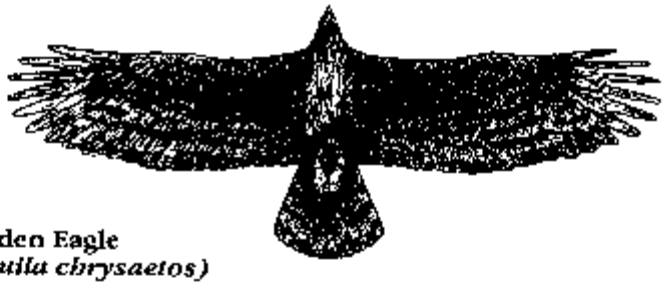
MONITORING OF FALL RAPTOR MIGRATION IN SOUTHWESTERN IDAHO

by
Gregory S. Kaltenecker,
Kirk K. Bates,
and Marc J. Bechard

Turkey Vulture
(Cathartes aura)

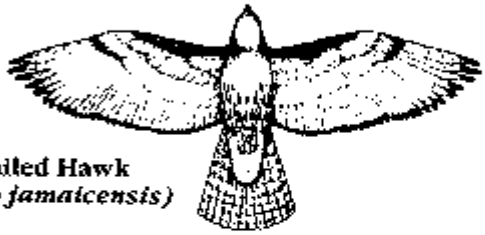
Swainson's Hawk
(Buteo swainsoni)

American Kestrel
(Falco sparverius)

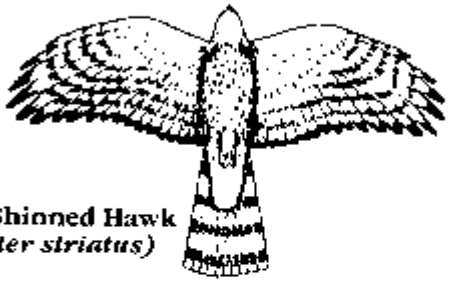


Golden Eagle
(Aquila chrysaetos)

Cooper's Hawk
(Accipiter cooperii)

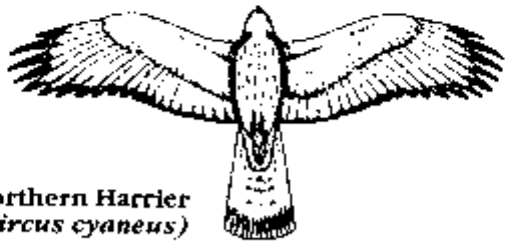


Red-Tailed Hawk
(Buteo jamaicensis)



Sharp-Shinned Hawk
(Accipiter striatus)

Northern Goshawk
(Accipiter gentilis)



Northern Harrier
(Circus cyaneus)

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Boise State University Cooperative Raptor Migration Project:
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ABSTRACT

Many species of North American birds migrate south to winter in Neotropical areas of Central and South America. Populations of several species, including raptors, have been shown to be declining. While it is suspected that shooting and the loss of habitat in developing third-world countries is the primary cause of this decline, few data exist to document the severity of these and other potential threats to migratory bird populations. Recently, federal agencies have undertaken a cooperative effort to study Neotropical migrant birds and verify the factors responsible for their decline.

Raptor migration is typically studied at counting stations established at points along migration routes where large soaring birds are forced to come together by physical features of the landscape such as coastlines, mountain ridges, and large bodies of water. These natural concentration points enable researchers to observe large numbers of birds while on migration, and to trap, mark, and release them for future tracking.

This study was undertaken to establish a permanent monitoring and research station at Lucky Peak. This site was determined to be the best location for the study of raptor migration in southwestern Idaho from pilot research efforts conducted during fall of 1992 and 1993.

Over 3500 migrating raptors were observed at this site during the 1994 migration season, with American kestrels (Falco sparverius), sharp-shinned hawks (Accipiter striatus), red-tailed hawks (Buteo jamaicensis), and Cooper's hawks (Accipiter cooperii) being the most common migrant species seen.

A full-time banding effort was also undertaken at 3 different locations along the Boise Ridge. Banding occurred from late August through late October, with a total of 758 raptors of 11 species being trapped and banded. Most were sharp-shinned and Cooper's hawks, but American kestrels, northern goshawks (Accipiter gentilis), and red-tailed hawks were also banded.

Results of this study indicate that Lucky Peak is an ideal location for the continuation of a long-term monitoring project to track populations of western migrant raptors, and it could become one of the most productive raptor monitoring stations in western North America.

Educational opportunities are also a major asset of the project. The migration station offers an excellent opportunity for use as an educational tool to teach university or high school students about hawk migration, field techniques, and raptor identification. The opportunity also exists to educate the general public through group visits about the importance of birds of prey, bird migration, and the conservation of tropical habitats.

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INTRODUCTION

The conservation of Neotropical migrant birds has recently become a primary environmental concern. Many populations of Neotropical migrants have been shown to be declining due to large-scale losses of habitat and global climate changes (Robbins et al. 1989, Temple and Wiens 1989, Finch 1991, Sauer and Droedge 1992).

