2006 BREEDING BIRD SURVEYS IN SIX RIPARIAN SITES

IN THE BUREAU OF LAND MANAGEMENT, TAOS RESOURCE AREA

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EXECUTIVE SUMMARY

Riparian corridors provide important habitat for breeding birds in arid regions of the western United States. Between 1994 and 2000, the Bureau of Land Management (BLM), Taos Field Office, established annual breeding bird surveys at five riparian sites in northern New Mexico: Agua Caliente, Orilla Verde, Rio Truchas, Santa Fe North, and Santa Fe South. BLM added a sixth site, La Cienega, in 2006. Hawks Aloft conducted point count surveys at each site to evaluate how local riparian conditions might affect avian detection rates and species richness. In 2006, we recorded the highest detection rates and species richness at Agua Caliente, La Cienega, Orilla Verde, and Rio Truchas, a pattern similar to previous years. Locally dense and extensive patches of vegetation likely contributed to high detection rates and species richness at these sites. Maintaining the dense structure and spatial configuration of riparian patches, even if patches contain exotic vegetation, is important for maintaining key riparian species, especially at Orilla Verde, where Willow Flycatchers (*Empidonax traillii*) have been regularly observed in recent years. Detection rates and species richness were consistently low at Santa Fe North and South from 2000-2006, likely because these sites were more sparsely vegetated and subject to grazing pressure. The appearance of a Willow Flycatcher at Santa Fe South for the first time in 2006 was noteworthy and should be strong incentive for BLM not to abandon efforts to improve habitat quality in the Santa Fe River canyon.

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 complicated by numerous competing land uses and environmental concerns. Grazing, recreation, water diversion, urban development, and invasion of exotic vegetation might affect breeding bird populations in riparian areas by changing habitat quality or by disrupting breeding activities (Szaro 1980, Knopf et al. 1988, Krueper 1993, Rich 2002). For example, riparian areas dominated by exotic vegetation (e.g., saltcedar, *Tamarix* spp.) often support fewer bird species than native riparian areas (Ellis 1995, Anderson et al. 1977, Cohan et al. 1978). The Southwestern Willow Flycatcher is strongly associated with the presence of water (Sedgwick 2000); therefore, lack of precipitation, or diversion of water away from a site, could impact abundance and distribution of this species, and others. Monitoring sites with a diversity of vegetation types and conditions can provide information on how multiple factors might affect bird populations, including riparian species and other 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 annual breeding bird surveys at one of these sites (Santa Fe South) in 1994, and began surveys 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 varied greatly 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 conditions; 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 six sites in 2006, and identify potential patterns in the data during the last seven years (2000-2006). Information on detection rates and species richness will 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). These sites varied 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 was mostly native, with a cottonwood (*Populus fremontii*) canopy over a narrow (<1 m wide in places) river channel. Understory and midstory vegetation included oaks (*Quercus* sp.), junipers (*Juniperus* sp.), and pinyons (*Pinus edulis*).

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 contained a mix of native (cottonwoods and willows, *Salix* sp.) and exotic (Russian olive, *Elaeagnus angustifolia*) vegetation. Willow patches along the river were dense in several places, prompting the establishment of annual Willow Flycatcher surveys at the site in 2005. The Santa Fe River contains relatively consistent water flow, and the channel width varies from one to several meters.

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 contained the widest river channel of the six sites, with substantial water flow in most seasons. Vegetation included 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 (Fig. 1). The Rio de Truchas contains variable, but often low, water flow in a narrow channel. Vegetation was sparse in portions of the site, but several areas contained extensive patches of dense willows and Russian olives. Like La Cienega and Orilla Verde, locally dense 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 contained less woody vegetation than the other sites, with the possible exception of Santa Fe South. Scattered Russian olives and junipers lined 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 (see photo, next page).

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

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 contained scattered Russian olives lining a narrow channel (see cover photo). A major flood event occurred in the Santa Fe River Canyon in 1996, removing many mature cottonwoods. Like Santa Fe North, livestock have been observed in the canyon riparian area during most years.

