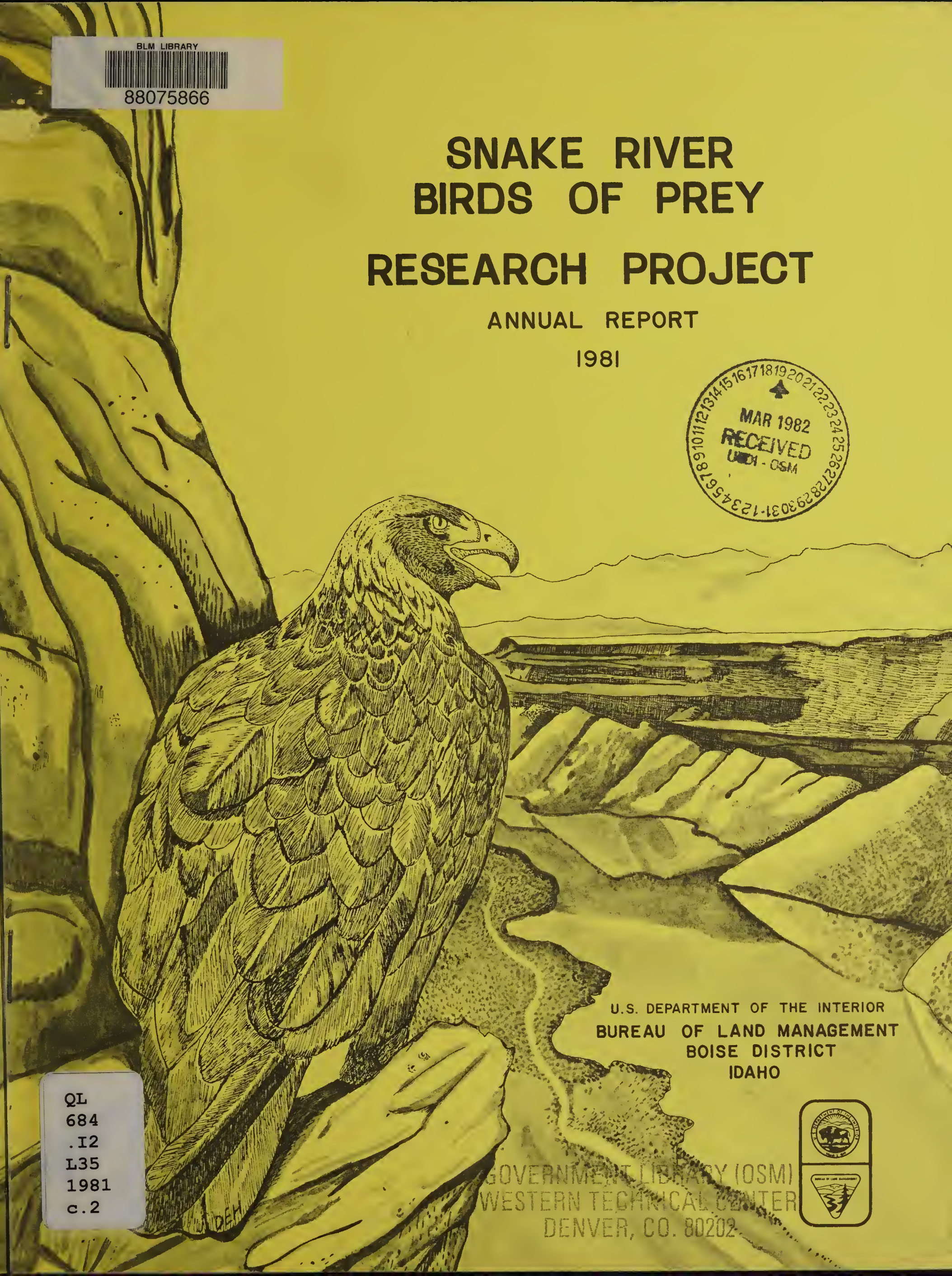
SNAKE RIVER BIRDS OF PREY RESEARCH PROJECT

ANNUAL REPORT

1981



U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BOISE DISTRICT
IDAHO

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NOT FOR PUBLICATION

The data presented herein are preliminary and may be inconclusive. Permission to publish or cite any of these materials is therefore withheld pending specific authorization of the Boise District, BLM, and the specific Principal Investigator.

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ACKNOWLEDGEMENTS

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Special appreciation is extended to Mr. E. T. Evans for providing the area for the Melba field camp and other assistance. Terri Thomason deserves special thanks for typing the manuscripts.

COOPERATING AGENCIES

Idaho Fish and Game Department
U.S. Fish and Wildlife Service

PREFACE

Like 1979 and 1980, 1981 was a Transition Phase year. Emphasis was placed on automating and debugging the backlog of Phase I data for publishing the research results. Raptor, prey and vegetation studies continued as did the cooperative study on long-eared owls. Work was initiated on nesting ecology and home range use of marsh hawks. A dissertation was completed on the reptile ecology study. A contract was awarded to assess land use and vegetation changes by manual interpretation of Landsat imagery for the study area and the golden eagle winter survey area from 1972-1981. These data will be analysed in 1982 to assess the effects of land use and vegetation on golden eagle reproduction and wintering densities.

No decision was made on future research, however, some preliminary work began. The remaining two of five planned livestock exclosures for Phase II were constructed in the winter range of the Birds of Prey Area. Sampling of all exclosures began during the 1981 field season.

This report presents the data collected and the results of the component studies of the Birds of Prey Research Project during the 1981 calendar year.

TABLE OF CONTENTS

TITLE: Reproductive performance, food habits, and population dynamics of raptors in the Snake River Birds of Prey Area (Study I).

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OBJECTIVES:

1. To determine occupancy and reproductive performance of golden eagles, prairie falcons, red-tailed hawks, common ravens, and ferruginous hawks at preselected traditional sites.

2. To determine food habits of golden eagles, prairie falcons, red-tailed hawks, and common ravens.

3. To determine wintering golden eagle densities in and near the study area.

ANNUAL SUMMARY

Data collection continued in 1981, the fourth transition year. Research focused on golden eagles (Aquila chrysaetos), red-tailed hawks (Buteo jamaicensis), prairie falcons (Falco mexicanus), ferruginous hawks (Buteo regalis), and common ravens (Corvus corax) as in previous years.

Reproductive success of each of the 4 major raptor species was higher than it has been since 1976. It was the highest ever observed for red-tailed hawks and prairie falcons. 1981 was the first year that all territorial pairs of the 4 main species laid eggs. Food habits of the raptors and ravens showed little changes from previous years except for prairie falcons. However, the percentage of the red-tailed hawk diet comprised by jackrabbits increased greatly. Fewer invertebrates were found in 1981 raven prey collections.

INTRODUCTION

Field work for Phase I research in the Snake River Birds of Prey Study Area (BPSA) was completed in 1978. From 1979 to 1981, interim research was

conducted on those raptor species intensively observed from 1973 to 1978. The intention was to continue monitoring the reproductive performance and nesting population density of selected birds of prey species until decisions were made on future research needs.

Several portions of the Phase I research were modified or eliminated during the interim phase of research. No effort was made to determine total nesting density in the BPSA or Comparison Area. Nest site occupancy was studied within the 1977 Study Area only at sites randomly selected for intensive research. To reduce investigator induced mortality, we did not intentionally collect data on clutch size and hatching success except for prairie falcons.

Data were collected on several other facets of raptor ecology but are not presented in this report. Management techniques, migration, effects of researcher disturbance, raptor behavior and mortality causes are still being studied. Results will be in publications that will be completed in 1983 and 1984.

METHODS

Research on raptors was conducted within the 1977 BPSA (Fig. 1). In addition, the Comparison Area was searched for golden eagles. A complete description of the BPSA and Comparison Area is given in USDI (1979). Observations concentrated on golden eagles, prairie falcons, red-tailed hawks, common ravens, and ferruginous hawks.

Prior to the breeding season 193 territories that had been occupied by raptors in previous years were selected for intensive study. All 36 golden eagle territories in the BPSA were "preselected"; 77 prairie falcon, 30 red-tailed hawk, 15 ferruginous hawk, and 35 raven sites were selected using stratified random sampling with proportional allocation according to densities in each 10 km stretch of the river.

We attempted to ascertain nesting success and number fledged at all preselected sites. Behavior of adult raptors, inaccessibility of nest sites, and logistical problems prevented observation of all variables at all sites. When possible, breeding attempts were confirmed by observing incubating or brooding adults without disturbing them. However, because prairie falcons frequently nested in cavities, adults could not be seen incubating or brooding, and most falcon breeding attempts had to be confirmed by climbing into the scrape and observing eggs.

Pairs that occupied preselected sites but showed no evidence of egg laying after repeated observations were categorized as "nonbreeding". A "breeding attempt" was confirmed if an occupied site contained an incubating adult, eggs, young, or any field sign that indicated eggs were laid, such as fresh eggshell fragments in fresh nesting material. A "successful nesting attempt" was a breeding attempt that produced one or more young that reached fledging age. Young were considered fledged if they reached 80% of the average age at which most young leave the nest of their own volition.