Several species of raptors that breed in North America winter in Neotropical regions of Central and South America. Raptor migration routes and wintering grounds have been studied extensively in eastern North America (Robbins 1975). These studies have focused on areas where mass flights occur along ridgelines, shorelines, and peninsulas, such as Cape May Point in eastcentral New Jersey, Kittatinny Ridge (Hawk Mountain Sanctuary) in eastern Pennsylvania, and various points on the Great Lakes, including Whitefish Point, and Cedar Grove (Allen and Peterson 1936, Broun 1949, Clark 1984, Heintzleman 1975, Hofslund 1966, Holthuizjen and Oosterhuis 1981, Kerlinger 1984, Kerlinger and Gauthreaux 1984, Nagy 1977, and Mueller and Berger 1961). Long-term counts of raptors during migration have been used to show population trends, and sampling of migrants has proven to be an effective method of monitoring Neotropical migrants over wide regions in the eastern U.S. (Bednarz et al. 1990b, Titus and Fuller 1990). Counts of migrant hawks also represent the most cost-effective means to monitor regional changes in diurnal raptor populations (Hoffman et al. 1992).

Raptor migration has been studied far less extensively in the western U.S. due to the lack of known concentration points, inaccessibility of suspected observation sites, and lack of

interested observers (Hoffman 1985). Most observations on raptor migration in the Great Basin region of the West have been obtained at the Goshute Mountains in eastern Nevada. Band recoveries from raptors banded at the Goshutes indicate that nearly 90% of all sharp-shinned and Cooper's hawks, (n=46 total recoveries) and 70% of all red-tailed hawks, (n=10 total recoveries) winter in western Mexico (S. Hoffman and J. Bednarz, Hawkwatch International, unpublished data). Over the last 15 years, at least 18 other known concentration points where migrating raptors can be observed have been identified in the West. Prior to this study, none were identified in Idaho.

A pilot study was conducted during 1992 and 1993 to search for a suitable location in southern Idaho where an effort could be established to monitor raptor migration. Sites surveyed included the West Mountains, Howe Peak, the Cottrel Mountains, Harrison Peak, the Sublet Range, Monument Peak, Squaw Butte, Bennett Mountain, the Owyhee Mountains, and 3 locations along the Boise Ridge. Boise Ridge locations included Shafer Butte, Boise Peak, and Lucky Peak. Observers stationed at each location recorded numbers and species of passing raptors.

The Boise Ridge sites were the most productive, especially the site at Lucky Peak. During fall of 1993, a total of 568 raptors were observed at Lucky Peak during 78 hours of observation including red-tailed hawks (Buteo jamaicensis), Cooper's hawks (Accipiter cooperii), sharp-shinned hawks (Accipiter striatus), golden eagles (Aquila chrysaetos), and American kestrels (Falco sparverius). Over 150 hawks were counted at Lucky Peak during 1 day in September 1993.

A pilot banding project was also conducted during the fall of 1993 on the Boise Ridge. A total of 243 sharp-shinned hawks, Cooper's hawks, American kestrels, red-tailed hawks, northern goshawks (Accipiter gentilis), and merlins (Falco columbarius) were trapped and banded.

This study was undertaken to establish a permanent monitoring and research station at Lucky peak. The site was determined to be the best possible location in southwestern Idaho based on the results of the pilot research.

STUDY AREA AND METHODS

The Boise Ridge, also termed the Boise Front, is a north-south trending series of peaks located in the Boise Mountains in southwestern Idaho. The ridge stretches from the town of Horseshoe Bend south to Mountain Home, and makes up the northern geographic boundary of the Snake River Plain. The upper slopes of the ridge are dominated by mixed conifer forest comprised of ponderosa pine (Pinus ponderosa) and Douglas-fir (Pseudotsuga menziesii) with an understory dominated primarily by ninebark (Physocarpus malvaceus). Mountain shrub communities dominated by buckbrush (Ceanothus velutinus) and chokecherry (Prunus virginiana) occupy forest openings and slopes just below treeline. These shrub communities grade into mid-elevation shrub-steppe supporting mountain big sagebrush (Artemisia tridentata ssp. vaseyana) and bitterbrush (Purshia tridentata) with an understory of native bunchgrasses, primarily bluebunch wheatgrass (Pseudoroegneria spicata), threeawn (Aristida longiseta), and Sandberg's bluegrass (Poa secunda). Vegetation degradation due to fire and overgrazing have resulted in conversion of some areas to monocultures of exotic annual grasses, primarily cheatgrass (Bromus tectorum) and medusahead (Taeniatherum asperum).

Monitoring of migrant raptors was conducted from Lucky Peak, located 12 km east of Boise on the Boise Ridge, Ada County (T3N, R3E, Sec. 11; ownership, Idaho Department of Fish and Game, Appendix A). Observations were conducted from the top of the peak on an exposed southwest-facing slope near the radio antennas (elevation 1845 m). Vegetation at the observation point was dominated by shrub-steppe, but was within 100 m of treeline. Lucky Peak is the southernmost forested peak on the Boise Ridge.

