



Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Summary Report of MAPS and Targeted Bird Banding at LCR MSCP Restoration Sites in 2011



October 2012

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National Park Service
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Bureau of Indian Affairs
Western Area Power Administration

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Palo Verde Irrigation District
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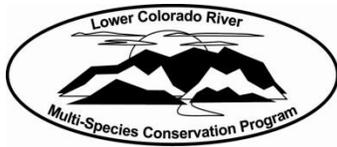
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Lower Colorado River Multi-Species Conservation Program

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Multi-Species Conservation Program
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ACRONYMS AND ABBREVIATIONS

AGFD	Arizona Game and Fish Department
BERS	Beal Lake Riparian Restoration Area
CIBO	Cibola National Wildlife Refuge Nature Trail
CVCA	Cibola Valley Conservation Area
ha	hectare(s)
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
m	meter(s)
MAPS	Monitoring Avian Productivity and Survival
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 at three sites during the summer breeding Monitoring Avian Productivity and Survivorship season in 2011. The number of stations was increased to three by adding a new banding station at the Cibola Valley Conservation Area. Four species covered under the program, yellow warbler (*Setophaga petechia*), Bell's vireo (*Vireo bellii*), Gila woodpecker (*Melanerpes uropygialis*), and summer tanager (*Piranga rubra*) were captured and color banded. Attempts to target capture covered species when passive capture was not possible as well as attempts throughout the banding season to re-sight color banded birds were made. A total of 506 birds were captured at all sites, and a total of 26 birds that were Lower Colorado River Multi-Species Conservation Program 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, and the principal purpose is to document the use of breeding habitat by birds throughout North America. The data are collected and analyzed by the Institute for Bird Populations (IBP), which also establishes a set of guidelines and protocols for all MAPS stations (DeSante et al. 2010). 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 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 and a winter banding station from 2003 to 2010. Winter banding operations ceased after the 2009–2010 winter season due to a lack of time and resources, and currently only summer MAPS banding operations are conducted. In 2011, a third MAPS station was established at the Cibola Valley Conservation Area (CVCA), adding to those at Beal Lake Riparian Restoration Area (BERS) and the Nature Trail on Cibola National Wildlife Refuge (CIBO), 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

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evaluate demographic characteristics, such as survivorship, productivity, and site fidelity, of covered species at restoration sites. Specifically, the banding program addresses the LCR MSCP conservation measures for the yellow warbler (*Setophaga petechia*) (CM 5.7.20.2-YWAR1), Bell's vireo (CM 5.7.19.2 – BEVII), and summer tanager (*Piranga rubra*) (CM 5.7.21.2-SUTA1). One or more of these species is 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-BEVII 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. On page 5-87 of the LCR MSCP Habitat Conservation 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 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

The 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 200 bird species (USFWS 2009). One banding station is located at the Cibola National Wildlife Refuge Nature Trail. 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 second banding station (BERS) is located on the Beal Lake Riparian Restoration Area on the Havasu National Wildlife Refuge between Beal Lake

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and Topock Marsh, approximately 5 miles (8 kilometers) northwest of the town of Topock, Arizona. 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 arrowweed (*Pluchea sericea*) and is 107 acres (43.3 ha) in size (Reclamation 2003).

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 (AGFD), and it is 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 site.

All three banding sites are indicated on the map on figure 1.

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 sub-permittees. At least one of the sub-permit holders was present during any banding effort.

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 DeSante et al. (2010) were followed at all times.

Nets were set up ½ 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 game

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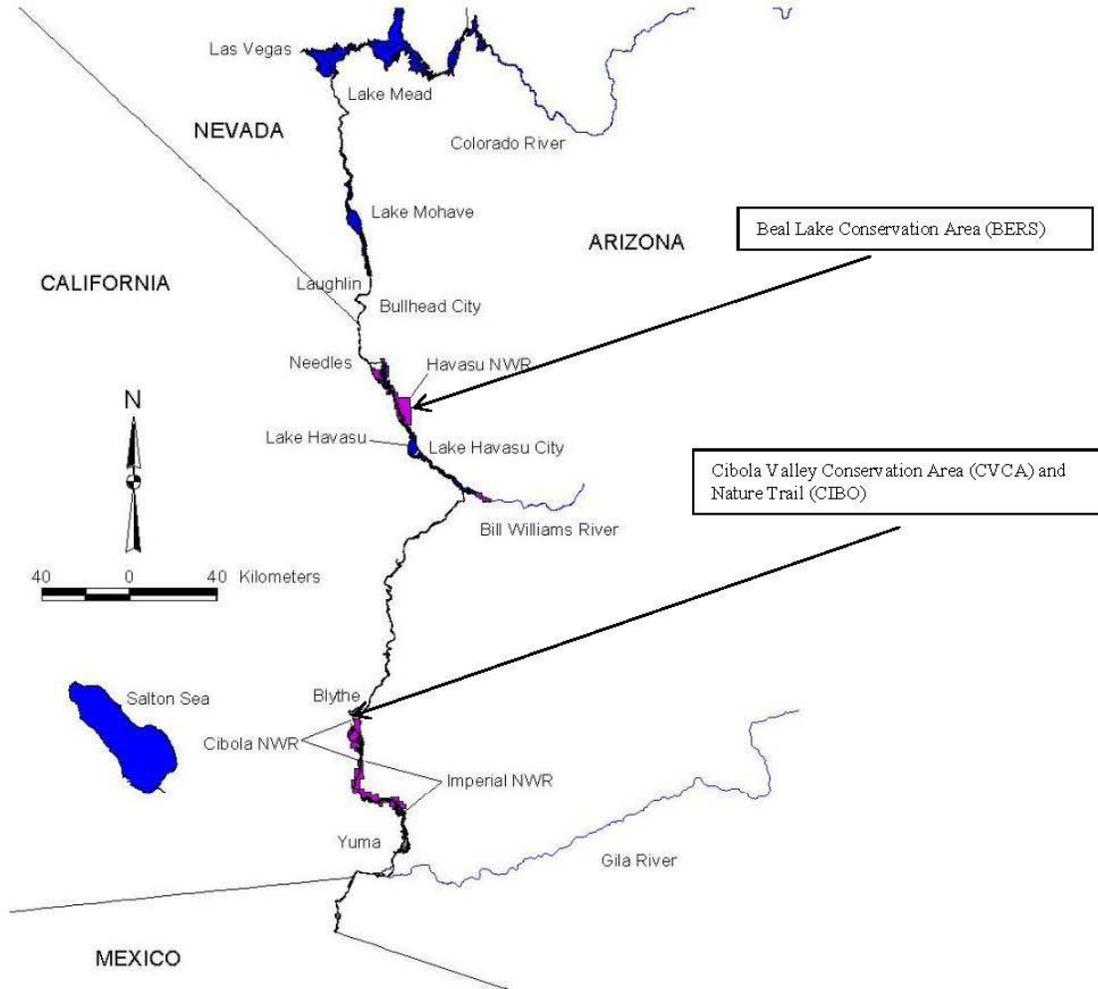


