2005 Monitoring Report for the Los Lunas Habitat Restoration Site

Prepared for:
U.S. Department of Defense
Army Corps of Engineers
Albuquerque District
Albuquerque, New Mexico

Prepared by:
U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Environmental Services Division
Fisheries and Wildlife Resources Group
Denver, Colorado

August 2006

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Prepared by

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Introduction

The Los Lunas Habitat Restoration Project is intended to fulfill requirements in one of eight reaches in which habitat restoration must be conducted in accordance with Element J of the Reasonable and Prudent Alternative (RPA) within the June 2001 Biological Opinion (BO) issued by the U.S. Fish and Wildlife Service (USFWS) (USFWS 2001). The U.S. Bureau of Reclamation (Reclamation), Albuquerque Area Office and the U.S. Army Corps of Engineers, Albuquerque District (Corps) have acted as joint lead Federal agencies on this project, and the Middle Rio Grande Conservancy District (MRGCD) is the primary non-Federal cooperator.

In April of 2000, an area of the bosque that included the entirety of the Los Lunas Restoration Site suffered a severe fire that destroyed virtually all of the aboveground vegetation. This area thus presented a unique opportunity for restoration and was subsequently selected as the first BO restoration project.

The primary objectives of the restoration project were to improve habitat conditions for the Rio Grande silvery minnow (*Hybognathus amarus* [minnow]) and southwestern willow flycatcher (*Empidonax traillii extimus* [WIFL]) such that, in combination with other elements of the RPA, continued jeopardy to the two species could be avoided.

The design goals were to generate inundation of the project area at flows of greater than or equal to 2,500 cubic feet/second (cfs). For flows below 2,500 cfs, a variety of substrate elevations were integrated into the project design, which allow for the inundation of certain regions at lower river stages. This includes features such as a network of variable depth side and transverse channels designed to aid in minnow egg retention and provide shallow water/low velocity rearing habitat. In addition, the increased inundation frequency would begin the process of post-fire regeneration of high-value existing and revegetated terrestrial habitats in portions within and adjacent to the restoration area to support the recovery of the WIFL.

In April 2002, the initial phase of work began by removing approximately 1,400 jetty jacks, establishing access routes, and a staging area. Upon the initiation of construction, the site was largely dominated by thick stands of herbaceous and exotic re-growth. Vegetation within the overbank area, access roads, staging area, and disturbance areas next to the levee and root-wad berm was cleared and mulched. With the removal of jetty jacks completed, crews from the Reclamation's Socorro Field Office began clearing, surveying, and excavating the flood plain. Specific areas within the site were revegetated using seed, potted shrubs, or cottonwood and willow poles.

To fulfill the requirements of the BO, monitoring of habitat suitability/ sustainability is being conducted. Reclamation's Technical Service Center in Denver, Colorado, has carried out avian, vegetation, and ground water monitoring at the restoration site since 2003.

Methods

Avian Monitoring

Point Counts

Los Lunas Restoration Site

We conducted 5-minute, 50-meter (m) fixed-radius point counts three times/year during the peak breeding seasons (late May to early July) within two habitat treatment types at the Los Lunas Restoration Site (Figures 1 and 2). These are located in:

- Burned/Regenerating Cottonwood Forest - A previously burned cottonwood (*Populus deltoides*) forest that is experiencing regrowth of mixed vegetation; 17 point counts were conducted at this site for 2 seasons in 2003 and 2004.
- Cleared/Overbank Area - The area bordering the active river channel that was cleared and excavated to allow overbank flooding; eight point counts were conducted at this site for three seasons in 2003, 2004, and 2005.

In addition, point counts were conducted upstream and downstream of the Los Lunas Restoration Site in three other habitat treatment types:

- Unburned/Untreated Cottonwood Forest – A cottonwood forest that had been neither burned nor treated; 12 point counts were conducted for 2 seasons in 2004 and 2005.
- Cottonwood Forest with Cleared Exotic Understory – A cottonwood forest that was cleared of understory saltcedar (*Tamarix ramosissima*) and Russian olive (*Eleagnus angustifolia*); 12 point counts were conducted for 1 season in 2005.
- Burned Cottonwood Forest with Willow Dominated Understory – This site is adjacent to the burned/regenerating cottonwood forest and located just upstream of the Los Luna Restoration Site; it is essentially an extension of the burned cottonwood forest that has been analyzed as a separate subplot of the burned/regenerating cottonwood forest because of the desirable habitat created from regenerating willow; three point counts were conducted for two seasons in 2003 and 2004.

Reference Areas

For comparison, we have also used reference area data from point counts conducted concurrently in riparian areas in the Sevilleta National Wildlife Refuge (NWR) and the Bosque del Apache NWR. The locations of point counts in the area of the Los Lunas Restoration Site are mapped on Figures 1 and 2. The point count location of the reference sites at Sevilleta and Bosque del Apache NWR are in Appendix A.

Nest Monitoring

We established Breeding Biology Research and Monitoring Database (BBIRD) nest monitoring plots in the burned/regenerating cottonwood forest area [4.5 hectares (ha)] and in the cleared/overbank area (5.5 ha) to determine breeding species and factors affecting nest success (Figure 1). Limited nest searching and monitoring were conducted weekly during mid-June and July in 2004 and 2005.

Southwestern Willow Flycatcher Surveys

We conducted presence/absence surveys for the endangered WIFL in accordance with Sogge et al. (1997) and the USFWS revised protocol (USFWS 2000). Surveys were conducted three times by permitted personnel within all suitable habitat at the Los Lunas Restoration Site as well as all of the Belen Reach. These surveys were part of Reclamation's annual WIFL monitoring program conducted at selected sites along the Rio Grande from Velarde to Elephant Butte Reservoir (Moore and Ahlers 2005). Willow flycatcher survey forms and maps are shown in Appendix B.

Vegetation Monitoring

River Transects

Twelve 5-m permanent transects were established at the Los Lunas Restoration Site between the root wad berm and the river to document the natural establishment of vegetation in this area. None of this area was replanted using seed or potted shrubs. All transects were evenly distributed in the disturbed area and were oriented perpendicular to the river (Figure 3).

Cover and species composition were measured every 0.5 m along the 50-m transect using the point-intercept method. Data were collected in late August/early September of 2003, 2004, and 2005. These 2005 data were statistically compared to the 2003 results for baseline comparison of the riparian zone development. The Student's t-test of means was used to statistically compare normally distributed data, and the Mann-Whitney nonparametric test of medians was used to compare data that were not normally distributed. At present, there are no similar restoration projects in the region to use as a comparison.

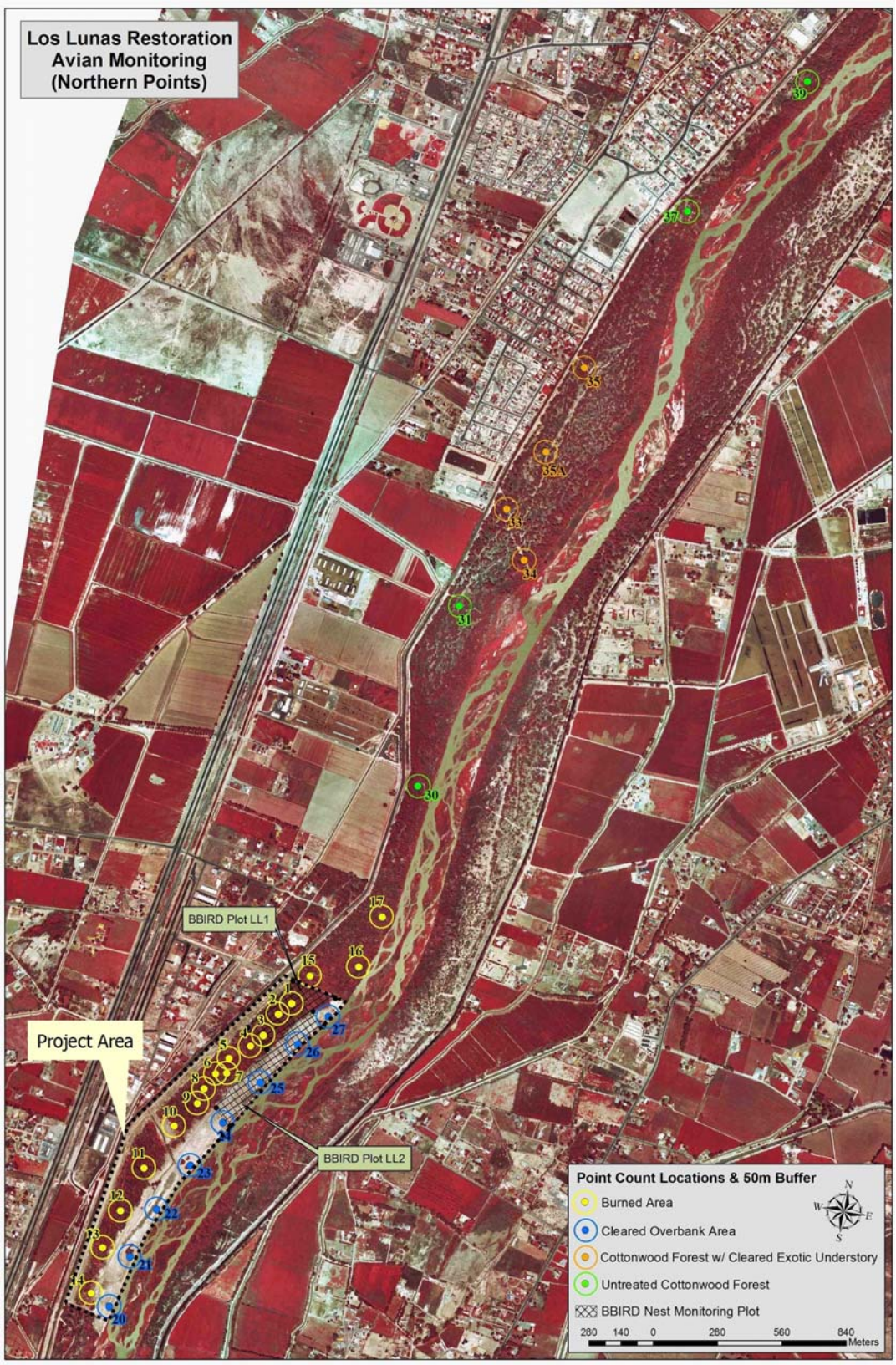


Figure 1. Point count locations at Los Lunas Restoration Site and upstream reference sites.

Figure 2. Point count locations at reference sites downstream of Los Lunas Restoration Site.

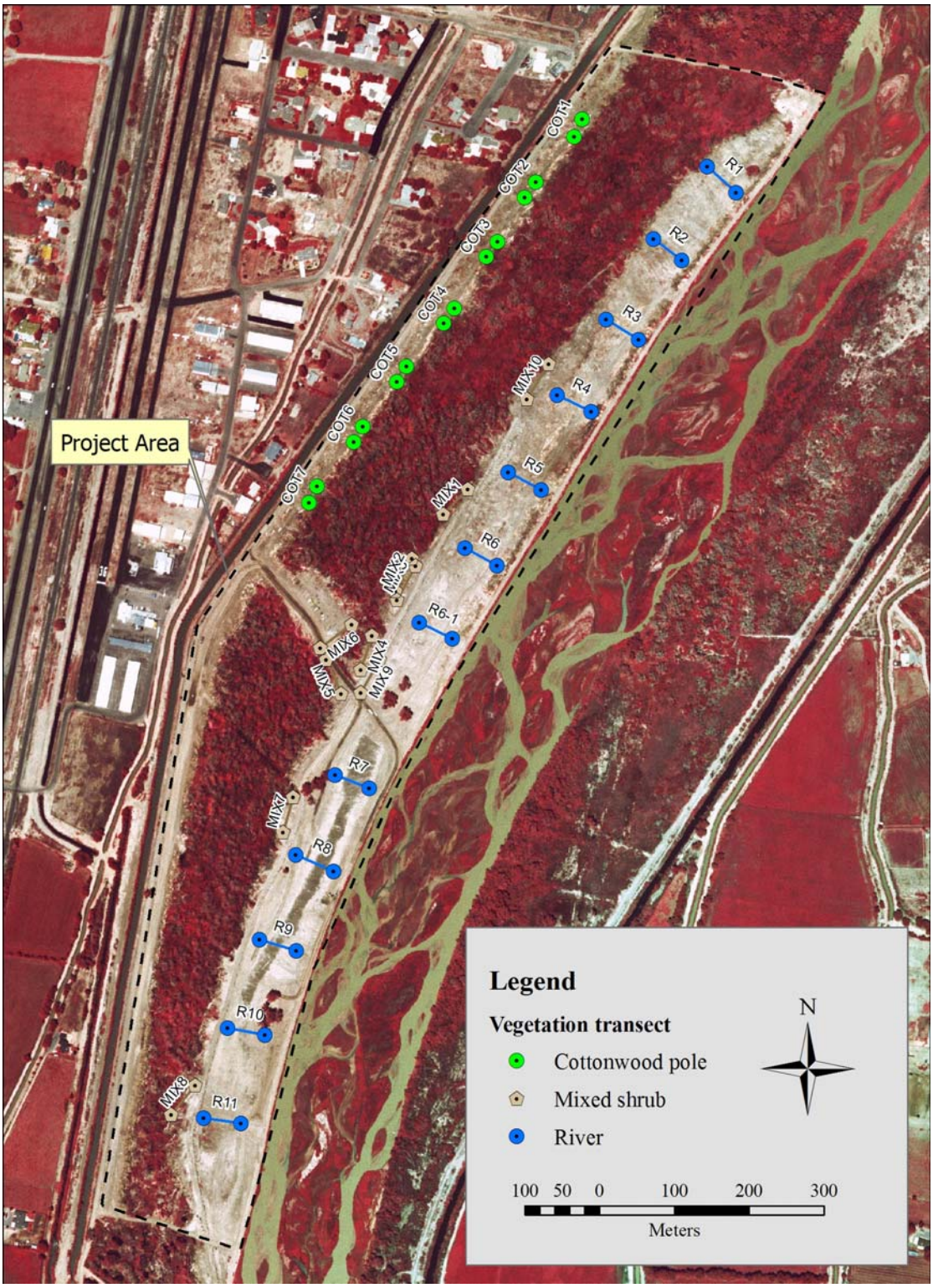


Figure 3. Vegetation transect locations.

Mixed Shrub Transects

Eight 50-m permanent transects were established just west of the root wad berm to document survival rates of mixed shrubs that were planted at this site in November of 2004. Transects were randomly placed within clusters of containerized transplantings. Two 50-m permanent transects were placed just east of the root wad berm (river side) where western black willow (*Salix gooddingii*) poles were planted. Refer to Figure 3 for the 10 transect locations.

Stem density was measured within 1 m of each side of the transect. The number of individual stems in this area was counted and their status (live or dead) was recorded. Data were collected in late August of 2005. Annual data will be compared to the 2005 results for baseline comparison of the mixed shrub container plantings survival.

Cottonwood Pole Plots

Seven 25- by 10-m permanent plots were established on the east side of the drain ditch road north of the river access road to document survival rates of cottonwood pole cuttings that were planted at this site in April of 2004. Plots were evenly distributed within the planted area and were placed parallel to the road (Figure 3). They were marked by a 25-m transect in the center.

The number of live poles, dead poles, and live root sprouts within each plot was counted. No other species besides cottonwoods were recorded. Annual data will be compared to the 2005 results for baseline comparison of the cottonwood pole plantings survival.

Ground Water Monitoring

A total of 11 ground water monitoring wells were installed along 3 transects running perpendicular to the river—4 wells on the north end of the site, 4 in the center, and 3 on the southern end (Figure 4). All wells were installed using the methodology described in the Corps publication “Installing Monitoring Wells and Piezometers in Wetlands” (ERDC TN-WRAP-00-02). All wells averaged 5.0 feet in depth, with the ground water depth at a range of 2.0 to 4.0 feet below the surface at the time of installation. Eight wells were installed in June 2003 and the remaining westernmost three were installed July 2004.

Photo Stations

Ten photo stations were established throughout the study area with permanent numbered t-posts (Figure 4). Digital photographs were taken in late August/early September of 2003, 2004, and 2005 to visually document vegetation height, density, species composition and overall site development. Annual photos will be compared to 2003 baseline photos to evaluate changes over time.

