Fire Management Species Profile

Brown-headed Nuthatch (*Sitta pusilla*)

Federal Status: (*16*): Not listed
State Ranking (*16*):
Imperiled - TN
Apparently Secure – AR, MS, SC, TX
Secure – AL, GA, LA, NC

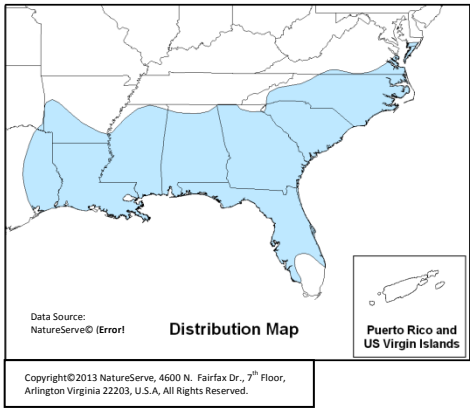

Photo – Danny Bales

Bio Facts (*6*)
Size: 3.5-4.5 inches

Nesting: Cavities
February – April

Feeding: Gleans insects from foliage, probes in bark, and opens pine cones for seeds.
Eggs: 3-7, 6 average
Incubation: 13-15 days

Landscape Conservation Cooperatives: Appalachian, Gulf Coastal Plains and Ozarks, Peninsular Florida, South Atlantic, Gulf Coast Prairie
Landfire Zones: 32, 37, 44, 45, 46, 47, 48, 49, 52, 53, 54, 55, 56, 57, 58, 59, 61, 62, 98, 99

Desired Vegetation Structure and Fire Components	
Criteria	**Monitoring Variables**
Canopy/Sub-canopy	Open. Low mortality of trees >10 in dbh; open pine density; BA 30-70 sq ft/acre; snag density of 3-6 snags per acre considered beneficial
Mid-story	Little to no mid-story; hardwoods < 2.8 stems per acre; hardwood BA <21.7 sq ft/acre
Understory	Shrubs < 5 feet high; nest cavities found at 7ft; low understory shrub cover (<35%)
Ground Cover	Sparse to dense grassy understory desired; ground cover >40%
Fire Regime	Natural fire regime 1-5 years; average 2-3 years; Moderate departure 5-10 years; High departure >10 years
Fire Regime Condition Class	Most desired FRCC1 (low departure from natural regime); FRCC2 (moderate departure from natural regime)
Seasonality	Growing season burns favorable for habitat maintenance
Fuel Models (40)	In well maintained habitat, fuel models include grass (GR3, GR5, GR6, GR8, GR9); grass-shrub (GS3, GS4); shrub (SH3, SH4); timber-understory (TU3); and timber-litter (TL8)
Burn Severity	Low to moderate burn severity; CBI <2.0; bole char height <12ft; canopy scorch 5-70%; canopy torch 5-50%; canopy foliage loss 5-50%; mid-story/ understory foliage altered 20-90%; mid-story/understory cover loss 15-70%; ground cover foliage altered 30-80%; heavy fuel consumption 10-25%; medium fuel consumption 20-40%; duff char light; litter consumption 50-100%
Fire Behavior	Low to moderate fireline intensity; flame heights < 10ft
Landscape Considerations	Higher number of birds found in one-year post-burn sites; maintain spatial matrix of one year post-burn patches across landscape; male territories are <25 acres

The objective of the Fire Management Species Profile project is to identify habitat management objectives that are specific, measurable, achievable, and clearly communicate among habitat management professionals and are firmly based in the best available science. Their use is intended to guide habitat managers in setting local objectives for habitat management in fire-adapted ecological systems. Fire management objectives are specific to habitat conditions in which maintenance and improvement, rather than restoration, of habitat condition is the goal.

Desired Habitat Conditions

Considered endemic to the southeastern pine ecosystem (***16, 41, 46***), the brown-headed nuthatch is a permanent resident of open canopied, mature pine habitats in the southeastern U.S. (***4, 5, 10, 15, 32***). It is considered a pine-obligate species (***12, 33***). Brown-headed nuthatch distribution mirrors that of loblolly pine (*Pinus taeda*) to the north. In Tennessee, the species has have expanded the range north, due in part to the maturation of planted loblolly (***38***). They are most abundant in sub-mature to mature longleaf pine (*Pinus palustris*) (***31***) stands that are regularly thinned (***11, 33***) or burned to produce habitat with an open mid-story and little understory growth (***46***).

