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DENSITY, DISTRIBUTION, AND HABITAT OF FLAMMULATED OWLS IN IDAHO

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ABSTRACT.—From 1990 to 1992 we surveyed for Flammulated Owls (*Otus flammeolus*) in 3 areas in Idaho: Salmon National Forest (SNF), Payette National Forest and adjacent Hells Canyon National Recreation Area (PNF-HCNRA), and Nez Perce National Forest (NPNF). We also collected and summarized information on all historic and modern records of Flammulated Owls in Idaho. Flammulated Owls were detected on 69% of 65 routes (2–16 km in length) surveyed at densities ranging from 0.04 to 1.25 singing males/40 ha. Owls were detected on survey routes as early as 10 May and as late as 23 July. Mean percent canopy cover estimated at owl locations on the PNF-HCNRA and NPNF study sites ranged from 52% to 64%, while shrub cover ranged from 16% to 21% and ground cover was 9% to 9%. Our surveys and summary of distributional records indicate that Flammulated Owls occur throughout the montane forests of Idaho in old or mature stands of open ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), and stands co-dominated by these 2 species. Fire suppression and timber harvest activity in ponderosa pine forests represent 2 main threats to the species' future security in Idaho. More research on the effects of various silvicultural treatments on Flammulated Owl populations is warranted.

Key words: Flammulated Owl, Otus flammeolus, population density, distribution, broadcast tape recordings, habitat, Idaho, ponderosa pine, Pinus ponderosa, Douglas-fir, Pseudotsuga menziesii

The Flammulated Owl (*Otus flammeolus*) is a small, insectivorous owl that nests in montane forests of western North America and apparently migrates to the Neotropics (McCallum 1994a). On its breeding grounds it is primarily associated with forests containing yellow pine, either ponderosa pine (*Pinus ponderosa*) or Jeffrey pine (*P. jeffreyi*; Reynolds and Linkhart 1992).

Knowledge of the biology of the Flammulated Owl comes principally from studies conducted in Colorado (e.g., Reynolds and Linkhart 1987a, 1987b), New Mexico (McCallum and Gehlbach 1988, McCallum et al. 1995), Oregon (Goggans 1986), and British Columbia (Howie and Ritcey 1987). Although the Flammulated Owl has been documented as a nesting species in Idaho (Burleigh 1972, Hayward 1986, Hayward and Garton 1988), little published information exists on its breeding status, distribution, habitats, or population density (Stephens and Sturts 1991).

We conducted surveys for Flammulated Owls from 1990 to 1992 at 3 study sites: (1) Salmon River mountains on the Salmon National Forest in east central Idaho (Atkinson and Atkinson 1990), (2) several small mountain ranges located primarily on the Payette National Forest in west central Idaho (Moore and Frederick 1991), and (3) Salmon River and Clearwater mountains on the Nez Perce National Forest in north central Idaho (Shepherd and Servheen 1992). Herein we report the distributions, densities, and habitats used by Flammulated Owls in these areas and summarize the statewide distribution based on a compilation of historic and modern records of Flammulated Owls in Idaho.

STUDY AREA AND METHODS

We surveyed for Flammulated Owls on portions of the Salmon National Forest (SNF), Lemhi County (45°15'N, 114°15'W), in 1990; the Payette National Forest (44°45'N, 116°30'W) and adjacent Hells Canyon National Recreation Area (45°35'N, 116°25'W) in Adams, Washington, and Idaho counties (PNF-HCNRA) in 1991; and the Nez Perce National Forest

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(NPNF), Idaho County (45°40'N, 115°50'W), in 1992 (Fig. 1).

