JACKSON HOLE WILDLIFE FOUNDATION

MOUNTAIN BLUEBIRD NESTBOX MONITORING PROJECT

- 2021 ANNUAL REPORT -

Photo by Vicki Morgan

Mountain Bluebird Nestbox Monitoring

2021 Report

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Summary

For 18 years, one of the longest bluebird trails (a series of nest boxes) in the country has been monitored by volunteers of the Jackson Hole Wildlife Foundation (JHWF) in western Wyoming. The project was created in partnership with the National Elk Refuge (NER) and consists of 112 nest boxes on NER fence posts along US-89 north of Jackson, which provide artificial nesting habitat to Tree Swallows, Mountain Bluebirds, House Wrens, and occasionally other cavity-nesting species. In 2021, 16 volunteers monitored the nest boxes, which successfully fledged 43 bluebird nestlings, 144 Tree Swallow nestlings, and 5 House Wren nestlings. 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 52 bluebirds in the area.

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 treeline in rocky crevices alongside Black Rosy-Finches, along waterways in old kingfisher burrows, and around human infrastructure, wherever a suitable hole 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 Bluebird face both intra- and interspecific competition for nest sites, including from species such as Tree Swallows. Research has shown that pairing nestboxes 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 for them 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 West 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 from the area (https://www.nps.gov/yell/learn/nature/wolf-restoration.htm). Changing fire regimes in the Greater Yellowstone Ecosystem (GYE) also negatively impacted aspen populations (Painter et al. 2018). Introduction of non-native, cavity-nesting species have further reduced available nesting sites for Mountain Bluebirds (Duckworth 2014).

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. 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 for them (Johnson and Dawson 2020). Additionally, the implementation of artificial nesting habitat, such as nestboxes, has been shown to mitigate the loss of natural nesting habitat for bluebird species (Johnson and Dawson 2020).

With implementation of artificial nesting habitat comes great responsibility. Nestboxes that fall into disrepair or are easily accessible by predators or used for nesting by non-native species can negatively impact native species by acting as ecological sinks and increasing competition from invasives (Johnson and Dawson 2020). Therefore, it is important to monitor nestboxes and maintain them so that they benefit native species. Understanding nest success is a key factor in assessing the influence of 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 that produce fledglings (Saab and Dudley 1998).

Since 2003, JHWF and our volunteers have monitored and maintained a “bluebird trail” consisting of 112 nest boxes in western Wyoming. In 2017, we began color-banding the Mountain Bluebirds that use our nest boxes to gain further knowledge about population trends, breeding site fidelity, survivorship, and dispersal. These banding data provide invaluable insight into the lives of the bluebirds in Jackson Hole.

Methods

Study Area

The bluebird trail is located along 6.1 miles of NER fence north of Jackson, Wyoming, 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 is comprised of 112 nestboxes which are positioned on fence posts between the NER and US-89 (figure 1).