Fledging ages were established by observing chicks of known age. Active eagle nests discovered after young had fledged were considered successful if (1) a platform decorated this season was worn flat and contained fresh prey remains; (2) fresh fecal matter covered the back and extended over the edge of the nest; and (3) no dead young birds were found within a 50-m radius of the nest. Renesting attempts were considered separate new attempts in calculating productivity.

Preliminary analysis conducted in 1980 showed that the overall productivity of raptors was not affected by observation blinds, radio-tracking activities, or time lapse camera. However, there was some evidence to indicate that disease treatment, shade devices, insecticide spraying, and fostering all enhanced survival rates of chicks. Consequently we excluded from our productivity analysis sites with the latter manipulations but included sites with the former manipulations.

Prey remains and regurgitated pellets were systematically collected from 9 golden eagle, 9 prairie falcon, and 7 red-tailed hawk nests every 6 to 8 days. The eagle and hawk nests were selected and stratified according to the amount of agriculture within a 5 km radius of the nests; prairie falcon nests were selected and stratified according to relative ground squirrel densities in their foraging ranges. Food remains were gathered non-systematically from raven nests whenever convenient; and 10 collections were made at 8 raven nests.

Fresh remains were identified, marked by removing the head, feet, and tail, and left in the nest. Inedible remains and pellets were collected and analyzed in the laboratory by Ross Haley, Reno, Nevada. Species, size, and sex of prey items were ascertained by comparison with study skins and taxonomic keys. A weight value was assigned to each species-age-sex class for computing biomass (Steenhof in prep.).

Prey numbers in the castings were calculated from a maximum count of body parts (femurs, toe-nails, feet, and/or mandibles). Prey remains identified in regurgitated pellets were compared with the tally of fresh prey individuals and partially eaten prey identified during the previous collection. If it was likely that the remains in the pellet were formed from a prey individual that had already been counted, the duplicate was excluded from totals.

In January 1981, twenty golden eagle aerial transects were flown over the Snake River plain between Meridian and Rupert, Idaho as in previous years.

Nestling raptors were weighed and ringed with U.S. Fish and Wildlife bands, and red-tailed hawks were fitted with a red marker on the right wing.

RESULTS

Reproductive Performance

For the first time in the 11-year study, 100% of all golden eagle, prairie falcon, red-tailed hawk, ferruginous hawk, and raven pairs observed laid eggs. The only other year that 100% of all territorial eagle pairs bred was in 1971, the year of the last jackrabbit peak. The only other year that all prairie falcons bred was in 1976, the year when ground squirrel populations were highest. At least some raven, red-tailed hawk, and ferruginous hawk pairs have failed to breed in all previous years.

Clutch size at 30 prairie falcon nests was similar to past years, averaging 4.46. Seven red-tailed hawk pairs laid average clutches of 2.86, also similar to previous years. Four ferruginous hawk pairs had an average of 3.75 eggs per nest, and marsh hawk clutch sizes averaged 5.0. Mean clutch size for ravens was 4.33, the lowest ever observed during the study. One kestrel nest was found with 5 eggs; a great horned owl nest had 3 eggs; and 7 eggs were found in a short-eared owl nest.

Mean brood sizes at hatching ranged from 1.91 for eagles to 5.0 for kestrels (Table 1). Initial brood sizes for all species except ravens were similar to those observed in previous years. Only one raven brood of 2 was observed. Average raven brood sizes have ranged from 4.38 to 5.20 since 1975.

The Mayfield analysis (Mayfield 1961, 1975; Steenhof and Kochert 1982) indicated that 68% of all eagles, 81% of all prairie falcons, 86% of all red-tailed hawks, 70% of all ferruginous hawks, and 77% of all ravens were successful. The number of young fledged per successful attempt ranged from 1.88 for eagles to 4.04 for prairie falcons (Table 1).

The number of young eagles fledged per pair was 1.28, the highest observed since 1971. Prairie falcons raised 3.27 fledging age young per pair, the highest ever observed in the study. Red-tailed hawk reproduction also reached a new peak with 2.25 young fledged per pair. Ferruginous hawk reproduction was higher than it has been since 1976. The number of ravens fledged per pair, however, declined slightly from 3.12 in 1980 to 2.86 in 1981.

Food Habits

Golden eagles fed on at least 28 prey species in 1981 (Table 2). As in past years, black-tailed jackrabbits (*Lepus californicus*) were the most common prey items, accounting for 58% of the individuals and 79% of the estimated biomass in the eagle diet. Cottontails (*Sylvilagus nuttallii*) were the second most prevalent food item in the eagle diet, and ring-necked pheasants (*Phasianus colchicus*) ranked third. Relative proportions of all food items were similar to those recorded in previous years.

The prairie falcon diet changed considerably in 1981. Townsend ground squirrels comprised less than 30% of both the biomass and frequency. The number of taxa found at prairie falcon eyries increased from 19 in 1980 to

26 in 1981. Several groups of invertebrates appeared in prairie falcon food collections for the first time. Both the frequency and biomass contribution of jackrabbits in the prairie falcon diet increased in 1981. We are reviewing our sampling and analytical procedures to determine if the large changes were due to changes in methods used by new personnel.

Red-tailed hawks preyed on at least 29 species of prey in 1981 (Table 4). Townsend ground squirrels continued to be the most important prey species by frequency (26.5%), but jackrabbits contributed significantly more biomass (61.1% of total) than in 1980. The percentage of gopher snakes in the diet dropped from 13.1% in 1980 to 7.7% in 1981. Mountain cottontails continued to be an important item in the red-tailed hawk diet.

Although only 10 prey collections were made at raven nest sites in 1981, the composition of the collections continued to reflect the ravens' varied diet (Table 5). For the first time since 1975, Townsend ground squirrels were the most frequent prey item found in the raven nests. Jackrabbits, however, were more important to ravens on the basis of biomass. This year beetles comprised an insignificant portion of the raven diet by both frequency and biomass.

Aerial Transects

Numbers of golden eagles seen on 7,000 mi^2 of transects increased to 53 in 1981 after 4 years of counts that recorded fewer than 30 eagles (Table 11). The proportion of immatures seen increased from 42% in 1980 to 47% in 1981. The proportion of immatures seen on midwinter counts has been increasing since 1976, presumably reflecting improved eagle reproduction in the area.

Banding and Marking

During 1981, 10 golden eagles, 7 prairie falcons, 25 red-tailed hawks, 26 ferruginous hawks, 3 ravens, 11 marsh hawks (*Circus cyaneus*), 6 American kestrels (*Falco sparverius*), 4 Cooper's hawks (*Accipter cooperii*), and 1 screech owl (*Otus asio*) were banded. Twenty-four red-tailed hawks were marked with red patagial markers on the right wing. Jeff Marks from the University of Montana banded 124 long-eared owls (*Asio otus*) in his cooperative study (see the long-eared owl study annual report).

In 1981 we received 9 band recoveries of eagles, red-tailed hawks, ravens, and long-eared owls. All of these birds were recovered within 30 km of the banding location. We also received 23 sightings of wing-marked raptors and ravens in 1981. All sightings were within 90 km of the marking location. In 1981, the staff worked on a paper that evaluated the success and problems encountered during the 10 year wing marking program. The paper is scheduled to be submitted for publication in 1982.

LITERATURE CITED

Mayfield, H. F. 1961. Nesting success calculated from exposure. Wilson

Bull. 73:225-261.

_____. 1975. Suggestions for calculating nest success. Wilson Bull. 87:456-466.

Steenhof, K. In Prep. Prey weights for computing percent biomass in raptor diets. Submitted to Raptor Research 11/81.

Steenhof, K. and M. N. Kochert. 1982. An evaluation of methods used to estimate raptor nesting success. J. Wildl. Manage. In Press.

U.S.D.I. Bur. Land Manage. 1979. Snake River Birds of Prey Special Research Report to the Secretary of the Interior. Boise District, Idaho. 142 pp.

