



MOUNTAIN BLUEBIRD NEST BOX MONITORING AND BANDING PROJECT

2024 Annual Report



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Summary

For 18 years, a bluebird trail (a series of nest boxes) has been monitored by volunteers of the Jackson Hole Wildlife Foundation (JHWF) in Jackson, Wyoming. The project was created in partnership with the National Elk Refuge (NER) and currently consists of 110 nest boxes on NER fence posts along HWY US-89 north of Jackson, which provide artificial nesting habitat to Tree Swallows, Mountain Bluebirds, Northern House Wrens, and occasionally other cavity-nesting species. In 2024, 18 volunteers monitored the nest boxes, which successfully fledged 78 Mountain Bluebirds, 135 Tree Swallows, five Violet-Green Swallows and four Northern House Wrens. A color-banding study on the trail seeks to understand nest site fidelity, survivorship, and dispersal patterns of Mountain Bluebirds in Jackson Hole. This year, we color-banded 78 Mountain Bluebirds.

Introduction

Mountain Bluebirds (*Sialia currucoides*) are secondary cavity nesters, which means they need sheltered holes in which to raise their young, but they are not capable of creating these spaces for themselves. Therefore, nest cavities are one of the limiting factors for their population growth. Often these nest locations take the form of holes excavated by woodpeckers in burned conifer forest and aspen stands, but Mountain Bluebirds are highly adaptable and have been known to nest above the tree line in rocky crevices alongside Black Rosy-Finches, along waterways in old kingfisher burrows, and in and around human infrastructure, wherever a suitable nest site exists (C. Brown pers. comm., Johnson and Dawson 2020). Mountain Bluebirds are regular users of nest boxes. Mountain Bluebirds forage for ground-dwelling invertebrates and therefore, require open foraging habitat. Heavily forested areas are not suitable for them. Mountain Bluebirds face both intra- and interspecific competition for nest sites, including from species such as Tree Swallows. Research has shown that pairing nest boxes can encourage these species to nest alongside each other (Johnson and Dawson 2020).

Historically, Mountain Bluebirds were closely tied to fire, inhabiting burned areas soon after woodpeckers had created nest cavities in snags (Johnson and Dawson 2020). Aspen (*Populus tremuloides*) stands typically support relatively high densities of Mountain Bluebirds as well (Johnson and Dawson 2020), but aspen have declined across the western United States due to a variety of factors. Aspen recruitment in Yellowstone National Park (YNP) was suppressed by excessive herbivory following the extirpation of wolves in the early 1900s (NPS 2023). Changing fire regimes in the Greater Yellowstone Ecosystem (GYE) also negatively impacted aspen

populations (Painter et al. 2018). The introduction of non-native, cavity-nesting species, such as House Sparrows and European Starlings, has further reduced the availability of nesting sites for Mountain Bluebirds (Duckworth, 2014; Prescott, 1982).

Despite these challenges, Mountain Bluebird populations in the Northern Rockies Conservation Region have remained stable, even showing slight, statistically significant increases according to the analysis of long-term Breeding Bird Survey (BBS) data. However, BBS data show a slight decline in populations in Wyoming, although these results are not statistically significant (Sauer et al. 2020). Mountain Bluebirds may benefit in some cases from human development, especially when such development creates openings in contiguous forest, increasing available habitat (Johnson and Dawson 2020). Additionally, the implementation of artificial nesting habitat, such as nest boxes, has been shown to mitigate the loss of natural nesting habitat for bluebird species (Johnson and Dawson 2020).

Artificial nesting habitat requires maintenance and monitoring. Nest boxes that are in disrepair are often useless and boxes that are accessible by predators or used for nesting by non-native species can negatively impact native species by acting as ecological sinks (i.e., poor quality habitat) and increasing competition from invasives (Johnson and Dawson 2020). Therefore, it is important to monitor nest boxes and maintain them so that they benefit native species. Understanding nest success is a key factor in assessing whether there is a benefit from artificial nest spaces on bird populations. For example, if most of the nests along a bluebird trail are failing due to extreme temperatures or predation, the artificial habitat may act as a sink for the population. A good measure of nest success is the number of eggs laid that produce fledglings (Saab and Dudley 1998).

