Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Bird Banding Summary Report for the 2009–2010 Seasons

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

November 2011

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Lower Colorado River
Multi-Species Conservation Program

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ACRONYMS AND ABBREVIATIONS

BERS	Beal Lake Riparian Restoration Area
CIBO	Cibola National Wildlife Refuge Nature Trail
GBBO	Great Basin Bird Observatory
ha	hectare(s)
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
MAPS	Monitoring Avian Survivorship and Productivity
Reclamation	Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service

Symbols

%	percent

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ABSTRACT

Bird banding was conducted at two restoration sites: Beal Lake Riparian Restoration Area and Cibola National Wildlife Refuge Nature Trail, as part of monitoring efforts conducted by the Lower Colorado River Multi-Species Conservation Program. Banding was conducted in two separate seasons: the winter season of 2009-2010 and the 2010 summer Monitoring Avian Survivorship and Productivity season. Three species that are covered under the program, the yellow warbler (*Dendroica petechia*), Bell's vireo (*Vireo bellii*), and summer tanager (*Piranga rubra*), were color banded when captured. These three species were also target captured when passive capture was not possible. A total of 351 individual birds were captured in the winter season, and 383 individual birds were captured in the summer season. There were a total of 25 species that were captured in both seasons.

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, 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 bird banding stations at various locations along the LCR since 2000. Originally, Reclamation operated MAPS summer banding stations, and in 2003, winter banding operations were added. Currently, both summer MAPS and winter banding operations are conducted at two sites for 10 months of the year.

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. Specifically, the banding program addresses the LCR MSCP conservation measures for the yellow warbler (*Dendroica petechia*) (CM 5.7.20.2-YWAR1), Bell's vireo (*Vireo bellii*) (CM 5.7.19.2 – BEVI1), 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-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. 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

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 (CIBO). 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 is located on the Beal Lake Riparian Restoration Area (BERS) on the Havasu National Wildlife Refuge between Beal Lake and Topock Marsh, approximately 5 miles (8 kilometers) northwest of the town of Topock, Arizona. The site, originally used for demonstration and experimentation, 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, and willow and is 107 acres (43.3 ha) in size.

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

METHODS

Banding was conducted in two separate seasons: the 2010 MAPS summer breeding season and the 2009–2010 winter season. The protocols for each season were slightly different, and some analyses were only appropriate for one of the two banding seasons.

Nets were set up ½ hour after sunrise and were open for 6 hours unless conditions, such as wind or temperature, exceeded protocol limits. Nets were checked every 30–50 minutes. The protocol includes six banding periods of 2 consecutive days, once a month, from October to March. 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 species and hummingbirds, for permit reasons. 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, 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).

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.

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 towards the individual bird capture total. The scientific names for all species captured can be found in attachment 1.

MAPS

During the summer season, the MAPS stations were run once during every 10-day period between May 4 and August 4, for a total of 10 banding periods. Established protocol for MAPS station operations was used at all times (DeSante et al. 2010). Nets were set up 1/2 hour before sunrise, and closed 5 hours later, or when the temperature exceeded 100 degrees Fahrenheit (37.8 degrees Celsius). The nets were checked every 30 to 50 minutes depending on the temperature.

At the CIBO site, nine 12-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 in the mesquites (figure 1).

Figure 1.—Photo of the CIBO banding site with net lanes.
Net lanes in red were added for winter banding.

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

mix, but these areas are now a mix of cottonwood, Goodding's willow, coyote willow, and honey mesquite. The two 6-m nets were located in an area dominated by honey mesquite (figure 2).

Figure 2.—A photograph of the BERS site with net lanes.
Net lanes in red were added for winter banding.

Winter Banding

In 2009-2010, banding began in October and continued through March. Banding during the winter utilized the same net lanes as were used during the MAPS summer season, with additional nets being added. At each site, the equivalent of two12-m nets were added to expand the area sampled into locations that were not normally shaded well enough to allow banding during the summer. At the CIBO site, one additional net was added, and two existing 6-m nets were expanded to 12 m in length.

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. This effort continued in the summer of 2010. 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 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 were 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, targeted 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 winter and 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. Analyses were conducted separately for each season (MAPS 2010, winter 2009–2010) unless otherwise stated.

Survivorship (Annual Return)

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. At the CIBO site, the number of recaptures of covered species is not sufficient to allow a value to be calculated.

Capture Rate

The birds per net hour capture rate was compared across all years of banding for each individual site and between sites for each of the MAPS and winter banding seasons. A quantile-comparison plot was used to determine if the capture data were normally distributed. In most cases, the data were found to be non-parametric, so in order to maintain a consistent approach, all data were analyzed using non-parametric methods. At each site, data were compared using the overall capture rates for each year, and also as a separate analysis, between the same banding periods from each year. A Kruskal-Wallace Rank Sum Test was used for this analysis.

Banding sites were compared using the capture rates for each species of resident bird that were captured for the entire banding season. Comparisons were conducted for each season (MAPS or winter) separately. A Wilcoxon Signed Rank Test was used to compare the capture rates between sites.

