

NEST SITE SELECTION BY WILLIAMSON AND RED-NAPED SAPSUCKERS

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Two congeneric woodpeckers, the Williamson Sapsucker (*Sphyrapicus thyroideus*) and the Red-naped Sapsucker (*S. [varius] nuchalis*) are sympatric throughout much of the Rocky Mountain region of the western United States. Although these two picids are closely enough related that two probable hybrids have been reported (Short and Morony 1970), there is generally effective reproductive isolation between them. This reproductive isolation apparently is not due to different nest site preferences. Bent (1939), Packard (1945), Bailey and Niedrach (1965), and Burleigh (1972) reported that Red-naped Sapsuckers prefer deciduous trees, especially aspen (*Populus tremuloides*), while Williamson Sapsuckers favor conifers. However, Rasmussen (1941), Hubbard (1965), and Tatschl (1967) noted that *thyroideus* nest in aspen, which Ligon (1961) suggested was their preferred nest tree in northern New Mexico. These differences in the literature led us to investigate the nesting habitat preferences of the two sapsuckers in Colorado and Wyoming. We use the name "Red-naped" for the Rocky Mountain form of the Yellow-bellied Sapsucker (*S. varius*) complex, as suggested by Short (1969) and Short and Morony (1970).

We examined a total of 57 *thyroideus* and 46 *nuchalis* nests at two locations in Colorado and one location in Wyoming. Both species nested at each location and were provided a choice of nest trees by the close proximity of conifers and aspen (fig. 1 and 2). At each nest site, we recorded the species and condition of the nest tree, its diameter at breast height (dbh, measured at 4.5 feet above the ground), the height of the nest hole, and the compass direction that the hole faced. We also measured various nest stand parameters, including stand density and stand

size. These data were examined for significance using *t*-test and Chi-square statistical analyses.

The primary study area, in northern Colorado, consisted of six sites within the eastern half of Rocky Mountain National Park, Larimer County. Elevations at which nests were found ranged from 2440 to 2800 m, roughly corresponding to the upper montane region and the upper montane/subalpine ecotone region of Marr (1967). The area was predominantly an open forest of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*), with lodgepole pine (*P. contorta*) on cooler north-facing slopes and with limber pine (*P. flexilis*) in exposed areas above 2700 m. Aspen occurred in discrete stands along permanent to ephemeral drainages within the coniferous forest (fig. 1). The understory was highly variable due to topographic differences but was always rather sparse and low.

The second Colorado study area was located on Missionary Ridge, about 20 mi NE of Durango, La Plata County. Elevations here ranged from 2500 m at Wallace Lake to 2900 m atop surrounding hillsides. Mature aspen ringed the ephemeral lake and extended up the adjacent slopes along drainages (fig. 2). Drier areas were covered by a coniferous forest of ponderosa pine, Douglas-fir, white fir (*Abies concolor*), and blue spruce (*Picea pungens*). Open areas on hillsides were covered by a dense growth of scrub oak (*Quercus gambelii*) and snowberry (*Symphoricarpos oreophilus*). Grasses, sedges, and forbs grew in a lush understory beneath the aspen, with kinnikinnik (*Arctostaphylos uva-ursi*) under the denser spruce/fir forest. Ground cover was sparse under the Douglas-fir/pine forest.

The third study area was located in the Bridger Wilderness on the west slope of the Wind River Mountains, 40 mi NE of Pinedale, Sublette County, Wyoming. Nests were found from 2440 to 3200 m. Areas at lower elevations were covered by a forest of aspen interspersed with Englemann spruce (*P. englemannii*), Douglas-fir, and lodgepole pine. Areas at higher elevations had a forest of mixed spruce and subalpine fir (*A. lasiocarpa*) with patches of lodgepole pine and small stands of aspen, the latter occurring as late seral stages and being replaced by spruce and fir.

At all three study locations, the two sapsucker species showed a strong preference for aspen (table 1), in which 85 percent of *thyroideus* nests and 100 percent of *nuchalis* nests were located. The close proximity of aspen and conifers at the three sites

TABLE 1. Nest site data for Williamson (*Sphyrapicus thyroideus*) and Red-naped (*S. nuchalis*) Sapsuckers.

Location	No. of nests	<i>thyroideus</i>				No. of nests	<i>nuchalis</i>			
		Height (m) ^a		Diameter (cm) ^b			Height (m)		Diameter (cm)	
		range	mean	range	mean		range	mean	range	mean
Rocky Mtn. Natl. Park, Colo. (aspen)	40	0.9-5.1	2.4	18.0-32.4	23.5	40	1.1-5.3	2.9	17.3-31.0	23.3
Rocky Mtn. Natl. Park, Colo. (pines)	8	0.8-7.9	5.1	34.2-54.8	50.9	—	—	—	—	—
Wallace Lake, Colo. (aspens)	7	4.0-16.9	10.3	22.5-39.3	33.1	6	3.9-10.8	6.9	36.0-41.7	38.9
Gypsum Creek, Wyo. (aspens)	2	5.6-13.4	9.5	31.1-41.6	36.4	5	2.8-7.3	4.8	23.7-35.2	29.5

^a Height from ground to bottom of nest entrance.