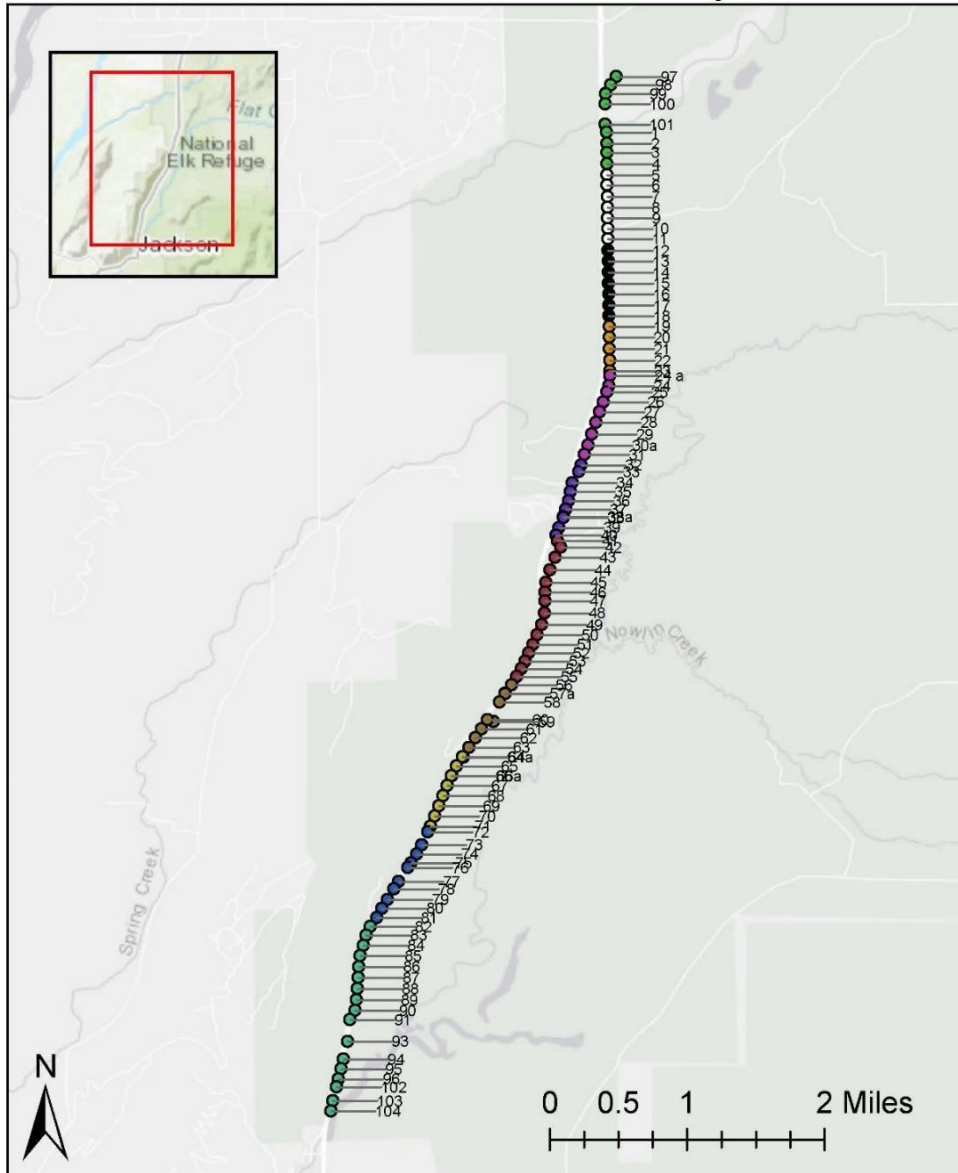
Since 2003, the Jackson Hole Wildlife Foundation (JHWF) and our dedicated volunteers have managed a "bluebird trail" consisting of 110 to 112 nest boxes. In 2017, we began color-banding Mountain Bluebirds using these nest boxes to deepen our understanding of population trends, breeding site fidelity, survivorship, and dispersal patterns. This banding effort offers vital insights into the lives of Jackson Hole's bluebirds.

