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Ecology of the Great Gray Owl

Evelyn L. Bull and Mark G. Henjum

We sampled the small mammal population in the Spring study area in August 1985 and 1987 by trapping in 18 plots. At each plot, we used a 5-by-5 grid with stations at 5-meter spacings and set two museum specials and one rat trap at each station. We trapped for three nights at each plot for a total of 4,050 trap-nights each August.

A dramatic decrease occurred in the number of small mammals trapped from 1985 to 1987. We trapped 187 small mammals in 1985 and 23 in 1987—on the same plots, at the same time of year with trapping done in the same manner. In 1985 and 1987, the respective numbers trapped were 107 and 0 voles, 23 and 3 redback voles, 22 and 13 deer mice, 20 and 6 yellow pine chipmunks, 8 and 0 northern pocket gophers, 6 and 1 shrews, and 1 and 0 bushytail woodrats.

We think the absence of voles and the decrease in other small mammal populations explained why none of the owls nested in the Spring study area in 1987. We have no small mammal data for Umatilla or Wallowa Counties, so do not know what occurred there. Because there was evidence from sightings, feathers, pellets, and whitewash of great gray owls in Spring in April 1987, we believe that the birds were there but did not nest and did not go elsewhere to nest. There simply was not enough prey for the birds to raise young.

Habitat

Nesting Habitat

Because great gray owls do not build their own nests, they must use existing platforms. From 1982 to 1988, we located 49 nests used by great gray owls. The same nest was often used more than once: one nest was used for 4 years, six nests were used for 3 years, nine nests were used for 2 years, and two nests were used twice in the same year. Fifty-one percent of the nests were stick platforms, 29 percent were artificial wooden platforms, and 20 percent were natural depressions on broken-topped dead trees (table 3, color plates B-D). Of the stick nests, 68 percent were originally made by northern goshawks, 12 percent were made by red-tailed hawks, and 20 percent were natural platforms formed by dwarf-mistletoe brooms (fig. 5).

The owls seemed to use whatever type of platform was available in each study area; for example, 72 percent of the nests in Spring and Sheep were on stick nests. Stick nests were common in these areas, but large-diameter dead trees were scarce, and there was only one artificial platform before 1985. At Thomason, where there were 38 artificial platforms available and an abundance of large-diameter, dead trees, all but one of the nests were on broken-topped dead trees or artificial platforms. Stick nests were uncommon in this study area.

If there was a preference for nest type, we think the owls favored artificial platforms, perhaps because they were more stable than stick ones. These platforms were readily used, even when there were natural stick platforms in the immediate vicinity. In addition, the rate of successful nesting attempts was higher on artificial platforms (83 percent) than on stick platforms (66 percent). Eggs or young fell through at least three stick nests, and 36 percent of the stick nests disintegrated within a year.

Most (72 percent) of the nests were in unlogged stands, while 19 percent were in stands with a partial removal of the overstory, and 9 percent were within 200 meters of a clearcut. This suggests that the owls favored unlogged stands, because 60-80 percent of the stands in each study area had been logged; however, we do not know if this reflected actual preference or the availability of nest sites. We think most goshawk nests and large-diameter dead trees occurred in unlogged stands because logging activity typically eliminates both.

Forty-seven of the 49 nest sites had two or more canopy layers with a canopy closure in excess of 60 percent at most nests. Western larch comprised the dominant crown class at 50 percent of the nest sites. Density of live trees 10-49 centimeters d.b.h. ranged from 5 to 64 stems/0.1 hectare, and live trees greater than 49 centimeters d.b.h. ranged from 0 to 10 stems/0.1 hectare.

Sixty-nine percent of the nests occurred on slopes, 22 percent on flat ground, and 9 percent in draws. Nest sites on slopes were in areas having a fairly gentle slope (averaged 13 percent slope gradient). Most of the nests (65 percent) occurred on north-facing slopes; however, these slopes usually contained denser stands than south slopes and were preferred nesting habitat of the northern goshawk (Reynolds and others 1982), the primary builder of nests used by great gray owls.

The percentage of area in forest within a 500-meter radius of each nest ranged from 52 to 99 percent, and the percentage of that forested area that had been logged ranged from 0 to 97 percent.

Perches Used by Nesting Females

Females with eggs or small young left the nest infrequently to defecate and regurgitate pellets. If we found a perch with a large accumulation of pellets, it was very likely that there was a nest nearby. One or several perches 30-200 meters from the nest were used repeatedly for this function (color plate H). If several perches were used, they were usually in the same general vicinity and often in a straight line away from the nest. Perches were usually uphill or on the same contour as the nest, presumably so the female could watch the nest and return to it quickly if necessary.

Females perched on branches (61 percent), leaning trees (26 percent), and broken-topped dead trees (13 percent). Branches used as perches were usually dead limbs in a large-diameter ponderosa pine; leaning trees used as perches were generally small-diameter western larch or lodgepole pine. Perches were typically close to the ground (most were less than 6 meters above the ground) in sites with a relatively open understory to facilitate easy and fast maneuvering, yet with a fairly dense canopy closure (average of 59 percent) overhead to provide cover.

