Habitat selection home range size and movements of bobcats in north-central Montana

Pamela R. Knowles

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HABITAT SELECTION, HOME RANGE SIZE, AND MOVEMENTS OF BOBCATS IN NORTH-CENTRAL MONTANA

By

Pamela R. Knowles

B.S., Montana State University, Bozeman, 1977

Presented in partial fulfillment of the requirements for the degree of Master of Science

UNIVERSITY OF MONTANA

1981

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Dean, Graduate School

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Date
ABSTRACT

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Habitat Selection, Home Range Size, and Movements of Bobcats in North-Central Montana (52 pp.)

Director: Bart W. O'Gara

A study of bobcat habitat selection and movements was conducted from January 1979 through August 1980 on the Charles M. Russell National Wildlife Refuge in north-central Montana. Five cats (1 adult female, 1 adult male, 2 juvenile males, and 1 juvenile female) were radio-collared and followed from 2 weeks to 17 months with 3 of the cats accounting for 429 of the 457 relocations. Home range size was largest (83.3 km²) for the adult male, followed by the adult female with 17.8 km² and her male kitten with 5.8 km². The 2 remaining juveniles had too few relocations to accurately reflect home range size. Both juvenile males were illegally killed within 2 months after marking and the fate of the juvenile female remained undetermined at the end of the study. Nine cover types were designated on the study area and vertical vegetative cover was measured with a coverboard for each type. The juniper cover type was the densest (93% cover), followed by river bottom (75%), Douglas-fir (71%), dense pine (52%), greasewood (30%), open pine (24%), sage-grass (11%), agricultural (9%), and prairie dog town (3%). The 3 cats with over 50 relocations all showed significant selection for cover types with 52% cover or greater. The only cover type with less than 52% cover used more often than expected was that of prairie dog towns. Lagomorph pellet transects showed a high positive correlation with cover type density. The highest densities of small rodents were in the dense cover types (greater than 50% cover) and the sage-grass cover type.
ACKNOWLEDGEMENTS

The Montana Cooperative Wildlife Research Unit and the Charles M. Russell National Wildlife Refuge provided equipment, housing, and vehicles; the Young Adult Conservation Corps through the U.S. Forest Service paid me during 1 year of field work; and Sigma Xi provided financial assistance during the final summer in the field.

I express sincere appreciation to numerous individuals from whom I received technical advice and assistance. Dr. Jonkel provided encouragement when I first conceived the idea for this study and in the initial stages of writing the study proposal. Dr. O'Gara's expertise was invaluable in the execution of the study. Drs. O'Gara and Ball advised in the writing of the manuscript and Drs. Jonkel and Metzgar provided critical review.

I particularly thank the individuals who provided assistance during the different stages of my field work: Dale Meeks, U.S. Fish and Wildlife Service, Willis Kent, Phillips County trapper, and Craig Swick, Department of Livestock, provided trapping expertise and advice on traps and bait; Refuge personnel, particularly Donald Fortenberry who piloted the aircraft used in relocating radio-marked
cats; Ken Hamlin, Montana Department of Fish, Wildlife and Parks, provided additional data on small mammal and lagomorph populations on the Refuge and other assistance; and Sally Olson and Charles Stoner each volunteered their assistance for 2 months. I am most deeply indebted to my husband, Craig, for his many vital contributions to all stages of the study.
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CHAPTER I

INTRODUCTION

Since the early 1970's, bobcat (*Lynx rufus*) fur prices and trapping efforts have increased because of the ban on importing most exotic "spotted cat" furs imposed by the Convention on International Trade in Endangered Species of Wild Flora and Fauna in 1973. In response, the bobcat has received an unprecedented amount of attention from private conservation groups as well as state and federal agencies. The Working Group on Bobcat, *Lynx*, and River Otter was formed to assist the Endangered Species Scientific Authority in determining whether numbers of bobcats, lynx (*Lynx canadensis*), and river otters (*Lutra canadensis*) are sufficient to allow export of their furs without detriment to the species. They concluded that, to determine harvestable numbers, the present status and trends of bobcat populations throughout their range should be known. The quality of data available varies regionally, placing the Authority in a quandary regarding U.S. concurrence with the Convention. State and federal wildlife management agencies must now obtain data on bobcat population status in various habitats to establish reasonable harvest quotas.

Early studies of the bobcat concentrated on distribution

Few studies have been published from the western states. Gashwiler et al. (1960) conducted an extensive food habits study throughout Utah and eastern Nevada by stomach and scat analyses. They also published a study (1961) of sex ratios, gestation periods, and embryo numbers obtained from trapped bobcats. Bailey (1972) was involved primarily with an ecological study on social organization and home range size of bobcats in southern Idaho. Crowe (1975), working in Wyoming, investigated age classification by characteristics of the canine teeth and cementum annuli. He also investigated reproduction and age at sexual maturity, and developed models of exploited bobcat populations. Jones and Smith (1979) reported on bobcat densities on a wildlife area in Arizona.

In Montana, Robinson and Grand (1958) compared movements of bobcats and coyotes (Canis latrans). In 1976, Phillips (pers. comm.),
U.S. Fish and Wildlife Service, captured and marked 12 bobcats in southeastern Montana. Eight were equipped with radio-collars. This study was discontinued because of a lack of control over the harvest and changing research priorities. Results were meager and not published. In addition, limited unpublished data have been compiled by personnel of the Montana Department of Fish, Wildlife and Parks, concerning the yearly trapping harvest of bobcats. Presently, the Department is also conducting a study of bobcat ecology in mountainous terrain west of the Continental Divide.

Essentially no information is available on the ecology of bobcats in the semi-open prairie breaks country of eastern Montana. Information concerning density, habitat requirements, and annual trapping levels of bobcats in this area is needed.

This study, conducted on the Charles M. Russell National Wildlife Refuge along the breaks of the Missouri River, was designed to obtain some of these data. The primary objectives were to:

1) determine home range size of bobcats in a prairie breaks habitat,

2) determine seasonal habitat selection and movements of bobcats, and

3) develop recommendations for management guidelines to the Charles M. Russell National Wildlife Refuge and the Montana Department of Fish, Wildlife and Parks.
CHAPTER II

STUDY AREA

The study area (440 km$^2$) is located in north-central Montana (Fig. 1) along the Missouri River at the northwest end of the Charles M. Russell National Wildlife Refuge. The area is an eroded plateau typified by rough timbered breaks and productive river bottom lands. The northern boundary of the Refuge roughly approximates the transition of the timbered breaks to rolling prairie. Elevation is 680 m at the River and rises to approximately 920 m. Topographic relief from the River to the tops of the adjacent ridges ranges from about 240 m at the west end to about 120 m at the east end of the study area. The Little Rocky Mountains are located 35 km north of the River. The study area is easily accessible by vehicle on existing roads.

