An inventory of the bird populations within the Sarpy Creek drainage, southeastern Montana
by Jeffrey Thomas Herbert

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE
in Fish and Wildlife Management
Montana State University


Abstract:
Segments of the bird populations within the Sarpy Creek drainage were censused during the spring and summer of 1975 and 1976. These investigations were undertaken to provide baseline population data with which to measure potential changes resulting from the development of a strip mining operation. The distribution and status of the primary game bird species were determined during the peak of breeding activity from mid-April to mid-May. A pheasant crowing count route yielded an average of 8.7 and 13.7 recorded crows per 2-minute period for the 1975 and 1976 spring estimates, respectively. The enumeration of the maximum number of male grouse attending individual breeding grounds yielded averages of 13.7 and 9.5 sharp-tailed grouse and 14.0 and 18.0 sage grouse per ground per year. The relative abundance, species composition and breeding pair densities of non-game species were determined by censusing a 15-mile road route and four 40-acre breeding pair plots. Both the road route stations and breeding pair plots were classified into gross dominant-subdominant vegetational types. An upland type, characterized as a mixed grassland, timber, deciduous thicket association, had the greatest diversity in numbers of bird species represented and the highest breeding pair densities for the 2-year period. Conversely, the grassland association had the least diversity in species composition and the lowest breeding pair densities. The pattern indicated a direct relationship between the structural complexity of the vegetational life form cover-types and the diversity of birds utilizing these types.

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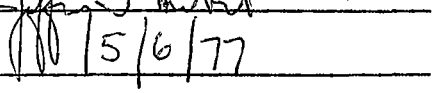
Date 

# AN INVENTORY OF THE BIRD POPULATIONS WITHIN THE SARPY CREEK DRAINAGE, SOUTHEASTERN MONTANA

by

JEFFREY THOMAS HERBERT

A thesis submitted in partial fulfillment
of the requirements for the degree

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Approved:

Robert P. Eng
Chairperson, Graduate Committee

James M. Lechleitner
Head, Major Department

Henry L. Parsons
Graduate Dean

MONTANA STATE UNIVERSITY
Bozeman, Montana

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## ABSTRACT

Segments of the bird populations within the Sarpy Creek drainage were censused during the spring and summer of 1975 and 1976. These investigations were undertaken to provide baseline population data with which to measure potential changes resulting from the development of a strip mining operation. The distribution and status of the primary game bird species were determined during the peak of breeding activity from mid-April to mid-May. A pheasant crowing count route yielded an average of 8.7 and 13.7 recorded crows per 2-minute period for the 1975 and 1976 spring estimates, respectively. The enumeration of the maximum number of male grouse attending individual breeding grounds yielded averages of 13.7 and 9.5 sharp-tailed grouse and 14.0 and 18.0 sage grouse per ground per year. The relative abundance, species composition and breeding pair densities of non-game species were determined by censusing a 15-mile road route and four 40-acre breeding pair plots. Both the road route stations and breeding pair plots were classified into gross dominant-subdominant vegetational types. An upland type, characterized as a mixed grassland, timber, deciduous thicket association, had the greatest diversity in numbers of bird species represented and the highest breeding pair densities for the 2-year period. Conversely, the grassland association had the least diversity in species composition and the lowest breeding pair densities. The pattern indicated a direct relationship between the structural complexity of the vegetational life form cover-types and the diversity of birds utilizing these types.

# INTRODUCTION

Increased energy demands have focused attention on the fossil fuel resources of many western states. Energy development in southeastern Montana has centered primarily on the strip mining of the Fort Union Coal Field. Recent federal legislation may further accelerate the removal of coal from this area. Strip mining in its present technological state may critically alter existing vegetational types and associated wildlife populations. Thus, there is a definite need for the establishment of baseline data on wildlife population parameters prior to the development of a mining operation.

Such a mining operation has been proposed by the Amax Coal Company for the Sarpy Creek area approximately 22 airline miles south-southeast of Hysham, Montana. The intent of this study was to inventory bird populations of the Sarpy Creek area. Specific study objectives were to determine the status and distribution of the game bird species and to record the species composition, relative abundance and breeding densities of non-game species in relation to the various vegetational types present.

Field work was conducted on a part-time basis during the spring (April-May) and a full-time basis during the summer months (June-August) of 1975 and 1976.

## DESCRIPTION OF STUDY AREA

The study area is located in southeastern Montana within Treasure and Big Horn counties (Figure 1). Sarpy Creek, a small meandering stream, serves as the major drainage of the area. Two of its tributaries, East Fork Sarpy Creek and Horse Creek, are associated with the study area.

