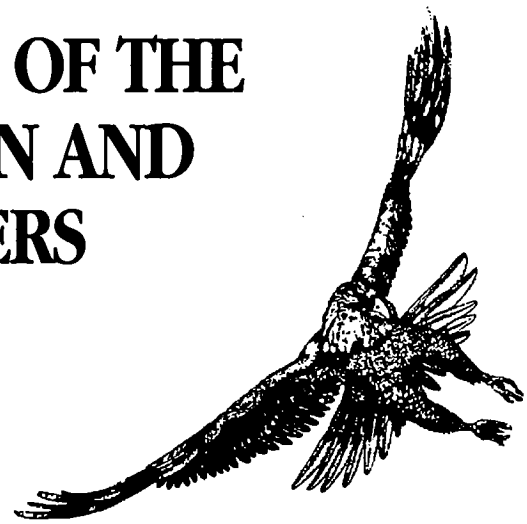
RAPTOR SURVEY OF THE LOWER SALMON AND SNAKE RIVERS



by
Carol Bradford
Frances Cassirer

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RAPTOR SURVEY OF THE LOWER SALMON AND SNAKE RIVERS, APRIL 1993

by

Carol Bradford and Frances Cassirer
Conservation Data Center
Nongame and Endangered Wildlife Program
Bureau of Wildlife

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Idaho Department of Fish and Game
600 S. Walnut St., Box 25
Boise, ID 83707
Jerry M. Conley, Director

Cooperative Challenge Cost-Share Project
Idaho Department of Fish and Game
Bureau of Land Management

ABSTRACT

Twelve raptor species were recorded during surveys conducted along the Lower Salmon and Snake River Canyons April 2-April 14, 1993. Golden eagles were the most commonly observed species, followed by red-tailed hawks and American kestrels. Prairie falcons, northern harriers, northern goshawks, Cooper's hawks, sharp-shinned hawks, and turkey vultures were less frequently observed. A single bald eagle was seen. Suitable peregrine falcon nesting habitat was present, but no peregrine falcons were observed.

The abundance of golden eagles relative to other raptors was higher than that suggested by previous surveys in the same area, possibly due to differences in survey methodology, observers, weather conditions, or actual changes in the raptor community. Suggestions are made for future surveys to better quantify raptor numbers and distribution. Helicopter surveys are recommended for documenting golden eagle nesting activity and for supplementing peregrine falcon surveys. Ground surveys are recommended for continued peregrine falcon inventory and for monitoring overall raptor community structure and abundance.

INTRODUCTION

This study was initiated to better document the raptor community in north-central Idaho along the Lower Salmon River and in lower Hells Canyon on the Snake River. The Lower Salmon River has been recommended for designation as a Scenic River under the Wild and Scenic Rivers Act and is classified as a BLM Area of Critical Environmental Concern, because of its important resource values (flora, fauna, scenic, cultural, and recreational). The study also served as part of an inventory of wildlife mitigation lands located near the confluence of the Snake and Salmon Rivers that were recently purchased by the Bonneville Power Administration (Bonneville Power Administration et al. 1992). Little quantitative information is available on the nongame bird species that inhabit or use this area. The goal of this survey was to determine the distribution and relative abundance of raptors. Because raptors are visible, topline predators, many land management agencies use them as indicators of ecosystem health.

The few raptor surveys conducted in the area prior to this study were done to provide input for the Wild and Scenic River Study of the Lower Salmon (Kochert 1977, Fisher 1978) and to present measures for protecting raptor nesting and roosting sites in association with dam construction on the Snake River (Asherin and Claar 1976). These studies were conducted primarily by helicopter, supplemented by boat and ground surveys. Surveys were conducted along the Lower Salmon River from Whitebird, Idaho

to its confluence with the Snake River in the Hells Canyon area, and down the Snake River to the Grande Ronde River. The American kestrel was the most commonly observed species in these previous surveys. Red-tailed hawks and golden eagles followed kestrels in abundance.

