,F	C-P resident	Stable	Marshes, fields and prairies
Family Pandionidae				
*Osprey (Pandion haliaetus)	A,B,C,D,E,F	U-P transient	Stable	Rivers, lakes and large bodies of water
Family Falconidae				
! *Prairie Falcon (Falco mexicanus)	A,B,C,D,E,F	C-P resident	Stable	Canyons, open habitat in mountains, plains and deserts
!*Peregrine Falcon (Falco peregrinus)	A,B,C,D,E,F	E-P resident	Unknown	Canyons, high cliffs, rivers, marshlands and deserts
*Merlin (Falco columbarius)	A,B,C,D,E,F	K-P winter resident	Unknown	Open country and foot-hills; often associated with flocking passerine

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* American Kestrel (Falco sparverius)	A,B,C,D,E,F	C-P summer resident U-P winter resident	Stable	Open country, prairies, deserts, wooded streams, farmland and cities
Order Galliformes				
Family Tetraonidae				
! * Blue Grouse (Dendragapus obscurus)	A,B,C,D,E,F	C-P resident	Stable	Coniferous forests, aspen, mountain brush, open slash and burns
! * Ruffed Grouse (Bonasa umbellus)	A,B	C-P resident	Stable	Aspen and coniferous forests near stream courses
! * Sage Grouse (Centrocercus urophasianus)	A,B,C,F	C-P resident	Stable	Sagebrush plains associated with pasture lands; sagebrush parks associated with wet meadows.
Family Phasianidae				
* California Quail (Lophortyx californicus)	A,B,D,E,F	C-P resident	Stable	Mountain brush, woodland edges and farmlands near river bottoms
* Gambels Quail (Lophortyx gambelii)	D,E,F	C-P resident	Stable	Desert thickets, usually near water
* Chukar (Alectoris chukar)	A,B,C,D,E,F	C-P resident	Stable	Rocky, grassy or brushy slopes in arid mountains and canyons
* Ring-necked Pheasant (Phasianus colchicus)	A,B,C,D,E,F	C-P resident	Decreasing	Irrigated cropland, pastureland, wetlands and desert washes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* White-winged Pheasant (Phasianus colchicus)	E,F	L-P resident	Decreasing	Irrigated cropland, pastureland and wetland: near Hanksville and Bluff, Utah
Family Meleagrididae				
*Merriam's Turkey (Meleagris gallapavo)	F	L-P resident	Stable	Mountainous regions with Ponderosa pine, mixed conifer and aspen woodlands or mountain brush
Order Gruiformes				
Family Gruidae				
*Sandhill Crane (Grus canadensis)	A,B,C,D,E,F	L-P transient	Stable	In winter, prairies grainfields and marshes in summer, mountain meadows and marshes
Family Rallidae				
*Virginia Rail (Rallus limicola)	A,B,C,D,E,F	C-P resident	Stable	Marshes
*Sora Rail (Porzana carolina)	A,B,C,D,E,F	U-P resident	Stable	Marshes and wet meadows
*Common Gallinule (Gallinula chloropus)	A,D	R-P transient	Unknown	Marshes, wet meadows, lakes with bulrush or cattails and sedges
*American Coot (Fulica americana)	A,B,C,D,E,F	C-P resident and transient	Stable	Ponds, lakes, marshes, and agricultural lands adjacent to wetland habitats.
Order Charadriiformes				
Family Charadriidae				
Semipalmated Plover (Charadrius semipalmatus)	A,B,C,D,E,F	U-P transient	Stable	Shores of marshes, reservoirs and mudflats

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*Snowy Plover (Charadrius alexandrinus)	A,B,C,D,E,F	K-P transient	Unknown	Alkali and sand flats
Killdeer (Charadrius vociferus)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Fields and pastures, lawns, riverbanks, irrigated land, shores, plowed fields, alkali flats and gravel roads
! Mountain Plover (Charadrius montanus)	A,B,C,F	R-P transient	Stable	Semi-arid grasslands, plains and plateaus
American Golden Plover (Pluvialis dominica)	A,B,C,D,E,F	U-P transient	Stable	Prairies, mudflats and shores
Black-bellied Plover (Pluvialis squatarola)	A,B,C,D,E,F	C-P transient	Stable	Mudflats, open marshes and shores
Family Scolopacidae				
* Common Snipe (Capella gallinago)	A,B,C,D,E,F	C-P resident	Stable	Marshes, irrigation ditches, stream sides, and wet meadows
* Long-billed Curlew (Numenius americanus)	A,B,C,D,E,F	K-P summer resident and transient	Unknown	Meadows, pastures and wetlands
* Willet (Catoptrophorus semipalmatus)	A,B,C,D,E,F	K-P summer resident and transient	Unknown	Marshes, wet meadows and muddy shores
! Spotted Sandpiper (Tringa macularia)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Pebbly lake shores, ponds and stream sides

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Solitary Sandpiper (Tringa solitaria)	A,B,C,D,E,F	U-P transient	Stable	Stream sides, ponds and marshes
Greater Yellowlegs (Tringa melanoleuca)	A,B,C,D,E,F	U-P transient	Stable	Open marshes, mudflats, streams and ponds
Lesser Yellowlegs (Tringa flavipes)	A,B,C,D,E,F	C-P transient	Stable	Marshes, mudflats, shores and pond edges
Pectoral Sandpiper (Calidris melanotos)	A,B,C,D,E,F	U-P transient	Stable	Prairie pools and marshy shores
Baird's Sandpiper (Calidris bairdii)	A,B,C,D,E,F	U-P transient	Stable	Rainpools, pond margins mudflats and shores
Least Sandpiper (Calidris minutilla)	A,B,C,D,E,F	C-P transient	Stable	Grassy marshes, rain-pools, shores and alkal mudflats
Western Sandpiper (Calidris mauri)	A,B,C,D,E,F	C-P transient	Stable	Shores, beaches, mud-flats and open marshes
Sanderling (Calidris alba)	A,B,C,D,E,F	U-P transient	Stable	Lake shores
Short-billed Dowitcher (Limnodromus griseus)	A,B,C,D,E,F	U-P summer resident and transient	Stable	Mudflats, open marshes and ponds
Long-billed Dowitcher (Limnodromous scolopaceus)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Mudflats, shallow pools and wetlands

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Marbled Godwit (Limosa fedoa)	A,B,C,D,E,F	C-P transient	Stable	Grasslands and meadows near lakes and shallow lake margins
Family Recurvirostridae				
American Avocet (Recurvirostra americana)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, mudflats, alkaline lakes, shallow ponds and sloughs
Black-necked Stilt (Himantopus mexicanus)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Grassy marshes, alkali mudflats, pools and shallow lakes
Family Phalaropodidae				
Wilson's Phalarope (Phalaropus tricolor)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Shallow lakes, marshes, pools, shores and mudflats
Northern Phalarope (Phalaropus lobatus)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Lakes and ponds
Family Laridae				
Glaucous Gull (Larus hyperboreus)	D	R-P transient	Stable	Recorded using marsh-lands at Desert Lake WMA
Herring Gull (Larus argentatus)	A,B,C,D,E,F	U-P transient	Stable	Lakes, farmlands and dumps
California Gull (Larus californicus)	A,B,C,D,E,F	C-P summer resident	Stable	Lakes, rivers, farm-lands and dumps
Ring-billed Gull (Larus delawarensis)	A,B,C,D,E,F	C-P winter resident	Stable	Lakes, rivers, refuse dumps, fields and cities

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Franklin's Gull (Larus pipixcan)	A,B,C,D,E,F	C-P summer resident	Stable	Prairies, marshes, lakes and plowed fields
Bonaparte's Gull (Larus philidelphia)	A,B,C,D,E,F	U-P transient	Stable	Rivers, lakes and open marshes
Forsters Tern (Sterna forsteri)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, lakes and reservoirs
Common Tern (Sterna hirundo)	A,B,C,D,E,F	U-P transient	Stable	Lakes and reservoirs
Black Tern (Chlidonias niger)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Marshes, lakes and reservoirs
Caspian Tern (Hydroprogne caspia)	A,B,C,D,E,F	U-P transient	Stable	Large lakes and reservoirs
Order Columbiformes Family Columbidae				
! * Band-tailed pigeon (Columba fasciata)	A,E,F	U-P summer resident and transient	Stable	Forests, canyons and foothills near mountain brush (acorns) and agricultural lands
! Rock Dove (Columba lavia)	A,B,C,D,E,F	C-N resident	Stable	Cities, farms and cliffs
! * Mourning Dove (Zenaida macroura)	A,B,C,D,E,F	C-P summer resident and transient	Stable	Farmlands, towns, open woods, grassland and deserts
White-winged Dove (Zenaidura asiatica)	E,F	A-P summer resident and transient	Unknown	Open woods and river bottoms

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Cuculiformes				
Family Cuculidae				
! * Yellow-billed Cuckoo (Coccyzus americanus)	A,B,C,D,E,F	K-P summer resident	Unknown	River thickets and willows
Order Strigiformes				
Family Tytonidae				
! * Barn Owl (Tyto alba)	A,B,C,D,E,F	K-P resident	Unknown	Woodlands, fields, farms, towns, canyons, cliffs and dirt banks
Family Strigidae				
! * Screech Owl (Otus asio)	A,B,C,D,E,F	U-P resident	Stable	Riparian communities and wooded canyons
! * Flammulated Owl (Otus flammeolus)	A,B,C,D,E,F	K-P summer resident	Unknown	Open pine and fir forests in mountains
! * Great Horned Owl (Bubo virginianus)	A,B,C,D,E,F	C-P resident	Stable	Ubiquitous
! * Pygmy Owl (Glaucidium gnoma)	A,B,C,D,E,F	K-P resident	Unknown	Wooded canyons in open coniferous, mixed woodlands and pinion-juniper forests
* Burrowing Owl (Speotyto cunicularia)	A,B,C,D,E,F	L-P resident	Declining	Open grassland, prairies, dikes, desert, farms and prairie dog colonies

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Spotted Owl (Strix occidentalis)	C,E	L-P Unknown	Unknown	Wooded canyons with narrow side canyons in the desert
! * Long-eared Owl (Asio otus)	A,B,C,D,E,F	C-P resident	Stable	River woodlands, pinion-juniper forests, willow thickets and Russian olive trees
* Short-eared Owl (Asio flammeus)	A,B,C,D,E,F	C-P resident	Stable	Marshes, prairies, irrigated land and open country with short vegetation
!* Saw-whet Owl (Aegolius acadicus)	A,B,C,D,E,F	K-P resident	Stable	Forest, conifers and groves
Order Caprimulgiformes Family Caprimulgidae				
! Common Nighthawk (Chordeiles minor)	A,B,C,D,E,F	C-P summer resident	Stable	Treeless plains to mountains with open pine woods; often seen in fli over country side or tov
Lesser Nighthawk (Chordeiles acutipennis)	E	R-P summer resident	Unknown	Arid open scrub, dry grasslands, pastures and desert washes
! Poor-will (Phalaenoptilus nuttallii)	A,B,C,D,E,F	C-P summer resident	Stable	Arid uplands with open pinion-juniper and spars brush; riparian areas ar roadsides

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Apodiformes				
Family Apodidae				
! *Black Swift (Cypseloides niger)	A,B,C,D,E,F	U-P summer resident	Unknown	Open areas in mountain country
! White-throated Swift (Aeronautes saxatalis)	A,B,C,D,F	C-P summer resident	Unknown	Open areas; wide ranging and breeds mainly in dry mountain canyons
Family Trochilidae				
! Black-chinned Hummingbird (Archilochus alexandri)	A,B,C,D,E,F	C-P summer resident	Unknown	Semi-arid country near water; semi-wooded canyons and slopes, mountain brush and riparian woodlands
! Broad-tailed Hummingbird (Selasphorus platycercus)	A,B,C,D,E,F	C-P summer resident	Unknown	Ubiquitous
! Rufous Hummingbird (Selasphorus rufus)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	Forest edges, thickets in coniferous and deciduous forests, mountain brush and alpine meadows
! Calliope Hummingbird (Stellula calliope)	A,B,C,D,E,F	C-P summer resident	Unknown	High mountains, canyons and forest openings
Rivoli's Hummingbird (Eugenes fulgens)	E,F	U-P summer resident	Unknown	High mountain forest openings, pine-oak forests and canyons

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Order Caraciiformes				
Family Alcedinidae				
! * Belted Kingfisher (Megaceryle alcyon)	A,B,C,D,E,F	K-P resident	Unknown	Rivers, ponds and lakes
Order Piciformes				
Family Picidae				
! Common Flicker (Colaptes auratus)	A,B,C,D,E,F	C-P resident	Stable	Deciduous or mixed woodlands, open forest, farms towns, canyons and semi-open country
* Pileated Woodpecker (Dryocopus pileatus)	F	K-P resident	Unknown	Mature coniferous and mixed forests with many snags
Red-headed Woodpecker (Melanerpes erythrocephalus)	B	R-P resident	Unknown	Groves, farm country, riparian areas, towns and scattered trees
! Yellow-bellied Sapsucker (Sphyrapicus varius)	A,B,C,D,E,F	C-P resident	Unknown	In summer woodlands and aspen groves; in winter orchards and other trees
* Williamson's Sapsucker (Sphyrapicus thyroideus)	F	U-P summer resident	Unknown	Higher coniferous forests and burns
* Lewis Woodpecker (Asyndesmus lewis)	F	K-P summer resident and transient	Unknown	Scattered or logged forests, burns, cottonwood groves and ponderosa pine
! Hairy Woodpecker (Dendrocopos villosus)	A,B,C,D,E,F	C-P resident	Unknown	Mountain forests, woodlands and river groves

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Downy Woodpecker (Dendrocopos pubescens)	A,B,C,D,E,F	C-P resident	Unknown	Broken or mixed forest, willows, poplars, riparian woodlands, orchards and shade trees
! Northern Three-toed Woodpecker (Picoides tridactylus)	A,B,C,E,F	U-P resident	Unknown	Coniferous forests
Order Passeriformes Family Tyrannidae Western Kingbird (Tyrannus verticalis)	A,B,C,D,E,F	C-P summer resident	Stable	Open country with scattered trees, farms and roadsides
! Cassin's Kingbird (Tyrannus vociferans)	A,B,C,D,E,F	U-P summer resident	Unknown	Semi-open high country, scattered trees, pine-oak mountains and ranch groves
Eastern Kingbird (Tyrannus tyrannus)	A,B,C,D,E,F	C-P summer resident	Unknown	Wood edges, parklands, riparian areas, farms, shelter belts, orchards and roadsides
! Ash-throated Flycatcher (Myiarchus cinerascens)	A,B,C,D,E,F	C-P summer resident	Stable	Semi-arid country, deserts, brush, pinion-juniper and open woods
Black Phoebe (Sayornis nigricans)	F	C-P resident	Unknown	Streamside woodlands, farmyards and towns with cliffs near water
Says Phoebe (Sayornis saya)	A,B,C,D,E,F	C-P resident	Unknown	Open arid country, deserts, bushy plains, prairie farms, c von mouths and butte.

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Willow (Traill's) Flycatcher (Empidonax traillii)	A,B,C,D,E,F	C-P summer resident	Unknown	Breeds in willow thickets in low valleys, along canyons or in high mountain meadows
! Hammond's Flycatcher (Empidonax hammondii)	A,B,C,E,F	U-P summer resident	Unknown	High coniferous forests
! Dusky Flycatcher (Empidonax oberholseri)	A,B,C,D,E,F	C-P summer resident	Unknown	Breeds in mountain brush with a scattering of trees
! Gray Flycatcher (Empidonax wrightii)	A,B,C,D,E,F	K-P summer resident	Unknown	Breeds in sagebrush and pinion-juniper woodlands
! Western Flycatcher (Empidonax difficilis)	A,B,C,D,E,F	C-P summer resident	Unknown	Moist woods, mixed or coniferous forests, canyons, groves; must have water and shade
! Western Wood Peewee (Contipus sordidulus)	A,B,C,D,E,F	C-P summer resident	Unknown	Woodlands, pine-oak forests, open conifers and river groves
! Olive-sided Flycatcher (Contopus borealis)	A,B,C,D,E,F	U-P summer resident	Unknown	Coniferous forests, burns and clearings; in migration habitats used are varied; usually seen on tip of dead tree or branch

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Alaudidae				
! Horned Lark (Eremophila alpestris)	A,B,C,D,E,F	C-P resident	Unknown	Plains, desert, prairies, fields, sparse sagebrush flats, dirt roads, shores, alpine meadows, alkali flats and areas of sparse vegetation
Family Hirundinidae				
! Violet-green Swallow (Tachycineta thalassina)	A,B,C,D,E,F	C-P summer resident	Unknown	Widespread when foraging; when nesting, open forests foothill woods, mountains, canyons, cliffs and towns
! Tree Swallow (Iridoprocne bicolor)	A,B,C,D,E,F	C-P summer resident	Unknown	Open country near water, marshes, mountain meadows, streams, lakes and wires; when nesting requires dead trees and snags, preferabl near water
! Bank Swallow (Riparia riparia)	A,B,C,D,E,F	C-P summer resident	Unknown	Usually near water; over fields, marshes, streams and lakes
! Rough-winged Swallow (Stelgidopteryx ruficollis)	A,B,C,D,E,F	C-P summer resident	Unknown	Near streams, lakes and washes
Barn Swallow (Hirundo rustica)	A,B,C,D,E,F	C-P summer resident	Unknown	Open or semi-wooded country, farms, ranches, fields, marshes and lakes; usually near man's habitation

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Cliff Swallow (Petrochelidon pyrrhonota)	A,B,C,D,E,F	C-P summer resident	Unknown	Open to semi-wooded country, neat farms, cliffs, canyons, rivers or lakes
! * Purple Martin (Progne subis)	A,B,C,E,F	K-P summer resident	Unknown	Open forests of aspen and conifers
Family Corvidae				
! Steller's Jay (Cyanocitta stelleri)	A,B,C,D,E,F	C-P resident	Unknown	Conifers and pine-oak forests
! Gray Jay (Perisorius canadensis)	A,B,C,E,F	R-P resident	Unknown	Coniferous forests
! Scrub Jay (Aphelocoma coerulescens)	A,B,C,D,E,F	C-P resident	Unknown	Foothills, oaks, mountain brush, river woods and pinion-juniper woodlands
! Black-billed Magpie (Pica pica)	A,B,C,D,E,F	C-P resident	Unknown	Foothills, ranches, sage-brush, river thickets, shelterbelts and prairie brush
! Common Raven (Corvus corax)	A,B,C,D,E,F	C-P resident	Unknown	Mountains, deserts, canyons and cliffs
! Common Crow (Corvus brachyrhynchos)	A,B,C,D,E,F	O-P transient	Unknown	Deciduous, mixed and open coniferous woodlands farmlands and river grove
! Pinion Jay (Gymnorhinus cyanocephala)	A,B,C,D,E,F	C-P resident	Unknown	Pinion-juniper woodlands, but ranges into sagebrush
! Clark's Nutcracker (Nucifraga columbiana)	A,B,C,E,F	C-P resident	Unknown	High mountains in conifer near tree line

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Paridae				
! Black-capped Chickadee (Parus atricapillus)	A,B,C,D,E,F	C-P resident	Unknown	In summer aspen-conifer, mixed woodlands and forest edges; in winter woodlands along valley streams and tree rows
! Mountain Chickadee (Parus gambeli)	A,B,C,D,E,F	C-P resident	Unknown	In summer mountain forests and conifers; in winter riparian woodlands at lower elevations
! Plain Titmouse (Parus inornatus)	A,B,C,D,E,F	K-P resident	Unknown	Pinion-juniper woodlands
! Bushtit (Psaltriparus minimus)	A,B,C,D,E,F	C-P resident	Unknown	Oak woodlands, mountain brush, broad-leafed and mixed woods and pinion-juniper forest
Family Sittidae				
! White-breasted Nuthatch (Sitta carolinensis)	A,B,C,D,E,F	C-P resident	Unknown	Coniferous forests, pinion-juniper woodlands, oak brush, and riparian woodlands
! Red-breasted Nuthatch (Sitta canadensis)	A,B,C,E,F	C-P resident	Unknown	Coniferous forests
! Pygmy Nuthatch (Sitta pusilla)	A,B,C,D,E,F	C-P resident	Unknown	Ponderosa pines and Douglas fir

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat and Area
Family Certidae				
! Brown Creeper (Certhia familiaris)	A,B,C,E,F	C-P resident	Unknown	In summer mature montane mixed and coniferous forests; lower elevations in winter
Family Cinclidae				
! Dipper (Cinclus mexicanus)	A,B,C,D,E,F	C-P resident	Unknown	Fast-flowing streams in or near mountains; lower levels in winter
Family Troglodytidae				
! House Wren (Troglodytes aedon)	A,B,C,D,E,F	C-P summer resident	Unknown	Woodlands of mountains and valleys
! Rock Wren (Salpinctes obsoletus)	A,B,C,D,E,F	C-P resident	Unknown	Desert to high mountain areas with talus slopes and cliffs
! Canyon Wren (Catherpes mexicanus)	A,B,C,D,E,F	C-P resident	Unknown	Rocky cliffs, crevices, and rock slides
! Bewick's Wren (Thryomanes bewickii)	A,B,C,D,E,F	C-P resident	Unknown	Under brush and pinion-juniper woodlands
Long-billed Marsh Wren (Cistothorus palustris)	A,B,C,D,E,F	L-P resident	Unknown	Cattail marshes
Family Mimidae				
Mockingbird (Mimus polyglottos)	A,B,C,D,E,F	U-P transient and summer resident	Unknown	Towns, farms, ranches, roadsides, brush and desert streamsides
Gray Catbird (Dumetella carolinensis)	A,B,C,D,E,F	U-P summer resident	Unknown	Undergrowth, brush or thickets along valley streams

