HABITAT REQUIREMENTS AND DISTRIBUTION OF THE BOREAL OWL IN CENTRAL IDAHO

Annual Progress Report

October 31, 1987

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Summary

An additional year of fieldwork with the River of No Return Wilderness boreal owl population allowed us to monitor the population following the dramatic decline observed in 1986. This year's work enabled us to document a complete rebound in breeding activity. As soon as we arrived in the study area on February 17, we heard a calling male. Several nights later, we captured a pair at the site. Our initial success typified the year's work. By mid-summer, we had captured four males (including one radio-tagged in 1986 and one radio-tagged in 1985) and four females and located seven nests.

Increased prey populations probably accounted for the increased breeding activity. Adequate prey populations, however, did not guarantee successful reproduction. Only two nests fledged young. One failure resulted from our disturbance, and one was lost to predation. We believe the wet spring and summer reduced small mammal activity which, in turn, hampered hunting success, leading to the abandonment of three nests.

Because we were able to capture many owls early in the season, our home range and movements data improved. Numerous nest locations, calling locations, and roost sites significantly increased our sample of used habitat.

Besides monitoring the breeding population trend at the lower elevations of Chamberlain, a major goal was to survey spruce-fir forest more thoroughly than in previous years. Our access was still limited, but we heard five calling males and located one nest site.

Lynn Flaccus and Dawn Zebley were instrumental to this year's success. Without their help, we could never have gathered all the data we did. The U. S. Forest Service Intermountain Forest and Range Experiment Station, Boise, Idaho, Idaho Department of Fish and Game, and University of Idaho Wilderness Research Center provided funding. Payette National Forest provided housing and logistical support in establishing the high elevation campsites. The U. S. Army loaned the project a night-vision scope.

Studies Within the River of No Return Wilderness

After attending the Symposium on the Biology and Conservation of Northern Forest Owls in Winnipeg, Manitoba (February 3-7), we flew into the wilderness study site on February 15. We continuously monitored the owls from then until August 24. During the field season, our crew travelled 5030 miles by foot (1898 in winter, 3132 in summer) surveying for owls, radio-tracking marked birds and measuring habitat characteristics.

Surveys

Between February 16 and April 27, we conducted 41 surveys covering 134 miles (Table 1). Of these, 40.8 miles (14 surveys) traversed mature spruce-fir forest. At the lower elevations of Chamberlain, we located 16 territories in the winter (and two more in early summer). Of these, 13 were new locations. We also spent 14 man-nights trapping and 42 man-nights listening for owls at old nest sites, potential nest sites, and inaccurate locations (in order to pinpoint the owl's location). Other owls also responded to the increased prey. We heard four barred, two

great-grey, three pygmy, one screech, two great-horned and three saw-whet owls.

On the high elevation spruce-fir surveys, we heard onefemale and five male boreal owls. Because of the limited time spent at the high elevation camps we were only able to pinpoint two calling sites but did document that the owls use the spruce-fir forests for breeding. As expected, however, nesting activity was not as frequent as in the lower elevation forests with their abundant large cavities.

Radio-telemetry

On our return, we could not locate the female reradioed last October. The reradioed male, however, occupied the same territory used in 1986. Within a week of our arrival, we captured a mated pair. The male wore a radio placed on him in August 1984. In May, after his mate abandoned her nest, this owl returned to the same area occupied in the summer of 1985. One week after capturing the first pair, we captured a second pair and in mid-April captured a third pair. In addition, in June we radioed another nesting female (Table 2).

In general, the owls intensively used small areas and seemed more predictable than in earlier years. Several times, however, they made large moves to new areas, where they again settled into a concentrated area. Unfortunately, although we began with three mated pairs of radioed owls, deaths and nest abandonments made it impossible for us to compare pre-nesting, nesting, and post-nesting home ranges of pairs or individuals. As in other years, however, the owls tended to shift to higher elevations and to mature to old-growth spruce-fir forest in summer.

Nesting and breeding biology

As mentioned earlier, in sharp contrast to last year, many owls paired and attempted breeding. Of course, we can not know if the owls present this year were present but silent last year or if many owls immigrated to Chamberlain. The recapture of an owl radioed in 1985 . indicates the former is at least partly correct; the movement of marked owls out of the study area last winter also makes the latter reasonable. We located eight nests in the following habitats:

1) ponderosa pine snag in old-growth mixed ponderosa pine/Douglas fir (this cavity was used by Boreal Owls in 1981)
2) nest box in decadent aspen (a pair courted at this site but later nested in another box, see No. 3)
3) nest box in old-growth mixed ponderosa pine/Douglas fir
4) nest box in mature Douglas fir
5) ponderosa pine snag in old-growth ponderosa pine/Douglas fir
6) aspen in mature spruce/aspen
7) aspen snag in mature spruce/aspen
8) dead-topped Engelman spruce (44" dbh) in boulder field bordered by old-growth spruce

An automatic event recorder monitored one nest from the beginning of incubation through fledging. We attempted to record prey deliveries with an infra-red triggered camera but had difficulties with the triggering system.

Boreal owls nested in two of fifty nest boxes. One pair courted at one nest box before nesting in another a half mile away.

Despite the start of seven nests, only two fledged young (two and three fledgings). Due to our disturbance, one female abandoned her nest before laying eggs. An unknown predator attacked another nest leaving the broken remains of at least three eggs. Another nest failed when the female was killed by an avian predator while off the nest during a snowstorm. In this case, we hypothesize that the male was unable to provide adaquate prey during the extended snowstorm, forcing the female to hunt on her own. Two other nests were abandoned mid-way through the nestling period. We found no evidence of predation and suspect the females abandoned the nests when their mates were unable to provide adaquate food due to the unseasonably wet weather.

Prey base studies

We collected over 125 pellets, observed the owls with prey 37 times, and found approximately 50 prey items in nests. Again, red-backed voles (*Clethrionomys gapperi*) dominated the diet. In summer, the owls' diets became more varied, although red-backed voles were still the most common prey. Pocket gophers and shrews increased in the owls' diet, and boreal owls occasionally consumed insects, deer mice, chipmunks and birds. During winter, the females ate several flying squirrels.

Snap trapping results varied by plot (Table 3). Catches in wet meadow and lodgepole pine decreased. Catch in the Douglas fir plot did not change, whereas more adults were trapped in the mixed conifer, spruce-fir, and sagebrush plots. Juvenile populations were smaller on two forested plots and larger on a third. Differences in weather and trapping date could affect the juvenile portion of the results.

We continued monitoring prey populations with 20 pit traps.

Vegetation Sampling

We collected structural data for ten calling/nest sites, 103 summer roosts and 72 winter roosts. These plots increased our sample sizes by 50%, 45%, and 50%, respectively. Sixty summer roosts and all winter roosts were paired with a random plot.

Information transfer

In February 1987, Greg presented a paper entitled "Movements and Home Range Use by Boreal Owls in Central Idaho" at the Northern Forest Owl Symposium in Winnipeg, Manitoba. The proceedings of the meeting were published in September (copy enclosed). At the meeting, Greg also assisted with a capture methods workshop. A summary of the workshop also appears in the proceedings.