Methods

Study Area

The bluebird trail was located along 6.1 miles of NER fence north of Jackson, Wyoming, extending from the Jackson Hole and Greater Yellowstone Ecosystem Visitor's Center to just north of the Gros Ventre River bridge on US-89. The trail was comprised of 110 nest boxes, which were positioned on fence posts along the NER (Figure 1).

Mountain Bluebird Nestbox Project Area



JACKSON HOLE



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Figure 1. The JHWF bluebird trail extends from the north end of Jackson near the Greater Yellowstone and Jackson Hole Visitor Center to the intersection of US-89 with the Gros Ventre River. Different colors indicate stretches monitored by different volunteers.

Nest boxes were approximately 100 feet apart, except for six paired boxes, which were placed within 10 feet of each other to encourage nesting of bluebirds and swallows alongside each other. The habitat along the bluebird trail was variable. At the southern end of the trail, the fence bordered Flat Creek Marsh, a wetland with emergent vegetation such as cattail (*Typha* sp.) and

willow (*Salix* sp.). Farther north, the habitat bordering the trail transitioned into intact sagebrush (*Artemisia* sp.) steppe. At the northern end, the trail bisected the Gros Ventre River and entered a riparian corridor dominated by cottonwood (*Populus* sp.).

Nest Box Monitoring Protocol

Volunteers were assigned a subset of nest boxes along the bluebird trail and monitored their nest boxes at least once per week between May 1 and August 30 to track occupancy and nest fate. Volunteers were trained 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 opened the nest boxes to view the contents and ascertain the stage of each nest throughout the season. Once nestlings were 12 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. Volunteers entered their data into the Jackson Hole Wildlife Foundation's Nature Mapping Jackson Hole (NMJH) database, and staff members performed quality control checks on the data.

Mountain Bluebird Banding Protocol

When nest box monitors observed a Mountain Bluebird nesting in one of their boxes, they notified JHWF staff and continued to monitor the nest twice per week. Once Mountain Bluebird nestlings were 10 days old, they could be aged by the extent of blue in their wings and tail feathers (Pyle 2001). At this age, they were ready to be banded. Trained JHWF staff banded the nestlings with one aluminum band and three plastic color bands. 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. Banders placed an aluminum band on the right leg with a color band above it to signify the year of the study (e.g., in 2024, birds were banded with a purple band above the aluminum band). Two color bands were placed on the left leg in unique combinations so that individual bluebirds could be recognized in the future by anyone who encountered them. Incidentally captured adult bluebirds were banded using the same methods. Adult bluebirds were sometimes captured if they entered the nest box as a bander was approaching. Staff also color-banded Mountain Bluebirds captured at one of the Monitoring Avian Productivity and Survivorship (MAPS) stations to augment the sample size.

Results

Nest Box Monitoring

We engaged 18 volunteers to monitor our bluebird trail this year. That number is higher than previous years, except 2017. In 2020, when the global pandemic created issues with staff capacity, very few volunteers were involved (Figure 2).

In 2024, our 18 nest box monitors were assisted by three staff members and three substitute volunteers who monitored boxes when the regular monitors were unable. This sustained high

interest in the bluebird monitoring project is valuable because it gives volunteers hands-on experience using scientific techniques in the field. It also engages the community in on-the-ground conservation, increases their connection to local wildlife, and encourages learning. Welltrained volunteers can collect accurate scientific data which may then inform management decisions.

Mountain Bluebirds experienced relatively high success this year, producing more than one fledgling per nest. Research has shown that nest boxes often achieve significantly higher success rates than natural cavities (Johnson and Dawson, 2020). This year had one of the highest success rates in the history of this trail.

Mountain Bluebird productivity on this bluebird trail has fluctuated over recent years. The lowest rate of productivity occurred in 2020, with only 24 chicks hatched. However, 2024 reflects a continued upward trend from last year and matches the 2017 season, which produced a record high 85 chicks.