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Brown Thrasher (Toxostoma rufum)	D,E,F	R-P resident	Unknown	Brushy places and thorny thickets
Bendire's Thrasher (Toxostoma bendirei)	F	R-P resident	Unknown	Desert scrub and farmlands
! Sage Thrasher (Oreoscoptes montanus)	A,B,C,D,E,F	C-P resident	Unknown	Sagebrush, rabbitbrush, brushy slopes and mesas
Family Muscicapidae				
! American Robin (Turdus migratorius)	A,B,C,D,E,F	C-P resident	Unknown	In summer towns, lawns, farmland, open forests, streamsides and any wooded habitat; in winter berry-bearing trees
Varied Thrush (Ixoreus naevius)	E,F	O-P winter resident	Unknown	Deciduous and coniferous forests usually near water
! Hermit Thrush (Catharus guttatus)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	In summer mixed woodlands and open coniferous forest in winter woods, thickets and parks
! Swainson's Thrush (Catharus ustulatus)	A,B,D	C-P summer resident	Unknown	Willow thickets, river woodlands, aspens, forest undergrowth and conifers
! Veery (Catharus fuscescens)	A,B	U-P summer resident	Unknown	Streamside woodlands

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! * Western Bluebird (Sialia mexicana)	A,B,C,D,E,F	K-P summer resident	Unknown	Scattered trees, open conifers, forests and farms
! * Mountain Bluebird (Sialia currucoides)	A,B,C,D,E,F	K-P resident	Unknown	In summer open areas where mountain meadows and pastures are interspersed with loose stands or single coniferous trees; in winter lower elevations, often open areas with available perching sites
! Townsend's Solitaire (Myadestes townsendi)	A,B,C,D,E,F	C-P resident	Unknown	In summer open coniferous forests in the mountains; in winter canyons, brushy slopes and junipers
Family Sylviidae				
! Blue-gray Gnatcatcher (Polioptila caerulea)	A,B,C,D,E,F	C-P summer resident	Unknown	Open mixed woods, streamside thickets, mountain brush and pinion-juniper woodlands
! Golden-crowned Kinglet (Regulus satrapa)	A,B,C,D,E,F	U-P resident	Unknown	In summer coniferous forests; in winter pinion-juniper and brush in lower elevations
! Ruby-crowned Kinglet (Regulus calendula)	A,B,C,D,E,F	C-P resident	Unknown	In summer coniferous forests; in winter other woodlands and thickets

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Motacillidae				
Water Pipet (Anthus spinoletta)	A,B,C,D,E,F	C-P resident	Unknown	In summer alpine zone; in migration and winter plains, bare fields, shores and irrigated fielc
Family Bombycillidae				
! Bohemian Waxwing (Bombycilla garrulus)	A,B,C,D,E,F	U-P winter resident	Unknown	Widespread and feeds on berries
! Cedar Waxwing (Bombycilla cedrorum)	A,B,C,D,E,F	C-P winter resident	Unknown	Open woodlands, Russian olive and other fruiting trees or orchards
Family Lanidae				
! Northern Shrike (Lanius excubitor)	A,B,C,D,E,F	U-P winter resident	Unknown	Semi-open country or open country with look-out posts
Loggerhead Shrike (Lanius ludovicianus)	A,B,C,D,E,F	C-P resident	Unknown	Deserts and other open country with lookout posts, wires, scattered trees and low scrub
Family Sturnidae				
Starling (Stuirnus vulgaris)	A,B,C,D,E,F	C-P resident	Unknown	Cities, fields, orchards and woodlands
Family Vireonidae				
Gray Vireo (Vireo vicinior)	D,E,F	U-P summer resident	Unknown	Brushy mountain slopes, scrub oak and junipers
! Solitary Vireo (Vireo solitarius)	A,B,C,D,E,F	U-P summer resident	Unknown	Streamside woodlands, pinion-juniper and Ponderosa pine forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Warbling Vireo (Vireo gilvus)	A,B,C,D,E,F	C-P summer resident	Unknown	Deciduous and mixed aspen woodlands near mountain and valley streams
Family Parulidae				
! Orange-crowned Warbler (Vermivora celata)	A,B,C,D,E,F	C-P summer resident and transient	Unknown	Brushy woodland clearings, hillsides, aspens and mountain brush; in migration streamside woodlands
! Nashville Warbler (Vermivora ruficapilla)	A,B,C,D,E,F	U-P transient	Unknown	Open mixed woods with undergrowth and at forest edges
! Virginia's Warbler (Vermivora virginiae)	A,B,C,D,E,F	C-P summer resident	Unknown	Oak canyons, brushy slopes and pinion-juniper brushland
Lucy's Warbler (Vermivora luciae)	E,F	U-P summer resident	Unknown	Along desert streams in willows and cottonwoods
! Yellow Warbler (Dendroica petechia)	A,B,C,D,E,F	C-P summer resident	Unknown	Willows, aspens, streamside trees and shrubs or town shade trees
* Grace's Warbler (Dendroica graciae)	E,F	U-P summer resident	Unknown	Ponderosa pine-oakbrush communities of the mountains
! Magnolia Warbler (Dendroica magnolia)	A,B,C,D,E,F	U-P transient	Unknown	Coniferous forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Hermit Warbler (Dendroica occidentalis)	E,F	U-P summer resident and transient	Unknown	Coniferous forests; in migration other trees
! Yellow-rumped Warbler (Dendroica coronata)	A,B,C,D,E,F	C-P summer resident	Unknown	In summer coniferous and mixed forests; in winter varied woods, river thickets, brush and gardens
! Black-throated Gray Warbler (Dendroica nigrescens)	A,B,C,D,E,F	K-P summer resident	Unknown	In summer dry oak slopes, pinion-juniper woodlands, open mixed woods; in migration varied trees and brush
! Townsend's Warbler (Dendroica townsendi)	A,B,C,D,E,F	U-P transient	Unknown	Coniferous forests
Northern Waterthrush (Seiurus noveboracensis)	B,C,D,E,F	U-P transient	Unknown	Swampy or wet woods, streamsides and lake-shores; in migration thickets
! MacGillivray's Warbler (Oporornis tolmiei)	A,B,C,D,E,F	C-P summer resident	Unknown	Low dense undergrowth and shady, damp thickets
Yellowthroat (Geothylpis trichas)	A,B,C,D,E,F	L-P summer resident	Unknown	Cattail and bulrush marshes, willow thickets and streamsides
! Yellow-breasted Chat (Icteria virens)	A,B,C,D,E,F	C-P summer resident	Unknown	Dense brush along water courses, willow

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Are
! Wilson's Warbler (Wilsonia pusilla)	A,B,C,D,E,F	C-P summer resident	Unknown	Deciduous shrubbery or thickets, streamside growth, willows and fir thickets in the mountains
! American Redstart (Setophaga ruticilla)	A,B,C	U-P transient	Unknown	Open secondary deciduous woodlands and riparian woodlands
Family Ploceidae				
House Sparrow (Passer domesticus)	A,B,C,D,E,F	C-P resident	Unknown	Cities, farms and houses
Family Icteridae				
Western Meadowlark (Sturnella neglecta)	A,B,C,D,E,F	C-P resident	Unknown	Open fields, meadows and plains
Yellow-headed Blackbird (Xanthocephalus xanthocephalus)	A,B,C,D,E,F	C-P summer resident	Unknown	Marshes with cattail and bulrushes; forages in fields and open country
Red-winged Blackbird (Agelaius phoeniceus)	A,B,C,D,E,F	C-P resident	Unknown	Breeds in marshes with emergent aquatic vegetation, forages in cultivated land and at the edge of water
! Northern Oriole (Icterus galbula)	A,B,C,D,E,F	C-P summer resident	Unknown	Open woodlands, cotton-woods or other shade trees and riparian areas

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
* Scotts Oriole (Icterus parisorum)	C,D,E,F	U-P summer resident	Unknown	Pinion-juniper woodlands of desert mountains, oak slopes and cottonwood trees in canyons
! Rusty Blackbird (Euphagus carolinus)	A	O-P transient	Unknown	Wooded marshes and riparian woodlands
Brewer's Blackbird (Euphagus cyanocephalus)	A,B,C,D,E,F	C-P resident	Unknown	Varied open country, lakeshores, irrigated pastures, feed lots, parks and cities
! Common Grackle (Quiscalus quiscula)	A,B,D	A-P transient	Unknown	Farms, fields, streamsides and wet woodlands
! Brown-headed Cowbird (Molothrus ater)	A,B,C,D,E,F	C-P resident	Unknown	Farms, fields, barnyards wood edges and riparian woodlands
Family Thraupidae				
! Western Tanager (Piranga ludoviciana)	A,B,C,D,E,F	C-P summer resident	Unknown	Open coniferous, aspen or mixed forests; widespread in migration
Family Embarizidae				
Rose-breasted Grosbeak (Pheucticus ludovicianus)	F	O-P summer resident	Unknown	Broadleaf riparian areas and aspens
! Black-headed Grosbeak (Pheucticus melanocephalus)	A,B,C,D,E,F	C-P summer resident	Unknown	Edges of second growth deciduous woods, pinion, riparian areas, orchards and parks

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Blue Grosbeak (Guiraca caerulea)	B,C,D,E,F	C-P summer resident	Unknown	Brushy and weedy places, willows and river thicke and other riparian areas
Lapland Longspur (Calcarius lapponicus)	A,B,C,D,E,F	R-P winter resident	Unknown	Fields, grasslands, saline flats, desert shrub; often seen with horned larks
! Indigo Bunting (Passerina cyanea)	A,B,D	R-P summer resident	Unknown	Brush, farm lands and streamsides
! Lazuli Bunting (Passerina amoena)	A,B,C,D,E,F	C-P summer resident	Unknown	Mountain brush, stream-side shrubs and farmland tree rows
! Green-tailed Towhee (Chlorura chlorura)	A,B,C,D,E,F	C-P summer resident	Unknown	Low mountain brush, greasewood and pinion-juniper woodlands
! Rufous-sided Towhee (Pipilo erythrophthalmus)	A,B,C,D,E,F	C-P resident	Unknown	Mountain brush, forest edges and city shrubs
! Lark Bunting (Calamospiza melanocorys)	A,B,C,D,E,F	O-P transient	Unknown	Plains, prairies, desert shrub and sagebrush
Savannah Sparrow (Passercules sandwichensis)	A,B,C,D,E,F	C-P summer resident	Unknown	Grasslands, fields, saltgrass meadows and open country
* Grasshopper Sparrow (Ammodramus savannarum)	A,B,C,D,E,F	K-P transient	Unknown	Dry grasslands
LeConte's Sparrow (Ammospiza leconteii)	F	A-P transient	Unknown	Tall grass, weedy meadows and marshes

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Vesper Sparrow (Pooecetes gramineus)	A,B,C,D,E,F	C-P summer resident	Unknown	Alfalfa and grain fields, meadows, sagebrush and desert shrub
! Lark Sparrow (Chondestes grammacus)	A,B,C,D,E,F	C-P summer resident	Unknown	Open country in sagebrush and desert shrub with available perch sites
! Sage Sparrow (Amphispiza belli)	A,B,C,D,E,F	U-P summer resident	Unknown	Sagebrush, greasewood and other desert shrubs
! Dark-eyed Junco (Junco hyemalis)	A,B,C,D,E,F	C-P resident	Unknown	In summer openings and edges of coniferous and mixed woodlands; in winter greasewood and undergrowth
! Gray-headed Junco (Junco caniceps)	A,B,C,D,E,F	C-P summer resident	Unknown	Coniferous, mixed forests and mountain brush
! Tree Sparrow (Spizella arborea)	A,B,C,D,E,F	U-P winter resident	Unknown	Willow thickets and brushy areas
! Chipping Sparrow (Spizella passerina)	A,B,C,D,E,F	C-P summer resident	Unknown	Mountain coniferous and deciduous woodlands, valley woodlands, farms, orchards, parks and brushlands
! Brewer's Sparrow (Spizella breweri)	A,B,C,D,E,F	C-P summer resident	Unknown	Sagebrush, greasewood and other desert shrubs or brushy areas
! Harris Sparrow (Zonotrichia querula)	A,B,C,D,E,F	U-P winter resident	Unknown	Brushy edges of open woodlands, Russian olives and willows

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! White-crowned Sparrow (Zonotrichia leucophrys)	A,B,C,D,E,F	C-P resident	Unknown	In summer forest edges and clearings, low brush and mountain thickets; in winter widespread in the valleys, along fence row willows, brushy areas, corn and greasewood
White-throated Sparrow (Zonotricia albicollis)	E,F	R-P winter resident	Unknown	Coniferous and mixed woodlands, woodland undergrowth thickets and brush
Golden-crowned Sparrow (Zonotrichia atricapilla)	E,F	R-P winter resident	Unknown	Mountain brush and brushy areas in the lower valleys
Swamp Sparrow (Zonotrichia georgiana)	F	U-P winter resident	Unknown	Marshes; in migration weedy fields
! Fox Sparrow (Zonotrichia iliaca)	A,B,C	K-P summer resident and transient	Unknown	Valley and mountain woodlands and brushy areas usually near water
! Lincoln's Sparrow (Zonotrichia lincolnii)	A,B,C	U-P summer resident R-P winter resident	Unknown	In summer willow thickets, brushy bogs; in winter lowland thickets, tall weeds and bushes
! Song Sparrow (Zonotrichia melodia)	A,B,C,D,E,F	C-P resident	Unknown	Woodland edges, grasslands, cattail marshes, thickets and brushy fence rows

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Black-throated Sparrow (Amphispiza bilineata)	A,B,C,D,E,F	U-P summer resident	Unknown	Pinion-juniper, mountain brush and sagebrush
Family Fringillidae				
Evening Grosbeak (Coccothraustes vespertinus)	A,B,C,D,E,F	C-P winter resident	Unknown	Boxelders, Russian olive trees and fruiting shrubs
! Cassin's Finch (Carpodacus cassinii)	A,B,C,D,E,F	C-P summer resident U-P winter resident	Unknown	In summer, open conifer forests of high mountains in winter valleys
! House Finch (Carpodacus mexicanus)	A,B,C,D,E,F	C-P resident	Unknown	Varied habitats; towns, ranches, open woods, mountain scrub, canyons, deserts and riparian area
! Pine Grosbeak (Pinicola enucleator)	A,B,C,E,F	U-P resident	Unknown	In summer coniferous forests; in winter mixed woods and fruiting trees
Rosy Finch (Leucosticte arctoa)	A,B,C,D,E,F	C-P resident	Unknown	In summer alpine tundra, meadows and snowfields; winters in lowlands
! Pine Siskin (Carduelis pinus)	A,B,C,D,E,F	C-P resident	Unknown	Coniferous forests, along edges of second growth deciduous forests; in migration seen in large flocks in the lower valle

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! American Goldfinch (Carduelis tristis)	A,B,C,D,E,F	C-P resident	Unknown	Riparian woodlands, willows, cottonwoods, orchards, roadsides and sunflowers
! Lesser Goldfinch (Carduelis psaltria)	A,B,C,D,E,F	C-P resident	Unknown	Open brushy country, open woods, wooded streams and gardens
! Red Crossbill (Loxia curvirostra)	A,B,C,E,F	U-P summer resident	Unknown	Coniferous forests
Mammals -- 103 species in southeastern Utah				
Order Insectivora				
Family Soricidae				
* Dwarf Shrew (Sorex nanus)	B,C,D,E,F	L-N	Unknown	Open grass-covered areas which may have scattered brush, marshes, coniferous forests and openings in woods
! North Water Shrew (Sorex palustris)	A,B,C,E,F	C-N	Unknown	Along nearly all permanent streams in mountainous areas
! Merriam Shrew (Sorex merriami)	A,B,C,D,E,F	U-N	Unknown	Arid sagebrush or grassland areas, mountain mahogany, coniferous forests, aspen and cottonwoods
Vagrant Shrew (Sorex vagrans)	A,B,C,F	C-N	Unknown	Marshes, bogs, wet meadows and along streams in forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Masked Shrew (Sorex cinereus)	A,B,D,E	C-N	Unknown	Moist sites in forests, open country and brushlan
! Dusky Shrew (Sorex obscurus)	A,B,C,F	C-N	Unknown	Marshes, coniferous forests and dry hillsides
* Gray (Desert) Shrew (Notiosorex crawfordi)	E,F	U-N	Unknown	Arid alluvial fans, brushy slopes, sagebrush and other low desert shrub communities
Order Chiroptera Family Vespertilionidae ! Little Brown Myotis (Myotis lucifugus)	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels, hollow trees or buildings usually near water
! Fringed Myotis (Myotis thysanodes)	A,B,C,D,E,F	U-N	Unknown	Caves, old buildings, rocl crevices, pinion-juniper and desert shrub
! Long-eared Myotis (Myotis evotis)	A,B,C,D,E,F	C-N	Unknown	Coniferous forests in hig mountains, around buildin or trees and occasionally caves
! Long-legged Myotis (Myotis volans)	A,B,C,D,E,F	C-N	Unknown	Buildings, small pockets, crevices in rock ledges and trees

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Yuma Myotis (Myotis yumanensis)	A,B,C,D,E,F	U-N	Unknown	Caves, tunnels and buildings in arid areas
California Myotis (Myotis californicus)	A,B,C,D,E,F	C-N	Unknown	Mine tunnels, hollow trees, loose rocks, buildings, bridges; chiefly a crevice dweller (up to 6,000 feet in elevation)
! Small-footed Myotis (Myotis leibii)	A,B,C,D,E,F	U-N	Unknown	Caves, mine tunnels, crevices in rocks and in buildings
! Silver-haired Bat (Lasionycteris noctivagans)	A,B,C,D,E,F	C-N	Unknown	Forest areas, occasionall in caves or buildings
! Western Pipistrelle (Pipistrellus hesperus)	A,B,C,D,E,F	C-N	Unknown	Caves, under loose rocks, crevices, in cliffs, buildings; arid areas nea water courses
! Big Brown Bat (Eptesicus fuscus)	A,B,C,D,E,F	C-N	Unknown	Caves, tunnels, crevices, hollow trees, buildings and wooded areas
! * Red Bat (Lasiurus borealis)	A,B,C,D,E,F	I-N	Unknown	Wooded areas; roosts in trees and occasionally enters caves
! Hoary Bat (Lasiurus cinereus)	A,B,C,D,E,F	U-N	Unknown	Wooded areas
! * Western Big-eared Bat (Plecotus townsendii)	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels and buildings utilized for roosting; inhabits arid western desert shrub, pinion-juniper and pine forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Mexican Big-eared Bat (Plecotus phyllotis)	F	L-N	Unknown	Caves in pine-oak forests between 5,000 to 8,500 feet elevation
*Spotted Bat (Euderma maculata)	Unknown	L-N	Unknown	Arid country; it occasionally enters buildings and caves
Pallid Bat (Antrozous pallidus)	A,B,C,D,E,F	C-N	Unknown	Caves, mine tunnels, crevices in rocks, buildings and trees are utilized for roosts; inhabits scattered desert shrub and pine-oak forests below 6,500 feet elevation
Family Molossidae				
Mexican Free-tailed Bat (Tadarida brasiliensis)	A,B,C,D,E,F	C-N	Unknown	Caves and buildings are utilized for roosts; inhabits lower and upper Sonoran Life Zones
Order Lagomorpha				
Family Ochotonidae				
Pika (Ochontona princeps)	A,B,C,E,F	C-N	Unknown	Talus slopes and rock-slides above 8,000 feet elevation
Family Leporidae				
White-tailed Jackrabbit (Lepus townsendii)	A,B,C,D	C-N	Stable	Open, grassy or sage-brush areas at medium elevation
*Snowshoe Hare (Lepus americanus)	A,B,C	L-P	Cyclic	Coniferous forests and aspen, riparian and brush types near conifers

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Black-tailed Jackrabbit (Lepus californicus)	A,B,C,D,E,F	C-N	Stable	Open grassland, sagebrush and desert shrub areas at low to medium elevations
!*Mountain Cottontail (Sylvilagus nuttallii)	A,B,C,E,F	C-P	Stable	Thickets, sagebrush, loose rocks, cliffs and forests
!*Desert Cottontail (Sylvilagus audubonii)	A,B,C,D,E,F	C-P	Stable	Open plains, foothills and low valleys with grass, sagebrush or scattered pinion-juniper
Order Rodentia				
Family Sciuridae				
Zuni Prairie Dog (Cynomys gunnisoni)	F	C-N	Stable	Mountain valleys, 5,000-12,000 feet elevation; open to slightly brushy country with scattered pinion-juniper
White-tailed Prairie Dog (Cynomys leucurus)	A,B,C,D,E,F	C-N	Stable	Valleys and flatlands where vegetation is sparse
*Abert Squirrel (Sciurus aberti)	F	L-P	Stable	Ponderosa pines
! Red Squirrel (Tamiasciurus hudsonicus)	A,B,C,F	C-N	Stable	Coniferous forests in the mountains