A peregrine falcon helicopter survey was also conducted in the vicinity of Snow Hole Rapids on the Lower Salmon River and Cottonwood Creek on the Snake River in 1979. Although the areas surveyed had been identified as excellent nesting substrate and hunting habitat for peregrine falcons (Kochert 1977) none were observed. Gusty wind conditions made the area difficult to survey and survey time was minimal (Johnson 1979).

In addition, mid-winter bald eagle counts are conducted periodically by helicopter on the Lower Salmon and annually by boat on the Snake River (Cottonwood BLM, unpubl. data). Golden eagles are also tallied in these mid-January surveys.

Information from the present study and others like it ultimately provide valuable information for managing the land, people, and wildlife along the river corridor. Specifically, raptor survey data can be used to protect individual raptor species, especially sensitive or endangered species, and their nest and roosting sites.

STUDY AREA

The landscape of the Lower Salmon River and Hells Canyons is diverse and austere. The rivers cut through narrow, deep,

desert-like canyons with dramatic topographic variation; vertical rock cliffs juxtaposed with wide, tiered grasslands. The Salmon River canyon is deeper than the Grand Canyon, and the Salmon is the longest free-flowing river in the contiguous United States. There are many rapids and sandy beaches along the river. Forests and arid rangeland in the upper reaches of the canyon extend to and beyond the canyon rim. While much of the river canyon is roaded, there are also large roadless areas.

The area has an extensive and varied cultural history. Native Americans have inhabited this canyon for over 10,000 years, and, since the 1860's, the land has been mined, farmed, and grazed. Currently the river corridor is extensively grazed by cattle, and the river is used by recreationists, both private and commercial. The majority of the area is public land administered by the Bureau of Land Management, the U.S. Forest Service, and more recently, the Idaho Department of Fish and Game.

Hells Canyon on the Snake River has a topography similar to the Lower Salmon--steep narrow canyons alternating with more wide open grasslands. Overall, it is a deeper canyon, though only by about 100 m, with longer continuous steep vertical cliffs. The Snake River is larger and managed differently than the Lower Salmon. Hells Canyon is a U.S. Forest Service National Recreational Area, and the flows on the Snake River are regulated by dams. As a result there has been a loss of sandy beaches on the upper reaches of Hells Canyon. Large jet boats are also more

common on the Snake River. Unlike the Lower Salmon River, the Snake River has a permit system for recreational nonmotorized boat use. Both river corridors have cliff walls and faces that provide excellent raptor nesting, foraging, and roosting sites.

The area surveyed encompassed 96 km of the Lower Salmon River corridor from the Hammer Creek boat launch (RM 53) to the confluence of the Salmon and Snake Rivers, and 11.2 km on the Snake River corridor from its confluence with the Lower Salmon to Cottonwood Creek (RM 181.2) (Fig. 1).

METHODS

Surveys were conducted April 2 to April 14, 1993. This period was selected as the optimal time to observe raptors along the river corridor because it provided the maximum overlap in breeding chronologies. Golden eagles were incubating; red-tailed hawks were laying and incubating, and both prairie and peregrine falcons were laying (Kochert et al. 1977, R. Lehman pers. comm., E. Levine pers. comm.).

Survey methods were similar to those used in the BLM Snake River Birds of Prey Area (Kochert et al. 1991). Surveys were conducted from 20 observation points at approximately 3-km intervals: 17 on the Lower Salmon River and 3 on the Snake River in Hells Canyon National Recreation Area (Fig. 1). The majority of observation points were 1-30 m from the river's edge on either side of the river. There were 3 observers at the first (upstream) 12 points and 2 observers at the last 8 points.

