# 2006 FIELD INVENTORY OF BREEDING BIRDS AT SEVEN RIPARIAN SITES IN CIBOLA AND SANDOVAL COUNTIES, NEW MEXICO

Submitted To:

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Riparian corridors provide important habitat for breeding birds in arid regions of the western United States. Between 1996 and 2001, the Bureau of Land Management (BLM), Albuquerque Field Office, established annual breeding bird surveys at seven riparian sites in Cibola and Sandoval Counties, New Mexico. We continued point count surveys in 2006 to evaluate how local conditions might affect detection rates and species richness. Detection rates and species richness were fairly consistent among the sites. Although dominated by exotic vegetation (i.e., saltcedar, *Tamarix* spp., and Russian olive, *Elaeagnus angustifolia*), Lost Valley and San Ysidro detection rates and species richness were comparable to sites containing native vegetation. The dense vegetation structure at Lost Valley and San Ysidro is perhaps responsible for the occurrence of numerous riparian species, including Willow Flycatcher (*Empidonax trailii*) during four of the last six years at San Ysidro. As in 2005, detection rates were relatively low at Senorito Creek and Wilson Canyon. These sites also contained exotic vegetation, but they lacked the dense vegetation structure featured by Lost Valley and San Ysidro. Low detection rates and the apparent decline of key riparian species are perhaps indications that any benefits of restoration projects at Senorito Creek and Wilson Canyon have not been realized for birds. We encourage BLM to continue restoration efforts at Senorito Creek and Wilson Canyon, while maintaining vegetation structure at the other sites. We recommend continued monitoring of bird populations at all sites. Although our power to detect meaningful population differences is limited by the size of the sites, detection rates and species richness information, especially for riparian species, can continue to provide an indication of how local conditions affect populations.

# INTRODUCTION

Riparian corridors provide important habitat for breeding birds in arid regions of the western United States (Knopf and Samson 1994). Although western riparian areas occupy less than one percent of the landscape, many support more breeding bird species than surrounding upland habitats (Knopf et al. 1988, Gates and Giffen 1991, Powell and Steidl 2000). Some species, such as the federally endangered Southwestern Willow Flycatcher (*Empidonax traillii extimus*) depend on quality riparian habitat for their continued existence (Sedgwick 2000). Because riparian areas provide breeding habitat for many bird species, and some depend on riparian areas for their continued existence, it is important to maintain or improve them to the best possible condition.

Management of riparian areas for birds is complicated by numerous competing land uses and environmental concerns. Grazing, recreation, water diversion, urban settlement, and exotic vegetation might affect breeding bird populations in riparian areas by changing the quality of habitat or by disrupting breeding activities (Szaro 1980, Knopf et al. 1988, Krueper 1993, Rich 2002). For example, riparian areas dominated by exotic vegetation (e.g., salt cedar, *Tamarix* spp.) often support fewer bird species than native riparian areas (Ellis 1995, Anderson et al. 1977, Cohan et al. 1978). The Southwestern Willow Flycatcher is strongly associated with the presence of water (Sedgwick 2000); therefore, lack of precipitation, or diversion of water away from a site, could impact abundance and distribution of this species, and others. Monitoring sites with a diversity of vegetation types and structure, as well as differences in water flow, can provide information on how local conditions affect bird populations, including riparian species and other species of conservation interest.

The Bureau of Land Management (BLM), Albuquerque Field Office, established annual breeding bird surveys at seven riparian sites in Cibola and Sandoval Counties, in central New Mexico. In 1996, we began conducting annual point count surveys at three of the sites (Rito Leche, Senorito Creek, and San Ysidro). We began monitoring the other four sites (Wilson Canyon, Bluewater Canyon, Lost Valley and Rinconada Canyon) between 1997 and 2001. These sites varied greatly in water flow, vegetation type (i.e., native or exotic), and vegetation structure (e.g., density). Because these sites are small, allowing only 5-12 survey points each, point count surveys provide little power for comparing abundance among sites or determining meaningful temporal changes. By supplementing a measure of abundance (i.e., detection rates) with species richness data, especially riparian indicators, we can improve our ability to evaluate site quality. For example, the appearance of Southwestern Willow Flycatcher at a site could indicate an improvement in conditions for riparian birds; the loss of one or more key riparian species at a site could indicate deteriorating conditions. Here, we report avian abundance and species richness at the seven sites in 2006, and identify potential patterns in the data during the last six years (2001-2006). Information on avian abundance and species richness will improve BLM's understanding of how local riparian conditions affect bird populations on the lands they manage.

Objectives In Brief:

- Determine detection rates for birds at seven riparian sites
- Identify riparian indicator species and temporal changes in occurrence

## STUDY AREA

We conducted surveys at Bluewater and Rinconada Canyons in Cibola County, New Mexico, and at Lost Valley, Rito Leche, San Ysidro, Senorito Creek, and Wilson Canyon in Sandoval County, New Mexico (Fig. 1). We qualitatively summarize the vegetation and hydrologic conditions at each site below in Table 1.

Table 1. Qualitative summary of vegetation and water flow conditions at seven Bureau of Land Management riparian sites in Cibola and Sandoval Counties, New Mexico.

| | Vegetation | | Water Flow | |
|---|---|---|---|---|
| Site | Type | Density | 2005 | 2006 |
| Bluewater Canyon | Native | Medium | High | Medium |
| Lost Valley | Exotic | High | Medium | Low |
| Rinconada Canyon | Native | Medium | Medium | Low |
| Rito Leche | Native | Medium | Medium | Very Low |
| San Ysidro | Exotic | High | Medium | Low |
| Senorito Creek | Exotic | Low | Medium | Very Low |
| Wilson Canyon | Exotic | Low | Medium | Very Low |

*Bluewater Canyon*

We surveyed 12 points along approximately 4 km of Bluewater Creek, northwest of Grants, New Mexico, and south of Interstate 40 (Fig. 1). The creek flows through a narrow, steep-walled canyon and is lined with native vegetation. Riparian vegetation was dominated by coyote willow (*Salix exigua*), narrowleaf cottonwood (*Populus angustifolia*), cliffrose (*Cowania mexicana*), candelabra cholla (*Opuntia imbricata*), rubber rabbitbrush (*Chrysothamnus nauseosus*) and juniper (*Juniperus* spp.). Willow patches were dense in places, but relatively narrow (≤10 m wide). Beavers (*Castor canadensis*) have reduced the number of standing cottonwoods. Although there are some annual and seasonal fluctuations, water flow in the creek through Bluewater Canyon is

more consistent than at the other six sites. Excessive water flow, and associated safety concerns, restricted access to some of the survey points during 2001. Water flow was also relatively high in 2005; however, we managed to access all survey points during that year. Water flow was moderate in all other years, including 2006.