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
*Spotted Ground Squirrel (Spermophilus spilosoma)	F	L-N	Unknown	Open forests, scattered brush and grassy areas with sandy soil is preferred
! Rock Squirrel (Spermophilus variegatus)	A,B,C,D,E,F	C-N	Stable	Rocky canyons with boulder strewn slopes, riparian woodlands, and ditchbanks
! Uintah Ground Squirrel (Spermophilus armatus)	A,B	C-N	Stable	Meadows and edges of fields near green vegetation up to 8,000 feet elevation
! Golden-mantled Ground Squirrel (Spermophilus lateralis)	A,B,C	C-N	Stable	Mountain brush, open pine and spruce-fir forests to above timberline
Whitetail Antelope Squirrel (Ammospermophilus leucurus)	A,B,C,D,E,F	C-N	Stable	Arid areas of low desert and foothills with sparse vegetation
! Yellow-billied Marmot (Marmota flaviventris)	A,B,C,E,F	C-N	Stable	Rocky sites or talus slopes along valleys or in foothills 5,000 to 9,000 feet elevation
!*Northern Flying Squirrel (Glaucomys sabrinus)	A,B,C,F	K-N	Unknown	Coniferous and mixed forests in high mountains

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Least Chipmunk (Eutamius minimus)	A,B,C,D,E,F	C-N	Stable	Variety of habitat types including sagebrush, desert shrub, mountain bush, coniferous and mixed forest areas
Colorado Chipmunk (Eutamius quadrivittatus)	C,E,F	C-N	Stable	Coniferous forests, mountain brush areas, rocky slopes and ridges
!Uintah Chipmunk (Eutamius umbrinus)	A,B,D,E,F	C-N	Stable	Coniferous forest and mountain brush areas up to timberline with rocky slopes
!Cliff Chipmunk (Eutamius dorsalis)	A,B,C,D,E	U-N	Stable	Pinion-juniper slopes, riparian woodlands with rocky areas
Family Geomyidae				
! Northern Pocket Gopher (Thomomys talpoides)	A,B,C,D,E,F	C-N	Unknown	Grassy prairies, alpine meadows, brush areas, open pine forests; generally restricted to the mountains
! Valley or Botta Pocket Gopher (Thomomys bottae)	A,B,C,D,E,F	C-N	Unknown	Valleys and mountain meadows; prefers loam soil but may be found in sandy or rocky situations

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Ord Kangaroo Rat (Dipodomys ordii)	A,B,C,D,E,F	C-N	Unknown	Desert shrub, pinion-juniper and tamarisk communities; sandy soils preferred but found on hard soils
Baird Pocket Mouse (Perognathus flavus)	F	C-N	Unknown	Prefers short grass areas with sandy or rocky soils
! Great Basin Pocket Mouse (Perognathus parvus)	A,D	C-N	Unknown	Sagebrush or greasewood and other desert shrub communities and pinion-juniper
Apache Pocket Mouse (Perognathus apache)	C,D,F	C-N	Unknown	Sparse brushlands and scattered pinion-juniper, usually 5,000-7,200 feet elevation
Family Castoridae				
! * Beaver (Castor canadensis)	A,B,C,D,E,F	C-P	Increasing	Streams, lakes and irrigation systems with poplars, birch or willows on the bank
Family Cricetidae				
! Western Harvest Mouse (Reithrodontomys megalotis)	A,B,C,D,E,F	C-N	Unknown	Grasslands, open desert, wetlands, irrigated farmland of dense vegetation near water
! Canyon Mouse (Peromyscus crinitus)	A,B,C,D,E,F	C-N	Unknown	Rocky canyons and slopes with mountain brush

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Deer Mouse (Peromyscus maniculatus)	A,B,C,D,E,F	C-N	Unknown	All dry-land habitat and irrigated farmland within its range
! Brush Mouse (Peromyscus boylei)	A,B,C,D,E,F	C-N	Unknown	Brushy areas of arid and semi-arid regions; prefers rocky sites
! Pinion Mouse (Peromyscus truei)	A,B,C,D,E,F	C-N	Unknown	Rocky terrain in pinion-juniper areas
Northern Grasshopper Mouse (Onychomys leucogaster)	C,F	U-N	Unknown	Open country of grass, sagebrush or greasewood and sandy or gravelly soil
*White-throated Wood Rat (Neotoma albigula)	F	K-N	Unknown	Brushland with rocky cliffs and shallow caves
! Desert Wood Rat (Neotoma lepida)	A,B,C,D,E	C-N	Unknown	Desert floors and rocky slopes with low desert vegetation or arid mountain brush
*Mexican Wood Rat (Neotoma mexicana)	F	K-N	Unknown	Rocks, cliffs and mountains
! Bushy-tailed Wood Rat (Neotoma cinerea)	A,B,C,D,E,F	C-N	Unknown	High mountains with rimrock, rock slides and pines
! Muskrat (Ondatra zibethicus)	A,B,C,D,E,F	C-N	Stable	Marshes, edge of ponds, lakes, streams and irrigation canals

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! Meadow Vole (Microtus pennsylvanicus)	A,D	C-N	Unknown	Moist areas with dense growth of grasses
! Mountain Vole (Microtus montanus)	A,B,D,E	C-N	Unknown	Dense vegetation in sagebrush-grass communities
! Richardson's Vole (Microtus richardsoni)	A	C-N	Unknown	Creekbanks and marshes in mountains to above timberline
! Longtail Vole (Microtus longicaudus)	A,B,C,D,E,F	C-N	Unknown	In summer streambanks, mountain meadows with dry sites; in winter brushy areas
Sagebrush Vole (Lagurus curtatus)	C,F	C-N	Unknown	Scattered sagebrush with loose soil and arid conditions
Family Muridae				
! Black Rat (Rattus rattus)	A,B,C,D,E,F	C-N	Unknown	Buildings and dumps
! Norway Rat (Rattus norvegicus)	A,B,C,D,E,F	C-N	Unknown	Burrows along building foundations and beneath rubbish piles
! House Mouse (Mus musculus)	A,B,C,D,E,F	C-N	Unknown	Buildings and occasionally in fields

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
Family Zapodidae				
! Western Jumping Mouse (Zapus princeps)	A	C-N	Unknown	Low meadows near streams with lush growth of grasses and forbs; found in various land habitats
Family Erethizontidae				
! Porcupine (Erethizon dorsatum)	A,B,C,D,E,F	C-N	Stable	Forested areas, occasionally away from trees if brush is available
Order Carnivora				
Family Canidae				
! Coyote (Canis latrans)	A,B,C,D,E,F	C-N	Stable	Ubiquitous
!* Red Fox (Vulpes fulva)	A,B,C,D,E,F	K-N	Unknown	Forest and open country preferred
* Kit Fox (Vulpes macrotis)	A,B,C,D,E,F	K-N	Unknown	Open level, sandy ground preferred with low desert vegetation
! Gray Fox (Urocyan cinereoargenteus)	A,B,C,D,E,F	C-N	Stable	Brush and open forests

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! *Gray Wolf (Canis lupus)	A,B,C,D,E,F	E-P	Decreasing	Wilderness forests
Family Ursidae				
! *Black Bear (Ursus americanus)	A,B,C,E,F	C-P	Increasing	Mountainous areas
! *Grizzly Bear (Ursus horribilis)	A,B,C,E,F	X-P	Extirpated	Remote mountainous regions
Family Procyonidae				
! Ring-tailed Cat (Bassariscus astutus)	A,B,C,D,E,F	C-N	Stable	Near water on slopes with mountain brush, rocky ridges and cliffs
! *Raccoon (Procyon lotor)	A,B,C,D,E,F	K-N	Unknown	Along streams, lake borders and near wooded areas or rock cliffs
Family Mustelidae				
!*Short-tailed Weasel (Mustela ermined)	A,B,C,F	K-P	Unknown	Brushy or wooded areas not far from water
!*Long-tailed Weasel (Mustela frenata)	A,B,C,D,E,F	C-P	Stable	All land habitat types near water
! *Mink (Mustela vison)	A,B,C,F	L-P	Unknown	Along streams and lakes
!*Wolverine (Gulo luscus)	A,B	L-P	Unknown	Remote mountain regions
*Black-footed Ferret (Mustela nigripes)	A,B,C,D,F	E-P	Unknown	Prairie dog towns
!*Marten (Martes caurina)	A,B,C,F	R-P	Unknown	Coniferous forests at high elevations

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
! * Badger (Taxidea taxus)	A,B,C,D,E,F	C-P	Stable	Open grasslands, deserts and high mountain forests where prey is available
! * Striped Skunk (Mephitis mephitis)	A,B,C,D,E,F	C-P	Increasing	Semi-open country of prairie, brushlands or mixed woodlands within two miles of water
! * Spotted Skunk (Spilogale gracilis)	A,B,C,D,E,F	C-P	Stable	Prairies or grasslands with brushy or sparsely wooded areas along streams with boulders
* River Otter (Lutra canadensis)	A,B,C,D,E,F	L-P	Unknown	Along streams and lake borders
Family Felidae				
! * Bobcat (Lynx rufus)	A,B,C,D,E,F	L-P	Unknown	Rimrock and mountain brush areas
! * Canada Lynx (Lynx canadensis)	A,B,C,E,F	L-P	Unknown	Forested areas in the mountains
! * Cougar (Felis concolor)	A,B,C,D,E,F	C-P	Stable	Rugged mountains with forests, cliffs and ledges
Order Artiodactyla				
Family Cervidae				
! * Mule Deer (Odocoileus hemionus)	A,B,C,D,E,F	C-P	Increasing	Coniferous forests, desert shrub, mountain brush, grassland with shrubs and other habitats where browse species are present

Species	Biogeographic Area Inhabited	Status	Population Trend	Habitat Use Area
!* Moose (Alces alces)	A	L-P	Increasing	Mountainous areas, forests, mountain brush and willow bottoms
!*Rocky Mountain Elk (Cervus canadensis)	A,B,C,E,F	C-P	Increasing	Semi-open forests, mountain meadows (in summer), foothills, plains and valleys
Family Antilocapridae				
* Pronghorn Antelope (Antilocapra americana)	B,C,D,E,F	L-P	Stable	Open prairies and sagebrush or desert shrub plains
Family Bovidae				
* Desert Bighorn Sheep (Ovis canadensis nelsoni)	D,E,F	L-P	Increasing	Precipitous terrain on mountain and canyon slopes and rims with sparse growth of trees
* Rocky Mountain Bighorn Sheep (Ovis canadensis canadensis)	B,C	L-P	Increasing	Precipitous terrain on mountain and canyon slopes and rims with sparse growth of trees
* Bison (Bison bison)	E	L-P	Stable	Desert shrub plains of the Burr Desert and mountain brush forest habitats associated with steep mountain slopes of the Henry Mountains

List of Game Species and [illegible] within Utah.

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
10 BIG GAME SPECIES					
Bison	x	x			
Black Bear	x	x	x	x	x
Cougar	x	x	x	x	x
Desert Bighorn Sheep	x	x			
Elk	x	x	x	x	x
Moose	x		x	x	x
Mountain Bighorn Sheep	x		x	x	x
Mountain Goat			x		
Mule Deer	x	x	x	x	x
Pronghorn Antelope	x	x	x	x	x
Subtotal	9	7	8	7	7
20 GAME FISH SPECIES					
Arctic Grayling		x		x	x
Black Bullhead	x	x	x	x	x
Black Crappie	x	x	x	x	x
Bluegill	x	x	x	x	x
Bonneville Cisco					x
Brook Trout	x	x	x	x	x
Brown Trout	x	x	x	x	x
Channel Catfish	x	x	x	x	x
Cutthroat Trout	x	x	x	x	x
Golden Trout			x	x	
Kokanee Salmon				x	x
Lake Trout		x	x	x	x
Largemouth Bass	x	x	x	x	x
Mountain Whitefish			x	x	x
Northern Pike	x	x			
Perch	x	x	x	x	x
Rainbow & Albino Trout	x	x	x	x	x
Smallmouth Bass			x	x	x
Striped Bass	x	x			
Walleye	x	x	x	x	x
White Bass		x	x		
Subtotal	13	16	16	17	17

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
9 FURBEARER SPECIES					
Badger	x	x	x	x	x
Beaver	x	x	x	x	x
Long-tailed Weasel	x	x	x	x	x
Marten	x	x	x	x	x
Mink	x	x	x	x	x
River Otter	x			x	x
Short-tailed weasel	x	x	x	x	x
Spotted Skunk	x	x	x	x	x
Striped Skunk	x	x	x	x	x
Subtotal	9	8	8	9	9
43 MIGRATORY GAME BIRD SPECIES					
American Widgeon	x	x	x	x	x
Band-tailed Pigeon	x	x	x		
Barrows Goldeneye	x	x	x	x	x
Black Brant		x			x
Black Duck	x	x	x	x	x
Blue-winged Teal	x	x	x	x	x
Bufflehead	x	x	x	x	x
Canada Goose	x	x	x	x	x
Canvasback	x	x	x	x	x
Cinnamon Teal	x	x	x	x	x
American Coot	x	x	x	x	x
Common Gallinule	x	x	x		
Common Goldeneye	x	x	x	x	x
Common Merganser	x	x	x	x	x
Common Snipe	x	x	x	x	x
European Widgeon			x		
Fulvous Tree Duck		x			x
Gadwall	x	x	x	x	x
Greater Scaup	x	x	x	x	x
Green-winged Teal	x	x	x	x	x
Harlequin Duck					x

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
Hooded Merganser	x	x	x	x	x
Lesser Scaup	x	x	x	x	x
Mallard	x	x	x	x	x
Mourning Dove	x	x	x	x	x
Old Squaw		x	x		x
Pintail	x	x	x	x	x
Red-breasted Merganser	x	x	x	x	x
Redhead	x	x	x	x	x
Ring-necked Duck	x	x	x	x	x
Ross Goose	x	x			x
Ruddy Duck	x	x	x	x	x
Sandhill Crane	x	x	x	x	x
Shoveler	x	x	x	x	x
Snow Goose	x	x	x	x	x
Sora Rail	x	x	x	x	x
Surf Scoter			x		x
Trumpeter Swan		x	x		x
Virginia Rail	x	x	x	x	x
Whistling Swan	x	x	x	x	x
White-fronted Goose	x	x	x	x	x
White-winged Scoter	x	x	x		x
Wood Duck	x	x	x	x	x
Subtotal	35	40	39	31	42

5 SMALL GAME-MAMMAL SPECIES

Abert Squirrel	x				
Desert Cottontail	x	x	x	x	
Mountain cottontail	x	x	x	x	x
Pigmy Cottontail		x	x		x
Snowshoe Hare	x	x	x	x	x
Subtotal	4	4	4	3	3

Game Species of Utah	REGION				
	Southeastern	Southern	Central	Northeastern	Northern
12 SMALL GAME-UPLAND BIRD SPECIES					
Blue Grouse	x	x	x	x	x
California Quail	x	x	x	x	x
Chukar	x	x	x	x	x
Gambels Quail	x	x			
Hungarian Partridge			x		x
Merriam's Turkey	x	x			
Ring-necked Pheasant	x	x	x	x	x
Ruffed Grouse	x	x	x	x	x
Sage Grouse	x	x			x
Sharp-tailed Grouse					x
White-tailed Ptarmigan				x	x
White-winged Pheasant	X	X			
Subtotal	9	9	7	7	9
100 Total Game Species in Utah	78	83	81	73	86

Table 2. Classification of the 466 species of vertebrate wildlife that inhabit six biogeographic areas within Southeastern Utah.

	Biogeographic Areas[1]					
	A	B	C	D	E	F
FISH	14	20	15	15	24	31
Protected-Threatened	(0)	(1)	(1)	(1)	(1)	(1)
Protected-Endangered	(0)	(3)	(2)	(1)	(1)	(2)
Protected-Nongame	(10)	(11)	(9)	(10)	(12)	(16)
Protected-Game	(4)	(5)	(3)	(3)	(10)	(12)
AMPHIBIANS	6	5	6	7	7	10
Protected-Nongame	(1)	(1)	(1)	(1)	(1)	(2)
Unprotected-Nongame	(5)	(4)	(5)	(6)	(6)	(8)
REPTILES	18	14	15	14	21	28
Unprotected-Nongame	(18)	(14)	(15)	(14)	(21)	(28)
BIRDS	242	244	242	235	251	262
Protected-Extirpated	(1)	(1)	(1)	(1)	(1)	(1)
Protected-Threatened	(0)	(0)	(0)	(0)	(0)	(0)
Protected-Endangered	(2)	(2)	(2)	(2)	(2)	(2)
Protected-Nongame	(199)	(202)	(202)	(193)	(208)	(217)
Protected-Game	(39)	(38)	(36)	(38)	(39)	(41)
Unprotected-Nongame	(1)	(1)	(1)	(1)	(1)	(1)
MAMMALS	84	80	80	65	66	90
Protected-Threatened	(0)	(0)	(0)	(0)	(0)	(0)
Protected-Endangered	(1)	(1)	(1)	(1)	(0)	(1)
Protected-Extirpated	(2)	(2)	(2)	(0)	(2)	(2)
Protected-Game	(18)	(19)	(19)	(12)	(16)	(19)
Unprotected-Extirpated	(0)	(0)	(0)	(0)	(0)	(0)
Unprotected-Nongame	(63)	(58)	(58)	(52)	(53)	(62)
Total Protected Species	277	286	279	263	293	317
TOTAL:	364	363	358	336	369	421

[1] Biogeographic areas of southeastern Utah
A- Wasatch Plateau east of Skyline Drive
B- West Tavaputs Plateau
C- East Tavaputs Plateau
D- San Rafael Swell and Desert
E- Henry Mountains and Burr Desert
F- Mountains and Deserts south of I-70 in Grand and San Juan counties

VERTEBRATE SPECIES OF WILDLIFE HAVING HIGH INTEREST TO THE STATE OF UTAH

Class of Animal	Number of species		
	Statewide[1]	SER[2]	Trail Mountain Mine
Fish	33	20	4
Amphbians	3	2	1
Reptiles	10	4	2
Birds	104	95	28
Mammals	61	40	26
TOTAL	211	161	61

1. Utah Division of Wildlife Resources as the state of Utah's wildlife authority recognizes 211 species of vertebrate wildlife that inhabit the state as being of high interest. High interest wildlife represent all game species and all species having significant economic importance from either a comsumptive or nonconsumptive perspective or special asthetic, scientific or educational values. This list includes all federally listed threatened or endangered species of wildlife.

2. Evaluation of data presented in Utah Division of Wildlife Resources publication No. 78-16, "Species List of Vertebrate Wildlife That Inhabit Southeastern Utah" shows that 161 of the 211 species of the states high interest wildlife inhabit the Southeastern Region (SER) of the state on occasion or during different seasons of the year.

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Appropriations No. 01-59-09
Archives Approval No. 7900014

APPENDIX 5

USFWS HELICOPTER SURVEY,

MAHOGANY POINT QUADRANGLE

(UTAH-EMERY COUNTY)

USFWS HELICOPTER SURVEY

MAHOGANY POINT QUADRANGE MAP

UTAH-EMERY CO.

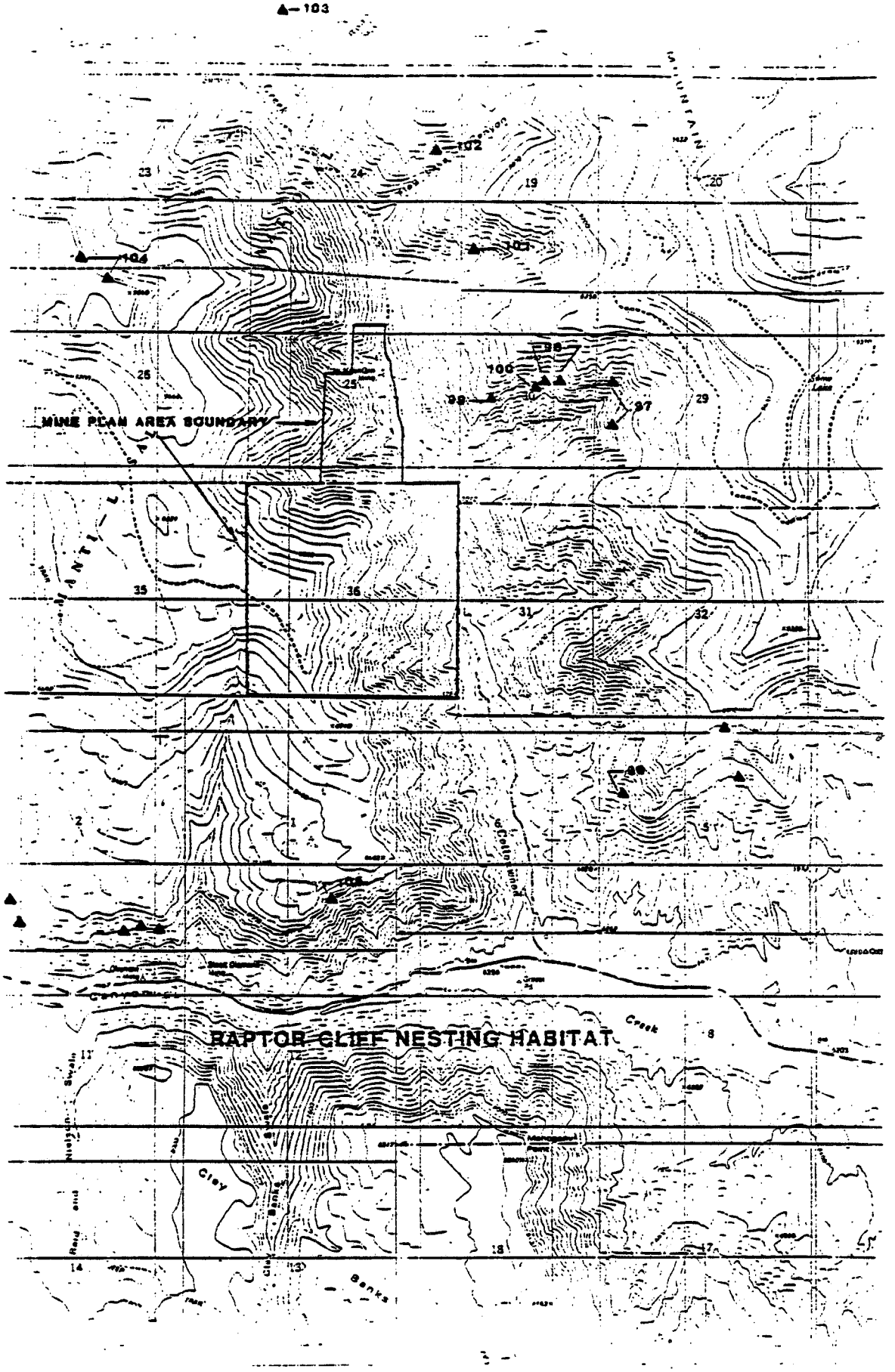
7.5 MINUTE SERIES (TOPOGRAPHIC)

	MAP LOCATION	1981 STATIS	1982 STATIS
Golden Eagle	#96	Birds Sighted	
Golden Eagle	#97	Tendid	Tendid
Golden Eagle	#98	Inactive	Tendid
Golden Eagle	#99	Tendid	Tendid
Golden Eagle	#100	Active	Tendid
Golden Eagle	#101	Inactive	Inactive
Buteo	#102	Inactive	No Data
Golden	#103	Tendid	Tendid
Raven-Buteo	#104	Inactive	Inactive
Falcon	#105	Potential	Potential

*NOTE: This information received from Larry Dalton, UDWR & USFWS

APPENDIX 6

LOCATION MAP OF RAPTOR HABITAT


MINE PLAN AREA BOUNDARY
RAPTOR CLIFF NESTING HABITAT
Clay Banks
Creek

APPENDIX 7

ABUNDANCY OF MULE DEER WITHIN THE PERMIT AREA

Abundancey of Mule Deer within the permit area and access road.