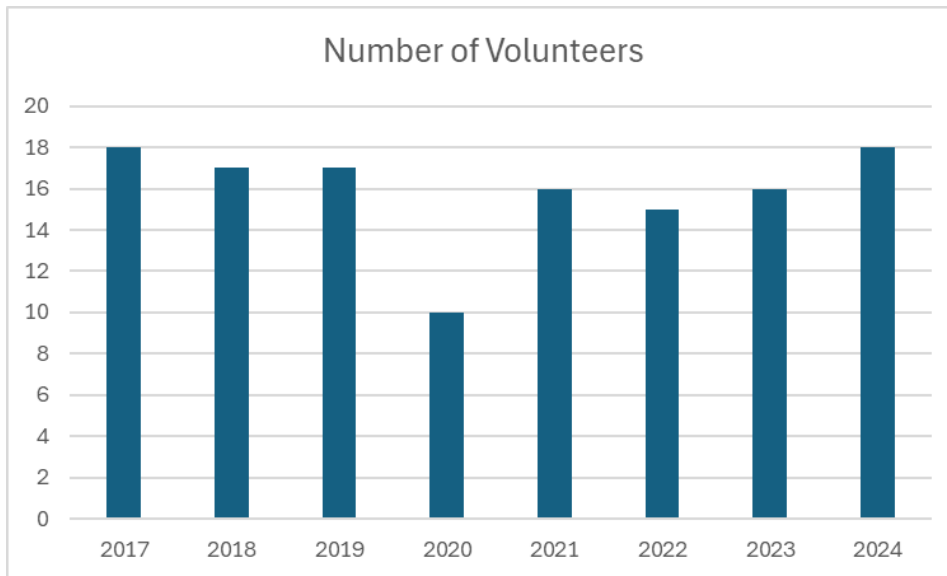


Figure 2. The number of volunteers on the Mountain Bluebird nest box monitoring project has remained relatively constant since 2017. In 2020, fewer volunteers participated in the project due to complications from the COVID-19 Pandemic.

In 2024, 45% of the available nest boxes (n=50) were occupied by Mountain Bluebirds, Tree Swallows, Violet-Green Swallows, and House Wrens, as indicated by recorded egg activity. Nest boxes 29, 30, 47, 55, and 63 each hosted two nesting attempts during the summer. In total, 55 successful nesting attempts were documented based on eggs laid.

55% of available nest boxes (n=60) were either unoccupied or showed signs of incomplete nesting attempts. Of the total boxes, 17 (15%) were used by Mountain Bluebirds, 36 (33%) by Tree Swallows, one (1%) by Northern House Wrens, one (1%) by Violet-Green Swallows, and 60 (55%) remained unused (Figures 3–5).

Mountain Bluebird occupancy decreased by 2% compared to 2023 but still resulted in the same number of successfully hatched eggs and 39 additional fledglings. In contrast to this year, last year was marked by well-documented instances of parasites and predation affecting the bluebirds along the trail. In 2024, predation occurred in only three nest boxes, and none were affected by parasites.