The study area shows a gradual transition in conifer species from west to east. North-facing slopes at the west end of the study area are timbered predominantly by Douglas-fir (Pseudotsuga menziesii) interspersed with thickets of Rocky Mountain juniper (Juniperus scopulorum); at the east end, Douglas-fir is replaced on north slopes by ponderosa pine (Pinus ponderosa) and juniper. Scattered ponderosa pine typify south-facing slopes throughout the
study area. River bottom vegetation consists of cottonwoods (Populus sargentii) and willows (Salix spp.) with a rose (Rosa spp.)-snowberry (Symphoricarpos spp.) understory. A small percentage of the river bottom is cultivated to produce hay. The River usually floods in March or April and sometimes in May. River bottom lands along the eastern third of the study area are inundated by waters of Fort Peck Reservoir. The upper boundaries of the river bottom lands and the coulee bottoms are dominated by grasses and greasewood (Sarcobatus vermiculatus). The broad ridgetops (where prairie dog [Cynomys ludovicianus] towns typically occur) are covered by big sagebrush (Artemisia tridentata) and grasses. Prairie dog towns occupy about 2% of the area and are most abundant at the east end of the study area. For more detailed information on the vegetation in this area see Allen (1968), Mackie (1970), and Knowles (1975).

Mean annual temperature and precipitation for this area are approximately 7°C and 35 cm. Winter 1979 was characterized by frequent snowstorms and had snow on the ground from mid-November through March with a total snowfall of 1.7 m. Winter 1980 was comparatively mild with infrequent, light snow cover and a total snowfall of only 0.3 m.
Trapping was conducted from March through May 1979 and October 1979 through 15 February 1980. Traps were set by myself, 2 professional trappers, and occasionally by my assistants.

Bobcats were trapped with No. 3 Victor long-spring and No. 4 Montgomery coilspring traps used with hanging bait and/or scent. Both types had unpadded, off-set jaws. To avoid injuries, leghold traps were not used during freezing weather. Four livetraps containing hanging bait, primarily jack rabbits (Lepus townsendi), were used. Commercially prepared bobcat and coyote scents, as well as bobcat and coyote urine were used. All traps were checked at least once daily.

Captured bobcats were injected with ketamine hydrochloride (22 mg/kg) and xylazine (1 mg/kg). Cats were then weighed, measured, radio-collared, eartagged with plastic Roto-tag cattle tags, and sex and approximate age class determined. Each cat was confined to a livetrap until it had recovered, then released and tracked for a short distance.

The radio-collars used for adults weighed approximately
180 g and had a battery life of 2 to 3 years. A 125 g collar with a battery life of 1 to 2 years was used for kittens. Both types of radio packages were equipped with 15 to 20 cm external antennas. The collared cats were relocated until February 1980 when I left the study area. Additional relocations were made from June through mid-August 1980. Relocations were obtained primarily through ground reconnaissance, with some aerial tracking from a Piper Supercub.

Bobcats were usually located in dense cover and I often could not see the animals without disturbing them. Therefore, locations were determined by triangulation, but I did not record cover type unless I could verify the type by circling the indicated location. Slope, aspect, weather data, my approximate distance from the cat, cover type, and activity were recorded. Activity of the cat was usually recorded as moving or not moving depending on the fluctuation of radio signal strength.

In this study, I referred to the existing vegetative cover at a site as a cover type and designated 9 distinct cover types. Cover types within the home ranges of the bobcats were mapped on acetate overlays on aerial photos (scale 1/24,000) and verified in the field. The area of each cover type was determined using an electronic digitizer. Selection of habitat was determined by comparing availability and use of cover types within the home range. Preference values were derived by determining expected number of relocations.
for each cat in each cover type by multiplying the percent availability of a cover type times the total number of relocations for a specific time period. If the expected number of relocations was larger than the observed number of relocations for a cover type, the former was divided by the latter and given a negative sign. If the expected number of relocations was less than the observed, the latter was divided by the former and given a positive sign. Therefore, a negative preference value denotes the number of times a cover type was used by a cat less than expected and a positive preference value is the number of times a cover type was used more than expected. Statistical significance of cover type selection was tested according to the method described by Neu et al. (1974). When determining seasonal use, seasons were designated as Spring (March-May), Summer (June-August), Fall (September-November), and Winter (December-February).

Vertical vegetative cover in each of the cover types was quantified with a coverboard 2 m high, 1 dm wide, and marked at 1 dm intervals. The board was held by an assistant 15 m from the observer, who recorded percentage of the board obscured by vegetation. Transects of 5 observation stations spaced 15 m apart with 5 corresponding board stations were used in each type sampled. Each cover type was sampled with 2 to 4 transects. I attempted to sample extremes within the cover types. The mean and 95% confidence limits were determined for each cover type.
I determined yearly and seasonal home range sizes using the minimum home range polygon method (Hayne 1949) and the modified minimum home range method (Harvey and Barbour 1965). Movements were determined by measuring the distance in a straight line between relocations on successive days. Average daily movements by season were also calculated.

Each cover type was sampled for small rodents with Sherman livetraps baited with rolled oats. Fifty traps were set out in a grid of 5 by 10 traps spaced 15 m apart. The traps were checked for 3 consecutive mornings, the small rodents marked and released, and the traps reset. The number of small rodents per 100 trap-nights was determined for each type. Trends of small rodent populations in this area since 1976 were obtained from data provided by personnel of the Montana Department of Fish, Wildlife and Parks.