Figure 1.—A map of the LCR with the locations of the banding sites.

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 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 data were recorded on standardized data sheets (DeSante et al. 2010). Birds were identified using Pyle (1997), National Geographic (1999), and Sibley (2000).

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The MAPS stations were run once during every 10-day period between May 5 and August 2, 2011, for a total of 10 banding periods. Established protocol for MAPS station operations was used at all times (DeSante et al. 2010).

For capture results, a resident bird is defined as one that is known to breed on 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 that 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 where 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.

At the CIBO site, nine 12-meter (m) nets and two 6-m nets were used. Six 12-m nets were located in the Goodding's willows, three 12-m nets in the Fremont cottonwoods, and two 6-m nets (nets 10 and 11) in the mesquites (figure 2).



Figure 2.—Photo of the CIBO banding site with net lanes.

At the BERS site, nine 12-m nets and two 6-m nets were used. The nets were located in the center of the site where watering was most frequently applied. The nine 12-m nets were placed in areas originally planted with cottonwood-willow

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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 were located in an area dominated by honey mesquite (figure 3).



Figure 3.—Photo of the BERS site with net lanes.

At the CVCA site, ten 12-m nets were located in Phases 1 and 2. Seven nets were placed in Phase 1, and three nets were placed in Phase 2 (figure 4). All the nets were located in cottonwood-willow habitat consisting of Fremont cottonwood, Goodding's willow, and coyote willow.



Figure 4.—Photo of the CVCA site with net lanes.

Color Banding

During the summer of 2009, a program was initiated to place color band combinations on any 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 third year in the summer of 2011. 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, a bird that is re-sighted can be used in the same way that 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. 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 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. USFWS bands were recorded as being “silver,” and these were the only bands to be silver in color. 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

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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 one-half net hour is given to 6-m nets for each hour they are operated. A total of 120 m of nets are operated at each site; therefore, a total of 10 net hours are conducted during a full hour of operation. A maximum of 50 net hours of operation 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.

Productivity

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

RESULTS

Following are the results from the 2011 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 145 individual birds were captured, and of those, 98 were resident birds. There were 137 new captures and 13 recaptures. The per net hour capture rate was 0.37 for all birds and 0.25 for resident species. Table 1 shows all the species captured and the number of individual captures per species in 2011. Figure 5 shows the relative percentage of resident birds captured at the CIBO site in 2011.

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

Species	Scientific name	Captures
Abert's towhee	<i>Melospiza aberti</i>	7
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>	7
Black phoebe	<i>Sayornis nigricans</i>	4
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	1
Blue grosbeak	<i>Passerina caerulea</i>	8
Bullock's oriole	<i>Icterus bullockii</i>	11
Cassin's vireo	<i>Vireo cassinii</i>	1
Common yellowthroat	<i>Geothlypis trichas</i>	1
Gila woodpecker	<i>Melanerpes uropygialis</i>	1
House finch	<i>Carpodacus mexicanus</i>	18
Ladder-backed woodpecker	<i>Picoides scalaris</i>	3
Lawrence's goldfinch	<i>Spinus lawrencei</i>	4
Lazuli bunting	<i>Passerina amoena</i>	1
Lucy's warbler	<i>Oreothlypis luciae</i>	12
Nashville warbler	<i>Oreothlypis ruficapilla</i>	1
Swainson's thrush	<i>Catharus ustulatus</i>	6
Townsend's warbler	<i>Setophaga townsendi</i>	1
Verdin	<i>Auriparus flaviceps</i>	2
Warbling vireo	<i>Vireo gilvus</i>	1
Western flycatcher	<i>Empidonax difficilis/occidentalis</i>	18
Western kingbird	<i>Tyrannus verticalis</i>	1
Western tanager	<i>Piranga ludoviciana</i>	7
Willow flycatcher	<i>Empidonax trailii</i>	1
Wilson's warbler	<i>Cardellina pusilla</i>	9
Yellow-breasted chat	<i>Icteria virens</i>	3

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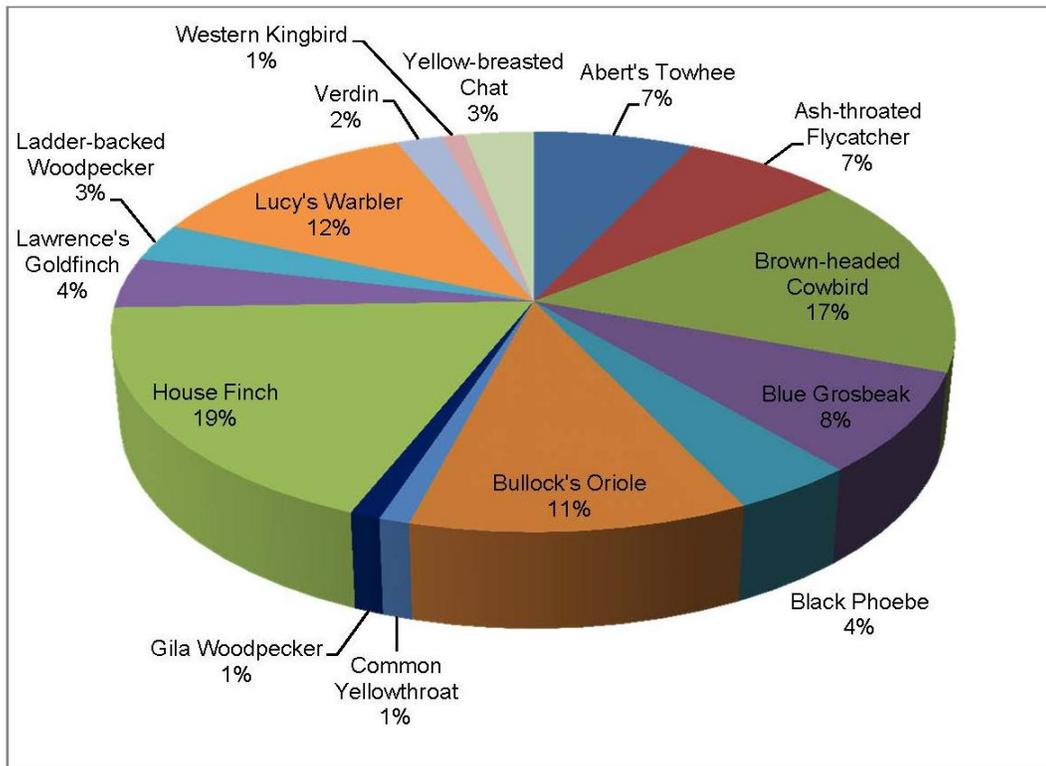