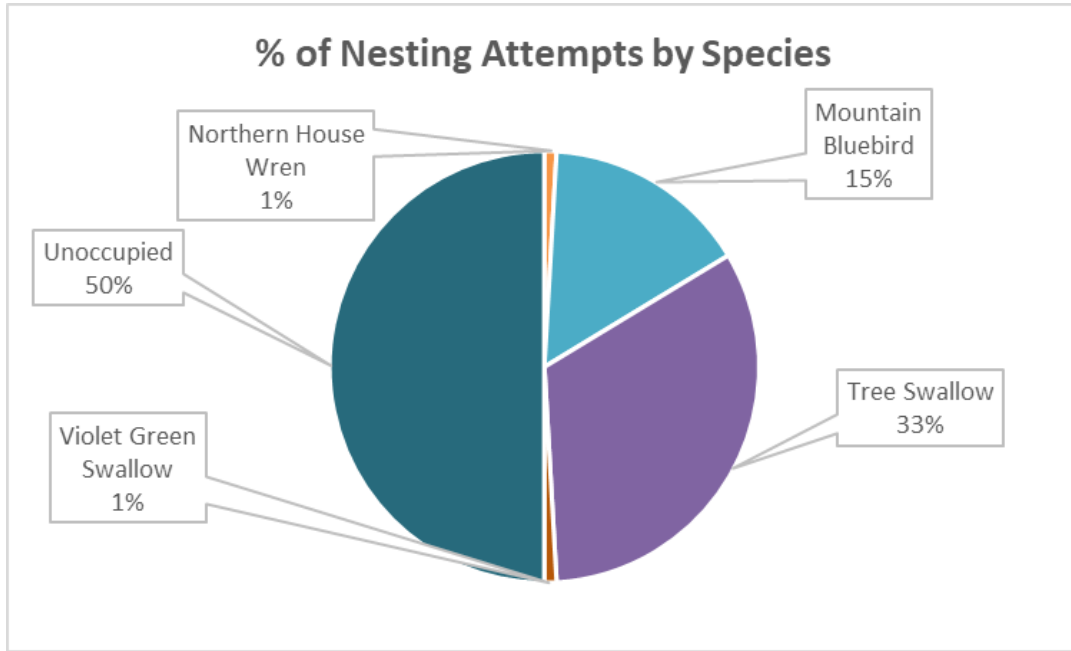


Figure 3. In 2024, the Mountain Bluebird nest box trail along the western boundary of the National Elk Refuge was utilized by Mountain Bluebirds (15% of the total available boxes), Tree Swallows (33%), Northern House Wrens (1%), and Violet-Green Swallows (1%).

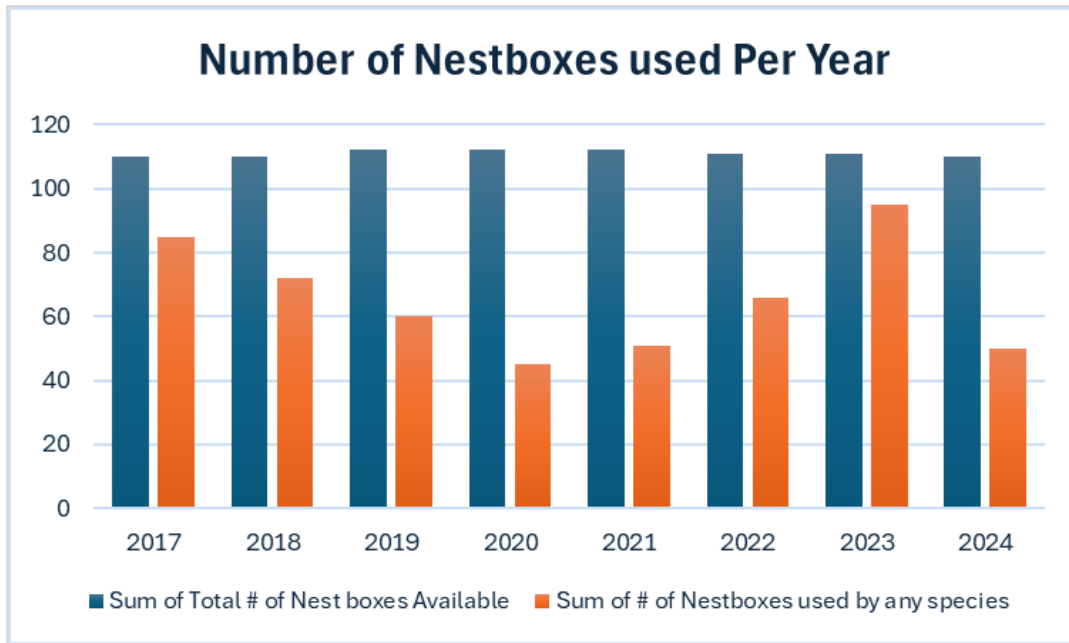


Figure 4. The number of nest boxes used per year along our Mountain Bluebird trail.