Relative lagomorph densities in the various cover types were sampled by counting fecal pellets within transects consisting of 10 randomly placed 0.2 X 0.5 m sampling frames. After establishing an initial point in a cover type, the direction and number of paces (0-100) to the next frame were determined using a random numbers table. All lagomorph pellets within each frame were counted regardless of age or condition. The mean and 95% confidence limits were determined for pellet densities in each type. No distinction was made between cottontail (Sylvilagus spp.) and jackrabbit pellets, but cottontail pellets
were the most common. Trends of lagomorph populations based on headlight surveys since 1976 were obtained from data provided by personnel of the Montana Department of Fish, Wildlife and Parks.
CHAPTER IV

RESULTS

Trapping and Overview of Captured Bobcats

Trapping effort totaled 2091 trap-nights. Five bobcats were captured 7 times resulting in 299 trap-nights per capture, or 418 trap-nights per individual cat. One of the 5 cats was trapped by a professional trapper and the other 4 were captured by myself or my assistants. Four of the 5 cats were observed at later dates after their release and no trap-related injuries were noted. The only cat not observed was relocated several times and often moved 3 to 4 km between relocations, suggesting no trap-related injury.

Cat F1, an adult female trapped on 11 March 1979 (Table 1), had a home range that included Highway 191 and the major access road to the Refuge headquarters at the west end of the study area (Fig. 2). This cat's teeth were worn, and she was probably 4 years old or older when captured. Based on the condition of her teats, she had nursed kittens the previous year. She had 2 kittens in mid-May 1979, and a single kitten in June 1980. This cat was alive when last relocated at the end of the study.

An adult male, M1, trapped on 5 May 1979, had a home
Table 1. Capture data and number of relocations for bobcats captured on the study area.

<table>
<thead>
<tr>
<th>Cat number</th>
<th>Date captured</th>
<th>Date last located</th>
<th>Sex</th>
<th>Age</th>
<th>Wt. (kg)</th>
<th>Number of relocations</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>11 Mar 79</td>
<td>2 Aug 80</td>
<td>♂️</td>
<td>adult</td>
<td>10.0</td>
<td>287</td>
</tr>
<tr>
<td>M1</td>
<td>5 May 79</td>
<td>10 Aug 80</td>
<td>♂️</td>
<td>adult</td>
<td>11.5</td>
<td>90</td>
</tr>
<tr>
<td>M2</td>
<td>17 Oct 79</td>
<td>31 Dec 79</td>
<td>♂️</td>
<td>juvenile</td>
<td>4.7</td>
<td>70</td>
</tr>
<tr>
<td>M3</td>
<td>2 Dec 79</td>
<td>12 Jan 80</td>
<td>♂️</td>
<td>juvenile</td>
<td>4.7</td>
<td>16</td>
</tr>
<tr>
<td>F2</td>
<td>30 Jan 80</td>
<td>11 Feb 80</td>
<td>♂️</td>
<td>juvenile</td>
<td>6.2</td>
<td>12</td>
</tr>
</tbody>
</table>
range located at the east end of the study area (Fig. 2). Because of extensive wear on the canines, I estimated his age at 4 years or older. The external antenna on the collar broke in January 1980 and only 2 relocations were made after that time. The last observation was a chance visual sighting in a prairie dog town on the last day of the study in August 1980.

Cat M2, a juvenile male trapped on 17 October 1979, was one of the kittens born to F1 in 1979. He was last relocated alive on 30 December 1979. The collar was found 2 days later on the ice along the River, and had been cut with a knife. Tracks in the snow suggested that hunters with dogs were probably responsible for the disappearance of this cat.

Another juvenile male, M3, was caught in an area approximately half way between the home ranges of F1 and M1 on 2 December 1979 (Fig. 2). Nothing suggested that he was a sibling of M2. The radio-collar was found in a juniper thicket about 0.5 km from a road on 25 January 1980. The collar had been cut with a knife. Presumably this cat had also been illegally killed by humans.

A juvenile female, F2, was captured on 30 January 1980 in the same general area as M3 and could have been a sibling. She was relocated only a few times, the last on the evening of 11 February 1980. The next morning, no signal was received despite an extensive ground search. One week later, an aerial search was conducted but no signal
was detected. The fate of this cat remains undetermined.

Cover Types

Nine cover types were designated on the study area and are discussed in order of decreasing cover density. The juniper cover type was predominately juniper thickets with few other conifers and little or no understory. The river bottom cover type occurred as parallel strips of vegetation along the River. Each strip was dominated either by cottonwoods with a rose-snowberry understory, willows with no understory, or rose-snowberry with little understory. The Douglas-fir cover type had variable amounts of ponderosa pine and juniper intermixed with the Douglas-fir and a patchy understory of rose, chokecherry (*Prunus virginiana*), and snowberry. The dense pine cover type replaced the Douglas-fir cover type at the east end of the study area and had a similar understory. Greasewood was found primarily in coulee bottoms and the upper edges of the floodplain of the River, and had a sparse grass-forb understory. The open pine cover type was found primarily on south-facing slopes and had an open canopy with a grass understory or sparse shrubs and bare ground on steeper slopes. The sage-grass cover type on the ridgetops was dominated by low growing stands of big sagebrush and grasses such as western wheatgrass (*Agropyron smithii*) and blue grama (*Bouteloua gracilis*). Agricultural lands included parts or all of several river
bottoms that were cultivated primarily for hay. Prairie dog towns differed from the sage-grass cover type in that grass was short, shrubs were absent, and the area was occupied by prairie dogs.

Mean cover values and 95% confidence limits for the 9 cover types are shown in Fig. 3. The juniper cover type was the densest with 93% vertical cover. This was followed by river bottom (75%), Douglas-fir (71%), dense pine (52%), greasewood (30%), and open pine (24%). Sage-grass cover types were rarely over 0.5 m high and averaged 11% vertical cover. Both agricultural lands and the prairie dog town cover types were primarily grass and/or forbs and had values of 9% and 3% respectively. Open pine showed large variations that were, in part, due to sampling one site that had been heavily grazed by cattle.

**Habitat Selection**

Sufficient numbers of relocations were made for 3 of the 5 radio-collared cats (F1, M1, M2) to determine selection of cover types. Cover types were determined for 215 of 287 relocations of the adult female. Three cover types (Douglas-fir, juniper thicket, and river bottom) accounted for 89% of the relocations (Table 2). Douglas-fir and juniper types were consistently used during all seasons. River bottom was used in all seasons except spring when the bottomlands were inundated by flood waters of the Missouri River. Overall,
Fig. 3. Mean cover values and 95% confidence limits for the 9 cover types on the study area.
Table 2. Seasonal and annual habitat selection preference values for an adult female bobcat (F1).