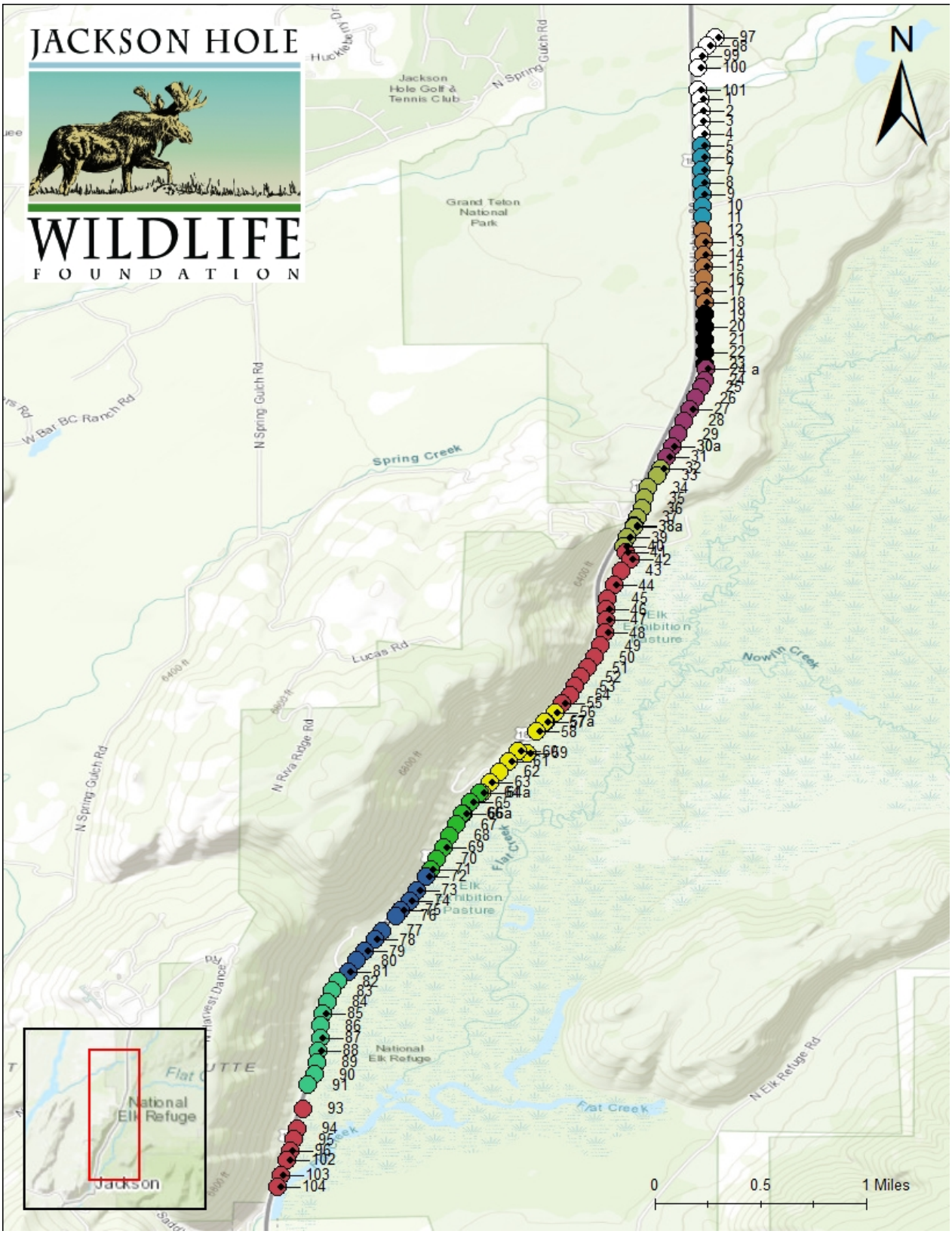

Figure 1. The JHWF bluebird trail extends from the north end of Jackson near the Greater Yellowstone and Jackson Hole Visitor Center to the intersection of US-89 with the Gros Ventre River.

Nest boxes are approximately 100 feet apart, except for 6 paired boxes, which are located within 10 feet of each other to encourage nesting of bluebirds and swallows alongside each other. The habitat along the bluebird trail is variable. At the southern end of the trail, the fence borders Flat Creek Marsh, a wetland with emergent vegetation such as cattail (*Typha* sp.) and willow (*Salix* sp.). Farther north, habitat bordering the trail transitions into an intact sagebrush (*Artemisia* sp.) steppe. At the northern end, the trail bisects the Gros Ventre River and enters a riparian corridor dominated by cottonwood (*Populus* sp.).

Nest Box Monitoring

Volunteers are assigned a subset of nest boxes along the bluebird trail, and they monitor their nest boxes at least once per week between May 1 and August 30 to understand occupancy and nest fate. We train volunteers on the nest monitoring techniques outlined in Martin and Geupel (1993), including low-impact data collection, while observing the stage and fate of each nest. Volunteers open the nest boxes to view the contents and ascertain the stage of each nest throughout the season. If present, once nestlings are 12 days old, volunteers monitor the nest boxes from afar for at least five minutes to determine if adults are present at the nest or if fledglings can be seen. Volunteers enter their data into Jackson Hole Wildlife Foundation's 'Nature Mapping' (NMJH) database and staff members perform quality control checks on the data.

