RECLAMATION
Managing Water in the West

Brown-Headed Cowbird Control Program

Results of Follow-up Monitoring—Years 2002-2005

Alamo Lake State Wildlife Area and Bill Williams River National Wildlife Refuge, Arizona

Southwestern Willow Flycatcher chicks about to fledge Dave Moore

U.S. Department of the Interior
Bureau of Reclamation
Lower Colorado Regional Office
Boulder City, Nevada

Technical Service Center
Ecological Planning and Assessment Group
Denver, Colorado

January 2006

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to tribes.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American Public.

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Alamo Lake State Wildlife Area Arizona and Bill Williams River National Wildlife Refuge, Arizona

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Brown-Headed Cowbird Control Program
Results of Follow-up Monitoring—2002-2005
Alamo Lake State Wildlife Area and Bill Williams National Wildlife Refuge, Arizona

Introduction

This report summarizes the last 4 years of followup monitoring after termination of the Bureau of Reclamation's (Reclamation) brown-headed cowbird (BHCO) control and trapping program at Alamo Lake State Wildlife Area (SWA) and Bill Williams River National Wildlife Refuge (NWR). The trapping was done from 1999 to 2001 as a measure to prevent further declines and promote recovery of breeding populations of the southwestern willow flycatcher (SWFL) and other neotropical migrant songbirds.

This program complied with terms and conditions set forth by U.S. Fish and Wildlife Service (USFWS) in their Biological Opinion on Reclamation's Lower Colorado River Operations and Maintenance – Lake Mead to Southerly International Boundary (USFWS 1997). According to this Biological Opinion, Reclamation was directed to conduct cowbird trapping adjacent to SWFL habitat where parasitism rates exceeded 10 percent. Biologists from Reclamation's Technical Service Center, in cooperation with Reclamation's Lower Colorado Regional Office, have conducted the BHCO control program starting in 1998. The results of the program have been documented in four annual reports (White et al. 1998, White and Best 1999, White et al. 2001, and White et al. 2002). The program included (1) BHCO trapping in an attempt to reduce parasitism, (2) avian point counts to estimate relative abundance of BHCOs and host species, and (3) nest monitoring to determine parasitism rates and nest success.

The occurrence of a breeding population of SWFLs, a rich and diverse population of breeding neotropical migratory host species, and initial population estimates of BHCOs at Alamo Lake SWA and Bill Williams River NWR indicated that these areas were suitable sites to implement a cowbird control program. For this study, trapping was conducted for 3 consecutive years from 1999 to 2001. As a result, 1,341 and 526 BHCOs were removed from the populations at the Alamo Lake SWA and Bill Williams River NWR, respectively. In 1998, trapping was conducted in limited areas for one season at the Havasu NWR where 232 BHCOs were removed (White et al. 1998). In separate studies, trapping was conducted from 1996 to 1998 at the Bill Williams River NWR where 621 BHCOs were removed (Morrison and Averill-Murray 2002).

The results from our evaluation of the control program indicated that BHCO populations in riparian habitat at both sites were reduced to levels that may have lowered the parasitism potential during the program (White et al. 2002). BHCO capture rates

dropped about 60 percent per year at the Alamo Lake SWA and Bill Williams River NWR. BHCO detection rates also decreased and became much lower than untrapped sites along the mainstem Lower Colorado River. BHCO to host ratios were reduced at both Alamo Lake SWA and Bill Williams River NWR, but remained consistently higher at Havasu NWR where trapping had been suspended after 1998. Finally, during BHCO control, our nest monitoring of several host species, including SWFLs, indicated parasitism rates in study plots dropped from 8 percent to 1 percent at the Alamo Lake SWA and remained at zero at the Bill Williams River NWR. Parasitism of SWFL nests has ranged from 15 percent to 30 percent at Havasu NWR from 1998 to 2004 (McKernan and Braden 2002; SWCA 2004; Olson pers. com. 2004).

BHCO trapping was terminated after the summer of 2001 as a result of re-initiation of Section 7 consultation with the USFWS. The most recent Biological Opinion (USFWS 2002) does not require cowbird trapping as a protective measure for the SWFL. Instead, a study was initiated beginning in 2002 to determine the effectiveness of trapping on SWFL reproductive success and population numbers[1]. Concurrently, biologists from the Technical Service Center have continued to conduct point counts and nest monitoring at Alamo Lake SWA and Bill Williams River NWR to monitor the response of the avian community during the four breeding seasons after the cessation of BHCO trapping (White and Ryan 2002 and 2003; Ryan and White 2004). This report summarizes the results of this followup monitoring during avian breeding seasons from 2002 through 2005 and compares BHCO abundances, BHCO and host species abundance ratios, and observed parasitism rates with data collected during the 3-year trapping program from 1999 to 2001.

Methods

Study Area

During 2002-2005, the general study areas were located on the Alamo Lake SWA adjacent to Alamo Lake State Park, Arizona, and on the Bill Williams River NWR, Arizona. These sites were the same ones used in the 1999 to 2001 BHCO control program (White et al. 2002). In addition, we continued BHCO/host species point counts at the Havasu NWR, Arizona, where we conducted one season of limited BHCO trapping in 1998 (White et al. 1998), and where trapping was re-initiated in June 2003 and continued through the 2005 breeding seasons by biologists from SWCA Environmental Consultants (SWCA 2004 and 2005).

Alamo Lake SWA

The Alamo Lake SWA is located about 64 kilometers (km) northeast of the town of Wenden, Arizona, located in La Paz County. This study area is located in and around the confluence of the Santa Maria, Bill Williams, and the Big Sandy rivers upstream of Alamo Lake Reservoir. The area contained three former trapping sites, three active nest

[1] A separate water transfer Biological Opinion directs Reclamation to control BHCOs below Parker Dam in areas where potential SWFL habitat is suspected pending the results of the controlled study to determine the effectiveness of trapping.

monitoring plots, and two active point count routes. The habitat at this site underwent considerable changes during 2005 as a result of the above average precipitation and flooding during the winter of 2004-05. There were large areas of riparian vegetation that were scoured on the upstream rivers and above average flows remained throughout the breeding season (Figure 1). We observed extensive areas where cottonwood, willow, and saltcedar were germinating in the scoured depositional areas (Figure 2). The vegetation in the delta of Alamo Lake, which was nesting habitat for southwestern willow flycatcher, was inundated by at least 4 m of reservoir water throughout the breeding season (Figures 3 and 4).