Figure 5.—Relative abundance of resident birds passively captured at the CIBO site.

At the BERS site, a total of 164 individual birds were captured, of which 101 were resident birds. There were 150 new captures and 21 recaptures. The per net hour capture rate was 0.40 for all species and 0.25 for resident species. Table 2 shows all the species captured and the number of individual captures per species in 2011. Figure 6 shows the relative percentage of resident birds captured at the BERS site in 2011.

At the CVCA site, a total of 197 individual birds were captured, of which 90 were resident birds. There were a total of 194 new captures and 16 recaptures. The per net hour capture rate was 0.42 for all species and 0.19 for resident species. 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.

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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	<i>Melospiza aberti</i>	5
Bell's vireo	<i>Vireo bellii</i>	3 (9)
Black-and-white warbler	<i>Mniotilta varia</i>	1
Brown-crested flycatcher	<i>Myiarchus tyrannulus</i>	2
Brown-headed cowbird	<i>Molothrus ater</i>	3
Blue grosbeak	<i>Passerina caerulea</i>	1
Bullock's oriole	<i>Icterus bullockii</i>	9
Cassin's vireo	<i>Vireo cassinii</i>	1
Common yellowthroat	<i>Geothlypis trichas</i>	9
Crissal thrasher	<i>Toxostoma crissale</i>	1
Dusky flycatcher	<i>Empidonax oberholseri</i>	1
Great-tailed grackle	<i>Quiscalus mexicanus</i>	7
Green-tailed towhee	<i>Pipilo chlorurus</i>	1
Indigo bunting	<i>Passerina cyanea</i>	2
Ladder-backed woodpecker	<i>Picoides scalaris</i>	1
Lucy's warbler	<i>Oreothlypis luciae</i>	29
Macgillivray's warbler	<i>Geothlypis tolmiei</i>	1
Summer tanager	<i>Piranga rubra</i>	2
Swainson's thrush	<i>Catharus ustulatus</i>	4
Verdin	<i>Auriparus flaviceps</i>	2
Warbling vireo	<i>Vireo gilvus</i>	1
Western flycatcher	<i>Empidonax difficilis/occidentalis</i>	32
Western tanager	<i>Piranga ludoviciana</i>	1
Western wood pee-wee	<i>Contopus sordidulus</i>	3
Wilson's warbler	<i>Cardellina pusilla</i>	17
Yellow-breasted chat	<i>Icteria virens</i>	15
Yellow warbler	<i>Setophaga petechia</i>	10

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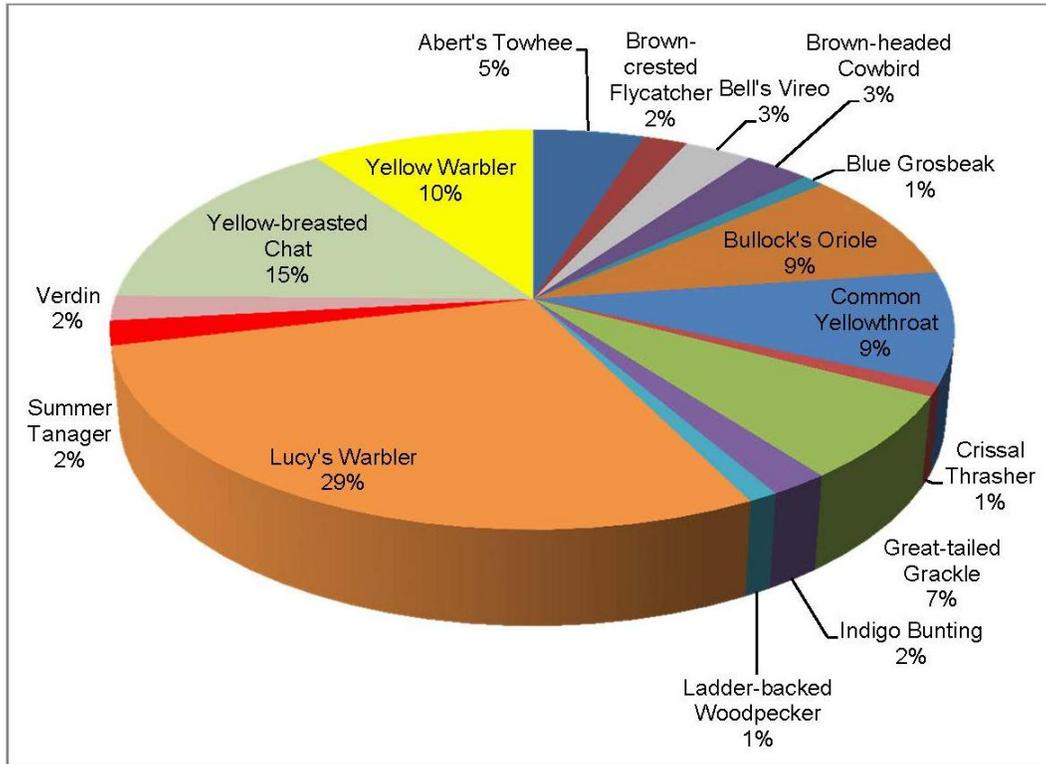


Figure 6.—Relative abundance of birds passively captured at the BERS site.