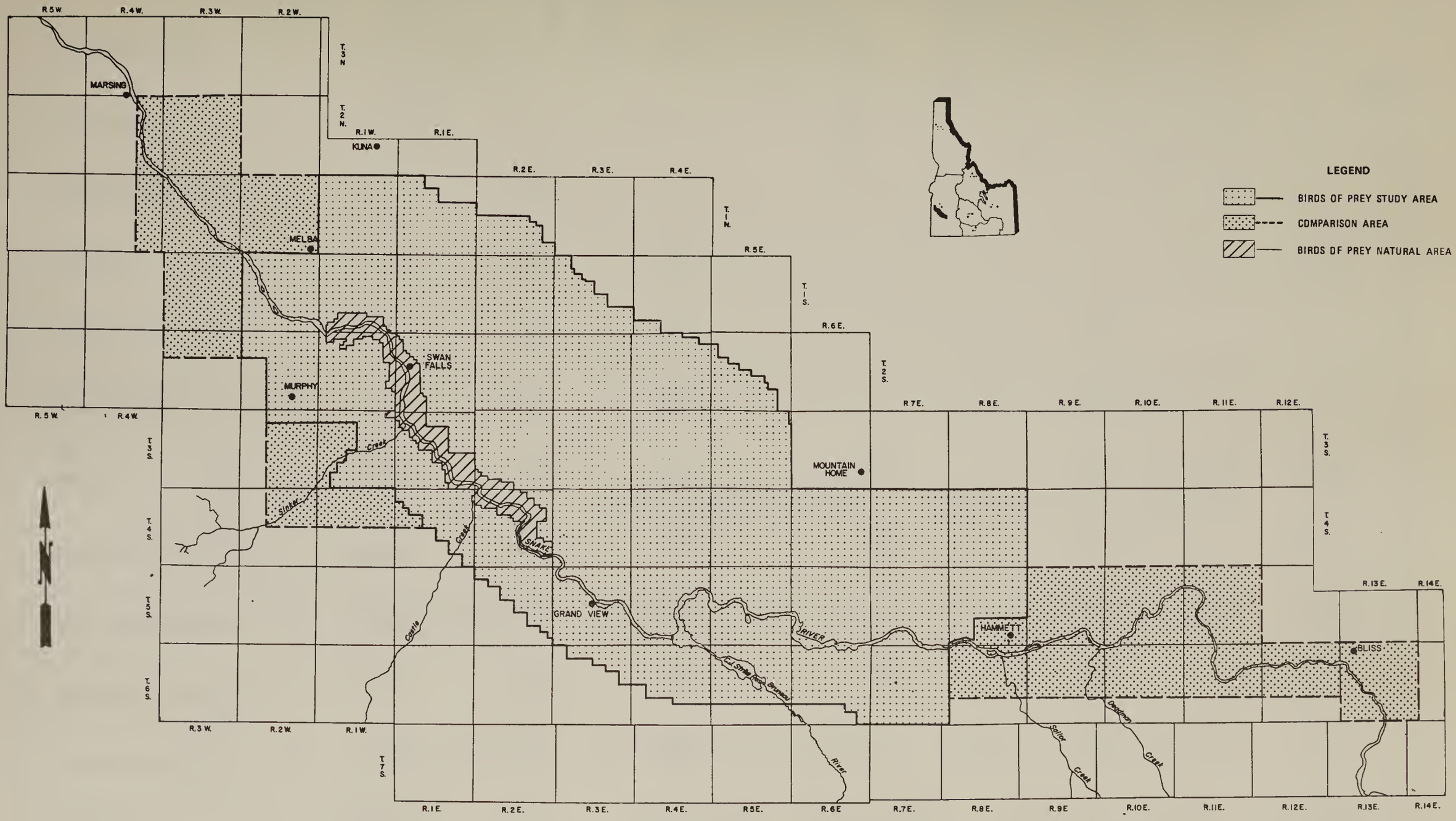

Fig. 1. LOCATION OF THE BIRDS OF PREY STUDY AREA (BPSA) AND COMPARISON AREA

Table 1. Reproductive parameters for 11 raptor species in the BPSA and Comparison Area, 1981.

Species	% Breeding	Clutch Size	Brood Size At Hatching	% of Attempts Successful	No. Fledged Per Successful Attempt	Number Fledged Per Pair
Golden Eagle	100% (30)	1.00 (1)	1.91 (11)	68% (31)	1.88 (34)	1.28
Prairie Falcon	100% (47)	4.46 (30)	4.17 (18)	81% (54)	4.04 (23)	3.27
Red-tailed Hawk	100% (23)	2.86 (7)	2.90 (10)	86% (40)	2.62 (24)	2.25
Ferruginous Hawk	100% (6)	3.75 (4)	3.00 (2)	70% (12)	3.22 (9)	2.25
Raven	100% (25)	4.33 (3)	2.00 (1)	77% (33)	3.72 (11)	2.86
Marsh Hawk	---	5.00 (4)	3.67 (3)	--	3.20 (5)	--
Great Horned Owl	---	3.00 (1)	3.00 (1)	--	2.67 (8)	--
Kestrel	---	5.00 (1)	5.00 (1)	--	--	--
Short-eared Owl	---	7.00 (1)	--	--	--	--
Barn Owl	---	--	--	--	2.25 (4)	--
Burrowing Owl	---	--	--	--	7.00 (1)	--

Table 2. Prey items found at systematically sampled golden eagle nest sites, 1981.

Species	Number	Perc. Freq.	Biomass	Percent Biomass	KCAL	Percent KCAL
MAMMALS						
Black-tailed Jackrabbit	79	58.1	306578	78.9	407442	76.1
Mountain Cottontail	41	13.3	25056	6.4	33299	6.2
Townsend Ground Squirrel	17	5.5	2919	0.8	6425	1.2
Yellow-bellied Marmot	3	1.0	6030	1.6	9720	1.8
Whitetailed Antelope Squirrel	2	0.6	210	0.1	462	0.1
Coyote	1	0.3	2043	0.5	2860	0.5
Deer Mouse	1	0.3	19	0.0	31	0.0
Kangaroo Rat - Unid.	1	0.3	53	0.0	85	0.0
Montane Vole	1	0.3	50	0.0	81	0.0
Muskrat	1	0.3	1171	0.3	1888	0.4
Townsend Pocket Gopher	1	0.3	200	0.1	322	0.1
Woodrat - Unid.	1	0.3	281	0.1	453	0.1
BIRDS						
Ring-necked Pheasant	29	9.4	32070	8.3	52851	9.9
Rock Dove	5	1.6	1660	0.4	2736	0.5
Mallard	3	1.0	3618	0.9	5962	1.1
Gray Partridge	2	0.6	778	0.2	1282	0.2
Chukar	2	0.6	1204	0.3	1984	0.4
Avian - Unid.	1	0.3	600	0.2	989	0.2
Barn Owl	1	0.3	603	0.2	1049	0.2
Common Crow	1	0.3	460	0.1	833	0.2
Coot	1	0.3	654	0.2	1078	0.2
Pinyon Jay	1	0.3	108	0.0	195	0.0
Water Pipit	1	0.3	19	0.0	34	0.0
REPTILES						
Snake - Unid.	4	1.3	760	0.2	1056	0.2
Gopher Snake	3	1.0	631	0.2	877	0.2
Garter Snake	1	0.3	109	0.0	152	0.0
Long-nosed Snake	1	0.3	85	0.0	118	0.0
Western Rattlesnake	1	0.3	19	0.0	26	0.0
Whiptail Lizard	1	0.3	17	0.0	22	0.0
FISH						
Bass	1	0.3	500	0.1	745	0.1
TOTAL	308		388505		535059.90	

Table 3. Prey items found at systematically sampled prairie falcon nest sites, 1981.

Species	Number	Perc. Freq.	Biomass	Percent Biomass	KCAL	Percent KCAL
MAMMALS						
Townsend Ground Squirrel	30	22.7	5400	18.0	11885	25.2
Kangaroo Rat - Unid.	11	8.3	583	1.9	940	2.0
Montane Vole	10	7.6	405	1.4	653	1.4
Black-tailed Jackrabbit	9	6.8	13435	44.8	17855	37.8
Deer Mouse	5	3.8	95	0.3	153	0.3
Mountain Cottontail	4	3.0	1203	4.0	1599	3.4
Townsend Pocket Gopher	3	2.3	596	2.0	961	2.0
Cow	2	1.5	300	1.0	648	1.4
Longtailed Weasel	2	1.5	356	1.2	536	1.1
Great Basin Pocket Mouse	1	0.8	17	0.1	27	0.1
BIRDS						
Avian - Unid.	3	2.3	295	1.0	534	1.1
Bird Eggs	2	1.5	40	0.1	72	0.2
Ring-necked Pheasant	2	1.5	1505	5.0	2480	5.3
California Quail	1	0.8	170	0.6	280	0.6
Chukar	1	0.8	602	2.0	992	2.1
Passerine - Unid.	1	0.8	17	0.1	31	0.1
Raven	1	0.8	650	2.2	1177	2.5
Western Meadowlark	1	0.8	96	0.3	174	0.4
REPTILES						
Snake - Unid.	3	2.3	570	1.9	792	1.7
Striped Whipsnake	1	0.8	50	0.2	70	0.1
Horned Lizard	1	0.8	18	0.1	24	0.1
AMPHIBIANS						
Woodhouse Toad	1	0.8	25	0.1	33	0.1
FISH						
Carp	6	4.5	3498	11.7	5212	11.0
INVERTEBRATES						
Scarabidae	23	17.4	23	0.1	53	0.1
Scorpionidae	7	5.3	7	0.0	16	0.0
Locustidae	1	0.8	1	0.0	2	0.0
TOTAL	132		29957		47199.91	

Table 4. Prey items found at systematically sampled red-tailed hawk nest sites, 1981.

