2010 BREEDING BIRD SURVEYS AT SEVEN RIPARIAN SITES IN THE BUREAU OF LAND MANAGEMENT, ALBUQUERQUE RESOURCE AREA

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EXECUTIVE SUMMARY

Riparian corridors provide important habitat for breeding birds in arid regions of the western United States. The Bureau of Land Management, Albuquerque Field Office, has established breeding bird surveys at several riparian sites in Cibola and Sandoval Counties, New Mexico. From 1996-2007, and 2010, we conducted avian surveys at these sites to evaluate how local conditions might affect avian abundance and species richness. Despite an increase in count duration, the detection rate and species richness for all sites in 2010 was nearly identical to the 2001-2007 mean. In 2010, the highest detection rates for all species and for a subset of riparian species occurred at San Ysidro and Lost Valley. The lowest detection rates for all species occurred at Senorito Creek and Wilson Canyon, while the lowest rates for riparian species occurred at Bluewater Canyon and Senorito Creek. Species richness in 2010 was highest at Bluewater Canyon and San Ysidro, and lowest at Senorito Creek. Although our power to significantly detect population trends is limited by the small size of the sites, a pattern of relatively low detection rates and species richness at Senorito Creek and Wilson Canyon during the last eight survey years indicates that these sites support fewer birds, particularly riparian obligate and dependent species. These sites lack the diverse native vegetation and more mature vegetation structure that typifies Bluewater Canyon, Rinconada Canyon, and Rito Leche, sites with consistently higher detection rates and species richness numbers. Despite high percentages of non-native vegetation, Lost Valley and San Ysidro had especially high detection rates and species richness numbers in 2010, indicating that avian abundance and diversity at the study sites may be influenced more by the presence of latter seral stage structure than high proportions of native plant species.

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 high quality riparian habitat for their continued existence (Sedgwick 2000). Because riparian areas provide breeding habitat for a variety of avian species, including riparian obligate or dependent species, it is important to maintain or improve them to the best possible condition.

Management of riparian areas for birds is influenced by numerous competing land uses and environmental concerns. Grazing, recreation, drought, water diversion, urban development, and invasion of non-native vegetation might affect breeding bird populations in riparian areas by changing habitat quality or disrupting breeding activities (Szaro 1980, Knopf et al. 1988, Krueper 1993, Rich 2002). For example, riparian areas dominated by non-native 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). 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 representing a variety of vegetation types and conditions can provide information on how multiple factors affect bird populations, including riparian species and other bird 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 vary in water flow, vegetation type (i.e., native or non-native), and vegetation structure (e.g., density). Because these sites are small, containing 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 detection rates and species richness at the seven sites in 2010, and identify patterns in the data during the last eight survey years from 2001-2007, and 2010 (Hawks Aloft, Inc. did not conduct surveys from 2008-2009). Information on detection rates and species richness, especially for riparian species, can improve BLM's understanding of how local riparian conditions affect bird populations on the lands they manage in central New Mexico.

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 categorize the dominant riparian vegetation and hydrologic conditions at each site below in Table 1, followed by a description of each site.

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

	Vegetation		Water Flow			
Site	Type	Density	2005	2006	2007	2010
Bluewater Can.	Native	Medium	High	Medium	Medium	High
Lost Valley	Exotic	High	Medium	Low	Medium	Medium
Rinconada Can.	Native	Medium	Medium	Low	Low	Low
Rito Leche	Native	High	Medium	Low	Low	Medium
San Ysidro	Exotic	High	Medium	Low	Low	Low
Senorito Creek	Native	Medium	Medium	Low	Low	Low
Wilson Canyon	Native	Low	Medium	Low	Low	Medium

Bluewater Canyon

The Bluewater Canyon site included 12 points along 4 km of Bluewater Creek, northwest of Grants, New Mexico, and just south of Interstate 40. Although the survey points at Bluewater Canyon were established along the creek within the confines of the canyon, the original coordinates for the points, which were still in use in 2010, place many of the points in the uplands north of the canyon (Fig. 2). This discrepancy between point descriptions and coordinates may be attributed to the coordinates having been set prior to the cessation of Selective Availability GPS signal scrambling. We believe that, in most previous survey years, the point counts were conducted within the canyon, but in 2010, the Hawks Aloft observer surveyed at the provided coordinates, and as a result, likely recorded more upland and fewer riparian species than in past years.

Bluewater Creek flows through a narrow, steep-walled canyon and is lined with primarily native vegetation. Dominant plant species include coyote willow (*Salix exigua*), juniper (*Juniperus* spp.), narrowleaf cottonwood (*Populus angustifolia*), cliffrose (*Cowania mexicana*), rubber rabbitbrush (*Chrysothamnus nauseosus*) and Gambel's oak (*Quercus gambelii*). Willow patches are dense in places, but relatively narrow (≤25 m wide). Beaver (*Castor canadensis*) activity has reduced the number of mature cottonwoods to the point that, in 2010, only a few individuals over 2 m in height were present. 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. Water flow was relatively high in 2001, 2005, and 2010; flow was noted as moderate in other years.

Vegetation in Bluewater Canyon is characterized by a variety of native species in a narrow canyon.

Lost Valley

The Lost Valley site included 10 survey points in two separate sections covering approximately 2.5 km of the Rio Puerco, near San Luis, New Mexico (Figs. 1, 3). 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. Riparian vegetation at Lost Valley is mostly non-native, including dense stands of salt cedar and Russian olive (*Elaeagnus angustifolia*), as well as patches of native species such as Fremont cottonwood (*P. fremonti*) and willow (*Salix* spp.). The low density upland vegetation on the canyon rim is primarily native. Water levels in the Rio Puerco fluctuate greatly, particularly within monitoring seasons. In most years, including 2010, surface water is plentiful during the beginning of the avian breeding season, but nearly absent by the end of the survey period. In 2002 and 2004, the Rio Puerco was completely dry during the entire monitoring season.

Rinconada Canyon

The Rinconada Canyon site included five survey points along approximately 1 km of Rinconada Creek, about 5 km northwest of Acomita, New Mexico (Figs. 1, 4). Management boundaries prevented the establishment of more than five points. Like Bluewater Canyon, Rinconada Canyon contains mostly native vegetation with at least some water flow during most years. A portion of the creek is typically dry with

subterranean flow. Unlike all other sites, vegetation at Rinconada Canyon was dominated by alder (*Alnus* spp.), with ponderosa pine (*Pinus ponderosa*), pinyon pine (*P. edulis*), juniper, and Gambel's oak common in both the canyon and adjacent uplands.

The vegetation at Rinconada Canyon is dominated by native species. Vegetation structure is a mosaic of open and closed canopy patches. Surface water is typically present throughout the breeding season, although often only at low volume.

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, 5). Management boundaries prevented the establishment of more than five points. Rito Leche contained mostly native riparian vegetation, including willow, cottonwood, and New Mexico locust (*Robinia*

neomexicana); the surrounding upland was dominated by sage (*Artemisia* spp.) and four-winged saltbush (*Atriplex canescens*). The site contained a broad-leaved cattail (*Typha latifolia*) marsh in the uppermost section of the stream. Beavers have reduced the number of live trees at the site. Water flows at this site during most years.

San Ysidro

The San Ysidro site 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 (Figs. 1, 6). This site contained dense, closed-canopy forest and scrub, as well as marsh habitat. Dominant vegetation included Russian olive, salt cedar, and bulrush (*Scirpus* spp.). Cattle grazing may have limited vegetation growth in this part of the creek outside of two exclosures. Water flow in the Rio Salado varies annually and usually decreases as the survey season progresses. After a wet year in 2005, subsequent survey seasons, including 2010, have been relatively dry.

In April 2010, Hawks Aloft and BLM personnel visited the site to investigate reports of impediments to water flow into the marsh. The team determined that an illegal containment dam was restricting the flow of water into the marsh and redirecting it into an adjacent pasture. BLM staff later returned to San Ysidro and cut a small channel in the dam in an attempt to restore water to the marsh. Hawks Aloft personnel visited the site after a high water flow episode in mid-August, and although the small channel was allowing some water to enter the marsh, a large percentage of the flow blocked by the dam was continuing to drain into the adjacent pasture. We recommend that BLM continue their efforts to remove the dam prior to the onset of the 2011 breeding season,

and continue their investigation of the legal water rights and usage of upstream neighbors. The return of water flow to the marsh at San Ysidro would benefit many riparian species, and should be one of the higher priorities of BLM Albuquerque.

