Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Monitoring Avian Productivity and Survivorship and Targeted Bird Banding at LCR MSCP Conservation Areas in 2019

April 2020

Work conducted under LCR MSCP Work Task D5

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

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Bureau of Reclamation
U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

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Ducks Unlimited
Lower Colorado River RC&D Area, Inc.
The Nature Conservancy

Lower Colorado River Multi-Species Conservation Program

Monitoring Avian Productivity and Survivorship and Targeted Bird Banding at LCR MSCP Conservation Areas in 2019

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April 2020

Dodge, C. and J. Kahl, Jr. 2020. Monitoring Avian Productivity and Survivorship and Targeted Bird Banding at LCR MSCP Conservation Areas in 2019. Lower Colorado River Multi-Species Conservation Program, Bureau of Reclamation, Boulder City, Nevada.

ACRONYMS AND ABBREVIATIONS

BERS	bird banding station in the riparian area on the Cibola Valley Conservation Area
CIBO	bird banding station on the Cibola NWR Unit #1 Nature Trail restoration site
Cibola NWR Unit #1	Cibola National Wildlife Refuge Unit #1 Conservation Area
CM	conservation measure
ha	hectare(s)
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
m	meter(s)
MAPS	Monitoring Avian Productivity and Survivorship
Reclamation	Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
UTM	Universal Transverse Mercator

Symbols

%	percent

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ABSTRACT

Bird banding was conducted using the Monitoring Avian Productivity and Survivorship program's protocol at two stations in Arizona (Beal Lake Conservation Area and Cibola National Wildlife Refuge Unit #1 Conservation Area) during the breeding season in 2019. Three species covered under the Lower Colorado River Multi-Species Conservation Program were captured and color banded: Sonoran yellow warbler (*Setophaga petechia sonorana* = *Dendroica petechia sonorana*), Arizona Bell's vireo (*Vireo bellii arizonae*), and summer tanager (*Piranga rubra*). Attempts were made to target capture covered species when passive capture was not possible and to resight color-banded birds. A total of 362 birds were captured at both sites in 2019. Twenty birds that are covered species were captured in 2019.

INTRODUCTION

The Lower Colorado River Multi-Species Conservation Program (LCR MSCP) is a multi-stakeholder Federal and non-Federal partnership responding to the need to balance the use of lower Colorado River (LCR) water resources and the conservation of native species and their habitats in compliance with the Endangered Species Act. This is a long-term (50-year) plan to conserve habitat for at least 27 species along the LCR from Lake Mead to the Southerly International Boundary with Mexico.

The Monitoring Avian Productivity and Survivorship (MAPS) program is a cooperative network of bird banding stations operated throughout the United States, Canada, and Mexico. All stations are operated during the summer breeding season with the principal purpose of documenting the use of breeding habitat by birds throughout North America. The data are collected and analyzed by the Institute for Bird Populations, which also establishes a set of guidelines and protocols for all MAPS stations (DeSante et al. 2019). Data from all the stations are compared to one another, and long-term trends for many bird species are monitored on a continent-wide basis.

Riparian areas of the Southwestern United States support a disproportionately high bird diversity and abundance, yet they make up less than 0.5% of all the land area (Powell and Stiedl 2000). Much of this habitat has been altered and decreased due to habitat destruction, agricultural land conversion, urban development, mining, overgrazing, river regulation, and climate change (Powell and Stiedl 2000; U.S. Fish and Wildlife Service [USFWS] 1997). Restoration of riparian habitats is an important part of the process to maintain or increase bird populations in the Southwestern United States. Monitoring of conservation areas is also an important part of understanding the effectiveness of restoration techniques to adaptively manage sites.

The Bureau of Reclamation (Reclamation) has operated MAPS breeding season banding stations since 2000. Since 2016, Reclamation has operated two stations in Arizona: Beal Lake Conservation Area and Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1).

Throughout this document, LCR MSCP covered species will be referred to by their subspecific name when discussing LCR MSCP conservation measures that call out a subspecies. When the document is referring to captured or detected birds, the subspecific common name will only be used if the bird was identified to subspecies with certainty, either based on its physical characteristics or if the subspecies can be determined by the fact it is breeding at the capture site. In almost all cases, this is not possible for the Bell's vireo (*Vireo bellii*) or yellow warbler (*Setophaga petechia* = *Dendroica petechia*).

The overall purposes of mist netting and bird banding programs are to (1) monitor avian use of the LCR, (2) intensively monitor avian use of LCR MSCP conservation areas, and (3) analyze avian use by LCR MSCP covered species. Data collected from the bird banding program are used to evaluate demographic characteristics such as survivorship, productivity, and site fidelity of covered species at LCR MSCP conservation areas. The banding program addresses the LCR MSCP conservation measures from the Habitat Conservation Plan (LCR MSCP 2004) for the Sonoran yellow warbler (*Setophaga petechia sonorana* = *Dendroica petechia sonorana*) (Conservation Measure [CM] 5.7.20.2-YWAR1), Arizona Bell's vireo (*Vireo bellii arizonae*) (CM 5.7.19.2-BEVI1), and summer tanager (*Piranga rubra*) (CM 5.7.21.2-SUTA1). All of these species have been present at both banding sites, and survivorship, productivity, and site fidelity all relate to the breeding success of these species as is mentioned for the yellow warbler: "Created riparian forests will support breeding and migration habitats…." (CM 5.7.20.2-YWAR1). These demographic measures also relate to both the Arizona Bell's vireo and summer tanager conservation measures, which state that created habitat "… will also provide other habitat requirements for this species (e.g., habitat patch size, food requirements)" (CM 5.7.19.2-BEVI1 and CM 5.7.21.2-SUTA1). If birds are surviving and producing young, as well as remaining onsite, it stands to reason that habitat requirements for these species are being provided.