<table>
<thead>
<tr>
<th>Cover types</th>
<th>Open pine</th>
<th>Sage-grass</th>
<th>Grease-wood/Ag</th>
<th>Douglas-fir</th>
<th>Juniper</th>
<th>River bottom</th>
<th>Prairie dog town</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>% available</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 1979</td>
<td>[57]a</td>
<td>-10 (4)b</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
<td>+6 (83)</td>
<td>+4 (13)</td>
<td>-∞ (0)</td>
</tr>
<tr>
<td>Summer</td>
<td>[49]</td>
<td>-3 (11)</td>
<td>-3 (6)</td>
<td>-∞ (0)</td>
<td>+3 (35)</td>
<td>+2 (6)</td>
<td>+22 (42)</td>
</tr>
<tr>
<td>Fall</td>
<td>[69]</td>
<td>-4 (10)</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
<td>+3 (34)</td>
<td>+3 (8)</td>
<td>+21 (42)</td>
</tr>
<tr>
<td>Winter</td>
<td>[22]</td>
<td>-7 (6)</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
<td>+4 (53)</td>
<td>+4 (12)</td>
<td>+11 (23)</td>
</tr>
<tr>
<td>Annualc</td>
<td>[197]</td>
<td>-6 (7)</td>
<td>-25 (1)</td>
<td>-∞ (0)</td>
<td>+4 (51)</td>
<td>+3 (10)</td>
<td>+13 (28)</td>
</tr>
<tr>
<td>Summer 1980</td>
<td>[18]</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
<td>+3 (40)</td>
<td>+3 (10)</td>
<td>+14 (30)</td>
</tr>
<tr>
<td>All 5 seasonsd</td>
<td>[215]</td>
<td>-6 (6)</td>
<td>-27 (1)</td>
<td>-∞ (0)</td>
<td>+4 (51)</td>
<td>+3 (10)</td>
<td>+14 (28)</td>
</tr>
</tbody>
</table>

*a* Number of relocations.

*b* Percent of relocations.

\[ c_x^2 = 1039.35, P < 0.005. \] All observed proportions greater than 0 vary significantly (\( P < 0.05 \)) from expected.

\[ d_x^2 = 2220.43, P < 0.005. \] All observed proportions greater than 0 vary significantly (\( P < 0.05 \)) from expected.
preference values for these types were positive. Douglas-fir accounted for over half of all the relocations though its preference value was considerably less than the value for the river bottom type. The cat was also frequently found at the only prairie dog town (located just above the flood plain of the Missouri River) in her home range. Because of the small size of this town, the overall preference value for this type was high even though it accounted for only 4% of the relocations. The remaining cover types--open pine, sage-grass, and greasewood/agriculture, comprising 81% of the cat's home range--received little use throughout the study and accounted for only 7% of the relocations. All preference values for these types were negative.

Some seasonal trends in habitat use were evident. Douglas-fir and juniper were preferred during winter and spring while the river bottom received its greatest use in summer and fall. Use of the prairie dog town was not detected during spring and summer 1979, but it was used during the remainder of the study. Open pine was used more often during summer and fall 1979 than during the remaining seasons.

Cover type use was determined for 41 of 90 relocations for the adult male. He showed a strong selection for dense vegetative cover (Table 3). Dense pine and juniper comprised only 14% of his home range but accounted for almost 66% of the relocations. These types all had positive preference values on an annual basis. Juniper
Table 3. Seasonal and annual habitat selection preference values for an adult male bobcat (M1).

<table>
<thead>
<tr>
<th>Cover types</th>
<th>Juniper</th>
<th>Dense pine</th>
<th>Greasewood</th>
<th>Open pine</th>
<th>Sage-grass</th>
<th>Prairie dog town</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% availability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>7</td>
<td>10</td>
<td>48</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>Spring 1979 [6]&lt;sup&gt;a&lt;/sup&gt;</td>
<td>+9 (66)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>+3 (17)</td>
<td>+2 (17)</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
</tr>
<tr>
<td>Summer [8]</td>
<td>+11 (75)</td>
<td>+4 (25)</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
<td>-∞ (0)</td>
</tr>
<tr>
<td>Fall [20]</td>
<td>+6 (40)</td>
<td>+2 (15)</td>
<td>-∞ (0)</td>
<td>-10 (5)</td>
<td>-∞ (0)</td>
<td>+21 (40)</td>
</tr>
<tr>
<td>Winter [7]</td>
<td>+2 (14)</td>
<td>+4 (29)</td>
<td>-∞ (0)</td>
<td>-1 (43)</td>
<td>-∞ (0)</td>
<td>+5 (14)</td>
</tr>
<tr>
<td>Annual&lt;sup&gt;c&lt;/sup&gt; [41]</td>
<td>+7 (46)</td>
<td>+3 (19)</td>
<td>-4 (2)</td>
<td>-5 (10)</td>
<td>-∞ (0)</td>
<td>+12 (22)</td>
</tr>
</tbody>
</table>

<sup>a</sup>[ ] Number of relocations.

<sup>b</sup>( ) Percent of relocations.

<sup>c</sup>x² = 209.78, P < 0.05. All observed proportions greater than 0 vary significantly (P < 0.10) from expected.
thickets were used much more extensively by M1 than by F1. The prairie dog town cover type was the only open cover type frequently used and had the highest positive preference value. Although this cover type comprised only 2% of his home range, 22% of his relocations occurred on prairie dog towns. The remaining types (sage-grass, open pine, and greasewood) were all used much less often than would be expected. No relocations were made in the sage-grass type (26% of the home range) while open pine and greasewood both accounted for few relocations. Agricultural lands were absent from the home range of this cat. The sample size was too small to adequately determine seasonal trends, but use of the prairie dog town cover type increased during fall and winter. Use of the open pine type increased at the same time to a lesser extent.

Cover types for the male kitten were determined for 50 of 52 relocations. One cover type, river bottom lands (27% of the home range) accounted for 89% of the relocations (Table 4). All other cover types were infrequently used and had negative preference values. Even though the river bottom cover type was intermixed with agricultural lands, this cat was found only once in the agricultural type.

Seasonal and Annual Movements and Home Range Sizes

The home range size for F1 totaled 17.8 km². Seasonal home range size increased as the seasons progressed from spring
Table 4. Seasonal and annual habitat selection preference values for a male bobcat kitten (M2).

