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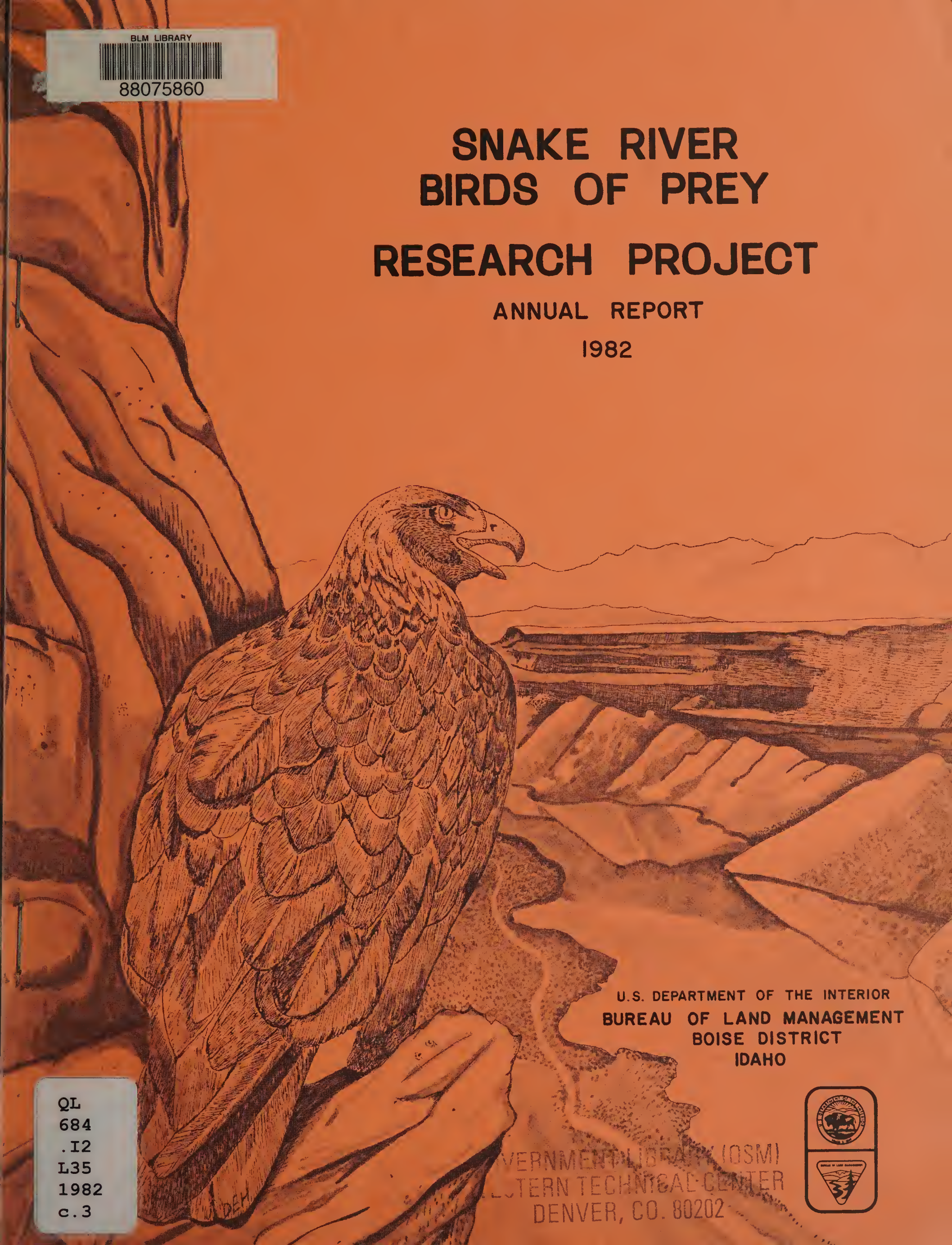

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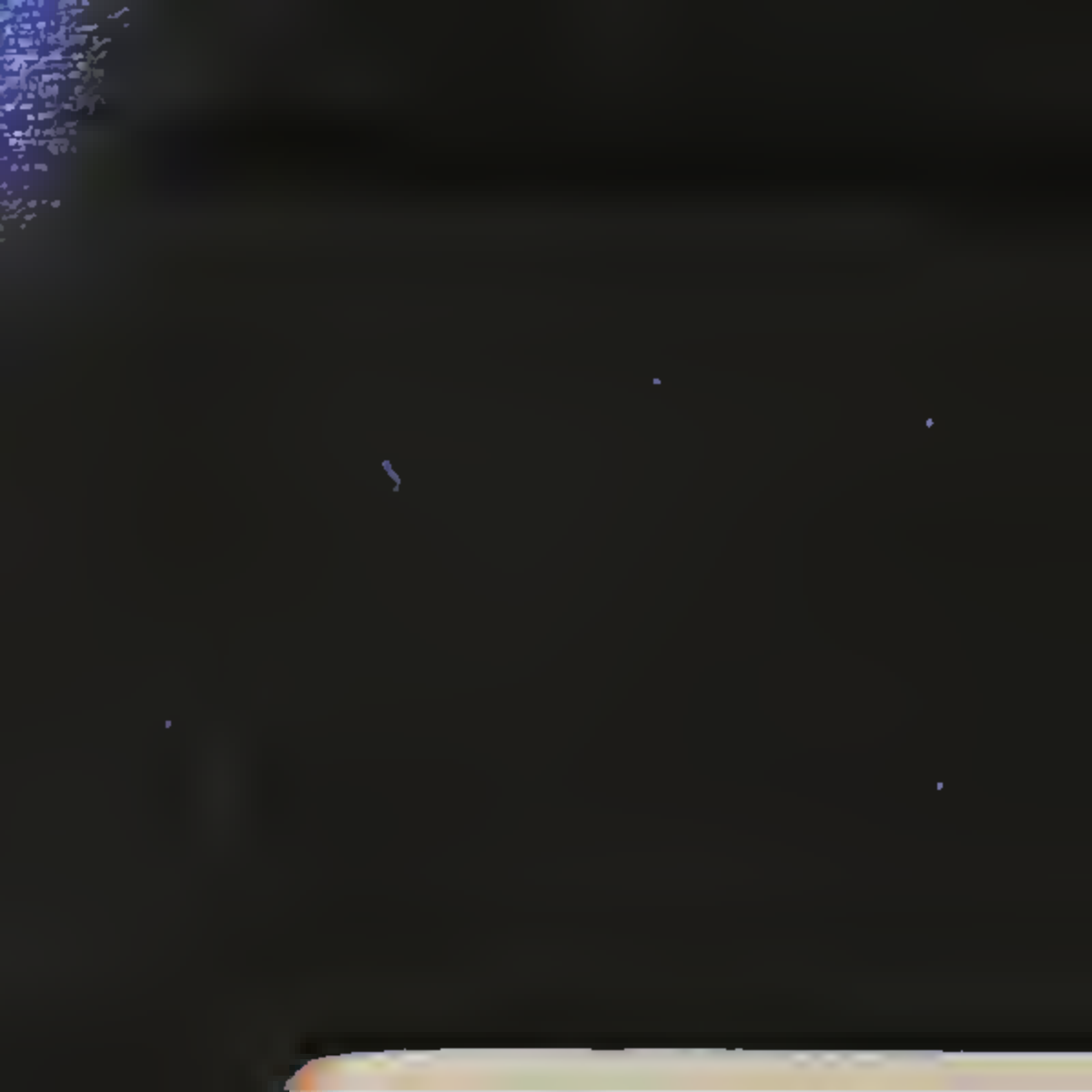
The Bureau of Land Management wishes to thank those agencies and individuals who assisted with the project. Appreciation is extended to the Idaho Fish and Game Department and the U.S. Fish and Wildlife Service for special permits and assistance. Thanks is extended to the Idaho Cooperative Wildlife Research Unit for furnishing the original background data and nest site locations and to those other individuals who volunteered their services.

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

This report summarizes activities of the Birds of Prey Research Program during calendar year 1982. In response to recommendation by the 1982 Birds of Prey Review Committee, work in 1982 emphasized data analysis and technology transfer. Field work was reduced to a basic monitoring effort while small cooperative studies continued.

Work in 1982 can best be described a transition from Goal 2 (coordinate and conduct research) to Goal 4 of the Birds of Prey Area management plan (make available to the public, other agencies, and the scientific community knowledge gained from research and management activities).

According to recommendations of the 1982 Birds of Prey Review Report the present Birds of Prey effort (Goal 4) should continue until at least the end of FY-84 and perhaps into FY-85. As illustrated within this report, the information gathered by Birds of Prey Research during the previous 10 years (1972-1981) is substantial and is useful to government agencies, private organizations and institutions, and BLM managers.

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PART I

TECHNOLOGY TRANSFER

As outlined in the 1982 Birds of Prey Review Committee Report, the principal priority for the Birds of Prey Research Project for 1982 was publication and dissemination of research findings.

In 1982, 11 new technical articles were published and/or accepted for publication, bringing the total number of Birds of Prey Project Publications to 21. Project members submitted an additional 10 technical articles to scientific journals in 1982 and are awaiting word on acceptance.

During 1982, the research staff mailed out more than 1000 project publications. The Research Project mailing list has been automated and includes almost 1500 people who have requested project documents.

Research Project personnel made 32 formal presentations to interested groups in 8 states and one foreign country (World Conference on Birds of Prey in Greece). These included 14 papers presented at scientific meetings and two 1-day sessions on Raptor Management at the BLM's Phoenix Training Center.

In addition to contacts at meetings and publication requests, research staff members received more than 280 requests for information and assistance from individuals representing more than 98 agencies, corporations, and organizations. Many requests for advice and assistance came from BLM employees. Research staff members responded to requests from all districts in Idaho as well as from BLM offices in Colorado, California, Montana, New Mexico, Arizona, Wyoming, and Oregon.

The majority of requests were for recommendations on raptor management problems and for advice on study techniques and research design. Persons contacting the Birds of Prey Research Staff were interested in our first-hand experience as well as in the scientific literature the staff has available on a keyworded computer data base. This scientific literature collection consits of 3200 references on raptor and prey ecology, plant ecology and the effects of fire and grazing and was used by personnel from other BLM districts as well as other agencies. Much of the technical information transferred consisted of specific advice on proposed BLM management actions in the Boise District, but information from the project also had broader applications. Birds of Prey information on the effectiveness of patagial wing markers was used in California Condor research and BLM data on jackrabbit density and distribution was used by the Agricultural Research Service in their studies of Anaplasmosis, a disease of range cattle in southwestern Idaho.

The staff continued to offer help to BLM employees in computer operations and statistics. Karen Steenhof's role as Leader of the Pacific States Bald Eagle Recovery Team and Coordinator of the Midwinter Eagle Survey led to numerous information exchanges. Project materials as well as information were used by other BLM districts and other agencies including the Idaho Fish and Game Department, the Agricultural Research Service and the U.S. Fish and Wildlife Service.

Technical Articles Published Prior to 1982

Diller, L.V. and R.L. Wallace. 1981. Additional distribution records and abundance of three species of snakes in southwestern Idaho. Great Basin Nat. 41:154-157.

ABSTRACT.—New county records are reported for Hypsiglena torquata and Rhinocheilus lecontei, and additional distribution records are presented for Sonora semiannulata in southwestern Idaho. These three species are more abundant than indicated by previous records.