Figure 4. Ground water well and photo station locations.

Results

Avian Monitoring

Point Counts

Tables 1 to 5 summarize point count data for the Los Lunas Restoration Site and reference areas. Data on the relative abundance of individual species are presented as well as pooled data for species groups including neotropical migrants, riparian obligates, non-migratory residents, marsh/waterbirds, and invasive bird species. “Invasive” bird species, which include brown-headed cowbird, great-tailed grackle, and European starling, are birds that are opportunistic invaders of disturbed habitat and appear to expand their population size from disturbance, agricultural development, and urbanization. The remaining species are generally classified as residents. The species and categories observed during point counts are listed in Appendix B.

Los Lunas Restoration Site

Burned/Regenerating Cottonwood Forest.—A total of 37 species was detected within the 50-m zone during point counts conducted in 2003 and 2004 (Table 1). In 2003 there was an average of 5.71 species and 8.44 individual birds detected per point. In 2004 these values decreased slightly to 5.43 species and 7.33 birds, respectively.

The most numerous species (mean number of detections per point $0.50 birds) included brown-headed cowbird, yellow-breasted chat, black-headed grosbeak, spotted towhee, mourning dove, gray catbird, black-chinned hummingbird, and turkey vulture. Of the individual birds detected at this site, 55.5 percent were neotropical migrant landbirds, 44.1 percent riparian obligates, 0.8 percent marsh/water birds, and 12.8 percent were “invasive” birds.

Analysis indicated the burned/regenerating cottonwood forest had an abundant and diverse avian population in 2003 and 2004 which is probably due to the dense regenerating understory vegetation. An Analysis of Variance (ANOVA) test indicated that this plot had significantly higher mean values compared to the other three plots in the Los Lunas Restoration Site in all categories including: species ($F=44.78$, $P<0.001$); birds ($H=49.85$, $P<0.001$); neotropical migrant species ($F=63.12$, $P<0.001$); neotropical migrant birds ($H=107.64$, $P<0.001$); riparian obligate species ($F=88.13$, $P<0.001$); and riparian obligate birds ($H=129.20$, $P<0.001$). The dense new-growth understory of the burned/regenerating cottonwood forest site provides high quality foraging and nesting habitat. The population in the burned site could serve as a source population of neotropical migrant and riparian obligate breeding birds for expansion into the cleared area as riparian vegetation develops.

Table 1. Avian point count summary for the burned and cleared/overbank plots at Los Lunas Restoration Site

Burned Area n=42	2003		2004	
Species	**Mean**	**SD**	**Mean**	**SD**
American kestrel	0.10	0.37	0.02	0.15
American robin	0.05	0.22	0.21	0.59
Ash-throated flycatcher	0.19	0.40	0.06	0.25
Barn swallow	0.02	0.15	0.02	0.15
Bewick's wren	0.05	0.22	0.00	0.00
Black-chinned hummingbird	0.57	0.74	0.51	0.59
Black-headed grosbeak	1.00	0.88	0.74	0.67
Black-necked stilt	0.02	0.15	0.00	0.00
Blue grosbeak	0.40	0.63	0.26	0.53
Black phoebe	0.00	0.00	0.02	0.15
Brown-headed cowbird	1.36	1.43	0.66	1.13
Common bushtit	0.00	0.00	0.11	0.73
Common yellowthroat	0.19	0.40	0.11	0.31
Downy woodpecker	0.00	0.00	0.02	0.15
European starling	0.02	0.15	0.02	0.15
Gambel's quail	0.00	0.00	0.02	0.15
Gray catbird	0.26	0.45	0.53	0.58
Hairy woodpecker	0.00	0.00	0.04	0.20
House finch	0.02	0.15	0.00	0.00
Killdeer	0.02	0.15	0.00	0.00
Lesser goldfinch	0.05	0.31	0.00	0.00
Mourning dove	0.67	0.90	0.96	0.88
Northern flicker	0.21	0.47	0.11	0.31
Northern mockingbird	0.05	0.31	0.00	0.00
Red-tailed hawk	0.05	0.22	0.00	0.00
Red-winged blackbird	0.12	0.40	0.06	0.25
Ring-necked pheasant	0.05	0.22	0.04	0.20
Say's phoebe	0.02	0.15	0.00	0.00
Snowy egret	0.00	0.00	0.02	0.15
Spotted sandpiper	0.05	0.22	0.00	0.00
Spotted towhee	0.69	0.84	0.91	0.54
Turkey vulture	0.67	1.72	0.36	1.28
Western kingbird	0.19	0.59	0.19	0.45
Western wood pewee	0.00	0.00	0.02	0.15
Western tanager	0.02	0.15	0.00	0.00
White-breasted nuthatch	0.07	0.26	0.17	0.38
Yellow-breasted chat	1.26	0.91	1.13	1.03
# Species	5.71	1.68	5.43	1.39
# Birds	8.44	3.27	7.33	2.57
# Neotropical migrant species	3.32	1.19	2.96	1.15
# Neotropical migrant birds	4.90	2.52	3.93	1.99
# Riparian obligate species	2.71	0.98	2.59	1.07
# Riparian obligate birds	3.71	1.63	3.26	1.77
# Marsh and waterbird species	0.10	0.37	0.02	0.15
# Marsh and waterbird birds	0.10	0.37	0.02	0.15
# Invasive species	0.68	0.47	0.37	0.49
# Invasive birds	1.37	1.43	0.67	1.14
Simpson's Diversity Index	**0.908**		**0.909**	

Excavated-cleared overbank area n=24	2003		2004		2005	
Species	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
American avocet	0.00	0.00	0.00	0.00	**0.04**	**0.2**
American kestrel	0.04	0.20	0.00	0.00	0.00	0.00
American robin	0.00	0.00	0.04	0.20	0.04	0.20
Barn swallow	0.08	0.41	0.17	0.38	0.08	0.28
Bewick's wren	0.00	0.00	0.13	0.45	0.00	0.00
Black-chinned hummingbird	0.08	0.41	0.08	0.28	0.13	0.34
Black-crowned night heron	0.04	0.20	0.00	0.00	0.00	0.00
Black-headed grosbeak	0.04	0.20	0.04	0.20	0.00	0.00
Black-necked stilt	0.00	0.00	0.17	0.82	0.42	0.83
Blue grosbeak	0.33	0.70	0.29	0.62	0.04	0.20
Blue-winged teal	0.00	0.00	0.00	0.00	0.21	0.66
Brown-headed cowbird	0.08	0.28	0.54	0.98	0.00	0.00
Cattle egret	0.00	0.00	0.00	0.00	0.25	1.22
Common yellowthroat	0.00	0.00	0.13	0.34	0.21	0.51
Downy woodpecker	0.00	0.00	0.00	0.00	0.04	0.20
Gadwall	0.00	0.00	0.00	0.00	0.13	0.61
Great-blue heron	0.00	0.00	0.00	0.00	0.04	0.20
Great-tailed grackle	0.00	0.00	0.00	0.00	0.04	0.20
House finch	0.00	0.00	0.00	0.00	0.13	0.61
Indigo bunting	0.08	0.28	0.04	0.20	0.00	0.00
Killdeer	0.08	0.28	0.67	1.20	0.96	1.60
Lesser goldfinch	0.04	0.20	0.00	0.00	0.00	0.00
Loggerhead shrike	0.04	0.20	0.00	0.00	0.00	0.00
Mallard	0.00	0.00	0.00	0.00	1.46	3.16
Mourning dove	0.00	0.00	0.17	0.38	0.25	0.74
Northern flicker	0.00	0.00	0.04	0.20	0.04	0.20
Northern mockingbird	0.00	0.00	0.04	0.20	0.00	0.00
Northern rough-winged swallow	0.13	0.34	0.00	0.00	0.00	0.00
Red-winged blackbird	0.67	1.13	1.21	1.50	4.63	1.79
Say's phoebe	0.13	0.45	0.04	0.20	0.00	0.00
Snowy egret	0.13	0.34	0.29	0.62	0.21	0.59
Spotted sandpiper	0.13	0.34	0.17	0.48	0.46	0.66
Turkey vulture	0.42	2.04	0.00	0.00	0.00	0.00
Western kingbird	0.21	0.59	0.29	0.55	0.21	0.51
Yellow-breasted chat	0.00	0.00	0.04	0.20	0.04	0.2
# Species	1.79	1.25	2.92	1.61	3.67	1.40
# Birds	2.75	3.08	4.58	2.92	10.04	4.61
# Neotropical migrant species	0.83	0.92	1.00	0.88	0.63	0.58
# Neotropical migrant birds	1.54	2.59	1.13	1.03	0.71	0.69
# Riparian obligate species	0.29	0.46	0.50	0.66	0.38	0.58
# Riparian obligate birds	0.46	0.78	0.58	0.78	0.42	0.65
# Marsh and waterbird species	0.38	0.65	0.75	0.74	1.75	1.29
# Marsh and waterbird birds	0.38	0.65	1.29	1.94	4.17	4.30
# Invasive species	0.08	0.28	0.29	0.46	0.04	0.20
# Invasive birds	0.08	0.28	0.54	0.98	0.04	0.20
Simpson's Diversity Index	**0.884**		**0.876**		**0.750**	

Table 2. Avian point count summary for adjacent cottonwood forest with uncleared and cleared exotic understory

Untreated area n=14	2004		2005			*Cleared exotic understory*	2005	
Species	**Mean**	**SD**	**Mean**	**SD**		**Species**	**Mean**	**SD**
American robin	0.57	1.60	0.08	0.27		American robin	0.08	0.36
Ash-throated flycatcher	0.29	0.47	0.21	0.41		Ash-throated flycatcher	0.27	0.51
Bewick's wren	0.14	0.36	0.05	0.22		Black phoebe	0.03	0.16
Black-capped chickadee	0.21	0.80	0.00	0.00		Black-chinned hummingbird	0.08	0.28
Black-chinned hummingbird	0.50	0.85	0.59	0.68		Black-crowned night heron	0.03	0.16
Black-headed grosbeak	0.29	0.47	0.41	0.55		Black-headed grosbeak	0.59	0.69
Blue grosbeak	0.21	0.43	0.15	0.43		Blue grosbeak	0.22	0.48
Brown-headed cowbird	0.29	0.83	0.1	0.31		Brown-headed cowbird	0.08	0.28
Bullock's oriole	0.21	0.80	0.00	0.00		Bullock's oriole	0.03	0.16
Chihuahuan raven	0.21	0.43	0.03	0.16		Downy woodpecker	0.08	0.28
Cooper's hawk	0.07	0.27	0.05	0.22		Europeon starling	0.11	0.66
Gray catbird	0.00	0.00	0.03	0.16		Great-blue heron	0.08	0.49
House finch	0.00	0.00	0.1	0.64		House finch	0.05	0.33
Indigo bunting	0.00	0.00	0.03	0.16		Killdeer	0.11	0.52
Lesser goldfinch	0.00	0.00	0.03	0.16		Lesser goldfinch	0.03	0.16
Mallard	0.00	0.00	0.03	0.16		Mallard	0.43	1.19
Mourning dove	0.50	0.65	0.36	0.58		Mourning dove	0.68	0.85
Northern flicker	0.00	0.00	0.13	0.34		Northern flicker	0.14	0.48
Ring-necked pheasant	0.07	0.27	0.08	0.27		Red-winged blackbird	0.22	0.58
Spotted towhee	0.50	0.52	0.59	0.75		Snowy egret	0.05	0.33
Summer tanager	0.36	0.63	0.21	0.47		Spotted towhee	0.11	0.31
Western kingbird	0.07	0.27	0.05	0.32		Summer tanager	0.35	0.68
Western meadowlark	0.00	0.00	0.03	0.16		Western kingbird	0.03	0.16
Western tanager	0.07	0.27	0.00	0.00		Western wood pewee	0.38	0.76
Western wood pewee	0.14	0.36	0.08	0.27		White-breasted nuthatch	0.19	0.40
White-breasted nuthatch	0.21	0.43	0.26	0.44		Yellow-breasted chat	0.03	0.16
Yellow-breasted chat	0.21	0.43	0.41	0.59				
# Species	4.07	1.86	3.51	1.64		**# Species**	3.39	1.68
# Birds	5.14	3.16	4.05	2.15		**# Birds**	4.58	3.21
# Neotropical migrant species	2.00	1.11	1.92	1.22		**# Neotropical migrant species**	1.69	1.04
# Neotropical migrant birds	2.36	1.65	2.18	1.50		**# Neotropical migrant birds**	2.06	1.47
# Riparian obligate species	1.57	1.22	1.62	0.96		**# Riparian obligate species**	1.14	0.87
# Riparian obligate birds	2.07	2.02	1.85	1.29		**# Riparian obligate birds**	1.33	1.17
# Marsh and waterbird species	0.00	0.00	0.03	0.16		**# Marsh and waterbird species**	0.31	0.75
# Marsh and waterbird birds	0.00	0.00	0.03	0.16		**# Marsh and waterbird birds**	0.72	1.95
# Invasive species	0.36	0.50	0.13	0.34		**# Invasive species**	0.11	0.32
# Invasive birds	0.50	0.85	0.13	0.34		**# Invasive birds**	0.19	0.71
Simpson's Diversity Index	**0.932**		**0.921**			**Simpson's Diversity Index**	**0.915**	

Table 3. Avian point count summary for burned cottonwood forest with willow dominated understory

Burned-willow understory	**2003-2004**	
Species	**Mean**	**SD**
Black-chinned hummingbird	0.36	0.63
Black-headed grosbeak	0.86	0.66
Blue-grosbeak	0.21	0.43
Gray catbird	0.50	0.52
Yellow-breasted chat	2.14	1.10
Ash-throated flycatcher	0.07	0.27
Western kingbird	0.07	0.27
American robin	0.14	0.36
Hairy woodpecker	0.07	0.27
Mourning dove	0.86	0.77
Northern flicker	0.21	0.43
Red-winged blackbird	0.07	0.27
Spotted towhee	0.71	0.61
White-breasted nuthatch	0.14	0.36
Brown-headed cowbird	1.00	1.62
# Species	5.14	1.61
# Birds	7.43	3.03
# Neotropical migrant species	2.79	0.97
# Neotropical migrant birds	4.21	1.85
# Riparian obligate species	2.64	0.93
# Riparian obligate birds	4.07	1.86
# Marsh and waterbird species	0.00	0.00
# Marsh and waterbird birds	0.00	0.00
# Invasive species	0.43	0.51
# Invasive birds	1.00	1.62
Simpson's Diversity Index	**0.853**	