San Ysidro is dominated by dense riparian vegetation, the majority of which is non-native. Water flow to the marsh is variable; recent years have been substantially low, likely due to an upstream dam that has diverted water away from the marsh.

Senorito Creek

The Senorito Creek site included 10 survey points along approximately 2.5 km of Senorito Creek, immediately east of the confluence with the Rio Puerco, south of Cuba, New Mexico (Figs. 1, 7). The creek flows through a steep arroyo, similar to nearby Rito Leche. At the onset of surveying, Senorito Creek contained mostly non-native salt cedar;

however, much of the salt cedar was killed after an herbicide treatment in 1998. Presently, the vegetation is mostly native and of medium density, but average canopy height is relatively low. The surrounding upland habitat is dominated by greasewood (*Sarcobatus vermiculatus*). In most years, there is little or no water at the site.

Wilson Canyon

The Wilson Canyon site included 10 survey points along approximately 2 km of the Rio Puerco, about 10 km south of Cuba, New Mexico (Figs. 1, 8). Wilson Canyon is dominated by herbaceous vegetation and shrubs (average canopy height for the canyon is approximately 1 m). Trees taller than 3 m, primarily cottonwood and Russian olive, make up only approximately one percent of the canopy within the riparian area. A large percentage of the vegetation in the canyon is comprised of upland species such as sage, greasewood, and rabbitbrush which have encroached into the riparian corridor. The two most common riparian shrubs present in the canyon, willow and salt cedar (most of the salt cedar appears to have been killed by treatment), each make up about 5% of the vegetation, but both species average less than 2 m in height. Exclosures were erected in the past to allow vegetation to regenerate along the riverbank, but the planted cottonwoods, which average about 3 m in height and have canopy diameters of approximately 1.5 m, currently provide little benefit to riparian avifauna. Water flow at Wilson Canyon was high during the first visit, but low on subsequent visits.

METHODS

We conducted two point count surveys (see Bibby et al. 2000) at each of the seven sites (59 points) between 24 May and the 22 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.

Survey points were originally established by the BLM or Hawks Aloft along the riparian corridors of each site. Point spacing is variable, and although most routes were intended to have 250 m intervals between survey points, many of the points at Bluewater Canyon, Lost Valley, Rito Leche, San Ysidro, and Wilson Canyon were set at closer intervals. We visited the same points for each survey at a site. Point coordinates are provided in Appendix 1.

A surveyor, experienced with avian identification by sight and sound, hiked to each point and recorded all birds seen or heard during the survey period. In the past, five minute survey periods were employed, but in 2010, count duration was increased to ten minutes for all surveys except one count at San Ysidro. Observers recorded birds at all distances and noted separately any birds flying overhead. Observers began each survey within 30 minutes after sunrise and concluded within four hours. Three or four observers were used annually for most of the years surveys were conducted; in 2010, one surveyor conducted all counts except at San Ysidro, where different observers conducted each of the two replicates.

We used detection rates as a measure of avian abundance. This allowed comparisons between sites with unequal numbers of survey points. 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 (two during most years). Detection rates for a site were calculated by dividing the total number of qualifying detections by the number of points and then dividing by the number of surveys that occurred at each point. 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 data analysis. These flocks were almost always associated with canyon walls along the riparian corridor. 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 also determined detection rates and species richness for a subset of riparian species, based on 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. Alternatively, 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 detection rates for riparian species in the same way that we calculated rates for all species; however, for riparian species, we only included observations of riparian obligates and dependents. We list all species encountered from 2001-2007, and 2010 (Appendix 2), and determine which sites had relatively high or low riparian species richness in 2010. We provide cumulative lists of species observed at each site during point counts in 2010 (Appendix 3), and during all years of monitoring (Appendix 4).

Many of the survey routes contain points with spacing intervals of less than 250 m; the close proximity of these points does not ensure detection independence between points, especially at more open sites. Routes appear to have been developed either arbitrarily (San Ysidro), with shorter intervals between points (Lost Valley and Wilson Canyon), or, as seems to be the case with the remaining sites, were intended to employ 250 m minimum intervals, but existing technologies at the time of establishment (Selective Availability scrambling of GPS signals ended in May 2000) precluded accurate measurements. In 2010, we recalculated inter-point distances, and found that as many as 38 points (64% of the total) are < 250 m from neighboring points.

The close spatial proximity to neighboring points introduces the possibility of detecting individual birds at multiple points. To compensate for this, detection rates were only calculated for a subset of points with an inter-point interval of at least 200 m, a distance we feel reduces probability of individual birds being detected at multiple points. At sites such as Wilson Canyon and Lost Valley, where the average distance between points is only about 125 m, it was necessary to omit nearly every other point in order to ensure that no points violated the 200 m rule. The selection of points to use in detection

rate calculations was updated in 2010, and rates for past years were recalculated and may differ slightly from those presented in earlier reports. We strongly recommend reestablishing point locations in 2011 with intervals of at least 250 m. This would likely result in a larger sample size and more accurate estimates of avian populations.

RESULTS

Detection Rates

The increase of survey time from five to ten minutes at most sites in 2010 undoubtedly inflated detection numbers, and this should be considered when making year-to-year comparisons. Detection rates at each site for 2001-2007, and 2010 are presented in Appendix 5 and Figure 9. The detection rate for all sites in 2010 (6.7 ± 0.9) was nearly identical to the 2001-2007 mean (6.8 ± 0.8). The highest detection rates occurred at San Ysidro (10.1 ± 2.0), Lost Valley (9.0 ± 2.4), and Rito Leche (8.4 ± 1.0); the mean site rates from 2001-2007 were highest at Rinconada Canyon and Rito Leche. The lowest detection rates occurred at Senorito Creek (3.5 ± 0.8) and Wilson Canyon (4.6 ± 2.2); these sites also had the lowest mean detection rates during the 2001-2007 period. The most significant divergences in 2010 from the 2001-2007 means occurred at San Ysidro (28% increase) and Senorito Creek (39% decrease). We have observed no definitive temporal trends in total detection rates at any site in the eight survey years from 2001-2010.

As with total detection rates, the detection rate for riparian species (Appendix 6, Figure 10) at all sites in 2010 (1.5 ± 0.4) was nearly identical to the 2001-2007 mean (1.4 ± 0.3). The highest detection rates for riparian species in 2010 occurred at San Ysidro

(4.0 ± 1.7), Lost Valley (2.5 ± 0.9), and Rinconada Canyon (2.3 ± 1.3); these sites are also the highest-ranking three (in the same order) for the 2001-2007 period. The lowest detection rates occurred at Senorito Creek (0.5 ± 0.3) and Bluewater Canyon (0.7 ± 0.4); the latter also recorded the lowest rate during the 2001-2007 period. The most significant divergences in 2010 from the 2001-2007 means occurred at San Ysidro (74% increase) and Bluewater Canyon (53% decrease). We have observed no definitive temporal trends in detection rates of riparian species at any site in the eight survey years from 2001-2010.

Species Richness

A total of 66 bird species were recorded during all surveys in 2010 (Appendix 3), bringing the total recorded since 2001 to 117 species (Table 4). The total of 66 species is very similar to the 2001-2007 mean of 65.4 species. Species richness was highest at Bluewater Canyon (S=30), San Ysidro (S =28), Lost Valley (S =27), and Wilson Canyon (S =27). The lowest richness occurred at Senorito Creek (S =16).

Cumulative species richness from 2001-2010 was highest at Rinconada Canyon (S =64) and Bluewater Canyon (S =63), and lowest at Rito Leche and Senorito Creek (S =45 at both sites). Lost Valley (S =47) and Wilson Canyon (S =48) also supported relatively low cumulative avian richness.

The most notable deviations from previous survey years, in terms of species richness, occurred at Rinconada Canyon, Wilson Canyon, and San Ysidro. Rinconada Canyon supported the highest cumulative species richness (from 2001-2010), but the second lowest richness in 2010. The 19 species recorded in 2010 was 28% lower than the 2001-2007 mean of 26.3 species. In contrast, at Wilson Canyon the 2010 species richness

was 36% higher than the 2001-2007 mean. At San Ysidro, the 2010 species richness represented a 27% increase over the 2001-2007 mean.