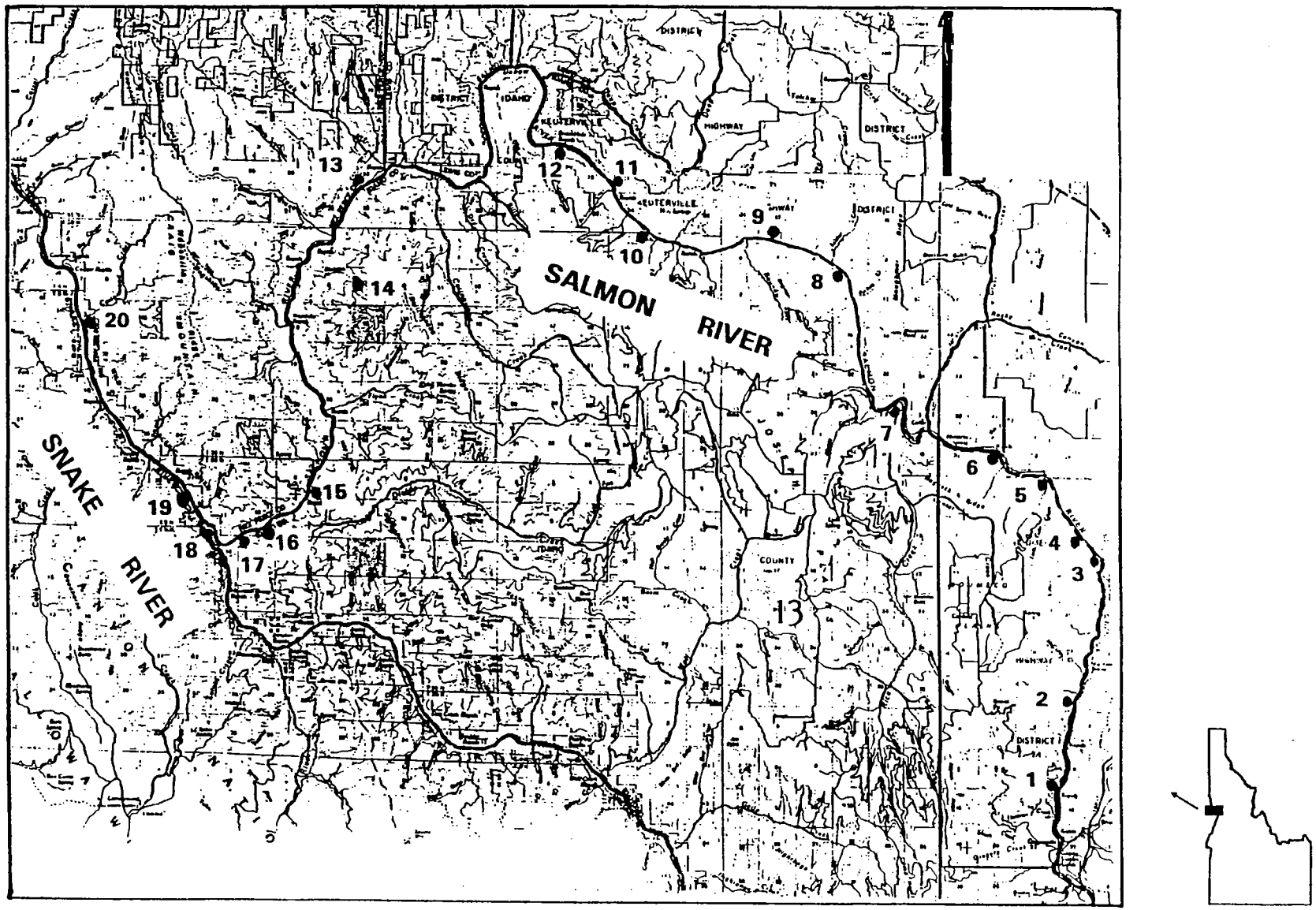

Figure 1. Raptor survey area, April 1993. Numbers 1 - 20 refer to observation points described in text.

Nine (45%) of the observation points were surveyed for 1.5-2.0 hours; 5 (25%) were surveyed for 2-3 hours; and 6 (30%) were observed for 3-7 hours.

All surveys were conducted from the ground and limited primarily to cliff habitats adjacent to the river corridor. The survey area was defined as the area visible from a given observation point in which raptors could be seen and positively identified. In all cases, the observation point selected offered a panoramic view of the nearest cliff faces.

Survey points were not evenly distributed because of selection for cliff habitat and/or the interference of rapids. Because of limited time and personnel during this river survey, suitable areas on the river not near a road were given priority when choosing survey points. Thus, an abundance of available raptor habitat was not surveyed.

