

INTRODUCTION

Birds have attracted the attention of citizens and scientists for centuries; they are abundant, easily observed, and are found across the globe. Additionally, they play a critical role in nearly every ecosystem (Sekercioglu 2006), and changes in populations can provide clues into the consequences of climate change across spatial and temporal scales (Crick, 2004; Dunn and Winkler, 2010; Sekercioglu et al., 2012; Riddell et al., 2021). The Institute for Bird Populations (IBP) operates Monitoring Avian Productivity and Survivorship (MAPS) banding stations through a continent-wide collaborative effort among public agencies, non-governmental organizations, and individuals. Since 1987, MAPS banding stations have collected over 2.5 million bird-capture records, from over 1300 stations (Albert et al. 2016). These banding stations allow scientists to examine key demographic trends in bird populations, while also providing opportunities to teach members of the public about avian ecology and conservation efforts. It was our objective to operate a MAPS banding station in Pleasant Creek, Capitol Reef National Park (CARE) to:

- 1) Help National Park Service (NPS) ecologists garner a better understanding of the neotropical bird migrants that breed within the park, filling a recently-identified data gap by a NPS Natural Resource Condition Assessment (2021 report in process).
- 2) Integrate tangible and exciting science into Capitol Reef Field Station's (CRFS) outreach and education programming, while also providing an educational opportunity for park visitors.
- 3) Contribute to IBP's continent-wide collaborative data collection effort.

METHODS

- All methods were adopted from the 2021 MAPS manual (Desante et al., 2021)

Site Selection

- Pleasant Creek (38.1784° N, 111.1871° W), located within Capitol Reef National Park, is one of the park's larger and more structurally-diverse riparian systems. It sits adjacent to intact sagebrush and pinion/juniper habitat, representing three distinct habitat types within the park. Additionally, Pleasant Creek is accessible to park and field-station visitors alike but is free from heavy anthropogenic influence due to its remote location.

General Net Configuration

- Ten 12-meter mist nets were used.
- Mist net placement was selected to represent multiple CARE habitat types while also containing forest edge, shrub habitat, and water—attributes suggested by IBP to improve capture rates in breeding birds and dispersing young. Additionally, sites were

distributed uniformly but also opportunistically within a core area of roughly 8 acres, and were placed such that all nets could be checked within 15-20 minutes if no birds were present, or roughly 75-100 meters apart.

- Mist nets easily snag vegetation and can tear, therefore, 12-meter-long lanes were cleared to accommodate nets. Care was taken when selecting net lanes to minimize vegetation clearing.
- Nets were strung between two poles, and poles were held upright by 4 rebar anchor points at ground level (two per pole), or opportunistically anchored to vegetation (Figure 1)

Mist-Netting Effort

- MAPS banding station data is to be collected strictly during the breeding season, though the same net array can be used for fall migration banding. In the case of the Pleasant Creek MAPS Banding Station, banding efforts began May 11-20, and ended July 30-Aug 8. This allowed for 9 ten-day periods to net.
- Nets were open at official local sunrise, in the same sequence each day, and remained open for exactly 6 hours.
- MAPS nets were operated for one day of each ten-day period, and spread out between periods as much as possible.
- The MAPS season is divided into two “superperiods,” including an adult superperiod and a young superperiod. There were a minimum of 3 periods during the adult superperiod, during which adults were the predominant capture, and 2 periods during the young superperiod, during which young-of-year were the predominant capture.

Collection and Recording of Banding Data

- All birds captured, including recaptures, were identified to species, aged, and sexed, if possible. Additional data included:
 - - Primary MAPS data
 - Band number
 - Date
 - Capture time
 - Station
 - Net number
 - Disposition
 - Feather sample
 - Supplemental data
 - Extent of skull pneumatization
 - Breeding condition

- Extent of molt
- Extent of primary-feather wear
- Extent of juvenile plumage
- Existence of molt limits
- Wing chord
- Body mass
- Amount of fat

Breeding Status Surveys

While operating the MAPS station during each period, we recorded breeding status information on all species seen or heard, using anecdotal observations of active nests, birds carrying nesting material, food, distraction displays, courtship, copulation, and territorial singing or drumming using a protocol like that employed in Breeding Bird Atlas projects. This allowed us to collect a more comprehensive list of established breeding birds in CARE.