^b Diameter at breast height (dbh) of nest tree.

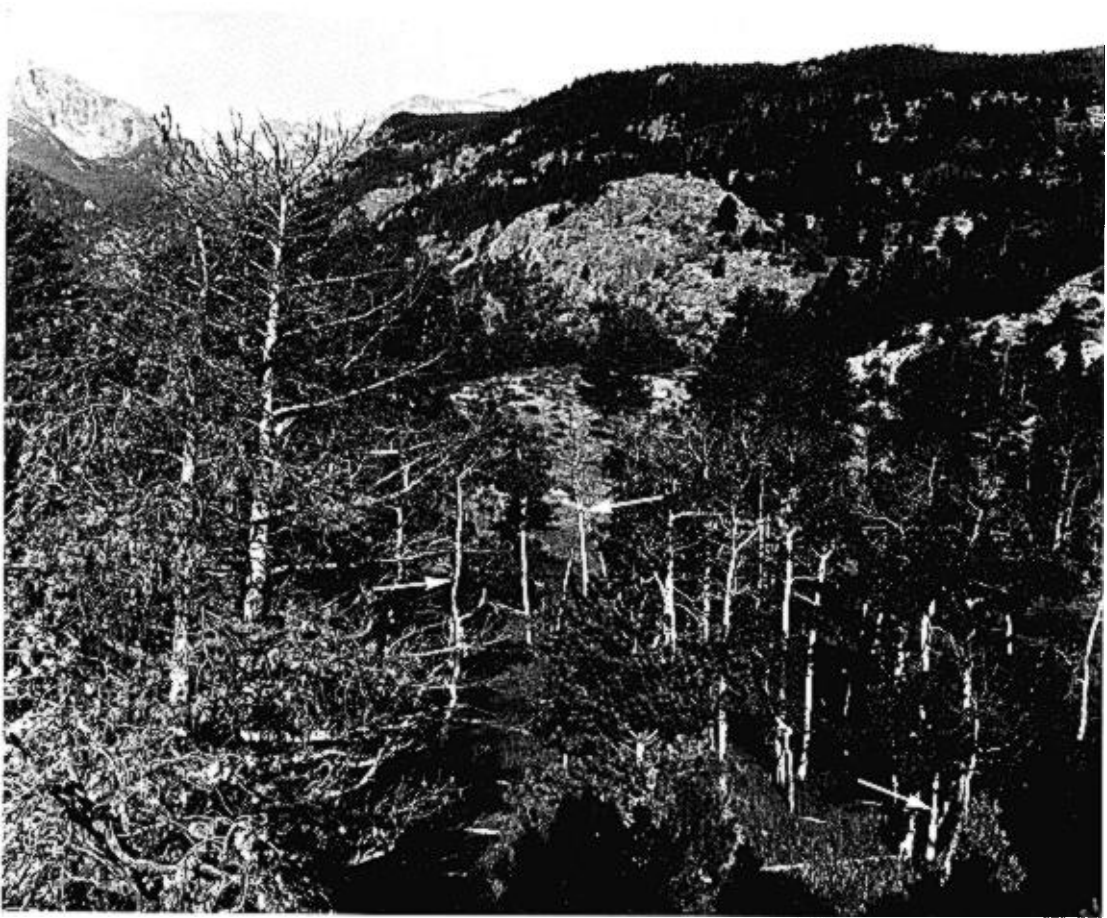


FIGURE 1. A sapsucker nest stand in Rocky Mountain National Park, Colorado. Dark trees in the upper right-hand portion of the photograph are ponderosa pines; white barked trees in the lower right hand corner are aspen; dead ponderosa pines occupy the left foreground. Right arrow indicates a nest used by *S. nuchalis* in 1972 and 1974, and by *S. thyroideus* in 1973. Left arrow indicates an *S. nuchalis* nest in 1973; nest marked by center arrow was used by *S. nuchalis* all three years.

indicates that aspen were used by choice, not necessity. Moreover, the eight *thyroideus* nests located in conifers were in areas where no suitable aspen sites were available nearby. Other hole excavators—Hairy Woodpeckers (*Dendrocopos villosus*), Downy Woodpeckers (*D. pubescens*), Common Flickers (*Colaptes auratus*), White-breasted Nuthatches (*Sitta carolinensis*), and Pygmy Nuthatches (*S. pygmaea*)—also nested almost exclusively in aspen in our study areas.