Our paper "Revised breeding distribution of the Boreal Owl in the northern Rocky Mountains" appeared in the May issue of *Condor* (copy enclosed).

In addition to these two publications, the journal *Raptor Research* has accepted a paper entitled "Betalights: An aid in the nocturnal study of owl foraging habitat and behavior". This paper does not present results from the study but discusses a technique developed during the boreal owl investigation.

In June, Craig Groves, Director of Idaho's Natural Heritage Program visited Chamberlain to learn more about Boreal Owls and survey techniques. He plans on surveying Boise, Challis, Sawtooth, and Targhee National Forests this coming winter. Bart Butterfield, a U. S. Forest

Service contractor, also visited to sample some LANDSAT ground truthing plots. Bart is keying out important vegetation types of Chamberlain for use in our macrohabitat analysis. Finally, Chuck Bergman, a freelance writer with *National Geographic*, *Smithsonian*, and *Audubon* credits visited to write an article about boreal owls for *Audubon*.

Future Plans

During winter and spring 1987-88 we will analyze prey base information, nesting and roosting habitat data, and further analyze home range and movements information. Macrohabitat analysis incorporating LANDSAT classification will begin in early summer 1988. We will begin writing several manuscripts in late summer 1988.

This past August, we reradioed five birds (3 females and 2 males). In March 1988, we plan on returning to Chamberlain for 2 weeks to replace these radios and conduct some calling surveys to continue monitoring breeding population trends. In June, we hope the radioed females will lead us to new nests. Because the males were mates of two radioed females, we should be able to learn more about pair bond and nest site fidelity. During the June trip, we will also check nest boxes, other potential nest sites and small mammal pit traps.

Table 1. Survey and radio-tracking results, Chamberlain Basin, 1984-1897.

Winter Survey Period	1984 Jan. 18-April 23	1985* Jan. 25-May 2	1986 Jan. 14-May 7	1987* Feb. 16-April 27
No. Surveys	13	29	32	36(5)[1]
No. listening nights	5	16	5	19(0)
Miles surveyed	34.70	105.25	117.25	117.6(16.4)
% surveying or trapping nights males heard	56	51	8	49(60)
% surveying nights calling males heard	62	48	6	53(60)
# calling males heard per survey mile	.46	.13	.03	.26(.18)
# owls captured				
winter	9	5	3	7
year	9	6	4	8
winter radio locations	62	92	40	134

Summer Monitoring Period	May 9-August 1	May 16-August 28	May 23-August 19 Sept. 5-Oct. 21	April 29-August 26
# summer radio locations	56	66	121	193
# nest started	3	2	3	7
# young fledged	7	2	0	5

*Four people worked in 1985 and 1987; two people in 1984 and 1986.
[1]Numbers in parentheses represent results of Arctic Point surveys.

Table 2. History of radio-tagged boreal owls at Chamberlain, 1987.

Owl	Sex	Period Monitored	Fate	# Winter Locations	# Summer Locations
B076[1]	M	Feb. 20-Aug. 22	released with new radio in August	29	45
B096[2]	M	Feb. 16-Aug. 10		23	37
B104	M	March 2-Aug. 18	released with new radio in August	22	38
B105	F	March 2-Aug. 18	released with new radio in August	20	18[3]
B107	F	Feb. 20-Aug. 17	released with new radio in August	30[4]	17[4]
B117	M	April 6-July 3	found dead, suspect mammalian predation	6	20
B128	F	April 6-April 16	found dead, suspect avian predator	4	-
B133[5]	F	June 7-Aug. 9	released with new radio	-	18

[1]Owl captured and radioed in 1985.
[2]Owl captured and radioed in 1986.
[3]On nest April 22-June 22.
[4]On nest April 28-June 8, then missing until June 23.
[5]Captured on nest

Table 3. Small mammal trend, 1984-1987.

Vegetation Type	Number of Captures per 900 Trap Nights			
	1984	1985	1986	1987
Wet Meadow[1]	4[2]	18	18	3
	2[3]	9	2	0
	1[4]	3	2	0
Sagebrush	11	7	6	10
	9	0	2	5
	9	0	2	2
Lodgepole I	13	19	2	1
	3	2	0	1
	3	2	0	0
Lodgepole II	not trapped	4	4	3
	not trapped	1	0	1
	not trapped	1	0	1
Mixed conifer	12	2	2	13
	7	1	2	11
	7	1	2	6
Douglas fir	not trapped	4	18	8
	not trapped	4	17	8
	not trapped	4	8	7
Spruce-fir	not trapped	not trapped	154	72[5]
	not trapped	not trapped	75	51
	not trapped	not trapped	38	45

[1]The wet meadow site trapped in 1984 was a disturbed site. The plot was moved to an undisturbed site 1985 and 1986.
[2]Total mammals captured.
[3]Total Peromyscus maniculatus, Clethrionomys gapperi, Phenacomys intermedus, and Microtus spp. captured.
[4]Total adult Peromyscus, Clethrionomys, Phenacomys, Microtus.
[5]Due to weather and bear problems trap effort was only 765 trap nights.

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REVISED BREEDING DISTRIBUTION OF THE BOREAL OWL (Aegolius funereus) IN THE NORTHERN ROCKY MOUNTAINS

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The 1983 American Ornithologists' Union checklist of North American birds describes the southern extent of western Boreal Owl (Aegolius funereus) populations as south central Canada, although it also records breeding populations in Colorado and northwestern Wyoming. Isolated sightings of the owls and the presence of juvenile owls in Colorado accounted for the inclusion of Colorado in the distribution of the species (Baldwin and Koplin 1966). Palmer and Ryder (1984) documented the location of fifteen Boreal Owls prior to 1980 and contacted 31 owls during their own studies in Colorado (Palmer 1986). In addition, Palmer and Ryder (1984) documented 12 sightings of Boreal Owls in Montana, Wyoming, and Washington. Rogers

(1985a,b, 1986) recently reported numerous observations in northeasern Washington. Hayward and Garton (1983) confirmed the presence of a breeding population of Boreal Owls in central Idaho. Continued study of the central Idaho population in the River of No Return Wilderness establishes the resident status of the population. Between January 1984 and July 1986, we heard over 40 calling males and located ten nest sites. These nests fledged nine young.

Between February and April 1984 to 1986, over 60 people, primarily Forest Service biologists, cooperated in a search for breeding Boreal Owls in the northern Rocky Mountains (here we refer to the Rocky Mountains south of Canada and north of 42 latitude north) by conducting foot, car, and snowmobile surveys using playback of tape recorded calls. Personnel on thirteen National Forests, as well as Grand Teton National Park, Wyoming Game and Fish, and the Garnett district of the Bureau of Land Management completed over 130 surveys in forest habitats from 1285-3050 m elevation. Surveyors contacted a total of 49 calling male Boreal Owls (Table 1) including sightings on nine National Forests where Boreal Owls had not been previously located (Figure 1). All Boreal Owls were heard in subalpine fir (Abies lasiocarpa) or western hemlock (Tsuga heterophylla) habitat types above 1585 m. Elevations at which Boreal Owls were heard reflected the latitudinal gradient in forest

types--the most northerly sightings were the lowest in elevation.