RESULTS:

- 1) Banding efforts began May 13 and ended August 5, allowing for 9 ten-day banding periods and therefore 9 total banding days. During that time, we captured 113 birds accounting for 22 different species (Figure 1), including 54 newly-banded birds, 6 recaptured birds, and 53 unbanded birds released at the net (e.g., hummingbirds and bushtits). Additionally, while conducting breeding-status surveys during each banding effort, we observed 41 species, 11 of which we deemed regular breeders, 2 likely breeders, 12 transient, and 15 migrant. With the combined breeding-status surveys and bird-banding data, we identified 13 breeding species in Pleasant Creek.
- 2) We captured 31 Bushtits, 13 black-chinned hummingbirds, and 11 broad-tailed hummingbirds, most of which were left unbanded. 22 bushtits were unbanded because we did not have the personnel to band and process them safely. Additionally, we did not have the appropriate permit to band hummingbirds, therefore all 24 hummingbirds were left unbanded.
- 3) Approximately 20 people visited the banding station this season, including park employees, school groups, and community volunteers. Of those 20 visitors, 8 were Utah Valley University (UVU) students or faculty. Additionally, 9 CARE employees, including the park superintendent, biologist, and ecologist, participated in banding efforts in a variety of capacities. We provided outreach and education to all visitors, focusing on the importance of banding as a tool for conservation and land-management decisions, and taught the basics of mist-net extraction, banding, and how to measure various morphological attributes. Visitor attendance records were not comprehensive for the 2022 banding season, therefore all reported numbers are approximate minimums. Attendance will be comprehensive for the 2023 season.
- 4) Banding data was submitted to IBP for use both in their long-term demographic studies, but also for individual research needs via requests to IBP.

DISCUSSION:

Bushtits are highly social birds that often form roving flocks of 20 or more individuals (Hartley et al., 2021). Of the 113 birds captured during the 2022 breeding season, 31 were bushtits, accounting for nearly 28 percent of the captures. Additionally, 28 of the 31 captures were in the same net (02) during only two net runs, presenting an anomaly in our capture data and potentially skewing intra-seasonal trends.

While capture rates seem varied throughout the season (Figure 2A), if bushtits are excluded from the data, a pattern emerges (Figure 2B), indicating that capture rates were higher at the beginning and end of the season. This suggests that after migrants moved out, and incubation began, birds moved less within their home ranges. Then, as the nesting season progressed and nests fledged or failed, adults and young were more mobile, preparing to depart their summer breeding grounds to fly south for the winter.

Anecdotally, capture rates did not vary substantially between nets, except that rates at Net 02 were much higher than at the other nets (Figure 3), a result of the outsized bushtit captures. Additionally, capture rates tended to be higher when nets were placed along habitat edges, and lower when nets were placed in riparian habitat.

Because our 2022 capture rates were relatively low, it is reasonable to assume that our recapture rates inter-season will be low. Therefore, our station would benefit from installing a Motus Wildlife Tracking System network along Pleasant Creek. This would provide the banding station with more accurate site-fidelity data, detailed timing of spring and fall migration, and stopover data, if tagged birds are using Pleasant Creek along their migration routes.

ACKNOWLEDGMENTS:

We thank all CARE employees who dedicated time and energy to the banding station, whether that was from behind a desk making sure permits were approved, or in the field wrangling birds and battling vegetation. Financial support was provided by UVU's Quick Grants program. As a friend of mine once said, "it takes a village."

FIGURES:

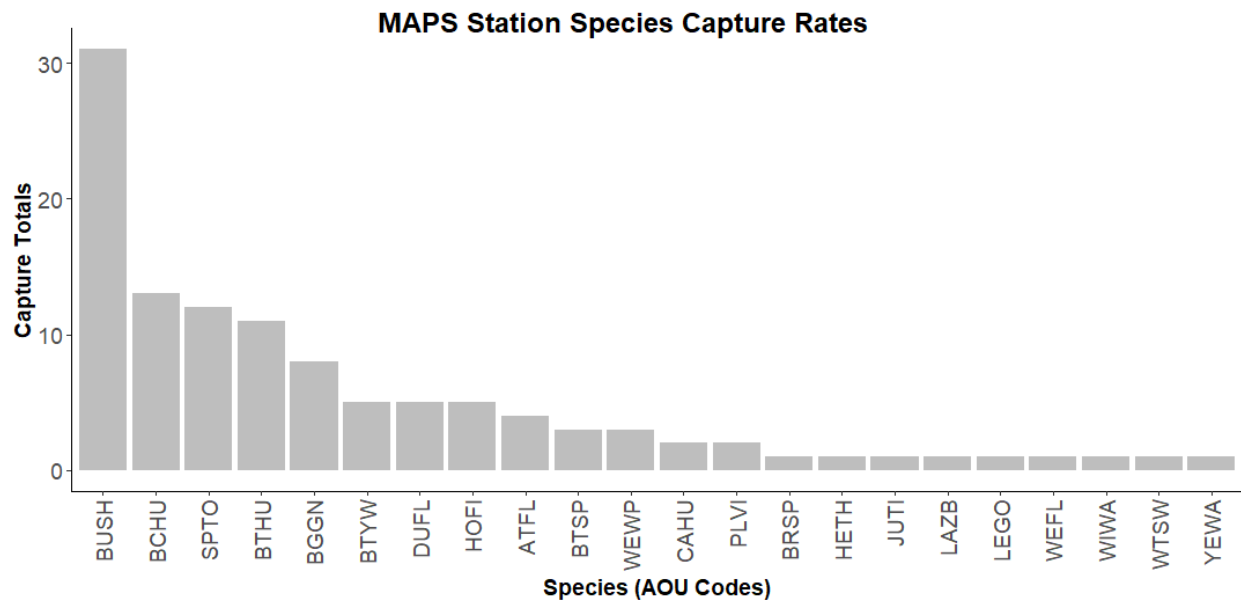


Figure 1. 2022 MAPS banding station species list, including capture totals.