Site Persistence

Site persistence is calculated as a percent of birds captured within one banding period and subsequently recaptured during a later banding period within the same season (Latta and Faaborg 2001, 2002). Winter site persistence is used as an index measure of habitat suitability for wintering birds. Some species are considered resident birds and stay in the area year round. If these birds were banded in a previous season, but not a previous year, they were included as birds exhibiting winter site persistence rather than being separated into a different category. If an individual had been recaptured from a previous year and then recaptured again during that same season, then it would be counted as both an annual return as well as a within season (inter-period) return.

Productivity

Productivity was calculated as a proportion of hatch year birds (born during the year of capture) to adult birds. Productivity was calculated for LCR MSCP species with sufficient captures (at least 10).

RESULTS

Following are the results from the 2010 MAPS summer season and the 2009-2010 winter banding seasons. All data were recorded in the field, entered, and quality

checked in MAPSPROG and then compiled in Excel. All statistical analyses were done using the programs R (v. 2.9.2) and PAST (v. 2.03). All capture totals are summarized below.

Summer MAPS Season

At the CIBO site, a total of 199 individuals were captured, and of those, 132 were resident birds. Captures were comprised of 181 new captures and 33 recaptures. The capture rate was 0.43 for all birds and 0.28 for resident birds. There were 33 species captured, and 18 were resident species.

At the BERS site, a total of 184 individuals were captured, and of those, 155 were resident birds. The captures were comprised of 171 new captures and 25 recaptures. The capture rate was 0.44 for all birds and 0.37 for resident birds. The percentage of each species' captures is shown below (figures 3 and 4).

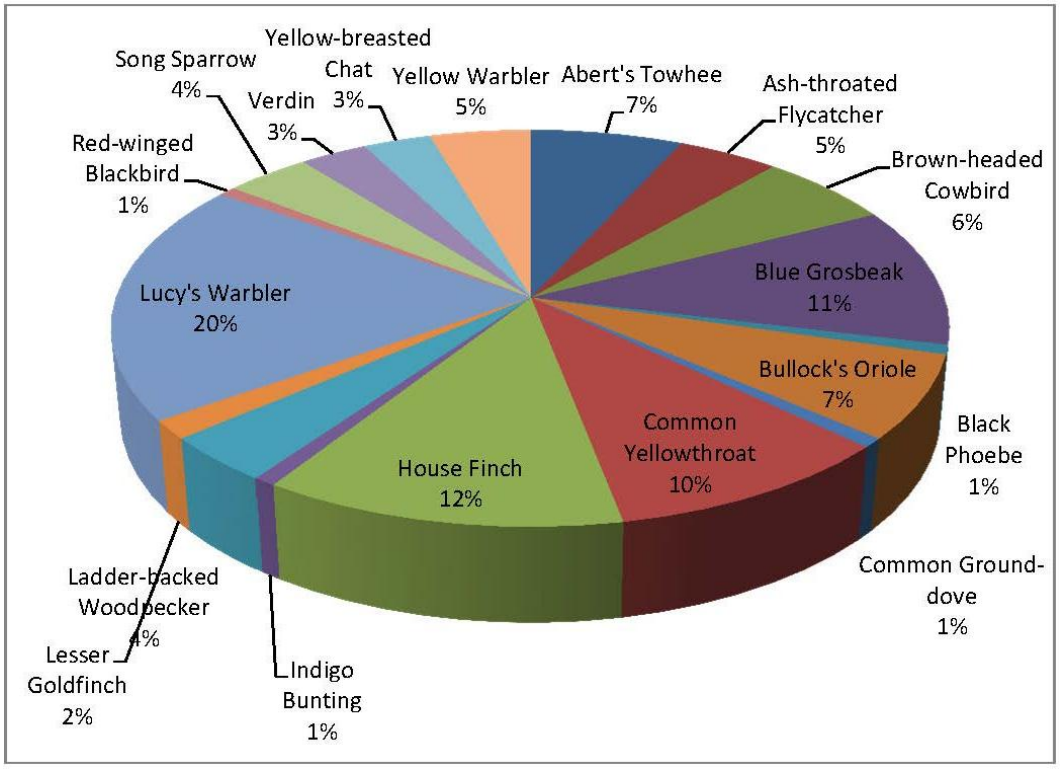

Figure 3.—Resident bird species captured and relative abundance at the CIBO site.