Monitoring at Lucky Peak was conducted between 29 August and 20 October 1994. Daily observations were conducted by at least 1 observer between 1000 and 1800 hours. Duration of observation periods varied depending on weather and daily flight characteristics. Observations were made using 8X and 10X binoculars. Data recorded included date, time, direction, and distance of passage of each individual raptor, species, age (adult or immature), color morph, and crop (if possible). For unidentified raptors, an attempt was made to identify them to genus, if possible (e.g. Buteo sp., Accipiter sp.). Weather variables were recorded once per hour and included maximum visibility (in km), temperature (in °C), cloud cover, and wind speed and direction. Sky codes were recorded as clear (0-15% cloud cover); partially cloudy (16-50% cloud cover); mostly cloudy (51-75% cloud cover); and overcast (76-100% cloud cover). Wind speed was estimated in km/hr using the Beaufort wind scale. Wind direction was recorded as one of 8 cardinal or sub cardinal directions (e.g. N, NW). Trapping and banding of migrant raptors was conducted at 3 points along the Boise Ridge including Lucky Peak, Boise Peak, and an unnamed ridge near Fivemile Creek. Raptors at Lucky Peak were trapped and banded approximately 300 m west of the observation site on an exposed hilltop, 50 m from treeline. The Boise Peak trapping blind was located 15 km northeast of Boise on the Boise Ridge, Boise County (T4N, R3E, Sec. 10; ownership, U.S. Forest Service, Appendix B). Boise Peak is located 8 km south of Shafer Butte. The trapping blind was constructed on the exposed west slope of the peak (elevation 1989 m). Vegetation at the Boise Peak site included mixed-conifer forest, mountain shrub communities, and shrub-steppe.

Fivemile Creek is located between Rocky Canyon and Hulls Gulch on the Boise Front and flows into Rocky Canyon. The trapping blind was constructed on the ridge separating the west and east forks of this creek (elevation 1560 m). This third banding site was located 6.5 km northeast of Boise (T4N, R3E, Sec. 28; ownership, U.S. Bureau of Land Management, Appendix C). Vegetation at this site consisted of mountain shrubs and shrub-steppe. The blind was located several hundred meters below treeline on an exposed ridge.

Construction of trapping blinds and preparation of equipment began during early August. Trapping blinds were set up on Boise and Lucky Peaks during the third and fourth weeks of August, respectfully. Trapping began on 18 August and continued through 30 October at these 2 sites. Trapping near Fivemile Creek occurred between 14 September and 16 October. At all 3 sites, migrating raptors were trapped between 1000 and 1900 hours over a variety of weather conditions and the average trapping day was 6 hours in duration. Raptors were lured into mist nets, bow nets, and Dho-gaza traps using feral pigeons (Columba livia), ringed turtle doves (Streptopelia risoria), European starlings (Sturnus vulgaris), and house sparrows (Passer domesticus). Once captured, raptors were fitted with National Biological Survey aluminum leg bands. Species, age, and sex (if possible) and several morphometric features including culmen, hallux, tarsus depth, wing chord, length of longest tail feather, weight, eye color, presence of ectoparasites, crop size, and stage of moult were also recorded.

An effort was made at Boise Peak during September to sample for migration of forest owls. We trapped owls by setting mist nets at night in the shape of a box and played flammulated (Otus flammeolus) and saw-whet owl (Aegolius acadicus) calls with a Johnny

Stewart electronic caller throughout the night. The electronic caller was placed inside the box of nets, and nets were checked every hour throughout the night.

Several efforts were made to establish an educational program at Lucky Peak. Local high school science teachers were informed of the project and its potential for education and student involvement. Teachers organized interested students who then arranged with project personnel to visit the site and assist with daily research activities. Groups including the local Audubon Society chapter, Peregrine Fund volunteers, and local school teachers were contacted and urged to coordinate group visits to the site.

Trapping blinds were disassembled and removed from Luck Peak and the Fivemile Creek sites during late October. Due to early storms and deep snow, the trapping blind was left on Boise Peak throughout the winter.

RESULTS

We conducted 342 hours of observations from Lucky Peak, observing 3572 migrating raptors including 15 different species (Table 1) for a total passage rate of 10.44 raptors/hr. In addition to the 15 species of raptors observed during monitoring efforts, numerous unidentified accipiters, buteos, falcons, and eagles were also recorded. The most frequently observed species included American kestrels (Falco sparverius, 734), sharp-shinned hawks (Accipiter striatus, 719), red-tailed hawks (Buteo jamaicensis, 578), and Cooper's hawks (Accipiter cooperii, 421). A surprisingly large number of turkey vultures (Cathartes aura, 291) was also observed.

Fall Raptor migration had already begun when monitoring started on 29 August. The peak of the migration for all species occurred during the 2nd and 3rd weeks of September, although peaks for individual species and age classes varied throughout the season. Daily flight patterns varied with changing wind and weather patterns. The migration along the Boise Front was almost strictly an afternoon phenomenon. Rarely were raptors observed migrating past the observation point prior to 1100 hours. Typically, migration began between 1100 and 1200 and continued throughout the day until 1800 to 1900 hours.

Preliminary results indicate that the best weather conditions for observing migrating raptors were during periods of high pressure with warm to high temperatures (10-20 °C) and light to moderate winds (0-10 km/hr) from the west or north. The largest numbers of migrating raptors were counted on days prior to the arrival of approaching storm fronts. Migration was slowed or stopped during inclement weather with winds from the south or east.

Table 1. Raptors observed from Lucky Peak, fall 1994.

