Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Report of MAPS and Targeted Bird Banding at LCR MSCP Restoration Sites in 2012

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

December 2013

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Lower Colorado River Multi-Species Conservation Program

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ACRONYMS AND ABBREVIATIONS

BERS	Beal Conservation Area
CIBO	Cibola Nature Trail restoration site
CNWR	Cibola National Wildlife Refuge
CVCA	Cibola Valley Conservation Area
ha	hectare(s)
HCP	Habitat Conservation Plan
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

Symbols

%	percent

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Attachment

1 Sample Data Sheets for Color Banding

ABSTRACT

Bird banding was conducted using the Monitoring Avian Productivity and Survivorship (MAPS) protocol at three sites during the summer breeding season in 2012. Three species covered under the Lower Colorado River Multi-Species Conservation Program, yellow warbler (*Setophaga petechia*), Bell's vireo (*Vireo bellii*), and summer tanager (*Piranga rubra*), were captured and color banded. Attempts were made to target capture covered species when passive capture was not possible and to re-sight color-banded birds. A total of 547 birds were captured at all sites, and a total of 20 birds that were covered species were either captured or re-sighted at all sites.

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 at least 26 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. 2012). 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 Southwest support a disproportionately high bird diversity and abundance, yet they make up less than 0.5 percent (%) of all the land area (Powell and Stiedl 2000). Much of this habitat has been altered and decreased due to climate change, habitat destruction, agricultural land conversion, urban development, mining, overgrazing, and river regulation (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 Southwest. Monitoring of restoration sites is also an important part of understanding the effectiveness of restoration techniques in order to adaptively manage sites.

The Bureau of Reclamation (Reclamation) has operated MAPS summer banding stations since 2000. In 2011, a third MAPS station was established at the Cibola Valley Conservation Area (CVCA), adding to those at Beal Conservation Area (BERS) and Cibola National Wildlife Refuge (CNWR), bringing the current total of MAPS stations that are operated to three.

The overall purpose of the mist netting and bird banding program is to intensively monitor avian use of restoration sites and 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 restoration sites. The banding program addresses the LCR MSCP conservation measures for the yellow warbler (CM 5.7.20.2-YWAR1), Arizona Bell's vireo (CM 5.7.19.2 – BEVI1), and summer tanager (CM 5.7.21.2-SUTA1). One or more of these species are present at all three banding sites, and survivorship, productivity, and site fidelity all relate to

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 summer tanager and Arizona Bell's vireo 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 (HCP). On page 5-87 of the LCR MSCP HCP, 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 National Wildlife Refuge 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 (U.S. Fish and Wildlife Service 2012a). One banding station is located at the Cibola Nature Trail restoration site (CIBO) on the Cibola National Wildlife Refuge. It contains three distinct areas separated into a 13.6-acre (5.5-hectare [ha]) mixture of honey mesquite (*Prosopis glandulosa*) 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*). A total of 1,500 honey mesquite, 1,500 screwbean mesquite, 10,000 Goodding's willow, and 2,600 Fremont cottonwoods were planted in 1999 (Reclamation 2003). In the years since the site was established, Johnson grass (*Sorghum halapense*) has encroached as an understory. Volunteer willow-baccharis (*Baccharis salicina*) were not planted, but are now the dominant species in the shrub layer. The site is actively irrigated and maintained.

The second banding station (BERS) is located on 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. Havasu National Wildlife Refuge was established in 1941 for the primary purpose of providing migratory bird habitat, and the refuge attracts more than 300 bird species (USFWS 2012b). 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 mesquite, cottonwood, willow, and arroweed (*Pluchea sericea*) and is 107 acres (43.3 ha) in size (Reclamation 2003, 2010). The site is actively irrigated and maintained.

In 2011, a third banding station was added at the CVCA, an LCR MSCP habitat creation site. The site is located on land owned by the Arizona Game and Fish Department and is actively irrigated and maintained. The site is located immediately adjacent to the Colorado River and approximately 1.5 miles north of Cibola, Arizona. The banding station is located in Phases 1 and 2 of the CVCA.

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

PERMITS

Banding was conducted under USFWS Banding Permit #22994, with Joe Kahl as the Master Bander and Beth Sabin, Allen Calvert, Barbara Raulston, and Chris Dodge as subpermitees. At least one of the subpermit holders was present during any banding effort. An Arizona Scientific Collecting Permit (SP601198) is also held by Joe Kahl with the above mentioned as agents.

METHODS

All operations of the banding station 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 De Sante et al. (2012) were followed at all times.

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. 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 on the right leg of most captured birds, excluding endangered species, game species, and hummingbirds, for permit reasons. Covered LCR MSCP species that were captured had a colored band placed on the leg opposite the USFWS band. Some birds that were color banded had USFWS

