

MOUNTAIN BLUEBIRD NESTBOX MONITORING PROJECT - 2023 ANNUAL REPORT -



JACKSON HOLE



Mountain Bluebird Nestbox Monitoring

2023 Report

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Summary

For 20 years, a bluebird trail (a series of nest boxes) 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 111 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 2023, 16 volunteers monitored the nest boxes, which successfully fledged 39 mountain bluebirds, 153 trees swallows, and six 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 60 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 treeline in rocky crevices alongside Black Rosy-Finches, along waterways in old kingfisher burrows, 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 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 (NPS 2023). 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 laid that produce fledglings (Saab and Dudley 1998).

Since 2003, JHWF and our volunteers have monitored and maintained a "bluebird trail" consisting of 111 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 111 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. Different colors indicate stretches monitored by different volunteers.

Jackson Hole Wildlife Foundation 2023 Nestbox Monitoring Report 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 2023, 95 nestboxes (86% of the nest boxes along the trail) were used by Mountain Bluebirds, Tree Swallows, and House Wrens. The remaining 14% were unoccupied. Of the total boxes along the trail, 19 (17%) boxes were used by Mountain Bluebirds, 72 (65%) were used by Tree Swallows, and four boxes were occupied by House Wrens (Figures 3 and 4).



Figure 3. In 2023, the Mountain Bluebird nest box trail on the National Elk Refuge's western boundary was occupied by Mountain Bluebirds (17% of total boxes), Tree Swallows (65% of total boxes), and House Wrens (4% of total boxes). Only 14% of boxes were not occupied this year.

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Figure 4. Nesting locations of three passerine birds along the bluebird trail. In 2023, Tree Swallows, Mountain Bluebirds, and House Wrens nested on the trail. Bluebirds nested throughout the trail this year. Tree Swallows nested throughout the trail and three House Wrens nested in the middle of the trail. Species ONot Occupied OHouse Wren Mountain Bluebird Tree Swallow A total of 543 eggs were laid in our nest boxes this summer; 36% of the eggs produced fledglings. Mountain Bluebirds laid 108 eggs and 36% of the eggs produced bluebird fledglings. Twenty-nine nestlings died before they were able to fledge and 40 eggs did not survive long enough to hatch. Tree Swallows laid 425 eggs and 36% of these produced swallow fledglings (153). Forty-six Tree Swallow nestlings died before fledging and 226 laid eggs did not hatch. Only four House Wren nests were reported. One nest was abandoned during bad weather midway through the laying period and the other fledged 6 young (Figure 5). The other two nests reported were likely dummy nests in which no eggs were ever laid. Of 20 total nest attempts by Mountain Bluebirds in our nest boxes (some birds renested), 9 attempts were successful, for a total success rate per nest attempt of 45%.



Figure 5. In 2023, Tree Swallows and Mountain Bluebirds both had an estimated fledge rate of 36% from eggs that were laid in boxes along the bluebird trail. House Wrens had 60% fledge rate from eggs that were laid in two boxes along the bluebird trail.

Mountain Bluebird Banding

In 2023, we color-banded 50 Mountain Bluebird nestlings and 10 adults along the bluebird trail. The number of bluebird nestlings banded along the bluebird trail dropped for several years after banding began in 2017 but numbers of nestlings banded increased after 2020. This year was slightly below the average number of nestlings banded (58; Figure 6).

Each Mountain Bluebird banded in 2023 has a black plastic color band above the aluminum USFWS band on one of its legs, so they can be identified as members of the 2023 cohort.



Figure 6. The number of Mountain Bluebird nestlings banded in boxes along the bluebird trail in 2023 was lower than the average number of nestlings banded since 2017, which is 58. *Due to the COVID-19 Pandemic, we did not band bluebird nestlings in 2020.

Color-banded Bluebird Resights

Twenty-six color-banded Mountain Bluebirds from our study were resighted this year. Following a positive trend, this is the most color band resights we have received in any given year. A full history of color band resights for this project can be found in Appendix 1.