Innis, G. et al. 1979. Birds of Prey Study Area Simulation Model, Vol. 1. Final Report. Utah State Univ. Wildlife Science Rep. 7. 277 pp.

Kochert, M.N. 1980. Golden eagle reproduction and population changes in relation to jackrabbit cycles: implications to eagle electrocutions in Proc. Workshop on raptors and energy developments. R.P. Howard and J.F. Gore eds. U.S. Fish and Wildl. Ser., Boise, Idaho, pp. 71-86.

ABSTRACT.—Golden eagle (Aquila chrysaetos) reproductive performance and relative black-tailed jackrabbit (Lepus californicus) densities were assessed in the Snake River Birds of Prey Area from 1970-1978. Golden eagle mid-winter densities were enumerated from 1973-1979. The proportion of eagles breeding, young eagles fledged per pair and per breeding attempt and eagle breeding success all declined in response to lower jackrabbit numbers. Mid-winter golden eagle densities were related to jackrabbit densities. The incidence of eagle electrocutions was correlated with the mid-winter eagle density. A possible relationship among golden eagle winter density and reproductive performance, the incidence of golden eagle electrocutions and jackrabbit density is established. The incidence of golden eagle electrocutions may be cyclic with jackrabbit fluctuations.

Marks, J.S., J.H. Doremus and A.R. Bammann. 1980. Black-throated sparrows breeding in Idaho. Murrelet 61:112-113.

Marks, J.S. and V.A. Marks. 1981. Comparative food habits of the screech owl and long-eared owl in southwestern Idaho. Murrelet 62:80-82.

Marks, J.S. and E. Yensen. 1980. Nest sites and food habits of long-eared owls in southwestern Idaho. Murrelet 61:86-91.

In desert areas where suitable nesting trees for Long-eared Owls are not abundant, the height distribution of nests available to the owls can be crucial to nest success. Low nests are more vulnerable to predation than higher nests. Introduced tree species grow taller than the native willows in southwestern Idaho, and thus may serve to increase Long-eared Owl productivity by reducing predation and by increasing the number of nesting sites available to the owls.

Long-eared Owls in southwestern Idaho appear to be opportunistic feeders. The majority of prey items weigh between 10 and 60 g. Larger individuals are occasionally captured, but prey species that weigh more than 100 g are probably not important in the diet of Long-eared Owls in southwestern Idaho. The importance of non-microtine prey in the diets of Long-eared Owls nesting in desert habitats is probably a function of prey species composition of desert environments. Further study of prey selection by desert Long-eared Owls may support this view.

Messick, J.P. and M.G. Hornocker. 1981. Ecology of the badger in southwestern Idaho. Wildl. Monogr. No. 76.

The ecology of the badger population on the Snake River Birds of Prey Study Area was investigated between spring 1975 and late summer 1977. Density, sex and age structure, fecundity, and mortality were assessed through mark-release, carcass, and skull collections. Radiotracking was used to monitor movement and activity, with additional data from recaptures, tracking on snow, and visual observations. Food habits data came from analysis of colons, stomachs, and fecal samples.

Olendorff, R.R. and M.N. Kochert. 1977. Land management for the conservation of Birds of Prey, in R.D. Chancellor, ed. Proc. World Conference on Birds of Prey, ICBP, Vienna, Pp. 294-307.

The Bureau of Land Management (BLM), an agency of the U.S. Department of the Interior, is the largest land managing agency in the United States. It administers 474 million acres (192 million hectares) of land. Much of this land is rugged or remote and provides much of the best remaining breeding habitat for a number of species of birds of prey. The highest known breeding density of raptors in Western North America occurs in the Snake River Birds of Prey Natural Area in Idaho. Here the BLM is investing substantial research funding to study land management opportunities related to preserving raptor habitats, while also accommodating agriculture, livestock grazing, recreation, and other activities of Twentieth Century Americans. Efforts to evaluate and safeguard important raptor habitats are widespread and still increasing in intensity on BLM-administered lands. Additional examples include routine consideration of birds of prey habitat requirements in land-use planning and environmental assessments; habitat maintenance and protection, such as mitigation of adverse resource development impacts on populations of birds of prey; habitat enhancement for raptors that will help in the development of management techniques so badly needed today in many parts of the world; involvement in research and recovery efforts for endangered raptors; and public and intra-Bureau education to communicate the aesthetic, cultural, and biological values of birds of prey.

Yensen, D. 1980. A grazing history of southwestern Idaho with emphasis on the Birds of Prey Study Area. Prog. Rept. Contract 52500-CT5-1002.

The rangeland of southwestern Idaho, once a mosaic of vegetation dominated by open stands of either big sagebrush with an understory of native perennial grasses, winterfat and other salt-desert shrubs, or wild rye and other grasses was severely damaged by over-grazing during the range cattle boom of the 1880's and by the sheep boom which followed. Continued high stocking levels, combined with the 14-year dry period which culminated in the severe drought of 1934, resulted in the virtual elimination of the native grass understory, a great reduction in the area dominated by winterfat, and the creation of dense monotypic stands of big sagebrush (Pechanec et al. 1937). After destruction of native range vegetation, exotic annuals such as Russian thistle, mustards, cheatgrass, halogeton, and Medusahead invaded southern Idaho. Millions of acres of rangeland are now dominated by these annuals, and the original character of the vegetation is much changed. In more recent decades grazing management and range improvement programs have brought about an increase in range productivity. But in some respects these programs do not well serve the native animals and vegetation. Much of the range is still overstocked or poorly managed, and could be severely damaged during a year of low rainfall. Since it is not possible to return the rangeland to its pristine condition, only very careful and enlightened management can guarantee a productive future for the southwestern Idaho range.

Yensen, D.L. 1981. The 1900 invasion of alien plants into southern Idaho. Great Basin Nat. 41(2):176-183.

ABSTRACT.—The European annual plants Salsola iberica, Sisymbrium altissimum, Descurainia sophia, and Bromus tectorum invaded southern Idaho about 1900 and spread very rapidly into native plant communities damaged or eliminated by burning, abusive grazing, and agricultural clearing. Historic photographs reveal that the sites of initial invasion were waterway margins, railroad rights-of-way, road shoulders, city streets, agricultural areas, and construction sites. By 1915, these plants were widespread and abundant. Burning and grazing fostered their spread and dominance on millions of acres in southern Idaho.

Technical Articles Published and/or Accepted for Publication in 1982*

Collopy, M.W. In Press. Food habits of golden eagles: a comparison of two techniques. J. Wildl. Manage. Accepted 8/82.

ABSTRACT.—Two techniques were used to determine the diets of 4 pairs of nesting golden eagles (Aquila chrysaetos) in southwestern Idaho during 1978 and 1979; direct observations of prey deliveries to nests were compared with estimates of food habits derived from analyses of systematic collections of pellet and prey remains. There was no difference ($P > 0.05$) between the 2 methods in the estimated species composition, either by percent frequency or percent biomass. Comparisons of the daily capture rates derived using the 2 techniques demonstrated that collections of pellet and prey remains consistently underestimated observed prey delivery. Estimates of the time period collections reflected prey deliveries ranged from 1.6 to 5.5 days, but were consistent for each nest. Periodic observations of food delivery at nest sites can be used to correct for prey biomass unaccounted for in the collections; this procedure would enable researchers to use collection of pellet and prey remains to estimate prey biomass delivered to nests.

Craig, T.H., E.H. Craig, and J.S. Marks. 1982. Aerial talon-grappling in Northern Harriers. Condor 84:239.

Diller, L.V. and D.R. Johnson. 1982. Ecology of reptiles in the Snake River Birds of Prey Area. 107 pp.

ABSTRACT.—Shadscale (Atriplex confertifolia), talus and canyon rim habitats yield the highest lizard density estimates. Lizard seasonal activity typically begins in April, reaches a peak by early June, drops off during July and August and then reaches a small secondary peak in October after which all activity ceases. Gopher snakes (Pituophis melanoleucus) and western rattlesnakes (Crotalus viridis) were most frequently captured. However, estimates from a drift fence census indicate that night snakes (Hypsiglena torquata) and gopher snakes are the most abundant snakes with densities of 1.4 and 1.3 snakes/ha, respectively. Rocky habitats (canyon rim and talus slopes) had highest snake densities. Most snake activity began in late April, reached a peak during late May and early June and gradually diminished throughout summer with no secondary peak in the fall. Most snakes in the study area do not have home ranges in the traditional sense, but wander randomly over relatively large areas. We identified five size classes of western rattlesnakes and gopher snakes and four size classes of striped whipsnakes using length-frequency curves. Length-frequency curves indicate that all three snake species are relatively long-lived with high mortality in the younger age classes and low mortality as adults. Most female rattlesnakes and gopher snakes first reproduce in their fourth summer, while male rattlesnakes and gopher snakes produce sperm by their second and third summers, respectively. Mean clutch size was 8.3 and 6.3 for western rattlesnakes and gopher snakes, respectively. Gopher snakes reproduce annually, while 75% of the rattlesnakes reproduce annually. Rattlesnakes have the highest percent body fat followed by gopher snakes and striped whipsnakes. In all three species females usually have higher percent body fat than the male. Over 80% of the rattlesnake's diet consists of Townsend ground squirrels (Spermophilus townsendi), while gopher snakes feed on a variety of small mammals. Striped whipsnakes have a varied diet of lizards, small mammals and other snakes. Rattlesnakes have a higher consumption rate and growth (production) efficiency than do gopher snakes. rattlesnakes consume an average of 2.3 Townsend ground squirrels per hectare. A drought in 1977 caused a drastic reduction in feeding, early cessation of activity, reduced body weight and a decrease in reproductive output for rattlesnakes. Gopher snakes showed no major response to the drought.

Doremus, J.H., and A.R. Bammann. 1982. The Snake River Birds of Prey Study Area Bird List.

Since 1972 BLM biologists have been conducting field studies to assess the biological requirements of raptors. This bird list has been compiled from the field notes of BLM biologists, Idaho Department of Fish and Game personnel, and individual bird students. Interstate 84 was the north and east boundary and state highway 78 was the south and west boundary of the area frequented most by the BLM staff. Most of the information was gathered along the Snake River Canyon between Hammett and Melba, Idaho, primarily between the months of January and August.

Kochert, M.N., K. Steenhof, and M.Q. Moritsch. In Press. Evaluation of patagial markers for raptors and ravens. Wildl. Soc. Bull. Accepted 31 December 1982.

Wrap-around wing-markers did not cause apparent adverse behavioral or physical effects on golden eagles, red-tailed hawks, or common ravens marked as nestlings. Breeding success of individuals of these species marked as nestlings did not differ significantly from unmarked individuals. All-vinyl markers caused extensive irritation and callusing of prairie falcon wings. Prairie falcons began losing their markers within a few months after tagging. Eagles reliably retained their markers for up to 20 months; some retained markers for up to 10 years. Because many sightings contained inadequate information, only 60% of the post-dispersal sightings were classed as complete. Color confusion, marker loss, and failure to see both wings were the main causes for inadequate sightings. The amount and quality of data provided by wing-marking depended on species and study objectives. Wing-marking was more useful than banding in post-fledging movement studies for all species and in studies of dispersal and mated birds on territory for all species except falcons. Wing-marking was effective in assessing long-range movements for golden eagles and ravens.

Marks, J.S. In Press. Prolonged incubation by a long-eared owl. J. Field Ornithology. Accepted 13 September 1982.

