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TERRESTRIAL WILDLIFE INVENTORY IN SELECTED COAL AREAS
Powder River Resources Area
Final Report - Contract No. YA-553-CTO-24

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Bureau of Land Management

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INTRODUCTION

In order to facilitate responsible development of national coal reserves with due consideration for other resources, inventory studies have been conducted on potential coal lease areas in southeastern Montana.

The wildlife inventory studies presented in this report were sponsored by the Bureau of Land Management. The study areas concerned are primarily privately owned lands overlaying federal coal deposits. Information furnished by these studies will be used by the Bureau of Land Management to (1) update BLM's land use planning system; (2) establish baseline data to assist in predicting impacts of coal development; (3) assess the reclamation potential of different habitats; and (4) determine habitats unsuitable for mining according to the Secretary of the Interior's "unsuitability criteria."

Wildlife studies sponsored by coal companies in the Colstrip, Rosebud Creek, Sarpy Creek, Spring Creek and Decker areas have added much information to the data base. Wildlife studies in coal field vicinities have been sponsored by the U.S. Fish and Wildlife Service and Bureau of Land Management. The Montana Department of Fish, Wildlife and Parks has also been active in gathering pertinent information. In spite of these efforts, which were initially directed toward game species, additional site-specific information is needed for each potential coal lease area for both game and nongame species. The primary game species found in the region are mule deer (*Odocoileus hemionus*), pronghorn antelope (*Antilocapra americana*), sharptailed grouse (*Pediacetes phasianellus*), sage grouse (*Centrocercus urophasianus*), and ring-necked pheasants (*Phasianus colchicus*). White-tailed deer (*Odocoileus virginianus*) and wild turkeys (*Meleagris gallopavo*) also inhabit the area.

Information on nongame wildlife in the region is meager. Range maps prepared by Stebbins (1966) indicate the occurrence of nineteen species of reptiles and amphibians in the area. Range maps of Hoffman and Pattie (1968) indicate the presence of 53 species of mammals. Skaar (1980) listed 255 bird species occurring in latilongs 33, 34, 43, and 44. Resident breeding status in at least one of the four latilongs concerned has been documented for 95 species. The bird inventory for the region is considered to be deficient.

These studies were begun in April 1980. Data gathered through the end of August 1981 are included in this report. Species lists are not to be considered inclusive, rather partial due to the extensive nature of this study.

PROCEDURES

Game Mammals

Observations were made during low-level fixed-wing aerial surveys in a super cub aircraft. Aerial surveys were conducted monthly and the data were compiled on a seasonal basis as follows: spring (March-May), summer (June-August), fall (September-November), and winter (December-February). Each study area was completely covered by flying a grid transect at half-mile intervals, oriented parallel to the major drainage. Flight times were planned to coincide with feeding periods so that maximum animal numbers could be observed. This biased observations in favor of the more open habitat types. Observations were also recorded during vehicular surveys and while walking through the study areas. Access limitations introduced a further observation bias. At each observation the vegetation type, activity, type of terrain, slope, exposure and time of day were recorded (Appendix Table 1). Pertinent population data were also recorded. Each observation was assigned UTM (Universal Transverse Mercator) grid coordinates to facilitate accurate mapping of animal distribution patterns.

Game Birds

The primary emphasis was directed toward locating sharp-tailed grouse dancing grounds and sage grouse strutting grounds. The importance of these breeding grounds to these species cannot be understated. Grounds were located by driving, walking and by flying low over likely terrain features and either seeing the birds on their arenas or flushing them into the air.

Pheasant crow count routes were conducted during the spring breeding season to determine the density of cock pheasants (Kimball 1949).

Ponds, sloughs, and creeks were visited regularly to obtain waterfowl observations.

Songbirds

Species composition and relative abundance of songbirds were determined using a roadside windshield technique. A vehicle route 20 to 25 miles in length was established on each study area, with listening stops spaced at approximately one mile intervals. Bird songs heard during a three minute time period were recorded and mapped at each stop. Routes were selected to equally sample representative habitat types on each study area.

Ten walking census strips similar to those used by Hickey and Mikol (1979) and Martin (1980a) were set up, four on the Birney study area, and three each on the Kirby and Tongue River Dam areas, to determine songbird species composition by habitat type. Songbird use by habitat could not be determined by the road routes on these three study areas, due to the high inter-

spersion of the different habitat types along the road routes. Each census strip was approximately 1250 m long and 100 m wide, and within a single habitat type as much as possible.

Nomenclature follows the A.O.U. checklist (1957) and supplements (1973, 1976).

Raptors

Raptor nests were located using the methods described by Call (1978). Creek bottoms were searched in the early spring by airplane and from the ground for hawk and eagle stick nests. Suitable cliffs were examined by airplane and on foot for falcon aeries and eagle nests. Intensive aerial nest searches were conducted by helicopter during the spring of 1981. Observations of all raptors except kestrels were mapped during the breeding season to aid in delineating territories. Intensive foot searches were employed when highly defensive adults were encountered. Prairie dog towns were checked during July for burrowing owl broods.

Nongame Mammals

Nongame mammals were sampled on all study areas during July and August. Two traplines were set in each of the three major habitat categories (riparian, ponderosa pine, sagebrush/grass land) and run for five consecutive days. Each trapline consisted of 25 stations, placed at 10 m intervals. Each station included one Sherman live trap and three mouse snap traps, with a rat snaptrap at every fourth station. A mixture of peanut butter and rolled oats was used as bait.

Live traps and snap traps which were sprung, but empty, were subtracted from the total trap nights.

Prairie dog towns were searched for sign of black-footed ferrets (Henderson et al. 1974, Martin 1978).

Amphibians and Reptiles

Observations of amphibians and reptiles on the study areas were noted in conjunction with other wildlife observations.

Description of Study Areas

Sweeney-Snyder

The Sweeney-Snyder study area (Figure 1) is located between Rosebud Creek and the Tongue River approximately 12 miles east of Colstrip, Montana. It lies about 20 miles south of the Yellowstone River with over 93 percent of its 74,000 plus acres located in Rosebud County. A small portion in the northeast corner of the area is located in Custer County.

Figure 1. Sweeney-Snyder study area.

There are no major water-ways within the study area. Snyder Creek, Hen Creek, Cherry Creek and Eagle Creek drain the west side of the study area as they flow into Rosebud Creek. Sweeney Creek and Beaver Creek rise in the northern portion of the study area and flow north to the Yellowstone River. Nine small drainages provide for run-off from the eastern portions of the area to the Tongue River.

The study area straddles the Rosebud Creek-Tongue River divide. Ponderosa pine subtypes dominate the area (Figure 2). Sagebrush-grassland subtypes occur along the edges of the study area near the two major flood plains outside the study area. Very small patches of riparian vegetation are found in the most mesic coulee bottoms and creek bottoms. It is by far the smallest of the vegetation types found on the study area. Cattle ranching is the only agricultural business conducted within the study area.

Greenleaf-Miller

The Greenleaf-Miller study area (Figure 3) is located west of the Tongue River approximately 6 miles south of Colstrip, Montana. All of its 58,000 plus acres are within Rosebud County. The southern boundary of the study area is the Northern Cheyenne Indian reservation.

Rosebud Creek flows through the northwest corner of the study area. Greenleaf Creek and Miller Creek are the major drainages in the study area. They rise on the reservation and flow northward into Rosebud Creek. Lay Creek, Bean Creek and Downey Coulee are also important drainages in the area.

The southern and eastern portions of the study area have significant stands of ponderosa pine (Figure 4). Although ponderosa pine is the largest vegetation type, most of the study area is covered by sagebrush-grassland vegetation subtypes. Most of the riparian vegetation is located in the Rosebud Creek flood plain. Isolated stands of deciduous trees and shrubs are found in the smaller drainages, especially Greenleaf Creek. Agricultural fields are practically all located on the lowland benches and flood plains. Alfalfa and small grains comprise the bulk of the crops produced. Livestock operations are the principal economic endeavor within the study area. Sandstone bluffs are very common in the central and southwestern portions of the study area.

Foster Creek

The Foster Creek study area (Figure 5) is located west of Pumpkin Creek and Highway 312, about 15 miles northeast of Ashland. It is adjacent to and north of the Custer National Forest and comprises approximately 62,720 acres in Custer and Powder River counties.

All drainages on the study area are intermittent and were devoid of flowing water during the study period. Foster Creek is the principal drainage of the central and northern portions. Drainages

Figure 2. Sweeney-Snyder study area vegetation map.

Figure 3. Greenleaf-Miller study area.

Figure 4. Greenleaf-Miller study area vegetation map.

Figure 5. Foster Creek study area.

of the southern and eastern sections join Little Pumpkin Creek and finally Pumpkin Creek, which is the nearest perennial stream.

Most of the study area is characterized by rolling terrain dominated by sagebrush and grassland habitats (Figure 6). Ponderosa pine breaks are prominent in the central, northeast and northwest portions. Terraces adjacent to Little Pumpkin Creek in the southeastern portion are cultivated. The remainder of the area is used predominantly for livestock grazing, with some agricultural development adjacent to larger drainages.

Landowner permission to conduct field investigation was not granted for a portion of the designated study area. Wildlife inventory and baseline information cannot be considered complete on that portion of the tract. Description of the affected area is as follows: Sections 15, 22, 27, 28, 33 and 34 (T1N R48E) and Section 2 (T1S R48E).

Sand Creek

The Sand Creek study area (Figure 7) is located east of Highway 312 and Pumpkin Creek, about 22 miles northwest of Broadus. It comprises approximately 8,960 acres in Custer and Powder River counties.

Sand Creek, an intermittent drainage which was dry during the study period, flows north through the center of the study area to join Mizpah Creek. The study area is situated on a plateau which drops off steeply along the southern and southeastern boundaries. The interior terrain, most of it cultivated, is flat to rolling (Figure 8). The remainder is characterized by sagebrush and grassland habitats and is used for livestock grazing. The northwest corner section of the area is predominately ponderosa pine breaks.

Landowner permission to conduct field investigation was not granted for a portion of the designated study area. Wildlife inventory and baseline information cannot be considered complete on that portion of the tract. Description of the affected area is as follows: Sections 6, 7, 8, (W 1/3), 16 and 17 (T1S R50E) and Section 35 (T1N R49E).

Birney

The Birney study area is about 32,640 acres in size, located west of the Tongue River and south of the Northern Cheyenne Indian Reservation near Birney, Montana (Figure 9). The topography consists of high, rugged hills rising 500 feet above the Tongue River. Vegetation is mainly ponderosa pine-juniper forest with sagebrush parks on the slopes and sagebrush on the tops of plateaus and along the larger creekbottoms (Figure 10). Deciduous tree and shrub riparian vegetation is well-developed along the creekbottoms in the study area. Agriculture consists of hayfields along the Tongue River.

Figure 6. Foster Creek study area vegetation map.

Figure 7. Sand Creek study area.

Figure 8. Sand Creek study area vegetation map.

Figure 9. Birney study area.

LEGEND

Riparian.....	
Ponderosa pine.....	
Juniper.....	
Grassland.....	
Agricultural.....	

Figure 10. Birney study area vegetation map.

Kirby

The Kirby study area is about 56,320 acres in size, located southwest of Birney between Rosebud Creek and the Tongue River (Figure 11). The eastern portion of the study area is very rugged, with hills rising 500 feet above the Tongue River to elevations of around 4000 feet. The western portion is composed of high, less rugged plateaus reaching elevations of 4,700 feet. Ponderosa pine-juniper forest with sagebrush or grassland parks cover the rugged eastern portion of the study area (Figure 12). The western portion is primarily covered by grasslands and sagebrush, with small stands of ponderosa pine trees along some of the ridges. Riparian vegetation is poorly developed in the eastern portion of the study area, consisting of scattered cottonwood trees along the Tongue River and the major creek bottoms. Riparian vegetation in the western portion consists of fairly dense stands of deciduous shrubs and trees in most of the drainages. Agriculture consists of hayfields along the Tongue River and a few grain fields on the western plateaus.

Tongue River Dam

The Tongue River Dam study area is located northeast of Decker, Montana around the Tongue River Reservoir (Figure 13). It covers about 23,500 acres, extending north from the reservoir along the river for about seven miles. The northern part of the study area is very rugged with hills rising 600 feet above the Tongue River. The southern portion around the reservoir consists of gently rolling hills and wide, flat valleys. Sparse ponderosa pine-juniper forests with small sagebrush parks cover the rugged northern portion (Figure 14). The southern part of the study area is mainly covered by sagebrush, grasslands, and skunkbush-grasslands. The river bottoms and the shoreline of the reservoir are mainly covered by grasslands. Deciduous tree and shrub riparian habitat is poorly developed, except for dense willow thickets and woodlots at the southern end of the reservoir. Low water levels in late summer expose extensive mud flats which become covered with *Rumex* sp. and other annual forbs. Agriculture consists mainly of hayfields along the Tongue River. Most of the study area is used for cattle grazing. The East Decker and West Decker coal mines lie partially within the study area. A housing development is under construction near the mouth of Spring Creek, within the study area.

VEGETATION TYPE DESCRIPTIONS

For the purposes of this study five broad vegetation types were identified. Four of these represent native vegetation and include ponderosa pine, juniper, sagebrush-grassland and riparian. The fifth type, agricultural, was defined as those areas where crops were being produced. Not all of these types were present on all seven study areas. See the appropriate study area sections for more detailed discussion concerning the vegetation types and their importance within the individual study areas.

Figure 11. Kirby study area.

Figure 12. Kirby study area vegetation map.

Figure 13. Tongue River Dam study area.

Figure 14. Tongue River Dam study area vegetation map.

Ponderosa Pine Series

This was the most diversified of the vegetation types with seven subtypes. It was defined as all areas in which ponderosa pine (*Pinus ponderosa*) occurred. The subtypes were determined by the dominant shrub in the understory. Edwards (1977) described a ponderosa pine mosaic vegetation type with four subtypes based on categories described by Pfister et al. (1974) in the Horse Creek drainage west of Colstrip. Martin (1980c) expanded that to six ponderosa pine vegetation subtypes in the Sarpy Creek drainage.

(1) Ponderosa Pine Subtype

This subtype (Figure 15) was defined as dense stands of ponderosa pine with sparse understory and ground cover. Krenzke (1976) referred to this subtype as "dog hair" thickets.

(2) Snowberry Subtype

This subtype occurred on mesic and north facing slopes (Figure 16). It had fairly dense stands of ponderosa pine with a very dense understory. Common snowberry (*Symphoricarpos alba*) and Western snowberry (*S. occidentalis*) were the dominant shrubs. Other common species included rose (*Rosa* spp.), chokecherry (*Prunus virginiana*), Oregon grape (*Berberis repens*), green needlegrass (*Stipa viridula*) and Kentucky bluegrass (*Poa pratensis*).

(3) Juniper Subtype

Rocky mountain juniper (*Juniperus scopulorum*) was the primary understory species (Figure 17). The ponderosa pine overstory was generally open. Ground cover species were variable but included bluebunch wheatgrass (*Agropyron spicatum*) and other forbs and grasses.

(4) Creeping Juniper Subtype

The ponderosa pine overstory varied from dense to fairly open canopy coverage (Figure 18). The understory was dominated by creeping juniper (*Juniperus horizontalis*) and bluebunch wheatgrass. Needle-and-thread grass (*Stipa comata*) is also present. Major forbs include cudweed sagewort (*Artemisia ludoviciana*), western yarrow (*Achillea millefolium*), curly cup gumweed (*Grindelia squarrosa*), white penstemon (*Penstemon albidus*) and several asters (*Aster* spp.).

(5) Sagebrush Subtype

In this subtype, big sagebrush (*Artemisia tridentata*) was the dominant understory shrub (Figure 19) in open stands of ponderosa pine. It occurred on xeric upland benches and plateaus. Bluebunch wheatgrass, blue grama grass (*Bouteloua gracilis*), Japanese chess (*Bromus japonicus*) and broom snakeweed (*Xanthocephalum sarothrae*) were common grasses and forbs.

Figure 15. Ponderosa pine-ponderosa pine vegetation subtype.

Figure 16. Ponderosa pine-snowberry vegetation subtypes.

Figure 17. Ponderosa pine-Juniper vegetation subtype.

Figure 18. Ponderosa pine-creeping juniper vegetation subtype.

(6) Skunkbush Subtype

This subtype is characterized by open stands of ponderosa pine with skunkbush sumac (*Rhus trilobata*) as the dominant shrub (Figure 20). It usually occurs on steep south facing slopes. Martin (1972) described skunkbush vegetation associations in detail. On his sites bluebunch wheatgrass was the dominant grass species. Other grasses associated with skunkbush stands in southeastern Montana include cheatgrass (*Bromus tectorum*), little bluestem (*Schizachyrium scoparius*), Japanese chess and Junegrass (*Koeleria cristata*). Fringed sagewort (*Artemisia frigida*) was the primary forb species. Western yarrow, common salsify (*Tragopogon dubius*) and broom snakeweed were also of some importance.

(7) Grassland Subtype

The grassland subtype (Figure 21) occurred in open stands of ponderosa pine with no shrub development. Many different grass species were found depending on soil type, elevation and aspect to name a few variables. Some grasses associated with this savannah-like vegetation type include bluebunch wheatgrass, Idaho fescue (*Festuca idahoensis*), sideoats grama (*Bouteloua curtipendula*), little bluestem, western wheatgrass (*Agropyron smithii*), blue grama, needle-and-thread, red-leaf three-awn (*Aristida longiseta*), and *Bromus* spp. Many forbs were found in this subtype.

Juniper Series

This vegetation type occurred primarily in the southern three study areas; Birney, Kirby and Tongue River Dam. It had three subtypes. In each case, rocky mountain juniper was the dominant shrub species. Subtypes were determined by the presence of other sub-dominant species. They were sagebrush, skunkbush and grassland.

(1) Sagebrush Subtype

The sagebrush subtype (Figure 22) was characterized by open stands of rocky mountain juniper and big sagebrush. Various grasses and forbs were present including blue grama, Junegrass, cheatgrass, fringed sagewort and salsify.

(2) Skunkbush Subtype

This subtype (Figure 23) occurred primarily as open stands of rocky mountain juniper interspersed with skunkbush. Bluebunch wheatgrass, little bluestem, fringed sagewort and yucca (*Yucca glauca*) were also present in the juniper-skunkbush subtype.

Figure 19. Ponderosa Pine-sagebrush skunkbush & grassland.

Figure 20. Ponderosa pine-skunkbush vegetation subtype.

Figure 21. Ponderosa pine-grassland vegetation subtype.

Figure 22. Juniper-sagebrush vegetation subtype.

Figure 23. Juniper-skunkbush vegetation subtype.

(3) Grassland Subtype

The juniper-grassland subtype (Figure 24) had no other shrub species present besides rocky mountain juniper. Its open stands were covered with a mixture of grasses and forbs, the primary species being bluebunch wheatgrass, little bluestem, blue grama, cheatgrass, broom snakeweed, Hood's phlox (*Phlox hoodii*), fringed sagewort and cudweed sagewort (*Artemisia ludoviciana*).

Sagebrush/Grassland Series

There were four subtypes defined in the sagebrush/grassland series. Big sagebrush and silver sage (*Artemisia cana*) were the primary shrub species in two of the subtypes. Skunkbush was the dominant shrub species in the third subtype. Few to no shrubs were found in the xeric grassland subtype.

(1) Big Sagebrush Subtype

Big sagebrush was the dominant shrub in this subtype (Figure 25). It usually occurred on flat to medium slopes. Various grasses and forbs were found on this subtype including Junegrass, blue grama, western wheatgrass, sedges (*Carex* spp.), needle-and-thread. Japanese chess, cheatgrass, false-tarragon sagewort (*Artemisia dracunculus*), field chickweed (*Cerastium arvense*), Hood's phlox, salsify and pale bastard toad flax (*Comandra umbellata*).

(2) Silver Sagebrush/Greasewood Subtype

This subtype occurred on alluvial valley floors (Figure 26). On many study areas it was the most common lowland vegetation type. Almost all coulee bottoms and small valleys had silver sagebrush stands. Greasewood (*Sarcobatus vermiculatus*) stands were best developed along the Tongue River bottoms. Ground cover included occasional prairie rose (*Rosa arkansana*) stands. A variety of grasses and forbs including Japanese chess, cheatgrass, false tarragon-sagewort and salsify were found in the silver sagebrush/greasewood subtype.

(3) Skunkbush Subtype

The skunkbush subtype (Figure 27), also referred to as the deciduous shrub subtype, occurred on rocky south facing slopes, where skunkbush was the dominant species. Other species present were yucca, fringed-sagewort, desert alyssum (*Alyssum desertorum*), broom snakeweed, bluebunch wheatgrass, little bluestem, needle-and-thread and red leaf three-awn.

(4) Xeric Grassland Subtype

The grassland subtype (Figure 28) was open grassland with a few isolated shrub patches. Many grass species were found depending on soil and moisture conditions. Bluebunch wheatgrass, western

Figure 24. Juniper-grassland vegetation subtype.

Figure 25. Sagebrush/grassland-big sagebrush vegetation subtype.

Figure 26. Sagebrush/grassland-silver sagebrush/greasewood vegetation subtype.

Figure 27. Sagebrush/grassland-skunkbush vegetation subtype.

Figure 28. Sagebrush/grassland-xeric grassland vegetation subtype.

wheatgrass, Idaho fescue, needle-and-thread, blue grama, prairie sand reedgrass (*Calamovilfa longifolia*), sedges and Junegrass were common grasses. Forbs included low ragweed (*Ambrosia artemisiifolia*), yarrow, sweet clover (*Melilotus officinale*) fringed sagewort and many others.

Riparian Series

This vegetation type was found primarily along creekbottoms, river bottoms, and coulee bottoms. Four subtypes were defined within the riparian or creekbottom vegetation type. They were deciduous tree, deciduous shrub, riparian grass and pioneer forb subtypes. This vegetation type, because of its small size, abundant vegetation for food and cover, and proximity to water, is without doubt the single most important vegetation type found in these study areas.

(1) Deciduous Tree Subtype

All areas which contained any of the three tree species, plains cottonwood (*Populus deltoides*), boxelder (*Acer negundo*) or green ash (*Fraxinus pennsylvanica*), were designated deciduous tree subtypes (Figure 29). Understory vegetation included hawthorn (*Crataegus succulenta*), chokecherry, buffaloberry (*Shepherdia argentea*), snowberry, rose, currants (*Ribes* spp.) and many grasses and forbs.

(2) Deciduous Shrub Subtype

This subtype occurred as dense shrub thickets (Figure 30). Willow (*Salix* spp.), chokecherry, wild plum (*Prunus americana*), hawthorn, buffaloberry, snowberry, rose, and currant were the primary species. None of the major tree species were present in this vegetation subtype. A variety of grasses and forbs were found.

(3) Riparian Grass Subtype

This vegetation type (Figure 31) had no tree or shrub overstory. It occurred in creekbottoms, river bottoms and other mesic areas. These grassy swales had many grass and forb species including Kentucky bluegrass, sedges, Canada wild-rye (*Elymus canadensis*) and other *Elymus* species, foxtail barley (*Hordeum jubatum*), several rushes (*Juncus* spp.), several *Poa* spp. and common cattail (*Typha latifolia*).

(4) Pioneer Forb Subtype

The "weed" community (Figure 32) was found in disturbed mesic areas. It tended to be best developed along river bottoms but was also found in washed out ponds in upland areas. Type of sites include roadsides, coal spoil piles, abandoned gravel pits and exposed mud flats. The species composition varies but

Figure 29. Riparian-deciduous tree vegetation subtype.

Figure 30. Riparian-deciduous shrub vegetation subtype.

Figure 31. Riparian-mesic grassland vegetation subtype.

Figure 32. Riparian-pioneer forb vegetation subtype.

usually consists of *Rumex* spp. on mud flats and various mustard (*Cruciferae*) and legume (*Leguminosae*) family species on upland sites.

Agricultural Series

This vegetation type occurred within the natural types. All active crop lands were included. Two subtypes were defined; the upland subtype and the creek bottom subtype.

(1) Upland Subtype

The primary crops produced on this subtype (Figure 33) were non-irrigated varieties of wheat, barley, oats and native grasses harvested either for hay or seed. This subtype occurred adjacent to subtypes within the ponderosa pine, juniper and sagebrush-grassland series.

(2) Creek Bottom Subtype

This type occurred on irrigated or non-irrigated bottoms along the Tongue River and the larger creeks (Figure 34). Alfalfa hay was the primary crop. Some corn and small grains were also grown. These lands would have been riparian series vegetation subtypes were they in their original condition.

RESULTS AND DISCUSSION

Each species or group of species is discussed separately for each of the seven study areas. Distribution maps are presented, with high use or critical areas delineated, for the important game species and the nongame species of special interest or concern. Care should be taken in interpretation of the tables and figures presented in this report as they represent observations made during a 17 month period covering all or portions of six seasons. The winter period was very mild with little snow cover. May and June of 1981 were the only months with appreciable precipitation. General drought conditions prevailed during most of the study.

Sweeney-Snyder

Mule Deer

Population characteristics: During the study 630 mule deer were observed in the Sweeney-Snyder study area (Table 1). Average group size ranged from summer lows of 2.0 in 1980 and 2.1 in 1981 to a high of 5.1 during the 1980-81 winter season. The same pattern was observed in several other wildlife studies conducted in southeastern Montana (Martin 1980a) and in the Bull Mountains of central Montana (Dusek 1978).

Figure 33. Agricultural-upland vegetation subtype.

Figure 34. Agricultural-creek bottom vegetation subtype.

Table 1 . Average group size of mule deer in the Sweeney-Snyder study area.

Year	Month	Number Observations	Total Deer	Average
1980	April	- *	-	-
	May	21	90	4.3
	Spring	21	90	4.3
	June	9	12	1.3
	July	6	9	1.5
	August	11	32	2.9
	Summer	26	53	2.0
	September	2	3	1.5
	October	11	42	3.8
	November	19	48	2.5
	Fall	32	93	2.9
1980	December	10	60	6.0
1981	January	9	34	3.8
	February	7	39	5.6
	Winter	26	133	5.1
	March	11	59	5.4
	April	24	83	3.5
	May	16	22	1.4
	Spring	51	164	3.2
	June	22	36	1.6
	July	14	28	2.0
	August	11	33	3.0
	Summer	47	97	2.1

* No surveys conducted

Mule deer observations per hour of aerial survey (Table 2) show December to have the greatest concentrations of the five complete seasons. The fall, winter and spring 1980 seasons had similar indices of relative abundance (Odum 1959) with a range of only 3.0 deer observed per hour. This reflects the relatively mild weather conditions prevalent during the 9 month period. The increased number observed per hour in the 1981 summer season over the 1980 summer season, a 74.4% increase, may indicate a rising trend in population numbers. General numbers observed are lowest during the spring, before the fawns are born, and summer, when the deer are still widely dispersed. Extreme drought conditions alter normal distribution patterns and force deer to concentrate near water. This occurred in May 1980 and shows up as the highest indices of relative abundance figure observed in the Sweeney-Snyder study, 39.0 in May of 1980 (Table 2). As the drought continued, many deer left the study area for the Rosebud Creek and Tongue River bottoms. The result was the low indices observed for June and July of 1980, the driest months of the study.

Mule deer population structure was determined during August, October and November. The 1980 composite result shows 58.5 fawns per 100 does in the Sweeney-Snyder study area (Table 3). The number of fawns per 100 does increased by 38 percent from August 1980 to August 1981. These are good reproduction figures and indicate a healthy mule deer herd (Swenson 1978). In spite of several years of bucks only hunting, there were over twice as many bucks as does in the Sweeney-Snyder study area during August 1981. Bucks comprised over 50% of the population in November 1980 as well as August 1981. This may be explained by a different distribution pattern for bucks and does during the driest months. As more does migrate to the adjacent creek bottoms to have fawns, a higher percentage of bucks occurs in the uplands of the Sweeney-Snyder study area. The small percentage of fawns in the fall population, 21.6%, may indicate some problems in the future. Swenson (1978) estimated that mule deer in Region 7 could maintain stability with 30-35 percent fawns in the postseason period.

Distribution: Spring distribution is shown in Figure 35. Mule deer were found over the entire unit in small groups, only three observations being more than 8 head. A cluster of observations occurred in the northeast corner of the study area in the Miller and Cow Creek drainages. Another group was located on Hart Creek in the southern portion of the study area. The central region had many scattered observations.

The summer distribution (Figure 36) pattern was even more scattered and nearly 85% of the observations were of the 1-3 group size category. An anomaly was observed in that most of the observations occurred on the ridges between drainage ways. The exceptions were the lower portions of Cherry, Hen and Snyder Creeks. These areas had available water while the other drainages were dry. This lack of water is probably the limiting factor for wildlife in the Sweeney-Snyder study area.

Table 2. Mule deer, antelope and coyote aerial observations per hour in the Sweeney-Snyder study area.

Year	Month	Hours	Aerial Observations			Observations/Hour			Coyotes per 100:		
			Mule Deer	Antelope	Coyote	Mule Deer	Antelope	Coyote	Mule Deer	Antelope	
1980	April	-	-	-	-	-	-	-	-	-	-
	May	2.0	78	10	3	39.0	5.0	1.5	3.8	30.0	30.0
	Spring	2.0	78	10	3	39.0	5.0	1.5	3.8	30.0	30.0
	June	1.9	12	2	2	6.3	1.1	1.1	16.7	100.0	100.0
	July	1.7	9	4	2	5.3	2.4	1.2	22.2	50.0	50.0
	August	2.3	32	8	2	13.9	3.5	0.9	6.3	25.0	25.0
	Summer	5.9	53	14	6	9.0	2.4	1.0	11.3	42.9	42.9
1980 1981	September	-	-	-	-	-	-	-	-	-	-
	October	2.5	41	6	1	16.4	2.4	0.4	2.4	16.7	16.7
	November	2.3	48	6	0	20.9	2.6	0	0	0	0
	Fall	4.8	89	12	1	18.5	2.5	0.2	1.1	8.3	8.3
	December	1.6	60	0	2	37.5	0	1.3	3.3	*	*
	January	2.1	32	0	3	15.2	0	1.4	9.4	*	*
	February	2.4	39	7	0	16.3	2.9	0	0	0	0
	Winter	6.1	131	7	5	21.5	1.1	0.8	3.8	71.4	71.4
	March	2.3	53	23	0	23.0	10.0	0	0	0	0
	April	2.1	53	4	0	25.2	1.9	0	0	0	0
	May	2.3	22	6	0	9.6	2.6	0	0	0	0
	Spring	6.7	128	33	0	19.1	4.9	0	0	0	0
	June	2.4	30	1	0	12.5	0.4	0	0	0	0
	July	1.9	28	7	1	14.7	3.7	0.5	3.6	14.3	14.3
	August	1.5	33	9	0	22.0	6.0	0	0	0	0
	Summer	5.8	91	17	1	15.7	2.9	0.2	1.1	5.9	5.9

- No aerial surveys conducted

* Infinite result

Table 3 • Mule deer population characteristics in the Sweeney-Snyder study area.

Year	Month	Total	Number Classified		Fawns:100		Bucks:100		Population Structure(%)		
			Bucks	Does	Fawns	Does	Adults	Does	Bucks	Does	Fawns
1980	August	33	15	11	7	63.6	26.9	36.4	45.5	33.3	21.2
	October	41	8	21	12	57.1	41.4	38.1	19.5	51.2	29.3
	November	69	36	21	12	57.1	21.1	71.4	52.2	30.4	17.4
	Fall	143	59	53	31	58.5	27.7	111.3	41.3	37.1	21.6
1981	August	33	18	8	7	87.5	26.9	225.0	54.5	24.2	21.2

Figure 35. Spring mule deer distribution on Sweeney-Snyder study area.

LEGEND

- County line .....
- County road .....
- Stream .....
- River .....
- Study area .....

Mule deer observations

Group size

1-3 .....

4-8 .....

9-15 .....

16+ .....

Year 1980 1981

Figure 36. Summer mule deer distribution on the Sweeney-Snyder study area.

Fall observations show the mule deer remaining in small groups and still widely dispersed (Figure 37). The northeast and southern areas again had the most observations. Not even the lower portions of drainage-ways had enough water to support mule deer during the drought of the fall season.

Winter observations are shown in Figure 38. The mild weather is shown in the small group sizes as still nearly 30% of the observations are in the 1-3 category and only one group larger than 8 was seen. No major concentration areas are apparent from this one season of observations.

Vegetation type usage: Examination of Table 4 shows that the ponderosa pine type received the most usage by mule deer in every season during the study. This is not surprising in light of the amount of area included in the ponderosa pine vegetation type (Figure 2). The sagebrush/grassland type followed in importance. This, combined with the sagebrush and grassland subtypes of the ponderosa pine type, may have proved most significant with a statistical evaluation due to the small portion of the area in the sagebrush/grassland type. Only in the summer of 1980 were significant numbers of mule deer observed in the creek bottom subtypes. No mule deer were observed in agricultural vegetation subtypes simply because there are practically no agricultural developments within the study area borders.

Activity: The highest percentages of mule deer observed feeding occurred during the spring and summer seasons (Table 5). The lowest percentages were observed during fall and winter. This compares with observations made in other areas of southeastern Montana (Martin 1980b). During this period deer are recovering from the stresses of winter. If they are unable to build themselves up at this time, especially as the stresses of summer increase, they will be in poor shape to survive the following winter season. By far the greatest percentage of deer observed laying down occurred during the winter months as they attempted to conserve energy.

Use of topography: The greatest numbers of mule deer were observed on dissected mid-slopes or hillsides in every season of the study (Table 6). Only in the spring and summer of 1980 was this topographic feature used by less than 75% of the mule deer in the area. Mesa-butte tops or plateaus were utilized in every season. Winter and summer seasons sustained the greatest use in this category with the summer of 1981 being the highest at 16%. The numbers of deer observed feeding adjacent to creek bottoms account for the high usage of the alluvium/terrace category in the spring and summer of 1980.

Use of exposure: Seasonal use of exposure is shown in Table 7. Usage of northerly slopes was highest in winter, 58%, and lowest during the 1980 spring, 12%. This reflects the light snow conditions during the winter. Southern slope usage increased from 12% in the 1980 spring to 48% in the 1981 spring. Easterly exposures received the most usage in the 1980 spring and the least in the

LEGEND

County line ..... - - - - -

County road ..... = = = = =

Stream ..... ~ ~ ~ ~ ~

River ..... ~ ~ ~ ~ ~

Study area ..... + + + + +

Mule deer observations

Group size

1 - 3 ..... △ ..... ○

4 - 8 ..... △ ..... ○

9 - 15 ..... △ ..... ●

16+ ..... △ ..... ●

Year 1980 1981

Figure 37. Fall mule deer distribution on the Sweeney-Snyder study area

LEGEND

- County line .....
 County road .....
 Stream .....
 River .....
 Study area .....
 Mule deer observations

Group size

1 - 3 ... △ ... ○

4 - 8 ... △ ... ○

9 - 15 ... △ ... ○

16+ ... ● ... ●

Year 1980 1981

Figure 38. Winter mule deer distribution on the Sweeney-Snyder study area.

Table 4 . Seasonal use of vegetation types by mule deer in the Sweeney-Snyder study area.

Vegetation subtypes	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Ponderosa pine	18	-	2	4	2	8
Sagebrush	19	19	30	16	20	9
Grassland	4	6	18	11	28	14
Skunkbush	11	6	4	13	10	10
Juniper	2	21	23	20	17	9
Snowberry	6	-	2	-	-	-
Total Ponderosa Pine	60	51	79	64	77	52
Sagebrush	30	6	8	32	18	21
Deciduous shrub	7	8	-	4	-	4
Grassland	3	11	13	-	2	19
Total Sagebrush/Grassland	40	25	21	36	20	43
Tree	-	4	-	-	2	2
Shrub	-	21	-	-	1	3
Total Creek bottom	-	25	-	-	3	5
Ponderosa pine	-	-	-	-	-	-
Sagebrush/Grassland	-	-	-	-	-	-
Creek bottom	-	-	-	-	-	-
Total Agricultural	-	-	-	-	-	-
Total Observed	90	53	93	133	164	97

Table 5. Seasonal activity of mule deer in the Sweeney-Snyder study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing	17	26	59	41	37	33
Running	25	-	4	7	13	15
Laying	-	2	8	39	4	9
Feeding	58	72	29	14	46	42
Total observed	12	53	93	133	164	97

Table 6. Seasonal use of topography by mule deer in the Sweeney-Snyder study area.

Topography	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-Butte top	9	11	5	15	10	16
Mesa-Butte steep slopes	2	13	-	-	-	-
Dissected mid-slopes	59	51	94	77	86	78
Alluvium/Terrace	30	25	-	8	-	3
Flood plain	-	-	1	-	4	2
Total observed	12	53	93	133	164	97

1981 summer, ranging from 41 to 12 percent, respectively. Western slopes received 43% usage during fall 1980 and summer 1981. Numbers observed on flat lands were highest during the summer of 1980 with 30% of the mule deer observed. Fall and winter seasons were the lowest seasons for flat land usage with 6 and 5 percent, respectively.

Use of slope: Flat and gentle slopes received the most usage during spring 1980, 73%, decreasing to a fall low of 37%, and increasing again to 56% in the 1981 summer season (Table 8). The flat land categories, primarily plateaus and bottom lands, were least used during the fall and winter. Steep slopes were utilized most heavily during the fall and winter months with 15 and 25 percent, respectively. Medium and steep slope usage was highest in the fall, 63%, and lowest in the spring of 1980 at 16%. The rougher terrain provides escape cover during the hunting season and protection from the wind during cold weather.