*Lost Valley*

Lost Valley included two separate sections covering approximately 2.5 km of the Rio Puerco, near San Luis, New Mexico (Fig. 1). The first seven survey points were located in the northern section, and the last three points were located in the southern section, about 2 km southwest of section one. Points were originally established in 1998 along the riverbank at the bottom of the Lost Valley canyon. Because high water flow or deep mud hindered access in some years, we relocated the survey points to the top of the canyon adjacent to riparian vegetation in 2001. We surveyed from the top of the canyon from 2001-2006. Riparian vegetation was mostly exotic, including dense stands of saltcedar and Russian olive (*Elaeagnus angustifolia*), as well as patches of Fremont cottonwood (*P. fremonti*), and willow (*Salix* spp.). Water levels in the Rio Puerco fluctuated greatly, particularly within monitoring seasons. In most years, including 2006, water was present during at least part of the avian breeding season, with a reduction as the season advanced. In 2002 and 2004, the Rio Puerco was completely dry during the entire monitoring season.

*Rinconada Canyon*

We began surveys at Rinconada Canyon in 2001. Rinconada Canyon included

five survey points along approximately 1 km of Rinconada Creek, about 5 km northwest of Acomita, New Mexico (Fig. 1). Management boundaries prevented the establishment of more than five points. Like Bluewater Canyon, Rinconada Canyon contained mostly native vegetation with at least some water flow. Some of the creek is typically dry with subterranean flow. Unlike all other sites, vegetation at Rinconada Canyon was dominated by alder (*Alnus* spp.), ponderosa pine (*Pinus ponderosa*), pinyon pine (*P. edulis*), and juniper.

*Rito Leche*

The Rito Leche site included five survey points, along approximately 1 km of the Rito Leche, about 1.5 km east of Cuba, New Mexico (Fig. 1). Management boundaries prevented the establishment of more than five points. Rito Leche contained mostly native riparian vegetation. Dominant vegetation along the streambed included willow, cottonwood, and New Mexico locust (*Robinia neomexicana*), whereas the surrounding upland was dominated by sage (*Artemisia* spp.) and four-winged saltbush (*Atriplex canescens*). There was a broad-leaved cattail (*Typha latifolia*) marsh in the uppermost section of the stream. Beavers have gradually reduced the number of live trees at the site. Water flowed in the Rio Puerco at this site during most years, but the site was relatively dry in 2006.

*San Ysidro*

San Ysidro included seven survey points along approximately 1.5 km of the Rio Salado, about 1 km before it empties into the Jemez River, near San Ysidro, New Mexico

(Fig. 1). San Ysidro contained considerable exotic vegetation. Half of the survey route was along the Perea Nature Trail, which was dominated by Russian olive and saltcedar. The western portion of the survey area was situated in a marsh area dominated by bulrush and Russian olive. Beavers have created dams in the upstream portions of the creek in at least three locations, altering water flow into the marsh. Although there is usually moderate water flow during the spring, this is followed by reduced flow in the Rio Salado and little saturated soil in the marsh by the time surveys are conducted in June. After a year of relatively high water levels in 2005, the marsh area was mostly dry in 2006.

*Senorito Creek*

The Senorito Creek site included ten survey points along approximately 2.5 km of Senorito Creek, immediately east of the confluence with the Rio Puerco, south of Cuba, New Mexico (Fig. 1). The creek flowed through a steep arroyo, similar to nearby Rito Leche. Senorito Creek contained mostly exotic saltcedar; however, much of the saltcedar was dead after an herbicide treatment was applied in 1998. As a result, relatively little live riparian vegetation remained at Senorito Creek. The surrounding upland habitat was dominated by greasewood (*Sarcobatus vermiculatus*). As in 2003 and 2004, there was little or no water at the site in 2006.

*Wilson Canyon*

We began surveys at Wilson Canyon in 1997. This site included ten survey points along approximately 2 km of the Rio Puerco, about 10 km south of Cuba, New Mexico (Fig. 1). Wilson Canyon contained mostly exotic vegetation, including saltcedar and

Russian olive. Willows and cottonwoods also were present and allowed to regenerate inside two elk exclosures along the riverbank. Upland vegetation adjacent to the river consisted primarily of greasewood. As with other sites along the Rio Puerco (Rito Leche, Senorito Creek, and Lost Valley), water flow was greatly reduced in 2006, relative to the wet year of 2005.

## METHODS

We conducted point count surveys (see Bibby et al. 2000) at each of the seven sites (59 points) twice in June (a total of 12 survey mornings). We surveyed Rito Leche and Wilson Canyon during the same mornings because of their close proximity and the small size of Rito Leche. Consecutive surveys at a site were separated by at least two weeks. For example, we surveyed at Bluewater Canyon on 12 and 26 June 2006.

We established most survey points at 250 m intervals along the riparian corridors of each site. Some of the points at Lost Valley, San Ysidro, and Wilson Canyon were established at closer intervals. We visited the same points for every survey at a site. Points were marked with flagging tape, described in printed directions, and assigned Universal Transverse Mercator (UTM) coordinates (North American Datum 27) (Appendix 1), to assist with relocation.

A surveyor, experienced with avian identification by sight and sound, hiked to each point and recorded all birds seen or heard for five minutes while standing at the point. Observers recorded birds at all distances and noted separately any birds flying overhead. We used three or four observers per year. We used the same observer for all surveys at San Ysidro from 2002-2006. Another observer conducted all surveys at

Senorito Creek, Rito Leche, and Wilson Canyon from 2003-2006. Bluewater Canyon, Lost Valley, and Rinconada Canyon were surveyed by a different observer each year. Observers began each survey within a half-hour after sunrise and concluded within four hours.