Survey routes 2–16 km in length were placed in areas containing large stands of mature ponderosa pine and Douglas-fir (*Pseudotsuga menziesii*). We broadcasted taped recordings or vocal imitations of territorial songs for owls along trails or roads from dusk until 0200 h at stations established 500 m apart on the SNF and PNF-HCNRA sites and 500–800 m apart on the NPNF study site. Distances between broadcast stations were based on the distance that we determined singing owls could be heard on our study sites. Howie and Ritcey (1987) estimated that Flammulated Owls are usually heard within 0.5 km under most weather and habitat conditions. At each broadcast station we listened for 1–2 min for unsolicited male songs, then alternated 1-min broadcasts of the songs with 1- to 2-min listening intervals for a total of 10 min. We estimated the azimuth and distance for each owl heard and recorded time and weather on each survey route. On the SNF and PNF-HCNRA study sites (1990–91), we surveyed each route only once, while on the NPNF study site (1992), each route was surveyed 2–3 times. Surveys were conducted 11 May–10 July on the NPNF, 10 May–23 July on the SNF, and 22 May–11 July on the PNF-HCNRA.

Broadcast stations were mapped on 1:24,000 or 1:62,000 USGS topographic maps and 1:24,000 or 1:15,840 orthophotos. In 1990 (SNF study site only) we estimated the densities of responding owls on each linear survey route with the soundscape formula modified from Howie and Ritcey (1987).

$$\text{Area (ha)} = 100\,[n\pi r^2 - (n-1)\,2985]$$

where n equals the number of stops per route and r equals the maximum distance at which owls can be heard, a distance assumed to be 0.5 km (Howie and Ritcey 1987). This formula assumes that surveys are conducted along linear transects, a correct assumption for the SNF study site. Because we used roads and trails for survey routes on the PNF-HCNRA and NPNF study sites that did not conform to linear transects, we measured survey areas on these study sites with a planimeter to estimate the density of responding owls for each survey route. All areas within 500 m of broadcast stations were used in density calculations. These

Fig. 1. Location of the Salmon National Forest (SNF), Payette National Forest–Hells Canyon National Recreation Area (PNF-HCNRA), and Nez Perce National Forest (NPNF) study sites. Triangles represent records for Flammulated Owls in Idaho located outside of these 3 study sites (see Appendix A).

2 techniques for estimating density have the same assumptions and are mathematically comparable.

On the PNF-HCNRA and NPNF study sites, we characterized the stand-level habitat at owl locations by measuring habitat characteristics following methods described in Noon (1981) on five 0.04-ha circular plots, 1 plot centered on the estimated or known owl location and the other 4 located 50 m from the center plot in the 4 cardinal directions. To minimize the effects of error in estimating azimuth and distance in the habitat analysis, we used only those owl detections estimated to be within 200 m of broadcast stations. Additionally, we used only those owl locations that we did not think were influenced by broadcasting tapes because the owl called before we began broadcasting (13 locations) or the owl began calling immediately after the broadcast and had likely

not yet moved in response to the taped call (4 locations).

Tree density and diameter-at-breast-height (dbh) were measured on each plot with the point-center quarter method (Cottam and Curtis 1956). Other measurements collected on each plot included elevation, topographic position, aspect, dominant tree cover and understory vegetation, number of canopy layers (ocular estimate), past silvicultural treatment, stand age, percent canopy cover (densiometer), percent ground cover (line intercept), percent shrub cover (line intercept), and distance to nearest snag with cavity (Moore and Frederick 1991). Stand age was defined as follows: (1) immature—trees not cone bearing, (2) mature—trees cone bearing, and (3) old—multiple canopy layers, abundant large snags, trees with dbh >64 cm (from Noon 1981). Data from the five 0.04-ha plots were combined to calculate means for canopy cover, ground cover, shrub cover, tree density, and dbh.

At the PNF-HCNRA study site, we also investigated macrohabitat characteristics through an analysis of the type of habitat, age of forest, and type of timber harvest that occurred in 400-m radius (50.3-ha) circles (approximately the diameter of a Flammulated Owl territory [Reynolds and Linkhart 1987a]) centered on the owl's estimated location. We overlaid these 50.3-ha circles on 1:15,840 aerial photos and 1:24,000 orthophotos on which Forest Service silviculturists had delineated polygons and assigned them to the following classes based on air photo interpretation and stand exams (Moore and Frederick 1991): nonforest (canopy closure <10%), clearcuts (seedlings not visible on photo), open woodlands (noncommercial forests with low canopy closure, poor accessibility, and poor regeneration), selective cuts, immature (poles and saplings visible on photo, trees generally <50 yr old), mature (trees 50–100 yr old), old (trees >120 yr old), and other (water, unclassified lands). The area of these classes within each 50.3-ha circular plot was estimated with a planimeter.