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 most 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. Observers recorded birds at all distances and noted separately any birds flying overhead. From 2000-2006, we used three or four observers per year. Observer consistency was greater at the northern sites (i.e., Agua Caliente, Orilla Verde, and Rio Truchas) than at the three Santa Fe County sites. We used the same observer for all surveys at the northern sites from 2001-2006. Another observer conducted nearly all surveys at Santa Fe South from 2000-2006. Different observers have conducted surveys at Santa Fe North, although we used the same observer in 2005 and 2006. Observers began each survey within a half-hour after sunrise and concluded within four hours.

We used detection rates as a measure of avian abundance. We calculated detection rates for each survey point (i.e., point detection rates) by adding the number of birds observed at a point during a given year and dividing by the number of surveys conducted at the point (usually two). For the number of birds observed, we did not include flyovers. 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 did not calculate annual detection rates for all sites combined, because we considered that sites varied substantially. 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, using classifications provided by the Bureau of Land Management (1998). BLM identified species that might be indicators of riparian habitat condition. They defined riparian obligates as species for which >90% of their abundance occurs within riparian habitat during the breeding season, or which place >90% of their nests in riparian vegetation (Bureau of Land Management 1998). BLM defined riparian dependents as species for which 60-90% of their abundance occurs in riparian habitat during the breeding season, or which place 60-90% of their nests in riparian vegetation (Bureau of Land Management 1998). For example, they list Willow Flycatcher as a riparian obligate, and suggest that this species will not likely occur in an area if riparian vegetation is in poor ecological condition. They list Blue Grosbeak (*Guiraca caerulea*) as a riparian dependent, and suggest that this species might occur if riparian vegetation is seriously degraded, but that populations would be reduced. We calculated 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 identify all riparian obligates and dependents encountered from 2000-2006 (Appendix 2), and determine which sites had the highest or lowest riparian species richness. We also present a list of all species observed during point counts in 2006 (Appendix 3), as well as during the seven-year period of 2000-2006 (Appendix 4).

RESULTS

We recorded a similar pattern of detection rates among the sites in 2006 as in previous years. As in most years from 2000-2005, we observed the highest detection rates at Orilla Verde (16.6 ± 1.87) and Agua Caliente (15.9 ± 4.0) in 2006, and slightly lower rates at Santa Fe North (10.1 ± 4.7) and Santa Fe South (11.0 ± 2.3, Fig. 2). At our new site, La Cienega, we recorded 13.6 birds per point (± 2.6), comparable to the rate at Rio Truchas (12.7 ± 1.9, Fig. 2).

Although detection rates were slightly higher at all sites in 2006 than in 2005, data from the last seven years do not indicate any obvious population trends over that time. At most sites, detection rates in 2006 fell within the range of values from 2000-2005 (Fig. 2). Last year, we reported a considerable decrease in detection rates for Rio Truchas and Santa Fe North from 2004 to 2005 (Hawks Aloft 2005); however, detection rates for those sites increased considerably in 2006, thereby reversing the apparent declines. The number of detections for many species increased in 2006, none more than the upland species, Northern Mockingbird (*Mimus polyglottos*). We observed 47 mockingbirds in 2006, compared to just 3 in 2005; the biggest increases occurred at Orilla Verde, Rio Truchas, and Santa Fe South, where we used the same observers in both years.

For riparian species, we recorded the same pattern of detection rates among sites, with the lowest rates at Santa Fe North (1.1 ± 4.7) and Santa Fe South (1.6 ± 4.7, Fig. 3). At La Cienega, we recorded a riparian detection rate of 5.5 ± 1.6, slightly higher than the rates at Agua Caliente (4.9 ± 2.8), Orilla Verde (3.8 ± 0.6), and Rio Truchas (3.0 ± 1.2). Riparian detection rates indicate no apparent trends from 2000-2006 (Fig. 3), but we

observed changes in the number of detections for several riparian species in 2006. We observed fewer Black-headed Grosbeaks (*Pheucticus melanocephalus*) in 2006 than in any other year since 2000 (Appendix 2). The greatest declines from 2005 to 2006 occurred at Agua Caliente (9 to 1), Orilla Verde (14 to 3), and Rio Truchas (22 to 16). Noticeable increases in Blue Grosbeak and Common Yellowthroat (*Geothlypis trichas*) numbers in 2006 (Appendix 2) were due, in large part, to the addition of La Cienega as a study site, where each was numerous.