<table>
<thead>
<tr>
<th>Cover types</th>
<th>% availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>River bottom fir</td>
<td>27</td>
</tr>
<tr>
<td>Grease-wood pine</td>
<td>17</td>
</tr>
<tr>
<td>Open pine</td>
<td>34</td>
</tr>
<tr>
<td>Sage-grass land</td>
<td>16</td>
</tr>
<tr>
<td>Agric. land</td>
<td>2</td>
</tr>
</tbody>
</table>

Total 1979 [64]^[a] +3 (90)^[b] -2 (8) -∞ (0) -∞ (0) -2 (1) -4 (1)

^[a] Number of relocations.

^[b] Percent of relocations.

\[
\chi^2 = 127.49, \quad P < 0.05. \quad \text{Observed proportions for river bottom and Douglas-fir vary significantly (} P < 0.10 \text{) from expected.}
\]
through winter 1979 (Table 5). Summer 1980 home range size was approximately 2.5 times larger than summer 1979 home range size. The average daily movements of summer 1979 was less than all other seasons (1-way ANOVA P<0.05). In contrast the average daily movement for the 1980 summer was significantly greater (P<0.05) than all other seasons except spring 1979.

The home range size of M1 totaled 83.3 km$^2$. The seasonal home range size varied from 40.4 km$^2$ in the summer of 1979 to 61.8 km$^2$ in the winter (Table 6). Daily movements averaged between 4.5 km in the winter and 5.5 km in the summer of 1979. No significant difference (Kruskal-Wallis 1-way ANOVA P<0.75) was noted in the movements between seasons.

The home range size of M2 was 5.8 km$^2$. The modified minimum home range method was used for this cat because of his extensive use of the river bottom habitat type and little use of upland types. M2 was occasionally found in upland types within his mother's (F1) home range, but never in an upland type outside of her home range. Therefore, those types were not included in the home range estimate for M2. Daily movements averaged 1.8 km (Table 7). No seasonal data were collected on this cat.

M3 and F2 were not followed long enough to obtain accurate estimates of their home range sizes. Home range size estimates are 22 km$^2$ for M3 and 16 km$^2$ for F2, but these are based on very few
### Table 5. Seasonal movements and home range sizes of F1.

<table>
<thead>
<tr>
<th>Season</th>
<th>Home range size (km²)</th>
<th>Furthest daily movement (km)</th>
<th>Ave. daily movement (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Spring 1979</td>
<td>[67]a</td>
<td>5.1</td>
<td>3.6</td>
</tr>
<tr>
<td>2 Summer</td>
<td>[57]</td>
<td>7.8</td>
<td>1.5</td>
</tr>
<tr>
<td>3 Fall</td>
<td>[96]</td>
<td>11.7</td>
<td>4.2</td>
</tr>
<tr>
<td>4 Winter</td>
<td>[40]</td>
<td>13.5</td>
<td>2.9</td>
</tr>
<tr>
<td>5 Summer 1980</td>
<td>[27]</td>
<td>13.0</td>
<td>4.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>[287]</td>
<td>17.8</td>
<td>4.2</td>
</tr>
</tbody>
</table>

a[ ] Number of relocations used to determine home range size.

b( ) Number of relocations used to determine average daily movements.

cSignificant differences (P<0.05) between this season and other numbered seasons.

### Table 6. Seasonal movements and home range sizes of M1.

<table>
<thead>
<tr>
<th>Season</th>
<th>Home range size (km²)</th>
<th>Furthest daily movement (km)</th>
<th>Ave. daily movement (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 1979</td>
<td>[12]a</td>
<td>55.2</td>
<td>6.8</td>
</tr>
<tr>
<td>Summer</td>
<td>[21]</td>
<td>40.4</td>
<td>8.2</td>
</tr>
<tr>
<td>Fall</td>
<td>[41]</td>
<td>61.8</td>
<td>9.1</td>
</tr>
<tr>
<td>Winter</td>
<td>[8]</td>
<td>46.4</td>
<td>c</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>[88]</td>
<td>83.3</td>
<td>9.1</td>
</tr>
</tbody>
</table>

a[ ] Number of relocations used to determine home range size.

b( ) Number of relocations used to determine average daily movements.

cNo data available for that season.

### Table 7. Movements and home range size of M2.

<table>
<thead>
<tr>
<th>Season</th>
<th>Home range size (km²)</th>
<th>Furthest daily movement (km)</th>
<th>Ave. daily movement (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct.-Nov. 1979</td>
<td>[52]a</td>
<td>5.8</td>
<td>4.3</td>
</tr>
</tbody>
</table>

a[ ] Number of relocations used to determine home range size.

b( ) Number of relocations used to determine average daily movements.
relocations and may be indicative of dispersing kittens rather than home ranges.

Relative Small Rodent Densities

In 1979, trapping was conducted in 4 cover types (Fig. 4). The juniper cover type had the highest density of small rodents at 32 captures/100 trap-nights, followed by dense pine, 17, Douglas-fir, 16, and river bottom, 14.

In 1980, trapping was conducted in all 9 cover types and the highest density (9) was in the sage-grass type (Fig. 5). River bottom and dense pine followed with 7 and 6, and juniper and Douglas-fir had 4. The remaining open cover types (less than 50% cover) had 3 captures/100 trap-nights or less.

Data were gathered on relative numbers of rodents in 3 cover types (greasewood, sage-grass, and dense pine) on the study area from 1976 to 1979 by the Montana Department of Fish, Wildlife and Parks. The Department discontinued trapping on the study area after 1979. I used my 1980 data for these 3 cover types plus the Department's data to establish yearly trends in relative densities of rodents (Fig. 6). Though I did not trap on the exact plots that the Department did, their 1979 data for comparable cover types were similar to mine (e.g., dense pine--16.3 vs. 17/100 trap-nights). Small rodent numbers were low in 1977, increased through 1978, peaked in 1979, and declined.
Fig. 4. Number of captures per 100 trap-nights in 4 cover types during 1979.

Fig. 5. Number of captures per 100 trap-nights in all 9 cover types during 1980.
Fig. 6. Small rodent population trends on the study area from 1976 through 1980.
dramatically in 1980.