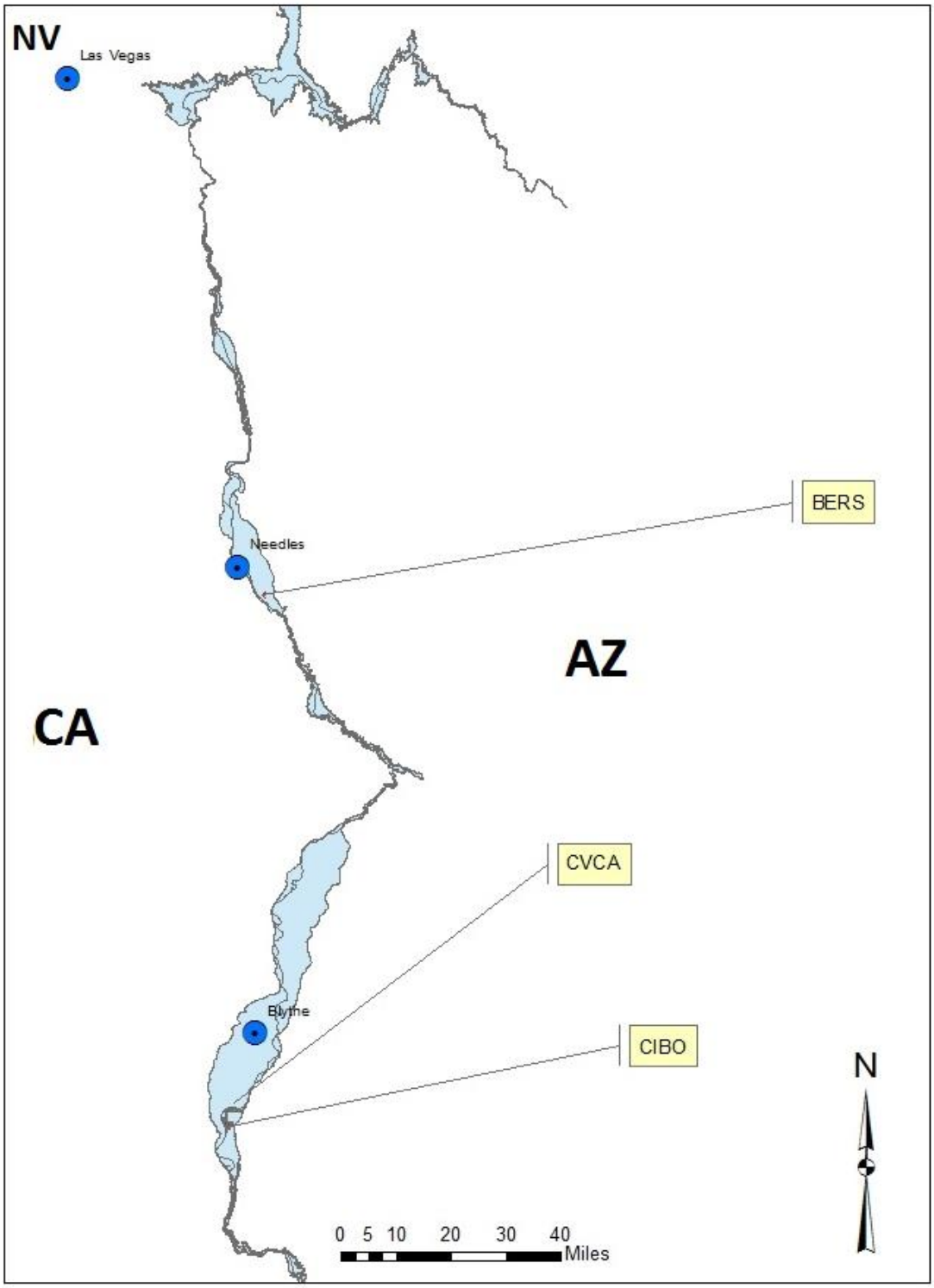

Figure 1.—Location of banding stations on the LCR.

bands placed on the left 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 net operations. All birds observed at each site during banding operations were also recorded. All data were recorded on standardized data sheets (Desante et al. 2012). Birds were identified using Pyle (1997), National Geographic (1999), and Sibley (2000).

The MAPS stations were run once during every 10-day period between May 1 and August 9, for a total of 10 banding periods. Established protocol for MAPS station operations was used at all times (De Sante et al. 2012).

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 is defined as 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 a bird into a net. Target captures are birds that were captured using a net set up outside the normal MAPS net locations and using call- playback to draw the bird into the net. Re-sights are not actual captures, but are instead the confirmed re-sighting of the color band combination on a bird previously captured and color banded. The locations of net lanes at all three sites were chosen in areas of high avian activity in order to allow greater chances of capturing birds.

In order to sample higher in the canopy, one double- or triple-high net was added to each restoration site. Double or triple nets were used instead of stacking several nets of normal height. These nets were 12 meters (m) in length. Each section of these nets that would represent the same height of a normal single net was numbered separately; for example, the lower half of a double net was assigned a number and the upper half a different number, and triple nets were assigned three numbers.

At CIBO, one 12-m double-high, nine 12-m, and two 6-m nets were used. Five 12-m nets were located in the Goodding's willows, four 12-m nets in the Fremont cottonwoods, two 6-m nets (nets 10 and 11) in the mesquites, and a double-high net was placed between the mesquite and cottonwood habitats (nets 12 and 13) (figure 2).

Figure 2.—The Cibola Nature Trail banding site with net lanes.

At the BERS site, nine 12-m nets, two 6-m nets, and one 12-m double net were used. The nets were located in the center of the site where irrigation was most frequently applied. The nine 12-m nets were placed in areas originally planted with cottonwood-willow mix, but these areas are now a mix of cottonwood, Goodding's willow, coyote willow (*Salix exigua*), and honey mesquite. The two 6-m nets are located in an area dominated by honey mesquite (figure 3).

Figure 3.—The Beal banding site with net lanes.

At the CVCA site, nine 12-m nets and one 12-m triple-high net were located in Phases 1 and 2. Six 12-m nets and the 12-m triple-high net were placed in Phase 1, and three 12-m nets were placed in Phase 2 (figure 4). All the nets are located in cottonwood-willow habitat consisting of Fremont cottonwood, Goodding's willow, and coyote willow.

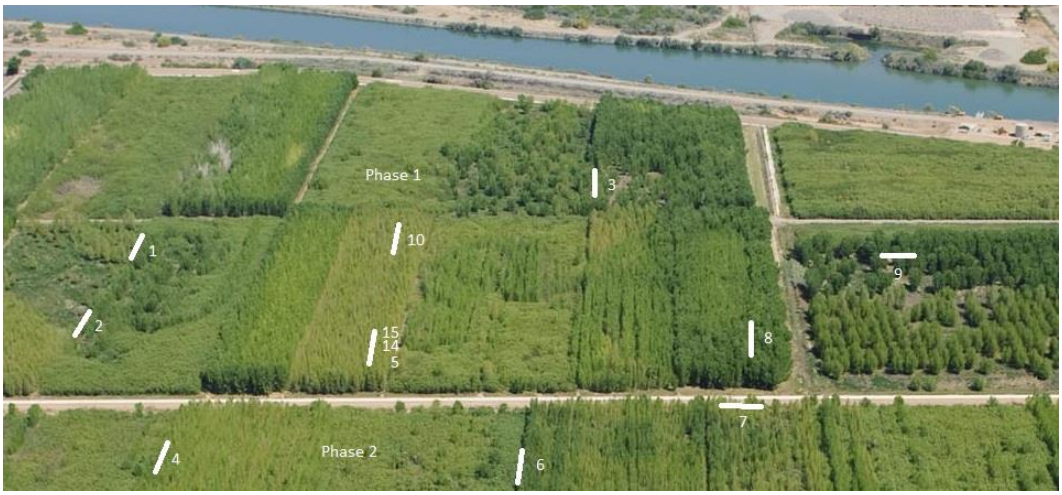

Figure 4.—The CVCA banding site with net lanes.