We observed 73 species during point count surveys at the six sites in 2006, 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=47 species). This site contained more survey points (19) than the others, perhaps limiting our ability to compare among sites. Agua Caliente and La Cienega contained the fewest number of survey points (6), but species richness exceeded that of Santa Fe North and Santa Fe South, two sites typically among the lowest in species richness. (Table 1). We observed Mountain Bluebird (*Sialia currucoides*) and Western Meadowlark (*Sturnella neglecta*) for the first time in 2006, both at La Cienega.

Table 1. Number of species observed during point count surveys at six Bureau of Land Management riparian sites in northern New Mexico from 2000-2006.

Site	2000	2001	2002	2003	2004	2005	2006	Total
Agua Caliente	33	35	31	28	35	32	32	56
La Cienega	-	-	-	-	-	-	29	29
Orilla Verde	59	48	46	49	49	50	47	80
Rio Truchas	33	28	26	29	32	29	34	52
Santa Fe North	25	17	23	15	24	20	19	38
Santa Fe South	26	27	27	27	29	26	26	52
Total – All Sites	77	67	69	67	74	74	73	106

We observed 18 riparian species (i.e., obligates and dependents) at the six sites in 2006, a total comparable to previous years (Table 2). Each year from 2000-2006, 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 2000-2006. Although we observed relatively few riparian species at Santa Fe South, the appearance of a Willow Flycatcher for the first time at this site was noteworthy. Our observation of a singing male at UTM 393714-3935103 (NAD 27) on 8 June was the only Willow Flycatcher detected among the six sites during 2006 point count surveys.

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 2000-2006. An annual list of riparian species for all sites combined is provided in Appendix 2.

Site	2000	2001	2002	2003	2004	2005	2006	Total
Agua Caliente	9	12	9	8	8	8	10	16
La Cienega	-	-	-	-	-	-	9	9
Orilla Verde	14	13	10	14	14	15	13	20
Rio Truchas	9	9	8	11	8	10	10	16
Santa Fe North	5	4	2	3	5	5	2	8
Santa Fe South	5	7	5	4	5	5	7	10
Total – All Sites	18	17	16	17	18	20	18	24

DISCUSSION

Relatively high detection rates and species richness at Agua Caliente, La Cienega, Orilla Verde, and Rio Truchas demonstrate the importance of maintaining a complex vegetation structure in riparian areas. 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 high complexity 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 generally lack high vegetation density and spatial coverage, perhaps explaining their consistently low detection rates and species richness. La Cienega was nearby and along the same waterway, but we recorded higher detection rates and species richness in our first season at that site, simply because that site contained more riparian vegetation than Santa Fe North and South. To some extent, the spatial extent of riparian habitat at these sites is limited because the sheer canyon walls closely border the riverbank. Nevertheless, these sites can be improved. Flood conditions in 1996 modified habitat in the Santa Fe River canyon by removing many mature cottonwoods. The prospects of emerging vegetation replacing this loss are confounded by livestock grazing in the canyon. Numerous cattle have been observed in most years, including 2006, at Santa Fe North and South, almost certainly altering shrub and ground

cover (Bock et al. 1993). Riparian habitat at Santa Fe North and South can be improved if BLM is able to exclude livestock from vegetation adjacent to the river. The appearance of a Willow Flycatcher at Santa Fe South for the first time is encouraging. Potential use of this site by migrant Willow Flycatchers should be strong incentive for BLM not to abandon efforts to improve habitat quality in this canyon.

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 potential value of saltcedar to Willow Flycatchers at Orilla Verde and the potential 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. Preliminary data from a current Hawks Aloft study along the Middle Rio Grande indicate that Russian olive berries might also provide a sizeable food benefit, particularly for winter residents. 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 local plantings of native vegetation.

Site-specific detection rates and species richness have remained consistent from 2000-2006. Our small sample sizes provide only limited power for us to determine meaningful temporal trends over such a short period. Nevertheless, we consider that any detection rate differences from 2000-2006 are small enough to conclude that considerable population changes have not occurred during that time. The consistency of our results is supported by our species richness information. The number of riparian obligates and

dependents has remained steady from 2000-2006, and no regular riparian species have disappeared from any site. The apparent 2006 decline in observations of Black-headed Grosbeaks, a riparian dependent, is noteworthy and should be explored in 2007. The apparent increase in Northern Mockingbirds is more of a curiosity than an indication of local riparian changes. We observed the same substantial increase for mockingbirds at seven other BLM riparian areas in Cibola and Sandoval Counties, New Mexico in 2006, as well as for another monitoring study along the Rio Grande. Continued monitoring will help determine if mockingbirds continue to increase or if this is a one-year phenomenon.