The banding program also directly addresses "Section 5.11.1 System Monitoring of the Habitat Conservation Plan." On page 5-87 of the plan, it states: "Additionally, productivity and survival for other avian species will be gathered through continued monitoring at two data Monitoring Avian Productivity and Survival (MAPS) stations," and then it further states: "If the appropriate sites are identified and become available for use, it may be feasible to establish one or more additional MAPS stations within the LCR MSCP planning area."

STUDY AREAS

Cibola NWR Unit #1 is located along the LCR south of Blythe, California, in Cibola, Arizona. Established in 1964 to offset wildlife and habitat losses due to channelization of the Colorado River, the refuge attracts more than 250 bird species (USFWS 2015a). One banding station (CIBO) is located on the Cibola NWR Unit #1 Nature Trail restoration site and has been operating since 2003. It contains three distinct areas separated into a 13.6-acre (5.5-hectare [ha]) mixture of honey mesquite (*Prosopis glandulosa* var. *torreyana*) and screwbean mesquite (*P. pubescens*), 6.4 acres (2.6 ha) of Goodding's willow (*Salix gooddingii*), and 2.5 acres (1 ha) of Fremont cottonwood (*Populus fremontii*) (hereafter cottonwood). A total of 1,500 honey mesquite, 1,500 screwbean mesquite, 10,000 Goodding's willows, and 2,600 cottonwoods were planted in 1999 (Reclamation 2003). In the years since the site was established, Johnsongrass (*Sorghum halapense*) has encroached as

an understory and is still present in parts of the site. Baccharis (*Baccharis* spp.) were not planted but are now a common species in the shrub layer. The site is actively irrigated and maintained.

The second banding station (BERS) is in the riparian portion of the Beal Lake Conservation Area on the Havasu National Wildlife Refuge between Beal Lake and Topock Marsh, approximately 5 miles (8 kilometers) northwest of the town of Topock, Arizona. This station has been operating since 2009. The refuge was established in 1941 for the primary purpose of providing migratory bird habitat, and the refuge attracts more than 300 bird species (USFWS 2015b). The site was planted in cells differing in habitat type and/or planting method. It was designed as an experimental demonstration of different planting techniques. Feral pigs have introduced screwbean mesquite, which has spread across most of the site. The site has developed into a heterogeneous mix of honey and screwbean mesquite, cottonwood, Goodding's willow, coyote willow (*S. exigua*) and arrowweed (*Pluchea sericea*) and is 116 acres (47.0 ha) in size (Reclamation 2003, 2010). The site is actively irrigated and managed.

Figure 1 shows the proximate location of each banding station on the LCR.

PERMITS

Banding was conducted under Federal Banding Permit No. 22994, with Joe Kahl, Jr., as the Master Bander and Beth Sabin, Barbara Raulston, and Chris Dodge as subpermittees. At least one of the subpermittees was present during any banding effort. Arizona Scientific Collecting Permits (SP7649762) were held by Mr. Kahl with the above-mentioned biologists as agents.

METHODS

All operations of the banding stations were conducted with bird safety as the first priority. If weather conditions, number of captures, or other circumstances were deemed to be unsafe, nets were closed immediately, and banding ceased for the day or until conditions improved. Injured birds were cared for and released as soon as possible. All birds were processed in a quick and timely manner to reduce stress caused by handling. Standard protocols for bird extraction and handling as established by Ralph et al. (1993) and DeSante et al. (2019) were always followed.

Nets were set up 1/2 hour before sunrise and were open for 5 hours unless conditions, such as wind or temperature, exceeded protocol limits. The nets were checked every 30–50 minutes. Inclement weather (wind, temperature, etc.) often caused one or more sessions to be shortened or cancelled. A metal, numbered USFWS band was placed