Antelope

Population characteristics: During the 16 months of the study only 112 antelope were observed on the Sweeney-Snyder study area. The rough, timbered nature of the study area is not typical of good antelope habitat. Average group size was lowest in June, 1.5 in 1980 and 1.0 in 1981, and highest in March, 7.7 antelope per observation (Table 9). Break-up of the winter herds occurred in April. No antelope were observed on the study area during the heart of the winter, i.e. December and January. Most likely the antelope wintered north of the study area in the Sweeney Creek drainage. The greatest densities of antelope were observed in the spring (Table 2) when 5.0 and 4.9 antelope per hour of aerial survey were spotted in 1980 and 1981, respectively.

Production data and population structures are shown in Table 10. The sample size is very small and thus carries little weight.

Distribution: All antelope observations are shown in Figure 39. Two major use areas are evident. One lies along Cherry Creek and includes the Tongue River-Rosebud Creek divide of the head of Coal and Ranch creeks. Cherry Creek had more spring observations while the upland area was primarily utilized during summer and fall. No winter observations were made within the Sweeney-Snyder Creek study area boundary. A second concentration of observations occurred along the northern edge of the area, primarily in the Sweeney Creek drainage.

Vegetation type usage: Antelope were found almost exclusively on sagebrush and grassland vegetation subtypes during the study (Table 11). The only exception was one winter observation, just off the area, on a skunkbush (*Rhus trilobata*) grassland site. The highest percentage observed on the ponderosa pine-grassland

Table 7. Seasonal use of exposure by mule deer in the Sweeney-Snyder study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
North	24	15	13	33	15	19
South	12	2	15	11	15	8
East	41	8	5	11	4	2
West	8	-	9	5	-	11
Northeast	-	9	11	17	6	10
Northwest	-	21	31	8	13	4
Southeast	-	8	6	3	18	-
Southwest	-	8	3	8	15	28
Flat	14	30	6	5	13	18
Total observed	90	53	93	133	164	97

Table 8. Seasonal use of slope by mule deer in the Sweeney-Snyder study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	14	30	7	5	13	18
Gentle	69	23	30	42	34	38
Medium	13	34	48	29	45	41
Steep	3	13	15	25	8	3
Total observed	90	53	93	133	164	97

Table 9. Average group size of antelope in the Sweeney-Snyder study area.

Year	Month	Number Observations	Total	Average
1980	April	- *	-	-
	May	3	11	3.7
	Spring	3	11	3.7
	June	2	3	1.5
	July	2	4	2.0
	August	2	8	4.0
	Summer	6	15	2.5
	September	2	11	5.5
	October	1	6	6.0
	November	1	6	6.0
	Fall	4	23	5.8
	December	0	0	0
1981	January	0	0	0
	February	1	7	7.0
	Winter	1	7	7.0
	March	3	23	7.7
	April	3	10	3.3
	May	3	6	2.0
	Spring	9	39	4.3
	June	1	1	1.0
	July	2	7	3.5
	August	1	9	9.0
	Summer	4	17	4.3

* No surveys conducted

LEGEND

County line	-----
County road	=====
Stream	~~~~~
River	~~~~~
Study area	+ + + + +

Antelope observations

Group size

1-3   △   ○

4-8   △   ○

9-15   △   ●

16+   ▲   ●

Year   1980   1981

Figure 39. Antelope distribution on the Sweeney-Snyder study area.

Table 10. Antelope population characteristics in the Sweeney-Snyder study area.

Year	Month	Total	Number Classified			Fawns:100		Bucks:100		Population Structure (Percent)		
			Bucks	Does	Fawns	Does	Adults	Does	Bucks	Bucks	Does	Fawns
1980	June	3	-	3	-	-	-	-	-	100.0	-	-
	July	4	2	2	-	-	-	100.0	50.0	50.0	-	-
	August	8	2	4	2	50.0	33.3	50.0	25.0	50.0	25.0	25.0
	Summer	15	4	9	2	22.2	15.4	44.4	26.7	60.0	13.3	13.3
1981	June	1	-	1	-	-	-	-	-	100.0	-	-
	July	7	4	1	2	200.0	40.0	400.0	57.1	14.3	28.6	28.6
	August	9	1	3	5	166.7	125.0	33.3	11.1	33.3	55.6	55.6
	Summer	17	5	5	7	140.0	70.0	100.0	29.4	29.4	41.2	41.2

Table 11. Seasonal use of vegetation types by antelope in the Sweeney-Snyder study area.

Vegetation subtypes	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Ponderosa pine	-	-	-	-	-	-
Sagebrush	-	-	-	-	13	-
Grassland	73	33	26	-	-	-
Skunkbush	-	-	-	-	-	-
Juniper	-	-	-	-	-	-
Snowberry	-	-	-	-	-	-
Total Ponderosa Pine	73	33	26	-	13	-
Sagebrush	-	20	-	-	62	-
Deciduous shrub	-	-	-	100	-	-
Grassland	27	47	74	-	23	76
Total Sagebrush/Grassland	27	67	74	100	85	76
Tree	-	-	-	-	-	-
Shrub	-	-	-	-	-	-
Total Creek bottom	-	-	-	-	-	-
Ponderosa pine	-	-	-	-	-	-
Sagebrush/grassland	-	-	-	-	3	24
Creek bottom	-	-	-	-	-	-
Total Agricultural	-	-	-	-	3	24
Total Observed	11	15	23	7	39	17

subtype was 73 and occurred during the 1980 spring season. The sagebrush/grassland vegetation type had antelope usage every season of the study and was highest, 100%, during the 1980-81 winter months. Antelope were observed on winter wheat fields during the spring and summer of 1981 for the only agricultural type usage recorded during the study period.

Activity: All antelope observed were either standing or running (Table 12) at the moment of observation. Most of them were running. This is in stark contrast to other studies (Martin 1980a; 1980c) where significant numbers were observed feeding and laying down. Why these antelope were so flighty is uncertain.

Use of topography: Every antelope seen was utilizing the dissected mid-slope category (Table 13). Obviously these antelope are avoiding the mesa-butte complexes and the creek bottom and flood plain areas.

Use of exposure: Spring 1981 was the season of greatest dispersion (Table 14) as antelope were observed on all eight aspects. No antelope were observed on northerly slopes during fall and winter. Greatest usage occurred during the spring of 1980 when 73 percent were seen on northeastern exposures. Southerly exposures received their highest usage in the summer and fall of 1980 with 47 and 48 percent respectively. Easterly slopes were utilized in each season of the study and comprised 100% of the observations in spring 1980, fall 1980 and winter 1980-81. Western aspects received their greatest usage during the summer seasons with 54 and 42 percent for 1980 and 1981 respectively.

Use of slope: Antelope avoided the flat and steep terrain features (Table 15) during all seasons of the study. Usage of the medium slopes was considerably higher in 1981 than in 1980 on the Sweeney-Snyder study area. Usage increased from 0 to 67 percent from spring to summer respectively in 1980 while increasing from 92 to 100 percent from spring to summer respectively in 1981. Usage of gentle slopes followed the opposite trend during the spring and summer seasons. Usage of gentle slopes was much greater than medium slopes during fall and winter.

Sharp-tailed Grouse

Fourteen sharp-tailed grouse dancing grounds were located on or adjacent to the Sweeney-Snyder creek study area (Figure 40). Attendance by male birds at known grounds decreased from 14.5 in 1980 to 11.8 in 1981 (Table 16). This amounts to an 18.6 percent decrease in this population trend parameter. While no broods were observed on the study area in 1980, Knapp et al. (1981) reports the average young/brood in FWP Region 7 to be a dismal 1.7 in 1980 compared to a 10 year average of 6.1. Obviously reproduction was extremely poor in 1980. This is most likely related to the lack of cover caused by the extended drought. Considering the lack of recruitment to the sharptail population, the overwinter survival rate must have been quite high to have

Figure 40. Sharptail and sage grouse dancing grounds and game bird observations in the Sweeney-Snyder study area.

Table 12. Seasonal activity of antelope in the Sweeney-Snyder study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing	-	40	26	100	26	6
Running	-	60	74	-	74	94
Laying	-	-	-	-	-	-
Feeding	-	-	-	-	-	-
Total observed	-	15	23	7	39	17

Table 13. Seasonal use of topography by antelope in the Sweeney-Snyder study area.

Topography	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-Butte top	-	-	-	-	-	-
Mesa-Butte steep slopes	-	-	-	-	-	-
Dissected mid-slopes	100	100	100	100	100	100
Alluvium/Terrace	-	-	-	-	-	-
Flood plain	-	-	-	-	-	-
Total observed	11	15	23	7	39	17

Table 14. Seasonal use of exposure by antelope in the Sweeney-Snyder study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
North	-	-	-	-	3	6
South	-	-	-	-	5	-
East	18	13	52	100	13	-
West	-	7	-	-	18	24
Northeast	73	33	-	-	44	53
Northwest	-	-	-	-	3	-
Southeast	9	-	48	-	3	-
Southwest	-	47	-	-	13	18
Flat	-	-	-	-	-	-
Total observed	11	15	23	7	39	17

Table 15. Seasonal use of slope by antelope in the Sweeney-Snyder study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	-	-	-	-	-	-
Gentle	100	33	74	100	8	-
Medium	-	67	26	-	92	100
Steep	-	-	-	-	-	-
Total observed	11	15	23	7	39	17

resulted in the 18.6 percent decline in the number of breeding males. One brood with 8 young was observed in 1981.

There are approximately 0.12 dancing grounds per square mile in the Sweeney-Snyder area. Schwarzkoph (1980) reported 0.12 grounds per square mile in the Colstrip area. Martin found 0.22 in the Otter Creek drainage (1980a) and .09 per square mile in the Saroy Creek drainage (1980c).

Observations of grouse not on dancing grounds (Figure 40) indicate the strong possibility of a dancing ground in or near Sand Coulee in the southwestern corner of the study area.

Sage Grouse

Three sage grouse strutting grounds were located on or adjacent to the Sweeney-Snyder study area (Figure 40). The number of male birds attending decreased from 7.0 in 1980 to 6.3 in 1981 (Table 17). Drought conditions were most likely responsible for this decline. No broods were observed on the study area during the study.

The vegetation map (Figure 2), which shows the ponderosa pine type covering most of the study area, and very little sagebrush explains the paucity of sage grouse numbers in the area.

Merriam's Turkey

Several sightings of turkeys were made during the study (Figure 40). These occurred in the heads of the Cherry, Miller, Cow and Eagle Creek drainages. All were in the northeast portion of the study area, mostly during the spring months.

Ring-necked Pheasant

Ring-necked pheasants are found in small numbers on the study area primarily at the lower ends of the Rosebud Creek tributaries. The lack of water and agricultural development in the area severely limited pheasant distribution and numbers.

The Rosebud Creek bottoms are excellent pheasant habitat. A pheasant crow count was conducted along 15 miles of Rosebud Creek road just to the west of the Sweeney-Snyder study area. The average number of calls per two minute stop in 1980 was 21.9 and was 19.6 in 1981. This is slightly better than the 17.8 and 18.6 calls per stop for 1980 and 1981, respectively reported for the lower 20 miles of Rosebud Creek (Knapp et al. 1981).

Waterfowl

Four species of waterfowl game birds were observed on the Sweeney-Snyder study area (Table 18). It is possible that all of them may breed in the area (Skaar 1980), however, no broods were observed during the two summers of this study. Extreme drought conditions in southeastern Montana resulted in the

Table 16. Sharptailed grouse dancing grounds in the Sweeney-Snyder study area and numbers of males attending.

Ground Number	Location			Number of Males Attending	
	T	R	S	1980	1981
1	4N	45E	28 NW $\frac{1}{4}$	20	30
2	4N	44E	25 NE $\frac{1}{4}$	30	25
3	3N	44E	2 SE $\frac{1}{4}$	14	0
4	3N	45E	19 SW $\frac{1}{4}$	8	5
5	3N	44E	21 NW $\frac{1}{4}$	8	6
6	2N	44E	4 SE $\frac{1}{4}$	7	5
7	2N	44E	20 NW $\frac{1}{4}$	4	0
8	1N	44E	7 SE $\frac{1}{4}$	25	14
9	2N	44E	21 SE $\frac{1}{4}$	-	5
10	2N	43E	16 SE $\frac{1}{4}$	-	12
11	2N	43E	25 NW $\frac{1}{4}$	-	7
12	3N	44E	6 NE $\frac{1}{4}$	-	5
13	1N	44E	5 NE $\frac{1}{4}$	-	7
14	1N	44E	2 SW $\frac{1}{4}$	-	20
Total males attending				116	141
Average males per active ground				14.5	11.8

Table 17. Sage grouse strutting grounds in the Sweeney-Snyder study area and numbers of males attending.

Ground Number	Location			Number of males attending	
	T	R	S	1980	1981
1	3N	43E	9 SE $\frac{1}{4}$	7	7
2	3N	43E	34 NW $\frac{1}{4}$	7	5
3	2N	44E	35 NE $\frac{1}{4}$	-	7
Total males attending				14	19
Average males per ground				7.0	6.3

Table 18. Bird species observed on the Sweeney-Snyder study area.

Species		Breeding Status*	Species		Breeding Status
1	Pied-billed grebe	b	35	Pinyon jay	b
2	Canada goose	B	36	Black-capped chickadee	B
3	Mallard	B	37	Red-breasted nuthatch	B
4	Gadwall	B	38	White-breasted nuthatch	b
5	Green-winged teal	b	39	House wren	B
6	Cooper's hawk	B	40	Rock wren	B
7	Red-tailed hawk	B	41	Brown thrasher	B
8	Rough-legged hawk	t	42	American robin	B
9	Ferruginous hawk	b	43	Mountain bluebird	B
10	Golden eagle	B	44	Townsend's solitaire	b
11	Marsh hawk	b	45	Cedar waxwing	b
12	Prairie falcon	B	46	Starling	B
13	American kestrel	B	47	Yellow warbler	B
14	Sharp-tailed grouse	B	48	Yellow-rumped warbler	B
15	Sage grouse	B	49	Common yellowthroat	b
16	Ring-necked pheasant	B	50	Yellow-breasted chat	b
17	Turkey	B	51	Western meadowlark	B
18	Killdeer	B	52	Yellow-headed blackbird	b
19	Upland sandpiper	B	53	Red-winged blackbird	B
20	Mourning dove	B	54	Northern oriole	B
21	Great-horned owl	B	55	Brewer's blackbird	B
22	Common nighthawk	B	56	Common grackle	B
23	Common flicker	B	57	Brown-headed cowbird	B
24	Red-headed woodpecker	B	58	American goldfinch	b
25	Hairy woodpecker	B	59	Red cross-bill	b
26	Eastern kingbird	B	60	Rufous-sided towhee	b
27	Western kingbird	B	61	Lark bunting	b
28	Cassin's kingbird	B	62	Savannah sparrow	b
29	Say's phoebe	B	63	Grasshopper sparrow	B
30	Western wood pewee	B	64	Vesper sparrow	B
31	Horned lark	b	65	Lark sparrow	B
32	Violet-green swallow	B	66	Chipping sparrow	B
33	Black-billed magpie	B	67	Brewer's sparrow	B
34	Common crow	B	68	Field sparrow	b

* Breeding status from Montana Bird Distribution (Skaar 1980) for latilong 33 and 43.

B - hard evidence of breeding

b - circumstantial evidence of breeding

t - occurs, but no evidence of breeding

reservoirs and ponds being dry during most of the study. Only in May and June of 1981, too late for breeding purposes, did any appreciable rainfall occur.

Song Birds

Sixty-eight species of birds, including game birds, were observed on the study area (Table 18). The Cooper's hawk, ferruginous hawk, golden eagle, prairie falcon, upland sandpiper, Brewer's sparrow and field sparrow were listed by Flath (1981) as species of special interest or concern. The ferruginous hawk, golden eagle and prairie falcon are also listed as migratory birds of high federal interest (U.S.D.I. 1979). All of these species are known or suspected to breed in the study area (Skaar 1980).

A total of 813 breeding bird observations (Table 19) were made along approximately 20 miles of trail (Figure 41) during the spring breeding bird roadside surveys. The nine most common birds in the area were, from top to bottom, western meadowlark, lark sparrow, Brewer's blackbird, chipping sparrow, mourning dove, rufous-sided towhee, American robin, house wren and yellow warbler. All seven species had greater than 3.5 percent composition and 15 percent frequency levels in the survey (Table 19). The vesper sparrow, brown-headed cowbird, Brewer's sparrow and killdeer had percent frequency figures greater than 10.

Raptors

Eight species of hawks and one species of owls were observed on the study area (Table 18). Spring observations, which correlate closely with the breeding season, are shown in Figure 42. All other raptor observations are shown in Figure 43.

A pair of Cooper's hawks was observed in July 1981. They were very defensive and may have had a nest in the area. No other accipiters were observed on the study area.

Several buteo species were observed. Red-tailed hawks were by far the most common. Three inactive nests were located during a helicopter nest search (Figure 42). They were located in ponderosa pine and cottonwood trees (Table 20). Several red-tails were observed during the breeding season but their nests were not found.

A transient rough-legged hawk was observed north of the study area in October. Two ferruginous hawk sightings were made during the study (Figure 43). Both were considered to be migratory birds.

Golden eagle sightings were made on the northeast, northwest and southern edges of the study area (Figure 43). They were always single birds. No nests were located.

Marsh hawks or harriers were observed over the open fields and sagebrush of the northeast portion of the study area. No nest

Figure 41. Sweeney-Snyder songbird roadside survey route and small mammal trapline locations.

Figure 42. Sweeney-Snyder study area spring (resident) raptor observations.

Figure 43. Sweeney-Snyder study area summer, fall and winter (migrant) raptor observations.

Table 19 Bird species composition and frequency of occurrence from five Sweeney-Snyder breeding bird surveys.

Species	Total Observations		Percent		
	1980	1981	Total	Composition	Frequency
Western meadowlark	102	100	202	24.8	83
Lark sparrow	62	38	100	12.3	55
Brewer's blackbird	29	42	71	8.7	23
Chipping sparrow	32	17	49	6.0	36
Mourning dove	18	21	39	4.8	25
Rufous-sided towhee	14	17	31	3.8	25
American robin	19	10	29	3.6	25
House wren	20	9	29	3.6	23
Yellow warbler	19	10	29	3.6	16
Pinyon jay	4	20	24	3.0	5
Vesper sparrow	11	11	22	2.7	14
Brown-headed cowbird	16	4	20	2.5	19
Red cross-bill	-	20	20	2.5	1
Eastern kingbird	14	4	18	2.2	12
Brewer's sparrow	10	6	16	2.0	13
Killdeer	5	9	14	1.7	8
Say's phoebe	7	3	10	1.2	8
Common grackle	1	8	9	1.1	5
Ring-necked pheasant	8	-	8	1.0	8
Cassin's kingbird	4	4	8	1.0	4
Common flicker	3	4	7	.9	7
Mountain bluebird	6	1	7	.9	6
Violet-green swallow	6	-	6	.7	3
Northern oriole	4	1	5	.6	4
Western kingbird	2	3	5	.6	3
Brown thrasher	4	-	4	.5	4
Yellow-rumped warbler	2	1	3	.4	3
Red-winged blackbird	2	1	3	.4	3
Western wood peewee	1	2	3	.4	3
American kestrel	1	2	3	.4	2
Lark bunting	-	2	2	.2	2
Rock wren	2	-	2	.2	2
Field sparrow	1	1	2	.2	2
Black-billed magpie	2	-	2	.2	2
Black-capped chickadee	2	-	2	.2	2
Grasshopper sparrow	-	2	2	.2	1
White-breasted nuthatch	-	1	1	.1	1
Savannah sparrow	-	1	1	.1	1
Upland sandpiper	1	-	1	.1	1
Sharp-tailed grouse	1	-	1	.1	1
Yellow-breasted chat	1	-	1	.1	1
American goldfinch	1	-	1	.1	1
Red-tailed hawk	1	-	1	.1	1
Total observations	438	375	813		

sites were located.

American kestrels were the most common falcon and raptor in the Sweeney-Snyder study area. They were so numerous that individual sightings were not recorded.

One prairie falcon aerie was located in the study area (Table 20) on a sandstone cliff. In 1980, the adults abandoned eggs in the nest. In 1981, one bird was fledged from four eggs which had been laid.

Several great-horned owl observations were made but no nests were found (Figures 42 and 43).

Non-game Mammals

Fifteen mammal species were observed on the study area (Table 21). The only non-game species of special interest or concern is the black-tailed prairie dog (Flath 1981). Five prairie dog towns were located primarily in the Cow Creek drainage (Figure 44). No sign of black-footed ferrets was discovered during examination of these prairie dog towns.

Results of summer and fall small mammal trapping are shown in Table 22. Three rodent species were captured. The deer mouse (*Peromyscus maniculatus*) was the most common, occurring in all three habitat types both seasons. The house mouse (*Mus musculus*) was captured only during the summer season in the riparian habitat type. A single prairie vole (*Microtus ochrogaster*) was captured in the sagebrush-grassland fall season trap line. The number of captures per 100 trap nights was very low compared to those observed in similar habitat types in the Otter, Hanging Woman and Prairie Dog Creek areas (Martin 1980a) the previous year. The prolonged drought may have been responsible for the low rodent populations.

Amphibians and Reptiles

Two amphibian species and two reptilian species were encountered on the Sweeney-Snyder study area (Table 23). None of them are species of special interest or concern (Flath 1981).

Greenleaf-Miller

Mule Deer

Population characteristics: During the field surveys, 738 mule deer observations were recorded in the Greenleaf-Miller study area (Table 24). Average group size was greatest during the winter and spring seasons. No large groups were formed due to the mild weather conditions. December and March had the highest average group sizes with 11.5 and 10.2 mule deer per group respectively. As expected, the summer months saw the greatest dispersement and lowest group sizes. June was the lowest

Table 20. Raptor nest sites on the Sweeney-Snyder study area.

No.	Species	Substrate	Activity
1	Red-tailed hawk	Ponderosa pine	Inactive
2	Red-tailed hawk	Cottonwood tree	Inactive
3	Red-tailed hawk	Ponderosa pine	Inactive
4	Prairie falcon	Sandstone cliff	1980-abandoned eggs 1981-fledged 1 from 4 eggs

Table 21. Mammals observed on the Sweeney-Snyder study area.

	Common Name	Scientific Name
1	Badger	<i>Taxidea taxus</i>
2	Coyote	<i>Canis latrans</i>
3	Red fox	<i>Vulpes fulva</i>
4	Black-tailed prairie dog	<i>Cynomys ludovicianus</i>
5	Thirteen-lined ground squirrel	<i>Citellus tridecemlineatus</i>
6	Red squirrel	<i>Tamiasciurus hudsonicus</i>
7	Deer mouse	<i>Peromyscus maniculatus</i>
8	Prairie vole	<i>Microtus ochrogaster</i>
9	Muskrat	<i>Ondatra zibethicus</i>
10	House mouse	<i>Mus musculus</i>
11	Porcupine	<i>Erethizon dorsatum</i>
12	White-tailed jackrabbit	<i>Lepus townsendi</i>
13	Desert cottontail	<i>Sylvilagus auduboni</i>
14	Mule Deer	<i>Odocoileus hemionus</i>
15	Antelope	<i>Antilocapra americana</i>

Table 22. Results of small mammal trapping on the Sweeney-Snyder study area during the summer and fall of 1980.

Vegetation type Season	Riparian		HABITAT TYPE		Sagebrush-Grass	
	Summer	Fall	Ponderosa Summer	Pine Fall	Summer	Fall
Total captures	13	1	3	4	4	11
Trap nights	811	844	839	840	836	842
Captures/100 trap nights	1.60	0.12	0.36	0.48	0.48	1.3
Number of species caught	2	1	1	1	1	2
Species:						
<i>Peromyscus maniculatus</i>	6	1	3	4	4	10
<i>Mus musculus</i>	7	-	-	-	-	-
<i>Microtus ochrogaster</i>	-	-	-	-	-	1

Table 23. Amphibians and reptiles observed on the Sweeney-Snyder study area.

	Common Name	Scientific Name
1	Sagebrush lizard	<i>Sceloporus graciosus</i>
2	Great plains toad	<i>Bufo cognatus</i>
3	Painted turtle	<i>Chrysemys picta</i>
4	Prairie rattlesnake	<i>Crotalus viridis</i>

Table 24. Average group size of mule deer in the Greenleaf-Miller study area.

Year		Number Observations	Total	Average
1980	April	- *	-	-
	May	4	27	6.8
	Spring	4	27	6.8
	June	11	16	1.5
	July	19	44	2.3
	August	11	33	3.0
	Summer	41	93	2.3
	September	-	-	-
	October	11	56	5.1
	November	18	83	4.6
1980 1981	Fall	29	139	4.8
	December	2	23	11.5
	January	11	68	6.2
	February	6	49	8.2
	Winter	19	140	7.4
	March	9	92	10.2
	April	16	113	7.1
	May	20	49	2.5
	Spring	45	254	5.6
	June	8	16	2.0
	July	13	28	2.2
	August	13	42	3.2
	Summer	34	86	2.5

* No surveys conducted

Figure 44. Sweeney-Snyder study area prairie dog town locations.

with 1.5 and 2.0 mule deer per observation in 1980 and 1981 respectively.

The most deer observed per unit of effort was 41.4 mule deer per hour of aerial survey in April 1981 (Table 25). Fall and spring (1981) mule deer densities were nearly equal with 31.2 deer observed per hour. Winter densities were lower than expected due to the lack of snow and above average temperatures.

Mule deer population structure and reproduction data is given in Table 26. In 1980, the number of fawns per 100 does observed increased from 29.4 in August to 70.8 in November. Obviously many young deer were not traveling with the adults in the earlier months of this survey. The number of fawns per 100 does was 115.9 in August 1981. This amounts to a nearly 400 percent increase over the August 1980 data and over 160 percent above November's data. The Greenleaf-Miller deer herd seems to have remained stable in 1980 as the percentage of fawns fell into the 30-35 percent range needed (Swenson 1978) for maintenance and apparently increased in numbers in 1981 as 52.4 percent of the population was composed of fawns in August. A very low percentage of bucks was observed in August 1981, 2.4 percent. This is opposite the situation observed in the Sweeney-Snyder study area and is explained by the presence of the Rosebud Creek bottoms in the northern portion of the Greenleaf-Miller area. Practically all of the fawns and does were observed on the creek bottom agricultural and "riparian" habitat types. As mentioned earlier, the Sweeney-Snyder study area had no creek bottom habitat which the doe-fawn segment of the population seems to prefer.

Distribution: Spring distribution is shown in Figure 45. A major concentration area is evident in the northwest portion of the study area along Rosebud Creek at the mouth of Lee Coulee. This area with its combination of creek bottoms, agriculture and adjacent uplands is exceptional mule deer habitat. In the southeast quarter of the study area along the upper portions of Miller, Greenleaf, Bean and Lay creeks is another important mule deer area. The deer were evenly distributed within this section of the study area. One third of these observations were in the 9-15 group size category. Two other areas, located in the northeast and southwest portions of the study, were clusters of smaller sized groups of mule deer. The center of the study area, along Miller and Bean creeks supported very few mule deer.

Summer distribution (Figure 46) again reveals the importance of the Lee Coulee-Downey Coulee-Rosebud Creek section of the study area. Mule deer density is extremely high in this vicinity. A band of observations was evident stretching across the area from the head of Downey Coulee to Greenleaf Creek. This includes the buttes and represents the edge between the ponderosa pine uplands and sagebrush-grassland habitat types. Mule deer were widely dispersed across the remainder of the study area.

During the fall season (Figure 47), most mule deer moved out of the bottoms of Rosebud Creek. The major concentration of deer

Table 25 . Mule deer, antelope and coyote aerial observations per hour in the Greenleaf-Miller study area.

Year	Month	Hours	Aerial Observations		Observations/Hour		Coyotes/100:	
			Mule Deer	Antelope	Mule Deer	Antelope	Mule Deer	Antelope
1980	April	- *	-	-	-	-	-	-
	May	1.6	27	8	16.9	5.0	11.1	37.5
	Spring	1.6	27	8	16.9	5.0	11.1	37.5
	June	1.8	16	27	8.9	15.0	31.3	18.5
	July	2.1	44	34	21.0	16.2	6.8	8.8
	August	1.8	33	23	18.3	12.8	21.2	80.4
	Summer	5.7	93	84	16.3	14.7	16.1	17.9
	September	-	-	-	-	-	-	-
	October	2.1	49	15	23.3	7.1	14.3	46.7
	November	2.0	79	56	39.5	28.0	8.9	12.5
1981	Fall	4.1	128	71	31.2	17.3	10.9	19.7
	December	1.8	23	42	12.8	23.3	8.7	4.8
	January	2.0	68	42	34.0	21.0	4.4	7.1
	February	1.9	49	0	25.8	0	16.3	**
	Winter	5.7	140	84	24.6	14.7	9.3	15.5
	March	2.5	92	36	36.8	14.4	10.9	27.8
	April	2.2	91	20	41.4	9.1	6.6	30.0
	May	1.9	23	10	12.1	5.3	0	0
	Spring	6.6	206	66	31.2	10.0	7.8	24.2
	June	1.9	16	26	8.4	13.7	18.8	11.5
	July	2.2	28	39	12.7	17.7	3.6	2.6
	August	1.9	42	14	22.1	7.4	16.7	50.0
	Summer	6.0	86	79	14.3	13.2	12.8	13.9

* No surveys conducted

** An infinite number

Table 26. Mule deer population characteristics in the Greenleaf-Miller study area.

Year	Month	Total	Number Classified		Fawns:100		Bucks: 100		Population Structure (%)		
			Bucks	Does	Fawns	Does	Adults	Does	Bucks	Does	Fawns
1980	August	33	11	17	5	29.4	17.9	64.7	33.3	51.5	15.2
	October	56	8	31	17	54.8	43.6	25.8	14.3	55.4	30.4
	November	50	9	24	17	70.8	51.5	37.5	18.0	48.0	34.0
	Fall	139	28	72	39	54.2	39.0	38.9	20.1	51.8	28.1
1981	August	42	1	19	22	115.8	110.0	5.3	2.4	45.2	52.4

LEGEND

County road	—
Stream	~~~~~
Cheyenne reservation	- · - · -
Study area	- - - - -
Mule deer observations	
Group size	
1 - 3	△ ○
4 - 8	△ ○
9 - 15	△ ●
16 +	▲ ●
Year	1980 1981

Figure 45. Spring mule deer distribution on the Greenleaf-Miller study area.

Figure 46. Summer mule deer distribution on the Greenleaf-Miller study area.

LEGEND

County road .....

Stream .....

Cheyenne reservation .....

Study area .....

Mule deer observations

Group size

1 - 3 ..... $\triangle$ ..... $\circ$

4 - 8 ..... $\triangle$ ..... $\circ$

9 - 15 ..... $\triangle$ ..... $\bullet$

16+ ..... $\blacktriangle$ ..... $\bullet$

Year   1980   1981

Figure 47. Fall mule deer distribution on the Greenleaf-Miller study area.

lay just to the west of the study area up Lee Coulee.

Mild weather resulted in mule deer remaining widely dispersed throughout the 1980-81 winter (Figure 48). Large groups of deer were observed in the uplands between Lee and Miller Coulees and along West Fork Miller Creek.

Vegetation type usage: The highest usage of a vegetation subtype occurred in spring 1980 (Table 27). The tree subtype of the larger creek bottom vegetation type received 70% of usage. This was followed by the 60% figure observed during the summer of 1981 in the agricultural-creek bottom subtype. The combined creek bottom subtypes equally 70% of the mule deer observations in summer 1981. Obviously, the creek bottom types, which comprise a small percentage of the study area (Figure 4), are an extremely important component of the mule deer habitat in the Greenleaf-Miller study area.

The ponderosa pine vegetation type was the only one to receive use during every season of the study. Its highest usage was during the winter months, averaging 68% of the mule deer observed (Table 27), falling to the lowest point, 14%, during the summer of 1981.

Fall 1980 was the peak season for usage of the sagebrush/grassland vegetation type with 50% of the observed deer. Summer 1981 was also the lowest point for this vegetation type.

During the dry months, which are late summer and early fall in southeastern Montana, mule deer rely on the creek bottom habitat types for sustenance and fawn rearing. The dependency of mule deer on this vegetation type has been statistically documented in the Sarpy Creek drainage (Martin 1980c), which lies approximately 15 miles west of the Greenleaf-Miller study area.

Activity: Seasonal activity of mule deer at the moment of observation is shown in Table 28. The greatest percentage observed feeding was during summer 1981, 60%, while the smallest percentage in this category, 9%, occurred during the fall months. This again points to the critical nature of the summer period.

The percentage of mule deer bedded down at observation was greatest during the winter surveys, 30%. No deer were observed laying down in spring 1981 which was the season when the greatest numbers of deer (Table 28), were observed, 254.

The cautious nature of mule deer is evidenced by the fact that fewer deer were observed running than standing in every season of the study. The fewest observations of running deer occurred during the summer time with both 1980 and 1981 registering 9% of the mule deer.

Most deer were standing, watching the observer, in all but one season of the study, summer 1980, when 26% were observed in that activity category. This represents the percentage of deer which had not been spooked prior to their being observed.

Table 27. Seasonal use of vegetation types by mule deer in the Greenleaf-Miller study area.

Vegetation subtypes	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Ponderosa pine	11	11	3	4	2	1
Sagebrush	19	3	10	21	23	1
Grassland	-	9	3	6	9	7
Skunkbush	-	10	13	17	5	3
Juniper	-	-	-	19	15	-
Snowberry	-	-	-	-	1	1
Total Ponderosa pine	30	32	29	68	55	14
Sagebrush	-	24	39	22	19	5
Deciduous shrub	-	-	5	10	-	5
Grassland	-	1	6	-	13	6
Total Sagebrush/Grassland	-	25	50	32	32	15
Tree	70	16	12	-	2	9
Shrub	-	4	10	-	4	1
Total Creek bottom	70	20	22	-	6	10
Ponderosa pine	-	-	-	-	-	-
Sagebrush/grassland	-	-	-	-	3	-
Creek bottom	-	23	-	-	4	60
Total Agricultural	-	23	-	-	7	60
Total observed	27	93	139	140	254	86

LEGEND

- County road ..... ———
- Stream ..... ~~~~~
- Cheyenne reservation ..... - - - - -
- Study area ..... + + + + +
- Mule deer observations

Group size

1-3 ..... △ ..... ○

4-8 ..... △ ..... ○

9-15 ..... ▲ ..... ●

16+ ..... ▲ ..... ●

Year   1980   1981

Figure 48. Winter mule deer distribution on the Greenleaf-Miller study area.

Use of topography: Usage of dissected mid-slopes, i.e. hillsides, occurred in all six seasons and was greatest during the winter months, 95% (Table 29). Spring, 1980, and summer 1981, saw the least use of the hillside category with 19 and 27 percent of the observations respectively.

The alluvium/terrace type received significant usage in spring 1980 and summer 1981 when 70 and 67 percent, respectively, of the mule deer were observed there. This category is primarily associated with alfalfa fields adjacent to Rosebud Creek. The least amount of usage in the lowland categories occurred during winter when no observations were made in the flood plain or alluvium/terrace categories. A similar usage pattern was observed along Sarpy Creek (Martin 1980c).

The upland types, mesa- butte tops and steep slopes, had limited deer usage in every season (Table 29). The spring and summer of 1980 had the most with 11 and 19 percent respectively.

Use of exposure: Usage of northerly exposures by mule deer in the Greenleaf-Miller study area was greatest during the spring of 1980 (Table 30), when 81% of the mule deer were observed there. The winter season followed with 50% of the winter mule deer observations occurring on northerly slopes. Obviously snow cover was not a problem. Swenson (1981) reported the average daily snow depth at Miles City from November 16 through March 15 to be .07 inches.

South slopes were most used during the fall of 1980 and spring of 1981 with 42 and 50 percent of the mule deer observed respectively. Summer usage of southern slopes was low in both years of the study with 17 and 11 percent respectively.

Eastern slopes received more use by mule deer than westerly slopes during every season except fall 1980 and spring 1981. Easterly slope usage ranged from 10% in summer 1981 to 89% during the 1980 spring. Westerly slopes had much less usage and ranged from 2% in summer 1981 to 42% during fall 1980.

Use of slope: Usage of flat lands was greatest during the summer months (Table 31). This corresponds to mule deer usage of the creek bottom vegetation subtypes and was 57% in 1980 and 72% in 1981. Gentle and flat slopes were credited with more mule deer observations than medium and steep slopes in every season except the 1980-81 winter. Even then 42% of the mule deer were observed on gentle slopes. Steep slopes received their greatest usage during spring months. Eleven percent in 1980 and 12% in 1981 were observed on steep slopes. Medium slope usage ranged from 49% in winter 1980-81 to 18 and 19 percent during the summers of 1980 and 1981, respectively. No observations were catagorized as medium during the spring 1980 surveys.

White-tailed Deer

A small white-tailed deer population was found on the Greenleaf-Miller study area. These deer were concentrated along Rosebud Creek between the mouths of Miller Coulee and Miller Creek.

Table 28. Seasonal activity of mule deer in the Greenleaf-Miller study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing	-	55	54	34	39	26
Running	-	9	14	11	24	9
Laying	-	4	24	30	-	5
Feeding	-	32	9	26	38	60
Total observed	-	93	139	140	254	86

Table 29. Seasonal use of topography by mule deer in the Greenleaf-Miller study area.