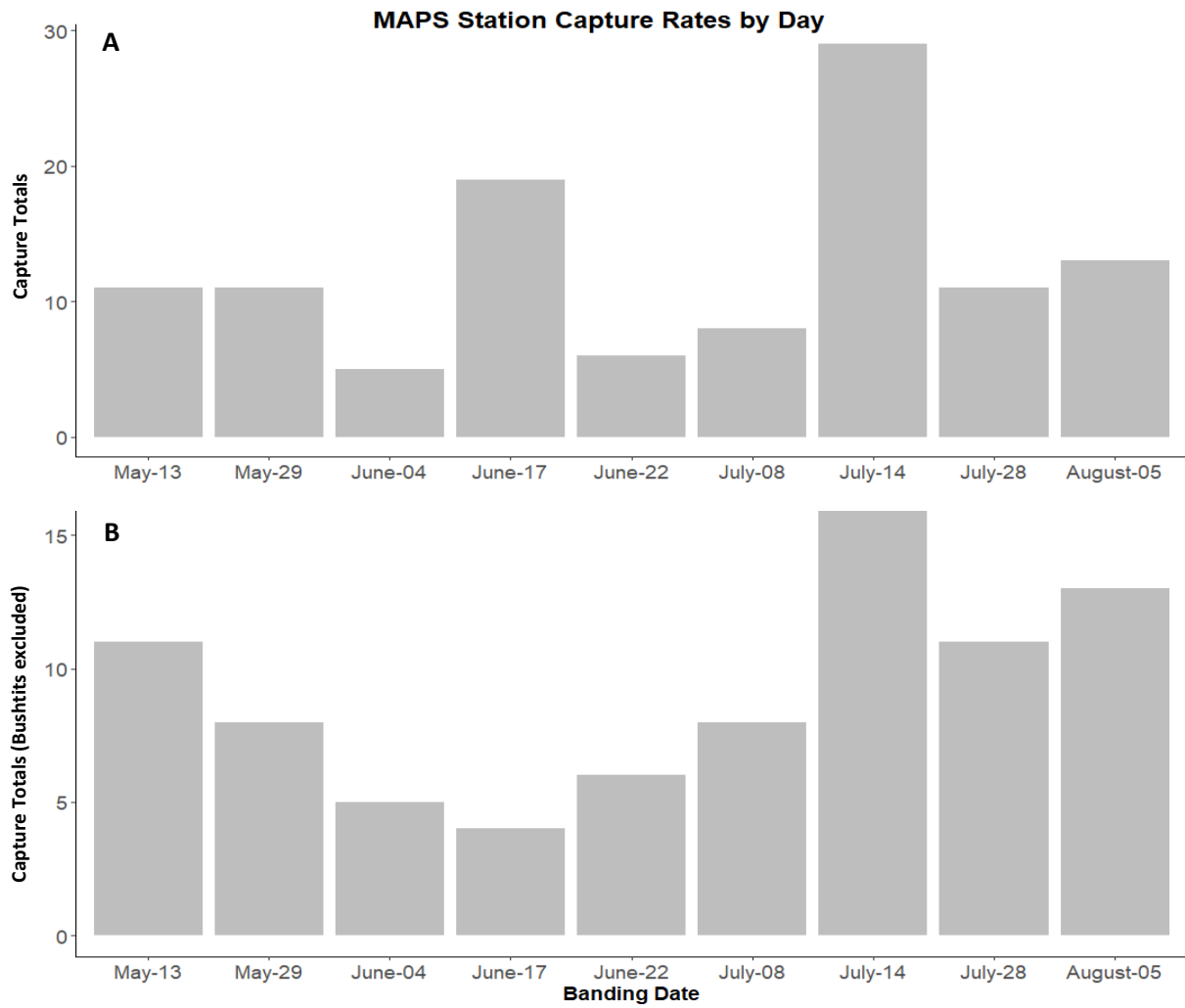


Figure 2. 2022 MAPS banding station captures per banding day.

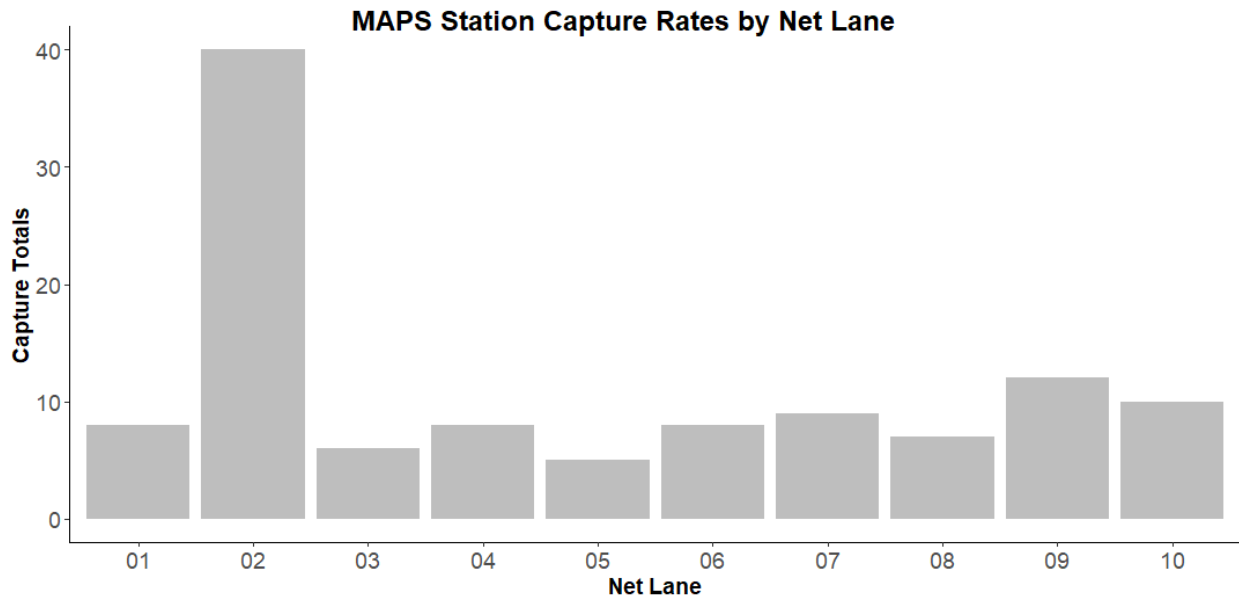


Figure 3. 2022 Maps banding station captures per mist net (season totals).

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