J. Raptor Res. 22(4):101–106

HOME RANGE AND DISPERSAL OF GREAT GRAY OWLS IN NORTHEASTERN OREGON

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ABSTRACT.—The average maximum distance radio-tagged adult Great Gray Owls (*Strix nebulosa*) traveled from their nest sites was 13.4 km. Average size of home range was 67.3 km^2. Maximum dispersal distance of juvenile Great Gray Owls from natal sites averaged 18.3 km, and home range averaged 139 km^2. Three juvenile owls had an average home range of 167 km^2 their first year of life and 13 km^2 their second year of life. Over 90% of radio-tagged owls dispersed to areas with less snow during the winter.

Great Gray Owls (*Strix nebulosa*) are uncommon throughout their range in North America and were considered rare in the United States until recent research revealed greater densities than anticipated (Nero 1980; Winter 1986; Franklin 1987; Forsman and Bryan 1987). Little is known of the movements of the species in North America, yet such information is essential for management. This paper reports on local movements, dispersal and home range of the Great Gray Owl.

STUDY AREA

The study was conducted in three areas (called Spring, Bowman and Sheep) in northeastern Oregon. Spring study area (44 km^2) was located 17 km west of La Grande at 930–1140 m elevation; Bowman study area (27 km^2) was located 50 km west of La Grande at 1380–1500 m elevation; Sheep study area (78 km^2) was located 37 km southwest of La Grande at 1290–1500 m elevation.

All study areas consisted of 60–70% conifer forest, with the remainder occurring as shallow-soiled grasslands, clearcuts and wet meadows. Of the mixed conifer forest, 60–80% had been selectively logged within the last 15 yrs, leaving some stands open and park-like. Isolated stands of unlogged, large trees (>50 cm dbh) occurred in each study area. Tree species included ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), grand fir (*Abies grandis*), lodgepole pine (*Pinus contorta*) and western larch (*Larix occidentalis*).

METHODS

During 1982–1986, we located owls by hiking through study areas after dark in February, March, or April, imitating the territorial call of male Great Gray Owls every 0 1 km. Areas where owls responded at night were searched during the day for nests. Attempts were made to trap birds once located.

Adult Great Gray Owls were captured with a variety of traps including bal-chatris, noose poles and mist nets (see Bull 1987). Radio transmitters were attached to 10 males and 13 females and replaced each year when possible. Observation periods of radio-tagged adults were 3 yrs for three owls, 2 yrs for seven owls, and 1 yr for 13 owls. We did not include data on seven radio-tagged birds because three died and four were located <10 times. Birds located <10 times had transmitters that malfunctioned

We attached transmitters to 32 juvenile owls after fledging. Observation periods of radio-tagged juveniles ranged from up to 1 yr (29 individuals)–2 yrs (3 individuals). We did not include data on 15 juveniles because 11 died within 6 mo and four were located <10 times.

AVM transmitters (SM1, L Module) were used with a 30-cm wire antenna with heat-shrink tubing on the outside. A 22-g transmitter attached to a back-pack harness of 6-mm tubular teflon ribbon was positioned on an owl's back. Transmitters lasted 242–505 d. A Telonics TR-2 receiver with a hand-held 2-element Yagi antenna was used for locations; transmitter range varied from 300 m–15 km but was usually about 3 km.

All radio-tagged adults nested each year. Nesting Great Gray Owls normally remained in the vicinity of their nest between March and July, so we determined movements from the nest area from August through February 1983–1986. We have called these local movements because they are movements within a home range (Caughley 1977).

Non-breeding owls (1- and 2-yr-old birds) were located all year, beginning the August after hatching. We have called these movements dispersal because they were movements away from natal sites. Caughley (1977) defines dispersal as the movement an animal makes from its point of origin to the place where it reproduces; we are using a slightly modified definition of dispersal because we do not know where the juveniles will reproduce.

We located radio-tagged owls from the ground once every 2–3 wks. Owls we could not first find from the ground were located from a fixed wing airplane and later located from the ground. All locations were marked on aerial photos. During winter we also recorded snow depth where each bird was found.