Bill Williams River NWR

The Bill Williams River NWR is located about 32 km south of Lake Havasu City, Arizona. The study site is located entirely within the NWR along the Bill Williams River. In previous years, this area included four trapping sites, three nest monitoring plots, and one active point count route. Flooding during the winter of 2004-2005 significantly changed the Bill Williams River channel and flood plain, scouring vegetation from two of three nest monitoring plots and destroying the 4-wheel drive interior road (Figure 5).

Havasu NWR

The Havasu NWR is located in the vicinity of Topock Marsh along the Colorado River in Arizona, just across the border from Needles, California. Here, we continued point counts for songbird host species and BHCOs along the same transect used since 1998 (White et al. 1998). Point counts were continued to evaluate the ratio of BHCOs to host species at a site where BHCO control was implemented in 1998, but subsequently terminated for 4 years, then re-initiated in 2003. The location of the point counts were identical to those designated as the “Glory Hole to North Dike” point count transects for the 1998 control program concurrent with our study (White et al. 1998). McKernan and Braden (2002) conducted SWFL surveys and nest monitoring to determine population levels and parasitism rates of SWFLs throughout the breeding season of 2002. The study was taken over by SWCA (2004) in 2003 and included the re-initiation of BHCO trapping.

BHCO Point Counts

We conducted bi-weekly fixed-radius point counts as a measure of BHCO distribution and abundance in the study areas. We used a modified version of the point count methodology described by Ralph et al. (1993) where individual BHCOs were recorded within 60 meters (m) of the observer during 5-minute intervals. We used a 60-m threshold (instead of 50-m) to better compare data with 60-m point counts conducted by Lynn and Averill (1996) in the Lower Colorado River Valley. BHCO point count routes started approximately 30 minutes before sunrise and never continued for more than 3.5 hours.

Figure 1. Flooding during the winter of 2004-2005 caused scouring of riparian vegetation on rivers upstream of Alamo Lake. Surface water remained in the channel throughout much of the breeding season.

Figure 2. Large areas of seedlings of riparian plants were developing along the Santa Maria River as a result of high winter flows.

Figure 3. SWFL nesting habitat at Alamo Lake delta was inundated throughout the 2005 breeding season. The Goodding willow retained foliage and the saltcedar appeared completely dead.

Figure 4. View into flooded active SWFL nesting territory, Alamo Lake SWA.

Figure 5. Bill Williams River flooded interior road and scoured vegetation at former nest monitoring plot.

Alamo Lake SWA

From mid-May through July, we conduced bi-weekly point counts along two established transects within the study area. These transects were located in and adjacent to riparian habitat in the flood plain area. In 2003, the Brown's Crossing transect was modified to include some riparian and SWFL habitat in the expanding delta with declining reservoir elevations. In 2005, the Santa Maria River transect was changed after 2001 due to ATV restrictions. The route then followed the host species point count walking transect.

In previous years, the Brown's Crossing BHCO point count transect consisted of 20 points approximately 200 m apart and 3.8 km in length beginning in the delta of Alamo Lake and then following the northwestern edge or the dry riverbed of the Bill Williams River to the confluence of the Big Sandy River. In 2005, since the area was flooded, the transect was surveyed by kayak and modified somewhat to cover areas with the remaining stands of riparian vegetation.

The Santa Maria River BHCO point count transect consisted of 20 points ranging from 200 to 400 m apart and was about 4 km in length. This transect formed a loop on both sides of a broad reach of the Santa Maria River flood plain. The riparian vegetation and river channel had changed in places along this transect in 2005. However the location of the point counts remained essentially the same.

Bill Williams River NWR

The BHCO point count route transect ran through or adjacent to riparian habitat for 6 km along the same transect used during the previous seasons (White et al. 2002). This transect ran along the interior road from the gate near the start of the 4-wheel drive road to a point upstream of Mineral Wash. This route consisted of 20 points spaced 200 to 400 m apart. The riparian vegetation and river channel had significantly changed along this transect in 2005. However, the location of the point counts remained essentially the same.

Host Species Point Counts

To monitor the distribution and abundance of the avian community in the BHCO control study area, we conducted 5-minute, 60-m fixed-radius point counts targeting host species and female BHCOs three times during the breeding season along established transects at the Alamo Lake SWA (Santa Maria River), the Bill Williams River NWR as described above, as well as one on the Havasu NWR. They were surveyed within the same general time period during the 7 study years. Each consisted of 20 points, which were identical to those surveyed since 1998 and were surveyed three times in a 5-week period from mid-May to mid-June. All songbirds were counted and classified as host species if there were any records for that species rearing parasitic young BHCOs based on the compilations of Friedmann and Kiff (1985). Obviously, certain species [i.e., Bell's vireo (BEVI)] are more susceptible and are parasitized more frequently compared to others (i.e., mourning dove). Nevertheless, all species identified as known hosts are included in our analysis.

During the host point counts, we also recorded all BHCOs and distinguished BHCO females by their distinctive "rattle call" as well as visual identification. We evaluated data on the abundance of host species in relationship to female BHCOs to determine and compare the potential for parasitism between the different sites. Robinson et al. (1993) suggested that the ratio of female cowbirds to hosts detected in fixed-radius point counts could be used as a crude index of parasitism intensity at the community level. They stated that ". . . ratios of 0.05-0.10 cowbird females:host males detected within fixed-radius point counts corresponded with very high levels of brood parasitism for most neotropical migrants." Thus, we have used the ratio of female BHCOs and individual host birds observed concurrently during point counts as an index to evaluate trends in BHCO parasitism.