SPECIES	NUMBER	PERCENT
AMERICAN KESTREL	734	20.5
SHARP-SHINNED HAWK	719	20.1
RED-TAILED HAWK	578	16.2
COOPER'S HAWK	421	11.8
TURKEY VULTURE	291	8.1
NORTHERN HARRIER	148	4.1
GOLDEN EAGLE	86	2.4
SWAINSON'S HAWK	40	1.1
NORTHERN GOSHAWK	39	1.1
OSPREY	33	0.9
MERLIN	20	0.6
PRAIRIE FALCON	12	0.3
FERRUGINOUS HAWK	6	0.2
BROAD-WINGED HAWK	4	0.1
BALD EAGLE	2	0.1
UNIDENTIFIED ACCIP.	203	5.7
UNIDENTIFIED RAPTOR	150	4.2
UNIDENTIFIED BUTEO	79	2.2
UNIDENTIFIED FALCON	12	0.3
TOTAL	3572	100

During the first 2-3 weeks of observations, visibility was only fair to poor due to smoke from nearby forest fires. It is unknown how this factor affected raptor migration.

We operated the 3 trapping blinds a total of 133 days during the season for an average of 6 hours/trapping day. A total of 758 raptors were trapped and banded for an estimated 0.95 raptors trapped/hour throughout the entire season (Table 2). The majority of raptors caught were sharp-shinned hawks (432), followed by Cooper's hawks (155), American kestrels (75), northern goshawks (Accipiter gentilis, 35), red-tailed hawks (34), and merlins (Falco columbarius, 12). Other species trapped and banded included prairie falcons (Falco mexicanus), northern harriers (Circus cyaneus), peregrine falcons (Falco peregrinus), flammulated owls, and saw-whet owls. Trapping of forest owls was only marginally successful, with a total of 3 being trapped and banded.

Almost identical numbers of raptors were trapped at Boise and Lucky Peaks (368 vs. 367). However, the species composition of raptors trapped differed greatly between the 2 sites. More sharp-shinned hawks and northern goshawks were captured at the Boise Peak banding site, while more American kestrels, Cooper's hawks, and prairie falcons were trapped at Lucky Peak (Table 3). These data may indicate differential use of habitat by different species of raptors migrating along the Boise Front. Habitat at the 2 banding sites differed, with Boise Peak situated at higher elevation above treeline and Lucky Peak situated on an open hillside below treeline. Attempts to trap and band forest owls occurred only at Boise Peak.

Table 2. Raptors trapped and banded, fall 1994.

SPECIES	%ADULT	%FEMALE	TOTAL
SHARP-SHINNED HAWK	26.0	57.0	432
COOPER'S HAWK	29.0	61.0	155
AMERICAN KESTREL	----	45.0	75
NORTHERN GOSHAWK	11.0	31.0	35
RED-TAILED HAWK	12.0	----	34
MERLIN	----	42.0	12
PRAIRIE FALCON	----	43.0	7
NORTHERN HARRIER	75.0	50.0	4
FLAMMULATED OWL	----	----	2
PEREGRINE FALCON	0.0	0.0	1
NORTHERN SAW-WHET OWL	----	----	1
		TOTAL	758

Table 3. Raptors banded by banding site, fall 1994.

SPECIES	BOISE PEAK	LUCKY PEAK	FIVEMILE CREEK	TOTAL
SHARP-SHINNED HAWK	251	170	11	432
COOPER'S HAWK	49	99	7	155
AMERICAN KESTREL	17	58	0	75
NORTHERN GOSHAWK	22	10	3	35
RED-TAILED HAWK	19	14	1	34
MERLIN	5	6	1	12
PRAIRIE FALCON	1	6	0	7
NORTHERN HARRIER	1	3	0	4
FLAMMULATED OWL	2	0	0	2
PEREGRINE FALCON	0	1	0	1
NORTHERN SAW-WHET OWL	1	0	0	1
TOTAL	368	367	23	758

Pilot education programs undertaken during 1994 were very successful. The volunteer program involved high school students from around the Treasure Valley and graduate students at BSU, giving both a unique opportunity to obtain "hands on" experience in the operation of a raptor migration station. The program was popular with both teachers and students from Boise School District's Wildlife program and high school advanced biology programs. Students and teachers volunteered to work with project personnel in both the banding and counting efforts. Student volunteers gained knowledge about raptor identification, the handling of wild birds, data collection and recording, and in raptor identification techniques. Groups from the local Audubon Society Chapter and Forest Service also visited the migration site.

DISCUSSION

Both monitoring and banding efforts during fall 1994 were very successful. The main objectives of the study were to establish a permanent, long-term monitoring site at Lucky Peak and to continue banding of migrant raptors on the Boise Front. Both of these objectives were met. Lucky Peak is an excellent monitoring site. Not only do the large numbers of raptors migrating over Lucky Peak make it ideal for long-term monitoring but the site is also very accessible to Boise. Lucky Peak can be easily reached by 4-WD vehicle in less than 1 hour from Boise.

The 2 most productive hawk observatories in the Western U.S.: the Goshute Mountains, Nevada and Golden Gate Raptor Observatory, California count 10,000-20,000 hawks annually during fall migration. We counted over 3500 raptors during fall of 1994. By standardizing daily observation periods, season starting and ending dates, and by using 2 main observers rather than 1, an estimated 5000-10,000 raptors could be counted annually during fall migration at Lucky Peak. This would make Lucky Peak one of the most productive observatories in the western U.S. Standardization of these methods would also make data collected more useful in determining long-term trends in populations. Raptors had already begun fall migration when monitoring started in late August. Future monitoring efforts should begin as early as 15 August to record the beginning of the migration. The end of the migration was more abrupt than expected based on observations made during 1993. That year, daily movements of hawks continued through mid-November. The 1994 migration ended by late October possibly because of early snows. Future monitoring should continue at

least until 1 November, or until bad weather prevents further observations. Duration of the fall migration likely fluctuates yearly because of variations in weather and prey availability.