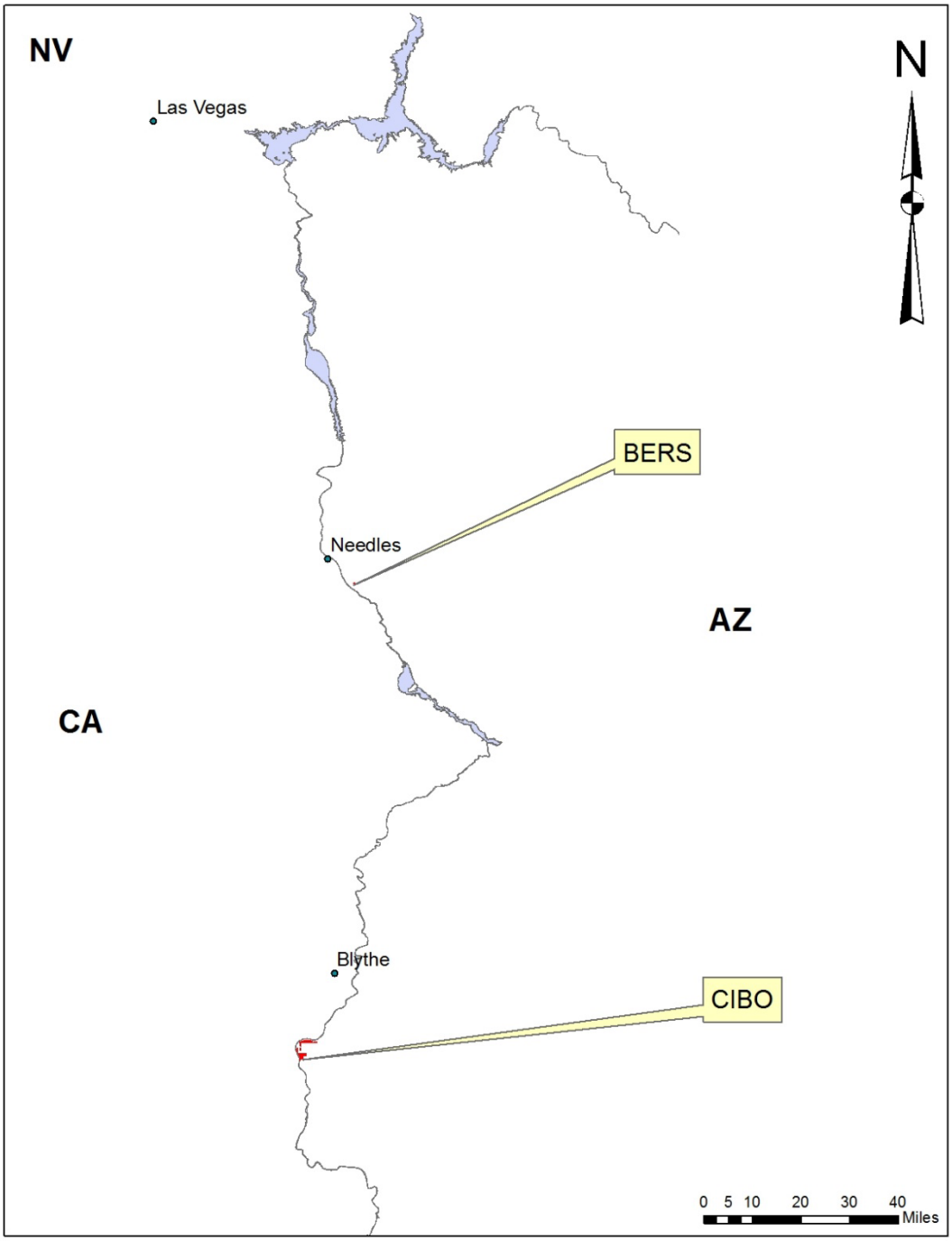

Figure 1.—Location of banding stations on the LCR.

on the right leg of most captured birds, excluding game species and hummingbirds. Game species were not banded due to restrictions in the permit, and hummingbirds were not banded because they require special equipment, permits, and bands. Starting in 2015, white-winged doves (*Zenaida asiatica*) and mourning doves (*Zenaida macroura*) were banded, despite their status as a game species, per a request from the USFWS. Covered LCR MSCP species that were captured had a color band placed on the leg opposite the Federal band. These bands can be of one solid color or bicolored, and only covered species are given color bands. Some birds that were color banded had Federal bands placed on the left leg and the color band placed on the right leg to allow a greater number of band combinations. Identification of species, age, sex, breeding condition, wing cord length, amount of body fat present, and weight were documented prior to releasing each bird. The time, date, and net location from each bird captured were recorded as well as the total hours of netting operations. All birds observed (visually or aurally) at each site during banding operations were also recorded. All data were recorded on standardized data sheets (DeSante et al. 2019). Birds were identified using Beadle and Rising (2002), Dunn and Garrett 1997, Pyle (1997), Sibley (2016), and Stephenson and Whittle (2013).

The MAPS stations were operated once during every 10-day period between the first week of May and the first week of August, for a total of 10 banding periods. The established protocol for MAPS station operations was always used (DeSante et al. 2019).

A resident bird is defined as one that is known to breed along the LCR. This determination is made by data summarized in Birds of the Lower Colorado River Valley (Rosenberg et al. 1991) and based on birds that have been captured and have demonstrated indications of breeding (full brood patches or cloacal protuberances). Birds not described as residents are considered to be migrants. Individual bird capture totals are defined as the sum of all unique individuals captured during banding operations. If a bird was recaptured several times, it would only count once toward the individual bird capture total. Passive captures are captures of birds, during normal MAPS operation, in which no inducement (such as call-playback) is used to draw them into a net. Target captures are birds that are captured using call-playback to draw them into a net placed outside the normal MAPS net locations. Unbanded birds are birds that are captured but not banded. Resights are not actual captures but are instead the confirmed resighting of the color band combination on a bird previously captured and color banded. The locations of net lanes at both sites were chosen to be in areas of high avian activity to allow for a greater chance of capturing birds.

Nets were 12 meters (m) in length. Each section of these nets that would represent the same height of a normal 2.6-m tall single net was numbered separately (e.g., the lower half of a double net was assigned a number and the upper half a different number).