Table 4. Avian point count summary for reference areas at Sevilleta NWR

Year	2003			2004			2005	
Species	**Mean**	**SD**		**Mean**	**SD**		**Mean**	**SD**
Ash-throated flycatcher	0.21	0.49		0.22	0.49		0.08	0.33
Barn swallow	0.00	0.00		0.18	0.85		1.11	4.72
Bewick's wren	0.32	0.51		0.23	0.46		0.16	0.45
Black phoebe	0.20	0.48		0.13	0.50		0.16	0.49
Black-chinned hummingbird	0.07	0.26		0.08	0.28		0.05	0.22
Black-headed grosbeak	0.82	0.72		0.53	0.75		0.44	0.67
Black-throated sparrow	0.02	0.13		0.00	0.00		0.02	0.13
Blue grosbeak	0.70	0.81		0.92	0.98		0.44	0.76
Brown-headed cowbird	1.07	1.44		0.95	1.35		0.62	0.90
Canada goose	0.13	0.94		0.00	0.00		0.00	0.00
Chihuahuan raven	0.05	0.30		0.00	0.00		0.00	0.00
Chipping sparrow	0.13	0.69		0.00	0.00		0.00	0.00
Common nighthawk	0.02	0.13		0.00	0.00		0.00	0.00
Common snipe	0.02	0.13		0.00	0.00		0.00	0.00
Common yellowthroat	0.45	0.63		0.28	0.49		0.36	0.48
Cooper's hawk	0.00	0.00		0.02	0.13		0.00	0.00
Gambel's quail	0.04	0.27		0.00	0.00		0.03	0.26
Gray catbird	0.02	0.13		0.02	0.13		0.00	0.00
Greater roadrunner	0.00	0.00		0.08	0.28		0.02	0.13
Green heron	0.00	0.00		0.02	0.13		0.00	0.00
House finch	0.09	0.39		0.13	0.50		0.00	0.00
Indigo bunting	0.00	0.00		0.03	0.18		0.00	0.00
Killdeer	0.00	0.00		0.08	0.38		0.11	0.37
Ladderback woodpecker	0.00	0.00		0.00	0.00		0.00	0.00
Lazuli bunting	0.00	0.00		0.00	0.00		0.02	0.13
Mourning dove	1.64	1.42		1.07	1.58		0.23	0.64
Northern flicker	0.04	0.19		0.00	0.00		0.00	0.00
Northern mockingbird	0.05	0.23		0.00	0.00		0.05	0.22
Red-winged blackbird	0.04	0.27		0.05	0.22		0.28	0.78
Ring-necked pheasant	0.02	0.13		0.03	0.18		0.00	0.00
Rough-winged swallow	0.00	0.00		0.17	1.29		0.00	0.00
Say's phoebe	0.18	0.47		0.12	0.37		0.02	0.13
Snowy egret	0.00	0.00		0.00	0.00		0.16	1.05
Sora	0.02	0.13		0.00	0.00		0.00	0.00
Spotted towhee	1.23	0.95		0.92	0.94		0.38	0.66
Summer tanager	0.05	0.30		0.13	0.39		0.03	0.18
Western kingbird	0.02	0.13		0.07	0.41		0.03	0.18
Western wood pewee	0.09	0.35		0.00	0.00		0.02	0.13
White-winged dove	0.05	0.30		0.22	0.56		0.07	0.31
Willow flycatcher	0.09	0.48		0.08	0.53		0.07	0.31
Wilson's warbler	0.04	0.19		0.00	0.00		0.00	0.00
Yellow-billed cuckoo	0.02	0.13		0.00	0.00		0.00	0.00
Yellow-brested chat	0.96	0.83		0.93	0.90		0.54	0.72
# Species	5.73	2.03		4.88	2.26		3.39	1.84
# Birds	8.88	4.16		7.72	3.71		5.54	5.20
# Invasive Species	0.55	0.50		0.45	0.50		0.41	0.50
# Invasive Birds	1.07	1.44		0.95	1.35		0.62	0.90
# Marsh/water Species	0.05	0.23		0.07	0.25		0.13	0.34
# Marsh/water Birds	0.16	0.95		0.10	0.40		0.28	1.10
# Neotropical Migrant Species	2.95	1.34		2.58	1.37		1.87	1.20
# Neotropical Migrant Birds	3.88	1.97		3.78	2.38		3.26	4.85
# Resident Species	2.18	1.06		1.78	1.29		0.98	0.90
# Resident Birds	3.77	1.99		2.88	2.20		1.38	1.40
# Riparian Obligate Species	2.45	1.14		2.17	1.21		1.64	1.11
# Riparian Obligate Birds	3.21	1.72		3.02	1.81		1.97	1.55

Table 5. Avian point count summary for reference areas at Bosque del Apache NWR

Year	2003			2004			2005	
Species	**Mean**	**SD**		**Mean**	**SD**		**Mean**	**SD**
American kestrel	0.00	0.00		0.00	0.00		0.05	0.23
Ash-throated flycatcher	0.41	0.78		0.61	0.98		0.33	0.58
Barn swallow	0.00	0.00		0.08	0.70		0.01	0.08
Bell's vireo	0.01	0.12		0.01	0.12		0.01	0.12
Bewick's wren	0.79	0.80		0.48	0.69		0.81	0.78
Black phoebe	0.11	0.73		0.00	0.00		0.11	0.52
Black-chinned hummingbird	0.05	0.23		0.09	0.29		0.14	0.42
Black-headed grosbeak	0.55	0.64		0.56	0.64		0.34	0.51
Blue grosbeak	0.55	0.85		0.68	0.88		0.49	0.67
Boat-tailed grackle	0.00	0.00		0.00	0.00		0.07	0.25
Brown-headed cowbird	0.69	1.27		0.91	1.64		0.42	0.80
Bullock's oriole	0.03	0.16		0.00	0.00		0.03	0.16
Chihuahuan raven	0.21	0.67		0.00	0.00		0.00	0.00
Common nighthawk	0.01	0.12		0.00	0.00		0.00	0.00
Common yellowthroat	0.32	0.58		0.31	0.57		0.52	0.58
Cooper hawk	0.00	0.00		0.00	0.00		0.01	0.12
Gambel's quail	0.01	0.12		0.03	0.16		0.01	0.12
Gray catbird	0.03	0.23		0.04	0.20		0.00	0.00
Great horned owl	0.00	0.00		0.01	0.12		0.00	0.00
Greater roadrunner	0.04	0.20		0.05	0.23		0.04	0.20
Hairy woodpecker	0.01	0.12		0.00	0.00		0.00	0.00
Hermit thrush	0.00	0.00		0.05	0.23		0.07	0.30
House finch	0.17	0.56		0.16	0.43		0.00	0.00
Indigo bunting	0.03	0.23		0.00	0.00		0.05	0.28
Killdeer	0.05	0.28		0.05	0.33		0.12	0.55
Ladderback woodpecker	0.00	0.00		0.00	0.00		0.01	0.26
Lazuli bunting	0.01	0.12		0.03	0.16		0.04	0.26
Lucy's warbler	0.04	0.26		0.24	0.74		0.21	0.58
MacGillivray's warbler	0.01	0.12		0.00	0.00		0.00	0.00
Mourning dove	1.65	1.40		0.64	0.93		0.32	0.68
Northern flicker	0.13	0.56		0.05	0.23		0.04	0.20
Northern mockingbird	0.00	0.00		0.04	0.20		0.05	0.23
Red-winged blackbird	0.36	1.32		0.05	0.28		0.23	0.51
Ring-necked pheasant	0.04	0.20		0.01	0.12		0.01	0.12
Say's phoebe	0.07	0.42		0.01	0.12		0.03	0.16
Snowy egret	0.00	0.00		0.00	0.00		0.03	0.23
Spotted sandpiper	0.00	0.00		0.01	0.12		0.01	0.12
Spotted towhee	1.01	0.95		0.73	0.86		0.67	0.76
Summer tanager	0.16	0.52		0.19	0.49		0.21	0.53
Turkey vulture	0.01	0.12		0.11	0.71		0.10	0.45
Unidentified thrush	0.00	0.00		0.01	0.12		0.00	0.01
Western kingbird	0.16	0.52		0.09	0.38		0.01	0.12
Western meadowlark	0.00	0.00		0.00	0.00		0.08	0.32
Western wood pewee	0.05	0.23		0.03	0.16		0.01	0.12
White-breasted nuthatch	0.00	0.00		0.00	0.00		0.01	0.12
White-winged dove	0.01	0.12		0.16	0.41		0.10	0.34
Wilson's warbler	0.00	0.00		0.01	0.12		0.01	0.12
Yellow warbler	0.00	0.00		0.03	0.16		0.04	0.20
Yellow-billed cuckoo	0.04	0.26		0.00	0.00		0.00	0.00
Yellow-breasted chat	0.45	0.67		0.51	0.62		0.30	0.49
# Species	5.23	1.89		5.11	2.05		5.12	1.82
# Birds	8.31	3.51		7.09	3.30		6.84	3.07
# Invasive Species	0.40	0.49		0.47	0.50		0.42	0.60
# Invasive Birds	0.69	1.27		0.91	1.64		1.01	1.98
# Marsh/water Species	0.04	0.20		0.04	0.26		0.10	0.30
# Marsh/water Birds	0.05	0.28		0.07	0.42		0.17	0.60
# Neotropical Migrant Species	2.24	1.38		2.76	1.43		2.53	1.45
# Neotropical Migrant Birds	3.00	2.13		3.69	2.37		2.96	1.74
# Resident Species	2.55	1.02		1.84	1.18		2.07	0.93
# Resident Birds	4.56	2.47		2.43	1.61		2.70	1.46
# Riparian Obligate Species	1.73	1.23		2.17	1.22		2.07	1.19
# Riparian Obligate Birds	2.24	1.70		2.72	1.68		2.38	1.47

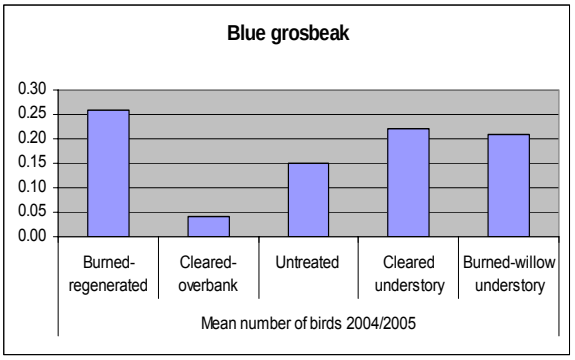
Compared to the Bosque del Apache NWR, t-tests indicated no difference in overall bird abundance (t=0.22, P>0.82), but greater abundance in the burned site for neotropical migrants (W=874, P<0.001) and riparian obligates (t=4.51). Comparing the burned/regenerating cottonwood forest site to Sevilleta NWR, no difference was indicated for overall bird abundance (W=1254, P>0.57), neotropical migrant abundance (W=921, P<0.06), and riparian obligate abundance (t=1.39, P>0.16).

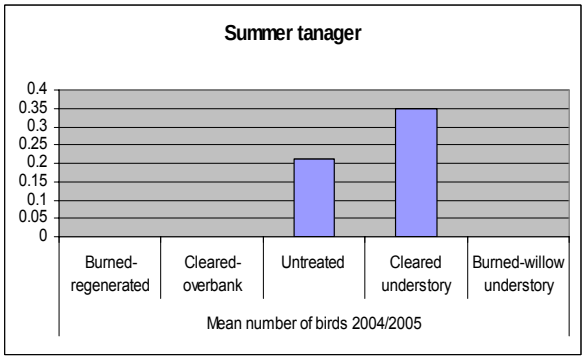
Figure 5 illustrates the mean detection rates for selected bird species in the burned/regenerating cottonwood forest compared to other plots. This plot had relatively high numbers of gray catbirds (0=0.53). This species is known to occupy dense early successional vegetation. Additional species with higher numbers were yellow-breasted chat (0=1.13), spotted towhee (0=0.91), black-headed grosbeak (0=0.74), black-chinned hummingbird (0=0.51), and blue grosbeak (0=0.26).

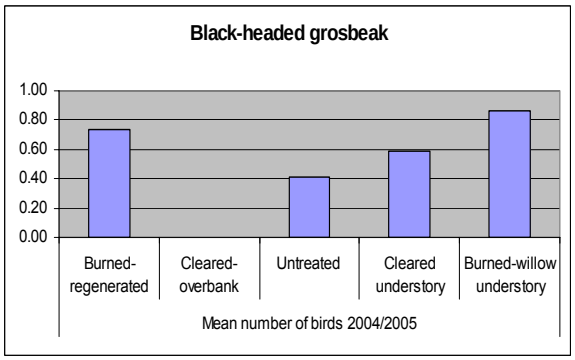
Cleared/Overbank Area.—A total of 35 species was detected within the 50-m zone during the point counts conducted from 2003 to 2005 (Table 1). The averages of 1.79 species and 2.75 individual birds detected per point in 2003 increased dramatically to 3.67 species and 10.04 birds in 2005. This increase was primarily due to an abundance of red-winged blackbirds and marsh/water birds apparently attracted to the site during the 2005 high-flow period when the site was mostly flooded.

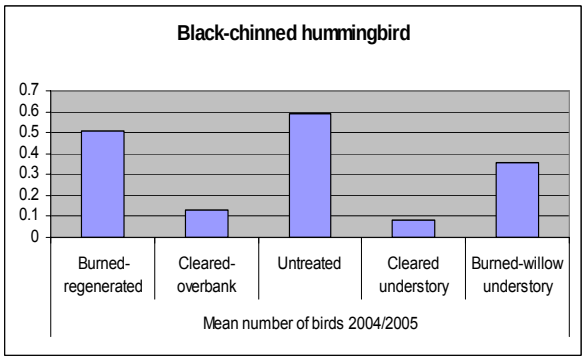
In 2003, the only species which exceeded the mean detection rate of 0.50 was the red-winged blackbird which increased from 0.67 to 4.63 in 2005. Other common species included mallard, killdeer, black-necked stilt, turkey vulture, blue grosbeak, and western kingbird. Of the individual birds detected at this site, 19.5 percent were neotropical migrant landbirds, 8.5 percent riparian obligates, 33.5 percent marsh/water birds, and 3.5 percent were “invasive” birds. This site had higher numbers of waterbirds, especially in 2005 when the extent and duration of overbank flooding was greater.

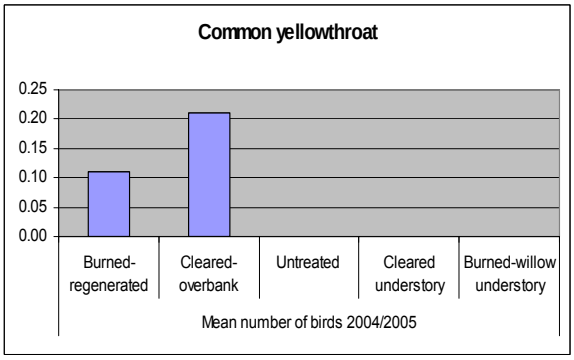
Point count data indicate that the cleared/overbank plot supported fewer birds and species compared to established riparian communities at the adjacent plots and reference sites during the two breeding season following clearing (2003 and 2004). During the third breeding season (2005) when the site was flooding, the number of birds and species increased significantly, primarily due to the abundance of red-winged blackbirds and marsh/water birds that were obviously attracted to the flooded habitat. However, in 2005, the species richness and abundance of neotropical migrant landbirds and riparian obligates did not increase and remained lower than the other monitoring plots. This was expected due to the lack of development of woody riparian vegetation. However, values are predicted to gradually increase if and when stands of riparian plants become established and develop adequate structure.

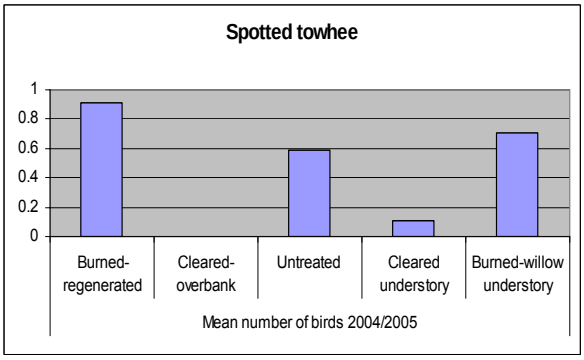


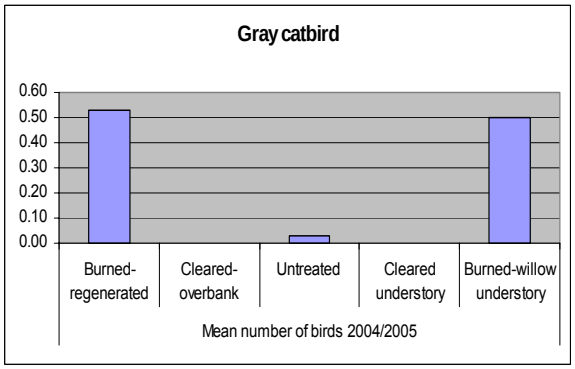












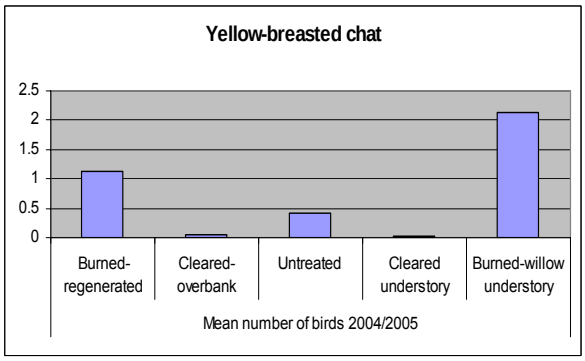


Figure 5. Plot comparisons for abundance of selected species.