We recommend that BLM continue monitoring each site to identify apparent changes in bird populations associated with local riparian conditions. With at least seven years of data available for five of the sites, we are continually refining our understanding of local riparian conditions and improving our ability to report apparent population changes in the proper perspective. Continued monitoring also ensures that species of conservation concern, such as Willow Flycatcher, are promptly documented, so that BLM can make appropriate management provisions. Hawks Aloft can improve the monitoring effort by distinguishing riparian from upland observations during surveys, and by estimating distances of birds from the survey points. Separating riparian birds from upland birds would improve our ability to evaluate the riparian aspect of a site separately from adjacent uplands. Estimating distances would allow us to determine avian densities, a more informative index of abundance than detection rates. We considered this change in 2006 but were concerned that estimating distances for so many individuals (15 or more birds per point at some sites) in a span of five minutes might compromise our ability to detect birds. This is a valid concern, but sorting observations into distance categories, or

estimating distances only for riparian species, might be realistic alternatives for improving our index of abundance with minimal extra effort. These additional data parameters, should they be incorporated, would not alter our current methodology or the use of past data; they would be intended to provide an added dimension to our analyses.

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Figure 1. Location of six Bureau of Land Management breeding bird survey sites monitored in northern New Mexico in 2006.

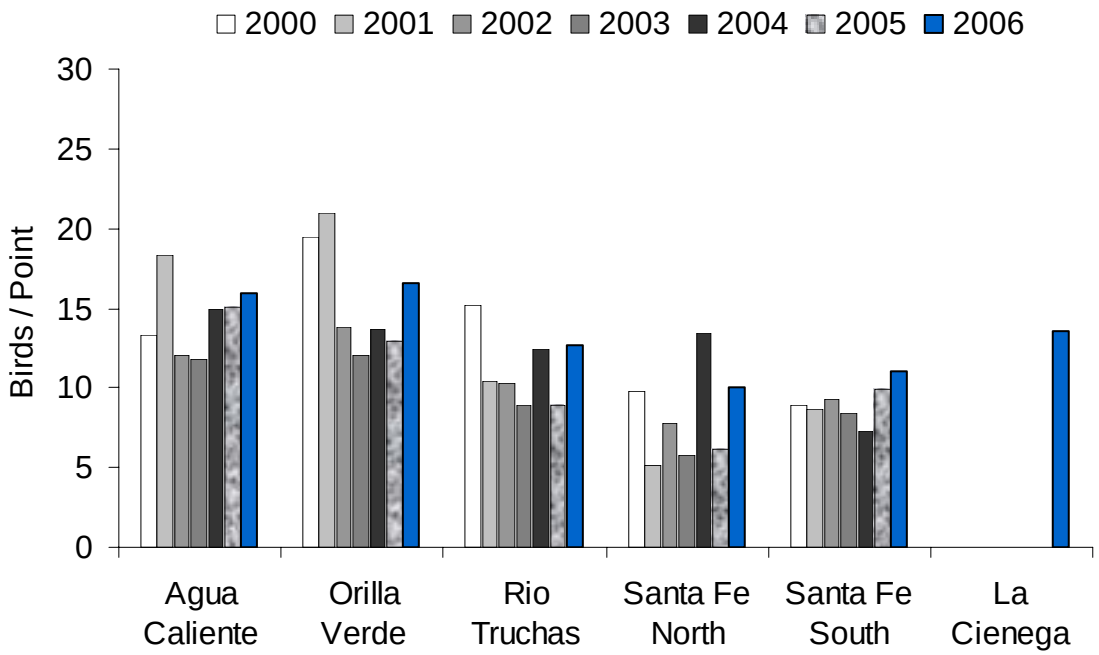

Figure 2. Annual detection rates (birds/point) for breeding bird point count surveys at six Bureau of Land Management sites in northern New Mexico from 2000-2006.