Optimal weather conditions for surveying include little or no wind, fog, or rain. Although no surveying was done during downpours of rain or hail, unstable weather is typical for this time of year. Due to time constraints, surveys were often conducted during suboptimal weather conditions. Also, for logistical reasons associated with conducting a river trip, surveying was conducted primarily from mid-morning through mid-afternoon, although peak activity of nesting raptors is in the early morning and late afternoon.

Observations were recorded on a survey form (Appendix A) modified from those used in peregrine falcon surveys (Levine

1992). All raptors sighted and their specific activities were recorded. Any raptor observed exhibiting territorial defense, courtship behavior, or nesting behavior was assumed to be occupying a breeding territory (Steenhof 1987). Observations were given the following designations:

Individual bird sighted

Pair of individuals sighted (P)

Pair or individual exhibiting territorial behavior (T)

Occupied nest site identified (N)

Survey equipment included Swift 15x60 spotting scopes, Bushnell 20x45 spotting scope, Nikon 8x25 binoculars, Nikon 8x40 binoculars, and Minolta 10x42 binoculars.

RESULTS

Twelve species of raptors were recorded: turkey vulture (*Cathartes aura*), golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), northern harrier (*Circus cyaneus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), northern goshawk (*Accipiter gentilis*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), western screech owl (*Otus kennicotti*), and great horned owl (*Bubo virginianus*) (Table 1). A mean of 3.2 raptor species were recorded at each observation point. The golden eagle was observed at 18 of the 20 survey points and was the most commonly observed raptor (an estimated 33 individuals). The second and third most commonly observed raptor species were

Table 1. Raptors observed along the lower Salmon River and the Snake River to Cottonwood Creek, Idaho, April 2 - April 14, 1993.

Point No.	Location	UTM E	UTM N	Date	Hours Obs.	Observations[a]
1	Lower Salmon RM 54	552700	5069100	4/2	2	2 prairie falcons (P,T) 2 red-tailed hawks (P,T) 2 red-tailed hawks (P,T) 2 golden eagles (P) 1 northern harrier 1 American kestrel
2	Lower Salmon RM 49.6 Lyons Bar	553300	5072450	4/2	2	2 golden eagles (P,T) 1 northern harrier 1 red-tailed hawk (T)
3	Lower Salmon RM 45.3 Shorts Bar	554600	5078450	4/3	2	2 prairie falcons (P,T) 2 golden eagles (P,T) 1 golden eagle subadult 2 northern harriers (P)
4	Lower Salmon RM 44.5	553800	5079200	4/3	2	1 golden eagle subadult 1 golden eagle 1 northern harrier 1 American kestrel 1 UNID Accipiter (Cooper's hawk or northern goshawk) 1 Cooper's hawk
5	Lower Salmon RM 42.8 Pine Bar	552050	5081700	4/4	7	2 golden eagles (P) 2 golden eagles (P) 2 red-tailed hawks (P,N) 2 red-tailed hawks (P) 1 bald eagle 1 northern harrier

[a] P = pair, T = pair or individual exhibiting territorial behavior, N = nest observed.

Table 1, cont'd. Raptors observed along the Lower Salmon River and the Snake River to Cottonwood Creek, Idaho April 2 - April 14, 1993.

Point No.	Location	UTM E	UTM N	Date	Hours Obs.	Observations[a]
6	Lower Salmon RM41	549900	5082600	4/5	1	1 golden eagle 2 red-tailed hawks (P,T) 1 accipiter (UNID) (probable northern goshawk) 1 accipiter (UNID)
7	Lower Salmon RM 37	545400	5084500	4/5	1	1 golden eagle 2 red-tailed hawks (P) 1 American kestrel
8	Lower Salmon RM 32.5 Cougar Canyon	542950	5090000	4/6	1.5	2 golden eagles (P,T) 2 golden eagles (subadults) 2 turkey vultures 1 northern harrier 1 sharp-shinned hawk 2 American kestrels (P) 1 falcon (UNID)
9	Lower Salmon RM 30.6 Cougar Canyon	540300	5091200	4/6	1.5	1 golden eagle
10	Lower Salmon RM 27.2	534400	5091400	4/7	1.5	1 golden eagle (subadult) 1 American kestrel 1 sharp-shinned hawk 1 northern goshawk 2 turkey vultures (P)

[a] P = pair, T = pair or individual exhibiting territorial behavior, N = nest observed.