Canopy and sub-canopy: Pine species composition is not as critical as the diameter at breast height (dbh) of the trees. An average dbh of 10.1 inches is optimal (***8, 34***). Brown-headed nuthatches prefer open pine stands with few hardwoods (≤ 2.8 stems/ac and BA ≤ 21.7 ft^2/ac) and an open mid-story (***45***). In Texas, preferred sites had a mean pine basal area of 24.2 ft^2/ac (34). At Tall Timbers Research Station (northwest Florida), where shortleaf-loblolly pine stands are considered to be high-quality nuthatch habitat, basal area ranged between 30 and 70 ft^2/ac (***J. Cox, Tall Timbers, pers. comm., 30 June 2009***). Stands with closed canopies are not preferred, but optimal canopy closure is highly variable (15-85 %) (***34, 45***); when deciduous hardwoods begin to reach the canopy of stands, this bird is rarely present (***24, 26, 28***).

Understory/Ground Cover: Understory is typically sparse (approximately 35 %) (***8***). A shrub height < 5 ft ensures that cavity entrances are not obscured (***42, 45***). As the mid-story reaches 20-30 feet under mature pines, brown-headed nuthatch abundance begins to decline. The effect of groundcover in longleaf pine stands of Georgia showed no difference in the relative abundance of brown-headed nuthatches between areas having native (*Aristida spp.*) or old-field disturbed (*Andropogon spp*. and *Pityopsis spp*.) (***39***).

Litter: Leaf litter and nesting in brown-headed nuthatches appear to be correlated, but it is not believed to be a causal relationship. In longleaf pine habitat where nuthatches nested, sites had reduced leaf litter accumulation (***3***). However, it is thought that this was a consequence of the fire regime and not a direct factor associated with nest site selection (***8***).

Snags: The retention and protection of snags is one of the most important considerations. Brown-headed nuthatch primarily nests in large dbh snags < 10 ft. tall. Although, no study has explicitly shown how many snags per acre are necessary to increase abundance of cavity nesters, a correlation exists between a number of snag characteristics (e.g., density, dbh, height) in relationship to bird communities on pine plantations (***35***). However, 3-6 snags per acre are believed to benefit most species of cavity nesters (***14***).

Breeding Information: Breeding bird densities in even-aged longleaf pine stands of Apalachicola National Forest, Florida have been recorded at 18 birds per 100 acres (***36***). Similar densities (17.2 birds per 100 acres) were determined previously in pure stands of longleaf pine in Louisiana (***30***). In mature loblolly pine stands an average of 9 birds per 100 acres has been reported, while in nearby 20-year old loblolly plantations they were all but absent (***43***). In mixed loblolly-shortleaf (*Pinus echinata*) pine stands, highest densities of nuthatches occur in stands 45-60 years old (***27***). Densities in slash pine (*P. elliottii*) stands in the Florida panhandle at 1 and 40 years old were 3 and 13 birds per 100 acres, respectively (***36***). As expected, these densities vary with habitat quality. In high-quality shortleaf/loblolly stands, densities in northwest Florida ranged between 7 and 14 pairs per 100 acres (***J. Cox, Tall Timbers, pers. comm., 19 June 2009***). Similar densities occur in pine flatwoods in many portions of Florida, but densities in sandhill and south Florida pine communities are much lower, often with only 4 pairs per 100 acres (***J. Cox, Tall***

Timbers, pers. comm., 19 June 2009). In Georgia Piedmont loblolly-shortleaf forest, densities ranged from 2 birds per 100 acres in 60 year old stands to 5 birds/100 acres in 100 year old stands (***18***). Across their range, densities of brown-headed nuthatch in optimal habitat average 11 pairs per 100 acres (***14***). In older stands, increases in mid-story hardwoods lead to decreases in birds, possibly because the vegetation may obscure potential nest cavity locations (***45***). Other studies have found that brown-headed nuthatches prefer mature pine forests (***46***) with an open mid-story (***13***) and that they avoid nesting in areas with numerous small pine trees (***41***). However, there is a positive relationship between the number of young fledged and density of small live pine trees around the nest site (***22***), but the authors did not have a good biological explanation for this result. Although brown-headed nuthatch is a pine specialist, it will forage on hardwoods as much as 20% of the time (***12***). In the Georgia Piedmont, relatively high numbers of wintering nuthatches were found in mature loblolly stands where hardwood densities were twice that of conifers (***43***).