Nestbox #	Mountain Bluebird	Tree Swallow	Violet Green Swallow	Total Nest Attempts in 2024
29	1	1		2
30	1	1		2
47	1		1	2
55	1	1		2
63	1	1		2

Figure 5. Nest boxes 29, 30, 47, 55, and 63 each hosted two nesting attempts by different species that successfully laid eggs this past summer.

A total of 283 eggs were laid in the nest boxes this summer, with 78% resulting in fledglings (Figure 6). Mountain Bluebirds laid 98 eggs, and 79.6% of these hatched into bluebird fledglings. Of the 17 nesting attempts by Mountain Bluebirds in our nest boxes (including re-nesting attempts), 15 (88%) were successful. Four nestlings died before fledging, and 16 eggs did not survive long enough to hatch. Tree Swallows laid 176 eggs, with 135 (76.7%) producing fledglings. Eight Tree Swallow nestlings died before fledging, and 27 eggs did not hatch. Only one House

Wren nest was recorded, all four eggs hatched all and nestlings successfully fledged. One VioletGreen Swallow nest produced five fledglings.

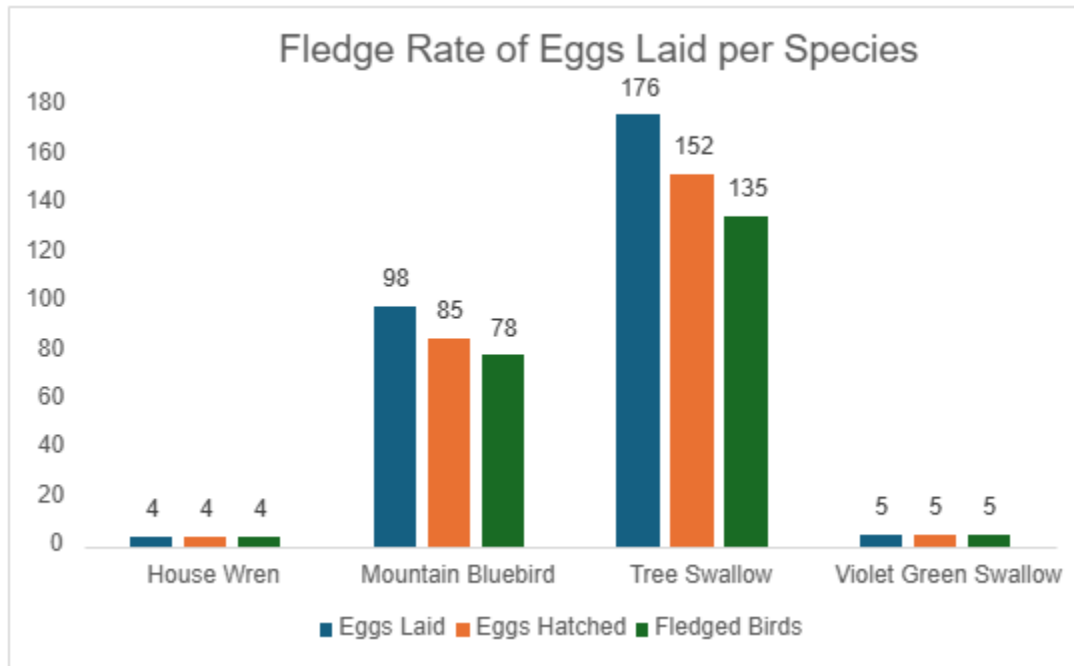


Figure 6. In 2024, House Wrens and Violet Green Swallows both had a fledge rate of 100% from eggs that were laid in nest boxes along the bluebird trail. Mountain Bluebirds had a 79.6% fledge rate from eggs that were laid, and Tree Swallows had a fledge rate of 76.7%.

Mountain Bluebird Color Banding

The 2024 Mountain Bluebird banding season yielded 78 banded nestlings along the established bluebird trail, with no adult birds banded. All 2024 nestlings were fitted with a unique combination of a standard aluminum United States Fish and Wildlife Service (USFWS) band and a purple plastic color band on one leg for cohort identification.

