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BLACKFOOT RIVER RAPTOR INVENTORY

Prepared for the

Bureau of Land Management

by

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U.S. Fish and Wildlife Service
Boise Field Office
Boise, Idaho

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BUREAU OF LAND MANAGEMENT
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ABSTRACT

During April-July 1989, a raptor inventory was conducted along 38 km of the Blackfoot River in southeastern Idaho. Diurnal raptors were surveyed by foot and owls were surveyed by playing tape recorded songs of 4 owl species. Forty-three pairs of 10 species were found occupying territories, including 6 species of diurnal raptors (golden eagles, red-tailed hawks, Swainson's hawks, prairie falcons, American kestrels, and Cooper's hawks), 2 species of owls (great horned owls and northern saw-whet owls), turkey vultures, and common ravens. Of the 18 territories where nests were located, 66% (N = 12) of the paired birds at those territories were known to breed. No owl nests were located in the study area. Raptors, vultures, and ravens averaged 1.13 pairs per km of river. Potential threats to raptors and their habitat in the Blackfoot River area include hydroelectric development of the river, livestock grazing, agricultural development, utility lines, mining, and recreation.

INTRODUCTION

The Blackfoot River in southeastern Idaho has been designated by the U.S. Bureau of Land Management (BLM) as a "key raptor area" because of its special habitat features and abundance of raptors (Olendorff et al. 1989). This designation indicates that future planning and management of this area for raptors should be a priority for the BLM. Developing a raptor management plan is especially important now because of recent changes in livestock grazing in the riparian corridor (USDI 1987) and a proposed hydropower project on the river (FERC No. 10672). Other land-use actions in the area that could affect raptors and other wildlife include utility lines, farming, mining, and recreation. Raptors are sensitive indicators of habitat conditions and are generally among the first group of birds to decline when habitats are lost or degraded (Hickey 1969). Conducting inventories and implementing monitoring programs are necessary for proper management and for evaluating effects of land-use changes on wildlife species of concern.

A cursory inventory of breeding raptors was conducted in spring 1988 (3 field trips) along the Blackfoot River. Of the nine raptor species observed [Cooper's hawk, sharp-shinned hawk, northern harrier, red-tailed hawk, Swainson's hawk, golden eagle, prairie falcon, American kestrel, and long-eared owl (see Appendix A for scientific names)] and turkey vultures (considered ecological equivalent of raptors), 29 nesting territories were identified. In winter 1989, the BLM initiated a season-long study to survey breeding raptors in the Blackfoot River Canyon. The study was conducted by the U. S. Fish and Wildlife Service (FWS) and objectives were to (1) determine distribution and density of nesting territories, and (2) determine number of breeding attempts at nesting territories. The purpose of this study was to collect information that would be useful in developing a raptor habitat management plan for the Blackfoot River.

STUDY AREA

The Blackfoot River study area (BRSA) included 38 km (24 mi.) of the Blackfoot River canyon in Bingam County, Idaho (Figure 1). The study area boundaries were within the canyon rim (generally less than 1 km wide) from Wolverine Creek upstream to Morgan Bridge (Figure 2). Elevations ranged from 1424 m (4700 ft) to 1818 m (6000 ft). Annual precipitation averaged 28-33 cm (11-13 in.) (USDA 1973). Soils were well drained and deep silt loams formed in calcareous loess (USDA 1973). About 22 km (14 mi.) of the lower study area (Beaver Creek to Wolverine Creek) was bordered by BLM land on the east and Fort Hall Indian Reservation on the west (Figure 2). BLM land bordered most of the river in the upstream section of the study area. Dominant land uses have been livestock grazing and dryland farming.

The river corridor was characterized by basalt cliffs and a narrow riparian area with little accessibility. Six cover types were identified in the study area: (1) sagebrush (*Artemisia* spp.), composed primarily by *A. tridentata vaseyana* and *A. tripartita*; (2) Douglas-fir (*Pseudotsuga menziesii*), which occurred in patches within the canyon rims; (3) juniper (*Juniperus osteosperma* and *J. scopulorum*); (4) quaking aspen (*Populus tremuloides*), which occurred in patches; (5) riparian, dominated by water birch (*Betula occidentalis*) with lesser amounts of red-osier dogwood (*Cornus*

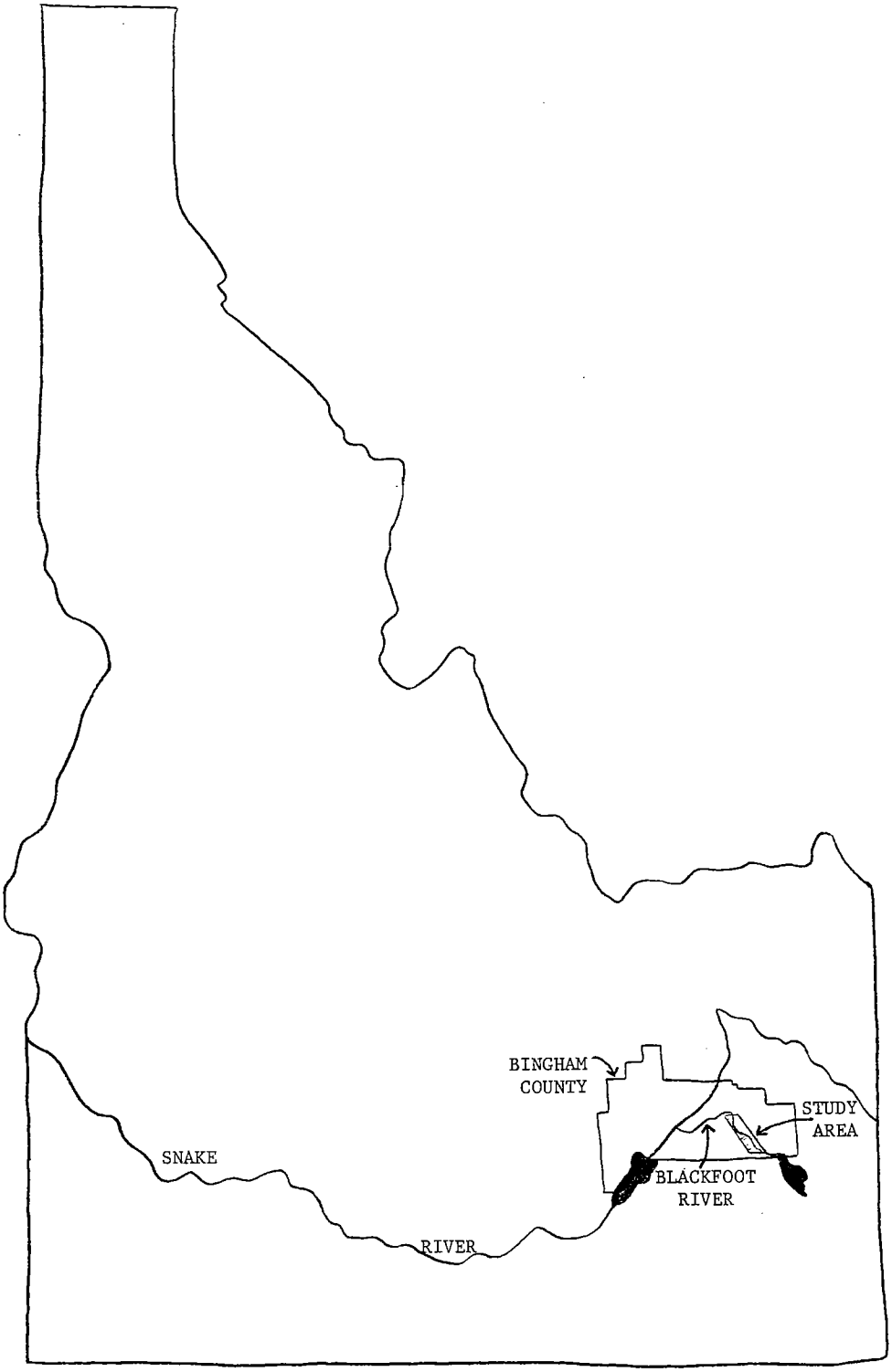

Figure 1. Blackfoot River study area in Bingham County, Idaho.

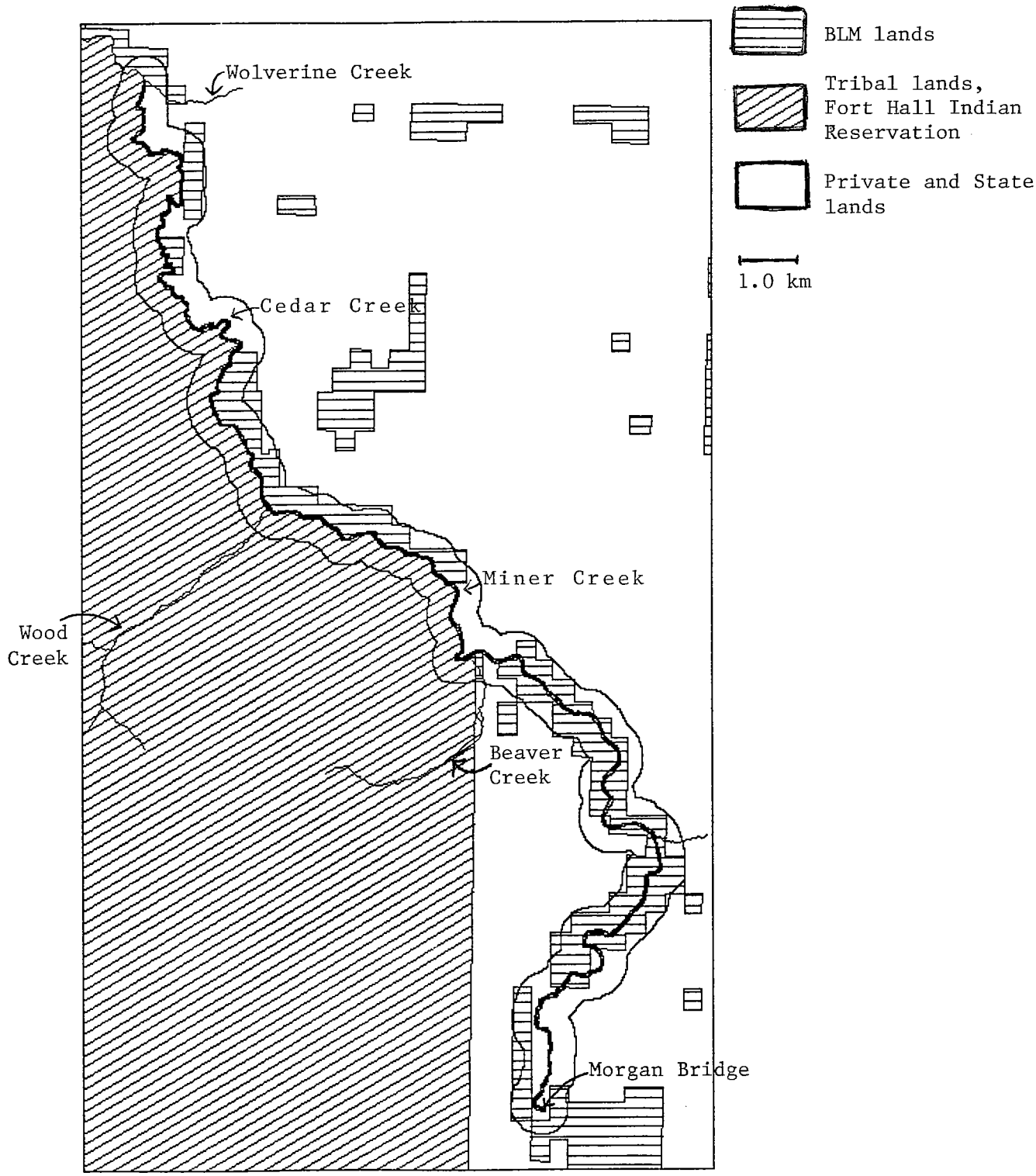

Figure 2. Blackfoot River study area boundaries (500 m on each side of the river) and land ownership.

stolonifera), mountain alder (Alnus incana), and willow (Salix spp.); and (6) agriculture, which included cultivated crops and pastureland.

The diversity of vegetation types in the BRSA provided habitat for a variety of wildlife, including 103 species of birds identified during the study (see Appendix A). Several bird species that occur in the study area have been given special status by state and federal agencies because of the species' restricted range, specific habitat requirements, and/or low numbers. Swainson's hawk are listed by BLM as sensitive species. Sharp-tailed grouse are listed by BLM as sensitive and are also designated as candidate species by FWS. Ferruginous hawks and merlins are occasionally seen in the area and both have been identified by Idaho Department of Fish and Game as species of special concern and by BLM as sensitive species. Bald eagles, a federally listed endangered species, winter along sections of the Blackfoot River. An abundance of cliffs and rock doves provide potential nesting habitat for the federally endangered peregrine falcon, which was released for reintroduction (in 1988 and 1989) at Grays Lake, about 45 km (28 mi.) southeast of the BRSA.

Big game species on the study area include an abundance of mule deer (Odocoileus hemionus), and fewer numbers of moose (Alces alces) and elk (Cervus canadensis), all of which use the area primarily in winter and early spring. Other conspicuous mammals found in the study area include white-tailed jackrabbits (Lepus townsendii), Nuttall's cottontails (Sylvilagus nuttallii), least chipmunks (Tamias minimus), yellow-bellied marmots (Marmota flaviventris), Uinta ground squirrels (Spermopholis armatus) (see Zeveloff 1988), red squirrels (Tamiasciurus hudsonicus), beavers (Castor canadensis), and red fox (Vulpes vulpes). Amphibians and reptiles observed and expected in the study area are listed in Appendix B.