Discussion

Nest Box Monitoring

Volunteer engagement was similar to previous years. Our 13 regular nest box monitors were assisted by three staff members and three 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 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 relatively low success (success defined as >1 fledgling per nest) this year. The breeding season started off with higher-than-average nest box occupancy by both bluebirds and swallows, but cold and wet weather in June caused nest abandonment and failure in many Tree Swallow and Mountain Bluebird nests. In several studies, nest boxes had much higher success rates than natural cavities (Johnson and Dawson 2020). Like previous years, many bluebirds along the trail suffered from abandonment, weather-induced nest failure, predation, and parasite infestation. This year had one of the lowest success rates ever

recorded on our trail, which is even lower than the success rates of nests in natural cavities shown in other studies (Johnson and Dawson 2020).

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 the number of hatchlings continued to increase from last year, but we still had lower productivity than in 2017 (68 chicks hatched in 2023). The reason for this decrease in productivity is unknown but for several years parasites and predation plagued bluebirds along the trail. This year had higher than average nest failure.

Predation can be mitigated by placing predator guards on nestboxes after nesting has been initiated. We will use predator guards to mitigate predation in the future to ensure that our trail is not acting as a sink for the local swallow and bluebird populations. We will also continue monitoring trends in bluebird productivity into the future.

Weather

Temperature and precipitation may have also impacted nest success in 2023. 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.

This year, we experienced above average high and low temperatures throughout May but the daily highs decreased to below average in June (Figure 7; Accuweather 2023).



Figure 7. Temperature graphs that show May 2023 actual temperatures were above average through much of the month and in June 2023, actual temperatures dipped below average several times throughout the month. (Source: Accuweather)

Additionally, during May Jackson received 1.8 inches of rain and that amount increased to 2.6 inches during June (National Weather Service 2023). The amount of rain received in May was slightly lower than the annual average (1.9 inches), but the amount of rain received in June was notably above the annual average (1.5 inches; US Climate Data 2023). These weather patterns likely influenced songbird productivity along the bluebird trail this year. Warmer and drier weather in May probably allowed many birds to initiate nests, which then failed when

conditions turned colder and wetter in June. Furthermore, poor conditions in June did not allow many birds to re-nest.

Bluebird Banding

Since 2017, we have received 52 resight 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 2022 returned to the same territory she occupied last year. We also had a bluebird that hatched along the trail in 2021 return to nest along the trail in 2023. Through color banding, we can gain some information about fledgling survival. Little is known about fledgling survival, so data from this project can provide some novel information regarding survival (Johnson and Dawson 2020). It is thought that most fledgling mortality occurs in the first few days after fledging (Johnson and Dawson 2020). This year, we resighted 4 fledglings a few days after they fledged.

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 continue marking some individuals at 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 also hope to work with University of Arizona professor Dr. Renee Duckworth to improve early season captures of adult bluebirds which nest along the trail. Our data will be more valuable when more adults are banded. **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

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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