We determined maximum distance each bird traveled from its nest or natal site while radio-tagged. Home ranges encompassing movements of each owl were determined by constructing a minimum convex polygon that connected the outermost points of observation (Hayne 1949). Home range of adults included the area used while the bird was

[1] Deceased.

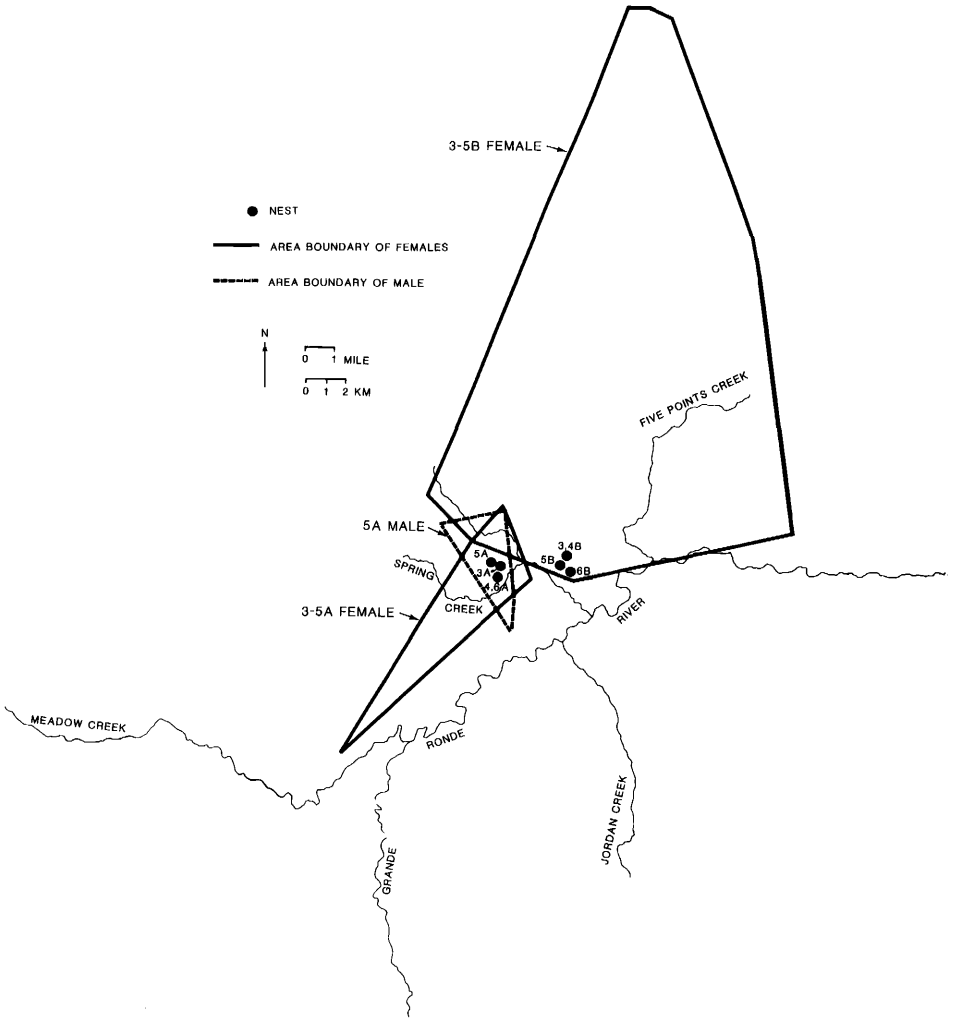

Figure 1. Home range of three adult Great Gray Owls in Spring study area. A letter refers to a particular bird or pair and the nest used. Numbers preceding a letter refer to the years that bird was located or the year a nest (dot) was used (3 = 1983, 4 = 1984, 5 = 1985, and 6 = 1986). Number of locations = 38 for 5A male, 72 for 3-5A female and 40 for 3-5B female.

radio-tagged. Home range of juveniles defined only that area used within the first 1 or 2 yrs of life and included the natal area, where birds spent 3–4 mo after fledging.