Our own intensive work and that of Bondrup-Nielson (1984) indicate that only potentially breeding males call, so we are confident these locations represent the presence of breeding populations. Most likely, northern Rocky Mountain Boreal Owl breeding populations have been well established but remained undetected because of the inaccessibility of breeding habitats during their February to May vocal period. Surveys required considerable effort and participation rapidly declined during the three years. The relative ease with which our cooperators contacted almost 50 Boreal Owls once they reached appropriate habitats, however, leads us to predict that continued searches will reveal breeding Boreal Owls in Oregon and Utah. Calling rates vary widely between years. In poor prey years, almost no males may call. Searches in bad years, therefore, may not reveal the presence of resident Boreal Owls.

Although results of our surveys confirm a widespread distribution, the true extent of Boreal Owl populations remains unknown. Are populations isolated relicts of a more widespread multi-latitudinal Pleistocene population, as theorized by Baldwin and Koplin (1966), or do interbreeding populations form a continuous peninsula along the Rocky Mountain corridor? We must still determine the degree of interchange among demes in

order to assess the potential vulnerability of local populations to extinction.

Surveys were conducted as part of a study supported by the Intermountain Forest and Range Experiment Station, Forest Sciences Laboratory, U.S. Forest Service, Regions I and IV, Idaho Department of Fish and Game, North American Bluebird Society, Lower Columbia Basin Audubon Society, and University of Idaho Wilderness Research Center. TDK Electronic Corporation donated cassette tapes used by survey participants. We especially thank the numerous Region I and IV Forest Service biologists, and other cooperators, who voluntarily worked long hours on cold winter nights conducting surveys.

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Table 1. Boreal Owl singing locations in the northern Rocky Mountains since 1983[1] (ID = Idaho, MT = Montana).

County, State	Year	Latitude (N)	Longitude (W)
Idaho, ID	1984	46°39′	114°21′
Bonner, ID	1984	48°22′	116°45′
Boundary, ID	1984	48°57′	116°45′
		48°40′	116°39′[2]
	1986	48°57′	116°03′[3]
		48°56′	116°03′[3]
		48°55′	116°03′[3]
		48°55′	116°05′
		48°54′	116°05′
		48°43′	116°37′
		48°42′	116°33′
		48°54′	116°48′
		48°55′	116°46′
		48°55′	116°45′
		48°56′	116°45′
		48°55′	116°42′
Bear Lake, ID	1984	42°17′	111°30′
		42°16′	111°32′
Caribou, ID	1985	42°42′	111°22′
		42°48′	112°07′[3]
Lemhi, ID	1984	45°39′	113°58′[3]
		45°05′	114°05′
	1986	45°42′	113°57′

County, State	Year	Latitude (N)	Longitude (W)
Valley, ID	1984	45°24′	116°04′
		44°34′	115°54′
		44°37′	115°50′
	1985	44°37′	115°47′
Freemont, ID	1986	44°25′	111°22′
Glacier, MT	1983	48°45′	114°17′
Lake, MT	1984	47°34′	113°52′[3]
	1985	47°34′	113°52′
		47°48′	113°53′
Mineral, MT	1984	46°52′	114°42′
Missoula, MT	1984	46°41′	114°21′
		46°41′	114°29′
	1985	46°41′	114°29′
		46°38′	114°29′
	1986	46°39′	114°21′
		46°41′	114°21′
Beaverhead, MT	1984	45°35′	113°05′
		45°34′	113°07′
		45°08′	113°28′
		45°45′	113°37′

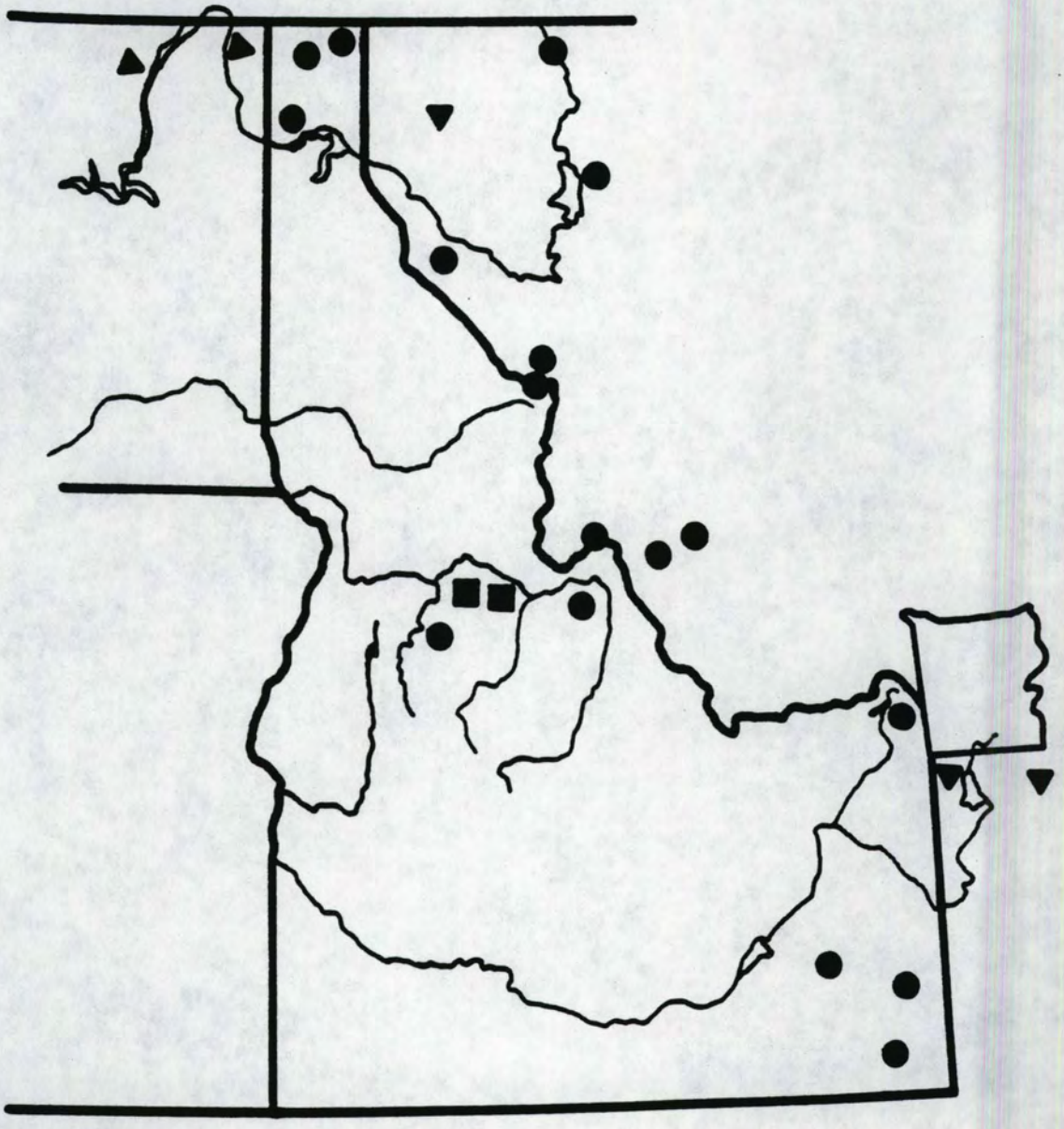
[1]Excludes sightings from the River of No Return Wilderness, Idaho.