METHODS

Foot surveys were used to search for nests of diurnal raptors. River sections were surveyed every week from 10 April through 21 June, and nest fates checked on 13, 17, and 18 July. Nest fate was not determined for several nests because the principal investigator was unable to conduct field work (due to an accident) after 21 June. For raptor and other wildlife sightings, observers recorded the species, age class, sex (if possible), activity, location, cover type, and time.

Rim tops, cliff bases, and stream bottoms were walked on both sides of the river when possible. Cliffs and rock outcrops were inspected for rocks stained with whitewash (feces), decorated or repaired nests, perches, plucking perches, and regurgitated pellets (Fuller and Mosher 1981, 1987; Reynolds 1982; Kochert 1986). Forest patches were searched for stick nests, cavities, perches, molted feathers, plucking perches, and prey remains. Behavioral observations were also used to locate nests. We watched for courtship displays, food deliveries, food transfers, copulation, nest building, active defense and calling by adults, and food begging by young (Fuller and Mosher 1981, 1987; Kochert 1986). Where territorial pairs were present, most of our time was spent locating nests of golden eagles, red-tailed hawks, prairie falcons, and Cooper's hawks, with little time spent trying to locate nests of kestrels, vultures, and owls. Raptor observations and nest sites were recorded in 1 of 6 cover types (see descriptions in above section).

Tape-recorded songs of owls (great horned, northern saw-whet, western screech, and long-eared) were used to survey owls by listening for an elicited response. Recordings to detect owls were used from 0.5 hr after sunset until about 0100 the next morning every week from 10 April (starting at Wolverine Creek) to 10 May (ending at Morgan Bridge). Surveys were not conducted during inclement weather. We used a portable casette tape player that was wired to a Portapage Megaphone to broadcast owl calls for 2-5 minutes at each stop, rotating the direction of the speaker after each set of calls. We remained at the stop for 3-5 minutes after the last broadcast to listen for a response. For continuous coverage, stops were spaced at 0.8 km (0.5 mi.) intervals along the canyon rim or riparian, or 0.4 km (0.25 mi) intervals where the noise from the river made it difficult to hear long distances. Suggestions for owl survey methods were provided by Greg Hayward (Univ. of Idaho) and described in Groves (1988). Approximate locations of vocal or visual detections, elicited from the recordings, were plotted on maps.

Tape-recorded songs of great horned owls were used to elicit a response from nesting Cooper's hawks (Johnson et al. 1981, Rosenfield 1985, Fuller and Mosher 1987). Owl songs were brodcast for 1-3 minutes, about every 5-10 minutes, while walking through forest patches and when near suspected Cooper's hawk nests. We walked slowly during playing of the tape and itermittently stopped to wait for a response.

Nesting areas were visited at least twice to confirm occupancy and breeding attempts. A pair of birds and, in some cases, territories occupied by a single adult constituted evidence for occupancy. Pairs of birds that showed no evidence of egg laying after repeated observations or after climbing into and examining potential nests were categorized as nonbreeding. A breeding attempt was confirmed if an occupied territory contained an incubating adult, eggs, young, or any other sign that eggs were laid (Steenhof 1987). The breeding attempt was considered successful if 1 or more young reached 80% of the age at which young normally leave the nest (Steenhof and Kochert 1982). Ageing keys developed by Hoechlin (1976) and Moritsch (1983a, 1983b) were used to age young of golden eagles, and prairie falcons and red-tailed hawks, respectively.

Nest locations were plotted on 7.5' topographic maps and digitized at U.S. Geological Survey. Coordinate values from the nest locations were entered into a data base (dBase III) and then imported into MOSS (a Geographic Information System). Information regarding nest visits were recorded on nest observation cards developed by the BLM (USDI 1982) (Appendix C). Data on nest sites were entered into a dBase III file (Appendix D).

RESULTS/DISCUSSION

General Discussion

Forty-three pairs of 10 species were found occupying territorities in the BRSA, including 6 species of diurnal raptors, 2 species of owls, turkey vultures, and common ravens (Table 1). Of the 18 territories where nests were located (Figure 3), 66% of the paired birds at those territories were known to breed (Figure 4). Old stick nests built by red-tailed hawks, golden eagles, ravens, and Cooper's hawks were found at 11 unoccupied sites within the river corridor (see Appendix D). Six breeding pairs of raptors, 4 red-tailed hawks

and 2 great horned owls, were found incidentally while travelling peripheral areas outside the study area boundary (Appendix E).

Table 1. Numbers of territorial pairs and known breeding attempts by raptors, turkey vultures, and common ravens in the 38 km river corridor of the Blackfoot River study area, 1989.

Species	No. Territorial Pairs	No. Known Breeding Attempts
Golden eagle	6[a]	1
Red-tailed hawk	5	4
Prairie falcon	2	2
Cooper's hawk	3	3
Swainson's hawk	1	NL[b]
American kestrel	6	NL
Great horned owl	7[c]	NL
Northern saw-whet owl	4[c]	NL
Turkey vulture	6	NL
Common raven	3	2
Total	43	

[a] Includes a site where a single adult was observed on 2 occasions near an eagle nest that was not decorated.

[b] No nests located.

[c] Based on voiced responses to tape recordings of owl songs.

Raptors in our study area averaged 0.89 pairs per km of river. Including vultures and ravens, the average was 1.13 pairs per km of river. We compared these averages to those of similiar habitat (basalt cliffs and sagebrush uplands) and species composition. Olendorff (1973) reported 0.24 pairs of large raptors per km of the Columbia River in Washington. He considered this low concentration a result of low prey populations and scarcity of suitable

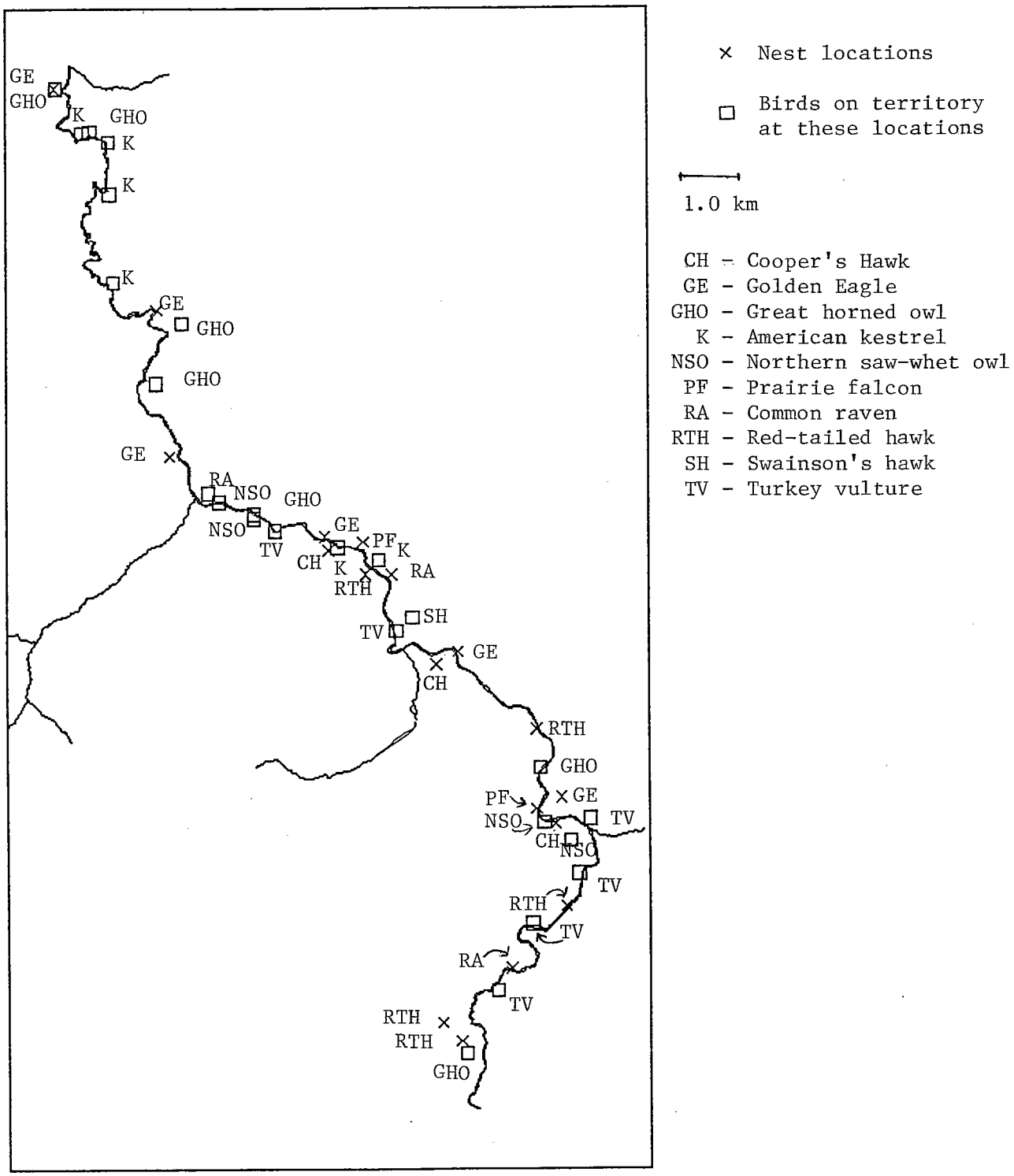

Figure 3. Distribution of 43 territories occupied by 10 species in the Blackfoot River study area, 1989.

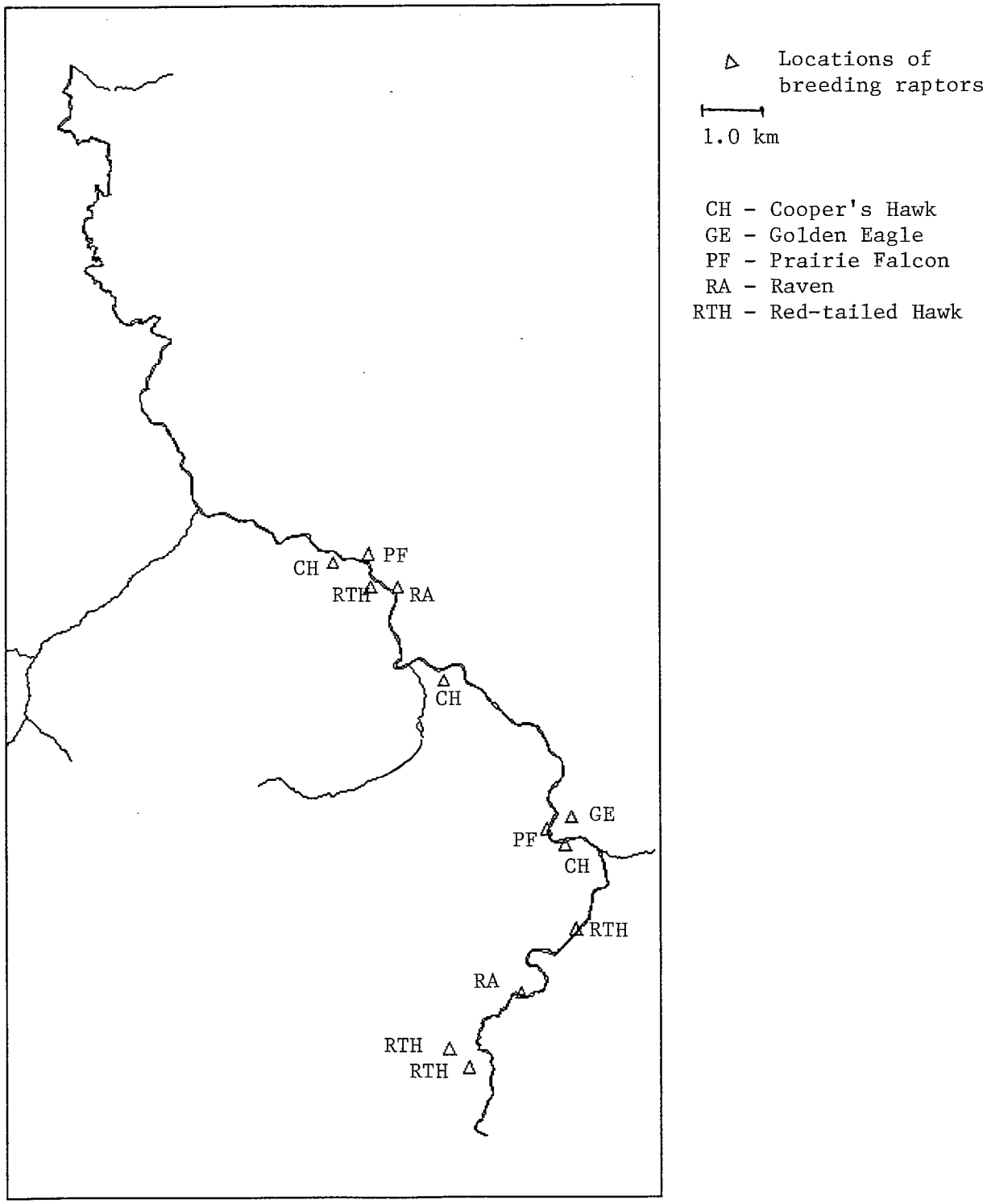

Figure 4. Distribution of diurnal raptors known to breed in the Blackfoot River study area, 1989.

nesting sites. Monk (1976) observed 2.47 pairs of raptors per km along 35.2 km of the Yakima River in Washington. Apparently, differences in topography between Olendorff's and Monk's study areas were marked (Knight et al. 1982). The Yakima River study area was within a steep-walled canyon with nearly continuous multi-tiered cliffs offering countless nesting sites. Knight et al. (1982) found an average of 1.21 pairs per km of river over 72 km of the Columbia River in Washington, most similiar to the density found in the BRSA. The highest concentrations of raptors reported in North America occur in the Snake River Birds of Prey Area (SRBPA) in southwestern Idaho. BLM biologists have projected an annual average of about 6 raptor pairs per km of river in the SRBPA (M. N. Kochert, U. S. Bureau of Land Management, pers. commun.).