At CIBO in 2016, ten 12-m and two 6-m nets were used. Five 12-m nets were in the Goodding's willows, five 12-m nets in the cottonwoods, and two 6-m nets were in the honey and screwbean mesquite (figure 2). In 2017, the double net was changed to a single net due to increased vegetative growth no longer providing space to place the double net; therefore, there was one less 12-m net of effort used at CIBO as compared to BERS in 2019.

Figure 2.—Location of net lanes at CIBO.

At BERS, ten 12-m nets, and to sample higher in the canopy, one double high net was used. A double net was used instead of stacking two 2.6-m tall nets. The two 6-m nets that were placed in honey and screwbean mesquite habitat in previous years were replaced by a new 12-m net (net 16). The 6-m nets were removed after dieback of honey and screwbean mesquite in the area caused a lack of shade needed to protect birds in the net. The net array was placed in the center of the site, where irrigation was most frequently applied. The ten 12-m nets were placed in areas originally planted with a cottonwood-willow mix, but these areas are now a mix of cottonwood, Goodding's willow, coyote willow, and honey mesquite (figure 3).

Figure 3.—Location of nets at BERS.

COLOR BANDING

During the summer of 2009, a program was initiated to place color band combinations on selected LCR MSCP covered species to allow the birds to be resighted and identified to individual without needing to be recaptured. This effort continued in the summer of 2019 at BERS and CIBO. For purposes of this analysis, data from a bird that is resighted can be used in the same way data are used from a bird that has been recaptured in a net. Thus, color banding increases the sample size of covered bird species and supports the main purposes of the banding efforts—to determine demographic characteristics as described in the "Introduction." Color banding also increases the time of year data can be collected, as birds can be resighted both before and after MAPS operations take place. Color bands were placed on the leg opposite the Federal band. The color bands were either solid or bicolored, aluminum bands. Two types of Federal numbered bands were placed on color-banded birds in 2016—either the normal silver band or a purple anodized band was used. In July 2017, a third electric yellow anodized Federal numbered band was added to increase the number of possible combinations. All three types of bands were used in 2019.

Birds that proved difficult to capture through passive means were target captured using call-playback methods to draw them into a net temporarily set up within their territory. A standard protocol was developed by Reclamation biologists for target capturing and resighting of birds (Dodge and Kahl, Jr. 2013). A standardized data sheet was developed for color banding, resighting of color-banded birds, target captures, and for tracking existing color band combinations (attachment 1).

Surveys were conducted for color-banded birds on an opportunistic basis, and no set schedule was used. Surveys were generally conducted for color-banded birds at least once a month, from April to August. Once the first month of banding in May was complete, surveys were conducted more frequently because the location of unbanded birds or birds with unknown band combinations was better known. Color band surveys or target capture attempts were conducted beginning at sunrise until conditions became too hot (usually around 9 a.m.). The color of each band and the leg on which it was placed were recorded for each color-banded bird. The Federal bands were recorded as being "silver," "purple ano," or "electric yellow" on the data sheets. The age, species, sex, Federal band number, capture method (passive or targeted), date, and time of capture were also recorded. For resighting, the location, color band combination, and the confidence of the observer in the accuracy of the resight were recorded (see attachment 1 for details of observer confidence levels).

Data Entry

All data were recorded while in the field on paper data sheets. Data were entered and quality checked in MAPSPROG and then compiled in Excel. Data were sent to the Institute for Breeding Bird Populations and the U.S. Geological Survey Bird Banding Laboratory that supplies the Federal numbered bands. All statistical analyses were completed using program R (v. 3.5.0).

RESULTS

In 2019 at CIBO, 141 individual birds were captured, of which 89 were resident birds. There were 125 new captures, 8 recaptures, and 18 unbanded birds. The per-net-hour capture rate was 0.33 for all birds and 0.21 for resident birds. Table 1 shows all the species captured and the number of individual captures per species in 2019. Figure 4 shows the relative percentage of resident birds passively captured at CIBO in 2019.

Table 1.—Species captured at CIBO in 2019

Species	Scientific name	Individuals captured
Abert's towhee	*Melozone aberti*	9
Ash-throated flycatcher	*Myiarchus cinerascens*	4
Black-chinned hummingbird	*Archilochus alexandri*	7
Brown-headed cowbird	*Molothrus ater*	3
Black-headed grosbeak	*Pheucticus melanocephalus*	2
Blue grosbeak	*Passerina caerulea*	1
Black phoebe	*Sayornis nigricans*	2
Black-tailed gnatcatcher	*Polioptila melanura*	2
Bullock's oriole	*Icterus bullockii*	1
Common yellowthroat	*Geothlypis trichas*	2
Crissal thrasher	*Toxostoma crissale*	3
Gambel's quail	*Callipepla gambelii*	1
Hammond's flycatcher	*Empidonax hammondii*	1
House finch	*Haemorhous mexicanus*	7
Lazuli bunting	*Passerina amoena*	1
Ladder-backed woodpecker	*Dryobates scalaris*	8
Lucy's warbler	*Oreothlypis luciae*	23
Macgillivray's warbler	*Geothlypis tolmiei*	4
Mourning dove	*Zenaida macroura*	1
Orange-crowned warbler	*Vermivora celata*	1
Summer tanager	*Piranga rubra*	2
Swainson's thrush	*Catharus ustulatus*	1
Townsend's x hermit warbler hybrid	*Setophaga townsendi* x *occidentalis*	1
Verdin	*Auriparus flaviceps*	9
Warbling vireo	*Vireo gilvus*	2
Western flycatcher	*Empidonax difficilis/occidentalis*	11
Western tanager	*Piranga ludoviciana*	1
White-crowned sparrow	*Zonotrichia leucophrys*	1
Wilson's warbler	*Cardellina pusilla*	26
White-winged dove	*Zenaida asiatica*	2
Yellow warbler	*Setophaga petechia*	2