Table 1, cont'd. Raptors observed along the Lower Salmon River and the Snake River to Cottonwood Creek, Idaho April 2 - April 14, 1993.

Point No.	Location	UTM E	UTM N	Date	Hours Obs.	Observations[a]
11	Lower Salmon RM 25.3	533050	5093100	4/7	3	2 golden eagles (P,T) 1 American kestrel (T) 1 turkey vulture 1 northern harrier 1 northern goshawk 2 red-tailed hawks (P,T) 2 red-tailed hawks (P,T)
12	Lower Salmon RM 23.2 Snow Hole	530700	5095200	4/8	3	2 golden eagles (P,T,N) 1 golden eagle 1 golden eagle (subadult) 2 red-tailed hawks 1 sharp-shinned hawk 1 American kestrel
13	Lower Salmon RM 12.5 Eagle Creek beach	522000	5092800	4/9	3	1 golden eagle 1 red-tailed hawk 1 northern goshawk
14	Lower Salmon RM 10 Skeleton Creek	522000	5089200	4/10	1.5	1 American kestrel 2 red-tailed hawks (P) 1 great horned owl
15	Lower Salmon RM 3.4 Slide Rapid	520100	5080700	4/11	1.5	1 American kestrel 2 red-tailed hawks (P) 2 red-tailed hawks (P)
16	Lower Salmon RM 1.5	517900	5078500	4/11	4	2 prairie falcons (P, T, Copulating) 2 golden eagles (P)

[a] P = pair, T = pair or individual exhibiting territorial behavior, N = nest observed.

Table 1, cont'd. Raptors observed along the Lower Salmon River and the Snake River to Cottonwood Creek, Idaho April 2 - April 14, 1993.

Point No.	Location	UTM E	UTM N	Date	Hours Obs.	Observations[a]
17	Lower Salmon RM 0.4 Eye of the Needle	517050	5078200	4/12	1.5	1 golden eagle 1 American kestrel
18	Snake River RM 187.8 Confluence	515850	5785000	4/12	1	1 golden eagle
19	Snake River RM 186.8 Cave	514800	5079700	4/12	2	1 golden eagle (T) 2 American kestrels (P)
20	Snake River RM 181.2 Cottonwood Creek Beach	510100	5085700	4/13	6	2 American kestrels (P,T) 1 Cooper's hawk
				4/14	3	1 golden eagle 1 red-tailed hawk (N)

[a] P = pair, T = pair or individual exhibiting territorial behavior, N = nest observed.

red-tailed hawks (11 points, 27 individuals) and American kestrels (12 points, 15 individuals). The most infrequently observed diurnal raptor was the bald eagle (1 observation). While boating between Maloney Creek and Eagle Creek we observed a western screech owl. A great horned owl was heard at the Skeleton Creek campsite.

An average of 2.5 raptors were recorded per hour of observation, but observation rates were highly variable (Table 2). The greatest frequency of observations (7.3/hr) was in Cougar Canyon on the Salmon at RM 32.5 (point 8). The lowest frequencies of observations (0.7 and 0.6/hr) were 2 miles downstream on the Salmon River also in Cougar Canyon (point 9), and on the Snake River at Cottonwood Creek (point 20).

One occupied golden eagle nest was observed with an adult incubating. Two occupied red-tailed hawk nests were observed with adults incubating (Appendix B). A total of 32 pairs or nesting areas were documented: 3 prairie falcon, 10 golden eagle, 13 red-tailed hawk, 1 northern harrier, 4 American kestrel, and 1 turkey vulture (Table 1).

DISCUSSION

This study indicates that the Lower Salmon River Canyon and to a lesser extent Lower Hells Canyon on the Snake River provide nesting and foraging habitat for a large number and variety of raptor species. Results of this initial survey suggest high densities of golden eagles, perhaps similar to those in the Snake

Table 2. Observation rates (birds/hr) of raptors at 20 points along the Lower Salmon and Snake Rivers, April 2 - 14, 1993.