Nest Monitoring

During previous years we conducted nest searches and nest monitoring for all potential host species at the Alamo Lake SWA and the Bill Williams River NWR within three plots at each site. Since much of the vegetation was flooded and/or scoured away in 2005, we monitored in two plots at Alamo Lake and one at the Bill Williams. Nest monitoring was conducted in proximity to previous BHCO trapping sites and existing point count transects to determine parasitism rates and any correlations between the abundance of BHCOs, the parasitism rates of host songbird species nests, and the effects of previous BHCO removal. In addition, in coordination with Arizona Game and Fish biologists, we monitored SWFL nests at the Alamo Lake SWA in all years except 2000.

Arizona Game and Fish protocol was used when monitoring SWFL nests, with emphasis placed on minimizing disturbance (Rourke et al. 1999).

For each species and site, we calculated the proportion of nests that was parasitized, predated, abandoned, or successfully hatched or fledged at least one host chick. For consistent and comparable analysis, we compared the year-to-year variation of parasitism and other variables for the four most common host species: Abert's towhee (ABTO), BEVI, SWFL, and yellow-breasted chat (YBCH). In addition, as a quantitative indicator of nest success, we used a "modified Mayfield index" used by Lynn (1996) during avian studies in the Lower Colorado River Valley. The degree of success of each nest was ranked: 0 = did not finish nest construction or no host eggs laid; 1 = at least one host egg laid; 2 = at least one host egg hatched; 3 = at least on host chick fledged.

Results

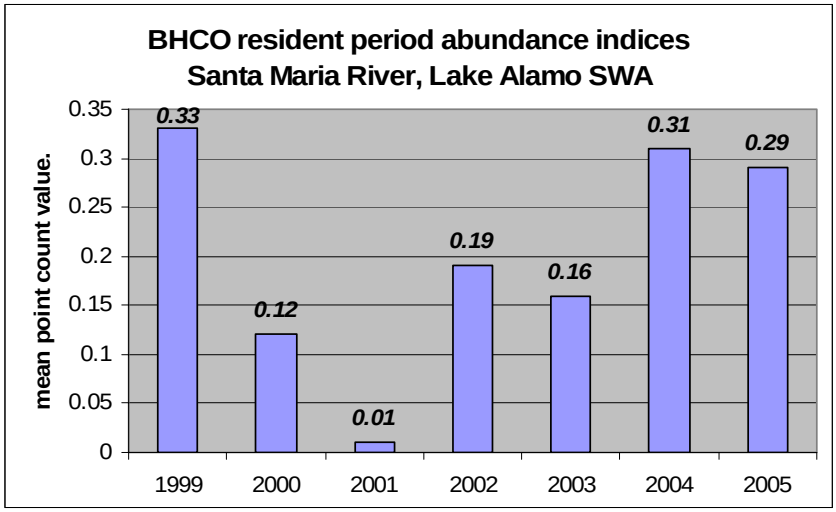
Cowbird Point Counts

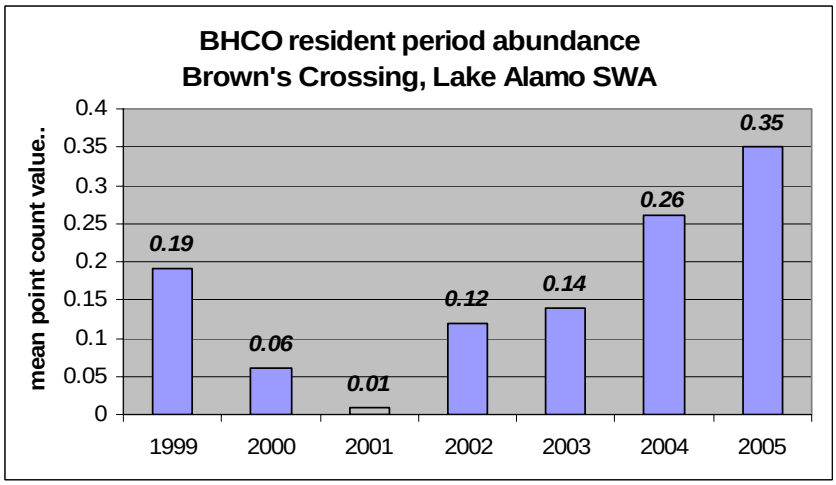
We used point counts to monitor the abundance of BHCOs in the vicinity of our BHCO control sites. For our analysis, we used point count data collected from the last week in May through the third week of July (outside the late migration period) when the majority of BHCOs are assumed to be summer residents.

Alamo Lake SWA

During the 7 study years, resident period mean BHCO detection rates ranged from 0.01 (2001) to 0.35 (2005) BHCOs per point for Brown's Crossing and 0.01 (2001) to 0.31 (2004) for Santa Maria River (Figure 6). During the trapping years (1999-2001), BHCO detections declined at both sites, which correlated with decreasing BHCO capture rates during our control activities at Alamo Lake SWA. Post trapping data indicate that BHCO mean values have increased from the low detection rates obtained during 2001 (the third year of BHCO control) along the two transects. This correlates with the increase in parasitism rates observed in the adjacent nest monitoring plots (see Nest Monitoring section).

The annual variation in BHCO numbers observed during point counts was analyzed using linear regression at the 95-percent confidence level for both the Santa Maria River Brown's Crossing. Significant decreases in BHCO mean values were indicated from 1999 to 2001 during the trapping years along the Santa Maria River ($R^2 = 0.721$, df = 1, 17, F = 43.7, P<0.001) and Brown's Crossing ($R^2 = 0.518$, df = 1, 16, F = 16.98, P<0.001). Mean values showed a significant increase post trapping between 2001 and 2005 along the Santa Maria River ($R^2 = 0.242$, df = 1, 20, F = 6.39, P<0.02) and Brown's Crossing ($R^2 = 0.360$, df = 1, 21, F = 11.39, P<0.003). For Santa Maria River, no change in BHCO detection rates was indicated between 1999 (first year of trapping) and 2005 (last year of monitoring) (t = 0.58, P>0.56). For Brown's Crossing 2005 BHCO means were greater than in 1999 (t = -3.02, P<0.02). This suggests that BHCO abundance has returned to or surpassed former levels 4 years after cessation of trapping at Alamo Lake.





