2025 Mountain Bluebird Nest Box Monitoring & Banding Report

Principal Investigator: Kate Gersh, Associate Director, Jackson Hole Wildlife Foundation, kate@jhwildlife.org; 307-739-0968

Co-Principal Investigator: Jessica Walters, Nature Mapping Jackson Hole Program Coordinator, Jackson Hole Wildlife Foundation

Project Personnel: Dakota Vaccaro (Lead Bird Bander), Martina Nordstrand (Assistant Bird Bander) and 26 volunteers

Report compiled by Dakota Vaccaro

Summary

The Mountain Bluebird (*Sialia currucoides*) is an obligate cavity nester whose populations are influenced by habitat availability and interspecific competition for nesting sites. To support local populations, the Jackson Hole Wildlife Foundation, in partnership with the National Elk Refuge, has supported a 6.1-mile nest box trail since 2007. In 2025, 26 volunteers conducted 1,651 nest box checks across 112 boxes, recording occupancy and reproductive success. Bluebirds

produced 28 active nests with high reproductive success (86% egg hatch rate; 80% fledging rate). A record 119 nestlings and 14 adults were color-banded, surpassing all previous years of the project. These strong outcomes highlight the importance of citizen science for long-term monitoring and emphasize the value of artificial nest boxes in supporting cavity-nesting bird conservation. Continued emphasis on resighting color-banded individuals will be critical for assessing site fidelity, habitat quality, and long-term population trends.

Introduction

Found throughout the western United States, the Mountain Bluebird (*Sialia currucoides*) is one of the region's most iconic and visually striking bird species. While a member of the thrush family, the Mountain Bluebird is distinguished by its brilliant blue plumage. Mountain Bluebirds are primarily insectivorous and feed on a variety of small invertebrates, including beetles, grasshoppers, and grubs. Unlike many other thrush species, they favor open grasslands and shrubby habitats for both breeding and foraging (Cornell Lab of Ornithology, 2025).

Mountain Bluebirds are obligate cavity nesters, relying on natural cavities or abandoned woodpecker holes in trees—or occasionally rock crevices—for nesting (Johnson & Dawson, 2020; Duckworth, 2014). Because they cannot excavate their own cavities, they face significant competition from other cavity-nesting birds, including Tree Swallows and invasive species like House Sparrows and European Starlings.

During the late 19th century, westward human expansion led to widespread logging and deforestation to create grazing habitat for livestock. By opening up grasslands, settlers inadvertently created favorable habitat for Mountain Bluebirds, resulting in a rapid population increase (Cornell Lab of Ornithology, 2025). This was followed by prolonged periods of fire suppression, which encouraged reforestation of many former grasslands and contributed to a population decline. Although Mountain Bluebird numbers have remained relatively stable over the past 70 years, local populations remain vulnerable to habitat loss and shifting ecological conditions (Sauer et al., 2019).

In 1912, President William Howard Taft established the National Elk Refuge (NER) in western Wyoming to protect dwindling elk populations, which had been severely affected by overhunting for elk teeth (ivories) and antlers. As elk populations rebounded, however, over browsing—particularly in areas such as Yellowstone National Park—led to widespread degradation of woody vegetation, including aspen stands (NPS 2023). The loss of this vegetation had cascading effects throughout the Greater Yellowstone Ecosystem, including the reduction of nesting habitat for cavity-nesting birds like the Mountain Bluebird. Compounding this challenge, the spread of non-native cavity nesters has further reduced available nesting sites (Duckworth, 2014).

To support Mountain Bluebird conservation, the Jackson Hole Wildlife Foundation (JHWF), in partnership with the NER, launched the Mountain Bluebird Nest Box Trail in 2007. Along U.S. Highway 89, more than 100 nest boxes were installed along the NER's fence line. Research has shown that artificial nesting structures can provide effective breeding habitat for bluebirds and

may be one reason populations have remained stable in certain areas. Each summer, volunteers monitor these nest boxes for bluebird activity, and in 2017, a color-banding initiative was introduced to track site fidelity and return rates. The long-term data collected through this citizen science program offers critical insights into the survivorship, reproductive success, and population dynamics of Mountain Bluebirds in the Jackson Hole region.