We used a t-Test to test for differences in maximum distance traveled and home range size between: 1) males (N = 5) vs. females (N = 8), 2) juveniles in Bowman/Sheep (N = 3) vs. juveniles in Spring (N = 14), 3) adults in Bowman/Sheep (N = 3) vs. adults in Spring (N = 13), and 4) first-yr vs. second-yr of 3 juveniles from Spring. Birds from Bowman and Sheep areas were combined because the two study areas were in close proximity, snow conditions were similar and sample sizes for each area were small. Significance was established when $P < 0.05$.

RESULTS

Local Movements of Adult Owls. During 1983–1986, maximum distance adults traveled from nest sites averaged 13.4 km (range = 2.4–43.2 km), and home range size averaged 67.3 km^2 (range = 4–312 km^2) (Fig. 1). No significant differences in maximum distance traveled from the nest ($t = -0.99$, df = 2.2, $P = 0.43$; $t = -0.41$, df = 7.0, $P = 0.69$) or in home range size ($t = 0.20$, df = 8.7, $P = 0.85$; $t = 0.64$, df = 10.6, $P = 0.54$) of adults were found between study areas or between sexes, respectively.

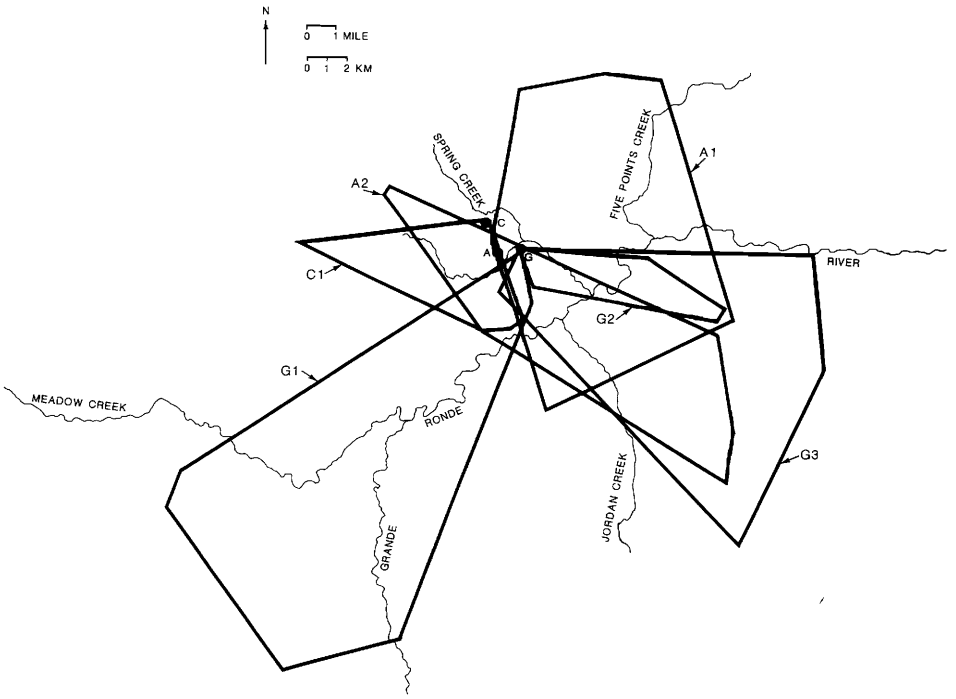

Figure 2. Home range of six juvenile Great Gray Owls hatched in Spring study area and located from August 1985 until June 1986. A dot with a letter refers to a nest site. A letter with a number refers to the home range of each juvenile raised at the nest with the corresponding letter. Number of locations ranged from 12–21/bird.