The study area comprised approximately 22 square miles and was situated adjacent to and east of Sarpy Creek. The linear boundaries as determined by Amax Coal Company, reflect probable distribution of subsurface coal deposits and potential mine sites. These boundaries are not indicative of any major change in land type or vegetational characteristics. Physiographic features of the study area boundary are Sarpy Creek road on the west, East Fork Sarpy Creek on the south, the divide between Sarpy Creek and Armell's Creek drainages on the east and a county road to the Wilson Ranch on the north. The area is owned almost entirely by private landowners and the uplands were accessible by vehicle only when the roads through the property were dry.

Geologically the area consists of disturbed beds of soft shale and sandstone of the Fort Union Formation which have been deeply eroded by the streams of the area (Moshier & Fielder 1967). This has resulted in the formation of rather narrow valleys (elevations 3150 to 3300 ft.) bordered in the southern and southwestern sectors of the area by abrupt, steep slopes and to the north and northwest by moderate to strongly

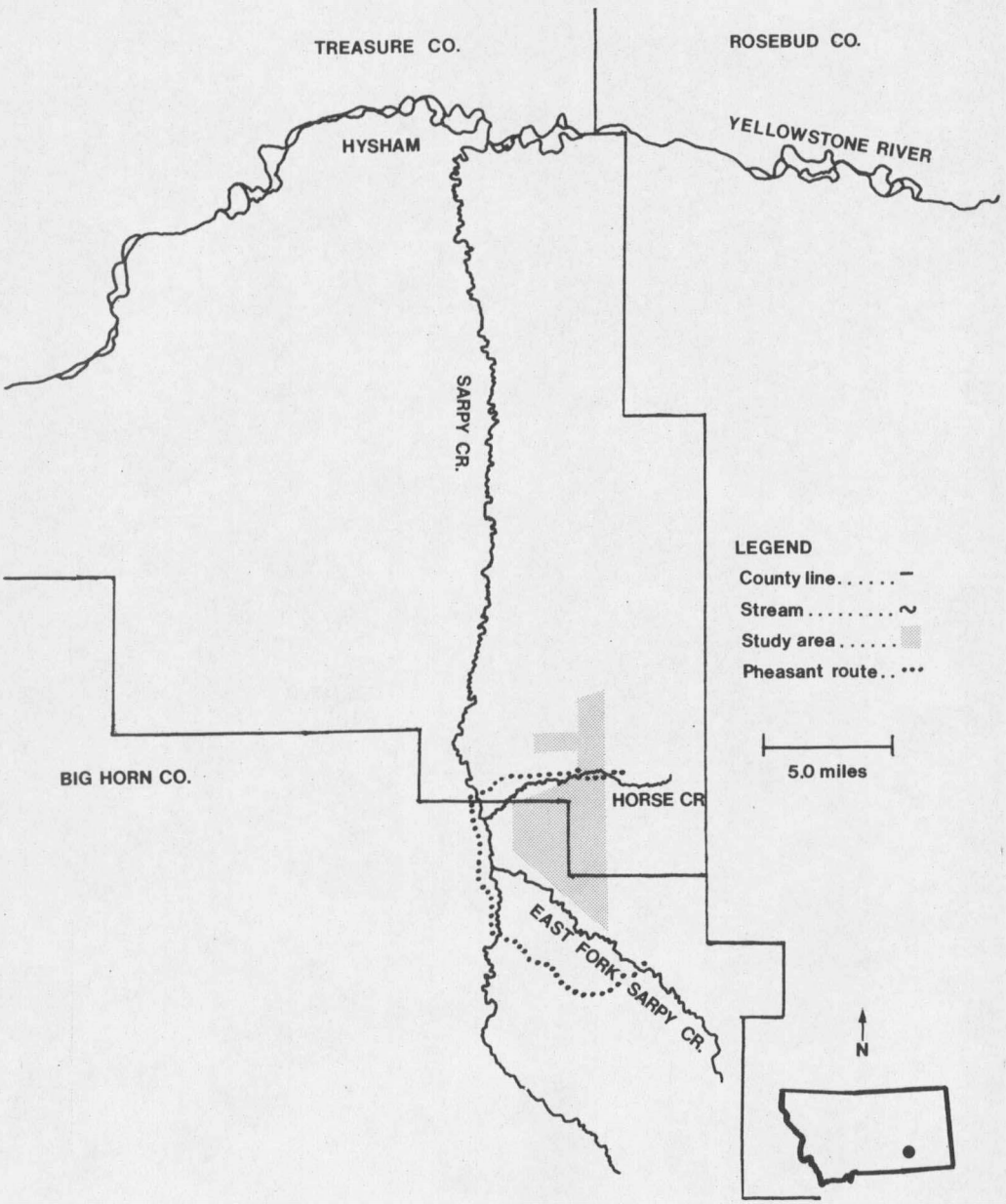


Figure 1. Map of the study area showing major features.