Messick, J.P., G.W. Smith, and A.M. Barnes. 1983. Serologic testing of badgers to monitor plague in southwestern Idaho. J. Wildl. Diseases 19:1-6.

ABSTRACT.—Serologic testing of badgers (Taxidea taxus) was used to monitor plague (Yersinia pestis) in a Townsend ground squirrel (Spermophilus townsendi) population in 10,000 ha of the Snake River Birds of Prey Study Area, Idaho. Eighty-six percent of the 294 sera tested in 1975 and in 1976 were positive. Significantly fewer (72%) seropositives occurred in 1977. Seasonal changes in the percentage of seropositives and the decline in 1977 were probably due to the phenology of the Townsend ground squirrel and the proportion of that species in the badger's diet. Eight Townsend ground squirrels found dead had positive bacteriologic tests for plague; however, a high mortality in the ground squirrel population was not observed. Food habits and movement patterns of badgers made them ideal for documenting the geographical and temporal characteristics of the plague form.

Steenhof, K. In Press. Prey weights for computing percent biomass in raptor diets. Raptor Research. Accepted 10/82.

Steenhof, K. 1982. Use of an automated geographic information system by the Snake River Birds of Prey Research Project. Comput. Envir. Urb. Systems: I-7.

ABSTRACT.—An automated natural resource information system, COMPIS, was used as part of a Bureau of Land Management (BLM) research project to assess the effects of agricultural expansion on nesting birds of prey. With a reasonable amount of investment, the BLM produced graphic maps and acreage summaries for individual nest sites and segments of the study area. The COMPIS system was also used to evaluate alternative boundaries for a proposed national conservation area.

Steenhof, K. and M.N. Kochert. 1982. An evaluation of methods used to estimate raptor nesting success. J. Wildl. Manage. 46:585-893.

ABSTRACT.—Surveys of raptor nesting populations can yield markedly different results depending on sampling and analytical procedures. Analysis of reproductive data for 3 raptor species in southwestern Idaho showed that productivity estimates based on pairs found early in the nesting season tend to be lower than those for pairs found late. Two factors seem to be responsible. First, researcher visits to nests early in the nesting season may cause nest failure, especially for eagles and red-tailed hawks (Buteo jamaicensis). Second, successful pairs are more conspicuous and are more easily located than unsuccessful pairs later in the season. To obtain an unbiased estimated of reproduction per pair by large raptors, begin surveys during incubation to identify breeding pairs, and avoid disturbing nesting pairs until just before young fledge to determine nest success. Nest success per pair can be calculated in 1 of 3 ways. A method that incorporates the Mayfield technique may be most appropriate.

Steenhof, K. and M.N. Kochert. 1982. Nest attentiveness and feeding rates of common ravens in Idaho. Murrelet 63:30-32.

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* Reprints of most of these articles are available from the Birds of Prey Research Project, Boise District, BLM, 3948 Development Avenue, Boise, ID 83705.

1982 Birds of Prey Research Technical Presentations

1/82 Yensen, D.L. Presettlement vegetation of southwestern Idaho. Idaho Entomology Group, Boise, Idaho.

1/82 Yensen, D.L. Invasion of alien plants into southwestern Idaho. Idaho Native Plant Society, Boise, Idaho.

1/82 Yensen, D.L. Alien plants in southwestern Idaho. College of Idaho Botany class, Caldwell, Idaho.

3/82 Yensen, D.L. Desert Plants of the Birds of Prey Study Area. Boise Continuing Education Program, Boise, Idaho.

3-11-82 Kochert, M.N. Raptor Management. BLM Phoenix Training Center, Phoenix, Arizona.

3-12-82 Kochert, M.N. Research and Management in the Birds of Prey Area. Safford District, BLM, Safford, Arizona.

4-24-82 Marks, J.S. Prey Selection by Nesting Long-eared Owls. Cooper Ornithological Society Meeting, Logan, Utah.

4-24-82 Steenhof, K. The Biology of Ferruginous Hawks Nesting Near Other Large Raptors. Cooper Ornithological Society Meeting, Logan, Utah.

4-27-82 Kochert, M.N. Evaluation of a long term raptor and raven wing marking program. International Council on Bird Preservation, World Conference on Birds of Prey, Thessaloniki, Greece.

5-29-82 Kochert, M.N. The Birds of Prey Research Program. Presentation to the Hawk Mountain Sanctuary Association, Boise, Idaho.

6-3-82 Kochert, M.N. The Birds of Prey Research Program. Meeting of the National Audubon Society Board of Directors, Boise, Idaho.

8-13-82 Steenhof, K. The Pacific States Bald Eagle Recovery Plan. Bald Eagle Days, Rochester, New York.

9-13-82 Kochert, M.N. Raptor Management. BLM Phoenix Training Center, Phoenix, Arizona.

9-17-82 Yensen, D.L. History of Grazing in Southwestern Idaho. Symposium on Man, Wildlife, and the Public Lands, Boise, Idaho.

9-17-82 Steenhof, K. Relations between raptors and men. Symposium on Man, Wildlife, and the Public Lands, Boise, Idaho.

10-14-82 Steenhof, K. Nesting of subadult Golden Eagles in Southwestern Idaho. 100th Meeting of the American Ornithologists' Union, Chicago, Illinois.

1982 Birds of Prey Research Technical Presentations (cont.)

10-14-82 Edwards, T.C. Factors influencing the occurrence of fractricide in eagles. 100th Meeting of the American Ornithologists' Union, Chicago, Illinois.

10-13-82 Marti, C.D. Feeding Niche of Two Great Basin Barn Owl Populations. 100th Meeting of the American Ornithologists' Union, Chicago, Illinois.

10/25/82 Kochert, M.N. Research in the Birds of Prey Area. Hawk Mountain Sanctuary, Kempton, Pennyslvania.

10-27-82 Kochert, M.N. Research in the Birds of Prey Area. Pakano Mountain, Audubon Society, Stroudsberg, Pennsylvania.

10-28-82 Kochert, M.N. Research in the Birds of Prey Area. New Jersey Raptor Society, Roselane, New Jersey.

10-29-82 Kochert, M.N. The Birds of Prey Area. Pennsylvania Raptor Society, Stroudsberg, Pennsylvania.

11-20-82 Marks, J.S. Natal Philopatry in Long-eared Owls. Raptor Research Foundation Annual Meeting, Salt Lake City, Utah.

11-20-82 Collopy, M.W. Foraging behavior and success of golden eagles. Raptor Research Foundation Annual Meeting, Salt Lake City, Utah.

11-20-82 Steenhof, K. Nesting of subadult Golden Eagles in Southwestern Idaho. Raptor Research Foundation Annual Meeting, Salt Lake City, Utah.

11-20-82 Steenhof, K. From Warblers to Eagles: Application of the Mayfield Method to Raptor Surveys. Raptor Research Foundation Annual Meeting, Salt Lake City, Utah.

11-20-82 Marks, J.S., and C.D. Marti. A comparison of the Feeding Ecology of Sympatric Barn and Long-eared Owls. Raptor Research Foundation Annual Meeting, Salt Lake City, Utah.

11-20-82 Kochert, M.N., K. Steenhof, and M.Q. Moritsch. Evaluation of a long term raptor and raven wing marking program. Raptor Research Foundation Annual Meeting, Salt Lake City, Utah.

11-20-82 Moritsch, M.Q. Photographic aging key for red-tailed hawks, and prairie falcons. Raptor Research Foundation Annual Meeting, Salt Lake City, Utah.

11-20-82 Marti, C.D. Feeding niche of two Great Basin Common Barn Owl Populations. Raptor Research Foundation Annual Meeting, Salt Lake City, Utah.

12-82 Yensen, D.L. Presettlement vegetation of southwestern Idaho. Idaho Native Plant Society, BSU, Boise, Idaho.

PART II

CONTINUING STUDIES: PROGRESS REPORTS

TITLE: Densities and reproductive performance of raptors in the Snake River Birds of Prey Area.

INVESTIGATORS: Michael N. Kochert, Research Project Leader.
John H. Doremus, Principal Investigator.
Karen Steenhof, Analytical Biologist.
Vicki Marks, Research Technician.
Dixie Duncan, Research Technician.
Marc Moritsch, Research Biologist.
Peggy Clements, Statistical Clerk.
Anne Dolde, SCA Volunteer.
Daria Carle, SCA Volunteer.

OBJECTIVES:

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

2. To determine raptor and raven density in 3 segments of the canyon.

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

ANNUAL SUMMARY

Research focused on golden eagles (Aquila chrysaetos), red-tailed hawks (Buteo jamaicensis), prairie falcons (Falco mexicanus), ferruginous hawks (Buteo regalis), and northern harriers (Circus cyaneus). Golden eagles counted on winter aerial transects decreased from 1981, but the proportion of subadults increased. Number of golden eagles nesting in the BPSA was stable, but red-tailed hawk and prairie falcon nesting densities dropped sharply in 1982. Eagles produced more young per pair than in any previous year and red-tailed hawk productivity was above average. Prairie falcon production per pair was lower than in any other year except 1978.

METHODS

In January 1982, twenty golden eagle aerial transects were flown over the Snake River plain between Meridian and Rupert, Idaho as in previous years.

Research on nesting raptors was conducted within the Birds of Prey Study Area (BPSA: Fig. 1). Observations concentrated on golden eagles, prairie falcons, red-tailed hawks, northern harriers, and ferruginous hawks.

All traditional eagle nesting territories in the BPSA were checked for occupancy during the 1982 breeding season. Because of funding cutbacks in recent years, we have been unable to identify all nesting pairs of prairie falcons and red-tailed hawks in the BPSA. To monitor nesting density changes in these 2 species, 3 sections of the canyon were chosen for complete surveys. Numbers in these intensive survey areas were correlated with total numbers in years when the entire BPSA was surveyed. From 1980 to 1982, the intensive survey areas were searched for nesting pairs each month from March to May. The intensive survey areas cover approximately 80 linear km of cliff in the BPSA.

Prior to the breeding season 158 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"; 54 prairie falcon, 31 red-tailed hawk, 13 ferruginous hawk, and 24 northern harrier 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 cameras. However, there was some evidence to indicate that disease treatment, shade devices, 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.

Nestling raptors were weighed and banded with aluminum U.S. Fish and Wildlife Service bands.

RESULTS

Winter Aerial Transects

Numbers of golden eagles seen on aerial transects dropped from 53 in January 1981 to 43 in January 1982 (Table 1). The percentage of eagles in subadult plumage continued its increase, presumably reflecting improved reproduction in recent years.

Nesting Density Surveys

Numbers of golden eagles remained steady, with 30 territorial pairs in the entire study area. Numbers of occupied prairie falcon and red-tailed hawk territories, however, dropped sharply from 1981 levels. Numbers of prairie falcon pairs in the intensive survey area dropped from 71 in 1981 to 60 in 1982, a level similar to those observed from 1978-1980. Only 23 red-tailed hawk pairs were found in the intensive survey area in 1982; 3 fewer than in 1981 and the lowest number of red-tailed hawk pairs recorded since complete surveys began.

Nesting Productivity

Although the percent of eagle pairs breeding dropped from 100% in 1981 to 87% in 1982 (Table 2), eagles produced more young per pair (1.32) than in any of the 11 previous years. Because we tried to minimize disturbance during incubation and early brood-rearing, sample sizes for clutch size and brood size at hatching were necessarily low. Nevertheless both were higher than the 12-year averages. Percent of breeding attempts successful (78%) was higher than in any previous year. Number of young fledged per successful attempt (1.94) approached the previous high of 1.95 reached in 1971. Five pairs in the BPSA each raised 3 young to fledging. This represented both the highest number and highest percentage of 3-chick broods among successful pairs ever recorded. Cool spring temperatures in 1982 may have been associated with improved nestling survival.