Color Banding

During the summer of 2009, a program was initiated to place color band combinations on selected LCR MSCP covered species. Color bands were placed on the leg opposite the USFWS silver band. The color bands were either solid colored or bicolored aluminum bands. This effort continued for the fourth year in the summer of 2012. The purpose of placing unique color band combinations on each individual of a covered species captured was to allow birds to be re-sighted and identified to individual without needing to be recaptured. For purposes of this analysis, data from a bird that is re-sighted can be used in the same way data are used from a bird that has been recaptured in a net.

Birds that proved difficult to capture through passive means are target captured using call-playback methods to draw a bird into a net temporarily set up within its territory. A standard protocol was developed by Reclamation biologists for target capturing and re-sighting of birds (Dodge and Kahl 2013). A standardized data sheet was developed for color banding, re-sighting 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 twice a month. Once the first month of banding 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 was recorded for each color-banded bird. In 2012, numbered USFWS bands that were anodized purple were used on color-banded birds for the first time. This effectively doubles the amount of combinations available, as either normal silver or the purple anodized USFWS band can be placed on one of the legs. These USFWS bands were recorded as being "silver," or as "purple ano," on the data sheets. The age, species, sex, USFWS band number, capture method (passive or targeted), date, and time of capture were also recorded. For re-sighting, the location, color band combination, and the confidence of the observer in the accuracy of the re-sight were recorded (see attachment 1 for details of observer confidence levels).

Data Analysis

The data collected from MAPS banding are used to create several indices (described below) to measure avian use of the sites. Some of these indices are then used in statistical analyses to evaluate change over time at each site or to compare sites to each other.

Survivorship (Annual Return Rate)

Annual return is an index of survivorship. This index measures the number of birds recaptured in subsequent field seasons after the field season of their initial capture. It is presented as the percentage of annual return recaptures that occurred within all captures (Latta and Faaborg 2001, 2002).

A more thorough measure of survivorship can be calculated using program Mark based on capture/recapture history for individual species. At least 5 years of data are required to calculate survivorship if data from passive captures, target captures, and re-sighting are combined. Once sufficient data are collected, survivorship of LCR MSCP covered species will be calculated using program Mark.

Capture Rate

The per-net-hour capture rate was calculated for each site and for each species at each site. This is a simple measure that divides the number of captures by the number of net hours operated at each site. Net hours are counted for each net of 12-m length that is operated for each hour of banding. A 1/2 net hour is given

to 6-m nets for each hour they are operated. A total of 144 m of nets are operated at each site; therefore, a total of 12 net hours are conducted during a full hour of operation. A maximum of 60 net hours is possible during a full day of operation. Some nets may be closed due to wind, heat, or other factors, lessening the hours of operation. A per-net-hour capture rate allows equal comparisons between sites, as it takes into account the different levels of effort that are conducted at each site.

The capture rate for resident birds was compared for the number of years since banding began at each site using a Kruskal-Wallis Rank Sum Test. When data are not normal, the nonparametric Kruskal-Wallis test is used to compare more than two populations that come from a continuous distribution. The idea of the Kruskal-Wallis test is to rank all the responses from all groups together and then apply one-way analysis of variance to the ranks rather than to the original observations. The null hypothesis is that the samples come from populations such that the probability that a random observation from one group is greater than a random observation from another group is 0.5.

Productivity

Productivity was calculated as a proportion of captured hatch year birds (born during the year of capture) to captured adult birds (Nur et al. 1999). Productivity was calculated for each LCR MSCP species with sufficient captures (at least seven).

RESULTS

Following are the results from the 2012 MAPS summer season. All data were recorded in the field, entered, quality checked in MAPSPROG, and then compiled in Excel. All statistical analyses were completed using program R (v. 2.9.2). A complete list of all species captured and their corresponding scientific name are presented in tables 1, 2, and 3.

At the CIBO site, a total of 233 individual birds were captured of which 139 were resident birds. There were 206 new captures, 20 recaptures, and 26 unbanded birds. The per-net-hour capture rate was 0.42 for all birds and 0.25 for resident birds. Table 1 shows all the species captured and the number of individual captures per species in 2012. Figure 5 shows the relative percentage of resident birds captured at the CIBO site in 2012.

Table 1.—All species captured and number of individual captures per species at the CIBO site

Species	Scientific name	Captures
Abert's towhee	*Melozone aberti*	13
Anna's hummingbird	*Calypte anna*	2
Ash-throated flycatcher	*Myiarchus cinerascens*	11
Brown-crested flycatcher	*Myiarchus tyrannulus*	1
Black-chinned hummingbird	*Archilochus alexandri*	7
Brown-headed cowbird	*Molothrus ater*	24
Black-headed grosbeak	*Pheucticus melanocephalus*	4
Blue grosbeak	*Passerina caerulea*	9
Black phoebe	*Sayornis nigricans*	2
Bullock's oriole	*Icterus bullockii*	17
Cassin's vireo	*Vireo cassinii*	1
Common yellowthroat	*Geothlypis trichas*	3
Great-tailed grackle	*Quiscalus mexicanus*	1
House finch	*Haemorhous mexicanus*	26
Lazuli bunting	*Passerina amoena*	4
Ladder-backed woodpecker	*Picoides scalaris*	7
Lesser goldfinch	*Spinus saltria*	1
Lincoln's sparrow	*Melospiza lincolnii*	1
Lucy's warbler	*Oreothlypis luciae*	5
Macgillivray's warbler	*Geothlypis tolmiei*	4
Mourning dove	*Zenaida macroura*	2
Red-winged blackbird	*Agelaius phoeniceus*	11
Say's phoebe	*Sayornis saya*	1
Song sparrow	*Melospiza melodia*	1
Swainson's thrush	*Catharus ustulatus*	12
Townsend's warbler	*Setophaga townsendi*	1
Verdin	*Auriparus flaviceps*	3
Warbling vireo	*Vireo gilvus*	5
Western flycatcher	*Empidonax difficilis/occid.*	14
Western kingbird	*Tyrannus verticalis*	5
Western tanager	*Piranga ludoviciana*	4
Western wood peewee	*Contopus sordidulus*	6
Willow flycatcher	*Empidonax traillii*	2
Wilson's warbler	*Cardellina pusilla*	17
White-winged dove	*Zenaida asiatica*	3
Yellow warbler	*Setophaga petechia*	3