Although the peak of the migration for all species occurred during the 2nd and 3rd weeks of September, there were differences in timing of migration between species. Sharp-shinned and Cooper's hawk flights peaked during mid-late September and early October. American kestrels were most commonly counted during September. Red-tailed hawks were counted equally throughout the season. Merlins were most often observed later in the season during October, as were northern goshawks. For sharp-shinned hawks, Cooper's hawks, and northern goshawks there was a difference in timing of migration between age classes. Immatures were most commonly seen earlier during the migration, and adults were most commonly seen later.

On average, an estimated 0.95 hawks/hr were trapped throughout the entire season. This compares to 0.4 hawks/hr trapped at Golden Gate, and 1.7 hawks/hr trapped at the Goshute mountains. To increase the number of birds trapped and banded in the future, more blinds could be placed along the Boise Ridge, especially near Lucky Peak. Standardizing trapping techniques between blind sites and improving trapping efficiency at each site would also increase the total number of raptors banded. With another banding site in operation, an estimated 1000 raptors could be trapped and banded each season. This would make the site the third most productive banding effort in the western U.S. The blinds used on Boise and Lucky Peaks were very effective, capturing 368 and 367 raptors respectively, and should be retained. Only 23 raptors were captured and banded at the third site near Fivemile Creek. This banding site should be relocated in future seasons to a more productive area. Equally or

more productive sites exist along the ridge, especially near Boise or Lucky Peaks. Although trapping of forest owls was only marginally successful, continuing this effort in future seasons could provide insight to agencies about sensitive owl species. The electronic caller used during fall 1994 was faulty, and lacked sufficient volume. Likewise, only one area of the front was sampled. Future owl banding efforts should experiment with different trapping locations and methods. Raptor banding from 1993 and 1994 fall seasons is already paying off. At the date of completion of this report we have received a total of 4 band recoveries from hawks banded on the Boise Front (Table 4). In addition to recoveries of banded birds, a 2-year old northern Goshawk was captured in 1994 at Lucky Peak which was banded the previous year as a juvenile at Boise Peak. Furthermore, an adult sharp-shinned hawk was captured in September 1994 at Boise Peak which was banded at the Goshute Mountains 4 years earlier as a juvenile. This is an excellent return rate so far for birds of prey.

Table 4. Band recoveries from hawks banded on the Boise Front, fall 1993 and 1994.

SPECIES	AGE WHEN BANDED	DATE BANDED	DATE RECOVERED	WHERE RECOVERED
SHARP-SHINNED HAWK	HATCH YEAR	09/03/93	12/??/93	SINALOA, MEXICO
SHARP-SHINNED HAWK	HATCH YEAR	09/08/94	11/19/94	TOLLESON, ARIZONA
SHARP-SHINNED HAWK	HATCH YEAR	10/08/94	11/13/94	CALDWELL, IDAHO
RED-TAILED HAWK	HATCH YEAR	09/20/94	09/30/94	NYSSA, OREGON

PLANS FOR CONTINUED RESEARCH

Project Potential Future work on Boise State University's raptor migration project should be focused at continuing full-time monitoring efforts on Lucky Peak during the fall migration period. Counting methods, starting and ending dates, and count times should be standardized next season. If methods are standardized, Lucky Peak has the potential to become one of the most productive and significant hawk migration stations in the western U.S. Data collected at this station will be crucial to the development of our understanding of the migration of western raptor species. The banding project is of equal importance and should also be conducted daily throughout the entire season. If possible, the banding operation should be expanded to include 3-4 well-positioned blinds, and trapping efficiency should be increased by standardizing techniques between sites.

Exploratory observations should be conducted during spring months along the Boise Front to assess its importance to raptors during spring migration. Preliminary observations conducted during spring 1994 indicated that raptors also migrate along the Boise Front during spring. At present, few sites in the West have been identified that support significant migrations during both spring and fall. Establishment of both fall and spring monitoring and banding would make the site one of the most important migration stations in the West. The potential exists to use radio-telemetry or tail-marking studies to locate migration corridors, specific wintering areas, and to identify threats to key habitats on those wintering areas. A tail-marking study is currently being planned to learn more about how hawks follow ridge systems similar to the Boise Ridge during migration. The results of counting, banding, and

other research activities will be incorporated into articles for submission to peer-reviewed ornithological journals and presented at professional conferences.

Because raptors are high level predators, they have been shown to be good indicators of chemical change in the environment (Cade et al. 1988). In addition, they can be used as indicators of the overall health of ecosystems (Bednarz et al. 1990a). A project should be developed to evaluate contaminant levels in migrant raptors by analyzing blood samples. Blood samples can also be used to study the physiological status of migrating raptors. A study is currently being planned to compare blood samples taken from migrating northern goshawks at the station to blood samples taken from a local breeding population.