When comparing the cleared/overbank area with both the unburned/untreated cottonwood forest and the cottonwood forest with cleared exotic understory plots, ANOVA analysis indicated significantly lower mean or median values for the following categories at the cleared/overbank site: abundance of neotropical migrants (F=10.16, P<0.001), species richness of neotropical migrants (F=12.54, P<0.001), abundance of riparian obligate birds (H=23.27, P<0.001); and species richness of riparian obligate birds (F=15.86, P=0.001). Median values that were higher in the cleared/overbank plots were total bird abundance (H=33.46, P<0.001) and marsh/waterbird abundance (H=47.04, P<0.001).

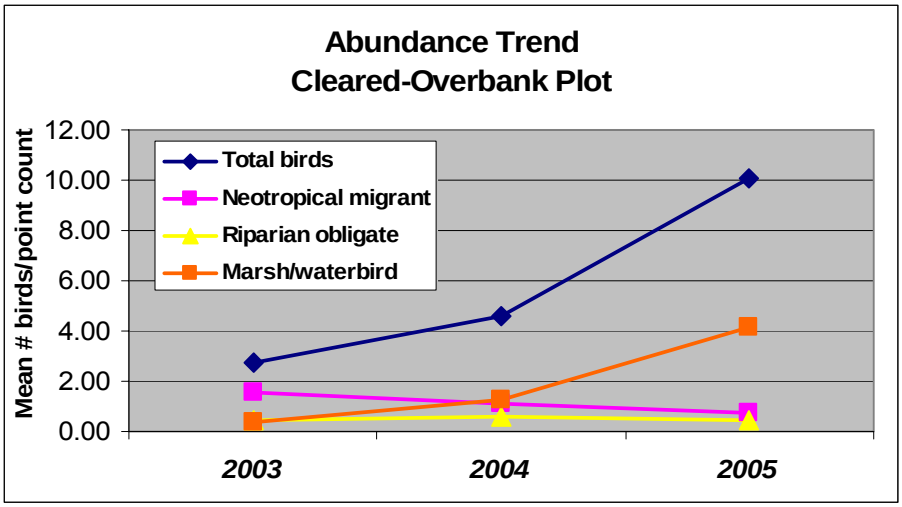
When comparing the cleared/overbank area with the reference plots at Sevilleta and Bosque del Apache for 2005, ANOVA indicated significantly lower median values for the cleared/overbank plot for both neotropical migrants (H=36.15, P<0.001) and riparian obligates (H=42.37, P<0.001); mean values for total bird abundance in 2005 was significantly higher in the cleared-overbank plot (H=46.94, P<0.001), but lower in 2003-2004 (F=5.34, P<0.001).

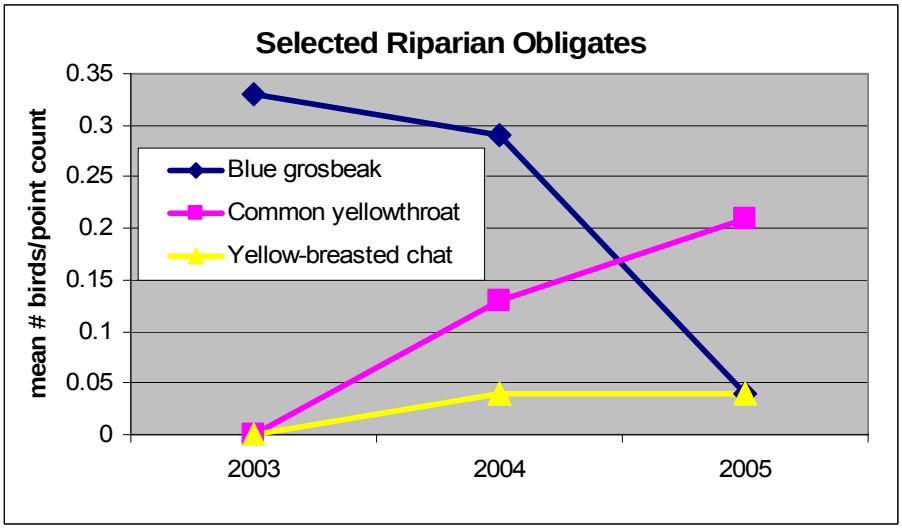
Figure 6 indicates the population trend for selected bird species in the cleared/overbank plot. In 2003 and 2004, the most abundant riparian obligate bird in the cleared area was the blue grosbeak (0=0.33), which is often associated with edges, openings, and lower vegetation structure. However, the species was much less numerous during 2005 (0=0.04), which could be attributable to flooding and competition from the abundant, possibly aggressive red-wing blackbirds (0=4.63). Much of the 2005 increase in abundance is attributable to red-winged blackbirds and dabbling duck species. Abundance of the common yellowthroat (0=0.21) in 2005 increased to higher means than other plots in the Los Lunas restoration area. This species is associated with the mesic conditions and herbaceous vegetation.

Unburned/Untreated Cottonwood Forest.—A total of 27 species was detected during point counts conducted in 2004 and 2005 (Table 2). In 2004 there was an average of 4.07 species and 5.14 individual birds detected per point. In 2005 these values decreased slightly to 3.51 species and 4.05 birds, respectively. Overall species richness and bird abundance was less than what was detected in the burned-regenerating cottonwood forest plot. In 2005, overbank flooding occurred over much of this plot for the first time in several years.

The most numerous species (mean number of detections per point $0.50 birds) included American robin, spotted towhee, mourning dove, black-chinned hummingbird, and turkey vulture. The summer tanager, a riparian obligate, was detected in the unburned/untreated cottonwood forest but not in the burned-regenerating forest.

ANOVA indicated significantly less abundance and diversity compared to the burned/regenerating cottonwood forest in the following categories: all species (F=44.78, P<0.001); all birds (H=49-85, P<0.001); neotropical migrant species





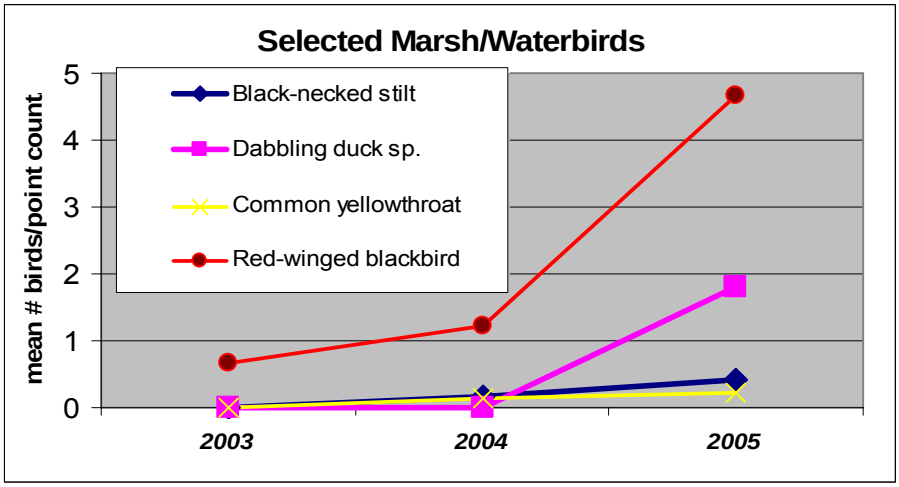


Figure 6. Trend in avian abundance at cleared/overbank site.

(F=63.12, P<0.001); neotropical migrant birds (H=107.74, P<0.001), riparian obligate species (F=88.13, P<0.001); and riparian obligate birds (H=81.68, P<0.001). Species which were more abundant in the unburned/untreated cottonwood forest than the burned/regenerating cottonwood forest included black-chinned hummingbird, Bullock's oriole, summer tanager, and western wood pewee. These species are often associated with the upper canopy of cottonwood which was mostly absent in the burned/regenerating cottonwood forest site.

Cottonwood Forest with Cleared Exotic Understory.—A total of 26 species was detected during point counts conducted in 2005 (Table 2). There was an average of 3.39 species and 4.48 birds detected per point. These values are similar to detection rates for the unburned/untreated cottonwood forest. However, there were less riparian obligate birds in the cottonwood forest with cleared understory plot. Because of ponded water in openings there were more waterbirds compared to the unburned/untreated cottonwood forest plot and two reference sites.

Numerous species included black-headed grosbeak and mourning dove. Species that had less detections in the cottonwood forest with cleared understory site included spotted towhee, yellow-breasted chat, and black-chinned hummingbird.

T-tests indicated that the only significant difference between this treatment type and the adjacent unburned/untreated cottonwood forest was with riparian obligate species (t=2.25, P<0.028) and riparian obligate birds (W=543, P<0.082) which had lower mean values in the cleared plots. There were fewer birds associated with understory vegetation in the cleared sites including spotted towhee and yellow-breasted chat. Species that were more abundant in the cottonwood forest with cleared understory site included blue grosbeak, summer tanager, and black-headed grosbeak. Because of the ponded water in forest openings in this site due to flooding in 2005, the number of waterbirds was significantly higher (W=824, P<0.02).

It is possible that effects of the understory clearing to bird abundance and species richness could increase in the next few breeding seasons. Because the clearing was done during the previous season, site fidelity may have caused certain birds to occupy their previous territories during the 2005 breeding season which they would subsequently abandon in future seasons due to reduction of cover and nest substrate vegetation. In addition, the effects may have been less than expected because of the relatively small size and patchiness of the clearings.

Burned Cottonwood Forest with Willow Dominated Understory.—A total of 15 species was detected (Table 3). There was an average of 5.14 species and 7.43 birds per point. The most numerous species included yellow-breasted chat, brown-headed cowbird, black-headed grosbeak, mourning dove, spotted towhee, and gray catbird.

The count data from the three points in the willow-dominated section of the burned area were evaluated to determine differences in avian abundance and diversity. This area had a higher mean abundance of riparian obligate birds compared to the burned area with less willow, although the difference was not significant (t=1.45, P=0.15). However, when compared to values from the adjacent untreated/unburned cottonwood site, the following values were statistically higher in the burned cottonwood forest with willow dominated understory plot: species (t=2.94, P<0.005); birds (t=3.98, P<0.001); neotropical migrant species (t=2.45, P<0.02), neotropical migrant birds (t=4.14, P<0.001); riparian obligate species (t=3.43, P<0.002); and riparian obligate birds (W=128.5, P<0.001). The high abundance of riparian obligates associated with the willow understory was due to large numbers of black-headed grosbeaks (0=0.86), gray catbirds (0=0.50), and yellow-breasted chats (0=2.14).

Reference Areas

Sevilleta NWR.—A total of 43 species was detected (Table 4). The 2003 average of 5.73 species and 8.88 individual birds per point decreased to 3.39 species and 5.24 birds per point in 2005. The 2003 riparian obligate average of 2.45 species and 3.21 birds decreased to 1.64 species and 1.97 birds in 2005. A few yellow-billed cuckoos were detected in 2003. The most numerous species included black-headed grosbeak, blue grosbeak, brown-headed cowbird, mourning dove, spotted towhee, and yellow-breasted chat. A few willow flycatchers were detected in 2003, 2004, and 2005 as well as one yellow-billed cuckoo in 2003.

ANOVA indicated higher abundance of neotropical migrants (H=41.56, P<0.001) and riparian obligates (F=11.85, P<0.001) compared to both the Los Lunas Restoration Site cleared/overbank and unburned/ untreated cottonwood plots. The 3-year trend (2003-2005) showed a significant decrease in general bird abundance (H=7.06, P<0.001), neotropical migrants (H=16.21, P<0.001), and riparian obligates (H=18.55, P<0.001). This trend may reflect clearing of riparian vegetation that was done by the refuge earlier in 2005.

Bosque del Apache NWR.—A total of 52 species was detected within the 50-m zone during point counts conducted from 2003-2005 (Table 5). The 2003 average of 5.23 species and 8.31 individual birds per point decreased to 4.93 species and 6.17 birds per point in 2005. The 2003 riparian obligate average of 1.73 species and 2.24 birds increased to 2.06 species and 2.36 birds in 2005. Usually, the most numerous species included ash-throated flycatcher, black-headed grosbeak, Bewick's wren, blue grosbeak, brown-headed cowbird, mourning dove, spotted towhee, and yellow-breasted chat.

ANOVA indicated significantly higher species richness at this reference site compared to all other sites (F=9.65, P=0.000), and higher general bird abundance than all plots except the Los Lunas cleared/overbank site (H=46.94, P<0.001). The abundance of riparian obligate birds was higher than the Los Lunas

cleared/overbank and cottonwood forest with cleared understory sites, but similar to Sevilleta NWR and the Los Lunas unburned/untreated cottonwood forest plot. The 3-year trend (2003-2005) showed a significant decrease in general bird abundance ($F=7.06$, $P<0.002$) but no statistical change for neotropical migrants ($H=4.72$, $P<0.09$) or riparian obligates ($F=1.80$, $P<0.16$).

Nest Monitoring

Nest monitoring was limited to understory vegetation within the two plots. Within this zone, a total of 19 nests of 5 species were found and monitored in the burned/regenerating cottonwood forest site and one nest in the cleared/overbank plot during the 2003 and 2004 seasons (Table 6). Nests were determined successful if they fledged at least one chick. Overall nest success was about 52 percent with 38 percent of nests predated. About 62 percent of nests were placed in willows (*Salix* spp.) and 38 percent in Russian olive. The nest substrate plants ranged from 1 to 4 m high and averaged 3.3 m. The one yellow-breasted chat nest in the cleared-overbank was in a small stand of mature coyote willow near the plot's edge that had survived the vegetation clearing and bank-lowering excavation.

Riparian vegetation had not developed suitable height, density, and structure by the breeding season of 2005 to support nesting birds in the cleared/overbank plot. During limited nest monitoring we found nests of five species in the burned-regenerating cottonwood forest with well-developed dense understory vegetation. Nest predation was the major factor causing nest failure.

Southwestern Willow Flycatcher Surveys

Three WIFL presence/absence surveys were conducted each year within the Los Lunas Restoration Site in 2004 and 2005 comprising 27 survey hours. Additional 180 survey hours were spent conducting surveys within the same period on both sides of the river in adjacent sections of the Belen Reach between the Los Lunas and Belen bridges. In 2005, three WIFLs were detected in the area of the restoration site, and six other WIFLs were detected at areas within the Belen Reach between the two bridges. All these detections occurred in late May and early June 2005 at locations shown on Figure 7. Because we made no detections at these sites during the subsequent surveys, and the detections were made during the late migration period, we believe that the WIFLs were probably migrants.