Topography	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-Butte top	-	16	4	-	6	1
Mesa-Butte steep slopes	11	3	6	5	3	1
Dissected mid-slopes	19	32	65	95	67	27
Alluvium/Terrace	70	35	8	-	18	67
Flood plain	-	13	17	-	6	3
Total observed	27	93	139	140	254	86

Table 30. Seasonal use of exposure by mule deer in the Greenleaf-Miller study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
North	-	8	11	14	9	10
South	-	6	11	16	15	5
East	19	5	4	25	1	1
West	-	-	11	1	2	1
Northeast	70	10	10	32	12	3
Northwest	11	2	4	4	1	1
Southeast	-	5	4	7	6	6
Southwest	-	6	27	-	29	-
Flat	-	57	17	-	24	72
Total observed	27	93	139	140	254	86

Table 31. Seasonal use of slope by mule deer in the Greenleaf-Miller study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	-	57	17	-	24	72
Gentle	89	19	33	42	35	8
Medium	-	18	42	49	29	19
Steep	11	5	7	9	12	1
Total observed	27	93	139	140	254	86

Several observations were made along the lower section of Miller Creek and in the upland area between Rosebud Creek and the lower section of Miller Creek (Figure 49).

Only 20 white-tailed deer observations were recorded during the study period. No group was larger than eight animals. Analysis of this small amount of data would not have resulted in meaningful conclusions and was not done.

Antelope

Population characteristics: A total of 456 antelope were observed on the Greenleaf-Miller area during this six season study. Average group size ranged from a high of 28.0 antelope per observation during November 1980 to a low of 1.6 in May 1981 (Table 32). Although no antelope were observed on the study area in February, the winter season had the highest average group size, 21.0 antelope. Spring 1981, saw the greatest number of antelope observed, 107, and the smallest group size, 3.3 antelope.

Apparently, antelope move off the study area during winter. This winter was very mild and weather should not have been responsible for the movement. This population is significantly less dense than that observed on Hanging Woman Creek (Martin 1980a) where 197.1 antelope per hour were observed during the winter of 1979-80. Winter aerial surveys resulted in 14.7 observations per hour on the Greenleaf-Miller area in 1980-81. Antelope were less abundant than mule deer in the Greenleaf-Miller study area (Table 25)

Population structure and production data are presented in Table 33. A large increase in fawns per 100 does was evident from 1980 to 1981. In 1980 the average for June through August was 32.4 fawns per 100 does while in 1981 the average was 60.5 fawns per 100 does. Wentland (1981) reported a range from 40 to 75 fawns per 100 does in Montana Fish, Wildlife and Parks H.D. 721 for 1972-1979. The Greenleaf-Miller study area is contained within hunting district 721. As a percentage of the population, fawns comprised 24.4% in summer 1980 and 31.0% in summer 1981.

The percentage of bucks increased slightly from 15.6 in 1980 to 17.9 in 1981 while the percentage of does decreased from 60.0 in 1980 to 51.2 percent in 1981.

Distribution: Antelope spring distribution is shown in Figure 50. Observations were mostly confined to the northeast quarter of the study area. The biggest concentration occurred in an area encompassing the head of Bean Creek, the middle segment of Greenleaf Creek and the bend of Lay Creek. Most of the observations fell into the 1-3 and 4-8 group size categories.

During the summer months (Figure 51), antelope were found in the same general areas noted during spring. The primary use area increased in size somewhat and shifted slightly to the north. About half of the groups observed were in the 1-3 size category. The 4-8 and 9-15 size groups comprised about 30 and 20 percent of the observations respectively.

LEGEND

County road	—
Stream	~~~~~
Cheyenne reservation	- - - -
Study area	+ + + +
White-tailed deer observations:	
Group size: 1-3 4-8 9-15	
Spring	○ ⊙ ⊕
Summer	△ ▴ ▸
Fall	○ ⊙ ⊕
Winter	□ ⊠ ⊡

Figure 49. Whitetail deer distribution on the Greenleaf-Miller study area.

Figure 50. Spring antelope distribution on the Greenleaf-Miller study area.

LEGEND

- County road ..... ———
- Stream ..... ~~~~~
- Cheyenne reservation ..... - - - -
- Study area ..... + + + +
- Antelope observations

Group size

1 - 3 ..... △ ..... ○

4 - 8 ..... △ ..... ○

9 - 15 ..... △ ..... ●

16+ ..... ▲ ..... ●

Year   1980   1981

Figure 51. Summer antelope distribution on the Greenleaf-Miller study area.

Table 32. Average group size of antelope in the Greenleaf-Miller study area.

Year	Month	Number of Observations	Total	Average
1980	April	-*	-	-
	May	2	8	4.0
	Spring	2	8	4.0
	June	11	34	3.1
	July	5	34	6.8
	August	3	23	7.7
	Summer	19	91	4.8
	September	-	-	-
	October	4	26	6.5
	November	2	56	28.0
	Fall	6	82	13.7
	December	2	42	21.0
	January	2	42	21.0
	February	0	0	0
1981	Winter	4	84	21.0
	March	9	51	5.7
	April	11	37	3.4
	May	12	19	1.6
	Spring	32	107	3.3
	June	7	26	3.7
	July	8	40	5.0
	August	4	18	4.5
	Summer	19	84	4.4

* No surveys conducted

Table 33. Antelope population characteristics in the Greenleaf-Miller study area.

Year	Month	Total	Number Classified		Fawns:100		Bucks:		Population Structure (Percent)		
			Bucks	Does	Fawns	Does	Adults	100 Does	Bucks	Does	Fawns
1980	June	33	3	24	6	25.0	22.2	12.5	9.1	72.7	18.2
	July	34	3	21	10	47.6	41.7	14.3	8.8	61.8	29.4
	August	23	8	9	6	66.7	35.3	88.9	34.8	39.1	26.1
	Summer	90	14	54	22	32.4	40.7	25.9	15.6	60.0	24.4
1981	June	26	4	14	8	57.1	44.4	28.6	15.4	53.8	30.8
	July	40	4	22	14	63.6	53.8	18.2	10.0	55.0	35.0
	August	18	7	7	4	57.1	28.6	100.0	38.9	38.9	22.2
	Summer	84	15	43	26	60.5	44.8	34.9	17.9	51.2	31.0

Winter and fall observations are found in Figure 52. The antelope were concentrated along Greenleaf Creek in relatively large herds. Seven of the ten groups observed were of nine or more antelope. No antelope were observed in February and the winter was mild with no snow cover to speak of. If the winter had been harsh, it is possible that no antelope would have wintered on the study area.

Vegetation type usage: The importance of the sagebrush/grassland vegetation types to antelope in various sections of southeastern Montana has been documented (Martin 1980a, 1980c). The Greenleaf-Miller area is no exception (Table 34). The sagebrush/grassland type was heavily utilized in each season of the study, reaching 100% in the fall and winter months. The lowest usage level was recorded in spring 1980 at 75%.

The ponderosa pine type received usage during spring and summer. Agricultural sagebrush/grassland subtype was used in the summer of 1981. No creek bottom usage was recorded.

Grassland subtypes supported more antelope than sagebrush subtypes in every season simply because there are more acres of grassland than sagebrush in the study area. That is the main reason the Greenleaf-Miller area is not optimum antelope habitat.

Activity: The activity of antelope at the time of observation is shown in Table 35. The propensity of antelope to run away when threatened is born out in the high percentages observed running during the fall, winter and summer of 1981 seasons (68, 67 and 73 percent respectively). Summer 1980 and spring 1981, with similar activity patterns, were the only seasons in which antelope were observed in all four activity categories. Substantial numbers were observed feeding, 26 and 18 percent respectively. The standing category, 47% in both seasons, had the most antelope and were the only seasons in which antelope were observed laying down. No antelope were laying down or feeding at the moment of observation during the fall and winter surveys.

Use of topography: Antelope were found primarily on the dissected midslopes of the Greenleaf-Miller study area (Table 36), reaching 100% of the observations in the summer of 1980 and the winter months. Only in the spring of 1980 when only 8 antelope were observed did any other topographic category receive more usage. The alluvium/terrace category supported 75% of the antelope observed in spring 1980 and 20% in spring 1981. This usage coincided with green-up of agricultural fields. No antelope were ever observed on the steep mesa-butte slopes nor on the brushy flood plains. One group was observed on a plateau top in the fall season.

Use of exposure: Antelope were observed on all eight aspects during both summer seasons and the spring of 1981 (Table 37). Antelope were in small groups and widely scattered during these seasons. During winter and fall they were in large herds and were not observed using all aspects. Northerly slopes received

Figure 52. Fall and winter antelope distribution on the Greenleaf-Miller study area.

Table 34. Seasonal use of vegetation types by antelope in the Greenleaf-Miller study area.

Vegetation subtypes	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Ponderosa pine	-	-	-	-	-	-
Sagebrush	-	-	-	-	-	-
Grassland	25	10	-	-	3	12
Skunkbush	-	-	-	-	9	5
Juniper	-	-	-	-	-	-
Snowberry	-	-	-	-	-	-
Total Ponderosa pine	25	10	-	-	12	17
Sagebrush	-	41	-	-	36	12
Deciduous shrub	-	1	-	33	16	2
Grassland	75	48	100	67	36	64
Total Sagebrush/Grassland	75	90	100	100	88	79
Tree	-	-	-	-	-	-
Shrub	-	-	-	-	-	-
Total Creek bottom	-	-	-	-	-	-
Ponderosa pine	-	-	-	-	-	-
Sagebrush/Grassland	-	-	-	-	-	5
Creek bottom	-	-	-	-	-	-
Total Agricultural	-	-	-	-	-	5
Total Observed	8	91	82	84	107	84

Table 35. Seasonal activity of antelope in the Greenleaf-Miller study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing	-	47	32	33	47	19
Running	-	9	68	67	28	73
Laying	-	18	-	-	7	-
Feeding	-	26	-	-	18	8
Total observed	-	91	82	84	107	84

Table 36. Seasonal use of topography by antelope in the Greenleaf-Miller study area.

Topography	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-Butte top	-	-	13	-	-	-
Mesa-Butte steep slopes	-	-	-	-	-	-
Dissected mid-slopes	25	100	87	100	80	95
Alluvium/Terrace	75	-	-	-	20	5
Flood plain	-	-	-	-	-	-
Total observed	8	91	82	84	107	84

their greatest usage during the spring and summer of 1981 with 58 and 46 percent of the antelope observations respectively. Outside of spring 1980, antelope most heavily used southern exposures during fall and winter, 65 and 67 percent respectively. No antelope were observed on eastern slopes during the fall and winter months. Western slopes supported 50% of the antelope observations during the winter months. Spring 1981 followed with 40%. Only during fall 1980, 13%, and summer 1981, 5%, were any antelope observed utilizing flat lands.

Use of slope: No antelope were observed using steep slopes (Table 38). During the fall season, more antelope were observed on medium slopes than on combined gentle slopes and flat lands, 65% and 35% respectively. Gentle slopes supported more antelope during the spring seasons, 100 and 61 percent for 1980 and 1981 respectively. During the other three seasons, antelope were evenly distributed between medium and gentle slopes.

Sharp-tailed Grouse

Twenty-one active sharp-tailed grouse dancing grounds were located during the study (Figure 53). They are distributed fairly evenly except in the southwest portion of the study area, which is primarily ponderosa pine uplands.

While the total number of males observed remained constant (Table 39), the number attending active dancing grounds decreased from 17.8 in 1980 to 10.8 in 1981. This amounts to at least a 39% decline in the pre-nesting sharptail population. A similar decline for 441 sharptail dancing grounds occurred in Fish, Wildlife and Parks Region 7. Male attendance dropped from 16 per active ground in 1980 to 10 in 1981 and a 50% drop in the sharptail population was indicated (Knapp et al. 1981).

One ground located in 1980 received no usage in 1981 (Table 39). Sharp-tailed grouse have been documented to abandon grounds in other southeastern Montana studies (Martin 1980a; 1980c).

No broods were observed on the study area. Knapp et al. (1981) reported average brood size, in 1980 to be 1.7 in FWP Region 7. Drought conditions, which caused a lack of adequate cover, resulted in either poor nesting success or lower brood survival.

Merriam's Turkey

One sighting of turkeys was made about 100 yards to the west of the study area in the Rye Grass Creek drainage (Figure 53). Turkeys may utilize the wooded, southwest portion of the Greenleaf-Miller study area.

Ring-necked Pheasant

Ring-necked pheasants were observed along creek bottoms throughout the Greenleaf-Miller study area. Rosebud Creek supported

LEGEND

County road ..... ———

Stream ..... ~~~~~

Cheyenne reservation ..... - - - - -

Study area ..... + + + + +

Sharp-tailed grouse
dancing grounds ..... •

Game bird observations:

Sharptail grouse   spring   summer   fall   winter

Turkey   •   Δ   ⊕   ⊠

Gray partridge   ○   Δ   ⊙   □

Figure 53. Sharptail grouse dancing ground locations and bird observations.

Table 37. Seasonal use of exposure by antelope in the Greenleaf-Miller study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
North	-	12	-	33	23	14
South	-	13	65	17	3	11
East	25	5	-	-	18	23
West	-	2	-	-	6	6
Northeast	-	21	-	-	7	30
Northwest	-	4	22	-	28	2
Southeast	75	12	-	-	9	4
Southwest	-	30	-	50	6	6
Flat	-	-	13	-	-	5
Total observed	8	91	82	84	107	84

Table 38. Seasonal use of slope by antelope in the Greenleaf-Miller study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	-	-	13	-	-	5
Gentle	100	59	22	50	61	48
Medium	-	41	65	50	39	48
Steep	-	-	-	-	-	-
Total Observed	8	91	82	84	107	84

Table 39. Sharp-tailed grouse dancing grounds in the Greenleaf-Miller study area and number of males attending.

Ground Number	Location			Number of Males Attending	
	T	R	S $\frac{1}{4}$	1980	1981
1	1S	42E	6 SE	8	7
2	1N	42E	31 SE	15	14
3	1S	42E	16 SW	20	0
4	1S	42E	14 NW	36	18
5	1S	42E	11 SW	11	9
6	1S	42E	1 SW	7	11
7	1S	42E	24 SW	21	13
8	1S	43E	6 NE	12	8
9	1S	43E	10 NE	16	13
10	1S	43E	9 SE	26	13
11	1S	43E	21 SE	26	17
12	1S	43E	36 NE	15	5
13	2S	43E	2 SW	-	11
14	1S	43E	29 NW	-	15
15	1S	42E	10 NE	-	11
16	1N	43E	29 SE	-	3
17	1S	43E	5 NE	-	7
18	1N	43E	33 NE	-	16
19	1N	42E	35 NE	-	6
20	1S	43E	22 SE	-	10
21	1N	43E	32 SW	-	8
Total				213	215
Average per Active Ground				17.8	10.8

the greatest densities of pheasants. Along a 10 mile route through the northwest portion of the study area, an average of 30.4 crows per two minute stops were recorded in the spring of 1980. This index showed a substantial reduction to 17.0 calls per stop in 1981. This was in contrast to the slight increase in pheasant density reported for lower Rosebud Creek, 17.8 calls per stop in 1980 to 18.6 in 1981 (Knapp et al. 1981).

A five mile segment of Greenleaf Creek saw a rise in pheasant density from 2.8 calls per stop in 1980 to 6.2 calls per stop in 1981. Greenleaf Creek does not have the cover and diversity of vegetation types found along Rosebud Creek, thus it is poorer pheasant habitat.

Gray Partridge

A single group of gray partridge was observed south of Rosebud Creek in the northwest portion of the study area (Figure 53). The lack of large expanses of grain fields limits gray partridge numbers on the study area.

Waterfowl

Seven species of waterfowl game birds were observed on the Greenleaf-Miller study area (Table 40). It is possible that some of them may at times breed within the study area boundaries. There are no large reservoirs on the area, only small stock ponds and creek bottoms. Drought conditions severely limited the amount of suitable nesting cover and brood rearing habitat during this study. One brood of four juvenile mallards was observed on a spring-fed pond during the summer of 1981.

Songbirds

Eighty-six bird species, including game birds and raptors, were observed on the Greenleaf-Miller study area. The Cooper's hawk, golden eagle, bald eagle, prairie falcon, peregrine falcon, upland sand piper, clay-colored sparrow and Brewer's sparrow were listed by Flath (1981) as species of special interest or concern. The golden eagle, bald eagle, prairie falcon and peregrine falcon are also listed as migratory birds of high federal interest (U.S.D.I. 1979). These species, except the bald eagle and peregrine falcon, known or suspected to breed in the study area.

A total of 1117 breeding bird observations (Table 41) were made along approximately 20 miles of trail (Figure 54) during the spring breeding bird roadside surveys. Only six species had a composition percentage greater than 3.0. They were, from the most to least common, western meadowlark, cliff swallow, lark bunting, lark sparrow, mourning dove and yellow warbler. The western meadowlark, with a 94% frequency of occurrence among the stops, was by far the most common. Large flocks of cliff swallows and lark buntings resulted in their appearance at the top of the composition ratings. Ten additional species had composition percentages greater than 2.0. They included the red-winged blackbird, house wren, eastern kingbird, vesper sparrow, rufous-sided towhee, pinyon jay, ring-necked pheasant, American robin, chipping sparrow and Brewer's sparrow. All of these, except the pinyon jay, had frequency percentages greater than 11%. The only other species with a frequency percentage greater than 10 were the western wood peewee and brown-headed cowbird.

Raptors

Ten species of hawks and one species of owls were observed on the Greenleaf-Miller study area (Table 40). Spring observations, which coincide with the breeding season, are shown in Figure 55. All other raptor observations are shown in Figure 56.

Two Cooper's hawks were observed. Both were single birds in flight. One observation was in May 1980 along Rosebud Creek and the other was in April 1981 along Lay Creek. While no nests were found, both of these birds were possibly part of a nesting pair. No other accipiters were seen on the study area.

Four buteo species were observed; red-tailed hawk, rough-legged hawk, golden eagle and bald eagle. The red-tailed hawk was by

Figure 54. Greenleaf-Miller songbird road side survey route and small mammal trapline locations.

Table 40. Bird species observed on the Greenleaf-Miller Study area.

Species		Breeding Status*	Species		Breeding Status*
1	Pied-billed	t	44	Bank swallow	b
2	Canada goose	B	45	Rough-winged swallow	b
3	Great blue heron	B	46	Barn swallow	B
4	Mallard	B	47	Cliff swallow	B
5	Green-winged teal	t	48	Black-billed magpie	B
6	Blue-winged teal	t	49	Common crow	b
7	American wigeon	t	50	Pinyon jay	b
8	Northern shoveler	b	51	Black-capped chickadee	B
9	Buffle head	t	52	White-breasted nuthatch	b
10	Turkey vulture	B	53	Red-breasted nuthatch	B
11	Sharp-shinned hawk	t	54	House wren	B
12	Cooper's hawk	B	55	Rock wren	B
13	Red-tailed hawk	B	56	Brown thrasher	b
14	Rough-legged hawk	t	57	American robin	B
15	Golden eagle	B	58	Mountain bluebird	B
16	Bald eagle	b	59	Bohemian waxwing	t
17	Marsh hawk	b	60	Loggerhead shrike	B
18	Prairie falcon	B	61	Solitary vireo	B
19	Peregrine falcon	t	62	Red-eyed vireo	b
20	American kestrel	B	63	Yellow warbler	B
21	Sharp-tailed grouse	B	64	Common yellowthroat	b
22	Ring-necked pheasant	B	65	Yellow-breasted chat	b
23	Gray partridge	B	66	Western meadowlark	B
24	Turkey	B	67	Yellow-headed blackbird	b
25	Killdeer	B	68	Red-winged blackbird	B
26	Upland sandpiper	B	69	Northern oriole	B
27	Mourning dove	B	70	Brewer's blackbird	B
28	Great-horned owl	B	71	Common grackle	B
29	Black-billed cuckoo	b	72	Brown-headed cowbird	B
30	Common nighthawk	B	73	Black-headed grosbeak	b
31	White-throated swift	b	74	Evening grosbeak	t
32	Common flicker	B	75	American goldfinch	b
33	Red-headed woodpecker	B	76	Red crossbill	b
34	Yellow-bellied sapsucker	b	77	Rufous-sided towhee	b
35	Eastern kingbird	b	78	Lark bunting	B
36	Western kingbird	B	79	Grasshopper sparrow	B
37	Cassin's kingbird	B	80	Vesper sparrow	B
38	Say's phoebe	B	81	Lark sparrow	B
39	Least flycatcher	b	82	Dark-eyed junco	B
40	Western wood pewee	b	83	Chipping sparrow	B
41	Horned lark	b	84	Clay-colored sparrow	b
42	Violet-green swallow	B	85	Brewer's sparrow	B
43	Tree swallow	B	86	Song sparrow	b

* Breeding status from Montana Bird Distribution (Skaar 1980) for latilong 43:

B - hard evidence of breeding

b - circumstantial evidence of breeding

t - occurs, but no evidence of breeding

Table 41. Bird species composition and frequency of occurrence from Greenleaf-Miller breeding bird surveys.

Species	Total Observations			Percent:	
	1980	1981	Total	Composition	Frequency
Western meadowlark	140	79	219	19.6	94
Cliff swallow	170	20	190	17.0	4
Lark bunting	100	-	100	9.0	1
Lark sparrow	39	17	56	5.0	34
Mourning dove	16	27	43	3.8	30
Yellow warbler	27	14	41	3.7	24
Red-winged blackbird	14	18	32	2.9	12
House wren	21	9	30	2.7	22
Eastern kingbird	17	11	28	2.5	23
Vesper sparrow	16	12	28	2.5	20
Rufous-sided towhee	18	8	26	2.3	21
Pinyon jay	5	21	26	2.3	7
Ring-necked pheasant	20	5	25	2.2	14
American robin	17	7	24	2.1	18
Chipping sparrow	13	11	24	2.1	17
Brewer's sparrow	10	14	24	2.1	15
Brewer's blackbird	13	8	21	1.9	14
Western wood peewee	18	2	20	1.8	17
Cassin's kingbird	7	7	14	1.3	7
Rock wren	10	3	13	1.2	8
Brown-headed cowbird	12	-	12	1.1	11
Red crossbill	2	10	12	1.1	3
Northern oriole	7	4	11	1.0	8
Common flicker	5	5	10	.9	10
Western kingbird	9	-	9	.8	6
Killdeer	6	3	9	.8	6
Sharp-tailed grouse	8	1	9	.8	4
Mountain bluebird	6	1	7	.6	6
American goldfinch	2	4	6	.5	6
Least flycatcher	4	1	5	.4	4
Red-headed woodpecker	4	-	4	.4	4
Say's phoebe	3	1	4	.4	4
American kestrel	2	2	4	.4	4
Barn swallow	4	-	4	.4	2
Rough-winged swallow	3	1	4	.4	2
Yellowthroat	2	-	2	.2	2
Violet-green swallow	2	-	2	.2	2
Yellow-breasted chat	2	-	2	.2	2
Brown thrasher	2	-	2	.2	2
Black-headed grossbeak	1	1	2	.2	2
Tree swallow	-	2	2	.2	2
Upland sandpiper	1	-	1	.1	1
Black-capped chickadee	1	-	1	.1	1
Common crow	1	-	1	.1	1

Table 41 continued.

Species	1980	1981	Total	Composition	Frequency
White-throated swift	1	-	1	.1	1
Cooper's hawk	1	-	1	.1	1
Yellow-bellied sapsucker	1	-	1	.1	1
Grasshopper sparrow	-	1	1	.1	1
Clay-colored sparrow	-	1	1	.1	1
Song sparrow	-	1	1	.1	1
Solitary vireo	-	1	1	.1	1
Red-tailed hawk	-	1	1	.1	1
Total Observed	783	334	1117		

far the most common of these. Three active nests were located on the study area (Figure 55). Two of these nests were on sandstone cliffs and the other was in a pine tree (Table 42). A pair of red-tails was observed along Miller Creek in the south-central portion of the study area. A nest was suspected to be in the area but was not located.

One golden eagle nest was located in the study area (Table 42). One juvenile eagle was fledged from the nest in 1980. The nest was not used in 1981. Several eagles were observed on hunting perches or flying over the study area (Figure 55).

The bald eagle and rough-legged hawks observed were thought to be migrating through the area.

Eleven large stick nests were located during a helicopter nest search in 1981 (Table 42). These nests were inactive at the time but may be used by red-tailed hawks, golden eagles or great-horned owls.

Marsh hawks were observed along Greenleaf, Lay and Miller Creeks during the spring (Figure 55) and other times of the year (Figure 56). While no nests were located, these birds undoubtedly nested in the area.

The most common raptor species in the Greenleaf-Miller study area was the American kestrel. They were seen in all portions of the study area and were so numerous that individual sightings were not recorded.

Three prairie falcon aeries were located in the study area (Table 42). Only one of these was active and no fledglings were observed near it.

LEGEND

County road .....

Stream .....

Cheyenne reservation .....

Study area .....

Spring raptor observations:

Marsh hawk..... H	Rough-legged hawk... L
Cooper's hawk..... C	Prairie falcon..... P
Golden eagle..... E	Peregrine falcon..... D
Bald eagle..... B	Great-horned owl.... N
Red-tailed hawk... R	

Raptor nests:

active.....●

inactive.....○

Figure 55. Greenleaf-Miller study area spring (resident) raptor observations.

Figure 56. Greenleaf-Miller study area summer, fall and winter (migrant) raptor observations.

Table 42. Raptor nest sites on the Greenleaf-Miller study area.

No.	Species	Substrate	1980	Activity	1981
1	Golden eagle	Sandstone cliff	Fledged one	/ Inactive	
2	Prairie falcon	Sandstone cliff	Inactive		
3	Prairie falcon	Sandstone cliff	Inactive		
4	Prairie falcon	Sandstone cliff	Inactive/Active-no fledglings seen		
5	Great horned owl	Ponderosa pine tree	? /Active - three fledged		
6	Red-tailed hawk	Ponderosa pine tree	? /Active - no fledglings seen		
7	Red-tailed hawk	Sandstone cliff	Active - no fledglings observed/ Active - two eggs observed but no fledglings		
8	Red-tailed hawk	Sandstone cliff	Two fledgled/one fledged		
9	Stick nest*	Sandstone cliff	Inactive		
10	Stick nest	Sandstone cliff	Inactive		
11	Stick nest	Cottonwood tree	Inactive		
12	Stick nest	Cottonwood tree	Inactive		
13	Stick nest	Ponderosa pine tree	Inactive		
14	Stick nest	Sandstone cliff	Inactive		
15	Stick nest	Sandstone cliff	Inactive		
16	Stick nest	Sandstone cliff	Inactive		
17	Stick nest	Sandstone cliff	Inactive		
18	Stick nest	Ponderosa pine tree	Inactive		
19	Stick nest	Ponderosa pine tree	Inactive		

* Inactive stick nests may have been used by golden eagles, red-tailed hawks or great horned owls.

There are an abundance of likely looking nest cavities scattered among the sandstone buttes and cliffs in the study area. It would seem that more active prairie falcon pairs should have been located. Some other factor, perhaps lack of prey base, is limiting the prairie falcon population in this vicinity.

A peregrine falcon was observed flying over ponderosa pine cover in the southwest portion of the study area. Since it was seen only one time it was assumed to be a migratory bird.

One great-horned owl nest with three fledglings was located during the helicopter survey (Table 42). It was in a ponderosa pine tree in the southeastern portion of the study area. Several great-horned owls were observed along the southern border of the study area but no other nests were found.

Nongame Mammals

Twenty-one mammal species were observed on the Greenleaf-Miller study area (Table 43). The black-tailed prairie dog was the only nongame species of special interest or concern (Flath 1981). Four prairie dog towns were located on the study area (Figure 57). The three smaller towns had no sign of black-footed ferrets or burrowing owls. The large town on the upper portion of Greenleaf Creek near the southern boundary of the study area was not visited because the landowner would not grant access.

The results of summer and fall small mammal trapping are presented in Table 44. Trapline locations are shown in Figure 54. Only five rodent species were captured. The deer mouse was the most common, occurring in all three vegetation types in both seasons. The house mouse had the highest density of any species as 11 and 9 were captured in the riparian summer and fall trap lines respectively. One masked shrew and one prairie vole were also captured in the riparian summer trapline. Two bushy-tailed wood rats (*Neotoma cinerea*) were captured in the ponderosa pine summer trap line.

No trap line had a success ratio greater than 2.0 captures per 100 trap nights. This very low density of rodents may explain the scarcity of raptor species in the Greenleaf-Miller study area.

Amphibians and Reptiles

Two amphibian and four reptiles species were observed on the Greenleaf-Miller study area (Table 45). None of them were listed by Flath (1981) as being species of special interest or concern.

LEGEND

County road	—
Stream	~~~~~
Cheyenne reservation	.....
Study area	- - - - -
Prairie dog town	○

Figure 57. Greenleaf-Miller study area prairie dog town locations.

Table 43. Mammals observed on the Greenleaf-Miller study area.

	Common Name	Scientific Name
1	Masked shrew	<i>Sorex cinereus</i>
2	Raccoon	<i>Procyon lotor</i>
3	Badger	<i>Taxidea taxus</i>
4	Striped skunk	<i>Mephitis mephitis</i>
5	Coyote	<i>Canis latrans</i>
6	Red fox	<i>Vulpes vulpes</i>
7	Black-tailed prairie dog	<i>Cynomys ludovicianus</i>
8	Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
9	Red squirrel	<i>Tamiasciurus hudsonicus</i>
10	Beaver	<i>Castor canadensis</i>
11	Deer mouse	<i>Peromyscus maniculatus</i>
12	Bushy-tailed woodrat	<i>Neotoma cinerea</i>
13	Prairie vole	<i>Microtus ochrogaster</i>
14	Muskrat	<i>Ondatra zibethicus</i>
15	House mouse	<i>Mus musculus</i>
16	Porcupine	<i>Erethizon dorsatum</i>
17	White-tailed jackrabbit	<i>Lepus townsendi</i>
18	Desert cottontail	<i>Sylvilagus auduboni</i>
19	Mule deer	<i>Odocoileus hemionus</i>
20	White-tailed deer	<i>Odocoileus virginianus</i>
21	Antelope	<i>Antilocapra americana</i>

Table 44. Results of small mammal trapping on the Greenleaf-Miller study area during the summer and fall of 1980.

Vegetation Type Season	Riparian		Ponderosa Pine		Sagebrush- Grassland	
	Summer	Fall	Summer	Fall	Summer	Fall
Total captures	16	15	10	2	2	10
Trap nights	803	836	829	844	816	813
Captures/100 trap nights	1.99	1.79	1.21	0.24	0.24	1.
Number of species caught	4	2	3	1	2	2
Species:						
<i>Peromyscus maniculatus</i>	3	6	6	2	1	7
<i>Mus musculus</i>	11	9	2	-	1	3
<i>Sorex cinereus</i>	1	-	-	-	-	-
<i>Microtus ochrogaster</i>	1	-	-	-	-	-
<i>Neotoma cinerea</i>	-	-	2	-	-	-

Table 45. Amphibians and reptiles observed on the Greenleaf-Miller study area.

Common Name	Scientific Name
1 Sagebrush lizard	<i>Sceloporus graciosus</i>
2 Great plains toad	<i>Bufo cognatus</i>
3 Painted turtle	<i>Chrysemys picta</i>
4 Racer	<i>Coluber constrictor</i>
5 Bull snake	<i>Pituophis catenifer</i>
6 Prairie rattlesnake	<i>Crotalus viridis</i>

Foster Creek

Mule Deer

Population characteristics: During the study period 3,249 mule deer were observed on the Foster Creek study area (Table 46). Mean group size was smallest during summer (2.1 to 2.3) and largest in winter (8.7). Mean number of observations per hour of aerial survey ranged between 21.2 (summer 1980) and 64.9 (winter 1980-81) (Table 47).

Population structure, determined during September and October 1980, indicates a healthy herd with a fawn/doe ratio between 81.3:100 and 116.2:100 (Table 48). Combined observations from September and October 1980 indicate a fawn/doe ratio of 91.4:100, with 41.3% of the population composed of fawns. Production surveys conducted by the Montana Dept. of Fish, Wildlife and Parks prior to hunting season resulted in an average fawn/doe ratio of 82:100 for all 30 hunting districts in southeastern Montana, with 44% of the population comprised of fawns (Swenson 1981).

Distribution: Spring mule deer distribution is illustrated in Figure 58. Most observations were in the area of Foster Creek, in the central portion of the study area, and along Little Pumpkin Creek to the south.

Summer observations were even more noticeably associated with major drainages (Figure 59). Foster Creek, Little Pumpkin Creek and the Mullins Coulee area of Lay Creek appeared to be high use areas. These mesic habitats were particularly important to deer during severe drought conditions of 1980 and 1981.

Fall mule deer distribution (Figure 60) was less concentrated than summer, but remained mostly associated with the Foster Creek drainage.

Winter observations (Figure 61) were dispersed over the study area. The winter of 1980-81 was extremely mild and of short duration, which made delineation of traditional winter concentration areas

Figure 58. Spring mule deer distribution on the Foster Creek study area.

Figure 59. Summer mule deer distribution on the Foster Creek study area.

Figure 60. Fall mule deer distribution on the Foster Creek study area.

Figure 61. Winter mule deer distribution on the Foster Creek study area.

Table 46. Observations by month and mean group size for mule deer on the Foster Creek study area.

Year		Observations	Individuals	Mean Group Size
1980	April	31	250	8.1
	May	39	181	4.6
	Spring	70	431	6.2
	June	33	55	1.7
	July	98	187	1.9
	August	40	113	2.8
	Summer	171	355	2.1
	September	17	76	4.5
	October	40	205	5.1
	November	39	201	5.2
	Fall	96	482	5.0
1981	December	28	224	8.0
	January	29	213	7.3
	February	19	223	11.7
	Winter	76	660	8.7
	March	31	310	10.0
	April	44	329	7.5
	May	71	201	2.8
	Spring	146	840	5.8
	June	64	125	2.0
	July	96	202	2.1
	August	52	154	3.0
	Summer	212	481	2.3

impossible. Although deer were observed in larger herds, they were able to range widely during the entire season.

Cover type usage: Seasonal use of cover types is presented in Table 49. Use of ponderosa pine habitats was undoubtedly underestimated for all seasons due to the difficulty of observing deer in coniferous cover. In spite of this observational bias, a large proportion of observations occurred in this cover category all seasons. Ponderosa pine habitats appeared to be most heavily used during winter and spring.

Use of sagebrush and grassland habitats was fairly constant except during the spring seasons of 1980 and 1981. Deer made more use of creek bottom habitats during the first spring and appeared to shift from creek bottom habitats to sagebrush/grassland habitats the second spring. Succulent forage was even more scarce early the second spring than the first, causing livestock

Table 47 . Mule deer, antelope and coyote aerial observations per hour on the Foster Creek study area.

Year	Month	Total Hours	Total Aerial Observations					Observations/Hour					Coyotes/100:	
			Mule	Deer	Antelope	Coyote	Mule	Deer	Antelope	Coyote	Mule	Deer	Antelope	
1980	April	6		245	*	3	40.8		-	2		1.2	-	
	May	2		154	84	1	77		42	.5		0.6	1.2	
	Spring	8		399	84	4	49.9			.5		1.		
	June	4	31		110	1	7.8		27.5	.2		3.2	.9	
	July	4.25	103		121	1	24.2		28.5	.2		1	.8	
1981	August	2.25	89		115	1	39.6		51.1	.4		1.1	.9	
	Summer	10.5	223		346	3	21.2		33.9	.3		1.3	.9	
	September					No Flight								
	October	3.75	194		177	4	51.7		47.2	1.1		2.1	2.2	
	November	4	171		180	6	42.8		45	1.5		3.5	3.3	
1981	Fall	7.75	365		357	10	47.1		46.1	1.3		2.7	2.8	
	December	3.5	197		161	4	56.3		46	1.1		2.	2.5	
	January	3.5	213		122	4	60.8		34.8	1.1		1.9	3.3	
	February	2.75	223		87	6	81.1		31.6	2.2		2.7	6.9	
	Winter	9.75	633		370	14	64.9		37.9	1.4		2.2	3.8	
1981	March	4	306		143	5	76.5		35.8	1.25		1.6	3.5	
	April	4.5	285		119	2	63.3		26.4	.4		.7	1.7	
	May	4	118		119	1	29.5		29.8	.2		.8	.8	
	Spring	12.5	709		381	8	56.7		30.5	.6		1.1	2.1	
	June	3.5	106		115	4	30.3		32.9	1.1		3.8	3.5	
1981	July	4.25	138		185	3	32.5		43.5	.7		2.2	1.6	
	August	5	151		173	7	30.2		34.6	1.4		4.6	4	
	Summer	12.75	395		473	14	31		37.1	1.1		3.5	3	

* Observations were not recorded.

Table 48. Mule deer population characteristics on the Foster Creek study area, 1980.

Month	Number Classified				Fawns:100		Bucks:100		Population Structure (%)	
	Total	Bucks	Does	Fawns	Does	Adults	Does	Bucks	Does	Fawns
September	90	10	37	43	116.2	91.5	27	11.1	41.1	47.8
October	193	28	91	74	81.3	62.2	30.8	14.5	47.2	38.3

Table 49 . Seasonal use of cover types by mule deer on the Foster Creek study area.

Cover Types	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Creeping juniper	19	12	12	35	12	7
Sagebrush	10	4	7	24	10	7
Grassland		1		1		2
Skunkbush				1	5	3
Total Ponderosa pine	29	17	19	60	28	19
Sagebrush	13	18	21	29	38	14
Deciduous shrub		1			6	4
Grassland		3	3		10	9
Total Sagebrush/Grassland	13	22	24	29	54	28
Mesic grass			tr*	1	tr	9
Deciduous tree	11	20	16		5	10
Shrub	28	29	34	9	6	28
Total Creekbottom	39	49	51	10	12	46
Upland	10	9	5	1	5	3
Creekbottom	9	3	1		1	4
Total Agricultural	19	12	6	1	6	7
Total Observed	431	355	482	660	840	481

| tr = trace; a percentage less than 0.5. | |

to concentrate on mesic areas. Competition with livestock may have been a significant factor in the observed change in habitat use between years. Use of creek bottom types increased again in summer 1981 when livestock were more dispersed. In addition to providing succulent forage and water, favorable thermal conditions in mesic creek bottom habitats provide relief from high temperatures for deer.