Species	Number	Perc. Freq.	Biomass	Percent Biomass	KCAL	Percent KCAL
MAMMALS						
Townsend Ground Squirrel	41	26.5	7584	13.1	16692	19.7
Black-tailed Jackrabbit	26	16.8	35344	61.1	46972	55.3
Mountain Cottontail	14	9.0	7337	12.7	9751	11.5
Kangaroo Rat - Unid.	8	5.2	424	0.7	683	0.8
Deer Mouse	3	1.9	57	0.1	92	0.1
Least Chipmunk	2	1.3	64	0.1	103	0.1
Townsend Pocket Gopher	2	1.3	448	0.8	722	0.9
Woodrat - Unid.	2	1.3	562	1.0	906	1.1
Bushy-tailed Woodrat	1	0.6	271	0.5	437	0.5
Great Basin Pocket Mouse	1	0.6	10	0.0	16	0.0
Montane Vole	1	0.6	50	0.1	81	0.1
Whitetailed Antelope Squirrel	1	0.6	105	0.2	231	0.3
BIRDS						
Avian - Unid.	6	3.9	773	1.3	1399	1.6
California Quail	1	0.6	170	0.3	280	0.3
Horned Lark	1	0.6	17	0.0	31	0.1
House Finch	1	0.6	22	0.0	40	0.0
Morning Dove	1	0.6	134	0.2	221	0.3
Passerine - Unid.	1	0.6	28	0.0	51	0.1
Rough-winged Swallow	1	0.6	16	0.0	29	0.0
Vesper Sparrow	1	0.6	27	0.0	49	0.1
Western Meadowlark	1	0.6	96	0.2	174	0.2
REPTILES						
Gopher Snake	12	7.7	2474	4.3	3439	4.0
Whiptail Lizard	9	5.8	140	0.2	185	0.2
Long-nosed Snake	3	1.9	255	0.4	354	0.4
Western Rattlesnake	3	1.9	1179	2.0	1639	1.9
Ground Snake	2	1.3	17	0.0	24	0.0
Horned Lizard	2	1.3	27	0.0	36	0.0
Racer	1	0.6	77	0.1	107	0.1
Side-blotched Lizard	1	0.6	4	0.0	5	0.0
Striped Whipsnake	1	0.6	111	0.2	154	0.2
INVERTEBRATES						
Scarabidae	4	2.6	4	0.0	9	0.0
Locustidae	1	0.6	1	0.0	2	0.0
TOTAL	155		57828		84914.12	

Table 5. Prey items found at raven nest sites, 1981.

Species	Number	Perc. Freq.	Biomass	Percent Biomass	KCAL	Percent KCAL
MAMMALS						
Townsend Ground Squirrel	30	22.7	5400	18.0	11885	25.2
Kangaroo Rat - Unid.	11	8.3	583	1.9	940	2.0
Montane Vole	10	7.6	405	1.4	653	1.4
Black-tailed Jackrabbit	9	6.0	13435	44.8	17855	37.8
Deer Mouse	5	3.8	95	0.3	153	0.3
Mountain Cottontail	4	3.0	1203	4.0	1599	3.4
Townsend Pocket Gopher	3	2.3	596	2.0	961	2.0
Cow	2	1.5	300	1.0	648	1.4
Longtailed Weasel	2	1.5	356	1.2	536	1.1
Great Basin Pocket Mouse	1	0.8	17	0.1	27	0.1
BIRDS						
Avian - Unid.	3	2.3	295	1.0	534	1.1
Bird Eggs	2	1.5	40	0.1	72	0.2
Ring-necked Pheasant	2	1.5	1505	5.0	2480	5.3
California Quail	1	0.8	170	0.6	280	0.6
Chukar	1	0.8	602	2.0	992	2.1
Passerine - Unid.	1	0.8	17	0.1	31	0.1
Raven	1	0.8	650	2.2	1177	2.5
Western Meadowlark	1	0.8	96	0.3	174	0.4
REPTILES						
Snake - Unid.	3	2.3	570	1.9	792	1.7
Horned Lizard	1	0.8	18	0.1	24	0.1
Striped Whipsnake	1	0.8	50	0.2	70	0.1
AMPHIBIANS						
Woodhouse's Toad	1	0.8	25	0.1	33	0.1
FISH						
Carp	6	4.5	3498	11.7	5212	11.0
INVERTEBRATES						
Scarabidae	23	17.4	23	0.1	53	0.1
Scorpionidae	7	5.3	7	0.0	16	0.0
Locustidae	1	0.8	1	0.0	2	0.0
TOTAL	132		29957		47199.91	

Table 6. Results of aerial transect sampling on 17,920 km^2 (7,000 mi^2) of the Snake River floodplain, 1972-80.

Date	No. Adults	No. Immatures	No. Unknown	Total	Percent Immature	Eagles/100 mi^2 /(100 km^2)
Oct. 72	10	11	8	29	52%	5.8(2.2)
Feb. 73	33	33	18	84	50%	16.8(6.5)
Oct. 73	7	3	7	17	30%	3.4(1.3)
Jan. 74	20	9	12	41	31%	8.2(3.2)
Oct. 74	4	2	10	16	33%	3.2(1.2)
Feb. 75	17	8	7	32	32%	6.4(2.5)
Oct. 75	10	0	5	15	00%	3.0(1.2)
Jan. 76	24	9	6	39	27%	8.1(3.1)*
Oct. 76	4	0	3	7	00%	1.4(0.5)
Feb. 77	16	1	9	26	06%	5.2(2.0)
Oct. 77	5	0	6	11	00%	2.2(0.8)
Jan. 78	16	3	10	29	16%	5.8(2.2)
Oct. 78	8	2	6	16	20%	3.2(1.2)
Jan. 79	14	4	9	27	22%	5.4(2.1)
Jan. 80	11	8	2	21	42%	4.2(1.6)
Jan. 81	23	20	10	53	47%	10.6(4.1)

* Survey incomplete due to fog: calculated on the basis of 475 mi^2 surveyed.

TITLE: Ecology of Townsend ground squirrels and demography of small mammals and birds in the Snake River Birds of Prey Study Area.

CONTRACTOR: Department of Biological Sciencies, University of Idaho, Moscow, Idaho 83843.

PERSONNEL: Donald R. Johnson, Principal Investigator
Graham W. Smith, Research Associate
Dixie Duncan, Research Technician
Nicholas C. Nydegger, Research Analyst
Dana L. Yensen, Research Technician

PROJECT SUPPORT: U.S. Department of the Interior, Bureau of Land Management, Contract No. 525000-CT5-1002.

OBJECTIVES:

1. Describe population variables of ground squirrel populations including productivity, recruitment, age and sex ratios, and turnover rates.

2. Ascertain yearly changes in prey species (cottontail rabbits, black-tailed jackrabbits, Townsend ground squirrels, ring-necked pheasants, passerine birds and reptiles) densities.

3. Stratify the Study Area into vegetation types and land use patterns. Check and correct where necessary the 1977-78 Birds of Prey Study Area vegetation map and sample the vegetation within each homogeneous vegetation stand.

4. Calculate the prey densities in terms of biomass within each vegetation type stratified in Objective 3.

ANNUAL SUMMARY

In 1981 we trapped 148 ground squirrels (Spermophilus townsendi) on 4 live-trapping grids. Squirrel densities varied from 4.23 to 5.13 squirrels per hectare depending on the cover type.

As in all years since the 1977 drought when reproduction was suspended, all yearling and adult squirrels bred in 1981.

Black-tailed jackrabbit (Lepus californicus) densities varied from 0.2 to 0.9 rabbits per hectare depending on the cover type. As in previous years big sagebrush (Artemisia tridentata) had the densest jackrabbit populations.

Five large livestock exclosures (3 @ 160 acres, 2 @ 40 acres) were established in the BPSA. A study plan was developed and baseline information collected on the vegetation and prey species.

Vegetation transects (Daubenmire 1959) were established on two newly burned sites to study post fire plant succession.

METHODS

Townsend ground squirrels

Townsend ground squirrels were livetrapped four times weekly from mid February through the first week in May at 4 of the intensive study sites. The Bedspring site was not trapped because no squirrels have been present on the site since 1979. Vegetation was sampled on each site trapped using Daubenmire's (1959) method.

Population estimates were obtained using the removal estimator in the computer program "CAPTURE" (Otis et al. 1978). The removal estimator is the most appropriate of the five discussed by Otis et al. (1978) because it most closely models the exhibited ground squirrel response to our trapping technique. Densities were calculated from these population estimates using an effective trapping area of 2.56 hectares for females and 4.84 hectares for males as determined by this study in 1975.

Squirrels were collected away from the intensive trapping sites with a .22 caliber rifle. Eye lenses were collected (for age determination), and embryo or placental scar counts taken from female squirrels in order to compare litter size between yearling and adult age classes.

Black-tailed jackrabbits

Black-tailed jackrabbits were surveyed with ten spotlighting transects (Flinders and Hansen 1973, Smith and Nydegger in prep.) running through the major vegetation types within the study area. Each transect was censused 3 times during mid May to mid June. This involved approximately 350 miles of transecting. Densities per major cover type were estimated using "TRANSECT" a computer program for analysis of line transect data (Burnham et al. 1980).

In addition to the spotlight transects the average number of jackrabbits seen each day by a 2-person raptor survey crew was tabulated from field notes.

Pheasants

Estimates of ring-necked pheasants (Phasianus colchicus) densities were obtained from 9 crow-count transects (Kimball 1949). The transects censused pheasants in or near agricultural areas throughout the BPSA.

Exclosures

Five large livestock exclosures were established in 1981 (Fig. 1). Three 160 acre exclosures were established, two in separate sagebrush types and one in shadscale (Atriplex confertifolia). Two 40 acre exclosures were established, one in grass and one in winterfat (Ceratoides lanata). A study plan was devised, and all procedures and data are located in the Birds of Prey Exclosure Plan binder at the Boise District Bureau of Land Management.