The most numerous small rodent species during all years and in all types was the deer mouse (*Peromyscus maniculatus*). In 1979, however, voles (*Microtus pennsylvanicus* and *M. ochrogaster*) were also abundant. Yellow pine chipmunks (*Eutamias amoenus*) were frequently caught in all of the dense cover types in 1979. Other small rodents captured or observed on the study area included the silky pocket mouse (*Perognathus flavus*), house mouse (*Mus musculus*), bushy-tailed woodrat (*Neotoma cinerea*), and pocket gopher (*Thomomys talpoides*).

**Lagomorph Pellet Transect Results**

Mean values of lagomorph pellets for each cover type showed strong positive correlation to percent cover in each type ($r^2 = .802$, $P < 0.001$; Fig. 7). No pellets were found along transects in agricultural or prairie dog town cover types.

Annual lagomorph population trends were determined from data collected by the Montana Department of Fish, Wildlife and Parks and suggest a substantial decline in lagomorph densities from 1979 to 1980 (Fig. 8) with population peaks in 1977 and 1979.

**Denning**

Between 16 and 18 May 1979, F1 gave birth to 2 kittens. The den site was located approximately 20 m west of Highway 191 midway
Fig. 7. Means and 95% confidence limits of lagomorph pellet transects by cover types.
Fig. 8. Numbers of lagomorphs counted on vehicular transect routes in 1976 through 1980.
up a steep roadcut that had slipped downwards and was littered with
dried mudballs averaging 1 m in diameter. The dominant vegetation
was fireweed (Koshia scoparia) about 1 m high. The kittens were in a
depression amid the forbs but had no other shelter within 2 to 3 m.
The cat and kittens were not visible from the highway because of the
broken topography and vegetative cover; the mean coverboard reading
for this area was 54%. When searching for this den, I came within
3 m of F1 and her kittens before realizing that this was a den site.
Although I stared at F1 for several seconds before actually seeing her,
she made no sound or movement until I realized what I was looking at.
The moment I recognized her she growled and crouched, so I retreated.
This behavior was exhibited on other occasions but only when she had
kittens nearby. After the kittens had dispersed, F1 no longer growled
at my approach. She usually slipped silently away or, if aware of
being observed, ran for cover.

On 12 June 1979, 27 days after their birth, the kittens were
moved east of Highway 191 to an area removed from human disturbance.
This den site was in an extremely thick (coverboard mean 99%) 10 m²
patch of snowberry, rose, and chokecherry within a Douglas-fir cover
type. The kittens were not seen at this site, but the female remained
in the vicinity for approximately 30 days, so I believe that the kittens
were also there. F1 moved to the river bottom cover type on 11 July
1979 and stayed in or close to this type. On 23 July 1979, F1 moved
from the river bottom cover type and thereafter stayed in any 1 site for only 1 to 4 days. She was seen traveling and/or hunting 8 times after 23 July 1979, and no kittens were observed with her again until 25 September 1979. At that time, both kittens were observed with F1 in a Douglas-fir cover type in a different area from any of the previous den sites. One of the kittens was collared 2 weeks later. After that time, he was rarely found with the female although she was in the immediate vicinity while he was being radio-collared.

During the summer of 1980, relocations were gathered 2 to 3 times a week rather than daily as during 1979. The 1980 den site contained only 1 kitten (approximately 2 weeks old) on 13 June 1980. This den was in a slump area on a south-facing slope within an open pine cover type bordered by a Douglas-fir cover type. The den was a small, cave-like hole with the entrance located at the base of a large juniper bush. The hole extended back about 4 m under the juniper bush and was formed by soil movement and the root structure of the juniper. Because of the broken topography, the coverboard reading for this den site (43%) was higher than normally occurred in an open pine cover type. F1 traveled further from this den site in 1980 than she had normally ranged from the den site during the same period of time in 1979.

On 22 June 1979 the kitten was not at the den site, and was not seen again. F1's movements did not follow as definite a pattern as
they had the previous year, and I could not determine if the kitten had been moved to a new den site. F1 consistently returned to 2 specific areas, a Douglas-fir type and a river bottom type. Most of the relocations not at these 2 types were closest to the Douglas-fir type. Movements throughout the 1980 summer were greater and more erratic than during the summer of 1979.

**Hunting Behavior**

In this study, the most common hunting observed was directed at prairie dogs. The open and relatively level aspect of prairie dog towns lent ready observation of this particular aspect of hunting.

The cats usually crouched in the taller vegetation at the edge of the town, often in a shallow drainage. The cat rushed a prairie dog when the dog had strayed from its mound, usually while foraging. The cats were rarely observed until after their initial rush at a dog had been made. On 2 occasions the cats swatted at escaping dogs, narrowly missing them. Had they connected, this would have delayed the dogs enough for the cats to complete the kill. I cannot say whether this technique was usually used. On another occasion a cat was observed within seconds after the dogs began their alarm barks and the cat already had a dog in its mouth. The cat left the town with the live prairie dog in its mouth. Hamlin and Knowles (pers. comm.) both reported seeing cats lying on prairie dog mounds with their heads
next to the burrow entrance at sunrise. They did not watch the cats long enough to determine if the technique was successful.

When the initial rush failed to capture a dog, varying responses followed. If a cat was aware of an observer, it often left the town but rarely did so if unaware of being observed. If unaware of being observed, a cat usually employed 1 of 2 tactics. It would walk through the town and disappear down into the drainage or slope at the town's boundary and when out of sight of the dogs would sneak back to the edge of the town, crouch down and wait for another opportunity. The cat would sometimes sit or lie down on a mound in the town after the first or second rush proved unfruitful. The cat then remained relatively motionless for up to 3 hours with only occasional stretching, yawning, or changing of position. On 1 occasion, a cat lying on a mound made 2 unsuccessful thrusts with a foreleg down the burrow.
CHAPTER V

DISCUSSION

Among the 3 cats (F1, M1, M2) that had over 50 relocations, the adult male (M1) clearly had the largest home range and average daily movements. The adult female (F1) used an area 3 times the home range size of her marked kitten, M2, but exhibited shorter average daily movements for the same time periods. This suggests that either the juvenile male traveled more extensively within his home range or that F1 returned to the same location more often.

Little can be concluded about the other 2 cats (F2, M3) because of the limited period that each was followed. Probably their actual home ranges were much larger than those recorded and perhaps these were dispersing individuals.

