

## NEST-BOX USE AND APPARENT DOUBLE BROODING BY RED-BREASTED NUTHATCHES IN CALIFORNIA

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We documented Red-breasted Nuthatches (*Sitta canadensis*) in the Berkeley Hills of coastal central California successfully using a nest box in 2021 and 2022, and successfully double brooding in 2022. Although we can't be certain the individuals responsible for the two broods in 2022 were the same, we never saw more than two adults. In both years, we also observed the nuthatches applying resin to the outside of the box, most conspicuously to create a mass that included some grass at the base of the entrance hole, somewhat reducing its diameter (Figure 1).

Nest-box use and double brooding by the Red-breasted Nuthatch have rarely been documented. Dunn et al. (1975) described two nests in boxes designed for Black-capped Chickadees (*Poecile atricapillus*) in Ontario, Canada, where adults and nestlings were banded. Campbell et al. (1997) also noted two nests in boxes in British Columbia but did not report details on their success. Strauss (2007) documented mortality of a female stuck to resin around the oval entrance, 3.0 × 3.4 cm, of a nest box in Victoria, British Columbia; Kilham (1972) similarly noted a dead female stuck in the entrance of a nest in a natural cavity. Ghalambor and Martin (2020) referenced just two cases of double brooding (one in the wild and one in captivity), though Norris and Martin (2014) confirmed six cases of second clutches following fledging of first broods in British Columbia, likely associated with increased abundance of the Mountain Pine



FIGURE 1. Adult male Red-breasted Nuthatch delivering food to a nestling on 3 July 2022, two days before fledging. Note the abundant resin at the bottom of the entrance hole as well as surrounding it.

*Photo by Phil Capitolo*

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Beetle (*Dendroctonus ponderosae*). Although Rand (1972) considered whether the Red-breasted Nuthatch's behavior of applying resin to a nest cavity's entrance and surrounding areas was a nonfunctional, evolutionary relic, related to the plastering of cavity interiors with mud by other nuthatch species (Pasquet 1998), its purpose is thought to be to deter potential competitors and predators from entering the cavity (Ghalambor and Martin 2020). The behavior is perhaps analogous to the maintenance of resin barriers by the Red-cockaded Woodpecker (*Dryobates borealis*) (Kappes and Sieving 2011).

In the other nuthatch species breeding in western North America, nest-box use and double brooding have likewise been documented uncommonly or never. Pygmy Nuthatches (*Sitta pygmaea*) are said to use nest boxes readily, though few opportunities exist. A few observations of double brooding have been reported (Kingery and Ghalambor 2020). White-breasted Nuthatches (*Sitta carolinensis*) may also use nest boxes "sparingly," but no records of double brooding are known (Grubb and Pravosudov 2020). The lack of observations of double brooding in nuthatches, however, may reflect the difficulty of detecting such behavior in species that do not often use nest boxes. Even for a species in which it should be easier to detect, Monroe et al. (2008) suggested double brooding in the Tree Swallow (*Tachycineta bicolor*), typically considered single brooded, may be underreported if nests boxes are not routinely checked after first broods fledge.

Double brooding is, however, well documented for several other nonmigratory passerine species in coastal central California (Geupel and DeSante 1990). White-crowned sparrows (*Zonotrichia leucophrys nuttalli*) may raise even three or four broods annually (Mewaldt and King 1977, Chilton et al. 2020). Nevertheless, the annual proportion of a population that double broods is not necessarily large and may be variable. For example, Geupel and DeSante (1990) estimated 20% of Wrentit (*Chamaea fasciata*) pairs double brooded from 1982 to 1985, but fewer during 1983, a year of late spring rains. A 12-year study of Western Bluebirds (*Sialia mexicana*) in California found second nests by fewer than 20% of pairs in eight of the years, and no second nests in the other four years (Dickinson et al. 1996). Furthermore, DeSante and Geupel (1987) found landbird productivity in coastal central California to be maximal following winters of average or slightly above-average rainfall. Rainfall in the Berkeley Hills during the 2021–2022 rain year (890 mm through 30 June), when the nuthatches double brooded, was indeed slightly above average (851 mm), according to data from a rain gauge maintained by the Contra Costa County Flood Control and Water Conservation District. Use of a nest box might also favor double brooding by the Red-breasted Nuthatch, given the savings of time and energy by not needing to excavate its own cavity, as it typically does.