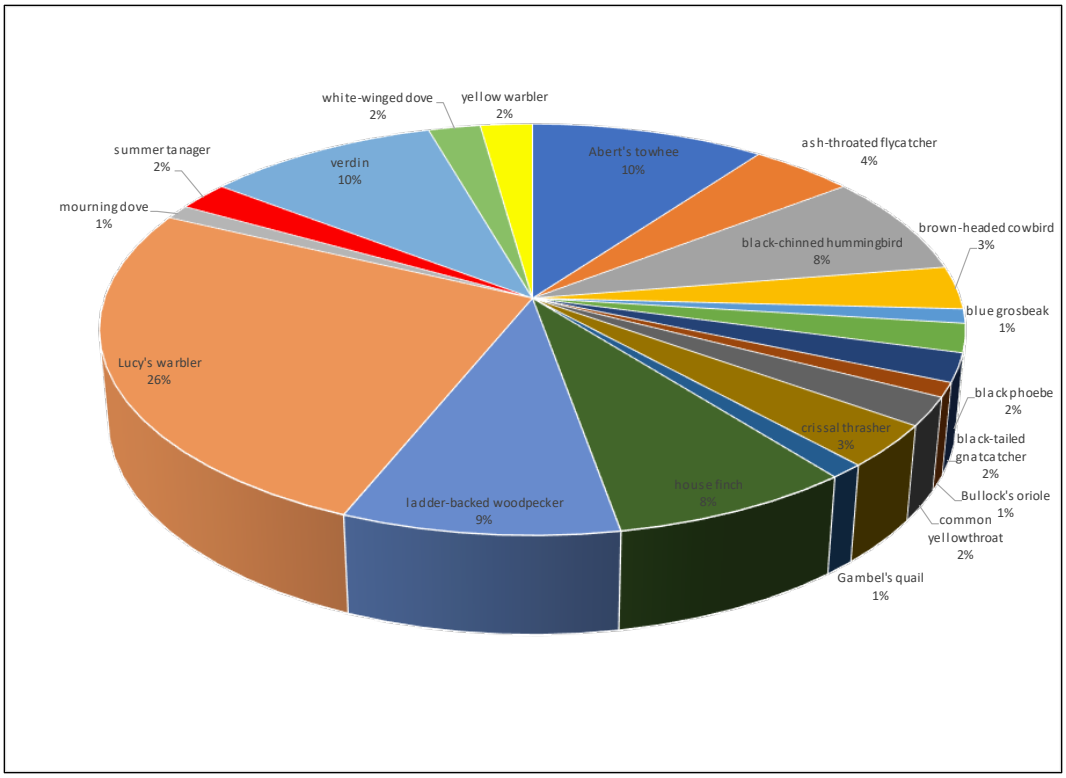

Figure 4.—Chart of the relative percentage of each resident species captured at CIBO in 2019.

In 2019 at BERS, 183 individual birds were captured, of which 155 were resident birds. There were 174 new captures, 12 recaptures, and 25 unbanded birds. The per-net-hour capture rate was 0.36 for all birds and 0.31 for resident birds. Table 2 shows all the species captured and the number of individual captures per species in 2019. Figure 5 shows the relative percentage of resident birds passively captured at BERS in 2019.

Table 2.—Species captured at BERS in 2019

Species	Scientific name	Individuals captured
Abert's towhee	*Melozone aberti*	11
Anna's hummingbird	*Calypte anna*	4
Ash-throated flycatcher	*Myiarchus cinerascens*	27
Brown-crested flycatcher	*Myiarchus tyrannulus*	2
Black-chinned hummingbird	*Archilochus alexandri*	1
Bell's vireo	*Vireo bellii*	7
Brown-headed cowbird	*Molothrus ater*	1
Black phoebe	*Sayornis nigricans*	1
Bullock's oriole	*Icterus bullockii*	26
Common yellowthroat	*Geothlypis trichas*	14
Great-tailed grackle	*Quiscalus mexicanus*	3
Hammond's flycatcher	*Empidonax hammondii*	1
Ladder-backed woodpecker	*Dryobates scalaris*	2
Lucy's warbler	*Oreothlypis luciae*	19
Macgillivray's warbler	*Geothlypis tolmiei*	3
Mourning dove	*Zenaida macroura*	1
Orange-crowned warbler	*Vermivora celata*	1
Red-winged blackbird	*Agelaius phoeniceus*	1
Song sparrow	*Melospiza melodia*	13
Summer tanager	*Piranga rubra*	3
Verdin	*Auriparus flaviceps*	1
Warbling vireo	*Vireo gilvus*	2
Western flycatcher	*Empidonax difficilis/occidentalis*	6
Western tanager	*Piranga ludoviciana*	8
Wilson's warbler	*Cardellina pusilla*	7
Yellow-breasted chat	*Icteria virens*	13
Yellow warbler	*Setophaga petechia*	6