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 site 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 BERS and CIBO sites, respectively.

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. The annual return rates for the CVCA site will be calculated in future years, as this was the first year of banding.

At the CIBO site, no LCR MSCP covered species were recaptured from previous years. However, a yellow warbler that was banded at the CIBO site in 2010 was recaptured at the CVCA site. Table 4 shows the annual return rates for species with at least seven captures.

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Table 3.—Species captured and number of captures per species at the CVCA site
(Numbers in parentheses represent 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	<i>Melospiza aberti</i>	2
Ash throated flycatcher	<i>Myiarchus cinerascens</i>	1
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	1
Brown-headed cowbird	<i>Molothrus ater</i>	24
Blue grosbeak	<i>Passerina caerulea</i>	12
Bullock's oriole	<i>Icterus bullockii</i>	14
Cassin's vireo	<i>Vireo cassinii</i>	1
Common yellowthroat	<i>Geothlypis trichas</i>	1
European starling	<i>Sturnus vulgaris</i>	3
Hammond's flycatcher	<i>Empidonax hammondii</i>	1
House finch	<i>Carpodacus mexicanus</i>	4
Indigo bunting	<i>Passerina cyanea</i>	1
Loggerhead shrike	<i>Lanius ludovicianus</i>	3
Lucy's warbler	<i>Oreothlypis luciae</i>	13
Macgillivray's warbler	<i>Geothlypis tolmiei</i>	3
Pacific-slope flycatcher	<i>Empidonax difficilis</i>	5
Red-winged blackbird	<i>Agelaius phoeniceus</i>	7
Song sparrow	<i>Melospiza melodia</i>	3
Summer tanager	<i>Piranga rubra</i>	2
Swainson's thrush	<i>Catharus ustulatus</i>	25
Townsend's warbler	<i>Setophaga townsendi</i>	1
Verdin	<i>Auriparus flaviceps</i>	1
Warbling vireo	<i>Vireo gilvus</i>	2
Western flycatcher	<i>Empidonax difficilis/occidentalis</i>	21
Western tanager	<i>Piranga ludoviciana</i>	4
Western wood pee-wee	<i>Contopus sordidulus</i>	1
Willow flycatcher	<i>Empidonax traillii</i>	2
Wilson's warbler	<i>Cardellina pusilla</i>	38
Yellow warbler	<i>Setophaga petechia</i>	1 (2)

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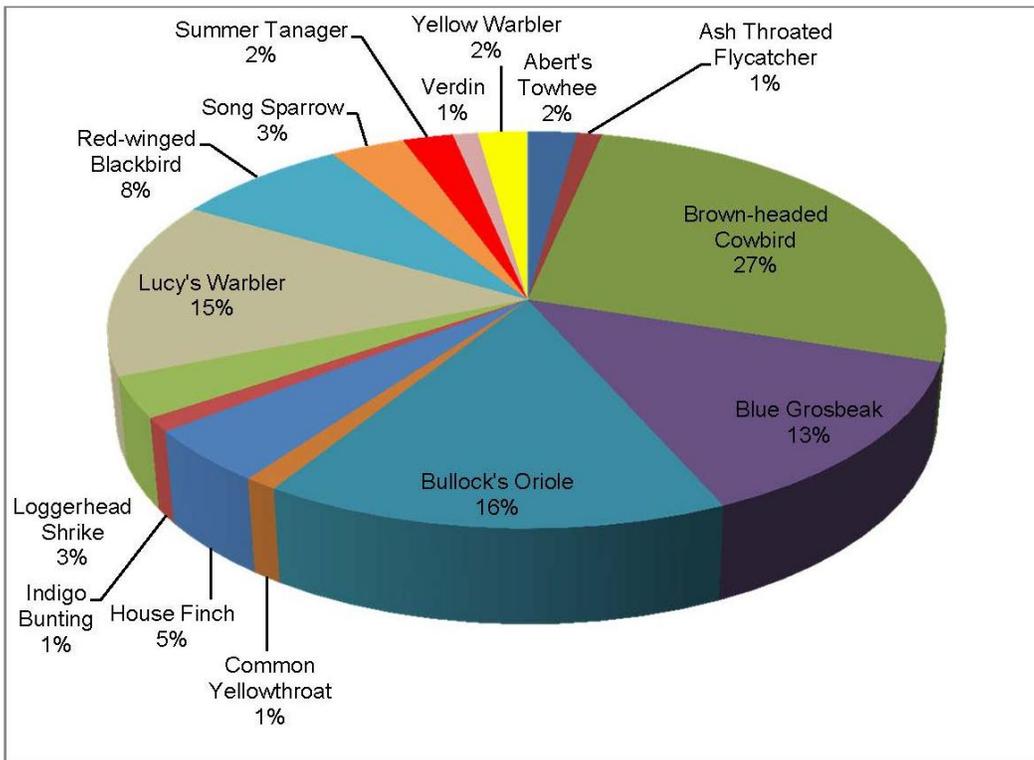


Figure 7.—Relative abundance of birds passively captured at the CVCA site.

Two LCR MSCP species were recaptured at the BERS site from previous years. Both annual returns for the Bell's vireo were confirmed by re-sights. The annual return rates for the CIBO site are shown in table 5.

Productivity

Productivity was calculated for two species, the yellow warbler and Bell's vireo, at the BERS site. Captures of LCR MSCP species at the other sites will be calculated after sufficient data are collected in future years. For the yellow warbler, there were 10 adults and 1 juvenile bird captured for a productivity rate of 0.1. Table 6 shows the productivity rate for Bell's vireos for the last 3 years at the BERS site.