Bluebird Banding

When nest box monitors have a bluebird nesting in one of their nest boxes, they notify JHWF staff and continue to monitor the nest twice per week. Once Mountain Bluebird nestlings reach approximately the tenth day of their nestling stage, they are old enough to age by the extent of blue color in their wings and tail feathers and thus, they are ready to be banded (Pyle 2001). JHWF staff band the nestlings with one aluminum and three plastic color bands. To prevent nest abandonment, we avoid removing all nestlings from the box at the same time; rather, we take them out in pairs, always leaving at least one bird in the nest. We place an aluminum band on the right leg of the bluebird with a color band above it to signify the year of the study (i.e. 2021 birds were banded with a red color band above the aluminum band). We put two color bands on the left leg in unique combinations so that individual bluebirds can be recognized in the future by anyone who encounters them. We band incidentally captured adult bluebirds using the same methods. Adult bluebirds can sometimes be captured if they enter the nest box as a bander is approaching. We also color-banded Mountain Bluebirds captured at one of our Monitoring Avian Production and Survival (MAPS) station to augment our sample size.

Results

Nest Box Monitoring

We engaged 16 volunteers to monitor our bluebird trail this year. That number was similar to previous years, with the exception of 2020 when the global pandemic created issues with capacity (figure 2).

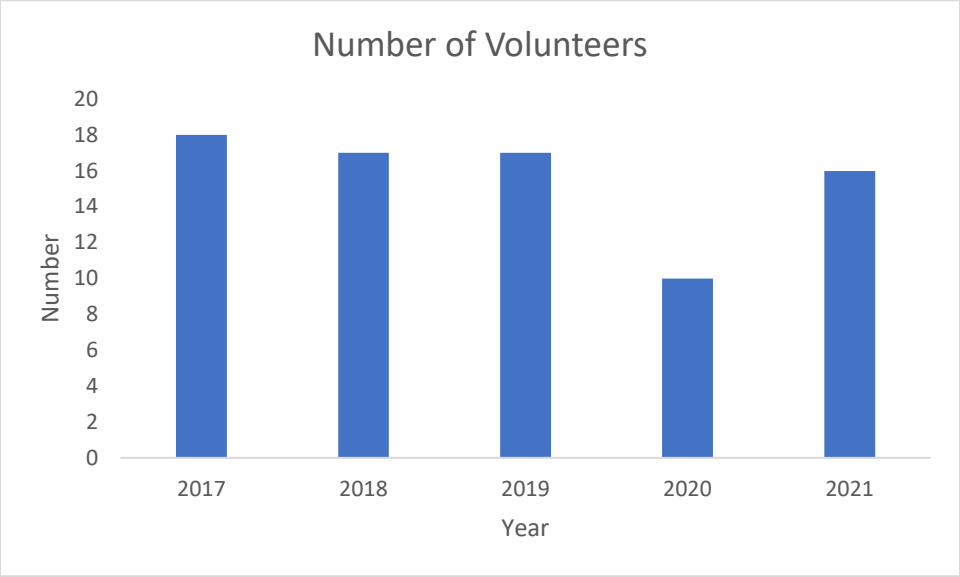

Figure 2. The number of volunteers on the Mountain Bluebird nest box monitoring project has remained relatively constant since 2017. In 2020, fewer volunteers participated in the project due to the COVID-19 Pandemic.

In 2021, 51 nestboxes (46% of nest boxes along the trail) were used by Mountain Bluebirds, Tree Swallows, and House Wrens. The remaining 54% were unoccupied. Of the total boxes along the trail, 10 (9%) boxes were used by Mountain Bluebirds, 40 (36%) were used by Tree Swallows, and only one box was occupied by a House Wren pair (figures 3 and 4).