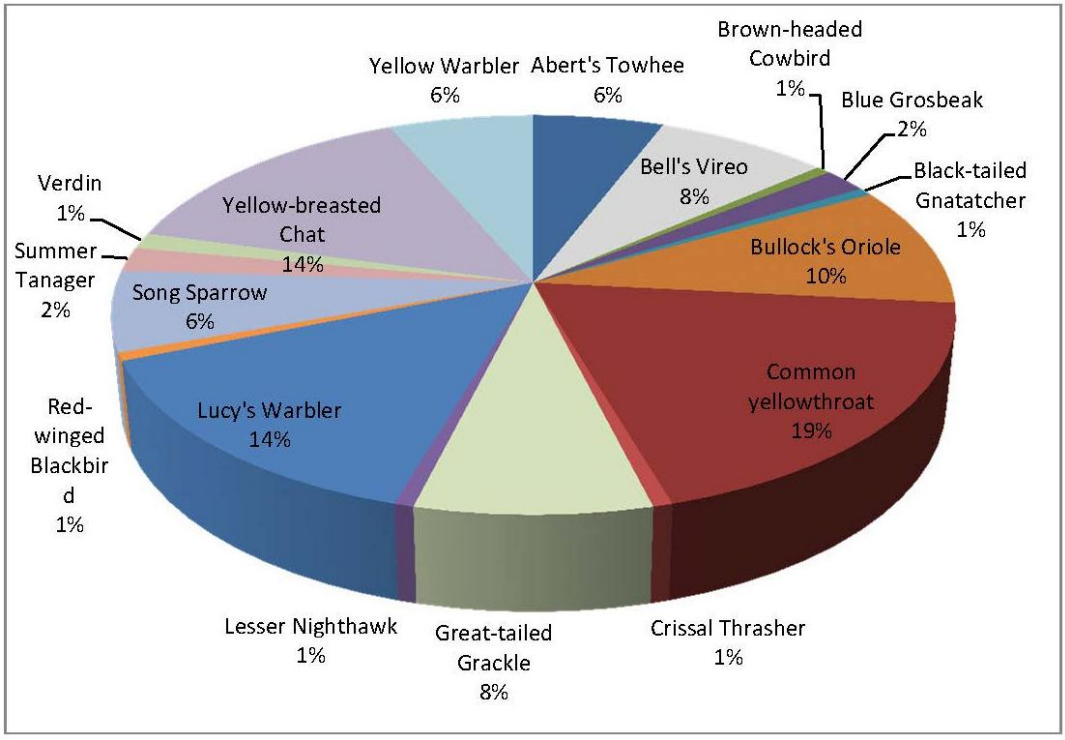

Figure 4.—Resident bird species captured and relative abundance at the BERS site.

Data were compiled across years at both sites. Banding began at the CIBO site in 2003 and at the BERS site in 2009. Figure 5 diagrams the yearly capture rate for both sites across all years. For both the BERS and CIBO sites, capture rates were compared across years for each resident bird species. At the CIBO site, a Kruskal-Wallace Rank Sum Test was used to compare yearly differences in capture rate. No significant difference was found in capture rates between years through 2010 (K-W $\chi^2 = 6.77$, $p = 0.45$). At the BERS site, 2 years of data were compared for capture rates using a Wilcoxon Signed Rank test, and no significant difference was found ($p = 0.17$).

The capture rates of resident birds between the BERS and CIBO sites were compared using a Wilcoxon Signed Rank test. No significant difference was found ($p = 0.84$). In 2009, the difference between the two sites was also not significant ($p = 0.06$).

Winter Banding

At the CIBO site, a total of 169 individual birds were captured, and there were 161 new captures and 25 recaptures. The capture rate was 0.23, and a total of 28 species were captured.

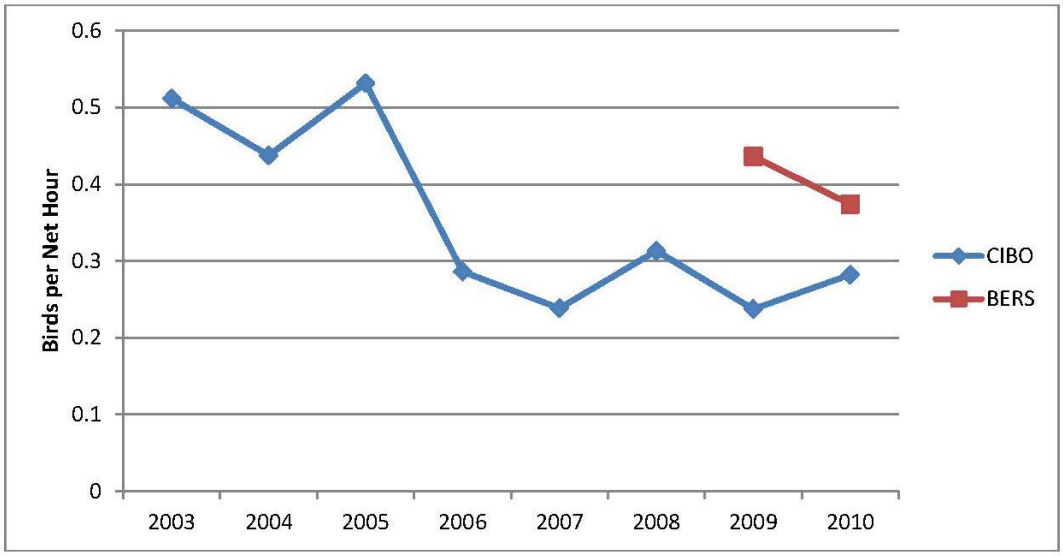

Figure 5.—Capture rate of resident individual birds for each year at each site.

At the BERS site, a total of 182 individual birds were captured, and there were 182 new captures and 30 recaptures. The capture rate was 0.33, and a total of 18 species were captured. The percentage of each species' captures is shown below (figures 6 and 7).

