2007 BREEDING BIRD SURVEYS AT SIX RIPARIAN SITES

IN THE BUREAU OF LAND MANAGEMENT, TAOS RESOURCE AREA

Submitted To:

Bureau of Land Management
Valerie Williams
Taos Field Office
226 Cruz Alta Road
Taos, New Mexico 87571

Prepared By:

Hawks Aloft, Inc.
P.O. Box 10028
Albuquerque, New Mexico 87184
(505) 828-9455
Website: www.hawksaloft.org
E-mail Contact: mstake@hawksaloft.org

1 November 2007

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

Between 1994 and 2000, the Bureau of Land Management (BLM), Taos Field Office, established breeding bird surveys at five riparian sites in northern New Mexico: Agua Caliente, Orilla Verde, Rio Truchas, Santa Fe North, and Santa Fe South. A sixth site, La Cienega, was added in 2006. Hawks Aloft, Inc. has conducted annual point count surveys at each site since their inception to evaluate how local riparian conditions affect avian detection rates and species richness. Each year from 2000-2007, we recorded the lowest riparian detection rates and species richness at Santa Fe North and South, likely because these corridors were narrow, more sparsely vegetated, and subject to grazing pressure. Locally dense or diverse patches of vegetation likely contributed to the high detection rates and species richness at Agua Caliente, La Cienega, Orilla Verde, and Rio Truchas. La Cienega is near Santa Fe North and South, and along the same river, but detection rates and species richness were relatively high in both years of surveys at the site; dense willow patches at La Cienega provide habitat for several riparian species not typically seen downstream at Santa Fe North and South. Maintaining the structure and spatial configuration of riparian patches at each site, even if patches contain exotic species, is important for protecting key riparian birds, especially at Orilla Verde, where Willow Flycatchers (*Empidonax traillii*) have been regularly observed in recent years. At Santa Fe North and South, exotic Russian olive (*Elaeagnus angustifolia*) provides much of the vertical vegetation structure required by some birds for nesting and cover. BLM can improve the Santa Fe sites by continuing their effort to remove cattle from the riparian corridor and fostering the growth of emergent vegetation.

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 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 exotic 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 exotic vegetation (e.g., saltcedar, *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), Taos Field Office, established annual breeding bird surveys at six riparian sites in northern New Mexico. Hawks Aloft, Inc. began conducting breeding bird surveys at one of these sites (Santa Fe South) in 1994, and at three others (Agua Caliente, Orilla Verde, and Rio Truchas) in 1999. Santa Fe North and La Cienega were added in 2000 and 2006, respectively. These sites vary in water flow, vegetation type (i.e., native or exotic), and vegetation structure (e.g., density). Because these sites are small, containing only 6-19 survey points each, point count surveys provide limited 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 riparian conditions; the loss or decline of one or more key riparian species could indicate deteriorating conditions. Here, we report detection rates and species richness at the six sites in 2007, and identify patterns in the data during the last eight years from 2000 through 2007. 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 northern New Mexico.

STUDY AREA

We conducted point count surveys for breeding birds at six riparian sites on BLM land within the Taos Resource Area: Agua Caliente, La Cienega, Orilla Verde, Rio Truchas, Santa Fe North, and Santa Fe South (Fig. 1). Additional Willow Flycatcher

surveys were conducted at Orilla Verde, Rio Truchas, and La Cienega (known as Santa Fe River for those surveys), and these results are presented in a separate report. These sites vary greatly in vegetation type (native or exotic), vegetation density, and water flow. We briefly summarize conditions at each site below.

Agua Caliente

We monitored six survey points at Agua Caliente, a small tributary of the Rio Grande near Pilar, in southern Taos County New Mexico (Fig. 1). Vegetation at Agua Caliente is mostly native, with a cottonwood (*Populus fremontii*) canopy over a narrow (<1 m wide in places) river channel. Understory and midstory vegetation includes oaks (*Quercus* sp.), junipers (*Juniperus* sp.), and pinyons (*Pinus edulis*).

A winter view of the narrow Agua Caliente river channel.

La Cienega

We monitored six survey points at La Cienega, a small section of the Santa Fe River near the town of La Cienega, in Santa Fe County, New Mexico (Fig. 1). Management boundaries prevented the establishment of more survey points. La Cienega contains a mix of native (cottonwoods and willows, *Salix* sp.) and exotic (Russian olive, *Elaeagnus angustifolia*) vegetation. Willow patches along the river are dense in several places, although local thinning occurred in portions of the site prior to the 2007 survey season. The Santa Fe River contains relatively consistent water flow, and the channel width varies from one to several meters. We began annual Willow Flycatcher surveys at La Cienega in 2005 and breeding bird surveys in 2006.

Orilla Verde

We monitored 19 survey points at Orilla Verde, a BLM-managed recreation area near Pilar, in southern Taos County, New Mexico (Fig. 1). Situated along the Rio Grande, Orilla Verde contains the widest river channel of the six sites, with substantial water flow in most seasons. Vegetation includes scattered cottonwoods with locally extensive patches of dense saltcedar or willow. Although breeding bird surveys began in 1999 at Orilla Verde, we have conducted Willow Flycatcher surveys separately at Orilla Verde since 1998.

Rio Truchas

We monitored 11 survey points at Rio Truchas, a tributary of the Rio Grande near the town of Velarde in Rio Arriba County, New Mexico (Fig. 1). The Rio de Truchas

contains variable, but often low, water flow in a narrow channel. Vegetation is sparse in portions of the site, but several areas contain extensive patches of dense willow and Russian olive. Like La Cienega and Orilla Verde, locally dense patches of vegetation might attract Willow Flycatchers, and concurrent surveys for this species have been conducted at Rio Truchas since 1998.