rolling hills. The upland portion of the area is characterized by rough, broken terrain and hills (elevations 3400 to 3600 ft.) which grade into the Little Wolf Mountains (peak elevation 4800 ft.) to the southeast. The major soils of the area are the Bainville-Flasher-Badlands and the Bainville-Midway associations (Southard 1973). The Bainville-Flasher-Badlands association is dominated by moderately deep to shallow soils, areas of shale, sandstone and siltstone outcrops and rough gullied lands. The Bainville-Midway association is one of light colored, shallow to moderately deep soils over sandstone, siltstone and shale. Drainage for the most part is excessive with rapid run-off.

The climate can be described as continental with chinook winds in the winter and a favorable distribution of precipitation during the growing season. Summers are hot and dry and winters moderately cold and dry (Moshier & Fielder 1967). From 1953-1967 the annual precipitation was 10-14 inches for lower elevations and 14-20 inches in the uplands (Jackson 1971). Average monthly temperatures and precipitation totals recorded at the United States Weather Bureau Station Hysham 25SSE for 1975 and 1976 are presented in Table 1. This station is located on Horse Creek road within the boundaries of the study area at an elevation of 3300 ft. The average frost-free season is approximately 105 days (Caprio 1965).

The following are gross vegetational types beginning with the riparian type found along the stream bottoms and progressing to types

TABLE 1. MONTHLY AVERAGE TEMPERATURES AND PRECIPITATION TOTALS RECORDED AT THE U. S. WEATHER BUREAU STATION HYSHAM 25SSE 1975, 1976.

| | J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature (°F) | | | | | | | | | | | | |
| 1975 | 22.1 | 14.0 | 28.8[1] | 36.0 | 50.0[1] | 58.5 | 71.9 | 66.0[1] | 55.2 | 45.1 | 29.2[1] | 23.1 |
| 1976 | 20.3 | 32.1 | 30.5 | 46.3 | 55.0[1] | 61.0[1] | 71.8 | 69.3 | 58.9[1] | 42.2 | 30.5 | 25.6 |
| Precipitation Total (- inches) | | | | | | | | | | | | |
| 1975 | 1.69 | .56 | .84[2] | 2.16 | 2.58 | 2.05 | 1.10 | .24 | .33 | 2.07 | 1.63 | 1.17 |
| 1976 | .67 | .91 | .41 | 1.29 | 1.93 | 4.14 | .27 | .96 | .92 | 1.52 | .77 | .23 |

[1]One or more days of record missing.
[2]Water equivalent of snowfall wholly or partially estimated, using ratio of 1" water equivalent to every 10" of new snowfall.

found at higher elevations. The creek bottom type is dominated by a deciduous overstory of box elder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*) and plains cottonwood (*Populus deltoides*). Areas immediately adjacent to this type have been developed for crop production, primarily cultivation of alfalfa for seed and hay, and as winter range for livestock. Those sections not disturbed by cultivation are represented by a silver sagebrush (*Artemisia cana*) type. Big sagebrush (*Artemisia tridentata*) predominates on the more xeric sites on the rolling hills of the western and northern sections and in scattered tracts throughout the study area. Stands of ponderosa pine (*Pinus ponderosa*) occur throughout the uplands and are characterized by Pfister et al. (1974) as typically even aged with a scattering of younger age and smaller size classes in old-growth stands. Deciduous trees and broadleaf shrubs in the uplands are largely limited to seeps and minor drainageways. Important species in these mesic sites are hawthorn (*Crataegus succulenta*), chokecherry (*Prunus virginiana*) and wild plum (*Prunus americanus*) with an occasional box elder or green ash. There are scattered stands of skunkbrush sumac (*Rhus trilobata*), snowberry (*Symphoricarpos* spp.) and sagebrush in association with either grassland or coniferous timber types. Herbaceous vegetation can be characterized as a mixed short- to mid-grass prairie type dominated by native bunchgrasses (*Agropyron* spp., *Stipa* spp., *Andropogon* spp.) and prairie forbs. Grazing pressure and cultivation

on the uplands has resulted in the introduction of exotic species and an increase in occurrence of species which are indicators of disturbed sites.