The monitoring site should continue to be used as an educational tool to teach university and high school students about hawk migration, field techniques, and identification skills. The opportunity also exists to educate the general public about the importance of birds of prey, bird migration, and conservation. Since the project also has the potential to offer the general public and local birding groups a quality wildlife viewing experience, the observatory could be developed into a 'Watchable Wildlife' site and managed in cooperation with project cooperators.

Large numbers of passerine birds were observed throughout the fall season by project personnel. It is suspected that the Boise Front is a migration corridor not only for raptors, but other birds as well. General abundance of passerines in all habitats along the front seemed to change on a daily basis throughout the fall. Passerines were most abundant at the ecotone between the forest and shrub-steppe communities, in areas dominated by mountain shrubs, with scattered patches of conifers. In addition to numerous unidentified passerines, large

flocks of northern flickers (Colaptes auratus), robins (Turdus migratorius), mountain bluebirds (Sialia currucoides), waxwings (Bombycilla sp.), olive-sided flycatchers (Nuttalornis borealis), and dark-eyed juncos (Junco hyemalis) were observed passing over Lucky Peak throughout the season. Local Audubon members visited the site on 24 September to view migrating raptors. The group also surveyed for passerine species at Lucky Peak during the early morning. A total of 24 species of passerines were observed by the group (Appendix D).

Projects should be developed to census songbirds along the Boise Front during fall to assess the extent of passerine migration. To provide the best possible information for land management agencies, these studies should attempt to identify species of songbirds using the front during migration, their relative abundances, and the specific habitats being used by them. Songbird abundance throughout the fall migration period could be correlated with raptor migration. It is recommended that an ecosystem approach be taken to study all aspects of this unique situation.

Funding Potential Since a long-term raptor migration project could lead to a variety of future research projects, the migration station has the potential to become a valuable asset to Boise State University. Results obtained from the first year's exploratory observations have been used to develop proposals to obtain future funding from the U.S. Fish and Wildlife Service, Idaho Department of Fish and Game, the U.S. Forest Service, the Bureau of Land Management, the Audubon Society, the Hawk Migration Association of North America, local corporations, local small businesses, and other sources of small grants. Proposals have been submitted to Boise State University for continuation of public education efforts. Proposals for the study of passerine migration will be prepared and submitted to federal agency challenge

cost share programs, as well as federal neotropical bird programs.

To date, only partial funding and support for continuation of this project in 1995 has been secured. The U.S. Forest Service, and the local Audubon chapter have committed funds for volunteer per diem stipends, and both RRTAC and Idaho Department of Fish and Game have committed vehicle support for project activities. No other funds have been secured. Funding for continuation of the monitoring and trapping efforts is most important. If adequate funding for these efforts can be secured, future research and education efforts stemming from these activities will be possible.