Santa Fe North

We monitored eight survey points at Santa Fe North, a section of the Santa Fe River several kilometers south of La Cienega, in Santa Fe County, New Mexico (Fig. 1). Santa Fe North contains less woody vegetation than the other sites, with the possible exception of Santa Fe South. Scattered Russian olives and junipers line the river channel. The spatial configuration of vegetation patches at Santa Fe North is perhaps limited by the narrow canyon bordered by steep rocky slopes. Livestock are often observed grazing along the river channel.

Santa Fe South

We monitored 14 survey points at Santa Fe South, a section of the Santa Fe River several kilometers south of La Cienega and Santa Fe North, in Santa Fe County, New Mexico (Fig. 1). Similar to nearby Santa Fe North, and along the same river, Santa Fe South contains scattered Russian olives lining a narrow channel. A major flood event occurred in the Santa Fe River Canyon in 1996, removing many mature cottonwoods. BLM has made an effort to exclude cattle grazing at Santa Fe South, but livestock have been observed in the canyon riparian area during most years.

Santa Fe North contains a narrow river channel with relatively few trees.

METHODS

We conducted point count surveys (see Bibby et al. 2000) at each of the six sites (64 points) twice in June (a total of 12 survey mornings). We established survey points at 250 m intervals along the riparian corridors of each site. 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) to assist with relocation (Appendix 1).

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. We separated observations into seven distance intervals (0-5, 6-25, 26-50, 51-75, 76-100, 101-125, and >125 meters) and noted separately any birds flying overhead. We also indicated which birds were observed in riparian habitat and which birds were recorded in upland habitat away from the riparian zone. We used three different observers to cover the six sites in 2007. After using the same observer for all surveys at the northern sites (i.e., Agua Caliente, Orilla Verde, and Rio Truchas) from 2001-2006, we used a new observer for those surveys in 2007. Another observer conducted nearly all surveys at Santa Fe South from 2000-2007. A third observer conducted all 2007 surveys at La Cienega and Santa Fe North. This observer conducted all surveys at La Cienega since its inception in 2006 but was new to the Santa Fe North route. 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 (not including flyovers) and dividing by the number of surveys conducted at the point (two). Because we only separated birds into distance categories beginning in 2007, we pooled our distance categories for this analysis to maintain comparability with previous years. 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 annual detection rates as the average number of birds per point with 95% confidence intervals. We present species richness as the number of species observed at each site for each year since 2000.

We determined detection rates and species richness for 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 riparian obligates and dependents encountered from 2000-2007 (Appendix 2), and determine which sites had relatively high or low riparian species richness. We also express the number of riparian species as a percentage of total observations at a site. We provide a cumulative list of species observed during point counts in 2007 (Appendix 3), as well as during the eight-year period of 2000-2007 (Appendix 4).

RESULTS

Detection Rates

We recorded a slightly higher detection rate at La Cienega (13.8 birds/point ± 2.4) than at the other five sites (Fig. 2). Detection rates at Agua Caliente (9.5 ± 1.7), Orilla

Verde (10.3 ± 1.4), Rio Truchas (9.4 ± 1.3), Santa Fe North (9.4 ± 2.3), and Santa Fe South (10.9 ± 2.1) were all very similar. In most years prior to 2007, we recorded the highest detection rates at Agua Caliente and Orilla Verde.

Although detection rates at each site have been fairly consistent over the last eight years, we recorded a considerable drop in detection rates from 2006 to 2007 at the three northern sites: Agua Caliente, Orilla Verde, and Rio Truchas (Fig. 2). Among the greatest apparent declines were species often detected in flight, such as Violet-green Swallow (*Tachycineta thalassina*), Northern Rough-winged Swallow (*Stelgidopteryx serripennis*), and Broad-tailed Hummingbird (*Selasphorus platycercus*). In 2007, the observer at the northern sites detected fewer of these species than the preceding observer, and showed a greater tendency for recording these observations as flyovers, which are not included in detection rate calculations. We also recorded notable declines for Bushtit (*Psaltriparus minimus*, 128 in 2006 and 77 in 2007) and Pinyon Jay (*Gymnorhinus cyanocephalus*, 48 in 2006 and 7 in 2007), two flocking species that are perhaps inconsistently encountered and highly subject to observer counting differences. The sudden increase that we reported for Northern Mockingbird (*Mimus polyglottos*) in 2006 (N=47) was reversed somewhat in 2007 (N=14).

For riparian obligates and dependents, we again observed the highest detection rate at La Cienega (5.3 ± 1.0); however, unlike the pattern for all species combined, we observed the lowest riparian detection rates for Santa Fe North (1.6 ± 0.4) and South (2.3 ± 0.9) (Fig. 3). At Santa Fe North and South, the percentage of all detections belonging to species classified as riparian was 18% and 21%, respectively, in 2007. The percentages were much higher at the other sites (38% at Agua Caliente, La Cienega, and Rio Truchas

and 41% at La Cienega). At Santa Fe North, most of the detections (63%) occurred in upland habitat, and relatively few detections (37%) occurred in vegetation actually within the riparian corridor. At all other sites, including Santa Fe South, the majority of detections occurred within the riparian corridor (range 67% at Rio Truchas to 80% at Agua Caliente).

Riparian detection rates have been fairly consistent over the last eight years for most sites, but we observed a slight decline at Agua Caliente in 2007 and an increasing trend at Santa Fe South from 2000-2007 (Fig. 3). At Santa Fe South, Blue Grosbeak detections have increased from a low of 2 in 2000 to a high of 30 in 2007. For all sites combined, we have observed a general increase in Yellow-breasted Chat (*Icteria virens*) detections (Appendix 2). The relatively low number of detections that we reported in 2006 for Black-headed Grosbeak (*Pheucticus melanocephalus*) rebounded somewhat in 2007 (Appendix 2).