Table 2. Number of species observed during point count surveys at seven Bureau of Land Management riparian sites in central New Mexico from 2001-2007, and 2010.

Site	2001	2002	2003	2004	2005	2006	2007	2010	Total
Bluewater Canyon	26	27	24	24	23	27	33	30	63
Lost Valley	27	20	23	22	23	21	23	27	47
Rinconada Canyon	26	23	28	30	27	26	24	19	64
Rito Leche	23	26	16	18	16	17	17	24	45
San Ysidro	20	25	23	22	22	26	17	28	52
Senorito Creek	20	21	18	16	16	20	16	16	45
Wilson Canyon	26	17	24	13	18	24	17	27	48
Total – All Sites	67	65	69	64	67	63	63	66	117

Table 3. Number of riparian obligate and dependent species observed during point count surveys at seven Bureau of Land Management sites in central New Mexico from 2001-2007, and 2010. A list of species designated as riparian obligates or dependents is provided in Appendix 2.

Site	2001	2002	2003	2004	2005	2006	2007	2010	Total
Bluewater Canyon	8	7	7	7	4	9	8	7	18
Lost Valley	7	5	8	7	7	5	6	9	14
Rinconada Canyon	5	5	4	8	4	3	2	4	15
Rito Leche	6	3	4	3	4	2	5	4	9
San Ysidro	6	6	5	9	7	9	6	10	15
Senorito Creek	3	3	2	2	4	3	3	2	8
Wilson Canyon	5	3	3	3	1	4	3	4	8
Total – All Sites	18	17	17	15	15	14	13	18	25

DISCUSSION

Several factors should be considered when comparing 2010 results to previous years. The increase of survey time from five to ten minutes at most sites in 2010 undoubtedly inflated the number of detections during each count. Although the increase

in detections as a factor of count duration is highly variable, Smith et al. (1998) reported increases in individuals detected of 32-45% and number of species detected between 24-33% when count duration was increased from 5 to 10 minutes. Lynch (1995) reported an increase in species detections of 49% between 5 and 10 minute counts. These findings give some indication of the likely impact of increased count duration in 2010.

One example of the effect of increased count duration is possibly reflected in the results of riparian species detections. Total riparian species richness across all sites consistently decreased from 2001-2007, but in 2010, the total returned to the high of 2001 (Table 3). This trend is only evident in the annual totals for all sites—the trend cannot be clearly seen for any individual site—indicating that it likely does not reflect a true decrease in riparian species populations. Although it is possible there was a real increase in the number of riparian species utilizing the survey sites in 2010, it seems more likely that the increase in species richness reflects the increase in survey time from five to ten minutes. Birds breeding in dense riparian vegetation can be difficult to detect when not actively singing; longer point count durations would likely allow better estimates of riparian species presence. The 2010 increases in riparian species counts from the 2001-2007 mean were most significant at San Ysidro and Lost Valley, sites with especially dense vegetation. For this reason, we recommend the continuation of 10 minute counts in the future. Recording the time of individual detections will allow the possibility of analysis of any temporal subset of detections in the future, thus enabling the comparison of future findings with both five minute counts from 1996-2007 and ten minute counts from 2010.

Species richness for riparian species at Bluewater Canyon averaged slightly above the total for all sites from 2001-2007, but in 2010 the total was the second lowest recorded. The decrease in riparian species detections at Bluewater Canyon is likely the result of the counts having been conducted at the point coordinates (which are often far from the canyon in the surrounding uplands) instead of in the canyon, where many of the past counts took place, and likely do not indicate an actual decrease in utilization by riparian obligate or dependent species.

It also should be noted that the number of points at each survey site is not equal; sites with more points allow for the possibility of more species detections. Although the correlation between the number of points and the number of species detections does not increase linearly, it is likely that the sites with only five survey points (Rito Leche and Rinconada Canyon) would have higher species totals if more points were possible. Furthermore, the number of years and visits where surveys have been conducted prior to 2001 is variable between sites. As a result, incorporating data from surveys between 1996 and 2000 with post-2000 results is not feasible. Appendix 4 is the only section of this report that includes data from before 2001; number of visits and mean number of survey points are given for each site and detection rates are presented which take these variables into account.

Detecting trends in population size for individual species can be difficult in small riparian areas where surveys occur infrequently. This is especially true for less common species because total annual detection numbers are low, and differences of even a few individuals from year to year can result in large and inconsistent percentage changes. Of the 13 avian species that average >20 total annual detections across all sites—a subset of

birds that typically occur at high enough densities that annual deviations are more likely to represent actual change—seven had total detection counts in 2010 that differed from the 2001-2007 mean by at least 40%. These included increased 2010 counts for Yellow-breasted Chat, Spotted Towhee, and House Finch, and decreased counts for Mourning Dove, Cliff Swallow, Rock Wren (one 2010 detection as opposed to the 2001-2007 mean of 31; this was the greatest deviation in the group), and Blue Grosbeak. Counts of Cliff Swallows, Mourning Doves, and House Finches are especially prone to fluctuation, but the other four species are all relatively sedentary and are prolific singers that are easily detected during point counts. Differences in the number of detections for these four species between 2010 and past years are more likely to represent real changes in population numbers, but small sample sizes make it difficult to support the finding with statistical certainty.

Overall, Senorito Creek and Wilson Canyon continue to show patterns of relatively low detection rates and species richness, especially riparian species, which indicates these areas lack features that favor populations of riparian birds. Both sites, however, have been the focus of restoration efforts during the past decade, and continued monitoring will show the impacts of these efforts on the avifauna. Numerous features could favor bird populations, including the presence of native vegetation, consistent water flow, and dense vegetation structure (Peterjohn et al. 1995). Although each of the seven sites offers different features, Bluewater Canyon, Lost Valley, Rinconada Canyon, Rito Leche, and San Ysidro offer particularly important features for maintaining riparian bird populations.

An important feature of Bluewater Canyon and Rinconada Canyon is the presence of native vegetation. Researchers have suggested that riparian areas with native vegetation support more birds than riparian areas dominated by non-native vegetation (e.g., Anderson et al. 1977, Cohan et al. 1978, Ellis 1995). Detection rates at Bluewater Canyon are 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 of detecting subtle vocalizations over the sound of swift, flowing water. Nevertheless, the presence of native riparian vegetation and consistent water flow appear to provide an oasis for a rich assemblage of birds, as indicated by the species richness totals. Rinconada Canyon contains less water than Bluewater Canyon, but the Rinconada Canyon terrain allowed increased detections of birds in a diverse upland-riparian ecotone, resulting in consistently high detection rates and species richness, except during the anomalous year of 2010 when both rates were below the 2001-2007 mean.

Lost Valley and San Ysidro contain substantial percentages of non-native vegetation and inconsistent water flow, yet detection rates and species richness (especially for riparian species) have been comparable to the sites dominated by native vegetation. In fact, in 2010, detection rates at these two sites were higher than at Bluewater Canyon and Rinconada Canyon, sites with little non-native vegetation. The redeeming features of Lost Valley and San Ysidro might be the large size of the habitat patches and the high density of the vegetation (Powell and Steidl 2000, 2002). Non-native riparian vegetation is suitable for some species, because it simulates the dense structure of native vegetation (Fleishman et al. 2003). For example, Willow Flycatchers,

which have been documented at Lost Valley and San Ysidro, may be attracted to these sites because of the dense vegetation present. Restoring water flow into the marsh at San Ysidro and excluding cattle from riparian vegetation at both San Ysidro and Lost Valley might improve the potential of these sites to host Southwestern Willow Flycatchers in the future, as well as other riparian obligate and dependent species.

Senorito Creek and Wilson Canyon are similar to Lost Valley and San Ysidro in terms of lacking native vegetation and consistent water flow; however, Senorito Creek and Wilson Canyon also lack tall and 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 non-native vegetation probably will not improve avian abundance and species richness until vegetation structure returns to later seral stages. We encourage BLM to be mindful of apparently low avian abundance and species richness at Senorito Creek and Wilson Canyon, and not abandon efforts to improve the quality of those sites.