The first case of a golden eagle pair renesting in the BPSA was recorded in 1982. The pair at Indian Cove laid a second clutch during the first week in April after its first clutch failed to hatch. The young from the second clutch died at 7 weeks of age, apparently from a severe ectoparasite infestation.

The percent of prairie falcon pairs that laid eggs in 1982 dropped to 88% (Table 2), the 2nd lowest level observed in 9 years. Average clutch size of those that laid, however, was the highest ever recorded (4.83), based on a sample size of 12. Brood size at hatching (4.25) was also higher than most previous years. Percent of attempts successful (64%), the most variable component of prairie falcon reproduction, was close to the 9-year average. Number fledged per successful attempt (3.53), however, was below average, and number fledged per pair (1.99) was lower than all other years except 1978.

The reduced number of red-tailed hawks nesting in the BPSA fared quite well in 1982. As in 1981, all preselected territorial pairs laid eggs.

Three clutches averaged 2.67 (Table 2). The number fledged per pair (2.13) was exceeded only by 1981's rate (2.25 per pair). Cool spring weather may have benefitted red-tailed hawk as well as eagle nestling survival. No red-tailed hawks were known to die of thermal stress in 1982.

Six of the 13 preselected ferruginous hawk nesting territories were vacant in 1982; 85% of pairs that occupied sites laid eggs in 1982. The single complete clutch that was found had 3 eggs. Eighty-three percent of the attempts were successful, and an average of 3 young fledged per successful attempt. Number fledged per pair (2.12) was the third highest ever recorded.

Harriers were preselected for reproductive study for the first time in 1982. All preselected harriers laid eggs, but only 27% of the breeding attempts were successful. Successful pairs produced an average of 3 fledging-age young, but the high number of unsuccessful nests reduced number fledged per pair to 0.81.

Banding and Marking

During 1982, 62 nestling, 1 young-of-year, and 8 adult raptors were banded with aluminum U.S. Fish and Wildlife Service Bands. The nestlings included 7 golden eagles, 4 prairie falcons, 4 red-tailed hawks, 30 ferruginous hawks, 2 northern harriers, 5 burrowing owls and 5 long-eared owls. Five long-eared owls and a screech owl were banded as adults, and a barn owl was banded shortly after fledging.

We received 8 band recoveries in 1982. One of the ferruginous hawks banded as a nestling in 1982 was killed by a train less than 2 km from its nest. A red-tailed hawk marked as a nestling in 1977 was found electrocuted in late summer of 1982. The hawk was wearing a patagial marker and had been seen on the breeding territory prior to its death. The location where the bird died was only 6.3 km from its natal area. A golden eagle that had been fitted with a band, a patagial marker, and a backpack radio transmitter as a nestling in 1975 was found dead in August of 1982, 77 km from its natal site. The radio and patagial tag were in good condition, and there were no signs of serious abrasion or feather wear.

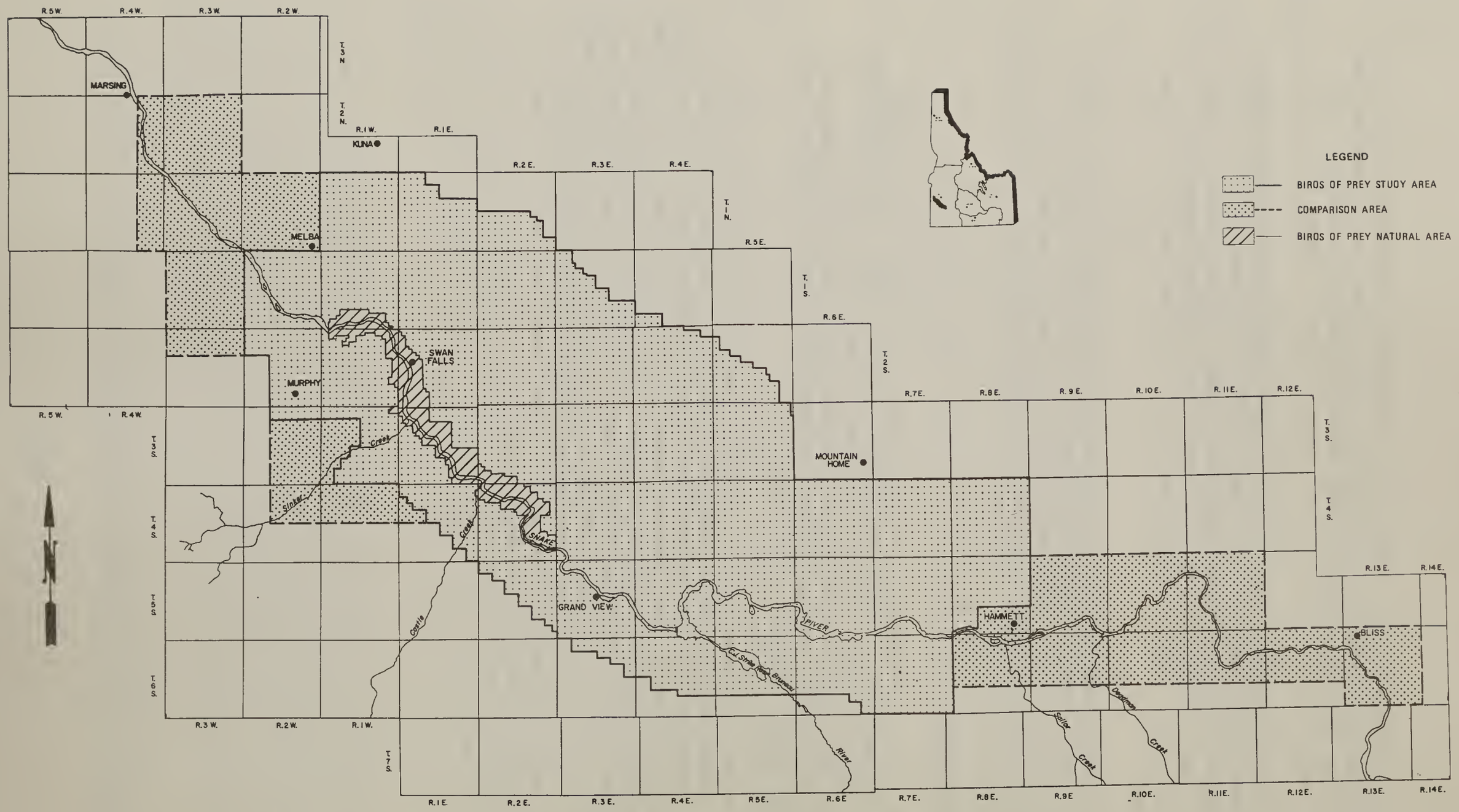

Fig. 1. LOCATION OF THE BIRDS OF PREY STUDY AREA (BPSA) AND COMPARISON AREA

Table 1. Results of aerial transect sampling on 17,290 km^2 (7,000 mi^2) of the Snake River floodplain, 1972-82.

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)
Jan. 82	14	20	9	43	59%	8.6 (3.3)

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

Table 2. Reproductive parameters for 11 raptor species in the BPSA, 1982. Sample sizes in parentheses.

Species	% Breeding	Clutch Size	Brood Size At Hatching	% of Attempts Successful	No. Fledged Per Successful Attempt	Number Fledged Per Pair
Golden Eagle	87% (30)	2.33 (3)	2.66 (3)	78% (31)	1.94 (19)	1.32
Prairie Falcon	88% (25)	4.83 (12)	4.25 (8)	64% (39)	3.53 (17)	1.99
Red-tailed Hawk	100% (25)	2.67 (3)	2.00 (2)	82% (35)	2.60 (20)	2.13
Ferruginous Hawk	85% (7)	3.00 (1)	2.50 (2)	83% (6)	3.00 (7)	2.12
Northern Harrier	100% (12)	4.80 (10)	4.00 (1)	27% (11)	3.00 (4)	0.81
Great Horned Owl	---	--	--	--	2.00 (3)	--
Kestrel	---	--	5.00 (1)	--	4.50 (2)	--
Burrowing Owl	---	--	--	--	4.50 (2)	--
Screech Owl	---	3.00 (1)	--	75% (4)	3.00 (2)	--

TITLE: Abundance and Demography of Prey Populations in the Snake River Birds of Prey Area.

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Nicholas C. Nydegger, Research Associate
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PROJECT SUPPORT: U.S. Department of the Interior, Bureau of Land Management, Contract No. YA-553-CT2-1019.

OBJECTIVES: To monitor changes in vegetation and populations of major prey species in the Birds of Prey Area from 1982 to 1983 and to integrate and analyze all prey and vegetation data collected in the Birds of Prey Area since 1974.

ANNUAL SUMMARY

In 1982 we trapped 342 ground squirrels (Spermophilus townsendi) on four trapping grids. Three grids were 1 hectare each and one grid was 7.84 hectares in area. Squirrel densities varied with the cover type and ranged from 4.78 to 10.67 squirrels per hectare.

A comparison of variable width (line) versus strip transect methods (Gates 1981) verified the valididty of previously collected ground squirrel hole count data.

Black-tailed jack rabbit (Lepus californicus) densities varied from 0.03 to 0.38 rabbits per hectare depending on the cover type. This represents a large reduction in density over the previous few years. Two other population indices confirm this "crash".

Five paired study plots were established to monitor recovery and succession in three distinct vegetation types that burned in 1981. A study plan was developed and baseline information collected.

METHODS

Townsend Ground Squirrels

Townsend ground squirrels were livetrapped four times weekly from

mid-February through the second week in May on four of the established study sites: Big Sage, Winterfat, Burn, and Comparison. Traps (41 x 13 x 13 cm) baited with apple were randomly set about specific locations in each site and checked three times daily. Squirrels were permanently marked by toe clipping. The Big Sage, Winterfat, and Burn sites, each 1 ha in area, were trapped as in previous years, using 20 traps per site set in 5 rows of 4 traps each. Trap interval was 20 m between rows and 30, 40, 30 meters respectively between traps in each row.

The 1-ha Comparison site was trapped like the other sites from the start of trapping in February until March 23. At that time we began trapping a large grid (7.84 ha) that was superimposed on the Comparison site in an attempt to determine the area being censused by our trapping efforts using the "edge effect" described by Schroder (1981). An 8 x 8 row-grid of traps placed at 40-meter intervals was used to form four concentric rings. Trapping continued on the larger grid through the second week in May.

Population estimates were obtained for each site using the removal estimator in the computer program "CAPTURE" (Otis et al. 1978). The removal estimator, which allows probability of capture to vary by behavior and individual animal, 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. Population estimates were obtained for both the inner 1-ha grid and the expanded 7.84-ha grid on the Comparison site.

As in previous years, densities were calculated from these population estimates using an effective trapping area of 2.56 hectares for females and 4.84 hectares for males. To maintain compatability, densities on the Comparison site were calculated using the population estimate from the inner 1-ha grid and the above effective trapping areas. Densities were also calculated for the expanded (7.84 ha) grid on the Comparison site using both a grid-boundary strip method (utilizing the radius of the above effective trapping areas as the strip width) and a nested subgrid method calculated by program "CAPTURE" (Otis et al. 1978).