The survey protocol requires a qualitative habitat assessment. We determined that the burned cottonwood forest with willow dominated understory site was probably the most suitable WIFL breeding habitat in the Belen Reach. The cleared/overbank site had not developed riparian vegetation anywhere near suitable height, density, and structure to provide breeding habitat by the breeding season of 2005 which was probably a result of the previous dry years. However, the overbank flooding and high ground water levels during the runoff period of

Table 6. Nest monitoring summary for Los Lunas Restoration Site

2004 Results - Burned cottonwood forest with regenerating understory						
Species	# Nests	# Success	# chicks fledged	# Parasitized	# Predated	# Abandoned
BCHU	3	3	5	0	0	0
BHGR	2	0	0	0	0	2
MODO	1	1	2	0	0	0
YBCH	2	2	5	0	0	0
TOTAL	8	6	12	0	0	2

2005 Results - Burned cottonwood forest with regenerating understory						
Species	# Nests	# Success	#chicks fledged	# Parasitized	# Predated	# Abandoned
BCHU	6	3	4	0	4	0
BHGR	4	2	6	0	2	0
GRCA	2	0	0	0	1	1
YBCH	1	0	0	0	1	0
TOTAL	13	5	10	0	8	1

SUMMARY 2004-2005 - Burned cottonwood forest with regenerating understory						
#Species	# Nests	% Success	AVE # chicks fledged	% Parasitized	% Predated	%Abandoned
5	21	52.4 %	1.8	0	38.1%	14.3%

2004-2005 Nest Substrate and Height Summary	Species Codes
Nests in Coyote and Goodding willow = 62 % hummingbird	BCHU=Black-chinned
Nest in Russian olive = 38 %	BHGR=Black-headed grosbeak
Average nest height 1.7 m	MODO=Mourning dove
Average substrate height 3.3 m	YBCH=Yellow breasted chat
	GRCA=Gray catbird

2004 Results – Cleared/overbank area						
Species	# Nests	# Success	# fledged	# Parasitized	# Predated	# Abandoned
YBCH	1	1	2	0	0	0
Nest Substrate=coyote willow; nest height =0.7m; substrate height=2m						

2005 Results – Cleared/overbank area						
Species	# Nests	# Success	# fledged	# Parasitized	# Predated	# Abandoned
none	0	0	0	0	0	0

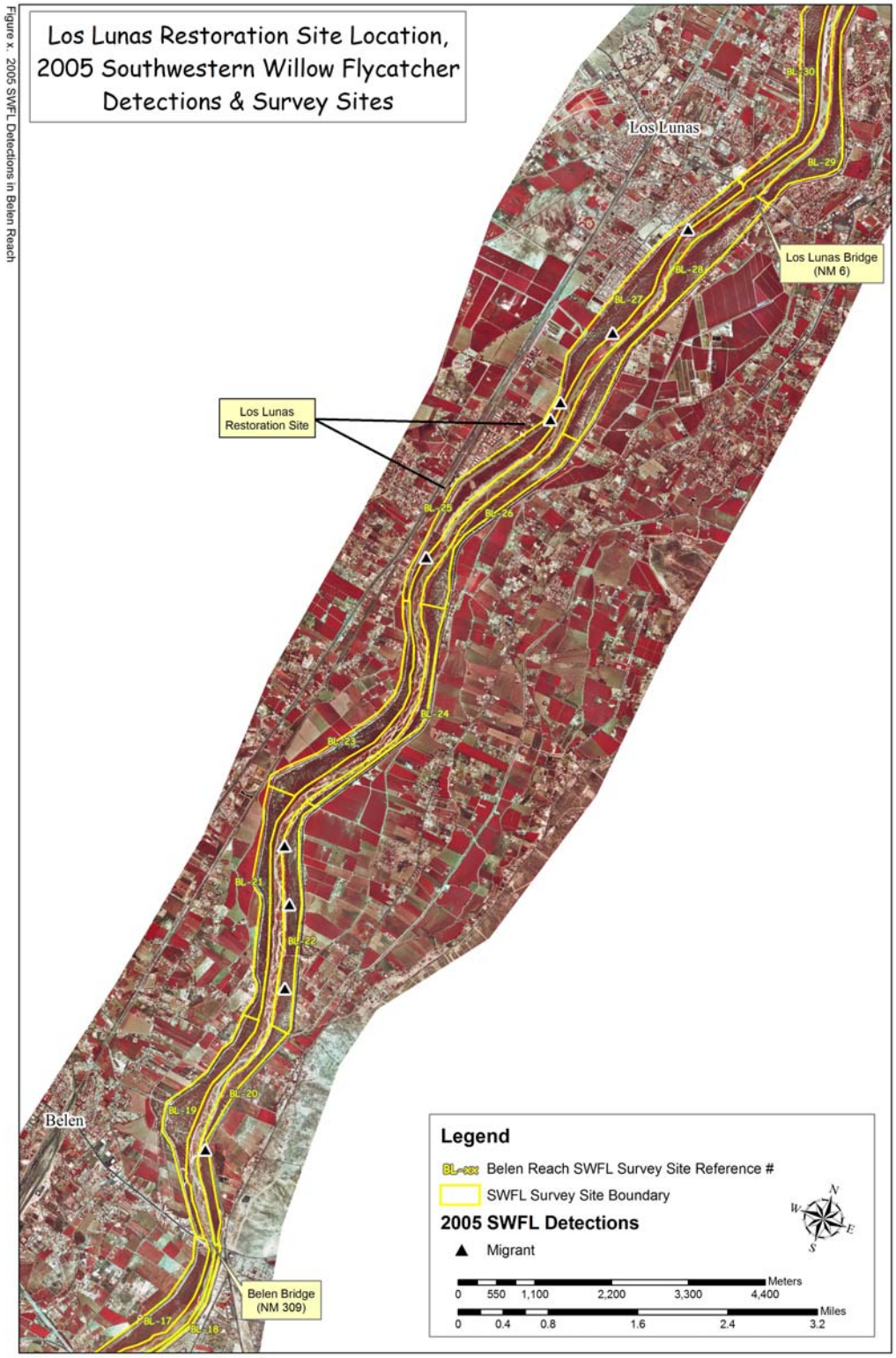


Figure 7. WIFL detections in the Belen Reach in the vicinity of Los Lunas Restoration Site.

2005 established stands of germinating riparian plants. If these seedlings are maintained by sufficient flows and ground water levels during the next several years, we estimate that suitable WIFL breeding habitat would develop in 5 to 10 years (2010-2015). It appears that small areas of highly suitable habitat currently exist within adjacent sites in the Belen Reach. These sites are apparently unoccupied by breeding WIFLs. The closest breeding populations that could serve as sources for WIFL dispersal into the Los Lunas sites are 15 miles upstream at Isleta Pueblo or 35 miles downstream at the Sevilleta NWR. However, much of the riparian habitat in the Belen Reach including the restoration site is currently suitable as stopover habitat for migrating WIFLs as confirmed by our presence/absence surveys.

Vegetation Monitoring

River Transects

Vegetation sampling in the area adjacent to the river included 33 annual and perennial species that are common to recently disturbed areas in riparian zones of the middle Rio Grande River system (Table 7). Total cover of shrubs, grasses and forbs for the sampled area was 32.1 percent in 2003, 67.5 percent in 2004, and 60.9 percent in 2005. Total cover of plant litter was 4.4 percent, 5.2 percent, and 7.3 percent in 2003, 2004, and 2005, respectively. Total cover of bare ground decreased from 63.5 percent in 2003 to 27.3 percent in 2004 and slightly increased to 31.5 percent in 2005 (Figure 8). The increase in total plant cover from 2003 to 2005 was statistically significant ($P<0.001$), as was the decrease in bare soil cover ($P<0.001$; Table 8). Total cover of litter did not change significantly ($P=0.211$) over time.

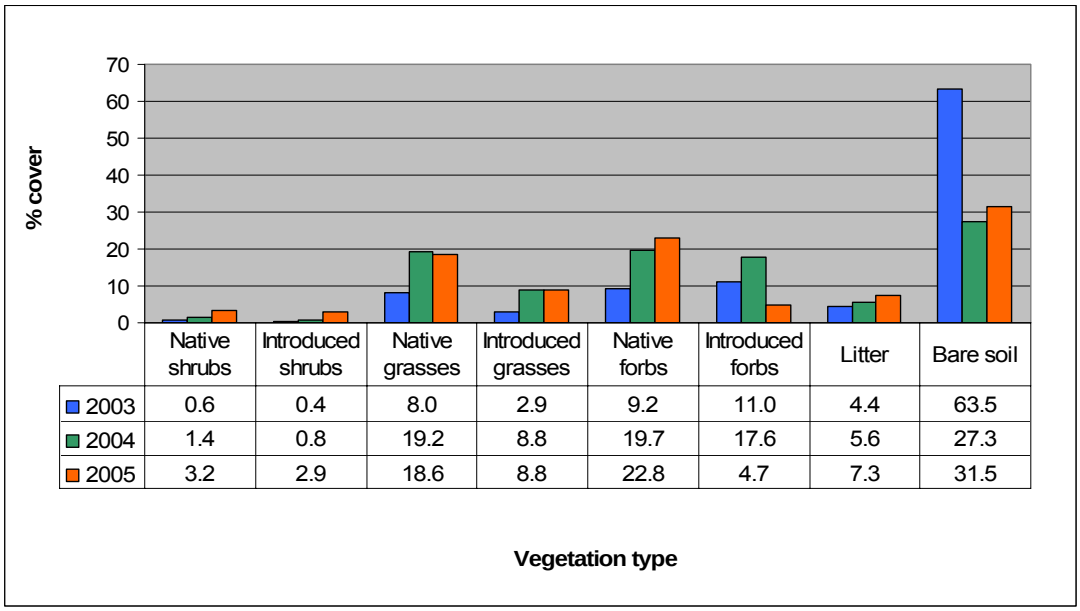
The most common forb species shifted from sunflowers[1], lambsquarters, and white sweetclover in 2003 to devil's beggarstick, kochia, and common cocklebur in 2005. Total cover of native forbs increased from 9.2 percent to 19.7 percent to 22.8 percent over the sampling period. Introduced forbs increased from 11.0 percent to 17.6 percent from 2003 to 2004 but fell to 4.7 percent in 2005. Relative plant cover by vegetation type in 2003 and 2005 is shown in Figure 9. Native forbs increased from 28.3 percent to 37.5 percent between these two data sets while introduced forbs decreased from 34.6 percent to 7.6 percent. Statistical comparisons of relative cover between these two years indicated no significant change in native forbs ($P=0.218$) and a significant decrease in introduced forbs ($P<0.001$).

Depression areas that retained soil moisture for extended periods had a variety of grass and grass-like species present. Bearded flatsedge, witchgrass, barnyard grass, and rabbitfoot polypogon were consistently among the highest cover of grass species found during the sampling period from 2003 to 2005. Total cover of

[1] Scientific names for plants are listed in Table 7.

Table 7. Total and relative percent vegetative cover for 2003 through 2005

	2003		2004		2005	
	Total % cover	**Rel. % cover**	**Total % cover**	**Rel. % cover**	**Total % cover**	**Rel. % cover**
Coyote willow (*Salix exigua*)	0.6	1.8	1.0	1.5	1.9	3.1
Cottonwood (*Populus deltoides*)	0.0	0.0	0.4	0.5	1.3	2.2
Native shrubs	0.6	1.8	1.4	2.0	3.2	5.3
Saltcedar (*Tamarix* sp.)	0.4	1.3	0.8	1.2	2.8	4.6
Introduced shrubs	0.4	1.3	0.8	1.2	2.8	4.6
Bearded flatsedge (*Cyperus squarrosa)*	1.8	5.4	3.5	5.2	8.4	13.8
Baltic rush (*Juncus balticus*)	1.2	3.9	0.0	0.0	0.0	0.0
Marsh muhly (*Muhlenbergia racemosa*)	1.2	3.9	2.7	4.0	0.0	0.0
Witchgrass (*Panicum capillare)*	1.1	3.4	5.2	7.7	4.3	7.1
Thin paspalum (*Paspalum setaceum)*	0.4	1.3	0.4	0.6	1.6	2.6
Dropseed (*Sporobolus* sp.)	2.3	7.0	6.7	9.9	0.0	0.0
Common spikerush (*Eleocharis palustris*)	0.0	0.0	0.3	0.4	0.0	0.0
Saltgrass (*Distichlis spicata*)	0.0	0.0	0.1	0.1	0.0	0.0
Bluegrass (*Poa* sp.)	0.0	0.0	0.2	0.2	0.6	1.0
Sedge (*Carex sp.*)	0.0	0.0	0.1	0.1	0.0	0.0
Mexican sprangletop (*Leptochloa fusca*)	0.0	0.0	0.0	0.0	1.1	1.8
Teal lovegrass (*Eragrostis hypnoides*)	0.0	0.0	0.0	0.0	2.6	4.2
Native grasses	8.0	24.9	19.2	28.2	18.6	30.5
Barnyard grass (*Echinochloa crus-galli)*	1.3	4.2	4.3	6.4	6.0	9.8
Rabbitfoot polypogon (*Polypogon monspeliensis)*	1.6	4.9	4.5	6.7	2.8	4.6
Introduced grasses	2.9	9.1	8.8	13.1	8.8	14.4
Horseweed (*Conyza canadensis)*	0.2	0.5	0.0	0.0	0.0	0.0
Common sunflower (*Helianthus annuus)*	7.9	24.7	13.9	20.6	0.3	0.4
Pale smartweed (*Polygonum lapathifolium)*	0.8	2.3	1.3	1.9	0.2	0.3
Common cocklebur (*Xanthium strumarium)*	0.3	0.8	3.3	5.0	17.9	29.4
Unidentified composite	0.0	0.0	0.3	0.5	0.8	1.4
Devil's beggarstick (*Bidens frondosa*)	0.0	0.0	0.9	1.3	3.3	5.5
Clasping-leaf dogbane (*Apocynum cannabinum*)	0.0	0.0	0.0	0.0	0.3	0.4
Native forbs	9.2	28.3	19.7	29.3	22.8	37.4
Lambsquarters (*Chenopodium album)*	6.2	19.5	5.3	7.8	0.3	0.4
Kochia (*Kochia scoparia)*	0.5	1.6	3.6	5.3	3.8	6.3
Prickly lettuce (*Lactuca serriola)*	0.1	0.3	0.7	1.0	0.0	0.0
White sweetclover (*Melilotus albus)*	4.2	13.2	7.0	10.5	0.3	0.5
Russian thistle (*Salsola iberica*)	0.0	0.0	0.7	1.0	0.0	0.0
Perrenial pepperweed (*Lepidium latifolium*)	0.0	0.0	0.2	0.4	0.0	0.0
Wormwood (*Artemisia absinthium*)	0.0	0.0	0.1	0.2	0.0	0.0
Curly dock (*Rumex crispis*)	0.0	0.0	0.0	0.0	0.1	0.1
Prostrate amaranth (*Amaranthus blitoides*)	0.0	0.0	0.0	0.0	0.2	0.3
Introduced forbs	11.0	34.6	17.6	26.2	4.7	7.6
Total vegetation	32.1		67.5		60.9	
Litter	4.4		5.2		7.3	
Bare soil	63.5		27.3		31.5	
Total cover	100	100	100	100	100	100



	Native shrubs	Introduced shrubs	Native grasses	Introduced grasses	Native forbs	Introduced forbs	Litter	Bare soil
2003	0.6	0.4	8.0	2.9	9.2	11.0	4.4	63.5
2004	1.4	0.8	19.2	8.8	19.7	17.6	5.6	27.3
2005	3.2	2.9	18.6	8.8	22.8	4.7	7.3	31.5

Figure 8. Total vegetation cover of river transects from 2003 to 2005 at the Los Lunas Restoration Site, middle Rio Grande, New Mexico.

Table 8. Statistical comparison between years 2003 and 2005 of total cover of plant, litter, and bare soil and relative cover of vegetation types of river transects at the Los Lunas Restoration Site, middle Rio Grande, New Mexico

Total cover		
Plant	2003<2005	P<0.001*
Litter	2003=2005	P=0.211**
Bare	2003>2005	P<0.001**
Relative cover		
Native shrub	2003<2005	P=0.011**
Introduced shrub	2003=2005	P=0.206**
Native grass	2003=2005	P=0.530*
Introduced grass	2003=2005	P=0.352*
Native forb	2003=2005	P=0.218*
Introduced forb	2003>2005	P<0.001**

* Student's t-test
** Mann-Whitney test

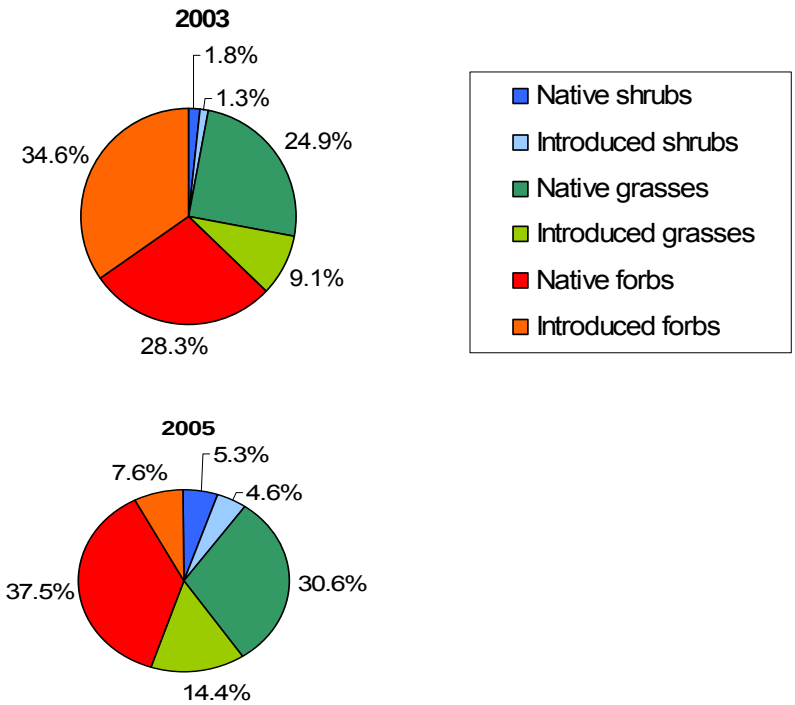


Figure 9. Relative percent of vegetation types in 2003 and 2005 at the Los Lunas Restoration Site, middle Rio Grande, New Mexico.

native grasses increased from 8.0 percent to 19.2 percent from 2003 to 2004 with a slight decrease to 18.6 percent in 2005. Total cover of introduced grasses increased from 2.9 percent in 2003 to 8.8 percent in both 2004 and 2005. Relative cover of native grasses increased from 24.9 percent in 2003 to 30.5 percent in 2005. This increase was not statistically significant (P=0.530). Relative cover of introduced grasses increased from 9.1 percent to 14.4 percent in the same time period, which was also not a significant change (P=0.352).