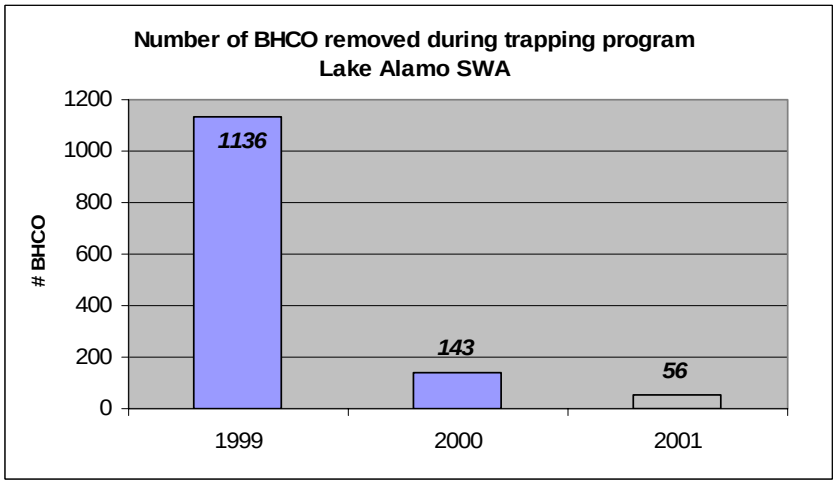


Figure 6. Results of BHCO point counts (1999-2005) and trapping rates (1999-2001) at Alamo Lake SWA.

Bill Williams River NWR

During the 7 study years, resident period mean BHCO detection rates ranged from 0.06 (1999) to 0.31 (2004) BHCOs per point along the transect (Figure 7). Unlike what was observed at Alamo Lake, BHCO detections actually increased during the trapping years from a low value during the first year of trapping. This increase continued into the post-trapping years except for a decline in BHCO abundance in 2003. Finally, BHCO abundance increased to the highest level in 2005. Regression analysis indicated a significant increase in BHCO mean values ($R^2 = 0.304$, df = 1, 44, F = 19.25, P<0.001) throughout most of 7 study years. T-tests indicated a significant increase by 2005 compared to both 1999 (t = -5.63, P<0.001) and 2001 (-3.14, P<0.01). During the trapping years, there was a slight decrease in BHCO capture rates, but the decrease was less than at Alamo Lake. Prior to our control efforts, 621 BHCOs had been removed from the Bill Williams River NWR from 1996 to 1998 by refuge personnel (Morrison and Averill-Murray 2002).

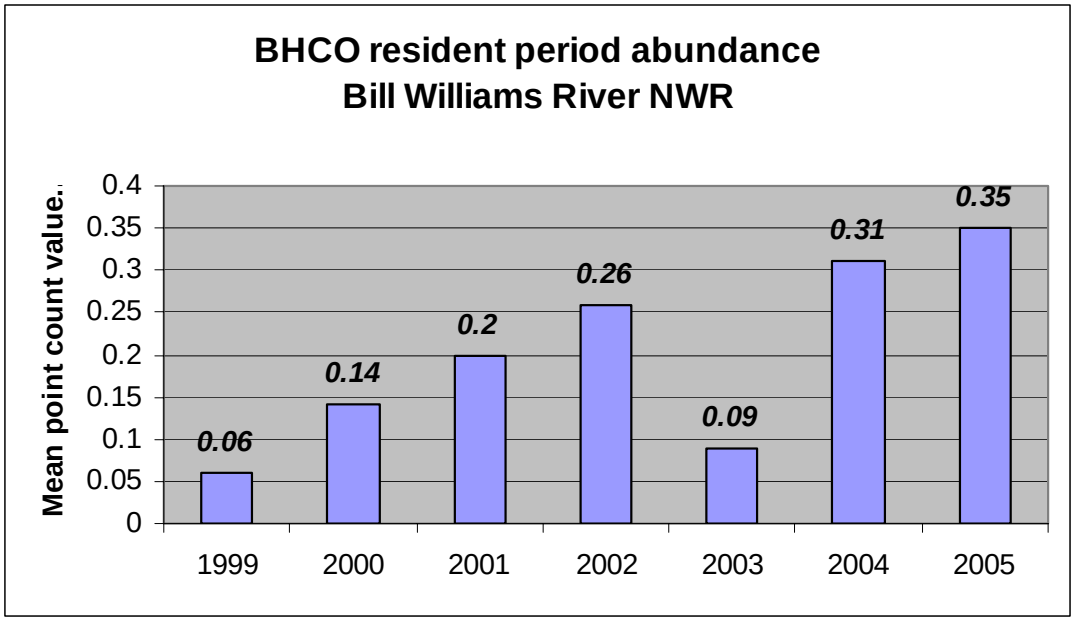
Host Species Point Counts

Tables 1-3 summarize the most recent point count data for the Alamo Lake SWA, Bill Williams River NWR, and Havasu NWR for 2005, and the Appendix contains summaries from 1999-2004. Data on the relative abundance of individual species are presented as well as pooled data for species groups including BHCOs, BHCO female to hosts ratios, neotropical migrants, riparian obligates, and invasive species (opportunistic invaders of disturbed habitat which include grackles, crows, ravens, and cowbirds).

Alamo Lake SWA

Overall, the number of pooled bird group detections, including neotropical migrants and riparian obligates, experienced a significant decline in 2002 (Figure 8). ANOVA indicated a significant reduction of neotropical migrants during the mid-June counts in 2002, followed by some increase by 2005 (F = 2.73, df = 4, 295, P<0.03). There was also a reduction in numbers of riparian obligate birds in 2002 (F = 2.90, df = 3,76, P<0.05) and a statistically significant increase by 2005.