[2]Sighting of fledged juvenile.

[3]Two owls heard simultaneously.

Figure Legend

Figure 1. Boreal Owl observations located in Idaho and neighboring states in 1983-1986. Circles = observations located during our study (see Table 1). Squares = River of No Return Wilderness population. Triangles = observations cited in Kingery (1984) and Rogers (1984, 1985a,b, 1986).



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MEMORANDUM

December 9, 1986

TO: Carol Arnold, Arnold Aviation, Cascade, ID 83611

FROM: Ed Krumpe, **Wilderness Research Center**

SUBJECT: 1987 Charges for flights for Boreal Owl Project

Once again, I would like to pay for $700.00 worth of flights for the Boreal Owl Project in exchange for services they will render Taylor Ranch. I have therefore authroized Greg Hayward, project director, to charge up to $700.00 in 1987 to the Taylor Ranch account for flights. Please send the billings directly to me for payment. Thank you.

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During the 1986 field season, the final season for the three-year study of habitat associations of boreal owls in central Idaho, we were fortunate to observe natural changes in the boreal owl population. These changes made data collection difficult but provided immeasurable insight into the birds' ecology.

The population decline, or at least the breeding population decline, observed in 1985 continued to alarmingly low levels in 1986. Indicators of this decline were the numbers of calling males, trapping success, and productivity. Although this decline hampered our efforts to collect habitat data on calling sites, roosting sites, winter food habits, winter home ranges, growth of young, and nest site and home range tenacity, it gave us invaluable insight into the natural dynamics of the boreal owl population. Such a dramatic decline in an undisturbed population will have important implications for managing the species in non-wilderness forests.

Last year, when the decline first became apparent, we suspected it was the result of declining prey populations. The owls' behavior and our small mammal trapping continued to strengthen this conjecture: 1) During one two-week period in early February two radioed owls disappeared from the study area despite occupying the exact areas they had in late August and for the two weeks prior to emigration. One of these owls was located in early May 50 miles away, near McCall, Idaho. A third male, who successfully fledged young last year, died of

starvation. 2) We heard almost no calling males all winter and had no females approach during surveys. 3) Although pairs initiated three nests, no young fledged. 4) A female captured in late March weighed so little that we originally considered her a male. She attempted nesting but abandoned after laying two eggs. When we recaptured her a week later, she weighed the same low weight although she had been sitting on a nest for two weeks with the male hunting for her. 6) Winter home ranges were much larger than in past years. 7) Small mammal trapping plots continued to show an overall depression in small mammals although by early- to mid-summer, two plots indicated small mammal populations were beginning to increase again (Table 4).

Numerous individuals and organizations contributed to the success of our final field season. Lynn Flaccus returned to help radiotrack and check traps during the summer. Russ Ryker hiked in to Chamberlain to help verify habitat types of random and nest sites. The U.S. Forest Service Intermountain Forest and Range Experiment Station, and Idaho Department of Fish and Game, and University of Idaho Wilderness Research Center provided major funding. The Max McGraw Wildlife Foundation funded the trip to examine boreal owl sites outside the Wilderness. Individual Audubon Society members privately contributed to the study. Several Forest Service biologists surveyed for owls on their own time and took time to show us

location sites. Their efforts are greatly appreciated. Ron Escano coordinated all survey efforts in Region I. Payette National Forest personnel provided assistance in coordinating the logistics involved in wilderness research. The United States Army loaned the project a night vision device to aid in observing foraging owls.

Distribution outside the River of No Return Wilderness

After last winter's poor success rate, few biologists conducted surveys this winter. Four surveys were run on Deerlodge National Forest (NF), an unknown number on Lewis and Clark NF, one on Flathead NF, an unknown number on Lolo NF, four on Kaniksu NF, and three on Salmon NF. A couple other Forests probably conducted surveys, did not hear owls so did not send the information on to us. One boreal was heard on each of the Lolo NF and Salmon NF. In both cases, females were heard simultaneously with the males so these sites represent probable nest sites. In contrast to results from most of the region, Paul Sieraki heard 15 separate calling males on three of his surveys on the Kaniksu NF.

During two weeks in August we travelled 2000 miles to visit boreal owl locations on Caribou NF, Salmon NF, Lolo NF and Kaniksu NF to collect site information on vegetation structure using line intercepts and circular tree plots. Sites

we visited this year continued to fit the pattern we observed at sites visited last year--occupying high elevation, mature forests in the Abies zone. Sites on the Caribou NF and Kaniksu NF were particularly interesting. Some sites on Caribou NF occupied old-growth aspen stands and the proximity of sagebrush rangeland to mature coniferous and aspen forest made these sites different from others. The area would be an interesting place to continue future studies. Near Bonner's Ferry, all sites occupied mature to old-growth forest but several appeared to be in small patches within large open areas (e.g. old burns). Unfortunately, all the unusual sites were distant birds so their locations weren't pinpointed. A major emphasis for future studies should be stand structure and stand size to determine if boreal owls can reproduce successfully in such small remnant stands.

The ornithological journal Condor has accepted a paper describing the expanded breeding distribution of boreal owls in the northern Rocky Mountains based on results obtained during the course of this study (copy enclosed).

Studies within the River of No Return Wilderness

Except for a two-week period in early May to prepare for the summer season and a two-week period in late August to visit Forest Service sites outside the Wilderness, we worked in the

River of No Return Wilderness from January 14 to October 21, 1986. We surveyed at Cold Meadows March 26 to April 13 and made two short trips there during the summer to finish vegetation work. All other time was spent at Chamberlain. Lynn Flaccus assisted in June and July. Otherwise, Greg and Pat worked alone. During the field season we travelled a minimum 3808 miles by foot.

Boreal Owl Surveys

Forty-three night-time surveys run between 21 January and 28 April covered 117.25 and 38 miles at Chamberlain Basin and Cold Meadows, respectively (Tables 1 and 2). Only four males were heard calling the entire winter. Two locations at Chamberlain occupied old sites. The third owl behaved unusually, so his location was discounted. The only boreal heard at Cold Meadows called from a new site--the first site confirmed in mature to old-growth spruce-fir in our study area. We had expanded our surveying routes even further than in 1985 and covered more spruce-fir forest but because of the lack of calling activity, we did not locate any new calling sites. We spent little time listening for owls at specific sites.