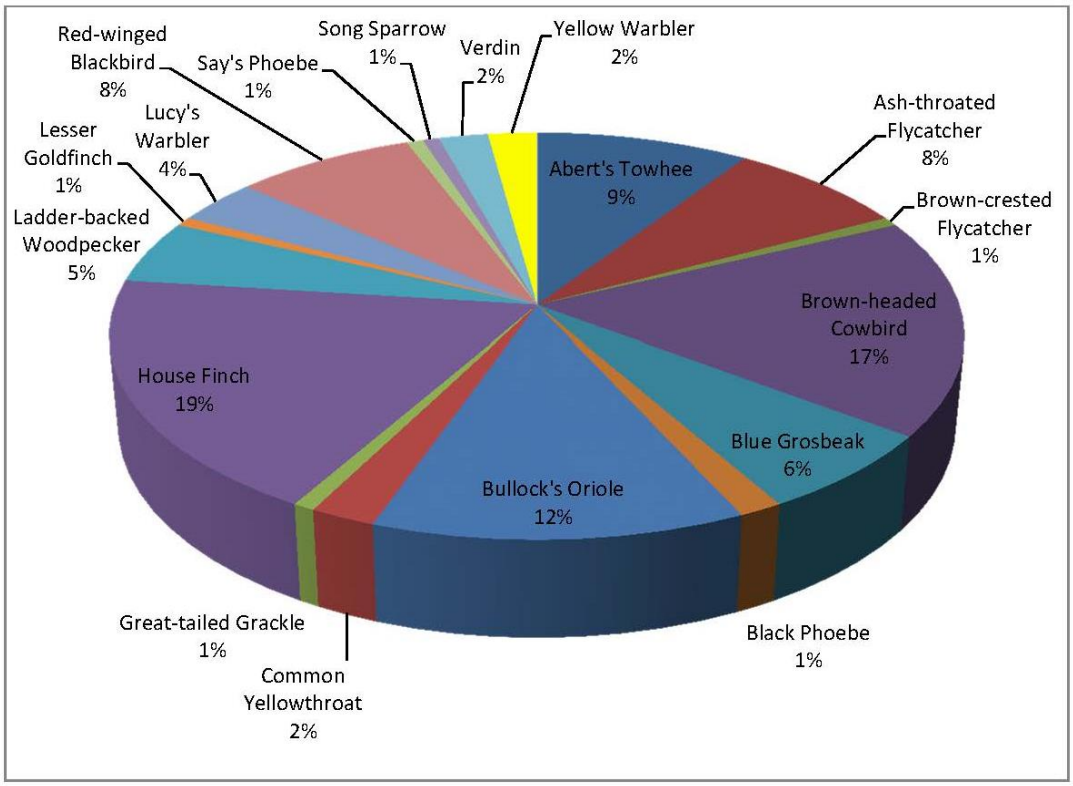

Figure 5.—Relative abundance of resident birds passively captured at the CIBO site.

At the BERS site, a total of 189 individual birds were captured of which 93 were resident birds. There were 154 new captures, 15 recaptures, and 25 unbanded birds. The per-net-hour capture rate was 0.35 for all birds and 0.17 for resident birds. Table 2 shows all the species captured and the number of individual captures per species in 2012. Figure 6 shows the relative percentage of resident birds captured at the BERS site in 2012.

At the CVCA site, 204 individual birds were captured, of which 93 were resident birds. There were 179 new captures, 13 recaptures, and 21 un-banded birds. The per-net-hour capture rate was 0.36 for all birds and 0.17 for resident birds. Table 3 shows all the species captured and the number of individual captures per species in 2011. Figure 7 shows the relative percentage of resident birds captured at the CVCA site in 2011.

Capture Rate

As discussed in the “Methods” section, the per-net-hour capture rate allows equal comparisons between sites, as it takes into account the different levels of effort

Table 2.—Species captured and number of captures per species at the BERS site (Numbers in parentheses represent the total number of birds captured or re-sighted from all methods combined [passive netting, target netting, and re-sighting].)

Species	Scientific name	Captures
Abert's towhee	*Melozone aberti*	9
Anna's hummingbird	*Calypte anna*	1
Black-and-white warbler	*Mniotilta varia*	1
Brown-crested flycatcher	*Myiarchus tyrannulus*	2
Bell's vireo	*Vireo bellii*	4 (6)
Brown-headed cowbird	*Molothrus ater*	1
Blue grosbeak	*Passerina caerulea*	4
Black-tailed gnatcatcher	*Polioptila melanura*	4
Bullock's oriole	*Icterus bullockii*	8
Cassin's vireo	*Vireo cassinii*	1
Common yellowthroat	*Geothlypis trichas*	9
Crissal thrasher	*Toxostoma crissale*	2
Gambel's quail	*Callipepla gambelii*	2
Great-tailed grackle	*Quiscalus mexicanus*	2
Green-tailed towhee	*Pipilo chlorurus*	1
House finch	*Haemorhous mexicanus*	3
Lincoln's sparrow	*Melospiza lincolnii*	1
Lucy's warbler	*Oreothlypis luciae*	20
Macgillivray's warbler	*Geothlypis tolmiei*	9
Mountain white-crowned sparrow	*Zonotrichia leucophrys oriantha*	2
Northern mockingbird	*Mimus polyglottos*	1
Song sparrow	*Melospiza melodia*	1
Summer tanager	*Piranga rubra*	2 (3)
Swainson's thrush	*Catharus ustulatus*	9
Warbling vireo	*Vireo gilvus*	2
Western flycatcher	*Empidonax difficilis/occidentalis*	41
Willow flycatcher	*Empidonax traillii*	2
Wilson's warbler	*Cardellina pusilla*	19
White-winged dove	*Zenaida asiatica*	1
Yellow-breasted chat	*Icteria virens*	17
Yellow warbler	*Setophaga petechia*	4 (5)