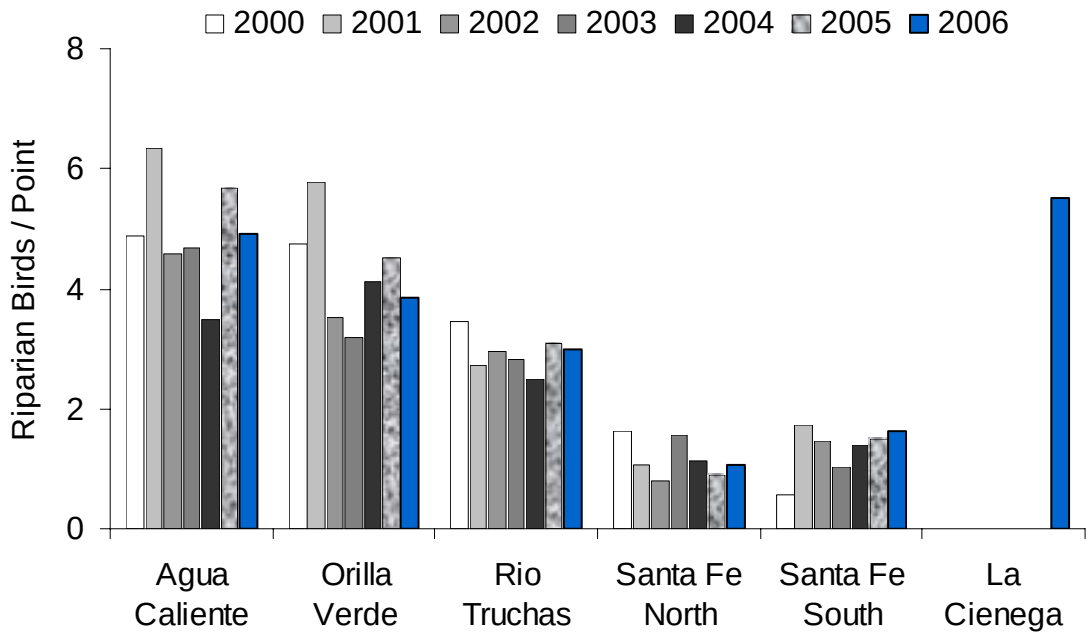

Figure 3. Annual detection rates (riparian birds/point) for riparian obligate and dependent species at six Bureau of Land Management sites in northern New Mexico from 2000-2006.

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 2000-2006.

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

Appendix 2. List of 24 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 2000-2006. We indicate the number of birds observed for each species, at any distance from the survey points. We monitored five sites annually from 2000-2006 and added a sixth site (La Cienega) in 2006. Site-specific species totals can be obtained in Appendices 3 and 4.

BLM Riparian Species	2000	2001	2002	2003	2004	2005	2006
American Goldfinch	1	17	-	-	-	-	3
Belted Kingfisher	2	1	3	1	7	4	1
Bewick's Wren	18	-	4	5	8	2	5
Black-capped Chickadee	5	1	5	-	1	8	-
Black-chinned Hummingbird	14	9	3	10	10	10	20
Black-headed Grosbeak	41	73	46	41	40	50	29
Blue Grosbeak	37	38	21	43	46	39	68
Bullock's Oriole	37	24	27	17	22	16	29
Common Yellowthroat	1	-	-	-	-	1	13
Cooper's Hawk	1	-	-	-	-	-	-
Cordilleran Flycatcher	6	7	5	3	7	6	4
Eastern Kingbird	-	-	-	-	1	-	-
Gray Catbird	-	3	-	-	-	1	1
House Wren	-	-	-	-	1	1	-
Indigo Bunting	-	6	6	4	1	1	-
Lazuli Bunting	-	9	2	7	2	4	4
Lesser Goldfinch	48	33	51	38	32	70	48
MacGillivray's Warbler	-	-	-	1	-	-	-
Song Sparrow	17	19	9	6	1	6	15
Warbling Vireo	16	24	20	13	6	20	14
Western Wood-Pewee	41	58	47	50	56	53	64
Willow Flycatcher	2	-	-	1	-	4	1
Yellow Warbler	35	57	22	9	28	16	28
Yellow-breasted Chat	28	42	37	44	41	52	53
Number of Individuals	350	421	308	293	310	364	400
Number of Riparian Species	18	17	16	17	18	20	18

Appendix 3. List of 73 bird species (in alphabetic order) observed 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 in 2006. We include numbers 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.

