

NORTHERN GOSHAWK NEST SITE REQUIREMENTS IN THE COLORADO ROCKIES

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This paper deals with 20 Northern Goshawk (*Accipiter gentilis*) nest sites I studied in northern Colorado. Numerous references have described typical Goshawk nests (Bailey and Niedrach 1965, Bent 1937, Beebe and Webster 1964, Brown and Amadon 1969), but there are few detailed studies of their nest sites. Bartelt (1977) completed a study in South Dakota using data gathering methods similar to this paper. Also, Reynolds (1971) and Reynolds and Wight (1978) described habitat requirements in Oregon.

For the purpose of this paper, a nest site is defined as the area, immediately surrounding the nest, in which most of the birds' nesting activities occur. In most cases this is confined in a definite size and age timber stand.

STUDY AREA AND METHODS

The area under study included the Arapaho and Roosevelt National Forests and Rocky Mountain National Park. The lower elevation areas of the study, from 2000 to 2500 m, were typically Ponderosa Pine (*Pinus ponderosa*)-Antelope Bitterbrush (*Purshia tridentata*) communities with sage (*Artemisia* sp.) meadows scattered throughout the stands. Lodgepole Pine (*Pinus contorta*) and Quaking Aspen (*Populus tremuloides*) were the dominant trees above 2500 m.

I located nests between 1971 and 1977, and measured all but the 1971 and 1972 nests in February and March 1977. Only the nests that were known to have been used were measured, to prevent any alternate nests (nests built but not used) from being included. The extent (if any) that Northern Goshawks build alternate nests is not known, but by leaving out nests of unknown use, any bias should be eliminated.

Standard timber survey measurements were taken at each nest site. These included: nest height, nest tree height, nest tree type, diameter at breast height (DBH), status of nest tree, slope, aspect, basal area (feet² per acre), distance to nearest water, distance to nearest 2.5 ha or larger opening, understory height and density, the location of nest in relation to the trunk and canopy, site elevation, and dominant tree type in the stand.

GOSHAWK NEST SITE REQUIREMENTS

These measurements were taken by standard foresters' tools which are all calibrated in the English system. The results below, with the exception of basal area, were converted into the metric system following computation.

NEST MEASUREMENTS

Trees selected for nests ranged from 13.7 to 24.1 m in height with a mean of 19.2. In this sample, the preferred species was Quaking Aspen with 10 nests. Five nests were located in Ponderosa Pine and 5 were in Lodgepole Pine. The nest height varied directly with tree height in Quaking Aspen, while in pine the correlation was less strong (Figure 1). This difference may be related to the fact that nests in Quaking Aspen were always directly below the canopy. In Quaking Aspen, the canopy increased in height as the trees grew, whereas in pine, the canopy lower level did not follow the trees' growth as quickly. Also, in pine the nests were not always below the canopy.

Although the lower nest height and tree height appear to be limiting, the upper range may be only due to the maximum size stand found in the study area. In eastern Oregon, nine nest trees were measured which were all over 35 m in height and the nests were correspondingly higher than the 7.0-18.0 m range found in this study. The nests in Oregon were in old growth stands typical for that part of the country. The nests in Colorado were also in the oldest stands in the area.

The diameter of the trees was also very similar for the pine and Quaking Aspen (range 20.6-50.0 cm). The upper range may again be limited only by the lack of large stands in the area.

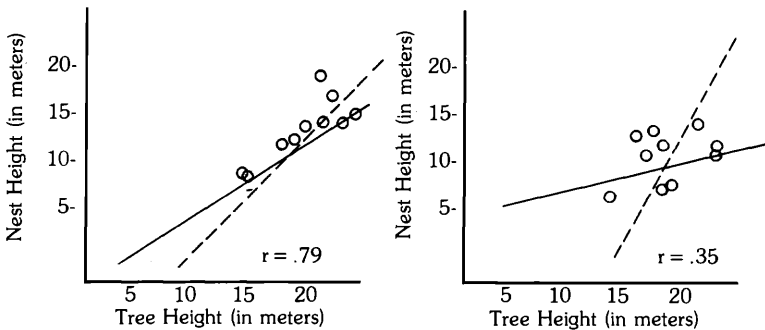


Figure 1. Correlation of Northern Goshawk nest height with nest tree height in aspen (left) and in pine (right) in the Colorado Rocky Mountains (Pearson r test).