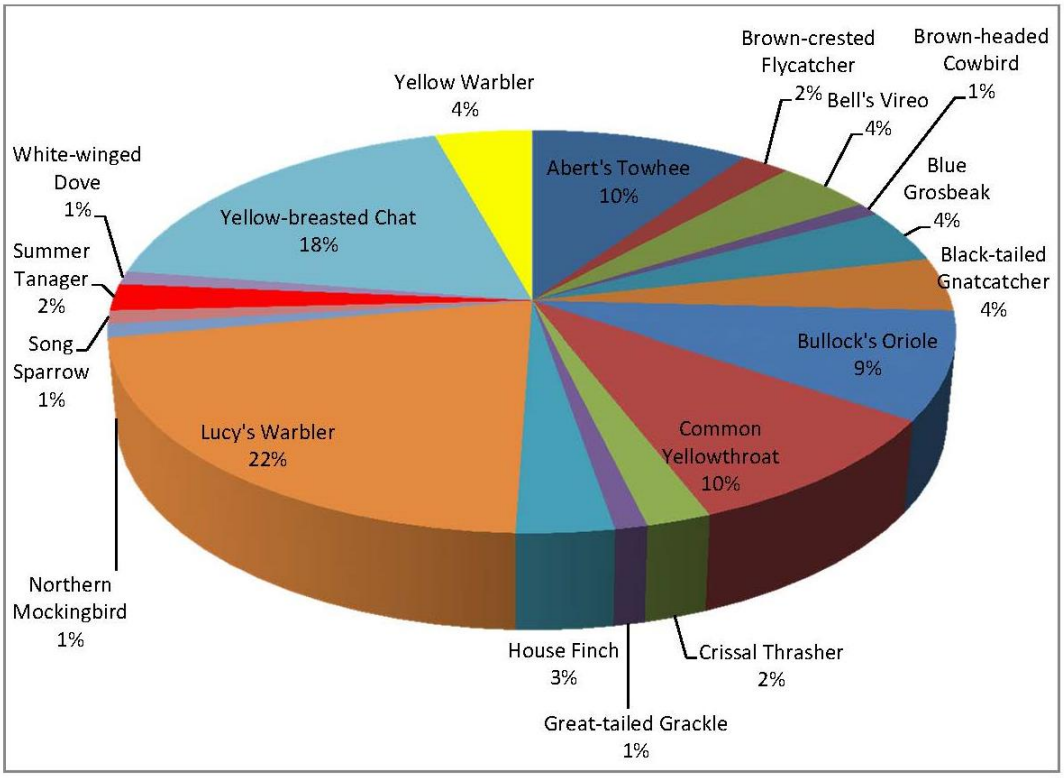

Figure 6.—Relative abundance of resident birds passively captured at the BERS site.

that are conducted at each site that may change due to inclement weather or other reasons. Data were compiled across the years at all sites. Banding began at the CIBO site in 2003, at the BERS site in 2009, and at the CVCA in 2011. Figure 8 shows the total capture rates for resident birds for each year banding has been conducted at each site. Figures 9 and 10 show the relative percentage of captures that occurred in each year, for each species, at the CIBO and BERS sites, respectively.

At the CIBO site, the capture rate for resident birds data were compared for the last 5 years (since 2008) using a Kruskal-Wallis Rank Sum Test. No significant difference was found between the yearly capture rates (K-W $X^2 = 0.56$, df = 4, p = 0.96). Figure 9 shows the relative percentage of resident bird captures that occurred in each year, for each species, at the CIBO site.

At the BERS site, the capture rate for resident birds data were compared for the last 4 years since 2009, when banding began at the site, using a Kruskal-Wallis Rank Sum Test. No significant difference was found between the yearly capture rates (K-W $X^2 = 4.64$, df = 3, p = 0.2). Figure 10 shows the relative percentage of resident bird captures that occurred in each year, for each species, at the BERS site.

Table 3.—Species captured and number of captures per species at the CVCA site

Species	Scientific name	Captures
Abert's towhee	*Melozone aberti*	3
Anna's hummingbird	*Calypte anna*	2
Ash-throated flycatcher	*Myiarchus cinerascens*	4
Black-chinned hummingbird	*Archilochus alexandri*	4
Brown-headed cowbird	*Molothrus ater*	21
Black-headed grosbeak	*Pheucticus melanocephalus*	1
Blue grosbeak	*Passerina caerulea*	11
Black phoebe	*Sayornis nigricans*	2
Bullock's oriole	*Icterus bullockii*	11
Gray flycatcher	*Empidonax wrightii*	1
House finch	*Haemorhous mexicanus*	4
Indigo bunting	*Passerina cyanea*	2
Lazuli bunting	*Passerina amoena*	1
Lesser goldfinch	*Spinus psaltria*	3
Lucy's warbler	*Oreothlypis luciae*	25
Macgillivray's warbler	*Geothlypis tolmiei*	2
Red-winged blackbird	*Agelaius phoeniceus*	1
Song sparrow	*Melospiza melodia*	1
Swainson's thrush	*Catharus ustulatus*	7
Townsend's warbler	*Setophaga townsendi*	1
Warbling vireo	*Vireo gilvus*	3
Western flycatcher	*Empidonax difficilis/occidentalis*	28
Western tanager	*Piranga ludoviciana*	28
Willow flycatcher	*Empidonax traillii*	4
Wilson's warbler	*Cardellina pusilla*	15
Western wood peewee	*Contopus sordidulus*	14
Yellow-breasted chat	*Icteria virens*	1
Yellow warbler	*Setophaga petechia*	4