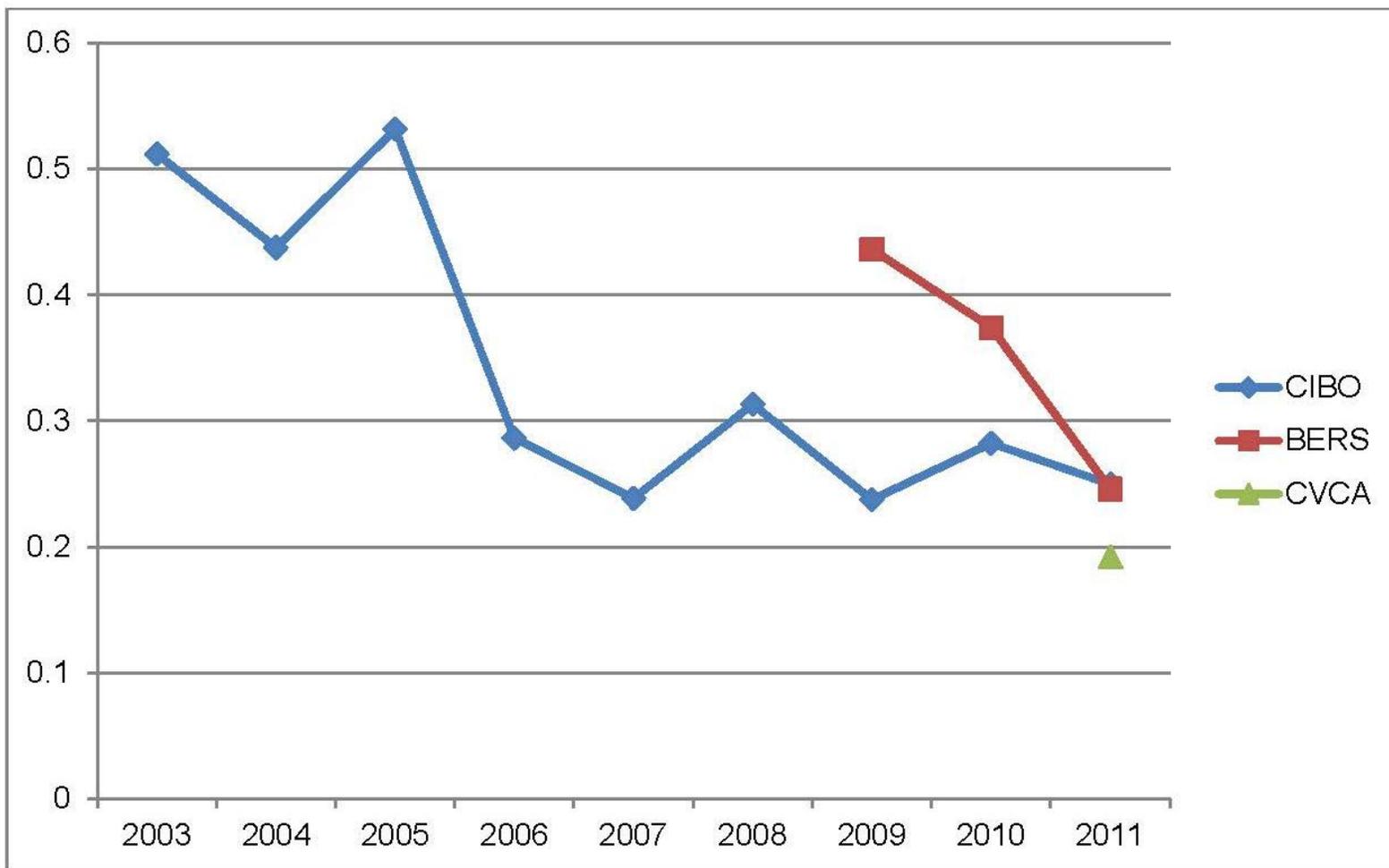


Figure 8.—Annual overall capture rate (birds/net hour) for resident species per year.

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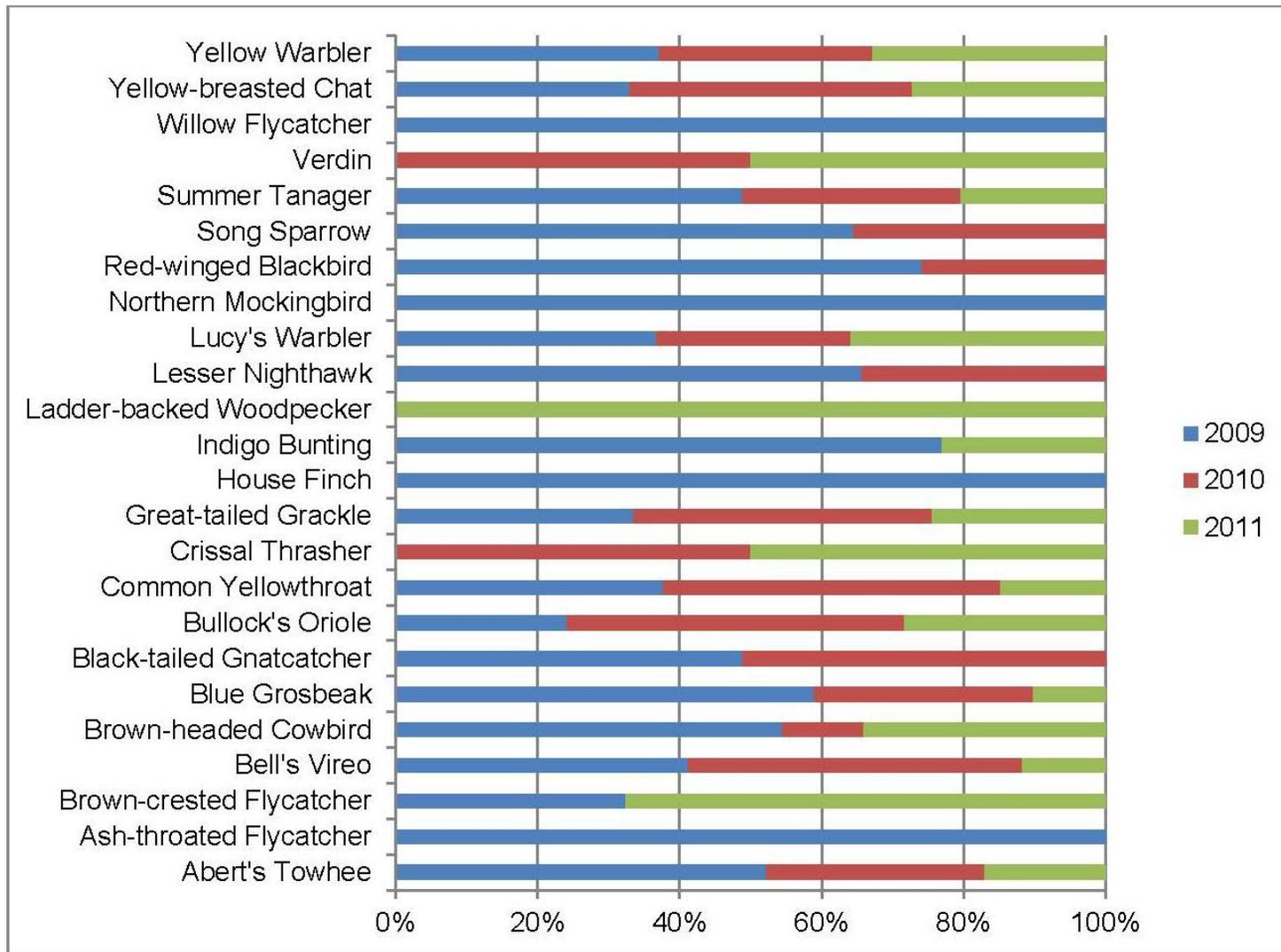