Activity: Mule deer activity at time of observation is presented in Table 50. The largest proportion of deer were standing or feeding when first seen during all seasons except winter, when a large proportion of animals were bedded. Feeding activity at time of observation was most prevalent in spring and least common in winter.

Use of topography: Deer used the rugged mesa-butte features most during fall and winter (Table 51). Dissected mid-slopes were most heavily used in early spring when new plant growth appeared. Use of alluvium/terrace and flood plain categories was highest during summer and fall, as deer use of creek bottom habitats increased.

Use of exposure: The percentage of mule deer observations on flat terrain was highest during summer and fall seasons, coincident with high use of mesic lowland habitats (Table 52). Deer were observed on every aspect during all seasons. Heavy use of the northeast exposure occurred during the warm and dry spring of 1981.

Use of slope: Use of flat and gentle terrain categories was greatest during summer and fall seasons (Table 53). Use of steeper terrain features was highest in winter, when mule deer utilized ponderosa pine habitats on ridges and hillsides.

White-tailed Deer

Seventy-nine individual white-tailed deer were observed on the study area during the study period (Figure 62). Most observations were associated with deciduous habitats and hayfields along Little Pumpkin Creek, in the southern portion of the study area.

Pronghorn Antelope

Population characteristics: During the study period 4,046 antelope were observed on the Foster Creek study area (Table 54). Mean group size was smallest during spring and summer, peaking at 26.3 in winter. Mean number of observations per hour of aerial survey was highest during fall surveys (46.1) (Table 47).

Summer population structure is presented in Table 55. Fawn/doe ratios between 48.7:100 and 50.7:100 indicate rather poor reproductive success both years for this herd. Population trend surveys covering all of hunting district 741 between 1972 and 1977 indicated fawn/doe ratios between 55:100 and 85:100 for this area (Wentland 1981). The population is on its way to recovery following a decline during the severe winters of 1977-78 and 1978-79 (Wentland 1981).

Figure 62. White-tail deer observations on the Foster Creek study area.

Table 50. Seasonal activity of mule deer on the Foster Creek study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing	50	51	39	43	38	41
Running	tr*	8	11	tr	7	14
Bedded	9	5	19	41	9	8
Feeding	41	32	28	12	42	30
Walking	tr	3	3	4	4	7
Total observed	431	355	482	660	840	481

* tr = trace; a percentage less than 0.5.

Table 51. Seasonal use of topography by mule deer on the Foster Creek study area.

Topography type	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-butte top	2	1	8	11		2
Mesa-butte steep slopes	2	tr*	8	6	4	
Dissected mid-slopes	55	29	15	55	42	28
Alluvium/terrace	12	14	23	18	39	19
Flood plain	29	55	46	9	15	51
Total observed	431	355	482	660	840	481

* tr = trace; a percentage less than 0.5.

Table 52. Seasonal use of exposure by mule deer on the Foster Creek study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
North	10	5	5	7	15	11
South	18	6	6	16	8	2
East	11	5	4	3	2	5
West	3	1	3	3	6	2
Northeast	7	7	6	14	25	5
Northwest	7	2	4	9	3	6
Southeast	3	2	10	14	9	6
Southwest	7	3	2	8	8	4
Flat	35	68	59	26	23	59
Total observed	431	355	482	660	840	481

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Table 53. Seasonal use of slope by mule deer on the Foster Creek study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	34	68	59	26	23	59
Gentle	34	12	19	18	34	21
Medium	27	19	10	36	23	12
Steep	5	1	13	20	19	8
Total Observed	431	355	482	660	840	481

Table 54 . Observations by month and mean group size for antelope on the Foster Creek study area.

Year	Month	Number of Observations	Total Individual	Mean Group Size
1980	April	10	22	2.2
	May	58	198	3.4
	Spring	68	220	3.2
	June	103	331	3.2
	July	95	410	4.3
	August	34	221	6.5
	Summer	232	962	4.1
	September	31	132	4.2
	October	32	250	7.8
	November	25	429	17.2
	Fall	88	811	9.2
1981	December	9	217	24.1
	January	4	122	30.5
	February	5	135	27
	Winter	18	474	26.3
	March	46	287	6.2
	April	68	422	6.2
	May	99	202	2.0
	Spring	213	911	4.3
	June	65	176	2.7
	July	72	293	4.1
	August	39	199	5.1
	Summer	176	668	3.8

Distribution: Spring antelope distribution is illustrated in Figure 63. Observations were concentrated in the northeast corner of the study area (Lay Creek and South Fork Foster Creek) and along Lone Tree Creek and Little Pumpkin Creek in the east and southeast portions.

Summer antelope distribution was less concentrated than spring (Figure 64). Most observations occurred in the northwest and southeast portions of the study area, extending into the Foster Creek area. Clumped observations along Little Pumpkin Creek were partially due to frequent travel along that route.

Similar to spring distribution, fall antelope observations were concentrated in the northwest and southeast portions of the study area (Figure 65). Winter observations (Figure 66) followed the same pattern but were fewer and less concentrated. The winter of 1980-81 was extremely mild and of short duration, making delineation

Figure 63. Spring antelope distribution on the Foster Creek study area.

Figure 64. Summer antelope distribution on the Foster Creek study area.

Figure 65. Fall antelope distribution on the Foster Creek study area.

Figure 66. Winter antelope distribution on the Foster Creek study area.

of traditional winter concentration areas impossible. Antelope were able to range widely during the entire season.

Cover type usage: The preponderance of antelope observations in sagebrush and grassland habitats illustrates the dependence of this species upon these habitats (Table 56). Use of the sagebrush sub-category peaked during winter. Mesic creek bottom habitats received significant use during spring, summer and fall of 1980. But as in the case of mule deer, use of this habitat category was much less the following year. Agricultural types received significant use during the winter season.

Activity: Antelope activity at time of observation is presented in Table 57. The largest proportion of animals were standing alert or running when first observed. Feeding activity was most prevalent during spring.

Use of topography: Use of dissected mid-slopes remained high and relatively constant during spring, summer and fall seasons (Table 58). A shift to alluvium/terrace areas was evident in winter. Flood plain features were used more during 1980 than 1981

Use of exposure: The greatest proportion of antelope observations were made on flat terrain during all seasons (Table 59). Antelope were observed using all exposures during every season except winter when northeast, northwest and southeast aspects appeared to be favored.

Use of slope: Most antelope sightings occurred in habitats characterized by gentle slopes or flat terrain all seasons (Table 60). This trend was particularly evident in winter.

Birds

One hundred and twenty-seven species of birds were observed on the Foster Creek study area during the study period (Table 61). Resident breeding was documented for 52 species. The goshawk, Cooper's hawk, ferruginous hawk, golden eagle, bald eagle, prairie falcon, peregrine falcon, merlin, long-billed curlew, upland sandpiper, burrowing owl, long-eared owl and field sparrow are all listed by Flath (1981) as species of special concern in Montana. The ferruginous hawk, bald eagle, golden eagle, burrowing owl, peregrine falcon, prairie falcon and long-billed curlew are also listed as migratory birds of high federal interest in the Powder River coal region (U.S.D.I. 1979).

Sharp-tailed grouse: Sharp-tailed grouse were abundant in the Foster Creek vicinity. Twenty-five sharp-tailed grouse arenas were located within the study area (Figure 67). Attendance by displaying males on the 12 arenas located in spring of 1981 averaged 9.4 (Table 62). Attendance averaged 22.1 in 1980 and 11.7 in 1981 on the 13 arenas for which two years of data were obtained. The 50% drop in attendance between years is consistent with poor sharptail production documented throughout southeastern Montana for 1980 (Knapp et al. 1981).

Table 55. Antelope population structure on the Foster Creek study area.

Year	Month	Number Classified			Fawns:100		Bucks:100		Population Structure(%)	
		Total	Bucks	Does	Fawns	Does	Adults	Does	Bucks	Does
1980	June	308	100	167	41	24.6	15.4	59.9	32.5	54.2
	July	395	103	198	94	47.5	31.2	52.0	26.1	50.1
	August	214	46	113	55	48.7	34.6	40.7	21.5	52.8
1981	June	172	55	88	29	33.0	20.3	62.5	32.0	51.2
	July	282	71	140	71	50.7	33.6	50.7	25.2	49.6

Table 56. Seasonal use of cover types by antelope on the Foster Creek study area.

Cover Types	Spring 1980		Summer 1980		Fall 1980		Winter 80-81		Spring 1981		Summer 1981	
	%		%		%		%		%		%	
Creeping juniper												
Sagebrush	1		tr	*					tr			
Grassland									tr			
Skunkbush	1		tr		0		0		1			
Total Ponderosa pine												
Sagebrush	45		52		63		71		60		63	
Deciduous shrub	1		tr		1				1		2	
Grassland	33		30		14		8		29		26	
Total Sagebrush/Grassland	79		82		78		79		90		90	
Mesic grass	5		10		5		4		2		7	
Deciduous tree												
Shrub	12		2		15				tr		tr	
Total Creekbottom	17		12		20		4		2		7	
Upland												
Creekbottom	2		6		2		17		6		2	
Total Agricultural	2		tr		2		17		tr		tr	
Total observed	220		962		811		474		911		668	

* tr = trace; a percentage less than 0.5.

Table 57. Seasonal activity of antelope on the Foster Creek study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing	16	26	31		15	12
Running	1	32	46	78	34	59
Bedded	8	11	6		15	11
Feeding	74	29	14	22	35	17
Walking	1	1	2		1	1
Total observed	220	962	811	474	911	668

Table 58. Seasonal use of topography by antelope on the Foster Creek study area.

Topography Type	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-butte top			4	11	tr *	tr
Dissected mid-slopes	57	54	38	15	45	54
Alluvium/terrace	24	28	34	67	51	38
Current flood plains	19	17	23	7	3	8
Total observed	220	962	811	474	911	668

* tr = trace; a percentage less than 0.5.

Table 59 . Seasonal use of exposure by antelope on the Foster Creek study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
North	7	9	2		8	10
South	7	10	8		9	9
East	10	4	9		11	20
West	12	6	5		3	2
Northeast	19	10	7	8	17	9
Northwest	2	8	13	21	10	8
Southeast	9	6	4	15	2	13
Southwest	3	9	3		9	4
Flat	31	38	48	56	30	25
Total observed	220	962	811	474	911	668

Table 60. Seasonal use of slope by antelope on the Foster Creek study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	31	40	48	56	30	25
Gentle	50	44	31	44	48	63
Medium	19	14	21		18	8
Steep		2			4	4
Total Observed	220	962	811	474	911	668

Table 61. Occurrence and breeding status of bird species observed on the Foster Creek study area, 1980-81.

Species Status*			Species Status		
1	Common loon	M	51	Solitary sandpiper	M
2	Eared grebe	B	52	Willet	t
3	Western grebe	M	53	Greater yellowlegs	M
4	Pied-billed grebe	B	54	Lesser yellowlegs	M
5	Great blue heron	t	55	Long-billed dowitcher	M
6	American bittern	b	56	American avocet	t
7	Canada goose	t	57	Wilson's phalarope	b
8	Snow goose	M	58	Northern phalarope	M
9	Mallard	B	59	California gull	t
10	Gadwall	B	60	Ring-billed gull	t
11	Pintail	B	61	Franklin's gull	t
12	Green-winged teal	B	62	Black tern	t
13	Blue-winged teal	B	63	Mourning dove	B
14	American wigeon	B	64	Screech owl	t
15	Northern shoveler	B	65	Great horned owl	B
16	Redhead	b	66	Snowy owl	t
17	Ring-necked duck	t	67	Burrowing owl	B
18	Canvasback	t	68	Long-eared owl	t
19	Lesser scaup	t	69	Short-eared owl	T
20	Bufflehead	t	70	Poor-will	B
21	Ruddy duck	t	71	Common nighthawk	B
22	Common merganser	t	72	Belted kingfisher	b
23	Goshawk	t	73	Common flicker	B
24	Sharp-shinned hawk	t	74	Red-headed woodpecker	b
25	Cooper's hawk	t	75	Hairy woodpecker	b
26	Red-tailed hawk	B	76	Downy woodpecker	b
27	Swainson's hawk	t	77	Eastern kingbird	B
28	Rough-legged hawk	M	78	Western kingbird	B
29	Ferruginous hawk	t	79	Say's phoebe	B
30	Golden eagle	B	80	Least flycatcher	t
31	Bald eagle	t	81	Western wood peewee	b
32	Marsh hawk	b	82	Horned lark	b
33	Prairie falcon	B	83	Violet-green swallow	t
34	Peregrine falcon	M	84	Barn swallow	B
35	Merlin	t	85	Cliff swallow	B
36	American kestrel	B	86	Black-billed magpie	B
37	Sharp-tailed grouse	B	87	Common raven	t
38	Sage grouse	B	88	Common crow	b
39	Ring-necked pheasant	B	89	Piñon jay	b
40	Gray partridge	B	90	Clark's nutcracker	t
41	Turkey	B	91	Black-capped chickadee	b
42	Virginia rail	t	92	Red-breasted nuthatch	b
43	Sora	t	93	House wren	B
44	American coot	b	94	Rock wren	b
45	Killdeer	B	95	Gray catbird	b
46	Black-bellied plover	M	96	Brown thrasher	B
47	Common snipe	t	97	American robin	B
48	Long-billed curlew	B	98	Mountain bluebird	B
49	Upland sandpiper	B	99	Townsend's solitaire	t
50	Spotted sandpiper	t	100	Loggerhead shrike	B

Table 61 . Continued.

	Species	Status
101	Starling	B
102	Yellow warbler	B
103	Yellow-rumped warbler	t
104	Common yellowthroat	t
105	House sparrow	B
106	Western meadowlark	B
107	Yellow-headed blackbird	B
108	Red-winged blackbird	B
109	Northern oriole	B
110	Brewer's blackbird	B
111	Common grackle	B
112	Brown-headed cowbird	b
113	Black-headed grosbeak	b
114	Lazuli bunting	t
115	American goldfinch	b
116	Red crossbill	B
117	Rufous-sided towhee	B
118	Lark bunting	B
119	Savannah sparrow	t
120	Grasshopper sparrow	b
121	Vesper sparrow	b
122	Lark sparrow	B
123	Chipping sparrow	B
124	Brewer's sparrow	t
125	Field sparrow	t
126	Song sparrow	b
127	Snow bunting	W

* Status:

- B - hard evidence of breeding
- b - circumstantial evidence of breeding
- t - occurs, but no evidence of breeding
- w - overwintering observation
- m - migratory observation

Figure 67. Sharp-tailed and sage grouse arenas on the Foster Creek study area.

Poor nesting success and/or brood survival in 1980 was a result of prevailing drought conditions.

Sage grouse: Two sage grouse arenas were located in the northeast portion of the study area (Figure 67). Attendance by displaying males was 12 and 7, respectively (Table 63). Average number of male sage grouse per arena declined in 1981, from a high in 1980, throughout eastern Montana (Knapp et al. 1981). One hundred and fifty-one individual sage grouse were sighted on the study area during the study period. Most observations were in the northeast portion and along the north and south boundaries. Additional sage grouse arenas are undoubtedly located in close proximity to the study area.

Other upland game birds: Seventy-one turkeys were observed in the vicinities of Foster Creek and Cameron Creek during the study period. A group including 4 adults and 11 young birds was sighted on Foster Creek in the summer of 1980. A group of about 30 birds frequented the Cameron Creek vicinity during the winter of 1980-81.

Pheasants are abundant and commonly seen on the study area, especially along Foster Creek and Little Pumpkin Creeks. Pheasant crow routes were not conducted during the study period due to time and weather constraints but frequent observations indicated that they are abundant wherever suitable habitat is present.

Gray partridge occur on the study area but were seen infrequently.

Waterfowl: In spite of severe drought conditions of 1980 and 1981, a large number and variety of waterfowl were observed on the study area (Table 61). Most stock ponds dried up during both summers and others were completely dry both years. Species successfully breeding on the study area include the eared grebe, pied-billed grebe, mallard, gadwall, pintail, green-winged teal, blue-winged teal, American wigeon and northern shoveler.

Three large reservoirs in the southern portion of the study area (Section 9, T1S, R48E) and their associated marsh habitats support a large number and variety of resident waterfowl and shorebirds. They served as a staging area for resident birds late in the summer when many other ponds were dry and they attracted migrant birds also. Flocks of as many as 140 Canada geese used these reservoirs and adjacent fields during migration.

Nongame birds: Species composition of songbirds observed during roadside inventory surveys is presented in Table 64. Location of songbird inventory route stops is illustrated in Figure 68. Observations of American kestrels were also recorded during these surveys. Meadowlarks made up approximately 30% of all birds observed. Meadowlarks, vesper sparrows and lark buntings together made up over 50% of the species composition. These data are probably biased in favor of species having the most conspicuous habits and loudest songs.

Table 62. Locations of sharp-tailed grouse arenas on the Foster Creek study area and male attendance.

Ground Number	UTM	Coordinates	T	R	S	No. Males Attending	
						1980	1981
1	4303	50648	1S	47E	SE $\frac{1}{4}$ NW $\frac{1}{4}$	17	5
2	4288	50678	1S	47E	NE $\frac{1}{4}$ SW $\frac{1}{4}$	25	10
3	4399	50712	1N	48E	NW $\frac{1}{4}$ SW $\frac{1}{4}$	26	20
4	4370	50711	1N	48E	SW $\frac{1}{4}$	23	12
5	4355	50706	1S	47E	NW $\frac{1}{4}$ NE $\frac{1}{4}$	35+	24
6	4400	50732	1N	48E	SW $\frac{1}{4}$ NW $\frac{1}{4}$	22	7
7	4389	50766	1N	48E	NE $\frac{1}{4}$ NW $\frac{1}{4}$	19	10
8	4363	50784	1N	47E	NE $\frac{1}{4}$ NE $\frac{1}{4}$	35	17
9	4287	50740	1N	47E	SW $\frac{1}{4}$ SW $\frac{1}{4}$	4	6
10	4319	50779	1N	47E	NW $\frac{1}{4}$ SW $\frac{1}{4}$	13	8
11	4293	50805	2N	47E	SE $\frac{1}{4}$ SW $\frac{1}{4}$	17	10
12	4213	50759	1N	46E	SE $\frac{1}{4}$ SW $\frac{1}{4}$	20	11
13	4319	50695	1S	47E	NE $\frac{1}{4}$ SW $\frac{1}{4}$	31	12
14	4304	50715	1N	47E	SW $\frac{1}{4}$ NW $\frac{1}{4}$		19
15	4397	50668	1S	48E	NW $\frac{1}{4}$ NW $\frac{1}{4}$		14
16	4415	50691	1S	48E	SW $\frac{1}{4}$ SW $\frac{1}{4}$		11*
17	4281	50763	1N	47E	NW $\frac{1}{4}$ SE $\frac{1}{4}$		7
18	4264	50773	1N	46E	SW $\frac{1}{4}$ SE $\frac{1}{4}$		6
19	4304	50618	1S	47E	SE $\frac{1}{4}$ NW $\frac{1}{4}$		8
20	4349	50723	1N	47E	SE $\frac{1}{4}$ SE $\frac{1}{4}$		9
21	4347	50796	1N	47E	SE $\frac{1}{4}$ NE $\frac{1}{4}$		15
22	4233	50747	1N	46E	NW $\frac{1}{4}$ SE $\frac{1}{4}$		9
23	4367	50766	1N	48E	SW $\frac{1}{4}$ NW $\frac{1}{4}$		5
24	4381	50802	1N	48E	NE $\frac{1}{4}$ NE $\frac{1}{4}$		5
25	4397	50796	1N	48E	SE $\frac{1}{4}$ NE $\frac{1}{4}$		5

* A male sage grouse regularly attended and displayed on this arena.

Table 63. Locations of sage grouse arenas on the Foster Creek study area and number of males attending, 1981.

Ground Number	UTM	Coordinates	T	R	S	No. of Males Attending
1	4408	50734	1N	48E	NW $\frac{1}{4}$ NE $\frac{1}{4}$	12
2	4435	50746	1N	48E	NW $\frac{1}{4}$ SW $\frac{1}{4}$	7

Table 64. Bird species composition from five runs of the song bird inventory route on the Foster Creek study area.

Species	Number Observed		Percent Composition	Percent Frequency
	1980	1981		
Western meadowlark	127	71	29	90
Vesper sparrow	59	23	12	50
Lark bunting	60	15	11	6
Mourning dove	18	25	6	25
Brewer's blackbird	15	13	4	14
Lark sparrow	18	7	4	20
Red crossbills		30	4	3
Chipping sparrow	16	6	3	17
Killdeer	8	12	3	17
Eastern kingbird	7	10	2	9
Yellow warbler	7	7	2	7
Common grackle	8	2	1	5
American robin	7	3	1	8
House wren	7	3	1	9
Horned lark	5	5	1	7
Red-winged blackbird	6	3	1	7
Piñon jay	5	3	1	6
Grasshopper sparrow	2	6	1	6
Common flicker	2	4	1	6
Song sparrow		6	1	5
Say's phoebe	4	1	1	4
American kestrel	1	4	1	4
Brown headed cowbird	4		tr*	3
Rock wren	3	1	tr	4
Upland sandpiper		4	tr	4
Black headed grosbeak	3		tr	2
Brewer's sparrow	3		tr	3
Black capped chickadee	3		tr	2
Least flycatcher	2	1	tr	3
Violet-green swallow	2		tr	1
American goldfinch	2		tr	1
Barn swallow	1	1	tr	2
Western kingbird	1	1	tr	2
Western wood peewee		2	tr	2
Lazuli bunting	1		tr	1
Mountain bluebird	1		tr	1
Starling	1		tr	1
Yellow-rumped warbler	1		tr	1
Yellowthroat	1		tr	1
Brown thrasher		1	tr	1
Northern oriole		1	tr	1

* tr = trace; a percentage less than 0.5.

Figure 68. Foster Creek songbird inventory route and small mammal trapline locations.

Long-billed curlews were commonly observed in an area immediately southeast of the study area (Figure 69). The vicinity of frequent sightings is referred to as "Curlew Flats" by local residents. During the summer of 1980 as many as 12 individuals were seen at one time in the vicinity. A significant decline in observations during 1981 may have been due to effects of the worsening drought.

At one time the long-billed curlew occurred in large numbers over most prairie regions of the United States and southern Canada. Today, curlews are restricted to scattered populations in the West (Allen 1980). Although the curlew is a protected species throughout North America, their numbers continue to decline due to habitat destruction. "Curlew Flats" is a special wildlife feature that should be protected from habitat alteration.

Raptors: Twenty species of raptors were observed on the Foster Creek study area. Secretive species such as saw-whet owls probably occur on the area, but were not observed during the study period. For the purpose of identifying resident breeding birds, raptor distribution was mapped as follows: Birds observed during the months of May, June and July were considered resident breeders (Figure 70). All other raptor observations were recorded on a separate distribution map, including migrant and transient birds (Figure 71).

Accipiters: One sighting of a goshawk was made during the 1980 breeding season. It may have nested undetected on the study area or in the immediate vicinity. Sharp-shinned hawks and Cooper's hawks observed in late summer and fall were considered migrant or transient birds.

Buteos: Red-tailed hawks were ubiquitous on the study area. Fifteen stick nests believed to be red-tailed hawk nests were located in spring of 1981 (Table 65). Four of these were active in 1981. Red-tailed hawks were known to breed on the study area in 1980 but no nests were located that year. Individuals of both Krider's and Harlan's color phases occurred on the area.

Swainson's hawks were observed several times and may have nested within the study area undetected. Large numbers of rough-legged hawks were present in the vicinity during migration periods. Several sightings of a ferruginous hawk were made during the 1980 breeding season. This individual may have nested southeast of the study area.

Golden eagles were commonly observed during all seasons. Three of four known nests on the study area were active during the study period (Table 65). One nest fledged a single young in 1980 and another fledged two young in 1981. A third nest active in 1981 was unsuccessful, possibly due to wind damage sustained in June. It is probable that an additional nest was active in 1981 and escaped detection. This was indicated by August sightings of two fledglings on the study area, which known nests could not account for.

Table 65 . Raptor nest sites on the Foster Creek study area.

Nest No.	Species/Type	Substrate	Status	
			1980	1981
1	Prairie falcon	Cliff	Unknown	Fledged 3 young
2	Golden eagle	Ponderosa pine tree	Unknown	Active, but failed
3	Golden eagle	Ponderosa pine tree	Fledged 1 young	Inactive
4	Golden eagle	Ponderosa pine tree	Unknown	Inactive
5	Golden eagle	Ponderosa pine tree	Unknown	Fledged 2 young
6	Great horned owl	Sandstone outcrop	Active	Inactive
7	Great horned owl	Sandstone outcrop	Active	Inactive
8	Great horned owl	Ponderosa pine tree	Unknown	Active
9	Stick nest	Ponderosa pine tree	Unknown	Unknown
10	Stick nest	Ponderosa pine tree	Unknown	Inactive
11	Stick nest	Ponderosa pine tree	Unknown	Inactive
12	Stick nest	Ponderosa pine tree	Unknown	Inactive
13	Stick nest	Ponderosa pine tree	Unknown	Inactive
14	Red-tailed hawk	Ponderosa pine tree	Unknown	Active
15	Stick nest	Ponderosa pine tree	Unknown	Inactive
16	Stick nest	Ponderosa pine tree	Unknown	Inactive
17	Red-tailed hawk	Ponderosa pine tree	Unknown	Active
18	Stick nest	Ponderosa pine tree	Unknown	Inactive
19	Red-tailed hawk	Ponderosa pine tree	Unknown	Active
20	Stick nest	Ponderosa pine tree	Unknown	Inactive
21	Stick nest	Ponderosa pine tree	Unknown	Inactive
22	Red-tailed hawk	Ponderosa pine tree	Unknown	Active
23	Stick nest	Ponderosa pine tree	Unknown	Inactive

Figure 69. Long-billed curlew sightings on the Foster Creek study area.

Figure 70. Resident raptor observations on the Foster Creek study area.

Figure 71. Migrant raptor observations on the Foster Creek study area.

A sighting was made of a migrant bald eagle in fall of 1980.

Harriers: Marsh hawks were common on the study area and undoubtedly nested there. Although young birds were observed, no nests were found.

Falcons: Kestrels were the most commonly observed raptor. Numerous nests were observed in snags, most often in ponderosa pine habitats.

A prairie falcon aerie was located in a scoria cliff just southeast of the study area. Three young fledged from that aerie in 1981.

Four sightings of peregrine falcons were made on the study area during migration periods.

Two sightings of merlins were obtained during the study period. Merlins may have nested on the study area undetected. Three pairs of merlins nested on the adjacent Sand Creek study area in 1980.

Owls: Great horned owls were commonly seen on the study area. Three nest sites were located (Table 65), two in sandstone outcrops and a stick nest in a ponderosa pine tree. Three families of burrowing owls were observed during the summer of 1981, two of which resided in prairie dog towns (Figure 70).

A snowy owl was observed in the northern part of the study area during the 1980-81 winter. A single long-eared owl and single short-eared owl were seen on the Foster Creek study area in 1981.

Nongame Mammals

Twenty-one species of mammals, including game species, were observed on the Foster Creek study area (Table 66). The black-tailed prairie dog is listed by Flath (1981) as a species of special concern in Montana.

Twenty-three prairie dog towns are located with the boundary of the study area (Table 67). Mean town size is 36.1 acres (14.4 hectares) (Figure 72). Intensive foot surveys during July of 1980 and 1981 failed to reveal evidence of black-footed ferret activity on any of these sites, which are periodically subject to prairie dog control measures.

Results of small mammal sampling on the study area are summarized in Table 68. Location of traplines is illustrated in Figure 68. The largest number of captures was obtained in riparian habitat but only two species were caught. Poor trapping success in all habitats probably reflect depressed population densities of small mammals due to drought conditions.

Other species possibly occurring on the study area (excluding bats) include: masked shrew (*Sorex cinereus*), mountain cottontail

Figure 72. Foster Creek study area prairie dog town locations.

Table 66 . Mammal species observed on the Foster Creek study area, 1980-81.

No.	Common Name	Scientific Name
1	Striped skunk	<i>Mephitis mephitis</i>
2	Badger	<i>Taxidea taxus</i>
3	Raccoon	<i>Procyon lotor</i>
4	Red fox	<i>Vulpes vulpes</i>
5	Coyote	<i>Canis latrans</i>
6	Bobcat	<i>Lynx rufus</i>
7	Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
8	Black-tailed prairie dog	<i>Cynomys ludovicianus</i>
9	Least chipmunk	<i>Eutamias minimus</i>
10	Red squirrel	<i>Tamiasciurus hudsonicus</i>
11	Northern pocket gopher	<i>Thomomys talpoides</i>
12	Western deer mouse	<i>Peromyscus maniculatus</i>
13	Bushy-tailed wood rat	<i>Neotoma cinerea</i>
14	Muskrat	<i>Ondatra zibethicus</i>
15	House mouse	<i>Mus musculus</i>
16	Porcupine	<i>Erethizon dorsatum</i>
17	White-tailed jack rabbit	<i>Lepus townsendi</i>
18	Desert cottontail	<i>Sylvilagus auduboni</i>
19	White-tailed deer	<i>Odocoileus virginianus</i>
20	Mule deer	<i>Odocoileus hemionus</i>
21	Pronghorn antelope	<i>Antilocapra americana</i>

(*Sylvilagus nuttallii*), Ord kangaroo rat (*Dipodomys ordii*), Wyoming pocket mouse (*Perognathus fasciatus*), meadow jumping mouse (*Zapus hudsonicus*), western harvest mouse (*Reithrodontomys megalotis*), northern grasshopper mouse (*Onychomys leucogaster*), white-footed deer mouse (*Peromyscus leucopus*), prairie vole (*Microtus ochrogaster*), meadow vole (*Microtus pennsylvanicus*), short-tailed weasel (*Mustela erminea*) and long-tailed weasel (*Mustela frenata*) (Hoffman and Pattie 1968, Flath 1981).

Amphibians and Reptiles

Occurrence of four species of amphibians and nine species of reptiles was documented on the study area (Table 69). The snapping turtle, plains hognose and milksnake are listed by Flath (1981) as species of special concern in Montana. The plains hognose and milksnake are thought to be uncommon on the area as only one specimen of each was observed.

Table 67. Prairie dog town locations and survey results, Foster Creek study area.

UTM Coordinates				T	R	S	Hectares	Acres	Survey Results*	
									1980	1981
1	4392	50765		1N	48E	17 NE $\frac{1}{4}$	26	65	N.S	N.S
2	4408	50757		1N	48E	16 S $\frac{1}{2}$	26	65	N.S	N.S
3	4412	50782		1N	48E	9 NE $\frac{1}{4}$	11	27.5	N.S	N.S
4	4411	50777		1N	48E	9 SE $\frac{1}{4}$	42	105	N.S	N.S
5	4371	50759		1N	48E	18 SW $\frac{1}{4}$	0.7	1.7	N.S	N.S
6	4371	50767		1N	48E	18 NW $\frac{1}{4}$	2	5	N.S	N.S
7	4363	50782		1N	47E	12 NE $\frac{1}{4}$	4	10	N.S	N.S
8	4330	50798		1N	47E	3 NE $\frac{1}{4}$	22.8	57.5	N.S	B.O
9	4208	50757		1N	46E	21 NW $\frac{1}{4}$	5.2	13	N.S	N.S
10	4235	50784		1N	46E	10 NE $\frac{1}{4}$	2.4	6	N.S	N.S
11	4267	50789		1N	46E	1 SE $\frac{1}{4}$	10	25	N.S	N.S
12	4258	50769		1N	46E	13 NW $\frac{1}{4}$	4	10	N.S	N.S
13	4286	50775		1N	47E	8 SW $\frac{1}{4}$	44	110	N.S	N.S
14	4302	50793		1N	47E	5 SE $\frac{1}{4}$	3	7.5	N.S	N.S
15	4265	50718		1N	46E	36 NE $\frac{1}{4}$	20	50	N.S	N.S
16	4372	50690		1S	48E	4 S $\frac{1}{2}$	82	205	N.S	N.S
17	4311	50699		1S	47E	2 E $\frac{1}{2}$	6	15	N.S	N.S
18	4295	50752		1N	47E	20 NE $\frac{1}{4}$	2.4	6	N.S	N.S
19	4262	50734		1N	47E	25 NE $\frac{1}{4}$	4	10	N.S	N.S
20	4310	50677		1S	47E	11 SE $\frac{1}{4}$	2	5	B.O	B.O
21	4291	50689		1S	47E	10 NE $\frac{1}{4}$	3.6	9	N.S	N.S
22	4337	50768		1N	47E	14 NW $\frac{1}{4}$	6.4	16	N.S	N.S
23	4274	50787		1N	47E	7 NW $\frac{1}{4}$	2.4	6	N.S	N.S

* Survey results:

N.S. - no sign of black-footed ferrets or burrowing owls.

B.O. - burrowing owls present.

Table 68. Results of small mammal trapping on the Foster Creek study area, summer and fall 1980.

	Riparian	Ponderosa Pine	Sagebrush/ Grassland
Total captures	26	15	11
Trap nights	1634	1658	1634
Captures/100 trap nights	1.59	0.90	0.67
Number of species caught	2	2	2
Species:			
<i>Peromyscus maniculatus</i>	21	14	10
<i>Mus musculus</i>	5	1	1

Table 69. Reptilian and amphibian species observed on the Foster Creek study area, 1980-81.

Common Name	Scientific Name
1 Rocky Mountain toad	<i>Bufo woodhousei</i>
2 Great Plains toad	<i>Bufo cognatus</i>
3 Northern chorus frog	<i>Pseudacris triseriata</i>
4 Leopard frog	<i>Rana pipiens</i>
5 Snapping turtle	<i>Chelydra serpentina</i>
6 Painted turtle	<i>Cyrysemys picta</i>
7 Short-horned lizard	<i>Phrynosoma douglassi</i>
8 Plains hognose snake	<i>Heterodon hasicus</i>
9 Racer	<i>Coluber constrictor</i>
10 Bull snake	<i>Pituophis catenifer</i>
11 Milk snake	<i>Lampropetis triangulum</i>
12 Plains garter snake	<i>Thamnophis radix</i>
13 Prairie rattlesnake	<i>Crotalus viridis</i>

Sand CreekMule Deer

Population characteristics: During the study period 963 mule deer were observed on the Sand Creek study area (Table 70). Mean group size was smallest during summer (2.2 to 2.3) and peaked at 8.6 in spring 1981. Mean number of observations per hour of aerial survey ranged between 22 (summer 1980) and 62 (winter and spring 1981) (Table 71).

Population structure, determined during September and October 1980, indicates a healthy herd with a fawn/doe ratio between 76:100 and 111.8:100 (Table 72). Combined observations from September and October 1980 indicate a fawn/doe ratio of 90.5:100 with 37.2% of the population composed of fawns. Production surveys conducted by the Mont. Dept. of Fish, Wildlife and Parks prior to hunting season resulted in an average fawn/doe ratio of 82:100 for all 30 hunting districts in southeastern Montana with 44% of the population composed of fawns (Swenson 1981).

Table 70. Observations by month and mean group size for mule deer on the Sand Creek study area.

Year	Month	Number of Observations	Total Individuals	Mean Group Size
1980	April	4	37	9.2
	May	11	68	6.2
	Spring	15	105	7.0
	June	20	39	2.0
	July	27	55	2.0
	August	15	49	3.3
	Summer	62	143	2.3
	September	5	11	2.2
	October	13	55	4.2
	November	13	62	4.8
	Fall	31	128	4.1
1981	December	12	84	7.0
	January	5	25	5.0
	February	7	63	9.0
	Winter	24	172	7.2
	March	7	96	13.7
	April	14	112	8.0
	May	8	41	5.1
	Spring	29	249	8.6
	June	27	51	1.9
	July	29	56	1.9
	August	19	59	3.1
	Summer	75	166	2.2

Table 71. Mule deer, antelope and coyote aerial observations per hour on the Sand Creek study area.

Year	Month	Total Hours	Total Aerial Observations				Observations/Hour				Coyotes/100:		
			Mule		Deer	Antelope	Coyote	Mule	Deer	Antelope	Mule	Deer	Antelope
			Deer	Antelope									
1980	April	2.5	37	8		14.8	3.2	0	0	0	0	0	
	May	1	62	3		62	3	1	1.6	33.3			
	Spring	3.5	99	11	1	28.3	3.1	1	1	9			
	June	2.5	32	5		12.8	2.	0	0	0	0		
	July	2	42	5		21	2.5	0	0	0	0		
	August	1	47	16	1	47	16	1	2.1	6.2			
	Summer	5.5	121	26	1	22	4.7	.2	.8	3.8			
	September				No Flight								
	October	1.5	55		2	36.7	0	1.3	3.6	0	0		
	November	1.5	62		2	41.3	0	1.3	3.2	0	0		
1981	Fall	3.0	117		4	39	0	1.3	3.4	0	0		
	December	.75	84		4	112	0	5.3	4.8	0	0		
	January	1	25	34	0	25	34	0	0	0	0		
	February	1	63		0	63	0	0	0	0	0		
	Winter	2.75	172	34	4	62.5	12.4	1.4	2.3	0	0		
	March	1	96	20	3	96	20	3.0	3.1	15			
	April	1.75	112	5		64	2.8	0	0	0	0		
	May	1.25	41	24		32.8	19.2	0	0	0	0		
	Spring	4	249	49	3	62.2	12.2	.8	1.2	6.1			
	June	1.25	38	23		30.4	18.4	0	0	0	0		
	July	1.25	52	26	1	41.6	20.8	.8	1.9	3.8			
	August	1	59	40	1	59	40	1.0	1.7	2.5			
	Summer	3.5	149	89	2	42.6	25.4	.6	1.4	2.4			

Table 72. Mule deer population characteristics on the Sand Creek study area, 1980.