Like borealS, few other species called. At Chamberlain, we heard one great-horned owl, one barred owl, one great grey owl, and a pair of screech owls. (The screech owls nested in a large aspen stand and fledged three young. The presence of

screech owls at this high elevation is rare.) In addition, we heard several pygmy owls in late winter and early fall. At Cold Meadows, we only heard the resident great grey owl twice. In past years we've heard at least one great grey owl every night as well as saw-whet and pygmy owls.

Radiotelemetry

When we returned to Chamberlain in January, we quickly located and reradioed three of five males that we had left radioed last August. All three were using the same areas they had been using last summer. By the first week in February, however, two had disappeared from the study area. One was relocated near McCall, Idaho (over 50 air miles away) in early May. The second, an owl radioed for three years never returned. The third male, who successfully fledged two young last year, died of starvation.

The lack of owls, or at least the lack of breeding owls, made trapping almost impossible. We failed to capture any owls until 11 March. By May we'd captured a female and two males. In July, we captured a second female--the nesting mate of a radioed male. To our surprise this female had an old radio on her back! She was captured and radioed in 1984. That year she nested 1/2 mile from this year's nest and fledged two young.

Obviously, we were unable to gather much winter home range data (Table 3). Even in the short time we monitored these

owls, however, we observed unusually large winter home ranges. The owls were travelling incredibly long distances--up to six miles a night. We speculate that these movements were due to low hunting success, i.e. the owls were having to travel further to find food.

One female disappeared from the study area during our May break. One male left the study area in early July. Because few owls were radioed, we were able to intensively follow each individual during the summer. We located each owl 27-53 times during the summer and fall.

As in other years, the owls' home ranges overlapped extensively. Once we found two males roosting within 100 m of each other and often, two owls would roost within 1/4 mile of one another. Nesting owls made long commutes between high elevation spruce-fir areas and the mixed conifer areas used for nesting. Non-nesting birds, on the other hand, made permanent shifts to high elevation spruce-fir during the summer. Here they intensively used a small area for a few days to a couple weeks before moving to another area. The owls' use of these areas seems to be a response to heat stress and local concentrations of red-backed voles (Clethrionomys gapperi), their primary food source. A lack of adequate cavities in these forest types, however, may preclude much nesting effort. The relationship of nesting and foraging opportunities in these high elevation forests will be an important topic to examine in future research.

Both remaining radioed owls shifted their home ranges to lower elevations by mid-September. Boreal owls may begin establishing nest territories or establishing pair bonds during the fall, a time when many bird species exhibit a burst of breeding-like behavior (e.g. singing). The male returned to the area he had attempted nesting in. The female returned to an area near her 1984 nest site. Changes in small mammal activity or simply the temperature change are other possible explanations for the home range shift.

Nesting and Breeding Biology

As mentioned in the surveying section, few birds attempted breeding. We have no way of knowing if boreal owls weren't present or were in too poor condition to stimulate breeding behavior. All owls captured attempted breeding but all three nests failed, one before eggs were laid and one after two eggs were laid. The last was abandoned by the male when the young were 20 days old, the time when the female normally leaves the nest. Five days after leaving the nest, the female returned and delivered prey for three nights after which she also abandoned the nest.

Two nests occurred in aspen; one in a wet, open old-growth aspen stand (Picea engelmanni/Equisetum arvense habitat type), and one in a small group of aspen within old-growth mixed Douglas fir, Engelmann spruce, and subalpine fir (Abies lasiocarpa/Xerophyllum tenax-Vaccinum globulare habitat type).

The third nest occupied a 23-inch dbh ponderosa pine in an old-growth mixed Douglas fir and ponderosa pine stand (Pseudotsuga menziesii/Calamogrostis rubescens-Pinus ponderosa habitat type).

An automatic event recorder monitored one nest for 28 days prior to hatching and 14 days afterward until it was abandoned. We also mounted a movie camera to try to record prey species. It did not work well to identify prey but did allow us to record which member of the pair came to the nest at various times.

No nest boxes were used this year, but the lack of use would be expected in view of the lack of breeding activity.

Prey-base studies

Unfortunately, we weren't able to gather much winter food habits information, but during the year collected 67 pellets, observed the owls with prey 35 times and found 29 prey items in the nest. Due to inclement weather in the fall, the owls' hunting was impeded and they were forced to forage in daylight giving us a rare opportunity to follow and observe their habitat use, behavior, and prey. Red-backed voles continued to dominate the owls' diet. Shrews (Sorex spp.) were also common. Boreal owls frequently ate pocket gophers (Thomomys talpoides) in the snow-free months. They occasionally ate Mountain phenacomys (Phenacomys intermedius), deer mice (Peromyscus

maniculatus), and birds. One male seemed to specialize in capturing red-tailed chipmunks (Eutamias amoenus).

We repeated snap trapping efforts on six sites trapped last year (Table 4). Results were varied--continuing to be quite low on most grids but showing a substantial increase on the Douglas fir site. Despite the large effort involved (the trap site was eight miles away and had to be checked daily), we snap trapped a high elevation old-growth spruce-fir site similar to those the boreals use and were surprised by the results. The maximum number of animals ever caught on a snap trapping grid on lower elevation plots has been 19 animals in 900 trap nights. On the spruce-fir site, we trapped 154 animals in the same period! Half were red-backed voles, the primary prey of the boreals, but a species trapped incidentally at lower elevations. None were deer mice.

In addition to snap trapping, we continued monitoring 18 pit trap sets established last year. We also established two new sets in high elevation spruce-fir forest.

Vegetation Sampling

In addition to collecting structural data on the three Chamberlain nest sites and the Cold Meadows' calling site, we sampled ten random plots (for a total of 100) and collected vegetation data at roost sites. On half the roost sites we collected information from a paired random tree.

Future Plans

Last August, an article on our research appeared in Idaho Fish and Game's monthly popular magazine Idaho Wildlife (copy enclosed). We have also received a tentative agreement from the magazine Natural History to write a popular science article on a specific aspect of our research. In February, Greg will present a paper entitled "Daily and seasonal movements of boreal owls in central Idaho" at an international symposium on northern forest owls in Winnepeg, Manitoba. Meeting organizers have also asked him to give a presentation at a workshop on capturing techniques.

Over the summer a National Geographic wildlife photographer flew in to photograph the owls and four Audubon Society members from across southern Idaho and Michigan flew to Chamberlain Basin to see the boreal owls.

In November 1986, the Intermountain Forest and Range Experiment Station agreed to extend funding in order to examine questions raised during the past three years. Idaho Department of Fish and Game has also agreed to continue support of our research, and we have proposals pending with several private foundations. To facilitate field work this winter, we stocked an abandoned Forest Service cabin and cached a tent with supplies at two sites. These temporary camps will enable us to survey high elevation spruce-fir forests more thoroughly.