During winter, 92% of birds from Spring and 83% of birds from Bowman and Sheep were located where snow depths were <40 cm. Spring had <50 cm of snow each winter, and six adults remained in that area for at least one winter. The seven adults that left Spring in the winter went to areas with a mean snow depth of 24 cm. None of the birds wintered at Bowman where snow depth was 70–100 cm. Birds

Table 1. Yearly variation in maximum distance traveled (km) and home range size (km^2) of radio-tagged adult Great Gray Owls in northeastern Oregon.

		1983–1984		1984–1985		1985–1986	
BIRD	N[a]	DISTANCE	AREA	DISTANCE	AREA	DISTANCE	AREA
Female A	72	2.9	4	12.5	18	2.4	5
Female B	40	6.9	10	28.2	151	18.7	115
Female D	89	18.0	135	17.0	43	10.4	26
Female C	42	—	—	8.2	27	6.7	16
Female H	27	—	—	41.2	91	43.2	68
$\bar{x}$		9.3	49.7	21.4	66	16.3	46
Male C	60	22.8	37	19.2	120	—	—
Male F	35	—	—	1.6	2	2.4	2
Male G	38	—	—	12.3	84	2.4	2
$\bar{x}$		—	—	11.0	68.7	—	—

[a] Number of locations.

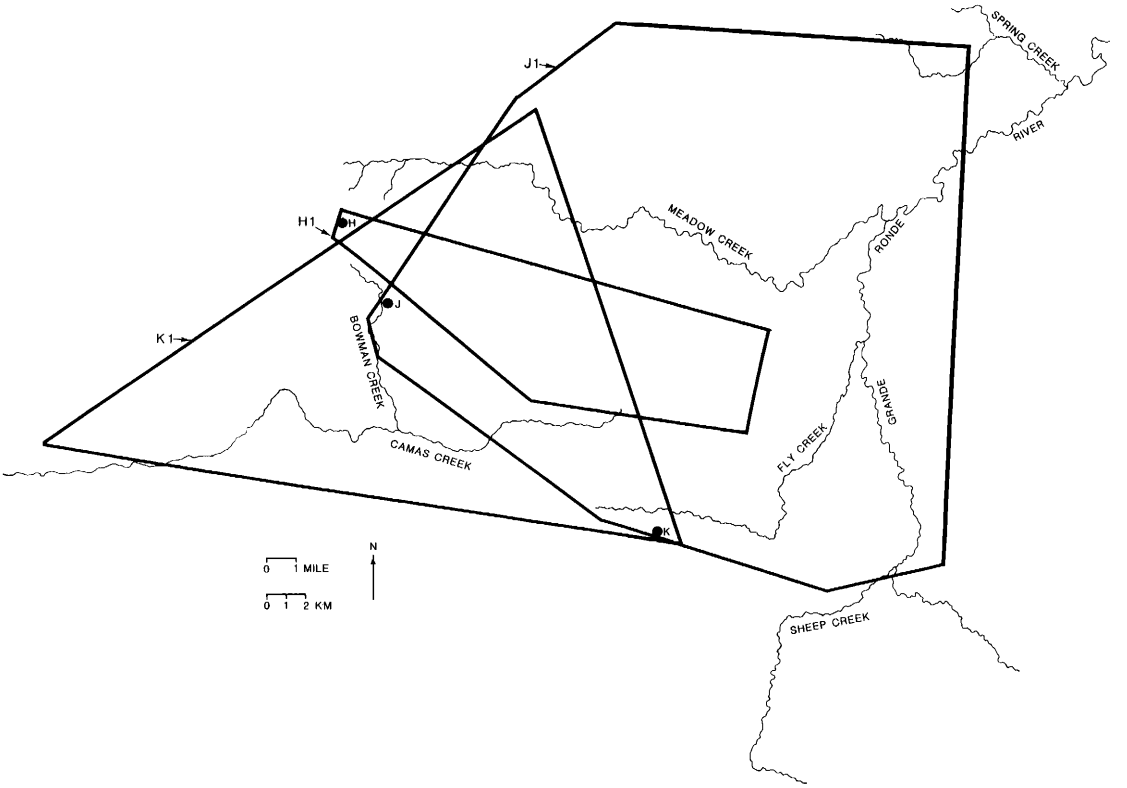

Figure 3. Home range of three juvenile Great Gray Owls hatched in Sheep and Bowman study areas and located from August 1985 until June 1986. A dot with a letter refers to a nest site. A letter with a number refers to the home range of each juvenile raised at the nest with the corresponding letter. Number of locations ranged from 10–20/bird.

from Bowman went to areas with shallower snow depths, except one female which was located for two winters in an area 43 km from Bowman with >150 cm of snow.