Month	Number Classified				Fawns:100		Bucks:100	Population Structure (%)		
	Total	Bucks	Does	Fawns	Does	Adults	Does	Bucks	Does	Fawns
Sept	57	13	25	19	76	50	52	22.8	43.8	33.3
Oct	45	9	17	19	111.8	73	52.9	20	37.8	42.2

Distribution: Spring mule deer distribution is illustrated in Figure 73. Most observations were in the northwest portion and along the southwest and southern boundaries.

Summer observations were more widely dispersed over the study area (Figure 74). Fall observations (Figure 75) were also scattered with some degree of concentration in the vicinity of ponderosa pine habitats (Figure 8). Winter observations were clumped in the northwest and southwest portions of the study area (Figure 76). The winter of 1980-81 was extremely mild and of short duration, which made delineation of traditional winter concentration areas impossible. Lack of significant snow cover allowed deer to range widely during the entire season.

Cover type usage: Seasonal use of cover types is presented in Table 73. Use of ponderosa pine habitats was undoubtedly underestimated for all seasons due to the difficulty of observing deer in coniferous cover. In spite of this observational bias, large proportion of observations occurred in this cover category all seasons. Ponderosa pine habitats occupy a very small proportion of the study area (Figure 4). Selection of ponderosa pine habitats was most evident in winter.

Use of sagebrush and grassland habitats was much greater during spring and summer of 1981 than the preceding year, with a corresponding lesser use of creek bottom types. This trend was also noted on the Foster Creek study area. Use of creek bottom habitats peaked during fall and use of agricultural areas was greatest in spring.

Activity: Mule deer activity at time of observation is presented in Table 74. The largest proportion of deer were standing or feeding when first seen during all seasons except winter and spring of 1981. Bedding activity was most prevalent in winter. Feeding activity was most commonly observed during spring. Feeding activity was significantly more commonly observed during spring and summer of 1981 than spring and summer of the preceding year. This trend suggests that it was necessary for deer to spend more time feeding during the 1981 seasons. Drough conditions severely limited forage in early spring to a greater extent in 1981 than in 1980.

Figure 73. Spring mule deer distribution on the Sand Creek study area.

Figure 74. Summer mule deer distribution on the Sand Creek study area.

Figure 75. Fall mule deer distribution on the Sand Creek study area.

Figure 76. Winter mule deer distribution on the Sand Creek study area.

Table 73 . Seasonal use of cover type by mule deer on the Sand Creek study area.

Cover Types	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Creeping juniper	12	11	9	45	11	10
Sagebrush	5		9		9	1
Grassland	14	3				
Skunkbush						5
Total ponderosa pine	31	14	19	45	21	16
Sagebrush	17	31	29	42	42	19
Deciduous shrub				2	tr	17
Grassland	3	1			5	3
Total Sagebrush/Grassland	20	32	29	44	48	38
Mesic grass			12			4
Deciduous tree		6	9		5	3
Shrub	21	36	22	9	5	23
Total Creekbottom	21	42	44	9	10	30
Upland	18	7	5	2	20	15
Creekbottom	10	6	4			1
Total Agricultural	28	13	8	2	20	16
Total Observed	105	143	128	172	249	166

* tr = trace; a percentage less than 0.5.

Use of topography: Deer appeared to use steep slopes to a greater extent in 1980 than in 1981 (Table 75). Use of dissected mid-slopes peaked in winter when deer heavily used ponderosa pine ridges. Dissected mid-slope and alluvium/terrace features were used to a greater extent during spring and summer of 1981 than 1980. A corresponding lesser use of flood plain areas was noted the second year.

Use of exposure: The percentage of deer observations on flat terrain was highest during summer of 1980 and least in winter (Table 76). South exposures received disproportionately higher use than other aspects during summer of both years.

Use of slope: The majority of mule deer observations were made on areas characterized by flat terrain or gentle slopes in all seasons except winter (Table 77). A shift to terrain of medium and steep slope was evident during winter. Heavy use of medium slopes was also evident during the 1981 spring season.

White-tailed Deer

Twenty-five individual white-tailed deer were observed on the study area during the study period (Figure 77). These observations were made primarily at the southwest boundary of the study area, in deciduous and ponderosa pine habitats.

Pronghorn Antelope

Population characteristics: During the study period 266 antelope were observed on the Sand Creek study area (Table 78). Mean group size ranged from 2.6 (summer 1980) to 17 (winter 1980-81). Mean number of observations per hour of aerial survey was substantially higher during summer 1981 than in any previous season (Table 71). No antelope were observed on the study area during 1980 fall surveys.

Summer population structure is presented in Table 79. Small sample size limits the use of these figures for comparative purposes. Population trend surveys covering all of hunting district 744 between 1971 and 1974 indicated fawn/doe ratios between 21:100 and 112:100 for this area (Wentland 1981). The 1979 survey revealed a fawn/doe ratio of 55:100, following a decline during the severe winters of 1977-78 and 1978-79.

Distribution: Antelope distribution during spring, summer and fall of 1980 and winter of 1980-81 is illustrated in Figure 78. Most observations occurred in sagebrush habitats of the northeast portion of the study area. Sightings in the southern half of the study area occurred on agricultural areas. Observations during 1981 were clustered in sagebrush habitats of the northern half of the study area (Figure 79).

Cover type usage: The preponderance of antelope observations in sagebrush and grassland habitats illustrates the dependence of this species upon these habitats (Table 80). Agricultural types (grain fields) received substantial use during the summer season.

Table 74. Seasonal activity of mule deer on the Sand Creek study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing	39	70	62	28	28	43
Running	14	10	14		8	13
Bedded		9	5	41	8	5
Feeding	34	8	16	26	57	36
Walking	12	3	3	5		3
Total Observed	105	143	128	172	249	166

Table 75. Seasonal use of topography by mule deer on the Sand Creek study area.

Topography type	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-butte top			5			3
Mesa-butte steep slopes	14	19	6	8		
Dissected mid-slopes	20	17	31	65	44	38
Alluvium/terrace	35	16	31	18	47	31
Flood plain	30	48	26	9	9	27
Total observed	105	143	128	172	249	166

Table 76. Seasonal use of exposure by mule deer on the Sand Creek study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
North	30	1	16	22	12	9
South	2	17	4	2	6	22
East			5	10	6	2
West		7	3	18	11	
Northeast	6	9	12	6		4
Northwest		2	9	7	4	5
Southeast		1	1	11	8	8
Southwest	15	1	9	17	19	4
Flat	48	63	41	8	33	46
Total observed	105	143	128	172	249	166

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Table 77. Seasonal use of slope by mule deer on the Sand Creek study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	48	64	41	8	33	46
Gentle	23	12	34	16	25	17
Medium	15	12	8	37	39	15
Steep	14	11	16	40	3	22
Total observed	105	143	128	172	249	166

Table 78. Observations by month and mean group size for antelope on the Sand Creek study area.

Year	Month	Number of Observations	Total Individuals	Mean Group Size
1980	April	1	8	
	May	1	3	
	Spring	2	11	
	June	10	16	1.6
	July	3	7	2.3
	August	4	22	5.5
	Summer	17	45	2.6
	September	4	23	5.8
	October			
	November	2	2	1.0
	Fall	6	25	4.2
	December			
1981	January	2	34	17.0
	February			
	Winter	2	34	17.0
	March	2	20	10.0
	April	3	5	1.7
	May	4	24	6.0
	Spring	9	49	5.4
	June	12	25	2.1
	July	6	30	5.0
	August	9	47	5.2
	Summer	27	102	3.8

Table 79. Antelope population structure on the Sand Creek study area

Year	Month	Number Classified				Population Structure (%)		
		Total	Bucks	Does	Fawns	Bucks	Does	Fawns
1980	June	16	6	10		37.5	62.5	0
	July	7		4	3	0	57.1	42.8
	August	22	3	8	11	13.6	36.4	50.0
1981	June	25	8	17		32.0	68.0	0
	July	30	4	17	9	13.3	56.7	30.0
	August	7	1	3	3	14.3	42.8	42.8

Table 80. Seasonal use of cover types by antelope on the Sand Creek study area.

Cover Types	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Creeping juniper						
Sagebrush						
Grassland						
Skunkbush						
Total Ponderosa pine	0	0	0	0	0	0
Sagebrush	73	27	89	100	45	28
Deciduous shrub						
Grassland	27	24			33	25
Total Sagebrush/Grassland	100	51	89	100	78	54
Mesic grass						
Deciduous tree						
Shrub						
Total Creekbottom	0	0	0	0	0	0
Upland						
Creekbottom		42	11		22	46
Total Agricultural	0	7				
		49	11	0	22	46
Total Observed	11	45	9	34	49	102

Figure 77. White-tailed deer observations on the Sand Creek study area.

Figure 78. Antelope observations, spring 1980 through winter 1980-81, on the Sand Creek study area.

Figure 79. Antelope observations, spring and summer 1981, on the Sand Creek study area.

Activity: Antelope activity at time of observation is presented in Table 81. Small sample sizes during some seasons limit the usefulness of seasonal comparisons.

Use of topography: Most observations were obtained on alluvium/terrace features during all seasons (Table 82). Use of dissected mid-slopes was highest in spring of 1980.

Use of exposure and slope: The greatest proportion of antelope observations were made on flat terrain during all seasons (Tables 83 and 84).

Birds

Seventy-eight species of birds were observed on the Sand Creek study area during the study period (Table 85). Resident breeding was documented for forty species. The Cooper's hawk, ferruginous hawk, golden eagle, prairie falcon, merlin, long-billed curlew, upland sandpiper, long-eared owl and field sparrow are all listed by Flath (1981) as species of special concern in Montana. The ferruginous hawk, golden eagle, prairie falcon and long-billed curlew are also listed as migratory birds of high federal interest in the Powder River coal region (U.S.D.I. 1979).

Sharp-tailed grouse: Sharp-tailed grouse were abundant in the Sand Creek vicinity. Ten sharp-tailed grouse arenas were located within the study area (Figure 80). Attendance by displaying males averaged 14.9 in 1980 and 12.8 in 1981, on arenas for which two years of data were obtained (Table 86). The drop in attendance between years is insignificant compared with the 50% decline noted on the Foster Creek study area. A significant drop in male attendance was documented on sharp-tail arenas throughout southeastern Montana in 1981 (Knapp et al. 1981). Poor nesting success and/or brood survival in 1980 was a result of prevailing drought conditions.

An additional arena was found in spring 1981 and an arena which had been used the previous year (#1) appeared to be abandoned in 1981.

Sage grouse: Although no sage grouse arenas were found on the study area, 43 individuals were observed during the summers of 1980 and 81. They were sighted in sagebrush habitats and cut hayfields.

Other upland game birds: One hundred seventy-nine turkeys were observed on the study area during the study period. Most sightings occurred in ponderosa pine habitats of the northwest corner section, in groups as large as 30 birds. Other observations were obtained along the west boundary of the study area.

Ring-necked pheasants were fairly common on the area. Gray partridge also occur but were seen infrequently.

Waterfowl: Waterfowl habitat on the Sand Creek study area is very limited. The few stock ponds on the area are small and were mostly dry 1980-81. Successful breeding was documented for only mallard and gadwalls during the study period.

Table 81. Seasonal activity of antelope on the Sand Creek study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing		29	22		14	12
Running	27	36		100	73	70
Bedded		13			10	8
Feeding	73	20	78		2	11
Walking		2				
Total observed	11	45	9	34	49	102

Table 82. Seasonal use of topography by antelope on the Sand Creek study area.

Topography type	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-butte top (plateau)					6	
Dissected mid-slopes	27	16			8	20
Alluvium/terrace	73	69	100	100	86	81
Flood plain		16				
Total observed	11	45	9	34	49	102

Table 83. Seasonal use of exposure by antelope on the Sand Creek study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
North		2				2
South		11	11			6
East			11			15
West						1
Northeast	27	7			8	10
Northwest						4
Southeast		2			12	3
Southwest		78				4
Flat	73		78	100	80	56
Total observed	11	45	9	34	49	102

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Table 84. Seasonal use of slope by antelope on the Sand Creek study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	73	78	78	100	80	56
Gentle	27	16	22		12	37
Medium		4			8	7
Steep		2				
Total observed	11	45	9	34	49	102

Table 85. Occurrence and breeding status of bird species observed on the Sand Creek study area, 1980-81.

Species		Status*	Species		Status
1	Great blue heron	t	40	Western wood peewee	b
2	Mallard	B	41	Horned lark	b
3	Gadwall	B	42	Barn swallow	B
4	Pintail	b	43	Cliff swallow	B
5	Green-winged teal	b	44	Black-billed magpie	B
6	Blue-winged teal	b	45	Common crow	b
7	American wigeon	t	46	Piñon jay	b
8	Red-tailed hawk	B	47	Clark's nutcracker	t
9	Cooper's hawk	t	48	Black-capped chickadee	b
10	Swainson's hawk	t	49	Red-breasted nuthatch	b
11	Rough-legged hawk	M	50	House wren	B
12	Ferruginous hawk	B	51	Rock wren	b
13	Golden eagle	B	52	Gray catbird	b
14	Marsh hawk	B	53	Brown thrasher	B
15	Prairie falcon	b	54	American robin	B
16	Merlin	B	55	Mountain bluebird	b
17	American kestrel	B	56	Townsend's solitaire	t
18	Sharp-tailed grouse	B	57	Loggerhead shrike	B
19	Sage grouse	B	58	Starling	B
20	Ring-necked pheasant	B	59	Yellow warbler	B
21	Gray partridge	B	60	House sparrow	B
22	Turkey	B	61	Western meadowlark	B
23	Killdeer	B	62	Yellow-headed blackbird	B
24	Long-billed curlew	b	63	Red-winged blackbird	B
25	Upland sandpiper	B	64	Northern oriole	b
26	Wilson's phalarope	b	65	Brewer's blackbird	B
27	Mourning dove	B	66	Common grackle	B
28	Great horned owl	b	67	Brown-headed cowbird	b
29	Long-eared owl	b	68	American goldfinch	b
30	Poor will	B	69	Red crossbill	B
31	Common nighthawk	B	70	Rufous-sided towhee	B
32	Common flicker	B	71	Lark bunting	b
33	Red-headed woodpecker	b	72	Grasshopper sparrow	b
34	Hairy woodpecker	b	73	Vesper sparrow	b
35	Downey woodpecker	b	74	Lark sparrow	B
36	Eastern kingbird	B	75	Chipping sparrow	B
37	Western kingbird	b	76	Field sparrow	t
38	Say's phoebe	B	77	Song sparrow	b
39	Least flycatcher	t	78	Snow bunting	W

* Status:

B - hard evidence of breeding

b - circumstantial evidence of breeding

t - occurs, but no evidence of breeding

W - overwintering observation

M - migratory observation

Table 86. Locations of sharp-tailed grouse arenas on the Sand Creek study area and male attendance.

Ground Number	UTM	Coordinates	T	R	S	No. Males Attending	
						1980	1981
1	4539	50729	1N	49E	26 SW $\frac{1}{4}$ NE $\frac{1}{4}$	10	0
2	4574	50694	1S	50E	3 NW $\frac{1}{4}$ SW $\frac{1}{4}$	13	4
3	4565	50656	1S	50E	16 SW $\frac{1}{4}$ SE $\frac{1}{4}$	8	10
4	4550	50696	1S	49E	5 SW $\frac{1}{4}$ NE $\frac{1}{4}$	10	2
5	4547	50716	1N	49E	36 NW $\frac{1}{4}$ NW $\frac{1}{4}$	16	20+
6	4541	50689	1S	49E	5 SW $\frac{1}{4}$ SW $\frac{1}{4}$	22	21
7	4537	50662	1S	49E	18 SE $\frac{1}{4}$ NE $\frac{1}{4}$	22	16
8	4533	50740	1N	49E	23 SW $\frac{1}{4}$ SW $\frac{1}{4}$	19	19
9	4591	50682	1S	50E	11 NW $\frac{1}{4}$ NW $\frac{1}{4}$	9	10
10	4574	50757	1N	50E	18 SE $\frac{1}{4}$ SE $\frac{1}{4}$		24+

Figure 80. Sharp-tailed grouse arenas on the Sand Creek study area.

Nongame birds: Species composition of songbirds observed during roadside inventory surveys is presented in Table 87. Location of songbird inventory route stops is illustrated in Figure 81. Similar to the Foster Creek study area, meadowlarks made up approximately 30% of all birds observed. Meadowlarks, vesper sparrows and Brewer's black birds together made up 50% of the species composition. These data are probably biased in favor of species having the most conspicuous habits and loudest songs.

Raptors: Twelve species of raptors were observed on the Sand Creek study area. Secretive species such as screech owls and saw-whet owls probably occur on the area, but were not observed during the study period.

For the purpose of identifying resident breeding birds, raptor distribution was mapped as follows: Birds observed during the months of May, June and July were considered resident breeders (Figure 82). All other raptor observations were recorded on a separate distribution map, including migrant and transient birds (Figure 83).

Accipiters: A Cooper's hawk was seen in the spring of 1981 and considered a migrant.

Buteos: Red-tailed hawks were the most commonly observed raptor on the study area. One active nest was found during the 1981 spring raptor survey (Table 88).

Swainson's hawks were observed several times during migration periods. Rough-legged hawks were also observed during migration.

Ferruginous hawks were observed on the study area in spring of 1980 and 1981, but were absent during summer. They may have made unsuccessful nesting attempts. A ferruginous hawk nest located in the southeast portion of the study area is in good repair and probably has been used in recent years. Numerous older ferruginous hawk nests are found on knolls and knobs in the vicinity of the southeast corner of the study area.

Golden eagles were frequently seen on the study area and an active nest was found in a ponderosa pine tree during the 1981 spring raptor survey (Table 88). It fell from the tree during a wind storm in June.

Harriers: Marsh hawks are very common on the study area. No nests were found although it was evident that there were several breeding pairs present.

Falcons: Kestrels were seen fairly commonly. Prairie falcons were observed during the breeding season as well as migration, but suitable nesting habitat is not found on the study area.

Three pairs of merlins nested on the area in 1980 (Table 88). All three pairs utilized magpie nests in ponderosa pine trees. One of these nests fledged a single young; however, production data for the other two nests was not obtained. No nesting activity

Table 87. Bird species composition from five runs of the song bird inventory route on the Sand Creek study area.

Species	Number Observed		Percent Composition	Percent Frequency
	1980	1981		
Western meadowlark	90	56	31	85
Vesper sparrow	31	17	10	37
Brewer's blackbird	41	5	10	13
Red-winged blackbird	21	17	8	12
Red crossbills		34	7	3
Mourning dove	11	18	6	23
Chipping sparrow	9	2	2	12
Horned lark	2	8	2	7
Eastern kingbird	6	4	2	11
Barn swallow	8	1	2	4
Brown-headed cowbird	7	2	2	8
Lark sparrow	7	2	2	9
American robin	6	3	2	9
Grasshopper sparrow	5	4	2	11
Upland sandpiper	3	4	1	7
Yellow warbler	3	4	1	7
House wren	6	1	1	7
Killdeer	5		1	7
Rufous-sided towhee	3		1	4
Common flicker	2	1	1	4
Say's phoebe	2	1	1	4
Western wood peewee	2	1	1	4
Black-capped chickadee		3	1	3
Song sparrow		3	1	3
Common grackle	2		tr*	3
Pinon jay	2		tr	3
Brown thrasher	1	1	tr	3
Field sparrow	1	1	tr	3
Common nighthawk	1		tr	1
Rock wren	1		tr	1
Yellow-rumped warbler		1	tr	1

* tr = trace; a percentage less than 0.5.

Table 88. Raptor nest sites on the Sand Creek study area.

Nest No.	Species	Substrate	Status	
			1980	1981
1	Merlin	Ponderosa pine tree	Fledged 1 young	Inactive
2	Merlin	Ponderosa pine tree	Active	Inactive
3	Merlin	Ponderosa pine tree	Active	Inactive
4	Golden eagle	Ponderosa pine tree	Occupied by magpies	Active-but failed
5	Red-tailed hawk	Ponderosa pine tree	Unknown	Active
6	Ferruginous hawk	Ground	Inactive	Inactive

Figure 81. Sand Creek study area songbird inventory route and small mammal trapline locations.

Figure 82. Resident raptor observations on the Sand Creek study area.

Figure 83. Migrant raptor observations on the Sand Creek study area.

was observed on the study area in 1981. A decline in merlin nesting activity was also documented in the Long Pines area of southeastern Montana in 1981 (Becker, pers. comm.).

Owls: Great horned owls were sighted on several occasions and it is very likely that they nested in the vicinity. A long-eared owl was observed during a migration period.

Nongame Mammals

Twenty species of mammals, including game species, were observed in the Sand Creek study area (Table 89). The black-tailed prairie dog is listed by Flath (1981) as a species of special concern in Montana. No prairie dog towns were present on the study area, but a transient individual was observed.

Results of small mammal sampling are summarized in Table 90. Location of traplines is illustrated in Figure 81. The largest number of captures was obtained in ponderosa pine habitat but only three species were caught. Poor trapping success in all habitats probably reflect depressed population densities of small mammals due to drought conditions.

Other species possibly occurring on the study area (excluding bats) include: masked shrew (*Sorex cinereus*), Mountain cottontail (*Sylvilagus nuttallii*), Ora kangaroo rat (*Dipodomys ordii*), Wyoming pocket mouse (*Perognathus fasciatus*), meadow jumping mouse (*Zapus hudsonicus*), western harvest mouse (*Reithrodontomys megalotis*), northern grasshopper mouse (*Onychomys leucogaster*), white-footed deer mouse (*Peromyscus leucopus*), prairie vole (*Microtus ochrogaster*), meadow vole (*Microtus pennsylvanicus*), short-tailed weasel (*Mustela erminea*) and long-tailed weasel (*Mustela frenata*) (Hoffman and Pattie 1968, Flath 1981).

Amphibians and Reptiles

Occurrence of two species of amphibians and five species of reptiles was documented on the study area (Table 91). None are listed as species of special concern in Montana (Flath 1981).

Table 89. Mammal species observed on the Sand Creek study area 1980-81.

	Common Name	Scientific Name
1	Striped skunk	<i>Mephitis mephitis</i>
2	Badger	<i>Taxidea taxus</i>
3	Raccoon	<i>Procyon lotor</i>
4	Red fox	<i>Vulpes vulpes</i>
5	Coyote	<i>Canis latrans</i>
6	Bobcat	<i>Lynx rufus</i>
7	Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
8	Black-tailed prairie dog	<i>Cynomys ludovicianus</i>
9	Least chipmunk	<i>Eutamias minimus</i>
10	Red squirrel	<i>Tamiasciurus hudsonicus</i>
11	Northern pocket gopher	<i>Thomomys talpoides</i>
12	Western deer mouse	<i>Peromyscus maniculatus</i>
13	Bushy-tailed wood rat	<i>Neotoma cinerea</i>
14	House mouse	<i>Mus musculus</i>
15	Porcupine	<i>Erethizon dorsatum</i>
16	White-tailed jack rabbit	<i>Lepus townsendii</i>
17	Desert cottontail	<i>Sylvilagus auduboni</i>
18	White-tailed deer	<i>Odocoileus virginianus</i>
19	Mule deer	<i>Odocoileus hemionus</i>
20	Pronghorn antelope	<i>Antilocapra americana</i>

Table 90. Results of small mammal trapping on the Sand Creek study area, summer and fall 1980.

	Riparian	Ponderosa Pine	Sagebrush/Grassland
Total captures	16	22	8
Trap nights	1629	1741	1715
Captures/100 trap nights	.98	1.26	.47
Number of species caught	2	3	2
Species:			
<i>Peromyscus maniculatus</i>	12	20	7
<i>Mus musculus</i>		1	
<i>Eutamias minimus</i>	4	1	
<i>Spermophilus tridecemlineatus</i>			1

Table 91. Reptilian and amphibian species observed on the Sand Creek study area, 1980-81.

Common Name	Scientific Name
1 Northern chorus frog	<i>Pseudacris triseriata</i>
2 Leopard frog	<i>Rana pipiens</i>
3 Painted turtle	<i>Chrysemys picta</i>
4 Racer	<i>Coluber constrictor</i>
5 Bull snake	<i>Pituophis catenifer</i>
6 Plains garter snake	<i>Thamnophis radix</i>
7 Prairie rattlesnake	<i>Crotalus viridis</i>

Birney

Mule Deer

Population characteristics: During the study 481 mule deer were observed in the Birney study area (Table 92). Average group size ranged from 1.7 in summer 1981 to 6.5 in winter. January 1981 had the highest average group size of any month. The pattern of larger groups during winter and spring, and small groups during summer and early fall is similar to that observed by Martin (1980a) on the nearby Otter Creek, Hanging Woman Creek, and Prairie Dog Creek areas.

Mule deer observations per hour of aerial survey were calculated to provide an index of relative abundance to compare the various study areas. Mule deer observations per hour on the Birney area ranged from 4.2 during summer 1981 to 19.8 during winter (Table 93). The relatively heavily timbered nature of the study area contributed to these low figures. Biggins and Phillips (1979) estimated that only 17% of the mule deer were observed in timbered areas, compared to 39% in upland shrub types. Nevertheless, all of the figures (observations per hour, total number of deer observed each month, number of groups of deer) indicate a much lower mule deer population than on the Otter Creek, Hanging Woman Creek, Foster Creek, and Sand Creek study areas (Martin 1980a, 1980b). Many of the local landowners attribute the low deer densities to poaching. It is unclear whether poaching is higher on the study area than in nearby areas with higher deer densities. The sparse, dry vegetation and lack of good riparian (deciduous tree and shrub) vegetation may result in a lower carrying capacity for deer in this area.

Mule deer population structure was determined during October and November (Table 94). Fawn production was poor with only 41.7 and 80.0 fawns/100 does observed. The 27.7 fawns/100 adults observed in October is far below the 40% fawn level necessary for a mule deer population to remain stable (Swenson 1978a). The November flight revealed a 50% fawn level, but only 12 deer were classified.

Table 92. Average group size of mule deer in the Birney area.

Month	No. Groups	No. Deer	Average
April	7	35	5.0
May	14	39	2.8
Spring	21	74	3.5
June	5	6	1.2
July	7	16	2.3
August	6	13	2.2
Summer	18	35	1.9
September		47	3.9
October	12	17	2.8
November	6	64	3.6
Fall	18		
December	1	7	7.0
January	9	65	7.2
February	8	45	5.6
Winter	18	117	6.5
March		62	4.8
April	13	85	4.5
May	19	18	2.6
Spring	7	165	4.2
	39		
June		17	1.7
July	10	5	1.7
August	3	4	2.0
Summer	2	26	1.7
	15		

This suggests the mule deer population in this area is either declining or stable, but not increasing.

Distribution: Spring distribution is shown in Figure 84. The deer sightings are scattered throughout the study area, but tend to be aligned along the tops of ridges, with very few sightings in the creek bottoms. No groups with more than 15 deer were observed. Most of the larger groups (9-15 deer) were located on the ridge between Zook Creek and Whitten Creek.

Summer distribution is shown in Figure 85. Only three sightings were of groups larger than 3 deer. Most of the sightings were located on the ridges in the southeastern part of the study area. No deer were sighted on Cook Creek or the ridges in the center of the study area during either year. Mule deer are extremely difficult

Figure 84. Spring mule deer distribution on the Birney Study area.

Figure 85. Summer mule deer distribution on the Birney study area.

Table 93. Mule deer, white-tailed deer, and coyote aerial observations per hour in the Birney study area.

Year	Aerial Observations				Observations/Hour				Coyotes/100:	
	Hours	Mule Deer		Whitetail Deer		Mule Deer	Whitetail Deer		Mule Deer	Whitetail
		Deer	Whitetail	Deer	Whitetail		Deer	Whitetail		
1980	May	1.4	30	0	2	21.4	0	1.4	6.7	0
	June	1.2	5	0	1	4.2	0	0.8	20.0	0
	July	1.9	16	0	0	8.4	0	0	0	0
	August	1.6	13	12	6	8.1	7.5	3.7	46.2	50.0
	Summer	4.7	34	12	7	7.2	2.6	1.5	20.6	58.3
	October	1.7	46	3	5	27.0	1.8	2.9	10.9	166.7
	November	1.8	13	0	1	7.2	0	0.6	7.7	0
	Fall	3.5	59	3	6	16.8	0.9	1.7	10.2	200.0
1981	December	2.3	7	0	2	3.0	0	0.9	28.6	0
	January	2.1	65	11	8	31.0	5.2	3.8	12.3	72.7
	February	1.5	45	11	3	30.0	7.3	2.0	6.7	27.3
	Winter	5.9	117	22	13	19.8	3.7	2.2	11.1	59.1
	March	2.5	47	10	1	18.8	4.0	0.4	2.1	10.0
	April	2.2	44	6	0	20.0	2.7	0	0	0
	May	1.5	12	3	0	8.0	2.0	0	0	0
	Spring	6.2	103	19	1	16.6	3.1	0.2	1.0	5.3
	June	1.7	16	3	1	9.4	1.8	0.6	6.2	33.3
	July	1.8	5	6	2	2.8	3.3	1.1	40.0	33.3
	August	1.5	0	1	5	0	0.7	3.3	0	500.0
	Summer	5.0	21	10	8	4.2	2.0	1.6	38.1	80.0

Table 94. Mule deer population characteristics in the Birney study area.

Year	Month	Number Classified				Fawns:100		Bucks:		Population Structure (%)		
		Total	Bucks	Does	Fawns	Does	Adults	100	Does	Bucks	Does	Fawns
1980	Oct	47	13	24	10	41.7	27.0	54.2		27.7	51.1	21.3
	Nov	12	3	5	4	80.0	50.0	60.0		25.0	41.7	33.3

to observe during the summer due to a tendency to "shade up" in more heavily wooded areas.

Deer groups during the fall were larger and located nearer to creek and river bottoms (Figure 86). More mule deer were observed along the Tongue River than in other seasons, and no deer were observed in the northwestern one-third of the study area.

Figure 87 shows the winter distribution of mule deer. Three main areas were used: 1) the ridge between Bull Creek and Whitten Creek, 2) the ridge between Whitten Creek and Zook Creek, 3) the head of Coal Bank Creek. A group of nine deer beds were observed in the southwestern part of the study area between Bull Creek and the head of Whitten Creek, but the herd was never located.

Most of the groups had more than three deer, but no groups of more than 15 deer were observed. This lack of large herds of mule deer during winter is in contrast with the Kirby and Tongue River Dam study areas and most other coal areas near Ashland (Martin 1980a).

The extent of winter range on the Birney area is uncertain due to the unusually mild winter. Most of the deer were on or near steep, sagebrush-covered south-facing slopes. These slopes, which are small and scattered throughout the study area, are probably the normal winter ranges.

Vegetation use: Mule deer made heavy use of sagebrush habitat during the entire study (Table 95). Ponderosa pine types were more heavily utilized in 1981 than in 1980. Use of this type was certainly underestimated because of the difficulty of seeing deer in it. Very few deer were observed in deciduous tree and shrub habitats, except in fall when many mule deer moved down on the Tongue River. This low use reflects the small amount and poor quality of riparian habitat within the study area.

Activity: A high percentage of mule deer were observed feeding during spring and summer (Table 96). The highest percentages of standing and laying deer were observed during winter, the period of greatest stress. Martin (1980a) correlates the high feeding

Figure 86. Fall mule deer distributions on the Birney study area.

Figure 87. Winter mule deer distribution on the Birney study area.

Table 95. Seasonal use of vegetation by mule deer in the Birney study area.

Vegetational type	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Ponderosa pine	7		1		2	
Big sage	7	29	9	6	25	8
Grassland	3	9	6	35	9	24
Skunkbush	3				7	
Juniper				9	10	12
Snowberry-rose						
Total Ponderosa Pine	20	38	16	50	53	44
Big sage	81	51	30	32	22	36
Silver sage			1	3	5	
Xeric grassland			9			
Skunkbush						4
Total grassland	81	51	40	35	27	40
Deciduous tree			14			
Deciduous shrub		3	11		1	
Mesic grass						
Forbs						
Total Riparian		3	25		1	
Grassland				9		
Big sage		7	19	5	19	12
Skunkbush						
Total Juniper		7	19	14	19	12
Upland						
River bottom			1			4
Total Agricultural			1			4
Total Observed	74	35	64	117	165	25

activity in spring and summer with the building up of fat reserves. The timing of the aerial surveys also affects the activity observations. Aerial surveys were started at sunrise in spring, summer, and fall, coinciding with high feeding activity. The winter surveys were conducted later in the day, when deer are more apt to be bedded or inactive.

Table 96. Seasonal activity of mule deer in the Birney study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing/sitting	1	0	31	34	9	12
Running	4	3	9	26	28	8
Laying	0	6	0	7	4	4
Feeding	95	91	52	27	32	68
Walking	0	0	8	6	27	8
Total Observed	74	35	64	117	165	25

Use of Topography: The percentage of mule deer observed on mesa-butte tops was highest during the summer 1980 and winter 1980-81, but was substantial during other seasons (Table 97). The lack of good riparian cover at lower elevations, and the very hot, dry weather may have caused the shift to higher elevations during the summer of 1980. During winter, 90% of the mule deer were observed on mesa-butte tops or steep side slopes, reflecting the location of their winter range. High percentages of mule deer were observed on dissected mid-slopes during spring and summer. Use of alluvium/terrace and current flood plain areas was highest during fall, reflecting the fall movement of mule deer down to the Tongue River.

Use of exposure: Use of flat areas (no exposure) was substantial during all seasons of the study, reflecting the high use of mesa-butte tops (especially in winter) and river bottoms in fall (Table 98). East and northeast exposures received heavy use during spring and summer. A total of 19% of the mule deer were observed on north, northeast, and northwest facing slopes during winter. This percentage probably would be lower during a normal winter.

Use of slope: The highest percentage of mule deer observed on steep side slopes was in winter (Table 99). This correlates with the high use of mesa-butte steep side slopes at this time of year. More deer were observed on steep side slopes in 1981 than in 1980. Low rainfall in 1980 probably resulted in poor browse conditions on the sparsely vegetated steep slopes. Medium slopes supported 1/3 to 1/2 the deer observations, except in winter. Use of gentle slopes was highest during spring 1980, reflecting the high use of gently sloping sagebrush flats.

Table 97. Seasonal use of topography by mule deer in the Birney study area.

Topography	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-butte top	18	43	14	51	19	24
Mesa-butte steep side slope	0	0	2	39	28	16
Dissected mid-slopes	82	51	52	10	47	56
Alluvium/terrace	0	6	11	0	0	0
Current flood plain	0	0	22	0	5	4
Total observed	74	35	64	117	165	25

Table 98. Seasonal use of exposure by mule deer in the Birney study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
No exposure (Flat)	20	40	30	51	19	24
North	4	9	6	3	5	4
South	4	14	13	0	16	0
East	40	23	28	0	10	16
West	0	6	0	8	10	0
Northeast	16	6	9	15	8	32
Northwest	1	0	0	1	6	8
Southeast	0	3	5	6	9	8
Southwest	14	0	9	16	16	16
Total observed	74	35	64	117	165	25

Table 99. Seasonal use of slope by mule deer in the Birney study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	11	40	30	51	19	24
Gentle	47	11	17	3	19	24
Medium	39	49	33	7	33	32
Steep	3	0	20	39	28	20
Total observed	74	35	64	117	165	25

Whitetail Deer

One hundred and thirty-nine whitetail deer were observed on or near the Birney study area. Average group size was lowest in summer (1.5) and highest in spring (4.4) (Table 100). Fall observations were too few to obtain production data. Aerial observations per hour ranged from zero to 7.5 deer per hour (Table 93).

Table 100. Average group size and vegetational use of white-tailed deer on the Birney study area.

	Spring	Summer	Fall	Winter
Number groups	19	17	3	7
Number deer	83	26	8	22
Average group size	4.4	1.5	2.7	3.1
Vegetational types				
Riparian	7%	42%	0%	41%
Grassland	23	12	38	18
Ponderosa pine/Juniper	4	0	0	41
Agricultural	66	46	62	0

Distribution: Figure 88 shows the distribution of whitetail deer during the entire study. Most of the observations were actually outside the study area boundary, along the Tongue River. They were most often observed in the uplands within the study area during winter.

Use of vegetation: The vegetation data were lumped into four main vegetational types because of the small number of observations (Table 100). Most whitetail deer were observed in the agricultural type, except during winter. All agricultural observations were in alfalfa hay fields. Winter sightings were mainly in types which provided shelter: ponderosa pine and riparian types. More specifically, most of these sightings were in the ponderosa pine-juniper and deciduous tree cover types. Grassland areas received the highest use during fall. Most grassland observations were in greasewood flats adjacent to the river bottom.

Use of topography, slope, exposure: Nearly all of the whitetail deer were observed on flood plains or alluvium/terrace areas of flat or gentle slope. Whitetail deer use more rugged topography in other areas where they are not dependent on river bottom forests for food and cover (Dusek 1980).

Antelope

Twenty-five antelope were observed on the Birney study area during the study. Most of the study area is marginal or unsuitable for antelope. Observations centered in two areas: 1) The ridge between Bull and Cook Creek near the Cheyenne Indian Reservation

Figure 88. White-tailed deer observations on the Birney study area.

in the northwestern part of the study area; 2) the northeastern corner of the study area, just south of Cook Creek. All the observations were in spring or summer.