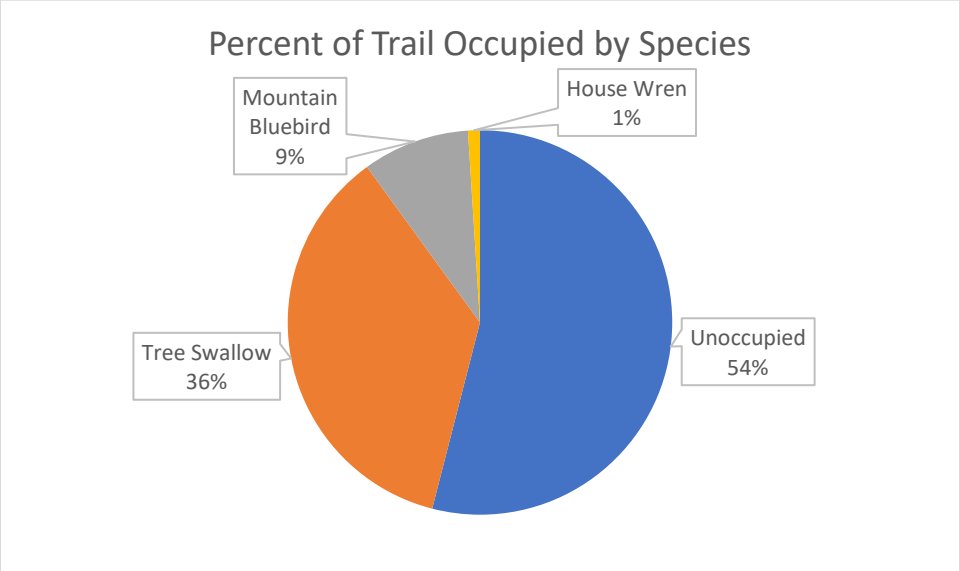

Figure 3. In 2021, the Mountain Bluebird nest box trail on the National Elk Refuge's western boundary was occupied by Mountain Bluebirds (9% of total boxes), Tree Swallows (36% of total boxes), and House Wrens (1% of total boxes). 54% of boxes were not occupied this year.