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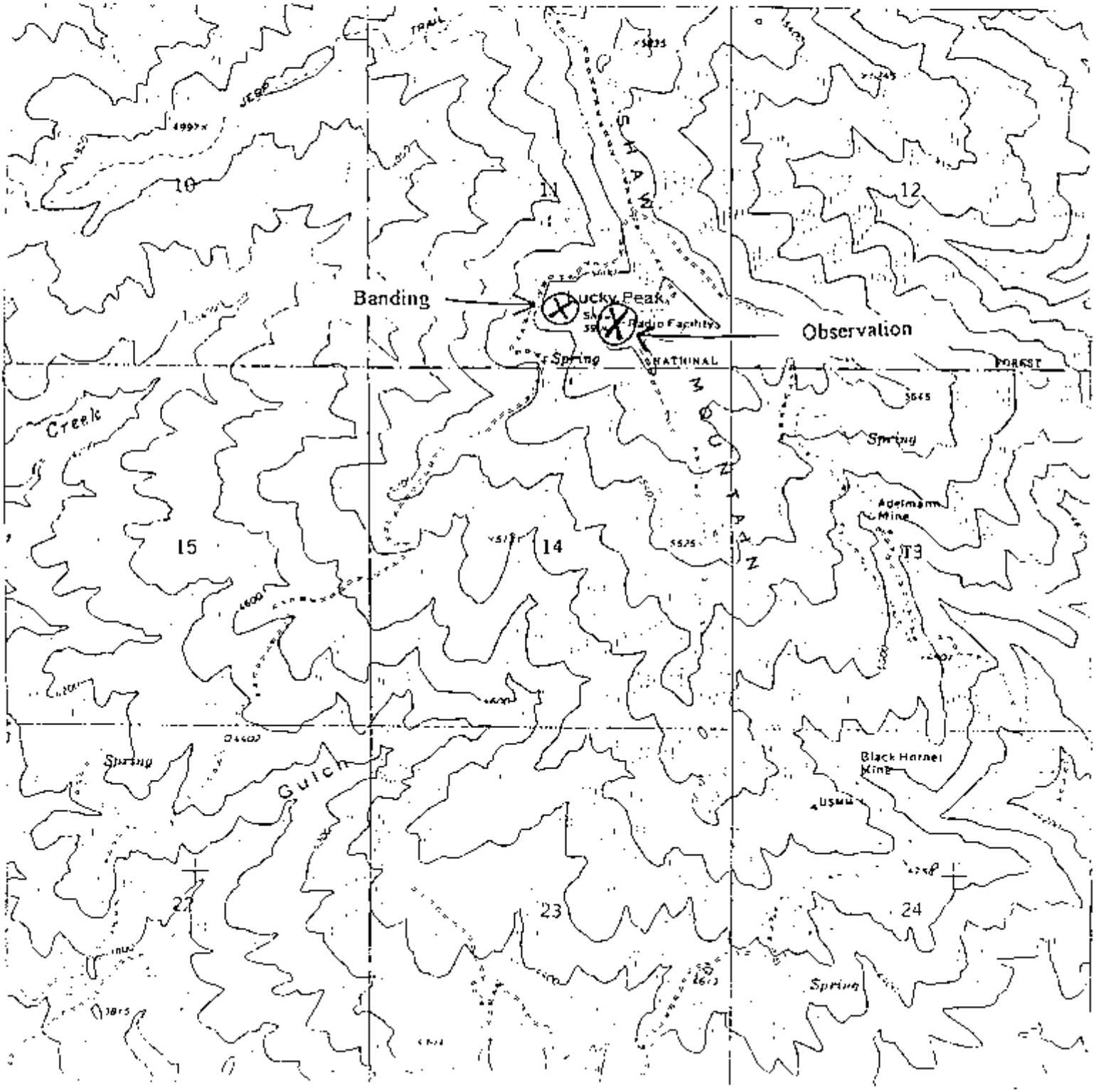
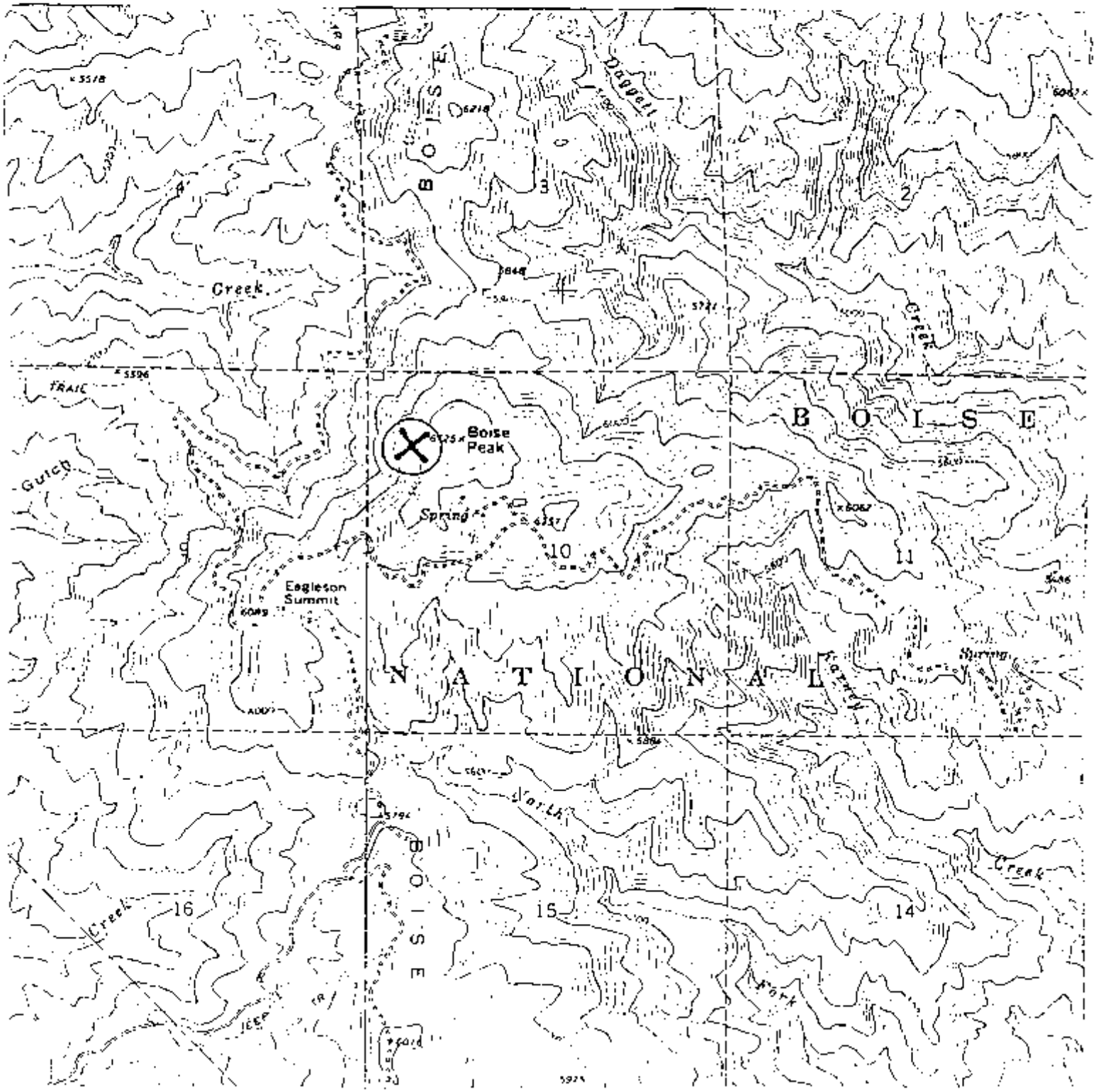
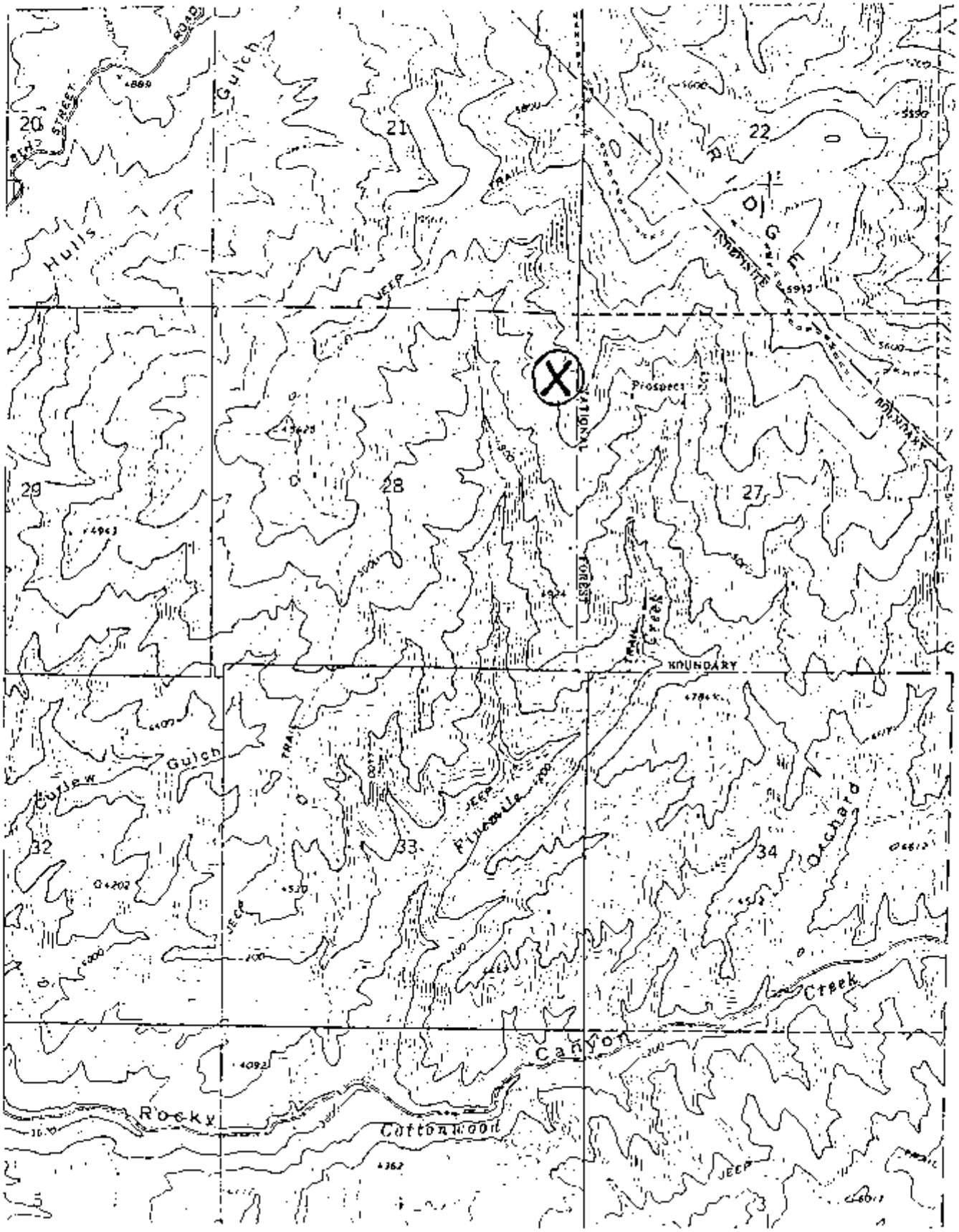
Appendix A. Location of Lucky Peak counting and banding sites.