Species Richness

We observed 72 species during point count surveys at the six sites in 2007, comparable to totals from previous years (Table 1, Appendix 3). As in all previous years since 2000, Orilla Verde contained the highest species richness (N=42 species) and Santa Fe North contained the lowest species richness (N=20 species). Orilla Verde contained more survey points (19) than the others, perhaps limiting our ability to compare among sites. However, Agua Caliente and La Cienega contained the fewest number of survey points (6), and their species richness totals were comparable to many of the sites with a greater number of survey points (Table 1).

Table 1. Number of species observed during point count surveys at six Bureau of Land Management riparian sites in northern New Mexico from 2000-2007.

Site	2000	2001	2002	2003	2004	2005	2006	2007	Total
Agua Caliente	33	35	31	28	35	32	32	33	61
La Cienega	-	-	-	-	-	-	29	28	37
Orilla Verde	59	48	46	49	49	50	47	42	84
Rio Truchas	33	28	26	29	32	29	34	30	54
Santa Fe North	25	17	23	15	24	20	19	20	38
Santa Fe South	26	27	27	27	29	26	26	29	57
Total – All Sites	77	67	69	67	74	74	73	72	114

We observed 20 riparian species (i.e., obligates and dependents) at the six sites in 2007, a total comparable to previous years (Table 2). Each year from 2000-2007, we recorded the greatest number of riparian species at Orilla Verde, a pattern similar to that for total species richness. We recorded the fewest number of riparian species at Santa Fe North and Santa Fe South every year from 2000-2007. Two species classified by BLM (1998) as riparian dependents, Fox Sparrow (*Passerella iliaca*) and Phainopepla (*Phainopepla nitens*), were observed for the first time in 2007 at Orilla Verde (Appendix 2). Orange-crowned Warbler (*Vermivora celata*), considered a riparian obligate, was observed for the first time in 2007 at Rio Truchas.

Table 2. Number of riparian obligate and dependent species observed during point count surveys at six Bureau of Land Management sites in northern New Mexico from 2000-2007. A list of riparian species for all sites combined is provided in Appendix 2.

Site	2000	2001	2002	2003	2004	2005	2006	2007	Total
Agua Caliente	9	12	9	8	8	8	10	10	17
La Cienega	-	-	-	-	-	-	9	9	10
Orilla Verde	14	13	10	14	14	15	13	15	22
Rio Truchas	9	9	8	11	8	10	10	13	17
Santa Fe North	5	4	2	3	5	5	2	5	8
Santa Fe South	5	7	5	4	5	5	7	5	10
Total – All Sites	18	17	16	17	18	20	18	20	27

DISCUSSION

Overall detection rates were consistent among sites (aside from a relative high at La Cienega), but riparian detection rates and riparian species richness indicate that Agua Caliente, La Cienega, Orilla Verde, and Rio Truchas might have qualities which render these sites superior to Santa Fe North and South for riparian birds. Santa Fe North and South has scored lowest in riparian detection rates and riparian species richness every year from 2000-2007. Although these sites had an overall detection rate comparable to most of the other sites, the percentage of detections belonging to riparian species was less than the other sites. Most of the detections at Santa Fe North were in surrounding upland habitat rather than in the riparian corridor.

Riparian vegetation at Agua Caliente, La Cienega, Orilla Verde, and Rio Truchas, is more diverse, thicker, or more plentiful than at Santa Fe North and South. Three of these sites (La Cienega, Orilla Verde, and Rio Truchas) contain locally extensive patches of both exotic and native vegetation. 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). However, exotic riparian vegetation is suitable for some species, because it simulates the dense structure of native vegetation (Fleishman et al. 2003). Abundance for many riparian obligates might depend more on this dense structure (Powell and Steidl 2000, 2002), and less on the type of vegetation. Maintaining the size and density of patches, even if the patches are exotic, can be important for maintaining key riparian species. Maintaining vegetation structure is especially important at Orilla Verde, a recreation area frequently visited by the public, because surveys regularly document Willow Flycatchers, perhaps including the federally

endangered Southwestern subspecies. Riparian habitat at Agua Caliente lacks the same dense structure and configuration of La Cienega, Orilla Verde, and Rio Truchas, but the diversity of vegetation (e.g., different species and heights) likely contributes to Agua Caliente's consistently high riparian detection rates and species richness.

Santa Fe North and South do not have the same diversity, density, and spatial coverage of vegetation, perhaps explaining their consistently low riparian detection rates and riparian species richness. La Cienega is near Santa Fe North and South, and along the same waterway, but this site contains more cottonwoods and substantial willow patches, providing habitat for several riparian species (e.g., Bullock's Oriole, *Icterus bullockii*, and Yellow-breasted Chat) not typically observed at Santa Fe North or South. The spatial extent of riparian habitat at Santa Fe North and South is somewhat limited by the adjacent canyon walls, which closely border the riverbank in some sections of the river. Nevertheless, these sites can be improved. Flood conditions in past years have modified habitat in the Santa Fe River canyon by removing mature cottonwoods. The prospects of restoring these sites by fostering the growth of emergent vegetation are confounded by livestock grazing in the canyon. Numerous cattle have been observed at Santa Fe North and South, and they have likely altered shrub and ground cover (Bock et al. 1993). Santa Fe North and South can be improved if BLM is able to exclude livestock from vegetation adjacent to the river. Although 14 cows were observed during our 5 June survey at Santa Fe South, BLM has recently redoubled efforts to remove cattle, thereby demonstrating their commitment to improving the quality of riparian habitat at these sites.

Improving riparian habitat quality is often attempted by removing all exotic salt cedar and Russian olive, then replanting the site with native woody plants. We generally

support the restoration of native plants, but such plans in the Taos Resource Area might be complicated by the use of saltcedar by Willow Flycatchers at Orilla Verde and the value of Russian olive to a variety of birds in the Santa Fe River Canyon. Removal of Russian olive at the Santa Fe sites would eliminate most of the vertical vegetation structure that some species depend on for nesting and cover. Russian olive berries might also provide a sizeable food benefit, particularly for winter residents (Hawks Aloft, unpublished data). We encourage BLM to protect the sparse vegetation structure that remains at Santa Fe North and South, while considering other methods of restoration, such as improved control of livestock and planting native vegetation.