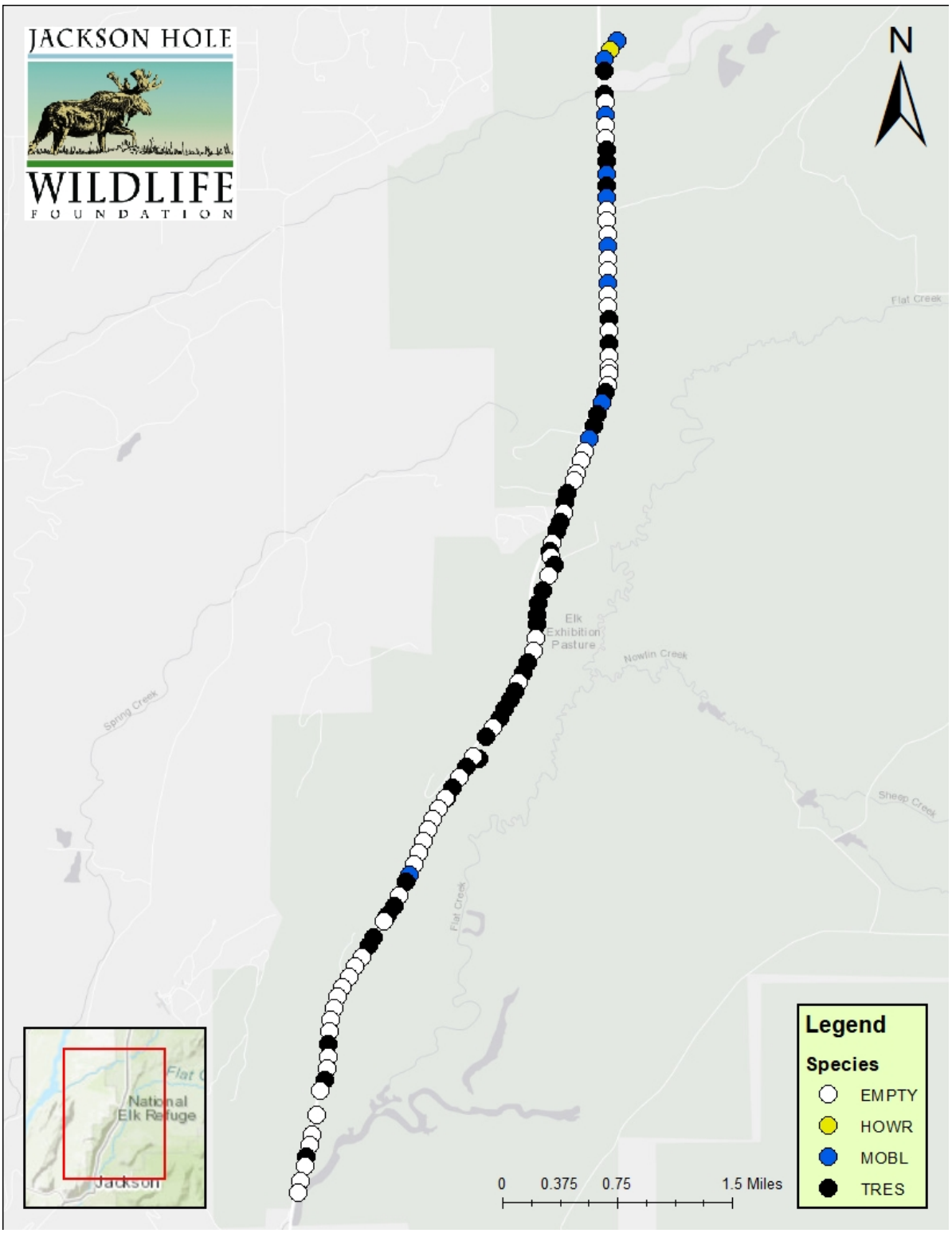

Figure 4. Nesting locations of three passerine birds along the bluebird trail. This year, the trail was occupied by Tree Swallows (TRES), Mountain Bluebirds (MOBL), and House Wrens (HOWR). Bluebird nests were concentrated at the northern end of the trail, but there was one nest in box 71 at the southern end of the trail. Tree Swallows were found nesting throughout the trail and only one House Wren nest was documented at the northern end of the trail.

A total of 217 eggs were laid in our nest boxes this summer; 88% of the eggs produced fledglings. Mountain Bluebirds laid 49 eggs and 90% of the eggs produced bluebird fledglings. One bluebird nestling died before fledging and one nest with four eggs was depredated. Tree Swallows laid 163 eggs and 88% of these produced swallow fledglings (144). Three Tree Swallow nestlings died before fledging and 16 laid eggs did not hatch. Only one House Wren nest was reported, and it fledged 5 young (Figure 5).

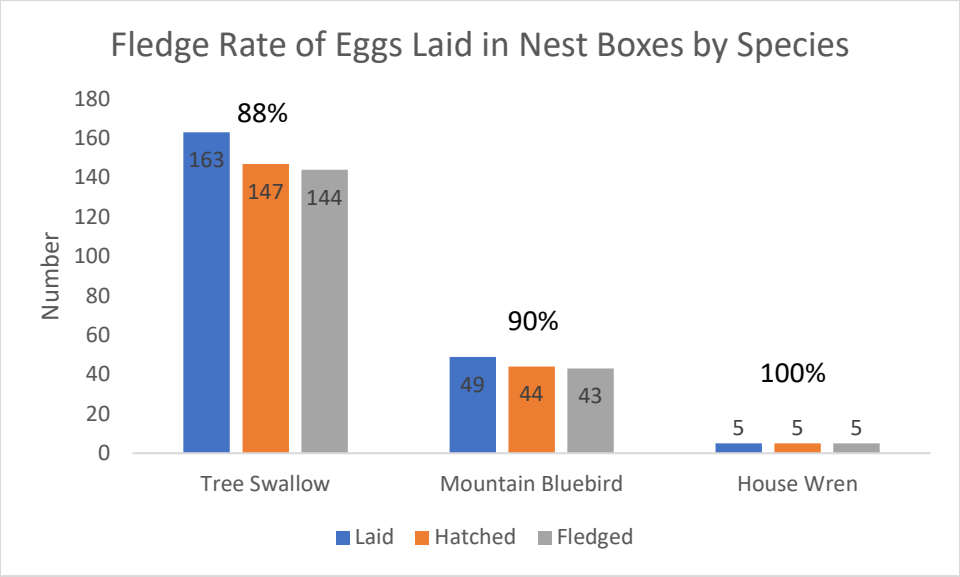

Figure 5. In 2021, Tree Swallows had an 88% fledge rate from eggs that were laid in boxes along the bluebird trail. Mountain Bluebirds had a 90% fledge rate from eggs that were laid in boxes along the bluebird trail. House Wrens had 100% fledge rate from eggs that were laid in one box along the bluebird trail.