Three shrubs were detected in the sampling. The total percent cover of the two native species, coyote willow and cottonwood, showed an increasing trend from 0.6 percent in 2003 to 1.4 percent in 2004 and 3.2 percent in 2005. Total cover of the introduced species, saltcedar, increased from 0.4 percent to 0.8 percent to 2.8 percent over the sampling period. Relative cover of native shrubs increased from 1.8 percent to 5.3 percent from 2003 to 2005, which was statistically significant (P=0.011). Relative cover of saltcedar increased from 1.3 percent in 2003 to 4.6 percent in 2005, which was not a significant change (P=0.206).

In the spring of 2005, the entire project area was flooded due to above average precipitation that led to high discharge levels in the river. Flooding likely had an effect on changes in the composition of vegetation over time, which altered notably from 2004 to 2005. For example, marsh muhly, which was absent in the 2005 dataset, has a low anaerobic tolerance, while teal lovegrass has medium anaerobic tolerance and high moisture use and was detected for the first time in 2005. Forbs such as sunflower and white sweetclover have low anaerobic tolerance and substantially decreased in cover between 2004 and 2005 while devil's beggarstick, which has a medium anaerobic tolerance, increased.

Native plant species have significantly increased in relative cover over time at this study site while introduced species have significantly decreased (P=0.015). Although much of the native vegetative cover is composed of predominately weedy species (e.g., common cocklebur), this is more desirable than a plant population dominated by invasive exotic species. The total percent cover for salt cedar after 3 years of monitoring was 2.8 percent, which is low compared to other areas adjacent to the site. The large increase in plant cover and concurrent drop in bare soil over time was also a favorable trend for the site, helping to stabilize soil and reduce erosion.

No problems were noted in 2005 with the establishment of noxious weeds.

Mixed Shrub Transects

Results of stem counts within the mixed shrub transects detected a total of 104 live shrubs and 56 dead shrubs (Table 9). Of the shrub species that had survived, 51 were western black willow, 50 were New Mexico olive, and 3 were wolfberry. Of the shrub species that had died, 21 were western black willow, 15 were unidentifiable, 10 were cottonwood, 6 were wolfberry, and 4 were New Mexico olive.

Approximately one-third of the shrubs counted at this site were dead within 9 months of being transplanted. Some of this mortality could be attributed to flooding during the spring following planting since species such as New Mexico olive and wolfberry are generally upland shrubs.

Table 9. Results of 2005 survival counts of the mixed shrub plantings transects at the Los Lunas Restoration Site, middle Rio Grande, New Mexico

Species	Live	Dead
New Mexico olive (*Forestiera neomexicana*)	50	4
Cottonwood (*Populus deltoides*)	0	10
Wolfberry (*Lycium torreyii*)	3	6
Western black willow (*Salix gooddingii*)	51	21
Other (Unidentifiable)	0	15
Total	104	56

Cottonwood Pole Plots

A total of 47 live or dead trees and live root sprouts were counted within the cottonwood pole planting plots (Table 10). Of these only 2 were live poles, 13 were live root sprouts, and 32 were dead trees.

Table 10. Results of 2005 survival counts of the cottonwood pole plots at the Los Lunas Restoration Site, middle Rio Grande, New Mexico

Cottonwood type	Count
Live tree/pole	2
Root sprout	13
Dead tree	32
Total	47

The majority of cottonwood poles counted within these plots was dead within 16 months of being planted. Inundation during the spring of 2005 should not have had a large impact on this species since it is adapted to a flooding regime. Pole planting may not be the best method for establishing cottonwoods at this sight. This appears to be supported by data from the mixed shrub transects as well, where there was 100 percent mortality of all the cottonwood recorded. Cottonwood seedlings are regenerating on their own adjacent to the river, which may prove to be the best method for cottonwood establishment at this site.

Ground Water Monitoring

Regular monthly well monitoring began in September 2004. The depth (in inches) below the ground surface to water at each well for each reading from June 2004 to February 2006 is summarized in Table 11. Data from the northern, middle, and southern wells were combined across transects to get an average depth per transect per month. These data were used to create a hydrograph that also included river discharge at the Rio Grande floodway in San Acacia, New Mexico (Figure 10).

The level of ground water at the Los Lunas Restoration Site correlates closely with the flows in the river. Records from the monitoring well readings helped explain the shift in vegetation composition following the period of inundation in 2005.

Photo Stations

Photos taken in 2003, 2004, and 2005 are shown for comparison purposes in Appendix C.

In many of the photo station comparisons, vegetation appears sparser in baseline (2003) photos than in the following years. Effects of the flood are evident in 2005 photos, where plant cover is not as dense as in the 2004 photos. Especially

Table 11. Depth in inches below ground to water at the shallow monitoring wells at Los Lunas Restoration Site, middle Rio Grande, New Mexico

	Well number										
Date	**N1**	**N2**	**N3**	**N4**	**M1**	**M2**	**M3**	**M4**	**S1**	**S2**	**S3**
06/04/03	44.0	41.0	29.0	No well	30.0	29.0	28.0	No well	34.0	49.0	No well
09/04/03	Dry	Dry	Dry	No well	Dry	Dry	Dry	No well	Dry	Dry	No well
10/30/03	45.0	41.0	31.0	No well	32.0	32.5	36.5	No well	40.0	Dry	No well
11/27/03	36.0	41.0	37.0	No well	20.0	19.0	22.5	No well	28.5	51.0	No well
12/21/03	37.0	33.0	25.0	No well	20.0	20.0	21.5	No well	30.5	53.0	No well
01/24/04	38.0	33.0	23.0	No well	20.5	19.5	20.5	No well	31.0	53.0	No well
03/11/04	38.5	33.5	23.5	No well	21.5	20.5	20.5	No well	32.0	54.0	No well
04/01/04	32.0	27.5	18.5	No well	15.5	15.5	18.0	No well	27.5	50.5	No well
04/30/04	42.0	37.0	26.0	No well	26.5	25.5	25.5	No well	37.5	60.0	No well
05/30/04	35.5	33.0	24.0	No well	19.5	20.5	21.5	No well	31.5	55.5	No well
06/29/04	53.5	47.5	35.0	No well	39.5	37.0	36.5	No well	48.5	Dry	No well
08/05/04	57.0	53.0	46.0	42.0	31.0	41.0	41.5	Dry	39.5	Dry	65.0
09/02/04	Dry	Dry	Dry	58.0	Dry	Dry	Dry	Dry	56.0	Dry	66.0
10/05/04	54.0	49.0	37.0	39.5	41.5	42.0	46.5	Dry	50.5	Dry	64.0
11/05/04	42.0	37.0	26.0	31.0	28.0	No well	29.5	41.0	35.5	58.0	49.0
12/04/04	36.5	30.0	19.0	23.5	20.0	No well	17.5	28.0	27.5	48.5	41.0
01/07/05	36.5	32.0	23.5	30.0	19.0	20.0	21.0	36.5	29.5	51.0	45.0
02/04/05	36.5	32.0	23.0	29.5	19.0	16.0	20.0	34.5	29.5	51.0	44.0
03/03/05	30.0	27.0	19.0	27.5	13.0	11.0	16.0	33.0	23.0	45.5	39.5
04/02/05	26.5	24.0	16.0	26.0	10.0	8.5	13.0	32.0	19.0	42.0	37.0
05/06/05	0.0	14.5	8.5	19.0	0.0	0.0	5.5	25.5	11.0	36.0	32.5
06/06/05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
07/31/05	Dry	57.5	43.0	40.5	47.0	39.5	42.0	49.5	52.0	Dry	61.5
08/30/05	Dry	59.0	40.0	34.0	48.0	40.0	37.5	52.0	52.5	Dry	63.0
09/30/05	56.0	47.0	34.0	35.5	26.0	26.0	34.5	47.0	39.5	Dry	56.0
10/31/05	52.0	43.5	31.0	34.0	28.0	24.5	29.0	43.5	34.5	56.5	48.5
11/29/05	45.5	38.0	27.0	32.0	22.5	20.0	25.0	40.0	30.0	52.0	45.5
12/30/05	42.5	35.0	23.5	28.0	21.0	17.0	21.5	33.0	29.0	50.0	43.5
01/31/06	46.5	39.0	27.5	32.5	24.0	21.0	25.0	38.0	34.0	54.5	46.5
02/28/06	48.0	40.0	28.5	32.5	26.5	22.5	25.0	38.5	36.5	56.5	49.0

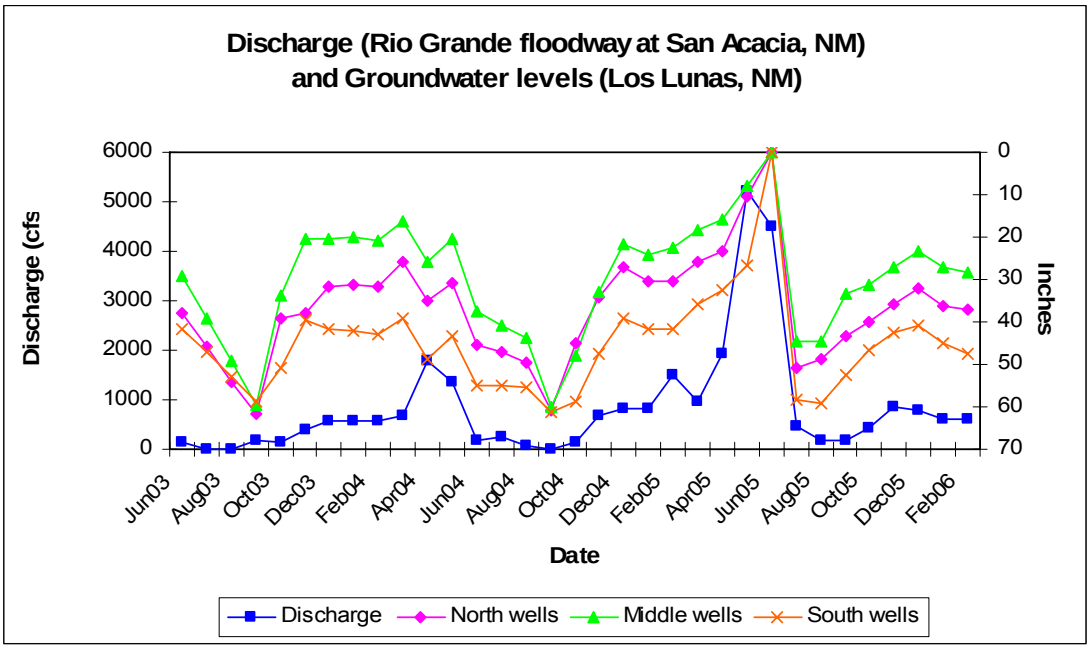


Figure 10. Discharge in cubic feet/second of the Rio Grande at San Acacia, New Mexico, and average ground water levels in inches at the Los Lunas Restoration Site, New Mexico.

noticeable in the photos is the shift in the percent cover of sunflowers. In 2003 and 2004, sunflower was a dominant species and in 2005 it had very low coverage, which is captured in the photos.

Conclusion and Recommendations

Avian Monitoring

During the 3-year monitoring period, baseline conditions have been established for avian abundance and species richness at the Los Lunas Restoration and Reference Area sites in riparian habitat along the middle Rio Grande. Data indicate that the abundance of riparian obligate breeding birds is a good indicator of the ecological condition of stands of riparian vegetation.

High abundance and diversity values, especially for species associated with dense understory (i.e., gray catbird and yellow-breasted chat) were found in the burned/regenerating cottonwood forest. This indicates at least partial recovery of the habitat value of this site for birds and the value of dense understory. The burned cottonwood forest with willow dominated understory had higher values and also appears to be most suitable for breeding Southwestern willow flycatchers, although no breeding flycatchers have been detected.

Monitoring has continued to track the development of the avian population and habitat suitability in the cleared/overbank area where establishment stands of riparian vegetation bordering high flow channels is the desired future condition. The relatively high flows in 2005, overbank flooding, and activation of high flow channels created conditions favorable for waterfowl, wading waterbirds, and red-winged blackbirds, whose numbers greatly increased from the 2 previous years. However, habitat value for breeding neotropical migrant and riparian obligate birds has remained low in the cleared/overbank area. Because of dry conditions in 2003 and 2004, overbank flows and ground water levels were apparently too low for establishment and maintenance of expansive stands of riparian plants suitable for viable population of these species. Fortunately, the high flows of 2005 along with higher ground water levels through the growing season have increased the potential for establishment of riparian vegetation. However we suspect that abundance and diversity of breeding neotropical migrants and riparian obligates (including the Southwestern willow flycatcher) will remain low for at least a few more seasons until woody riparian plants develop height and density suitable for nesting substrate and cover. Nevertheless, suitability for stopover habitat for migrating landbirds is probably developing much faster.

Within a 5- to 10-year time frame we expect that the cleared/overbank site could develop linear patches of understory 1- to 3-m-high riparian shrubs, preferably dominated by willow interspersed with high flow channels. Stands of overstory trees and understory shrubs will probably develop only on the interior edge of this stand as a result of pole plantings and natural regeneration.
The burned cottonwood forest with mostly mixed stands of dense, regenerating understory vegetation does not exactly represent the anticipated structure of the cleared/overbank site. Neither does the unburned/untreated cottonwood forest, or the cottonwood forest with cleared exotic vegetation due to the stands of mid-aged and mature cottonwood trees. In order to accurately represent a reference area for the desired future condition of the avian population of the cleared/overbank site, we recommend that we modify the monitoring plan and include a plot with stands of understory riparian plants (preferably willows) near the active river channel that is interspersed with high flow channels. Point counts and nest monitoring should be conducted in this plot and compared with continued monitoring in the cleared/overbank plots.

We suggest that criteria should be established to measure the success of the riparian restoration at Los Lunas. For example, success criteria for quality riparian habitat could be met in terms of avian habitat values when the pooled means of neotropical migrants and riparian obligates reach at least 75 percent of the values at reference sites at Bosque del Apache and Sevilleta NWR. Table 12 presents suggested success criteria and target values for avian abundance, diversity, and habitat suitability.

Table 12. Recommendations for success measures and target values for developing riparian avian habitat at Los Lunas Restoration Site

Resource category	Success measure	Target values (existing values in parentheses)
Neotropical migrant landbirds	Abundance	Mean point count value ≥2.50 birds/point (2003-2005 value at cleared/overbank area = 1.13)
Neotropical migrant landbirds	Diversity	Mean point count value ≥1.85 species/point (2003-2005 value at cleared/overbank area = 0.82)
Riparian obligate bird	Abundance	Mean point count value ≥1.86 birds/point (2003-2005 value at cleared/overbank area = 0.49)
Riparian obligates bird	Diversity	Mean point count value ≥1.46 species/point 2003-2005 value at cleared/overbank area = 0.39
Riparian obligate bird	Common yellowthroat	Mean point count value ≥ 0.25 (2003-2005 value at cleared/overbank area = 0.11)
Riparian obligate bird	Yellow-breasted chat	Mean point count value ≥ 0.36 (2003-2005 value at cleared/overbank area = 0.03)
Riparian obligate bird	Blue grosbeak	Mean point count value ≥ 0.47 (2003-2005 value at cleared/overbank area = 0.22)
Nesting habitat suitability for understory nesters	Shrub species composition and height	Shrub species dominated by natives. Mean vegetation height > 3m (2003-2005 seedlings ranged from 33% to 50% native; mean height <1m)
WIFL nesting habitat suitability	Shrub species composition and height; Hydrology	Same as above plus habitat flooded or has moist soil and <50m of surface water in breeding season (2003-2005 hydrology met these conditions)

Vegetation Monitoring

Baseline and monitoring data are being used to document: 1) the effectiveness of the native planting effort, 2) the natural establishment of riparian vegetation of the disturbed areas, 3) the establishment of wetland vegetation in depression areas, and 4) the possible establishment of noxious weeds and recolonization of exotics. Success of the riparian restoration at this site can also be used for comparison at other restoration sites along the middle Rio Grande.