GOSHAWK NEST SITE REQUIREMENTS



Adult male Goshawk near nest at San Juan National Forest, Montezuma County, Colorado, on 10 June 1978. This bird frequently flew to and inspected my blind, apparently to see if it was occupied. 300 mm lens, 12 mm extension tube, f4, $\frac{1}{600}$ sec

Photo by W C Shuster



Goshawk nest in Quaking Aspen, Roosevelt National Forest, Larimer County, Colorado, 1974. Note typical lack of understory. Placement of nest at the bottom of the canopy, and density and large size of the aspens

Photo by W C Shuster

GOSHAWK NEST SITE REQUIREMENTS

Of the 20 nests, only 2 were built on a limb away from the trunk. Most nests were built at a major fork or where a large limb branched from the trunk. In Lodgepole Pine, dwarf mistletoe (*Arceuthobium* sp.) infected limbs provided sturdy nest platforms.

All of the nests were in live trees during the year they were used. Three of the trees died the following year due to a beetle infestation, and these nests have not been used again.

NEST SITE MEASUREMENTS

The nest site basal area, which is a weighted combination of tree density and size, was found to be a very specific factor according to the tree type the nest was in. In Quaking Aspen, the range was 35-165, though the 95% confidence interval was 51.8-88.0. Figure 2 shows the wide difference between these two. Apparently the hawks are keying on this factor quite heavily.

The slope of the site varied from 0 to 40%, with a mean of 12.5%. Most nests were on gentle slopes with a north to east aspect (Figure 3). Most nest sites, however, were on benches or basins surrounded by much steeper slopes.

Another important factor proved to be the lack of understory under the nest tree. The heaviest understory found was one nest site that had 4940 stems per hectare, with an average height of 1 m. Only two nests had trees taller than 5 m under the tree. This preference for a lack of understory is in sharp contrast to nest sites studied in Oregon (Reynolds 1971), where a dense multi-leveled understory appeared to be necessary.

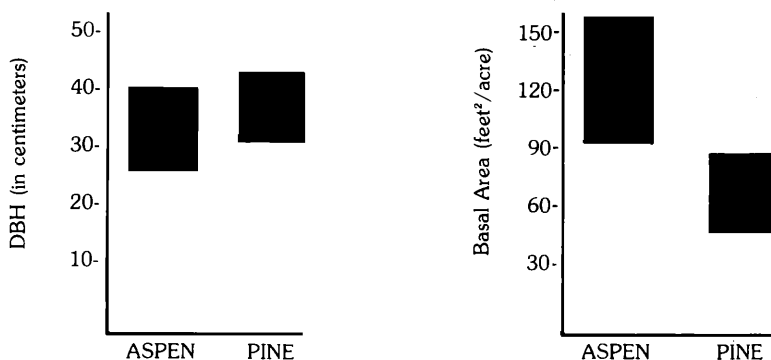


Figure 2. Northern Goshawk nest tree DBH (left) and nest site basal area (right) in the Colorado Rockies (95% confidence limits).

GOSHAWK NEST SITE REQUIREMENTS

All nest sites had a small opening immediately adjacent to the nest tree. The use of this clearing is not known; it may be simply for easy access to the top of the nest.

All nest sites had a 0.4 ha plus opening within 350 m of the nest. The importance of this opening is evident from looking at the adults' diet during the nesting season. The preferred prey at this time in montane Colorado is the Richardson's Ground Squirrel (*Spermophilus richardsonii*) and the Thirteen-lined Ground Squirrel (*S. tridecemlineatus*). These squirrels are abundant in the sage and bitterbrush openings, seldom venturing under any dense stand of trees. The openings are heavily hunted by the hawks for the squirrels, and therefore seem to be a strong attractant during selection of a nest site. It should be noted, however, that the squirrels are not yet out of hibernation when nest site selection and nest building are taking place. Both natural openings and clearcuts were used extensively by the nesting hawks.

The lowest elevation found for the nest sites was 2255 m, with the highest being 2664 m. Because of weather, I was unable to measure nest sites that were above 3000 m, therefore the upper elevation should not be considered as a limiting factor. The lower elevation should be however. Despite a search at lower elevations, I found no nests.