Advances in database management and GIS technology have enabled Hawks Aloft to identify components of the current survey system that should be modified in future years to improve the quality of data being collected. We recommend that points be reestablished in order to maintain inter-point distances of at least 250 m and to ensure that riparian habitats are adequately covered in the point radii. We also recommend a move to 10 minute counts to better detect the presence of riparian species. Modifications in the data collection protocol (including times of individual detections, details on the demographics of each detection, and denoting detections as inside or outside of riparian habitat) will enable Hawks Aloft the continued ability to make comparisons between

future and past results despite changes in study design, and the ability to expand our understanding of the avian communities by means of more detailed and complex analyses.

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LITERATURE CITED

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Figure 1. Location of Bureau of Land Management breeding bird survey sites in Cibola and Sandoval Counties, New Mexico in 2010.

Figure 2. Location of Bluewater Canyon breeding bird survey points in Cibola County, New Mexico in 2010.

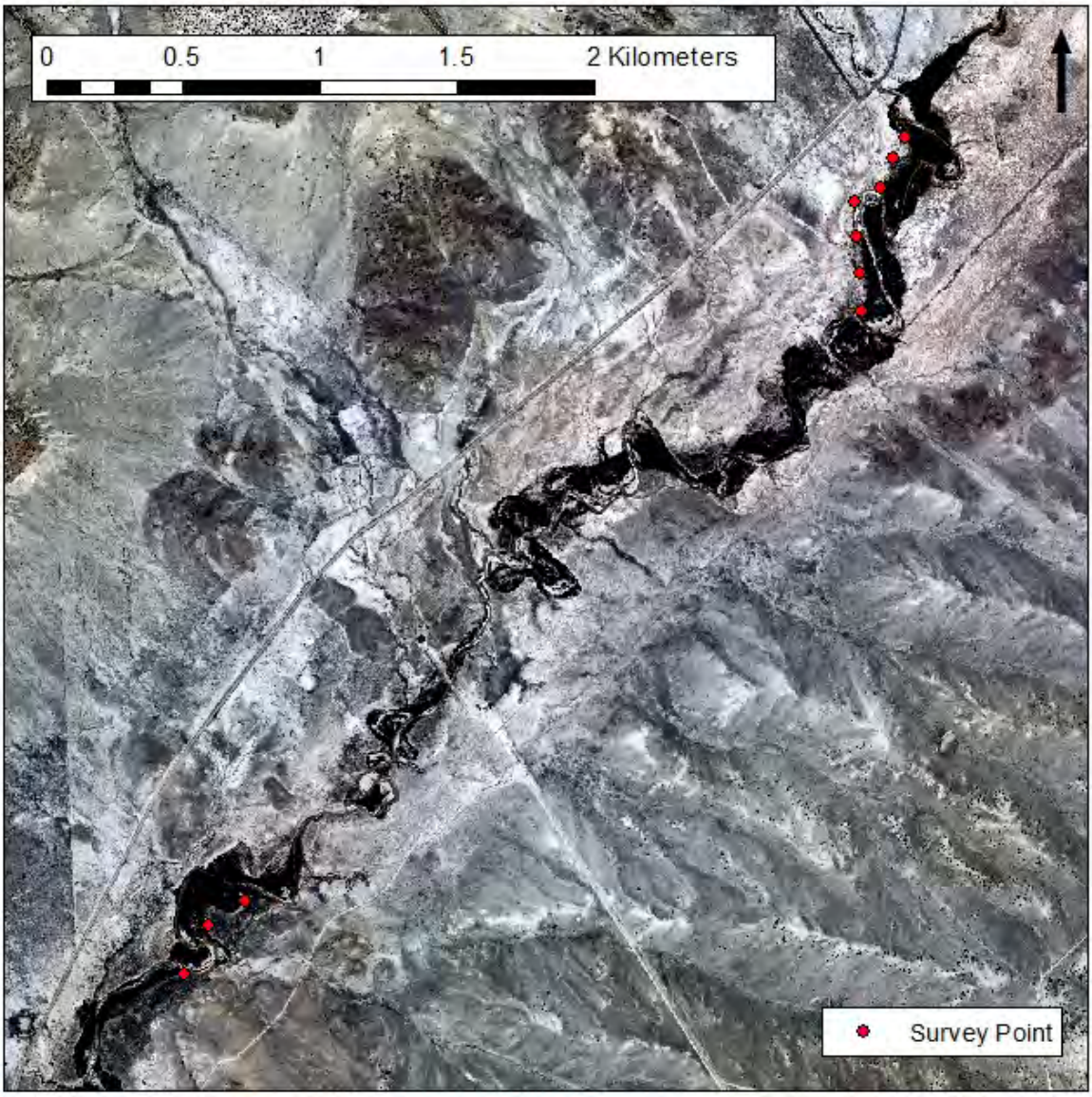

Figure 3. Location of Lost Valley breeding bird survey points in Sandoval County, New Mexico in 2010.

Figure 4. Location of Rinconada Canyon breeding bird survey points in Cibola County, New Mexico in 2010.

Figure 5. Location of Rito Leche breeding bird survey points in Sandoval County, New Mexico in 2010.

Figure 6. Location of San Ysidro breeding bird survey points in Sandoval County, New Mexico in 2010.

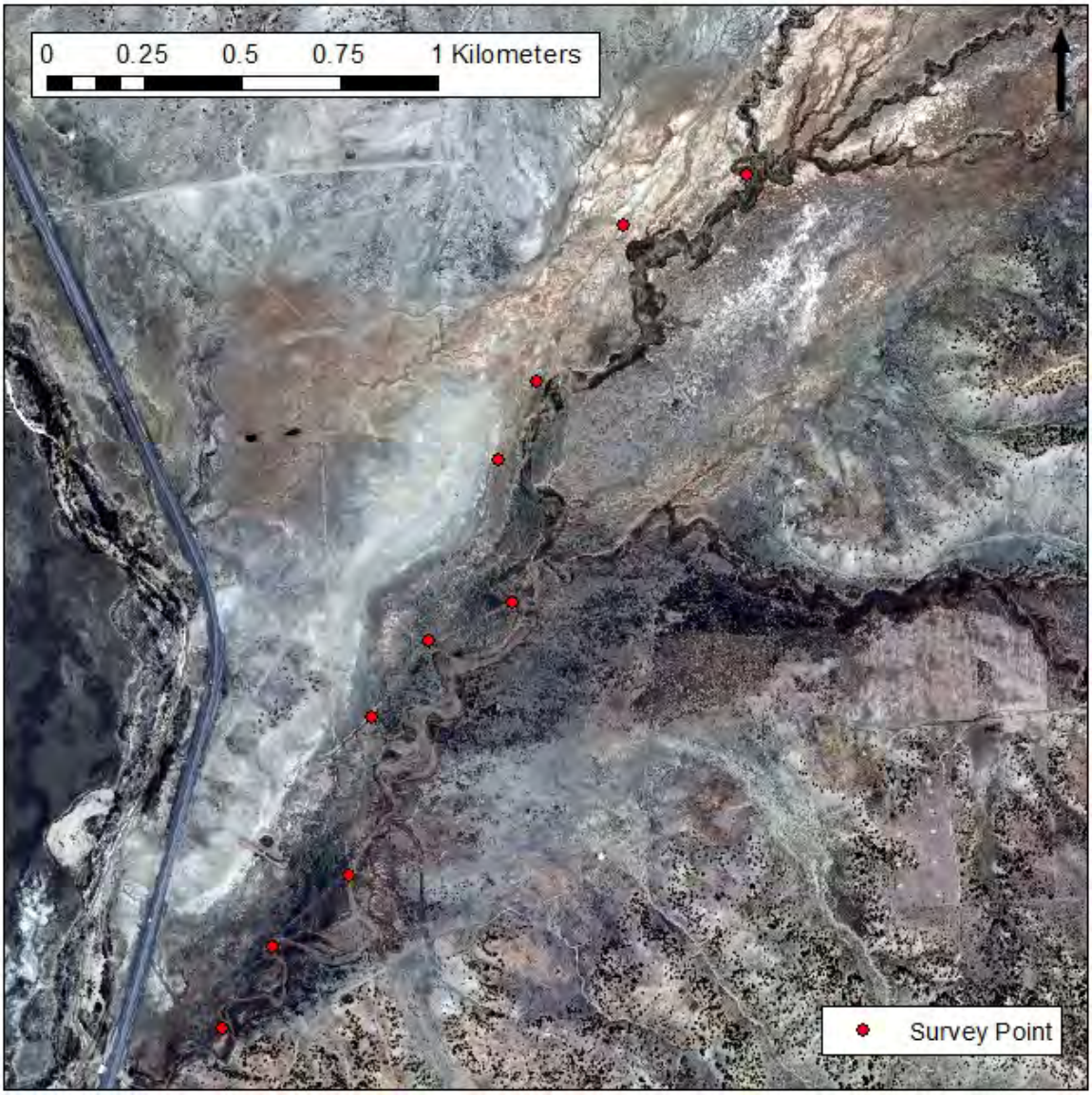

Figure 7. Location of Senorito Creek breeding bird survey points in Sandoval County, New Mexico in 2010.