Howard and Sather-Blair (1983) compared nesting densities of 3 raptor species (which also occur in the BRSA) in 2 sections of the Snake River Plain: the SRBPA (140 km of river) and a portion of river canyon near Twin Falls (TFSA) (36 km of river) (Table 2). The 2 areas were similar in raptor species composition, topography, soils, and vegetation. Elevations ranged from 700 m (2310 ft) in the SRBPA to 1024 m (3379 ft) at Twin Falls. Terrain was generally flat above the canyon rims. Precipitation in both study areas averaged about 23 cm. The TFSA had 73% agriculture, while the SRBPA had only 19% agriculture (measured within a 13 km corridor extending laterally from both sides of the river canyon). Overall there was a 3:1 increase in raptor nesting density in the SRBPA as compared to the TFSA (see Table 2). They considered this drastic difference in raptor density to be a result of land use patterns in the TFSA where agriculture reduced habitat for prey species used by raptors. They cautioned that similar reductions in raptor nesting densities could occur in the SRBPA if agriculture dominated the landscape.

The BRSA differs somewhat in climate, vegetation, and topography but has similar soils (deep, silty loams) and general habitat characteristics (basalt cliffs and sagebrush-grass associations) as the 2 Snake River study areas. With higher elevations present in the BRSA, the climate is cooler and the effective moisture is greater than the Snake River study areas. In addition to sagebrush-grass habitat on flat terrain, the BRSA has rolling terrain with juniper-grass associations and patches of Douglas-fir and aspen within the canyon rims, creating more structural diversity in the habitat.

Densities of 3 raptor species were twice as large in the TFSA and six times as large in the SRBPA as compared to the BRSA (Table 2). Nesting substrate did not appear to be limiting. Numerous patches of mature Douglas-fir and aspen provide nest trees for golden eagles, red-tailed hawks, and Cooper's hawks. Cliffs throughout the length of the study area offer many rock platforms and cavities on which to nest. Although cliff area was not measured during this study, inspection of cliffs in the BRSA and my familiarity with cliff characteristics in the SRBPA suggests that cliff nesting substrate was suitable in the BRSA. In addition, cliffs in the BRSA contained numerous old stick nests (built by large raptors) in areas that were not occupied by territorial raptors. This was probably a good indication that cliff nesting substrate was adequate, and that other factors may be responsible for the low densities of nesting raptors in the BRSA.

Many raptor populations have been limited by food; it is well documented that densities of principal prey species influence raptor productivity (e.g., Smith and Murphy 1979, Smith et al. 1981). Research in the SRBPA has shown that there were significant positive correlations between ground squirrel abundance and prairie falcon productivity (USDI 1979) and significant positive

correlations between jackrabbit densities and golden eagle productivity (Steenhof and Kochert 1989). Because little if any information exists on prey populations in the BRSA, it is difficult to determine how prey affected the raptor populations. However, we speculate that raptors in the BRSA were limited by food.

Table 2. Comparative nesting densities of 3 species of raptors in the Blackfoot River (BRSA) (38 km), Twin Falls (TFSA) (36 km), and Snake River Birds of Prey (SRBPA) (140 km) study areas [data taken from Howard and Sather-Blair (1983)].

Species	No. nesting raptors				Nesting density nests/river km		
	BRSA[a]	TFSA[b]	SRBPA[c]		BRSA	TFSA	SRBPA
Golden eagle	6	5	33		0.16	0.14	0.24
Red-tailed hawk	5	14	57		0.13	0.38	0.41
Prairie falcon	2	5	196		0.05	0.14	1.40
Total	13	24	286	Ave.	0.34	0.66	2.04

[a] No. territorial pairs occupying sites in 1989.

[b] No. nesting raptors in 1982.

[c] Average no. nesting raptors 1975-78.

Uinta ground squirrels had a limited distribution in the study area (based on observations during this study) (Figure 5), although they appeared abundant where present. Ground squirrels were never observed within study area boundaries downstream of Womack Hill to Wolverine Creek (Figure 5). Interestingly, diurnal raptors that prey on ground squirrels (prairie falcons, red-tailed hawks, and golden eagles) were not found breeding downstream of Womack Hill (cf. Figure 4). Known locations of ground squirrels and breeding raptors were similar in distribution and it appeared that dirunal raptors were selecting nest sites near colonies of ground squirrels. In the SRBPA, the distribution of nesting prairie falcons and red-tailed hawks corresponded closely to the distribution of Townsend ground squirrels (*Spermopholis townsendii*); raptor densities were highest where squirrel numbers were greatest (USDI 1979). Prairie falcons, red-tailed hawks, and golden eagles can certainly fly long distances to catch prey [up to 25 km for prairie falcons (USDI 1979)] but foraging nearby is more energy efficient. Although percent of agriculture was not measured in the BRSA, after inspection of aerial photos, it appeared to be considerably less than that in the TFSA and similar to that in the SRBPA. We noted that most agricultural lands in

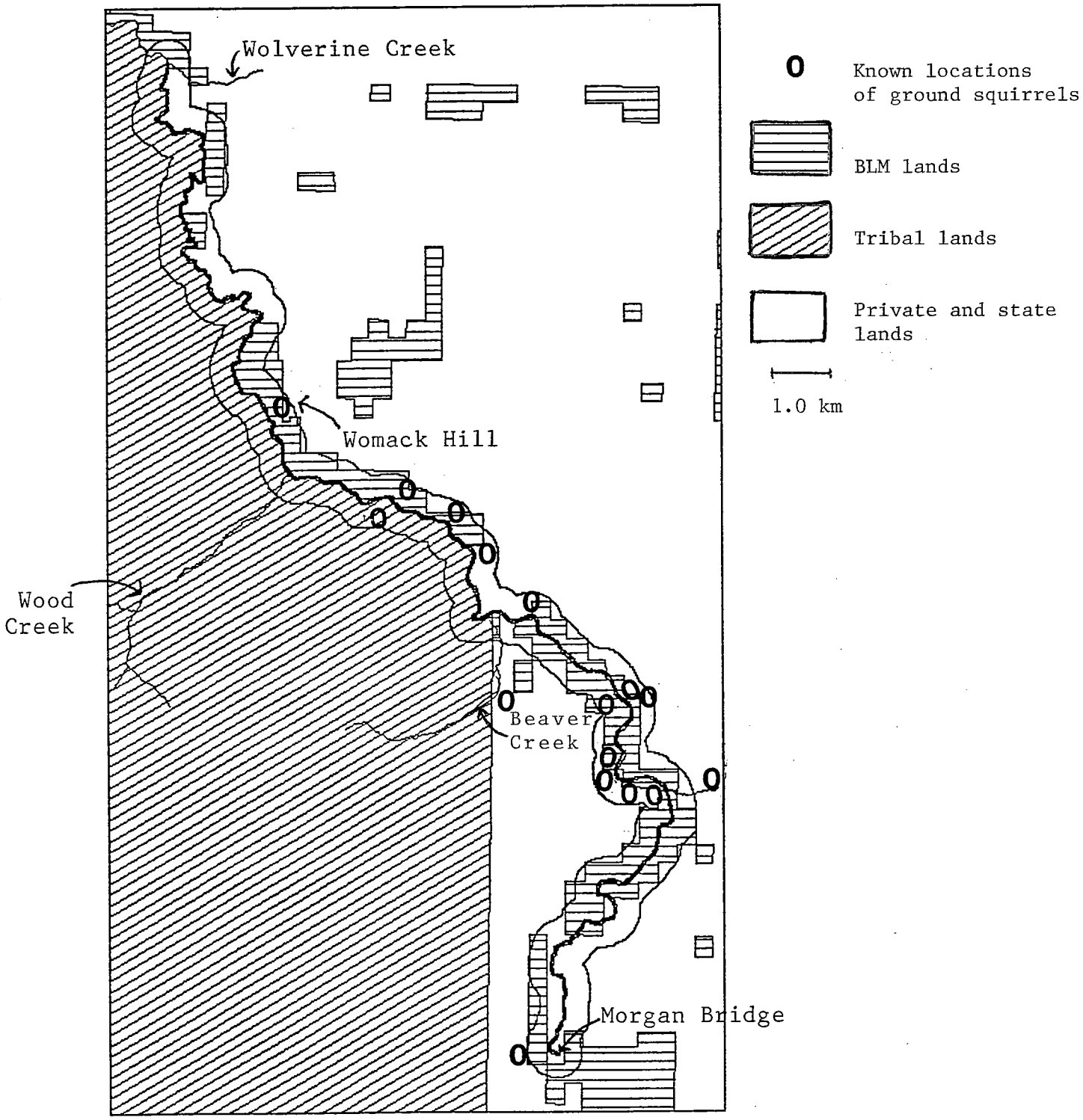

Figure 5. Known locations of Uinta ground squirrels in the Blackfoot River study area, 1989.

and adjacent to the BRSA occurred downstream of Womack Hill, where ground squirrels were not observed (Figure 5). Type of agriculture, which differs between the BRSA and the Snake River study areas, could have different effects on prey species. Agriculture in the BRSA is primarily dryland, whereas irrigated agriculture dominates the Snake River study areas. Irrigated agriculture usually stays greener longer and provides more succulent vegetation; thus, probably being more palatable to ground squirrels. Soils can also affect the distribution of ground squirrels because textures must be suitable for burrowing. We hypothesized that soils would be different in squirrel use and non-use areas but found there were no differences (see USDA 1973).

During this study, only 11 white-tailed jackrabbits were seen from the road over 1459 km (912 mi.) travelled in the BRSA and peripheral areas (included those jackrabbits seen within 5 m either side of the road) . By contrast, 101 black-tailed jackrabbits were observed from the road over 710 km (444 mi.) travelled in the SRBPA from 15 May to 3 June 1989 (J. Doremus, U. S. Bureau of Land Managemnt, pers. commun.). This indicates that jackrabbit numbers were extremely low in the BRSA, possibly explaining the low percentage of golden eagles that attempted to breed in 1989 (see discussion below). Jackrabbit populations are cyclic and usually peak every 10 years. The last peak in rabbit numbers occurred in 1981-82 in southeastern Idaho, so they should be expected to peak again in 1991-92.

Golden Eagles

Pairs of golden eagles occupied 5 territories, and a single adult was observed near an old eagle nest on 2 different occasions (Appendix F). Nests were built on cliffs in all territories and alternate nests at 2 of 6 sites were built in trees (Table 3). One breeding attempt was recorded during the inventory (Figure 4). Nest fate was not determined for this nest; however, the 1 young produced appeared healthy and near 80% of fledging age (ca. 46 days vs. 51 days for 80% fledging) when last seen in the nest on 19 June. Breeding chronology was determined by back-dating from dates of known activities. Chronology was as follows: courtship -February/late March; incubation - 22 March/4 May; hatching - 4 May; brood-rearing - 4 May/7 July; and fledging - 7 July. This chronology averaged 3 weeks later than that reported for golden eagles in the SRBPA (USDI 1977).

Assuming that there were 6 occupied territories, only 17% or 1 pair of eagles was known to breed (Table 1, Figure 4). This percentage was extremely low compared to the percent of eagle pairs occupying territories that laid eggs (39-100%) in the SRBPA from 1971 to 1988 (Steenhof and Kochert 1989). It could be that we were unable to locate the nests used for egg-laying. We intensively searched all cliffs and forest patches within the canyon rim but perhaps some pairs nested in trees outside the canyon. More likely, low numbers of jackrabbits (principal prey of golden eagles) were probably associated with the low percentage of eagle pairs that laid eggs. Steenhof and Kochert (1989) found that jackrabbit abundance was significantly and positively correlated with the percent of eagle pairs that attempted to breed in the SRBPA over a 17-year period. Other raptors are known to remain in nesting areas but do not lay eggs during periods of low prey abundance (Southern 1970, Adamcik et al. 1978, Village 1981).

Table 3. Structure and habitat of occupied nest sites in the Blackfoot River study area, 1989.

	No. nests				
	Structure/Habitat				
Species	Cliff/ Sagebrush	Cliff/ Agriculture	Tree/ Aspen	Tree/ D.Fir	Tree/ Juniper
Golden eagle	6			2[a]	
Red-tailed hawk	1		2	2	
Cooper's hawk				3	
Prairie falcon	2				
Great horned owl[b]	2	1	1	1	2
Northern saw-whet owl[b]			1	3	

[a] Alternate nests not decorated this year.

[b] Nests not actually found; based on owl calls and visual locations in those habitats.

Mean distance between adjacent occupied sites for golden eagles was 3.63 km (range 1.94-5.17 km) (Table 4). This was similar to that reported by Phillips et al. (1984) where the mean distance between sites was 3.4 km in a sagebrush-mixed riparian habitat in southern Wyoming. Phillips et al. (1984) also reported an overall mean distance of 5.3 km (range 3.1-8.2 km) for 12 survey areas in Wyoming (including the area above), which included habitats of pine-grassland, grassland-rimrock, sagebrush-agriculture, sagebrush-rimrock, and grassland-agriculture. They explained that golden eagle territories appeared evenly spaced in many parts of Wyoming where nest sites were abundant. Golden eagle nests associated with ponderosa pine (Pinus ponderosa) and cottonwood (Populus spp.) forests were more closely spaced and evenly distributed than those in open sagbrush-grassland where nest trees were scarce. In north-central Washington, the average distance between occupied nests of golden eagles was 11.5 km (Knight et al. 1982), much larger than that in the BRSA. The mean distance between nearest adjacent pairs in the SRBPA was 3.47 km (USDI 1979), very similar to that observed in the BRSA and in Wyoming.