One factor which has been described as a limiting factor by many authors is the presence of water. All of the aspen stands had running

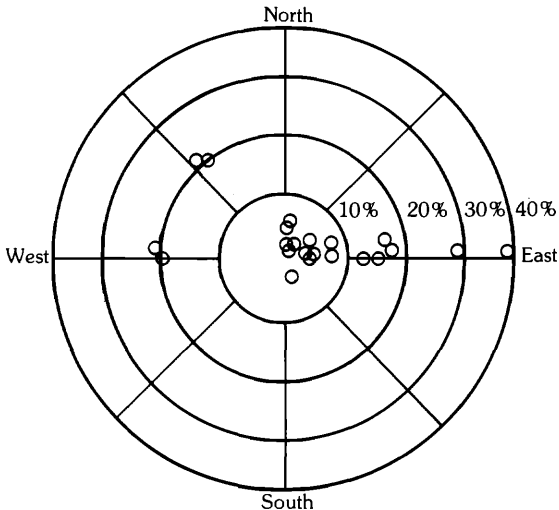


Figure 3. Aspect and slope of Northern Goshawk nest sites in the Colorado Rockies.

GOSHAWK NEST SITE REQUIREMENTS

water associated with them. In pine, however, the distance to water ranged from 10 m-450 m. This limitation holds true upon review of all 72 other nest sites I have measured in western United States. Another factor concerning water is that none of the nests were in drainages near cataracts. There were many fast flowing (loud) streams in the study area with apparently suitable nest sites nearby. None were used however. Whether noise level is the reason for these sites not being used is unknown.

CONCLUSIONS

The following conclusions were drawn for the Northern Goshawk population in montane Colorado.

NEST TREE PREFERENCE

1. Only live, large trees are used for nest sites. These trees are normally 25 cm in diameter or larger.
2. The nest is built close to the trunk of the tree, usually at a major fork or branch.
3. The nest is built at the bottom of the living canopy in aspens or in any tree displaying a definite lower canopy level.
4. The nest is normally 12-15 m above the ground in aspen, and 8.5-12 m in pine.

NEST SITE PREFERENCE

1. There appears to be a preference for nesting on gentle north and east facing slopes or benches, including those surrounded by steep terrain.
2. Basal area in aspen must be between 99-152 to be an ideal site. In pine the basal area is usually 52-88.
3. Understory in the stand is sparse, if present at all.
4. Goshawk populations are highest near dense populations of ground squirrels. Nests are normally within 350 m of such areas.
5. Nests are seldom found at elevations lower than 2,300 m.
6. Nests are seldom found farther than 275 m from water.
7. Although many nests are found in drainages, drainages or portions of drainages with cataracts are not desired as nest sites.

GOSHAWK NEST SITE REQUIREMENTS



Immature-plumaged Goshawk, about 3 weeks old, at nest in Roosevelt National Forest, Larimer County, Colorado, 17 July 1974. 300 mm lens, 36 mm extension tube, f11, $\frac{1}{60}$ sec.

Photo by W. C. Shuster

GOSHAWK NEST SITE REQUIREMENTS

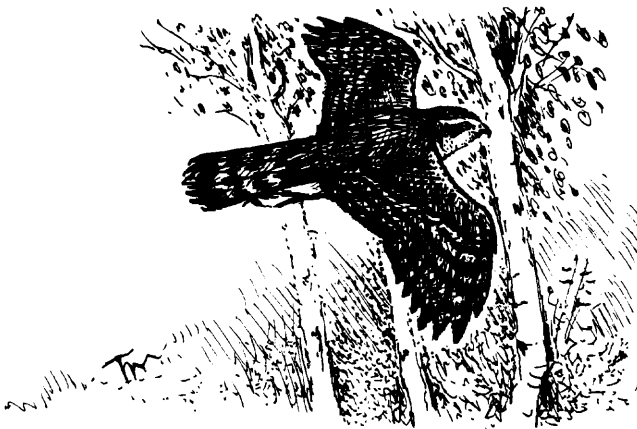
ACKNOWLEDGMENTS

I am indebted to John Wagner, Colorado Division of Wildlife, for his field assistance, to Paul Baldwin, Colorado State University, for his encouragement on this study, and to Richard Olendorff for reviewing the paper.

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Accepted 17 March 1980



Sketch by Tim Manolis