Sharp-tailed Grouse

Nine sharp-tailed grouse dancing grounds were located in or near the study area (Figure 89). Attendance by male birds at known grounds averaged 11.5 in 1980 and 9.2 in 1981 (Table 101). Comparisons between the two years on the two grounds located in 1980 indicates a decrease. This is consistent with the trend in the southeastern part of the state (Knapp et al. 1981).

There are approximately 0.18 grounds per square mile in the study area. This compares with 0.09 grounds per square mile in the Sarpy Creek drainage (Martin 1980a), 0.12 grounds per square mile in the Colstrip area (Schwarzkooph 1980) and 0.22 grounds per square mile in the Otter Creek area (Martin 1980b). However, the average attendance was much higher on grounds in the Otter Creek area (17.8 in 1980). No broods were observed in the study area.

Table 101. Sharp-tailed grouse dancing grounds in the Birney study area and number of males attending in 1980 and 1981.

Ground Number	Location			Males Observed	
	T	R	S	1980	1981
1	6S	42E	4 SW $\frac{1}{4}$	5	5
2	5S	41E	29 NW $\frac{1}{4}$	18	10
3	5S	41E	17 SW $\frac{1}{4}$		5
4	5S	42E	27 NW $\frac{1}{4}$		25
5	6S	42E	12 SW $\frac{1}{4}$		3
6	6S	42E	22 NW $\frac{1}{4}$		3
7	6S	42E	19 SE $\frac{1}{4}$		6
8	5S	42E	34 NE $\frac{1}{4}$		8
9	5S	40E	24 NE $\frac{1}{4}$		18

Ring-necked Pheasant

Ring-necked pheasants occur along the Tongue River and the lower ends of Bull, Whitten and Zook Creeks. A pheasant crow count was run along the Tongue River south of Birney. Stops 1-6 were along the county road on the opposite side of the river from the Birney study area. Crow counts averaged 2.1 per stop in 1980 and 5.4 per stop in 1981. The low count in 1980 was probably due to foggy weather during the two days of census. A nest with 16 eggs was found in deciduous tree and shrub cover along the river bottom bird census trip in 1981 (Figure 91). The nest was

Figure 89. Sharp-tailed grouse breeding grounds and observations on the Birney study area.

later destroyed by predators. A brood with six young was seen in Birney in 1981.

Turkey

A flock of approximately 33 turkeys wintered on the Tongue River just on the edge of the study area (Figure 90). Only a few scattered observations were made in the study area, mainly in spring and fall. One group of six young with one hen was seen. A rancher indicated that a flock of about 40 turkeys formerly wintered on Cook Creek (Figure 90). This was probably the same flock which now winters on the Tongue River.

Waterfowl

Thirteen species of waterfowl were observed on the study area (Table 102). The large pond near the head of Cook Creek in the northwestern corner of the study area produced three broods of mallards and one brood of American wigeon in 1980. A pair of Canada geese nested in the northern great blue heron rookery on the Tongue River in 1980. A brood of geese was observed on the Tongue River in 1981.

Below average precipitation during the fall and winter of 1979 and 1980 resulted in little or no water in most of the stockponds by fall of 1981. The cluster of ponds near the head of Cook Creek in the northwestern corner of the study area held water throughout the study period, although no broods were produced on them in 1981. These ponds were used frequently in the spring and fall by migrating waterfowl and shorebirds.

Songbirds

One hundred and eighteen species of birds including game species were observed on the study area (Table 102). Eighty-seven of these were either suspected or confirmed breeders on the study area. This list is not thought to be complete. A number of additional species were recorded during the baseline wildlife study for the Montco mine permit application (Olson-Elliott and Associates 1980). Their study area overlapped the Birney study area by about 2 square miles on the northeast corner.

The songbird census road route (Figure 91) was run three times in 1980, but only once in 1981 due to bad weather, so the results were combined. The vegetation along the route was approximately 72% sage-grassland, 22% ponderosa pine and juniper, and 6% riparian. A total of 546 birds and 46 species were observed (Table 103). Western meadowlarks, chipping sparrows, vesper sparrows, and lark sparrows were the most common, together making up 50% of the total number of birds counted. They were also observed more frequently than other species, indicating a wide-spread distribution with little clumping.

Figure 90. Great blue heron rookery and turkey observations and wintering grounds on the Birney study area.

Figure 91. Birney study area songbird road survey route and songbird census strip and small mammal trapline locations.

Table 102. Breeding status of the bird species observed on the Birney study area.

Species	Breeding Status*	Species	Breeding Status*
1 Double-crested cormorant	V	51 Red-headed woodpecker	b
2 Great blue heron	B	52 Lewis' woodpecker	b
3 Canada goose	B	53 Hairy woodpecker	b
4 Mallard	B	54 Downy woodpecker	b
5 Gadwall	M	55 Eastern kingbird	b
6 Pintail	M	56 Western kingbird	b
7 Green-winged teal	M	57 Cassin's kingbird	b
8 Blue-winged teal	M	58 Say's phoebe	b
9 American wigeon	B	59 Least flycatcher	b
10 Northern shoveler	M	60 Dusky flycatcher	b
11 Wood duck	M	61 Western wood pewee	b
12 Redhead	M	62 Horned lark	b
13 Lesser scaup	M	63 Violet-green swallow	b
14 Bufflehead	M	64 Tree swallow	b
15 Common merganser	M	65 Barn swallow	b
16 Turkey vulture	b	66 Cliff swallow	B
17 Goshawk	b	67 Black-billed magpie	B
18 Sharp-shinned hawk	b	68 Piñon jay	b
19 Red-tailed hawk	B	69 Clark's nutcracker	t
20 Rough-legged hawk	W	70 Black-capped chickadee	b
21 Golden eagle	V	71 White-breasted nuthatch	b
22 Bald eagle	W	72 Red-breasted nuthatch	b
23 Marsh hawk	M	73 House wren	b
24 Osprey	M	74 Canyon wren	b
25 Prairie falcon	B	75 Rock wren	b
26 Merlin	M	76 Gray catbird	b
27 American kestrel	b	77 Brown thrasher	B
28 Sharp-tailed grouse	B	78 American robin	b
29 Ring-necked pheasant	B	79 Wood thrush	M
30 Turkey	B	80 Mountain bluebird	B
31 Killdeer	b	81 Townsend's solitaire	b
32 Common snipe	b	82 Bohemian waxwing	W
33 Upland sandpiper	b	83 Cedar waxwing	t
34 Spotted sandpiper	b	84 Loggerhead shrike	b
35 Solitary sandpiper	M	85 Starling	b
36 Willet	M	86 Solitary vireo	b
37 Lesser yellowlegs	M	87 Red-eyed vireo	b
38 Semipalmated sandpiper	M	88 Warbling vireo	b
39 Wilson's phalarope	M	89 Yellow warbler	b
40 Rock dove	V	90 Yellow-rumped warbler	b
41 Mourning dove	b	91 Common yellowthroat	b
42 Yellow-billed cuckoo	b	92 Yellow-breasted chat	b
43 Black-billed cuckoo	b	93 American redstart	t
44 Screech owl	b	94 Western meadowlark	b
45 Great-horned owl	B	95 Red-winged blackbird	b
46 Poor-will	b	96 Northern oriole	b
47 Common nighthawk	b	97 Brewer's blackbird	b
48 White-throated swift	b	98 Common grackle	b
49 Belted kingfisher	b	99 Brown-headed cowbird	b
50 Common flicker	b	100 Western tanager	b

Table 102. Continued

Species	Breeding Status*
101 Black-headed grosbeak	b
102 Lazuli bunting	b
103 Evening grosbeak	W
104 Cassin's finch	b
105 Pine siskin	b
106 American goldfinch	b
107 Red crossbill	B
108 Rufous-sided towhee	b
109 Lark bunting	b
110 Vesper sparrow	b
111 Lark sparrow	b
112 Dark-eyed junco	b
113 Tree sparrow	w
114 Chipping sparrow	b
115 Brewer's sparrow	b
116 Field sparrow	b
117 White-crowned sparrow	M
118 Song sparrow	b

B - confirmed breeding (nest or dependent young observed).
 b - suspected breeding (present during breeding season)
 V - Visitor (breeds nearby, but not on study area)
 t - present, but no evidence of breeding
 W - Winter resident and migrant only
 M - Migrant only

The walking census stops (Figure 91) were only run once each due to bad weather, so the results should only be used for general comparisons between habitats. River bottom riparian habitat was by far the most diverse and productive for songbirds (Table 104). The intermittent creek riparian strip was along Whitten Creek where the deciduous cover was discontinuous and bordered mostly by ponderosa pine-juniper habitat. It is not surprising that this census strip was similar in diversity and productivity to the ponderosa pine-juniper census strip (Tables 105 and 106). The intermittent creek riparian strip in the Kirby area, with thicker, more continuous deciduous cover adjacent to sagebrush flats, was similar to the river bottom riparian in diversity and productivity (Tables 104 and 105), indicating a wide variation in productivity of intermittent creeks. The sagebrush census strip had the fewest number of species and numbers of birds (Table 107). These results and other studies in southeastern Montana by Swenson (1978b), Hickey and Mikol (1979), Martin (1980a), Herbert (1977), Matthews (1981),

Table 103. Species composition, frequency of occurrence, and numbers of songbirds observed on the Birney road census route.

Species	Number Observed		Total no. (4 runs or 80 stops)	% Frequency (No stops of Occurrence ÷ 80 stops total)		Percent Species Comp.
	1980 (3 runs)	1981 (1 run)				
Western meadowlark	115	33	148	81	27	
Chipping sparrow	60	12	72	49	13	
Vesper sparrow	40	14	54	41	10	
Lark sparrow	18	20	38	28	7	
Rufous-sided towhee	23	5	28	28	5	
House wren	17	8	25	22	5	
American robin	10	8	18	19	3	
Red crossbill	0	16	16	5	3	
Yellow warbler	7	7	14	14	3	
Brown-headed cowbird	7	5	12	10	2	
Western kingbird	7	5	12	8	2	
Mountain bluebird	5	4	9	11	2	
Yellow-rumped warbler	3	6	9	9	2	
Brewer's blackbird	4	5	9	4	2	
Red-winged blackbird	7	1	8	9	1	
Brewer's sparrow	5	3	8	6	1	
Cassin's kingbird	1	6	7	5	1	
Rock wren	3	3	6	6	1	
Northern oriole	3	3	6	6	1	
Western wood pewee	4	2	6	5	1	
Eastern kingbird	4	1	5	5	1	
Say's phoebe	2	1	3	4	1	
Common grackle	3	0	3	4	1	
Solitary vireo	0	2	2	2	+	
Common flicker	2	0	2	2	+	
Upland sandpiper	2	0	2	2	+	
Least flycatcher	0	2	2	2	+	
Dusky flycatcher	0	2	2	2	+	
Tree swallow	2	0	2	1	+	
Violet-green swallow	2	0	2	1	+	
Lark bunting	1	0	1	1	+	
Black-capped chickadee	1	0	1	1	+	
American goldfinch	0	1	1	1	+	
White-breasted nuthatch	0	1	1	1	+	

Table 103 continued.

Species	Number observed		Total no.	% Frequency		Percent
	1980	1981	(4 runs or 80 stops)	(No. stops of Occurrence ÷ 80 stops total)	Species Comp.	
Common yellowthroat	0	1	1	1	+	
Clark's nutcracker	0	1	1	1	+	
Western tanager	0	1	1	1	+	
Dark-eyed junco	0	1	1	1	+	
Yellow-breasted chat	0	1	1	1	+	
Gray catbird	0	1	1	1	+	
Song sparrow	0	1	1	1	+	
Mourning dove	0	1	1	1	+	
Lazuli bunting	0	1	1	1	+	
Barn swallow	0	1	1	1	+	
American kestrel	0	1	1	1	+	
Killdeer	0	1	1	1	+	
46 species						
546 birds						
+ - less than 1%						

Table 104. Total numbers, numbers of singing males, and percent composition of songbirds observed on the river bottom riparian census strip on the Birney study area.

Species	Total of Singing Males		Total of all Birds	
	No. Observed	% Composition	No. Observed	% Composition
Yellow warbler	25	28	28	19
House wren	23	26	24	16
Least flycatcher	13	15	17	11
American robin	4	5	14	9
Common grackle	0	0	10	7
Yellow-breasted chat	8	9	8	5
Western wood pewee	1	1	8	5
Red crossbill	0	0	7	5
Western kingbird	2	2	5	3
Eastern kingbird	0	0	5	3
Northern oriole	3	3	3	2
Mourning dove	0	0	3	2
Black-capped chickadee	1	1	2	1
Brewer's blackbird	0	0	2	1
Brown-headed cowbird	0	0	2	1
Song sparrow	1	1	2	1
Rufous-sided towhee	1	1	1	1
Black-headed grosbeak	1	1	1	1
Gray catbird	1	1	1	1
Starling	1	1	1	1
Warbling vireo	1	1	1	1
Red-eyed vireo	1	1	1	1
Lark sparrow	1	1	1	1
Common flicker	0	0	1	1
Screech owl	0	0	1	1
Hairy woodpecker	0	0	1	1
Belted kingfisher	0	0	1	1
American goldfinch	0	0	1	1
28 species	88		151	

Table 105. Total numbers, numbers of singing males, and percent composition of songbirds observed on the intermittent creek riparian census strip on the Birney study area.

Species	Total of Singing Males		Total of All Birds	
	No. Observed	% Composition	No. Observed	% Composition
Red crossbill	0	0	20	26
House wren	8	30	11	14
Chipping sparrow	4	15	11	14
American robin	2	7	9	12
Mountain bluebird	1	4	5	7
Dusky flycatcher	4	15	4	5
Dark-eyed junco	1	4	4	5
Yellow warbler	3	11	3	4
Rufous-sided towhee	2	7	2	3
Lark sparrow	1	4	2	3
Brewer's blackbird	0	0	2	3
Brown-headed cowbird	0	0	2	3
Solitary vireo	1	4	1	1
13 species	27		76	

Table 106. Total numbers, numbers of singing males, and percent composition of songbirds observed on the ponderosa pine census strip on the Birney study area.

Species	Singing Males		All Birds	
	No.	Percent	No.	Percent
	Observed	Composition	Observed	Composition
Chipping sparrow	7	29	21	32
Yellow-rumped warbler	6	25	9	14
Red crossbill	0	0	7	11
Western wood pewee	4	17	4	6
American robin	0	0	4	6
Red-breasted nuthatch	0	0	3	5
House wren	2	8	2	3
Townsend's solitaire	1	4	2	3
White-breasted nuthatch	0	0	2	3
Mountain bluebird	0	0	2	3
Pine siskin	0	0	2	3
Brown-headed cowbird	0	0	2	3
Dark-eyed junco	1	4	1	2
Dusky flycatcher	1	4	1	2
Solitary vireo	1	4	1	2
Lark sparrow	1	4	1	2
American goldfinch	0	0	1	2
17 species	24		65	

Table 107. Total numbers, numbers of singing males, and percent composition of songbirds observed on the sagebrush census strip on the Birney study area.

Species	Singing Males		All Birds	
	No.	Percent	No.	Percent
	Observed	Composition	Observed	Composition
Brewer's sparrow	16	46	22	37
Lark sparrow	6	17	14	24
Western meadowlark	6	17	10	17
Vesper sparrow	6	17	9	15
Rufous-sided towhee	1	3	1	2
Mourning dove	0	0	1	2
Chipping sparrow	0	0	1	2
Mountain bluebird	0	0	1	2
8 species	35		59	

and DuBois (1979) all point out the importance of deciduous tree and shrub cover to songbirds. The presence or absence of water year-round mainly affects the songbird community indirectly by affecting the quantity and quality of deciduous tree and shrub (riparian) vegetation.

Raptors

Twelve species of hawks and two species of owls were found on the study area. Nine of these were known or suspected breeders. Thirteen nests, excluding the American kestrel, were located in or near the study area (Table 108 and Figure 92). This nest census is not considered complete. In addition, a turkey vulture roosting area was identified (Figure 92). About 15-20 turkey vultures used this roost throughout both summers. Red-tailed hawks, great-horned owls, and American kestrels were the most common breeding raptors.

Ten species of raptors were observed migrating or wintering on the study area. Observations of all except the American kestrel are shown in Figure 93. Two areas of high use by wintering bald eagles are delineated. The distribution of wintering bald eagles probably depends on the location of open water "holes" while the river is frozen. Bald eagles were observed eating fish next to these "holes" during the short period in January and February 1981 when the Tongue River was frozen. Livestock loss also provides food along river bottoms for wintering eagles.

The goshawk, Cooper's hawk, golden eagle, bald eagle, osprey, prairie falcon, and merlin are listed as species of special interest or concern by Flath (1981). The golden eagle, bald eagle, osprey, prairie falcon, and merlin are also listed as species of high federal interest. The status of each of these within the study area is as follows:

Goshawk- One was observed on 2 June 1980, which is within the normal nesting period for this species. One sighting does not constitute good evidence for breeding; however, several unidentified accipiters (observed from too far for this observer to correctly judge size and color) may have been goshawks, and some suitable habitat for nesting goshawks is present in the study area.

Cooper's hawk - One migrant was observed. This species may also be present as a breeder (see explanation under goshawk). Accipiters tend to nest in heavily timbered areas where they are easily overlooked in general wildlife surveys.

Golden eagle - This species is listed as a visitor. Several pairs of eagles appeared to have territories to the north, east, and southeast of the study area, but were rarely observed on the study area. Although these birds were mapped as "breeding" eagles on the breeding raptors map, the study area does not

Figure 92. Resident raptors observations on the Birney study area.

Figure 93. Migrant raptor observations on the Birney study area.

Table 108. Nest substrates and production data of raptor nests on the Birney study area.

Nest No.	Species	Substrate	Activity	
			1980	1981
1	Red-tailed hawk	Cottonwood	Active, no production data	3 eggs laid, no fledging data
2	Red-tailed hawk	Cottonwood	Active, no production data	2 eggs laid, no fledging data
3	Red-tailed hawk	Cottonwood	Active, no production data	Inactive
4	Red-tailed hawk	Cottonwood	Inactive	1 young fledged
5	Red-tailed hawk	Cottonwood	Inactive	3 young hatched, 1 fledged
6	Red-tailed hawk	Cliff	Status unknown	Inactive
7	Red-tailed hawk	Cliff	Status unknown	Inactive
8	Red-tailed hawk	Cliff	Status unknown	Inactive
9	Red-tailed hawk	Cottonwood	Status unknown	1 egg laid, no fledging data
10	Great-horned owl	Cottonwood	Inactive	Active, no production data
11	Great-horned owl	Cottonwood	Inactive	2 young fledged
12	Great-horned owl	Hole in dirt bank	Status unknown	At least 1 young produced
13	Prairie falcon	Cliff	Active, no production data	5 eggs laid, 3 young fledged

support any major portion of an eagle territory. All fall and winter observations of golden eagles were mapped as "nonbreeders" although some of these may have been resident eagles from surrounding territories. The reason why territorial golden eagles are absent on the study area, yet present in adjacent, similar habitat is not known. The absence of a sufficient prey base may be a factor. Prairie dogs, formerly abundant on the study area, have all been eliminated. They are often a major food source for golden eagles.

Bald eagle - As mentioned above, bald eagles occur throughout the winter, primarily along the Tongue River. They were present from about the end of October to mid-late April.

Osprey - Several ospreys were sighted along the Tongue River. They were all assumed to be migrants. The nearest osprey nest is located on the Tongue River Reservoir, about 20 miles to the south.

Prairie falcon- One prairie falcon aerie was located in the study area. It was active both summers of the study. Prairie falcons were sighted over the study area fairly far from the known nest. It is not known if these were members of that pair, visitors with aeries outside the study area, or territorial non-breeders. Another cliff in the study area with suitable potholes was checked for falcons, but none were found. This cliff was suspected to have been occupied by great-horned owls. Most of the cliffs in the study area did not have suitable potholes or ledges for nesting prairie falcons.

Merlin - One merlin, assumed to be a migrant, was observed. Suitable habitat for nesting merlins does occur in the study area, so future nesting is a possibility.

Saw-whet owl - This species was not observed in the study area, but was suspected to occur in the marsh at the mouth of Cook Creek. Suitable habitat for them is also found on the upper ends of Bull Creek and Cook Creek.

Other Special Interest Species

The Brewer's sparrow, field sparrow, and upland sandpiper are also listed by Flath (1981) as species of special interest or concern. All three were suspected breeders on the study area. Upland sandpipers were commonly observed on the ridge near sharp-tailed grouse ground number 2 (Figure 89). Brewer's sparrows were common in sagebrush habitat throughout the study area. One territorial field sparrow was observed on Coal Bank Creek during the breeding season.

The double-crested cormorant and Lewis' woodpecker are listed as migratory bird species of high federal interest for the Powder River Coal Region. The double-crested cormorants were visitors from a rookery located on the Tongue River Reservoir. Lewis' woodpeckers were occasionally seen on Cook Creek near the reservoir in the northwestern corner of the study area.

Two great blue heron rookeries were located on the Tongue River (Figure 90). They each had around 10-15 nests. Although not a special interest species. Their nests are often used by raptors or waterfowl. A pair of red-tailed hawks nested in the southern rookery in 1981, and a pair of Canada geese nested in the northern rookery in 1980.

Nongame Mammals

Twenty-four species of mammals including game species were observed in the Birney study area (Table 109). This list is probably not complete. Thirteen small mammal traplines were run, seven during the summer and six during fall (Figure 91). Trapping success was higher in the fall (1.6 captures/100 trap nights, 5 species) than in summer (0.9 capture/100 trap nights, 3 species). Table 110 lists the results of small-mammal trapping, separated by habitat. Although cliff habitat appears to have had the highest trapping success, only one trapline was run in this habitat. One fall trapline in riparian habitat had a success of 2.9 captures/100 trap nights, the highest success rate of any trapline. However, this high rate was offset by another fall riparian trapline which met with zero success. The other two riparian traplines were set in exactly the same location. The summer trapline had a success rate of 0.5 captures/100 trap nights, and the fall trapline had 1.7 captures/100 trap nights. This all suggests that generalizations about small-mammal productivity in different habitats cannot be made with sample sizes as small as ours because of: 1) large seasonal differences in trapping success on any one site; 2) large differences in trapping success between different localities.

A total of 57 coyotes were observed during the study. Coyote observations per hour of aerial survey reached a high of 3.8 obs/hr in January. Bobcat tracks were noted in several areas and one bobcat was trapped on Zook Creek by a local resident during the winter of 1980-81. A mountain lion was seen along the Tongue River north of Birney by Dr. A. Hayes in May 1981, only about 1½ miles outside the study area.

One mammal species, observed during this study the western big-eared bat, is considered by Flath (1981) to be of special interest or concern. This bat was found in an old root cellar on Bull Creek, near the western edge of the study area.

Historically, extensive prairie dog towns were found along the Tongue River and most of the creek bottoms (Olson-Elliott and Associates 1980). There are presently no known active prairie dog towns on the Birney study area, although old mounds are still visible in areas along Bull Creek and Cook Creek.

Amphibians and Reptiles

Seven species of herpetiles were observed on the Birney study area (Table 111). This list is not considered to be complete. Racers and rattlesnakes were the two most commonly encountered reptiles.

Northern chorus frogs were rarely seen, but were heard along most of the creek bottoms early in spring.

Table 109. Mammals observed on the Birney study area.

	Common Name	Scientific Name
1	Big brown bat	<i>Eptesicus fuscus</i>
2	Western big-eared bat	<i>Plecotus townsendi</i>
3	Raccoon	<i>Procyon lotor</i>
4	Mink	<i>Mustela vison</i>
5	Striped skunk	<i>Mephitis mephitis</i>
6	Coyote	<i>Canis latrans</i>
7	Bobcat	<i>Lynx rufus</i>
8	Yellowbelly marmot	<i>Marmota flaviventris</i>
9	Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
10	Least chipmunk	<i>Eutamias minimus</i>
11	Red squirrel	<i>Tamiasciurus hudsonicus</i>
12	Northern pocket mouse	<i>Thomomys talpoides</i>
13	Wyoming pocket mouse	<i>Perognathus fasciatus</i>
14	Ord kangaroo rat	<i>Dipodomys ordi</i>
15	Beaver	<i>Castor canadensis</i>
16	Deer mouse	<i>Peromyscus maniculatus</i>
17	Northern grasshopper mouse	<i>Onychomys leucogaster</i>
18	Bushytail woodrat	<i>Neotoma cinerea</i>
19	Muskrat	<i>Ondatra zibethicus</i>
20	Porcupine	<i>Erethizon dorsatum</i>
21	Desert cottontail	<i>Sylvilagus audubonii</i>
22	Mule deer	<i>Odocoileus hemionus</i>
23	Whitetail deer	<i>Odocoileus virginianus</i>
24	Pronghorn antelope	<i>Antilocapra americana</i>

Table 110. Results of small-mammal trapping on the Birney study area

	Sagebrush	Ponderosa Pine	Riparian	Cliff
Total captures	16	16	21	9
Trap nights	1575	1610	1585	405
Captures/100 trap nights	1.0	1.0	1.3	2.2
Number of species caught	4	3	2	1
Species:				
<i>Peromyscus maniculatus</i>	12	13	20	9
<i>Eutamias minimus</i>		2		
<i>Perognathus fasciatus</i>	1			
<i>Thomomys talpoides</i>			1	
<i>Onychomys leucogaster</i>	1			
<i>Neotoma cinerea</i>		1		
<i>Dipodomys ordi</i>	1			

Table 111. Amphibians and reptiles observed on the Birney study area.

Common Name	Scientific Name
1 Leopard frog	<i>Rana pipiens</i>
2 Woodhouses's toad	<i>Bufo woodhousei</i>
3 Northern chorus frog	<i>Pseudacris triseriata</i>
4 Painted turtle	<i>Chrysemys picta</i>
5 Racer	<i>Coluber constrictor</i>
6 Bull snake	<i>Pituophis melanoleucus</i>
7 Prairie rattlesnake	<i>Crotalus viridis</i>

Kirby

Mule Deer

Population characteristics: During the study 1,325 mule deer were observed in the Kirby study area (Table 112). Average group size ranged from 1.9 in summer to 6.6 in winter. Deer followed the annual pattern of large groups during winter and early spring, and small groups during summer when they dispersed and moved to summer range.

Mule deer observations per hour of aerial survey ranged from 7.5 deer/hour in summer to 33.6 deer/hour in winter (Table 113). Many more deer were observed in the western half of the study area than in the eastern half, so these values represent the average of the two greatly different areas.

Mule deer population structure was determined during October and November (Table 114). Fawn production was much better than on the Birney area, with 93.5 fawns per 100 does observed in October, when 85 deer were classified. This population is probably stable or increasing slightly (Swenson 1978a).

Distribution: Spring distribution is shown in Figure 94. Deer groups were scattered throughout the study area, but the largest groups were all located in the western half of the study area.

During summer mule deer were broken into small groups and dispersed throughout the study area (Figure 95). The groups tended to be more numerous in the western half of the study area, which is higher and wetter, with better developed riparian areas and more lush grassy cover than the eastern half. The western half appears to be much better summer range for mule deer than the

Figure 94. Spring mule deer distribution on the Kirby study area.

LEGEND

- Intermittent stream.....
- River.....
- Unpaved road.....
- Study area.....
- Mule deer observations
- Group size
- 1 - 3...△.....○
- 4 - 8...△.....⊙
- 9 - 15...△.....⊕
- 16+...△.....●
- Year: 1980 1981

Figure 95. Summer mule deer distribution on the Kirby study area.

Table 112. Average group size of mule deer in the Kirby Dam area.

Month	No. Groups	No. Deer	Average
April	18	157	8.7
May	20	62	3.1
Spring	38	219	5.8
June	9	12	1.3
July	16	32	2.0
August	8	19	2.4
Summer	33	63	1.9
September	1	5	5
October	24	82	3.4
November	23	80	3.5
Fall	48	167	3.5
December	11	56	5.1
January	7	47	6.7
February	7	61	8.7
Winter	25	164	6.6
March	27	160	5.9
April	41	258	6.3
May	44	118	2.7
Spring	112	536	4.8
June	36	63	1.75
July	39	71	1.8
August	17	42	2.5
Summer	92	176	1.9

eastern half. Several mule deer with radio collars were observed on and near the study area. These deer were collared during winter on the CX Ranch, East Decker, and West Decker mines during several years of trapping (Biggins and Phillips 1979). They appeared to summer on the west and east sides of Rosebud Creek, including the west edge of the study area.

During fall the groups were larger as the mule deer started to congregate (Figure 96). Most of the larger groups were found in two main areas in the western half of the study area.

Winter distribution is shown in Figure 97. Most of the mule deer were in groups of four or more, and located at higher elevations along the tops of ridges. The extent of critical winter range is uncertain due to the mild winter. The presence of large groups in the northwestern part of the study area suggests that the winter range may be located on the high ridges in this area. The

Table 113. Mule deer, antelope and coyote aerial observations in the Kirby study area.

Year	Month	Aerial Observations				Observations/Hour				Coyotes/100:		
		Hours	Mule		Antelope	Coyote	Mule		Antelope	Coyote	Deer	Antelope
			Deer	Antelope			Deer	Antelope				
1980	May	2.3	30	22	2	2	13.0	9.6	0.9	0.9	6.7	9.1
	June	2.2	12	16	4	4	5.5	7.3	1.8	1.8	33.3	25.0
	July	2.8	29	24	7	7	10.4	8.6	2.5	2.5	24.1	29.2
	August	2.6	16	13	1	1	6.2	5.0	0.4	0.4	6.2	7.7
	Summer	7.6	57	53	12	12	7.5	7.0	1.6	1.6	21.1	22.6
1981	October	3.0	77	32	9	9	25.7	10.7	3.0	3.0	11.7	28.1
	November	2.9	79	9	9	9	27.2	3.1	3.1	3.1	11.4	100.0
	Fall	5.9	156	41	18	18	26.4	6.9	3.1	3.1	11.5	43.9
	December	2.5	56	59	0	0	22.4	23.6	0	0	0	0
	January	2.2	47	0	1	1	21.4	0	0.5	0.5	2.1	-
	February	2.2	61	0	0	0	27.7	0	0	0	0	-
	Winter	6.9	164	59	1	1	23.8	8.6	0.1	0.1	0.6	1.7
	March	3.6	106	31	6	6	29.4	8.6	1.7	1.7	5.7	19.4
	April	2.7	104	11	10	10	38.5	4.1	3.7	3.7	9.6	90.9
	May	3.4	116	12	2	2	34.1	3.5	0.6	0.6	1.7	16.7
	Spring	9.7	326	54	18	18	33.6	5.6	1.9	1.9	5.5	33.3
	June	2.8	49	16	1	1	17.5	5.7	0.4	0.4	2.0	6.3
	July	2.7	63	17	0	0	23.3	6.3	0	0	0	0
	August	2.5	34	11	0	0	13.6	4.4	0	0	0	0
	Summer	8.0	146	44	1	1	18.3	5.5	0.1	0.1	0.7	2.3

Table 114. Mule deer population characteristics in the Kirby study area.

Year	Month	Number Classified				Fawns:100		Bucks:		Population Structure(%)		
		Total	Bucks		Fawns	Does	Adults	100	Does	Bucks	Does	Fawns
			Bucks	Does								
1980	October	85	25	31	29	93.5	51.8	80.6	29.4	36.5	34.1	
	November	25	9	9	7	77.8	38.9	100.0	36.0	36.0	28.0	

LEGEND

Intermittent stream.....

River.....

Unpaved road.....

Study area.....

Mule deer observations

Group size

1 - 3....△

4 - 8....△

9 - 15...△

16+....△

Year: 1980

Figure 96. Fall mule deer distribution on the Kirby study area.

Figure 97. Winter mule deer distribution on the Kirby study area.

LEGEND

- Intermittent stream.....~
- River.....=
- Unpaved road.....-
- Study area.....-
- Mule deer observations
- Group size
- 1 - 3.....△
- 4 - 8.....△
- 9 - 15.....△
- 16+.....▲
- Year: 1980 - 81

key parts to this wintering area may be the high, wind-swept ridges and large deciduous shrub thickets in the draws to provide food and shelter.

It appeared that many more deer were observed in the western half of the study area, although both halves were covered roughly equally by plane, and much more time was spent in the eastern half on the ground. The difference in mule deer numbers between the two halves of the study area were estimated by dividing the area in half along the 357000 M.E mercator line and estimating area and deer numbers observed in each half. The eastern half contained approximately 52% of the study area. Roughly 25% of the deer observed (332 deer) were in the eastern half. The western half of the study area contained approximately 48% of the area and 75% of the observed mule deer (993 deer). Average group size for the totals of all seasons' observations were 4.2 in the western half, 2.9 in the eastern half, and 3.8 for all observations in the entire study area. The western half of the study area definitely has a higher mule deer population than the eastern half, probably due to the differences in vegetation discussed earlier.

Vegetation use: Mule deer made heavy use of ponderosa pine types during the entire study (Table 115). Numbers of deer observed in this type peaked during winter. Numbers of deer observed in grasslands were highest during both springs, and lowest in fall. High numbers of deer used riparian habitat, especially the deciduous shrub type, during the hot, dry summer of 1980. Use of riparian habitat was also high in summer 1981 and in fall 1980.

Activity: The majority of mule deer observed were feeding in all seasons except fall and winter, when they were usually standing or laying (Table 116). This is similar to the behavior of mule deer in other study areas. The highest numbers of bedded deer were observed in winter, when they tend to lay out in the sun. Bedded deer were probably underestimated during other seasons.

Use of topography: The majority of deer were observed on dissected mid-slopes (Table 117). The percent observed on dissected mid-slopes tended to be lowest in winter. Use of mesa-butte tops and steep side slopes was highest in winter and spring, agreeing with the findings of Martin (1980) in the Otter Creek area. The low use of the mesa-butte tops and steep side slopes during the spring of 1980 was probably due to the lack of sightings in March and early April, when deer are still on or near their winter ranges. Numbers of deer observed on the flood plain or alluvium/terrace features was highest in fall.

Use of exposures: Mule deer choice of exposures did not appear to follow a definite pattern (Table 118). A large proportion of deer were observed on southwest exposures during spring of 1980. During summer, the highest percentage was observed on south-facing slopes. This may reflect the higher visibility of deer on the dryer,

Table 115. Seasonal use of vegetation by mule deer in the Kirby study area.

Vegetational Type	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Ponderosa pine	7	2	1	2	2	
Big sage	5	2		6	5	5
Grassland	14	17	29	46	30	22
Skunkbush		13	21	5	12	10
Juniper	2		2		5	1
Snowberry-rose						4
Total Ponderosa Pine	28	34	53	59	54	42
Big sage	29	2	1	2	19	6
Silver sage/greasewood	5		2		19	6
Xeric grassland	35	14	5	22	18	11
Skunkbush			3		3	9
Total Grassland	69	16	11	24	42	29
Deciduous tree	1	8	3			
Deciduous shrub		43	26	10	3	23
Mesic grass			1			
Pioneer forbs						
Total Riparian	1	51	30	10	3	24
Grassland						
Big sage			1			2
Skunkbush			1	6	2	2
Total Juniper			3	6	2	4
Upland						
Creekbottom	2		2			3
Total Agricultural	2		2			3
Total Observed	201	63	167	164	536	176

Table 116. Seasonal activity of mule deer in the Kirby Study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing/sitting	0	0	35	23	9	12
Running	9	5	12	5	15	23
Laying	4	2	4	37	4	0
Feeding	85	75	40	33	70	61
Walking	2	19	9	2	2	4
Total observed	201	63	167	164	536	176

Table 117. Seasonal use of topography by mule deer in the Kirby Study area.

Topography	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-butte top	5	5	3	18	20	14
Mesa-butte steep side slope	1	19	7	32	23	14
Dissected mid-slope	88	73	81	50	55	64
Alluvium/terrace	4	0	4	0	2	6
Current flood plain	2	3	5	0	0	3
Total observed	201	63	167	164	536	176

Table 118. Seasonal use of exposure by mule deer in the Kirby Study Area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
No exposure (flat)	11	5	8	13	12	9
North	9	10	14	7	15	12
South	5	29	12	7	14	22
East	9	16	16	4	15	14
West	1	6	10	2	10	7
Northeast	5	6	20	46	16	12
Northwest	2	11	13	5	2	10
Southeast	11	13	7	2	4	6
Southwest	47	5	1	15	13	10
Total observed	201	63	167	164	536	176

more open south-facing slopes, rather than a true picture of deer use. During fall roughly equal proportion of deer were found on all exposures except southwest exposures, which may have been too dry in this period. During winter a large proportion of deer were on northeast exposures, just the opposite of what seems logical. The mild winter and lack of snow cover certainly allowed mule deer more freedom of choice of areas to feed in. Spring and summer 1981 observations were scattered over all exposures, with no clear preferences.

Use of slope: The majority of mule deer observed were on medium slopes (Table 119). Numbers of deer on gentle slopes was highest in summer and fall and lowest in spring and winter. The proportion of deer on steep slopes was highest in spring and summer of 1981, and much lower in winter than on the Birney study area.

Whitetail Deer

Eighty-one whitetail deer were observed on the Kirby study area. Average group size was highest in spring and lowest in summer (Table 120). Fall observations were too few to obtain production data.

Distribution: Figure 98 shows the distribution of whitetail deer during the entire study. All of the observations were on or near the Tongue River.