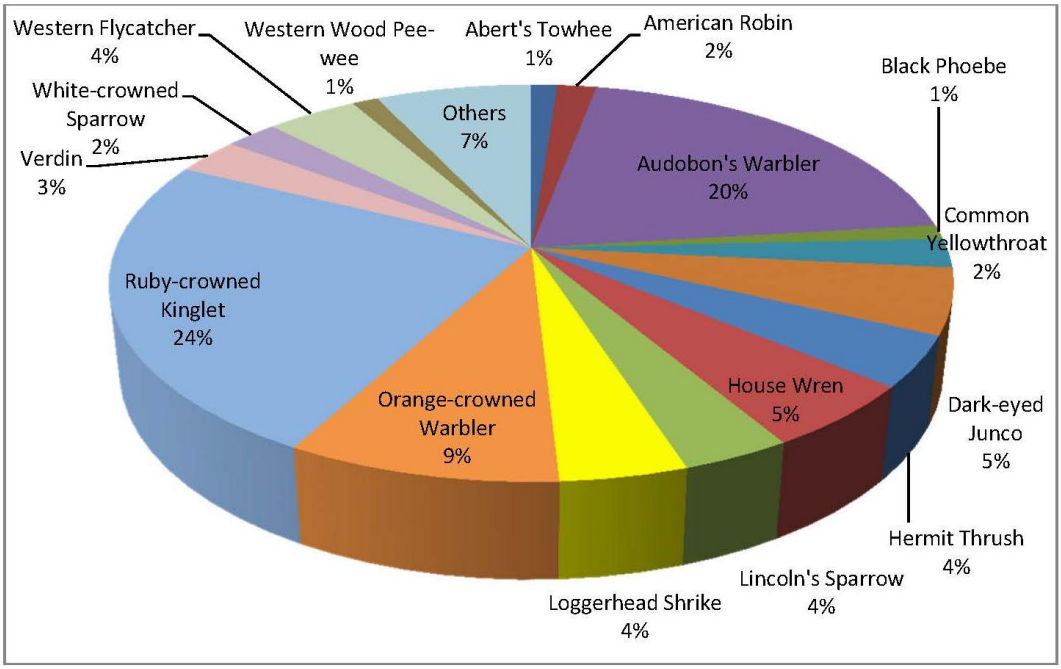

Figure 6.—Bird species captured and relative abundance for the winter at the CIBO site.

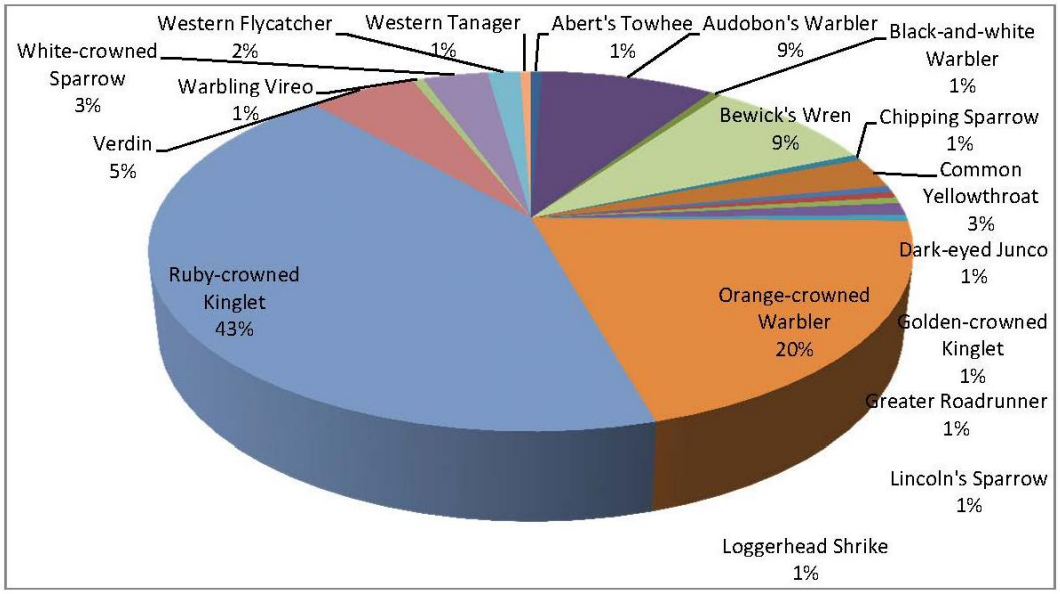

Figure 7.—Bird species captured and relative abundance for the winter at the BERS site.

Data were compiled across all years at both sites. Banding began in 2003 at the CIBO site and in 2009 at the BERS site. Figure 8 diagrams the yearly birds per net hour rate for all sites across all years.