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		Right:	R:	Left:	Ŀ								
Date	Time	Top	Bottom	Top	Bottom	UTM Easting	UTM Northing	Location	Substrate	Activity	Sex.	Age	Comments
8/8/2017	7:30 AM	Green	Silver	Black	Peach	2				-	-	1	Per Tim Griffith
8/10/2017	7:30 AM	Green	Silver	Red	Black			North of Miller's					Per Tim Griffith
3/7/2018		Green	Silver	-				BUTTE		-	M	-	Per Tim Griffith
5/2018		Yellow	Silver	Black	Red	519480	4816223	on MOBLtrail	Nestbox #90	Nesting	F	Adult	Per Sarah Ramirez
6/27/2018	1 1	Peach	Silver	Yellow	Black			2820 Rungles Road,		Deceased	F		Reported to BBL by Barbara Long, Band #2821-04917; Caught due to striking or being
	-		-	-	-	-	-	Jackson, WY			-	-	struck by: motor vehicle.
9/2/2018		Peach	Silver	Gray	Gray			Rd /Jackson, WY		Deceased	M		object other than wires or towers, deceased and band removed.
4/3/2019	4:40pm	Green	Silver	Gray	Gray			Elk Refuee Road	on a rock	Perched	M	Adult	Seen by Steena 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	Adolt	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	м	Spotted	Per Britton Parker, photo on file; from Nestbox 80
9/23/2019	5:20 PM	Green	Silver	Peach (faded)	Hat Pink			North entrance to the Miller House Complex (campground) along the Refuge Road	on a road sign	Perched	м	Adult	Plots (on file) anapped by National Elk Refuge Volentzer, Walt Nilsen, from Nextbox 80
10/2/2019		Green	Yellow	Gray	Silver			Fort Worth, Texas		Alive			Reported to Bird Banding Laboratory. Resignted and photographed. The 74th nestling banded since the start of the project back in 2017, from Nestbox #66. Was seved as
-								-	-	1.000			Female as a nextlings. This is an adult female banded in 2019 from Nestbox #60 who is nesting in Nestbox #60
5/28/2020	8:00 AM	Blue	Silver	Green	Purple	520602	4818690	Jackson, WY	Nestbox #60	Breeding	F	Adult	in 2020; 4 eggs.
6/12/2020		Green	Yellow	Gray	Silver			Elk Terrace View / Jackson, WY		Nesting	м	Adult	Reported to JHWF by Lawrie Bay whose friend Martha Van Genderen has this bird nesting at her house on EK View Terrace, which is above the Fish Hatchery on west side of HWY 88, so constitution estime with field lines.
8/22/2020		Green	Yellow	Gray	Silver	43*3441*N	1 10° 4447" W	Jackson, WY		Breeding	M	Adult	Seen north of the National Elk Refuge in the -B-neighborhood by local resident irene
di to tato	-	Green		anal		a na n	110 444) 1	Marchine March and 117		er ce c reg		/****	Greenberg
4/23/2021	12:00 PM	Blue	Silver	Purple	Purple	521612	4822771	Jackson, WY			F	Adult	Bandled in 2019 as an Adult from Nestbox 9, she had five chloss fiedge in 2019. Potential nesting with site fidelty.
7/21/2021	1:37 PM	Red	Silver	DkBbe	Dk Blue	521682	4824143	Nestbox 97	Nestbox	Deceased	F	Nestling	Banded on 7/2. Did notfledge from nestbox. Found dead when cleaned
9/20/2021		Red	Silver	White	Pink			National Rsh Hatzhery, National Elk Refuge/Jackson, WY	3	Deceased	F	Juvenile	Band # 282195127, found at one of the readences at the Jackson National Fish Hatchery, it appears to have gone down the chimney and had been trapped in the woodstow at the readence. Randed at Box #16 on Jone 7, 2021. Reported by Eric Cole
3/27/2022		Red	Silver	Dk Blue	Pink			Zenith Road near Airport	Fence	Rocsting	м	FCF	Hatched in Box 2 and banded 5/11/2021. Photographed by Sam Bland and reported to us via email
5/23/2022		2	7	Green	Bive	704/04	8000000					FCF	Amy Girard Reported from NER, Likely R/S: Green/Blue