Vegetation

Paired Daubenmire transects (Daubenmire 1959) were established on

each exclosure, one 50 meters inside and one 50 meters outside the fence line. Ten 1 m^2 trend plots were randomly located within each exclosure. Canopy coverage data were taken, and all perennial plants were counted and mapped to scale. Photographic documentation was taken at each trend plot and at the exclosure corners. Several views were taken and documented. All transects and trend plots were permanently marked and documented. A list of all plant species found was kept for each exclosure.

Townsend ground squirrels

Ground squirrels were surveyed within the exclosures using hole counts as an index (USDI 1979).

Rodents

Rodents were live-trapped on each exclosure using a square 15 row grid containing 225 traps at 15 meter intervals. Sherman live traps were baited with rolled oats and maintained for 10 consecutive days.

Other prey

A list of prey species seen was kept for each exclosure.

Burns

Two 400 meter paired Daubenmire transects (Daubenmire 1959) were established and permanently marked on two different sagebrush areas burned in 1980.

RESULTS

Townsend ground squirrels

Vegetation

Plant coverage on the intensive study sites in 1981 is given in Table 1.

Population Characteristics

There were 148 ground squirrels captured on the intensive study sites in 1981 (Table 2). This number was an increase over 1980 and comparable to 1979. We trapped more intensively (4 days per week) for a shorter duration than in previous years and received compatible results.

The sex ratios of adult and yearling squirrels slightly favored females (1:1.04).

Estimated densities of ground squirrels on the live-trapping grids varied from 4.23 to 5.13 per hectare (Table 3). This was an increase over both 1979 and 1980. These are the highest density estimates since the pre-drought (1975-76) levels.

Survivorship of squirrels from 1980 to 1981 is given in Table 4.

Reproduction

All adult and yearling squirrels bred in 1981. This is consistent with the increase in yearling squirrels breeding observed since the 1977 drought.

The average litter size for 1981 was 8.15 (N=39). Adult squirrels had a significantly larger litter size than yearlings (t=3.62, df=11, $P<0.005$).

Black-tailed jackrabbits

The 1981 spotlighting data reflect a slight increase in jackrabbit density in all cover types over the 1979 and 1980 values (Table 5).

The average number of rabbits seen per raptor crew day in 1981 was 4.53. This also shows an increase over 1980 (Table 6).

The jackrabbit population has been on the rise since the early 1970's and increased markedly during the 1978-79 period. A slight decrease was noted in 1980, but the 1981 data show that the population still seems to be rising.

Pheasants

April pheasant densities were 0.13 pheasants per hectare in old agriculture and 0.16 pheasants per hectare in new agriculture. These are the highest densities calculated since the censusing of pheasants began in 1976.

Exclosures

Vegetation

Vegetation data, photographs, and the study plan are located in the Birds of Prey Exclosure binder at the Boise District Bureau of Land Management.

Townsend ground squirrels

Hole count data for each exclosure is given in Table 7.

Rodents

Modified Lincoln-Peterson estimates (Seber 1973) of rodent populations on each grid (exclosure) are given in Table 8. These values must be taken as rough estimates because populations in some cases are not closed, violating one of the analytical assumptions.

Burns

Vegetation data collected from the two burn study sties are stored in the Birds of Prey Exclosure binder at the Boise District, Bureau of Land Management.

LITERATURE CITED

Burnham, K. P., D. R. Anderson, J. L. Laake. 1980. Estimation of density from line transect sampling of biological populations. Wildl. Monogr. 62. 202 pages.

Daubenmire, R. 1959. A canopy coverage method of vegetational analysis. Northwest Sci. 33:43-64.

Flinders, J. T., R. M. Hansen. 1973. Abundance and dispersion of leporids within a shortgrass ecosystem. J. Mammal. 54(1):287-291.

Kimball, J. W. 1949. The crowing count pheasant census. J. Wildl. Manage. 13:101-120.

Otis, D. L., K. P. Burnham, G. C. White and D. R. Anderson. 1978. Statistical inference from captive data on closed animal populations. Wildl. Monogr. 62. 135 pages.

Seber, G. A. F. 1973. The Estimation of Animal Abundance and Related parameters. Griffin, London. Page 14 in: Begon, Micheal 1979. Investigating animal abundance. University Park Press. Baltimore, MD.

Smith, G. W., N. C. Nydegger. In Prep. A comparison of walking and spotlighting transect sampling techniques for surveying black-tailed jackrabbits.

U.S.D.I., Bur. Land Manage. 1979. Snake River Birds of Prey Special Reserach Report. Boise District, Idaho.

Table 1. Plant coverage (%) late May 1981 on the Townsend ground squirrel intensive trapping sites.

Trapping Site	Big Sage	Winterfat	Burn	Comparison
Shrubs				
Big sagebrush	12.3	--	0.1	11.3
Spiny Hopsage	0.1	--	--	10.8
Winterfat	--	24.1	0.9	11.8
Rabbitbrush	--	--	1.6	--
Forbs				
Cruciferae	5.2	1.4	1.5	1.0
Russian thistle	--	--	2.0	--
Other forbs	--	1.6	0.2	1.6
Grasses				
Cheatgrass	32.8	0.1	21.8	1.0
Six weeks fescue	0.1	6.7	0.2	2.3
Indian ricegrass	--	--	0.9	0.1
Sandberg bluegrass	4.2	13.1	7.5	7.2
Bottlebrush squirreltail	0.5	0.7	2.6	0.9
Bare Ground	77.9	61.3	77.0	71.6

Table 2. Townsend ground squirrel captures in relation to age class on the intensive study sites 1981.

Site	Age Classes J	Y	A	U	Total
Big Sage					
male	11	3	4	4	22
female	7	6	5	2	20
Winterfat					
male	9	1	6	2	18
female	9	2	5	2	18
Burn					
male	2	4	3	5	14
female	4	5	4	0	13
Comparison					
male	5	5	8	3	21
female	4	9	6	3	22
TOTAL					148
male	27		48		
female	24		49		

J = Juvenile, Y = Yearling, A = Adult, U = Unknown

Table 3. 1981 estimated (April) densities of Townsend ground squirrels using the removal estimator and an effective trapping area of 4.84 hectares for males and 2.56 hectares for females.

Site	Density Number/hectare	95% Confidence Interval
Big Sage	4.53	(3.22 - 5.41)
Winterfat	4.23	(3.93 - 4.53)
Burn	4.23	(3.02 - 5.44)
Comparison	5.13	(4.53 - 5.74)

Table 4. Survivorship of Townsend ground squirrels from 1980 to 1981. Percent survival in parentheses.

Site	Juvenile 1980	Yearling 1981	Yearling & Adults 1980	Adults 1981
Big Sage				
male	17	3	5	3
female	9	2	7	4
Winterfat				
male	10	1	3	3
female	5	1	13	3
Burn				
male	9	0	3	2
female	7	0	4	2
Comparison				
male	5	1	9	5
female	13	3	8	4
Total				
male	41	5 (12%)	20	13 (65%)
female	34	6 (18%)	32	13 (41%)
All	75	11 (15%)	52	26 (50%)

Table 5. 1981 Black-tailed jackrabbit densities from spotlighting transects.

Vegetation Type	Density (Rabbits/ha)	95% Confidence Interval	Number of Rabbits Observed
Big sagebrush	0.9	(.8 - 1.1)	460
Big sagebrush - winterfat	0.3	(.2 - .4)	70
Shadscale - winterfat	0.5	(.4 - .6)	139
Big sagebrush - shadscale	0.6	(.4 - .8)	60
Greasewood	0.8	(.5 - 1.1)	64

Table 6. Average number of jackrabbits seen per crew day, in the BPSA 1973-81.

Year	# BTJR/day
1973	0.87
1975	0.26
1976	0.46
1977	1.0
1978	1.2
1979	2.62
1980	3.63
1981	4.53

Table 7. Townsend ground squirrel hole counts on Exclosures 1981.

Site	Number Active Burrows	
Grass	TGS -	23
	Badger -	22
		45
Big sage Sunnyside	TGS -	33
spring/fall	Badger -	7
		40
Winterfat	TGS -	15
	Badger -	7
		22
Big sage Sunnyside	TGS -	10
winter	Badger -	6
		16
Shadscale	TGS -	2
	Badger -	1
		3

Table 8. Estimated rodent abundance (Seber 1973) on the Birds of Prey Exclosures 1981.