Methods

Study Area

The bluebird trail is 6.1 miles long and found along the NER fence north of Jackson, Wyoming. It extends from the Jackson Hole and Greater Yellowstone Ecosystem Visitor's Center to just north of the Gros Ventre River bridge on US-89 (Fig. 1). The trail is comprised of 112 nest boxes, mounted approximately 30 meters apart to NER fence poles. Twelve of the nest boxes are located within three meters of each other to potentially examine if nest distance changed bluebird or tree swallow nesting attempts or success.

Along the bluebird trail, nest boxes are located in three different habitat types: 1. Wetland – where the fence borders Flat Creek Marsh and is dominated by cattails (*Typha* sp.), willows (*Salix* sp.), and large patches of open water; 2. Shrub-steppe – dominated by sagebrush (*Artemisia* sp.) and rabbit brush, with no tree cover; 3. Mixed-riparian shrub-steppe woodland – where the trail is bisected by the Gros Ventre River, is mostly cottonwood woodland with large patches of sage and grassland habitat.

Nest Box Monitoring Protocol

From May 1st to August 15th, all volunteers were assigned a subset of nest boxes along the bluebird trail that they monitored once a week for wildlife activity. Volunteers were trained prior to summer on nest monitoring techniques outlined in Martin and Geupel (1993), including low-impact data collection, while observing the stage and fate of each nest. Volunteers were additionally trained in how to identify the most common bird species in the study area based on nest design (i.e., swallows have feathers in nest, bluebirds' grass, and wrens' sticks). During each check, volunteers would first open the nest box and record if nesting material were present. If present, volunteers would identify the species and count any eggs or nestlings.

Once nestlings were 10 days old, volunteers monitored the nest boxes from a distance for at least five minutes to determine if adults were present at the nest or if fledglings could be seen. If no activity was observed, volunteers were allowed to open the box and check for unhatched eggs or dead nestling, which was also recorded. If no birds were observed in the area and there were no signs of a predation event, we considered the nest successful and recorded the number of fledglings for each nest based on prior counts of nestling.

While the focus of this study is Mountain Bluebirds, we asked volunteers to record the same data for other nesting species such as swallows and wrens. Once a nest had fledged, volunteers removed the old nest to promote re-nesting in the box. We additionally encouraged volunteers to take binoculars with them while checking boxes and attempt to re-sight any previously color-banded bluebird adults from previous years.

All data was recorded with the JHWF's Nature Mapping Jackson Hole app, which automatically recorded information such as date, time, and location of check. At the end of the season all nest check data was proofed by JHWF staff to maintain high quality and error free data.