Appendix B. Location of Boise Peak banding site.



Appendix C. Location of Fivemile Creek banding site.



Appendix D. List of passserine bird species observed at Lucky Peak, 24 September 1994.

Northern flicker (Colaptes auratus)

Stellar's jay (Cyanocitta stellarii)

Blue jay (Cyanocitta cristata)

Clark's nutcracker (Nucifraga columbiana)

Black-billed magpie (Pica pica)

Common raven (Corvus corax)

Black-capped chickadee (Parus atricapillus)

Mountain chickadee (Parus gambelli)

Red-breasted nuthatch (Sitta canadensis)

House wren (Troglodytes aedon)

Ruby-crowned kinglet (Regulus calendula)

Townsend's solitaire (Myadestes townsendii)

Robin (Turdus migratorius)

Yellow-rumped warbler (Dendroica coronata)

White-crowned sparrow (Zonotrichia leucophrys)

Dark-eyed junco (Junco hyemalis)

Cassin's finch (Carpodacus cassinii)

Pine siskin (Carduelis pinus)

Swainson's thrush (Catharus ustulatus)

Yellow warbler (Dendroica petechia)

Varied thrush (Ixorens naevius)

Downy woodpecker (Picoides pubescens)

Evening grosbeak (Hesperiphona vespertina)

Black-headed grosbeak (Pheucticus melanocephalus)

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