Site-specific detection rates and species richness have remained fairly consistent over the last eight years. Our small annual sample sizes provide only limited power for us to determine meaningful short-term population trends from detection rates. Therefore, the apparent decline in detection rates at the northern sites from 2006 to 2007 should not yet be a source of great concern. We suggest that observer differences in recording several aerial foragers, and in counting flocking species, contributed greatly to the difference in detection rates. Employing one observer to survey all sites in all years would improve our ability to compare sites and examine temporal population trends. We strive to maintain observer consistency, but multiple observers have been used in recent years to account for the departure of seasonal biologists, the considerable travel distance between some of the sites, and the limited availability for some observers.

Despite limited power for determining short-term population trends, and potential observer differences in sampling, we recommend continued monitoring at each site. With at least eight years of data available for five of the sites, we are continually improving our

understanding of how local riparian conditions influence detection rates and species richness, especially for riparian obligates and dependents. The longevity of the data set allows us to report apparent population changes within the proper perspective. Continued monitoring also ensures that species of conservation concern, such as the Willow Flycatcher observed at Santa Fe South in 2006, are promptly documented, so that BLM can make appropriate management provisions. If we continue recording observations in the distance categories we established in 2007, we will have greater flexibility in the future for evaluating abundance of riparian birds and potential population changes in these riparian areas.

ACKNOWLEDGMENTS

The Bureau of Land Management, Taos Field Office, provided funding for breeding bird surveys. We thank Valerie Williams, BLM, for her support of this research. Sandy Skeba, Gail Garber, and Mike Stake conducted surveys in 2007. This report was written by Mike Stake and reviewed by Gail Garber. Photos by Gail Garber (Santa Fe South, cover), Lorraine McInnes (Agua Caliente, page 4), and Mike Stake (Santa Fe North, page 7).

LITERATURE CITED

Anderson, B. W., A. Higgins, and R. D. Ohmart. 1977. Avian use of saltcedar communities in the lower Colorado River Valley. USDA Forest Service, General Technical Report RM-43:128-136.

Bibby, C. J., N. D. Burgess, D. A. Hill, and S. H. Hustoe. 2000. Point counts and point transects. Pages 91-112 *in* Bird Census Techniques. Academic Press, London, United Kingdom.

Bock, C. E., V. A. Saab, T. D. Rich, and D. S. Dobkin. 1993. Effects of livestock grazing on Neotropical migratory landbirds in Western North America. Pages 296-309 *in* D. M. Finch and P. W. Stangel, eds. Status and Management of Neotropical Migratory Birds, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Bureau of Land Management. 1998. Birds as indicators of riparian vegetation condition in the western U.S. Bureau of Land Management, Partners in Flight, Boise, Idaho. BLM/ID/PT-98/004+6635. Northern Prairie Wildlife Research Center, Jamestown, North Dakota.

Cohan, D. R., B. W. Anderson, and R. D. Ohmart. 1978. Avian population responses to saltcedar along the Lower Colorado River. Pages 371-383 *in* R. R. Johnson and F. J. McCormick (Technical Coordinators), Strategies for Protection and Management of Floodplain Wetlands and Other Riparian Ecosystems. USDA Forest Service, General Technical Report WO-12. USDA Forest Service, Washington, D.C.

Ellis, L. M. 1995. Bird use of saltcedar and cottonwood vegetation in the Middle Rio Grande Valley of New Mexico, USA. Journal of Arid Environments 30:339-349.

Fleishman, E., N. McDonal, R. MacNally, D. D. Murphy, J. Walters, and T. Floyd. 2003. Effects of floristics, physiognomy and non-native vegetation on riparian bird communities in a Mojave Desert watershed. Journal of Animal Ecology 72:484-490.

Gates, J. E., and N. R. Giffen. 1991. Neotropical migrant birds and edge effects at a forest-stream ecotone. Wilson Bulletin 103:204-217.

Knopf, F. L., R. R. Johnson, T. Rich, F. B. Samson, and R. C. Szaro. 1988. Conservation of riparian ecosystems in the United States. Wilson Bulletin 100:272-284.

Knopf, F. L., and F. B. Samson. 1994. Scale perspective on avian diversity in Western riparian ecosystems. Conservation Biology 8:669-676.

Krueper, D. J. 1993. Effects of land use practices on western riparian ecosystems. Pages 321-330 *in* D. M. Finch and P. W. Stangel, eds., Status and Management of Neotropical Migratory Birds. USDA Forest Service, General Technical Report RM-229.

Powell, B. F., and R. J. Steidl. 2000. Nesting habitat and reproductive success of southwestern riparian birds. Condor 102:823-831.

Powell, B. F., and R. J. Steidl. 2002. Habitat selection by riparian songbirds breeding in southern Arizona. Journal of Wildlife Management 66:1096-1103.

Rich, T. D. 2002. Using breeding land birds in the assessment of western riparian systems. Wildlife Society Bulletin 30:1128-1139.

Sedgwick, J. A. 2000. Willow Flycatcher (*Empidonax traillii*). *In* The Birds of North America, No. 533 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.

Szaro, R. C. 1980. Factors influencing bird populations in southwestern riparian forests. Pages 403-418 *in* R. M. DeGraff, ed., Management of Western Forests and Grasslands for Nongame Birds. USDA Forest Service, General Technical Report INT-86.

Figure 1. Location of six Bureau of Land Management breeding bird survey sites monitored in northern New Mexico in 2007.