Figure 8. Location of Wilson Canyon breeding bird survey points in Sandoval County, New Mexico in 2010.

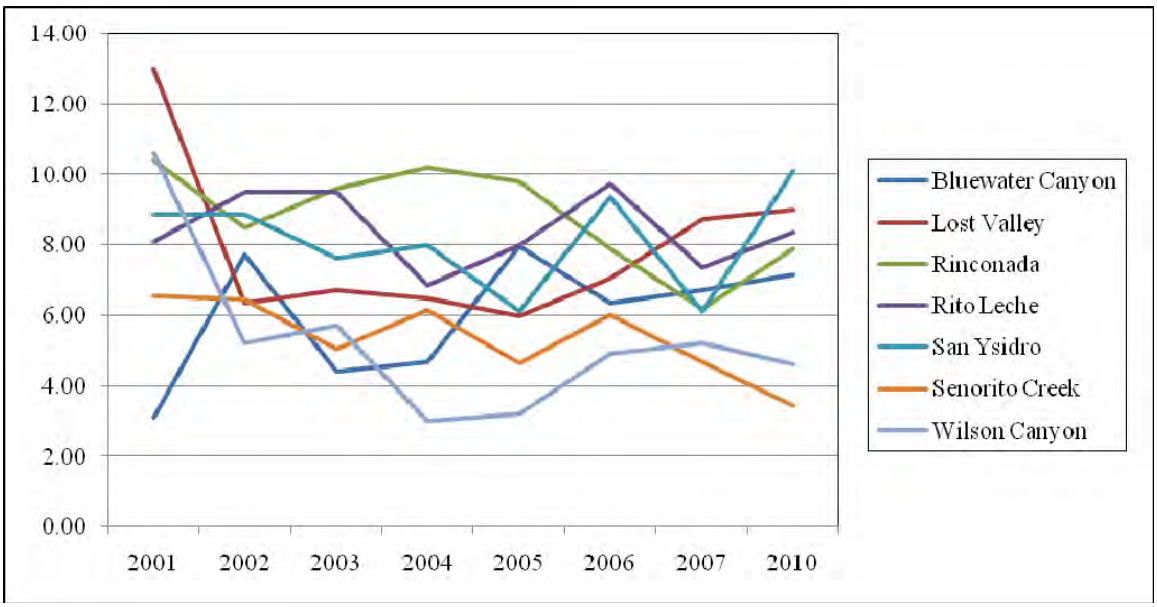

Figure 9. Annual detection rates (birds/point) for breeding bird point count surveys at seven Bureau of Land Management sites in Cibola and Sandoval Counties, New Mexico from 2001-2007, and 2010.

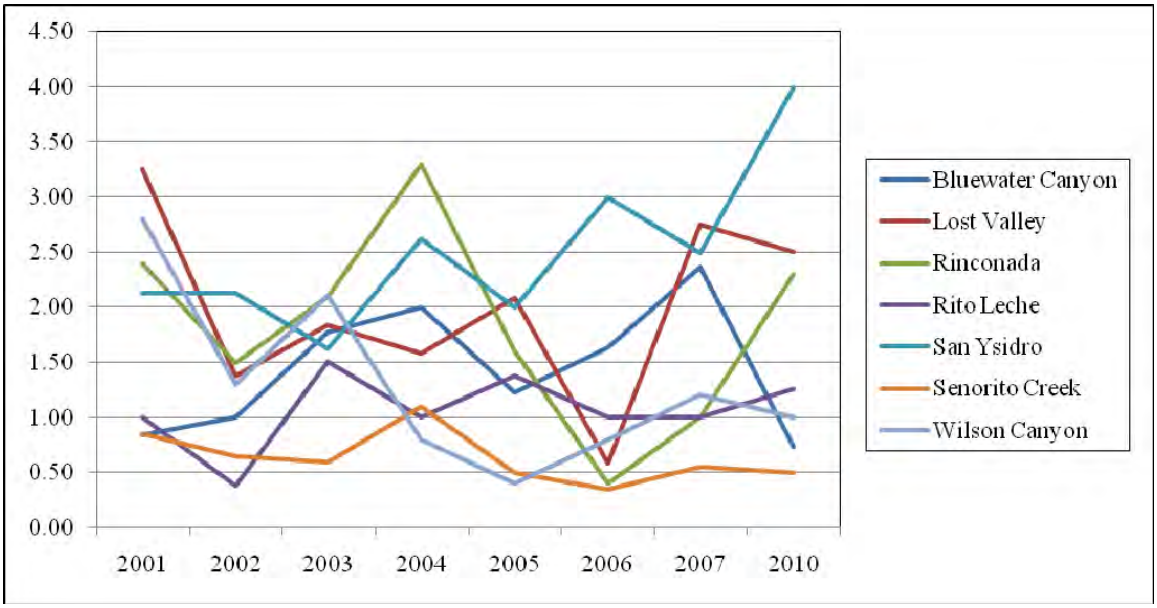

Figure 10. Annual detection rates (riparian birds/point) for riparian obligate and dependent species at seven Bureau of Land Management sites in Cibola and Sandoval Counties, New Mexico from 2001-2007, and 2010.

Appendix 1. Universal Transverse Mercator coordinates (North American Datum 27) of 59 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 2001-2007.

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

Appendix 2. Total detections per year of 118 bird species (in taxonomic order, American Birding Association, Checklist 6.7) observed from 2001-2007, and 2010 during point count surveys at all sites. We include the number of each species observed at any distance from survey points, excluding flyovers. We indicate 14 riparian obligates or dependents, as determined by the Bureau of Land Management (1998), in bold font.

Species	2001	2002	2003	2004	2005	2006	2007	2010
Mallard	3	2	7	2	0	0	7	0
Blue-winged Teal	0	0	2	0	0	0	0	0
Cinnamon Teal	0	0	0	2	0	0	0	0
Wild Turkey	0	0	0	0	0	0	0	5
Scaled Quail	0	0	0	0	0	2	0	0
Gambel's Quail	1	0	1	0	0	0	1	0
Great Blue Heron	0	0	0	0	1	0	0	0
Green Heron	0	1	0	0	0	0	0	0
Black-crowned Night-Heron	0	0	0	0	0	0	1	0
Turkey Vulture	2	0	0	0	0	1	0	0
Northern Harrier	0	0	1	0	0	0	0	0
Cooper's Hawk	1	2	0	0	1	0	0	1
Red-tailed Hawk	0	0	1	1	2	3	4	0
American Kestrel	16	10	6	8	3	7	3	1
Peregrine Falcon	0	0	1	0	0	0	1	0
Virginia Rail	0	1	0	0	0	0	0	0
Killdeer	3	0	1	0	1	1	0	2
Spotted Sandpiper	0	0	0	0	0	0	0	2
Eurasian Collared-Dove	0	0	0	0	0	0	1	0
White-winged Dove	0	0	0	0	1	1	0	4
Mourning Dove	40	20	17	47	15	25	40	12
Greater Roadrunner	0	0	0	0	1	0	0	0
Great Horned Owl	0	0	0	0	0	0	1	0
Common Nighthawk	0	0	0	0	1	0	0	0
White-throated Swift	21	28	9	2	24	6	2	0
Black-chinned Hummingbird	5	1	3	3	0	10	2	6
Broad-tailed Hummingbird	0	7	1	0	3	2	0	0
Lewis's Woodpecker	3	1	3	0	0	1	1	1
Acorn Woodpecker	0	0	0	3	1	0	0	0
Red-naped Sapsucker	0	1	0	1	0	0	0	0
Ladder-backed Woodpecker	2	5	0	1	0	2	1	0
Downy Woodpecker	0	0	0	0	0	0	0	1
Hairy Woodpecker	0	0	2	1	1	0	2	3
Northern Flicker	9	3	7	3	20	13	7	7
Olive-sided Flycatcher	0	0	1	0	0	0	0	0