Color-banded Bluebird Resights

Since 2017, we have received 58 resight reports of color-banded Mountain Bluebirds from our study. While most resights occurred in and around Jackson, one individual was observed near Fort Worth, Texas. Although this was a single observation, it highlights the value of banding bluebirds along the trail. Before this finding, there were no data to indicate where Mountain Bluebirds that breed near Jackson overwintered.

Survivorship, a critical aspect of avian demography, can often have a greater influence on population trends than factors such as productivity (IBP 2021). This year, a female bluebird banded in 2021 was observed twice at nest box 44. Color banding allows us to gather valuable information about fledgling survival, a topic with limited existing data. Research suggests that

most fledgling mortality occurs within the first few days after fledging (Johnson and Dawson 2020). Notably, this year we resighted fledglings perched on a fence wire with their parents, offering rare insight into post-fledging survival behavior. After leaving the nest, young bluebirds remain with their parents for about three weeks, during which the parents continue to feed them and teach them essential survival skills. During this period, fledglings often perch together, sometimes on fence wires, as they learn to forage and adapt to their environment. This behavior underscores the importance of parental care in the early stages of a bluebird's life (Avian Report 2024).

In 2024, four previously color-banded birds were resighted. This represents a significant decline in resights compared to previous years, reversing a previously positive trend. We speculate this decline is due to reduced public engagement efforts caused by capacity constraints and staff changes at JHWF. To address this, we plan to revitalize our [Bluebirds with Bling](#) awareness campaign. This initiative will focus on encouraging more resight reports by engaging the Jackson Hole community and reinforcing the importance of resighting efforts by volunteer monitors. A detailed history of resights is in Appendix 1.

Conclusion

The 2024 Mountain Bluebird monitoring season demonstrated both successes and opportunities for future improvement. The high fledging success rate—with 79.6% of Mountain Bluebird eggs producing fledglings—represents one of the strongest breeding seasons in the project's history. This success, combined with minimal predation and parasite issues, suggests that the nest boxes are providing quality breeding habitat for native cavity-nesting birds.

The volunteer monitoring program remains robust, with 18 dedicated monitors representing one of the highest participation rates since the project's inception. This sustained community engagement is vital for both data collection and fostering local wildlife conservation awareness. However, the notable decline in resightings of color-banded birds highlights the need to reinvigorate public outreach efforts to maintain this crucial aspect of the research.

As we look ahead, the project's dual role in scientific research and community science continues to yield valuable data about Mountain Bluebird population dynamics while engaging local citizens in meaningful conservation work. The success of artificial nest boxes in supporting breeding birds, particularly in an era of declining natural cavity availability, demonstrates the practical conservation value of this long-term initiative. Moving forward, strengthening public engagement and maintaining consistent monitoring efforts will be crucial for building upon these achievements and ensuring the project's continued contribution to Mountain Bluebird conservation in Jackson Hole.

Acknowledgments

Every year this project is continued with the generous support of the U.S. Fish and Wildlife Service's National Elk Refuge, the Wyoming Game and Fish Department, Teton Conservation District, Meg and Bert Raynes Wildlife Fund and individual donors. We also thank our tremendous volunteers for monitoring nest boxes, spreading the word, and encouraging others to get involved.

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Appendix 1. Resight data for the Mountain Bluebird banding project 2017-present

Band Colors: Silver (Metal), Red, Yellow, Green, Peach, Hot Pink, Gray, Black

Mountain Bluebird - No Lighting Data Used

Photograph: Adults (lighted) or Adult

Date	Site	Light Type	# Banders	Light Type	Color	UTM Easting	UTM Northing	Location	Substrate	Activity	Sex	Age	Comments
6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles
6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles
6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles
6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles
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6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles
6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles
6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles
6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles
6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles
6/16/2018	14 20	Yellow	2	Strip	Yellow	512520	492990	West 2nd St	Roofline	Perched	M	Adult	Perched on roofline, observed by Michael St. Charles

Resident