Species	AC	LC	OV	RT	SN	SS	Total
American Crow	-	-	1	-	-	-	1
American Goldfinch	**-**	**-**	**3**	**-**	**-**	**-**	**3**
American Kestrel	-	-	2	-	-	-	2
American Robin	6	14	59	6	3	3	91
Ash-throated Flycatcher	3	4	5	4	1	6	23
Barn Swallow	-	-	1	-	-	-	1
Belted Kingfisher	**-**	**-**	**1**	**-**	**-**	**-**	**1**
Bewick's Wren	**-**	**1**	**-**	**4**	**-**	**-**	**5**
Black Phoebe	-	-	3	-	1	4	8
Black-billed Magpie	-	-	-	-	9	-	9
Black-chinned Hummingbird	**6**	**1**	**2**	**2**	**-**	**9**	**20**
Black-crowned Night-Heron	-	-	3	-	-	-	3
Black-headed Grosbeak	**1**	**5**	**3**	**16**	**-**	**4**	**29**
Black-throated Gray Warbler	6	-	-	-	-	-	6
Blue Grosbeak	**1**	**20**	**17**	**5**	**7**	**18**	**68**
Blue-gray Gnatcatcher	3	-	7	11	-	-	21
Brewer's Blackbird	-	-	18	-	-	-	18
Broad-tailed Hummingbird	19	-	1	3	-	-	23
Brown-headed Cowbird	-	-	23	14	2	23	62
Bullock's Oriole	**3**	**2**	**24**	**-**	**-**	**-**	**29**
Bushtit	7	1	41	24	-	55	128
Canada Goose	-	-	29	-	-	-	29
Canyon Wren	-	1	5	-	7	11	24
Cassin's Kingbird	-	-	27	-	8	10	45
Chipping Sparrow	8	-	4	14	-	4	30
Cliff Swallow	-	2	-	-	45	1	48
Common Nighthawk	-	-	-	2	-	-	2
Common Raven	3	10	8	3	-	-	24
Common Yellowthroat	**-**	**11**	**2**	**-**	**-**	**-**	**13**
Cordilleran Flycatcher	**4**	**-**	**-**	**-**	**-**	**-**	**4**
Downy Woodpecker	-	-	-	2	-	-	2
Golden Eagle	-	-	1	-	-	-	1
Gray Catbird	**-**	**-**	**-**	**1**	**-**	**-**	**1**
Gray Flycatcher	2	-	-	3	-	-	5
Hairy Woodpecker	5	-	-	-	-	-	5

Species	AC	LC	OV	RT	SN	SS	Total
Horned Lark	-	-	-	-	-	6	6
House Finch	4	10	20	31	30	22	117
Juniper Titmouse	2	-	-	1	-	-	3
Killdeer	-	2	-	-	-	-	2
Ladder-backed Woodpecker	-	-	-	-	1	-	1
Lark Sparrow	-	1	-	-	-	21	22
Lazuli Bunting	**2**	**-**	**1**	**-**	**-**	**1**	**4**
Lesser Goldfinch	**17**	**2**	**8**	**19**	**-**	**2**	**48**
Mallard	-	2	15	-	-	1	18
Mountain Bluebird	-	1	-	-	-	-	1
Mountain Chickadee	4	-	-	-	-	-	4
Mourning Dove	2	7	22	7	12	23	73
Northern Flicker	-	-	3	-	1	-	4
Northern Mockingbird	1	5	14	5	2	20	47
Northern Rough-winged Swallow	-	-	12	-	-	5	17
Pinyon Jay	-	-	45	3	-	-	48
Plumbeous Vireo	5	-	1	2	-	-	8
Red-tailed Hawk	-	-	-	1	3	-	4
Red-winged Blackbird	-	22	22	-	-	-	44
Rock Wren	-	2	28	-	15	43	88
Rufous-crowned Sparrow	-	-	-	-	3	-	3
Say's Phoebe	-	1	-	-	1	1	3
Song Sparrow	**-**	**-**	**6**	**9**	**-**	**-**	**15**
Spotted Sandpiper	-	-	14	-	-	-	14
Spotted Towhee	13	1	21	45	-	-	80
Turkey Vulture	-	-	-	1	-	-	1
Violet-green Swallow	18	-	12	4	-	3	37
Virginia's Warbler	5	-	-	6	-	-	11
Warbling Vireo	**11**	**-**	**-**	**3**	**-**	**-**	**14**
Western Bluebird	3	-	-	-	-	-	3
Western Meadowlark	-	9	-	-	-	-	9
Western Scrub-Jay	4	1	10	14	-	-	29
Western Tanager	8	1	3	8	-	-	20
Western Wood-Pewee	**10**	**-**	**30**	**3**	**10**	**11**	**64**
White-throated Swift	-	-	4	-	-	-	4
Willow Flycatcher	**-**	**-**	**-**	**-**	**-**	**1**	**1**
Yellow Warbler	**-**	**3**	**25**	**-**	**-**	**-**	**28**
Yellow-breasted Chat	**4**	**21**	**24**	**4**	**-**	**-**	**53**