Of eight adults followed two or more winters, six returned to the same area or even the same stand in more than one winter. However, considerable variation occurred in local movements and home range size among birds (Fig. 1) and even between years for the same bird (Table 1). Pairs did not stay together during non-breeding periods; however, pairs did return to the same area to nest.

Dispersal of Juveniles. Maximum distance 17 juveniles traveled from natal sites in their first year averaged 18.5 km (range = 7.5–32 km), and home range size averaged 157 km^2 (range = 20–637 km^2). Juveniles from Bowman and Sheep areas dispersed significantly farther ($t = -3.69$, df = 3.5, P = 0.03) than juveniles from Spring area (Figs. 2, 3). Mean dispersal distance for Bowman/Sheep and Spring were 29 and 16 km, respectively. Home range sizes were not significantly different ($t = -1.5$, df = 2.1, P = 0.27) between the two areas.

All juveniles from Bowman and Sheep moved to areas with less snow. Twelve of 14 juveniles from Spring area spent most of their first winter 6–13 km to the southeast in an area characterized by open ponderosa pine stands. One juvenile spent the winter in Spring and another 6 km north of Spring in an area that was being logged; as logging operations moved location, the bird followed.

Dispersal of 2-yr-old Birds. We followed two male and one female juveniles for 2 yrs. Although the difference was not significant ($t = 2.13$, df = 2, P = 0.17), juveniles had a larger home range their first year (167 km^2, range = 23–245 km^2), then