We used detection rates as a measure of avian abundance. We calculated detection rates for each survey point (i.e., point detection rates) by adding the number of birds observed at a point during a given year and dividing by the number of surveys conducted at the point (usually two). For measuring detection rates, we used birds at any distance but did not include flyovers. We also excluded Cliff Swallows (*Petrochelidon pyrrhonota*), because unpredictable flocks of 100 or more birds skewed the data. These flocks were almost always associated with canyon walls rather than riparian vegetation. We calculated annual detection rates for each site by adding the point detection rates in a given year and dividing by the number of points at a site. We present detection rates as birds per point with 95% confidence intervals. We did not calculate annual detection rates for all sites combined, because we considered that sites varied substantially. Also, some points were close enough to other points to allow individual birds to be observed at multiple points. Because observations at these points were not necessarily independent, we removed from the detection rate analysis all points closer than 200 m from neighboring points. As a result, we calculated point detection rates for only 5 of the 10 Lost Valley points, 4 of the 7 San Ysidro points, and 5 of the 10 Wilson Canyon points. We used all points at the remaining four sites.

We determined detection rates and species richness for riparian species, using classifications provided by the Bureau of Land Management (1998). BLM identified

species that might be indicators of riparian habitat condition. They defined riparian obligates as species for which >90% of their abundance occurs within riparian habitat during the breeding season, or which place >90% of their nests in riparian vegetation (Bureau of Land Management 1998). BLM defined riparian dependents as species for which 60-90% of their abundance occurs in riparian habitat during the breeding season, or which place 60-90% of their nests in riparian vegetation (Bureau of Land Management 1998). For example, they list Willow Flycatcher as a riparian obligate, and suggest that this species will not likely occur in an area if riparian vegetation is in poor ecological condition. They list Blue Grosbeak (*Guiraca caerulea*) as a riparian dependent, and suggest that this species might occur if riparian vegetation is seriously degraded, but that populations would be reduced. We calculated site-specific annual detection rates for riparian species in the same way that we calculated the rate for all species; however, for riparian species, we only included observations of riparian obligates and dependents. We identify all riparian obligates and dependents encountered from 2001-2006 (Appendix 2), and determine which sites had the highest or lowest riparian species richness in 2006.

## RESULTS

In 2006, we observed similar detection rates among sites (Fig. 2); however, detection rates were slightly lower at Bluewater Canyon (6.4 birds/point ± 0.9), Senorito Creek (6.0 ± 1.2), and Wilson Canyon (3.9 ± 1.8) than at the other four sites (range 7.2 – 9.5). Detection rates averaged over the six-year period of 2001-2006 show the same pattern among sites, with Bluewater Canyon and Senorito Creek slightly lower, and Wilson Canyon considerably lower, than the other four sites. We observed no obvious

temporal trends in detection rates at any site from 2001-2006. In 2005 (Hawks Aloft 2005), we suggested that negative trends might have been occurring at Lost Valley, San Ysidro, Senorito Creek, and Wilson Canyon. Detection rates increased slightly at these sites in 2006, perhaps stabilizing any short-term declines that may have been occurring.

Detection rates for riparian species were highest at Bluewater Canyon (1.6 riparian birds/point ± 0.4), Rito Leche (1.4 ± 1.3), and San Ysidro (3.0 ± 1.2) in 2006 (Fig. 3). As in 2005, we observed relatively low detection rates for riparian species at Senorito Creek (0.4 ± 0.3) and Wilson Canyon (0.4 ± 0.4). Although riparian detection rates were typically high at Lost Valley and Rinconada Canyon from 2001-2005, the rates in 2006 (0.6 ± 0.6 at Lost Valley and 0.4 ± 0.6 at Rinconada Canyon) were lower than usual and comparable to Senorito Creek and Wilson Canyon. At Lost Valley, we recorded few Yellow-breasted Chats (*Icteria virens,* N=3) and Bullock's Orioles (*Icterus bullockii,* N=1) in 2006, compared to averages of 7.6 and 9.0 at the site for chats and orioles, respectively, from 2001-2005. At Rinconada Canyon, we detected no Black-headed Grosbeaks (*Pheucticus melanocephalus* ) in 2006, after averaging 6.0 per year from 2001-2005.

Species richness was fairly consistent among sites in 2006 (average of about 24 species per site, Appendix 3), although slightly fewer species were recorded at Rito Leche (N=18), Senorito Creek (N=22), and Lost Valley (N=23). We observed a similar pattern of species richness among sites from 2001-2006 (Appendix 4); fewer species have been recorded at Senorito Creek (N=50) and Lost Valley (N=46) during the last six years, but Rito Leche is among the five remaining sites that have relatively high species richness (i.e., 57-59 species per site). For all sites combined, we observed 64 species in

2006 (Appendix 3), down from 72 in 2005, and less than any other year from 2001-2005.

In addition to having relatively low detection rates at Senorito Creek and Wilson Canyon, these sites also contained low riparian species richness. The two most likely riparian species at these sites, Blue Grosbeak and Yellow-breasted Chat, have been recorded with decreasing frequency over the last few years. Only one Yellow-breasted Chat was recorded at Senorito Creek in 2006, after the same observer recorded 11 in 2004 and 5 in 2005. At Wilson Canyon, the same observer recorded 29, 12, 9, and 7 Blue Grosbeaks in 2003, 2004, 2005, and 2006, respectively. Observations of Yellow-breasted Chats at Wilson Canyon have dropped from 9 to 1 during the same time period. Riparian species richness was highest for Bluewater Canyon and San Ysidro (N=9 species per site). For the second consecutive year, we observed Willow Flycatchers (3 individuals on 9 June) at San Ysidro. After not recording Black-chinned Hummingbirds or Cordilleran Flycatchers at any site for the first time in 2005, we observed a considerable number of each during 2006 (Appendix 3).

## DISCUSSION

With a few exceptions, detection rates and species richness were fairly consistent among sites in 2006. Numerous features could favor bird populations (Peterjohn et al. 1995), including the presence of native vegetation, consistent water flow, and dense vegetation structure. Although these sites offer different features, most of them offer at least one feature potentially favoring bird populations.

Researchers have suggested that riparian areas with native vegetation support more birds than riparian areas with exotic vegetation (e.g., Anderson et al. 1977, Cohan

et al. 1978, Ellis 1995). Annual detection rates from 2001-2006 were usually among the highest at Rinconada Canyon and Rito Leche, two sites with fairly consistent water flow and little or no saltcedar or Russian olive encroachment. At Bluewater Canyon, the other site with native riparian vegetation, detection rates were relatively low during some years, including 2006. Detection rates at Bluewater Canyon were perhaps regulated by the habitat and the terrain; the narrow line of vegetation between the sheer canyon walls resulted in a small sampling area at each point, relative to other sites. Detection rates might be further limited at Bluewater Canyon by the difficulty detecting subtle vocalizations over the sound of swift, flowing water. Although the Bluewater Canyon detection rate was modest in 2006, we observed the highest species richness and riparian species richness at this site. From 2001-2006, all three sites with native vegetation scored among the highest in total species richness.