(Larry Dalton, Division of Wildlife Resourses, Price, Utah)

Animal population is much to dynamic to attach a meaningful number figure. It is possible for an entire mule deer herd to be in the related mine plan and access areas of Trail Mountain Coal Company one day and it is possible that they may never be in that area again. Also, the fluxation in population of deer herds from day to day and season to season makes it impossible to attach meaningful number values.

The Division of Wildlife Resources incorporates a ranking system. (see appendix 10-1).

APPENDIX 8

DOCUMENTATION FOR A LOW LEVEL WILDLIFE STUDY

state of utah

DIVISION OF WILDLIFE RESOURCES

EQUAL OPPORTUNITY EMPLOYER

DOUGLAS F. DAY
Director

1596 West North Temple/Salt Lake City, Utah 84116/801-533-9333

June 9, 1981

Mr. Cleon B. Feight, Director
Division of Oil, Gas and Mining
1588 West North Temple
Salt Lake City, Utah 84116

Attention: Mary Ann Wright

Dear Jack:

Although the Division has not been requested to provide a consultation concerning the nature and level of detail for fish and wildlife resource information to be provided for the Trail Mountain Coal Mine Project by Natomas Trail Mountain Coal Company, the following recommendations are offered. We feel this input is needed since the company is now preparing a mining and reclamation plan. These recommendations parallel the "Guidelines for Fish and Wildlife Information Required in Utah on Coal Mine Lands" suggested by our Division and provided earlier to Mary Ann Wright.

Mapping and Associated Narrative

1. The applicant should provide detailed topographic maps or aerial photographs of the mine plan and designated adjacent areas that display wildlife habitats or land cover. Unique habitats (such as wetlands, bogs, seeps and riparian zones; floodplains; and cliffs with their associated tallus) are of special importance to wildlife; they should be displayed on maps. The maps should be accompanied by sufficient descriptive narration describing the various wildlife habitats or land cover as follows:

   a. Total acreage for each habitat type.

   b. Floral composition of each wildlife habitat.

   c. Condition, successional stage and trend of all habitats.

   d. Present use by livestock.

It is probable that this information would have to be secured through a land management agency or a qualified, private consultant.

2. The applicant should provide detailed maps of the mine plan and designated adjacent areas that display distributions and use areas for high interest species of terrestrial and aquatic vertebrate wildlife. The map display should also show the relationship of the project area to regional wildlife distributions. The mine plan area maps should be accompanied by sufficient descriptive narration describing the high interest aquatic, amphibian, reptilian, avian and mammalian forms of wildlife and the quality (ranking) and quantity (extent or acreage) of their use areas.

This information can be assimilated by the company from a map overlay-display system available from our regional office in Price, Utah.

3. The applicant should provide detailed topgraphic maps of the mine plan and designated adjacent areas that display locations of all seeps, springs, wells, perennial, intermittent and ephemeral streams, lakes, reservoirs and ponds. Such maps should be accompanied by sufficient descriptive narration and tabular data concerning quantity and quality of the various surface waters (e.g., miles of stream as classified by the state water plan to include stream velocity, gradient-width, depth, pool-riffle ratio, substrata type, acres of flat water and surface water information required for SMC, Part 779.16). Water sources and unique habitats are critical to the survival of many forms of wildlife.

It is probable that this information would have to be secured through a land management agency, State Department of Health (Bureau of Water Quality) or a qualified, private consultant.

Fish or Wildlife Studies

A. Aquatic Wildlife

1. Macrophytes. Studies are not recommended.

2. Macroinvertebrates. Studies may be needed for purposes of determining stream buffer zones (UMC 817.57) in stream sections supporting biological communities.

Studies of macroinvertebrates in Cottonwood Creek are needed, since impacts have resulted from accumulations of sediments in the form of coal and other materials into this creek. Additionally other sediments have resulted from encroachment of the road upon the creek. These accumulations of sediments will likely continue until coal particles cease to enter the creek and the encroachment problems are alleviated. The area to be studied should extend from the property's uppermost access point downstream for at least two kilometers. Additionally, an appropriate upstream control area should be studied.

Sampling of macroinvertebrate populations should be conducted each year in early spring before runoff and again in late fall. Supportive data relative to historic coal sediments through core samples of the stream's substrata should also be collected along with recording of basic water chemistry measurements. Water chemistry measurements should consider temperature, pH, conductivity, alkalinity (total and bicarbonate), sulfate, chloride, sodium, potassium, magnesium, calcium, nitrogen (nitrate), orthophosphate, turbidity, hardness, oil and grease, total dissolved solids, bacteria (total and fecal) and heavy metals (copper, lead, zinc and cadmium). Such studies should continue over a period of years until it is demonstrated that the impacts from sediments to the macroinvertebrates population in the impacted areas as compared to the control have been corrected. If, during a reasonable period of time, the impacts cannot be corrected, then mining activity should be suspended.

Studies relative to macrophytes (if desired) or macroinvertebrates (if needed) must be conducted by a qualified, private consultant.

The applicant must identify in the application what impact avoidance procedures will be utilized to keep any form of coal sediments or other pollution from entering Cottonwood Creek, which is a tributary water to Straight Canyon Creek. Snow removal is a significant contributor of sediments to local riverine systems. Deposition of coal particles in the aquatic system could have a variety of negative impacts on invertebrates and downstream fish populations. The applicant must also demonstrate facility designs that will preclude impacts on this stream.

3. Fish. All fish in the state of Utah are protected; therefore, data from low levels of study for fishes inhabiting the mine plan and adjacent areas (Straight Canyon Creek--stream section 2) are recommended to be included in the application for this mine project. Low level studies should identify potential occurrence, relative abundance, status, population trend and preferred habitat use areas for all fishes inhabiting the mine plan and adjacent areas.

If project operations are planned or develop that would alter, destroy or discharge polluting effluents into any perennial waters, appropriate state and federal permits, a mitigation plan and results from high level studies of the fish population in Straight Canyon Creek would be required of the company. Achievement of mitigation would demand detailed studies of stream velocity correlated to flow, representatives of the stream channel profile, gradient, pool-riffle ratio, substrata types identifying percent representation of each type and surface water information required for SMC 779.16.

If modification of flows is anticipated, instream flow requirements must be considered to meet the needs of the existing fisheries "biological community" and maintenance of existing riparian or wetland zones. Such baseline information would allow for development of mitigation or reclamation plans that would allow for avoidance, lessening or mitigation of impacts to the fishery and maintenance or reestablishment of unique habitat types.

Low levels of study concerning fishes have already been completed and are available from the Utah Division of Wildlife Resources office in Price. High level studies have not been conducted and would necessitate the applicant contracting the Utah Division of Wildlife Resources to conduct a fish popula- tion inventory. Other elements of such a high level study would have to be secured through the services of a qualified private consultant.

B. Terrestrial Wildlife

1. Wildlife habitat types. Within southeastern Utah, there are twelve basic wildlife habitat types (riparian and wetland, desert scrub, pasture and fields, urban or parks, cliffs and tallus, sagebrush, aspen forest, ponderosa forest, parkland and spruce-fir forest). These wildlife habitats are appropriately located within the cold desert (upper Sonoran life zone), submontane (Transition life zone) and montane (Canadian, Hudsonian and Alpine life zones) ecological associations. The applicant should identify these environs as they relate to the mine plan and adjacent areas.

   Wetland and riparian habitats are ranked as being of critical value to all wildlife. Such zones are normally associated with drainage bottoms (ephemeral or intermittent), or perennial streams (SMC 700.5 and UMC 700.5), seeps and springs within the upper Sonoran, Transi- tion and Canadian life zones. Cliffs and their associated tallus areas that lie within the upper Sonoran and Transition life zones are ranked as being of high-priority value to all wildlife. When compared to all other wildlife habitats, the aforementioned situations are considered to represent unique habitat associations.

   Riparian and wetland areas are highly productive in terms of herbage produced and use by wildlife as compared to surrounding areas. Experience has shown that as much as 70 percent of a local wildlife population are dependent upon riparian zones. Cliffs and tallus are of special importance to many high interest wildlife. These unique habitat types must be identified in the permit application and protected due to their high value for all wildlife.

   Quantitative (acreage) and qualitative (condition, successional stage and trend) data concerning the wildlife habitats in each ecological association should be included as part of the mine permit application.

2. Amphibians. All amphibians in the state of Utah are protected; therefore, data from low levels of study for amphibians inhabiting the mine plan and adjacent areas are recommended to be included with the application for this mine project. Currently, the tiger salamander is the only species of amphibian (that inhabits the project area) recognized as being of high interest to the state of Utah. It is not believed that the project will significantly impact this species or its high value habitat use areas; thus, high level studies need not be considered.

3. Reptiles. All reptiles in the state of Utah are protected; therefore, data from low levels of study for reptiles inhabiting the mine plan and adjacent areas are recommended to be included with the application for this mine project. Currently, the Utah milk snake and Utah mountain kingsnake are the only species of reptiles (that inhabit the project area) recognized as being of high interest to the state of Utah. It is not believed that the project will significantly impact these species or their high value habitat use areas; thus, high level studies need not be considered.

   Low level studies should identify potential occurrence, relative abundance, status, population trend and preferred habitat use areas for all amphibians and reptiles inhabiting the mine plan and designated adjacent areas. Such studies concerning amphibians and reptiles have already been completed and are available from our regional office in Price.

4. Birds. All birds in the state of Utah are protected; therefore, data from the low levels of study for avifauna inhabiting the mine plan and adjacent areas are recommended to be included with the application for this mine project. Low level studies should identify potential occurrence, season of use, relative abundance, status population trend and preferred habitat use areas for all birds inhabiting the mine plan and designated adjacent areas. These studies have already been completed and are available from our office in Price.

An intensive survey to be provided by the applicant for breeding raptors and "high priority" habitats--43 CFR 3461.1 (n-1)--for other birds that have high federal interest is recommended. Raptors are extremely sensitive to man's disturbances. There exists a lack of significant site-specific knowledge of aeries and other "high priority" habitats for avifauna on the mine project area. Such a survey would represent a high level of study and only needs to be conducted within a one kilometer radius of planned surface developments and activity centers. The result of such study should be included with the application for a mining permit.

If such surveys have already been completed, the Division requests an opportunity to review this work in order to make a determination of its adequacy.

High level studies relative to use of the mine plan and designated adjacent areas by migratory and upland game birds, federally listed endangered species of avifauna and potential use by migratory birds having high federal interest in the Uintah-Southwestern Utah coal leasing region should be included with the application for a mining permit. Such studies are ongoing or have been completed and are available from our regional office in Price.

No other high level studies are recommended for avifauna since unique habitats have not been identified as having potential to be impacted by the mine project. If the applicant's plans change, high levels of study would be recommended concerning high interest species and their use of unique habitats. Results of such studies should be included with the permit application. This data is not generally available and would necessitate the services of a qualified, private consultant.

5. Mammals. It is recommended that data from low levels of study for mammals inhabiting the mine plan and adjacent areas be included with the application for this mine project. Low level studies should identify potential habitat use areas for all mammals inhabiting the mine plan and designated adjacent areas. These studies have already been completed and are available from our office in Price.

Additionally, high level studies relative to use of the mine plan and designated adjacent areas by protected species and federally listed endangered species of mammals should be included with the application for a mining permit. Such studies are ongoing or have been completed and are available from our office in Price.

No other high level studies are recommended for mammals since high interest species of limited distribution will not be severely impacted by the mining project.

6. Consultation Required for the Presence of Threatened or Endangered Species. It is recommended that the applicant and the Division of Oil, Gas and Mining contact the U. S. Fish and Wildlife Service for consultation required to determine the presence or nonpresence of threatened or endangered biotic species on the project.

Thank you for an opportunity to provide input into this area of concern.

Sincerely,

Douglas F. Day
Director

APPENDIX 9

MONITORING THE OCCURRENCE OF ROAD-KILLED MULE DEER

Trail Mountain Coal Company has made a committment with the Utah Division of Wildlife Recources and with the United States Fish and Wildlife Services to jointly monitor occurance of road-killed mule deer in the mine plan area and access area to the minesite.

When a road-kill is sighted by anyone associated with Trail Mountain Coal Company, that person is to notify Trail Mountain Coal Company mine management of such an occurance. Mine management will promptly notify UDUR and/or USFWS of occurance and location. UDWR and USFWS have an on going program in this area of monitoring the the road-kill of mule deer. They map areas of road-kill and if they arrive at the site before the carcass of the animal has spoiled, they will dress the animal out and preserve the meat and dispence of it to needy organizations.

During the mapping of road-kill occurances if a problem area is indicated, proper mitagating proceedures are implemented.

Trail Mountain Coal Company plans to reduce speed across winter ranges during the period between November 1 and May 15 each year. (Speed Reductions signs have been pruchased and installed from highway 10 to the minesite).

Trail Mountain Coal company feels that jointly working with the UDWR and USFWS, a reduction in speed of coal-haulage trucks and other mine related traffic and encreased awareness of wildlife values by mine associated employees should result in a reduction of deer-highway mortality problems. Such a reduction would represent satisfactory mitigation.

APPENDIX 10

RAPTOR PROTECTION

UTAH
NATURAL RESOURCES & ENERGY
Salt Lake City, UT 84114

November 26, 1982

Mr. Andy King
Natomas Trail Mountain Coal Company
P.O. Box 370
Orangeville, Utah 84537

RE: Raptor Protection on Powerlines
Trail Mountain Mine
ACT/015/009
Emery County, Utah

Dear Mr. King:

The U S Fish and Wildlife Service (USFWS) has completed a survey of existing powerlines as per your request of May 26, 1982. The USFWS has found the design and construction of the existing powerlines at the Trail Mountain Mine to be "safe" to raptors (survey results enclosed). Therefore modification of the existing powerpoles will not be required.

Should you have any questions or concerns, please don't hesitiate to call.

Sincerely,

LYNN KUNZLER
RECLAMATION BIOLOGIST

LK/lm

cc: OSM, Albuquerque
Ken Wyatt, DOGM

Enclosure

United States Department of the Interior
FISH AND WILDLIFE SERVICE
AREA OFFICE COLORADO—UTAH
1311 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138-1197

IN REPLY REFER TO

November 10, 1982

Cleon Feight, Director
Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, Utah 84114

Dear Mr. Feight:

This letter is written to inform you of two field trips to examine potentially hazardous powerlines within the permit boundaries of the mines described in your letter dated August 18, 1982. Mr. Ron Joseph of my staff has completed a review of the distribution lines of the following mining companies. Overall, he found no eagle remains beneath the lines examined nor does he suspect any problems with the lines in question. The following is a brief summary of each site visited and a description of the configuration examined. When possible, he examined the lines with company personnel.

Valley Camp of Utah Inc.

Mr. Joseph met with E.B. Foust, Chief Engineer to survey the lines of Valley Camp's Belina Mines and Utah #2. The three phase Belina lines for the most part traverse high timbered mountainous terrain. Previous Fish and Wildlife Service (FWS) surveys have not shown a problem with powerlines in coniferous cover primarily because trees themselves offer much better perch sites than crossarms of power poles. As an added precaution, Mr. Foust pointed out to Mr. Joseph where Valley Camp has erected perch sites in areas where the Company believed a problem could exist within the Belina Mine complex. However, on close examination, the lines did not reveal any use by raptors.

Mr. Foust also toured Mr. Joseph through the Utah #2 Mine area across from its headquarters. Due to extensive mining near the facilities and associated human activity, it is unlikely that raptors would use the lines. Again, trees dominate the landscape and raptor perch use is undoubtedly confined to trees and ridges.

Utah Power and Light (UP&L); Des-Bee-Dove, Wilberg, Deer Creek Mines

Des-Bee-Dove

Ron Joseph met with Scott Rassmussen, UP&L District Manager in Castledale, Utah, to examine the forementioned mine sites. The Des-Bee-Dove mine lines consist predominantly of 69KV three phase powerlines. The configuration is safe since adequate conductor clearance exists on the 10-foot crossarms should an eagle attempt

to perch on the pole. Much of the line traverses habitat used by wintering golden eagles. In fact, an adult golden eagle was observed using the crossarm as a perch. Mr. Joseph walked segments of the Bee-Dove line passing through relatively flat, sparsely vegetated habitat and documented some use of the lines by raptors. However, no remains were found and more importantly the lines are constructed such that birds are not likely to be electrocuted when using the crossarms as perch sites.

Wilberg

Mr. Rassmussen also showed Mr. Joseph the Wilberg line. The three phase line is energized with 69KV and is constructed such that eagles and other raptors are not likely to be electrocuted. As with the Bee-Dove line, the Wilberg line has adequate conductor clearance on the 6-foot crossarm and center pole. A minimum of 42 inches separates the conductor on the pole top and those on the crossarm. Approximately 1-2 miles of line traverses habitat used by jackrabbits and no remains of rabbits or eagles were evident beneath the crossarms. Therefore, we do not anticipate any electrocution problems with the Wilberg line.

Deer Creek

The Deer Creek Mine line is constructed without a crossarm. Raptors are unable to perch on the staggered conductors of the 12KV line thereby eliminating electrocution hazards.

Trail Mountain and Knight

Mr. Rassmussen accompanied Mr. Joseph in the field to examine the UP&L lines providing power to the Trail Mountain Mine, Natomas Coal Company. The 12KV lines parallel the road and are of an armless configuration; a design which is safe for raptors because it prevents perching. The Knight Mine is of the same configuration as the Trail Mountain Mine. No problems are expected with the lines to the Knight Mine.

Beaver Creek Coal Company, Castle Valley Spur

Dave Myers of Beaver Creek Coal Company met with Mr. Joseph at the C.V. Spur facility and both walked the length of the line. The armless configuration and close proximity of the line to the C.V. Spur accounts for the lack of raptor use of the powerlines.

In summary, Mr. Joseph examined the lines described in your August 18, 1982, letter and has not found any to be a threat to eagles or other raptors. Please feel free to contact us once again if we can be of additional assistance.

Sincerely,

Field Supervisor
Ecological Services

REA BULLETIN 61-10

SUBJECT: Powerline Contacts by Eagles and Other Large Birds

State and Federal agencies concerned with the protection of wildlife have requested that REA and its borrowers cooperate in reducing the loss of eagles and other large birds due to accidental electrocution by powerlines.

Reports indicate that this problem exists primarily on distribution lines in localized areas of the western and southwestern states. However, it may exist to a lesser extent in other parts of the country. Because of greater clearances, transmission lines apparently do not present a significant threat to large birds.

Since the bald eagle is in danger of extinction, and other eagles may be in trouble also, we are asking you to cooperate to the fullest extent with State and Federal agencies to minimize accidental electrocution of these birds. The attached report discusses the causes of electrocution on REA distribution lines and offers suggestions for modifying existing structures and constructing new lines in areas where eagle electrocutions have occurred.

Administrator

Attachment

Index:
DESIGN, SYSTEM
Powerline Contacts by Large Birds - Bul. 61-10

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration

REA BULLETIN 61-10

SUBJECT: Powerline Contacts by Eagles and Other Large Birds

I. Introduction: In areas frequented by eagles and other large birds of prey, principally herons and pelicans, power poles are often favorite perches. Occasionally through contact with wiring and fixtures on distribution line poles birds are electrocuted. Such contact also causes momentary or sustained outage of the powerline. Both of these incidents are undesirable and may be minimized by relatively inexpensive modifications in distribution structure design and fixtures by the power supplier. Because of their greater clearances, transmission line structures do not present a significant hazard to either small or large birds.