Table 4. Raptor density and spatial relationships along 38 km of the Blackfoot River, Bingham County, Idaho, 1989.

Species	No. Pairs	Mean distance between adjacent occupied sites (km)	Range of distance between adjacent occupied sites (km)
Golden eagle	6	3.63	1.94 - 5.17
Red-tailed hawk	5	3.40	0.55 - 4.86
Cooper's hawk	3	3.74	3.30 - 4.17
Prairie falcon	2	6.67	----
Great horned owl	7	4.06	1.42 - 8.01
Northern saw-whet owl	4	3.42	0.66 - 8.83

Minimum distances between eagle pairs in the SRBPA and the TFSA were 0.96 km and 4.34 km, respectively (USDI 1979, Howard and Sather-Blair 1983). Differences in golden eagle territory size reflect differences in habitat types, prey densities, local topography, and nesting densities (Collopy and Edwards 1989). Golden eagles in the BRSA occupied sites in relatively close proximity compared to the other mentioned study areas. Perhaps the diverse topography, characterized by the winding river, hills, and trees, provided visual barriers allowing the eagles to be more tolerant of their neighbors.

Red-tailed Hawks

Five pairs of red-tailed hawks occupied territories (Appendix G), and 4 of these were known to breed (Figure 4). Nest fate was successful for 2 pairs and unknown for the other 2. Breeding chronology was determined by back-dating from dates of known activities and chronology was as follows: courtship - late March/early May; incubation - 16-29 April/16-29 May; hatching - 16-29 May; brood-rearing - 16-29 May/24 June-7 July; and fledging - 24 June/ 7 July. This chronology averaged 3 weeks later than that reported for red-tailed hawks in the SRBPA (USDI 1977).

Eighty percent of the nests were built in trees (Table 3), indicating that redtails in the BRSA (where cliffs were abundant and appeared suitable) preferred trees to cliffs for nest placement. Two nests were built in mature aspens and the other 2 in mature Douglas-firs. Nests were built in the larger trees of forest patches, and exhibited good visibility of the area surrounding them. Alternate nests found in territories occupied by tree-nesters were in trees. We did not find any alternate nests in the territory occupied by the cliff-nesting redtail.

Mean distance between adjacent occupied sites for red-tailed hawks was 3.40 km (range 0.55-4.86 km) (Table 4). The minimum distance between nests in the BRSA (0.55 km) was similar to that in the SRBPA (0.34 km) but much closer than those in north-central Washington (2.7 km) and the TFSA (1.93 km) (USDI 1979, Knight et al. 1982, Howard and Sather-Blair 1983). In Washington and the Snake River study areas, redtails nested primarily in cliffs, whereas

redtails in the BRSA nested primarily in trees. Tree nesting and the diverse topography in the BRSA provided visual barriers, probably allowing the hawks to nest closer.

Prairie Falcons

Two pairs of prairie falcons occupied territories (Appendix H) and both were successful breeders (Appendix D). Breeding chronology was determined by back-dating from dates of known activities and chronology was as follows: courtship - late March/April; incubation -26 April/27 May; brood-rearing - 27 May/5 July; and fledging - 5 July. This chronology averaged 3 weeks later than that reported for prairie falcons in the SRBPA (USDI 1977).

This density of prairie falcons (0.05 nests/river km) was extremely low considering the availability and quality of cliff nesting substrate. Prairie falcon densities were nearly 3 and 28 times as large in the TFSA and SRBPA, respectively (Table 2).

Some prairie falcons might not have been detected during the survey, although we surveyed the full length of the study area twice. By the time of egg-laying (26 April), we had completed the first ground search of the study area, and by hatching (27 May) we had completed the second full survey of the study area. Allen (1987) reported that about 22% of occupied prairie falcon aeries might not have been seen during a single ground survey if they had not been previously known. Investigator nest visits do not always elicit a response by adults. Some adults may be secretive, and many are less defensive and less visible near their nests after nesting failures (Allen 1987).

The density of ground squirrels (principal prey for prairie falcons) and their patchy distribution probably influenced the density of nesting prairie falcons. Drought conditions for 2 consecutive years (1988-89) in southeastern Idaho might have reduced ground squirrel numbers, which could have reduced occupancy by prairie falcons. The population density of Townsend ground squirrels in the SRBPA was reduced by more than one-half as a result of the 1977 drought (Smith and Johnson 1985). Two years before the 1977 drought prairie falcons occcupied an average of 90.5% of preselected traditional sites, but after the drought occupancy dropped to an average of 76.5% in 1977 and 1978 (USDI 1979). Percent of prairie falcons breeding also dropped; between 1974-78 the percentage of breeding attempts was lowest in 1977. These reductions in occupancy and breeding were explained by the lower densities of ground squirrels in the SRBPA (USDI 1979).

Cooper's Hawks

Three pairs of Cooper's hawks occupied territories and attempted to breed (Appendix I); 2 were successful and 1 nest fate was unknown. Breeding chronology was determined by back-dating from the estimated age of young and averaging the dates for the 2 successful nests. Chronology was as follows: courtship - mid April/May; incubation -24 May/24 June; brood-rearing - 24 June/23 July; and fledging - 23 July. This chronology averaged 10 days later than that reported for Cooper's hawks in Oregon (Reynolds 1983).

Cooper's hawks retain juvenal plumage for 1 year and generally do not breed the first year (Reynolds and Wight 1978). We found a female in juvenal plumage breeding successfully at Short Creek Butte. Others have reported Cooper's hawks in juvenal plumage breeding successfully (Moore and Henny

1984). Raptors breeding in juvenal plumage may be evidence of favorable breeding conditions or higher numbers of unoccupied territories (Newton 1979). In the BRSA, we found 1 unoccupied Cooper's hawk nest and, based on available habitat, we suspect that there were others.

Cooper's hawks demonstrated the most narrow use of habitats for nest sites, using only Douglas-firs (Table 3). Nests were constructed in the medium-sized trees within forest patches and were placed about 10-12 m up the tree. All nests were located on moderately steep (ca. 25-35% slope) and north-facing slopes. Two nests were on horizontal limbs against the trunk and one was in the crotch of a double trunk. All nests were immediately below the nest-tree crown. Characteristics of slope, aspect, and nest placement were similar to those reported for nests of Cooper's hawks in Oregon (Reynolds et al. 1982).

Cooper's hawks are known to nest in deciduous forest patches, especially along stream courses, in the western United States (see Jones 1981). We expected to find Cooper's hawk nests in aspens but none were found there. In early May, 1 Cooper's hawk in an aspen patch responded to the recording of the great horned owl song. The only other Cooper's hawks associated with aspens in our study area were those that appeared to be hunting.

Reynolds et al. (1982) explained that the tendency for Cooper's hawks (and Accipters generally) to nest on northern and eastern aspects demonstrated a preference for cooler, more protected sites. They theorized that having evolved primarily in woodland habitats, accipiters may have low tolerances of high temperatures and direct sunlight. This could explain why Cooper's hawks in the BRSA selected Douglas-fir over aspen. Douglas-firs grew on moderately steep, north- and east-facing slopes, which provided cooler, more protected sites. Aspens tended to grow on gentler, more exposed terrain, probably creating a warmer microclimate.

Great Horned Owls

Broadcasting tape recordings of owl songs elicited vocal responses on 6 occasions and approach on 1 occasion by great horned owls. In addition to responding to horned owl songs, great horned owls responded to the song of long-eared owls. Based on these responses, we assumed that there were 7 potential breeding territories (Appendix J). Judging from this information, the great horned owl was the most common raptor in the study area. No nests were located in the study area; however, we determined breeding chronology from a nest near the study area boundary. Chronology was as follows: courtship - February/March; incubation - 21 March/24 April; hatching - 24 April; brood-rearing (approximate time in the nest before branching) - 24 April/1 June; and fledging (attaining flight) - 3 July.

Great horned owls displayed the greatest use of habitats for territory and/or nest sites (Table 3), indicating that they were the most adaptable raptor in the study area. They were found in all cover types except riparian, where nest structures were limited. Horned owls do not build their own nests; they use abandoned nests built by other raptors and corvids, and a variety of other structures including cliffs. We searched for large stick nests in riparian areas before leaf-out. We were hoping to find horned owls and long-eared owls using old corvid nests but found only a few unoccupied magpie nests.

Mean distance between adjacent occupied sites for great horned owls was 4.06 km (range 1.42-8.01 km) (Table 4). This was similar to that reported by Knight et al. (1982) for great horned owls in Washington, where the mean distance between pairs was 3.9 km (range 0.8-10.3 km).

Northern Saw-whet Owls

Northern saw-whet owls responded to tape recordings of owl songs (both saw-whet and great horned) on 4 occasions. Based on these responses we assumed that there were 4 saw-whet owl breeding territories (Appendix K). No nests were located.

Saw-whet owls are secondary cavity nesters and use low-elevation deciduous woodlands to high elevation coniferous forests (Reynolds et al. 1989). This owl species was found in both aspen and Douglas-fir woodlands in the BRSA (Table 3).

Mean distance between adjacent occupied sites was 3.42 km (range 0.66-8.83 km) (Table 4) and density of saw-whets was 0.11 singing owls/river km. Swengel and Swengel (1987) reported a population density of 5.0 singing saw-whets/km^2 in Wisconsin, a density far higher than in the BRSA. Their study area was in a mixed hardwood-coniferous forest that provided continuous woodland habitat, unlike that in the BRSA where the habitat was patchy. Swengel and Swengel (1987) also used tape-recorded calls for their census; however, their stops were spaced 100 m apart, whereas our stops were spaced 400 m or 800 m apart. With stops placed so close together in Wisconsin, they could have been hearing some of the same owls. Hayward (1983) conducted forest owl surveys in coniferous forests in central Idaho and he recommended stops every 400-800 m for adequate coverage.

In Wisconsin saw-whet owl detectiblility was highest in March and dropped considerably in April (Swengel and Swengel 1987). In southwestern Idaho and southern British Columbia, saw-whets begin nesting in March (USDI 1988, Cannings 1987). This suggests that in the BRSA we should have conducted the owl surveys earlier in the season to have greatest detectibility.

In order to survey the entire study area before the end of May, we surveyed past midnight on many nights. Some owls might not have responded in late evening/early morning hours because the most vocal period is often 2-3 hours after sunset (see Groves 1988).

Other Raptors, Turkey Vultures, and Ravens

No nests were found of the species discussed in this section because relatively little time was spent trying to locate their nests. Paired American kestrels were observed regularly in 6 locations (Table 1, Figure 3). Kestrels were rarely observed along the upstream half of the study area and no paired birds were seen there. Most agricultural lands occurred in the downstream half of the study area, where kestrel pairs were located. This suggests that kestrels were associated with agriculture in the BRSA.

Swainson's hawks were seen occasionally throughout the study area but were more often observed in the agricultural lands to the north. Only 1 pair of Swainson's hawks was observed courting in the study area near Miner Creek (Figure 3). In this same area, a single adult was seen on several occasions perched near the edge of an aspen patch.

Common ravens seemed fairly common, although only 3 known pairs occupied sites and 2 of those were known to breed. Turkey vultures were very common throughout the study area and pairs of birds were observed in 6 locations (Figure 3). Locating turkey vulture nests often proves difficult because they are not audibly defensive at nest sites as many raptors. They are versatile in the types of sites chosen for nesting, using ledges and caves in cliffs, hollow logs, tree stumps, brushy thickets, and rocky terrain (see Ehrlich et al. 1988).

In early April groups of more than 8 vultures were seen regularly and a roost was found in Douglas-firs near Deer Creek. Vultures were probably taking advantage of winter-killed mule deer, an abundant food source in the Blackfoot River area. The hunting unit within this area had a 2-deer limit, indicating that the mule deer population was abundant and doing well.

Northern harriers were uncommon in the study area but seen more often in the agricultural lands to the north. We expected to find nesting harriers in meadows and brushy areas although none were found. Single birds (both male and female) were seen regularly over the pastureland south of Cedar Creek but courtship behavior was never observed.

No western screech-owls or long-eared owls were seen or heard during this study, although we expected to encounter them. Screech-owls have never been sighted in the study area and possibly the elevation is too high, creating a climate unsuitable for them. A single long-eared owl was observed in the riparian near Trail Creek bridge in 1988 (Frank Renn, pers. commun.). Additional evidence of long-eared owls in the study area was indicated by vocal responses of great horned owls to the tape recorded songs of long-eared owls.

Long-eared owls primarily nest in abandoned corvid nests. We searched riparian areas for old corvid nests hoping to find nesting long-eared owls but in the BRSA magpies and crows rarely built nests in riparian vegetation. Magpies built nests in primarily junipers and crows used junipers, conifers, and aspens. This made it more difficult to find long-eared owls because, unlike the SRBPA, corvid nests were not concentrated in the deciduous trees along the river.

Other Birds

A wide variety of songbirds were found in the study area (see Appendix A). Bird species richness was greatest in aspen communities (33 species), with fewer birds found using sagebrush (29 species), riparian (28 species), juniper (24 species), Douglas-fir (20 species), and agriculture (19 species).