During the coming year we will continue surveying past routes at Chamberlain to monitor boreal owl population trends but will concentrate on previously unsurveyed high elevation spruce-fir forests. We will continue to capture and monitor owls to determine relationships between population levels, home range sizes, home range use, and productivity as well as continue monitoring small mammal population levels.

Table 1. Survey and radio-tracking results, Chamberlain Basin, 1984-1986.

	1984	1985*	1986
Winter Survey Period	Jan. 18 - April 23	Jan. 25 - May 2	Jan. 14 - May 7
No. surveys	13	29	32
No. listening nights	5	16	5
Miles surveyed	34.70	105.25	117.25
% surveying or trapping nights males heard	56	51	8
% surveying nights calling males heard	62	48	6
# calling males heard per survey mile	.46	.13	.03
# owls captured			
winter	9	5	3
year	9	6	4
winter radio locations	62	92	40

Summer Monitoring Period	May 9 - August 1	May 16 - August 28	May 23 - August 19 Sept. 5 - Oct. 21
# summer radio locations	56	66	121
# nests started	3	2	3
# young fledged	7	2	0

* Four people worked in 1985, two people in 1984 and 1986.

Table 2. Cold Meadows survey results, 1984-1986.

	1984	1985	1986
Survey Periods	Feb. 19 - March 4 April 3 - April 11	Feb. 25 - March 7 April 6 - April 18	March 27 - April 11
# surveys	17	20	11
Miles surveyed	40	54	38
% surveying nights calling males heard	40	20	18
# calling males heard per mile survey	.38	.13	.05

Table 3. History of radio-tagged boreal owls at Chamberlain, 1986.

Owl	Period Monitored	Fate	# Winter Locations	# Summer Locations
B043[1]	Jan. 15 - Jan. 29	flew from study area	2	0
B084	Jan. 14 - Jan. 29	flew from study area[2]	3	0
B085	Jan. 16 - Feb. 3	died of starvation	3	0
B095	March 11 - May 7	abandoned nest flew from study area	14	0
B096	April 26 - Oct. 20	re-radioed in preparation for 1987 field season	5	53
B097	March 25 - July 7	abandoned nest disappeared from study area	13	27
B083[3]	May 23 - Oct. 20	re-radioed in preparation for 1987 field season	0	41

1 Third year bird was monitored.

2 Located above upper Payette Lake near McCall, Idaho on 7 May and 24 May, 1986.

3 This female was radioed during the first year of study. Bird on nest May 23 - July 11.

Table 4. Small mammal trend, 1984-1986.

Vegetation Type	Number of Captures per 900 Trap Nights		
	1984	1985	1986
Wet Meadow	4[1,2]	18	18
	2	9	2
	1	3	2
Sagebrush	11	7	6
	9	0	2
	9	0	2
Lodgepole I	13	19	2
	3	2	0
	3	2	0
Lodgepole II	not trapped	4	4
	not trapped	1	0
	not trapped	1	0
Mixed confier	12	2	2
	7	1	2
	7	1	2
Douglas fir	not trapped	4	18
	not trapped	4	17
	not trapped	4	8
Spruce-fir	not trapped	not trapped	154
	not trapped	not trapped	75
	not trapped	not trapped	38

1 Total mammals captured
Total Peromyscus maniculatus, Clethrionomys gapperi, Phenacomys intermedus, and Microtus spp. captured
Total adult Peromyscus, Clethrionomys, Phenacomys, Microtus

2 The wet meadow site trapped in 1984 was a disturbed site. The plot was moved to an undisturbed site 1985 and 1986.

TEACHING/RESEARCH/SERVICE
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Ed Krumpe
Wilderness Research Center
Department of Wildland Recreation
University of Idaho

Dear Ed:

Enclosed is a copy of our report outlining progress and accomplishments during the second year of fieldwork studying habitat associations of boreal owls in central Idaho. We are quite proud of the amount of information gathered this year and feel that, considering the resources available for this investigation, we have made substantial progress toward an understanding of the relationships of boreal owls to forest structure in the mountains of Idaho. Please note that an appendix to the enclosed report provides some information with which to evaluate how efficiently we are spending our funds.

In general, the pattern of habitat use was similar to that observed in 1984. Severe weather conditions and reduced prey populations, however, provided interesting conditions in which to observe boreal owl habitat use. Data from the intensive study area indicated a reduction in owl breeding but no immediately apparent shift in habitat use due to these conditions. Several surveys outside the intensive (wilderness) study area continued to produce new owl locations.

An expanding public interest in boreal owls was apparent this past year. We received invitations to present slide talks on our study from private organizations in Montana, Washington, Idaho, and Canada (a lack of travel funds prevented us from honoring some invitations). Bird clubs from as far away as San Francisco have inquired about traveling to see boreal owls in our study area and some plans are being arranged for 1986. This summer, the Lower Columbia Basin Audubon Club flew into Chamberlain Basin from Richland, Washington to spend a weekend with our crew, watching and learning about boreal owls. Finally, Idaho Wildlife magazine printed a major article describing our study in their August issue.

If you have any questions or comments concerning our progress or any aspect of the investigation, we hope you will call or write.

Sincerely,

GH

Gregory D. Hayward
Research Associate

O3

Dr. E. O. Garton
Associate Professor

PH

Patricia H. Hayward
Research Assistant

Enclosure

HABITAT REQUIREMENTS AND DISTRIBUTION OF THE BOREAL OWL IN CENTRAL IDAHO

Annual Progress Report

October 29, 1985

Gregory D. Hayward
Research Associate

Patricia H. Hayward
Research Assistant

and

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During the 1985 field season, the second of the three year study of habitat associations of boreal owls, data collection began slowly due to changes in the owls' behavior. By the year's end, however, information gathered contributed greatly to our overall understanding of boreal owl ecology. Boreal owls (most owls, in fact) behaved quite differently than last year. Males called later, irregularly, and for shorter periods. Females rarely responded to taped calls. The birds' silence made locating and trapping difficult, but individuals captured provided valuable data.

Two factors may be responsible for this year's behavior differences. First, weather patterns varied. Temperatures were substantially lower, and extremely cold conditions existed over a two-week period in early February. Perhaps more importantly, our small mammal trapping indicated greatly reduced prey populations. European studies indicate female nomadism and decreased productivity occur during years of low small mammal populations.

Despite reduced survey efforts outside the River of No Return Wilderness (RNRW), our understanding of the geographic distribution and range of habitats used by boreal owls continued to grow. Intensive study within the wilderness continued to provide detailed information on seasonal habitat use, home range size, food habits, and breeding biology. This report describes the information collected during the second year of field work. The help of two assistants significantly increased the quantity of data collected.

Although we are not prepared to draw any conclusions until the final year's data is collected, some patterns are beginning to

emerge, and we are confident that the study will provide a solid basis for understanding the ecology of boreal owls, for evaluating the impact of natural resource management on boreal owls, and for managing boreal owl populations in central Idaho.