Obs. Pt.	All Raptors	NOHA[a]	PRFA	AMKS	GOEA	BALD	RTHA	TUVU	SSHA	COHA	NOGO	GHOW	UNID
1	4	0.5	1	0.5	1	0	2	0	0	0	0	0	0
2	2	0.5	0	0	1	0	0.5	0	0	0	0	0	0
3	1.4	0.5	1	0	1.5	0	0	0	0	0	0	0	0.5
4	2.5	0.5	0	0.5	1	0	0	0	0	0.5	0	0	0
5	1.4	0.1	0	0	0.6	0.1	0.6	0	0	0	0	0	0
6	4	0	0	0	1	0	2	0	0	0	1	0	1
7	4	0	0	1	1	0	2	0	0	0	0	0	0
8	7.3	0.7	0	1.3	2.6	0	0	1.3	0.7	0	0	0	0.7
9	0.7	0	0	0	0.7	0	0	0	0	0	0	0	0
10	4	0.7	0	0.7	0.7	0	0	1.3	0.7	0	0	0	0
11	3.3	0	0	0.3	0.7	0	1.3	0.3	0	0	0	0	0
12	2.3	0	0	0.3	1	0	0.7	0	0.3	0	0	0	0
13	1	0	0	0	0.3	0	0.3	0	0	0	0	0	0
14	2.6	0	0	0.7	0	0	1.3	0	0	0	0	0.7	0
15	3.3	0	0	0.7	0	0	2.6	0	0	0	0	0	0
16	1	0	0.5	0	0.5	0	0	0	0	0	0	0	0
17	1.3	0	0	0.7	0.7	0	0	0	0	0	0	0	0
18	1	0	0	0	1	0	0	0	0	0	0	0	0
19	1.5	0	0	1	0.5	0	0	0	0	0	0	0	0
20	0.64	0	0	0.2	0.2	0	0.1	0	0	0.1	0	0	0
Avg/hr	2.5	-	-	0.4	0.9	-	0.7	-	-	-	-	-	-
S.D.	1.7	-	-	0.4	0.6	-	0.9	-	-	-	-	-	-
Median	2.2	0	0	1	0.7	0	0.2	0	0	0	0	0	0
Min.	0.6	0	0	0	0	0	0	0	0	0	0	0	0
Max.	7.3	0.7	1	1.3	2.6	0.1	2.6	1.3	0.1	0.5	1	0.7	1

[a] NOHA - northern harrier, PRFA - prairie falcon, AMKS - American kestrel, GOEA - golden eagle, BALD - bald eagle, RTHA - red-tailed hawk, TUVU - turkey vulture, SSHA - sharp-shinned hawk, COHA - Cooper's hawk, NOGO - northern goshawk, GHOW - great horned owl

River Birds of Prey Area (SRBPA) (compare approximately 1 pair per 4.2 km, 1993 for SRBPA, R. Lehman, pers. comm., with 1 pair approximately every 5.3 km for Lower Salmon/Hells Canyon). However, since the Lower Salmon/Hells Canyon survey was fairly extensive over a short period of time, few actual nest sites were observed. Therefore, results may not be completely comparable.

It does seem likely that there may be more golden eagles in the study area than were observed. Since surveying was only performed from the river corridor, birds foraging above the corridor or nesting on rims or up side canyons may have been missed by this survey. Cold, rainy, and snowy weather also influenced results. Raptor activity fell off dramatically during inclement weather and borderline bad weather. Also, estimates of actual numbers were reduced because most golden eagles would have been incubating during the study period (Fuller and Mosher 1987). More intensive work would be required to make accurate comparisons with nesting densities in other areas.