Studies of montane birds have demonstrated that aspen forests are rich in both density and diversity of birds (see Winternitz 1980). Many montane breeding birds have shown a preference for aspen vegetation over conifers. Winternitz (1980) found that several properties of aspen forests were related to breeding bird diversity (numbers and richness); these included abundance of insects, ground moisture levels, nesthole availability, and foliage height diversity. These were probably some of the factors responsible for attracting birds to aspen communities in the BRSA.

MANAGEMENT IMPLICATIONS

The Pocatello Resource Management Plan (RMP) and Environmental Impact Statement analyzed some existing and potential impacts of various activities on wildlife habitat along the Blackfoot River (USDI 1987). Analysis of impacts primarily addressed riparian issues. The RMP did not recognize the Blackfoot River as an important resource for raptors. However, in 1989 Olendorff et al. recognized the BLM land along the Blackfoot River as a "key raptor area".

Primary threats to raptors and their habitat in the Blackfoot River area include hydroelectric development of the river, livestock grazing, agricultural development, utility lines, mining, and recreation. Olendorff et al. (1989) reviewed various land-use actions and their effects (both beneficial and detrimental) on raptors and raptor habitats. According to their evaluation, in the Blackfoot River area all potential land uses except utility lines and some types of recreation would adversely modify habitat and diminish biological diversity. These types of land use actions commonly preclude reproduction or traditional use of habitat for long periods of time or permanently (Olendorff et al. 1989).

Raptors are sensitive indicators of habitat conditions and are usually among the first group of birds to decline when habitats are lost or degraded (Hickey 1969). That is why monitoring is important to determine population trends, habitat trends, actions stated in management plans, and effectiveness of mitigation measures (Olendorff et al. 1989). Monitoring efforts should be directed towards those species that are most sensitive to land use changes and human disturbance. Those species that are probably most sensitive, based on relatively narrow food niche breadth and nesting habitat, include golden eagles, prairie falcons, and Cooper's hawks. Those species that select a wider variety of prey and nest sites (e.g., red-tailed hawks and great horned owls) are probably more adaptable to changes and less likely to suffer major impacts.

This 1 year inventory of breeding raptors along the Blackfoot River provides a baseline from which to monitor in the future. Consecutive-year sampling should reduce survey problems and the effects of annual fluctuations in nesting. To measure environmental changes, resource managers need not only baseline data on distribution and abundance (objectives of this study) but also on productivity of raptors. This will provide a basis for evaluating the future status of these species in southeastern Idaho.

Needed changes in survey methods were recognized. Owl surveys should be conducted in March and April. Access to the Blackfoot River is limited that time of year and a snowmobile or 4-wheeler would be necessary for travelling. Also, owl surveys should not be conducted past midnight.

An outline of recommendations for monitoring follows.

1. Four years of baseline data on productivity are probably needed to evaluate changes in productivity that might be due to land-use actions; most likely, 4 years of data would clarify changes in productivity due to rodent cycles.

2. This effort would require 2 people for 4-8 days a month in April, May, June, and July; cliffs and trees should be surveyed with equal time beginning in May.

3. Once baseline data collection on productivity is completed, then occupancy and breeding attempts could be checked for preselected sites, which would reduce the amount of work power needed to monitor in the future.

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Appendix A. Bird species identified in the Blackfoot River study area during March - July 1989.

Species	Habitat
Great blue heron (*Ardea herodias*)	Riparian/meadow, River/pond
Canada goose (*Branta canadensis*)	Riparian/meadow, River/pond, Cliff, Agriculture
Green-winged teal (*Anas crecca*)	River/pond
Mallard (*Anas platyrhynchos*)	River/pond
Cinnamon teal (*Anas cyanoptera*)	River/pond
American wigeon (*Anas americana*)	River/meadow, River/pond
Ring-necked duck (*Aythya collaris*)	River/pond
Lesser scaup (*Aythya affinis*)	River/pond
Barrow's goldeneye (*Bucephala islandica*)	River/pond
Common merganser (*Mergus merganser*)	River/pond
Red-breasted merganser (*Mergus serrator*)	River/pond
Turkey vulture (*Cathartes aura*)	Sagebrush, Cliff
Bald eagle (*Haliaeetus leucocephalus*)[a]	
Northern harrier (*Circus cyaneus*)	Sagebrush, Mountain Brush, Riparian/pond
Sharp-shinned hawk (*Accipiter striatus*)	Aspen, Douglas Fir
Cooper's hawk (*Accipiter cooperii*)	Douglas Fir, Juniper, Aspen
Swainson's hawk (*Buteo swainsoni*)	Sagebrush, Aspen, Agriculture
Red-tailed hawk (*Buteo jamaicensis*)	Juniper, Aspen, Douglas Fir
Ferruginous hawk (*Buteo regalis*)	Sagebrush
Golden eagle (*Aquila chrysaetos*)	Sagebrush, Cliff
American kestrel (*Falco sparverius*)	Sagebrush, Douglas Fir, Cliff
Merlin (*Falco sparverius*)[a]	

Appendix A. (p.2)

Species	Habitat
Peregrine falcon (*Falco peregrinus*)[a]	
Prairie falcon (*Falco mexicanus*)	Sagebrush, Cliff
Gray partridge (*Perdix perdix*)	Sagebrush
Ring-necked pheasant (*Phasianus colchicus*)	Sagebrush, Agriculture
Ruffed grouse (*Bonasa umbellus*)	Aspen
Sage grouse (*Centrocercus urophasianus*)	Sagebrush
Sharp-tailed grouse (*Tympanuchus phasianellus*)	Sagebrush, Mountain Brush, Aspen
Sandhill crane (*Grus canadensis*)	Riparian/meadow
Killdeer (*Charadrius vociferus*)	River, Agriculture
Willet (*Catoptrophorus semipalmatus*)	Douglas Fir
Spotted sandpiper (*Actitis macularia*)	River
Common snipe (*Gallinago gallinago*)	Riparian/meadow
Franklin's gull (*Larus pipixcan*)	Sagebrush, Agriculture
Ring-billed gull (*Larus delawarensis*)	Agriculture
California gull (*Larus californicus*)	Agriculture
Rock dove (*Columba livia*)	River, Cliff, Sagebrush
Mourning dove (*Zenaida macroura*)	Sagebrush, Mountain brush
Western Screech-owl (*Otus kennicottii*)[a]	
Great horned owl (*Bubo virginanus*)	Sagebrush, Cliff, Agriculture
Long-eared owl (*Asio otus*)[a]	
Northern saw-whet owl (*Aegolius acadicus*)	Douglas Fir
Common nighthawk (*Chordeiles minor*)	Sagebrush, Agriculture
White-throated swift (*Aeronautes saxatalis*)	Cliff

Appendix A. (p.3)

Species	Habitat
Black-chinned hummingbird (*Archilochus alexandri*)	Sagebrush, Mountain brush
Belted Kingfisher (*Ceryle alcyon*)	River
Lewis' woodpecker (*Melanerpes lewis*)	Aspen
Red-naped sapsucker (*Sphyrapius nuchalis*)	Aspen, Riparian/meadow
Hairy woodpecker (*Picoides villosus*)	Aspen, Douglas Fir
Northern flicker (*Colaptes auratus*)	Sagebrush, Juniper
Hammonds's flycatcher (*Empidonax hammondii*)	Douglas Fir
Dusky flycatcher (*Empidonax oberholseri*)	Aspen, Riparian/meadow
Western kingbird (*Tyrannus verticalis*)	Agriculture
Eastern kingbird (*Tyrannus tyrannus*)	Sagebrush, Riparian/meadow
Horned lark (*Eremophila alpestris*)	Agriculture
Tree swallow (*Tachycineta bicolor*)	Aspen, Riparian/meadow, Cliff
Violet-green swallow (*Tachycineta thalassina*)	Cliff, River/Riparian
Northern rough-winged swallow (*Stelgidopteryx serripennis*)	Agriculture
Bank swallow (*Riparia riparia*)	Riparian/meadow
Cliff swallow (*Hirunda pyrrhonota*)	Cliff, Riparian
Barn swallow (*Hirundo rustica*)	Agriculture
Pinyon jay (*Gymnorhinus cyancephalus*)	Juniper
Black-billed magpie (*Pica pica*)	Sagebrush, Juniper
American crow (*Corvus brachyrhynchos*)	Juniper, Aspen
Common raven (*Corvus corvax*)	Sagebrush, Juniper, Aspen, Cliff, Agriculture
Black-capped chickadee (*Parus atricapillus*)	Aspen, Riparian/meadow

Appendix A. (p.4)

Species	Habitat
Plain titmouse (Parus inornatus)	Juniper
Rock wren (Salpinctes obsoletus)	Sagebrush, Juniper, Cliff
House wren (Troglodytes aedon)	Aspen, Riparian/meadow, Cliff
American dipper (Cinclus mexicanus)	Riparian/meadow, River
Ruby-crowned Kinglet (Regulus calendula)	Aspen, Douglas Fir, Riparian/meadow
Blue-gray gnatcatcher (Polioptila caurulea)	Juniper
Mountain bluebird (Sialia currucoides)	Sagebrush, Juniper, Aspen, Agriculture
Townsend's solitaire (Myadestes townsendi)	Juniper
Veery (Catharus fuscescens)	Riparian/meadow
Swainson's thrush (Catharus ustulatus)	Douglas Fir
American robin (Turdus migratorius)	Juniper, Aspen, Riparian/meadow
Gray catbird (Dumetella carolinensis)	Riparian/meadow
Cedar waxwing (Bombycilla cedrorum)	Mountain brush, Juniper
European starling (Sturnus vulgaris)	Agriculture
Warbling vireo (Vireo gilvas)	Aspen
Orange-crowned warbler (Vermivora celata)	Mountain brush, Aspen
Yellow warbler (Dendroica petechia)	Juniper, Aspen, Douglas Fir
Yellow-rumped warbler (Dendroica coronata)	Douglas Fir
Black-throated gray warbler (Dendroica nigrescens)	Juniper
MacGillivray's warbler (Oporonis tolmiei)	Douglas Fir, Riparian/meadow
Yellow-breasted chat (Icteria virens)	Riparian/meadow
Western tanager (Piranga ludoviciana)	Juniper, Aspen, Douglas Fir, Riparian/meadow

Appendix A. (p.5)

Species	Habitat
Black-headed grosbeak (*Pheucticus melanocephalus*)	Aspen, Douglas Fir, Riparian/meadow
Lazuli bunting (*Passerina amoena*)	Sagebrush, Mountain brush, Juniper, Douglas Fir, Riparian/meadow
Green-tailed towhee (*Pipilo chlorurus*)	Sagebrush, Mountain brush, Juniper
Chipping sparrow (*Spizella passerina*)	Juniper, Aspen, Douglas Fir, Riparian/meadow
Brewer's sparrow (*Spizella breweri*)	Sagebrush
Vesper sparrow (*Pooecetes gramineus*)	Sagebrush
Fox sparrow (*Passerella iliaca*)	Juniper, Riparian/meadow
Song sparrow (*Melospiza melodia*)	Riparian/meadow
White-crowned sparrow (*Zonotrichia leucophryus*)	Aspen
Dark-eyed junco (*Junco hyemalis*)	Douglas Fir
Red-winged blackbird (*Agelaius phoeniceus*)	Riparian/meadow
Western meadowlark (*Sturnella neglecta*)	Sagebrush
Brewer's blackbird (*Euphagus cyanocephalus*)	Agriculture
Brown-headed cowbird (*Molothrus ater*)	Juniper, Aspen, Agriculture
Northern oriole (*Icterus galbula*)	Riparian/meadow
Cassin's finch (*Carpodacus cassinii*)	Juniper, Aspen
Pine siskin (*Carduelis pinus*)	Douglas Fir
American goldfinch (*Carduelis tristis*)	Juniper, Aspen, Riparian/meadow
House sparrow (*Passer domesticus*)	Agriculture

[a] Mentioned in the text but not observed during the study.

Appendix B. Amphibian and reptile species observed[a] and expected[b] [based on Groves (1989)] in the Blackfoot River Study area.

Species	Habitat
Tiger salamander (Ambystoma tigrinum)[b]	Sagebrush
Western toad (Bufo boreas)[a]	All habitats
Striped chorus frog (Pseudacris triseriata)[b]	Riparian/pond/meadow
Great Basin spadefoot (Scaphiopus intermontanus)[b]	Sagebrush, Juniper
Northern leopard frog (Rana pipiens)[b]	Riparian/meadow/pond
Sagebrush lizard (Sceloporus graciosus)[a]	Sagebrush, Juniper
Short-horned lizard (Phrynosoma douglassii)[b]	Sagebrush, Juniper
Western skink (Eumeces skiltonianus)[a]	Sagebrush, Juniper
Rubber boa (Charina bottae)[b]	Sagebrush, Juniper, Aspen
Racer (Coluber constrictor)[a]	Sagebrush
Gopher snake (Pituophis melanoleucus)[a]	Sagebrush, Douglas Fir
Western terrestrial garter snake (Thamnophis elegans)[a]	Riparian
Common garter snake (Thamnophis sirtalis)[a]	Riparian
Western rattlesnake (Crotalus viridus)[a]	Sagebrush, Juniper

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Appendix C.

NEST OBSERVATION RECORD

Species_____ Nest_____ Yr____ Mo____ Day____ Obs_____
Time in_____ Out_____ Climbed in___ Distance obs_____ m Disturbed_____
Adults on_____ Activity_____ Distance flushed_____ m
Adults by_____ Activity_____ Reaction distance_____ m
Reaction of adults_____
Nest shade_____ % Heat stress_____ Nest decoration_____
#eggs_____ #chicks_____ Age_____ #branching_____
#fledged_____ #missing_____ #dead_____ Cause_____
Prey remains_____ Ectoparasites_____ Cloud cover____ % Precip_____
Temp____ °F Wind____ ____mph Comments_____

No.	Cond.	Eye	Beak	Toe	Crop	Wt.	Pad	Feather development
					%			
					%			
					%			
					%			
					%			
					%			

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Species	Age	Sex	Condition	Comments

Appendix D.