We installed the nest box 17 April 2020. Interior dimensions are width 9.5 cm × depth front to back 10.2 cm × height 22.9 cm in front and 24.8 cm in back, as the roof has a 1.9-cm slope and 5.1-cm overhang in front. The circular entry hole is 3.5 cm in diameter and placed 15.2 cm above the floor. The nest box was placed on the north side of Doe's house, where a deck faces the open space of Tilden Regional Park immediately downslope of Wildcat Canyon Rd., which is the border between Alameda (upslope) and Contra Costa (downslope) counties. On the slope around our and nearby houses grow many trees of several native and introduced species, including the Coast Live Oak (*Quercus agrifolia*), Monterey Pine (*Pinus radiata*), Coast Redwood (*Sequoia sempervirens*), and Deodar Cedar (*Cedrus deodara*). An oak just west of the deck was typically where birds departing the nest box first landed. From 1998 to 2002, during field work for the breeding bird atlas for Contra Costa County, evidence of Red-breasted Nuthatch breeding was confined to the "fog belt" in the west, especially in the Berkeley Hills, with most foraging noted in stands of pine and redwood (Glover 2009).

The nest box was not used in 2020, though we noted Violet-green Swallows (*Tachycineta thalassina*) inspecting it in May of that year (in May of following years also). Chestnut-backed Chickadees (*Poecile rufescens*) were the first to use the nest

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FIGURE 2. Red-breasted Nuthatch nest structures in 2021 (A; 15 July 2021) and 2022 (B; 1 June 2022). The 2021 nest was built by Chestnut-backed Chickadees, with redwood bark added on top by the nuthatches, whereas the 2022 nest was built by nuthatches only. Note the 4-egg clutch in 2022.

*Photos by Barbara Doe*

box in 2021. We first observed a chickadee entering the box on 29 March, first noted food deliveries and fecal sac removals on 23 April, and then first noted fledglings out of the nest in the morning on 12 May, sometime after 07:15. We then observed a Red-breasted Nuthatch enter the nest box on 1 June. By 12 June, a resinous mass containing plant matter was conspicuous at the bottom of the entrance hole. We heard nestlings on 28 June, and, in the morning on 15 July, we observed three young nuthatches fledge, although we could have missed others. We did not confirm clutch size for either species. The nuthatches had apparently added only a thin layer of redwood bark strips atop the mossy chickadee nest (Figure 2).

After we cleaned the box in the fall of 2021, we first noted activity there by Red-breasted Nuthatches on 1 March 2022. We noted resin at the entrance hole by mid-April and heard nestlings on 27 April. We saw two young fledge in the morning on 14 May; at least two additional nestlings remained in the box at the end of the day. We missed the fledging of the remaining young the next morning. We then saw an adult enter the box again on 20 May. Only with this second nuthatch clutch did we begin opening the nest box (when we knew both adults were away) to check for clutch size and hatching dates. We confirmed a 4-egg clutch on 1 and 2 June and four small, naked nestlings in the early evening on 15 June. On 26 June, four nestlings with erupted flight feathers were still alive (Figure 3). On 5 July, with the young about 20 days old, fledging had begun by 08:35, when we began observations. We saw only the final young depart to a nearby oak at 09:08, 26 minutes after the last visit by an adult. The nuthatches had built a nest about 3.8 cm deep, apparently mostly of redwood bark, with many fine pieces of mammal fur of unknown origin intermixed (Figure 2). Nuthatches continued to make occasional brief visits to the nest box through October, and to the deck railing on 26 October, when we removed the nest. The nest is now in the collections of the Museum of Vertebrate Zoology, University of California, Berkeley (MVZ:Egg:15008).

We cleaned the inside and outside of the nest box again in the fall of 2022. A Red-breasted Nuthatch was observed three times on 19 February 2023, entering the nest box once, but Oak Titmice (*Baeolophus inornatus*) had been exploring the nest box since early February. By 10 March an Oak Titmouse nest in the box appeared complete, though eggs had not yet been laid. If the purpose of the Red-breasted

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FIGURE 3. Red-breasted Nuthatch nestlings on 26 June 2022, likely 11 days old.

*Photo by Phil Capitolo*

Nuthatch's applying resin to a nest cavity's entrance and surrounding surfaces is in fact to deter potential competitors and predators (Ghalambor and Martin 2020), the benefit may extend across years and not be limited to a single breeding season, given the possibly limited availability of trees with wood suitably softened for nuthatch excavation and possible competition for cavities with other taxa (e.g., Steeger and Hitchcock 1998, Robinson et al. 2005). Had we cleaned only the inside of the nest box, the larger Oak Titmice may not have occupied it. Red-breasted Nuthatches often reuse nest cavities from previous years (Norris and Martin 2012).

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