River Transects

Monitoring should be continued at the established vegetation transects. Changes in vegetative structure will be documented and this information used to determine if the resulting habitat is suitable for supporting WIFLs. Further monitoring will also examine if native species will continue to dominate vegetative cover and how future climate will effect the trend in species over time. In 2004 it was noted that perennial pepperweed was rapidly invading the river site. Flooding appeared to have controlled the spread of this species, though recolonization of pepperweed and other invasive species should continue to be monitored.

Mixed Shrub Transects

Monitoring should be continued at the established mixed shrub containerized plantings transects. One year of baseline data has been collected and further monitoring will document the success of containerized planting of these species over time.

Cottonwood Pole Plots

Monitoring should be continued at the established cottonwood pole plantings plots. One year of baseline data has been collected and further monitoring will document the success of pole plantings of this species over time.

Ground Water Monitoring

Data from the monitoring wells are being used to correlate the development and extent of wetland/riparian type vegetation on the site. As was demonstrated during the flood event in 2005, these data have been instrumental in interpreting the development of plant communities at the site. Well monitoring should be continued for the duration of vegetation monitoring.

Photo Stations

In just 3 years time, changes in the vegetation at the Los Lunas Restoration Site are evident in photos. Trends in the vegetation should continue to be captured through photos to visually document changes and overall development of the site over time.

Literature Cited

Moore, D, and D. Ahlers. 2006. Southwestern willow flycatcher study results 2005: Selected sites along the Rio Grande from Velarde to Elephant Butte Reservoir, New Mexico.

Sogge, M. K, R. M. Marshall, S. J. Sferra, and T. J. Tibbits. 1997. A Southwestern willow flycatcher natural history summary and survey protocol. Technical Report NPS/NAUCPRS/NRTR-97/12.

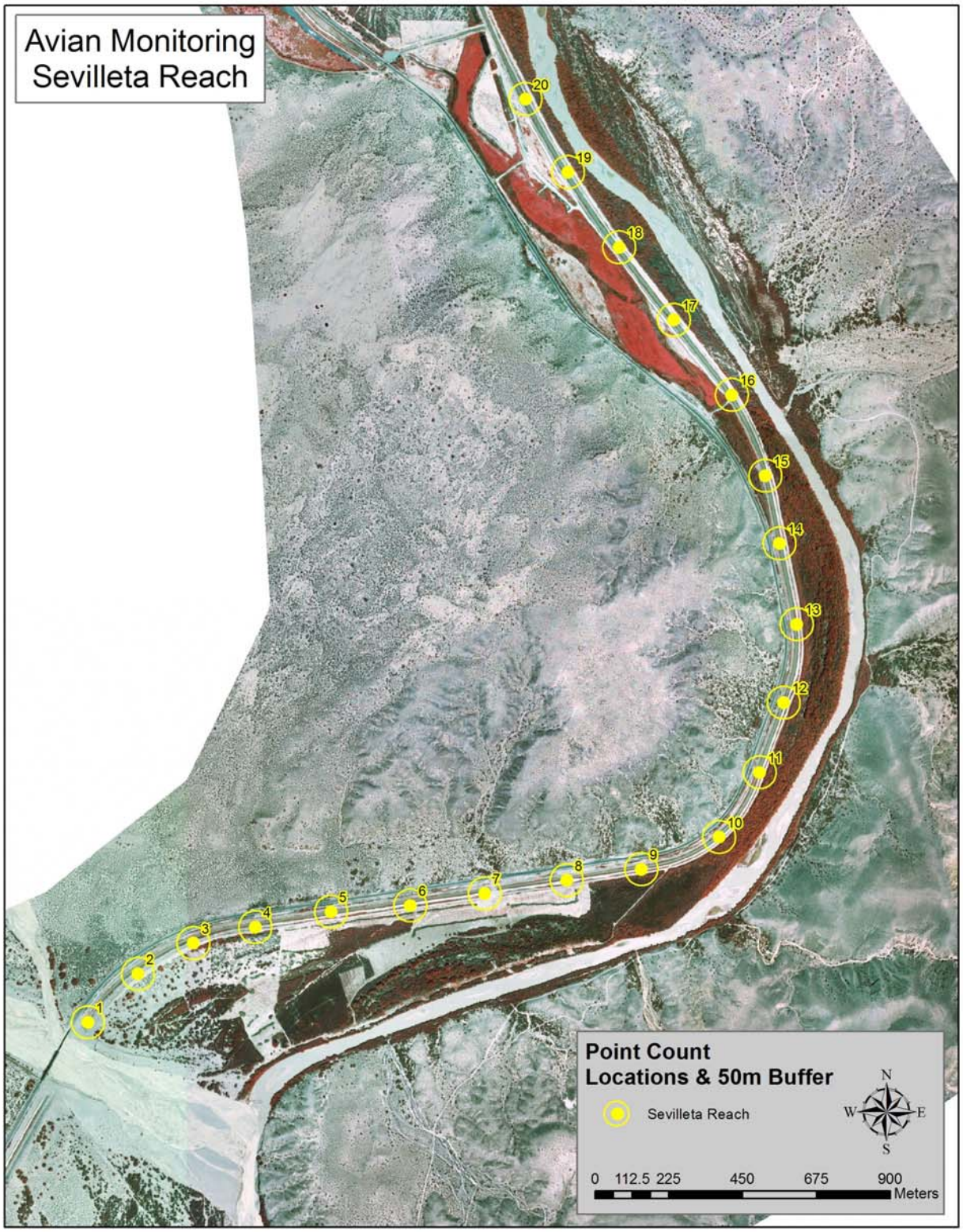
U.S. Fish and Wildlife Service (USFWS) 2000. Southwestern willow flycatcher protocol revision. USFWS Memorandum R2/ES-TE. May 31, 2000.

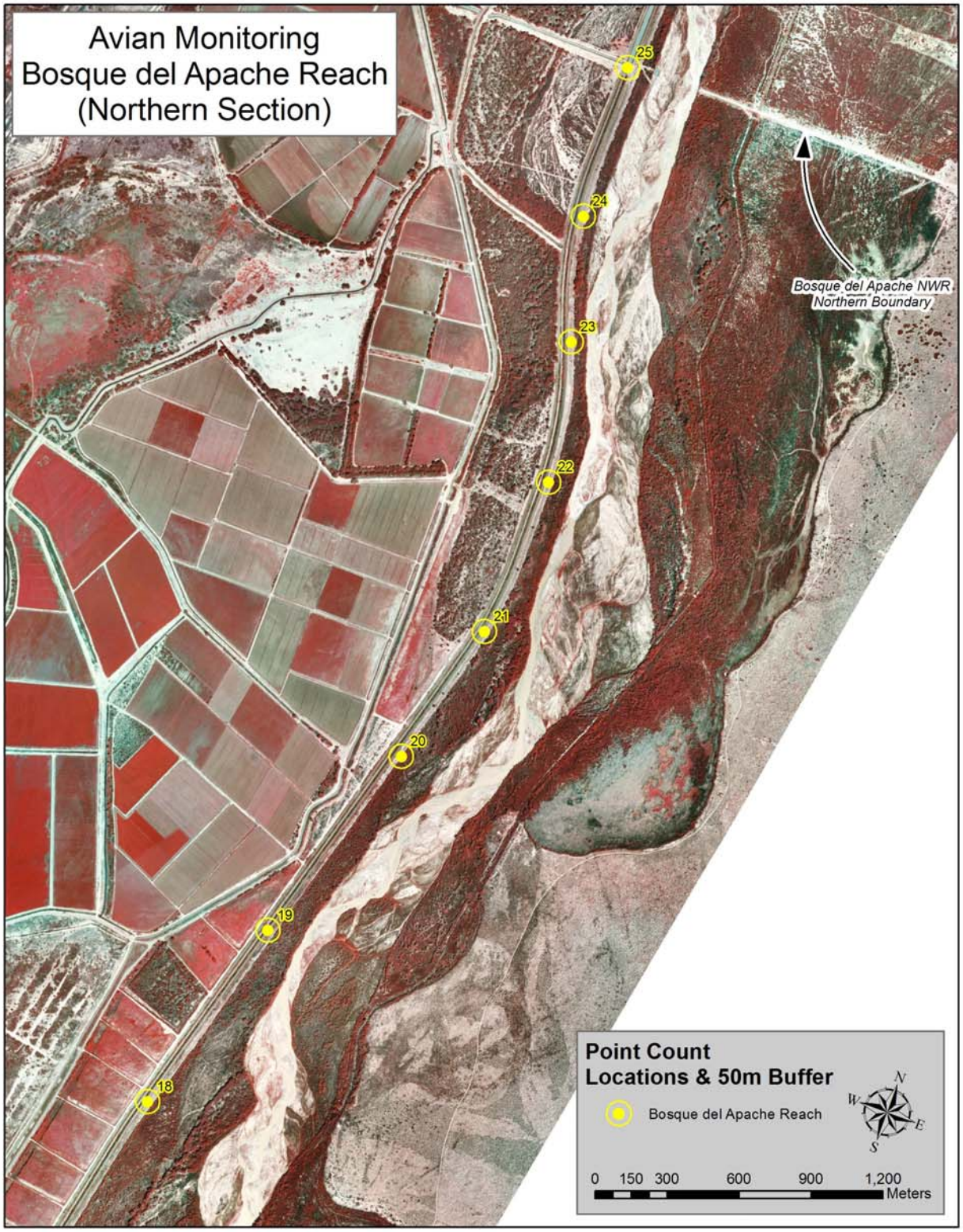
USFWS. June 29, 2001. Programmatic biological opinion on the effects of the U.S. Bureau of Reclamation's, U.S. Army Corps of Engineers', and non-Federal

entities' discretionary actions related to water management on the middle Rio Grande, Albuquerque, NM.

APPENDIX A

Maps of Point Counts at Sevilleta and Bosque Del Apache NWR


Avian Monitoring
Sevilleta Reach
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Point Count
Locations & 50m Buffer
Sevilleta Reach
N
W
E
S
0 112.5 225 450 675 900
Meters


Avian Monitoring
Bosque del Apache Reach
(Northern Section)
25
24
23
22
21
20
19
18
Bosque del Apache NWR
Northern Boundary
Point Count
Locations & 50m Buffer
Bosque del Apache Reach
N
W
E
S
0 150 300 600 900 1,200
Meters

Avian Monitoring
Bosque del Apache Reach
(Central Section)
17
16
15
14
13
12
11
10
9
Point Count
Locations & 50m Buffer
Bosque del Apache Reach
N
W
E
S
0 150 300 600 900 1,200
Meters

Avian Monitoring
Bosque del Apache Reach
(Southern Section)
1
2
3
4
5
6
7
8
Bosque del Apache NWR
Southern Boundary
Point Count
Locations & 50m Buffer
Bosque del Apache Reach
N
W
E
S
0 150 300 600 900 1,200
Meters

APPENDIX B

Southwestern Willow Flycatcher
Survey Forms and Maps

Willow Flycatcher Survey and Detection Form (revised April, 2004)

Site Name_____**Los Lunas Restoration Site**_____ State___**NM**____**County**_____**Valencia**_____
USGS Quad Name_____**Tome, Los Lunas**_____ Elevation_____**4820**__ **feet** / meters

Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? ☒ ***Yes*** ☐ ***No***

Site Coordinates: Start:N __3847943__ E _340938__ UTM Datum ___NAD83 (NAD27 preferred)
Stop:N __3846343__ E _340432__ UTM Zone ___13

***** Fill in additional site information on back of this page *****

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N	Cowbirds Detected? Y or N	Presence of Livestock, Recent sign, If Yes, Describe Y or N	Comments about this survey (e.g., bird behavior, evidence of pairs or breeding, number of nests, nest contents or number of fledges seen; potential threats)
1.Konigsburg	Date 6/5/04 Start 7:00am Stop 10:00am Total hrs 3.0	0	0	0	N	Y	N	Note: this site is a portion of BL-25.
2.F.Leonard	Date 6/21/04 Start 7:00am Stop 10:15am Total hrs 3.25	0	0	0	N	Y	N	
3.Konigsburg	Date 7/11/04 Start 7:15am Stop 10:15am Total hrs 3.0	0	0	0	N	Y	N	
4_____	Date Start Stop Total hrs _____							
5_____	Date Start Stop Total hrs _____							

Overall Site Summary (Total **resident** WIFLs only)	Adults	Pairs	Territories	Nests	Were any WIFLs color-banded? Yes **No**
Total survey hrs 9.25	0	0	0	0	If yes, report color combination(s) in the comments section on back of form

Reporting Individual _____Darrell Ahlers_____ Date Report Completed _____8/25/04_____
US Fish and Wildlife Service Permit #___TE819475-3 AZ Game and Fish Department (or other state) Permit # ___N/A____

Reporting Individual _**Darrell Ahlers**_____Phone # _____**(303) 445-2233**_____
Affiliation _**BOR**_____ E-mail _____**dahlers@do.usbr.gov**_____
Site Name __**Los Lunas Restoration Site**_____Date Report Completed _____**8/25/04**_____

Did you verify that this site name is consistent with that used in previous years? **Yes** / No (circle one)
If name is different, what name(s) was used in the past?
_____
If site was surveyed last year, did you survey the same general area this year? **Yes** / No If no, summarize in comments below.
Did you survey the same general area during each visit to this site this year? Yes / No If no, summarize in comments below.

N/A (This site is within site BL-25, which was surveyed in 2002 and 2004.)