Vegetation was sampled on each trapping grid with a 40-sample transect line (Daubenmire transect) using the canopy coverage technique of Daubenmire (1959, 1970).

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 to compare litter size between yearling and adult age classes.

We attempted to survey ground squirrels off the intensive sites using a modified Lishak alarm call technique (Lishak 1977). This method showed promise but needs further development and was abandoned.

Paired ground squirrel hole count transects (USDI 1979) were run to assess the validity of previously collected strip transect data across vegetation types. One line transect (Gates 1981) and one strip transect (Gates 1981) were run at each of 190 random locations, stratified by vegetation type. Seven vegetation types were surveyed.

Black-tailed Jack rabbits

Black-tailed jack rabbits were surveyed on 11 spotlighting transects (Flinders and Hansen 1973; Frylestam 1981; Smith and Nydegger in prep.) running through the major vegetation types within the study area. Each transect was sampled three times from mid-May to mid-June totaling approximately 340 miles. Densities per major cover type were estimated using the program "TRANSECT" (Burnham et al. 1980). The locations of all kangaroo rats (Dipodomys ordii, D. microps) sighted during the jack rabbit survey were also recorded.

In addition to the spotlighting transects, the average number of jack rabbits seen each day by a two-person raptor survey crew was tabulated from field notes.

Twenty-seven jack rabbits were collected with a .22 caliber rifle to supplement the principal investigator's work on jack rabbit litter size.

Exclosures

The five large livestock exclosures established in 1981 were sampled as specified in the Birds of Prey Exclosure Study Plan. Techniques used on each exclosure included: paired 40-sample (10 meter spacing) Daubenmire transects (Daubenmire 1959, 1970), 1/300 acre (13.49 m^2) density plots (Asherin 1973), 1-m^2 trend or stem plots, and photographic documentation.

Ground squirrel hole count transects (USDI 1979) were conducted on each exclosure. A record of all flora and fauna seen was kept by field personnel.

Burns

Fire Transect Lines

We sampled the two sets of permanently marked 400-meter Daubenmire transects (Daubenmire 1959, 1970) established in 1981 on big sagebrush (Artemisia tridentata) areas that had burned in 1980.

Fire Study Plots

Five paired study plots were established in areas that burned in 1981; 2 sites had supported big sagebrush, 2 winterfat (Ceratoides lanata), and 1 shadscale (Atriplex confertifolia) (Fig. 1).

Each plot consisted of three permanently marked 100-foot (30.5 m) transect lines in a radial arrangement with a common origin (Fig. 2). Each plot pair consisted of two of these radial triads. One triad of each pair was fenced to prevent livestock grazing.

Sixty canopy coverage estimates (Daubenmire 1959) were obtained on each triad (20 per line) at 5-foot intervals.

Twelve 1/300-acre circular plots (Asherin 1973) were used on each triad to record plant density (perennials only). Each line was also photographed.

Species frequency of occurrence was calculated for each triad from canopy coverage estimates.

The study plan containing procedures, monitoring schedule, and data is located in the Birds of Prey Fire Plot binder at the Boise District Bureau of Land Management.

RESULTS

Townsend Ground Squirrels

Vegetation. Plant coverage on the intensive study sites for 1982 is given in Table 1. These results are very similar to the previous few years.

Population Characteristics. We captured 342 ground squirrels on the intensive study sites in 1982 (Table 2). Total number captured in 1982 is not comparable with previous years due to a large increase in effort on the Comparison site. The sex ratio of adult and yearling squirrels favored females (1:1.23). This has been the case in all years with the exception of 1977.

Estimated densities of ground squirrels on the 1-ha livetrapping grids (Table 3) varied from 4.78 squirrels per hectare on the Winterfat site to 10.67 squirrels per hectare on the Comparison site (inner 1 ha grid). This was an increase over 1981 and has been the general trend since 1978. The value derived from the inner grid on the Comparison site may be slightly inflated but appears reasonable when comparing between years and sites. When interpreting these data one must bear in mind the bias introduced by the difference in methods on the Comparison site. Influences affecting the population estimate used in the density calculations on this site (inner grid) include: traps on the periphery of the grid, a decrease in trap density, and an increase in trap interval. All of these factors can affect both squirrel behavior and probability of capture. Both estimates of density on the large grid (7.84-ha) were lower than for the inner grid. The manually-calculated grid-strip method yielded a value of 3.41 (3.40-3.41) squirrels per hectare while program "CAPTURE" calculated 3.68 (2.16-5.22) squirrels per hectare.

Survivorship of squirrels from 1981 to 1982 (Table 4) favored females and the older age classes. These results are similar to 1981 when the trapping effort was also very similar.

Reproduction. As in 1981, all adult and yearling squirrels bred in 1982. The average litter size for 1982 was 7.64 (N=39). There was no significant difference between adult and yearling litter sizes ($t = 0.66$, $P = 0.52$).

Fallopian cysts were reported for the first time appearing in 2 (5%) of the 40 squirrels collected for litter size analysis. One case had a single cyst blocking the fallopian tube on the left horn of the duplex uterus. This allowed fertilization and implantation only in the right horn.

Placental scar count was 5-right, 0-left for this animal. The other case had a single cyst blocking each fallopian tube. No indications of pregnancy were visible in this squirrel.

Field Observations. Field personnel reported two instances of sighting sick squirrels in the study area, one on the Big Sage site and one on the Winterfat site. No collections were possible.

The heaviest infestation of cestodes (Hymenolepis citelli) in the last 4 years was recorded during squirrel collections. Cestodes were evident in all squirrels necropsied. In most cases, very heavy intestinal packing was present.

Selective utilization (site specific) of the exotic annual, bur-buttercup (Ranunculus testiculatus), by ground squirrels was also recorded from field analysis of stomach contents during collections.

Large Grid. Of the 342 squirrels captured in 1982, 220 were captured on this expanded site. Of these, 109 were juveniles.

Because our data did not show an edge effect as described by Schroder (1981), we were unable to define the area being censused using this technique. Both squirrel behavior and the trap interval contributed to this failure. The trap interval, based on home range estimates determined by this study in 1975, was too large. In theory, trap density was further reduced by "trap happy" individuals (White et al. 1982:56) who reduced capture probabilities for other animals by tying up traps. To correct these problems, one might shrink trap interval and use multiple traps per station. Ad hoc estimates of "home range" were calculated from movements on the grid. Only animals captured more than once were used in the calculations. Calculations assumed all animals captured more than once moved at least one trap interval (40 m). Some animals were captured up to 30 times at the same location.

The values calculated are the average of the maximum distance between any two capture points for each individual by class. Assuming a circular home range and using the average maximum distance (Table 5) as the radius, we arrived at estimates of "home range" that varied from 1.35 to 1.87 hectares depending on sex and age class.

Hole Counts. A paired t-test of the data pooled over all transects in each vegetation type showed no significant differences between line transects and 5-m strip transects (t - 0.83, df = 6, P = 0.44). These techniques yielded similar results over all vegetation types, lending more confidence to the hole count data collected by a strip method in 1976-77.

Further analysis looking at vegetation types individually and treating each transect separately showed a significant difference between the methods in the big sagebrush type (t = 3.88, df = 16, P = 0.001). Shrub height and density contribute to this difference. As shrub height and/or density increase the probability of seeing a hole at a given (strip) distance decreases. This results in estimates of abundance that are low in comparison to more open vegetation types.

The conclusion drawn from this information is the 1976-77 hole count data (strip method) are usable with the realization that some bias is present in the shrub types.

Recommendations for future use of hole count transects are to use narrow (1-3 meters) strip transects (at least in shrub type vegetation). Strip transects are more time- and manpower-efficient and, if done at widths of less than 5-m, biases between vegetation types would be minimized.

Black-tailed jack rabbits

Estimated densities of jack rabbits (Table 6) varied from 0.07 to 0.32 rabbits per hectare depending on the cover type. These data reflect a major decrease in jack rabbit density in all cover types over the previous few years. A population index calculated by pooling all yearly spotlighting data (Table 7) and the average number of rabbits seen per raptor crew day (Table 8) illustrate this decline.

The average litter size for jack rabbits collected in the study area was 4.67 (N = 9).

The number of kangaroo rats seen per unit of effort (Table 9) varied from 0.61 to 2.17 animals/km.

Exclosures

No definitive changes in plant coverage on the exclosures (Table 10) occurred in 1982. All data collected on the exclosures are located in the Birds of Prey exclosure binder at the Boise District, Bureau of Land Management. All exclosures are scheduled for sampling again in 1983.

Burns

Fire Transect Lines

Plant coverage on the transects established in 1981 is given in Table 11.

Fire Study Plots

Plant coverage on the Fire Study Plots is given in Table 12.

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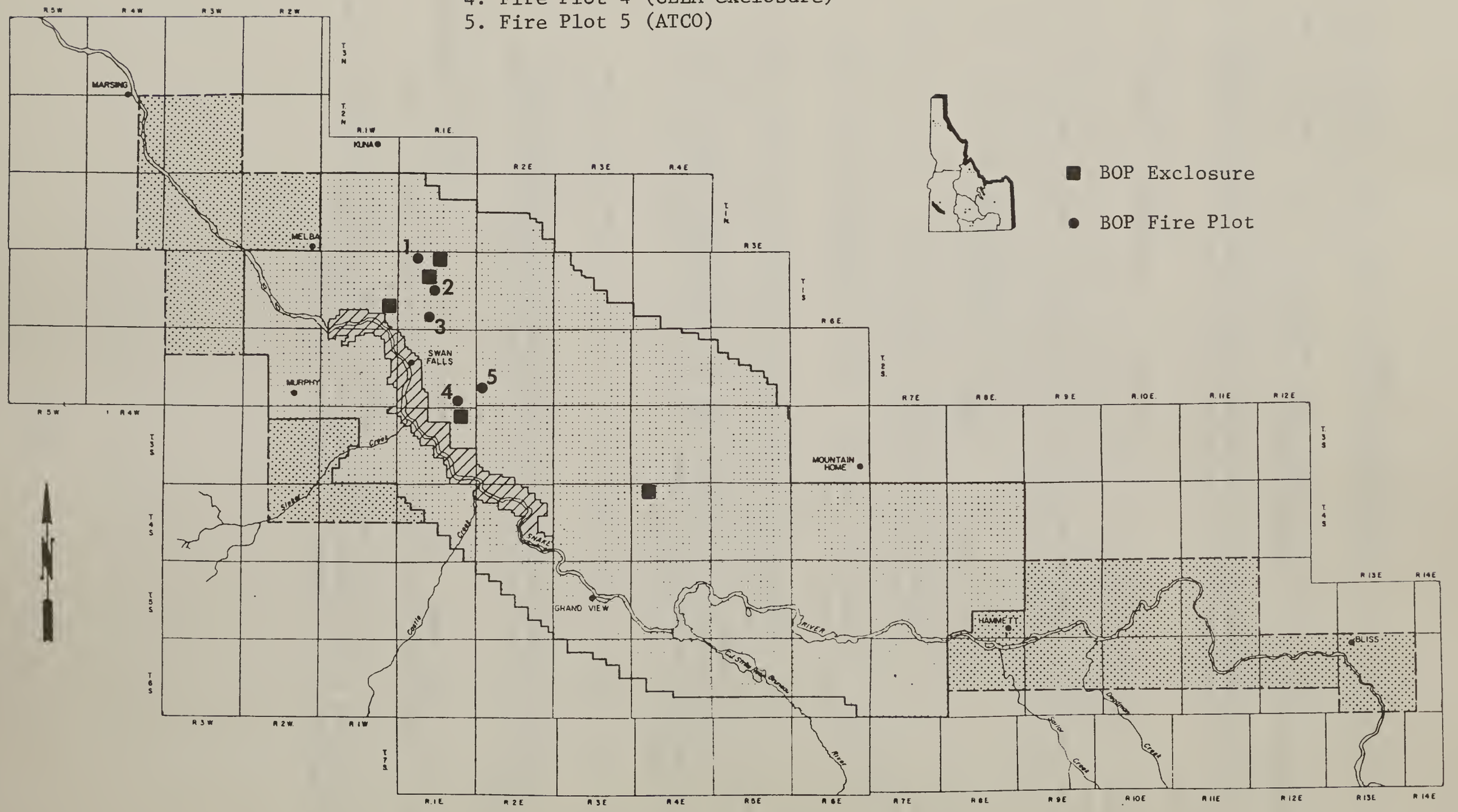
1. Fire Plot 1 (ARTR/seeding)
2. Fire Plot 2 (ARTR)
3. Fire Plot 3 (CELA-Trio Butte)
4. Fire Plot 4 (CELA-exclosure)
5. Fire Plot 5 (ATCO)