Lost Valley and San Ysidro contained a substantial amount of exotic vegetation and inconsistent water flow, yet detection rates and species richness (especially for riparian species) were comparable to the sites with native vegetation. The redeeming feature of Lost Valley and San Ysidro might be the large size of patches and the high density of the vegetation (Powell and Steidl 2000, 2002). Exotic riparian vegetation is suitable for some species, because it simulates the dense structure of native vegetation (Fleishman et al. 2003). Perhaps because of the dense vegetation, we observed a small number of Willow Flycatchers during four of the last six years at San Ysidro, as well as in 2005 at Lost Valley. Restoring water flow into the marsh at San Ysidro and excluding cattle from riparian vegetation at both San Ysidro and Lost Valley might improve occupancy of these sites by Willow Flycatchers, including the federally endangered

subspecies. At Lost Valley, the apparent drop for two riparian species, Bullock's Oriole and Yellow-breasted Chat, is noteworthy and should be investigated in future seasons.

As in 2005, we observed low detection rates, especially for riparian species, at Senorito Creek and Wilson Canyon. The apparent reduction in Blue Grosbeak and Yellow-breasted Chat observations in the last few years at Senorito Creek and Wilson Canyon is reason for concern. Like Lost Valley and San Ysidro, Senorito Creek and Wilson Canyon lack native vegetation and consistent water flow. Unlike Lost Valley and San Ysidro, however, Senorito Creek and Wilson Canyon also lack dense vegetation structure. Riparian restoration projects have been attempted at both sites, but our observations indicate that benefits to the avian community have not been realized. Riparian restoration projects that kill or remove exotic vegetation probably will not improve avian abundance and species richness until that vegetation structure is replaced. Where exotic vegetation has been controlled at Senorito Creek and Wilson Canyon, detection rates and species richness might remain low until native vegetation replaces the structure of the treated vegetation. We encourage BLM to be mindful of apparently low avian abundance at Senorito Creek and Wilson Canyon, and not abandon efforts to improve the quality of those sites.

We recommend that BLM continue to monitor bird populations at all sites. Although our power to detect meaningful population differences is limited by the size of our sites, detection rates and species richness information, especially for riparian species, can provide an indication of how local conditions affect populations. Our ability to quantify the abundance of birds could be improved by adding two fields to our point count data in 2007: one separating upland and riparian observations and another

indicating distances of birds from survey points. The ability to easily separate and remove upland observations from an analysis would provide a more accurate evaluation of riparian conditions. Recording distances would allow us to estimate densities, a truer measure of abundance than detection rates.

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Figure 1. Location of Bureau of Land Management breeding bird survey sites in Cibola and Sandoval Counties, New Mexico in 2006.

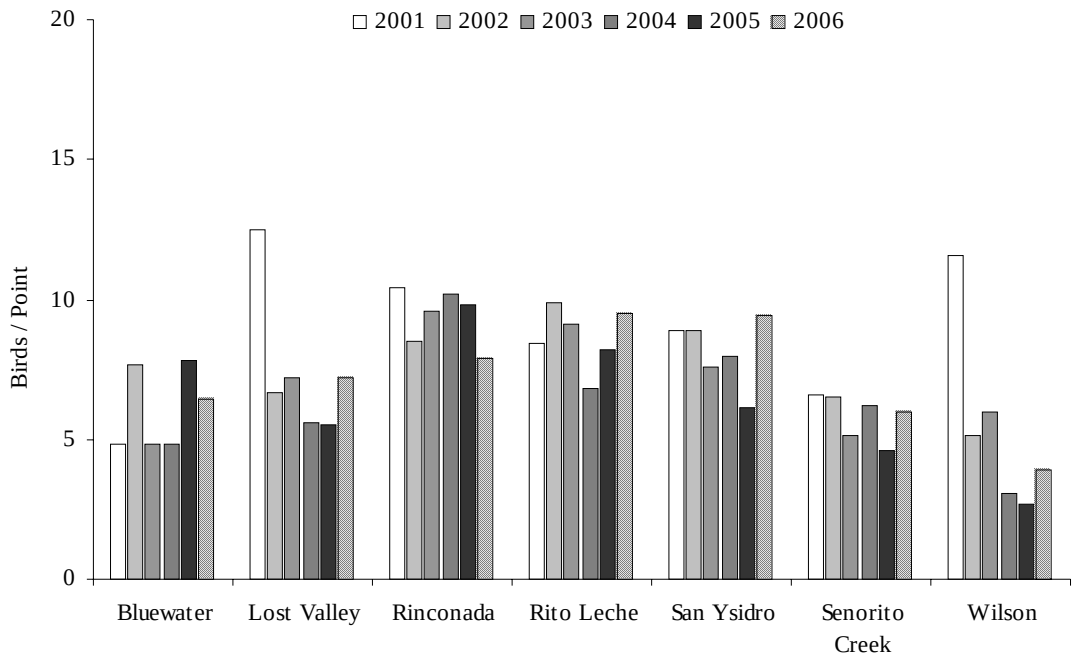


Figure 2. Annual detection rates (birds/point) for breeding bird point count surveys at seven Bureau of Land Management sites in Cibola and Sandoval Counties, New Mexico from 2001-2006.