Nesting Structure: The brown-headed nuthatch nests in a variety of cavities. This includes those in snags, modify existing cavities in live trees, and use artificial nest boxes (***6, 26***). The abundance of large pine snags in the Florida Keys was show to be positively associated with the number of nuthatch offspring produced per nesting attempt (***22***). In addition, a study conducted in North Carolina pine plantations showed that brown-headed nuthatches were over three times more likely to be detected within survey plots containing dead snag (***45***). Increased breeding productivity was correlated with increasing snag density in a Florida study (***29***). Snag density and dispersion were also shown to account for a large amount of the variation of brown-headed nuthatch densities in a Florida (***21***). Though the brown-headed nuthatch forages within the canopy of the forest, nest placement is low in the mid-story. In a Texas, the brown-headed nuthatch nested in snags that averaged 10.5 ft. tall and excavated cavities 7.2 ft. above the ground (***8***). Habitats in which the mid-story is dense could possibly conceal short cavity snags and entrances (***42, 43***). Additionally, a dense mid-story may inhibit movement between the high foraging sites and low nesting sites (***47***). Therefore, by selecting for low cavity sites, nuthatches are constrained to habitats that have little or no mid-story. Nuthatches in south Florida selected nest territories with a greater proportion of large pines (***41***), and the density and diversity of large pine trees might affect food resources and habitat quality (***20***). Large pines produce proportionally more seeds than smaller pines, and nuthatches cache and rely heavily upon pine seeds during the winter (***48***). Large pines also have greater surface area, providing more foraging space. In another study conducted in Florida, the abundance of large pine snags was positively associated with the number of offspring produced per nesting attempt (***22***). Although studies in some areas show a relationship between snag availability and nuthatch abundances (***45, 47***), this is has not been determined range-wide. The effect of removing coarse woody debris (primarily snags) showed no difference in the abundance of breeding and non-breeding brown-headed nuthatch (***23***).

Role of Fire: The importance of fire in shaping brown-headed nuthatch demographics has been investigated, and fire is thought, in part, to benefit this species by suppressing understory encroachment. The abundances of breeding birds, including brown-headed nuthatches, between various longleaf pine stands that had been exposed to either a fire-intense or fire-suppressed regime has been compared (***1***). Fire-suppressed plots had significantly more non-longleaf pines and hardwoods and lower abundances of brown-headed nuthatches than areas subjected to fire treatments (***1***). Data obtained from various shortleaf-bluestem restoration regimes at the Ouachita National Forest in Arkansas showed the highest densities and frequencies of brown-headed nuthatches occurring in the year immediately following a burn (***44***). Fire-treated areas were compared to control stands, which had greater canopy cover, denser mid-story growth, and sparser groundcover. During the first year following the burn, densities averaged 18.4 birds/100 acres. In years two and three, post-burn, densities declined to 11.9 and 4.5 birds per 100 acres, respectively (***45***). Similar findings were reported for to the first three years of a longer study

conducted in northwest Florida (***9***). The appropriate fire regime for a given area may well depend upon local climatic conditions, aspect, and site history, all of which can affect the rate of understory regeneration. Data suggest that burns be limited in size so as to create a mosaic of understory development (***19***), but no information is currently available on the ideal size of such patches.

In addition to the effect on brown-headed nuthatch habitat, fire can cause both direct and indirect mortality. Nesting success is influenced by two key factors: depredation (50-70% of annual losses) and nests destroyed by prescribed fires (25-45% of annual losses) (***7***). They suggest that these sources of nest failure also are interdependent because early burns (i.e., burns conducted in March and April) that destroy initial nesting attempts often are followed by second nesting attempts that consequently occur later in spring when temperatures are warmer (e.g., initiated early April). At this time, predatory snakes (i.e., *Elaphe spp.*) that frequently take nuthatch nests have emerged from hibernation and further lower nesting success. Fewer than 30% of the nests initiated after April 10 typically are successful (***J. Cox, Tall Timbers Res, unpubl. data***).