Most common host species during the study were consistently YBCH, BEVI, and ABTO (Figure 9). A Yellow-billed cuckoo was detected during point counts along the Santa Maria River in 2005. YBCH annual mean detection rates ranged from 0.77 to1.53 birds/ point with the low value in 1999; high in 2005; BEVI from 0.53 in 2005 to 0.86 in 1999; ABTO from 0.21 in 1999 to 0.63 in 2001. The only statistical difference in the annual detection rates for these individual species was for YBCH highest values in 2001 and 2005 (F = -2.60, df = 6, 14 P<0.07). Detection rates for the yellow warbler (YWAR), a species of regional concern, were relatively low ranging from 0.11 to 0.40. YWAR lowest values were observed in 1999 and 2002; higher values were observed in 2001 and 2005. Higher numbers of YWAR were detected at Alamo Lake SWA than at the Bill Williams River or Havasu NWR.



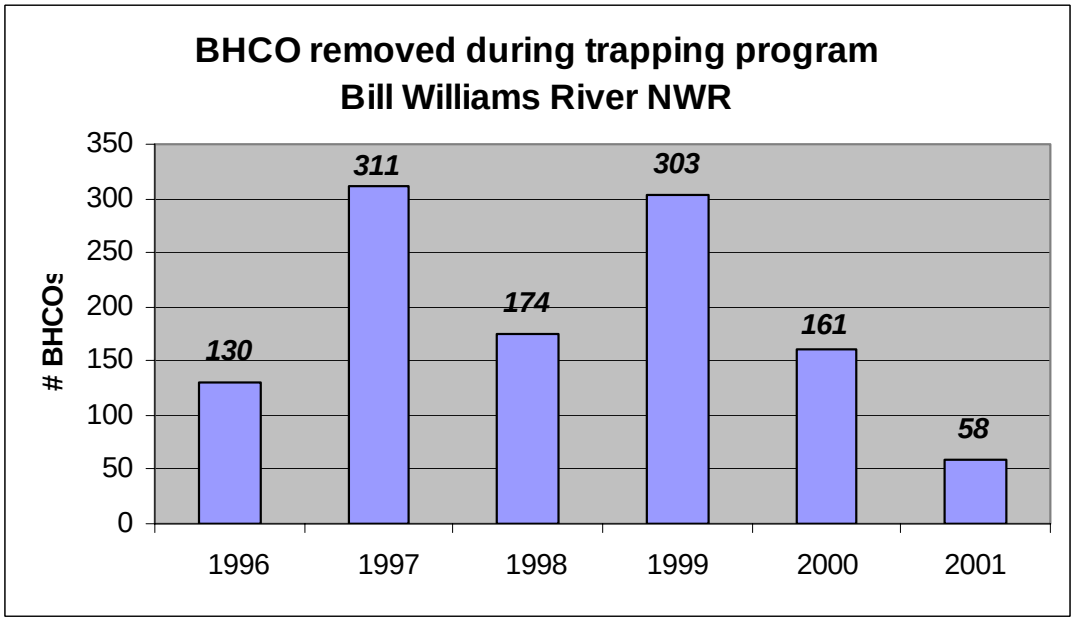


Figure 7. Results of BHCO point counts (1999-2005) and trapping rates (1999-2001) at Bill Williams River NWR**.**

Table 1. Results of 2005 point counts for Alamo Lake SWA

Santa Maria River Point Count 5 minute point counts Detections within 60 meters Year 2005	Survey 1 24-May			Survey 2 7-Jun			Survey 3 21-Jun		
	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
Abert's towhee*	10	0.5	0.61	10	0.50	0.61	9	0.45	0.51
American kestrel	0	0	0	0	0.00	0.00	1	0.05	0.22
Ash-throated flycatcher	1	0.05	0.22	6	0.30	0.47	8	0.40	0.68
Brown-crested flycatcher	1	0.05	0.22	0	0.00	0.00	1	0.05	0.22
Black-chinned hummingbird	2	0.1	0.31	4	0.20	0.41	2	0.10	0.31
Bell's vireo*	15	0.75	0.72	8	0.40	0.60	9	0.45	0.60
Bewick's wren*	0	0	0	1	0.05	0.22	0	0.00	0.00
Brown-headed cowbird	5	0.25	0.64	3	0.15	0.49	7	0.35	0.81
Blue grosbeak*	7	0.35	0.81	7	0.35	0.67	8	0.40	0.75
Black phoebe*	0	0	0	0	0.00	0.00	1	0.05	0.22
Black-tailed gnatcatcher*	0	0	0	0	0.00	0.00	2	0.10	0.31
Cooper's hawk	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Common yellowthroat*	6	0.3	0.66	7	0.35	0.59	1	0.05	0.22
Crissal thrasher*	2	0.1	0.45	0	0.00	0.00	0	0.00	0.00
Gambel's quail	5	0.25	0.44	4	0.20	0.41	1	0.05	0.22
House finch*	2	0.1	0.45	1	0.05	0.22	0	0.00	0.00
Killdeer	0	0	0	1	0.05	0.22	0	0.00	0.00
Ladder-backed woodpecker	2	0.1	0.31	2	0.10	0.31	2	0.10	0.31
Lesser goldfinch*	7	0.35	0.93	7	0.35	1.35	15	0.75	3.13
Lesser nighthawk	1	0.05	0.22	0	0.00	0.00	1	0.05	0.22
Lucy's warbler*	2	0.1	0.31	0	0.00	0.00	3	0.15	0.37
Mourning dove	10	0.5	0.69	3	0.15	0.37	5	0.25	0.55
Phainopepla*	2	0.1	0.31	0	0.00	0.00	0	0.00	0.00
Red-winged blackbird*	1	0.05	0.22	2	0.10	0.31	1	0.05	0.22
Song sparrow*	12	0.6	0.88	6	0.30	0.57	5	0.25	0.55
Solitary vireo*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Summer tanager*	1	0.05	0.22	0	0.00	0.00	5	0.25	0.44
Vermilion flycatcher*	1	0.05	0.22	4	0.20	0.52	3	0.15	0.49
Western kingbird*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
White-winged dove	1	0.05	0.22	5	0.25	0.55	3	0.15	0.37
Western wood pewee*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Yellow-breasted chat*	37	1.85	0.81	33	1.65	1.04	22	1.10	0.97
Yellow-billed cuckoo	0	0	0	0	0.00	0.00	1	0.05	0.22
Yellow warbler*	5	0.25	0.44	4	0.20	0.52	15	0.75	0.91
TOTAL SPECIES	27	5.05	1.7	21	4.40	1.90	26	4.70	2.41
TOTAL BIRDS	141	7.05	2.68	119	5.95	3.19	132	6.60	3.78
NEOTROPICAL MIGRANT SPECIES	16	3	1.03	9	2.65	1.23	15	3.10	1.71
NEOTROPICAL MIGRANT BIRDS	89	4.45	1.79	80	4.00	2.47	95	4.75	3.35
RIPARIAN OBLIGATE SPECIES	9	2.85	1.04	8	2.20	1.01	11	2.65	1.57
RIPARIAN OBLIGATE BIRDS	86	4.3	1.63	72	3.30	1.81	71	3.55	2.06
INVASIVE SPECIES	1	0.15	0.37	1	0.10	0.31	1	0.20	0.41
INVASIVE BIRDS	5	0.25	0.64	3	0.15	0.49	7	0.35	0.81
BHCO HOSTS*	123			93			104		
Brown-headed cowbird (female)	2	0.1	0.31	1	0.05	0.22	4	0.20	0.41
RATIO of BHCO FEMALES:HOSTS	0.02			0.01			0.04		