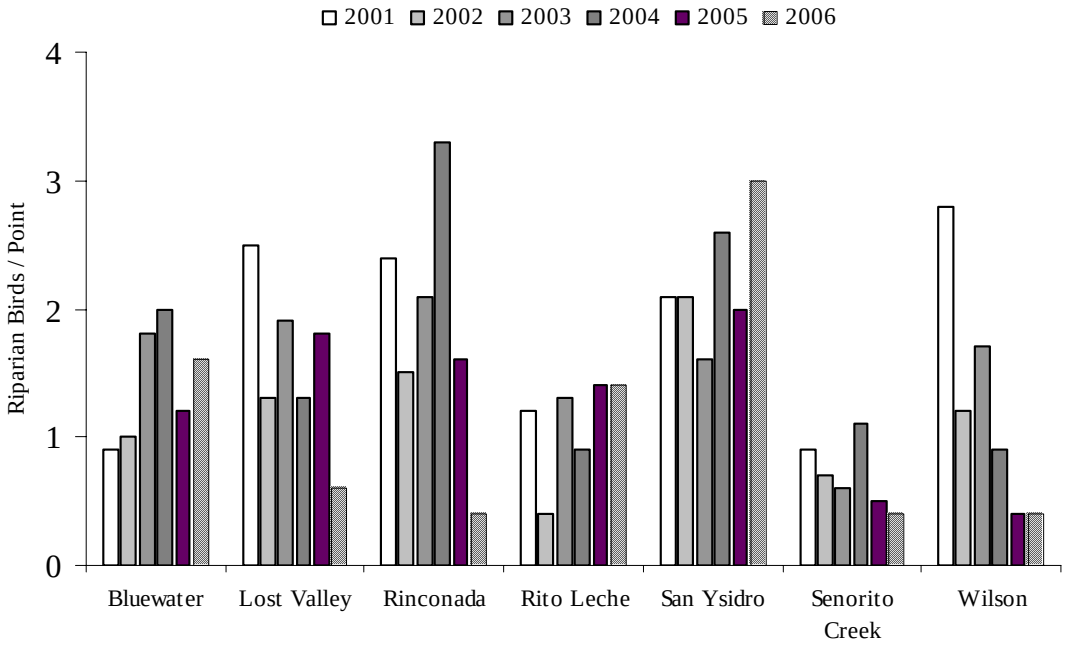


Figure 3. Annual detection rates (riparian birds/point) for riparian obligate and dependent species at seven Bureau of Land Management sites in Cibola and Sandoval Counties, New Mexico from 2001-2006.

Appendix 1. Universal Transverse Mercator coordinates (North American Datum 27) of point count surveys at Bluewater Canyon (BC), Lost Valley (LV), Rinconada Canyon (RC), Rito Leche (RL), San Ysidro (SY), Senorito Creek (SE), and Wilson Canyon (WC), New Mexico from 2001-2006.

| Site | Point | Easting | Northing |
|---|---|---|---|
| BC | 1 | 770561 | 3909401 |
| BC | 2 | 770355 | 3909552 |
| BC | 3 | 770199 | 3909666 |
| BC | 4 | 770296 | 3909808 |
| BC | 5 | 770054 | 3909861 |
| BC | 6 | 769971 | 3910102 |
| BC | 7 | 769732 | 3910048 |
| BC | 8 | 769534 | 3909932 |
| BC | 9 | 769348 | 3909999 |
| BC | 10 | 769130 | 3909881 |
| BC | 11 | 768874 | 3909906 |
| BC | 12 | 768637 | 3909929 |
| LV | 1 | 313666 | 3948905 |
| LV | 2 | 313619 | 3948830 |
| LV | 3 | 313564 | 3948724 |
| LV | 4 | 313469 | 3948683 |
| LV | 5 | 313467 | 3948558 |
| LV | 6 | 313473 | 3948421 |
| LV | 7 | 313469 | 3948284 |
| LV | 9 | 310952 | 3946194 |
| LV | 10 | 311088 | 3946276 |
| LV | 11 | 310850 | 3946018 |
| RC | 1 | 257786 | 3893063 |
| RC | 2 | 257807 | 3893306 |
| RC | 3 | 257964 | 3893560 |
| RC | 4 | 258095 | 3893710 |
| RC | 5 | 258198 | 3893932 |
| RL | 1 | 325598 | 3987691 |
| RL | 2 | 325433 | 3987428 |
| RL | 3 | 325344 | 3987317 |
| RL | 4 | 325145 | 3987244 |
| RL | 5 | 324880 | 3987280 |
| SY | 1 | 338507 | 3934934 |
| SY | 2 | 338414 | 3935040 |
| SY | 3 | 338139 | 3935100 |
| SY | 4 | 337998 | 3935086 |
| SY | 5 | 337856 | 3935069 |
| SY | 6 | 337805 | 3935072 |
| SY | 7 | 337959 | 3935216 |
| SE | 1 | 322769 | 3979364 |
| SE | 2 | 322448 | 3979255 |
| SE | 3 | 322202 | 3978869 |
| SE | 4 | 322091 | 3978675 |
| SE | 5 | 322105 | 3978313 |
| SE | 6 | 321885 | 3978229 |
| SE | 7 | 321728 | 3978039 |
| SE | 8 | 321644 | 3977643 |
| SE | 9 | 321440 | 3977472 |
| SE | 10 | 321299 | 3977271 |
| WC | 1 | 321816 | 3972337 |
| WC | 2 | 321683 | 3972479 |
| WC | 3 | 321671 | 3972658 |
| WC | 4 | 321683 | 3972788 |
| WC | 5 | 321656 | 3972889 |
| WC | 6 | 321714 | 3972921 |
| WC | 7 | 321776 | 3972988 |
| WC | 8 | 321754 | 3973086 |
| WC | 9 | 321735 | 3973179 |
| WC | 10 | 321706 | 3973305 |

Appendix 2. List of riparian obligate and dependent species, as determined by the Bureau of Land Management (1998), observed during point count surveys at seven riparian sites in the Albuquerque, New Mexico Resource Area from 2001-2006.