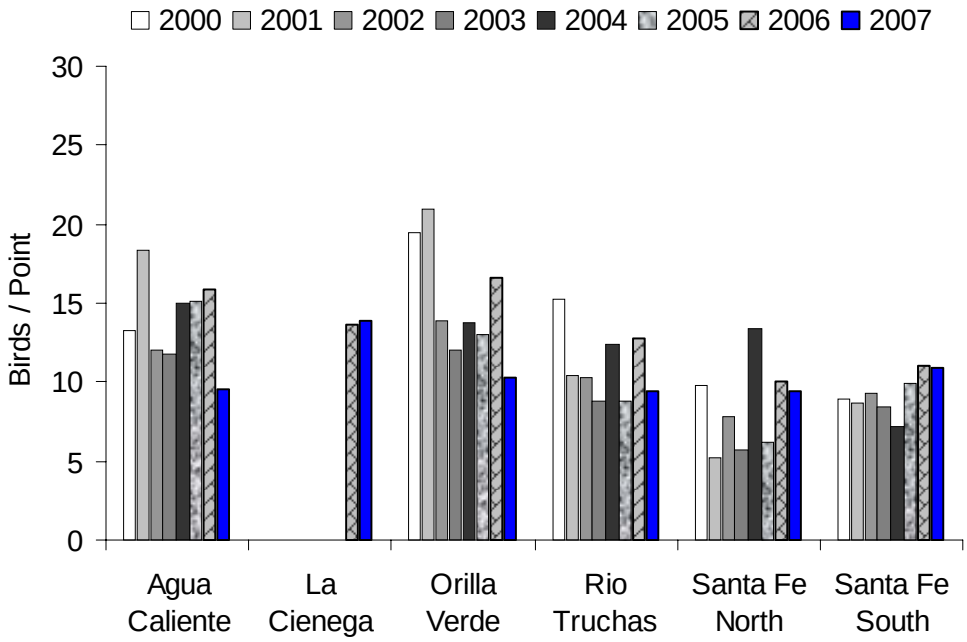

Figure 2. Annual detection rates (birds/point) for breeding bird point count surveys at six Bureau of Land Management sites in northern New Mexico from 2000-2007.

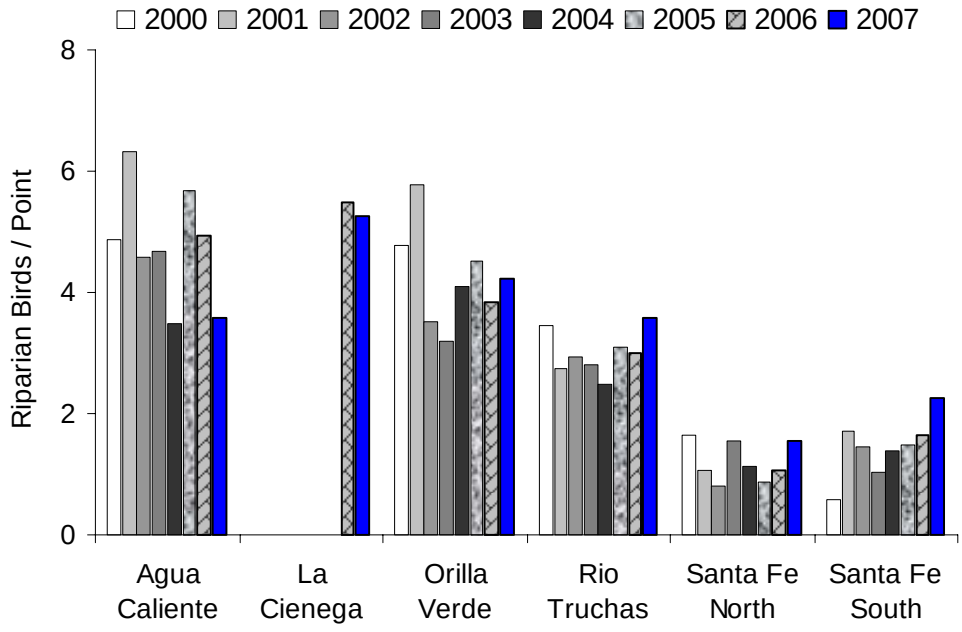

Figure 3. Annual detection rates (riparian birds/point) for riparian obligate and dependent species at six Bureau of Land Management sites in northern New Mexico from 2000-2007.

Appendix 1. Universal Transverse Mercator coordinates (North American Datum 27) of point count survey locations at Agua Caliente (AC), La Cienega (LC), Orilla Verde (OV), Rio Truchas (RT), Santa Fe North (SN), and Santa Fe South (SS), New Mexico from 2000-2007. We indicate either North American Datum 83 or 27.

Site	Point	Easting	Northing	Datum	Site	Point	Easting	Northing	Datum
AC	1	430414	4014217	NAD 83	RT	2	418852	3995847	NAD 27
AC	2	430501	4014062	NAD 83	RT	3	418740	3996049	NAD 27
AC	3	430711	4013935	NAD 83	RT	4	418499	3996184	NAD 27
AC	4	430878	4013774	NAD 83	RT	5	418323	3996355	NAD 27
AC	5	431033	4013566	NAD 83	RT	6	418090	3996417	NAD 27
AC	6	431162	4013393	NAD 83	RT	7	417811	3996518	NAD 27
LC	1	398861	3941095	NAD 27	RT	8	417630	3996698	NAD 27
LC	2	398793	3940842	NAD 27	RT	9	417430	3996855	NAD 27
LC	3	398750	3940588	NAD 27	RT	10	417360	3997118	NAD 27
LC	4	398579	3940393	NAD 27	RT	11	417163	3997233	NAD 27
LC	5	398354	3940219	NAD 27	SN	1	396647	3936162	NAD 27
LC	6	398188	3940029	NAD 27	SN	2	396618	3936419	NAD 27
OV	1	434166	4021407	NAD 83	SN	3	396567	3936674	NAD 27
OV	2	433836	4021320	NAD 83	SN	4	396516	3936918	NAD 27
OV	3	433501	4020945	NAD 83	SN	5	396521	3937130	NAD 27
OV	4	433109	4020911	NAD 83	SN	6	396548	3937362	NAD 27
OV	5	432766	4020404	NAD 83	SN	7	396689	3937246	NAD 27
OV	6	432581	4020084	NAD 83	SN	8	396802	3937430	NAD 27
OV	7	432393	4019885	NAD 83	SS	1	391928	3934444	NAD 27
OV	8	432054	4019584	NAD 83	SS	2	392095	3934566	NAD 27
OV	9	431719	4019279	NAD 83	SS	3	392358	3934526	NAD 27
OV	10	431508	4018879	NAD 83	SS	4	392548	3934480	NAD 27
OV	11	431230	4018518	NAD 83	SS	5	392858	3934539	NAD 27
OV	12	431064	4018169	NAD 83	SS	6	393124	3934665	NAD 27
OV	13	430864	4017820	NAD 83	SS	7	393193	3934843	NAD 27
OV	14	430636	4017365	NAD 83	SS	8	393448	3934946	NAD 27
OV	15	430477	4016941	NAD 83	SS	9	393688	3935073	NAD 27
OV	16	430050	4016755	NAD 83	SS	10	393809	3935260	NAD 27
OV	17	429760	4016542	NAD 83	SS	11	394048	3935299	NAD 27
OV	18	429454	4016180	NAD 83	SS	12	394307	3935271	NAD 27
OV	19	429303	4015920	NAD 83	SS	13	394562	3935352	NAD 27
RT	1	419041	3995700	NAD 27	SS	14	394704	3935490	NAD 27