Figure 9.—Relative percentage of all passive captures that have occurred in each year, by species, at the BERS site.

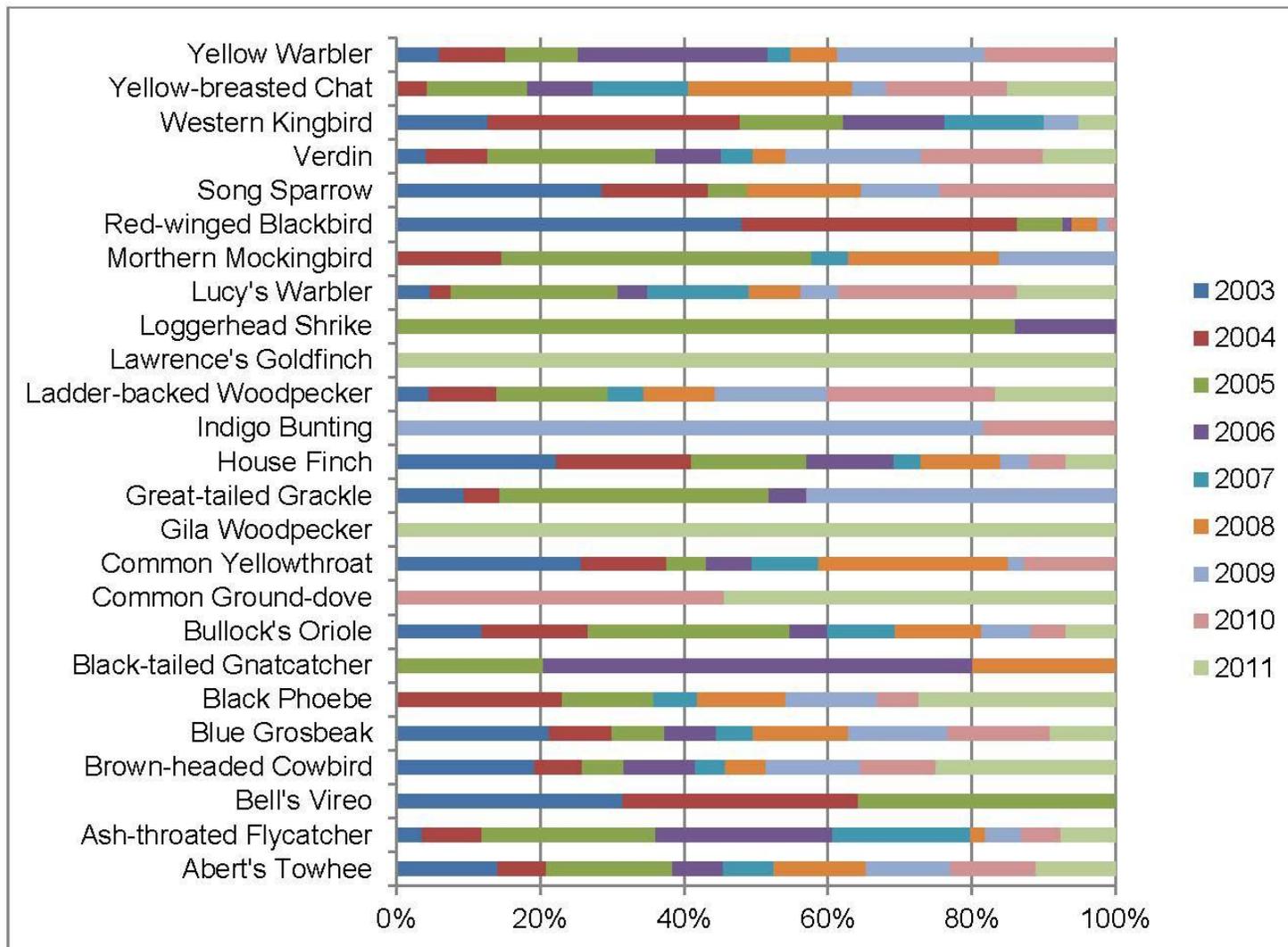


Figure 10.—Relative percentage of all passive captures that have occurred in each year, by species, at the CIBO site.

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

Species	Individuals	Annual return	%
Abert's towhee	7	1	14.3
Ash-throated flycatcher	7	1	14.3
Brown-headed cowbird	16	1	6.3
Blue grosbeak	8	2	25.0
Bullock's oriole	11	1	9.1

Table 5.—Annual return rates for birds with at least seven captures at the BERS site¹

Species	Individuals	Annual return	%
Bell's vireo	9	2	22.2
Bullock's oriole	9	1	11.1
Common yellowthroat	9	3	33.3
Lucy's warbler	29	2	6.9
Yellow-breasted chat	15	2	13.3
Yellow warbler	10	2	20.0

¹ Species marked in bold are LCR MSCP covered species.