Use of vegetation: The vegetation data were lumped into four main vegetational types because of the small number of observations (Table 120). Most of the spring observations were in the ponderosa pine and juniper series (mostly juniper-sage) and the grassland series (all in sagebrush). Deer were observed in all four types during summer, but mainly in the riparian type. All of the observations in fall were in riparian types. Only one group was sighted during winter, in juniper-sage habitat. Undoubtedly many deer in deciduous tree and shrub riparian types were missed due to poor observability in these types.

Use of topography, slope, exposure: Nearly all of the whitetail deer were on flat or gentle slopes near the river where exposure is not important. They often used alluvium/terraces near the river, but rarely used more rugged uplands.

Antelope

Four hundred and seven antelope were observed on the Kirby study area. Average group size ranged from 2.6 in summer to 29.5 in winter (Table 121). Dispersal from the large winter herds into small groups occurred in March and April. Antelope were most easily observed in December, when 23.6 antelope were observed per hour of aerial survey (Table 113). Fawn production appeared to be low in both years (Table 122), but this may be an artifact of the small sample sizes classified.

Figure 98. White-tailed deer observations on the Kirby study area.

LEGEND

Intermittent stream.....	~~~~~
River.....	~~~~~
Unpaved road.....	———
Study area.....	———
White-tailed deer observations:	
Group size: 1-3 4-8 9-15	
Spring.....	○ ○ ⊕
Summer.....	△ △ △
Fall.....	○ ○ ⊕
Winter.....	□ □ ⊕

Table 119. Seasonal use of slope by mule deer in the Kirby study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	11	5	8	13	12	9
Gentle	7	36	29	11	15	23
Medium	82	57	58	70	56	49
Steep	0	2	4	6	17	19
Total Observed	201	63	167	164	536	176

Table 120. Average group size and vegetational use of white-tailed deer on the Kirby study area.

	Spring	Summer	Fall	Winter
Number groups	8	9	3	1
Number deer	42	21	13	5
Average group size	5.3	2.3	4.3	5.0
Vegetational type				
Riparian	0%	48%	100%	0%
Ponderosa pine/juniper	38	24	0	100
Grassland	55	10	0	0
Agricultural	7	19	0	0

Distribution: In spring most of the antelope were observed in the southwestern corner of the study area (Figure 99). Summer observations were even more concentrated into the southwestern corner (Figure 100). Many newborn and young fawns were observed in this area in both years, indicating that this is used as a fawning area. Few antelope were seen in suitable antelope habitat extending to the north of this area.

Fall distribution is shown in Figure 101. Only a few large groups of antelope were observed in fall, mainly in the southwestern portion of the study area. Only two herds were observed in winter, both in December (Figure 102). No antelope were observed on the study area in January and February. Thus, it appears that antelope use the southwestern corner of the study area for fawning and summering, then move out of the area to winter.

Table 121. Average group size of antelope in the Kirby study area.

Month	No. Groups	No. Antelope	Average
April	7	35	5.0
May	11	38	3.4
Spring	18	73	4.1
June	9	22	2.4
July	6	24	4.0
August	4	15	3.8
Summer	19	61	3.2
September	1	1	1.0
October	4	32	8.0
November	1	9	9.0
Fall	6	42	7.0
December	2	59	29.5
January	0	0	0
February	0	0	0
Winter	2	59	29.5
March	7	70	10.0
April	9	27	3.0
May	12	28	2.3
Spring	28	125	4.5
June	9	19	2.1
July	5	17	3.4
August	4	11	2.8
Summer	18	47	2.6

Table 122. Antelope population characteristics in the Kirby study area

Year	Month	Number Classified				Fawns:100		Bucks:	Population Structure (		
		Total	Bucks	Does	Fawns	Does	Adults	100 Does	Bucks	Does	Fawns
1980	June	16	6	9	1	11.1	6.3	66.7	37.5	56.2	6.3
	July	22	12	6	4	66.7	18.2	200.0	54.5	27.3	18.2
	August	15	6	7	2	28.6	13.3	85.7	40.0	46.7	13.3
1981	June	19	4	13	2	15.4	11.8	30.8	21.1	68.4	10.5
	July	17	5	9	3	33.3	21.4	55.6	29.4	52.9	17.6
	August	11	5	5	1	20.0	10.0	100.0	45.5	45.5	9.1

LEGEND

Intermittent stream.....
 River.....
 Unpaved road.....
 Study area.....

Antelope observations

Group size

1 - 3...△...○
 4 - 8...△...○
 9 - 15...△...⊕
 16+...▲...●

Year: 1980 1981

Figure 99. Spring antelope distribution on the Kirby study area.

Figure 100. Summer antelope distribution on the Kirby study area.

LEGEND

- Intermittent stream.....
- River.....
- Unpaved road.....
- Study area.....
- Antelope observations
- Group size
- 1 - 3...△
- 4 - 8...△
- 9 - 15...△
- 16+...▲
- Year: 1980

Figure 101. Fall antelope distribution on the Kirby study area.

LEGEND

- Intermittent stream.....
 River.....
 Unpaved road.....
 Study area.....
 Antelope observations
- Group size
- 1 - 3.....△
  - 4 - 8.....△
  - 9 - 15.....△
  - 16+.....▲
- Year: 1980-81

Figure 102. Winter antelope distribution on the Kirby study area.

Use of vegetation: Nearly all antelope were observed in grassland habitats (Table 123). Xeric grassland, big sage-grassland and skunkbush grassland may have been underestimated in spring 1980 because this type was not separated from xeric grassland during that season. Use of sagebrush was highest in spring and summer. Use of agricultural types was highest in fall.

Activity: Most of the antelope were already running from the airplane when observed (Table 124). The proportion of antelope observed running was partly dependent on the proportion of antelope observed during ground surveys (which were less likely to spook). Antelope which were farther from the aerial flight line were less likely to be running when spotted. Antelope were more likely to be stationary when observed during spring and winter. This agrees with the findings of Martin (1980a) in the Otter Creek and Hanging Woman Creek areas.

Use of topography: Most antelope were observed on dissected mid-slopes or mesa-butte tops (Table 125). Antelope were observed only on large, fairly flat-topped mesas which afforded them good visibility. Alluvium areas along creek bottoms were occasionally used in spring and summer.

Use of exposure: Antelope were observed on nearly all exposures in every season except winter (Table 126). The 100% use of east exposures in winter cannot be considered significant, since only two herds were sighted in winter. Antelope choice of exposure is probably not significant on gentle slopes, which were heavily used during most seasons.

Use of slope: The majority of antelope were seen on flat or gentle slopes in all seasons except fall (Table 127), when the majority of observations were on medium slopes. Antelope were never observed on steep slopes.

Sharp-tailed Grouse

Sixteen sharp-tailed grouse dancing grounds were located in or near the study area (Figure 103). Attendance by male birds on known grounds averaged 11.8 in 1980 and 9.1 in 1981 (Table 128). These figures are nearly identical to attendance on grounds in the Birney study area (Table 101). Average attendance on the 13 grounds located in 1980 was 9.8 in 1981, indicating a decrease in numbers. Since the winter of 1980-81 was very mild, the decrease probably was caused by poor production and recruitment during the summer of 1980.

There are approximately 0.17 grounds per square mile in the study area. This compares favorably with 0.18 grounds per square mile in the Birney study area, 0.12 grounds per square mile in the Colstrip area (Schwartzkopf pers. comm) and 0.22 grounds per square mile in the Otter Creek area (Martin 1980a). All except two of the grounds were located in the western half of the

Table 123. Seasonal use of vegetation by antelope in the Kirby area.

Vegetational Type	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Ponderosa pine						
Big sage			21			
Grassland	6					
Skunkbush						
Juniper						
Snowberry-rose						
Total Ponderosa Pine	6		21			
Big sage	28	40			28	17
Silver sage/greasewood						2
Xeric grassland	64	50	60	100	57	74
Skunkbush					15	6
Total Grassland	92	90	60	100	100	100
Deciduous tree						
Deciduous shrub		5				
Mesic grass						
Pioneer forbs						
Total Riparian		5				
Grassland						
Big Sage						
Skunbush						
Total Juniper						
Upland		5	17			
Creekbottom						
Total Agricultural		5	17			
Road			2			
Total Observed	67	58	42	59	125	47

Table 124. Seasonal activity of antelope in the Kirby study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing/sitting	6	10	0	0	9	13
Running	52	59	100	51	47	81
Laying	8	0	0	0	5	0
Feeding	34	31	0	49	34	6
Walking	0	0	0	0	5	0
Total observed	67	58	42	59	125	47

Table 125. Seasonal use of topography by antelope in the Kirby study area.

Topography	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-butte top	16	24	55	49	36	0
Mesa-butte steep side slope	0	0	0	0	0	0
Dissected mid-slopes	76	76	45	51	61	98
Alluvium/terrace	8	0	0	0	3	2
Current flood plain	0	0	0	0	0	0
Total observed	67	58	42	59	125	47

Table 126. Seasonal use of exposure by antelope in the Kirby study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
No exposure (flat)	9	19	17	0	36	6
North	3	12	0	0	2	9
South	30	26	0	0	14	30
East	12	7	21	100	6	17
West	4	3	21	0	10	0
Northeast	3	14	21	0	10	4
Northwest	0	0	0	0	3	0
Southeast	21	3	17	0	20	19
Southwest	18	16	2	0	0	15
Total observed	67	58	42	59	125	47

LEGEND

- Intermittent stream.....~
- River.....~
- Unpaved road.....~
- Study area.....
- Sharp-tailed grouse:
- Breeding grounds.....●
- Observations:
- Winter.....□
- Spring.....○
- Summer.....△
- Fall.....○

Figure 103. Sharp-tailed grouse breeding grounds and observations on the Kirby study area.

Table 127. Seasonal use of slope by antelope in the Kirby study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	9	19	17	0	36	6
Gentle	60	52	17	100	37	66
Medium	31	29	67	0	27	28
Steep	0	0	0	0	0	0
Total observed	67	58	42	59	125	47

Table 128. Sharp-tailed grouse dancing grounds and number of males attending in the Kirby study area.

Number	Location			Males Observed	
	T	R	S	1980	1981
1	6S	40E	21 NW¼	14	15
2	6S	39E	23 NE¼	3	6
3	6S	39E	22 SE¼	10	2
4	6S	40E	31 NW¼	11	8
5	7S	39E	2 SE¼	14	14
6	7S	40E	8 NE¼	7	2
7	7S	39E	12 SW¼	13	7
8	7S	39E	15 SE¼	14	13
9	7S	39E	26 NE¼	16	17
10	7S	40E	19 SW¼	7	7
11	7S	39E	36 SW¼	16	6
12	7S	40E	32 NE¼	18	15
13	7S	41E	3 NW¼	10	15
14	6S	40E	19 NW¼		5
15	6S	39E	26 SE¼		4
16	6S	40E	11 SE¼		9

study area. If the grounds per square mile are calculated only for the portion of the study area west of the 357000 ME mercator line, the ground density rises to 0.32 grounds per square mile. It is apparent that the western half of the study area is excellent sharp-tail habitat. Only one brood was observed, in 1981. A hen was in the brush along the roadside and a chick was seen running across the road. The cover was too thick to locate any more chicks, if there were in fact any more.

Ring-necked Pheasant

Ring-necked pheasants occur along the Tongue River and Fourmile Creek. A pheasant crowing count was run along the Tongue River south of Birney. Stops 6-12 were located in the Kirby area. Crowing counts for these stops averaged 2.2 per stop in 1980 and 3.1 per stop in 1981. The low count in 1980 was probably due to the foggy weather during the count. The 1981 count was lower than the count on the Birney area. One brood with 9 young was seen in 1981 in sagebrush habitat about 1/4 mile from the river.

Turkey

Seven groups of turkeys were observed in the study area (Figure 104). A brood with 5 young was observed in 1980 and a combined brood with 3 hens and about 20 young was observed in 1981. Turkeys were hard to observe, preferring ponderosa pine habitats. No turkeys were observed during the winter of 1980-81, but landowners described two flocks, totaling about 76 turkeys which wintered on Fourmile Creek during the severe winter of 1978-79.

Waterfowl

Nine species of waterfowl were observed on the study area (Table 129). Three of these were confirmed or suspected breeders. Mallard broods were observed on the lower end of Canyon Creek near the Tongue River, and in several ponds in the western half of the study area. Migrants were observed along the river and on most of the ponds which held water.

Other Possible Game Birds

Several landowners commented that Hungarian partridge were formerly fairly common in the western portion of the study area. One landowner had also observed sage grouse on the upper end of Post Creek. Ruffed grouse have been sighted on the Rosebud Battlefield just a few miles west of the study area. Landowners have seen ruffed grouse on a ridge just on the northwestern edge of the study area. Stands of aspen, thick ponderosa pine timber, and deciduous shrub thickets favored by ruffed grouse are only widely scattered throughout the western half of the study area, providing only marginal habitat for them.

Songbirds

One hundred and seven species of birds, including game birds, were observed on the study area (Table 129). Eighty-nine of these were suspected or confirmed breeders on the study area. This list is probably not complete.

The songbird census road route (Figure 105) was run three times in 1980, but only once in 1981 due to bad weather, so the results were combined. Vegetation along the route was 68% sage-grassland, 22% ponderosa pine and juniper, and 10% riparian. A total

Figure 104. Turkey wintering area and observations on the Kirby study area.

LEGEND

- Intermittent stream.....
- River.....
- Unpaved road.....
- Study area.....
- Turkey:
- Probable wintering area.....
- Observations:
- Group size: 1-3 4-8 9-15 16+
- Spring.....○.....○.....⊕.....●
- Summer.....△.....△.....△.....▲
- Fall.....○.....○.....⊕.....●
- Winter.....□.....□.....⊞.....■

Figure 105. Kirby study area songbird road route and songbird census strip and small mammal trapline locations.

LEGEND

- Intermittent stream.....
- River.....
- Unpaved road.....
- Study area.....
- Songbird road route.....
- Songbird census strips.....●
- Small-mammal traplines:
  - Summer.....△
  - Fall.....○
- Vegetational types:
  - Riparian.....R
  - Ponderosa pine/juniper...P
  - Sagebrush.....S
  - Grassland.....G

Table 129. Breeding status of the bird species observed on the Kirby study area.

Species		Breeding Status	Species		Breeding Status
1	Double-crested cormorant	V	51	Western wood pewee	b
2	Great blue heron	V	52	Horned lark	b
3	Canada goose	b	53	Violet-green swallow	b
4	Mallard	B	54	Tree swallow	b
5	Pintail	M	55	Barn swallow	b
6	Green-winged teal	M	56	Cliff swallow	B
7	Blue-winged teal	M	57	Black-billed magpie	b
8	American wigeon	b	58	Pinyon jay	b
9	Northern shoveler	M	59	Clark's nutcracker	t
10	Ring-necked duck	M	60	Black-capped chickadee	b
11	Common merganser	M	61	White-breasted nuthatch	b
12	Turkey vulture	b	62	Red-breasted nuthatch	b
13	Goshawk	b	63	Brown creeper	M
14	Cooper's hawk	b	64	House wren	b
15	Red-tailed hawk	B	65	Canyon wren	b
16	Rough-legged hawk	W	66	Rock wren	b
17	Golden eagle	b	67	Gray catbird	b
18	Bald eagle	W	68	Brown thrasher	b
19	Marsh hawk	b	69	Sage thrasher	b
20	Osprey	M	70	American robin	b
21	Prairie falcon	B	71	Veery	b
22	Merlin	M	72	Mountain bluebird	b
23	American kestrel	B	73	Townsend's solitaire	b
24	Sharp-tailed grouse	B	74	Bohemian waxwing	W
25	Ring-necked pheasant	B	75	Cedar waxwing	t
26	Turkey	B	76	Loggerhead shrike	b
27	Sora	b	77	Starling	b
28	Killdeer	B	78	Solitary vireo	B
29	Common snipe	b	79	Warbling vireo	b
30	Spotted sandpiper	b	80	Yellow warbler	b
31	Mourning dove	b	81	Yellow-rumped warbler	b
32	Yellow-billed cuckoo	b	82	Common yellowthroat	b
33	Black-billed cuckoo	b	83	Yellow-breasted chat	b
34	Great-horned owl	b	84	American redstart	b
35	Saw-whet owl	b	85	Western meadowlark	b
36	Poor-will	b	86	Red-winged blackbird	b
37	Common nighthawk	b	87	Northern oriole	b
38	White-throated swift	b	88	Brewer's blackbird	b
39	Common flicker	b	89	Common grackle	b
40	Red-headed woodpecker	B	90	Brown-headed cowbird	b
41	Lewis' woodpecker	b	91	Western tanager	b
42	Yellow-bellied sapsucker	M	92	Black-headed grosbeak	b
43	Hairy woodpecker	b	93	Indigo bunting	b
44	Downy woodpecker	b	94	Lazuli bunting	b
45	Eastern kingbird	b	95	Cassin's finch	b
46	Western kingbird	b	96	Pine siskin	b
47	Cassin's kingbird	b	97	American goldfinch	b
48	Say's phoebe	b	98	Red crossbill	b
49	Least flycatcher	B	99	Rufous-sided towhee	b
50	Dusky flycatcher	b	100	Lark bunting	b

Table 129. Continued

Species	Breeding Status
101 Vesper sparrow	b
102 Lark sparrow	b
103 Dark-eyed junco	b
104 Tree sparrow	W
105 Chipping sparrow	b
106 Brewer's sparrow	b
107 Song sparrow	b

- * B - confirmed breeding (nest or dependent young observed)
 b - suspected breeding (present during breeding season)
 V - visitor (breeds nearby, but not on the study area)
 t - present, but no evidence of breeding
 W - winter resident and migrant only
 M - migrant only

of 618 birds and 47 species were observed (Table 130). Western meadowlarks, chipping sparrows, yellow warblers, and house wrens were the most common species, together making up 40% of the total number of birds counted. They were also counted more frequently than other species of birds.

The walking strips (Figure 105) were only run once each due to bad weather, so the results should only be used for general comparisons between habitats. Creek bottom riparian habitat, composed mainly of boxelder-ash forest, was by far the most diverse and productive area for songbirds (Table 131). It was as productive as river bottom riparian habitat on the Birney study area (Table 104). The deciduous tree cover, unlike that on the intermittent creek strip on the Birney area, was thick and continuous along the entire census strip. The narrow riparian zone was bordered by open silver sagebrush habitat along most of the strip, favoring edge species. Running water was present in the creek throughout the summer, however, intermittent creeks that are usually dry can also support high densities of songbirds (See Otter Creek area in Martin 1980a). The quality and quantity of cover is more important than the presence or absence of water in determining songbird productivity.

The ponderosa pine census strip, located in the western part of the study area (Figure 105) was more diverse and productive than the ponderosa pine strip on the Birney study area, probably because it was located in more mesic ponderosa pine forest with a deciduous shrub understory (Table 132). The more xeric ponderosa pine in the eastern half of the Kirby area is probably very similar in productivity to the Birney strip (Table 106). The ponderosa pine

Table 130. Species composition, frequency of occurrence and numbers of songbirds observed on the Kirby Road census route.

Species	Number Observed		Total No. Observ. (4 runs or 80 stops)	Percent	
	1980 (3 runs)	1981 (1 run)		Frequency (No. stops occurrence ÷ 80 stops total)	Percent Species Comp.
Western meadowlark	84	7	91	58	15
Chipping sparrow	44	25	69	52	11
Yellow warbler	36	9	45	38	7
House wren	27	15	42	35	7
Rufous-sided towhee	29	10	39	38	6
Lark sparrow	21	14	35	35	6
Brewer's blackbird	3	31	34	5	6
Vesper sparrow	21	10	31	22	5
American robin	14	11	25	26	4
Rock wren	18	3	21	22	3
Western wood pewee	14	7	21	18	3
Brown-headed cowbird	14	3	17	11	3
Brewer's sparrow	11	2	13	12	2
Yellow-breasted chat	4	8	12	10	2
Western kingbird	9	3	12	10	2
Red-winged blackbird	12	0	12	9	2
Yellow-rumped warbler	9	2	11	11	2
Eastern kingbird	10	0	10	8	2
Mourning dove	4	4	8	8	1
Red crossbill	0	8	8	4	1
Common flicker	5	1	6	8	1
Northern oriole	5	1	6	5	1
Lazuli bunting	1	4	5	5	1
Mountain bluebird	1	3	4	5	1
Red-headed woodpecker	3	1	4	5	1
Cassin's kingbird	0	4	4	2	1
American goldfinch	0	3	3	4	+
Black-billed cuckoo	0	3	3	4	+
Black-capped chickadee	1	1	2	2	+
Western tanager	1	1	2	2	+
American kestrel	1	1	2	2	+
Say's phoebe	1	1	2	2	+
Brown thrasher	2	0	2	2	+

Table 130. Continued.

Species	Number 1980 (3 runs)	Observed 1981 (1 run)	Total No. Observ. (4 runs or 80 stops)	Percent Frequency (No. stops occurrence ÷ 80 stops total)	Percent Species Comp.
Solitary vireo	0	2	2	2	+
Red-breasted nuthatch	0	2	2	2	+
Cassin's finch	0	2	2	1	+
Common grackle	1	0	1	1	+
Killdeer	1	0	1	1	+
Gray catbird	1	0	1	1	+
Common snipe	1	0	1	1	+
Barn swallow	0	1	1	1	+
Common nighthawk	0	1	1	1	+
Song sparrow	0	1	1	1	+
American redstart	0	1	1	1	+
Common yellowthroat	0	1	1	1	+
Yellow-billed cuckoo	0	1	1	1	+
Dusky flycatcher	0	1	1	1	+
47 species					
618 birds					
+ - less than 1%					

Table 131 Total numbers, numbers of singing males, and percent composition of songbirds observed on the riparian census strip on the Kirby study area.

Species	Total of Singing Males		Total of all Birds Observed	
	No. Observed	% Composition	No. Observed	% Composition
American robin	8	10	26	17
Red crossbill	0	0	20	13
House wren	12	15	15	10
Lark sparrow	5	6	9	6
Western wood pewee	7	9	7	4
Yellow warbler	6	7	7	4
Eastern kingbird	2	2	7	4
Chipping sparrow	4	5	6	4
Lazuli bunting	4	5	4	3
Warbling vireo	4	5	4	3
Common yellowthroat	4	5	4	3
Rufous-sided towhee	4	5	4	3
Northern oriole	3	4	4	3
Black-capped chickadee	0	0	4	3
Mourning dove	0	0	4	3
Solitary vireo	3	4	3	2
Yellow-breasted chat	3	4	3	2
Least flycatcher	3	4	3	2
Brown-headed cowbird	0	0	3	2
Black-billed cuckoo	2	2	2	1
Vesper sparrow	2	2	2	1
Mountain bluebird	1	1	2	1
Common flicker	0	0	2	1
Downy woodpecker	0	0	2	1
Gray catbird	1	1	1	1
Veery	1	1	1	1
American goldfinch	1	1	1	1
Song sparrow	1	1	1	1
Black-headed grosbeak	1	1	1	1
Common grackle	0	0	1	1
White-breasted nuthatch	0	0	1	1
Red-headed woodpecker	0	0	1	1
Red-breasted nuthatch	0	0	1	1
33 Species	82		156	

Table 132. Total numbers, numbers of singing males, and percent composition of songbirds observed on the ponderosa pine census strip on the Kirby study area.

Species	Total of Singing Males		Total of All Birds	
	No. Observed	% Composition	No. Observed	% Composition
Rufous-sided towhee	9	16	9	10
Yellow-rumped warbler	8	14	8	9
Chipping sparrow	4	7	7	8
American robin	1	2	7	8
Yellow warbler	6	11	6	7
Dark-eyed junco	1	2	6	7
House wren	5	9	5	6
Warbling vireo	5	9	5	6
American goldfinch	2	4	5	6
Solitary vireo	4	7	4	4
Dusky flycatcher	4	7	4	4
Western wood pewee	3	5	4	4
Red crossbill	0	0	4	4
American redstart	2	4	2	2
Western tanager	1	2	2	2
Pine siskin	0	0	2	2
Brown-headed cowbird	0	0	2	2
Black-capped chickadee	1	2	1	1
Yellow-breasted chat	1	2	1	1
White-breasted nuthatch	0	0	1	1
Common flicker	0	0	1	1
Mountain bluebird	0	0	1	1
Cassin's finch	0	0	1	1
Townsend's solitaire	0	0	1	1
24 species	57		89	

census strip on the Prairie Dog Creek study area was located right along the border of the Kirby area. It supported 27 species and approximately 155 pairs of songbirds per 100 ha (Martin 1980a).

The grassland census strip supported the fewest number of birds. Vesper sparrows made up 61% of the birds observed. This strip was located in the western portion of the study area on a high ridge. Grassland and sagebrush habitat in the more xeric eastern part of the study area was probably more similar in productivity to the Birney sagebrush census strip (Table 133).

Raptors

Twelve species of hawks and two species of owls were found on the study area (Table 129). Nine of these were known or suspected breeders. Fifteen nests, excluding American kestrels, were found on or near the study area (Table 134 and Figure 106). This nest census is not considered complete. Red-tailed hawks, great-horned owls, and American kestrels were the most common breeding raptors.

Nine species of raptors, excluding American kestrels, were observed as migrants or wintering on the study area (Figure 107). The Tongue River along the east boundary of the study area and the southwestern corner of the study area received the highest use by non-breeding raptors.

The goshawk, Cooper's hawk, golden eagle, bald eagle, osprey, prairie falcon, merlin, and saw-whet owl are listed by Flath (1981) as species of special interest or concern in Montana. The golden eagle, bald eagle, osprey, prairie falcon, and merlin are also listed as species of high federal interest. The status of each of these within the study area is as follows:

Goshawk- One was observed on 27 August 1981. This bird was probably a migrant, although the area in which it was observed has dense stands of ponderosa pine which may be suitable for nesting goshawks. They are known to nest in the Wolf Mountains, approximately 14 miles to the southwest (Lockhart 1976).

Cooper's hawk - Several observations of adults were made during the breeding season in the northwestern corner of the study area. They probably had a nest located nearby, but an intensive nest search was not made.

Golden eagle - One pair had part of their territory on the western end of the study area. They probably had one or more nests located somewhere west of the study area. They were suspected not to have nested in 1981, because the pair was often seen together in the Kirby area in spring when the female should have been incubating eggs. Their nesting status in 1980 was unknown. There are many suitable nest sites in the portion of their territory within the study area, so this pair should be checked in the future if coal development should take place.

Table 133. Total numbers, numbers of singing males, and percent composition of songbirds observed on the grassland census strip on the Kirby study area.

Species	Total of Singing Males		Total of all Birds	
	No. Observed	% Composition	No. Observed	% Composition
Vesper sparrow	19	86	25	61
Western meadowlark	3	14	13	32
American robin	0	0	2	5
Brown-headed cowbird	0	0	1	2
4 species	22		41	

Table 134. Nest substrates and production data of raptor nests on the Kirby study area.

Nest No.	Species	Substrate	Activity	
			1980	1981
1	Red-tailed hawk	Cottonwood	Active, no production data	Active, no production data
2	Red-tailed hawk	Cottonwood	Active, no production data	Active, no production data
3	Red-tailed hawk	Cottonwood	Active, no production data	Inactive
4	Red-tailed hawk	Ponderosa pine	Active, no production data	Status unknown
5	Red-tailed hawk	Ponderosa pine	Inactive	Inactive
6	Red-tailed hawk	Cottonwood	Inactive	Active, no production data
7	Red-tailed hawk	Cottonwood	Inactive	Abandoned with 2 eggs
8	Red-tailed hawk	Ponderosa pine	Inactive	Inactive
9	Red-tailed hawk	Dead ponderosa pine	Status unknown	Fledged 1 young
10	Unknown buteo	Cliff	Inactive	Inactive
11	Unknown buteo	Ponderosa pine	Inactive	Inactive
12	Great-horned owl	Cliff	Status unknown	Active, no production data
13	Prairie falcon	Cliff	1 young produced	Pair present, did not nest
14	Prairie falcon	Cliff	Active, no production data	4 young fledged
15	Prairie falcon	Cliff	Pair present, did not nest	Pair present, did not nest

LEGEND

Intermittent stream.....	~~~~~
River.....	=====
Unpaved road.....	-----
Study area.....	-----
Raptor nests.....	●
Observations:	
Turkey vulture.....T	Marsh hawk.....H
Golden eagle.....E	Prairie falcon.....P
Cooper's hawk.....C	Great-horned owl....N
Red-tailed hawk....R	Saw-whet owl.....W

Figure 106. Resident raptor observations on the Kirby study area.

Figure 107. Migrant and wintering raptor observations on the Kirby study area.

LEGEND

Intermittent stream.....
 River.....
 Unpaved road.....
 Study area.....

Raptor observations:

Red-tailed hawk.....R
 Rough-legged hawk.....L
 Golden eagle.....E
 Bald eagle.....B
 Marsh hawk.....H
 Osprey.....O
 Prairie falcon.....P
 Merlin.....M
 Goshawk.....G

Bald eagle - Bald eagles were observed as migrants and wintering along the Tongue River (Figure 107). One area was particularly favored by eagles. The river in the Kirby study area was not as heavily used as in the Birney study area.

Osprey - One migrant osprey was observed just off the study area on the Tongue River. Several others, along with other bald eagles were observed on the stretch of river between the Birney and Kirby study areas. This stretch of river (mostly off the map in Figure 107) appeared to be another high use area or perhaps an extension of the one on the Birney area.

Prairie falcon - Two confirmed and one suspected prairie falcon nests were located. One nest fledged one young in 1980 and another fledged 4 young in 1981. Pair number 15 was present on the cliff both years during the breeding season, but did not appear to have nested. The pair was flushed from the cliff with the helicopter in late April 1981. A falcon was heard calling from a pothole on the cliff a week later, but no young were ever observed. One or both of these birds may have been too young to breed, or the nest may have failed due to interference from a pair of great-horned owls nesting on the same cliff.

Merlin - Several migrant merlins were observed, mainly along the Tongue River. The merlin sighting north of the study area may have been of a nesting bird. There is a possibility that merlins might nest in the northwestern corner of the study area. The area could not be covered on foot in 1980, and no merlins were found in other parts of southeastern Montana (Youmans 1981, Becker 1981).

Saw-whet owl - A pair of saw-whet owls were heard calling on the North Fork of Canyon Creek in 1981. They were probably nesting there. They may be common in riparian habitat, but their secretive nature makes detection difficult.

Other special interest species - The Brewer's sparrow was also listed by Flath (1981) as a species of special interest or concern. They were common in sagebrush habitat throughout the study area. Upland sandpipers, another special interest species, were suspected to breed in the western part of the study area. Local landowners reported seeing them in past years on Dale Creek, just off the northwest corner of the study area. The pair was not observed in 1981 by myself or the landowners.

In the past, there were extensive prairie dog towns covering the high ridges in the western part of the study area. They were probably also present along wide creek bottoms in the eastern part. Local landowners recalled seeing burrowing owls frequently on the prairie dog towns. No prairie dog towns exist in the study area today, and burrowing owls are no longer present.

The double-crested cormorant and Lewis' woodpecker are listed as species of high federal interest. Double-crested cormorants were visitors along the Tongue River from the rookery on the Tongue River Reservoir. Lewis' woodpeckers were observed frequently along the county road on Leaf Rock Creek.

Nongame Mammals

Twenty species of mammals, including game species were observed on the Kirby study area (Table 135). This list is probably not complete. Fourteen small-mammal traplines were run, eight in summer and six in fall (Figure 105). Trapping success was highest (3.2 captures/100 trap nights) in grassland and lowest (0.8 captures/100 trap nights) in riparian habitats (Table 136). Grassland areas also yielded the highest number of species (4). This low success in riparian habitat is the opposite of trapping success on other study areas (Martin 1980a). Deer mice were the most abundant small-mammal in all habitats.

A total of seventy-six coyotes were observed on the Kirby area during the study. Coyote aerial observations per hour were highest in fall and the lowest in summer and winter (Table 113). Several bobcats were seen during the study.

Table 135. Mammals observed on the Kirby study area.

Common Name	Scientific Name
1 Masked shrew	<i>Sorex cinereus</i>
2 Raccoon	<i>Procyon lotor</i>
3 Striped skunk	<i>Mephitis mephitis</i>
4 Coyote	<i>Canis latrans</i>
5 Bobcat	<i>Lynx rufus</i>
6 Yellowbelly marmot	<i>Marmota flaviventris</i>
7 Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
8 Least chipmunk	<i>Eutamias minimus</i>
9 Red squirrel	<i>Tamiasciurus hudsonicus</i>
10 Northern pocket gopher	<i>Thomomys talpoides</i>
11 Deer mouse	<i>Peromyscus maniculatus</i>
12 Northern grasshopper mouse	<i>Onychomys leucogaster</i>
13 Bushytail woodrat	<i>Neotoma cinerea</i>
14 Muskrat	<i>Ondatra zibethicus</i>
15 House mouse	<i>Mus musculus</i>
16 Porcupine	<i>Erethizon dorsatum</i>
17 Desert cottontail	<i>Sylvilagus audubonii</i>
18 Mule deer	<i>Odocoileus hemionus</i>
19 White-tailed deer	<i>Odocoileus virginianus</i>
20 Pronghorn antelope	<i>Antilocapra americana</i>

Table 136. Results of small-mammal trapping in the Kirby study area.

	Grassland	Sagebrush	Ponderosa Pine	Riparian
Total captures	22	18	16	12
Trap nights	681	1616	1596	1578
Captures/100 trap nights	3.2	1.1	1.0	0.8
Number of species caught	4	2	2	2
Species:				
<i>Peromyscus maniculatus</i>	14	32	23	10
<i>Onychomys leucogaster</i>	6	1		
<i>Mus musculus</i>	1			
<i>Spermophilus tridecemlineatus</i>	1			
<i>Eutamias minimus</i>			1	
<i>Sorex cinereus</i>				2

Reptiles and Amphibians

Nine species of herps were observed on the study area (Table 137). This list is probably not complete. Racers, bull snakes, and rattlesnakes were the three most frequently encountered species. Northern chorus frogs were heard along many creek bottoms and stock ponds in the spring.

A possible spotted chorus frog was captured near a playa in the western part of the study area during June 1981. The only known population of these in Montana is found near Fort Benton in Choteau County (Black 1970). The specimen is awaiting confirmation of identification.

Table 137. Amphibians and reptiles observed on the Kirby study area.

Common Name	Scientific Name
1 Leopard frog	<i>Rana pipiens</i>
2 Western toad	<i>Bufo boreas</i>
3 Woodhouse's toad	<i>Bufo woodhousei</i>
4 Spotted chorus frog	<i>Pseudacris clarki</i>
5 Northern chorus frog	<i>Pseudacris triseriata</i>
6 Sagebrush lizard	<i>Sceloporus graciosus</i>
7 Racer	<i>Coluber constrictor</i>
8 Bull snake	<i>Pituophis melanoleucus</i>
9 Prairie rattlesnake	<i>Crotalus viridis</i>

Tongue River Dam AreaMule Deer

During the study 1104 mule deer were observed in the Tongue River Dam area (Table 138). Average group size ranged from 2.1 in summer to 6.2 in winter. January 1981 had the highest average group size of any month.

Table 138. Average group size of mule deer in the Tongue River Dam area.

Month	No. Groups	No. Deer	Average
April			
May	10	37	3.7
Spring	10	37	3.7
June	11	21	1.9
July	17	32	1.9
August	35	81	2.3
Summer	63	134	2.1
September			
October	30	132	4.4
November	18	86	4.8
Fall	48	218	4.5
December	6	28	4.7
January	18	128	7.1
February	14	78	5.6
Winter	38	234	6.2
March	11	75	6.8
April	32	191	6.0
May	17	42	2.5
Spring	60	308	5.1
June	35	44	1.3
July	24	62	2.6
August	25	67	2.7
Summer	84	173	2.1

Mule deer observations per hour of aerial survey ranged from 15.9 in summer of 1980 to 56.9 in fall (Table 139). This suggests a higher deer population than in the Birney or Kirby areas. Most of these deer were concentrated in the southern half of the study area. The population status, movements, and observability of mule deer is being studied by the Fish and Wildlife Service (Biggin and Phillips 1979).

Mule deer population structure was determined during October and November. Fawn production was fair at 81.1 fawns/100 does and 55.8 fawns/100 adults in October (Table 140). The low fawn

Table 139. Mule deer, antelope and coyote aerial observations per hour in the Tongue River Dam area.

Year	Month	Hours	Aerial Observations			Observations /hr			Coyotes/100:		
			Mule Deer	Antelope	Coyote	Mule Deer	Antelope	Coyote	Mule Deer	Antelope	
1980	May	2.3	30	26	0	13.0	11.3	0	0	0	0
	June	2.3	19	7	1	8.3	3.0	0.4	5.3	14.3	
	July	2.1	27	14	0	12.9	6.7	0	0	0	
	August	2.6	65	36	0	25.0	13.8	0	0	0	
	Summer	7.0	111	57	1	15.9	8.1	0.1	0.9	1.8	
	October	1.6	113	48	0	70.6	30	0	0	0	
	November	1.9	86	55	0	45.3	28.9	0	0	0	
	Fall	3.5	199	103	0	56.9	29.4	0	0	0	
1981	December	1.2	28	33	0	23.3	27.5	0	0	0	
	January	1.9	128	8	1	67.4	4.2	0.5	0.8	12.5	
	February	2.2	78	56	1	35.5	25.5	0.5	1.3	1.8	
	Winter	5.3	224	97	2	42.3	18.3	0.4	0.9	2.1	
	March	1.5	75	29	3	50.0	19.3	2.0	4.0	10.3	
	April	2.1	147	72	0	70.0	34.3	0	0	0	
	May	1.7	38	52	0	22.4	30.6	0	0	0	
	Spring	5.3	260	153	3	49.1	28.9	0.6	1.2	2.0	
	June	2.2	37	58	4	16.8	26.4	1.8	10.8	6.9	
	July	1.5	59	68	0	39.3	45.3	0	0	0	
	August	1.9	67	50	0	35.3	26.3	0	0	0	
	Summer	5.6	163	176	4	29.1	31.4	0.7	2.5	2.3	

Table 140. Mule deer population characteristics in the Tongue River dam study area.