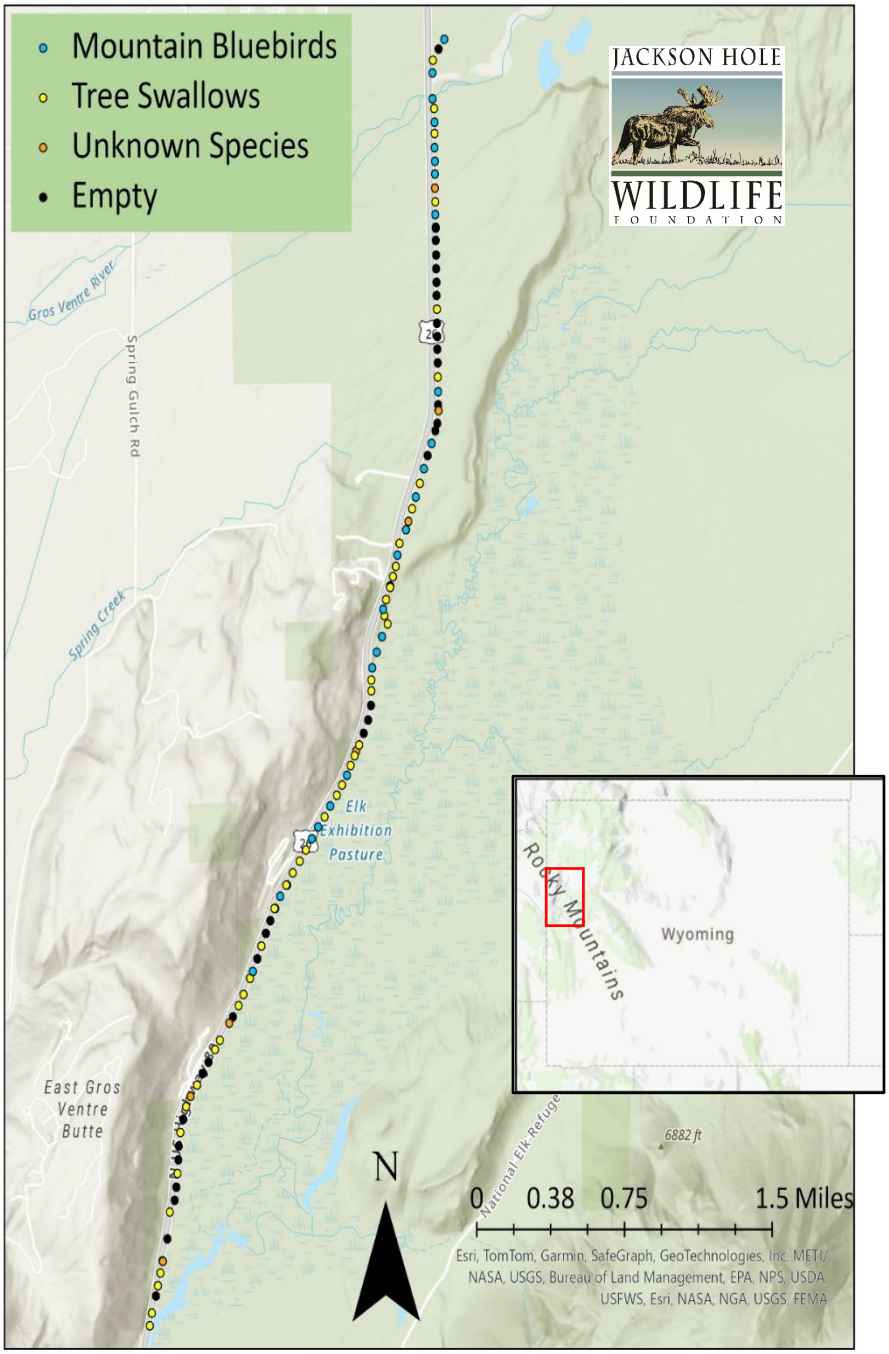

Figure 1: The Jackson Hole Wildlife Foundation Mountain Bluebird Nest Box Trail, located in Jackson, WY. The trail has 112 boxes and extends from the Jackson Hole and Greater Yellowstone Ecosystem Visitor's Center to just north of the Gros Ventre River bridge on US-89. Each point stands for a nest box location and color indicates the 2025 occupancy status.

Mountain Bluebird Banding Protocol

When nest box monitors saw a Mountain Bluebird nesting in one of their boxes, they notified JHWF staff and continued to monitor the nest twice per week. We calculated hatch windows for each active nest based on when the first and final eggs were laid. For example, if a volunteer observed a nest with two eggs and then six eggs next week, we could calculate what day the final egg was laid and when incubation started. When nests entered their hatch window, around day 14, we had either a volunteer or JHWF staff go out and check the nest in hopes of observing the nest hatching to provide the most accurate nestling age. We also encouraged volunteers to take pictures of recently hatched babies, which combined with our hatch windows, provided highly accurate estimates of nestling age.