In addition to the surveys conducted in this study, we collected information on all historic and modern observations or records of Flammulated Owls in Idaho. We examined the collection records of all natural history museums in Idaho (College of Idaho, Boise State University, University of Idaho, Idaho State University), records from American Birds, records from the state's primary ornithological treatment (Burleigh 1972), records from a database developed by Stephens and Sturts (1991) for publication of their latilong bird book, and records from the Idaho Conservation Data Center (Idaho Department of Fish and Game) a comprehensive database on the status and distribution of Idaho's rare, threatened, and endangered flora and fauna. Appendix A provides a summary of these records and observations.

RESULTS

Owl Densities and Distribution

From 1990 to 1992 we conducted 85 surveys on 68 survey routes distributed over 3 national forests (Table 1). Flammulated Owls were detected on 44 of the 68 routes (65%). On routes where owls were detected, mean owl densities (# singing males/40 ha) for the 3 study sites ranged from 0.28 to 0.52 (Table 1). The earliest and latest dates that owls were detected were 10 May 1990 and 23 July 1990, respectively. Other owl species detected on these surveys included Great Horned Owl (*Bubo virginianus*), Long-eared Owl (*Asio otus*), Northern Saw-whet Owl (*Aegolius acadicus*), and Barred Owl (*Strix varia*) on the SNF, Short-eared Owl (*Asio flammeus*), Northern Pygmy Owl (*Glaucidium gnoma*), Great Gray Owl (*Strix nebulosa*), Barred, Great Horned, Long-eared, and Northern Saw-whet Owls on the PNF-HCNRA, and Great Horned, Northern Saw-whet, and Barred Owls on the NPNF.

We compiled 74 additional distributional records of Flammulated Owls in Idaho (Appendix A, Fig. 1). Eighteen of these records came from additional surveys conducted by Payette National Forest staff in Adams County within the PNF-HCNRA study site. For the 55 records that contained habitat information, 43 (78%) were from areas dominated by ponderosa pine, Douglas-fir, or a combination of both species. These records were distributed throughout the montane forest portions of the state. The earliest record was dated 30 March and the latest 17 October.

Habitat Characteristics

STAND LEVEL.—We measured stand-level habitat characteristics at 12 owl locations on the PNF-HCNRA and 5 locations on the NPNF study sites (Table 2). Forty percent of

TABLE 1. Flammulated Owl survey results on the Salmon (SNF), Payette–Hells Canyon NRA (PNF-HCNRA), and Nez Perce (NPNF) national forests, Idaho, 1990–1992.

Survey site	Survey dates	Number survey routes	Number routes with owls	Owl density (owls / 40 ha)		
				$\bar{x}$	s	Range
SNF	9 May–23 July 1990	20	16	0.28	0.29	0.04–1.25
PNF-HCNRA	22 May–11 July 1991	38	22	0.31	0.22	0.09–0.84
NPNF	11 May–10 July 1992	10	6	0.52	0.29	0.25–0.98
Total		68	44			

[illegible]

owl locations were located on upper slopes, 25% on ridges, 25% on mid-slopes, and 10% on valley bottoms. Elevations for the 17 locations averaged 1561 m ($s_{\bar{x}}$ = 39.8) on the PNF-HCNRA study site and 1504 m ($s_{\bar{x}}$ = 27) on the NPNF site.

Either ponderosa pine or ponderosa pine mixed with Douglas-fir dominated the vegetation at owl locations on the NPNF and PNF-HCNRA sites (Table 2). Cover estimates for canopy, shrub, and ground vegetation layers were similar in the 2 study sites. Tree density was approximately 500/ha on both areas, and mean dbh values for all trees was 32 cm for the PNF-HCNRA and 31 cm for the NPNF.