Year	Month	Number Classified			Fawns:100			Bucks:			Population Structure(%)		
		Total	Bucks	Does	Fawns	Does	Adults	100	Does	Bucks	Does	Fawns	
1980	October	120	24	53	43	81.1	55.8	45.2	20.0	44.0	36.0		
	November	17	4	9	4	44.4	30.8	44.4	23.5	53.0	23.5		

production in November was probably an artifact of the small sample size.

Spring distribution is shown in Figure 108. Mule deer in the northern half of the study area tended to be fairly scattered, while deer in the southern half were concentrated into two small areas. The large deer herd (>16 deer) located just west of the study area in 1980 was still on winter range on the West Decker Mine.

During summer most mule deer groups had less than 4 deer (Figure 109). The observations were scattered throughout the study area except for three areas of high concentrations. Deer herds with 9-15 deer were seen in all three of these concentration areas. The middle concentration area on the southern end of the reservoir had very high concentrations of deer. This area had extensive willow thickets in which deer were extremely difficult to observe. Yet in the August 1981 flight, 34 mule deer were observed in an area of about 1 square mile in the center of this concentration area.

During fall mule deer observations in the northern part of the study area decreased (Figure 110). Mule deer in the southern part of the study area were gathered in larger herds and concentrated into two small areas. As water levels in the Tongue River Reservoir fall, mud flats are exposed and willow thickets dry out at the upper end of the reservoir. The ground becomes covered with tender, leafy weeds such as *Rumex* spp. Mule deer move into this area as this food supply becomes available. They reach the highest concentrations in fall, and remain there until late fall (depending on snow cover).

During winter mule deer were scattered throughout the northern part of the study area and concentrated into three groups in the southern part (Figure 111). The dashed lines show the three winter ranges in the area outlined by Phillips (1978). Two of the groups of sightings coincide with the winter range. The lack of snow cover during the winter probably made it unnecessary for mule deer to retreat to their usual winter ranges. It is important to note that none of the three winter ranges were entirely covered by my surveys. Incomplete coverage of a winter range can easily lead to misinterpretation of its extent and importance.

Vegetation Use - The majority of deer observed were in grasslands during both spring seasons (Table 141). Xeric grassland was more heavily used in 1980 and sagebrush in 1981. In summer and fall of 1980 the majority of deer were in riparian habitat. In contrast, more deer were seen in grasslands, than in riparian habitat in the summer of 1981. The summer of 1980 had a drought, so only riparian zones had green vegetation in late summer and fall. Scattered rains occurred throughout the summer of 1981, so uplands remained green through much of the summer, making grasslands more attractive to mule deer.

Figure 108. Spring mule deer distribution on the Tongue River Dam study area.

Figure 109. Summer mule deer distribution on the Tongue River Dam study area.

Figure 110. Fall mule deer distribution on the Tongue River Dam study area.

Figure 111. Winter mule deer distribution on the Tongue River Dam study area.

Table 141. Seasonal use of vegetation by mule deer in the Tongue River Dam study area.

Vegetational Type	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Ponderosa Pine						
Big sage		1			2	3
Grassland		4		10	3	8
Skunkbush		2				1
Juniper	22	4	3	1	7	4
Snowberry-rose						
Total Ponderosa Pine	22	11	3	11	12	16
Big sage	19	12	4	42	41	18
Silver sage				2	3	3
Xeric grassland	57	7	6	22	24	18
Skunkbush		4	1		7	1
Total grassland	76	23	11	66	75	40
Deciduous tree						
Deciduous shrub	3	9	9		1	2
Mesic grass		29	21		4	6
Pioneer forbs		5	2	1		7
Total Riparian	3	1	23	1	4	10
		44	55	2	9	25
Grassland						
Big sage		2	6	10	1	
Skunkbush		2	20	9	2	9
Total Juniper		14				3
		18	26	19	3	12
Upland						
Creekbottom			1			
Total Agricultural			1			
River			3		1	1
Total observed	37	134	218	234	308	173

Most of the mule deer observed in winter were in grassland habitats. Phillips (1978) described winter ranges in the region as mainly scattered stands of juniper or ponderosa pine. The discrepancy is probably due to two factors: 1) not all of the mule deer were on their normal winter ranges. Lack of snow cover would make grassland areas more available than normal. 2) Only the edges near the Tongue River Reservoir of three winter ranges were covered in this survey. All three winter ranges extended away from the reservoir into higher, more heavily timbered hills. Incomplete coverage of a winter range can give distorted views of habitat use.

Activity - The majority of mule deer were feeding at the time of observation in all seasons except winter (Table 142). In winter half of the deer were either standing or laying. This is similar to deer behavior on other study areas.

Table 142. Seasonal activity of mule deer in the Tongue River Dam study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing/sitting	16	4	16	24	6	17
Running	3	8	2	0	6	4
Laying	3	3	18	26	13	1
Feeding	78	77	51	46	72	66
Walking	0	8	13	4	4	12
Total observed	37	134	218	234	308	173

Use of topography - Table 143 shows the percentages of mule deer observed on different topographic features. Some of the same trends discussed earlier show up here. Higher proportions of mule deer were on flood plains in summer and fall than in other seasons. The proportion of mule deer on dissected mid-slopes was lowest in fall, when most deer were on flood plains. More deer were observed on mesa-butte tops in spring and winter, than in other seasons.

Use of exposure: Fairly high proportions of mule deer were observed on flat areas (Table 144) during most seasons. There did not appear to be any clear-cut trends in distribution among the exposures. East-facing exposures appeared to be used less than west-facing exposures in most seasons. Choice of exposure may not be significant in much of the relatively flat southern half of the study area.

Use of slope: The majority of mule deer were observed on flat and gentle slopes in all seasons except the spring of 1981, when slightly more deer were on medium and steep slopes (Table 145). The proportion of deer seen on steep slopes was never very high. The

Figure 112. White-tailed deer observations on the Tongue River Dam study area.

Table 143. Seasonal use of topography by mule deer in the Tongue River Dam study area.

Topography	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-butte top	22	7	1	12	11	8
Mesa-butte steep side slope	0	2	1	3	7	6
Dissected mid-slope	43	41	35	69	61	40
Alluvium/terrace	32	7	4	15	7	17
Current flood plain	3	43	60	0	14	30
Total observed	37	134	218	234	308	173

Table 144. Seasonal use of exposure by mule deer in the Tongue River Dam study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
No exposure (flat)	57	48	63	34	22	43
North	16	2	7	16	14	10
South	0	12	1	4	8	15
East	2	4	1	0	8	3
West	22	6	7	17	15	2
Northeast	0	10	6	8	6	4
Northwest	0	3	11	9	4	2
Southeast	2	3	0	4	6	14
Southwest	0	12	3	9	18	5
Total observed	37	134	213	234	308	173

proportion of deer using flat areas was lowest in spring and peaked in fall.

White-tailed Deer

Forty-six whitetail deer were observed on the Tongue River Dam study area. Average group size was lowest in summer and highest in spring (Table 146). No whitetail deer were observed during fall.

Distribution - Figure 112 shows the distribution of whitetail deer during the study. Most of the observations were along the Tongue river at the southern end of the study area. About 15-30 whitetail are thought to be in this area (Phillips 1978).

Table 145. Seasonal use of slope by mule deer in the Tongue River Dam study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	57	48	63	25	22	43
Gentle	19	26	5	33	24	14
Medium	24	24	31	42	43	35
Steep	0	2	1	0	11	8
Total observed	37	134	218	234	308	173

Use of vegetation - The majority of whitetail deer were observed in riparian habitats, primarily deciduous tree and shrub types (Table 146). They were also observed in juniper-sage, sagebrush-grassland types, and hayfields.

Table 146. Average group size and vegetational use of white-tailed deer on the Tongue River Dam area.

	Spring	Summer	Fall	Winter
Number groups	20	11	0	2
Number deer	9	30		7
Average group size	4.5	2.7		3.5
Vegetational type:				
Riparian	100%	50%		100%
Ponderosa pine/juniper	0	20		0
Grassland	0	7		0
Agricultural	0	23		0

Antelope

Population characteristics - During the study 697 antelope were observed on the study area (Table 147). Average group size ranged from 3.7 in summer to 23.0 in winter. Antelope observations per hour of aerial survey ranged from 8.1 in summer of 1980 to 31.4 in summer of 1981 (Table 139). The highest number of antelope observed per hour was 45.3 in July 1981. The number of fawns per 100 does was around 85-90 in 1980, but fluctuated widely in 1981 (Table 148). This may have been due to different groups of antelope moving in and out of the study area during 1981.

Table 147. Average group size of antelope in the Tongue River study area.

Month	No. Groups	No. Antelope	Average
April	1	13	13.0
May	6	27	4.5
Spring	7	40	5.7
June	3	7	2.3
July	6	18	3.0
August	7	37	5.3
Summer	16	62	3.9
September			
October	3	48	16.0
November	3	55	18.3
Fall	6	103	17.2
December	1	33	33.0
January	1	8	8.0
February	3	74	24.7
Winter	5	115	23.0
March	6	29	4.8
April	19	113	5.9
May	12	57	4.8
Spring	37	199	5.4
June	26	60	2.3
July	14	68	4.9
August	8	50	6.3
Summer	48	178	3.7

Table 148. Antelope population characteristics in the Tongue River Dam study area.

Year	Month	Number Classified				Fawns:100		Bucks:	Population Structure(%)		
		Total	Bucks	Does	Fawns	Deer	Adults	100 Does	Bucks	Does	Fawns
1980	June	5	1	4	0	0	0	25.0	20.0	80.0	0
	July	18	1	9	8	88.9	44.4	11.1	5.6	50.0	44.4
	August	36	10	14	12	85.7	33.3	71.4	27.8	38.9	33.3

Distribution: Spring distribution is shown in Figure 113. Most of the large groups were seen in the Deer Creek area north of East Decker. Antelope were concentrated in this same area again in summer (Figure 114). There were also many antelope using the area east of East Decker.

During fall only a few large groups of antelope were observed (Figure 115). As in spring and summer, antelope were mainly concentrated in the Deer Creek area. Figure 116 shows the winter distribution of antelope from this study and the winter ranges of antelope from Phillips (1978). Two herds of antelope were sighted in the Deer Creek area, which is not normal winter range. Antelope were probably not restricted to winter range because of the mild winter.

Vegetation use: The majority of antelope were sighted in grass-land types (Table 149). They were occasionally seen feeding on forbs on mud flats along the reservoir and on spoil piles on the East Decker mine. More antelope were seen in xeric grassland than in sagebrush during most seasons of the study.

Activity: Most antelope were running when observed (Table 150). They were least likely to be running in fall. The highest proportion of bedded antelope was observed in winter. These results are similar to those from the Kirby area.

Use of topography: Antelope were most commonly observed on dissected mid-slopes and alluvium/terraces (Table 151). A high proportion of antelope were observed on mesa-butte steep side slopes.

Use of exposure: Antelope sightings on various exposures is shown in Table 152. Antelope were often seen on flat areas (no exposure). In winter the majority of antelope were observed on southwest exposures. One-third of the antelope seen in fall were on south exposures. No definite trends in use of exposure were noticeable in spring and summer.

Use of slope: The majority of antelope were observed on flat or gentle slopes (Table 153). During summer increased percentages of antelope made use of medium slopes. Antelope were almost never observed on steep slopes.

Sharp-tailed Grouse

Only one dancing ground was located in the study area (Figure 117) in 1981. It was attended by 7 males. Two observations of grouse were made in fall; one of 16 birds and the other of a single bird. No broods were seen.

Four sharp-tailed grouse dancing grounds were present in 1977 in the area now covered by the East Decker mine (Amstrup 1977). Average attendance was 11.3 males.

Table 149. Seasonal use of vegetation by antelope in the Tongue River Dam study area.

Vegetational Type	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Ponderosa pine						
Big sage						
Grassland						
Skunkbush						
Juniper						
Snowberry-rose						
Total Ponderosa Pine						
Big sage	20	21	27	45	27	45
Silver/sage/greasewood						
Xeric grassland	80	66	44	55	60	45
Skunkbush					2	10
Total Grassland	100	87	71	100	89	100
Deciduous tree						
Deciduous shrub						
Mesic grass					7	
Pioneer forbs			29		7	
Total Riparian			29			
Grassland						
Big sage		13			4	
Skunkbush						
Total Juniper		13			4	
Upland						
Creekbottom						
Total Agricultural						
Total Observed	40	62	103	115	199	178

Table 150. Seasonal activity of antelope in the Tongue River Dam study area.

Activity	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Standing/sitting	3	2	46	7	8	8
Running	77	79	54	61	61	67
Laying	0	5	0	17	1	2
Feeding	20	14	0	15	24	20
Walking	0	0	0	0	8	2
Total observed	40	62	103	115	199	178

Table 151. Seasonal use of topography by antelope in the Tongue River Dam study area.

Topography	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Mesa-butte top	0	0	4	61	12	10
Mesa-butte steep side slope	0	0	0	0	0	0
Dissected mid-slopes	22	64	61	39	58	86
Alluvium/terrace	78	36	6	0	25	0
Current flood plain	0	0	29	0	5	4
Total observed	40	62	103	115	199	178

Table 152. Seasonal use of exposure by antelope in the Tongue River Dam study area.

Exposure	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
No exposure (flat)	78	36	35	0	36	14
North	0	14	4	7	9	19
South	22	19	34	0	13	2
East	0	5	0	29	7	1
West	0	5	12	0	5	15
Northeast	0	0	15	0	12	3
Northwest	0	0	0	0	15	24
Southeast	0	21	0	0	5	18
Southwest	0	0	0	69	10	5
Total observed	40	62	103	115	199	178

Table 153. Seasonal use of slope by antelope in the Tongue River Dam study area.

Slope	Spring 1980 %	Summer 1980 %	Fall 1980 %	Winter 80-81 %	Spring 1981 %	Summer 1981 %
Flat	78	36	35	0	39	14
Gentle	22	11	53	84	41	54
Medium	0	53	12	16	20	31
Steep	0	0	0	0	0	1
Total Observed	40	62	103	115	199	178

Figure 113. Spring antelope distribution on the Tongue River Dam study area.

Figure 114. Summer antelope distribution on the Tongue River Dam study area.

Figure 115. Fall antelope distribution on the Tongue River Dam study area.

Figure 116. Winter antelope distribution on the Tongue River Dam study area.

Figure 117. Sharp-tailed grouse breeding grounds and observations on the Tongue River Dam study area.

Ring-necked Pheasant

Ring-necked pheasants were found in areas with sufficient riparian cover along the Tongue River. The only major area of cover is at the southern end of the reservoir. Pheasant use of this area is probably limited by periodic flooding

Turkey

Several groups of turkeys were observed on or near the study area (Figure 118). A brood with 2 hens and 8 young were seen in 1980. Three other large groups were seen too late in the summer to distinguish young (from an airplane). Males were seen displaying with hens twice. Turkeys have been known to winter in ranch yards along the Tongue River in severe winters.

Sage Grouse

A sage grouse strutting ground was located on Monument Creek about 2 miles outside the study area. Five males and four or five females were observed on the ground on April 7, 1981. Sage grouse were observed in the study area twice, along the west shore of the reservoir between Monument and Spring creeks.

Waterfowl

Twenty species of waterfowl were observed on the study area (Table 154). Three of these were known or suspected breeders. The Tongue River Reservoir and the river downstream in the Tongue River Dam area were both used extensively by migrating waterfowl. Mallards, northern shovelers, Canada geese, common mergansers, blue-winged teal, and green-winged teal were especially common during migration. One species, the canvasback, is a species of high federal interest.

Non-game Birds

One hundred and twenty-four species of birds, including game birds, were observed on the study area (Table 154). Of these, 81 species were suspected or confirmed breeders. Several other species were found by Mikol (1978) a few miles southwest of my study area.

The songbird census road route (Figure 119) was run three times in 1980, but only once in 1981 due to bad weather, so the results were combined. Vegetation along the route was 64% sage-grassland, 20% ponderosa pine and juniper, 15% riparian, and 1% agricultural. A total of 650 birds and 43 species were observed (Table 155). Western meadowlarks, red-winged blackbirds, lark sparrows, and chipping sparrows were the four most common birds, together making up 43% of the birds seen. They were also observed the most frequently.

Table 154. Breeding status of the bird species observed on the Tongue River Dam area.

Species		Breeding Status	Species		Breeding Status
1	Common loon	M	51	Wilson's phalarope	M
2	Eared grebe	M	52	Ring-billed gull	V
3	Western grebe	t	53	Franklin's gull	V
4	Pied-billed grebe	M	54	Caspian tern	M
5	White pelican	t	55	Black tern	V
6	Double-crested cormorant	B	56	Mourning dove	b
7	Great blue heron	B	57	Black-billed cuckoo	b
8	Canada goose	B	58	Screech owl	b
9	White-fronted goose	M	59	Great-horned owl	B
10	Mallard	B	60	Short-eared owl	t
11	Gadwall	M	61	Poor-will	b
12	Pintail	M	62	Common nighthawk	b
13	Green-winged teal	M	63	White-throated swift	b
14	Blue-winged teal	M	64	Belted kingfisher	b
15	Cinnamon teal	M	65	Common flicker	b
16	American wigeon	b	66	Red-headed woodpecker	b
17	Northern shoveler	M	67	Hairy woodpecker	b
18	Wood duck	t	68	Eastern kingbird	b
19	Redhead	M	69	Western kingbird	b
20	Ring-necked duck	M	70	Cassin's kingbird	b
21	Canvasback	M	71	Say's phoebe	b
22	Lesser scaup	M	72	Least flycatcher	b
23	Common goldeneye	M	73	Western wood pewee	b
24	Bufflehead	M	74	Horned lark	b
25	Surf scoter	M	75	Violet-green swallow	b
26	Ruddy duck	M	76	Tree swallow	b
27	Common merganser	M	77	Bank swallow	b
28	Turkey vulture	b	78	Barn swallow	b
29	Goshawk	M	79	Cliff swallow	B
30	Red-tailed hawk	B	80	Black-billed magpie	b
31	Swainson's hawk	M	81	Common crow	t
32	Rough-legged hawk	W	82	Pinyon jay	b
33	Golden eagle	B	83	Clark's nutcracker	t
34	Bald eagle	W	84	Black-capped chickadee	b
35	Marsh hawk	b	85	White-breasted nuthatch	b
36	Osprey	B	86	Red-breasted nuthatch	b
37	Prairie falcon	B	87	House wren	b
38	Peregrine falcon	M	88	Rock wren	b
39	American kestrel	b	89	Gray catbird	b
40	Sharp-tailed grouse	B	90	Brown thrasher	b
41	Sage grouse	b	91	Sage thrasher	b
42	Ring-necked pheasant	b	92	American robin	b
43	Turkey	B	93	Mountain bluebird	b
44	American coot	b	94	Townsend's solitaire	b
45	Killdeer	b	95	Bohemian waxwing	W
46	Spotted sandpiper	b	96	Cedar waxwing	t
47	Solitary sandpiper	M	97	Loggerhead shrike	b
48	Lesser yellowlegs	M	98	Starling	b
49	Semipalmated sandpiper	M	99	Solitary vireo	b
50	American avocet	M	100	Warbling vireo	b

Table 154. Continued

Species	Breeding Status
101 Yellow warbler	b
102 Yellow-rumped warbler	b
103 Common yellowthroat	b
104 Yellow-breasted chat	b
105 Western meadowlark	b
106 Yellow-headed blackbird	t
107 Red-winged blackbird	b
108 Northern oriole	B
109 Brewer's blackbird	b
110 Common grackle	b
111 Brown-headed cowbird	b
112 Western tanager	b
113 Black-headed grosbeak	b
114 Lazuli bunting	b
115 American goldfinch	b
116 Red crossbill	b
117 Rufous-sided towhee	b
118 Lark bunting	b
119 Vesper sparrow	b
120 Lark sparrow	b
121 Chipping sparrow	b
122 Brewer's sparrow	b
123 White-crowned sparrow	M
124 Song sparrow	b

- * B - confirmed breeding (nest or dependent young observed)
 b - suspected breeding (present during breeding season)
 V - visitor (breeds nearby, but not on the study area)
 t - present, but no evidence of breeding
 W - winter resident and migrant only
 M - migrant only

Table 155. Species composition, frequency of occurrence, and numbers of songbirds observed on the Tongue River Dam road census route.

Species	Number Observed		Total No. Observ. (4 runs or 80 stops)	Percent	
	1980 (3 runs)	1981 (1 run)		Frequency (No. stops occurrence ÷ 80 stops total)	Percent Species Comp.
Western meadowlark	95	29	124	81	19
Red-winged blackbird	55	19	74	36	11
Lark sparrow	18	26	44	34	7
Chipping sparrow	30	7	37	31	6
Brewer's blackbird	20	13	33	18	5
Yellow warbler	22	10	32	22	5
Common grackle	10	20	30	11	5
Western kingbird	14	13	27	18	4
American robin	13	12	25	22	4
House wren	13	6	19	15	3
Tree swallow	11	8	19	6	3
Northern oriole	8	10	18	15	3
Eastern kingbird	8	9	17	12	3
Rufous-sided towhee	11	3	14	15	2
Rock wren	10	4	14	15	2
Mourning dove	7	7	14	12	2
Starling	1	11	12	8	2
Killdeer	7	3	10	10	2
Vesper sparrow	5	3	8	9	1
Brown-headed cowbird	7	1	8	8	1
Cassin's kingbird	4	4	8	4	1
Brewer's sparrow	4	3	7	8	1
American goldfinch	0	7	7	5	1
Common flicker	3	3	6	8	1
Black-billed magpie	5	0	5	5	1
American kestrel	1	3	4	5	1
Western wood pewee	4	0	4	5	1
Black-capped chickadee	3	1	4	5	1
Spotted sandpiper	2	2	4	4	1
Lark bunting	3	0	3	2	+
Common yellowthroat	1	1	2	2	+
Yellow-rumped warbler	2	0	2	2	+

Table 155. Continued

Species	Number Observed		(4 runs or 80 stops)	Percent	
	1980 (3 runs)	1981 (1 run)		Frequency (No. stops occurrence: 80 stops total)	Species Comp.
Lazuli bunting	2	0	2	2	+
Least flycatcher	2	0	2	2	+
Double-crested cormorant	0	2	2	2	+
Pinyon jay	2	0	2	1	+
White-crowned sparrow	1	0	1	1	+
Cedar waxwing	1	0	1	1	+
Say's phoebe	1	0	1	1	+
Brown thrasher	1	0	1	1	+
Barn swallow	0	1	1	1	+
Warbling vireo	0	1	1	1	+
Belted kingfisher	0	1	1	1	+
43 species					
650 birds					

Figure 118. Turkey observations and great blue heron and cormorant rookery, on the Tongue River Dam study area.

Figure 119. Tongue River Dam study area songbird road survey route and songbird census and small mammal trapline locations.

The walking census strips (Figure 119) were only run once each due to bad weather, so the results should only be used for general comparisons between habitats. River bottom riparian was the most diverse and productive for songbirds (Table 156). Nearly twice as many birds were observed in this strip than on the ponderosa pine-juniper strip (Table 157). The census strip in grassland ran through sagebrush, xeric grassland, and some scattered juniper. It supported more species than the grassland strips on the Birney and Kirby areas (Table 158).

Table 156. Total numbers, numbers of singing males, and percent composition of songbirds observed on the riparian census strip on the Tongue River Dam area.

Species	Singing Males		Total Birds	
	No. Observed	%Composition	No. Observed	%Composition
Yellow warbler	15	28	22	18
House wren	9	17	15	13
Lazuli bunting	5	9	6	5
American robin	2	4	6	5
American goldfinch	1	2	6	5
Common flicker	0	0	6	5
Common grackle	0	0	6	5
Western wood pewee	4	8	5	4
Western kingbird	2	4	5	4
Chipping sparrow	1	2	5	4
Red crossbill	0	0	4	3
Eastern kingbird	0	0	4	3
Brewer's blackbird	0	0	4	3
Least flycatcher	2	4	3	3
Mourning dove	0	0	3	3
Starling	0	0	3	3
Black-billed cuckoo	2	4	2	2
Warbling vireo	2	4	2	2
Red-winged blackbird	2	4	2	2
Northern oriole	2	4	2	2
Yellow-headed blackbird	0	0	2	2
Black-headed grosbeak	1	2	1	1
Common yellowthroat	1	2	1	1
Yellow-breasted chat	1	2	1	1
Western meadowlark	1	2	1	1
Screech owl	0	0	1	1
Brown-headed cowbird	0	0	1	1
27 species	53		119	

Table 157. Total numbers, numbers of singing males, and percent composition of songbirds on the ponderosa pine census strip on the Tongue River Dam area.

Species	Singing Males		Total Birds	
	No.	%	No.	%
Species	Observed	Composition	Observed	Composition
Red crossbill	0	0	17	26
Chipping sparrow	6	21	14	21
Rufous-sided towhee	5	18	8	12
House wren	4	14	6	9
Yellow-rumped warbler	3	11	3	5
Black-capped chickadee	2	7	3	5
Western meadowlark	2	7	2	3
Rock wren	2	7	2	3
Lark sparrow	2	7	2	3
Red-breasted nuthatch	0	0	2	3
Brown-headed cowbird	0	0	2	3
Western tanager	1	4	1	2
Solitary vireo	1	4	1	2
American robin	0	0	1	2
Mourning dove	0	0	1	2
American goldfinch	0	0	1	2
16 species	28		66	

Table 158. Total numbers, numbers of singing males, and percent composition of songbirds on the grassland census strip on the Tongue River Dam study area.

Species	Singing Males		Total Birds	
	No.	%	No.	%
Species	Observed	Composition	Observed	Composition
Western meadowlark	4	15	14	28
Lark sparrow	4	15	12	24
Lark bunting	10	38	10	20
Brewer's sparrow	5	19	6	12
Vesper sparrow	2	7	6	12
Sage thrasher	1	4	1	2
Brewer's blackbird	0	0	1	2
7 species	26		50	

Raptors

Twelve species of hawks and three species of owls were observed on the study area. Nine of these were known or suspected breeders. Thirteen nests, excluding kestrel nests, were located on or near the study area (Table 159 and Figure 120). Red-tailed hawks, American kestrels, and great-horned owls were the most common breeding raptors. Nine species of raptors (excluding kestrels) were observed migrating or wintering on the study area (Figure 121). Additional raptor species were found as migrants or nesters in the region by Lockhart, McEneaney and Hartin (1977).

The goshawk, golden eagle, bald eagle, osprey, prairie falcon, and peregrine falcon are listed by Flath (1981) as species of special interest or concern in Montana. The golden eagle, bald eagle, osprey, prairie falcon, and peregrine falcon are also listed as species of high federal interest. The status of each of these within the study area is as follows:

Goshawk - Several migrants were observed. Goshawks and other accipiters may nest in the study area, but they are hard to observe in the dense timber stands they prefer. Goshawks are known to breed in the Wolf Mountains to the west of the study area.

Golden eagle - McEneaney and Lockhart (1979) studied the golden eagle population in an area that included the southern half of the Tongue River Dam study area. Two pairs of eagles use parts of the study area by the reservoir. A third pair was located outside of their study area in the northern part of the Tongue River Dam area. Therefore, parts of three eagle territories are within the study area, but the study area is too small and narrow to support an entire eagle territory. Four nests were located in or near the study area (Table 159). Two of the nests belong to one pair.

Bald eagle - Bald eagles were present on the study area through the winter. They appeared to concentrate in two small areas (Figure 121), probably due to the presence of open water.

Osprey - One pair of ospreys nested at the southern end of the reservoir in both years. They were unsuccessful in bringing off young. In past years, two pairs of osprey have inhabited the reservoir area (Lockhart, McEneaney, and Harting 1977). In an attempt to provide nest less susceptible to wind damage, biologists from Peter Kiewit and Sons constructed several nest platforms around the reservoir during the winter of 1980-81. They placed one of these in the tree used for nesting in 1980. The ospreys used this nest again in 1981. After it failed, they constructed a frustration nest on another nest platform.

Table 159. Nest substrates and production data of raptor nests on the Tongue River Dam area.

Nes No. Species	Substrate	Activity	
		1980	1981
1 Red-tailed hawk	Cottonwood	Active, no production data	Inactive
2 Red-tailed hawk	Cottonwood	Status unknown	Active, 1 young fledged
3 Red-tailed hawk	Cottonwood	Inactive	Inactive
4 Red-tailed hawk	Cottonwood	Status unknown	Active, no production data
5 Red-tailed hawk	Cottonwood	Status unknown	Active, no production data
6 Great-horned owl	Cottonwood	Status unknown	Active, no production data
7 Osprey	Dead cottonwood	Active, failed during incubation	Active, failed during incubation
8 Osprey	Dead cottonwood	-	Frustration nest
9 Prairie falcon	Cliff	Status unknown	Active, 1 young fledged
10 Golden eagle	Ponderosa pine	Inactive	Inactive
11 Golden eagle	Dead ponderosa pine	Inactive	Inactive
12 Golden eagle	Ponderosa pine	Inactive	2 young fledged
13 Golden eagle	Ponderosa pine	Inactive	1 young fledged

Figure 120. Resident raptor observations on the Tongue River Dam study area.

Figure 121. Migrant and wintering raptor observations on the Tongue River Dam study area.

Prairie falcon - One prairie falcon aerie was located in 1981 (Table 159). Most of the cliffs in the study area are unsuitable for falcon nesting, being either too crumbly or lacking potholes.

Peregrine falcon - One female peregrine falcon was sighted over the reservoir on 12 May 1980. This bird was definitely a migrant. Other migrant peregrine falcons were sighted in the region on the Foster Creek area, the Greenleaf-Miller area, the Cheyenne Indian Reservation, and the Montco Mine permit area (Olson-Elliott and Associates 1980). Peregrines seemed to be attracted to the Tongue River and large stock ponds, probably to feed on waterfowl, during migration.

Other special interest species - The Brewer's sparrow is also listed as a species of special interest or concern in Montana (Flath 1981). They were fairly common in sagebrush areas throughout the study area.

The white pelican and double-crested cormorant are species of high federal interest. Flocks of white pelicans were seen occasionally during both summers of the study. They apparently were non-breeders. Double-crested cormorants nested in the great blue heron rookery at the southern end of the reservoir (Figure 118). No nest count was made, but the rookery was large and contained many nests of both species.

Nongame Mammals

Twenty species of mammals, including game species, were observed on the study area (Table 160). This list is certainly not a complete list of the mammals found in the area. Other species of small-mammals were captured during studies conducted on and near the study area by Ecological Consultants Inc. (1976), Pitcher (1976) and Renewable Resources Consulting Services, Ltd. (1976).

Fourteen small-mammal traplines were run, eight during summer and six during fall (Figure 119). Trapping success ranged from 1.7 captures/100 trap nights in riparian habitats to 2.7 captures/100 trap nights in areas next to cliffs (Table 161). Deer mice were the most common of the four species caught.

Only a few coyotes were observed, mainly in the northern half of the study area. One den with four pups was located on Anderson Creek in 1981. A few red fox were observed, primarily at the southern end of the reservoir. Bobcats probably occur in the rugged northern half of the study area, but none were seen during the study. There are no prairie dog towns in the study area.

Amphibians and Reptiles

Seven species of herps were observed in the study area (Table 162). This is certainly not a complete list of all herps found in the area. The three species of snakes were the most commonly encountered herps. The snapping turtle is listed as a species of special interest or concern in Montana by Flath (1981). They were fairly common in the Tongue River below the dam.

Table 160. Mammals observed on the Tongue River Dam study area.

	Common Name	Scientific Name
1	Raccoon	<i>Procyon lotor</i>
2	Striped skunk	<i>Mephitis mephitis</i>
3	Coyote	<i>Canis latrans</i>
4	Red fox	<i>Vulpes vulpes</i>
5	Yellowbelly marmot	<i>Marmota flaviventris</i>
6	Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>
7	Least chipmunk	<i>Eutamias minimus</i>
8	Red squirrel	<i>Tamiasciurus hudsonicus</i>
9	Northern pocket gopher	<i>Thomomys talpoides</i>
10	Beaver	<i>Castor canadensis</i>
11	Western harvest mouse	<i>Reithrodontomys megalotis</i>
12	Deer mouse	<i>Peromyscus maniculatus</i>
13	Northern grasshopper mouse	<i>Onychomys leucogaster</i>
14	Bushytail woodrat	<i>Neotoma cinerea</i>
15	Muskrat	<i>Ondatra zibethicus</i>
16	Porcupine	<i>Erethizon dorsatum</i>
17	Desert cottontail	<i>Sylvilagus audubonii</i>
18	Mule deer	<i>Odocoileus hemionus</i>
19	Whitetail deer	<i>Odocoileus virginianus</i>
20	Pronghorn antelope	<i>Antilocapra americana</i>

Table 161. Results of small-mammal trapping the Tongue River Dam area.

	Ponderosa			
	Sagebrush	Pine-Juniper	Riparian	Cliff
Total captures	28	43	24	22
Trap nights	1567	1640	1424	820
Captures/100 trap nights	1.8	2.6	1.7	2.7
Number of species caught	2	2	2	1
Species:				
<i>Peromyscus maniculatus</i>	27	42	22	22
<i>Eutamias minimus</i>		1		
<i>Onychomys leucogaster</i>	1			
<i>Reithrodontomys megalotis</i>			2	

Table 162. Amphibians and reptiles observed on the Tongue River Dam area.

Common Name	Scientific Name
1 Leopard frog	<i>Rana pipiens</i>
2 Northern chorus frog	<i>Pseudacris triseriata</i>
3 Snapping turtle	<i>Chelydra serpentina</i>
4 Short-horned lizard	<i>Phrynosoma douglassi</i>
5 Racer	<i>Coluber constrictor</i>
6 Bull snake	<i>Pituophis melanoleucas</i>
7 Prairie rattlesnake	<i>Crotalus viridis</i>

RECOMMENDATIONS

If any of these potential coal lease areas are leased, the following measures should be taken to protect and maintain the wildlife resource:

1. Exclude from leasing all sharptail and sage grouse breeding grounds and appropriate buffer zones. Buffer zones should be a minimum of one-half mile, or more if necessary, to include nesting cover and wintering areas.
2. Exclude from leasing all major mule deer and antelope winter ranges and other seasonal concentration areas. Traditional wintering areas could not be delineated during the unusually mild and short winter of 1980-81. Therefore, prior to further consideration for leasing, these study areas should be monitored during a winter season for the purpose of identifying big game winter ranges.
3. Exclude from leasing all creek bottoms and associated riparian habitats. As used here, the term "riparian habitat" includes all mesic areas supporting deciduous trees and shrubs. A significant proportion of the riparian vegetation on the study areas is found on side drainages and mesic draws away from the major flood plains.

Although riparian vegetation comprises the smallest portion of active vegetation on the study areas, its destruction would have a devastating impact on the wildlife resource. Riparian habitats play an extremely important role for livestock as well as wildlife species during the hot and dry summer and fall seasons in eastern Montana. In addition to providing succulent forage, security cover and a favorable thermal environment for relief from the heat, they are often the sole source of water. Riparian vegetation supports the highest density and diversity of resident songbirds and small mammals and a large proportion of known raptor nests. These habitats are also heavily used by roosting raptors and migrating songbirds.

4. Maintenance or enhancement of habitat diversity should be addressed in mining and reclamation plans. Habitat diversity and favorable interspersions of habitats is the key to maintaining or restoring current diversity of the wildlife resource.
5. Protect or enhance cliff and rock formations, particularly those made of sandstone. Cliffs with suitable potholes and ledges are used by raptors for roosting and may be used as nest sites in the future, even if they are not currently used.
6. Preserve nest sites used by golden eagles and other "special interest" raptors, with an appropriate buffer zone. Raptors

commonly build several nests within their territories and use them alternately between years (Call 1978). A nest may be used again, even if it has been inactive for several years.

All known raptor stick nests, including those originally built by red-tailed hawks, should be monitored for use by "special interest" species until mining actually takes place. Raptors often rebuild and use nests originally constructed by other species.

7. Minimize disturbance of active raptor nests during the breeding season (April-July). Disturbance during incubation can cause egg mortality from predation or exposure after an incubating bird is flushed, or abandonment of the nest. Disturbance of nests with nestlings can cause mortality from exposure, interrupted feedings and premature fledging.

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Appendix Table 1. Parameters recorded at each observation.

A. Vegetation type and subtype

1. Ponderosa pine
  - a. ponderosa pine
  - b. snowberry
  - c. juniper
  - d. creeping juniper
  - e. sagebrush
  - f. skunkbush
  - g. grassland
2. Juniper
  - a. sagebrush
  - b. skunkbush
  - c. grassland
3. Sagebrush/grassland
  - a. big sagebrush
  - b. silver sagebrush/greasewood
  - c. skunkbush (deciduous shrub)
  - d. xeric grassland
4. Creek bottom
  - a. deciduous tree
  - b. deciduous shrub
  - c. mesic grassland
5. Agricultural
  - a. upland
  - b. creek bottom

B. Activity

1. Standing
2. Running
3. Lying
4. Feeding

C. Topography

1. Mesa-butte top
2. Mesa-butte steep sides
3. Dissected mid-slopes
4. Alluvium/terrace
5. Current flood plain

D. Exposure

1. North
2. South
3. East
4. West
5. Northeast
6. Northwest
7. Southeast
8. Southwest
9. Flat

E. Slope

1. Flat
2. Gentle
3. Medium
4. Steep