Mechanical Treatments: The effects of forest thinning on brown-headed nuthatch populations have been studied on commercial loblolly pine plantations. In planted loblolly pine stands of eastern North Carolina, the abundances of nuthatches were the highest during the year following the initial treatment (***45***). As with the previous studies mentioned above that measured the effects of fire treatments (***9, 44***), nuthatch abundances declined with time following mechanical treatment. One explanation given for the inverse relationship between nuthatch abundance and the density of understory growth was that vegetation could obscure potential nest cavity locations (***45***). These findings are supported by a study conducted on North Carolina pine plantation to determine the relationship between snags and bird communities as a result of thinning operations (***35***). These authors reported that an assessment of habitat use by brown-headed nuthatches suggested that commercial thinning events were important for both creating snags and reducing interference from understory vegetation (***35***).

Landscape/Spatiality-Temporality (Mobility, Area Sensitivity, Insularity-Connectivity Considerations)

As with many cooperative breeders, this species is a poor colonist (***2, 37, 46***). In shortleaf/loblolly stands at Tall Timbers (northwest Florida), females dispersed between 0.2 and 1.2 miles, while males moved between 0.06 to 0.2 miles (***J. Cox, Tall Timbers, pers. comm., 19 June 2009***).

Territories for breeding males in Georgia averaged 8 acres (***32***) and wintering territories in Louisiana were estimated to be 40 acres. In Texas, breeding territories for family groups averaged 19.8 acres in mixed pine-hardwoods (***12***). Most territories do not exceed 25 acres (***14***). In Florida, territories in shortleaf/loblolly have been determined to be 7-15 acres (***J. Cox, Tall Timbers, pers. comm., 19 June 2009***). In many portions of Florida, similar territory sizes occur in pine flatwoods, but territories in sandhill settings and south Florida pine rocklands are much larger, often upwards to 25 acres (***J. Cox, Tall Timbers, pers. comm., 19 June 2009***). There is currently a paucity of data concerning minimum area requirements for nuthatches, which likely depends on the quality of the habitat type (***J. Cox, Tall Timbers, pers. comm., 30 June 2009***).

This species is not known to be parasitized by the brown-headed cowbird (*Molothrus ater*) (***46***), and in this respect, brown-headed nuthatches are likely not affected by their proximity to forest edges. However, how nuthatches respond to other edge-related factors(e.g., predation) is currently unknown. The effect of habitat fragmentation on brown-headed nuthatches studied in the Georgia Piedmont

revealed a relationship between abundance and patch size (***25***). Bird abundance in "large" (24- 33 ac) and "small" (<8 ac) patches of hardwood and mixed pine-hardwood stands surrounded by farmland were compared to 33-acre control stands. Brown-headed nuthatch abundance in "large" patches was significantly lower than the controls, and zero in the "small" patches (***25***).