Species	2001	2002	2003	2004	2005	2006	2007	2010
Western Wood-Pewee	17	16	21	28	28	18	23	19
Willow Flycatcher	0	2	0	0	4	3	0	2
Gray Flycatcher	2	0	0	1	2	0	4	10
Dusky Flycatcher	0	0	1	0	0	0	0	0
Cordilleran Flycatcher	3	5	5	4	0	8	6	5
Black Phoebe	1	2	4	1	9	0	5	1
Say's Phoebe	3	3	14	11	4	17	11	3
Ash-throated Flycatcher	31	16	28	23	37	29	30	48
Cassin's Kingbird	19	12	15	12	11	9	11	0
Western Kingbird	0	2	0	0	1	2	6	5
Plumbeous Vireo	10	7	9	7	24	2	8	7
Warbling Vireo	5	0	4	0	7	0	1	10
Steller's Jay	0	0	1	0	1	0	0	0
Western Scrub-Jay	19	22	18	2	2	2	8	14
Pinyon Jay	10	59	4	1	19	12	14	31
Black-billed Magpie	1	0	0	0	0	0	0	2
American Crow	29	7	5	6	3	7	0	1
Common Raven	15	5	6	5	28	36	20	26
Horned Lark	1	2	7	3	0	0	1	0
Violet-green Swallow	8	24	17	12	29	18	0	62
N. Rough-winged Swallow	8	9	10	3	3	2	6	0
Bank Swallow	5	0	0	0	0	0	0	2
Cliff Swallow	414	398	174	134	139	250	105	98
Barn Swallow	1	8	2	1	0	1	0	0
Mountain Chickadee	0	0	0	0	2	0	0	8
Juniper Titmouse	2	0	0	0	10	10	3	11
Bushtit	0	15	10	8	21	15	3	0
Red-breasted Nuthatch	0	0	0	0	0	1	0	0
White-breasted Nuthatch	0	0	0	0	0	0	0	6
Rock Wren	20	13	30	16	16	49	70	1
Canyon Wren	3	5	7	8	13	10	19	2
Bewick's Wren	1	7	2	2	4	6	13	10
House Wren	1	0	0	0	0	0	0	0
Blue-gray Gnatcatcher	0	0	0	0	0	2	4	0
Western Bluebird	5	3	1	2	0	2	0	0
Mountain Bluebird	0	0	0	0	0	0	1	0
American Robin	4	9	4	2	5	4	0	12
Gray Catbird	0	0	2	0	2	0	0	5
Northern Mockingbird	10	35	28	25	13	46	5	27

Species	2001	2002	2003	2004	2005	2006	2007	2010
Sage Thrasher	0	0	1	0	0	0	0	0
Curve-billed Thrasher	0	0	0	0	0	0	0	0
European Starling	8	3	0	1	0	0	0	0
Orange-crowned Warbler	0	0	0	0	0	0	0	2
Virginia's Warbler	4	3	1	0	3	0	2	0
Yellow Warbler	0	0	0	3	0	1	0	0
Yellow-rumped Warbler	0	1	0	0	2	4	2	4
Black-throated Gray Warbler	1	2	2	2	0	0	0	0
Grace's Warbler	0	0	0	1	3	0	0	0
MacGillivray's Warbler	0	1	2	0	0	0	0	0
Common Yellowthroat	4	2	5	2	3	2	2	5
Wilson's Warbler	3	2	1	1	1	0	0	0
Yellow-breasted Chat	43	18	30	41	38	23	48	65
Hepatic Tanager	5	0	1	1	3	0	1	0
Summer Tanager	0	2	0	0	0	0	0	0
Western Tanager	13	3	10	2	15	9	5	10
Green-tailed Towhee	12	15	14	21	12	25	18	24
Spotted Towhee	31	26	36	42	31	40	43	68
Canyon Towhee	0	1	2	1	3	0	0	0
Cassin's Sparrow	2	0	0	0	0	4	0	0
Rufous-crowned Sparrow	0	0	0	3	0	0	0	7
Chipping Sparrow	6	7	2	9	6	6	11	1
Brewer's Sparrow	36	19	27	29	20	43	26	20
Vesper Sparrow	19	3	3	13	16	14	9	8
Lark Sparrow	5	36	0	5	7	7	7	8
Black-throated Sparrow	0	8	0	0	0	0	7	0
Sage Sparrow	0	0	0	0	0	1	0	0
Song Sparrow	1	0	1	6	0	0	0	2
White-crowned Sparrow	0	0	0	0	0	0	0	1
Dark-eyed Junco	0	0	0	0	0	2	0	2
Black-headed Grosbeak	1	6	11	18	8	5	16	22
Blue Grosbeak	88	36	73	51	40	40	52	28
Lazuli Bunting	7	0	0	2	2	3	14	4
Indigo Bunting	0	0	1	0	1	0	0	0
Red-winged Blackbird	82	72	51	13	6	11	3	15
Western Meadowlark	119	74	84	93	78	58	74	56
Brewer's Blackbird	33	17	22	5	7	16	21	0
Common Grackle	0	0	0	0	0	0	0	2
Brown-headed Cowbird	30	11	18	19	9	21	15	43

Species	2001	2002	2003	2004	2005	2006	2007	2010
Bullock's Oriole	18	9	5	8	10	5	1	9
Scott's Oriole	1	0	0	0	0	0	2	1
House Finch	11	34	22	19	25	54	7	42
Pine Siskin	0	0	0	0	0	0	0	3
Lesser Goldfinch	14	11	20	23	5	10	22	15
Total Individuals	1377	1208	955	825	866	1046	865	1015
Total Species	67	65	69	64	67	63	63	66
Total Riparian Individuals	220	122	189	193	154	135	201	211
Total Riparian Species	18	17	17	15	15	14	13	18

Appendix 3. List of 66 bird species (in taxonomic order, American Birding Association, Checklist 6.7) observed in 2010 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. We include the number of each species observed at any distance from survey points, excluding flyovers. We indicate 14 riparian obligates or dependents, as determined by the Bureau of Land Management (1998), in bold font.

Species	BC	LV	RC	RL	SY	SE	WC	Total
Wild Turkey	-	-	-	5	-	-	-	5
Cooper's Hawk	-	1	-	-	-	-	-	1
American Kestrel	-	-	-	1	-	-	-	1
Killdeer	-	-	-	-	1	1	-	2
Spotted Sandpiper	-	-	-	-	-	-	2	2
White-winged Dove	4	-	-	-	-	-	-	4
Mourning Dove	-	6	-	1	2	2	1	12
Black-chinned Hummingbird	1	-	-	-	5	-	-	6
Lewis's Woodpecker	-	-	-	1	-	-	-	1
Downy Woodpecker	-	-	-	-	1	-	-	1
Hairy Woodpecker	-	-	3	-	-	-	-	3
Northern Flicker	-	2	-	3	1	-	1	7
Western Wood-Pewee	6	-	11	-	2	-	-	19
Willow Flycatcher	-	-	-	-	2	-	-	2
Gray Flycatcher	7	-	3	-	-	-	-	10
Cordilleran Flycatcher	-	-	5	-	-	-	-	5
Black Phoebe	-	-	-	-	1	-	-	1
Say's Phoebe	-	1	-	-	2	-	-	3
Ash-throated Flycatcher	13	10	2	1	11	1	10	48
Western Kingbird	-	-	-	1	-	-	4	5
Plumbeous Vireo	1	-	6	-	-	-	-	7
Warbling Vireo	6	4	-	-	-	-	-	10
Western Scrub-Jay	5	-	7	1	-	1	-	14
Pinyon Jay	25	-	2	-	-	2	2	31
Black-billed Magpie	-	-	-	2	-	-	-	2
American Crow	-	-	-	-	1	-	-	1
Common Raven	1	14	-	6	3	-	2	26
Violet-green Swallow	41	11	6	-	-	-	4	62
Bank Swallow	-	1	-	-	-	1	-	2
Cliff Swallow	56	4	-	-	11	5	22	98
Mountain Chickadee	7	-	1	-	-	-	-	8
Juniper Titmouse	7	-	3	-	-	-	1	11
White-breasted Nuthatch	3	-	3	-	-	-	-	6
Rock Wren	1	-	-	-	-	-	-	1
Canyon Wren	2	-	-	-	-	-	-	2
Bewick's Wren	1	8	-	-	1	-	-	10
American Robin	1	1	9	-	1	-	-	12
Gray Catbird	-	-	-	-	5	-	-	5