Although we did not collect habitat data on the SNF study site, Forest Service timber crews had previously inventoried 26 of the 67 stands that contained owl locations in our surveys on the SNF (Atkinson and Atkinson 1990). All but one of these stands were dominated by Douglas-fir, ponderosa pine, or a mix of both. The exception was a stand of subalpine fir (*Abies lasiocarpa*) / beargrass (*Xerophyllum tenax*). Average dbh values were 28.3 cm (s = 8.1) for Douglas-fir and 38.1 cm (s = 15.0) for ponderosa pine.

MACROHABITAT.—We measured macrohabitat features of Flammulated Owls at 9 owl locations on the PNF-HCNRA study site. Within the nine 50.3-ha macrohabitat plots on the PNF-HCNRA, mean percent cover of forest >120 yr old was 31% ($\bar{x}$ = 16 ha; s = 18). Mean cover of timber stands 50–100 yr old was 30% ($\bar{x}$ = 15 ha, s = 10), followed by natural openings at 12% ($\bar{x}$ = 6 ha, s = 9) and selective cuts at 12% ($\bar{x}$ = 6 ha, s = 5). Clearcuts, immature forest, open woodlands, and other unclassified areas were relatively low in cover (<2 ha each).

DISCUSSION

Our surveys and compilation of distributional records of Flammulated Owls show that this species inhabits montane forests throughout Idaho (Fig. 1). In our surveys Flammulated Owls were not detected in only 1 area—the South Fork Clearwater River of NPNF. A lack of snags and large-diameter ponderosa pine trees due to timber harvest and firewood cutting may have made this area less suitable to Flammulated Owls.

Densities of responding owls in Idaho were within the range of 0.03–1.00 owls/40 ha reported in northern California (Marcot and Hill 1980) during similar aural surveys. Although we recorded high densities on some survey routes, average regional densities were less than estimates of 0.7 males/40 ha recorded by Howie and Ritcey (1987) in British Columbia. However, caution should be exercised in comparing these results because the actual areas surveyed vary due to differences in wind, topography, individual and seasonal variation in owl responses, and observer bias. Furthermore, estimates of density calculated with a theoretical radius of coverage around broadcast stations may be biased upward because of owls moving into "survey areas" in response to broadcasted calls and owls following surveyors from 1 broadcast station to another (R. Reynolds personal communication).

Most detections of Flammulated Owls in Idaho were in mature to older stands of ponderosa pine mixed with Douglas-fir. However, several records of Flammulated Owls that we compiled from areas outside our study sites represented owls heard calling (and nesting in 1 case) from pure stands of Douglas-fir or aspen, particularly in southeastern Idaho where

TABLE 2. Habitat characteristics at Flammulated Owl locations on the Payette National Forest (Hells Canyon National Recreation Area (PNF-HCNRA; n = 12) and the Nez Perce National Forest (NPNF; n = [illegible]), Idaho, 1990–1992.

Location	Tree density [#/ha (s)]	F dbh [cm (s)]	Percent cover [% (s)]			Dominant vegetation type (% of plots)		
			Canopy	Shrub	Ground	PIPO/PSME	PIPO	Other
PNF-HCNRA	499 (294)	32 (5)	64 (12)	16 (13)	49 (10)	25	50	25[b]
NPNF	494 (1426)	31 (27)	52 (30)	23 (26)	39 (18)	54	—	16[c]

[a]PIPO = *Pinus ponderosa*, PSME = *Pseudotsuga menziesii*.
[b]This category represents plots dominated by *Populus tremuloides* or *Abies grandis*.
[c]This category represents plots dominated by *P. menziesii* or *Larix occidentalis*.

ponderosa pine is absent. In addition, we recorded several instances of owls calling from stands of grand fir (*Abies grandis*). These patterns are consistent with other studies which indicate that while open ponderosa pine forests represent the most common nesting habitat, other forest types are used. Aspen is a frequent component of nesting habitat in Colorado and Nevada (Reynolds and Linkhart 1987b, McCallum 1994b), and owls have nested successfully in selectively harvested Douglas-fir stands in British Columbia (Howie and Ritcey 1987).