5/23/2022	2.04PM	KED	SIVET	Dark	Black	521606	4823223	Nestoox do	Nestbox	nesting	F	FLF	Banded last year in hestbox #2
5/23/2022	3:41PM	Red	Silver	Blue	Red	520118	4817787	Nestbox 71	Nestbox	Nesting	F	DCB	Banded as FCF lastyear at Nestbox 72
6/23/2022	12:44PM	Yellow	Silver	Pink	Pink	521610	4822945	Nestbox 9	Nestbox	Nesting	F		Banded on 6/6/22 at Box 11. Renested in Box 9
7/5/2022	1:04PM	Yellow	Silver	Purple	Blue	521606	4923223	Nestbox 6		Flying	-	FCF	Following Male, fled ging resight, banded on 6/13 at Nestbox 6
7/5/2022	1:04PM	Yellow	Silver	Blue	Rine	521606	4823223	Nestbox 6		Flying		FCF	Following Male, fledgling resight, banded on 6/13 at Nestbox 6
7/7/2022	8/25AM	Yellow	Silver	Paach	Digite	521578	4821387	Nestbox 26		Flying	-	FCF	Fieldging resight, banded on 5/5 Proting resight, Realy Redeling from Nerthox 5
9/29/2022	2:24PM	Yellow	Silver	Purple	Yellow	523268	4818059	HER, HOTEI SHO DI		Perched			Amy Girard Reported from NER
3/30/2022	2	Red	Silver	Green	Blue	43.481201	-110.748014	Elk Refuge Housing	Fence Post	Perched	M	FCF	Garrett Moon Reported to Hilary almost a year later, banded as Nsti in nestbox 71
4/9/2023	13:07	Yellow	Silver	Pink	Purple	521172	4820070	Nestbox 43	Nestbox	Perched	F	DCB	Garrett Moon reported to Hilary on 4/9 when he saw the bird
4/12/2023	17.24	Yellow	Styer	Pearle	Yellor	520096	4817738	Miller Butte	Sign	Perchad	M	ECE.	faded. Hatthed in 2023 in Box 12
5/1/2023	19:30	Yellow	Silver	Pink	Purple	521172	48 20070	nestbox 42	Nestbox	Perched	F	DCB	Mitchell McClosky reported to Hilary after surveying his nest boxes
6/28/2023	14:57	Purple?	Silver	White	2	521607	4823128	nestbox 7	n estbox	Perched	F		
5/16/2023	11:24	Yellow	Siver	Pink	Pink	521610	4822945	nestbox 9	n estbox	Perched	F	0.00	
7/4/2023	11:21	pk? White	Siver Bib /k	Bed	Silver	520043	481/630	nestbox 73	n estàcor	Perched	E.	DCB	
6/13/2023	11:42	Black	Silver	Pink	-IWAT	519549	4816775	nestbox 84	n estbox	Perched	F	<u> </u>	
6/1/2023	12.28	Red	Silver	Blue	Pink	520118	4817787	nestbox 71	n estbox	Perched	F		
5/15/2023	18:10	Yellow	Silver	Pink	Purple	521130	4819961	nestbox 44	n estbox	Perched	F		
5/27/2023	12:25	Black	Vallow	Sille Vallow	rellow	520887	4819123	nestbox 54	n estbox	Perched	F	-	
5/24/2023	12:04	Yellow	Silver	Pink	Purple	521130	4819961	nestbox 44	nestbox	Perched	F		
5/23/2023	9:31	Red	Silver	Blue	Pink	520118	4817787	Nestbox 71	n estbox	Perched	F		
7/3/2023	7.54	Red	Silver	Blue	Pink	520043	4817630	Nestbox 73	n estbox	Perched	F		
7/14/2023	18.05	Black	Shier	Grange	Orange	521187 2424 521187 2434	4820135.501	Ne ar box 44	fence	Perched	0	-	Family group observed by Mitchell McClosky
7/14/2023	18:05	Black	Styer	Blue	Pink	521187 2424	4820135 501	Nearbox 44	fence	Perched	U		
7/14/2023	19:10	Black	Silver	Purple	Yellow	521121.6519	4819985.113		fence	Perched	U	Juvenile	Observed by Mitch ell McClosky
5/15/2023	18:14	Blue	Pink	Yellow	Silver	521102 3868	4819889.575		fence	Perched	м		
5/15/2023	18:10	Yellow	Silver	Pink	Purple	521126.9618	4819974.084		Fence	Perched	F	-	
5/8/2023	17:42	Yellow	Silver	Pink	Purple	520965.9153	4819301.025	Nestbox 51	Fence	Perched	F	<u> </u>	

Remember that the color combinations recorded on your data sheets are in order from the bird's site kips to is right leg. This means that the combination will appear backwards if the bird's the strange of the strange of the strange of the strange of the Accuracy is critical. If you are not sure, do not report it.