Table 2. Results of 2005 point counts for Bill Williams River NWR

Bill Williams River NWR 5 minute point counts Detections within 60 meters Year 2005	Survey 1 25-May			Survey 2 8-Jun			Survey 3 22-Jun		
	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
Abert's towhee*	4	0.24	0.44	9	0.45	0.76	12	0.60	0.88
Ash-throated flycatcher	11	0.65	0.70	8	0.40	0.68	14	0.70	0.98
Brown-crested flycatcher	3	0.18	0.39	0	0.00	0.00	3	0.15	0.37
Bell's vireo*	9	0.53	0.72	10	0.50	0.69	9	0.45	0.60
Bewick's wren*	6	0.35	0.49	3	0.15	0.37	1	0.05	0.22
Brown-headed cowbird	5	0.29	0.59	6	0.30	0.57	3	0.15	0.37
Blue grosbeak*	1	0.06	0.24	1	0.05	0.22	2	0.10	0.31
Black-tailed gnatcatcher*	1	0.06	0.24	1	0.05	0.22	1	0.05	0.22
Black-chinned hummingbird	1	0.06	0.24	1	0.05	0.22	2	0.10	0.45
Bullock's oriole*	0	0.00	0.00	2	0.10	0.31	0	0.00	0.00
Canyon wren	1	0.06	0.24	2	0.19	0.60	1	0.05	0.22
Common raven	0	0.00	0.00	0	0.00	0.00	1	0.05	0.22
Common yellowthroat*	0	0.00	0.00	4	0.20	0.41	3	0.15	0.37
Crissal thrasher*	0	0.00	0.00	0	0.00	0.00	2	0.10	0.31
Gambel's quail	4	0.24	0.56	2	0.10	0.31	3	0.15	0.49
Gila wodpecker	9	0.53	1.07	8	0.40	0.68	5	0.25	0.44
Greater roadrunner	1	0.06	0.24	0	0.00	0.00	0	0.00	0.00
Great-tailed grackle	1	0.06	0.24	0	0.00	0.00	1	0.05	0.22
House finch*	1	0.06	0.24	2	0.10	0.45	6	0.30	0.92
Ladder-backed woodpecker	2	0.12	0.33	2	0.10	0.31	0	0.00	0.00
Lesser goldfinch*	4	0.24	0.97	0	0.00	0.00	0	0.00	0.00
Loggerhead shrike	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Lucy's warbler*	0	0.24	0.44	0	0.00	0.00	3	0.15	0.37
Mourning dove*	12	0.71	0.47	7	0.35	0.67	14	0.70	0.86
Northern rough-winged swallow	0	0.00	0.00	9	0.45	1.47	9	0.45	1.39
Phainopepla*	1	0.06	0.24	0	0.00	0.00	1	0.05	0.22
Red-tailed hawk	0	0.00	0.00	0	0.00	0.00	1	0.05	0.22
Song sparrow*	3	0.18	0.53	1	0.05	0.22	8	0.40	0.68
Spotted sandpiper	1	0.06	0.24	2	0.10	0.31	0	0.00	0.00
Summer tanager*	1	0.06	0.24	0	0.00	0.00	0	0.00	0.00
Verdin*	1	0.06	0.24	0	0.00	0.00	0	0.00	0.00
Western tanager*	0	0.00	0.00	0	0.00	0.00	1	0.05	0.22
White-throated swift	0	0.00	0.00	0	0.00	0.00	1	0.05	0.22
White-winged dove	13	0.76	0.66	9	0.45	0.60	13	0.65	1.14
Yellow-breasted chat*	17	1.00	0.71	10	0.50	0.83	14	0.70	0.92
Yellow warbler*	1	0.06	0.24	0	0.00	0.00	0	0.00	0.00
Zone-tailed hawk	0	0.00	0.00	0	0.00	0.00	1	0.05	0.22
TOTAL SPECIES	26	5.76	2.25	22	3.80	2.09	31	5.15	1.98
TOTAL BIRDS	114	6.94	2.95	100	5.00	3.13	139	6.95	3.61
NEOTROPICAL MIGRANT SPECIES	9	2.41	1.00	8	1.55	1.19	13	2.25	1.21
NEOTROPICAL MIGRANT BIRDS	48	3.06	1.30	45	2.25	1.92	63	3.15	2.18
RIPARIAN OBLIGATE SPECIES	7	1.88	0.86	6	1.15	1.04	10	1.85	1.14
RIPARIAN OBLIGATE BIRDS	35	2.29	1.10	28	1.40	1.27	45	2.25	1.29
INVASIVE SPECIES	2	0.29	0.47	1	0.25	0.44	3	0.25	0.55
INVASIVE BIRDS	6	0.35	0.61	6	0.30	0.57	5	0.25	0.55
BHCO HOSTS*	62			50			77		
Brown-headed cowbird (female)	2	0.12	0.33	2	0.10	0.31	0	0.00	0.00
RATIO of BHCO FEMALES:HOSTS	**0.03**			**0.04**			**0.00**		