II. The Problem: Powerline contacts by large raptors, such as eagles and red-tailed hawks, in general are limited to localized areas where these birds hunt and nest. On any given system, it appears that remedial modification to frequently used power poles, within relatively short stretches of line, will greatly reduce the incidence of electrocution. It is probable that linemen and other operating personnel, after a short orientation, can readily identify the poles potentially most hazardous to birds. State and Federal wildlife authorities are available to conduct these orientations.

III. Behavior of Large Birds of Prey: In general, predatory birds select for perching those poles that give them the best view of the habitat of their quarry. Therefore, the poles selected often are the most elevated poles in areas heavily populated by ground squirrels, other rodents, and game within reasonable flying distance of the eyrie or within the wintering habitat of the raptor. Reports indicate that the birds are most likely to make contact between energized parts and ground wire on transformer poles. However, kills have occurred on single-phase and three-phase tangent poles as well. Favorite perch poles can be specifically determined by examining the area just below the pole for mutes or droppings of the birds and for their castings. Since birds of prey cannot digest the fur, feathers or bones of their quarry, they cast or disgorge them in the form of a pellet called a casting. These castings are as large as 1.5 inches in diameter and 5.0 inches in length.

IV. Remedial Measures: The illustrations and the text that follow (1) identify those details of standard construction that seem to contribute to bird electrocutions, and (2) offer suggestions for inexpensive modifications which will make the various

structures less hazardous to large birds. Only the most commonly used structures are discussed, but an understanding of how these structures can cause electrocution and how they may be modified for greater safety will permit similar corrections to other less commonly used structures that may be involved in eagle electrocution.

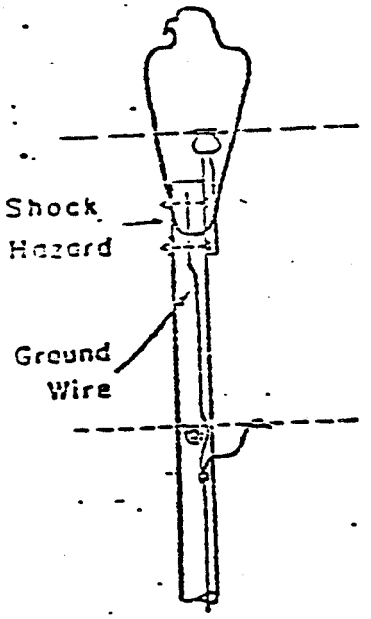


Figure 1

Single-Phase Poles Without Equipment

This structure is potentially hazardous to large birds only when the pole ground wire is extended above the neutral as shown in Figure 1. In such a case, contact could be made simultaneously between the phase conductor and pole ground wire when the bird landed on the poletop. Actually, the poletop does not seem to be a good perch because of the obstruction of the phase conductor. It is probable, therefore, that relatively few electrocutions will be experienced at these structures.

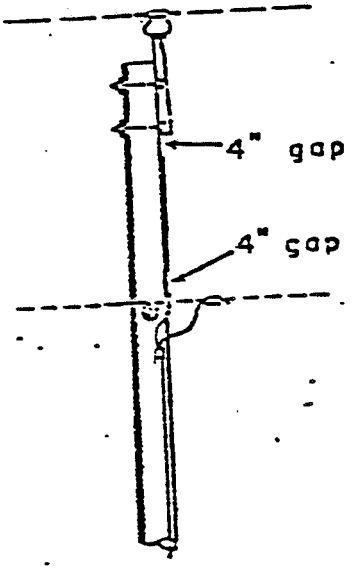


Figure 2

When electrocuted birds have been found at the base of single-phase structures, it is recommended that the ground wire be cut back to the neutral. If this is not feasible because of lightning considerations, the pole ground wire above the neutral should be double gapped as shown in Figure 2. A total of 8 inches of clear wood is believed adequate to provide safety to large birds.

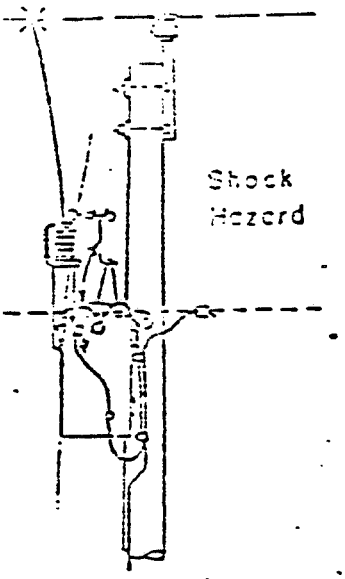
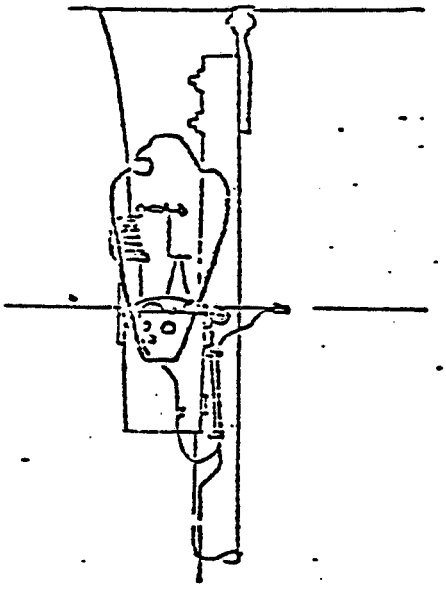


Figure 3

Single-Phase Transformer Poles

On single-phase poles with transformers or other equipment, raptors may land on the grounded equipment tank and contact energized parts such as jumpers, open fuse links or bushing terminals. (See Figure 3.)



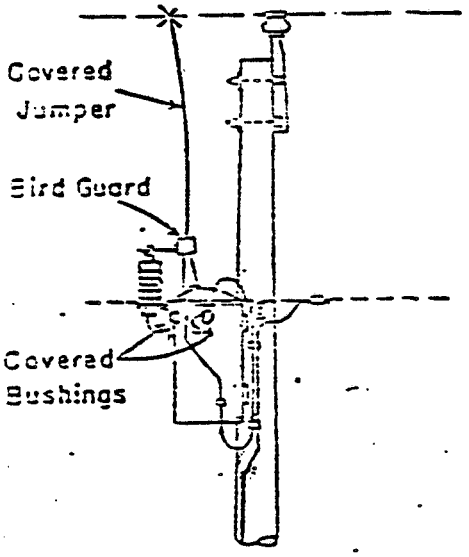


Figure 4

Depending on the type of transformer, it may be possible to cover all primary and secondary energized parts with which a bird is likely to make contact. The use of bird guards, transformers with internal fuses, and insulated conductors for primary jumpers should provide effective protection. (See Figure 4.)

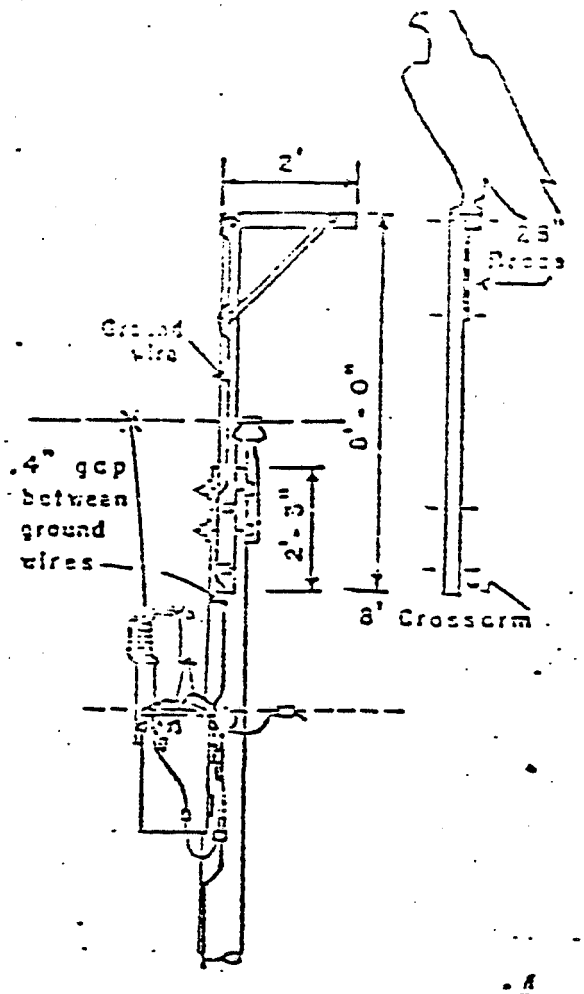
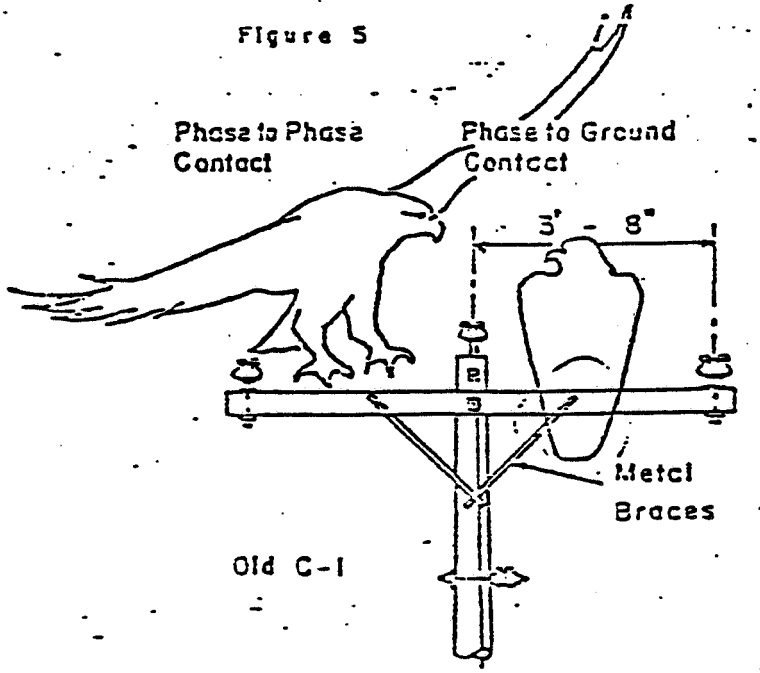


Figure 5

Where the nature of the equipment installation is such that it is not feasible to cover exposed energized parts, a perch as shown in Figure 5 could be installed. Eagles normally use such a perch in preference to the equipment tank. Alternatively the transformer could be changed to a self-protecting type which would permit covering the primary energized parts as in Figure 4.



Old single-arm assemblies

Figure 6

Three-Phase Tangent Construction

Of all REA poles in common use, pre 1962 REA standard construction is potentially the most hazardous to large birds because

- its crossarm construction is particularly attractive, as a perch, to large birds.
- its relatively flat construction permits phase-to-phase contact as the bird approaches the crossarm.
- the use of steel crossarm braces in close proximity to the pole ground wire facilitates phase-to-ground contact.

Both of these types of contact are illustrated in Figure 6.

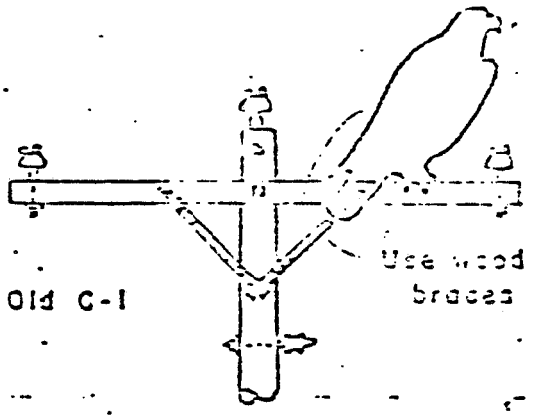


Figure 7

Bird electrocutions may be minimized on pre 1962 structures by changing the steel braces to wood braces as shown in Figure 7 and by

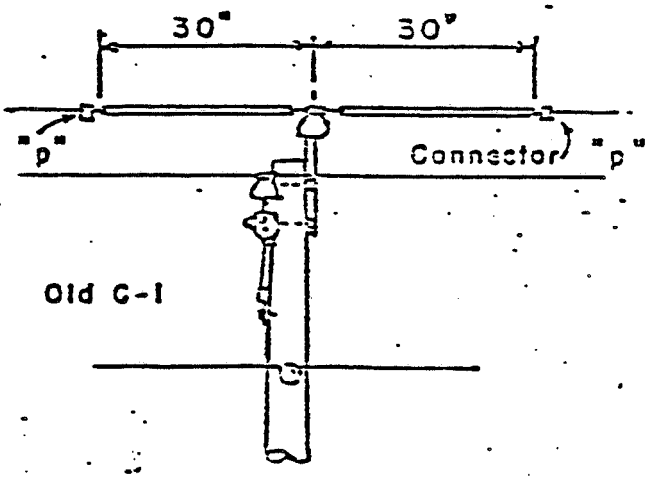


Figure 8

covering the center phase for about 30 inches on either side of the insulator as shown in Figure 8. Any material used for covering the conductor need provide for only momentary contacts. However, it should not have any seams, cracks or openings on its top or sides through which a spark may jump. Several manufacturers provide "tree guards" which seem adequate for this purpose. Guards may be restrained from moving into the span by the use of a connector or other obstruction.

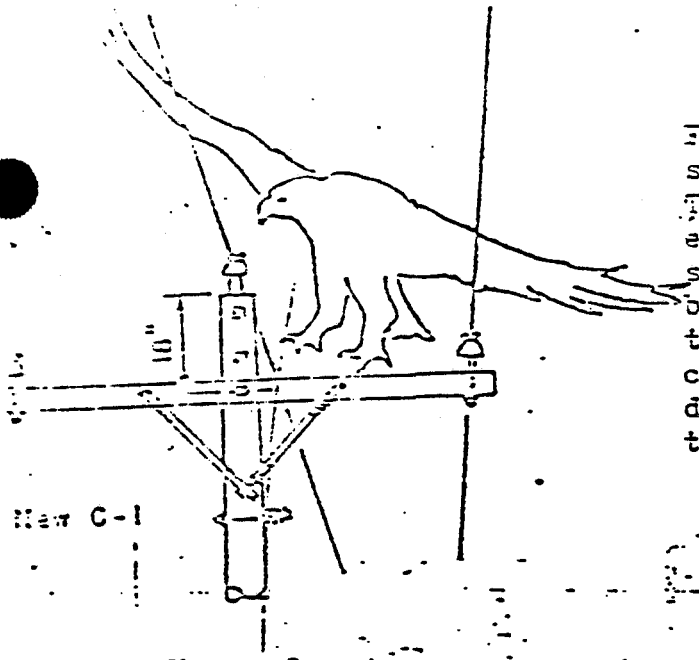
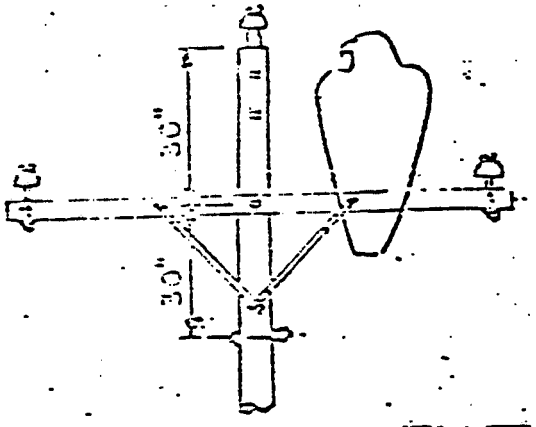


Figure 9

Figure 9 shows the post 1962 REA standard three-phase construction. The use of wood braces and the lowered crossarm should make this structure relatively safe for large birds. However, in the event electrocutions are experienced, the center phase should be covered as described in the preceding paragraph to avoid phase-to-phase contacts.



Proposed three-phase line assembly for eagle areas.

Figure 10

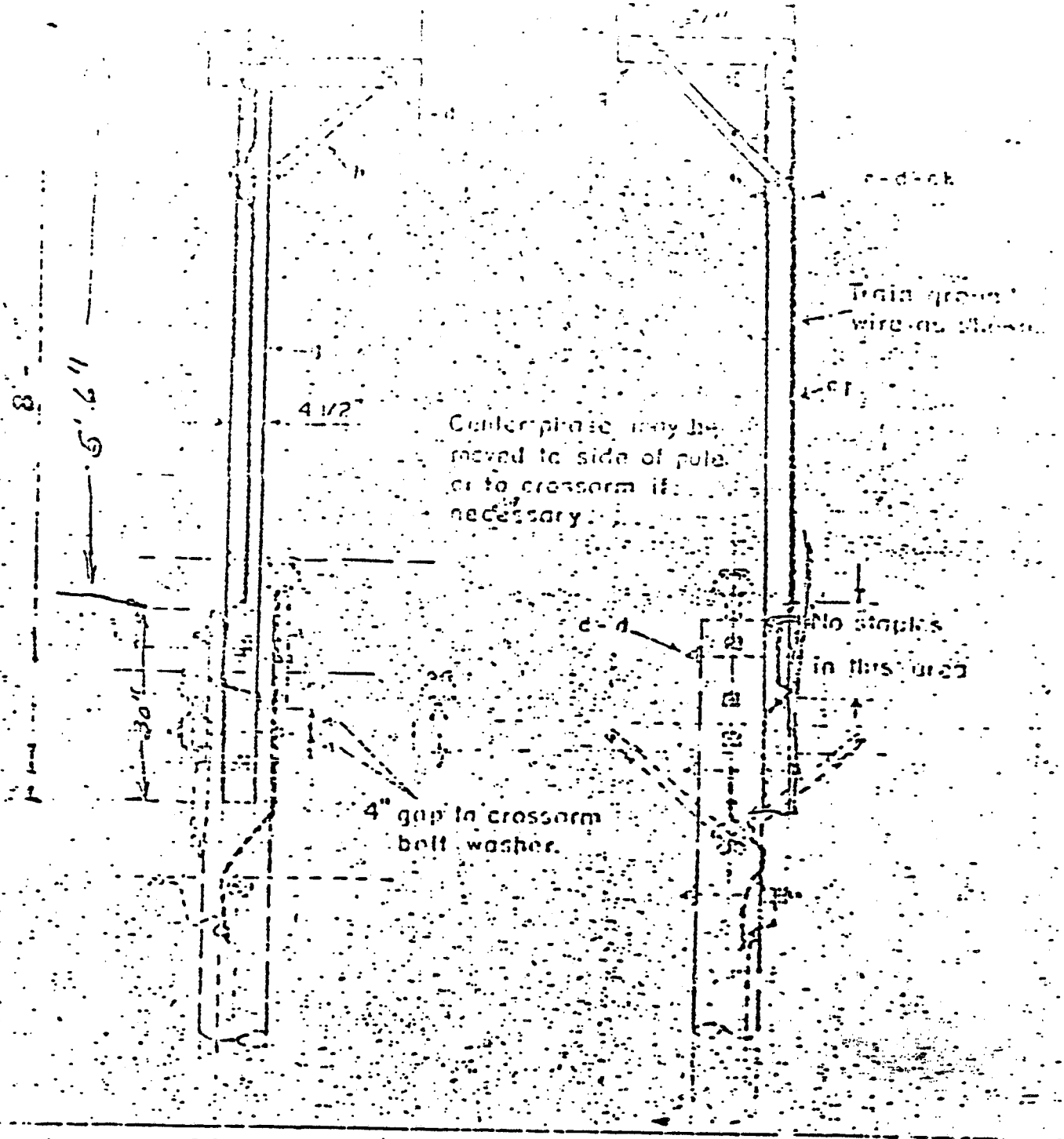
New Three-Phase Construction

For new construction in areas frequented by eagles and other large birds, it is recommended that the crossarm and neutral conductor be lowered as shown in Figure 9. All other features of standard construction including positioning of the ground wire and the use of wood crossarm braces should be as shown in REA standard drawings.

Other New Construction

Single-phase construction should be in accordance with Figure 2.

Single-phase transformer installations should make use of transformers



ITEM NO.	MATERIAL	ITEM NO.	MATERIAL
a	Crossarm, round 1 3/5" dia.	i	2 Bolt, carriage, 5/8" x 4 1/2"
b	Bolt, machine, 1/2" or 5/8" x req'd. length		
c	Wire, 2 1/4" square	a1	Staples, as req'd.
d	Insulator, pin, 2" to 3" - 0"	c1	Ground wire, as required
e	Crossarm, 3 1/2" x 4 1/2" x 8' - 0"	sk	Knockouts
f	Brace, flat, 25		

EAGLE PERCH

APPENDIX 11

MACROINVERTIBRATE STUDY

Interim Report

The Benthic Macroinvertebrates of Cottonwood Creek

Prepared for the
Trail Mountain Coal Company

by
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Station Description

The benthic community of Cottonwood Creek was examined at two locations, Surface Water Monitoring Stations SW-1 and SW-2. These stations were sampled on July 31, 1985 and again on October 25, 1985. Station SW-1 is located upstream from the Trail Mountain Coal Company facilities. The riparian vegetation produces a closed canopy over the stream. The stream bed itself is a large rubble substrate with a matrix of sand. Station SW-2 is downstream from the mining facilities and the riparian vegetation is more open resulting in very little shading of the station. The substrate here is a small rubble with a matrix of sand. The matrix and rubble tended to be cemented together by a calcarious marl. The marl was more noticeable on the first sampling date.