Literature Cited

1. **Allen, J.C., S.M. Krieger, J.R. Walters, and J.A. Collazo. 2006.** Associations of breeding birds with fire-influenced and riparian-upland gradients in a longleaf pine ecosystem. Auk 123:1110-1128.
2. **Cockburn, A. 2003.** Cooperative breeding in oscine passerines: does sociality inhibit speciation? Proceedings of Biological Science. 270:2207-2214.
3. **Conner, R.N. 1981.** Fire and cavity nesters. Pages 61-65 *In.* G.W. Wood (ed.). Prescribed fire and wildlife in southern forests. The Belle W. Baruch Forest Science Institute of Clemson University, Georgetown, SC.
4. **Conner, R.N., J.G. Dickson, B.A. Locke, and C.A. Segelquist. 1983.** Vegetation characteristics important to common songbirds in east Texas. Wilson Bulletin. 95:349-361.
5. **Conner, R.N. and D.C. Rudolph. 1989.** Red-cockaded woodpecker colony status and trends on the Angelina, Davy Crockett, and Sabine National Forests. U.S.D.A., Forest Service, Research Paper SO-250. 15pp.
6. **Cornell Laboratory of Ornithology. 2009.** Birds in forested landscapes: brown-headed nuthatch (*Sitta pusilla).* Ithaca, NY. Available: http://www.birds.cornell.edu/bfl/speciesaccts/bnhnut.html. [Accessed: May 2009].
7. **Cox, J. and G. Slater. 2007**. Social breeding in the brown-headed nuthatch. The Wilson Journal of Ornithology 119:1-8.
8. **Dornak, L.L., D.B. Burt, D.W. Coble, and R.N. Conner. 2004**. Relationships between habitat and snag characteristics and the reproductive success of the brown-headed nuthatch (*Sitta pusilla*) in Eastern Texas. Southeastern Naturalist 3:683-694.
9. **Engstrom, R.T., R.L. Crawford, and W.W. Baker. 1984.** Breeding bird populations in relation to changing forest structure following fire exclusion: a 15-year study. Wilson Bulletin 96:437-450.
10. **Hamel, P.B. 1992.** Land manager's guide to the birds of the South. Chapel Hill, NC: The Nature Conservancy, Southeastern Region. 437pp.
11. **Haney, J.C. 1981.** The distribution and life history of the brown-headed nuthatch (*Sitta pusilla*) in Tennessee. Migrant 52:77-86.
12. **Herb, A., Jr. and D.B. Burt. 2000.** Influence of habitat use-patterns in cooperative breeding in the brown-headed nuthatch. Bulletin of the Texas Ornithological Society 33:25-36.
13. **Hirth, D.H., L.D. Harris, and R.F. Noss. 1991.** Avian community dynamics in a peninsular Florida longleaf pine forest. Florida Field Naturalist 19:33-48.
14. **Hunter, W.C., L. Peoples, and J. Collazo. 2001.** Atlantic coastal plain Partners in Flight bird conservation plan (Physiographic Area #03). Version 1.0. American Bird Conservancy. 166pp.
15. **Imhof, T.A. 1976**. Alabama birds. 2nd Edition. University of Alabama Press, Tuscaloosa, AL. 445 pp.
16. **NatureServe: Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003.** Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, VA.
17. **Jackson, J.A. 1989.** The southeastern pine forest ecosystem and its birds: past, present, and future. Pages 119-159 *In*. J.A. Jackson (ed). Bird Conservation 3. University of Wisconsin

Press, Madison, WI. 186pp.

18. **Johnston, D.W. and E.P. Odum. 1956.** Breeding bird population in relation to plant succession on the Piedmont of Georgia. Ecology 37:50-62.
19. **Kerpez, T.A. and D.F. Stauffer. 1989.** Avian communities of pine-hardwood forests in the Southeast: characteristics, management, and modeling. Pages 156-169 *In*. T.A. Waldrop (ed.). Proceedings of pine-hardwood mixtures: a symposium on management and ecology of the type. USDA, Forest Service, General Technical Report SE-58.
20. **Koenig, W.D. and J. Haydock. 1999.** Oaks, acorns, and the geographical ecology of acorn woodpeckers. Journal of Biogeography 26:159-165.
21. **Land, D., W.R. Marion, and T.E. O'Meara. 1989.** Snag availability and cavity nesting birds in slash pine plantations. Journal of Wildlife Management 53: 1165-1171.
22. **Lloyd, J.D. and G.L. Slater. 2007.** Environmental factors affecting productivity of brown-headed nuthatches. Journal of Wildlife Management. 71:1968-1975.
23. **Lohr, S.M., S.A. Gauthreaux, and J.C. Kilgo. 2002.** Importance of coarse woody debris to avian communities in loblolly pine forests. Conservation Biology 16:767-777.
24. **McComb, W.C., S.A. Bonney, R.M. Sheffield, and N.D. Cost. 1986.** Snag resources in Florida: are they sufficient for average populations of primary cavity-nesters? Wildlife Society Bulletin 14:40-48.
25. **McIntyre, N.E. 1995.** Effects of forest patch size on avian diversity. Landscape Ecology 10:85-99.
26. **McNair, D.B. 1984.** Clutch-size and nest placement in the brown-headed nuthatch. The Wilson Bulletin 96:296-301.
27. **Meyers, J.M. and A.S. Johnson. 1978.** Bird communities associated with the management of loblolly-shortleaf pine forests. Pages 50-65 *In*. R.M. DeGraff (ed.). Proceedings of the workshop for the management of southern forests for nongame birds. U.S.D.A., Forest Service, General Technical Report SE-14.
28. **Miller, S.H., and Marion, W.R. 1995**. Natural and created snags and cavity-nesting birds in north Florida pine forests. Report for Project GFC-84-020, Florida Game and Fresh Water Fish Commission, Tallahassee.
29. **Miller, K.E. and G.A. Jones. 1999.** Nesting phenology and cooperative breeding of the brown-headed nuthatch in north Florida pinelands. Florida Field Naturalist 27:89-94.
30. **Morse, D.H. 1970.** Ecological aspects of some mixed-species foraging flocks of birds. Ecological Monographs 40:119-168.
31. **Nicholson, C.P. 1997**. Atlas of breeding birds of Tennessee. University of Tennessee Press, Knoxville, TN. 504pp.
32. **Norris, R.A. 1958.** Comparative biosystematics and life history of the nuthatches, *Sitta pygmaea* and *Sitta pusilla*. University of California Publications of Zoology 56:119–300.
33. **O'Halloran, K.A. 1984.** Quantitative description of habitat utilized by brown-headed nuthatches. Master's Thesis. Stephen F. Austin State University, Nacogdoches, TX.
34. **O'Halloran, K.A. and R.N. Conner. 1987**. Habitat used by brown-headed nuthatches. Bulletin of Texas Ornithological Society 20:7-13.
35. **Paxton, B.J., M.D. Wilson, and B.D. Watts. 2004.** Relationship between standing dead wood dynamics and bird communities within North Carolina pine plantations. College of William and Mary, Williamsburg, VA., Center for Conservation Biology Technical Report Series, CCBTR-04-0835. 35pp.
36. **Repenning, R.W. and R.F. Labisky. 1985.** Effects of even-age timber management on bird communities of the longleaf pine forest in northern Florida. Journal of Wildlife Management 49:1088-1098.