Table 6.—Productivity of Bell's vireos at the BERS site from 2009–2011

	2009	2010	2011	Total
Juvenile	7	2	3	12
Adult	5	13	6	24
Productivity	1.40	0.15	0.50	0.50

Color Banding and LCR MSCP Covered Species

Color bands were placed on all passively captured LCR MSCP covered species and birds that were target captured at both the CVCA and BERS sites. Bell's vireos were re-sighted as late as September 30 at the BERS site, and yellow warblers and summer tanagers were re-sighted as late as September 23 at the BERS site. Table 7 summarizes all the captures and re-sights of LCR MSCP

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Table 7.—Color banding and re-sight summary table

Species	Site	Total passive	Unique passive	Total target	Unique target	Recap	Total re-sights	Unique re-sights	Total birds
Yellow warbler	BERS	11	10	0	0	2	0	0	10
Summer tanager	BERS	2	2	0	0	0	2	0	2
Bell's vireo	BERS	4	3	5	4	2	6	2	9
Gila woodpecker	CIBO	1	1	0	0	0	0	0	1
Summer tanager	CVCA	2	2	0	0	0	0	0	2
Yellow warbler	CVCA	1	1	1	1	2	0	0	2

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 “recap” 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.

DISCUSSION

In previous years, the capture rate of resident birds at the BERS site has been higher than that at the CIBO site. In 2011, capture rates of both sites were nearly identical, and the capture rate at the CVCA site was somewhat lower than at the other two sites. Over the last 3 years, this represents a decline in resident captures at the BERS site. When individual captures are analyzed, the BERS site had certain species that have occurred in greater numbers, but are now declining. This decline may be due to the site maturing even though the number of LCR MSCP covered species has been maintained at similar levels since 2009 (figure 11). The decline in the overall capture rate may be explained by the decline in certain species such as the song sparrow, red-winged blackbird, northern mockingbird, and house finch. As is shown on figure 9, these species have declined to the point where there were no captures in 2011. At the BERS site, these species made up 15% of the total resident captures in 2009 and 7% in 2010 (Dodge and Kahl 2009, 2011). In the desert southwest, these species are often associated with emergent vegetation and/or edge habitat (Corman and Wise-Gervais 2005). A similar trend was seen at the CIBO site in the first years of banding (see figure 8).

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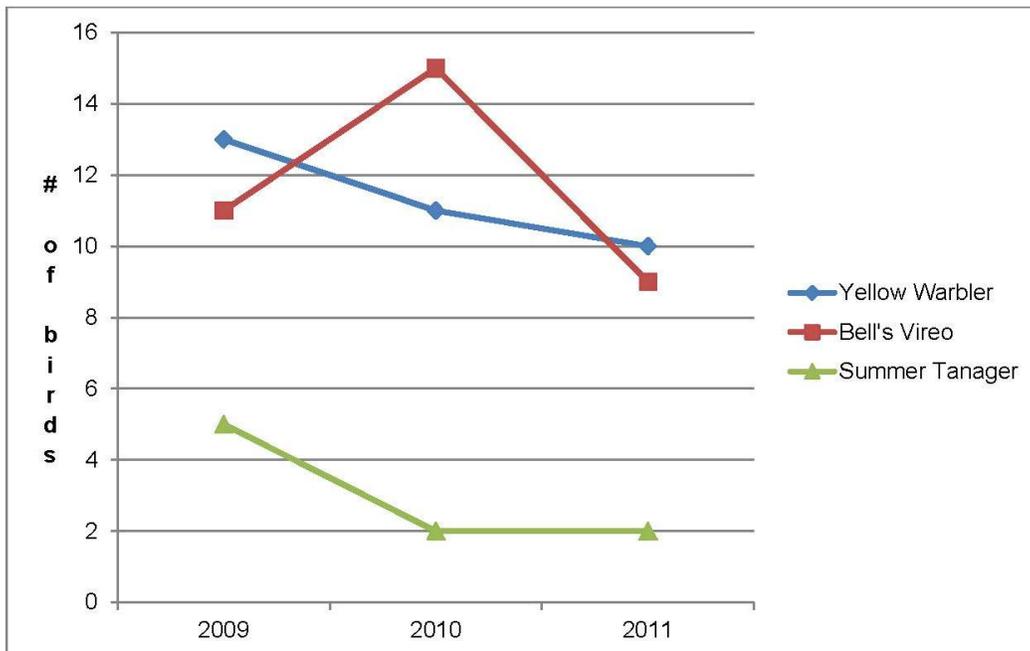


Figure 11.—Total number of individual birds captured or re-sighted at the BERS site.

For the first time at the CIBO site, a Gila woodpecker, an LCR MSCP covered species, was captured. This may reflect the maturity and age of the cottonwood-willow habitat at the site, as this species is a cavity nester and known to nest in cottonwood-willow habitat (Corman and Wise-Gervais 2005). The trees at the CIBO site may have attained sufficient age to facilitate the excavation of cavities for species such as the Gila woodpecker. No other LCR MSCP covered species were captured at the CIBO site; however, a yellow warbler was recaptured at the CVCA site that was originally captured at the CIBO site in 2010. Yellow warblers were also heard singing at the site beginning May 3 until June 21. This indicates that both sites are connected for this species, and it may be reaching the point where the CIBO and CVCA sites are close enough and large enough to effectively become one site for the metapopulation of this species in this area. This could mean that both sites benefit from the other in terms of production for yellow warblers, and perhaps other, LCR MSCP covered species.

At CVCA, several interesting results were derived from the first year of banding at this site. Many Lucy's warblers were captured at the site; however, it is unlikely that they were breeding there potentially due to a small number of mature mesquite at the site and the dates of capture for most of the Lucy's warblers. Lucy's warblers are generally associated with mesquite habitat on the LCR and breed beginning in early April, peaking in May and declining steeply in June (Great Basin Bird Observatory 2010; Corman and Wise-Gervais 2005). All captures of Lucy's warblers occurred from June 15 to July 27 at the CVCA site,

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and many birds showed brood patches of four or five, indicating females in post-nesting status. When looking at the value of this site, and other sites such as BERS, for some early breeding species it is important to not only focus on breeding, but also on use throughout the entire summer. The restoration sites may provide an important role for these species, as they feed and prepare for migration after breeding takes place. The true value for a certain early breeding species may not be evident if based strictly on surveys during the breeding period, but programs such as MAPS provide additional insight into the value the restoration sites can provide to birds both during breeding and post-breeding.