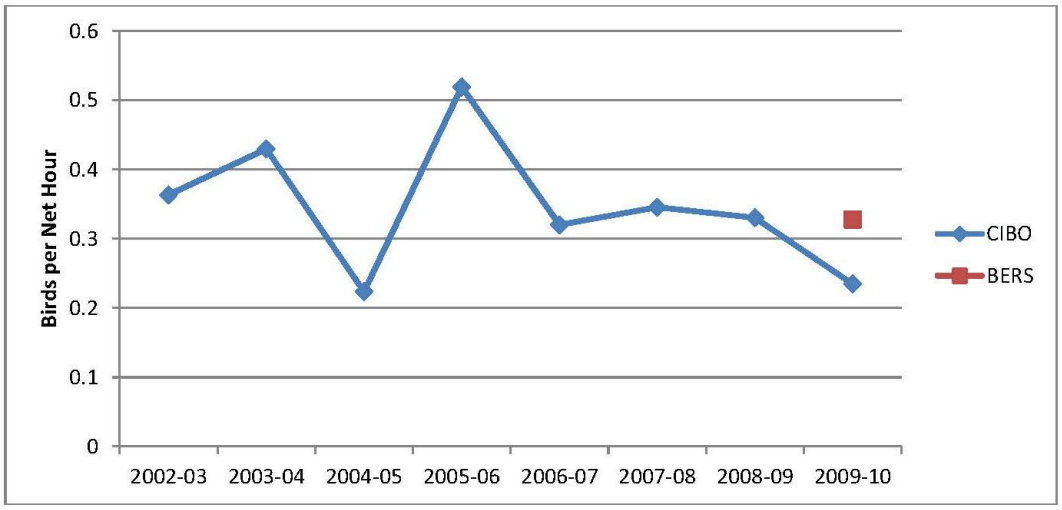

Figure 8.—Capture rate of individual birds for each year at each site.

Capture rates at the CIBO site for each year of winter banding were compared using a Kruskal-Wallace Rank Sum Test. No significant difference was found between years (K-W $\chi^2 = 2.77$, $p = 0.91$). Only 1 year of data exists for the BERS site; therefore, no across-year comparisons were possible.

The CIBO and BERS sites were compared for capture rates between species using the 2009-2010 data. A Wilcoxon Signed Rank Test was used to compare sites as a whole to the others using capture rates for individual species. No significant difference was found ($p = 0.44$).

Summer-Winter Comparison

Capture rates were calculated across years at the CIBO site and graphed for comparison (figure 9). In the graph, the year represents the year MAPS banding took place and the year the last one-half of the winter banding was conducted (e.g., the 2002–03 season would be listed as 2003).

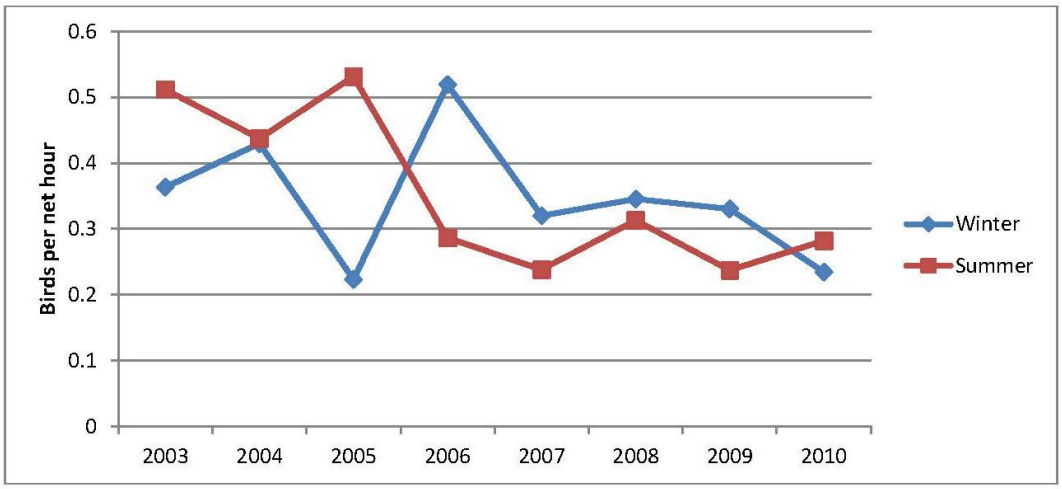

Figure 9.—Comparison of capture rates between summer and winter banding seasons at the CIBO site.

Annual Return Rate

The annual return rate for all species with at least 10 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.

Summer MAPS Season

At the CIBO site, three species experienced both more than 10 captures and annual return captures. At the BERS site, 7 species experienced both more than 10 captures and at least 1 annual return recapture. Tables 1 and 2 summarize the number of total individuals captured at each site per season, the number of annual return recaptures, and the annual return rate for each species.

Table 1.—Annual return rates for all species with more than 10 captures and LCR MSCP covered species at the CIBO site

Species	Individuals	Annual return	%
Blue grosbeak	15	2	13.3
Common yellowthroat	13	1	7.7
Lucy's warbler	26	3	11.5
Yellow warbler	6	2	33.3

Table 2.—Annual return rates for all species with more than 10 captures and LCR MSCP covered species at the BERS site

Species	Individuals	Annual return	%
Bell's vireo	13	2	15.4
Bullock's oriole	15	1	6.7
Common yellowthroat	29	1	3.4
Lucy's warbler	22	2	9.1
Song sparrow	10	2	20.0
Summer tanager	3	1	33.3
Yellow-breasted chat	22	1	4.5
Yellow warbler	15	6	40.0

Winter Season

The 2009–2010 winter banding season was the first season in which winter banding was conducted at the BERS site, so no annual returns were possible. At the CIBO site, orange-crowned warbler and ruby-crowned kinglet were the only species with more than 10 individual captures that had any annual return recaptures (table 3). Other species with annual return captures included black phoebe, common yellowthroat, and Lincoln's sparrow.