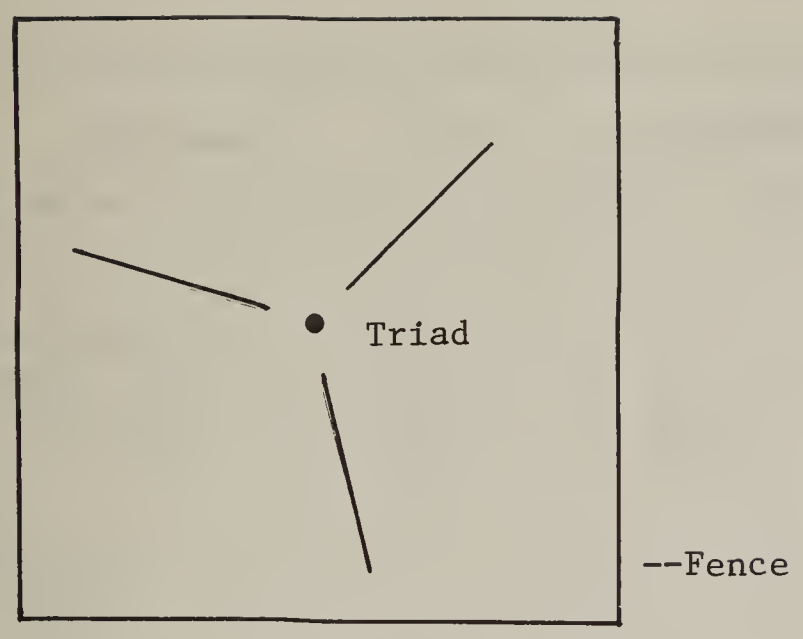


■ BOP Exclosure

● BOP Fire Plot

Fig. 1. Birds of Prey Fire Plot Locations.

A.



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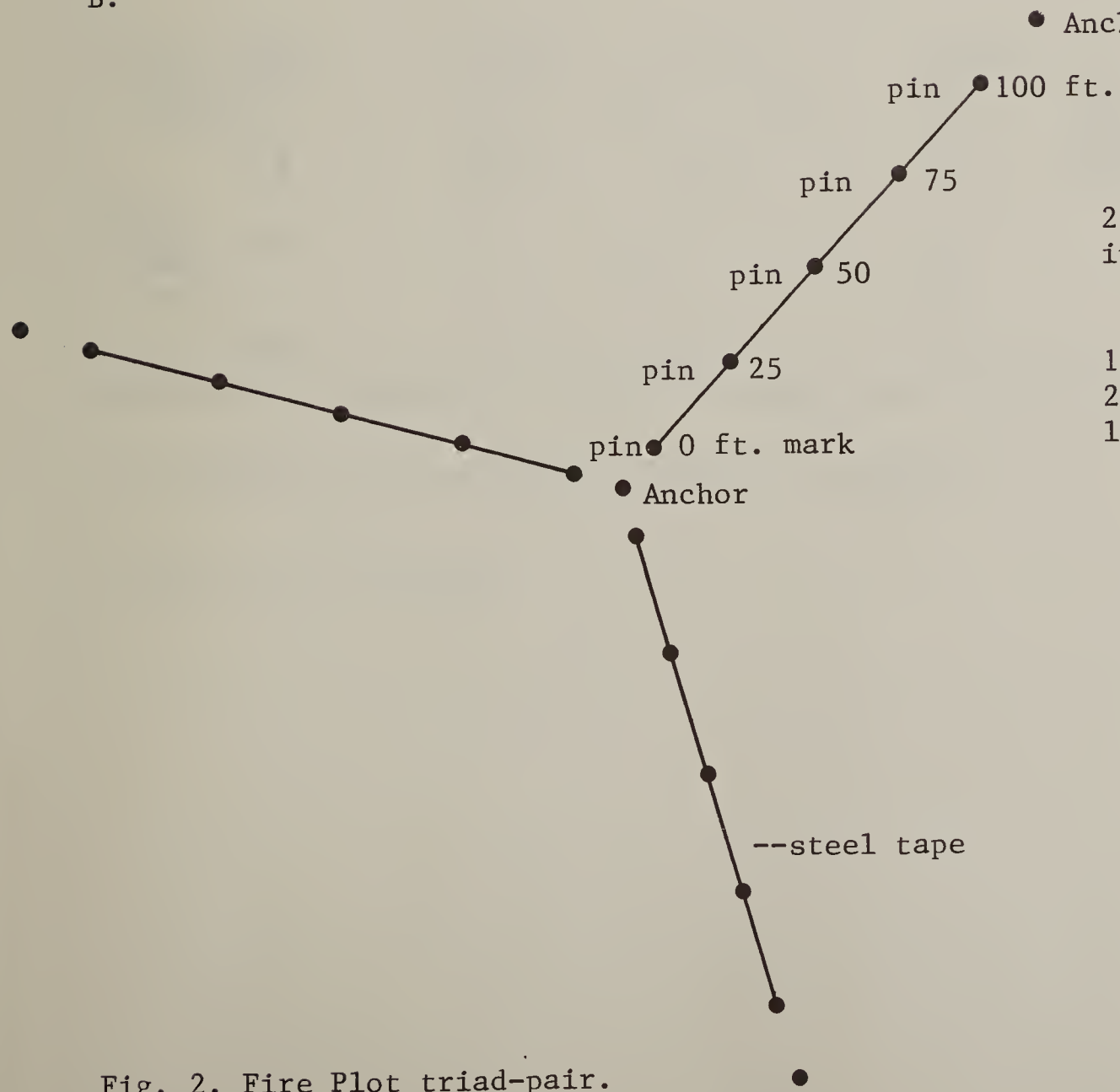

20 X 50 cm plots at 5 ft. intervals on each spoke.

1/300 acre plots at the 25, 50, 75, and 100 ft. locations on each spoke.

Fig. 2. Fire Plot triad-pair.

Table 1. Plant cover (%) late May 1982 on the Townsend ground squirrel intensive trapping sites.

Trapping Site	Big Sage	Winterfat	Burn	Comparison
Shrubs				
Big sagebrush	8.7	---	---	11.8
Spiny Hopsage	0.1	---	0.5	2.1
Winterfat	---	19.0	0.2	18.9
Rabbitbrush	0.3	---	---	---
Forbs				
Cruciferae	2.2	1.2	0.1	1.0
Russian thistle	---	---	0.8	---
Other forbs	0.1	2.3	0.1	0.6
Grasses				
Cheatgrass	34.6	0.1	26.4	0.5
Six weeks fescue	---	4.7	---	2.6
Indian ricegrass	0.1	---	0.2	0.3
Sandberg bluegrass	4.7	14.6	13.8	6.3
Bottlebrush squirreltail	0.2	0.3	1.8	0.8
Bare Ground	75.9	70.9	72.2	69.0

Table 2. Number of Townsend ground squirrels in relation to age class on the intensive study sites, 1982.

Site	Age Classes J	Y	A	U	Total
Big Sage					
male	6	0	3	11	20
female	5	0	5	13	23
Winterfat					
male	6	1	2	4	13
female	14	1	3	7	25
Burn					
male	7	0	2	7	16
female	8	1	3	13	25
Comparison *					
male	52	0	8	46	106
female	57	2	7	48	114
TOTAL					
male	71		84		342
female	84		103		

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

* based on 7.84-ha grid

Table 3. Estimated April densities of Townsend ground squirrels using the removal estimator and an effective trapping area of 4.84 ha for males and 2.56 ha for females.

Site	Density Number/hectare	95% Confidence Interval
Big Sage	7.44	(7.13-7.75)
Winterfat	4.78	(4.46-5.11)
Burn	6.86	(5.56-8.17)
Comparison*	10.67	(8.94-12.40)

* Based on inner 1-ha grid.

Table 4. Surivorship of Townsend ground squirrels from 1981 to 1982. Percent survival in parentheses.

Site	Number of Juveniles Captured 1981	Number Re-Captured as Yearlings 1982	Number of Yearling & Adults Captured 1981	Number Re-Captured As Adults 1982
Big Sage				
male	11	0	11	3
female	7	0	13	5
Winterfat				
male	9	1	9	2
female	9	1	9	3
Burn				
male	2	0	12	2
female	4	1	9	3
Comparison				
male	5	0	16	8
female	4	2	18	7
Total				
male	27	1 (4)	48	15 (31)
female	24	4 (17)	49	18 (37)
All	51	5 (10)	97	33 (34)

Table 5. Average maximum distances moved and estimated home range sizes on the expanded Comparison Site, 1982.

Age	Sex	# Individuals	Mean captures/ individual	Mean maximum distance (m)	SE	Home Range (hectares)
Adult & Yearling						
	all	62	7.3	70.4	6.6	1.56
	male	26	6.5	77.1	12.1	1.87
	female	36	7.9	65.6	7.3	1.35
Juvenile						
	all	58	4.1	70.1	8.1	1.54

Table 6. 1982 Black-tailed jack rabbit densities from spotlighting transects.

Vegetation Type	Density (N/ha)	CV	95% Confidence Interval	Number of Rabbits Observed
Big sagebrush	0.29	7.9	(0.24-0.33)	163
Big sagebrush - winterfat	0.07	23.6	(0.04-0.10)	18
Shadscale - winterfat	0.09	17.7	(0.06-0.12)	32
Big sagebrush - shadscale	0.08	24.3	(0.04-0.12)	17
Greasewood	0.32	17.3	(0.21-0.43)	34

Table 7. Black-tailed jack rabbit index of abundance from spotlighting data (1977-1982).

Year	Sample Size	Density Index	95% Confidence Interval	Coefficient of Variation
1977	218	0.16	(0.14-0.18)	6.86
1978	103	0.17	(0.13-0.21)	10.09
1979	701	0.49	(0.46-0.53)	3.84
1980	807	0.48	(0.43-0.53)	4.98
1981	870	0.52	(0.49-0.56)	3.44
1982	282	0.14	(0.12-0.16)	6.05

Table 8. Average number of jack rabbits seen per crew day, BPSA, 1973-82.