Appendix 2. List of 27 riparian obligate or dependent species, as determined by the Bureau of Land Management (1998), observed during point count surveys in the Taos, New Mexico, Resource Area from 2000-2007. We indicate the number of birds observed for each species at any distance from the survey points. We monitored five sites annually from 2000-2007 and added a sixth site (La Cienega) in 2006. Site-specific species lists appear in Appendices 3 and 4.

BLM Riparian Species	'00	'01	'02	'03	'04	'05	'06	'07
American Goldfinch	1	17	-	-	-	-	3	1
Belted Kingfisher	2	1	3	1	7	4	1	-
Bewick's Wren	18	-	4	5	8	2	5	23
Black-capped Chickadee	5	1	5	-	1	8	-	-
Black-chinned Hummingbird	14	9	3	10	10	10	20	18
Black-headed Grosbeak	41	73	46	41	40	50	29	37
Blue Grosbeak	37	38	21	43	46	39	68	65
Bullock's Oriole	37	24	27	17	22	16	29	18
Common Yellowthroat	1	-	-	-	-	1	13	7
Cooper's Hawk	1	-	-	-	-	-	-	-
Cordilleran Flycatcher	6	7	5	3	7	6	4	2
Eastern Kingbird	-	-	-	-	1	-	-	-
Fox Sparrow	-	-	-	-	-	-	-	2
Gray Catbird	-	3	-	-	-	1	1	-
House Wren	-	-	-	-	1	1	-	-
Indigo Bunting	-	6	6	4	1	1	-	2
Lazuli Bunting	-	9	2	7	2	4	4	8
Lesser Goldfinch	48	33	51	38	32	70	48	65
MacGillivray's Warbler	-	-	-	1	-	-	-	4
Orange-crowned Warbler	-	-	-	-	-	-	-	1
Phainopepla	-	-	-	-	-	-	-	2
Song Sparrow	17	19	9	6	1	6	15	7
Warbling Vireo	16	24	20	13	6	20	14	2
Western Wood-Pewee	41	58	47	50	56	53	64	61
Willow Flycatcher	2	-	-	1	-	4	1	-
Yellow Warbler	35	57	22	9	28	16	28	31
Yellow-breasted Chat	28	42	37	44	41	52	53	77
Number of Individuals	350	421	308	293	310	364	400	433
Number of Riparian Species	18	17	16	17	18	20	18	20

Appendix 3. List of 72 bird species (in taxonomic order, American Birding Association, Checklist 6.7) observed in 2007 during point count surveys at Agua Caliente (AC), La Cienega (LC), Orilla Verde (OV), Rio Truchas (RT), Santa Fe North (SN), and Santa Fe South (SS), New Mexico. We include the number of each species observed at any distance from survey points. We indicate riparian obligate or dependent species, as determined by the Bureau of Land Management (1998), in **bold** font.

Common Name	AC	LC	OV	RT	SN	SS	Total
Mallard	-	-	1	-	-	4	5
Scaled Quail	-	2	-	-	-	-	2
Black-crowned Night-Heron	-	-	2	-	-	-	2
Red-tailed Hawk	-	-	1	-	5	1	7
Killdeer	-	1	-	-	-	-	1
Spotted Sandpiper	-	-	6	-	-	-	6
Rock Pigeon	-	5	-	-	-	-	5
White-winged Dove	-	-	-	-	-	2	2
Mourning Dove	5	16	14	7	13	24	79
White-throated Swift	-	-	-	-	2	-	2
Black-chinned Hummingbird	**2**	**2**	**1**	**6**	**4**	**3**	**18**
Broad-tailed Hummingbird	-	-	-	1	-	-	1
Downy Woodpecker	4	-	-	-	-	1	5
Hairy Woodpecker	1	-	-	-	-	-	1
Northern Flicker	1	-	-	-	-	-	1
Western Wood-Pewee	**6**	**-**	**29**	**5**	**9**	**12**	**61**
Gray Flycatcher	1	-	-	-	-	1	2
Cordilleran Flycatcher	**1**	**-**	**-**	**1**	**-**	**-**	**2**
Black Phoebe	-	2	1	-	4	7	14
Say's Phoebe	-	1	6	-	3	4	14
Ash-throated Flycatcher	3	1	-	6	2	13	25
Cassin's Kingbird	1	2	5	-	10	7	25
Western Kingbird	-	-	3	-	-	-	3
Plumbeous Vireo	6	1	1	6	-	-	14
Warbling Vireo	**2**	**-**	**-**	**-**	**-**	**-**	**2**
Western Scrub-Jay	1	-	3	10	-	1	15
Pinyon Jay	-	-	7	-	-	-	7
Black-billed Magpie	1	-	-	-	6	-	7
American Crow	-	-	2	-	-	-	2
Common Raven	-	1	-	-	-	-	1
Northern Rough-winged Swallow	-	-	2	-	-	-	2
Cliff Swallow	-	-	-	-	1	5	6
Juniper Titmouse	3	-	3	7	-	1	14
Bushtit	7	-	29	4	8	29	77
White-breasted Nuthatch	2	-	-	-	-	-	2
Rock Wren	-	6	30	-	19	71	126
Canyon Wren	-	-	10	-	11	15	36
Bewick's Wren	**-**	**7**	**1**	**15**	**-**	**-**	**23**