Table 3. Results of 2005 point counts for Havasu NWR

Havasu NWR	n=20								
5 minute point counts	**Survey 1**			**Survey 2**			**Survey 3**		
Detections within 60 meters	**26-May**			**9-Jun**			**23-Jun**		
Year 2005	**TOTALS**	**MEAN**	**SD**	**TOTALS**	**MEAN**	**SD**	**TOTALS**	**MEAN**	**SD**
Abert's towhee*	1	0.05	0.22	7	0.35	0.49	4	0.20	0.41
Ash-throated flycatcher	7	0.35	0.49	1	0.05	0.22	3	0.15	0.37
Bewick's wren*	10	0.50	1.00	4	0.20	0.41	5	0.25	0.44
Black-chinned hummingbird	3	0.15	0.37	3	0.15	0.37	1	0.05	0.22
Black-tailed gnatcatcher*	1	0.05	0.22	1	0.05	0.22	1	0.05	0.22
Blue grosbeak*	0	0.00	0.00	2	0.10	0.31	2	0.10	0.31
Brown-crested flycatcher	4	0.20	0.52	0	0.00	0.00	0	0.00	0.00
Brown-headed cowbird	4	0.20	0.62	4	0.20	0.41	0	0.00	0.00
Bullock's oriole*	0	0.00	0.00	0	0.00	0.00	3	0.15	0.49
Common raven	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Common yellowthroat*	7	0.35	0.67	7	0.35	0.59	11	0.55	0.60
Gila woodpecker	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Great-tailed grackle	14	0.70	0.92	11	0.55	0.69	12	0.60	1.27
Ladder-backed woodpecker	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Lucy's warbler*	0	0.00	0.00	4	0.20	0.41	6	0.30	0.73
Mourning dove	5	0.25	0.72	4	0.20	0.41	1	0.05	0.22
Red-winged blackbird*	9	0.45	0.76	15	0.75	1.16	3	0.15	0.37
Song sparrow*	3	0.15	0.37	4	0.20	0.52	6	0.30	0.66
Summer tanager*	0	0.00	0.00	1	0.05	0.22	1	0.05	0.22
White-winged dove	30	1.50	1.05	24	1.20	1.15	25	1.25	0.97
Willow flycatcher*	1	0.05	0.22	1	0.05	0.22	0	0.00	0.00
Yellow warbler*	1	0.05	0.22	0	0.00	0.00	1	0.05	0.22
Yellow-breasted chat*	26	1.30	0.66	25	1.25	0.64	25	1.25	1.02
Yellow-headed blackbird*	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
TOTAL SPECIES	17	4.35	1.23	20	4.55	1.73	17	3.90	1.55
TOTAL BIRDS	127	6.35	2.32	121	6.05	2.86	110	5.50	2.46
NEOTROPICAL MIGRANT SPECIES	7	1.90	0.91	9	1.85	1.09	9	1.95	0.94
NEOTROPICAL MIGRANT BIRDS	49	2.45	1.28	45	2.25	1.29	53	2.65	1.46
RIPARIAN OBLIGATE SPECIES	6	1.55	0.83	7	1.75	0.85	8	1.95	0.89
RIPARIAN OBLIGATE BIRDS	42	2.10	1.37	44	2.20	1.24	55	2.75	1.65
INVASIVE SPECIES	2	0.55	0.69	3	0.70	0.73	1	0.25	0.44
INVASIVE BIRDS	18	0.90	1.25	16	0.80	0.83	12	0.60	1.27
BHCO HOSTS*	59			72			68		
Brown-headed cowbird (female)	2	0.10	0.31	2	0.10	0.31	0	0.00	0.00
RATIO of BHCO FEMALES:HOSTS	**0.03**			**0.03**			**0.00**		

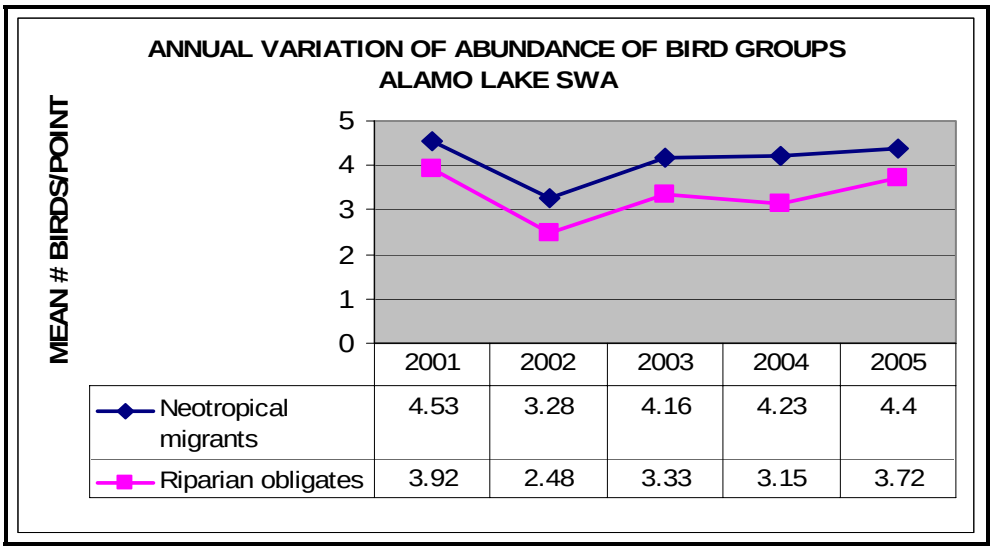


Figure 8. Mean number of neotropical migrants and riparian obligates detected during point counts on Santa Maria River**.**