Reported home range sizes of bobcats in the literature differ widely. Home range size is influenced by many factors including the field technique used, season and duration of the work, geographic region, and possibly the availability of prey and density of bobcats. Marston (1942) found the minimum winter home range size of a bobcat in Maine to be approximately 30 km² based on observations of 3 sets of distinctively marked cat tracks in the snow over a 1-month period.
Rollings (1945) snow-tracked cats in Minnesota and estimated home ranges of bobcats at 26 to 39 km². Problems encountered with this technique are that the age and sex of the cats tracked or whether cats are transients or residents are usually unknown, and the cats tend to step in tracks of other individuals confusing the track record if the cats are unmarked (McCord pers. comm.).

Seasonal variations in home range size may also cause problems in home range size comparisons unless the season is noted and taken into account. For example, F1's home range size varied significantly during the different seasons. Her home range size even varied widely between 1 summer and the next, and in no season was the entire home range used. Therefore, in comparing home range sizes between studies, season and duration of the study must be considered in addition to sex and age of the cats.

Even with these considerations, home range size evidently varies between geographic regions. Based on comparable radio tagging studies, home ranges of bobcats are smallest in the Southeast and largest in the Northwest. Hall and Newsom (1978) reported summer female and male home ranges at 0.98 and 4.9 km², respectively, in Louisiana. Marshall and Jenkins (1966) reported spring-summer female home ranges of 1.79 km² in South Carolina. These were considerably smaller than the average summer home range size of 7.8 km² for F1. Bailey (1974), working in Idaho, reported average
home range size for females at 19.3 km² and average male home ranges of 42.1 km². Although Bailey did not mention the seasons encompassed by these relocations, he did state that the transmitters lasted for approximately 3.5 months. Thus, the home range sizes for his cats may actually be larger than those he reported. The seasonal home range sizes for M1 are slightly larger than the average reported by Bailey.

Variation in the seasonal home range size of F1 is due, at least in part, to reproductive constraints. Although she had smaller average daily movements during the summer when remaining close to the den, F1 moved her kittens at various times thereby increasing the summer home range size. Prey was abundant throughout the summer of 1979 and probably during the early fall. Home range size for the fall increased from the summer, possibly because of increased size of the kittens and their ability to travel on their own. The kittens apparently were not dependent on F1 for food during the winter months. However, because prey abundance had probably decreased by winter, F1 may have needed to hunt further distances to obtain enough food for her own maintenance. Summer home range size in 1980 was twice that of 1979 and several explanations are possible. F1 had only 1 kitten in early June 1980 and I could not determine if it survived. Although her movements were more erratic in 1980 than the previous year, they centered around certain areas (possible den.
sites). Relative prey densities were substantially lower in 1980 than the previous summer. F1 was probably forced to hunt more extensively over a larger area, whether she had a kitten or not. This may explain the larger average daily movements and home range size for summer 1980.

**Habitat Selection**

Because bobcats originally occupied all 48 states of the contiguous United States, they are obviously adapted to a variety of habitats. Much of the literature describes bobcat habitat as areas with rocky outcrops (Young 1958, others), but Rollings (1945) noted that where rock outcrops were not available the cats preferred areas with dense undergrowth. McCord (1974) concluded in a study of winter habitat selection in Maine that bobcats selected cover types with high prey densities combined with dense cover. However, he concluded that prey abundance and environmental conditions alone were not sufficient to explain the selection for the more dense cover types and that behavioral factors were important considerations. The hunting methods employed by bobcats make some kind of cover important for hunting success. Therefore, bobcats probably use rocky outcrops and dense vegetation in a similar manner, both as security cover and as an aid to their hunting techniques.

In this study, 74% of the combined relocations of M1, F1,
and M2 were in dense cover types (greater than 52% vertical cover) that made up less than 40% of their home ranges. These dense vegetative types coincided with high prey densities of lagomorphs and rodents. Thus, these cover types provided both food and the cover necessary for the cat's hunting technique.

Seasonal variation in use of cover types occurred with F1 and, to a lesser degree, M1. The minimal use of the river bottom cover type during the spring of 1979 by F1 was undoubtedly due to flooding. The Douglas-fir and juniper cover types were used more intensively instead.

During summer 1979, the use of the river bottom cover type increased dramatically while use of Douglas-fir and juniper cover types decreased. During this summer, unusually high prey densities probably provided easy hunting and the river bottom cover type provided a large continuous area where F1 did not have to move from 1 patch to another. This probably facilitated hunting and made a convenient place to keep her kittens.

During autumn, the use of prairie dog towns by F1 and, particularly M1, increased, probably because of a decline in the microtine population. In addition, ground nesting birds had fledged and most migrated south, removing another possible prey source. During a 4-month period from late June to October, Knowles (pers. comm.) found that 14 of 58 prairie dogs had been lost from a small
town where M1 frequently hunted. One prairie dog was known to have been killed by a raptor but M1 was probably partly responsible for the disappearance of the other 13.

During winter, use of the river bottom cover type decreased concurrent with increased use of Douglas-fir and juniper cover types. Because snow was scarce during the winter of 1979-1980, snow cover was not a factor influencing choice of cover types. However, the river bottom cover type was primarily deciduous and once leaves dropped, cover density decreased, and dried frozen leaves probably decreased the ability to hunt silently. In contrast, the Douglas-fir and juniper cover types were primarily coniferous with little deciduous understory. The use of prairie dog towns remained the same for F1 and increased for M1. Prairie dogs provide a relatively dependable food supply during winters with little snow cover. When snow cover is not great and spells of sunny weather occur, prairie dogs on the Refuge remain active and forage above ground. Hunting prairie dogs requires relatively little energy on the part of a cat; towns are easily located and the cat employs a sit and wait strategy.

Use of prairie dog towns by F1 increased during summer 1980. Although river bottom use increased slightly, use of Douglas-fir and juniper cover types decreased from that of winter. These variations are probably explained by 2 factors. A substantial decline occurred in both small rodent and lagomorph densities during 1980,
and a greater reliance was placed on prairie dogs. Also, F1's den was located close to a prairie dog town, and the town provided a readily accessible food supply.

Population Characteristics and Density

This study, because of the limited duration, was not designed to investigate bobcat population parameters. I can only speculate, given what data were gathered, on the size of the bobcat population on the study area. However, these data are valuable in light of the fact that they represent the only completed bobcat study in a prairie breaks habitat in Montana.