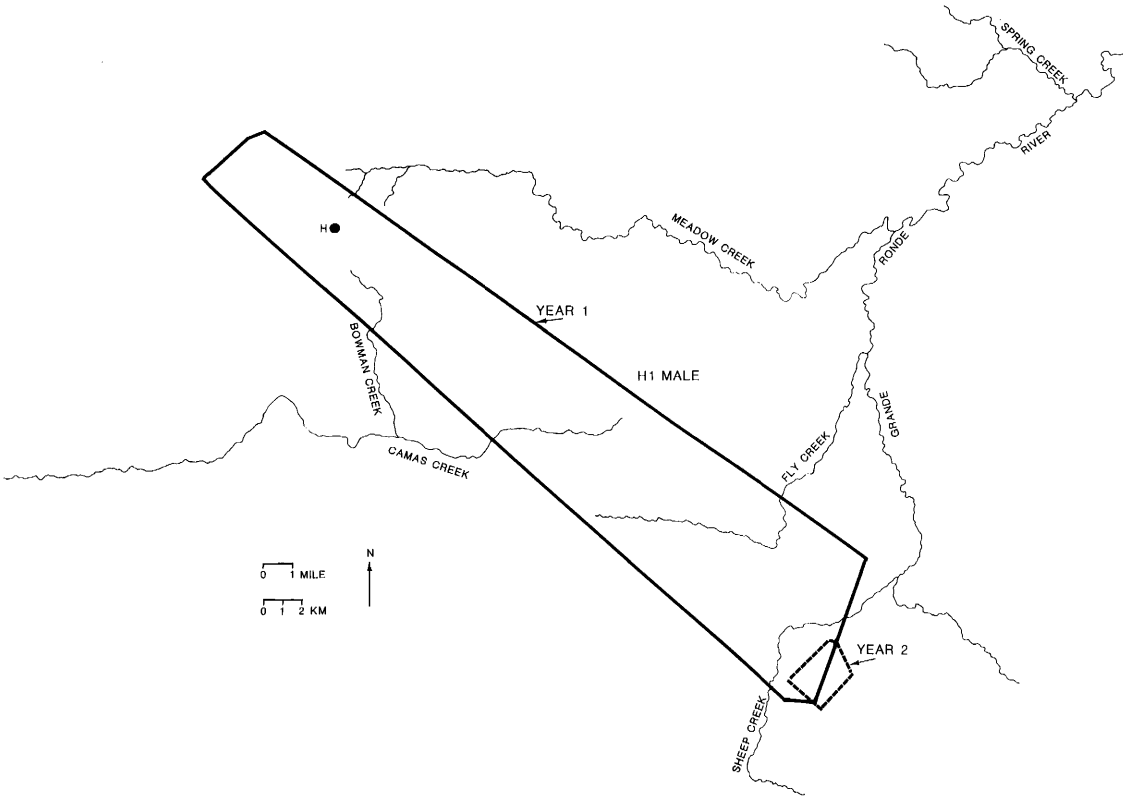

Figure 4. Home range of a male juvenile Great Gray Owl during first and second year of life (August 1984–June 1986) hatched in Bowman area at nest (dot) H; number of locations = 34.

restricted their movements to a smaller area their second year (13 km^2, range = 6–22 km^2) (Fig. 4). No juveniles were known to nest.

DISCUSSION

Much greater movements have been reported for the Great Gray Owl than we observed. Nero and Copland (1981) captured an adult female in Canada that had been banded as an adult 3 yrs prior 223 miles (359 km) away. Nero (1981) found a dead juvenile 468 miles (753 km) from its natal site. Mikkola (1981) in Finland reported the range of a female as 110 km, of a male as 22 km, of one juvenile as 20 km and of a second juvenile as 220 km. He found that in years with normal mouse populations, most birds spent the winter in breeding areas in Finland. In the Sierra Nevada in California Great Gray Owls moved to lower elevations in the winter (Winter 1986). Franklin (1987) observed elevational movements in Great Gray Owls in southeastern Idaho and northwestern Wyoming and theorized that when snow reached a certain depth, prey became unavailable and owls moved to areas with shallower snow

We think the relatively short distances we observed birds travel were a function of topography. Owls had to travel only a short distance to change elevation, snow depth and probable availability of prey. In contrast owls in Ontario, Manitoba and Minnesota must travel long distances to change elevation or snow depth (R. W. Nero, pers. comm.).

In winter all adult owls in Bowman, and all juvenile owls in Bowman and Sheep (study areas with deepest snow), moved to areas with less snow. In contrast six of 13 adults remained in Spring (study area with least snow). Birds presumably left areas with deep snow which rendered small mammals unavailable; nesting birds fed primarily on voles (*Microtus* spp.—52% of diet) and Northern Pocket Gophers (*Thomomys talpoides*—29% of diet) in northeastern Oregon (Bull et al., in press). However,

the fact that one female spent two winters in an area with >150 cm of snow suggests that at least some birds can survive in areas with deep snow.

We were surprised to find a juvenile owl adjacent to active logging operations. Presumably, tree falling and soil disturbance displaced many small mammals which became easy prey. Both this juvenile and an adult female in another winter followed logging operations which moved to different stands.

Our observations showed considerable variability in local movements, dispersal, and home range size among individuals and even between years for the same bird, suggesting that Great Gray Owls in Oregon were not associated with a specific area yearround and were somewhat nomadic, versatile and opportunistic.

ACKNOWLEDGMENTS

Funding was provided by the USDA Forest Service's Pacific Northwest Research Station and Oregon Department of Fish and Wildlife Nongame Fund. Additional assistance was provided by Wallowa Valley and La Grande Ranger Stations. We are grateful to R. G. Anderson, H. A. Akenson, J. Akenson, S. Feltis, R. Goggans, R. A. Grove, J. S. Henderson, J. E. Hohmann, M. Hunter, M. D. Snider, M. E. Walker, and W. G. Williams.

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Received 22 February 1988; accepted 5 October 1988