| BLM Riparian Species | Designation | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|
| Bank Swallow | Dependent | 5 | - | - | - | - | - |
| Black-chinned Hummingbird | Dependent | 5 | 1 | 3 | 3 | - | 10 |
| Bewick's Wren | Dependent | 1 | 7 | 2 | 2 | 4 | 6 |
| Black-headed Grosbeak | Dependent | 1 | 6 | 11 | 18 | 8 | 5 |
| Blue Grosbeak | Dependent | 88 | 36 | 73 | 51 | 40 | 40 |
| Bullock's Oriole | Dependent | 18 | 9 | 5 | 8 | 10 | 5 |
| Cooper's Hawk | Dependent | 1 | 2 | - | - | 1 | - |
| Common Yellowthroat | Obligate | 4 | 2 | 5 | 2 | 3 | 2 |
| Cordilleran Flycatcher | Dependent | 3 | 5 | 5 | 4 | - | 8 |
| Gray Catbird | Dependent | - | - | 2 | - | 2 | - |
| House Wren | Dependent | 1 | - | - | - | - | - |
| Indigo Bunting | Dependent | - | - | 1 | - | 1 | - |
| Lazuli Bunting | Dependent | 7 | - | - | 2 | 2 | 3 |
| Lesser Goldfinch | Dependent | 14 | 11 | 20 | 23 | 5 | 10 |
| Lewis' Woodpecker | Dependent | 3 | 1 | 3 | - | - | 1 |
| MacGillivray's Warbler | Dependent | - | 1 | 2 | - | - | - |
| Red-naped Sapsucker | Dependent | - | 1 | - | 1 | - | - |
| Song Sparrow | Obligate | 1 | - | 1 | 6 | - | - |
| Summer Tanager | Obligate | - | 2 | - | - | - | - |
| Warbling Vireo | Dependent | 5 | - | 4 | - | 7 | - |
| Western Wood-Pewee | Dependent | 17 | 16 | 21 | 28 | 28 | 18 |
| Willow Flycatcher | Obligate | - | 2 | - | - | 4 | 3 |
| Wilson's Warbler | Obligate | 3 | 2 | 1 | 1 | 1 | - |
| Yellow Warbler | Obligate | - | - | - | 3 | - | 1 |
| Yellow-breasted Chat | Obligate | 43 | 18 | 30 | 41 | 38 | 23 |
| Number of Individuals | | 220 | 122 | 189 | 193 | 154 | 135 |
| Number of BLM Riparian Species | | 18 | 17 | 17 | 15 | 15 | 14 |

Appendix 3. List of 64 bird species observed during point count surveys at Bluewater Canyon (BC), Lost Valley (LV), Rinconada Canyon (RC), Rito Leche (RL), San Ysidro (SY), Senorito Creek (SE), and Wilson Canyon (WC), New Mexico in 2006. We include flyovers and birds detected at all distances.

| Species | BC | LV | RC | RL | SY | SE | WC | Total |
|---|---|---|---|---|---|---|---|---|
| American Crow | - | - | - | 14 | - | - | - | 14 |
| American Kestrel | - | 1 | - | - | 5 | 1 | - | 7 |
| American Robin | 2 | - | 2 | - | - | - | 1 | 5 |
| Ash-throated Flycatcher | 6 | 4 | 9 | 1 | 8 | - | 1 | 29 |
| Barn Swallow | - | - | - | 1 | - | - | 4 | 5 |
| Bewick's Wren | 1 | 5 | - | - | - | - | - | 6 |
| Black-chinned Hummingbird | 3 | - | 1 | - | 6 | - | - | 10 |
| Black-headed Grosbeak | 4 | - | - | - | 1 | - | - | 5 |
| Blue Grosbeak | 1 | 2 | - | 10 | 15 | 5 | 7 | 40 |
| Blue-gray Gnatcatcher | 1 | - | - | - | 1 | - | - | 2 |
| Brewer's Blackbird | - | - | - | 20 | - | - | - | 20 |
| Brewer's Sparrow | - | - | - | 9 | - | 19 | 15 | 43 |
| Broad-tailed Hummingbird | - | - | - | 3 | - | - | - | 3 |
| Brown-headed Cowbird | 1 | 6 | 3 | - | 12 | - | 1 | 23 |
| Bullock's Oriole | - | 1 | - | - | - | - | 4 | 5 |
| Bushtit | 11 | - | 4 | - | - | - | - | 15 |
| Canyon Wren | 8 | - | 2 | - | - | - | - | 10 |
| Cassin's Kingbird | - | 1 | 2 | - | 6 | - | - | 9 |
| Cassin's Sparrow | - | - | - | - | - | 4 | - | 4 |
| Chipping Sparrow | - | 2 | 5 | - | - | - | - | 7 |
| Cliff Swallow | 231 | 6 | 9 | - | 5 | - | 30 | 281 |
| Common Raven | - | 10 | 2 | 3 | - | 26 | 4 | 45 |
| Common Yellowthroat | - | - | - | - | 1 | 1 | - | 2 |
| Cordilleran Flycatcher | 8 | - | - | - | - | - | - | 8 |
| Dark-eyed Junco | - | - | 2 | - | - | - | - | 2 |
| Great Blue Heron | - | 1 | - | - | - | - | - | 1 |
| Green-tailed Towhee | - | - | - | 7 | - | 5 | 13 | 25 |
| House Finch | 6 | 50 | 4 | - | 3 | 1 | 23 | 87 |
| Juniper Titmouse | 3 | - | 7 | - | - | - | - | 10 |
| Killdeer | - | - | - | - | - | - | 1 | 1 |
| Ladder-backed Woodpecker | 1 | - | 1 | - | - | - | - | 2 |
| Lark Sparrow | - | 4 | - | - | 1 | 1 | 1 | 7 |
| Lazuli Bunting | - | - | - | - | 3 | - | - | 3 |
| Lesser Goldfinch | 7 | - | - | 2 | 2 | - | 1 | 12 |
| Lewis' Woodpecker | - | - | 1 | 1 | - | - | - | 2 |
| Mourning Dove | 6 | 1 | 7 | - | 9 | 2 | 1 | 26 |
| Northern Flicker | - | 1 | 1 | 5 | - | 1 | 5 | 13 |
| Northern Mockingbird | - | - | - | 2 | 27 | 10 | 7 | 46 |
| Northern Rough-winged Swallow | - | - | - | 4 | - | 2 | - | 6 |
| Pinyon Jay | 4 | 2 | 5 | - | - | 1 | - | 12 |