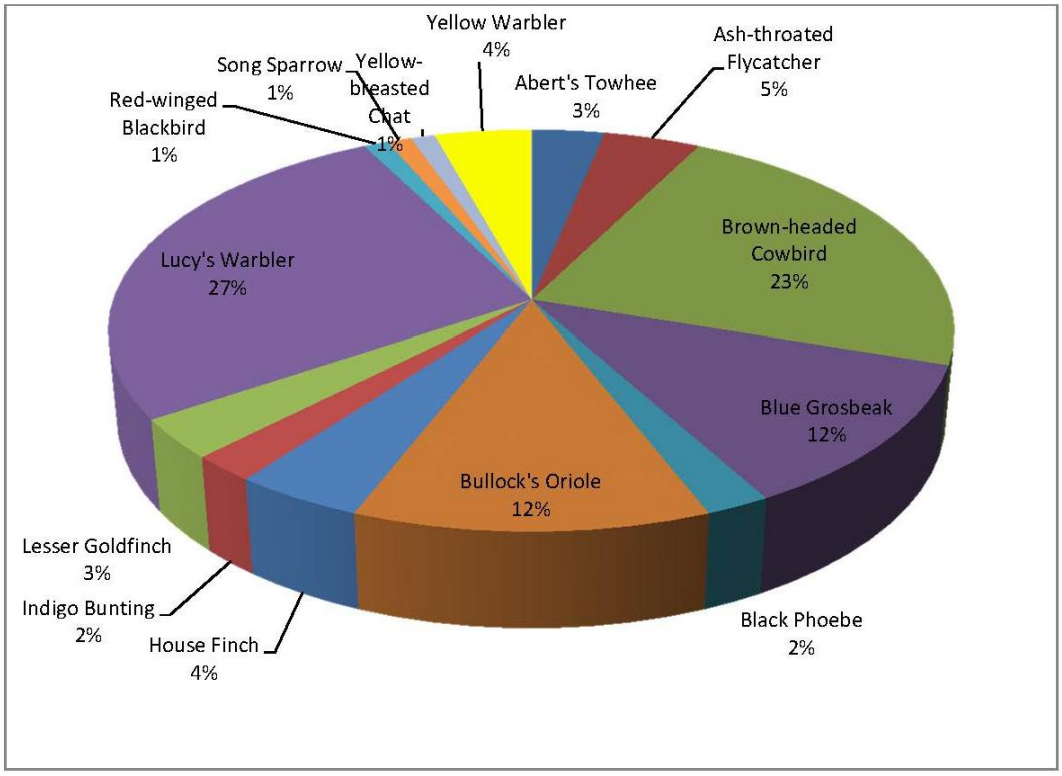

Figure 7.—Relative abundance of resident birds passively captured at the CVCA site.

Figure 8.—Annual overall capture rate (birds/net hour) for resident species, per year.

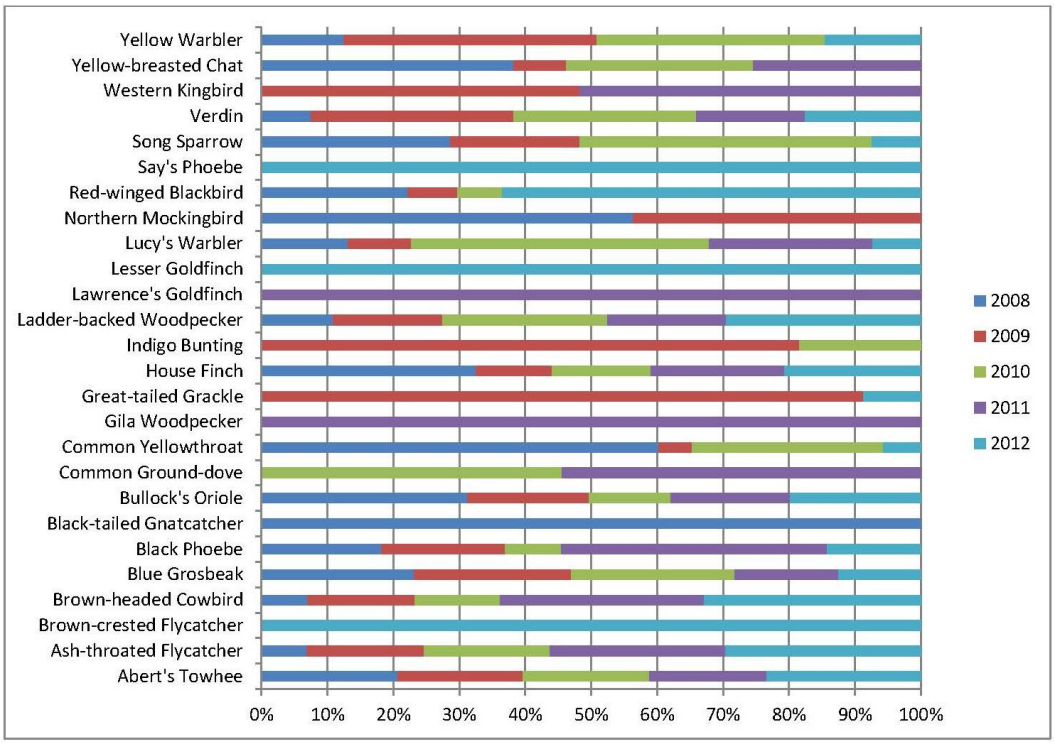

Figure 9.—Relative percentages of all passive captures of resident birds that have occurred in each year, by species, at the CIBO site.

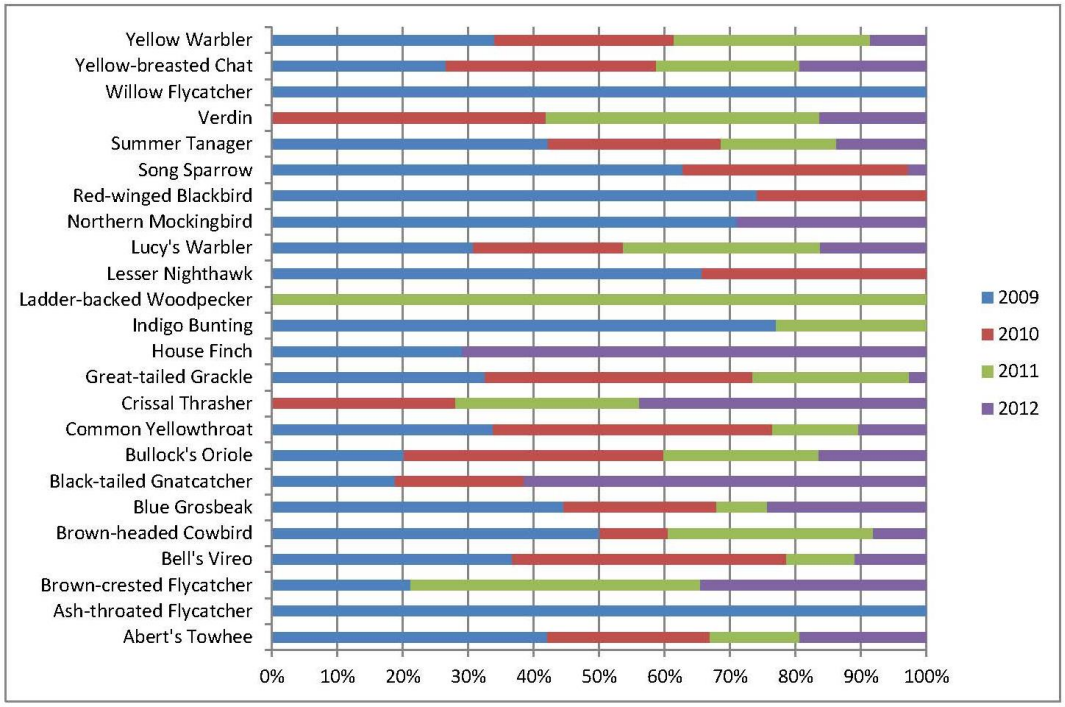

Figure 10.—Relative percentages of all passive captures of resident birds that have occurred in each year, by species, at the BERS site.