Appendix 4. List of 106 bird species (in alphabetic order) observed 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 from 2000-2006. We include numbers 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.

Species	AC	LC	OV	RT	SN	SS	Total
American Crow	1	-	14	-	-	-	15
American Goldfinch	**-**	**-**	**11**	**10**	**-**	**-**	**21**
American Kestrel	-	-	2	-	-	1	3
American Pipit	-	-	-	-	-	4	4
American Robin	74	14	271	65	17	21	462
Ash-throated Flycatcher	13	4	35	68	9	29	158
Band-tailed Pigeon	-	-	-	1	-	-	1
Barn Swallow	1	-	4	-	-	2	7
Belted Kingfisher	**-**	**-**	**13**	**-**	**1**	**5**	**19**
Bewick's Wren	**1**	**1**	**6**	**34**	**-**	**-**	**42**
Black Phoebe	-	-	21	-	13	26	60
Black-billed Magpie	-	-	33	-	10	6	49
Black-capped Chickadee	**13**	**-**	**-**	**7**	**-**	**-**	**20**
Black-chinned Hummingbird	**22**	**1**	**9**	**19**	**6**	**19**	**76**
Black-chinned Sparrow	-	-	3	-	-	-	3
Black-crowned Night-Heron	-	-	7	-	-	-	7
Black-headed Grosbeak	**47**	**5**	**82**	**140**	**5**	**41**	**320**
Black-throated Gray Warbler	26	-	4	2	-	-	32
Blue Grosbeak	**7**	**20**	**97**	**40**	**42**	**86**	**342**
Blue-gray Gnatcatcher	20	-	54	36	-	1	111
Brewer's Blackbird	-	-	202	-	-	-	202
Broad-tailed Hummingbird	78	-	12	4	1	1	96
Brown-headed Cowbird	20	-	169	77	23	105	394
Bullock's Oriole	**7**	**2**	**163**	**-**	**-**	**-**	**172**
Bushtit	35	1	120	101	29	133	419
Canada Goose	-	-	51	-	-	-	51
Canyon Towhee	-	-	34	-	2	1	37
Canyon Wren	2	1	71	-	43	39	156
Cassin's Kingbird	-	-	169	-	21	23	213
Cedar Waxwing	-	-	2	-	-	-	2
Chestnut-sided Warbler	-	-	1	-	-	-	1
Chipping Sparrow	34	-	25	94	3	17	173
Cinnamon Teal	-	-	8	-	-	-	8
Clark's Nutcracker	3	-	2	-	-	-	5
Cliff Swallow	3	2	44	-	212	151	582