Table 3.—Annual return rates for all species with more than 10 captures at the CIBO site

Species	Individuals	Inter-period recapture	%
Orange-crowned warbler	15	1	6.7
Ruby-crowned kinglet	41	4	9.8

Site Persistence

The site persistence rate was calculated for any species that had at least one recapture, or re-sight occurrence in a different banding period than that of its original capture, but within the same banding season. Tables 4 and 5 summarize the site persistence rates for each location and season.

Summer MAPS Season

Table 4.—Site persistence for all species with more than 10 captures and LCR MSCP covered species at the CIBO site

Species	Individuals	Inter-period recaptures	%
Common yellowthroat	13	1	7.7
Lucy's warbler	26	1	3.8
Yellow warbler	6	3	50.0

Table 5.—Site persistence for all species with more than 10 captures and LCR MSCP covered species at the BERS site

Species	Individuals	Inter-period recaptures	%
Bell's Vireo	12	2	16.7
Common yellowthroat	29	1	3.4
Lucy's warbler	22	1	4.5
Song sparrow	10	2	20.0
Summer tanager	3	1	33.3
Yellow warbler	10	1	10.0

Winter Season

At the BERS site, only one species was recaptured in a different period than that of its original capture. For ruby-crowned kinglets, 78 individuals were captured, and 9 were recaptured in different banding periods, for a persistence rate of 11.5%. The site persistence data for the CIBO site are summarized in table 6.

Table 6.—Site persistence for all species with more than 10 captures during winter banding at the CIBO site

Species	Individuals	Inter-period recapture	%
Orange-crowned warbler	15	1	6.7
Ruby-crowned kinglet	41	4	9.8

Productivity

No hatch year yellow warblers have been captured in the last 2 years. No Bell's vireos have been captured at the CIBO site. Summer tanagers were captured at the BERS site, but total captures were less than 10. Table 7 summarizes the productivity for Bell's vireo at the BERS site.

Table 7.—Productivity of Bell's vireo at the BERS site

	2009	2010	All
Juvenile	7	2	9
Adult	5	13	18
Productivity	1.40	0.15	0.50

Color Banding and LCR MSCP Covered Species

Color banding of covered species has been conducted for the past two MAPS seasons at both sites. Table 8 summarizes the number of birds color banded in 2010. Figure 10 shows captures of yellow warblers and Bell's vireos at the CIBO site over 8 years of banding.

Table 8.—Results of color banding effort in 2010

(Shown are results for number of individuals newly color banded, captured using targeted effort, recaptured, and re-sighted.)

Species	Site	Total new	Target	Recaptured	Re-sights
Yellow warbler	BERS	7	0	1	6
Yellow warbler	CIBO	4	0	1	1
Yellow warbler	CVCA[1]	1	1	0	0
Bell's vireo	BERS	11	3	3	1
Summer tanager	BERS	2	0	1	1

[1] Cibola Valley Conservation Area.

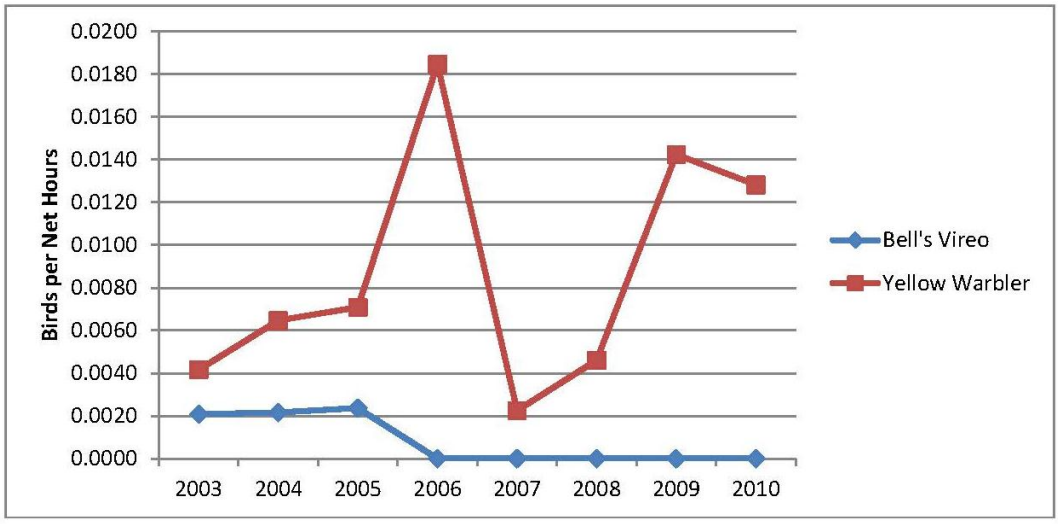

Figure 10.—Capture rates of yellow warblers and Bell's vireo at the CIBO site per year.