During Bailey's (1972) bobcat study in southern Idaho he reported female home range sizes and movements similar to those of F1. He trapped 66 cats (27 adults) on 648 km$^2$ (1 adult cat/24 km$^2$) and had approximately 149 trap-nights per capture. In Utah, Karpowitz and Flinders (1979) had 110 trap-nights per capture. These are in contrast to my 299 trap-nights per capture. Although many variables affect trapping, these differences are large and probably reflect real differences in bobcat densities. The majority of traps on my area were set by professional trappers, so my lack of trapping experience had no bearing on numbers of cats captured. Using Bailey's capture rate (0.0067 captures/day) and density (0.1019 cats/km$^2$) and my capture rate (0.0033) and assuming 40% adults, a density estimate of
cats on my study area would be 1 adult cat/49.8 km$^2$ or about 9 adult cats. This is probably a reasonable density estimate.

To estimate the maximum density of adult bobcats possible on my study area, I assumed F1 and M1 had representative home ranges, home ranges of adult cats had minimal overlap with others of the same sex (Bailey 1972, Buie et al. 1979), and all available areas were filled. Conceivably, my study area could support 25 adult females and 5 adult male cats plus young of the year and transients. Possibly, the large home range of M1 was partly due to the scarcity of cats. If more cats were present, home range sizes might be smaller.

Jones (pers. comm), a Refuge employee for over 20 years, reported that bobcats were much more abundant on the Refuge during the 1960's. Other anecdotal data suggest this also. Such changes in bobcat density could be accounted for by changes in percentage of the available habitat occupied, plasticity of the home range size of adult cats, and production of young. A reasonable assumption is that this area could support 2 or 3 times as many adult cats as it does now.

One theory used to explain the decline of bobcats during the 1970's is that the ban on the use of toxicants on federal lands in 1972 allowed coyotes to increase. The coyotes could compete with bobcats for food and/or prey upon cats directly. Coyotes could be more efficient in the utilization of open country, thus restricting bobcats to rough timbered or rocky habitats.
Although coyotes and bobcats often select similar prey items, there is no evidence that competition between these species exists. Small (1971) in a study of interspecific competition between coyotes, grey fox (*Urocyon cinereoargenteus*), and bobcats concluded that the bobcat differed significantly from the 2 canids in its use of most prey items. Bailey (1979) also stated that the scat analysis of coyotes and bobcats suggested that interspecific competition between these species for food was not acute.

Linhart and Robinson (1972) summarized relative population trends of bobcats and coyotes based on 7 traplines in 3 states run in 1940, 1951, 1960, and 1970. Using their data, I calculated correlation coefficients for captures of bobcats and coyotes for each of the study areas and for all areas combined. In New Mexico there was a weak positive correlation \( r^2 = 0.33 \) between bobcats and coyotes while the other 2 study areas (Colorado and Wyoming) had weak negative correlations \( r^2 = 0.17 \) and \( 0.43 \). Data for all study areas combined showed essentially no correlation \( r^2 = 0.04 \) suggesting other factors are more important than relative changes in coyote numbers. The data for Wyoming, however, may indicate that in some areas coyotes can negatively affect bobcats. This may be particularly true in areas where bobcat habitat is marginal.

However, there are no data showing this to be a factor on my study area where security and hunting cover is abundant. Nothing in
this study suggested that coyotes competed with bobcats for foods or preyed on bobcats. Knowles (pers. comm.) observed coyotes and bobcats together on 2 occasions on the Refuge. One observation was of a bobcat and coyote lying 3 m apart facing each other in a semi-timbered situation. The coyote ran when disturbed by the observer, and the interaction occurring before the disturbance is unknown. The other case was of 1 bobcat and 2 coyotes hunting in a prairie dog town in view of, but apparently ignoring, each other.

Another explanation, not to be overlooked, is the rapid increase in fur prices in the 1970's as well as increased trapping pressure. Over-exploitation due to increased fur prices is a more plausible explanation for low bobcat numbers on my study area. The only known mortality factors during my study were man-caused. Two of 5 marked cats were killed by humans and the fate of a third remained undetermined at the end of the study. Such a high proportion of cats being illegally killed on the Refuge could be explained 3 ways: 1) the marked cats were somehow predisposed to being found by humans; 2) random chance and small sample size; and 3) the cats represent an actual percentage of bobcats illegally killed on the study area. Because the cats all appeared to behave in a normal manner when observed after marking and/or moved substantial distances after marking, serious injuries caused by marking seems unlikely. M2's home range was very accessible by road and he was apparently taken
by hunters using dogs. However, M3's home range was much less accessible and how he was killed is unknown. The disappearance of the third cat, F2, has not been considered as a mortality although that is a distinct possibility. The evening before she disappeared she was by the frozen Fort Peck Reservoir which saw frequent light plane traffic and suspected illegal aerial gunning. Although the sample size is small, 2 out of 4 cats illegally killed (where their fate was determined) is a substantial loss. The fact that this proportion of cats were killed in an area of high security habitat and protected by law leaves questions about the harvest mortality on areas in the vicinity that are not so protected and may explain why cats are rarely seen in open prairie habitats in this area.
CHAPTER VI

MANAGEMENT RECOMMENDATIONS

Charles M. Russell National Wildlife Refuge

Neither habitat nor available prey appear to be lacking and competition with coyotes is not an apparent problem. The only detrimental factor to bobcat populations during this study was the illegal killing of cats. Outside of routine law enforcement, Refuge personnel can contribute little to solving this problem.

1) Hounds are sometimes used to hunt coyotes on the Refuge. Because cats are susceptible to this type of hunting and at least 1 of the marked cats is believed to have been taken with hounds, banning this type of hunting within Refuge boundaries would be beneficial to bobcats.

2) Because prairie dog towns are potentially important as a food source, particularly when other prey items are scarce, their continued protection on the Refuge is recommended.

3) Farming and grazing practices that decrease existing density of native river bottom vegetation should be discouraged.
Montana Department of Fish, Wildlife and Parks for Bobcat Populations Adjoining the Charles M. Russell National Wildlife Refuge

1) Because bobcat populations appear to be abnormally low when compared to what the habitat has supported in the past and is probably capable of supporting presently, the season in this area should be shortened from 2 months to 1 month and the limit kept at no more than 1 bobcat.

2) Going to a permit system for bobcats with a required fee would generate money to support detailed population research on bobcats.
REFERENCES CITED


Marston, M. A. 1942. Winter relations of bobcats to white-tailed deer in Maine. J. Wildl. Manage. 6:328-337.