Relative abundance of raptors observed in this survey differed from that reported in previous surveys. This may be due to survey methodology (aerial and ground 1976-1978 versus ground alone in this study), weather conditions, observer variablity, or to actual changes in the raptor community. Surveys in the late 1970's found fewer golden eagles and many more American kestrels than were observed in this study. American kestrels (36) and red-tailed hawks (29) were observed much more frequently than golden eagles (18) in the 1978 study. The 1977 study revealed an

almost equal number of golden eagles (21) and American kestrels (22) and very few red-tailed hawks (7). The results from the Asherin (1976) study are not directly comparable since the study area included only the Snake River corridor, but kestrels were also the most frequently observed raptor in that survey. In the 1993 survey, an estimated 33 golden eagles, 27 red-tailed hawks, and 15 American kestrels were observed, almost the inverse of the 1978 survey.

The number of prairie falcons observed in this study (6 birds) is comparable to the 1978 study (4 birds and 9 scrapes). No peregrine falcons were observed in either the 1977-78 studies or in this survey of the same study area. Peregrine falcons were, however, successfully nesting in Hells Canyon as late as 1965. The species was reported hunting in the same area in 1976 (Fisher 1978). Since 1986, 73 peregrines have been released at 3 hack sites within the vicinity of Hells Canyon on both the Oregon and Idaho sides of the Snake River (Heinrich 1986, 1987, 1988, 1989, 1990, 1991, 1992). Peregrines have also been hacked at Asotin, Washington, and near the Little Salmon River. At least 2 nests have been established on the Salmon and Snake Rivers outside the area covered in this survey. The Lower Salmon River Canyon and Hells Canyon NRA both contain a tremendous amount of potential cliff nesting habitat for peregrines (Levine 1992) that remains to be adequately surveyed for occupancy.

No recent bald eagle nesting activity has been reported in the study area and none was observed in this survey. The area is

apparently primarily used as a wintering area by bald eagles from December-February (Cottonwood BLM, unpubl. data).

RECOMMENDATIONS

The Lower Salmon Canyon and Hells Canyon provide habitat for a large number and diversity of raptors. The high numbers of golden eagles alone justify further surveys and research. If the density of golden eagles is as high or higher than that of the SRBPA, then significant reasons exist for protecting and studying the river, its corridor, and the wildlife it supports. To confirm the actual nesting density of golden eagles, 2 helicoptor surveys for nest sites should be made--1 during incubation in April and 1 prior to fledging in May. These should be combined with ground surveys to better document nesting activity.

The possibility that peregrine falcons may be nesting in, or using the area, also would justify further protection and study. Surveys to detect peregrine falcons should target suitable nesting areas with repeated, intensive searches. Survey points should be located on the river, in suitable side-canyons, and possibly on the canyon rim. Helicopter surveys for further habitat assessment and to follow up any potential ground observations could be combined with golden eagle helicopter surveys.

Continued monitoring at the points established in this study is also recommended. Baseline monitoring can be used to help document any changes in the raptor community in response to

management activities, and this information can be used in future management plans. Observation times should be standardized to 2 hours per point to minimize the factors potentially accounting for different observation rates at each point. Future surveys could also include additional points, time permitting. Additional observers and 2 boats would provide better coverage of the area, and could possibly allow combining a general raptor survey with a peregrine survey.

ACKNOWLEDGMENTS

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LITERATURE CITED

Asherin, D.A. and J. J. Claar. 1976. Inventory of riparian habitats and associated wildlife along the Columbia and Snake River. Vol. 3A: Snake River-McNary Reservoir. U. S. Army Corps of Engineers. 556pp.

Bonneville Power Administration, State of Idaho, and Nez Perce Tribe. 1992. Wildlife mitigation agreement for Dworshak Dam, March 1992. 48pp.

Fisher, R. 1978. U.S. Department of the Interior, Fish and Wildlife Service, Memo to BLM District Manager Martin Zimmer, Coeur d'Alene, 10/6/78.

Fuller, M. R. and J. A. Mosher. 1987. Raptor Survey Techniques. Pages 37-65 in B. A. Giron Pendleton, B. A. Millsap, K. W. Cline, and D. M. Bird, eds. Raptor Management Techniques Manual, Natl. Wildl. Fed., Washington, D. C.

Heinrich, W. H. 1986. Rocky Mountain/northwest peregrine falcon reintroduction. Pages 29-36 in W. Burnham, ed. The Peregrine Fund, Inc. Operation Report. 1986.