DISCUSSION

The addition of the BERS site to the MAPS and winter banding program has added considerable data on LCR MSCP species and general avian use of mixed habitat types. Specifically, the 2 years of MAPS banding have greatly increased the amount of data on yellow warblers and Bell's vireo, and to a lesser extent, summer tanager. The number of birds that can be captured at the site may allow for more indepth analysis of covered species' demographics, as the sample size may be sufficient to analyze productivity and survivorship for these species. More data will be needed before survivorship based on a capture/recapture models can be calculated for either the yellow warbler or Bell's vireo. A minimum of 3 years of data, but preferably 4, would be needed to calculate survivorship using only the passive capture numbers. If the color re-sight data are also used, 5 years of data would be needed. After the 2012 MAPS season, a preliminary survivorship analysis will be conducted using BERS data and for all MAPS data. It may be necessary to collect more than 4 years of data to be able to properly calculate survivorship, but after the 2012 season, the preliminary analysis will give an idea of how many more years of data will be needed.

Survivorship was calculated using annual return rates. This is a simple way of calculating survivorship, and with the re-sight data, more data are available at the BERS site than at any other site in previous years. The number of birds using the BERS site, and the inclusion of re-sight data that added six birds to the annual return numbers, allow for a sample size at the site that may give a more reliable annual return rate. The annual return rate of 40% for yellow warblers is a fairly high number considering that these birds are short lived and some captured birds may be migrants, and do not return. The rate of 15% for the Bell's vireo is low, and it will remain to be seen if this was only a 1-year event or if this value will

remain low in subsequent years. Bell's vireos are known to have very high site fidelity, oftentimes nesting in the same bush or tree every year (Kus 2002). More birds were detected in 2010 than in 2009 by the Great Basin Bird Observatory (GBBO) intensive bird surveys conducted at the site, and the site has a very high density of Bell's vireo (GBBO 2010). It will remain to be seen what population numbers do at the site and if birds captured in 2010 return in 2011.

Productivity for the BERS site was calculated for Bell's vireo and yellow warblers. Yellow warblers had a value of 0, and for Bell's vireo, productivity declined substantially in 2010 as compared to 2009. In both cases, it is hard to determine if the low productivity rates are the result of actual low production or if hatch year birds are more difficult to capture. In the case of the yellow warbler, it may be that juvenile birds are more difficult to capture given the low capture rates in 2010. Target capture techniques in 2011 should focus on these birds. The use of triple-high nets may allow increased capture success of juvenile birds that fly above the height of normal nets and are not likely to come down lower in response to call playback (due to lack of territoriality). Similar techniques may also help increase captures of hatch year Bell's vireo.

Yellow warblers at the CIBO site increased slightly from 2009. However, many of the birds captured in 2009 were likely migrants and were not seen again after their capture. More nesting pairs were present at the site in 2010. This is based both on re-sighted birds and on intensive surveys conducted by GBBO where the number of territories increased from two to five (GBBO 2010). No Bell's vireos were captured at the CIBO site in 2010.

The greatest value that the data from the CIBO site provides is that it is the longest continuous data set available on bird use of a restoration site for the LCR MSCP. The 8 years of data demonstrate the fairly stable use of the site by the bird community. The capture rates have experienced highs and lows, but when graphed for the entire 8-year period, show no trends of increase or decrease. This would indicate that the overall number of birds has remained at a steady rate over the period banding has been conducted at the site. This is the case both for summer and winter banding. This may not be entirely expected, as some changes in vegetation have occurred at the site. The site was originally dominated by Johnson grass and honey mesquite, and over the years, willow baccharis has moved in and become co-dominant with the Johnson grass and mesquite. This may indicate that vegetation cover and density are driving bird numbers and not the species composition of the vegetation.

Another notable observation is the overall similarity between winter and summer capture rates. In some years, the values for one season may be higher than the other, but overall, there is no trend showing higher capture rates or diversity from one season to the next. There were years in which one season had higher captures than the other, but no one season consistently had higher captures. While very

few species are captured commonly in both the summer and winter, the number of birds captured and the number of species are comparable between the two seasons over 8 years of banding.

Data gathered through the 2010 seasons will be used to focus banding efforts in 2011. Winter banding will not continue in 2011 due to time and budget constraints, but a third banding station will be added to Cibola Valley Conservation Area. Attempts will be made to increase captures of juvenile yellow warblers. Triple-high nets will be used with target banding for the first time, thus allowing capture of birds higher in the canopy. Yellow warblers often forage in the higher canopy layer, and younger birds may be targeted more effectively with higher nets.