Nestlings were color-banded when they reached 10 to 11 days old. By day 10, nestling legs had reached their maximum thickness and would not grow any wider, thus bands would not hinder development. Additionally, nestlings were still too young at this age to try and leave the box, therefore early fledging was exceedingly unlikely. Trained JHWF staff color-banded the nestlings with one aluminum band (size 1B) and three plastic color bands. Each bird received a unique combination, so that individual bluebirds could be recognized in the future by anyone who encountered them. All birds color-banded in 2025, had an orange band over an aluminum band on either their left or right leg to signify the year in which they were color-banded. After banding, we recorded the sex (if possible), mass, and tarsus length of each nestling.

To prevent nest abandonment, staff avoided removing all nestlings from the box at the same time; instead, they were taken out in pairs, always leaving at least one bird in the nest. Adult bluebirds were opportunistically captured if they entered the nest box when banders were present. Captured adult bluebirds were color-banded using the same methods, however more data was recorded including sex, age, skull ossification amount, presence and development level of cloacal protuberance or brood patches, fat levels, presence of molting feathers, flight feather wear, wing chord, and mass.

Results

Nest Box Monitoring

In 2025, we had a total of 26 volunteers help monitor nest boxes along the NER, which has been the most volunteers to date (Fig. 2). Over the summer, volunteers recorded 1,651 nest box checks. This year 68% of our boxes were occupied by bluebirds, tree swallows, or house wrens. Out of our 112 boxes, we observed bluebird activity in 25 boxes. One of the boxes never progressed past the nest stage, but the other 24 all had eggs. Boxes 22, 54, and 65 each had a second bluebird nesting attempt, resulting in a total of 28 active bluebirds nests this season (Fig. 3). The majority of first nesting attempts (n=17) occurred from May to Mid-June. We saw a second wave of nesting attempts (n=8) from July to mid-August. Interestingly one pair of bluebirds that nested in box 30 had a second nest in box 30A, which was located about 10 feet from box 30.

Mountain bluebird nest success was relatively high this year with 86% of eggs hatching and 80% of nestlings fledging (Fig. 4). Three boxes were predated by an unknown predator, potentially a raccoon, one box never made it past the egg stage and was most likely abandoned by parents, and one nest was found with dead nestlings close to fledging. Dead nestlings, without

evidence of a predation event, can often occur if both or a single parent die while foraging and are unable to continue feeding the nestlings. Besides bluebirds, most boxes were occupied by tree swallows and one house wren (Fig. 3).