Mountain Bluebird Banding

In 2021, we color-banded 44 Mountain Bluebird nestlings and 2 adults along the bluebird trail. The number of bluebird nestlings banded along the bluebird trail has dropped each year since banding began in 2017. In 2020, we did not band any Mountain Bluebird nestlings, as we did not hire seasonal staff to perform the work due to the COVID-19 Pandemic; however, we were still able to monitor the trail and there were only 24 fledglings produced during that nesting season. That number is equivalent to what we would have banded in 2020. The number of chicks banded rebounded to 44 this year but is still substantially lower than 2017, when 85 bluebird chicks were banded (figure 6).

Each Mountain Bluebird banded in 2021 has a red plastic color band above the aluminum USFWS band on the right leg, so they can be identified as a member of the 2021 cohort. To bolster our sample size for color-banded bluebirds in Jackson Hole and hopefully increase the incidence of resights, we color-banded four nestlings and two adults at one of our MAPS banding stations in Jackson.

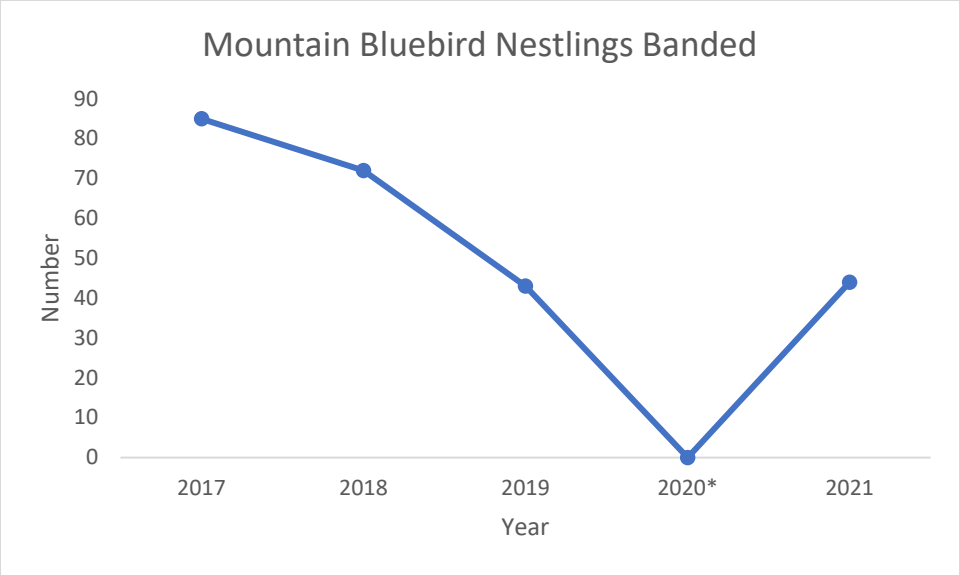

*Figure 6. The number of Mountain Bluebird nestlings banded in boxes along the bluebird trail has dropped since 2017 but slightly rebounded this year. *Due to the COVID-19 Pandemic, we did not band bluebird nestlings in 2020.*

Color-banded Bluebird Resights

Three color-banded Mountain Bluebirds from our study were resighted this year. Our first resight was on 4/23 near Nestbox 11. This female (Purple/Purple:Blue/Silver) was banded as an adult in 2019, when she nested in Nestbox 9. This year she successfully nested in Nestbox 13 and fledged 6 chicks. Her mate was unbanded. The photograph on the cover page of this report is of this bird, carrying food for her nestlings. One female chick (Dark Blue/Dark Blue:Red/Silver) hatched this year in Nestbox 97 that was banded on 7/2/21 was found deceased inside the nestbox. She died of unknown causes. Another female chick banded this year (White/Hot Pink:Red/Silver) fledged successfully but was found deceased in a wood stove at the National Fish Hatchery. She was hatched in Nestbox 16, banded on 6/7/21 and reported to us by a National Elk Refuge biologist on 9/20/21. A full history of color band resights for this project can be found in Appendix 1.