Sampling Procedure

Four samples were taken at each station. This number of samples was determined to be adequate for monitoring purposes. Samples were taken with a standard surber sampler with a 351 micron mesh net. Sampler positioning within each sampling station was determined randomly so as to eliminate any potential investigator induced bias. The substrate was removed to a depth of ten centimeters and placed in a plastic container. The contents of the surber sampler was also washed into this container. The sample was preserved with a 10% formalin solution with rose bengal stain added. The samples were washed in the laboratory and organic materials were retained in a 64 micron mesh sieve. The organic residue was washed into a bottle and preserved with the 10 % formalin - rose bengal solution until it could be sorted. The sediments were oven dried and then separated into size fractions with a Tyler sieve shaker set at 20 minutes. The size fractions were weighed to determine proportional weight content.

Sample sorting was done under a dissecting microscope. Organisms were removed and placed into two dram vials and 70% ethyl alcohol was added as a preservative. These samples were later sorted to Order and Family levels and Generic identification was accomplished with the use of several keys for aquatic invertebrates (see bibliography). Identification was made with a dissecting microscope and occasionally with the aid of a compound microscope for those specimens which required dissection and slide mounting.

Preliminary Results

The sediment data are summarized in a table. While this only depicts the average proportional composition for each sampling site and sampling date, it does reveal the gross differences between the sediments of the two stations. SW-1 on both sampling dates had the highest proportion of the substrate particles in the 64mm + category (74% and 64% respectively). While SW-2 samples taken on 10-25-85 did have the dominant substrate as 64mm + (53%), it is also apparent that the smaller rubble sizes are more predominant. For instance the 32-8 mm size range for SW-1 was 11% and 14% for July and October respectively while the same size range for SW-2 was 40% and 25%. This implies that substrate may be important in influencing the structure of the communities at the two respective stations and a certain degree of confounding may occur when attempting to determine any impact form mining activities. An additional confounding factor was alluded to earlier, that is the difference in canopy cover at the two sites. The open canopy of station SW-2 is likely the cause of the calcareous marl on the substrate. The marl is induced by the action of photosynthetic organisms, in this case epilithic algae. This marl will reduce the interstitial spaces available to the benthic fauna and thus will

influence the community. The reduced marl on the second sampling date could be from either lower overall photosynthesis on the benthos due to season or it could result from the disturbance induced by the sampling three months earlier in July. Regardless, the samples taken in October are more comparable between stations than are those taken in July. This is easily seen in the densities of the invertebrates. The October samples are more similar between the stations than are the July samples. In July the SW-2 station has about 30% fewer taxa than SW-1, while in October SW-2 has approximately the same number of taxa. From these preliminary results it appears that the mining activities are having little or no impact on the stream communities, although more definitive conclusions must await a final analysis with quantitative methods.

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Substrate Size (%)

Date and Sample	Rubble (mm) 64+	64-32	32-8	Gravel (mm) 8-4	4-2	2-1	Sand (mm) 1-.5	.5-.25	.25-.125	.125-.063
7/31/85 SW-1	74.2	9.6	10.7	2.1	1.3	0.6	0.4	0.9	0.2	0.2
7/31/85 SW-2	12.6	26.3	39.8	7.8	4.0	2.5	2.3	4.4	0.5	0.1
10/25/85 SW-1	64.4	13.1	13.9	4.2	1.3	0.7	0.6	1.5	0.5	0.1
10/25/85 SW-2	52.8	14.2	25.0	4.2	1.2	0.6	0.4	1.0	0.5	0.1

Date: 7-31-85
Sample site: SW-1

	Sample Number			
	1	2	3	4
Ephemeroptera				
Baetidae				
Baetis sp.	285	72	147	148
Heptageniidae				
Heptagenia sp.	0	0	0	0
Plecoptera				
Perlodidae				
Cultus sp.	29	19	8	13
Chloroperlidae				
Chloroperla sp.	3	0	0	0
Nemouridae				
Malenka sp.	0	5	3	11
Trichoptera				
Hydropsychidae				
Hydropsyche sp.	11	3	3	5
Brachycentridae				
Brachycentrus sp.	0	0	0	3
Limnephilidae	0	0	0	0
Diptera				
Chironomidae	24	3	21	5
Rhagionidae				
Atherix varigata	0	3	0	0
Simuliidae				
Prosimulium sp.	77	0	19	5
Tipulidae				
Tipula sp.	0	0	0	0
Coleoptera				
Dytiscidae				
nr. *Agabus*	0	0	0	3
Copepoda				
Harpacticoida	0	0	0	0
Oligocheta	19	64	8	11
Nematoda 0	0	0	0	

Date: 7-31-85
Sample site: SW-2

	Sample Number			
	1	2	3	4
Ephemeroptera				
Baetidae				
Baetis sp.	259	149	155	75
Heptageniidae				
Heptagenia sp.	0	0	0	0
Plecoptera				
Perlodidae				
Cultus sp.	0	3	3	11
Chloroperlidae				
Chloroperla sp.	0	0	0	0
Nemouridae				
Malenka sp.	0	3	8	3
Trichoptera				
Hydropsychidae				
Hydropsyche sp.	3	0	0	8
Brachycentridae				
Brachycentrus pp.	0	0	0	0
Limnephilidae	0	0	0	0
Diptera				
Chironomidae	5	8	19	16
Rhagionidae				
Atherix varigata	0	0	0	0
Simuliidae				
Prosimulium sp.	3	8	13	0
Tipulidae				
Tipula sp.	0	0	0	0
Coleoptera				
Dytiscidae				
nr. *Agabus*	0	0	0	0
Copepoda				
Harpacticoida	0	3	0	0
Oligocheta	32	45	13	21
Nematoda 11	3	0	0	

Date: 10-25-85
Sample site: SW-1

	Sample Number 1	2	3	4
Ephemeroptera				
Baetidae				
Baetis sp.	139	115	45	139
Heptageniidae				
Heptagenia sp.	5	5	0	3
Plecoptera				
Perlodidae				
Cultus sp.	5	11	0	8
Chloroperlidae				
Chloroperla sp.	19	13	0	0
Nemouridae				
Malenka sp.	8	0	0	0
Trichoptera				
Hydropsychidae				
Hydropsyche sp.	13	5	3	11
Brachycentridae				
Brachycentrus sp.	0	0	0	0
Limnephilidae	0	0	0	0
Diptera				
Chironomidae	5	12	11	24
Rhagionidae				
Atherix varigata	0	8	0	0
Simuliidae				
Prosimulium sp.	0	0	0	5
Tipulidae				
Tipula sp.	0	0	0	0
Coleoptera				
Dytiscidae				
nr. *Agabus*	0	0	0	0
Copepoda				
Harpacticoida	0	0	0	0
Oligocheta	19	29	53	35
Nematoda 0	0	3	0	

Date: 10-25-85
Sample site: SW-2

	Sample Number 1	2	3	4
Ephemeroptera				
Baetidae				
Baetis sp.	557	275	93	115
Heptageniidae				
Heptagenia sp.	0	8	3	0
Plecoptera				
Perlodidae				
Cultus sp.	27	16	5	0
Chloroperlidae				
Chloroperla sp.	12	0	3	0
Nemouridae				
Malenka sp.	0	0	0	0
Trichoptera				
Hydropsychidae				
Hydropsyche sp.	3	3	5	0
Brachycentridae				
Brachycentrus sp.	0	0	0	0
Limnephilidae	3	0	0	3
Diptera				
Chironomidae	5	275	83	261
Rhagionidae				
Atherix variegata	3	0	3	0
Simuliidae				
Prosimulium sp.	0	0	0	0
Tipulidae				
Tipula sp.	5	0	0	0
Coleoptera				
Dytiscidae				
nr. *Agabus*	0	0	3	0
Copepoda				
Harpacticoida	0	0	0	0
Oligocheta	77	45	3	64
Nematoda 8	0	0	0	

APPENDIX 11

MACROINVERTIBRATE STUDY

COTTONWOOD CREEK

(ADD THIS FINAL REPORT TO PREVIOUSLY INCORPORATED INTERIUM REPORT)

Final Report

Cottonwood Creek Macroinvertebrate Assessment

for the

Trail Mountain Coal Company

by

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Introduction and Purpose

The Utah Division of Oil, Gas and Mining and the United States Department of the Interior have required a study of the Cottonwood Creek macroinvertebrate community with the objective of documenting any negative impacts of the Trail Mountain Coal Company mining operations on the stream system. The instructions were to compare the faunal elements over three sampling periods at two stations on Cottonwood Creek. A total of four samples per station were recommended. This report details the results of the study and interprets the similarities and dissimilarities of the two communities and the habitat found at each station.

Description of Study Area

The study was conducted from two preestablished sampling stations in Cottonwood Canyon, Emery County, Utah. These sites are the surface water monitoring stations SW-1 and SW-2 of the Hydrologic Monitoring program established by the Trail Mountain Coal Company in compliance with requirements by the Utah Division of Oil, Gas & Mining and the United States Department of the Interior. SW-1 is above the Trail Mountain Coal Company mining facilities and represents a control, or non impact section. SW-2 is approximately one kilometer downstream from the facilities and represents the portion of the stream where mining impacts would be expected if such impacts occur.

The upstream station, SW-1 is located in a shaded portion of the stream, with a relatively dense overhead canopy of Cottonwood (Populus sp.) and a riparian of varied native shrubs. The stream passes through a narrow channel, confined by steep side walls. The substrate is large rubble with a sand matrix. SW-2 is in a more open setting, and has significantly less overstory cover. The stream bed is, for the most part, exposed to direct sunlight. The bank slopes gradually to the stream bed from the east, while the western bank is steep, similar to the banks at location SW-1. The substrate here is a small rubble with a matrix of sand. The matrix and rubble tended to be cemented together with a calcarious marl, and this marl was best developed during the summer sampling period.

Materials and Methods

Sampling Methods

Samples were taken three times during the year: July 31, 1985; October 25, 1985 and February 9, 1986. Four replicate samples were taken per station using a one square foot surber sampler with a net mesh of 351 microns. The positioning of each sample was determined with random numbers to avoid any bias by the investigator. Once the sample position was determined, the surber sampler was centered directly over the sampling point. Large rocks found within the sample area were washed and measured in the field, but were not retained for laboratory processing. The volume of each rock was used to determine its approximate weight for sediment analysis. The remaining substrate in each sample was removed to a depth of 4 inches (10 cm.) and placed in a polyethylene jar. Excess water was removed by filtering through a 64 micron mesh sieve. The contents of the surber sampler net was also washed into the sieve and then transferred into the jar. Samples

were preserved with ten percent formalin. Rose bengal stain was added to aid in laboratory processing.

Samples were transported to the laboratory where the sediments were separated from the benthic invertebrates using elutriation (Shiozawa 1986). The elutriated organic residue was collected with a 65 micron mesh sieve, washed into a jar, and preserved with a 10% formalin - rose bengal solution. The inorganic residual was retained for sediment analysis. The samples were picked under a stereo dissecting scope and the recovered invertebrates were sorted and separated by genus or species when possible. The sediments were oven dried at 120 degrees centigrade to a constant weight. The dried material was then placed in a series of nested sieves sized according to the phi scale (Cummins, 1962; Cummins and Lauff, 1969), beginning at 250 microns mesh diameter. The sieves were then placed on a Tyler sediment shaker for 20 minutes. The size fractions were weighed and the resulting percents were used to characterize the sediments distribution in each sample.

Samples were sorted with a dissecting microscope using fiber optics lighting. Organisms were enumerated and placed into vials. The sorted invertebrates were preserved with 70% ethyl alcohol. The preserved samples were later sorted to Order and Family and the Genus and Species were determined when possible using standard keys for aquatic invertebrates (Baumann, Gaufin and Surdick, 1977; Edmondson, 1959; Edmunds, Jensen and Berner, 1976; Hitchcock, 1974; Merritt and Cummins,1978; Ross, 1944; Usinger, 1971; Wiggens, 1977). Identifications were made under a dissecting microscope and occasionally with slide mounted specimens viewed with a compound microscope.

Results and Discussion

Analysis of aquatic impact data has traditionally focused on either the invertebrate community or the water chemistry of the stream areas in question. Water chemistry (which has been monitored separately and is not of consideration in this report) has the advantage of giving direct levels of potential contaminants reaching a given site and, in that sense, simplifies management decisions when pre-established toxicant levels are exceeded. However water chemistry varies regionally as well as seasonally (Hem 1970), and the conditions present in one system can remove or neutralize materials which might be toxic or stressful under other conditions. In addition a serial water sampling program represents point data and does not detect pollutants which may enter the system for only short periods of time, such as immediately following a storm (storm runoff) or materials that are only periodically discharged into the stream system. Materials which may enter the stream in sublethal quantities can still impact the aquatic community yet not exceed established standards and some materials may be difficult or prohibitively expensive to measure and assess chemically. The use of the biotic community is advantageous under such conditions. Lotic organisms will respond to stress if it exceeds their tolerance limits. Thus a single slug flow of a toxicant may result in the elimination or reduction of certain species and favor the multiplication or survival of other more tolerant species. The resulting shift in community structure can be detected long after the stressing factor(s) have left the system. This initially led investigators to develop the concept of indicator species

(Gaufin and Tarzwell, 1956; Tarzwell and Gaufin, 1953) where certain species were considered to be indicative of stress, especially organic pollution. If these indicators were present, then pollution was likely.

Later with the adaptation of information theory to ecology (Margalef 1957) an additional tool was made available for such evaluation. Information theory predicted that the number of pathways available for information transfer was directly correlated with the stability of information systems. A direct adaptation of this concept to that of trophic associations and food web connectivity led to the widespread use of diversity indices as a measure of the stability of natural and perturbed systems (Margalef, 1957; MacArthur, 1972; Patrick, 1963; Pielou, 1975). The Shannon-Weiner (Shannon and Weaver 1949) index of diversity became widely used in evaluating impacts in the early 1970's. This index for diversity is:

$$H' = \text{sum}(pi * \log(p_i))$$

where H' = the Shannon Weiner Index of diversity
p_i = the proportion of species i in the sampled community

This function is maximum when $p_i = 1/S$ for all S species in the sample. That is:

$$H'max = S((1/S) * \log(1/S))$$

where H'max = the maximum diversity
S = the total number of species in the sample

Assuming that the ideal community would have maximum diversity, the nearness to this ideal state could be calculated. This measure of nearness to the ideal is called evenness and is found with the formula:

$$E = H'/H'max$$

where E = evenness
H' = the Shannon-Weiner Diversity Index
H' = the maximum diversity index defined above

Evenness ranges between 0 and 1 where 1 is maximum evenness.

As more was understood about natural communities the connection between diversity and stability began to come under question (see Pielou, 1975) and the use of diversity and evenness alone as an index of environmental stress became limited. An association between diversity and stability may exist (May, 1974) but that association is in no way as simplistic as the original users of information theory had assumed. The most reasonable use of diversity indices now are for comparisons of adjacent sites, such as is the case in this study where two stations on the same stream are being compared. Regional and broad geographical comparisons are likely to be less valid, especially when interpretations associated with the condition or quality of various systems are being considered.

In 1972 Chutter recommended the use of a biotic index to assess the impact of perturbations on aquatic systems. This index was designed to allow a

quantitative evaluation of the indicator species concept. All species in the sampled station are enumerated and each is assigned a value according to it's importance as an indicator. The higher the value, the higher the tolerance is to stressful conditions. Species values range from zero to ten and the density of each species is included in the computation of the index. The index is:

$$BI = (Sum(n_i * s_i))/N$$

where BI = the biotic index
n_i = the importance value of the ith species
s_i = the density of species i in the sample being evaluated
N = the total number of organisms in the sample

Here values of unperturbed systems are generally considered to be in the range of 0-2, while values of 2-4 indicate slightly enriched (stressed) situations, 4-7 are typical of enriched waters and 7-10 are characteristic of polluted waters (Hilsenhoff 1977).

Additional factors can be useful when interpreting the relative conditions of several sites. One is the influence of substrate on community structure (DeMarch, 1976) and another is the functional grouping of stream organisms (Cummins 1974). In this report these various techniques were used in extracting information relative to the impact of the Trail Mountain Coal company operations on Cottonwood Creek.

Sediment Characterization

The sediment size frequencies for each sample taken during the study are listed in Tables I, II and III. Sediments have been shown to undergo a seasonal change in structure associated with annual changes in discharge in some stream systems (DeMarch, 1976; Shiozawa, 1986). This has implications for community structure since the substrate essentially establishes the template on which the community is structured (Shiozawa 1983). Differences in sediment dynamics or in sediment structure at the two stations could induce differences in the community structure and thus complicate the interpretation of the data. Station SW-1 shifts from slightly higher percentages in the 64+mm size range to more in the 32-8 mm sizes between July and October of 1985. These particles are in the gravel sizes, and indicate selective erosion of sands from the substrate. Essentially no change in substrate size frequency occurred between October and the February samples at SW-1. Station SW-2 underwent an increase in the coarse material greater than 64 mm in size between July and October. This implies the erosion of sands and gravels from the substrate. Between October and February the proportion of gravels increased in the samples and deposition is the likely source of materials. It appears that the stations are undergoing different sediment dynamics. If annual sediment deposition - erosion cycles occur, then station SW-1 is undergoing a change from a depositional environment in the early-mid summer to an erosional one in the fall. Over the winter it stabilizes and in the spring runoff it should become erosional again. Once water levels stabilize the stream becomes depositional, replacing the materials lost to the spring floods. Station SW-2 underwent an erosional period between July and October with

Table I. Sediment size frequency data for samples collected on 7-31-85

Station: SW-1

Sample	Percent Composition							
	64+	32-64	8-32	4-8	2-4	1-2	.5-1	.25-.5
1	82.1	8.3	7.6	0.8	0.4	0.2	0.2	0.4
2	62.8	16.9	12.9	3.1	1.7	0.8	0.5	1.3
3	75.8	13.0	7.7	1.2	0.7	0.3	0.2	1.1
4	75.9	0.0	14.4	3.5	2.2	1.1	0.8	2.1
Mean	74.15	9.55	10.65	2.15	1.25	0.60	0.43	1.23
Std. Deviation	7.03	6.30	3.05	1.17	0.73	0.37	0.25	0.61

Mean Sediment Diversity: 0.929741
Mean Sediment Evenness: 0.447111

Station: SW-2

Sample	Percent Composition							
	64+	32-64	8-32	4-8	2-4	1-2	.5-1	.25-.5
1	34.2	33.7	19.7	7.8	1.7	0.9	0.6	1.4
2	16.0	28.0	17.9	9.6	6.3	4.9	5.7	11.6
3	0.0	0.0	75.9	8.8	5.7	3.1	2.1	4.4
4	0.0	43.3	45.6	4.9	2.3	1.0	0.6	2.3
Mean	12.55	26.25	39.78	7.78	4.00	2.48	2.25	4.93
Std. Deviation	14.10	26.25	23.56	1.79	2.02	1.65	2.05	4.00

Mean Sediment Diversity: 1.630813
Mean Sediment Evenness: 0.784255

Table II. Sediment size frequency data for samples collected on 10-25-85

Station: SW-1

Sample	Percent Composition							
	64+	32-64	8-32	4-8	2-4	1-2	.5-1	.25-.5
1	55.3	16.9	21.9	3.0	0.8	0.4	0.3	1.4
2	79.9	14.7	2.6	1.1	0.6	0.3	0.2	0.6
3	76.9	7.1	9.7	2.3	1.3	0.7	0.5	1.5
4	45.3	13.8	21.5	10.5	2.4	1.3	1.2	4.0
Mean	64.35	13.13	13.93	4.23	1.28	0.68	0.55	1.88
Std. Deviation	14.53	3.66	8.17	3.69	0.70	0.39	0.39	1.28

Mean Sediment Diversity: 1.150947
Mean Sediment Evenness: 0.553958

Station: SW-2

Sample	Percent Composition							
	64+	32-64	8-32	4-8	2-4	1-2	.5-1	.25-.5
1	0.0	35.9	43.6	13.1	3.1	1.5	0.9	1.9
2	71.2	14.4	10.9	1.5	0.6	0.3	0.2	0.9
3	55.9	7.5	32.8	1.3	0.9	0.4	0.3	0.9
4	84.6	0.0	12.7	0.9	0.3	0.3	0.3	0.9
Mean	52.93	14.45	25.00	4.20	1.23	0.63	0.43	1.15
Std. Deviation	32.20	13.39	13.76	5.14	1.10	0.51	0.28	0.43

Mean Sediment Diversity: 1.256215
Mean Sediment Evenness: 0.604112

Table III. Sediment size frequency data for samples collected on 2-9-86

Station: SW-1

Sample	Percent Composition 64+	32-64	8-32	4-8	2-4	1-2	.5-1	.25-.5
1	46.2	12.5	21.8	7.6	3.9	2.2	1.9	3.9
2	85.0	3.6	6.1	1.9	1.0	0.7	0.7	1.0
3	72.8	11.8	10.2	2.5	0.9	0.4	0.3	1.1
4	58.0	22.0	16.6	1.9	0.7	0.3	0.2	0.3
Mean	65.50	12.48	13.68	3.48	1.63	0.90	0.78	1.58
Std. Deviation	14.68	6.52	6.00	2.39	1.32	0.76	0.68	0.38

Mean Sediment Diversity: 1.138008
Mean Sediment Evenness: 0.547266

Station: SW-2

Sample	Percent Composition 64+	32-64	8-32	4-8	2-4	1-2	.5-1	.25-.5
1	0.0	39.3	42.0	5.8	2.8	2.0	2.2	5.9
2	79.2	5.3	8.9	3.3	1.8	0.9	0.4	0.2
3	0.0	9.8	77.1	7.7	2.8	1.2	0.6	0.8
4	13.5	14.7	58.0	6.5	2.8	1.3	0.9	1.9
Mean	23.18	17.28	46.60	5.83	2.55	1.35	1.03	2.20
Std. Deviation	32.81	13.14	25.06	1.61	0.43	0.40	0.70	2.22

Mean Sediment Diversity: 1.446200
Mean Sediment Evenness: 0.695475

even more coarse materials being removed than in station SW-1. From October to February deposition occurred. In the spring the runoff would again be expected to act as an erosional factor. The difference in the size of particles deposited is indicative of the stream velocity in the two sites. Station SW-2 has a higher gradient than does station SW-1 and higher velocity water will carry larger particles. However the sediment determinations were based upon the four replicate random samples. Other studies (DeMarch, 1976; Shiozawa, 1986) relied upon more replicates per station and sampled much more frequently when deriving the seasonal patterns. Thus the three sampling periods used here can give only partial support of such seasonal trends existing in Cottonwood Creek. It is obvious that the substrates at the two sites are quite different, especially during the July and February sampling periods.