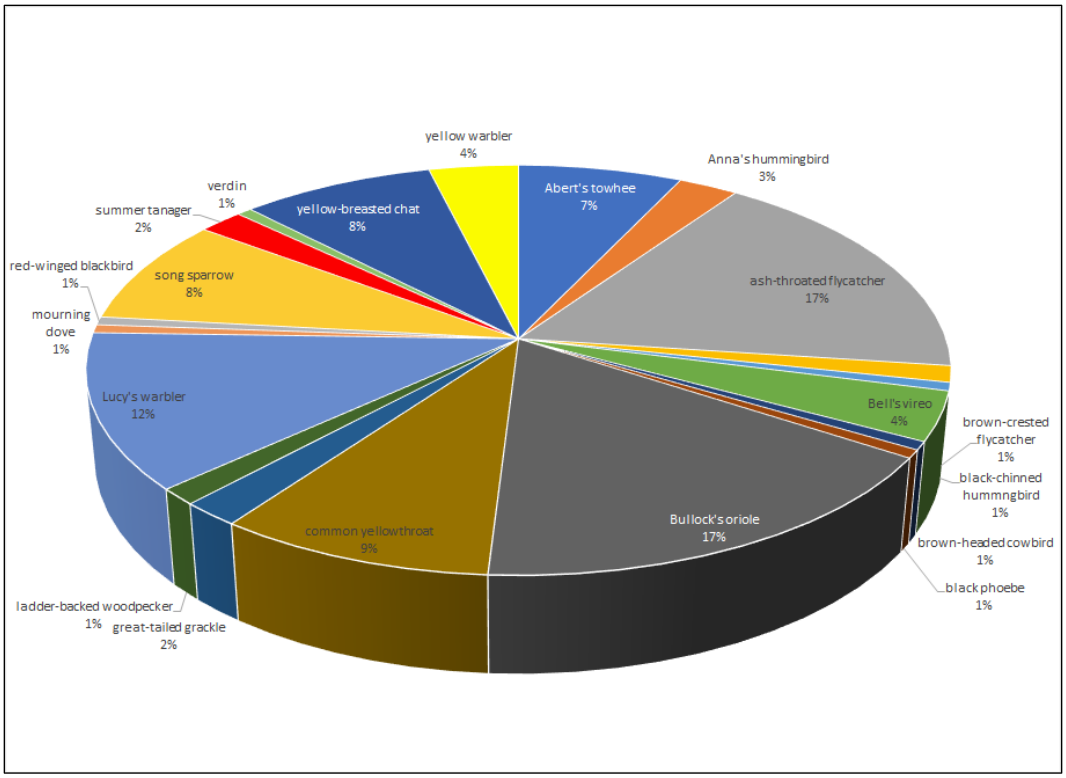

Figure 5.—Chart of the relative percentage of each resident species captured at BERS in 2019.

Capture Rate

As discussed in the "Methods" section, the per-net-hour capture rate allows equal comparisons among stations as it takes into account the different levels of effort that are conducted at each station that may change due to inclement weather or other reasons. Data were compiled for each year since 2014. Figure 6 shows the total capture rates for resident birds for each year banding has been conducted at each station.

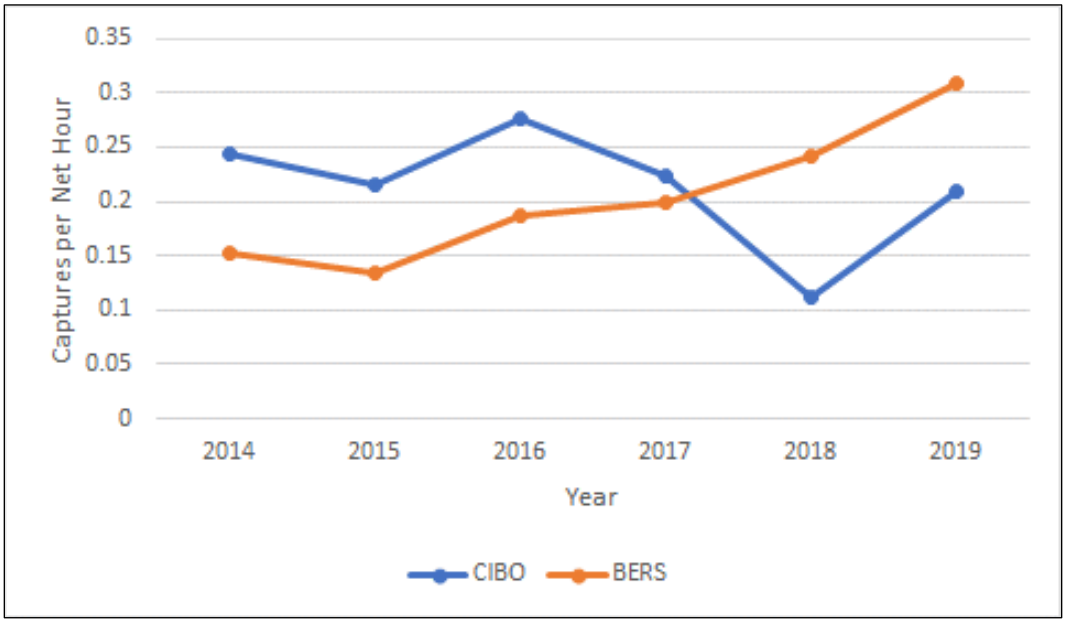

Figure 6.—Annual overall capture rate (birds per net-hour) for resident species per year.

