Western Wildlife 9:1–4 • 2022
Submitted: 6 December 2021; Accepted: 11 March 2022.

NOTES

Nest Descriptions for Birds of Sub-Alpine Meadows in the Trinity Alps Wilderness, California

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***Abstract.*—Descriptive studies are foundational for ecological models and theories and for conservation efforts, and the lack of accurate descriptive studies on wildlife populations can lead to mismanagement of species. The Trinity Alps Wilderness of northern California lacks any published description of the current breeding bird communities. I found nests opportunistically in sub-alpine meadows by observing behavior, accidental flushing, and systematic searching. Once the nest was inactive, I recorded nest material, nest dimensions, and nest microhabitat. I found 25 nests of seven species. The most common species of nests that I found were Lincoln's Sparrows (*Melospiza lincolnii*) and Dark-eyed Juncos (*Junco hyemalis*). I found Lincoln's Sparrow nests much closer to water than previously described in the literature, and they commonly left one egg unhatched and unviable in the nest. Some of the dimensions of nests differed from what is published in other areas. These data add to our knowledge of bird nesting in the Trinity Alps.**

Key Words.—baseline; birds; meadow; montane; monitoring; subalpine

Descriptive scientific studies have been foundational for ecological models and theories. These types of studies supported development of accepted concepts of biogeography and evolution, and they have helped us understand how communities change over time (Dayton and Sala 2001). As ecosystems are stressed by development, invasive species, and climate change, we are often left without an understanding of what the communities were like prior to their modification (Pitcher 2001). While conducting amphibian monitoring surveys for the California Department of Fish and Wildlife, I often accidentally flushed breeding birds off their nests. I describe the species, microhabitats, and construction materials of the nests I found.

I found nests in various sub-alpine meadows contained in two basins (Echo Lake Basin and Siligo Basin) within the Trinity Alps Wilderness in the Klamath Mountains (Fig. 1). The Klamath Mountains Bioregion ranges from northern California to south-eastern Oregon. In California, it lies between the northern California coast on the west and the southern Cascade Range to the east. The region has the most diverse conifer forests in North America (Skinner et al. 2006). The climate is Mediterranean, which is characterized by cool, wet winters and dry, warm summers. The proximity to the Pacific Ocean creates a moisture and temperature gradient that leads to patterns of precipitation via orographic effects producing occasional summer rains. Precipitation average is 101 cm annually with most rainfall between October and April (Skinner et al. 2006). The average snowpack by 1 April is 259 cm at an elevation of 2,042 m (Skinner et al. 2006). The diverse parent rock types of the region including mixtures of granite and peridotite rock creating vegetation patterns more complex than found in the Sierra Nevada or the Cascade Range (Sawyer and Thornburg 1977). The Upper Montane and Subalpine Forest include tree species such as Shasta Red Fir (*Abies magnifica* var. *shastensis*), Mountain Hemlock (*Tsuga mertensiana*), Western White Pine (*Pinus monticola*), and Foxtail Pine (*Pinus balforiana*). Common understory shrubs are manzanita (*Arcostaphilus* spp.), Huckleberry Oak (*Quercus vaccinifolia*), and Mountain Spiraea (*Spiraea densiflora*). In the meadows, the dominant plant are sedges (*Carex* spp.), interspersed with Cobra Lily (*Darlingtonia californica*) and White Rush Lily (*Hastingsia alba*) growing in the fens.

I conducted surveys at 12 sites in 2016: six sites were in the Echo Lake Basin and six in Silago Basin (Fig. 1). Sites ranged from 1,800 to 2,100 m elevation; Penthouse, Echo Lake, and Snowmelt Pond were at higher elevations. I located most nests while conducting amphibian and reptile Visual Encounter Surveys that involved walking along the perimeter of ponds or streams, and when water was not present, walking in a zig-zag pattern covering the entire meadow. I found most bird nests by accidentally flushing the parent bird off the nest; otherwise, I noticed the behavior of a parent bird and followed it to the nest. These methods are similar to those used by Martin and Guepel (1993) and the Breeding Biology Research and Monitoring Database (BBIRD).