Some of the differences between the sediments at SW-1 and SW-2 are associated with the high carbonate content at location SW-2. The open exposure of the eastern bank of the stream at SW-2 and the lack of an overhead canopy combine to favor photosynthesis of algae. Under condition of very active photosynthesis, algae can switch from utilizing dissolved CO_2 in the water to utilizing carbon dioxide in the bicarbonate form. Extraction of CO_2 from the bicarbonate, HCO_3^-, leaves a hydroxide group (OH^-) which then reacts with other bicarbonates to form insoluble carbonate complexes. These complexes cement the substrate together in the form of a calcareous marl. The benthos of SW-2 was cemented in place by such a marl when samples were taken in July. Less cementing was noted when sampling in November and February. The lower marl presence in the fall and winter may be due to lower primary production associated with shorter days in the narrow canyon in which the sampling stations are located, or it may be an artifact resulting from the initial disturbance of the stream channel by the July sampling. The answer to this cannot be determined without further sampling. Station SW-1 did not have marl deposits during any of the sampling periods. This was to be expected because of the overhead canopy which would reduce the rate of algal photosynthesis.

The differences in the sediments collected from the two stations are summarized in Table IV. A comparison of sediment weight based on both modal and median weight frequencies also indicates the differences between stations SW-1 and SW-2. SW-2 samples in general had a smaller modal and median size although this difference is not apparent in the October samples. Diversity and evenness of each sample is also listed in Table IV. The diversity value gives a relative picture of the distribution of the sediment weights. The lower the diversity, the more a single size class dominates the sample. Again both diversity and evenness indicate that the sediments in station SW-1 are more skewed in distribution than are those in station SW-2 with the exception of the October sampling series.

Benthic Invertebrate Community

The benthic invertebrate community consisted of 15 taxa representing eight orders.. The distributions of the invertebrates resulted in a high variance to mean ratio which implies a contagious distribution. Such patterns are typical of stream systems and the currently accepted treatment of such data is to utilize the geometric confidence limits based on a log(x+1) transformation on the arithmetic mean (Elliott, 1977; Shiozawa and Barnes,

Table IV. Sediment Data Summary

Date: 7-31-85	modal size	median size	Diversity	Evenness
SW-1 1	64+	64+	0.67201	0.323172
SW-1 2	64+	64+	1.15532	0.555594
SW-1 3	64+	64+	0.83994	0.403928
SW-1 4	64+	64+	0.85902	0.413103
mean conditions:	64+	64+	0.92974*	0.447111*
SW-2 1	32-64	64+	1.45463	0.699529
SW-2 2	8-32	32-64	1.91767	0.922209
SW-2 3	8-32	8-32	0.91271	0.438922
SW-2 4	8-32	8-32	1.11856	0.537914
mean conditions	8-32	8-32	1.63081*	0.784255*
Date: 10-25-85				
SW-1 1	64+	64+	1.20374	0.578878
SW-1 2	64+	64+	0.69688	0.335131
SW-1 3	64+	64+	0.88353	0.424889
SW-1 4	32-64	64+	1.52695	0.734307
mean conditions	64+	64+	1.15095*	0.553958*
SW-2 1	8-32	8-32	1.28434	0.617639
SW-2 2	64+	64+	0.92844	0.446487
SW-2 3	64+	64+	1.06578	0.512532
SW-2 4	64+	64+	0.54062	0.259986
mean conditions	64+	64+	1.25622*	0.604112*
Date 2-9-86				
SW-1 1	32-64	32-64	1.55692	0.748722
SW-1 2	64+	64+	0.66529	0.319939
SW-1 3	64+	64+	0.93986	0.451978
SW-1 4	64+	64+	1.10446	0.531136
mean conditions	64+	64+	1.13801*	0.547266*
SW-2 1	8-32	8-32	1.32584	0.637594
SW-2 2	64+	64+	0.81747	0.393120
SW-2 3	8-32	8-32	0.84808	0.407840
SW-2 4	8-32	8-32	1.33412	0.641577
mean conditions	8-32	8-32	1.446208*	0.695475*

* note that these values are based on the mean percent composition values from Tables I,II,III and are not arithmetic means of the individual diversity and evenness values.

1977). For that reason the confidence limits about each species will not be symmetrical. It is important to recognize that contagious distributions predominate in most benthic groups, and that this distributional pattern further limits the accuracy of small numbers of replicate samples.

The predominant benthic invertebrate groups collected included the mayflies, especially Baetis, perlodid and nemourid stoneflies, hydropsychid caddisflies, chironomids, simuliids and oligochaetes. These taxa can be placed into functional group designations (Cummins, 1974; Merritt and Cummins, 1978) which can add insight into the functional structures of the two sites. The stations can be compared over time as well as between each other for differences in functional groupings. The functional group concept of Cummins (1974) is based on the processing of food in the stream system. Most streams have a considerable portion of their energetic budget supplied by the surrounding riparian vegetation. The resulting food web is thus detrital based, and the functional groups correspond to the role which various species play in processing food within the system. Whole leaves, after being conditioned by bacteria and fungi are broken into smaller particles by shredders. The finer particles are collected from the flowing water by filterers, and those particles which settle out onto the stream bed are fed upon by the collector-gatherers. Grazers are those species which actively feed on living plant materials, algae being the main food source, while those designated as grazer/scrapers may also feed on epilithic detritus. Predators are those species which feed upon other benthic invertebrates.

In July SW-1 (Table V) had abundant collector-gatherers (Baetis, Chironomids, oligochaetes) and filter feeders (Brachycentrus, Hydropsyche and Prosimulium. Predators were represented by the plecopterans Cultus and Choloroperla, rhagionid fly larvae and the dytiscid beetle larvae, Agabus. The only shredder at SW-1 was Melanka (Plecoptera). The October (Table VI) samples had a decrease in shredder (still the one plecopteran species) and predator densities. The grazer/scraper Heptagenia (Ephemeroptera) occurred, possibly as a partial response to the open canopy following leaf drop and to the increased organic flocculates on the rock surfaces. The collector gatherers were in slightly lower densities. By February (Table VII) the collector gatherer Baetis was in low density but the chironomids, also collector gatherers, had increased to over ten times their October densities. The grazer Heptagenia was still present and the shredders were predominantly represented by Tipula and limnephilid caddisflies. The filterers were still present but the hydropsychid caddisflies decreased in density and the simuliid larvae became more abundant.

The July (Table VIII) samples from Station SW-2 had collector gatherer densities virtually identical to that of SW-1. The filter feeders were lower in density than those at station SW-1, but this difference was strongly influenced by the substrate size distribution. Filter feeders require a substratum for attachment and from the sediment analysis for SW-2 (Table I) it is apparent that the dominant substrate in July was gravel, too unstable for the development of a high filter feeder density. Shredders were also in lower densities in the SW-2 July samples, but with the high variance associated with the contagious distributions of this group the difference is not significant. The only predator in station SW-2 for July was the plecopteran Cultus. Its densities were approximately one fourth

Table V. Invertebrate density, diversity, evenness and biotic index for site SW-1, July 31, 1985.

	no./sq. meter	95% confidence interval lower	upper
Ephemeroptera			
Baetidae			
Baetis sp.	1754.52	716.11	4276.38
Heptageniidae			
Heptagenia sp.	0.0	-	-
Plecoptera			
Perlodidae			
Cultus sp.	185.68	76.12	433.37
Chloperlidae			
Chloroperla sp.	8.07	-4.51	45.98
Nemouridae			
Melanka sp.	51.13	0.93	316.72
Trichoptera			
Hydropsychidae			
Hydropsyche sp.	59.20	19.91	148.82
Brachycentridae			
Brachycentrus sp.	8.07	-4.51	45.98
Limnephillidae	0.0	-	-
Diptera			
Chironomidae	142.62	24.69	652.80
Rhagionidae			
Athrix varigata	8.07	-4.51	45.98
Simuliidae			
Prosimulium sp.	271.79	4.14	5347.37
Tipulidae			
Tipula sp.	0.0	-	-
Coleoptera			
Dytiscidae			
Agabus sp.	8.07	-4.51	45.98
Crustacea			
Copepoda			
Harpacticoida	0.0	-	-
Annellida			
Oligochaeta	274.48	60.42	1132.24
Nematoda	0.0	-	-
Total Invertebrates	2771.70		

Number of Taxa	11
H' Max	2.397895
Diversity, H'	1.303748
Evenness	0.543705
Biotic Index (Hilsenhoff 1977)	2.0748

Table VI. Invertebrate density, diversity, evenness and biotic index for site SW-1, October 25, 1985.

	no./sq. meter	95% confidence interval lower	upper
Ephemeroptera			
Baetidae			
Baetis sp.	1178.65	498.96	2764.67
Heptageniidae			
Heptagenia sp.	34.98	4.11	65.86
Plecoptera			
Perlodidae			
Cultus sp.	64.58	2.00	433.92
Chloperlidae			
Chloroperla sp.	86.11	-3.56	1291.33
Nemouridae			
Melanka sp.	21.53	-5.14	174.67
Trichoptera			
Hydropsychidae			
Hydropsyche sp.	86.11	27.19	236.51
Brachycentridae			
Brachycentrus sp.	0.0	-	-
Limnephillidae	0.0	-	-
Diptera			
Chironomidae	139.93	48.78	370.63
Rhagionidae			
Athrix variqata	21.53	-5.14	174.67
Simuliidae			
Prosimulium sp.	13.45	-4.94	89.97
Tipulidae			
Tipula sp.	0.0	-	-
Coleoptera			
Dytiscidae			
Agabus sp.	0.0	-	-
Crustacea			
Copepoda			
Harpacticoida	0.0	-	-
Annellida			
Oligochaeta	365.97	184.75	715.17
Nematoda	8.07	-4.51	45.98
Total Invertebrates	2020.92		

Number of Taxa	11
H' Max	2.397895
Diversity, H'	1.410172
Evenness	0.588087
Biotic Index (Hilsenhoff 1977)	2.0719

Table VII. Invertebrate density, diversity, evenness and biotic index for site SW-1, February 9, 1986.

	no./sq. meter	95% confidence interval lower	upper
Ephemeroptera			
Baetidae			
Baetis sp.	861.11	161.00	4414.80
Heptageniidae			
Heptagenia sp.	45.75	10.44	81.05
Plecoptera			
Perlodidae			
Cultus sp.	26.91	-0.17	53.99
Chloperlidae			
Chloroperla sp.	24.22	-1.47	49.91
Nemouridae			
Melanka sp.	8.07	-4.51	45.98
Trichoptera			
Hydropsychidae			
Hydropsyche sp.	69.97	17.75	217.80
Brachycentridae			
Brachycentrus sp.	0.0	-	-
Limnephillidae	16.15	-4.83	37.12
Diptera			
Chironomidae	4039.15	1675.14	9718.06
Rhagionidae			
Athrix varigata	0.0	-	-
Simuliidae			
Prosimulium sp.	91.49	2.94	752.20
Tipulidae			
Tipula sp.	29.60	1.20	58.00
Coleoptera			
Dytiscidae			
Agabus sp.	8.07	-4.5	45.98
Crustacea			
Copepoda			
Harpacticoida	0.0	-	-
Annellida			
Oligochaeta	129.17	-3.24	2591.57
Nematoda	0.0	-	-
Total Invertebrates	5349.66		

Number of Taxa	12
H' Max	2.484906
Diversity, H'	0.880037
Evenness	0.354153
Biotic Index (Hilsenhoff 1977)	2.0645

Table VIII. Invertebrate density, diversity, evenness and biotic index for site SW-2, July 31, 1985.

	no./sq. meter	95% confidence interval lower	upper
Ephemeroptera			
Baetidae			
Baetis sp.	1716.84	763.14	3845.84
Heptageniidae			
Heptagenia sp.	0.0	-	-
Plecoptera			
Perlodidae			
Cultus sp.	45.75	0.43	274.62
Chloroperlidae			
Chloroperla sp.	0.0	-	-
Nemouridae			
Melanka sp.	37.67	0.58	196.02
Trichoptera			
Hydropsychidae			
Hydropsyche sp.	29.60	-3.59	216.48
Brachycentridae			
Brachycentrus sp.	0.0	-	-
Limnephillidae	0.0	-	-
Diptera			
Chironomidae	129.17	46.62	330.47
Rhagionidae			
Athrix varigata	0.0	-	-
Simuliidae			
Prosimulium sp.	64.58	1.14	466.02
Tipulidae			
Tipula sp.	0.0	-	-
Coleoptera			
Dytiscidae			
Agabus sp.	0.0	-	-
Crustacea			
Copepoda			
Harpacticoida	8.07	-4.51	45.98
Annellida			
Oligochaeta	298.70	125.78	690.58
Nematoda	37.67	-3.63	318.25
Total Invertebrates	2368.06		

Number of Taxa	9
H' Max	2.197224
Diversity, H'	1.033331
Evenness	0.470289
Biotic Index (Hilsenhoff 1977)	2.3216

of that of the same species at SW-1.

In October (Table IX) the invertebrate density in SW-2 was double that of SW-1. Baetis was 2.5 times more abundant and the midge larvae (Chironomidae) were approximately ten times more abundant. Both the predacious stoneflies and the grazer Heptagenia were present in approximately the same density as in SW-1. The grazer was not present in SW-2 in July, and the change to more favorable substrate size classes are associated with its October occurrence. Filter feeders were less abundant. The simuliids appear to have undergone a fall emergence prior to the October sampling date and therefore were absent. The hydropsychid caddisflies were significantly lower in density than those in SW-1 for October, and were about the same density as they were in the previous SW-2 samples taken in July. The cause of this difference is not clear and the data taken in this project will not allow a resolution of this problem. One factor which could be influential is the lower drift rates of later instar hydropsychid caddisflies which slows dispersal and would therefore imply that later instar hydropsychids would be slow in colonizing newly opened habitat. However the ability of such behavioral factors to control densities several months later seems unlikely.

The February samples from SW-2 (Table X) are indicative of the stressful conditions which exist in the stream during the winter. At the time of sampling frazzle ice was present and it appeared that anchor ice had occurred as well. Invertebrate densities were approximately one eighth the October level. The location of SW-2 with its open exposure would increase the likelihood of anchor ice formation. In addition the sediments collected in February had shifted back to gravel (Table IV) which would also favor reduced numbers of species. The total invertebrate density in SW-2 was also about one eighth of that of SW-1 on that same sampling date. The functional groups present include mostly collector gatherers. A few filterers (hydropsychids) and shredders (Tipula) were collected, but in general the community appeared as a vagrant benthos with opportunistic species being dominant.

Diversity, evenness and the biotic index were also computed for the benthic communities. Highest diversity for SW-1 and SW-2 occurred during October. The lowest diversity for both stations occurred in February. SW-2 had the lowest diversity value in July and October samples but in February SW-1 was found to have the lowest diversity. At this time SW-2 had 6 taxa and SW-1 had 12 taxa but the evenness of SW-1 was much lower than that of SW-2. Wilhm (1970) proposed diversity indices less than one to be indicative of stressed or polluted systems while values above 3 represented clean water conditions. On this basis both stations are borderline polluted or polluted. Neither would fall into the clean water categories.

The biotic index, based on the computed values of Hilsenhoff (1972) was also used to compare the benthic communities. SW-2 had consistently higher biotic index values throughout the three sampling periods, averaging 2.3493 while SW-1 averaged 2.0704. Values between 0-2 are indicative of clean water conditions and values between 2 and 3 are indicative of sightly stressed conditions (Hilsenhoff 1972). Thus SW-1 is at worst very slightly stressed on the biotic index rating and SW-2 is only slightly but significantly more so. However much of the stress is can be attributed to the differences

Table IX. Invertebrate density, diversity, evenness and biotic index for site SW-2, October 25, 1985.

	no./sq. meter	95% confidence interval lower	upper
Ephemeroptera			
Baetidae			
Baetis sp.	2798.61	750.00	10363.83
Heptageniidae			
Heptagenia sp.	29.60	-3.59	216.48
Plecoptera			
Perlodidae			
Cultus sp.	129.17	2.66	1447.76
Chloroperlidae			
Chloroperla sp.	40.36	-3.63	355.72
Nemouridae			
Melanka sp.	0.0	-	-
Trichoptera			
Hydropsychidae			
Hydropsyche sp.	26.91	0.35	116.96
Brachycentridae			
Brachycentrus sp.	0.0	-	-
Limnephillidae	16.16	-4.83	37.12
Diptera			
Chironomidae	1679.17	86.66	29303.24
Rhagionidae			
Athrix varigata	16.15	-4.83	37.12
Simuliidae			
Prosimulium sp.	0.0	-	-
Tipulidae			
Tipula sp.	13.45	-4.94	89.97
Coleoptera			
Dytiscidae			
Agabus sp.	8.07	-4.51	45.98
Crustacea			
Copepoda			
Harpacticoida	0.0	-	-
Annellida			
Oligochaeta	508.59	46.65	4687.38
Nematoda	21.53	-5.14	174.67
Total Invertebrates	5287.77		

Number of Taxa	12
H' Max	2.484906
Diversity, H'	1.192904
Evenness	0.480060
Biotic Index (Hilsenhoff 1977)	2.2651

Table X. Invertebrate density, diversity, evenness and biotic index for site SW-2, February 9, 1986.

	no./sq. meter	95% confidence interval lower	upper
Ephemeroptera			
Baetidae			
Baetis sp.	441.32	91.01	1997.33
Heptageniidae			
Heptagenia sp.	0.0	-	-
Plecoptera			
Perlodidae			
Cultus sp.	0.0	-	-
Chloperlidae			
Chloroperla sp.	8.07	-6.76	22.90
Nemouridae			
Melanka sp.	0.0	-	-
Trichoptera			
Hydropsychidae			
Hydropsyche sp.	8.07	-4.51	45.98
Brachycentridae			
Brachycentrus sp.	0.0	-	-
Limnephillidae	0.0	-	-
Diptera			
Chironomidae	123.78	-0.97	1837.34
Rhagionidae			
Athrix varigata	0.0	-	-
Simuliidae			
Prosimulium sp.	0.0	-	-
Tipulidae			
Tipula sp.	13.45	-4.94	89.97
Coleoptera			
Dytiscidae			
Agabus sp.	0.0	-	-
Crustacea			
Copepoda			
Harpacticoida	0.0	-	-
Annellida			
Oligochaeta	64.58	-3.56	776.95
Nematoda	0.0	-	-
Total Invertebrates	659.29		

Number of Taxa	6
H' Max	1.791759
Diversity, H'	0.997553
Evenness	0.556744
Biotic Index (Hilsenhoff 1977)	2.4612

of substrate size, a factor not fully considered in the derivation of the biotic index.

The final technique used to evaluate the samples was a form of multivariate analysis known as cluster analysis. Cluster analysis utilizes a similarity matrix based on comparisons of all possible pairs of samples in the study. The similarity can be measured with any index, including those based on presence and absence as well as on quantitative comparisons. In this study correlation coefficients were used as the measure of similarity. The resulting correlation matrices are listed in Tables XI and XII. Table XI lists the correlations of all possible pairs of sediment samples and Table XII lists the correlations for all pairs of benthic invertebrate samples. Cluster dendrograms for the sediments (Figure 1) and the benthic invertebrate communities (Figure 2) were prepared from the correlation matrices. The algorithm used was the unweighted pair-group arithmetic averaging method (Sokal and Sneath, 1963; Sneath and Sokal, 1973). The initial purpose of clustering was to check for associations between the sediments and samples. The high degree of sediment variability between the stations as well as within station SW-2 over time made it necessary to look for associations between the sediment structure of a sample and invertebrate community structure. That is, to determine if sediment-invertebrate community structure was tightly enough linked that community structure could be determined solely on the sediment structure of the sample. Discrete multivariate comparisons of categorized groupings showed no significant associations between sediment structure and community structure. This should not be interpreted to imply that no association exists. The earlier discussions of various functional groups did develop the concept of functional associations, but the results of the cluster analysis point to no general response to the sediment composition by the community as a unit. The various species involved in the system act independently of one another in their responses to the ambient conditions.