At CIBO, the capture rate from resident bird data was compared for the last 6 years. Figure 7 shows the relative percentage of resident bird passive captures that occurred in each year, for each species, at CIBO.

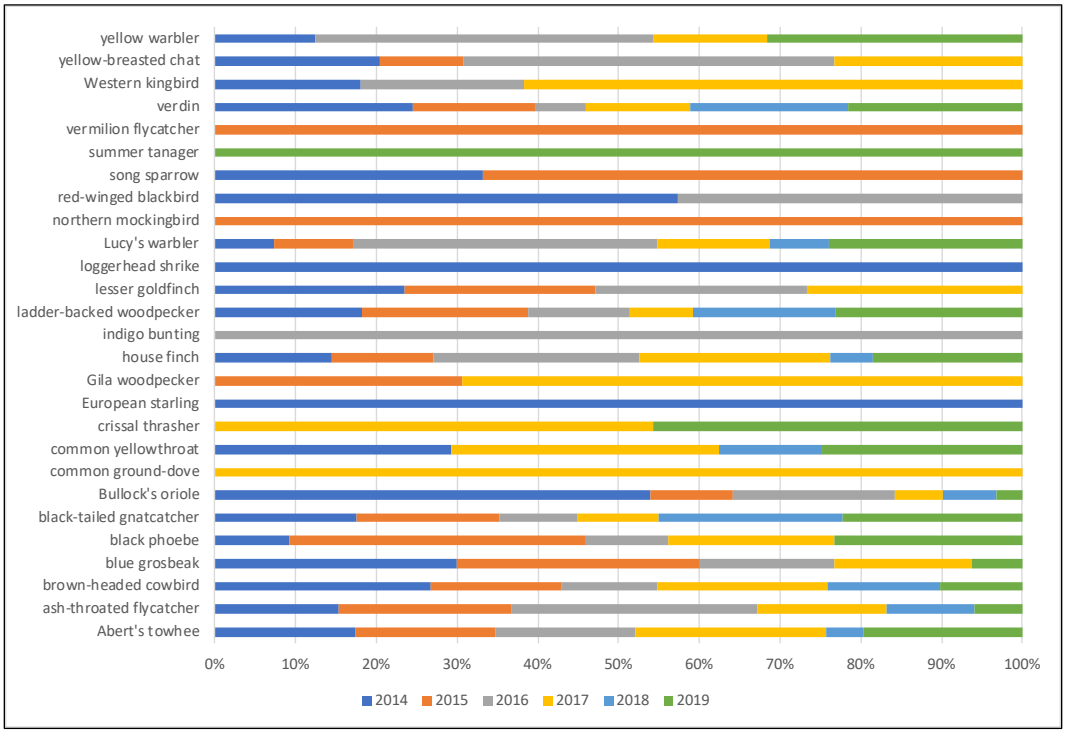

Figure 7.—Relative percentages of all passive captures of resident birds that have occurred in each year, by species, at CIBO.

At BERS, the capture rate from resident bird data was compared for the last 5 years. Figure 8 shows the relative percentage of resident bird passive captures that occurred in each year, for each species, at BERS.