37. **Robbins, M.B. and D.E. Easterla. 1992.** Birds of Missouri: their abundance and distribution. University of Missouri Press, Columbia, MO. 399pp.
38. **Roy, W.K., J.W. Evans, M.G. Ryon. 2001.** The red-headed woodpecker and brown-headed nuthatch on the Oak Ridge Reservation: relationship to recent landscape changes. The Migrant 72:1-12.
39. **Rutledge, B.T. and L. M. Conner. 2002.** Potential effects of groundcover restoration on breeding bird communities in longleaf pine stands. Wildlife Society Bulletin 30: 354-360.
40. **Scott, J. H. and R. E. Burgan. 2005.** Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. U.S.D.A., Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-153. 72pp.
41. **Slater, G. 1997.** Brown-headed nuthatches and eastern bluebirds in southern Florida pinelands: breeding biology, nest-site selection, and the influence of habitat on nesting success. Master's Thesis, University of Florida, Gainesville, FL.
42. **Van Balen, J.B. and P.D. Doerr. 1978.** The relationship of understory vegetation to red-cockaded woodpecker activity. Proceedings of Annual Conference of Southeast Association of Fish and Wildlife Agencies 32:82-92.
43. **White, D.H., C.B. Kepler, J.S. Hatfield, P.W. Sykes, Jr., and J.T. Seginak. 1996**. Habitat associations of birds in the Georgia Piedmont during winter. Journal of Field Ornithology 67:159-166.
44. **Wilson, C.W., R.E. Masters, and G.A. Bukenhofer. 1995.** Breeding bird response to pine-grassland community restoration for red-cockaded woodpeckers. Journal of Wildlife Management 59:56-67.
45. **Wilson, M.D. and B.D. Watts. 1999.** Response of brown-headed nuthatches to thinning of pine plantations. The Wilson Bulletin 111:56-60.
46. **Withgott, J.H. and K.G. Smith. 1998.** Brown-headed nuthatch (*Sitta pusilla*). Pages 1-23. *In*. A. Poole and F. Gill (eds.). The Birds of North America, No. 349. Philadelphia, PA.
47. **Wood, D.A. 1983.** Foraging and colony habitat characteristics of the red-cockaded woodpecker in Oklahoma. Page 51-58. *In*. D.A. Wood (ed.). Red-cockaded woodpecker symposium II. Florida Game and Fresh Water Fish Commission, Tallahassee, FL.
48. **Yaukey, P.H. 1995.** Effects of food supplementation and predator simulation on nuthatches and parids within mixed-species flocks. Wilson Bulletin 107:542-547.

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