| Species | BC | LV | RC | RL | SY | SE | WC | Total |
|---|---|---|---|---|---|---|---|---|
| Plumbeous Vireo | 1 | - | 1 | - | - | - | - | 2 |
| Red-breasted Nuthatch | - | - | 1 | - | - | - | - | 1 |
| Red-tailed Hawk | 3 | - | - | - | - | - | - | 3 |
| Red-winged Blackbird | - | - | - | - | 7 | - | 4 | 11 |
| Rock Wren | 27 | 15 | 1 | - | - | 2 | 4 | 49 |
| Sage Sparrow | - | - | - | - | - | 1 | - | 1 |
| Say's Phoebe | - | 3 | - | 7 | 2 | 3 | 2 | 17 |
| Scaled Quail | - | - | - | - | 2 | - | - | 2 |
| Spotted Towhee | - | 29 | 2 | - | 5 | 2 | 2 | 40 |
| Turkey Vulture | - | - | - | - | - | - | 1 | 1 |
| Vesper Sparrow | - | - | - | 4 | - | 8 | 2 | 14 |
| Violet-green Swallow | 17 | - | - | - | 1 | 1 | - | 19 |
| Western Bluebird | - | - | 1 | 1 | - | - | - | 2 |
| Western Kingbird | - | - | - | - | - | - | 2 | 2 |
| Western Meadowlark | - | 6 | - | 17 | 3 | 31 | 3 | 60 |
| Western Scrub-Jay | - | - | - | - | - | - | 2 | 2 |
| Western Tanager | 3 | - | 6 | - | - | - | - | 9 |
| Western Wood-Pewee | 13 | 2 | 2 | - | 1 | - | - | 18 |
| White-throated Swift | 4 | 2 | - | - | - | - | - | 6 |
| White-winged Dove | - | - | - | - | 1 | - | - | 1 |
| Willow Flycatcher | - | - | - | - | 3 | - | - | 3 |
| Yellow Warbler | 1 | - | - | - | - | - | - | 1 |
| Yellow-breasted Chat | 3 | 4 | - | - | 15 | 1 | 1 | 24 |
| Yellow-rumped Warbler | 2 | - | 2 | - | - | - | - | 4 |
| Total Number of Individuals | 378 | 158 | 83 | 111 | 145 | 128 | 142 | 1145 |
| Total Number of Species | 28 | 23 | 26 | 18 | 26 | 22 | 27 | 64 |

Appendix 4. List of 118 bird species observed during point count surveys at Bluewater Canyon (BC), Lost Valley (LV), Rinconada Canyon (RC), Rito Leche (RL), San Ysidro (SY), Senorito Creek (SE), and Wilson Canyon (WC), New Mexico from 1996-2006. We include flyovers and birds detected at all distances.

| Species | BC | LV | RC | RL | SY | SE | WC | Total |
|---|---|---|---|---|---|---|---|---|
| Acorn Woodpecker | - | - | 5 | - | - | - | - | 5 |
| American Crow | - | 27 | | 45 | 47 | - | - | 119 |
| American Kestrel | 5 | 23 | 2 | 19 | 21 | 4 | 7 | 81 |
| American Robin | 14 | - | 7 | - | 1 | 5 | 25 | 52 |
| Ash-throated Flycatcher | 28 | 67 | 26 | 5 | 63 | 17 | 11 | 217 |
| Bank Swallow | - | 1 | - | - | - | 5 | 1 | 7 |
| Barn Swallow | - | - | - | 5 | - | 5 | 12 | 22 |
| Bewick's Wren | 1 | 19 | 1 | 2 | - | 2 | 6 | 31 |
| Black Phoebe | 23 | - | 2 | - | - | - | - | 25 |
| Black-billed Magpie | - | - | - | 2 | - | - | - | 2 |
| Black-chinned Hummingbird | 11 | - | 3 | - | 14 | - | 1 | 29 |
| Black-headed Grosbeak | 17 | 9 | 30 | - | 10 | 1 | - | 67 |
| Black-throated Gray Warbler | - | - | - | 7 | - | - | - | 7 |
| Black-throated Sparrow | - | - | - | 2 | - | 6 | 2 | 10 |
| Blue Grosbeak | 28 | 91 | 1 | 42 | 146 | 85 | 132 | 525 |
| Blue-gray Gnatcatcher | 1 | - | - | - | 2 | - | - | 3 |
| Blue-winged Teal | - | - | - | - | 2 | - | - | 2 |
| Brewer's Blackbird | - | - | - | 159 | 1 | 20 | 29 | 209 |
| Brewer's Sparrow | - | - | - | 43 | - | 170 | 95 | 308 |
| Broad-tailed Hummingbird | 9 | - | 3 | 7 | - | 3 | 2 | 24 |
| Brown-headed Cowbird | 26 | 37 | 14 | 12 | 75 | 16 | 27 | 207 |
| Bullock's Oriole | 2 | 90 | - | 20 | 6 | 2 | 5 | 125 |
| Bushtit | 70 | - | 7 | - | 4 | - | - | 81 |
| Canada Goose | - | - | - | - | 8 | - | - | 8 |
| Canyon Towhee | 4 | 4 | - | - | - | - | 1 | 9 |
| Canyon Wren | 61 | - | 7 | - | - | - | - | 68 |
| Cassin's Kingbird | 6 | 19 | 27 | 2 | 22 | 3 | 6 | 85 |
| Cassin's Sparrow | - | 1 | - | - | - | 6 | - | 7 |
| Chestnut-sided Warbler | 1 | - | - | - | - | - | - | 1 |
| Chipping Sparrow | 2 | 2 | 35 | - | - | - | 1 | 40 |
| Cinnamon Teal | - | - | - | - | 2 | - | - | 2 |
| Cliff Swallow | 1521 | 28 | 9 | 2 | 156 | 34 | 486 | 2236 |
| Common Grackle | - | - | - | 1 | - | - | - | 1 |
| Common Nighthawk | - | - | - | 1 | - | 2 | 1 | 4 |
| Common Raven | 26 | 52 | 6 | 28 | 8 | 47 | 25 | 192 |
| Common Yellowthroat | - | 4 | - | 1 | 38 | 1 | 3 | 47 |
| Cooper's Hawk | 2 | - | 1 | - | 1 | - | - | 4 |
| Cordilleran Flycatcher | 32 | - | 1 | - | 1 | - | - | 34 |
| Curve-billed Thrasher | - | - | - | - | 1 | - | - | 1 |
| Dark-eyed Junco | - | - | 2 | - | - | - | - | 2 |