Common Name	AC	LC	OV	RT	SN	SS	Total
Blue-gray Gnatcatcher	1	-	-	9	-	-	10
Western Bluebird	-	-	-	1	-	-	1
American Robin	7	14	39	11	1	7	79
Northern Mockingbird	-	3	1	-	-	10	14
Phainopepla	**-**	**-**	**2**	**-**	**-**	**-**	**2**
Orange-crowned Warbler	**-**	**-**	**-**	**1**	**-**	**-**	**1**
Virginia's Warbler	1	-	-	4	-	-	5
Yellow Warbler	**3**	**-**	**25**	**3**	**-**	**-**	**31**
Yellow-rumped Warbler	1	-	-	-	-	-	1
Black-throated Gray Warbler	2	-	-	-	-	1	3
MacGillivray's Warbler	**3**	**-**	**-**	**1**	**-**	**-**	**4**
Common Yellowthroat	**-**	**6**	**1**	**-**	**-**	**-**	**7**
Yellow-breasted Chat	**2**	**17**	**51**	**7**	**-**	**-**	**77**
Western Tanager	1	-	-	5	-	-	6
Spotted Towhee	11	-	12	44	-	-	67
Canyon Towhee	-	-	1	3	-	-	4
Rufous-crowned Sparrow	-	-	-	-	1	-	1
Chipping Sparrow	4	1	2	2	-	1	10
Lark Sparrow	-	1	-	-	-	8	9
Fox Sparrow	**-**	**-**	**2**	**-**	**-**	**-**	**2**
Song Sparrow	**-**	**-**	**5**	**2**	**-**	**-**	**7**
Black-headed Grosbeak	**4**	**6**	**3**	**15**	**1**	**8**	**37**
Blue Grosbeak	**-**	**18**	**7**	**4**	**6**	**30**	**65**
Lazuli Bunting	**3**	**-**	**1**	**4**	**-**	**-**	**8**
Indigo Bunting	**-**	**2**	**-**	**-**	**-**	**-**	**2**
Red-winged Blackbird	-	29	4	-	-	-	33
Western Meadowlark	-	6	-	-	-	-	6
Brewer's Blackbird	-	-	13	-	-	-	13
Brown-headed Cowbird	1	7	6	5	-	11	30
Bullock's Oriole	**-**	**3**	**15**	**-**	**-**	**-**	**18**
Cassin's Finch	-	-	-	-	-	1	1
House Finch	6	4	27	2	30	17	86
Lesser Goldfinch	**17**	**2**	**16**	**15**	**5**	**10**	**65**
American Goldfinch	**-**	**-**	**1**	**-**	**-**	**-**	**1**

Appendix 4. List of 114 bird species (in taxonomic order, American Birding Association, Checklist 6.7) observed from 2000-2007 during point count surveys at Agua Caliente (AC), La Cienega (LC), Orilla Verde (OV), Rio Truchas (RT), Santa Fe North (SN), and Santa Fe South (SS), New Mexico. We include the number of each species observed at any distance from survey points. We indicate 27 riparian obligate or dependent species, as determined by the Bureau of Land Management (1998), in **bold** font.

Common Name	AC	LC	OV	RT	SN	SS	Total
Canada Goose	-	-	51	-	-	-	51
Mallard	-	2	55	-	-	6	63
Cinnamon Teal	-	-	8	-	-	-	8
Common Merganser	-	-	3	-	-	-	3
Scaled Quail	-	2	-	-	-	1	3
Black-crowned Night-Heron	-	-	9	-	-	-	9
Turkey Vulture	-	-	9	4	-	1	14
Cooper's Hawk	**-**	**-**	**-**	**-**	**-**	**1**	**1**
Red-tailed Hawk	-	-	1	2	27	3	33
Golden Eagle	-	-	1	-	-	4	5
American Kestrel	-	-	2	-	-	1	3
Prairie Falcon	-	-	2	-	-	-	2
Killdeer	-	3	-	-	-	2	5
Spotted Sandpiper	-	-	98	-	-	-	98
Solitary Sandpiper	-	-	-	-	-	1	1
Rock Pigeon	9	5	-	-	-	-	14
Band-tailed Pigeon	-	-	-	1	-	-	1
White-winged Dove	-	-	-	-	-	2	2
Mourning Dove	33	23	136	60	72	214	538
Great Horned Owl	2	-	-	-	1	-	3
Common Nighthawk	-	-	3	17	1	5	26
White-throated Swift	-	-	36	1	14	8	59
Black-chinned Hummingbird	**24**	**3**	**10**	**25**	**10**	**22**	**94**
Broad-tailed Hummingbird	78	-	12	5	1	1	97
Belted Kingfisher	**-**	**-**	**13**	**-**	**1**	**5**	**19**
Ladder-backed Woodpecker	-	-	2	3	4	-	9
Downy Woodpecker	5	-	-	2	-	1	8
Hairy Woodpecker	11	-	-	4	-	-	15
Northern Flicker	11	-	9	5	2	-	27
Western Wood-Pewee	**76**	**-**	**155**	**28**	**76**	**95**	**430**
Willow Flycatcher	**-**	**-**	**7**	**-**	**-**	**1**	**8**
Hammond's Flycatcher	3	-	-	-	-	-	3
Gray Flycatcher	4	-	5	10	-	2	21
Dusky Flycatcher	8	-	1	-	-	-	9
Cordilleran Flycatcher	**37**	**-**	**1**	**2**	**-**	**-**	**40**
Black Phoebe	-	2	22	-	17	33	74
Say's Phoebe	-	2	14	-	16	23	55
Ash-throated Flycatcher	16	5	35	74	11	42	183