Year	N/day
1973	0.87
1975	0.26
1976	0.46
1977	1.00
1978	1.20
1979	2.62
1980	3.63
1981	4.53
1982	2.85

Table 9. Number of kangaroo rats per unit effort seen on 1982 spotlighting routes.

Vegetation	Sample Size	N/km
sagebrush	112	0.61
sagebrush/winterfat	45	0.85
sagebrush/shadscale	74	2.17
winterfat	30	1.10
shadscale/shadscale-winterfat	101	0.77
grass	56	0.69
greasewood[1]	29	1.53

[1] Sarcobatus vermiculatus

Table 10. Plant cover (%, May-June) on the Birds of Prey Livestock Exclosures, 1981-1982.

Exclosure	Big Sagebrush (spr/fall)		Big Sagebrush (winter)		Grass		Winterfat		Shadscale	
Year	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982
Shrubs										
Bud Sagebrush									3.0	2.4
Big Sagebrush	11.9	11.6	10.6	14.0					2.1	1.4
Shadscale									10.8	9.0
Spiny Hopsage							0.2	--	0.0*	0.0*
Winterfat			10.4	15.7			25.7	31.8		
Forbs										
Tansy Mustard	0.4	0.1	1.0	0.4	--	0.0*	1.8	1.1	1.8	0.3
Pepper Weed	9.1	7.4			2.6	0.8	0.1	--	--	0.0*
Tall Tumble Mustard	0.1	---			7.6	0.2			0.2	0.1
Russian Thistle					1.8	--				
other forbs	0.3	7.4	0.8	1.0	0.0*	0.1	0.8	0.4	0.4	0.0*
Grasses										
Cheatgrass	26.0	25.9	1.1	1.8	40.1	29.9	--	0.0*	26.3	39.4
Six Weeks Fescue	4.7	0.4	7.6	5.2	0.1	---	4.5	1.2	0.3	0.6
Indian Ricegrass			---	0.0*					0.6	0.4
Sandberg Bluegrass	0.1	--	17.8	20.0	28.8	40.5	13.0	12.8	0.2	0.1
Bottlebrush squirreltail	1.9	1.4	3.7	2.7	--	0.1	0.5	0.2	2.0	1.9
Giant Wildrye			0.1	--						
Bare Ground	72.0	68.8	59.4	68.0	46.3	55.1	59.4	61.6	75.0	64.9

* 0.0% = trace

Table 11. Plant cover (%, May-June) on the Fire Transect Lines, 1981-1982

Site	Swan Falls Road				Rattlesnake			
Year	1981		1982		1981		1982	
	In Burn	In Sage	In Burn	In Sage	In Burn	In Sage	In Burn	In Sage
Shrubs								
Big Sagebrush		26.7		32.5		7.1		9.4
Forbs								
Tansy Mustard	3.6	0.6	4.2	0.2	---	0.0*	0.0*	0.1
Pepper weed			0.3					
Russian Thistle	0.5		0.0*		0.6		---	
Tall Tumble Mustard	0.1		10.2		0.1	0.4	0.4	0.1
other forbs	0.1	0.0*	0.2	1.2	0.4	0.0*	0.5	0.1
Grasses								
Cheatgrass		0.1	0.1		28.6	29.2	52.2	42.7
Giant Wildrye	0.9	0.2	1.2	0.2				
Six Weeks Fescue	9.1	19.4	17.9	19.8				
Sandberg Bluegrass	3.2	2.1	4.6	1.5	0.4	0.8	0.5	1.6
Needle and Thread grass	0.0*	0.1		---				
Bottlebrush Squirreltail		1.3		1.2	0.1	0.5	0.1	1.0
Bare Ground	88.5	75.9	73.6	68.4	76.4	74.6	61.2	67.1

*0.0% = trace

Table 12. Plant cover (%, June-July) on the Birds of Prey Fire Plots, 1982.

Site	Big Sagebrush seeding		Big Sagebrush		Winterfat Trio Butte		Winterfat Exclosure		Shadscale	
	Fenced	Open	Fenced	Open	Fenced	Open	Fenced	Open	Fenced	Open
Shrubs										
Winterfat					0.08		---	0.05		
Forbs										
Tansy Mustard	4.9	4.3	0.7	0.3	2.0	1.9	4.1	5.5	0.2	0.4
Tumble Mustard	2.6	1.3					0.8	0.2	1.3	0.1
other forbs	0.1	1.3	1.9	1.8	0.1	0.1	3.0	1.5	0.1	0.1
Grasses										
Crested Wheatgrass	0.3	0.1								
Cheatgrass	0.9	1.3	11.2	26.7					13.0	16.3
Six Weeks Fescue	3.1	3.0	0.6	0.9	0.4	2.1	4.8	1.2	0.2	0.0*
Sandberg Bluegrass	2.8	1.2	7.8	4.4	12.7	9.5	4.0	4.6	0.8	1.5
Bottlebrush Squirrel-tail			0.0*		0.4	1.5	0.0*	3.0	0.2	0.8

*0.0% = trace

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

COOPERATOR: Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, Montana 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

During 1982 work continued on data analysis and writing of publications. During spring and summer a few of the traditional sites were visited and food samples collected.

I also trapped 9 owls at 4 sites. Of these, 1 had been banded as a nestling at the same site in 1981. This brings the number of birds found breeding near their natal nest site to 4.

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 Common 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 began in 1978 and data have been collected from 1978 through 1982. All data were collected in the Birds of Prey Study Area (U.S.D.I. 1979). Analysis and subsequent statistical treatments were done at Weber State College, Ogden, Utah. Previous progress reports are available (Marti 1979, 1981).

This report describes field activities and preliminary analysis for 1982 data and progress on analysis of data gathered in earlier years.

ANNUAL REPORT

Two visits for data collection were made to the Snake River Birds of Prey Area in 1982: 2-3 May and 21-24 June. Twenty-two samples of regurgitated pellets were collected from 16 sites (Table 1). These pellets contained remains of 5,074 prey (Table 2).

The most striking preliminary observation in the total Barn Owl diet sample was the 21% increase in numbers of Microtus montanus over the 1981 sample. Microtus increased from 3-54% in Barn Owl diets at nine collection sites where 1981 and 1982 data were available. There was a decline in Microtus numbers at only two sites (1 and 12%). In previous years Microtus numbers had increased in the Barn Owl diet from 1978 to 1980 and then declined in 1981. Other major prey genera (Peromyscus, Dipodomys, and Mus) were lower in 1982 than in 1981, but birds reached the highest percentage of the diet since the study began (2.9%).

Results derived from data collected in 1978-1981 are nearly ready for publication. Data from 1979 and 1980 were used to compare the feeding

ecology of Barn Owls with that of Long-eared Owls (Asio otus) in the Snake River Birds of Prey Area. A paper presenting this analysis will soon be submitted for publication in coauthorship with Jeffrey S. Marks.

Plans for 1983

Two or three trips to the Snake River Birds of Prey Area are anticipated for 1983. The primary objective will be to continue food habits data collection for the eventual analysis of long-term predation trends in Barn Owls.

ACKNOWLEDGMENTS

I thank Michael Kochert, Karen Steenhof, John Doremus, Marc Moritsch and the rest of the Snake River Birds of Prey Research 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 Weber State College which provided 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 Ann. Rept. U.S.D.I., Bureau of Land Manage., Boise, Idaho.

Marti, C. D. 1981. Feeding ecology of the Barn Owl in the Snake River Birds of Prey Area. Pp. 37-40 in Snake River Birds of Prey Research Project Ann. Rept. 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 SRBPA, 1982.

Castle Rock (3 sites
Chattin Hill
Fence Corner
Garbage Draw
Jensen Cliff
Kitten's
Little Hole
Lower Lower Black Butte
Mary's
Road End
Upper Lower Black Butte (4 sites)

Table 2. Total prey identified for the Barn owl in the SRBPA, 1982.

Prey Species	Number	Percent Number
MAMMALS		
Sorex vagrans	35	0.7
Mus musculus	288	5.7
Peromyscus spp. 1/	429	8.4
Reithrodontomys megalotis	154	3.0
Neotoma cinerea	3	tr. 2/
Neotoma lepida	28	0.5
Microtus montanus	2,925	57.6
Perognathus parvus	397	7.8
Dipodomys ordii 3/	341	6.7
Thomomys townsendii (juvenile)	315	6.2
unidentified leporids (neonate) 4/	32	0.6
BIRDS		
Callipepla californica	1	tr.
Sturnus vulgaris	21	0.4
unidentified icterid	32	0.6
unidentified medium birds	29	0.6
unidentified small birds	44	0.9
Totals	5,074	100.0

1/ Probably mostly *P. maniculatus*

2/ Less than 0.1%

3/ May include some *D. microps*

4/ Probably mostly *Sylvilagus nuttallii*

TITLE: Terrestrial vertebrate associations in 3 habitats in the Snake River Birds of Prey Area.

INVESTIGATORS: Fritz L. Knopf, Ornithologist, Ecology Section, Denver Wildlife Research Center, USFWS.
R. Bruce Bury, Herpetologist, Ecology Section, Denver Wildlife Research Center, USFWS.
Glenn Clemmer, Mammalogist, Ecology Section, Denver Wildlife Research Center, USFWS.
Brett Riddle, Mammalogist, Ecology Section, Denver Wildlife Research Center, USFWS.
Donald E. Wilson, Mammalogist, U.S. National Museum of Natural History.

COOPERATOR: Denver Wildlife Research Center, U.S. Fish and Wildlife Service.

OBJECTIVES:

1. Report comparative vertebrate associations in native riparian and Russian olive (Elaeagnus angustifolia) areas along the river.

2. Compare these associations with an upland native big sagebrush (Artemisia tridentata) area.

ANNUAL SUMMARY

Generally we found a rich avian community in both the native riparian and Russian olive sites, and a depauperate one in the upslope site. In contrast the Russian olive contained no reptiles or amphibians and only 2 species of small mammals. Both of these groups were well represented in the sagebrush and native riparian sites.

METHODS

Vertebrates were sampled in 3 representative areas in the Snake River Birds of Prey Area:

1. Sagebrush plot. 3 air mi. SE Murphy, Owyhee Co., Idaho (T.3S., R.1W., Sec. 6; elev. 1,020 m). An upland flat predominated by big sagebrush; part of plot included a broad valley and rolling slopes with open areas of soil and a few sedimentary rock faces (mostly less than 1 m high). This habitat is typical of the region (Great Basin desert).

2. Riparian plot. Mouth of Sinker Creek, about 9 air mi. ESE Murphy, Owyhee Co., Idaho (T.3S., R.1E., Sec. 7; elev. 790 m). A densely vegetated alluvial fan where Sinker Creek flows into the Snake River; thickets of willow (Salix sp.) on both sides of creek, wild rose (Rosa sp.) on east side; limited cottonwood (Populus sp.) overstory in places; bullrushes (Scirpus sp.) in and adjacent to river bank.

3. Russian Olive plot. Walters Ferry, north side of Snake River, west side of Idaho, highway 45, Canyon Co., Idaho (T.1S., R.2W., Sec. 7 and 8; elev. 740 m). A thicket of mature Russian Olive trees; grass and a few scattered shrubs (mostly in openings) as understory. Shrubs were primarily greasewood (Sarcobatus vermiculatus) and Rose (Rosa sp.). A shallow wetland with cattails (Typha sp.) and bullrushes bordered the Russian Olive on the north side.