| Species | BC | LV | RC | RL | SY | SE | WC | Total |
|---|---|---|---|---|---|---|---|---|
| Dusky Flycatcher | - | - | 1 | - | - | - | - | 1 |
| Eastern Kingbird | - | - | - | - | 1 | - | - | 1 |
| European Starling | - | - | - | 46 | 3 | - | 2 | 51 |
| Gambel's Quail | - | - | - | - | - | 1 | 1 | 2 |
| Golden Eagle | - | - | - | 1 | - | - | - | 1 |
| Grace's Warbler | - | - | 4 | - | - | - | - | 4 |
| Gray Catbird | 2 | - | - | - | 2 | - | - | 4 |
| Gray Flycatcher | - | - | 5 | - | - | - | - | 5 |
| Great Blue Heron | - | 1 | - | - | 1 | - | - | 2 |
| Greater Roadrunner | - | 1 | - | - | 1 | - | - | 2 |
| Green Heron | - | - | - | - | 1 | - | - | 1 |
| Green-tailed Towhee | - | - | - | 58 | - | 82 | 62 | 202 |
| Hairy Woodpecker | - | - | 4 | - | - | - | - | 4 |
| Hepatic Tanager | 5 | - | 8 | - | - | - | - | 13 |
| Horned Lark | - | 2 | - | 1 | - | 15 | - | 18 |
| House Finch | 110 | 98 | 11 | 2 | 43 | 6 | 69 | 339 |
| House Wren | 1 | - | - | - | - | - | - | 1 |
| Juniper Titmouse | 9 | - | 13 | - | - | - | - | 22 |
| Killdeer | - | - | - | 2 | 6 | 2 | 10 | 20 |
| Ladder-backed Woodpecker | 12 | - | 1 | - | - | 1 | - | 14 |
| Lark Sparrow | 2 | 29 | - | 3 | 5 | 19 | 12 | 70 |
| Lazuli Bunting | 3 | 5 | - | 5 | 9 | - | 1 | 23 |
| Lesser Goldfinch | 41 | 21 | 20 | 9 | 46 | 7 | 12 | 156 |
| Lewis' Woodpecker | - | - | 1 | 33 | - | - | - | 34 |
| Lincoln Sparrow | 1 | - | - | - | - | - | - | 1 |
| Loggerhead Shrike | - | 1 | - | - | - | 1 | - | 2 |
| Mallard | 8 | - | - | 4 | 17 | - | 2 | 31 |
| MacGillivray's Warbler | 2 | - | 2 | - | - | - | - | 4 |
| Marsh Wren | - | - | - | - | 1 | - | - | 1 |
| Mountain Bluebird | - | 2 | - | 1 | - | 6 | 10 | 19 |
| Mourning Dove | 55 | 63 | 30 | 51 | 43 | 15 | 36 | 293 |
| Northern Flicker | 1 | 7 | 2 | 37 | - | 16 | 33 | 96 |
| Northern Harrier | - | - | - | - | 1 | - | - | 1 |
| Northern Mockingbird | 9 | 68 | 12 | 4 | 63 | 76 | 35 | 267 |
| Northern Rough-winged Swallow | - | 33 | - | 33 | 3 | 27 | 34 | 130 |
| Olive-sided Flycatcher | - | - | 1 | - | - | - | - | 1 |
| Orchard Oriole | - | - | - | - | - | - | 1 | 1 |
| Peregrine Falcon | - | - | 1 | - | - | - | - | 1 |
| Pine Siskin | 7 | 3 | 4 | 11 | - | 1 | - | 26 |
| Pinyon Jay | 111 | 4 | 17 | 3 | 1 | 18 | 19 | 173 |
| Plumbeous Vireo | 25 | - | 34 | - | - | - | 1 | 60 |
| Purple Martin | - | - | - | - | - | - | 1 | 1 |
| Red-breasted Nuthatch | - | - | 1 | - | - | - | - | 1 |
| Red-naped Sapsucker | - | - | 2 | - | - | - | - | 2 |
| Red-tailed Hawk | 7 | - | 1 | 1 | - | - | - | 9 |

| Species | BC | LV | RC | RL | SY | SE | WC | Total |
|---|---|---|---|---|---|---|---|---|
| Red-winged Blackbird | - | - | - | 147 | 128 | 66 | 88 | 429 |
| Rock Pigeon | - | - | - | - | - | - | 3 | 3 |
| Rock Wren | 71 | 74 | 16 | 2 | 1 | 16 | 15 | 195 |
| Rufous-crowned Sparrow | - | - | 3 | - | - | - | - | 3 |
| Sage Sparrow | - | - | - | - | - | 3 | 2 | 5 |
| Sage Thrasher | - | - | - | - | - | 6 | - | 6 |
| Say's Phoebe | 5 | 22 | - | 18 | 5 | 15 | 7 | 72 |
| Scaled Quail | - | - | - | - | 3 | - | - | 3 |
| Scott's Oriole | - | - | 1 | - | - | - | - | 1 |
| Song Sparrow | - | 1 | - | 30 | - | - | 1 | 32 |
| Spotted Sandpiper | - | - | - | - | - | - | 1 | 1 |
| Spotted Towhee | 2 | 175 | 16 | 3 | 8 | 14 | 75 | 293 |
| Steller's Jay | - | - | 2 | - | - | - | - | 2 |
| Summer Tanager | - | 1 | 2 | - | - | - | - | 3 |
| Turkey Vulture | 7 | - | - | 12 | - | 2 | 1 | 22 |
| Vesper Sparrow | - | - | - | 38 | - | 90 | 22 | 150 |
| Violet-green Swallow | 84 | 15 | 39 | 6 | 19 | 14 | 9 | 186 |
| Virginia Rail | - | - | - | 1 | 4 | - | - | 5 |
| Virginia's Warbler | 4 | - | 10 | 1 | - | - | - | 15 |
| Warbling Vireo | 1 | 7 | 9 | - | - | - | - | 17 |
| Western Bluebird | - | 3 | 8 | 3 | 2 | 2 | - | 18 |
| Western Kingbird | 2 | 14 | - | 2 | 2 | - | 5 | 25 |
| Western Meadowlark | 1 | 143 | - | 152 | 86 | 420 | 115 | 917 |
| Western Scrub-Jay | 4 | 64 | 13 | 3 | 23 | 7 | 7 | 121 |
| Western Tanager | 12 | - | 40 | - | - | - | - | 52 |
| Western Wood-Pewee | 89 | 13 | 39 | 3 | 6 | 1 | 2 | 153 |
| White-breasted Nuthatch | - | - | - | 2 | - | - | - | 2 |
| White-throated Swift | 144 | 7 | 12 | - | 4 | - | 1 | 168 |
| White-winged Dove | - | - | - | - | 2 | - | - | 2 |
| Willow Flycatcher | - | 2 | - | - | 8 | - | 1 | 11 |
| Yellow Warbler | 3 | - | 2 | - | 2 | - | - | 7 |
| Yellow-breasted Chat | 28 | 43 | 1 | 7 | 133 | 46 | 57 | 315 |
| Yellow-rumped Warbler | 7 | - | 4 | 1 | - | - | - | 12 |
| Total Number of Individuals | 2765 | 1396 | 576 | 1141 | 1312 | 1429 | 1631 | 10250 |
| Total Number of Species | 57 | 46 | 59 | 57 | 57 | 50 | 57 | 118 |