BLACKFOOT RIVER RAPTOR DATA

SPECIES	TERRITORY	RVR[a]	BRD[b]	OCC[c]	RVSD[d]	NLOC[e]	STRUCTURE	HABITAT	LONSHP	FATE
American Kestrel	Boundary Flat	Y	U	Y	E	N		Cliff/Artr	BLM	Unknown
American Kestrel	Cedar Creek	N	U	Y	E	Y	Snag	Ripa	Private	Unknown
American Kestrel	Lower Brood Pasture	Y	U	Y	E	N		Cliff/Artr	Private	Unknown
American Kestrel	Ship Rock	Y	U	Y	E	N		Cliff/Artr	BLM	Unknown
American Kestrel	Short Creek E	Y	U	Y	E	N		Cliff/Artr	BLM	Unknown
American Kestrel	Spring Creek	Y	U	Y	W	N		Cliff/Agri	Tribal	Unknown
American Kestrel	Trash Barrel	Y	U	Y	E	N		Cliff/Agri	Private	Unknown
Coopers Hawk	Aspen Hollow	Y	Y	Y	W	Y	Tree	D Fir	BLM	Successful
Coopers Hawk	Beaver Cliff	Y	N	N	W	Y	Tree	D Fir	BLM	Not occupied
Coopers Hawk	Beaver Creek	Y	Y	Y	W	Y	Tree	D Fir	BLM	Unknown
Coopers Hawk	Short Creek Butte	Y	Y	Y	W	Y	Tree	D Fir	Tribal	Successful
Golden Eagle	Beaver Cliff	Y	N	Y	W	Y	Cliff	Cliff/Artr	BLM	Nonbreeding
Golden Eagle	Beaver Cliff	Y	N	Y	W	Y	Cliff	Cliff/Artr	BLM	Nonbreeding
Golden Eagle	Beaver Cliff	Y	N	Y	W	Y	Cliff	Cliff/Artr	BLM	Nonbreeding
Golden Eagle	Beaver Cliff	Y	N	Y	E	Y	Cliff	Cliff/Artr/Juos	BLM	Nonbreeding
Golden Eagle	Brood Pasture	Y	N	N	W	Y	Cliff	Cliff/Juos	Tribal	Unknown
Golden Eagle	Brush Creek	Y	N	N	W	Y	Cliff	Cliff/Artr	BLM	Not occupied
Golden Eagle	Brush Creek	Y	N	N	E	Y	Cliff	Cliff/Artr	BLM	Not occupied
Golden Eagle	Cedar Creek	Y	N	Y	W	Y	Cliff	Cliff/Artr	Tribal	Nonbreeding
Golden Eagle	Cedar Creek	Y	N	Y	E	Y	Cliff	Cliff/Artr	Private	Nonbreeding
Golden Eagle	Cedar Creek	Y	N	Y	E	Y	Cliff	Cliff/Artr	Private	Nonbreeding
Golden Eagle	Crater Cliff	Y	Y	Y	E	Y	Cliff	Cliff/Artr	BLM	Unknown
Golden Eagle	Crater Cliff	Y	Y	N	E	Y	Cliff	Cliff/Artr	BLM	Not occupied
Golden Eagle	Devils Tower	Y	N	Y	W	Y	Cliff	Cliff/Artr/Juos	Tribal	Unknown
Golden Eagle	Spring Creek	Y	N	Y	E	Y	Cliff	Cliff/Artr	BLM	Nonbreeding
Golden Eagle	Spring Creek	Y	N	Y	W	Y	Tree	D Fir	Tribal	Nonbreeding
Golden Eagle	Wood Creek	Y	N	Y	W	Y	Tree	D Fir	Tribal	Nonbreeding
Golden Eagle	Wood Creek	Y	N	Y	E	Y	Cliff	Cliff/Artr	BLM	Nonbreeding
Golden Eagle	Wood Creek	Y	N	Y	E	Y	Cliff	Cliff/Juos/Artr	BLM	Nonbreeding
Great Horned Owl	Cedar Creek Knob	Y	U	Y	E	N		Juos	Private	Unknown
Great Horned Owl	Deer Creek	Y	U	Y	W	N		D Fir	Tribal	Unknown
Great Horned Owl	Devils Tower	Y	U	Y	W	N		Cliff/Artr/Juos	Tribal	Unknown
Great Horned Owl	Lincoln Creek	N	Y	Y	W	Y	Tree	Agri	Private	Failed
Great Horned Owl	Lincoln Peak	N	Y	Y	W	Y	Tree	Aspen	Tribal	Unknown
Great Horned Owl	Miner Creek	N	U	Y	E	N		Cliff/Artr/D Fir	Private	Unknown

Appendix D. (p.2)

SPECIES	TERRITORY	RVR	BRD	OCC	RVSD	NLOC	STRUCTURE	HABITAT	LONSHP	FATE
Great Horned Owl	Morgans	Y	U	Y	W	N		Aspen	BLM	Unknown
Great Horned Owl	Portneuf Presto	Y	U	Y	E	N		Juos/Artr	BLM	Unknown
Great Horned Owl	Trail Creek Bridge	Y	U	Y	W	N		Artr	BLM	Unknown
Great Horned Owl	Trash Barrel	Y	U	Y	E	N		Cliff/Agri	Private	Unknown
Northern Harrier	Beaver Cliff	N	U	Y	E	N		Artr	Private	Unknown
Northern Saw-whet Owl	Ash Canyon	Y	U	Y	E	N		Juos	BLM	Unknown
Northern Saw-whet Owl	Aspen Hollow	Y	U	Y	W	N		D Fir	BLM	Unknown
Northern Saw-whet Owl	Brush Creek	Y	U	Y	W	N		Aspen	BLM	Unknown
Northern Saw-whet Owl	Deer Creek	Y	U	Y	W	N		D Fir	Tribal	Unknown
Prairie Falcon	RM47	Y	Y	Y	W	Y	Cliff	Cliff/Artr	BLM	Successful
Prairie Falcon	Short Creek East	Y	Y	Y	E	Y	Cliff	Cliff/Artr	BLM	Successful
Raven	Ash Canyon	Y	U	Y	E	N		Cliff/Juos	BLM	Unknown
Raven	Aspen Spring	Y	N	N	E	Y	Cliff	Cliff/Artr	BLM	Not occupied
Raven	Brood Pasture	Y	N	N	E	Y	Cliff	Cliff/Artr	Private	Nonbreeding
Raven	Miner Creek	Y	Y	Y	E	Y	Cliff	Cliff/Artr	BLM	Unknown
Raven	Pillar	Y	Y	Y	W	Y	Cliff	Cliff	BLM	Unknown
Red-tailed Hawk	Aspen Hollow	N	U	Y	W	N		Aspen	BLM	Unknown
Red-tailed Hawk	Aspen Spring	N	Y	Y	E	Y	Tree	Aspen	Private	Unsuccessful
Red-tailed Hawk	Beaver Cliff	Y	N	N	E	Y	Cliff	Cliff/Artr	BLM	Not occupied
Red-tailed Hawk	Beaver Cliff	Y	N	N	E	Y	Cliff	Cliff/Artr	BLM	Not occupied
Red-tailed Hawk	Beaver Creek	Y	N	N	E	Y	Cliff	Cliff/Agri	BLM	Not occupied
Red-tailed Hawk	Broken Cliff	Y	Y	Y	W	Y	Cliff	Cliff/Artr	BLM	Unknown
Red-tailed Hawk	Cedar Creek	N	U	Y	E	N		Juos	Private	Unknown
Red-tailed Hawk	Deadmans Aspen Grove	Y	Y	Y	W	Y	Tree	Aspen	Private	Successful
Red-tailed Hawk	Lincoln Peak	N	Y	Y	W	Y	Tree	Aspen	Tribal	Unknown
Red-tailed Hawk	Miner Creek	N	N	Y	E	Y	Tree	Aspen/Agri	Private	Nonbreeding
Red-tailed Hawk	Miner Creek	N	N	Y	E	Y	Powerpole	Artr	Private	Nonbreeding
Red-tailed Hawk	Miner Creek	N	U	Y	E	N		D Fir	Private	Unknown
Red-tailed Hawk	Morgans	Y	Y	N	W	Y	Tree	Aspen	BLM	Not occupied
Red-tailed Hawk	Morgans	Y	Y	Y	W	Y	Tree	Aspen	BLM	Successful
Red-tailed Hawk	Short Creek	Y	Y	Y	W	Y	Tree	D Fir	Tribal	Unknown
Red-tailed Hawk	Split Cliff	Y	N	N	E	Y	Cliff	Cliff/Artr	BLM	Not occupied
Red-tailed Hawk	Trail Creek	N	Y	Y	E	Y	Tree	Aspen	Private	Unknown
Red-tailed Hawk	Trail Creek	N	Y	N	E	Y	Tree	Aspen	Private	Not occupied
Red-tailed Hawk	Trail Creek Bridge	Y	N	Y	W	Y	Tree	D Fir	BLM	Unsuccesful
Red-tailed Hawk	Trail Creek Bridge	Y	N	Y	W	Y	Tree	D Fir	BLM	Unsuccessful
Red-tailed Hawk	Trail Creek Bridge	Y	N	Y	W	Y	Tree	Aspen	BLM	Unsuccessful
Red-tailed Hawk	Upper Portneuf	N	Y	Y	W	Y	Tree	Aspen/Artr	Tribal	Unknown
Red-tailed Hawk	Wood Creek	Y	N	U	E	Y	Cliff	Cliff/Artr	BLM	Unknown
Swainsons Hawk	Menassa Pass	Y	U	Y	E	N		Aspen	Private	Unknown

Appendix D. (p.3)

SPECIES	TERRITORY	RVR	BRD	OCC	RVSD	NLOC	STRUCTURE	HABITAT	LONSHP	FATE
Turkey Vulture	Aspen Spring	Y	U	Y	E	N		Cliff	Private	Unknown
Turkey Vulture	Beaver Creek	Y	U	Y	E	N		Cliff/Agri	Private	Unknown
Turkey Vulture	Broken Cliff	Y	U	Y	W	N		Cliff	BLM	Unknown
Turkey Vulture	Brush Creek	Y	U	Y	E	N		Cliff	BLM	Unknown
Turkey Vulture	Brush Creek Upstream	Y	U	Y	W	N		Cliff	BLM	Unknown
Turkey Vulture	Deer Point	Y	U	Y	E	N		Cliff/Artr	BLM	Unknown
Unknown	Devils Tower	Y	N	N	E	Y	Cliff	Cliff/Artr/Agri	Private	Not occupied
Unknown	Devils Tower	Y	N	N	E	Y	Cliff	Cliff/Artr/Agri	Private	Not occupied
Unknown	Menassa Creek	N	N	N	E	Y	Tree	Aspen	Private	Not occupied

[a]In the river corridor.

[b]Breeding.

[c]Occupied.

[d]Side of the river.

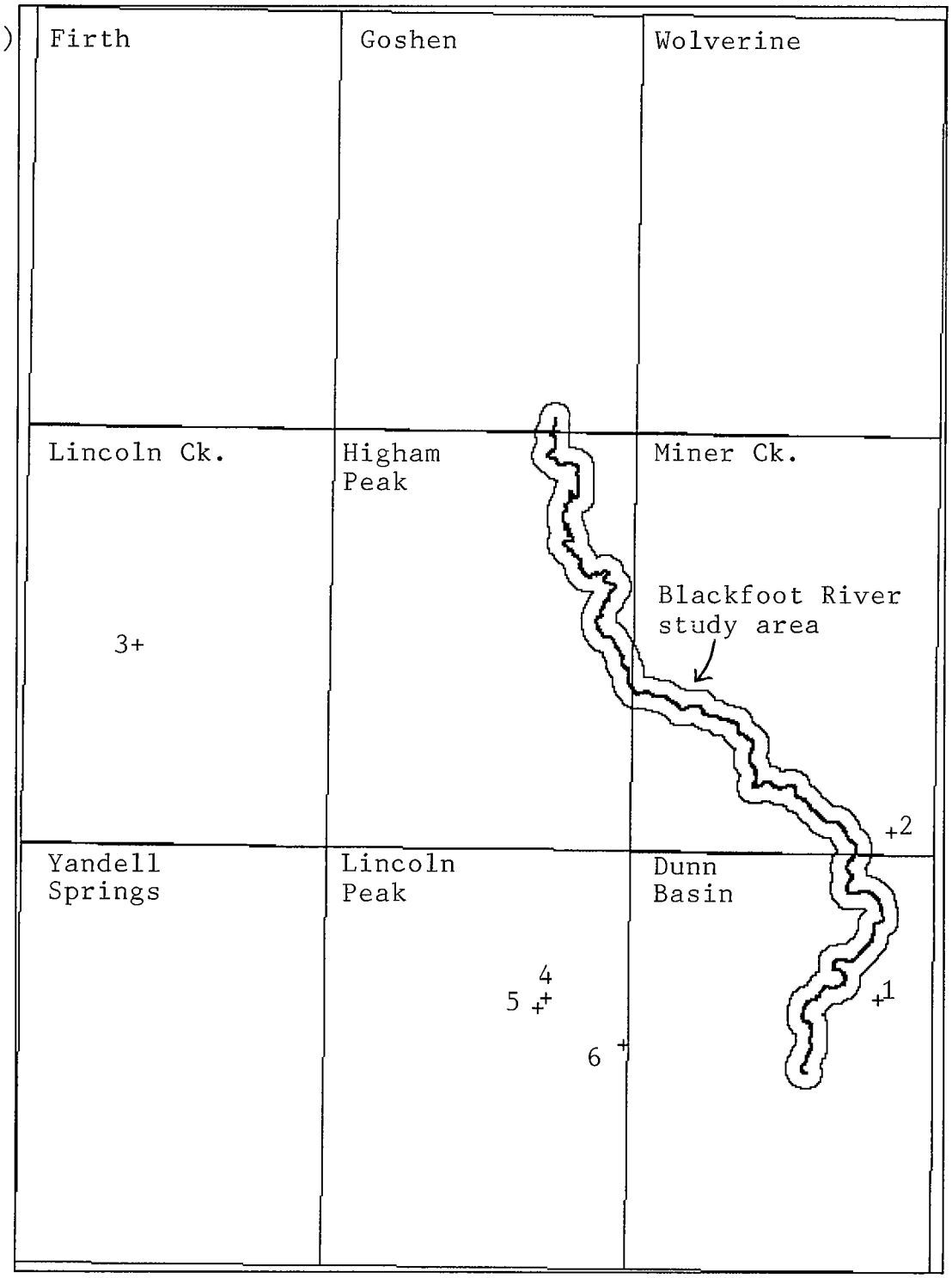
[e]Nest location.