Site	Species	# Individuals	SE
Big sage - Sunnyside winter	Perpar	49	4.6
	Perman	23	2.9
	Reimeg*	5	1.8
	Onyleu*	4	0.9
Winterfat	Perman	50	3.8
	Perpar	26	3.9
	Onyleu	16	2.9
Big sage - Sunnyside spring/fall	Perman	36	5.6
	Perpar	15	3.2
Grass	Perman	74	6.5
	Perpar	15	2.7
Shadscale	Perpar	26	3.0
	Perman	21	0.6

* low number captures

Onyleu - Onychomys leucogaster
Perman - Peromyscus maniculatus
Perpar - Perognathus parvis
Reimeg - Reithrodontomys megalotis

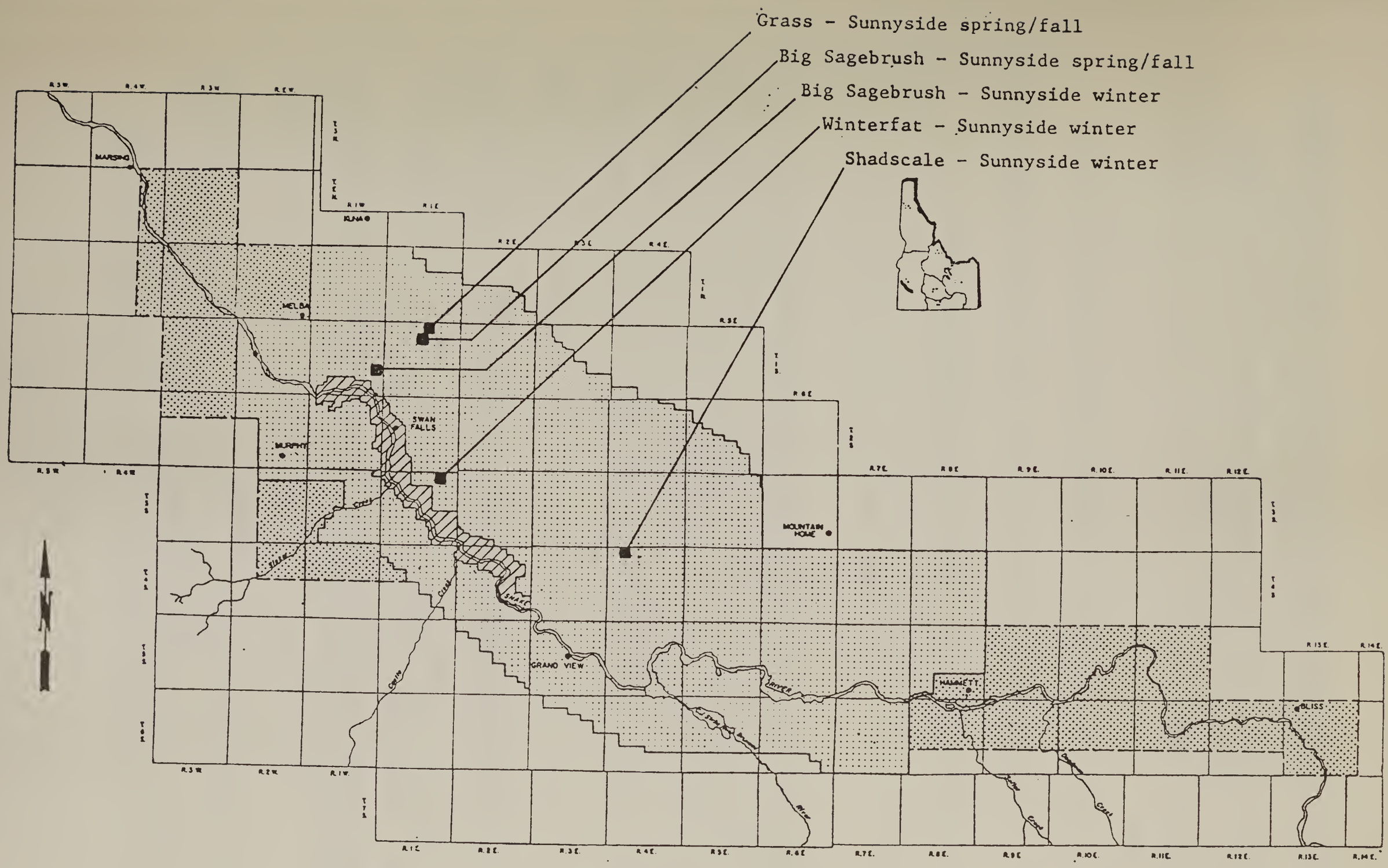

Fig. 1. 1981 Birds of Prey Exclosures.

TITLE: Productivity, nest site characteristics, and food habits of Long-eared Owls in the Snake River Birds of Prey Area.

COOPERATOR: Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, MT 59812.

INVESTIGATOR: Jeffrey S. Marks

OBJECTIVES:

1. To determine the nesting density and annual productivity of Long-eared Owls in the BPSA.

2. To determine the influence of nest site characteristics on the nesting success of Long-eared Owls.

3. To determine the food habits of nesting Long-eared Owls.

ANNUAL REPORT

Forty-one breeding pairs of Long-eared Owls (Asio otus) were located in the Snake River Birds of Prey Study Area (BPSA) in 1981. There were 5 renestings for a total of 46 nesting attempts. In all cases, eggs were laid in the abandoned nest of a Black-billed Magpie (Pica pica) or a Common Crow (Corvus brachyrhynchos). One hundred fifteen nestlings and 6 adults were banded (three additional owls were banded during winter 1981). One hundred one of the banded nestlings were known to have survived to fledging age. Twenty-five owl pairs (61%) raised at least 1 young to fledging age. Despite a decrease of 22 nesting pairs in the study area (63 pairs nested in 1980), nest success and the total number of fledged young increased in 1981. Reasons for the decrease in the number of nesting pairs are not clear, but increased success was due in part to decreased nest predation.

Three breeding males captured at their nests were banded as nestlings in 1980. All 3 nested successfully within 1.5 km of their natal nests.

There was little change in prey species composition in 1981. Four species (Dipodomys ordi, Peromyscus sp., Perognathus parvus, and Microtus montanus) comprised 91% of the 2,207 prey items identified.

Field work was completed in August, and a final report in the form of a thesis will be completed in summer 1982.

METHODS

The nest survey, data collection on reproduction, nest site characteristics, and food habits followed Marks (1980). In addition, the width of each nesting grove (including 1980 sites) was measured as was the

distance from each nest to the 1980 nest for sites that were active both years. See Marks (1980) for definition of terms used in this report.

A single red plastic leg band was placed on the right leg of 67 nestlings to facilitate detection of banded birds from 1981 cohort. Adult owls (6 males and 3 females) were captured at night with mist nets placed near nesting sites. Adults were not trapped until their young were at least 1 week old.

RESULTS

Nest Census

Forty-one pairs of Long-eared Owls attempted breeding in the study area. Owls renested in 5 cases; in each case the renesting followed a failure during incubation. One pair renested twice within a 2-week period, the second failure occurring before clutch completion. As in 1980, the greatest concentration of nesting pairs was between Sinker Creek and the C.J. Strike fieldcamp (33 of 41 nesting pairs).

Reasons for the decline in the number of nesting pairs in 1981 are not apparent (63 pairs nested in 1980). Nesting success was less than 50% in 1980, and it appears that the owls are less likely to return to a site if the site was unsuccessful the previous year ($\chi^2 = 13.3$, $p<0.001$; Table 1). The results in Table 1 may be misleading, however, because most of the breeding owls were not banded, thus it is not certain that the same individuals were present at a site occupied in both years. Nine sites (22%) were new in 1981; the remainder of the nest sites had been active at least once prior to 1981. Thirty sites occupied in 1980 were reoccupied in 1981 (Table 1). In 5 of these sites owls nested in the same nests both years.

Reproductive Performance

Twenty-five of the 41 owl pairs fledged at least one young (61% nest success; Table 2). Nest success per nesting attempt (includes renestings) was 54%. Of the 21 unsuccessful nests, 12 (57%) failed during incubation, and 9 (43%) failed during the nestling stage. Two of 5 renestings were successful.

At least 101 young owls survived to fledging age. The fate of 8 banded young was unknown. Based on this information, the mean number of young fledged per nesting attempt (n=46) was between 2.2 and 2.4. The mean number of young fledged per pair was between 2.5 and 2.7 (Table 2), and the mean number of young fledged per successful pair was between 4.0 and 4.4.

The increase in nest success in 1981 (see Table 2) was due in part to a decrease in nest predation. The decrease in nest predation may have been a function of a decrease in the density of nesting owls. Further conclusions await the completion of analysis of reproduction data.

Three adult males captured at their nest sites were banded as nestlings in 1980. All 3 nested successfully within 1.5 km of their natal nests. To my knowledge, this represents the first confirmation of age of first breeding in the Long-eared Owl.

Nest Sites

As in 1980, Long-eared Owls nested primarily in willows (Table 3). Magpie nests were chosen in 34 nesting attempts (74%). Nest height ranged from 1.5 to 6.5 m ($x = 3.2 \pm 0.98$ m). The percentage of successful magpie nests was similar to that of crow nests (53% and 58% respectively; Table 4).

Analysis of nest site characteristics will focus on nesting success and its relation to nest height, distance of nest to water and roads, and distance of nest to the nests of potential predators.

Food Habits

Mammals were the preferred prey, with small rodents comprising 97% of the 2,207 prey items identified (Table 5). Prey species composition in 1981 was similar to that of 1980. Proportions of the major prey species were similar in both years with the exception of the Great Basin pocket mouse (Perognathus parvus), which increased in the diet of Long-eared Owls from 17% in 1980 to 26% in 1981 (Table 6). The estimated mean prey weight was 30 grams. One Long-eared Owl nestling was recovered in a pellet at a nest site, and was presumed to have been cannibalized by its siblings or parents.

Acknowledgements

Funding was provided by the Snake River Birds of Prey Research Project with additional support from the New Jersey Raptor Association. John Doremus, Mike Kochert, and Vicki Marks aided in many aspects of the study. I thank Karen Steenhof for analytical assistance, and John Martin and Leon Powers for the loan of mist nets. Riley McClelland improved a draft of this report, and provided much encouragement throughout the study.