Discussion

Nest Box Monitoring

Volunteer engagement rebounded this year after a low in 2020, due to the COVID-19 Pandemic. Our 14 regular nest box monitors were assisted by two staff members and two substitutes who monitored boxes when the regular monitors were unable. We are happy to sustain high interest in the bluebird monitoring project, which is valuable because it gives volunteers a 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. Well-trained volunteers can collect accurate scientific data which may then inform management decisions.

Mountain Bluebirds had high success (success defined as >1 fledgling per nest) this year. Only one nest failed before hatching and one nestling out of 44 hatched chicks died before fledging. In several studies, nest boxes had much higher success rates than natural cavities (Johnson and Dawson 2020). Our bluebird nest success rate was 90% this year, which is comparable to other studies of bluebirds nesting in boxes (Johnson and Dawson 2020). However, in previous years many bluebirds along the trail suffered from predation, abandonment, and parasite infestation and had success rates as low as 56%, which is more comparable to the success rates of nests in natural cavities shown in other studies (Johnson and Dawson 2020). Predator guards can reduce predation on bluebird nests in boxes but we did not use predator guards in 2021 and our birds still achieved very high nest success.

The number of Mountain Bluebird chicks hatched from eggs on the bluebird trail has fluctuated through the years. 2020 saw a low of 24 bluebird chicks. The highest count of bluebird chicks on record is from 2017, when 85 chicks hatched along the trail. This year saw an increase from last year, but we still only had about half of the productivity of 2017 (44 chicks hatched in 2021). The reason for this decrease in productivity is unknown but for several years parasites and predation plagued bluebirds along the trail. Spring 2019 was long, wet, and cold and that may have also impacted nest success. Cold and wet spring weather prevents early nesting from occurring, which decreases the chance that birds will have time produce second broods later in the season (Johnson and Dawson 2020). These conditions can also impact food resource availability, potentially leading to lower productivity. In addition to decreased productivity due to local issues, the fall of 2020 saw major bird die-offs across the western United States which impacted the number of birds that would return to northern climes for breeding the next spring (NMDGF 2020). Insectivorous birds were disproportionately impacted by the die off (McCullough 2020). We will continue monitoring trends in bluebird productivity in the future.

Bluebird Banding

Since 2017, we have received 17 reports of color-banded Mountain Bluebirds from our study. Most of our bluebirds have been resighted in and around Jackson, but one individual was seen near Fort Worth, TX. Even though this is a single observation, it demonstrates the value of color-banding bluebirds along the trail. Prior to this observation, there were no data showing where Mountain Bluebirds that breed near Jackson spend the winter! Survivorship is another key factor in avian demography and can be more influential in population trends than other factors such as productivity (IBP 2021). This year, a female bluebird banded in 2019 returned to the same territory she occupied in 2019. In 2021, she is now at least 4 years old. Through color-banding, we also gain information about threats to the local bluebird population. In the last four years, four birds have been reported deceased. Causes of death for these birds include vehicle strike, window strike, and entrapment in a chimney.

As more birds are banded, we hope to increase the number of birds that are reported back to us. To increase our sample size of color-banded bluebirds around Jackson, next year we plan to mark some individuals from the Miller's Butte area on the NER as well as continue our bluebird

trail banding and incidental color-banding of individuals that we capture at our MAPS banding stations. We ask interested citizen scientists to take a second look at any bluebirds you see near Jackson and inspect them for color bands so we can increase our resight data! To report your sightings, please contact Hilary Turner at hilary@jhwildlife.org.