Common Name	AC	LC	OV	RT	SN	SS	Total
Cassin's Kingbird	1	2	174	-	31	30	238
Western Kingbird	-	-	3	-	-	-	3
Eastern Kingbird	**-**	**-**	**1**	**-**	**-**	**-**	**1**
Gray Vireo	-	-	1	-	-	-	1
Plumbeous Vireo	46	1	7	48	-	-	102
Warbling Vireo	**86**	**-**	**2**	**27**	**-**	**-**	**115**
Steller's Jay	5	-	-	-	-	-	5
Western Scrub-Jay	29	1	45	107	3	10	195
Pinyon Jay	-	-	167	11	2	-	180
Clark's Nutcracker	3	-	2	-	-	-	5
Black-billed Magpie	1	-	33	-	16	6	56
American Crow	1	-	16	-	-	-	17
Common Raven	13	11	50	6	-	7	87
Horned Lark	-	-	-	-	-	19	19
Violet-green Swallow	25	-	159	5	8	4	201
Northern Rough-winged Swallow	4	-	107	-	7	43	161
Cliff Swallow	3	2	44	-	213	156	418
Barn Swallow	1	-	4	-	-	2	7
Black-capped Chickadee	**13**	**-**	**-**	**7**	**-**	**-**	**20**
Mountain Chickadee	19	-	-	17	-	-	36
Juniper Titmouse	25	-	5	47	2	1	80
Bushtit	42	1	149	105	37	162	496
White-breasted Nuthatch	2	-	-	-	-	-	2
Rock Wren	-	8	261	-	118	324	711
Canyon Wren	2	1	81	-	54	54	192
Bewick's Wren	**1**	**8**	**7**	**49**	**-**	**-**	**65**
House Wren	**1**	**-**	**-**	**-**	**1**	**-**	**2**
Blue-gray Gnatcatcher	21	-	54	45	-	1	121
Western Bluebird	6	-	2	3	-	1	12
Mountain Bluebird	-	1	-	-	-	-	1
Townsend's Solitaire	-	-	-	-	-	2	2
Hermit Thrush	1	-	-	-	-	-	1
American Robin	81	28	310	76	18	28	541
Gray Catbird	**-**	**-**	**4**	**1**	**-**	**-**	**5**
Northern Mockingbird	1	8	32	12	6	68	127
Sage Thrasher	-	-	-	1	-	-	1
Curve-billed Thrasher	-	-	-	-	-	2	2
European Starling	-	-	12	-	-	-	12
American Pipit	-	-	-	-	-	4	4
Cedar Waxwing	-	-	2	-	-	-	2
Phainopepla	**-**	**-**	**2**	**-**	**-**	**-**	**2**
Orange-crowned Warbler	**-**	**-**	**-**	**1**	**-**	**-**	**1**
Virginia's Warbler	59	-	30	53	-	-	142
Yellow Warbler	**9**	**3**	**209**	**5**	**-**	**-**	**226**
Chestnut-sided Warbler	-	-	1	-	-	-	1

Common Name	AC	LC	OV	RT	SN	SS	Total
Yellow-rumped Warbler	1	-	-	-	-	-	1
Black-throated Gray Warbler	28	-	4	2	-	1	35
Grace's Warbler	3	-	-	-	-	-	3
MacGillivray's Warbler	**3**	**-**	**-**	**2**	**-**	**-**	**5**
Common Yellowthroat	**-**	**17**	**5**	**-**	**-**	**-**	**22**
Yellow-breasted Chat	**8**	**38**	**307**	**21**	**-**	**-**	**374**
Western Tanager	70	1	32	46	-	-	149
Green-tailed Towhee	1	-	-	2	-	-	3
Spotted Towhee	93	1	181	337	-	-	612
Canyon Towhee	-	-	35	3	2	1	41
Rufous-crowned Sparrow	-	-	11	-	31	2	44
Chipping Sparrow	38	1	27	96	3	18	183
Black-chinned Sparrow	-	-	3	-	-	-	3
Lark Sparrow	-	2	3	-	2	61	68
Fox Sparrow	**-**	**-**	**2**	**-**	**-**	**-**	**2**
Song Sparrow	**1**	**-**	**51**	**28**	**-**	**-**	**80**
Black-headed Grosbeak	**51**	**11**	**85**	**155**	**6**	**49**	**357**
Blue Grosbeak	**7**	**38**	**104**	**44**	**48**	**116**	**357**
Lazuli Bunting	**12**	**-**	**14**	**9**	**-**	**1**	**36**
Indigo Bunting	**3**	**2**	**12**	**-**	**1**	**2**	**20**
Red-winged Blackbird	-	51	64	8	-	-	123
Western Meadowlark	-	15	-	-	-	1	16
Brewer's Blackbird	-	-	215	-	-	-	215
Common Grackle	-	-	2	-	-	-	2
Brown-headed Cowbird	21	7	175	82	23	116	424
Bullock's Oriole	**7**	**5**	**178**	**-**	**-**	**-**	**190**
Cassin's Finch	-	-	-	-	-	1	1
House Finch	41	14	245	108	166	161	735
Pine Siskin	3	-	2	1	-	-	6
Lesser Goldfinch	**119**	**4**	**109**	**117**	**12**	**24**	**385**
American Goldfinch	**-**	**-**	**12**	**10**	**-**	**-**	**22**