Aspen, even apparently healthy ones, tend to have soft cores and are therefore easily excavated (see Lawrence 1967). In Rocky Mountain National Park, both sapsuckers apparently were attracted to aspen that were infected by the shelf fungus *Fomes igniarius* var. *populinus*; 65 percent of the nests of both species were in *Fomes*-infected trees. Of the infected nest trees, 85 percent had no shelf fungus visible on the four nearest trees; none of the uninfected nest trees showed *Fomes* on any adjacent aspen. These data suggest that *Fomes* infection was related in some way to nest site selection, possibly by causing the affected trees to have a softer core. It is possible, however, that *Fomes* selectively attacks trees that are weak for other reasons and are therefore more vulnerable to infection, and that the presence of shelf fungus provides a sapsucker with some visual cue. A third possibility is that *Fomes* tends to infect

trees that have been weakened by sapsucker activity, such as nest excavation. Ligon (1970) found that Red-cockaded Woopeckers (*D. borealis*) preferred to nest in pines that were infected by another shelf fungus, *Fomes pinii*. Ligon (pers. commun.) also found that *S. thyroideus* nested most frequently in *Fomes*-infected aspen in New Mexico. Shigo and Kilham (1968) reported that Yellow-bellied Sapsuckers chose to nest in *Fomes*-infected aspen in the eastern United States. These studies support the conclusion that sapsuckers tend to nest in aspen that show external signs of shelf fungus infection.

The two sapsuckers showed essentially no difference in the size of the aspen chosen for nest excavation (table 1). In Rocky Mountain National Park, *thyroideus* nest trees averaged 23.5 cm ($n = 40$) in diameter, while *nuchalis* nest trees averaged 23.3 cm ($n = 40$). This difference is not statistically significant. The lower limit of nest tree size probably corresponded to the minimum diameter which provided adequate space for a nest cavity; the upper limit was the maximum size of aspen in the study area.

Sphyrapicus thyroideus and *S. nuchalis* also showed considerable similarity in the placement of their nest entrances (table 1). In Rocky Mountain National Park, *thyroideus* nests had a mean height of 2.4 m ($n = 40$), compared to an average height of 2.9 m

($n = 40$) for *nuchalis*, a difference which is not statistically significant. The similarities in tree diameter and hole height are not surprising, since both affect the size of the nest cavity, and the two sapsuckers are nearly equal in size. Those *thyroideus* nests located in pines averaged 5.1 m in height ($n = 8$); the pines had a mean diameter of 50.9 cm. The higher placement of nests in pines probably was related to (1) the thinner bark in the upper portion of trunks, (2) the extra protection from ground predators (e.g. weasels, squirrels, and snakes) that a higher nest would provide, or (3) some combination of these two. It therefore appears that the larger diameters of conifers allowed the sapsuckers to nest higher in them and thereby reduce their vulnerability to predation, but that the advantages of aspen as nest trees (i.e. abundance and easier excavation) resulted in their being used much more frequently (table 1).

In her landmark study of four North American woodpeckers, Lawrence (1967) stressed the importance of nest entrance orientation. Of 89 nests that she examined, more faced southward (54 percent) than northward (10 percent). Comparable findings were reported for European picids by Pynnönen (1939) and Blume (1961). We, too, found more nests opening southward (57.5 percent) than northward (17.5 percent), a statistically significant difference at the $P < 0.01$ level. A southward orientation of the nest entrance might aid in keeping eggs and nestlings warm during the cool spring and early summer months (Lawrence 1967). We found no significant difference in the number of eastward and westward facing holes, suggesting that warming was no more important in the morning than in the afternoon. Lawrence (1967) believed that early morning warming was especially important in her study area, where more nests faced eastward (43 percent) than westward (22 percent). Nest entrance orientation probably is also affected by topography and the position of the nest tree relative to the nest stand. Thus, nests generally faced toward the open edge of the stand rather than toward its center. Such a placement would facilitate easy arrival to and departure from the nest tree.

We found that the two sapsuckers preferred aspen stands of about the same size and density. Aspen stands used by *thyroideus* averaged 0.34 ha in size, with a density of 772.4 trees/ha; *nuchalis* aspen stands averaged 0.48 ha and 685.0 trees/ha. The differences in these data are not statistically significant.

The data presented so far indicate that the two Rocky Mountain sapsuckers, *S. thyroideus* and *S. nuchalis*, show many similarities in nest site preference. Indeed, both species frequently nested in the same aspen stand. In some instances, the nests were as close as fifteen m (fig. 1 and 2). At Rocky Mountain National Park, one nest hole was used by *nuchalis* in 1972 and 1974 and by *thyroideus* in 1973 (fig. 1). At Wallace Lake, both species nested in a ring of aspen around the lake each year (fig. 2).