Birds were censused using the variable circular-plot method in all 3 study areas, 30 May 1982 through 1 June 1982. Every 50 m an observer walking through the study area stopped, waited 1 min, then recorded all birds observed within a 10 min time period. The distance to each sighting, height of sighting, substrate, and behavioral activity of a bird were recorded for all observations. A total of 24 plots were sampled at each site. Surveys were conducted from shortly after sunrise until 1000 hours.

A 30-station trapline was run for 5 nights at each study site. Trap stations, spaced 20 m apart, had 1 rat trap, 1 museum special, and 1 Sherman live trap. All traps were baited with rolled oats.

Amphibians and reptiles were sampled by walking and turning over debris for 4 person-hours each in the 3 study areas. A search was condcuted in the sagebrush plot from noon to 4 p.m. on 30 May 1982. Amphibians and reptiles were was collected in the riparian plot from 2:00 -3:30 and 4:30-5:30 p.m. on 31 May 1982 and 12:30-2:00 p.m. on 2 June 1982. The Russian Olive thicket was explored from 12:45 to 4:45 p.m. on 1 June 1982. Also, amphibians and reptiles were incidently found during mammal surveys and other work.

RESULTS

The surveys were designed to provide an equal-effort measure and species richness of relative abundance for the vertebrate classes. Preliminary data are presented in Tables 1-3.

Table 1. Avian species observed at 3 study sites on or near the Snake River Birds of Prey Area, Idaho.

Species	Total number observed		
	Riparian	Russian Olive	Sagebrush
Double-crested Cormorant (*Phalacrocorax auritus*)	1	0	0
Great Blue Heron (*Ardea herodias*)	2	0	0
Canada Goose (*Branta canadensis*)	2	0	0
Mallard (*Anas platyrhynchos*)	2	0	0
Cinnamon Teal (*Anas cyanoptera*)	0	2	0
Redhead (*Aythya americana*)	2	0	0
Northern Harrier (*Circus cyaneus*)	0	0	1
American Kestrel (*Falco sparverius*)	2	0	0
Ring-necked Pheasant (*Phasianus colchicus*)	2	1	0
California Quail (*Callipepla californica*)	1	3	0
Sora (*Porzana carolina*)	1	0	0
Killdeer (*Charadrius vociferus*)	0	4	0
Spotted Sandpiper (*Actitis macularia*)	2	1	0
Long-billed Curlew (*Numenius americanus*)	0	0	1
Mourning Dove (*Zenaida macroura*)	1	16	0
Common Barn-Owl (*Tyto alba*)	0	1	0
Western Screech-Owl (*Otus kennicottii*)	0	1	0
Burrowing Owl (*Athene cunicularia*)	0	0	2
Long-eared Owl (*Asio otus*)	5	0	0
Common Nighthawk (*Chordeiles minor*)	1	1	0
Common Poorwill (*Phalaenoptilus nuttallii*)	0	0	1
Northern Flicker (*Colaptes auratus*)	1	0	0
Olive-sided Flycatcher (*Contopus borealis*)	1	0	0

Table 1. (Cont.)

Species	Total number observed		
	Riparian	Russian Olive	Sagebrush
Western Wood-Pewee (Contopus sordidulus)	1	0	0
Eastern Kingbird (Tryannus tyrannus)	0	2	0
Horned Lark (Eremophila alpestris)	0	0	1
Violet-green Swallow (Tachycineta thallassina)	0	1	0
Cliff Swallow (Hirundo pyrrhonota)	1	2	0
Barn Swallow (Hirundo rustica)	0	3	0
Black-billed Magpie (Pica pica)	5	2	0
Common Raven (Corvus corax)	0	0	2
Rock Wren (Salpinctes obsoletus)	0	0	1
American Robin (Turdus migratorius)	0	1	0
Cedar Waxwing (Bombycilla cedrorum)	5	0	0
Warbling Vireo (Vireo gilvus)	9	0	0
Yellow Warbler (Dendroica petechia)	6	8	0
Yellow-breasted Chat (Icteria virens)	10	10	0
Western Tanager (Piranga ludoviciana)	2	10	0
Black-headed Grosbeak (Pheucticus melanocephalus)	2	0	0
Lazuli Bunting (Passerina amoena)	2	2	0
Green-tailed Towhee (Pipilo chlorurus)	1	0	0
Brewer's Sparrow (Spizella breweri)	0	0	7
Sage Sparrow (Amphispiza belli)	0	0	28
Song Sparrow (Melospiza melodia)	4	11	0
Red-winged Blackbird (Agelaius phoeniceus)	6	16	0
Western Meadowlark (Sturnella neglecta)	0	0	9

Table 1. (Cont.)

Species	Total number observed		
	Riparian	Russian Olive	Sagebrush
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)	3	0	0
Brown-headed Cowbird (*Molothrus ater*)	7	18	7
Northern Oriole (*Icterus galbula*)	1	13	0
American Goldfinch (*Carduelis tristis*)	1	1	0
Evening Grosbeak (*Coccothraustes vespertinus*)	1	47	0
Totals:			
Number of species	33	26	11
Number of individuals	93	180	60

Table 2. Small mammals trapped at 3 sites on or near the Snake River Birds of Prey Area, Idaho.

Species	Total number trapped		
	Russian Olive	Sagebrush	Riparian
White-tailed Antelope Squirrel (*Ammospermophilus leucurus*)	0	6	0
Great Basin Pocket Mouse (*Perognathus parvus*)	0	15	1
Ord's Kangaroo Rat (*Dipodomys ordii*)	0	17	0
Western Harvest Mouse (*Reithrodontomys megalotis*)	0	1	0
Deer Mouse (*Peromyscus maniculatus*)	6	4	11
Canyon Mouse (*Peromyscus crinitus*)	0	0	1
Bushy-tailed Woodrat (*Neotoma cinerea*)	0	0	8
House Mouse (*Mus musculus*)	11	0	0
Totals:			
Number of species	2	5	4
Number of Individuals	17	43	21

Table 3. Amphibians and reptiles observed or collected during 4 person-hour searches or incidentally found at 3 sites on or near the Snake River Birds of Prey Area, Idaho.

Species	Total number observed and collected		
	4-Hour Search	Incidental	Total
Sagebrush			
Great Basin Spadefoot (*Scaphiopus intermontanus*)	0	1	1
Side-blotched Lizard (*Uta stansburiana*)	8	0	8
Western Whiptail Lizard (*Cnemidophorus tigris*)	4	3	7
Leopard Lizard (*Gambelia wislizenii*)	4	0	4
Western Rattlesnake (*Crotalus viridis*)	0	1	1
Totals:			
Number of species	3	3	5
Number of individuals	16	5	21
Riparian			
Woodhouse's Toad (*Bufo woodhousei*)	1	1	2
Great Basin Spadefoot (*Scaphiopus intermontanus*)	0	1	1
Western Whiptail Lizard (*Cnemidophorus tigris*)	0	1	1
Striped Whipsnake (*Masticophis taeniatus*)	0	1	1
Western Terrestrial Garter Snake (*Thamnophis elegans*)	1	0	1
Unid. Snake	1	0	1
Totals:			
Number of species	3	4	6
Number of individuals	3	4	7

Table 3. (Cont.)

Species	Total number observed and collected		
	4-Hour Search	Incidental	Total
Russian Olive			
	0	0	0
Totals:			
Number of species	0	0	0
Number of individuals	0	0	0

TITLE. Photographic guide for aging nestling prairie falcons and red-tailed hawks.

INVESTIGATOR: Marc Q. Moritsch

OBJECTIVES:

1. To develop a photographic aging key for nestling prairie falcons and red-tailed hawks that will facilitate age estimation from a distance.

METHODS

During the 1982 nesting season, I photographed two young from one red-tailed hawk (Buteo jamaicensis) nest and two young from each of two prairie falcon (Falco mexicanus) nests. Approximate hatch date, to within three days, was determined by observing behavior of the adults and by visually inspecting the nests without entering them during incubation. Each nest was visited at four-day intervals from the time the birds were one week of age until fledging. The young were removed from the nest at each visit, photographed, and returned to the nest. Nests were not entered before the chicks were one week old to reduce the chance of early nestling mortality. A plastic colored leg band was placed on each bird for identification. Photographs of the head, wing, and dorsum were taken with black and white and color film to allow identification of important characteristics. Where possible, photographs of the body include a scale or 10 cm grid.

RESULTS

With the young of both species it was possible to assign a unique series of characters at each visit or age class. The number and combinations of useful characteristics increased with the age of the young.

In both species, the nestlings appeared to be covered only in down until they were about 18 days old. Juvenile feathers were not apparent. The body size of the young bird and the stages of growth of the down were used to discriminate between the first 3 age classes.

At approximately 18 days of age juvenile feathers begin to show on the wings. The progression of development of wing, tail, scapular, and head feathers allowed distinctions to be made between later age classes. Comparisons between ages were easier following the appearance of the juvenile feathers.

A BLM publication with photographs of each species at 4-day intervals is expected to be printed in 1983.

TITLE: Western screech-owl reproduction, food habits and use of nest boxes in the Snake River Birds of Prey Area

INVESTIGATORS: John H. Doremus
Jeffrey S. Marks

OBJECTIVES:

1. Assess the use of artificial nest boxes by western screech-owls.

2. Determine food habits and reproductive performance of western screech-owls at these sites.

METHODS

In September 1981, 2 nest boxes were placed at each of seven locations. Boxes were checked at irregular intervals between March and July. Prey remains and reproductive information (i.e. occupancy by screech-owls, number of eggs or young) were collected during each visit. Prey remains were also collected at two natural nest sites.

RESULTS

Four of the 7 sites (57%) were occupied by pairs of western screech-owls (Otus kennicottii) by March 1982. Pairs at all 4 nest boxes laid eggs and 3 (75%) successfully fledged 10 young (3.33 young fledged per attempt and 2.5 young fledged per pair).

Prey remains collected at 6 screech-owl nest sites are presented in Table 1. Nearly 2/3 of the individuals taken by the owls were mammals. Montane voles (Microtus montanus) were most frequently taken (32%) and great basin pocket mice (Perognathus parvus) were next most numerous (19%). Nearly 1/4 of the prey individuals were insects while birds and herps accounted for less than 10%.

Table 1. Prey items found in 6 western screech owl nests, 1982.

Species	No. of Individuals	% of Individuals
MAMMALS	211	65.1
Mus musculus	8	2.5
Peromyscus maniculatus	26	8.0
Reithrodontomys megalotis	4	1.2
Microtus montanus	105	32.4
Neotoma lepida	1	0.3
Perognathus parvus	62	19.1
Dipodomys ordii	4	1.2
Thomomys talpoides	1	0.3
BIRDS	26	8.0
European Starling	11	3.4
Yellow Warbler	1	0.3
Yellow-rumped Warbler	1	0.3
MacGillivray's Warbler	1	0.3
Red-winged Blackbird	1	0.3
American Robin	5	1.5
Lazuli Bunting	1	0.3
Unid. passerine	5	1.5
HERPS	1	0.3
Unid. herp	1	0.3
INSECTS	80	24.7
Forficulidae	67	20.7
Scarabaeidae	6	1.8
Carabidae	5	1.5
Dytiscidae	1	0.3
Silphidae	1	0.3
ARACHNIDS	4	1.2
Scorpionida	2	1.2
CRUSTACEANS	2	0.6
Decapoda	2	0.6
TOTAL	324	99.9

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