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ATTACHMENT 1

All Species of Birds Caught at Each Site, Per Season, and Their Scientific Names

BERS site MAPS season

Abert's towhee	*Pipilo aberti*
Bell's vireo	*Vireo bellii*
Black-and-white warbler	*Mniotilta varia*
Black-tailed gnatatcher	*Polioptila melanura*
Blue grosbeak	*Passerina caerulea*
Brown-headed cowbird	*Molothrus ater*
Bullock's oriole	*Icterus bullockii*
Common yellowthroat	*Geothlypis trichas*
Crissal thrasher	*Toxostoma crissale*
Great-tailed grackle	*Quiscalus mexicanus*
Lesser nighthawk	*Chordeiles acutipennis*
Lucy's warbler	*Vermivora luciae*
Macgillivray's warbler	*Opornis tolmiei*
Nashville warbler	*Vermivora ruficapilla*
Red-winged blackbird	*Agelaius phoeniceus*
Ruby-crowned kinglet	*Regulus calendula*
Song sparrow	*Melospiza melodia*
Summer tanager	*Piranga rubra*
Swainson's thrush	*Catharus ustulatus*
Verdin	*Auriparus flaviceps*
Western flycatcher	*Empidonax difficilis/occidentalis*
Western tanager	*Piranga ludoviciana*
Wilson's warbler	*Wilsonia pusilla*
Yellow warbler	*Dendroica petechia*
Yellow-breasted chat	*Icteria virens*

CIBO site MAPS season

Abert's towhee	*Pipilo aberti*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Black phoebe	*Sayornis nigricans*
Blue grosbeak	*Passerina caerulea*
Brown-headed cowbird	*Molothrus ater*
Bullock's oriole	*Icterus bullockii*
Cassin's vireo	*Vireo cassinii*
Common ground-dove	*Columbina passerina*
Common yellowthroat	*Geothlypis trichas*
Dusky flycatcher	*Empidonax oberholseri*
Hammond's flycatcher	*Empidonax hammondii*
House finch	*Carpodacus mexicanus*
Indigo bunting	*Passerina cyanea*
Ladder-backed woodpecker	*Picoides scalaris*
Lesser goldfinch	*Carduelis psaltria*
Lucy's warbler	*Vermivora luciae*
Macgillivray's warbler	*Opornis tolmiei*
Mountain white-crowned sparrow	*Zonotrichia leucophrys oriantha*
Northern waterthrush	*Seiurus noveboracensis*
Orange-crowned warbler	*Vermivora celata*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Song sparrow	*Melospiza melodia*
Swainson's thrush	*Catharus ustulatus*
Verdin	*Auriparus flaviceps*
Warbling vireo	*Vireo gilvus*
Western flycatcher	*Empidonax difficilis/occidentalis*
Western tanager	*Piranga ludoviciana*
Western wood pee-wee	*Contopus sordidulus*
Willow flycatcher	*Empidona trailii*
Wilson's warbler	*Wilsonia pusilla*
Yellow warbler	*Dendroica petechia*
Yellow-breasted chat	*Icteria virens*

BERS site winter season

Abert's towhee	*Pipilo aberti*
Audobon's warbler	*Dendroica coronata*
Bewick's wren	*Thyromanes bewickii*
Black-and-white warbler	*Mniotilta varia*
Chipping sparrow	*Spizella passerina*
Common yellowthroat	*Geothlypis trichas*
Dark-eyed junco	*Junco hyemalis*
Golden-crowned kinglet	*Regulus satrapa*
Greater roadrunner	*Geococcyx californianus*
Lincoln's sparrow	*Melospiza lincolnii*
Loggerhead shrike	*Lanius ludovicianus*
Orange-crowned warbler	*Vermivora celata*
Ruby-crowned kinglet	*Regulus calendula*
Verdin	*Auriparus flaviceps*
Warbling vireo	*Vireo gilvus*
Western flycatcher	*Empidonax difficilis/occidentalis*
Western tanager	*Piranga ludoviciana*
White-crowned sparrow	*Zonotrichia leucophrys*

CIBO site winter season

Abert's towhee	*Pipilo aberti*
American robin	*Turdus migratorius*
Anna's hummingbird	*Calypte anna*
Audobon's warbler	*Dendroica coronata*
Bell's vireo	*Vireo bellii*
Black phoebe	*Sayornis nigricans*
Black-throated grey warbler	*Dendroica nigrescens*
Common yellowthroat	*Geothlypis trichas*
Crissal thrasher	*Toxostoma crissale*
Dark-eyed junco	*Junco hyemalis*
Dusky flycatcher	*Empidonax oberholsen*
Fox sparrow	*Passerella illiaca*
Green-tailed towhee	*Pipilo chlorurus*
Hermit thrush	*Catharus guttatus*
House wren	*Troglodytes aedon*
Lincoln's sparrow	*Melospiza lincolnii*
Loggerhead shrike	*Lanius ludovicianus*
Macgillivray's warbler	*Oporornis tolmiei*
Marsh wren	*Cistothorus palustris*
Orange-crowned warbler	*Vermivora celata*
Red-naped sapsucker	*Sphyrapicus nuchalis*
Ruby-crowned kinglet	*Regulus calendula*
Spotted towhee	*Pipilo maculatus*
Verdin	*Auriparus flaviceps*
Western flycatcher	*Empidonax difficilis/occidentalis*
Western wood pee-wee	*Contopus sordidulus*
White-crowned sparrow	*Zonotrichia leucophrys*
Wilson's warbler	*Wilsonia pusilla*

ATTACHMENT 2

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

[1] Capture types are: NCP = New capture passive; NCT = New capture target; RCP = Recapture passive; RCT = Recapture target; and N = Nestling.