We found the lack of pronounced interspecific differences in nest site preference somewhat surprising. Indeed, some partitioning of nesting habitat might be beneficial to both species by (1) reducing interspecific competition for suitable nest trees and (2) reinforcing reproductive isolation by minimizing interspecific intersexual encounters. Because we observed neither interspecific courtship nor frequent interspecific aggression, and since hybridization is rare, it appears that there exists some isolating mechanism other than spatial separation. Competition for



FIGURE 2. Wallace Lake study area near Durango, Colorado. Light trees around the lake are mature aspen; darker vegetation on the slope is Gambel oak; dark conifers in the lower left foreground, on the right side of the lake, and on the ridge top in the background are ponderosa pine, Douglas-fir, and white fir. Upper left and lower right arrows indicate 1973 nests of *S. thyroideus*. Upper right and lower left arrows indicate 1973 nests of *S. nuchalis*.

nests trees may not have been severe, since aspen were abundant at all three study sites.

Despite the similarities in nesting habitat and nest site preferences shown by *thyroideus* and *nuchalis*, we noted one apparent difference between them in Rocky Mountain National Park. In every instance, *thyroideus* nested in or adjacent to open stands of ponderosa pine, where they fed by gleaning for insects and by sapsucking. No such close association was shown by *nuchalis*, which used aspen in or near stands of spruce, fir, and lodgepole pine, as well as ponderosa pine. The feeding habits of *nuchalis* were correspondingly diverse, with a variety of conifers and deciduous trees and bushes used for sapsucking and insect foraging. Thus, in the northern Colorado study area, a stand of aspen within a spruce, fir, or lodgepole pine forest, or along a river in the floor of an open valley, almost invariably contained *nuchalis*. Aspen stands within an open ponderosa pine forest—especially on drier slopes—generally contained *thyroideus*. This tendency was found, to a lesser degree, at the two smaller study areas.

At one small (0.22 ha) aspen stand in which both sapsuckers nested in 1973 (fig. 1), encounters and competition were reduced by the utilization of different foraging areas. The pair of *thyroideus* fed to the north along a dry hillside of ponderosa pines, while the *nuchalis* pair fed to the south along a dense riparian grove of deciduous trees, brush, and scattered conifers. It therefore appears that nest sites were chosen for their proximity to suitable foraging habitat rather than on the characteristics of the aspen nest stand itself. Isolating mechanisms were sufficiently well developed to allow *thyroideus* and *nuchalis* to share aspen stands on occasion. These isolating mechanisms probably were chiefly behavioral but may have also been temporal, since in Rocky Mountain National Park *thyroideus* arrived and bred an average of two weeks ahead of *nuchalis*. Temporal differences were less marked in the two other study areas.

SUMMARY

Two congeneric woodpeckers, the Williamson and Red-naped Sapsuckers, are sympatric in much of the Rocky Mountains. We collected nest tree data for a total of 57 *thyroideus* and 46 *nuchalis* nests at three locations in Colorado and Wyoming. Our findings show that in these three areas, at least, there were no significant differences between the two species in nest site preference. Both favored healthy or, more frequently, *Fomes*-infected aspen about 23 cm in diameter, and tended to excavate nests low (2–3 m) above the ground. Both also showed a preference for nests with their entrances facing southward, possibly to help keep the nest warm during the cool spring and early summer months. Nest stands used by *thyroideus* were invariably near an open forest of ponderosa pine, which the birds used for sap and insect foraging; *nuchalis* used a wide variety of habitats for nesting and feeding. Because the two sapsucker species often nested in close proximity, it appears that species isolation was not dependent on spatial (habitat) separation in our study areas.

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POST-FLEDGING PARENTAL CARE IN CRESTED AND SOOTY TERNS

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Ashmole and Tovar (1968) described the feeding of 5 to 7 month old Royal Terns (*Thalasseus maximus*) by their presumed parents. They also cited evidence of prolonged parental care in Elegant and Sandwich terns (*Thalasseus elegans* and *Sterna sandvicensis*) and attributed this to the time needed by juveniles

to learn specialized feeding techniques. Dunn (1972) showed that, in their winter quarters, first winter Sandwich Terns were less efficient at feeding than older birds, but he did not record adults feeding their young.

The following observations were made between May and October 1973 on Bird Island, Seychelles, and are pertinent to the phenomenon of protracted parental care in terns.

OBSERVATIONS

Thalasseus bergii. Crested Terns are not known to breed in the Seychelles but are present throughout the year. On Bird Island 10 to 30 were always