Management Authority for Survey Area (circle one): Federal Municipal/County **State** Tribal Private
Name of Management Entity or Owner (e.g., Tonto National Forest) ____**MRGCD**_____
Length of area surveyed: ____**1mi**____ (specify units, e.g., miles = mi, kilometers = km, meters = m)

Vegetation Characteristics: Overall, are the species in tree/shrub layer at this site comprised predominantly of (check one):

- [ ] Native broadleaf plants (entirely or almost entirely, includes high-elevation willow)
- [x] **Mixed native and exotic plants (mostly native)**
- [ ] Mixed native and exotic plants (mostly exotic)
- [ ] Exotic/introduced plants (entirely or almost entirely)

Identify the 2-3 predominant tree/shrub species: _____**Cottonwood, Coyote Willow, Russian olive**_____

Average height of canopy (Do not put a range): ___**10 ft.**_____

Was surface water or saturated soil present at or adjacent to site? **Yes** / No (circle one)
Distance from the site to surface water or saturated soil: ____**0m**_____ (specify units)

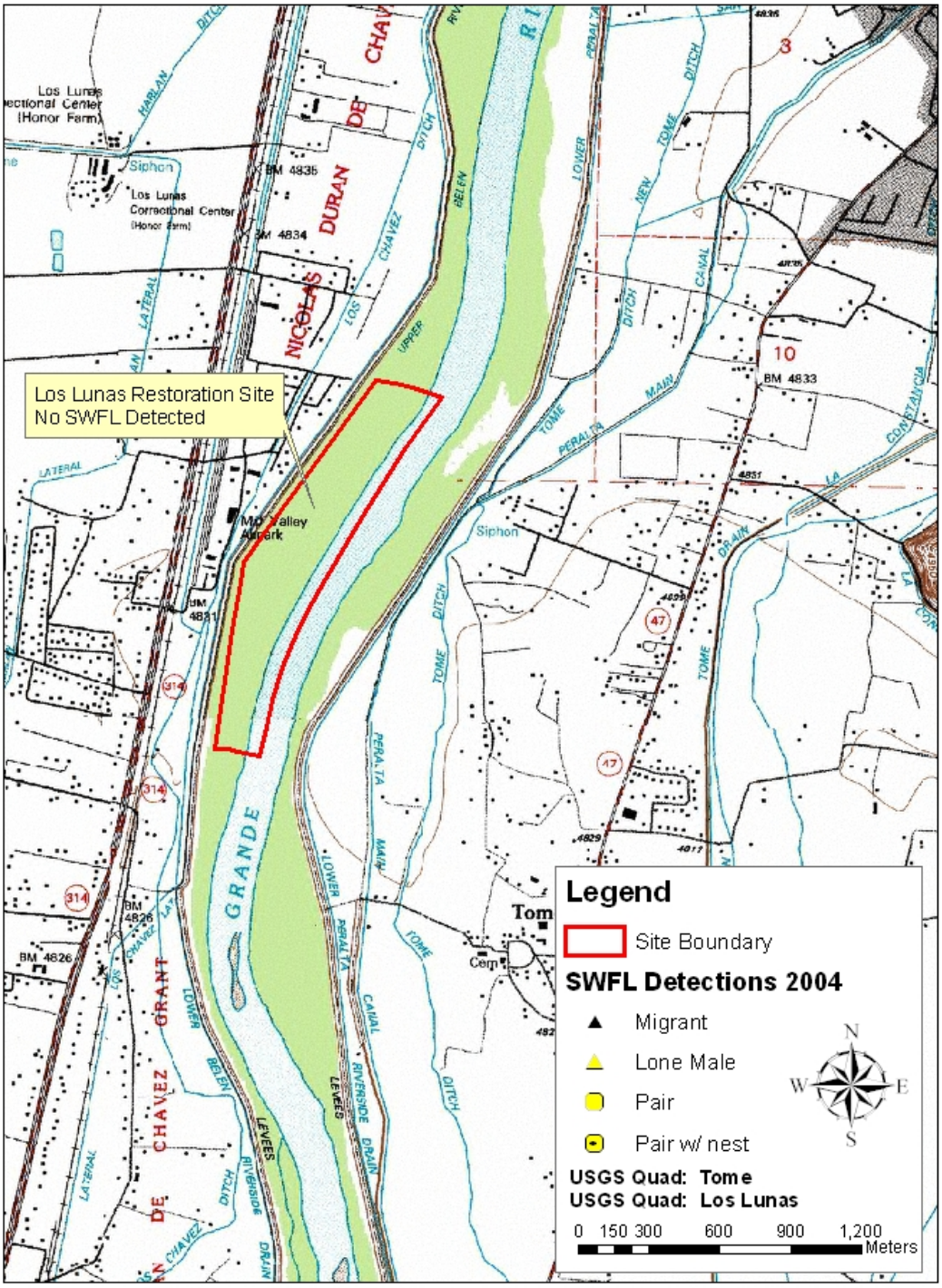
Did hydrological conditions change significantly among visits (did the site flood or dry out)? Yes / **No** (circle one)
If yes, describe in comments section below.

Remember to attach a copy of a USGS quad/topographical map (REQUIRED) of the survey area, outlining the survey site and location of WIFL detections. Also include a sketch or aerial photograph showing details of site location, patch shape, survey route in relation to patch, and location of any willow flycatchers or willow flycatcher nests detected. Such sketches or photographs are welcomed, but DO NOT substitute for the required USGS quad map. Please include photos of the interior of the patch, exterior of the patch, and overall site and describe any unique habitat features.

Comments (attach additional sheets if necessary)
The Los Lunas Restoration Site is within the BL-25 site, starting 0.3m from the northern end and ending 0.7m from the southern end of BL-25. This area has been cleared along the road and along the river. This is an old burn, no canopy, nice mixed habitat, mostly still young. Nice patches of mature Coyote Willow. Young Cottonwoods have been planted along the site, next to the cleared area along the levee road._____

WIFL Detection Locations:

Date Detected	N UTM	E UTM	Date Detected	N UTM	E UTM


Los Lunas Restoration Site
No SWFL Detected
Legend
Site Boundary
SWFL Detections 2004
Migrant
Lone Male
Pair
Pair w/ nest
USGS Quad: Tome
USGS Quad: Los Lunas
0 150 300 600 900 1,200
Meters
N
S
E
W
Los Lunas Correctional Center (Honor Farm)
Siphon
BM 4835
BM 4834
BM 4833
BM 4831
BM 4826
Mid Valley Airpark
NICOLAS DURAN DE CHAVEZ
GRANDE
GRANT
DE CHAVEZ
Tom
Cem
LOWER PERALTA MAIN
TOME DITCH
CANAL
RIVERSIDE DRAIN
LEVEES
BELEN
HARLAN
LATERAL
UPPER
LA CONTENCIA
DRAIN
3
10
47
314

Willow Flycatcher Survey and Detection Form (revised April, 2004)

Site Name_____**Los Lunas Restoration Site**_____ State___**NM**____ County_____**Valencia**_____
USGS Quad Name_____**Tome, Los Lunas**_____ Elevation_____**4820**_____ **feet** / meters

Is copy of USGS map marked with survey area and WIFL sightings attached (as required) ☐ ***Yes*** ☐ ***No***

Site Coordinates: Start:N __3847943__ E _340938__ UTM Datum __NAD83 (NAD27 preferred)
Stop:N __3846343__ E _340432__ UTM Zone __13

***** Fill in additional site information on back of this page *****

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N	Cowbirds Detected? Y or N	Presence of Livestock, Recent sign, If Yes, Describe Y or N	Comments about this survey (e.g., bird behavior, evidence of pairs or breeding, number of nests, nest contents or number of fledges seen; potential threats)
1.K.Hoffman	Date 5/24/05 Start 6:30am Stop 9:30am Total hrs 3.0	0	0	0	N	N	N	
2.E.Druskat	Date 6/2/05 Start 6:30am Stop 9:00am Total hrs 2.5	0	0	0	N	Y	N	
3.J.Hartley	Date 6/30/05 Start 6:45am Stop 9:45am Total hrs 3.0	0	0	0	N	Y	N	
4_____	Date Start Stop Total hrs _____							
5_____	Date Start Stop Total hrs _____							

Overall Site Summary (Total **resident** WIFLs only)	Adults	Pairs	Territories	Nests	Were any WIFLs color-banded? Yes **No**
Total survey hrs 8.5	0	0	0	0	If yes, report color combination(s) in the comments section on back of form

Reporting Individual _____Darrell Ahlers_____ Date Report Completed _____8/19/05_____
US Fish and Wildlife Service Permit #___TE819475-3 AZ Game and Fish Department (or other state) Permit # __N/A____

Reporting Individual _**Darrell Ahlers**_____Phone # _____**(303) 445-2233**_____
Affiliation _**BOR**_____ E-mail _____**dahlers@do.usbr.gov**_____
Site Name __**Los Lunas Restoration Site**_____Date Report Completed _____**8/19/05**_____

Did you verify that this site name is consistent with that used in previous years? **Yes** / No (circle one)
If name is different, what name(s) was used in the past?
_____

If site was surveyed last year, did you survey the same general area this year? **Yes** / No If no, summarize in comments below.
Did you survey the same general area during each visit to this site this year? **Yes** / No If no, summarize in comments below.

Management Authority for Survey Area (circle one): Federal Municipal/County **State** Tribal Private
Name of Management Entity or Owner (e.g., Tonto National Forest) ____**MRGCD**_____
Length of area surveyed: ____**1mi**____ (specify units, e.g., miles = mi, kilometers = km, meters = m)

Vegetation Characteristics: Overall, are the species in tree/shrub layer at this site comprised predominantly of (check one):

- [ ] Native broadleaf plants (entirely or almost entirely, includes high-elevation willow)
- [x] **Mixed native and exotic plants (mostly native)**
- [ ] Mixed native and exotic plants (mostly exotic)
- [ ] Exotic/introduced plants (entirely or almost entirely)

Identify the 2-3 predominant tree/shrub species: _____**Cottonwood, Coyote Willow, Russian olive**_____

Average height of canopy (Do not put a range): ___**10 ft.**_____

Was surface water or saturated soil present at or adjacent to site? **Yes** / No (circle one)
Distance from the site to surface water or saturated soil: ____**0m**_____ (specify units)

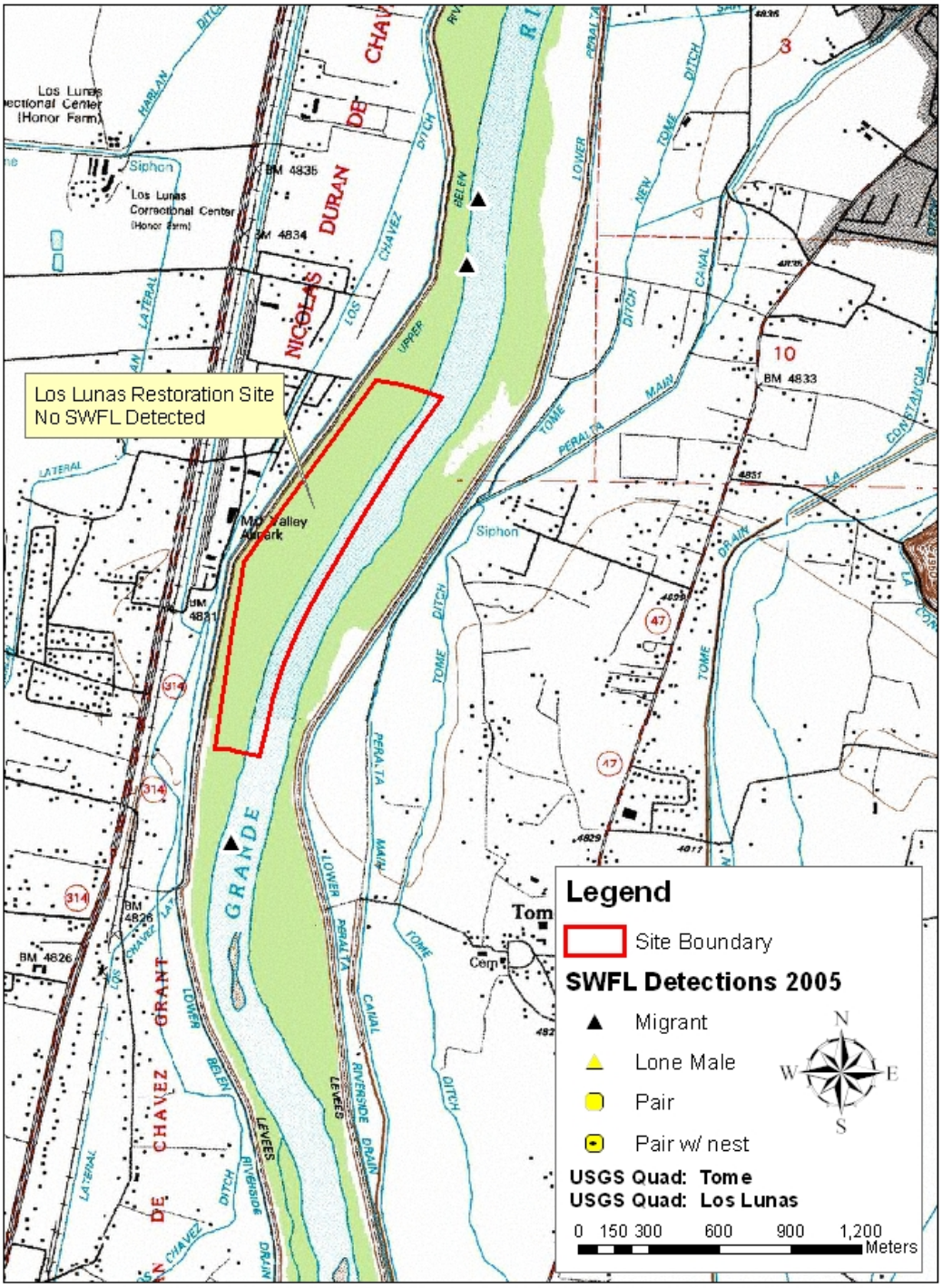
Did hydrological conditions change significantly among visits (did the site flood or dry out)? Yes / **No** (circle one)
If yes, describe in comments section below.

Remember to attach a copy of a USGS quad/topographical map (REQUIRED) of the survey area, outlining the survey site and location of WIFL detections. Also include a sketch or aerial photograph showing details of site location, patch shape, survey route in relation to patch, and location of any willow flycatchers or willow flycatcher nests detected. Such sketches or photographs are welcomed, but DO NOT substitute for the required USGS quad map. Please include photos of the interior of the patch, exterior of the patch, and overall site and describe any unique habitat features.

Comments (attach additional sheets if necessary)
_____
_____
_____
_____

WIFL Detection Locations:

Date Detected	N UTM	E UTM	Date Detected	N UTM	E UTM


Los Lunas Restoration Site
No SWFL Detected
Legend
Site Boundary
SWFL Detections 2005
Migrant
Lone Male
Pair
Pair w/ nest
USGS Quad: Tome
USGS Quad: Los Lunas
0 150 300 600 900 1,200
Meters
N
S
E
W

APPENDIX C
Bird Species and Categories Detected During Point Counts

Table A-1. Categories of species observed during Rio Grande point counts 2003-2005.

SPECIES	Neotropical migrant	Riparian obligate	Marsh/waterbird	Resident	Invasive bird
American kestrel				X	
American robin				X	
Ash-throated flycatcher	X				
Barn swallow	X				
Bell's vireo	X	X			
Bewick's wren				X	
Black phoebe				X	
Black-capped chickadee		X		X	
Black-chinned hummingbird	X	X			
Black-crowned night heron			X		
Black-headed grosbeak	X	X			
Black-necked stilt			X		
Blue grosbeak	X	X			
Blue-winged teal			X		
Brown-headed cowbird					X
Bullock’s oriole	X	X			
Canada goose			X		
Cattle egret			X		
Chihuahuan raven				X	
Chipping sparrow	X				
Common bushtit				X	
Common grackel					X
Common nighthawk	X				
Common yellowthroat	X	X	X		
Cooper’s hawk		X			
Downy woodpecker				X	
European starling					X
Gadwall			X		
Gambel's quail				X	
Gray catbird	X	X			
Great-blue heron			X		
Great-tailed grackel					X
Greater roadrunner				X	
Hairy woodpecker				X	
House finch				X	
Indigo bunting	X				
Killdeer			X		
Lazuli bunting	X				
Lesser goldfinch	X				
Loggerhead shrike				X	
Lucy's warbler	X	X			
Mallard			X		
Macgillivray's warbler	X	X			
Mourning dove				X	
Northern flicker				X	
Northern mockingbird				X	
Northern rough-winged swallow	X				

Table A-1 continued

SPECIES	Neotropical migrant	Riparian obligate	Marsh/waterbird	Resident	Invasive bird
Red-tailed hawk				X	
Red-winged blackbird				X	
Ring-necked pheasant				X	
Rufous-crowned sparrow				X	
Say's phoebe	X				
Snowy egret			X		
Sora			X		
Southwestern willow flycatcher	X	X			
Spotted sandpiper			X		
Spotted towhee				X	
Summer tanager	X	X			
Tree swallow	X				
Turkey vulture	X				
Western kingbird	X				
Western meadowlark				X	
Western tanager	X				
Western wood pewee	X				
White-breasted nuthatch				X	
White-winged dove	X				
Wilson's snipe			X		
Wilson's warbler	X	X			
Yellow warbler	X	X			
Yellow-billed cuckoo	X	X			
Yellow-breasted chat	X	X			

APPENDIX D

Photo Stations
2003, 2004, and 2005

Photo Station 1 - Facing North

2003

2004

2005

Photo Station 1 – Facing River

2003

2005

Photo Station 1 – Facing South

2003

2004

2005

Photo Station 2 – Facing North

2003

2004

2005

Photo Station 2 – Facing River

2003

2005

Photo Station 2 – Facing South

2003

2004

2005

Photo Station 3 – Facing North

2003

2004

2005

Photo Station 3 - Facing South

2003

2004

2005

Photo Station 4 – Facing North

2003

2004

2005

Photo Station 4 – Facing South

2003

2004

2005

Photo Station 5 – Facing North

2003

2004

2005

Photo Station 5 – Facing South

2003

2004

2005

Photo Station 6 – Facing North

2004

2005

Photo Station 6 – Facing South

2003

2004

2005

Photo Station 7 – Facing North

2003

2004

2005

Photo Station 8 - Pond

2003

2004

2005

Photo Station 9 – Facing South

2003

2004

2005

Photo Station 10 – Facing North

2003

2004

2005