Numerous individuals and organizations contributed to the success of our second field season. Tony Wright and Lynn Flaccus worked tirelessly in the field gathering data. Russ Ryker provided support and encouragement. The U. S. Forest Service Intermountain Forest and Range Experiment Station, Idaho Department of Fish and Game, and University of Idaho Wilderness Research Center provided major funding. In addition, Edward Miller, Lower Columbia Basin Audubon Society, and U. S. Forest Service, Region I funded a trip to examine boreal owl locations outside the Wilderness. Several Forest Service biologists surveyed for owls on their own time and took time to show us location sites. Their efforts are greatly appreciated. Ron Escano coordinated all survey efforts in Region I. Payette National Forest personnel provided assistance in coordinating the logistics involved in wilderness research. The United States Army loaned the project a night vision device to aid in observing foraging owls.

PROGRESS

Distribution Outside the River of No Return Wilderness

Bad weather and logistic problems limited the number of surveys conducted by Forest Service biologists and other cooperators outside the RNRW. Twelve surveys run on Caribou, Payette, Lolo, and Flathead National Forests resulted in six new locations and confirmation of three old sites.

In September, we travelled to sites on the Idaho Panhandle, Flathead, Lolo and Bitterroot National Forests* to collect site information using our line intercept technique (with four lines instead of eight) and circular tree plots. We must still visit sites on Caribou, Salmon and Boise National Forests so have not analyzed data yet. Simple qualitative assessment, however, shows interesting patterns. All sites occupied high elevation, mature forest sites. In general, boreal locations occupied the oldest stands available in a given drainage. Tree species composition varied, but structure was similar among sites. Almost all visited locations occurred in Abies lasiocarpa habitat types. One (Bitterroot NF) occupied a Pseudotsuga menziesii/Calamogrostis rubescens-Pinus ponderosa site almost identical in structure to Chamberlain Basin sites.

Besides visiting boreal owl locations, we visited many

* Forests in Region I were visited for three reasons: 1) Region I provided travel funds; 2) more boreal owl locations were available in a limited geographic area in northern Idaho and western Montana; and 3) Region IV forests will be visited in 1986 after more boreal owl locations have accumulated.

biologists who have not previously run surveys. Most biologists showed enthusiasm and interest in conducting surveys after learning more about the study. Many new biologists will probably conduct surveys this winter if not discouraged by supervisors. In addition, Audubon Society members expressed interest in conducting surveys in Washington, Oregon, and Idaho mountains.

Intensive Ecological Investigation in the River of No Return Wilderness

Work in the River of No Return Wilderness began 25 January 1985 and ended 28 August 1985. Except for a two-week period in early May when we planned the summer's goals and gathered equipment, work continued non-stop. Four biologists worked together at the Chamberlain Basin study camp except during two two-week periods in February and April when two biologists travelled to the Cold Meadows study camp.

Boreal Owl Surveys

Sixty-five night-time surveys run between 27 January and 29 April covered 94.25 and 57 miles at Chamberlain Basin and Cold Meadows, respectively, and produced eight and six new boreal owl locations, respectively. At Chamberlain, birds called from seven old sites, including all of last year's nest sites. At Cold Meadows, we heard boreal owls calling on two sites located last year. In 1985, we expanded our sampling area at both Chamberlain and Cold Meadows. At Cold Meadows, we concentrated on finding and

surveying spruce-fir stands, whereas at Chamberlain, we continued surveying all available vegetation types. In addition to surveying at Chamberlain, however, we spent 68 man-nights listening for owls at likely locations in hopes of pinpointing singing sites and locating new birds. (During summer months another 62 man-nights were spent listening for male delivery calls and for begging young in hopes of locating new nest sites.)

Distribution of calling sites resembled those located last year. Only a single male sang in the extensive lodgepole pine stands found at both study areas, and this bird sang at the site of a nest box. Of the seven other new sites at Chamberlain, one was in a small aspen stand of large diameter (9-15" dbh) trees. Another sang in a mature Douglas fir stand (we suspect this bird began singing in the above-mentioned aspen stand and moved toward us). All others occurred in the over-mature mixed Douglas fir/ponderosa pine stands typical of last year's locations. At Cold Meadows, only two new locations could be identified specifically enough for analysis. One occurred in mature Douglas fir (both male and female were simultaneously present on the site). Another bird called from a lodgepole stand surrounded by old growth spruce-fir and near a ponderosa pine snag. Spruce-fir habitats continued to be underrepresented in survey routes although we tried to reach such sites more often than in 1984.

Other species heard giving territorial calls included: one great-horned, one great grey, four pygmy, one barred, one long-eared, one saw-whet, and four flammulated owls at Chamberlain. At

Cold Meadows, we heard one pygmy, one long-eared, and three great grey owls.

Radio telemetry studies

The low response rate of male and female boreal owls to taped calls made locating and trapping owls difficult. Twenty (two-man) trap nights at Chamberlain resulted in the capture of two females and four males. Three nights of summer work enabled the capture of a nesting male. Two nights at Cold Meadows were unsuccessful. (See Table 1.)

Six of the seven owls captured this year were unmarked birds (i.e. birds not captured in previous years or fledged from monitored nests). One male was recaptured on the same hill he was captured on last year. Although his 1985 movements were similar to 1984 and his 1985 home range overlapped with his 1984 home range, differences between his activity the two years were apparent.

The additional field assistance enabled us to locate each bird once or twice a week, resulting in 155 roost locations. In addition to collecting data describing forest stand structure and roost tree characteristics, we collected weather information to more accurately examine the role of weather in roost site selection. The new weather information enabled us to see an apparent trend in summer roost selection. Boreal owls seem easily heat stressed and besides shifting home ranges to higher elevations in summer months, showed a tendency to select roost trees in microclimates 3-6^{o}F cooler than adjacent sites within 50-100 ft.

Winter roosts still appeared to be fairly random. Besides collecting specific stand and tree characteristic information at roosts, we collected identical data from forty-nine random trees for comparison with selected roosts (using a paired plot design).

Attempts to follow foraging birds were not as successful as we had hoped, but we were able to follow individuals for 2-5 hours on several nights. Although these attempts have not given us detailed data on foraging behavior, they have enabled us to begin describing the owls' behavior and foraging habitat use.

In an attempt to study individual year to year changes in home range use, site tenacity, and mate permanence, we reradioed four owls in September 1984, hoping to follow these owls again in 1985. Despite a transmitter life expectancy of 150-200 days, not a single radio was functioning when we returned the last week of January, 1985. Five owls were reradioed the last week of August this year to attempt once more to gather this valuable information.

Other home range use patterns outlined in 1984 were strengthened by this year's observations. Home ranges were large (even larger than last year's for some birds), elliptically shaped, overlapped extensively among owls, and showed seasonal elevation shifts.