At the CVCA site, capture rates for resident birds were compared between the 2 years banding has been conducted with a Wilcoxon Signed Rank Test. There was no significant difference between the capture rates for each year (V= 108, p = 0.34). Figure 11 compares the relative percentage of resident bird captures that occurred between each year, for each species, at the CVCA site.

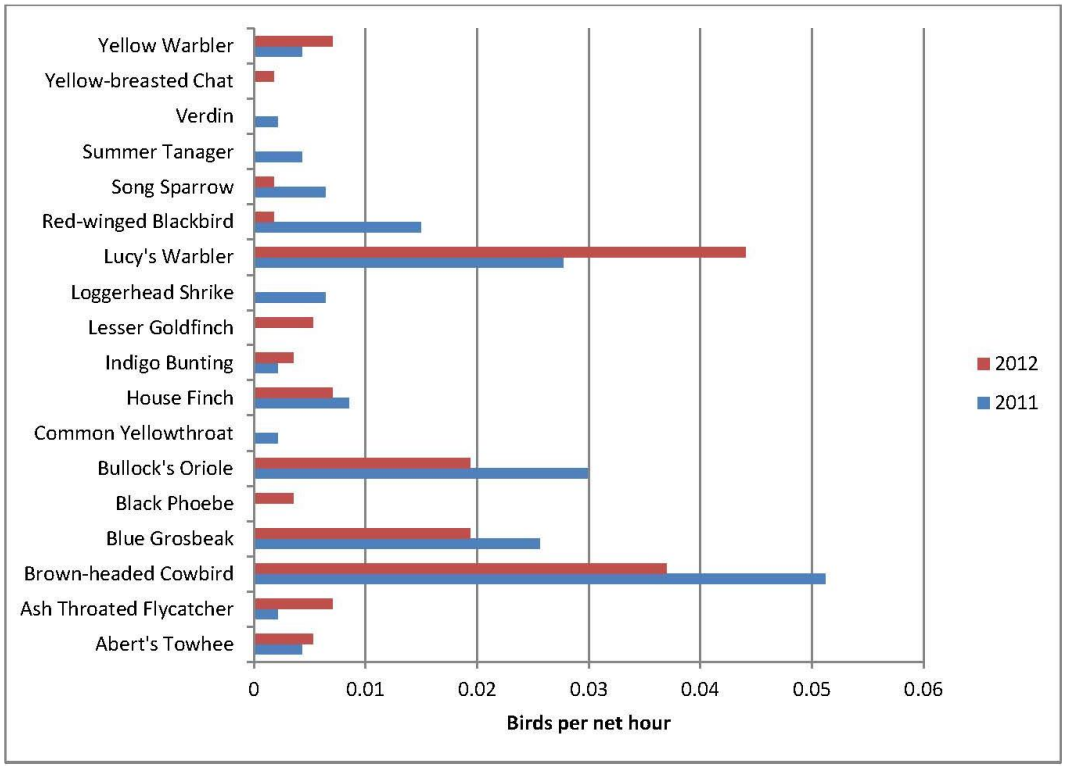

Figure 11.—Relative percentages of all passive captures of resident birds that have occurred in 2011 and 2012, by species, at the CVCA site.

Annual Return Rate

The annual return rate for all resident species with at least seven (representing at least 5% of total residents) individuals captured or re-sighted and experiencing at least one annual return-recapture or re-sight was calculated. The annual return rate was also calculated for any LCR MSCP covered species.

At the CIBO site, no LCR MSCP covered species were recaptured from previous years. Table 4 shows the annual return rates for species with at least seven captures.

Table 4.—Annual return rates for birds with at least seven captures at the CIBO site

Species	Individuals	Annual return	Percent
Abert's towhee	13	2	15.4%
Brown-headed cowbird	24	5	20.8%
Bullock's oriole	17	3	17.6%
Ladder-backed woodpecker	7	2	28.6%

At the BERS site, several species had recaptures from previous years, including three LCR MSCP covered species (table 5). For the summer tanager, yellow warbler, and Bell's vireo, one of the annual returns was detected by resighting a color-banded bird.

Table 5.—Annual return rates for birds with at least seven captures and LCR MSCP covered species at the BERS site

Species	Individuals	Annual return	Percent
Abert's towhee	9	1	11.1%
Bell's vireo	5	2	40.0%
Bullock's oriole	8	1	12.5%
Lucy's warbler	20	1	5.0%
Yellow-breasted chat	17	2	11.8%
Yellow warbler	5	3	60.0%
Summer tanager	3	1	33.3%

At the CVCA site, 24 brown-headed cowbirds were captured, and 7 of those were annual returns from 2011, for an annual return rate of 19%. The only other annual return recapture was of a single song sparrow, the only individual of that species captured at CVCA. A yellow warbler that was recaptured at CVCA was initially banded at the CIBO site earlier in the year.

Productivity

In 2012, there were no captures of juvenile, hatch year birds for any of the LCR MSCP covered species at any of the sites. Productivity was considered to be zero for all species at all sites based on the banding results.

Color Banding and LCR MSCP Covered Species

Table 6 summarizes all the captures and re-sights of LCR MSCP covered species. The "total passive" category represents all captures that were passive and not targeted. The "unique passive" category is all unique individuals (no recaptures of the same bird included). The "total target" category represents all targeted captures. The "unique target" category represents all unique individuals target captured. The "recapture" category represents all recaptures. The "total re-sights" category represents a total of all re-sightings, including separate re-sightings of the same bird. The "unique re-sights" category represents unique individual birds re-sighted. Finally, the "total birds" category is the true total of all unique individual birds that were captured or re-sighted by all methods combined. Figure 12 summarizes the number of individuals captured for covered LCR MSCP species for each year MAPS banding has been conducted at the BERS site.