LITERATURE CITED

Marks, J.S. 1980. Productivity, nest site characteristics, and food habits of Long-eared Owls in the Snake River Birds of Prey Study Area. Pages 36-47 in Snake River Birds of Prey Research Project Annual Report, U.S.D.I., Bureau of Land Management, Boise, ID.

Steenhof, K. In Prep. Prey weights for computing percent biomass in raptor diets. Submited to Raptor Research 11/81.

Table 1. Status of a nest site in 1981 in relation to the success of the site in 1980.

		Status of nest in 1981	
		Reoccupied	Unoccupied
Outcome of nest in 1980	Successful	20	7
	Unsuccessful	10	26

Table 2. Long-eared Owl nesting success and productivity in the BPSA, 1980-1981.

	Number of pairs	Number of successful nests	Success rate	Number of young per pair[1]
1980	63	27	43%	1.3 - 1.6
1981	41	25	61%	2.5 - 2.7
Total	104	52	50%	1.8 - 2.0

[1] Includes nests found after young had hatched and renestings.

Table 3. Nest sites selected by 41 Long-eared Owl pairs in the BPSA, 1981.[1]

Nest substrate[2]	No. (%)	Avg. ht. (m)	Original nest construction		
			Magpie-canopy	Magpie-no canopy	Crow
Willow	41 (89.1)	3.2	16	13	12
Russian olive	3 (06.5)	3.1	1	2	-
Squawbush	1 (02.2)	1.8	-	1	-
Black locust	1 (02.2)	3.0	1	-	-
Total	46	($\bar{x}$ = 3.2 $\pm$ 0.98)	18	16	12

[1]Data include 5 renests, one of which was in the same nest.

[2]Willow (*Salix* spp.); Russian olive (*Eleaeagnus angustifolia*); Squawbush (*Rhus trilobata*); Black locust (*Robinia pseudoacacia*).

Table 4. Long-eared Owl nest success in relation to original nest construction and nest height, BPSA 1981.

	Original nest construction		
	Magpie-canopy	Magpie-no canopy	Crow
No. nests (%)	18 (39.1)	16 (34.8)	12 (26.1)
Avg. height (m)	2.9	2.8	4.0
No. successful (%)	9 (50.0)	9 (56.2)	7 (58.3)

Table 5. Prey of Long-eared Owls during the nesting season, BPSA 1981.

	No. individ.	% individ.	Biomass[1] (g)	% biomass
Antrozous pallidus	1	Trace	32	Trace
Sorex vagrans	1	Trace	6	Trace
Mus musculus	47	02.1	799	01.2
Peromyscus sp.	587	26.6	11,153	16.7
Reithrodontomys megalotis	81	03.7	891	01.3
Onychomys leucogaster	10	00.4	260	00.4
Neotoma lepida	14	00.6	2,100	03.1
Microtus montanus	286	13.0	10,010	15.0
Lagurus curtatus	2	00.1	60	00.1
Perognathus parvus	580	26.3	9,860	14.8
Dipodomys sp.	547	24.8	28,991	43.4
Thomomys townsendi	5	00.2	500	00.7
Lagomorpha sp.	14	00.6	1,400	02.1
Mammal subtotal	2,175	98.6	66,062	98.9
Asio otus	1	Trace	100	00.1
Eremophila alpestris	1	Trace	26	Trace
Agelaius phoeniceus	1	Trace	62	00.1
Melospiza melodia	1	Trace	21	Trace
Passeriformes sp.	16	00.7	480	00.7
Bird subtotal	20	00.9	689	01.1
Cnemidophorus tigris	1	Trace	17	Trace
Orthoptera sp.	6	00.3	Trace	Trace
Coleoptera sp.	5	00.2	Trace	Trace
Total	2,207	100.0	66,768	99.9

[1]Average weights from Steenhof (1982).

Table 6. Frequency of occurrence of the 4 major prey species of BPSA Long-eared Owls, 1980 and 1981.

	1980		1981	
	Number	(% of total prey)	Number	(% of total prey)
Dipodomys	555	(27.7)	547	(24.8)
Peromyscus	547	(27.3)	587	(26.6)
Perognathus	339	(16.9)	580	(26.3)
Microtus	292	(14.6)	286	(13.0)
TOTAL	1733	(86.6)	2000	(90.6)

TITLE: Feeding ecology of the Barn Owl in the Snake River Birds of Prey Area

INVESTIGATOR: Carl D. Marti, Department of Zoology, Weber State College, Ogden, Utah 84408

OBJECTIVES:

1. Determine food habits and other food niche parameters of nesting Barn Owls (Tyto alba).

2. Determine food niche variation (a) between sites and (b) between years.

3. Determine the Barn Owl's position in the raptor feeding guild.

INTRODUCTION

Field studies for this project started in 1978 with most intensive field work done in 1979 (Marti 1979). Additional data were collected in 1980 and 1981. All data have been collected in the Birds of Prey Study Area (USDI 1979). Food habits analysis and subsequent statistical treatment were done at Weber State College, Ogden, Utah.

This report describes field activities for 1981 and preliminary results for that year.

ANNUAL REPORT

Three visits for data collections were made to the BPSA in 1981: 18-21 March, 11-16 June and 18-20 August. Thirty-eight samples of regurgitated pellets were collected from 25 sites (Table 1). These pellets contained remains of 5,359 prey (Table 2).

Analysis to enable a description of the Barn Owl food niche and position in the raptor feeding guild in the BPSA is underway and should be completed in 1982.

ACKNOWLEDGEMENTS

I thank Michael Kochert and the rest of the Snake River Birds of Prey Research Project staff for a variety of assistance in carrying out this study. The Bureau of Land Management provided a vehicle for field use and living space in a field camp. Thanks also to Jeffrey Marks and John Doremus for making some of the pellet collections and providing other information.

Weber State College provided funds through a Faculty Research Grant for travel to the study area from Ogden, Utah.

LITERATURE CITED

Marti, C. D. 1979. Ecology of nesting Barn Owls in the Snake River Birds of Prey Area. Pp. 32-37 in Snake River Birds of Prey Research Project Annual Report. U.S.D.I., Bureau of Land Manage., Boise, Idaho.

U.S.D.I. Bur. Land Manage. 1979. Snake River Birds of Prey Special Research Report to the Secretary of the Interior. Boise District, Idaho.

Table 1. Sites where Barn Owl food habits data were collected in the BPSA, 1981.

Collection Site Name
Bird Butte
Can-Ada
Castle Rock Cave
Castle Rock Southeast
Castle Rock South Spire
Chatton Hill
Colt Draw
Fence Corner
Garbage Draw
Grandview Sandcliff (east end)
Henderson Draw
Jensen Cliff
Kitten's
Little Hole
Lower Lower Black Butte
Mack-the-Knife
Mary's
Rabbit Creek Mouth
Road End
Simplot Pump Plant
Spoon Draw
Tom Draw
Upper Lower Black Butte
Victory
Wildhorse Butte Southwest

Table 2. Total prey identified for the Barn Owl in the BPSA, 1981.

Prey Species	Number	Percent Number
MAMMALS		
Sorex vagrans	18	0.3
Mus musculus	429	8.0
Peromyscus spp.[1]	751	14.0
Reithrodontomys megalotis	211	3.9
Onychomys leucogaster	9	0.2
Neotoma cinerea	17	0.3
Neotoma lepida	25	0.5
Microtus montanus	1,948	36.3
Perognathus parvus	606	11.3
Dipodomys ordii	778	14.5
Thomomys townsendii	482	9.0
unidentified leporids[2] (neonate)	27	0.5
BIRDS		
Porzana carolina	1	tr.[3]
Sturnus vulgaris	6	0.1
unidentified icterids	6	0.1
unidentified medium birds	14	0.3
unidentified small birds	30	0.5
ARACHNIDS		
unidentified scorpion	1	tr.
Totals	5,359	100.0

[1] Probably largely *P. maniculatus*

[2] Probably largely *Sylvilagus nuttallii*

[3] less than 0.1%

TITLE: Marsh Hawk Nesting Density, Reproduction, and Food Habits in Riparian Areas in the Birds of Prey Area.

CONTRACTOR: Western Ecological Studies Team, 224 W. Dewey St., Nampa, ID 83651

PERSONNEL: Leon R. Powers
Tim Craig
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Michael J. Smith

PROJECT SUPPORT: U.S. Department of the Interior, Bureau of Land Management, Contract No. ID-010-CT1-0002.

OBJECTIVES:

1. Determine density and distribution of nesting Marsh Hawks in the riparian areas.

2. Determine reproductive performance of selected Marsh Hawk pairs in relation to habitat and land use type.

3. Determine food habits of selected Marsh Hawk pairs in different habitat and land use types.

RESULTS

Eighty-eight pairs of nesting marsh hawks (Circus cyaneus) were found in the study area. Many of these pairs seemed to occupy nesting territories only during the early part of the nesting season. Of 63 pairs that were watched closely throughout the breeding season, only 46 (73%) stayed on their nesting territory for the full nesting cycle. Seventeen pairs (27%) were known to have abandoned their territory early in the breeding season.