Species	BC	LV	RC	RL	SY	SE	WC	Total
Northern Mockingbird	3	11	-	1	4	5	3	27
Orange-crowned Warbler	-	2	-	-	-	-	-	2
Yellow-rumped Warbler	-	2	1	1	-	-	-	4
Common Yellowthroat	-	-	-	-	5	-	-	5
Yellow-breasted Chat	2	18	-	7	38	-	-	65
Western Tanager	1	2	6	-	-	-	1	10
Green-tailed Towhee	2	-	-	9	-	10	3	24
Spotted Towhee	-	35	1	5	6	8	13	68
Rufous-crowned Sparrow	-	-	-	5	-	1	1	7
Chipping Sparrow	1	-	-	-	-	-	-	1
Brewer's Sparrow	-	-	-	8	-	6	6	20
Vesper Sparrow	-	-	-	1	-	5	2	8
Lark Sparrow	-	2	-	-	6	-	-	8
Song Sparrow	-	-	-	-	-	-	2	2
White-crowned Sparrow	-	-	-	-	-	-	1	1
Dark-eyed Junco	1	1	-	-	-	-	-	2
Black-headed Grosbeak	3	12	4	-	3	-	-	22
Blue Grosbeak	-	5	-	3	6	9	5	28
Lazuli Bunting	-	2	-	2	-	-	-	4
Red-winged Blackbird	-	-	-	-	5	-	10	15
Western Meadowlark	-	13	-	20	6	14	3	56
Common Grackle	-	-	-	2	-	-	-	2
Brown-headed Cowbird	2	15	-	4	11	2	9	43
Bullock's Oriole	-	-	-	-	-	-	9	9
Scott's Oriole	1	-	-	-	-	-	-	1
House Finch	24	10	-	1	3	-	4	42
Pine Siskin	-	-	2	-	-	-	1	3
Lesser Goldfinch	2	3	3	-	4	-	3	15
Unknown Species	1	2	1	-	-	1	1	6
Total Individuals	231	198	79	91	147	74	126	946
Total Species	30	27	19	24	28	16	27	66

Appendix 4. List of 124 bird species (in taxonomic order, American Birding Association, Checklist 6.7) observed from 1996-2007, and 2010 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. We include the number of each species observed at any distance from survey points, excluding flyovers. The detection rates (adjusted for the number of years each site has been surveyed) given at the bottom of the appendix do not exclude detections of Cliff Swallows.

Species	BC	LV	RC	RL	SY	SE	WC	Total
Canada Goose	0	0	0	0	0	0	0	0
Mallard	13	0	0	4	17	0	2	36
Blue-winged Teal	0	0	0	0	2	0	0	2
Cinnamon Teal	0	0	0	0	2	0	0	2
Wild Turkey	0	0	0	5	0	0	0	5
Scaled Quail	0	0	0	0	3	0	0	3
Gambel's Quail	0	0	0	0	1	1	1	3
Great Blue Heron	0	0	0	0	1	0	0	1
Green Heron	0	0	0	0	1	0	0	1
Black-crowned Night-Heron	0	0	0	0	1	0	0	1
Turkey Vulture	7	0	0	8	0	2	1	18
Northern Harrier	0	0	0	0	1	0	0	1
Cooper's Hawk	2	1	1	0	1	0	0	5
Red-tailed Hawk	10	0	1	1	0	0	0	12
Golden Eagle	0	0	0	0	0	0	0	0
American Kestrel	5	21	2	19	24	4	7	82
Peregrine Falcon	0	0	2	0	0	0	0	2
Virginia Rail	0	0	0	1	4	0	0	5
Killdeer	0	0	0	0	7	3	10	20
Spotted Sandpiper	0	0	0	0	0	0	3	3
Rock Pigeon	0	0	0	0	0	0	0	0
Eurasian Collared-Dove	0	0	0	0	0	0	1	1
White-winged Dove	4	0	0	0	2	0	0	6
Mourning Dove	54	87	31	55	47	17	39	330
Greater Roadrunner	0	1	0	0	1	0	0	2
Great Horned Owl	1	0	0	0	2	0	0	3
Common Nighthawk	0	0	0	1	0	2	1	4
White-throated Swift	124	7	7	0	4	0	1	143
Black-chinned Hummingbird	11	0	2	0	21	0	1	35
Broad-tailed Hummingbird	6	0	2	6	0	3	2	19
Lewis's Woodpecker	0	0	1	33	0	0	0	34
Acorn Woodpecker	0	0	4	0	0	0	0	4
Red-naped Sapsucker	0	0	2	0	0	0	0	2
Ladder-backed Woodpecker	12	0	2	0	0	1	0	15
Downy Woodpecker	0	0	0	0	1	0	0	1
Hairy Woodpecker	1	0	8	0	0	0	0	9
Northern Flicker	2	8	2	43	1	16	36	108
Olive-sided Flycatcher	0	0	1	0	0	0	0	1
Western Wood-Pewee	110	15	56	3	8	1	2	195
Willow Flycatcher	0	2	0	0	10	0	1	13

Species	BC	LV	RC	RL	SY	SE	WC	Total
Gray Flycatcher	8	0	11	0	0	0	1	20
Dusky Flycatcher	0	0	1	0	0	0	0	1
Cordilleran Flycatcher	38	0	6	0	1	0	0	45
Black Phoebe	27	0	3	0	1	0	0	31
Say's Phoebe	6	33	0	18	7	15	7	86
Ash-throated Flycatcher	45	83	32	6	84	20	25	295
Cassin's Kingbird	6	22	29	2	22	3	12	96
Western Kingbird	5	17	0	3	2	0	9	36
Eastern Kingbird	0	0	0	0	1	0	0	1
Loggerhead Shrike	0	0	0	0	0	1	0	1
Plumbeous Vireo	29	0	45	0	0	0	1	75
Warbling Vireo	8	11	9	0	0	0	0	28
Steller's Jay	0	0	2	0	0	0	0	2
Western Scrub-Jay	10	69	20	4	24	9	7	143
Pinyon Jay	142	4	24	4	1	15	21	211
Black-billed Magpie	0	0	0	4	0	0	0	4
American Crow	0	27	0	34	46	0	0	107
Common Raven	26	67	6	34	14	35	21	203
Horned Lark	0	2	0	1	0	16	0	19
Purple Martin	0	0	0	0	0	0	1	1
Violet-green Swallow	116	22	35	6	17	13	13	222
N. Rough-winged Swallow	0	33	0	34	3	25	37	132
Bank Swallow	0	2	0	0	0	6	1	9
Cliff Swallow	1437	26	9	2	150	39	485	2148
Barn Swallow	0	0	0	5	0	5	8	18
Mountain Chickadee	7	0	3	0	0	0	2	12
Juniper Titmouse	16	0	19	0	0	0	1	36
Bushtit	70	0	10	0	4	0	0	84
Red-breasted Nuthatch	0	0	1	0	0	0	0	1
White-breasted Nuthatch	3	0	3	2	0	0	0	8
Rock Wren	101	94	17	2	1	30	21	266
Canyon Wren	82	0	7	0	0	0	0	89
Bewick's Wren	2	40	1	2	1	2	6	54
House Wren	1	0	0	0	0	0	0	1
Blue-gray Gnatcatcher	3	0	2	0	2	0	0	7
Western Bluebird	0	3	8	3	2	2	0	18
Mountain Bluebird	0	2	1	1	0	6	10	20
American Robin	15	1	16	0	2	5	24	63
Gray Catbird	2	0	0	0	7	0	0	9
Northern Mockingbird	12	81	12	5	68	83	38	299
Sage Thrasher	0	0	0	0	0	6	0	6
Curve-billed Thrasher	0	0	0	0	1	0	0	1
European Starling	0	0	0	32	3	0	1	36
Orange-crowned Warbler	0	2	0	0	0	0	0	2
Virginia's Warbler	4	1	11	1	0	0	0	17
Yellow Warbler	3	0	2	0	2	0	0	7
Chestnut-sided Warbler	1	0	0	0	0	0	0	1
Yellow-rumped Warbler	7	2	7	2	0	0	0	18
Black-throated Gray Warbler	0	0	7	0	0	0	0	7