The clusters can also be used to distinguish patterns within the clustered samples. The sediment cluster (Figure 1) can be subdivided into three clusters at the similarity level of 0.55. The samples which make up the first cluster consist of SW-2 samples exclusively, and the third cluster is comprised of two samples from SW-2 taken in July. The second cluster contains all of the SW-1 samples as well as most of the October SW-2 samples. This indicates that the samples from SW-2 are much more variable than those from SW-1, and that the October SW-2 samples did converge towards the sediment distribution typical of the upstream site, SW-1. This interpretation confirms the earlier discussion of sediment size structure, with an additional observation that two of the July samples from SW-2 (sample #'s 1 and 2) were quite different from those taken from the same site in July and February.

The benthic invertebrate cluster (Figure 2) is more difficult to interpret. In general the July samples from SW-1 and SW-2 tend to be quite similar and the SW-2 February samples tend to also fall within this cluster. However the samples from SW-1 in February are very different from the patterns found at that station during the other two sampling periods. Since the samples all fall in a single discrete cluster, a seasonal succession in the community structure at SW-1 is implied. Such dynamics are not as

Table XI. Correlation matrix of percent sediment composition.

July 1985 SW-1 1	July 1985 SW-1 2	July 1985 SW-1 3	July 1985 SW-1 4	July 1985 SW-2 1	July 1985 SW-2 2	July 1985 SW-2 3	July 1985 SW-2 4	October 1985 SW-1 1	October 1985 SW-1 2	October 1985 SW-1 3	October 1985 SW-1 4
1.000											
0.984	1.000										
0.998	0.992	1.000									
0.987	0.961	0.976	1.000								
0.685	0.802	0.728	0.622	1.000							
0.288	0.445	0.347	0.212	0.869	1.000						
-0.129	-0.059	-0.137	-0.021	0.126	0.216	1.000					
-0.137	0.032	-0.090	-0.157	0.567	0.803	0.639	1.000				
0.945	0.981	0.954	0.936	0.845	0.523	0.130	0.188	1.000			
0.994	0.985	0.997	0.964	0.717	0.335	-0.207	-0.127	0.935	1.000		
0.999	0.983	0.996	0.992	0.680	0.282	-0.101	-0.133	0.948	0.990	1.000	
0.923	0.959	0.929	0.929	0.827	0.508	0.188	0.190	0.986	0.906	0.930	1.000
-0.176	-0.012	-0.135	-0.177	0.519	0.745	0.701	0.982	0.152	-0.175	-0.167	0.184
0.994	0.998	0.998	0.974	0.759	0.387	-0.091	-0.035	0.970	0.993	0.993	0.946
0.888	0.913	0.886	0.920	0.738	0.415	0.337	0.202	0.965	0.850	0.900	0.965
0.992	0.966	0.982	0.999	0.628	0.219	-0.051	-0.163	0.937	0.972	0.995	0.924
0.938	0.966	0.942	0.947	0.804	0.471	0.190	0.164	0.992	0.917	0.945	0.995
0.998	0.970	0.991	0.991	0.635	0.225	-0.143	-0.197	0.925	0.987	0.998	0.907
0.998	0.994	0.999	0.982	0.730	0.347	-0.099	-0.075	0.962	0.994	0.997	0.942
0.951	0.990	0.966	0.921	0.872	0.555	0.009	0.168	0.990	0.956	0.949	0.964
-0.172	-0.004	-0.125	-0.189	0.535	0.795	0.646	0.998	0.154	-0.162	-0.167	0.158
0.998	0.978	0.993	0.993	0.661	0.252	-0.108	-0.158	0.939	0.987	0.999	0.924
-0.113	-0.015	-0.108	-0.021	0.246	0.355	0.987	0.750	0.178	-0.175	-0.084	0.229
0.113	0.219	0.121	0.185	0.462	0.504	0.937	0.782	0.403	0.055	0.136	0.444

October 1985 SW-2 1	October 1985 SW-2 2	October 1985 SW-2 3	October 1985 SW-2 4	February 1986 SW-1 1	February 1986 SW-1 2	February 1986 SW-1 3	February 1986 SW-1 4	February 1986 SW-2 1	February 1986 SW-2 2	February 1986 SW-2 3	February 1986 SW-2 4
1.000											
-0.079	1.000										
0.186	0.905	1.000									
-0.190	0.979	0.912	1.000								
0.148	0.957	0.980	0.942	1.000							
-0.230	0.984	0.876	0.995	0.923	1.000						
-0.113	0.999	0.903	0.987	0.954	0.991	1.000					
0.118	0.978	0.919	0.926	0.968	0.928	0.968	1.000				
0.980	-0.070	0.173	-0.195	0.131	-0.231	-0.110	0.132	1.000			
-0.188	0.989	0.893	0.996	0.939	0.999	0.995	0.940	-0.193	1.000		
0.801	-0.057	0.357	-0.048	0.225	-0.134	-0.071	0.070	0.754	-0.096	1.000	
0.816	0.174	0.550	0.161	0.440	0.082	0.156	0.307	0.778	0.121	0.970	1.000

Table XII. Correlation matrix of the benthic communities.

July 1985 SW-1 1	SW-1 2	SW-1 3	SW-1 4	July 1985 SW-2 1	SW-2 2	SW-2 3	SW-2 4	October 1985 SW-1 1	SW-1 2	SW-1 3	SW-1 4
1.000											
0.718	1.000										
0.987	0.729	1.000									
0.966	0.762	0.986	1.000								
0.958	0.786	0.980	0.990	1.000							
0.941	0.875	0.959	0.967	0.983	1.000						
0.976	0.752	0.997	0.990	0.989	0.971	1.000					
0.927	0.861	0.957	0.958	0.960	0.973	0.962	1.000				
0.942	0.779	0.966	0.983	0.985	0.967	0.976	0.956	1.000			
0.934	0.849	0.960	0.969	0.979	0.983	0.969	0.980	0.983	1.000		
0.612	0.953	0.637	0.645	0.698	0.808	0.665	0.789	0.684	0.765	1.000	
0.946	0.845	0.973	0.969	0.979	0.987	0.979	0.994	0.970	0.986	0.782	1.000
0.956	0.802	0.977	0.992	0.998	0.984	0.986	0.965	0.988	0.985	0.702	0.979
0.692	0.539	0.761	0.689	0.690	0.697	0.755	0.794	0.679	0.725	0.575	0.780
0.731	0.504	0.798	0.729	0.725	0.711	0.789	0.807	0.718	0.748	0.519	0.797
0.372	0.352	0.449	0.351	0.363	0.404	0.443	0.527	0.352	0.427	0.474	0.501
0.230	0.158	0.302	0.190	0.192	0.222	0.288	0.360	0.185	0.252	0.290	0.541
0.012	-0.060	0.084	-0.032	-0.034	-0.013	0.067	0.136	-0.038	0.024	0.089	0.332
0.466	0.265	0.539	0.437	0.432	0.430	0.523	0.559	0.425	0.468	0.346	0.104
0.140	0.027	0.216	0.104	0.099	0.111	0.199	0.261	0.094	0.151	0.156	0.231
0.849	0.791	0.902	0.866	0.884	0.910	0.909	0.948	0.869	0.913	0.796	0.946
0.942	0.737	0.982	0.967	0.972	0.954	0.985	0.969	0.960	0.962	0.677	0.980
0.935	0.684	0.957	0.967	0.969	0.930	0.962	0.907	0.983	0.956	0.580	0.929
0.958	0.705	0.985	0.989	0.989	0.953	0.989	0.940	0.984	0.966	0.606	0.960

October 1985 SW-2 1	SW-2 2	SW-2 3	SW-2 4	February 1986 SW-1 1	SW-1 2	SW-1 3	SW-1 4	February 1986 SW-2 1	SW-2 2	SW-2 3	SW-2 4
1.000											
0.681	1.000										
0.715	0.992	1.000									
0.352	0.915	0.871	1.000								
0.418	0.840	0.798	0.977	1.000							
0.179	0.697	0.654	0.904	0.972	1.000						
-0.048	0.945	0.932	0.966	0.957	0.822	1.000					
0.085	0.785	0.751	0.941	0.989	0.990	0.938	1.000				
0.879	0.923	0.916	0.744	0.601	0.397	0.751	0.506	1.000			
0.968	0.829	0.858	0.547	0.399	0.185	0.621	0.315	0.947	1.000		
0.972	0.651	0.704	0.310	0.157	-0.055	0.410	0.078	0.825	0.944	1.000	
0.987	0.713	0.760	0.379	0.225	0.010	0.477	0.145	0.871	0.977	0.988	1.000

Figure I

Sediment cluster

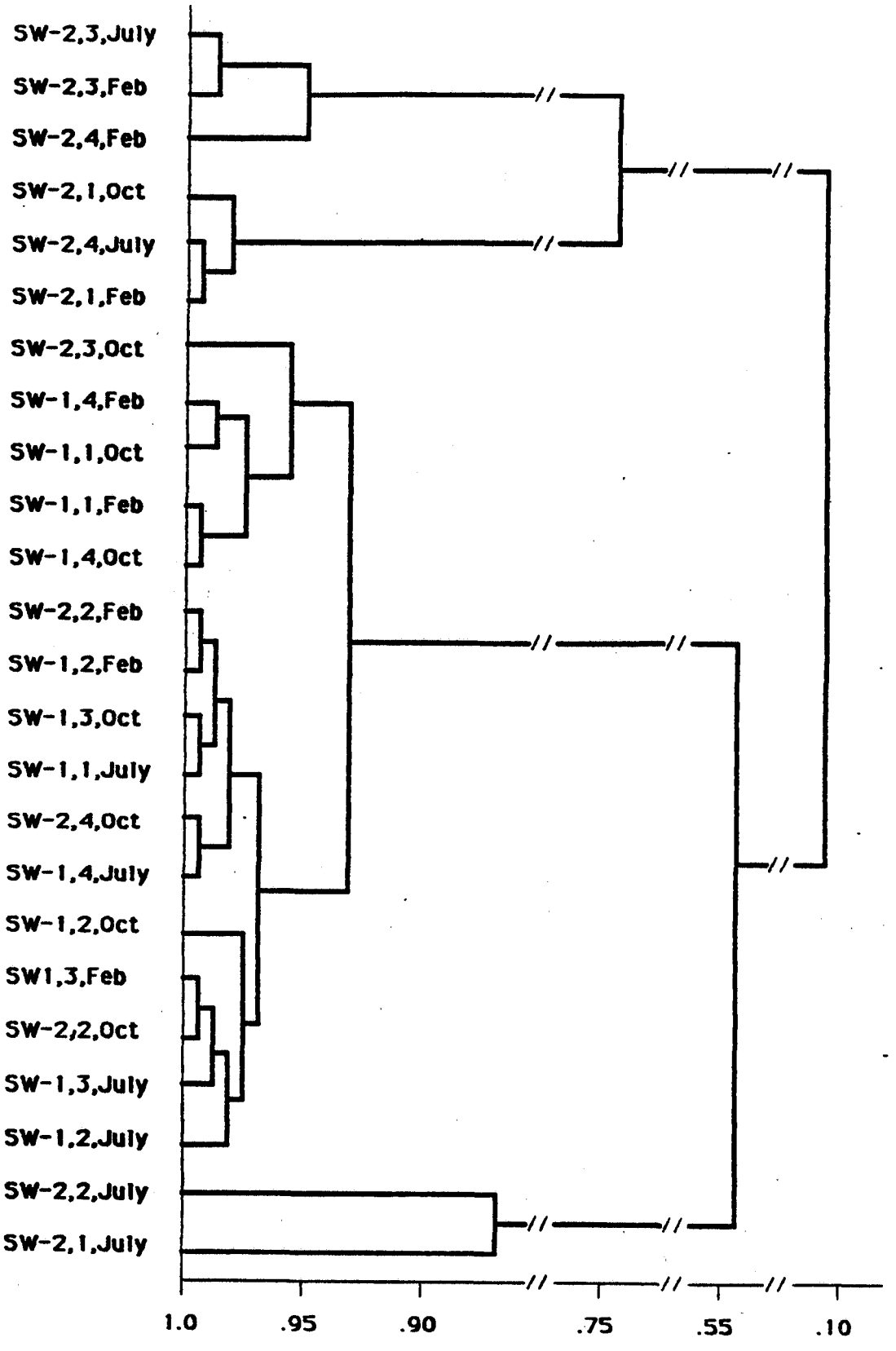
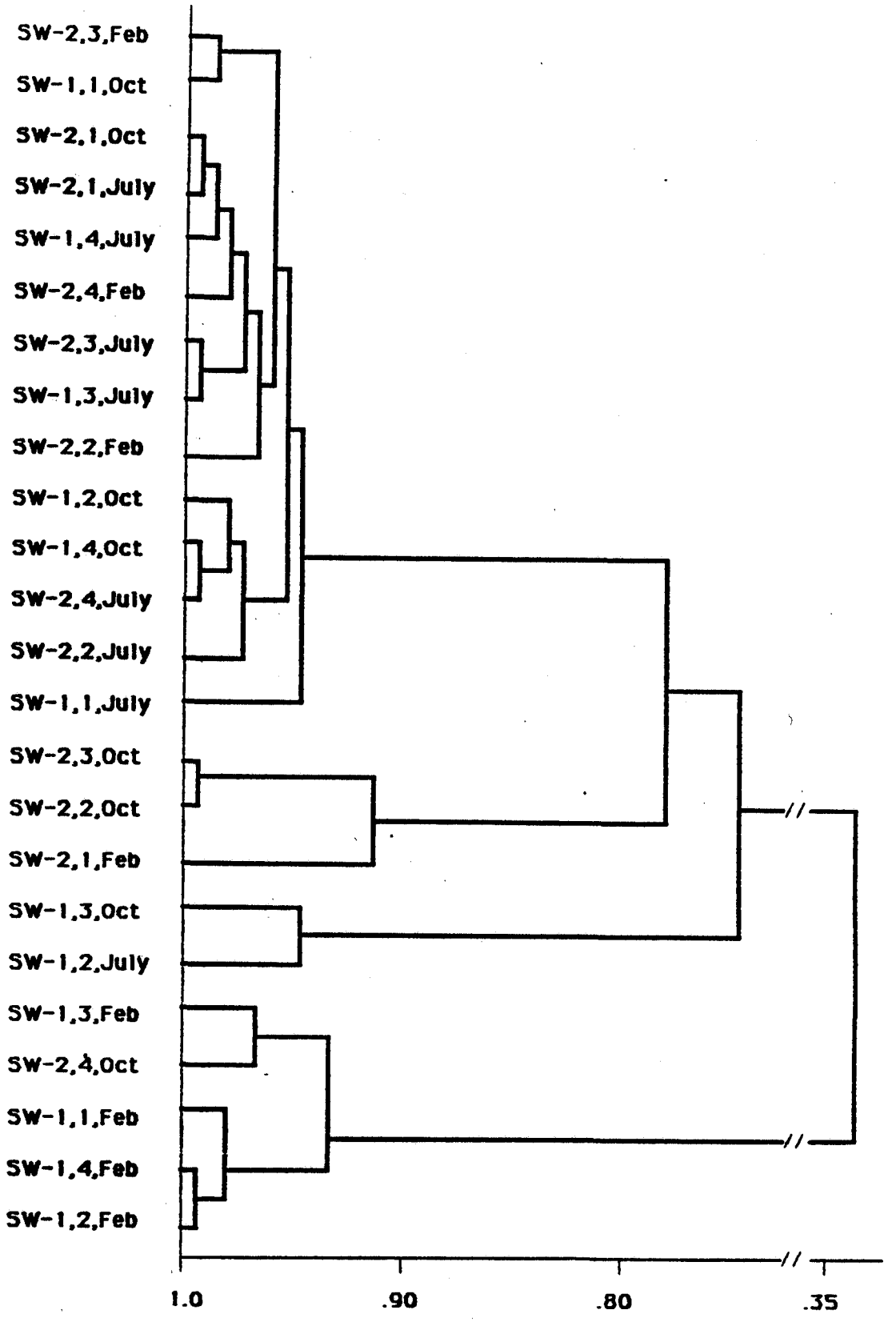

SW-2,3,July
SW-2,3,Feb
SW-2,4,Feb
SW-2,1,Oct
SW-2,4,July
SW-2,1,Feb
SW-2,3,Oct
SW-1,4,Feb
SW-1,1,Oct
SW-1,1,Feb
SW-1,4,Oct
SW-2,2,Feb
SW-1,2,Feb
SW-1,3,Oct
SW-1,1,July
SW-2,4,Oct
SW-1,4,July
SW-1,2,Oct
SW1,3,Feb
SW-2,2,Oct
SW-1,3,July
SW-1,2,July
SW-2,2,July
SW-2,1,July
1.0
.95
.90
.75
.55
.10

Figure II

Benthic community cluster


SW-2,3,Feb
SW-1,1,Oct
SW-2,1,Oct
SW-2,1,July
SW-1,4,July
SW-2,4,Feb
SW-2,3,July
SW-1,3,July
SW-2,2,Feb
SW-1,2,Oct
SW-1,4,Oct
SW-2,4,July
SW-2,2,July
SW-1,1,July
SW-2,3,Oct
SW-2,2,Oct
SW-2,1,Feb
SW-1,3,Oct
SW-1,2,July
SW-1,3,Feb
SW-2,4,Oct
SW-1,1,Feb
SW-1,4,Feb
SW-1,2,Feb
1.0
.90
.80
.35

clear from station SW-2, likely because of the sediment variability over time which complicates interpretation of any existing trends.

Conclusions

The data gathered for this study have not yielded discrete answers to the impact or degree of impact of the Trail Mountain Coal Company Mining operation on Cottonwood Creek but an evaluation of the various analytical methods used do allow a conclusion to be reached. The general trends shown by the diversity values and the biotic index do point towards some impact on the downstream station, however that impact, if real, is minor. Additional factors need to be considered. 1) Sediment analysis showed that the lower station underwent greater seasonal changes than did the upper station. It is significant that the predominant sediment type at SW-2 was gravel. This substrate size is less stable than the rubble habitat found at station SW-1, and thus the differences seen between SW-1 and SW-2 communities could be a function of the sediment structure and completely independent of any mining impact. 2) It is also notable that in February the diversity value at SW-1 was actually lower than that at SW-2, implying that if diversity alone were the judgement tool, SW-2 at that time was in better condition than is the upstream SW-1. The location of a road paralleling Cottonwood Creek above SW-1 will also stress the stream independently of the Trail Mountain Mining operation. 3) Observations made when sampling began in July included the presence of a calcarious marl in the sediments at SW-2. Whether sampling sufficiently disturbed this marl and thus initiated the shift in sediment structure observed in October is not known, but must be retained as a possibility. 4) The degree of development of various functional groups differed between the two sites. In particular the filter feeders and grazers are strongly influenced by substrate size since unstable substrates have a lower standing crop of algae and are not good anchoring sites for filter feeders. Different substrate sizes will also influence the settling and retention of different sizes of detrital particles and thus influence the densities and species composition of the shredder groups in the substrate.

In general the differences between the two stations can be sufficiently explained by differences in sediment structure. The higher biotic index values of SW-2, while consistently above that of SW-1, are associated with the microhabitat created in a gravel environment as opposed to a rubble area. The benthic inhabitants of gravel tend to be those which have been given higher biotic index values. This relates to their ability to live under less turbulent (and thus less oxygenated) conditions. The biotic index does not consider variations in substrate type, other than assuming that samples will be taken from the most coarse substrate available. This results in an index which is robust and more reliable than diversity indices, but which can confound the effects of sediment structure and thus give biased results.

Therefore I am concluding that the impact of the Trail Mountain mining operation on the Cottonwood Creek invertebrate community is negligible as determined by the prescribed sampling program. Because of various confounding factors unanticipated in the original design of the study, a more direct conclusion is not possible. It does not appear that additional studies

need to be conducted, however if further sampling is required I recommend that several changes be made in the prescribed methodology. First, care should be taken to select a downstream station with canopy cover, sediments and slope conditions comparable to that at station SW-1. This will allow the elimination of the marl as a confounding variable. The taking of four replicate samples is often standard, but usually results in too few samples to give strong statistical confidence in the results of the study. More samples should be taken per station. More frequent sampling will allow a more accurate assessment of seasonal events, and in some ways reduce the extrapolation necessary to interpret results, but monthly sampling is probably not necessary. It also appears that winter samples may not be as useful as samples taken during the warmer months.

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APPENDIX 12*

DIVISION OF WILDFILE RESOURCES (DWR)

RECOMMENDATION TO DISCONTINUE MACROINVERTEBRATE

STUDY ON COTTONWOODCREEK

*Ch 10 Rev. 1-11-87

STATE OF UTAH
NATURAL RESOURCES
Wildlife Resources

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
William H. Geer, Division Director

Southeastern Region • 455 West Railroad Avenue • Price, UT 84501-2829 • 801-637-3310

November 25, 1986

Mr. Allen Childs
Trail Mountain Coal Company
P.O. Box 370
Orangeville, UT 84537

Dear Allen:

As per your request, the Division has reviewed the final report for "Cottonwood Creek Macroinvertebrate Assessment" as prepared by Dennis K. Shiozawa in the Department of Zoology at Brigham Young University. The differences in substrate and vegetation overstory between the two sample sites is substantial. This diminishes our ability to evaluate differences between control and experimental (potential impact area) data. The small number of replicate samples would also confound an evaluation if the control and experimental sites were more closely matched.

Considering that control and experimental sites each showed diversity indices suggestive of polluted systems and the biotic index showed the experimental and control to be slightly stressed, mining is not likely a measurable influence on the stream system. As a result, we concur with the author that additional studies relative to mining are not necessary.

Thank you for the opportunity to review and provide comment.

Sincerely

John Livesay, Supervisor
Southeastern Region

JL/LBD/dd

cc: Kathy Mutz
Darrell Nish