Perches Used by Juveniles

Owlets left the nest before they could fly but were capable climbers; they used talons, bill, and wings to claw and flap their way up tree trunks. For the first few days, leaning trees with bark were easiest for the young to climb to get off the ground and away from terrestrial predators (color plate I). After several days, juveniles could climb some vertical trees, particularly those with branches or deeply fissured bark because the bark provided a gripping surface for the owlets. After leaving the nest, juveniles invariably headed for dense forest cover (color plate J), if the nest was not already in such cover. As the owlets aged, they perched higher in the canopy and thus had more cover and shade.

Foraging Habitat

Great gray owls usually hunted from perches close to the ground. They flew from perch to perch, listening and watching the ground intently. Even after hearing something, they would often listen or watch for several minutes before attacking. The average distance from the perch to the prey was 10.5 meters. If they did not catch prey, they usually flew to a perch quickly. If they caught prey, they often remained on the ground for several minutes and eventually swallowed the prey or carried it to the nest. If the prey captured was as large as a woodrat or flying squirrel, they flew to a perch and picked meat off the carcass. The great gray owls we observed usually hunted in forested stands having an open understory, thus enabling them to fly without maneuvering around trees. Most of the stands had been logged, thereby leaving an open stand of trees with a dense cover of grass on the ground (color plate K).

We followed eight male great gray owls (with radio transmitters) for 229 hours during daylight hours while they were foraging, and we recorded habitat characteristics of the areas used for hunting (Bull and others 1988b). The males hunted from perches averaging 5.5 meters aboveground. At sites where the owls either caught prey or attempted to catch prey, vegetative cover averaged 88 percent with a mean height of 21 centimeters; grasses dominated (color plate L). At 77 percent of the sites, downed wood was within 1 meter of the point of capture (color plate M). This downed wood presumably provided cover for small mammals.

For five of the eight radio-tagged males, we compared habitat they used with expected use based on availability. Males preferentially foraged in stands with 11-59 percent canopy closure and avoided clearings. Four of the males avoided stands with at least 60 percent canopy closure; one male used such stands in proportion to their occurrence. Use of edge was greater than expected with two males (color plate L), less than expected with two males, and no different than expected with one male. This variability again reflects the opportunistic nature of the species; they go where the prey is.

There were differences in habitat used between five foraging males at Spring and three at Sheep and Bowman (table 4). Males at Spring hunted more often in open, logged stands with one or two canopy layers and containing more ponderosa pine (fig. 8). Males at Sheep and Bowman hunted more often in stands that were unlogged with two or three canopy layers and containing more Douglas-fir and lodgepole pine (fig. 9).

Maximum distances from the nest that the eight radio-tagged males foraged ranged from 0.7 to 3.2 kilometers. The home range of five males (with more than 90 location points) during the nesting season averaged 4.5 square kilometers (range, 1.3 to 6.5 square kilometers). The home range was calculated by connecting the outermost points of observation and determining the area of the polygon (minimum convex polygon method).

The areas used by several males for foraging overlapped. We observed three instances of males hunting within sight of each other with no aggressive behavior exhibited. The occurrence of shared hunting grounds supports the theory that pairs defend only the immediate nest site. This behavior is unlike that of many owl species that defend their entire territory all year to ensure that other owls of the same species do not hunt in the same area (Mikkola 1983).

The easiest management practice is to put up nest platforms, because they are readily used and the birds often successfully raise young on them. These platforms should be open (design shown in fig. 6), placed at 9-15 meters above the ground, and located in a forested stand next to foraging areas. The platform should be positioned so that canopy cover over it provides shade and concealment from avian predators. The area immediately around and above the nest should be open so the birds can easily fly into the nest.

To provide natural nest sites, large-diameter (more than 50 centimeters d.b.h.) dead trees with broken tops should be left standing and marked so they will not be cut. Large-diameter live larch with dwarf-mistletoe provide natural stick nest platforms. Any tree with a stick platform, particularly old raptor nests, should be left standing with cover around the nest. Managing habitat for northern goshawks will provide nest sites over time for great gray owls, because the owls used old goshawk nests more than any other type of nest.

The areas used most often for nesting were unlogged, mature or older stands containing grand fir, Douglas-fir, and western larch. These stands usually contained a fairly open understory facilitating easy flight, yet a fairly dense overstory (more than 60 percent canopy closure) providing shade and concealment from above.

At all nests, dead and downed material and leaning trees are important so that the juveniles can climb them to avoid mammalian predators. In addition, a dense stand of trees around or near the nest tree provides critical cover for the juveniles for several months. It does no good to provide nest sites if the young owls are immediately killed by predators for lack of cover.

Great gray owls are efficient predators and can make an impact on a population of small mammals. A single bird can consume more than 1,400 voles in a year, and a family group can consume many more. For open areas such as clearcuts to be used by great gray owls for foraging, perches must be available for the owls to hunt from. Perches can be as short as 3 meters and should occur every 20 meters. The owls do more foraging near the edges of openings so will use a greater percentage of area in a small clearcut than in a large one.

Partial cuts are generally suitable foraging habitat because the stand is open enough for maneuvering and adequate perches are available. Dead and downed material should be left for cover for voles. Burning that destroys this downed material should be avoided.

The best way to increase populations of great gray owls is to provide the best habitat possible, meaning solid nest sites in suitable areas with adequate cover. Many juveniles are killed by avian predators; this number might be reduced by providing dense stands around nests to furnish more cover. In addition, any practice enhancing populations of voles and pocket gophers will be beneficial to these owls.