Species	BC	LV	RC	RL	SY	SE	WC	Total
Grace's Warbler	0	0	4	0	0	0	0	4
MacGillivray's Warbler	2	0	2	0	1	0	0	5
Common Yellowthroat	0	4	0	1	45	1	3	54
Wilson's Warbler	2	4	0	1	2	0	0	9
Yellow-breasted Chat	37	82	1	15	185	47	60	427
Hepatic Tanager	5	0	9	0	0	0	0	14
Summer Tanager	0	1	2	0	0	0	0	3
Western Tanager	14	2	50	0	0	0	1	67
Green-tailed Towhee	2	0	0	73	0	100	69	244
Spotted Towhee	7	234	18	9	14	26	96	404
Canyon Towhee	4	4	0	0	0	0	1	9
Cassin's Sparrow	0	1	0	0	0	6	0	7
Rufous-crowned Sparrow	0	0	3	5	0	1	1	10
Chipping Sparrow	4	6	40	0	0	0	1	51
Brewer's Sparrow	0	0	0	56	0	184	114	354
Vesper Sparrow	0	0	0	43	0	100	24	167
Lark Sparrow	2	38	0	3	11	19	12	85
Black-throated Sparrow	0	7	0	2	0	6	2	17
Sage Sparrow	0	1	0	0	0	3	2	6
Song Sparrow	0	1	0	30	0	0	3	34
Lincoln's Sparrow	1	0	0	0	0	0	0	1
White-crowned Sparrow	0	0	0	0	0	0	1	1
Dark-eyed Junco	1	1	2	0	0	0	0	4
Black-headed Grosbeak	21	32	38	0	13	1	0	105
Blue Grosbeak	31	105	1	49	165	101	151	603
Lazuli Bunting	7	9	0	11	10	3	1	41
Indigo Bunting	5	0	0	0	0	1	0	6
Red-winged Blackbird	0	0	0	148	135	66	98	447
Western Meadowlark	1	166	0	182	98	467	129	1043
Brewer's Blackbird	0	0	0	173	1	20	28	222
Common Grackle	0	0	0	3	0	0	0	3
Brown-headed Cowbird	26	50	12	16	94	18	41	257
Orchard Oriole	0	0	0	0	0	0	1	1
Bullock's Oriole	2	89	0	21	6	2	14	134
Scott's Oriole	3	0	1	0	0	0	0	4
House Finch	118	83	6	3	46	6	55	317
Pine Siskin	0	1	2	11	0	1	1	16
Lesser Goldfinch	58	17	22	9	53	7	16	182
Total Individuals	2973	1742	714	1250	1507	1579	1791	11556
Total Species	67	54	64	57	64	53	64	124
Replicates (Total Visits)	22	21	16	24	22	24	22	151
Mean Number of Points	12	10	5	5	7	10	10	59
Detections per Point per Visit	11.3	8.3	8.9	10.4	9.8	6.6	8.1	9.1

Appendix 5. Annual detection rates for breeding bird point count surveys at seven Bureau of Land Management sites in Cibola and Sandoval Counties, New Mexico from 2001-2007, and 2010.

Site		2001	2002	2003	2004	2005	2006	2007	2010
Bluewater Canyon	Mean	3.11	7.73	4.41	4.68	7.95	6.36	6.73	7.14
	SD	2.16	4.00	1.26	3.38	1.62	1.69	2.16	2.58
	CI	1.41	2.36	0.75	2.00	0.96	1.00	1.28	1.52
Lost Valley	Mean	13.00	6.38	6.75	6.50	6.00	7.08	8.75	9.00
	SD	2.65	2.53	2.66	2.65	2.88	1.74	3.19	3.05
	CI	2.59	2.48	2.13	2.12	2.31	1.40	2.55	2.44
Rinconada	Mean	10.40	8.50	9.60	10.20	9.80	7.90	6.20	7.90
	SD	2.43	2.57	2.30	2.25	4.10	0.96	2.14	2.48
	CI	2.13	2.26	2.02	1.97	3.60	0.84	1.87	2.18
Rito Leche	Mean	8.13	9.50	9.50	6.88	8.00	9.75	7.38	8.38
	SD	0.85	4.14	3.11	1.38	1.73	2.06	2.06	1.03
	CI	0.84	4.06	3.05	1.35	1.70	2.02	2.02	1.01
San Ysidro	Mean	8.88	8.88	7.63	8.00	6.13	9.38	6.13	10.13
	SD	1.49	0.75	2.72	0.82	1.38	3.75	1.55	2.02
	CI	1.46	0.73	2.67	0.80	1.35	3.67	1.52	1.98
Senorito Creek	Mean	6.55	6.45	5.05	6.15	4.65	6.00	4.70	3.45
	SD	1.50	1.40	1.66	2.11	1.83	1.86	1.53	1.34
	CI	0.93	0.87	1.03	1.31	1.13	1.15	0.95	0.83
Wilson Canyon	Mean	10.60	5.20	5.70	3.00	3.20	4.90	5.20	4.60
	SD	3.60	2.02	0.84	1.46	1.35	0.82	1.79	2.53
	CI	3.15	1.77	0.73	1.28	1.18	0.72	1.57	2.22
All Sites	Mean	7.77	7.37	6.32	6.17	6.48	6.96	6.32	6.74
	SD	3.75	2.94	2.66	3.01	2.88	2.28	2.36	3.10
	CI	1.15	0.88	0.78	0.88	0.84	0.67	0.69	0.90

Appendix 6. Annual detection rates for riparian obligate and dependent species at seven Bureau of Land Management sites in Cibola and Sandoval Counties, New Mexico from 2001-2007, and 2010.

Site		2001	2002	2003	2004	2005	2006	2007	2010
Bluewater Canyon	Mean	0.83	1.00	1.77	2.00	1.23	1.64	2.36	0.73
	SD	0.43	0.89	0.68	0.95	0.79	0.81	1.25	0.61
	CI	0.28	0.53	0.40	0.56	0.46	0.48	0.74	0.36
Lost Valley	Mean	3.25	1.38	1.83	1.58	2.08	0.58	2.75	2.50
	SD	1.66	0.48	1.08	0.86	1.96	0.58	1.47	1.10
	CI	1.63	0.47	0.86	0.69	1.57	0.47	1.18	0.88
Rinconada	Mean	2.40	1.50	2.10	3.30	1.60	0.40	1.00	2.30
	SD	1.29	0.00	0.65	1.04	0.96	0.65	0.79	1.44
	CI	1.13	0.00	0.57	0.91	0.84	0.57	0.69	1.26
Rito Leche	Mean	1.00	0.38	1.50	1.00	1.38	1.00	1.00	1.25
	SD	1.41	0.48	0.82	0.91	0.63	1.41	0.41	0.50
	CI	1.39	0.47	0.80	0.89	0.62	1.39	0.40	0.49
San Ysidro	Mean	2.13	2.13	1.63	2.63	2.00	3.00	2.50	4.00
	SD	0.63	0.75	1.60	0.85	1.58	1.22	1.63	1.78
	CI	0.62	0.73	1.57	0.84	1.55	1.20	1.60	1.74
Senorito Creek	Mean	0.85	0.65	0.60	1.10	0.50	0.35	0.55	0.50
	SD	0.82	0.71	0.46	0.77	0.33	0.41	0.44	0.53
	CI	0.51	0.44	0.28	0.48	0.21	0.26	0.27	0.33
Wilson Canyon	Mean	2.80	1.30	2.10	0.80	0.40	0.80	1.20	1.00
	SD	1.20	1.20	0.55	0.57	0.42	0.76	1.20	0.94
	CI	1.06	1.06	0.48	0.50	0.37	0.66	1.06	0.82
All Sites	Mean	1.65	1.09	1.56	1.72	1.21	1.04	1.62	1.46
	SD	1.32	0.86	0.93	1.12	1.13	1.09	1.33	1.40
	CI	0.41	0.26	0.27	0.33	0.33	0.32	0.39	0.41