Once I located a nest, I recorded the nest location with a handheld GPS unit (UTM NAD 27 CONUS). I only used flagging if necessary, which I placed 20 m away or more to avoid predator association and increased predation. I approached nests and left them in a different direction and I did not approach an active nest if I knew potential predators were present or watching. For each nest, I recorded species, date, and nesting stage (building, laying, incubation, nestling). To avoid birds abandoning active

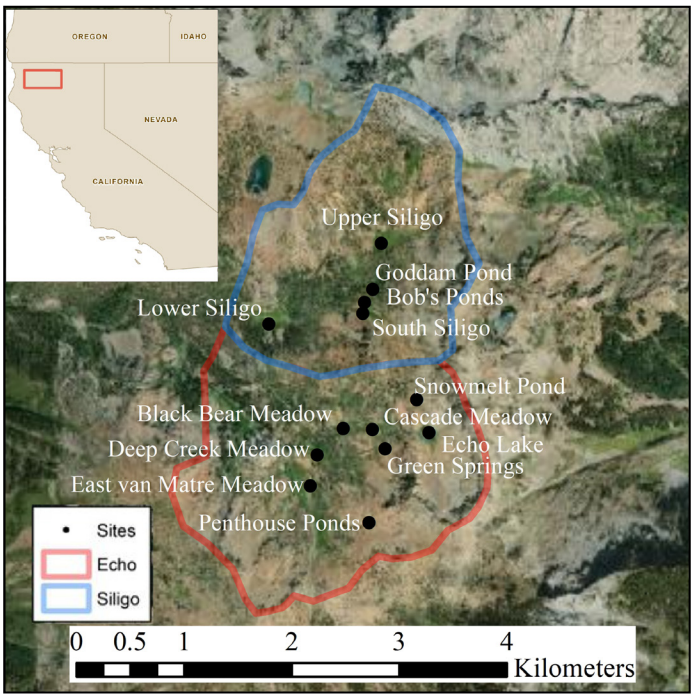

Figure 1. The study area with the names of specific study sites in the Trinity Alps Wilderness, California (insert).

nests, I measured nests after nesting was completed and young were fledged.

After the nest was inactive (e.g., nestlings fledged), I recorded the materials used in nest construction, taking samples of materials for identification when necessary. I measured the width (edge or rim to edge of rim), height (top of nest to base of nest), cup width (inner rim of nest to inner rim), and cup depth (base of nest cup to top rim) using millimeter calipers. I collected data on nest location including nest height (visually estimated) and plant species used as the nest substrate. I recorded the objects concealing the nest (cover type), height of the grass, shrubs or trees the nest was in, distance from trunk, and distance of nest from foliage edge.

I located nests of seven species: Lincoln's Sparrow (*Melospiza lincolnii*), Dark-eyed Junco (*Junco hyemalis*), American Robin (*Turdus migratorius*), Sooty Grouse (*Dendragapus fuliginosus*), Mallard (*Anus platyrhynchos*), Audubon's Yellow-rumped Warbler (*Setophaga coronate auduboni*), and Green-tailed Towhee (*Pipilo chlorurus*). The most nests I found were those of Lincoln's Sparrows and Dark-eyed Juncos (Table 1). I found 15 Lincoln's Sparrow nests between 14 June and 23 July. Most were associated with wet sedge as cover and substrate type, and nest material was composed of dry sedge (Fig. 2). Average distance to water of Lincoln's Sparrow nests was 0.4 m, and average grass height was 45.0 cm around nests (Table 2). The Lincoln Sparrow nests I observed were similar to published studies that reported the nest microsites being wetter than that used by other species, including Dark-eyed Junco (Hadley 1970; Ammon 1995). Even though Ammon (1995) found no significant association of nest

Table 1. Average (± standard deviation) and range (in parentheses) of nest dimensions (except for nests of n = 1) of Lincoln's Sparrow (*Melospiza lincolnii*; LISP), Green-tailed Towhee (*Pipilo chlorurus*; GTTO), Dark-eyed Junco (*Junco hyemalis*; DEJU), Mallard (*Anus platyrhynchos*; MALL), Sooty Grouse (*Dendragapus fuliginosus*; SOGR), American Robin (*Turdus migratorius*; AMRO), and Audubon's Yellow-rumped Warbler (*Setophaga coronate auduboni*; YRWA) in the Trinity Alps, California.

Species	Number Observed	Mean Cup Width (mm)	Mean Cup Depth (mm)	Mean Nest Width (mm)	Mean Nest Height (mm)
AMRO	2	98.0 ± 6.7 (91.3–104.7)	72.2 ± 0/7 (71.5–72.8)	126.7 ± 13.2 (113.5–139.9)	85.3 ± 12.5 (72.8–97.7)
DEJU	3	62.4 ± 8.4 (51.3–72.0)	50.7 ± 13.1 (32.6–63.0)	86.0 ± 5.1 (79.6–92.1)	47.9 ± 6.2 (42.7–56.6)
GTTO	2	61.7 ± 2.5 (59.1–64.2)	51 ± 3 (29.9–35.6)	119.1 ± 19.1 (100.0–138.2)	32.6 ± 3.0 (29.6–35.6)
LISP	15	60.5 ± 5.6 (48.1–71.4)	32.6 ± 12.2 (45.0–90.0)	96.8 ± 8.1 (81.7–105.2)	62. 4 ± 14.7 (45.6–90.2)
MALL	1	170.0	75.5	290.0	76.0
SOGR	1	145.4	71.8	305.0	79.0
YRWA	1	79.5	35.3	139.0	98.0