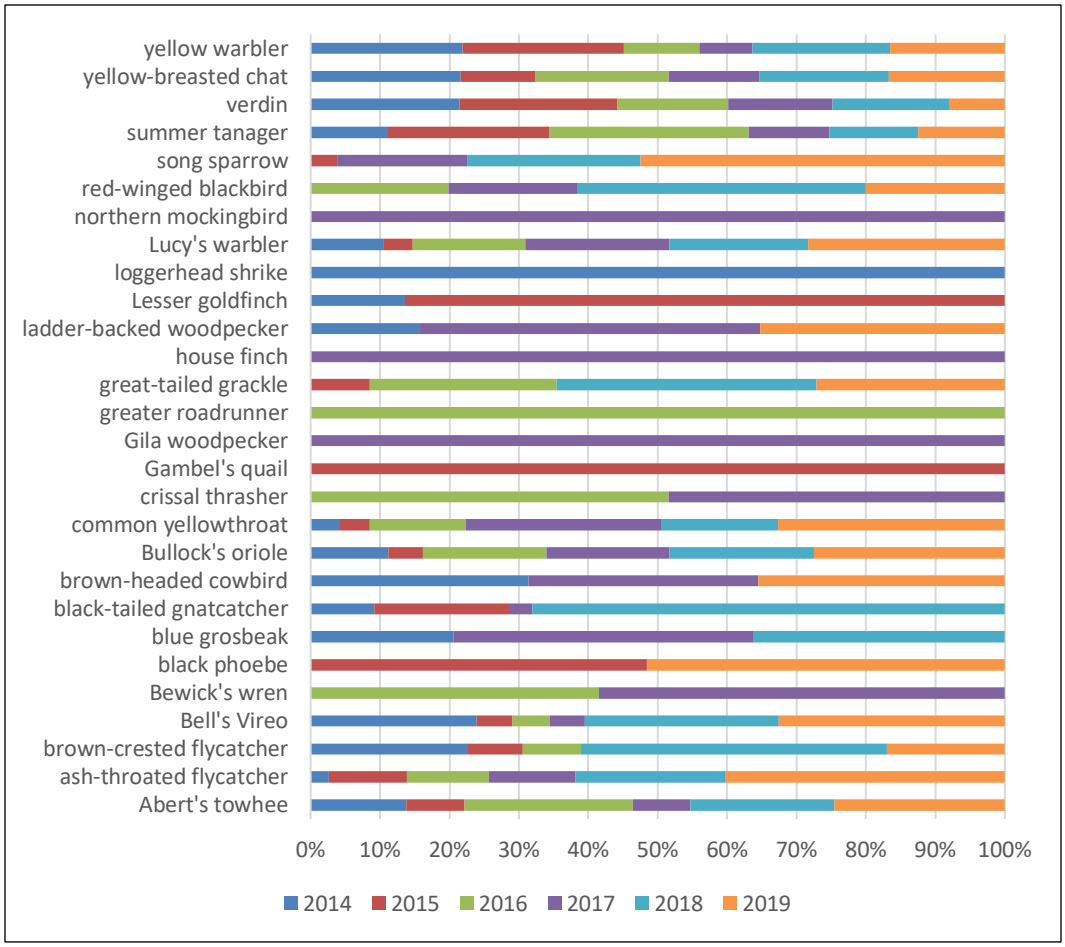

Figure 8.—Relative percentages of all passive captures of resident birds that have occurred in each year, by species, at BERS.

Color Banding and Covered LCR MSCP Species

There were several attempts to resight and target capture LCR MSCP covered species in 2019; however, all resights were of birds that were also captured or that were unbanded. There was one Bell's vireo that was successfully captured at the BERS site using target net techniques. This raises the total number of Bell's vireo captured at the BERS site to seven. One attempt was made to target net a vermilion flycatcher (*Pyrocephalus rubinus*) near the CIBO site, but the attempt was unsuccessful.

DISCUSSION

At both banding sites, the number of resident bird captures showed an increase from the previous year. In 2018 at the CIBO site, there was some issues with irrigation management, and the numbers of captures were at one of the lowest points over the last 6 years (Dodge and Kahl, Jr 2020). The vegetation has shown less signs of stress in 2019 since irrigation management practices were changed at the site. At the same time, the results from the 2019 MAPS operations have shown an increase in capture rate that corresponds to the rates that were seen before 2018. For the first time, summer tanagers were captured at the CIBO site. This is further indication that the habitat at this site may be improving from the previous year.

The BERS site continues to provide habitat for three LCR MSCP covered species. Despite the small size of the site, the number of Bell's vireos, summer tanagers, and yellow warblers represents the highest density of these three species at any site in the program. This site continues to provide excellent habitat for several LCR MSCP covered species.

One notable capture was made during the 2019 banding season. A Townsend's x hermit warbler hybrid was captured at the CIBO site for the first time (pictured on the cover). Due to the rarity of this hybrid, the identity was confirmed with the Arizona Field Ornithologists and the Breeding Bird Lab.

Another notable capture was a summer tanager that was recaptured at the BERS site. This bird was originally captured at the BERS site in 2011 as a second-year bird, meaning it was born in the summer of 2010. This recapture was submitted to the Bird Banding Laboratory, and the bird was determined to have the oldest known age for this species.

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ATTACHMENT 1

Sample Data Sheets for Color Banding

Color Band Resight Data Sheet

Date:_____ **Observer(s):_____**

Wind:_____ **Temp:_____**

Site:_____

Resight #1

Species:_____ **Sex:_____**

Left Color:_____ **Right Color:_____**

Confidence Level:_____ **UTM:_____**

Notes:_____

_____

Resight #2

Species:_____ **Sex:_____**

Left Color:_____ **Right Color:_____**

Confidence Level:_____ **UTM:_____**

Notes:_____

_____

Confidence Level Codes:

A = 100% confidence. Both legs were resighted, and the color of each band was accurately identified twice. A bird was resighted, the combination was recorded, and the bird was resighted a second time. This category also applies to birds passively recaptured without any call-playback.

B = 100% confidence having resighted the full band combination only once in a visit.

C = 95–99% confidence in the resight and one or more resights in a visit.

N = 95% or lower confidence level or a bird that was resighted with a color band, but the color was not confidently identified.

P = Resight or capture using call-playback. The bird may be from another territory and cannot be reliably confirmed to be within a territory.

Target Netting Capture Attempt Data Sheet

Date_____ **Bander(s)**_____

1. Start Time (net placed)_____ **End Time**_____

Net Location (UTM) _____

Call Start Time_____ **Call End Time**_____

Notes: _____

_____

_____

_____

2. Start Time (net placed)_____ **End Time**_____

Net Location (UTM) _____

Call Start Time_____ **Call End Time**_____

Notes: _____

_____

_____

_____

Color Banding Data Sheet

Band number	Species	Size	Sex	Age	Left color	Right color	Capture type[1]	Date	Site