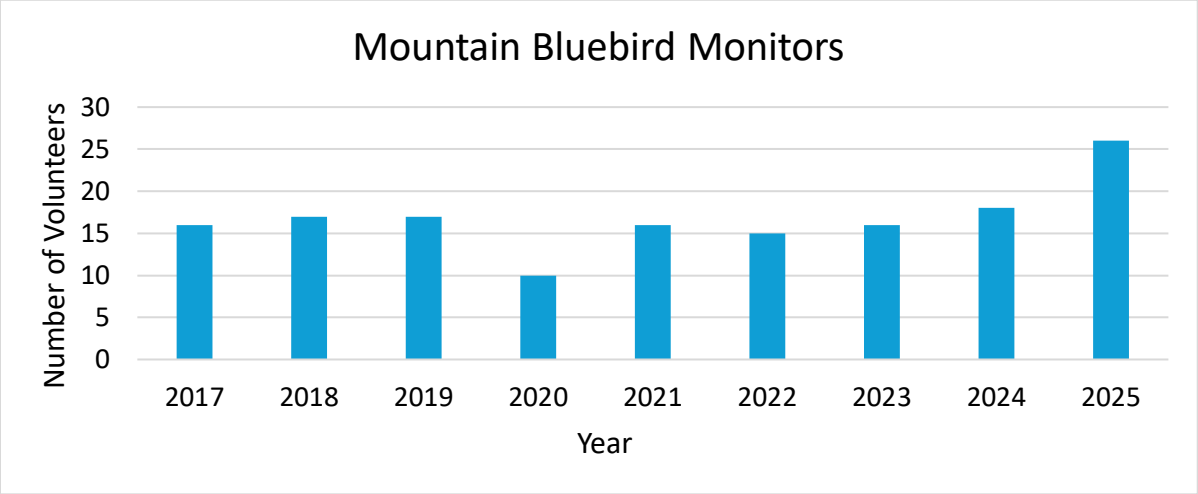

Figure 2: The number of Mountain Bluebird Nest Box Trail volunteers recruited by the Jackson Hole Wildlife Foundation since 2017. Volunteers handle checking the 112 nest boxes from early May to August and recording any nesting bird activity.

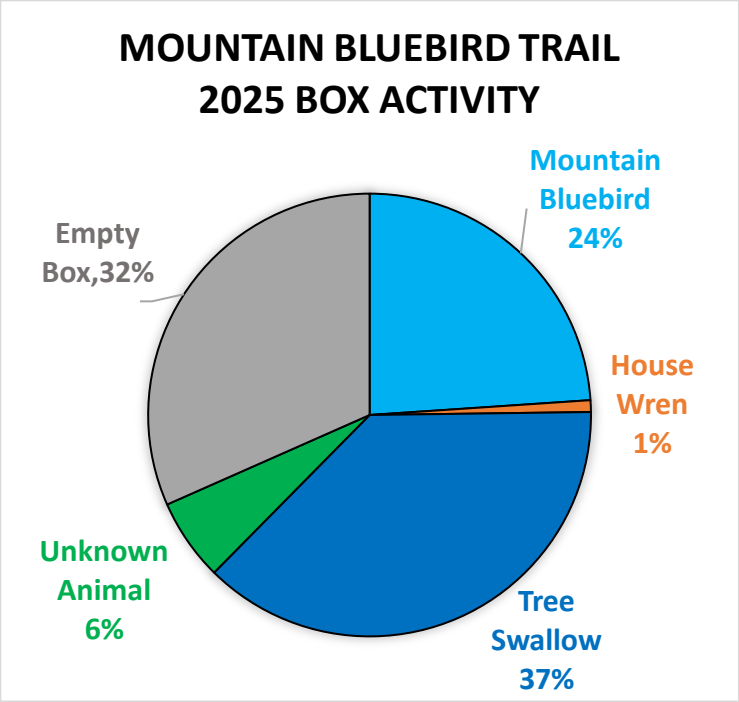

Figure 3: Percent of species occupancy status for all nest boxes along the Mountain Bluebird Trail in Jackson, WY, from May to August 2025. Percentages include second nests within the same box. Picture shows a pair of color-banded and fledged hatch year Mountain Bluebirds from 2025 season.