Nesting and Breeding Biology

In 1985, few pairs attempted nesting and those nesting appeared to have much lower success than in 1984. We feel low prey population densities stressed the birds enough to lower nesting

activity and success. Of five birds radiotracked during the nesting season, we were able to confirm nesting for only one male and one female. The male's nest was abandoned after one of two eggs hatched. The radioed female, however, fledged two young (of three eggs). Nest site data including data on forest stand structure, topographic features, and habitat and nest tree characteristics, were recorded.

As in 1984, nesting boreal owls both occupied pileated woodpecker cavities in 1985. The abandoned nest occurred in an open, uneven-aged mixed-conifer stand typical of Chamberlain nest sites to date. In fact, the nest was in a 15" dbh ponderosa pine snag less than 100 m from one of last year's nests. The second nest, while also in a pileated woodpecker cavity, occurred in a 15" dbh live aspen tree in a small, open, boggy aspen stand with numerous pileated cavities in nearby aspen. Habitat types for the two sites were Pseudotsuga menziesii/Calamogrostis rubescens-Pinus ponderosa (Psme/Caru-Pipo) and Abies lasiocarpa/Senecio triangularis (Abla/Setr).

An automatic event recorder monitored both nests from mid-incubation to abandonment or fledging. We obtained records of the time and number of prey deliveries for 12 nights prior to hatching at each nest and for 3 and 36 nights post-hatching from the two nests. Several nights of continuous observation helped us to more accurately interpret the meaning of recordings. We climbed the aspen nest every 2-3 days, to monitor growth and development of the young more closely than in 1984.

As expected for the first year of a nest box investigation, boreal owls used none of 50 nest boxes erected at Chamberlain late in 1984. A calling male was heard in the vicinity of one box. Flying squirrels (Glaucomys sabrinas) nested in three boxes.

Prey Base Studies

Our understanding of boreal owl food habits (and thus, indirectly, of foraging habitat) was enhanced by our more frequent roost locations. We collected 103 pellets and identified 33 prey items cached at roosts and in nests. Red-back voles (Clethrionomys gapperi) continued to provide the bulk of the owls' year-round diet. Pocket gophers (Thomomys talpoides) became fairly important during nesting season. Other prey identified at the nest included shrews (Sorex spp.), deer mice (Peromyscus maniculatus), mountain phenacomys (Phenacomys intermedius), a red-tailed chipmunk (Eutamias amoenus), and several birds.

We repeated snap trapping efforts on three sites trapped last year (sagebrush, lodgepole pine, and mixed conifer), moved the meadow site to a more undisturbed area, and established grids on a Douglas fir and a second lodge pole pine site. Small mammal populations, as indicated by the two year's snap trapping results, appeared substantially reduced and may have been responsible for the unusual behavior in the owls. Differential habitat use by various prey species is becoming apparent through the small mammal studies.

In addition to snap trapping, we established pit trap sets on 18 sites (three each in Douglas fir, lodgepole pine, spruce-fir, mixed-conifer, meadow, and sagebrush)--pairing with snap trap grids where possible. Each pit trap set consisted of four, cone-shaped cans sunk to ground level. The four pits were arranged along a metal drift fence (6 inches high, 10 feet long), one at each end and one on each side in the middle. Pit traps have greatly reduced the effort needed to gather small mammal population trend and habitat association information. By leaving pit traps out all year, we hope to gain more understanding into the year-round habitat associations of the small mammal populations upon which boreal owls prey. An additional advantage of pit traps is the increased trappability of species not vulnerable to snap trapping, e.g. pocket gophers and shrews.

Random vegetation

To more accurately assess the features of habitats used by boreal owls vs. the range of habitats available at Chamberlain Basin, we sampled 100 randomly selected forest plots (25 each in Douglas fir, mixed-conifer, lodgepole pine and spruce-fir vegetation types). Random plots were measured similarly to calling and nest sites using four 100-foot intercept lines rather than eight.

Logistics

Preparations were made at Chamberlain Basin and Cold Meadows so two or more biologists could safely live at each camp during the winter 1986. We cached food supplies for two biologists for three months. In addition to leftover fuel supplies from 1985, we cut (using cross-cut saws), hauled, and stored three cords of fuel wood at Chamberlain Guard Station. A cord of wood remained at Cold Meadows, plenty for the coming winter. Clothing, bedding, and research equipment were also stored at each camp. Radio-telemetry receivers and radios, cassette tape players, and other equipment are being repaired.

APPENDIX TO REPORT

Aside from information in the above report which is directly related to research progress, we would like to provide some statistics with which you can compare the efficiency of our work to studies with which you are more familiar. A field crew of four biologists moved into the wilderness study area in late January and lived there through August (a two week break was taken in May). During the 28 weeks of fieldwork, the four man crew worked approximately 5760 hours and travelled an estimated 4664 miles on skis or foot. To move food and personnel in and out of the study area, the project chartered approximately 14 hours of single engine, fixed wing aircraft time. The cost for salaries and travel during the field season (February-August) was approximately $14,819 and $1089, respectively.

Expanding our field crew from two biologists in 1984 to four during this field season substantially increased the amount of data collected. Habitat use by radio-marked owls at Chamberlain Basin was monitored without interruption from February through May and mid-May through August. During this time each owl was followed more closely than was possible in 1984 (see Table 1 in 1984 and 1985 reports for comparisons). Also, despite substantially reduced owl calling and resulting difficulties associated with trapping owls, we followed nearly as many radio-marked owls in 1985 as in 1984. While more thoroughly investigating boreal owl habitat use at Chamberlain Basin, we continued our studies at the Cold Meadows site and coordinated owl surveys in Idaho and Montana. With the

expanded crew we gathered vegetation information from over seven times as many plots in 1985 as in 1984 while continuing nest monitoring and prey sampling acitvities begun last year. Unfortunately, current funding will not support a four man field crew in 1986. Two biologists will begin fieldwork in mid-January, 1986.

Data gathered by October 1986, will provide information to answer the questions outlined in our agreement and to answer additional questions not addressed in that document. However, it should be apparent to biologists in resource management that the level of understanding resulting from a limited investigation such as the boreal owl study, will not be sufficient to direct sound management of a species throughout an entire Forest Service Region. An awareness of the millions of dollars spent on grizzly bear habitat studies and the resulting level of understanding should place the results of the boreal owl project in perspective.

Table 1. Monitoring history for seven boreal owls during 1985 in the Chamberlain Basin, Idaho.

Boreal ID Number	Sex	Monitoring Period (1985)	No. Winter Roosts (20 Jan-3 May)	No. Summer Roosts (1 May-28 Aug)
B043[1]	M	17 March - 21 August	18	13
B075[2]	F	16 Feb - 25 Feb	6	--
B076	M	18 Feb - 22 August	24	17
B086[3]	F	23 April - 5 July	2	--
B084	M	31 March - 23 August	11	17
B085	M	9 July - 22 August	--	5
B077[4]	M	18 Feb - 20 August	31	14

1. Bird radioed in 1984.
2. Bird died unknown causes.
3. Bird attempted nesting but his mate abandoned at hatching.
4. Bird nested successfully, mated to B085; left study area 5 July.