Another point of interest in the capture data at the CVCA site is the captures of summer tanager at the site. This is the first year summer tanagers have been confirmed at the CVCA site (Great Basin Bird Observatory 2010). Two birds were captured, and a male was heard singing throughout the season, strongly indicating that at least one pair of birds was resident and possibly breeding. This demonstrates that the CVCA site may be attracting more LCR MSCP covered species as the trees at the site mature.

The role that non-passive capture techniques played in the overall results for the LCR MSCP covered species increased in 2011 and provided additional data, especially at the BERS site. The number of Bell's vireo at the BERS site passively captured was only three, and if only the passive numbers were available, the data might suggest a decline in numbers. However, when all target captures and re-sights are included, the total number of birds was nine, indicating a decline of one from the previous year. Yellow warblers, Bell's vireos, and summer tanagers were detected and re-sighted into late September at the BERS site, providing valuable insight into the length of time these covered species remain at the site. The combination of the three techniques should provide more reliable numbers for LCR MSCP species.

There is a low number of captures for juvenile birds for both the Bell's vireo and the yellow warbler, and it is unclear why. One possible reason is that the trees at the restoration sites have increased in height to the point that the nets may not be high enough to capture some birds that remain in the upper canopy. In order to address this possible issue, stacked nets of double or triple height will be put into all three sites in 2012, which will increase the total amount of net length by two 12-m nets, from 120 m to 144 m. Next year, the success of these higher nets will be evaluated.

LITERATURE CITED

- Bibby, C.J., N.D. Burgess, and D.A. Hill. 1992. *Monitoring Bird Populations*. Academic Press Inc., San Diego, CA.
- Bureau of Reclamation (Reclamation). 2003. *Habitat Restoration on the Lower Colorado River Demonstration Projects: 1995–2002*. U.S. Department of the Interior, Lower Colorado Regional Office, Bureau of Reclamation. Boulder City, NV.
- _____. *Lower Colorado River Multi-Species Conservation Plan*. 2010. *Beal Riparian and Marsh Restoration Development and Monitoring Plan: Overview*, March 2010. Bureau of Reclamation, Boulder City, NV.
- Corman, T.E. and C. Wise-Gervais (Eds.). 2005. *The Arizona Breeding Bird Atlas*. UNM Press.
- DeSante, D.F., K.M. Burton, P. Velez, D. Froehlich, and D. Kaschube. 2010. *Maps Manual 2010 Protocol instructions for the establishment and operation of constant-effort bird-banding stations as part of the monitoring avian productivity and survivorship (MAPS) program*. The Institute for Bird Populations. Point Reyes Bird Observatory, Bolinas, CA.
- Dodge, C. and J. Kahl. *Bird banding summary for the 2008–09 seasons*. 2009. Report for the Lower Colorado River Multi-Species Conservation Program. Boulder City, NV.
- _____. *Bird banding summary for the 2009–10 seasons*. 2011. Report for the Lower Colorado River Multi-Species Conservation Program. Boulder City, NV.
- Fleishman, E., D.D. Murphy; T. Floyd; N. McDonal, and J. Walters. 2002. *Characterization of riparian bird communities in a Mojave Desert watershed*. *Great Basin Birds* 5(1), pp. 38–44.
- Great Basin Bird Observatory. 2010. *Annual Report on the Lower Colorado River Riparian Bird Surveys, 2009*. Annual report submitted to the Bureau of Reclamation as part of Grant No. 07SF300004. Great Basin Bird Observatory, Reno, NV.
- Kus, B. 2002. *Least Bell's Vireo (Vireo bellii pusillus)*. In *The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California*. California Partners in Flight. http://www.prbo.org/calpif/htmldocs/species/riparian/least_bell_vireo.htm

**Summary Report of MAPS and Targeted Bird Banding
at LCR MSCP Restoration Sites in 2011**

- Latta, S.C. and J. Faaborg. 2001. Winter site fidelity of prairie warblers in the Dominican Republic. *The Condor*: Vol. 103, No. 3, pp. 455–468.
- _____. 2002. Demographic and population responses of Cape May warblers wintering in multiple habitats. *Ecology*:83(9), pp. 2502–2515.
- National Geographic Society. 1999. Field guide to the birds of North America, Third edition. National Geographic Society, Washington D.C. 457 p.
- Nur, N., S.L. Jones, and G.R. Geupel. 1999. A statistical guide to data analysis of avian monitoring programs. U.S. Department of the Interior, U.S. Fish and Wildlife Service, BTP-R6001-1999, Washington, D.C.
- Powell, B.F. and R.J. Stiedl. 2000. Nesting habitat and reproductive success of southwestern riparian birds. *The Condor*:102:823–831.
- Pyle, P. 1997. Identification guide to North American birds. Slate Creek Press, Bolinas, CA.
- Ralph, C.J., G.R. Geupel, P. Pyle, T.E. Martin, and D.F. DeSante. 1993. Handbook of field methods for monitoring landbirds. U.S. Department of Agriculture, Gen. Tech. Rep Report PSW-GTR-144. Pacific Southwest Research Station, Albany, CA.
- Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Iñigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, and T.C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology, Ithaca, NY.
- Rosenberg, K.V., R.D. Ohmart, W.C. Hunter, and B.W. Anderson. 1991. Birds of the Lower Colorado River Valley. The University of Arizona Press. Tucson, AZ. 416 p.
- Sibley, D.A. 2000. The Sibley guide to birds. Alfred A. Knopf, New York.
- U.S. Fish and Wildlife Service (USFWS). 1997. Biological and conference opinion on lower Colorado operations and maintenance - Lake Mead to southerly international border. Biological opinion issued to the Bureau of Reclamation.
- _____. 2009. Cibola National Wildlife Refuge. <http://www.fws.gov/southwest/refuges/CibolaNWR/index.html>. Accessed in April 2009.

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: _____