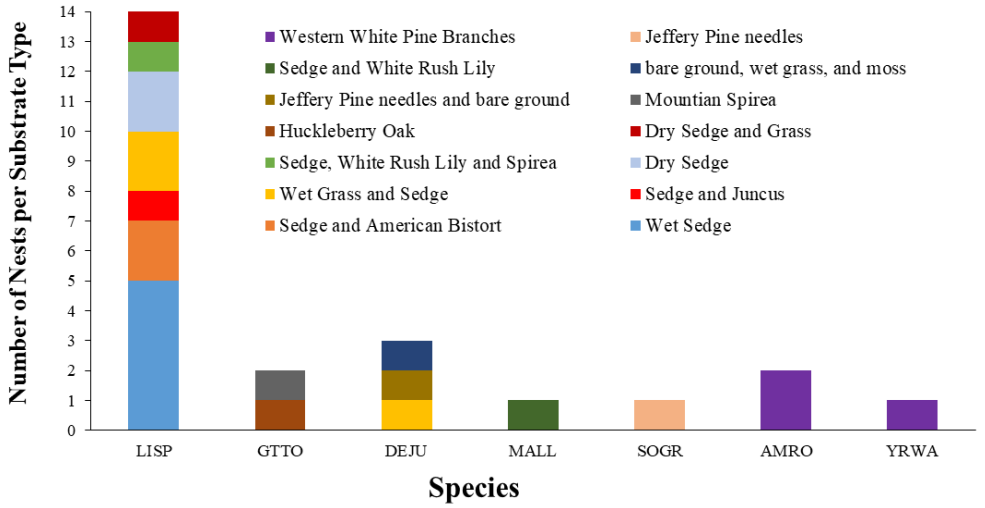

Figure 2. Number of nests of Lincoln's Sparrow (*Melospiza lincolnii*; LISP), Green-tailed Towhee (*Pipilo chlorurus*; GTTO), Dark-eyed Junco (*Junco hyemalis*; DEJU), Mallard (*Anus platyrhynchos*; MALL), Sooty Grouse (*Dendragapus fuliginosus*; SOGR), American Robin (*Turdus migratorius*; AMRO), and Audubon's Yellow-rumped Warbler (*Setophaga coronate auduboni*; YRWA) found the various vegetative substrates in the Echo Lake and Siligo basins in the Trinity Alps, California.

site with perch trees or other microhabitat features, I found Lincoln's Sparrow nests associated with water features such as ponds, lakes, and streams. Heights of grass cover were similar to published data showing shrub cover that is usually < 60 cm (Ammon 1995). The nest measurements of Lincoln's Sparrow (Table 1) did not differ substantially from the published data from Colorado (Ammon 1995).

Of the three Dark-eyed Junco nests I found between 25 May and 10 July, two were in creek cut banks and the other was among rock and Mountain Spiraea on a glacial moraine. All three Dark-eyed Junco nests I found were most associated with wet grass, Jeffrey Pine (*Pinus jeffreyi*) needles, and moss for the substrate type (Fig. 2). Dark-eyed Junco nests were composed of a variety of sedge, pine needles, hair, and fine roots. Dimensions of Dark-eyed Junco nests (Table 1) were larger than those of Peck and James (1987, 1998). This was possibly due to latitudinal effects because published measurements were collected in Ontario, Canada. Differences in nest size could reflect the possible larger size of the individuals in this colder climate (i.e., Bergmann's Rule).

I found two American Robin nests between 5–7 August in the crowns of Western White Pine trees (Fig. 2), and nests were made from Huckleberry Oak twigs, sedges, grasses (Poaceae), and mud. Robins nested higher off the ground than any other species nests I measured (Table 2). The American Robin nests had slightly greater nest widths and nest heights, yet smaller cup depths and cup widths (Table 1), than nests from published data in New York (Howell 1942). I think the nest height differences are related to the stunted tree heights in the Trinity Alps due to elevational effects and heavy snowpack during the winter.