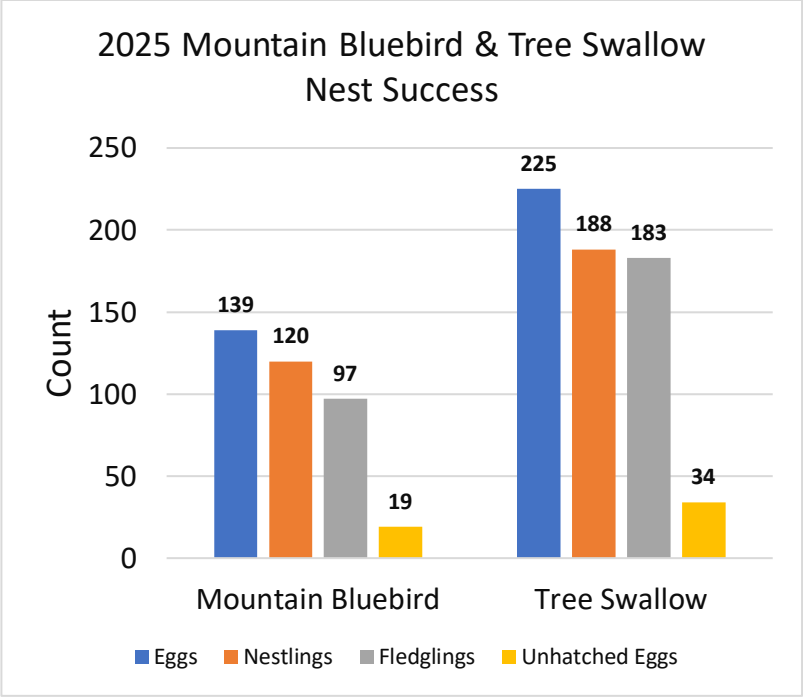

Figure 4: Total number of eggs, nestlings, fledglings, and unhatched eggs of Mountain Bluebirds and Tree Swallows recorded by monitors during the 2025 Mountain Bluebird Nest Box Trail project from May to August 2025 in Jackson, WY. Picture shows 1–2-day-old Mountain Bluebird nestlings. Interestingly, this nest is lined with Mountain Bluebird feathers, suggesting they were collected from a previously deceased male when the female was building the nest.

Mountain Bluebird Banding & Resighting

In 2025, we color-banded 119 out of 120 total Mountain Bluebird nestlings and 14 adult Mountain Bluebirds which was a record-breaking number for both nestlings and adults (Fig. 5; Fig. 6). Prior to 2025, the most bluebird nestlings color-banded had been in 2017 when 85 were color-banded (Fig. 5). We were unable to band one nestling as it was several days younger than its clutch mates and too small to band. Most likely this nestling's egg was laid several days later than its clutch mates. When its siblings hatched their body heat allowed the egg to continue incubating and hatch out at a later date. We observed no signs of a dead nestling in this box, suggesting that the parents continued to care for the nestling until it was old enough to fledge.

Of the 14 adult bluebirds captured this year, eight were males and six were females. Among the males, eight were older than two years, two were two years old, and one was of unknown age. Among the females, three were older than two years, two were two years old, and one was of unknown age. A notable behavioral observation was that males typically flew directly into the nest box upon returning with food, whereas females often perched on the fence for extended periods before entering, displaying more cautious behavior.

The average mass of nestlings was 28.5 grams (Max: 31.2g, Min:25.2g). The average tarsus length was 21.8mm (Max: 22.7mm, Min:20.0mm).