_____. 1987. Peregrine reproduction and reintroduction in the Rocky Mountains and Pacific Northwest. Pages 23-28 in W. Burnham, ed. The Peregrine Fund, Inc. Operation Report. 1987.

_____. 1988. Results from the Rocky Mountains and Pacific Northwest. Pages 39-42 in W. Burnham, ed. The Peregrine Fund, Inc. Operation Report. 1988.

_____. 1989. Results from the Rocky Mountains and Pacific Northwest. Pages 21-23 in W. Burnham, ed. The Peregrine Fund, Inc. Operation Report. 1989.

_____. 1990. Results from the Rocky Mountains and Pacific Northwest. Pages 19-22 in W. Burnham, ed. The Peregrine Fund, Inc. Operation Report. 1990.

_____. 1991. Rocky Mountain and Pacific Northwest Release Summary. Pages 15-18 in W. Burnham, ed. The Peregrine Fund, Inc. Operation Report. 1991.

_____. 1992. Rocky Mountain and Pacific Nortwest Release Summary. Pages 21-24 in W. Burnham, ed. The Peregrine Fund, Inc. Operation Report. 1992.

Johnson, C. 1979. Peregrine Falcon Survey. Unpubl. Memo, Bur. of Land Mgmt., Cottonwood Resource Area.

Kochert, M. N. 1977. Unpubl. data., Snake River Birds of Prey Area. Bur. of Land Mgmt., Boise, ID.

_____, K. Steenhof, and A. R. Bammann. 1977. Reproductive performance, food habits, and population dynamics of raptors. Pages 1-39 in Snake River Birds of Prey Research Project Annual Rept. U.S.D.I., Bur. Land Manage., Boise, ID.

_____, R. L. Lehman, and K. Steenhof. 1991. Raptor nesting densities and reproductive Success. In Research plan to assess the impacts of habitat alteration in the Snake River Birds of Prey area. U.S.D.I., Bur. Land Manage., Boise, ID.

Levine, E. 1992. Idaho Peregrine Falcon Survey, Nest Monitoring and Release Program - 1992. Idaho Department of Fish and Game Nongame and Endangered Wildlife Program. 21pp.

Steenhof, K. 1987. Assessing Raptor Reproductive Success and Productivity. Pages 162-170 in B. A. Giron Pendleton, B. A. Millsap, K. W. Cline, and D. M. Bird, eds. Raptor Management Techniques Manual, Natl. Wildl. Fed., Washington, D. C.

Appendix A

Raptor survey form

RAPTOR SURVEY FORM

LOCATION: DATE:

SURVEY POINTS:

OBSERVERS:

TIME: Start = Finish = Total =

DESCRIPTION OF AREA OBSERVED:

WEATHER CONDITIONS:

CONDITIONS FOR HEARING:

RAPTORS OBSERVED:

	Species	Age	Sex	Behavior
1.				
2.				
3.				
4.				
5.				

(Behavior Code: 0=unknown, 1=territory defense
2=courtship, 3=incubation
4=nestlings, 5=fledgings, 6=other)

OTHER BIRD SPECIES OBSERVED:

1.	6.
2.	7.
3.	8.
4.	9.
5.	10.

PLEASE RECORD: (Use back of page if needed)

A. FOR ALL RAPTORS OBSERVED:
   1. General behavior
   2. Descriptions of nest site locations if known
   3. Miscellaneous (photos, sketches, items collected, etc.)

SPECIES LIST

ON ATTACHED MAP PLOT:
1. cliffs surveyed and observations points
2. Raptors observed: perches, nest sites, flight paths, etc.

Appendix B

Locations of raptor nests observed on the Lower Salmon and Snake Rivers, April 1993

Appendix B. Locations of raptor nests observed on the Lower Salmon and Snake Rivers, April 1993.

Species	Location	UTM East	UTM North
Red-tailed Hawk	Across Snake River from Cottonwood Cr. (Oregon)	509850	5087950
Red-tailed Hawk	Pine Bar	552250	5081850
Golden Eagle	Snowhole Rapids	530700	5094800