I found one Sooty Grouse nest 25 May at the base of a small Western White Pine and a large Jeffrey Pine on the edge of a small meadow (Fig. 2). The branches and trunk of both trees covered the nest from above and about 50%

Table 2. Average (± standard deviation) and range (in parentheses) of nest microhabitats, (except for nests of n = 1) of Lincoln's Sparrow (*Melospiza lincolnii*; LISP), Green-tailed Towhee (*Pipilo chlorurus*; GTTO), Dark-eyed Junco (*Junco hyemalis*; DEJU), Mallard (*Anus platyrhynchos*; MALL), Sooty Grouse (*Dendragapus fuliginosus*; SOGR), American Robin (*Turdus migratorius*; AMRO), and Audubon's Yellow-rumped Warbler (*Setophaga coronate auduboni*; YRWA) in the Trinity Alps Wilderness, California. Distance from Trunk not applicable (NA) to ground nesting birds. Plant cover height not applicable (NA) for tree nesting birds.

Species	Number Observed	Plant Cover Height (cm)	Nest Height Off Ground (m)	Distance to Water (m)	Distance from Trunk (cm)	Distance to Foliar Edge (cm)	Distance to Nearest Tree (m)
AMRO	2	NA	6.1 ± 1.8 (4.3–7.9)	1.8 ± .65 (4.5–3.2)	12 ± 12 (0–24)	21.5 ± 11.5 (10–33)	0
DEJU	3	120.0 ± 58.2 (10–120)	0	1.4 ± 1.3 (0.5–3.3)	NA	0	5.58 ± 4.7 (2.7–11)
GTTO	2	92.0± 21.2 (77–107)	0.2 ± 0.2 (0.04–0.40)	70.9 ± 20.6 (50.3–91.4)	6.5 ± 1.5 (5–8)	101 ± 51 (50–152)	11.7 ± 13.1 (2.4–21)
LISP	15	45.0 ± 14.1 (23–71)	0.1 ± 0.2 (0–0.9)	0.4 ± 0.5 (0.02–1.5)	NA	0	16.5 ± 7.0 (2.1–24)
MALL	1	7.5	0	0.4	NA	0	6.1
SOGR	1	25.4	0	3.0	NA	0	0.1
YRWA	1	NA	3.1	3.0	79	45.3	0

of the sides (Table 2). The nest itself was built in a small depression and composed of mostly Jeffrey Pine needles and some Western White Pine needles. I found one Mallard nest 10 July in a large meadow on a small island between three ponds that dried by the end of summer (Fig. 2). The mallard and Lincoln's Sparrows nested the closest to standing water than other birds I found (Table 2). The Mallard nest was placed in thick cover of sedges and White Rush Lily that had a maximum height of 7.5 cm (Table 1). The nest was made up entirely of sedge.

I found one nest of an Audubon's Yellow-rumped Warbler 26 June on the fork of a branch of a Western White Pine in a small strip of timber that penetrated East van Matre Meadows along a glacial moraine (Table 2). The nest was 3 m up the 5.2 m tall tree, and the nest was made of a homogeneous mixture of hair, feathers of multiple bird species including Steller's Jay (*Cyanocitta stelleri*), and plant fibers (roots, grasses, and twigs), none of which were > 1 mm thick (Table 1, Fig. 2). The nest had much larger dimensions (Table 1) than those measured by Harrison (1975), but similar to those measured in Ontario by Peck and James (1987). This nest did have some damage, and the young may have fledged for some time before I measured it, and that could account for some differences in size. Elevational effects might also account for the differences with nest from Ontario. The nest I found was in a horizontal branch fork of a conifer (Table 2), which is what has been found before (Peck and James 1987). Nest of Audubon's Warblers were unique by having feathers of other bird species incorporated in the nest material, compared to the other breeding bird nests I studied. What I found has been seen for this warbler in other areas (Mcilwraith 1894).

Lastly, I found two nests of Green-tailed Towhee during their construction 26 July, and both nests were immediately abandoned after I located them. One nest was along a traveling route on a glacial moraine between meadows and was subject to more disturbance by amphibian surveyors while moving from meadow to meadow. The other nest was next to the camping area amphibian surveyors used throughout the 4-mo survey season. Despite our best effort to limit disturbance, the nests were quickly abandoned. I measured the two unfinished nests, and they were both associated with Huckleberry Oak and Mountain Spiraea for cover type and nest material (Fig. 2). Both nests were found in shrubs on glacial moraines that have vegetative community of mostly Huckleberry Oak, prostrate manzanita, and stunted Western White Pine. Compared to the other nests described, these nests were the farthest from water (Table 2). The quick abandonment of these nests suggests that Green-tailed Towhees seem much quicker to abandon their nests than the other birds I observed to be breeding in the area. Green-tailed Towhee nests reported in the literature (Harrison 1978) were just under twice the width and height what I measured (Table 1). They may have been abandoned before they were finished, therefore these nests my not be comparable to data on completed nests.

Acknowledgments.—I thank Dr. Daniel Barton for advising me on this project by teaching me methods of locating nests and reviewing my writing. I would like to thank Justin Demianew and Justin Garwood for support and assisting in the finding some of nests.

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