Acknowledgments

Every year this project is continued by the generous support of the U.S. Fish and Wildlife Service's National Elk Refuge, the Wyoming Game and Fish Department, Teton Conservation District and the Meg and Bert Raynes Wildlife Fund. We also thank our tremendous volunteers for monitoring nestboxes, 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 USGS) Red, Yellow, Green, Peach, Hot Pink, Gray, Black

Mountain Bluebird Re-Sighting Data Sheet

Plumage: Juvenile (spotted) or Adult

		Color Band Combination				Location: Specific							
Date	Time	Right: Top	R: Bottom	Left: Top	L: Bottom	UTM Easting	UTM Northing	General Location	Substrate *(e.g. fence post, ground, telephone wire, etc)*	Behavior	Sex	Plumage	Notes
8/8/2017	7:30 AM	Green	Silver	Black	Peach								Per Tim Griffith
8/10/2017	7:30 AM	Green	Silver	Red	Black			East side of Refuge, North of Miller's Butte					Per Tim Griffith
3/7/2018		Green	Silver								M		Per Tim Griffith
5/2018		Yellow	Silver	Black	Red	519480	4816223	on MOBL trail	Nestbox #90	Nesting	F	Adult	Per Sarah Ramirez
6/27/2018		Peach	Silver	Yellow	Black			2820 Rungius Road, Jackson, WY		Deceased	F		Reported to BBL by Barbara Long; Band #2821-04917; Caught due to striking or being struck by: motor vehicle.
9/2/2018		Peach	Silver	Gray	Gray			865 Tribal Trail Rd./Jackson, WY		Deceased	M		Reported to BBL by Mike Halpin; Band #282104909; Caught due to striking: stationary object other than wires or towers; deceased and band removed.
4/3/2019	4:40pm	Green	Silver	Gray	Gray			Elk Refuge Road	on a rock	Perched	M	Adult	Seen by Sheena Patel; from Nestbox 57-a
6/14/2019	4:00 PM	Peach	Silver	Pink	Pink			On fence across from gas station along highway	Sitting on fence	Perched	F	Adult	Female had nest in Box 94 and then later in Box 88. Both nests failed. Bird anded in 2018 from Nestbox 16
8/19/2019		Green	Silver	Peach	Hot Pink			National Elk Refuge Road	on a road sign	Perched	M	Spotted	Per Britton Parker; photo on file; from Nestbox 80
9/23/2019	5:20 PM	Green	Silver	Peach (faded)	Hot Pink			North entrance to the Miller House Complex (campground) along the Refuge Road	on a road sign	Perched	M	Adult	Photo (on file) snapped by National Elk Refuge Volunteer, Walt Nilsen; from Nestbox 80
10/2/2019		Green	Yellow	Gray	Silver			Fort Worth, Texas		Alive			Reported to Bird Banding Laboratory. Resighted and photographed. The 74th nestling banded since the start of the project back in 2017, from Nestbox #66. Was sexed as Female as a nestlings.
5/28/2020	8:00 AM	Blue	Silver	Green	Purple	520602	4818690	Jackson, WY	Nestbox #60	Breeding	F	Adult	This is an adult female banded in 2019 from Nestbox #60 who is nesting in Nestbox #60 in 2020; 4 eggs.
6/12/2020		Green	Yellow	Gray	Silver			Elk Terrace View / Jackson, WY		Nesting	M	Adult	Reported to JHWF by Laurie Bay whose friend Martha Van Genderen has this bird nesting at her house on Elk View Terrace, which is above the Fish Hatchery on west side of HWY 89. Successful nesting with fledglings.
8/22/2020		Green	Yellow	Gray	Silver	43° 34'41" N	1 10° 44'47" W	Jackson, WY		Breeding	M	Adult	Seen north of the National Elk Refuge in the -B- neighborhood by local resident Irene Greenberg
4/23/2021	12:00 PM	Blue	Silver	Purple	Purple	521612	4822771	Near Nestbox 11/ Jackson, WY			F	Adult	Banded in 2019 as an Adult from Nestbox 9; she had five chicks fledge in 2019. Potential nesting with site fidelity.
7/21/2021	1:37 PM	Red	Silver	Dk Blue	Dk Blue	521682	4824143	Nestbox 97	Nestbox	Deceased	F	Nestling	Banded on 7/2. Did not fledge from nestbox. Found dead when cleaned
9/20/2021		Red	Silver	White	Pink			National Fish Hatchery, National Elk Refuge/ Jackson, WY	Chimney	Deceased	F	Juvenile	Band # 2821 95327; found at one of the residences at the Jackson National Fish Hatchery; it appears to have gone down the chimney and had been trapped in the woodstove at the residence. Banded at Box #16 on June 7, 2021. Reported by Eric Cole