Our habitat analyses indicated Flammulated Owls in western and north central Idaho use forest stands with mature to old ponderosa pine and Douglas-fir, multiple canopy layers, low tree densities, moderate to low canopy closure, and moderate ground cover. These habitat features are characteristic of old ponderosa pine forests and are similar to those reported for this species elsewhere in its breeding range (Goggans 1986, McCallum and Gehlbach 1988, Bull et al. 1990, Reynolds and Linkhart 1992). However, because habitat measurements were taken only at occupied sites and survey routes were chosen to maximize the amount of old or mature ponderosa pine, habitat selection cannot be inferred from these data.

Marshall (1939) suggested that the Flammulated Owl may be the most common raptor in pine forests of the western United States. Our surveys in Idaho indicate Flammulated Owls are abundant in particular habitats, but no comparative data exist for densities of other forest raptors. Whether the populations we studied are increasing, stable, or declining is not known, nor is it known for the species throughout its range (McCallum 1994c).

There is, however, some concern for the species' future. Ponderosa pine forests in Idaho and elsewhere are declining due, in part, to fire suppression and timber harvest. Little is known about the effects of these management activities on Flammulated Owls at either the stand level through changes in forest structure or at the landscape level through habitat fragmentation (McCallum 1994b, 1994c). Biologists and land managers would greatly benefit from more research aimed at a greater understanding of the habitat requirements of this forest owl and the impacts that various silvicultural treatments might have on these requirements.

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LITERATURE CITED

ATKINSON, E. C., AND M. L. ATKINSON. 1980. Distribution and status of Flammulated Owls (*Otus flammeolus*) on the Salmon National Forest. Idaho Department of Fish and Game, Boise. 25 pp.

BULL, E., A. WRIGHT, AND M. HENJUM. 1990. Nesting habitat of Flammulated Owls in Oregon. Journal of Raptor Research 24: 52–55.

BURLEIGH, T. D. 1972. Birds of Idaho. Caxton Printers, Caldwell, ID. 467 pp.

CURTIS, J. T., AND R. P. MCINTOSH. 1956. The use of distance measures in phytosociological sampling. Ecology 37: 451–460.

GOGGANS, R. 1986. Habitat use by Flammulated Owls in southeastern Oregon. Unpublished thesis, Oregon State University, Corvallis. 54 pp.

HAYWARD, G. 1986. Activity pattern of a pair of nesting Flammulated Owls (*Otus flammeolus*) in Idaho. Northwest Science 60: 141–144.

HAYWARD, G., AND E. O. GARTON. 1988. Resource partitioning among forest owls in the River of No Return Wilderness, Idaho. Oecologia 75: 253–265.

HOWIE, R. R., AND R. RITCEY. 1987. Distribution, habitat selection, and densities of Flammulated Owls in British Columbia. Pages 249–254 in R. W. Nero, R. J. Clark, R. J. Knapton, and R. H. Hamre, editors, Biology and conservation of northern forest owls: symposium proceedings, 3–7 February 1987, Winnipeg, Manitoba. USDA Forest Service General Technical Report RM-142. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

MARGOT, B. G., AND R. HILL. 1990. Flammulated Owls in southwestern California. Western Birds 11: 141–149.

MARSHALL, J. T. 1939. Territorial behavior of the Flammulated Screech Owl. Condor 41: 71–78.

MCCALLUM, D. A. 1994a. Flammulated Owl. In A. Poole and F. Gill, editors, Birds of North America. No. 93. Academy of Natural Sciences, Philadelphia, PA.

———. 1994b. Review of technical knowledge: Flammulated Owl. Pages 44–46 in G. D. Hayward and J. Verner, editors, Flammulated, Boreal, and Great Gray Owls in the United States: a technical conservation assessment. USDA Forest Service General Technical Report RM-253. Rocky Mountain Forest and Range Experiment Station, Fort Collins. 131.

———. 1994c. Conservation status of Flammulated Owls in the United States. Pages 74–79 in G. D. Hayward and J. Verner, editors, Flammulated, Boreal and Great Gray Owls in the United States: a technical conservation assessment. USDA Forest Service General Technical Report RM-253. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

MCCALLUM, D. A., AND F. R. GEHLBACH. 1988. Nest-site preferences of Flammulated Owls in western New Mexico. Condor 90: 653–661.