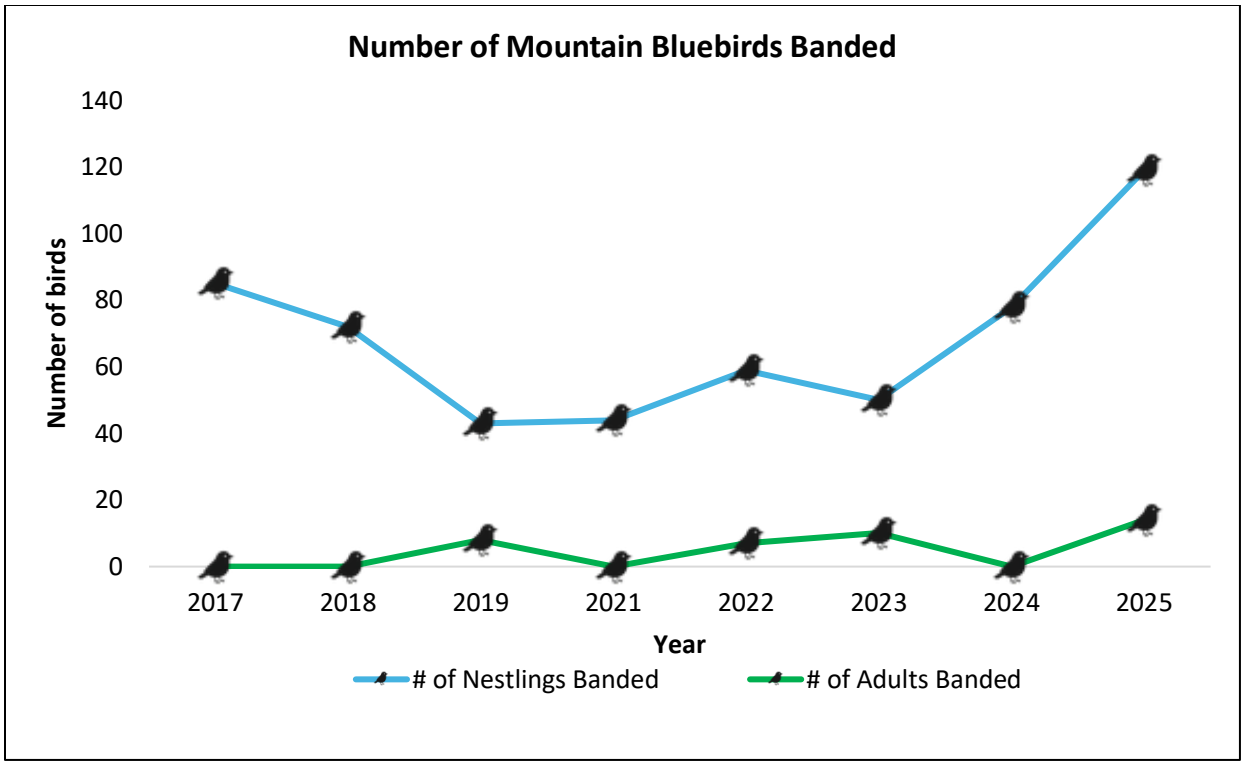

Figure 5: Number of nestling and adult Mountain Bluebirds color-banded from 2017 to 2025, along the Mountain Bluebird Nest Box Trail in Jackson, Wyoming.

Figure 6: Left – Pair of adult Mountain Bluebirds; Right – Nestling Mountain Bluebird with color bands.

Discussion

JHWF's 2025 Mountain Bluebird Nest Box Monitoring & Banding Project was one of the most productive seasons to date, producing record numbers of hatchlings along the National Elk Refuge boundary trail. Nestling success rose 35% over 2024, with 120 fledglings compared to 78 last year.

Although the reasons for 2025's unusually high productivity are uncertain, several factors may have contributed. Average May temperatures were about 2°F warmer than normal, creating a mild spring that likely prompted earlier nesting. The first nestlings were color-banded on May 3—nearly two weeks earlier than in 2024. This earlier start may have allowed some pairs to attempt a second clutch. Abundant insect and cicada activity also may have provided rich food resources. Whatever the cause, this success marks a major milestone for the project.

Volunteer engagement also peaked in 2025, with 26 monitors completing 1,651 nest box checks. This project relies on these citizen scientists, whose work provides critical data on bluebird demography while strengthening human–wildlife connections. By joining banding sessions and observing field methods, volunteers gain a deeper appreciation for conservation and play a vital role in long-term monitoring.

With the record number of birds banded in 2025, resighting will be especially important in 2026. This season, several adults banded in previous years were observed raising nestlings, including two females (banded in 2021 and 2023) and a male (banded in 2024). Resight data is one of the most valuable outcomes of color-banding, as it reveals site fidelity and habitat use over time. Low resight rates could signal habitat concerns, while shifts in nesting locations may identify preferred breeding and foraging habitats.

Although many monitors identified color-banded birds this year, recording exact band combinations proved difficult. To improve data quality, future training will emphasize bringing binoculars and, when possible, zoom-capable cameras, since photographs provide the most dependable resight records.

Overall, the record number of bluebird nestlings in 2025 highlights the conservation value of artificial nest structures and the power of citizen science in long-term monitoring. Sustaining this project will be essential for tracking population trends, guiding habitat management, and ensuring Mountain Bluebirds remain a vibrant part of the Jackson Hole ecosystem for years to come.

Acknowledgments

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