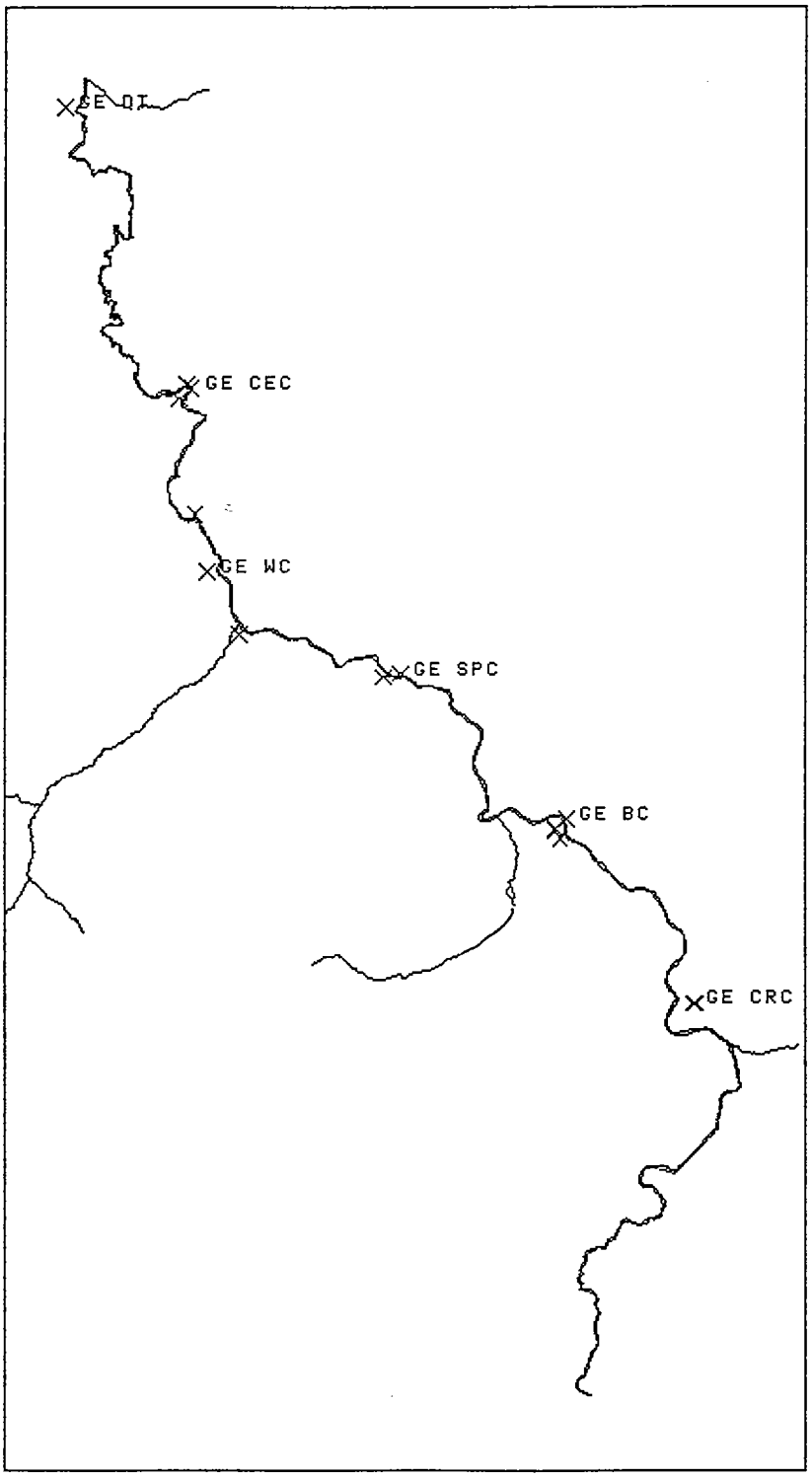
Appendix E. List and distribution (see page 2 of Appendix E) of raptor nests found outside the Blackfoot River study area along roads in peripheral areas.

	SPECIES	TERRITORY	QUAD	LONSHP	HABITAT	FATE
1	Red-tailed Hawk	Aspen Spring	Dunn Basin	Private	Aspen	Unsuccessful
2	Red-tailed Hawk	Trail Creek	Miner Creek	Private	Aspen	Unknown
3	Great Horned Owl	Lincoln Creek	Lincoln Creek	Private	Agri	Failed
4	Great Horned Owl	Lincoln Peak	Lincoln Peak	Tribal	Aspen	Unknown
5	Red-tailed Hawk	Lincoln Peak	Lincoln Peak	Tribal	Aspen	Unknown
6	Red-tailed Hawk	Upper Portneuf	Lincoln Peak	Tribal	Aspen	Unknown

(note that numbers correspond to map locations on page 2 of Appendix E)

Appendix E. (cont.)



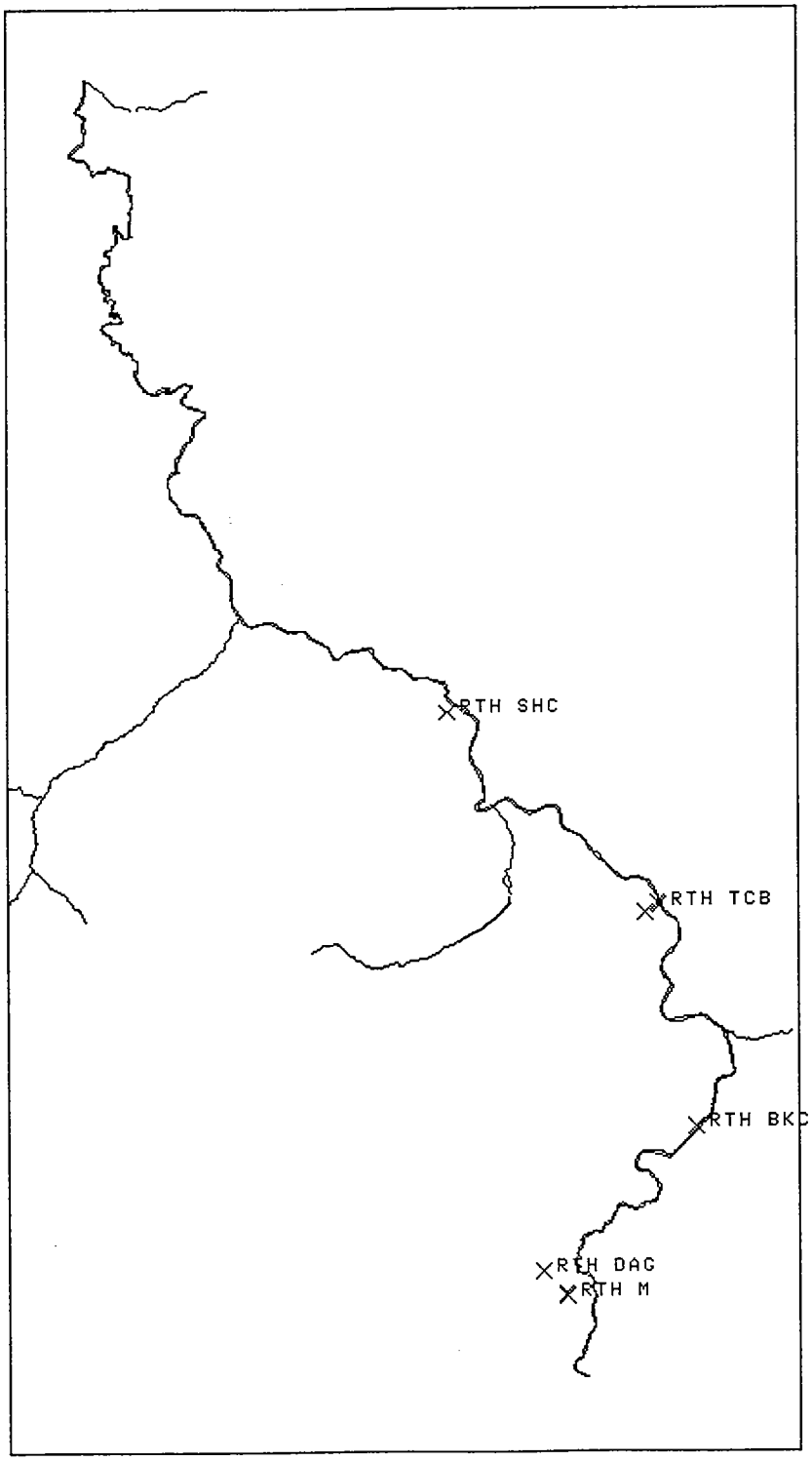


X = Nest locations

Territory Names
DT = Devil's Tower
CEC = Cedar Creek
WC = Wood Creek
SPC = Spring Creek
BC = Beaver Cliff
CRC = Crater Cliff

1.0 km

Appendix F. Distribution of occupied golden eagle territories in the Blackfoot River study area, 1989.

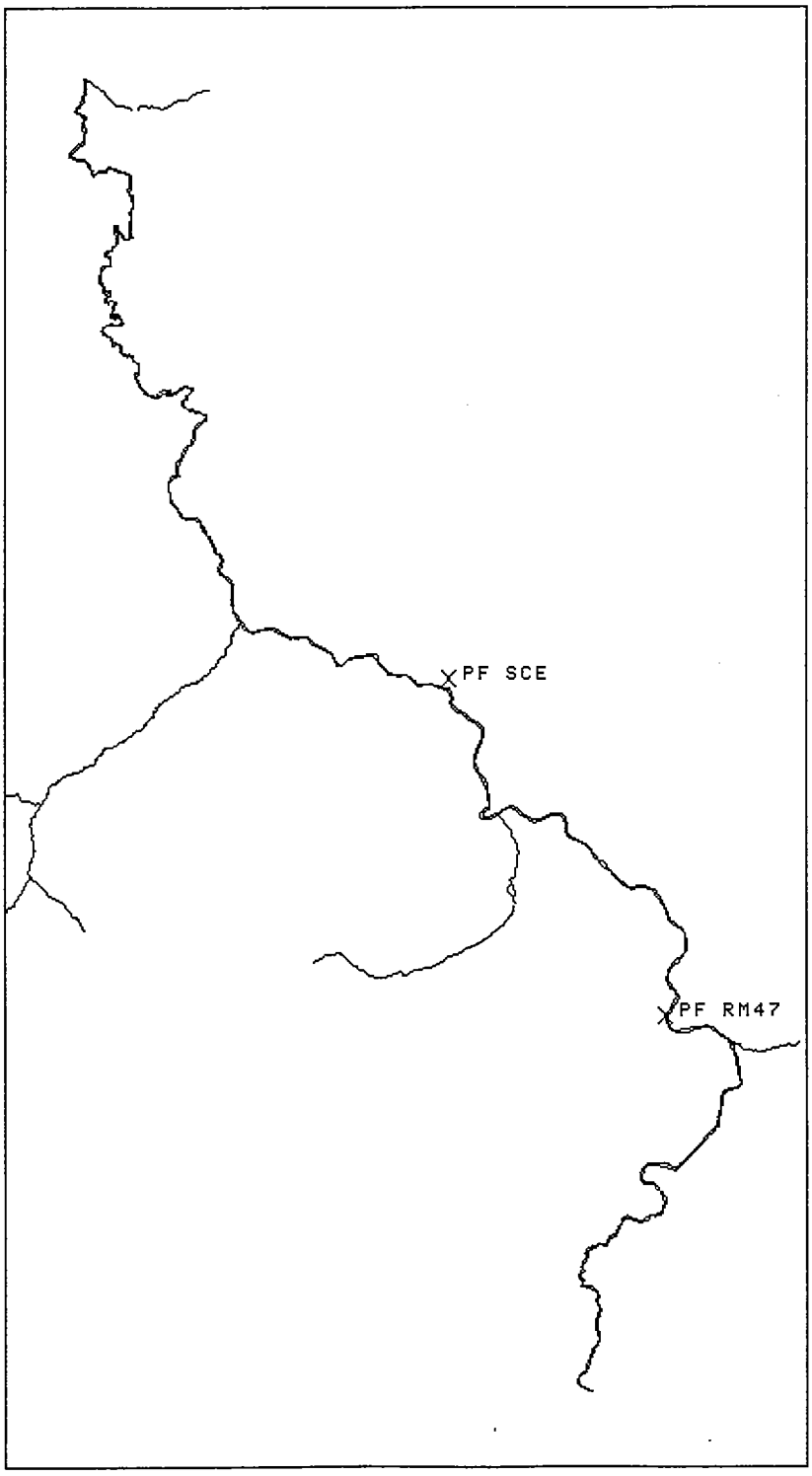


X = Nest locations

Territory Names
SHC = Short Creek
TCB = Trail Creek Bridge
BKC = Broken Cliff
DAG = Deadmans Aspen Grove
M = Morgans

1.0 km

Appendix G. Distribution of occupied red-tailed hawk territories in the Blackfoot River study area, 1989.