Species	AC	LC	OV	RT	SN	SS	Total
Common Grackle	-	-	2	-	-	-	2
Common Merganser	-	-	3	-	-	-	3
Common Nighthawk	-	-	3	17	1	5	26
Common Raven	13	10	50	6	-	7	86
Common Yellowthroat	**-**	**11**	**4**	**-**	**-**	**-**	**15**
Cooper's Hawk	**-**	**-**	**-**	**-**	**-**	**1**	**1**
Cordilleran Flycatcher	**36**	**-**	**1**	**1**	**-**	**-**	**38**
Curve-billed Thrasher	-	-	-	-	-	2	2
Downy Woodpecker	1	-	-	2	-	-	3
Dusky Flycatcher	8	-	1	-	-	-	9
Eastern Kingbird	**-**	**-**	**1**	**-**	**-**	**-**	**1**
European Starling	-	-	12	-	-	-	12
Golden Eagle	-	-	1	-	-	4	5
Grace's Warbler	3	-	-	-	-	-	3
Gray Catbird	**-**	**-**	**4**	**1**	**-**	**-**	**5**
Gray Flycatcher	3	-	5	10	-	1	19
Gray Vireo	-	-	1	-	-	-	1
Great Horned Owl	2	-	-	-	1	-	3
Green-tailed Towhee	1	-	-	2	-	-	3
Hairy Woodpecker	10	-	-	4	-	-	14
Hammond's Flycatcher	3	-	-	-	-	-	3
Hermit Thrush	1	-	-	-	-	-	1
Horned Lark	-	-	-	-	-	19	19
House Finch	35	10	218	106	136	144	649
House Wren	**1**	**-**	**-**	**-**	**1**	**-**	**2**
Indigo Bunting	**3**	**-**	**12**	**-**	**1**	**2**	**18**
Juniper Titmouse	22	-	2	40	2	-	66
Killdeer	-	2	-	-	-	2	4
Ladder-backed Woodpecker	-	-	2	3	4	-	9
Lark Sparrow	-	1	3	-	2	53	59
Lazuli Bunting	**9**	**-**	**13**	**5**	**-**	**1**	**28**
Lesser Goldfinch	**102**	**2**	**93**	**102**	**7**	**14**	**320**
MacGillivray's Warbler	**-**	**-**	**-**	**1**	**-**	**-**	**2**
Mallard	-	2	54	-	-	2	58
Mountain Bluebird	-	1	-	-	-	-	1
Mountain Chickadee	19	-	-	17	-	-	36
Mourning Dove	28	7	122	53	59	190	459
Northern Flicker	10	-	9	5	2	-	26
Northern Mockingbird	1	5	31	12	6	58	113
Northern Rough-winged Swallow	4	-	105	-	7	43	159
Pine Siskin	3	-	2	1	-	-	6
Pinyon Jay	-	-	160	11	2	-	173

Species	AC	LC	OV	RT	SN	SS	Total
Plumbeous Vireo	40	-	6	42	-	-	88
Prairie Falcon	-	-	2	-	-	-	2
Red-tailed Hawk	-	-	-	2	22	2	26
Red-winged Blackbird	-	22	60	8	-	-	90
Rock Pigeon	9	-	-	-	-	-	9
Rock Wren	-	2	231	-	99	253	585
Rufous-crowned Sparrow	-	-	11	-	30	2	43
Sage Thrasher	-	-	-	1	-	-	1
Say's Phoebe	-	1	8	-	13	19	41
Scaled Quail	-	-	-	-	-	1	1
Solitary Sandpiper	-	-	-	-	-	1	1
Song Sparrow	**1**	**-**	**46**	**26**	**-**	**-**	**73**
Spotted Sandpiper	-	-	92	-	-	-	92
Spotted Towhee	82	1	169	293	-	-	545
Steller's Jay	5	-	-	-	-	-	5
Townsend's Solitaire	-	-	-	-	-	2	2
Turkey Vulture	-	-	9	4	-	1	14
Violet-green Swallow	25	-	159	5	8	4	201
Virginia's Warbler	58	-	30	49	-	-	137
Warbling Vireo	**84**	**-**	**2**	**27**	**-**	**-**	**113**
Western Bluebird	6	-	2	2	-	1	11
Western Meadowlark	-	9	-	-	-	1	10
Western Scrub-Jay	28	1	42	97	3	9	180
Western Tanager	69	1	32	41	-	-	143
Western Wood-Pewee	**70**	**-**	**126**	**23**	**67**	**83**	**369**
White-throated Swift	-	-	36	1	12	8	57
Willow Flycatcher	**-**	**-**	**7**	**-**	**-**	**1**	**8**
Yellow Warbler	**6**	**3**	**184**	**2**	**-**	**-**	**195**
Yellow-breasted Chat	**6**	**21**	**256**	**14**	**-**	**-**	**297**