MCCALLUM, D. A., F. R. GEHLBACH, AND S. W. WEBB. 1995. Life history and ecology of Flammulated Owls in a marginal New Mexico population. Wilson Bulletin 107: 530–537.

MESSER, J. L., AND G. P. FREDERICK. 1991. Distribution and habitat of Flammulated Owls (*Otus flammeolus*) in west-central Idaho. Idaho Department of Fish and Game, Boise. 28 pp.

NOON, B. R. 1981. Techniques for sampling avian habitats. Pages 42–52 in D. E. Capen, editor, The use of multivariate statistics in studies of wildlife habitat. USDA Forest Service General Technical Report RM-87, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

REYNOLDS, R. T., AND B. D. LINKHART. 1987a. Fidelity to territory and mate in Flammulated Owls. Pages 234–238 in R. W. Nero, R. J. Clark, R. J. Knapton, and R. H. Hamre, editors, Biology and conservation of northern forest owls: symposium proceedings, 3–7 February 1987, Winnipeg, Manitoba. USDA Forest Service General Technical Report RM-142. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

———. 1987b. The nesting biology of Flammulated Owls in Colorado. Pages 239–249 in R. W. Nero, R. J. Clark, R. J. Knapton, and R. H. Hamre, editors, Biology and conservation of northern forest owls: symposium proceedings, 3–7 February 1987, Winnipeg, Manitoba. USDA Forest Service General Technical Report RM-142. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

———. 1992. Flammulated Owls in ponderosa pine: evidence of preference for old growth. Pages 166–169 in M. R. Kaufmann, W. H. Moir, and R. L. Bassett, editors, Old-growth forests in the Southwest and Rocky Mountain regions: proceedings of a workshop. USDA Forest Service General Technical Report RM-213. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

SHEPHERD, J. F., AND G. SERVHEEN. 1992. Flammulated Owl (*Otus flammeolus*) surveys and habitat sampling on the Clearwater, Red River and Salmon River ranger districts, Nez Perce National Forest. Idaho Department of Fish and Game, Boise. 23 pp.

STEPHENS, D. A., AND S. H. STUBBS. 1991. Idaho bird distribution. Special Publication 11. Idaho Museum of Natural History, Pocatello. 76 pp.

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(Appendix A begins on the following page.)

APPENDIX A

Summary of all Unpublished Owl records and observations in Idaho not recorded during surveys conducted at 3 study sites (SNE, PNF-IRCNRA, NPNF) and reported in this paper. More detail on these records is provided by the Idaho Conservation Data Center (IDCDC), Idaho Department of Fish and Game, Box 25, Boise ID 83707.