# METHODS

## Vegetation

Aerial photos, ocular estimates and specific sampling procedures were used in various combination to delimit and describe gross vegetational types. These types were defined along a pheasant crowing count route, a breeding bird survey route and on four plots established to census bird breeding pair densities.

A visual estimate was made of the vegetational physiognomy within a one-half mile radius of each pheasant route station and a one-quarter mile radius of each breeding bird route station. Data from stations with similar vegetational characteristics were combined and grouped into gross dominant-subdominant types.

Four 40-acre plots were established, one in each of four contrasting types: upland grassland; mixed grassland, ponderosa pine with hawthorn dominated drainages; ponderosa pine-mixed grassland; and a riparian creek bottom, silver sagebrush type. Each plot was gridded and staked throughout at 330-foot intervals. A composite map of prominent cover-types was constructed for each plot using a combination of aerial photos and ocular estimates. A dot grid was used to calculate the percentage composition of each important type.

Herbaceous vegetation was classified by using the pace-point method (Cottam & Curtis 1956). The species occurring on each of 200 points

established on three transect lines were recorded on each of the four plots. These data were later separated into the following categories: grasses, forbs, half-shrubs, or bare ground.

Species and canopy coverage of shrubs (Canfield 1941) were recorded along the same three transect lines. The location of dominant shrub and tree species on each of the plots was noted on a cover map. Diameter breast height (dbh) and relative densities of ponderosa pine were measured on Plots 2 and 3 using the point-quarter method described by Cottam and Curtis (1956), with a modification made to include saplings in density measurements.

A plant collection and subsequent species list for the area was compiled to facilitate vegetational analyses. Plant nomenclature follows Booth (1950, 1972) and Booth and Wright (1959).

## Birds

### Game Species

Of the five game bird species observed on the area, only the ring-necked pheasant (*Phasianus colchicus*), sharp-tailed grouse (*Pedioecetes phasianellus jamesi*), and sage grouse (*Centrocercus urophasianus*) populations were sampled quantitatively. Turkey (*Meleagris gallopavo merriami*) observations were limited but records were kept of birds seen or heard.

The spring pheasant population was censused using the crowing count method described by Kimball (1949). Logistic problems and weather conditions hampered field work during both spring periods of the study. As a result, the crowing count route was censused on a restricted basis during the peak of breeding activity from late April to mid-May (Gates 1966, Desimone 1975). The route was sampled and the crowing averages calculated only on mornings when the skies were clear and the wind velocity did not exceed 5 miles per hour. The approximate sampling period for the entire route was 45 minutes before, to 45 minutes after sunrise.

Sharp-tailed and sage grouse observations were directed mainly toward locating breeding grounds and recording numbers of males in attendance. Accessibility was a major problem and most spring travel was restricted to county roads. Limited aerial observations were made from a fixed wing aircraft (Piper Supercub). Breeding ground locations and number of male birds in attendance were compared to and averaged with those compiled by Martin (pers. comm.) during 1975 and 1976 for the same area.

Non-game Species

Two basic approaches to determining and analyzing bird abundance are discussed by Kendeigh (1944). One approach is dependent upon deriving a species index which permits comparison of relative abundance

of different species. The second involves determining the actual number of birds of each species on an area of known size.

A road route was established through a major portion of the study area (Figure 2) to obtain an index of relative abundance of breeding birds as outlined by the Cooperative Breeding Bird Survey of North America (1975). The route length was 15 miles, the first 10 stations (1-10) being separated by 0.5 mile and the second 10 (11-20) by 1.0 mile intervals. Each station was sampled for a 3-minute period with both audible and visual observations of all species recorded (each species being recorded only once per station). Weather condition requirements were similar to those of the pheasant census. The route was started 0.5 hour before sunrise and took an average of 3.0 hours to complete.

A breeding pair census was conducted on the four 40-acre plots (Figure 2) that were established in contrasting vegetational types. Procedures were similar to that described by Williams (1936). Each plot was sampled once per week in sequence so that the four plots and the road route constituted a 5-day sampling period. The total sampling period for each summer began in mid-June and extended to mid-July. The census of each plot followed the grid pattern, beginning on and walking the north-south axis lines and then repeating along the east-west axis lines. This pattern was varied every other sampling period. Birds were recorded as to species, sex (if possible) and whether or not the