Average marsh hawk clutch size was 5 (N=20), and average brood size at hatching was 3.67 (N=11). Successful pairs raised an average of 3.2 young that reached fledging age (N=16). Predation accounted, at minimum, for 6 lost eggs at 4 nests and 6 lost nestlings at 3 nests. Coyotes were responsible for egg predation at one nest, unidentified mammals were responsible at another, a reptile caused losses at a third, and the fourth egg predator could not be identified. Nestling predation could not be ascribed to any specific group of predators.

Sixteen prey collections were made at 14 marsh hawk nests. These samples were analysed by Ross Haley with the BLM inhouse study food habits samples. Montane voles (Microtus montanus) were the most frequent prey item found at marsh hawk nests (Table 1). Their biomass contribution, however, was exceeded by each of 4 other species: black-tailed jackrabitts, mountain cottontails, Townsend ground squirrels, and ring-necked pheasants. Few reptiles were found as prey at marsh hawk nests.

Table 1. Prey items found at marsh hawk nest sites, 1981.

Species	Number	Perc. Freq.	Biomass	Percent Biomass	KCAL	Percent KCAL
MAMMALS						
Montane Vole	16	25.0	560	8.4	872	8.2
Townsend Ground Squirrel	5	7.8	930	13.9	2047	19.2
Mountain Cottontail	4	6.3	1203	18.0	1660	15.6
Black-tailed Jackrabbit	3	4.7	1900	28.4	2525	23.7
Deer Mouse	2	3.1	38	0.6	61	0.6
Kangaroo Rat - Unid.	1	1.6	53	0.8	85	0.8
BIRDS						
Avian - Unid.	9	14.1	350	5.2	633	6.0
Ring-necked Pheasant	2	3.1	913	13.6	1505	14.1
Blackbilled Magpie	1	1.6	170	2.5	308	2.9
California Quail	1	1.6	170	2.5	280	2.6
Horned Lark	1	1.6	17	0.3	31	0.3
Loggerhead Shrike	1	1.6	51	0.8	92	0.9
Passerine - Unid.	1	1.6	17	0.3	31	0.3
Red-winged Blackbird	1	1.6	42	0.6	76	0.7
Starling	1	1.6	79	1.2	143	1.3
Western Meadowlark	1	1.6	40	0.6	72	0.7
REPTILES						
Whiptail Lizard	8	12.5	123	1.8	162	1.5
Lizard - Unid.	1	1.6	17	0.3	22	0.2
Western Fence Lizard	1	1.6	18	0.3	24	0.2
INVERTEBRATES						
Insects - Unid.	1	1.6	1	0.0	2	0.0
Locustidae	1	1.6	1	0.0	2	0.0
Scarabidae	1	1.6	1	0.0	2	0.0
Scorpionidae	1	1.6	1	0.0	2	0.0
TOTAL	64		6995		10639.48	

TITLE: Marsh Hawk Home Range Use in the Birds of Prey Area

CONTRACTOR: John W. Martin, Department of Biological Sciences, Weber State College, Ogden, Utah 84317.

PERSONNEL: John W. Martin, Principal Investigator
Wendy Sykora, Volunteer Research Assistant

PROJECT SUPPORT: U.S. Department of the Interior, Bureau of Land Management, Contract #ID-010-CT1-0003.

OBJECTIVES:

1. To determine habitat use of selected marsh hawk pairs nesting in riparian areas.

2. To determine daily activity of selected marsh hawk pairs nesting in riparian areas.

3. To determine home range of selected marsh hawk pairs in riparian areas.

RESULTS

Between 5 April and 2 July 1981, 9 nesting marsh hawks (Circus cyaneus) were trapped and banded. Five birds were fitted with tail mount radio transmitters (Beske 1978). This included both members of 2 nesting pairs and 1 male member of a third pair. All birds were marked with color leg bands for individual recognition. Adults were additionally marked with yellow paint on primaries, rectricies or shoulder to aid in visual observations.

The radioed birds were monitored for thirty-two days between 1 May and 3 July. Data were collected on habitat use, daily time and activity budgets and home range delineation.

Field work was completed in July 1981. Data analysis is continuing and results will be submitted in a forthcoming publication.

LITERATURE CITED

Beske, A. E. 1978. Harrier radio tagging techniques and local and migratory movements of radio-tagged juvenile harriers. M.S. Thesis, University of Wisconsin, Stevens Point. 47 pp.

TITLE: Ecology of reptiles in the Snake River Birds of Prey Area.

CONTRACTOR: Department of Biological Sciences,
University of Idaho 83843

INVESTIGATORS: Donald R. Johnson, Major Professor
Lowell Diller, Research Assistant
Ted Daehnke, Field Assistant

PROJECT SUPPORT: U.S. Department of the Interior, Bureau of Land Management, Contract No. 5200-CT5-1002.

OBJECTIVES:

1. Determine the specific composition and biomass of lizards and snakes in specific habitat types within the study area.

2. Determine significant population parameters for these reptile populations including productivity, sex and age ratios, survivorship, and mortality factors.

3. Assess the availability of reptiles as prey for raptorial birds.

4. Determine the impact of snakes on prey populations utilized by raptorial birds.

5. Determine the effects of habitat alteration on reptile densities.

RESULTS

Lowell Diller completed a dissertation entitled "Comparative ecology of Great Basin Rattlesnakes (Crotalus viridis lutosus) and Great Basin Gopher Snakes (Pituophis melanoleucus deserlicola) and their impact on small mammal populations in the Snake River Birds of Prey Natural Area" in October 1981.

ABSTRACT

Capture data from southwestern Idaho indicate that P. melanoleucus disperse shortly after spring emergence in mid-April, while C. viridis, which emerge in late April, remain near hibernacula for several weeks. Both species reach a peak of activity in late May to early June with activity gradually diminishing throughout summer and early fall. Most daily activity of C. viridis occurs between 1000 and 1300 hours with little evidence of nocturnal activity. Daily activity of P. melanoleucus is strongly bimodal during summer with peaks in mid-morning and early evening. At the time of capture, most snakes for both species had a cloacal temperature of about 30°C when the air temperature was about 22°C and the substrate temperature

was about 33°C. However, C. viridis had a narrower range of cloacal temperatures. Based on recapture data, 40% of all recaptures of C. viridis occurred within 5 m of the original capture point. Of movements over 5 m, 70% were between 30 to 150 m. Limited recapture data on P. melanoleucus indicate they are more fragile.

Male C. viridis are significantly larger than females, while both sexes of P. melanoleucus are essentially equal in size. The sex ratio is nearly equal for C. viridis, but male P. melanoleucus clearly outnumber females due to a supposed increased mortality in females. Female C. viridis grow more slowly than males. Two-year-old P. malenoleucus show a spurt in growth which is believed to be associated with a change in prey utilized. Females for both species reproduce for the first time in their fourth year. Male C. viridis had sperm present in the vas deferens by the fall of their second year, while male P. melanoleucus reached this condition by late summer of their third year. Ovulation occurred in early June for both species. Limited observations indicate that young C. viridis are born from mid-September to October, while P. melanoleucus hatch in October indicating a shorter developmental period for the live-bearing C. viridis. Mean clutch sizes were 8.3 and 6.9, respectively, for C. viridis and P. melanoleucus. Annual reproductive effort was about 0.4 for females of both species. However, mature female P. melanoleucus reproduce annually, while 70% of the mature female C. viridis reproduce annually, indicating a greater life-time reproductive effort for P. melanoleucus. Both species show a strong correlation between clutch size and female size ($r = 0.78$ C. viridis; $r = 0.86$ P. melanoleucus). Fat bodies as a percent of body weight are larger in C. viridis than P. melanoleucus. Also, females of both species tend to have larger fat bodies than males. Nonreproductive mature female C. viridis have larger fat bodies than gravid or pregnant females. Males of both species tend to have excess fat reserves, so that seasonal fat body cycles cannot be identified. Fat bodies were used primarily for reproduction in both species.

Based on drift fence captures, mean densities were 0.6 snakes/ha for C. viridis and 1.3 snakes/ha for P. melanoleucus. C. viridis ocurred at a high density (6.9 snakes/ha) in rocky habitats such as the canyon rim and basalt outcrops, but were rare in all other habitats. The density of P. melanoleucus was between about 1 and 2 snakes/ha throughout most of the study area. More than 80% of the adult C. viridis diet was composed of Spermophilus townsendi, while P. melanoleucus took a variety of small mammals. In general, C. viridis was seen as an ecological specialist and P. melanoleucus an ecological generalist.

Feeding studies with captive snakes indicated annual consumption rates of 300% body weight (3.0%/day) for young C. viridis and 160% (1.6%/day) for adult C. viridis. P. melanoleucus had corresponding annual consumption rates of 220% (2.2%/day) for young and 150% (1.5%/day) for adults. Production efficiency (total production of body tissues/total weight of ingested prey) was 30% and 28%, respectively, for young and adult C. viridis and 24% and 20% respectively, for young and adult P. melanoleucus. C. viridis annually take an estimated 25% of the Spermophilus townsendi, while P. melanoleucus take 10% of the S. townsendi, 20% of the Sylvilagus nuttalli and 10% of the Permomyscus maniculatus. The patchy distribution of C. viridis suggests that they would have a high impact on S. townsendi only in localized areas of high snake density, but little impact elsewhere.

U.S.D.I.-BLM Boise District
Kochert, et al
Snake River Birds of Prey
Research Project Annual
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