Date	Observer	Habitat[a]	County	Source of data
22 September 1890	Merriam		Blaine	Burleigh 1972
28 September 1914	Rust		Kootenai	Burleigh 1972
Summer 1973	Trost	urban	Bannock	ISU Museum[b]
22 September 1977	Powers	urban	Ada	AB 32:234
23 September 1977	Jeppson	urban	Bannock	AB 32:234
September 1978	Jeppson	urban	Bannock	AB 33:197
7 May 1980	Hoodole		Shoshone	IDCDC
5 October 1980	Trost	DF	Bannock	ISU Museum
1981–1985	Hayward	PP	Idaho	Hayward and Garton 1988
June 1982	Hayward	DF/PP	Boise	Hayward 1986
26 August 1982	Jeppson	urban	Bannock	AB 37:204
26 September 1986	Jeppson	urban	Bannock	ISU Museum
6 July 1987	Chouchaneider	DF	Elmore	IDCDC
3 October 1987	Dudley		Gem	Stephens and Starts 1991[d]
5 July 1988	Hansen		Kootenai	AB 42:1319
September 1988	Trost	urban	Bannock	ISU Museum
17 October 1989	Hansen		Kootenai	AB 43:139
July 1989	Trost	DF	Bannock	IDCDC
May 1990	Trotter		Twin Falls	AB 44:467
22 May 1990	Trost	DF	Bannock	AB 44:467
14 June 1991	Atkinson	DF	Fremont	IDCDC
19 June 1991	Pattie	aspen	Teton	IDCDC
May 1991	Trotter		Twin Falls	AB 45:475
31 May 1991	Boehlell	DF	Camas	IDCDC
1 June 1991	Boehlell		Twin Falls	IDCDC
July 1991	Trost	DF	Bannock	AB 45:1140
18 September 1991		urban	Bingham	ISU Museum
12 April 1992	Leppert	PP	Adams	IDCDC
21 April 1992	McCammon	PP	Boundary	IDCDC
24 May 1992	Gray	DF/PP	Idaho	IDCDC
29 May 1992	Roebuck/r		Idaho	Stephens and Starts 1991
30 May 1992	Chouchaneider		Boise	IDCDC
June 1992	Leppert	DF/PP	Adams	IDCDC
16 June 1992	Leppert		Adams	IDCDC
18 June 1992	McCammon	PP	Boundary	IDCDC
18 June 1992	Walker	DF/PP	Adams	IDCDC
18 June 1992	Leppert	DF/PP	Adams	IDCDC
19 June 1992	Leppert	DF/PP	Adams	IDCDC
20 June 1992	Leppert	DF/PP	Adams	IDCDC
21 June 1992	Leppert	DF/PP	Adams	IDCDC
22 June 1992	Riley	PP	Bonner	IDCDC
23 June 1992	Atkinson	aspen	Bonneville	IDCDC
24 June 1992	Richards	PP	Adams	IDCDC
7 July 1992	Leppert	DF/PP	Washington	IDCDC
14 July 1992	Skinner	DF/PP	Washington	IDCDC
17 July 1992	Bell	grand fir	Idaho	IDCDC
17 July 1992	Leppert		Idaho	IDCDC
27 July 1992	Nadeauman		Bonneville	IDCDC
17 August 1992	Fehlhaber	DF	Bear Lake	Stephens and Starts 1991
5 October 1992	Sringer		Benewah	AB 47:122
30 March 1993	Leppert	DF/PP	Adams	IDCDC
23 April 1993	Wessman	DF/PP	Boise	IDCDC
5 May 1993	Trost	DF	Bannock	AB 46:453
26 May 1993	Evans		Adams	IDCDC
16 June 1993	O'Neill	PP	Adams	IDCDC
17 June 1993	Johnston	DF	Idaho	IDCDC
23 June 1993	Hollinger	DF/PP	Adams	IDCDC
24 June 1993	Hollinger	DF/PP	Adams	IDCDC
24 June 1993	Hollinger	DF/PP	Adams	IDCDC

APPENDIX A

Continued.

Date	Observer	Habitat[a]	County	Source of data
11 July 1993	Johnston	PP	Idaho	IDCDC
11 July 1993	Cassirer		Nez Perce	IDCDC
13 July 1993	Robinson	aspen	Bear Lake	IDCDC
3 May 1994	Garwood	DF	Camas	IDCDC
24 May 1994	Dhaemers	PP	Idaho	IDCDC
26 May 1994	Garwood	DF/aspen	Blaine	IDCDC
June 1994	Stutts	DF/PP	Idaho	Clearwater NF
28 June 1994	Hollinger	PP	Adams	IDCDC
28 June 1994	Leppert	DF/PP	Adams	IDCDC
28 June 1994	Hollinger	PP	Adams	IDCDC
28 June 1994	Bell	grand fir	Idaho	IDCDC
October 1994			Jefferson	ISU Museum
17 May 1995	Wunsdolleck	DF/PP	Shoshone	IDCDC
8 June 1995	Paike		Blaine	IDCDC
27 June 1995	McCammon	PP	Valley	IDCDC

[a]Douglas fir = DF, ponderosa pine = PP, Douglas fir and ponderosa pine = DF/PP.
[b]ISU = Idaho Museum of Natural History, Idaho State University, Pocatello.
[c]AB = American Birds.
[d]Stephens and Starts 1991 = a lifebirg database developed by D. A. Stephens and maintained by the Idaho Department of Fish and Game.