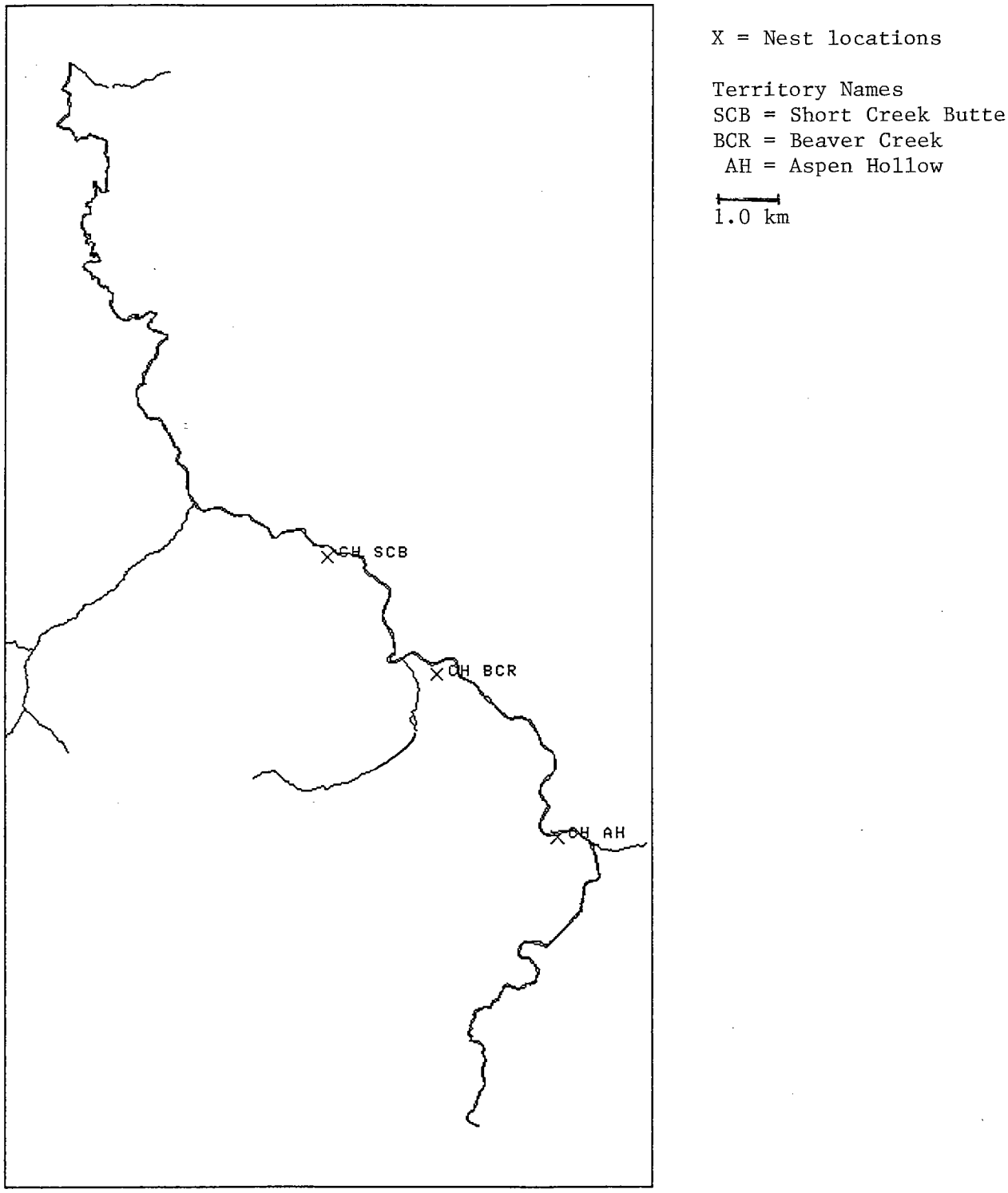


X = Nest locations

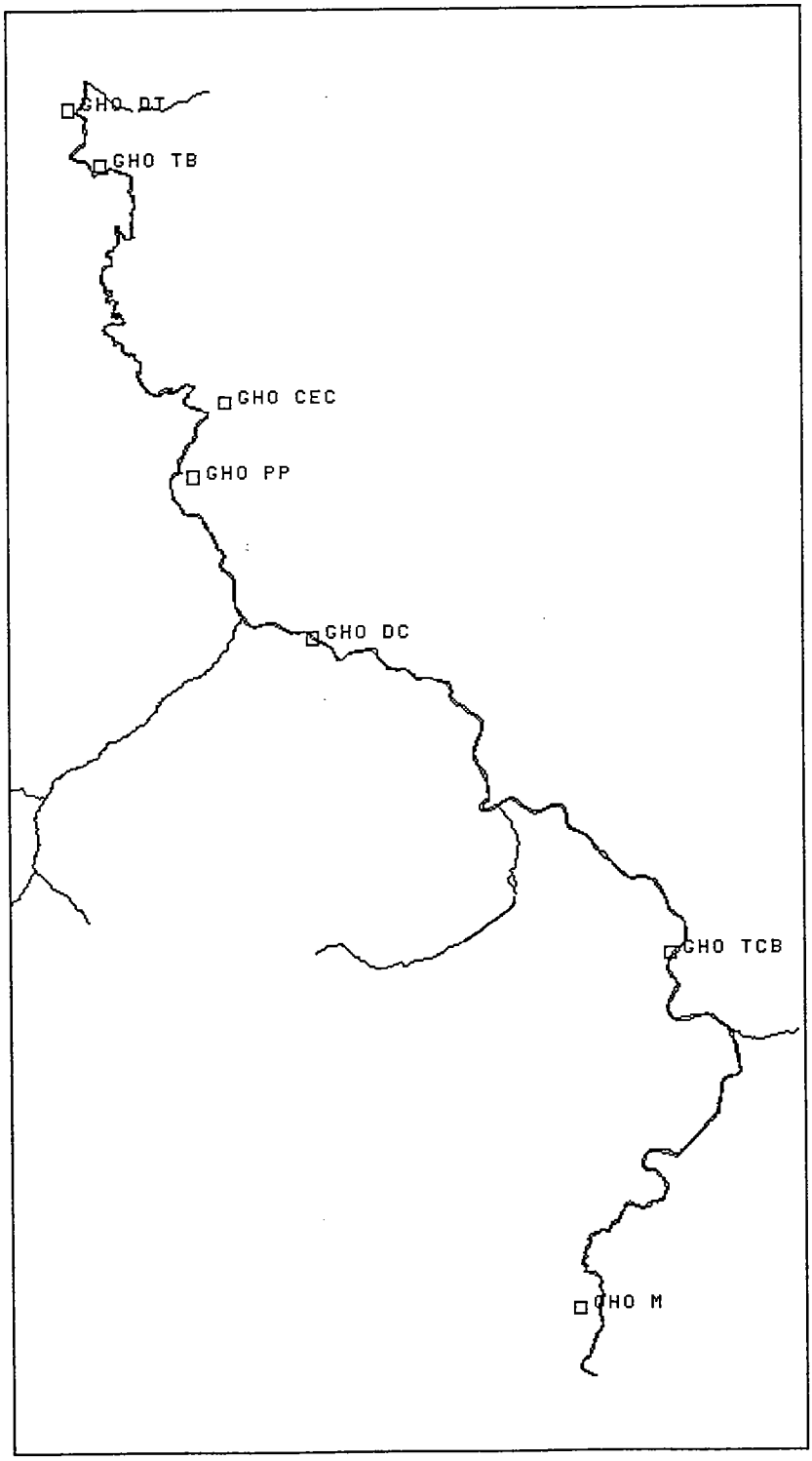
Territory Names
SCE = Short Creek East
RM47 = River Mile 47

1.0 km

Appendix H. Distribution of occupied and breeding prairie falcons in the Blackfoot River study area, 1989.



Appendix I. Distribution of occupied and breeding Cooper's hawks in the Blackfoot River study area, 1989.

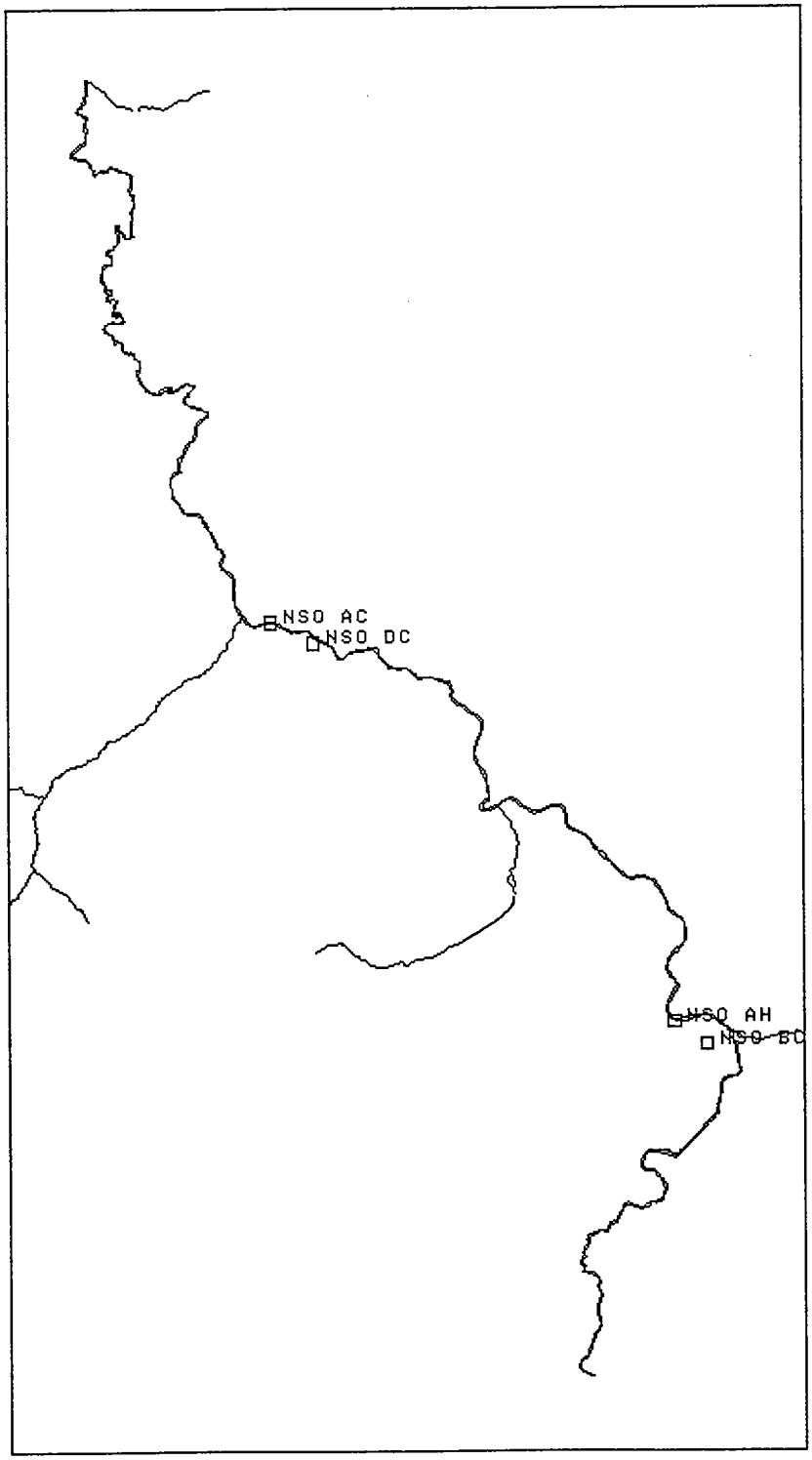


□ Locations of responses to tape recordings of owl songs

Territory Names
DT = Devil's Tower
TB = Trash Barrel
CEC = Cedar Creek
PP = Portneuf Presto
DC = Deer Creek
TCB = Trail Creek Bridge
M = Morgans

1.0 km

Appendix J. Distribution of singing great horned owls in the Blackfoot River study area, 1989.

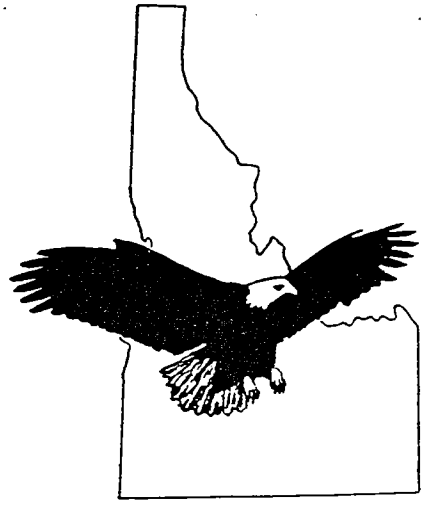


Locations of responses to tape recordings of owl songs

Territory Names
AC = Ash Canyon
DC = Deer Creek
AH = Aspen Hollow
BC = Brush Creek

1.0 km

Appendix K. Distribution of singing northern saw-whet owls in the Blackfoot River study area, 1989.



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