Table 6.—Color banding and re-sight summary table

Species	Site	Total passive	Unique passive	Total target	Unique target	Recapture	Total re-sights	Unique re-sights	Total birds
Yellow warbler	BERS	4	4	0	0	2	1	1	5
Bell's vireo	BERS	4	3	1	1	2	2	1	5
Summer tanager	BERS	2	2	0	0	1	1	1	3
Yellow warbler	CIBO	3	3	0	0	0	0	0	3
Yellow warbler	CVCA	4	4	0	0	1	0	0	4

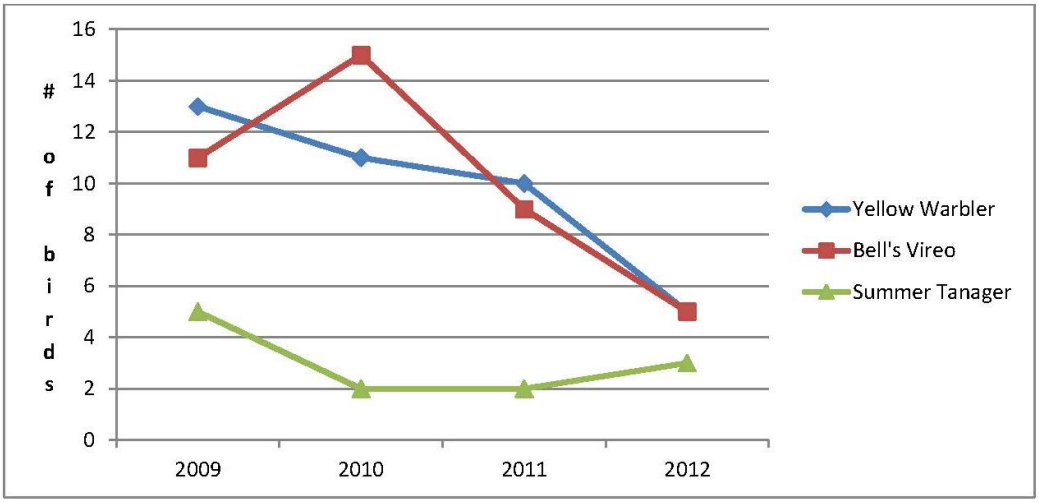

Figure 12.—Total number of individual birds of LCR MSCP covered species captured or re-sighted at the BERS site.

DISCUSSION

One of the notable changes in the capture data is the yearly decline in overall bird captures at the BERS site and, in 2012, the decline in captures and re-sights of both the yellow warbler and Bell's vireo. These declines may be due to annual variations in some cases, and it also may be the continuance of a trend seen in 2011, the decline in the abundance of certain species that are associated with successional growth. As in 2011, species such as song sparrow, red-winged blackbird, and great-tailed grackle have declined in captures as compared to 2009 and 2010 (Dodge and Kahl 2009, 2011). These species are often associated with emergent, low-growth habitat. Other species associated with large, mature vegetation, such as brown-crested flycatcher, yellow-breasted chat, and Lucy's warbler, have shown a relatively steady capture rate over the last 4 years. It is possible that the lower capture rates seen in 2012 and 2011 are due to a reduction in the number of species associated with less mature vegetation and not a reduction in the captures of all species. The decline in capture rates is not statistically significant over the 4 years banding has taken place at BERS, so this decline is likely not a reason for concern. There were lower capture rates for both the yellow warbler and Bell's vireo at the BERS site. The general bird surveys at the BERS site detected similar numbers of both species in 2012 as were detected in 2011 (Great Basin Bird Observatory 2012, 2013). It is likely that the lower capture rates for these species were due to annual variation and not to actual lower numbers of these species.

At the CIBO site, captures have remained at similar rates over the last 5 years. The one noticeable difference in the data from 2012 was the increase in red-winged blackbirds. This may have been due to the early watering of the site and in the field adjacent, as most of the captures occurred on the first day of banding when the areas were being irrigated and had standing water present. The number of yellow warblers increased in 2012 from those found in 2011 when no yellow warblers were present at the site (Dodge and Kahl 2012). One yellow warbler that was captured initially at the CIBO site moved to CVCA later in the season, indicating that movement between sites continues to occur, as was first seen in 2011.

At the CVCA site, the number of yellow warblers increased as compared to the previous year. Summer tanager was not present at the site even though they were in 2011 (Dodge and Kahl 2012). This would indicate that the phases of CVCA where banding takes place is providing habitat for yellow warbler and may be providing habitat for the summer tanager. There was summer tanager detected in Phase 1 of CVCA by the general bird surveys (Great Basin Bird Observatory 2013), and it is possible that this species had moved to a different part of the site outside the area where banding takes place.

At the BERS site, the rates of annual returns for both Bell's vireo and yellow warbler are high, although it is difficult to read too much into it given the low sample size of the total captures for both species. It does give some indication that these LCR MSCP covered species are returning to the site. The aspect of the data that should warrant further consideration if it continues in future years of banding is the lack of hatch year birds for any of the three covered species caught at any of the sites. It is unclear why there were no captures of hatch year birds, and it may just be due to annual variation in hatch year bird captures. Other explanations could be that productivity is actually low or that the capture rate of hatch year birds is lower than that of adult birds. If productivity is low, this will become evident in subsequent years, as the populations should decline, and the amount of annual returns should decline as well. It will be important to follow the annual return rates, the number of hatch year birds captured, and the population of covered species in 2013 and subsequent years.

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ATTACHMENT 1

Sample Data Sheets for Color Banding

Color Band Re-sight Data Sheet

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

Wind:_____ **Temp:**_____

Site:_____

Re-sight #1

Species:_____ **Sex:**_____

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

Confidence Level:_____ **UTM:**_____

Notes:_____

_____

Re-sight #2

Species:_____ **Sex:**_____

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

Confidence Level:_____ **UTM:**_____

Notes:_____

_____

Confidence Level Codes:

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

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

C = 95–99% confidence in the re-sight and one or more re-sights in a visit.

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

P = Re-sight 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 #	Species	Size	Sex	Age	Left Color	Right Color	Capture Type[1]	Date	Site