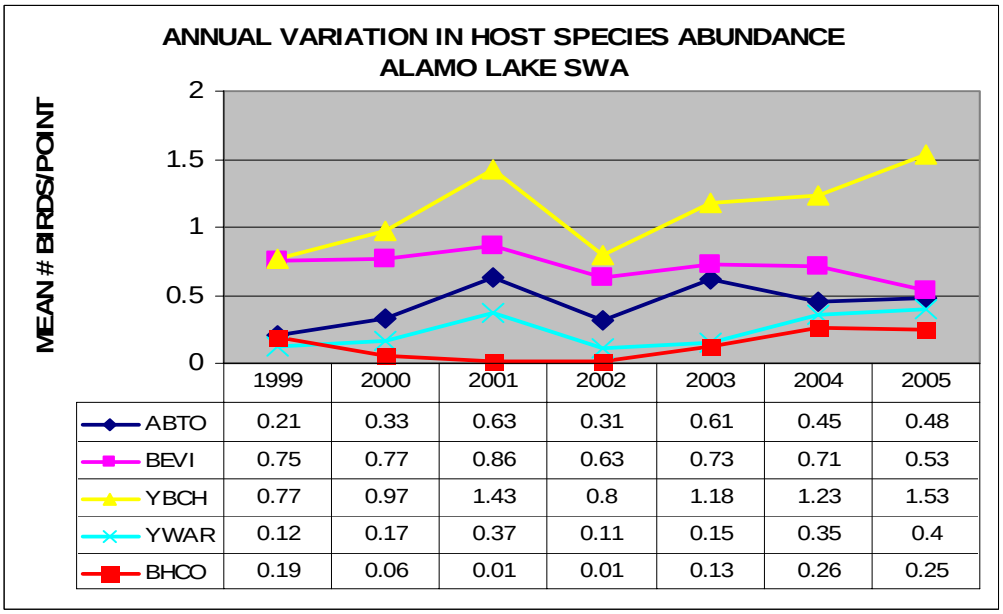


Figure 9. Mean number of common host species and BHCO detected during point counts on Santa Maria River.

In 2005, the total of individual host birds ranged from 123 on May 24, to 93 on June 7, to 104 on June 21. The number of BHCO females ranged from one to four on those dates. From this we calculated an average cowbird female:host ratio of 0.08 which was higher than the previous years. However, ANOVA indicated that the apparent ratio increase in 2005 was not significant at the 90 percent confidence level ($F = 1.0$, $df = 4, 17$, $P>0.46$).

Bill Williams River NWR

Overall, the number of pooled bird group detections including neotropical migrants and riparian obligates experienced a significant decline in 2002, with a slight increase the next year and a decline by 2005 (Figure 10). ANOVA indicated a significant reduction of neotropical migrants in 2002 and no recovery by 2005 ($F = 7.11$, df = 4, 292, $P<0.0001$). There was a similar trend indicated for riparian obligate birds. ($F = 6.62$, df = 4, 292, $P<0.0001$).

Similar to Alamo Lake SWA, the most abundant host species were YBCH, BEVI, and ABTO (Figure 11). A zone-tailed hawk was detected during point counts along the Bill Williams River in 2005. YBCH annual mean detection rates ranged from 0.48 to 1.2 birds/point with the low in 2002; high value in 2000; BEVI from 0.46 in 2002 to 0.72 in 2001; ABTO from 0.20 in 2000 and 2004 to 0.43 in 2005. No statistical differences in the annual detection rates were indicated for YBCH ($F = 1.65$ $P>0.22$). BEVI had significantly higher value in 2001 and 2004 ($F = 3.89$, df = 5, 12, $P<0.03$). Detection rates for the YWAR ranged from 0.02 (2002, 2003, 2005) to 0.20 (2000).

In 2005, the total number of individual host birds ranged from 62 on May 25 to 50 on June 8, and 77 on June 22. BHCO female numbers ranged from 2, 2, and 0 on those dates, respectively. From this, we calculated and average cowbird female:host ratio of 0.02. Previous years' ratio ranged from 0.01 to 0.04. ANOVA indicated that the 2005 ratios had decreased significantly from the 2003 to 2004 ratios ($F = 3.89$, df = 5, 12, $P<0.03$).

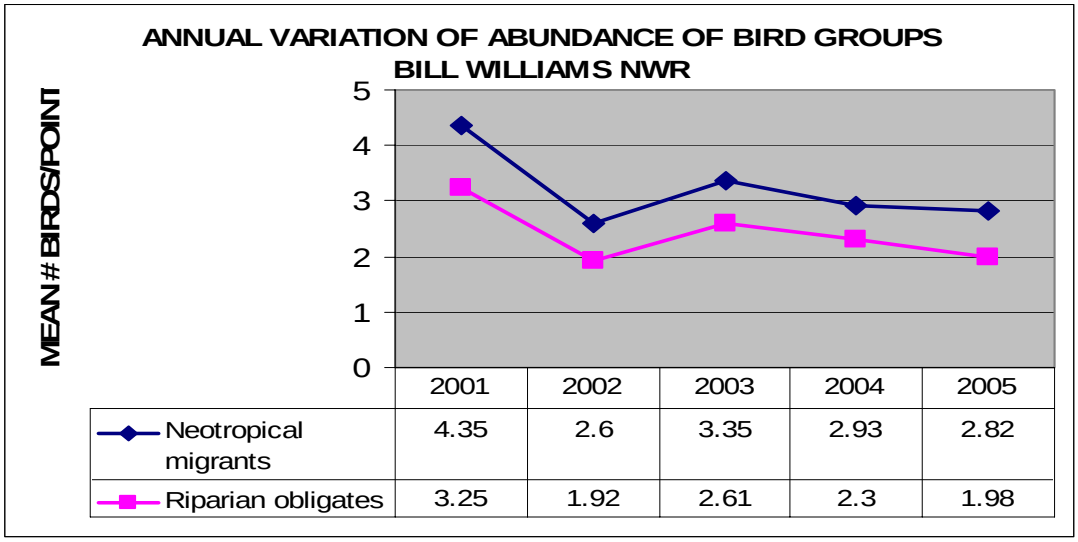
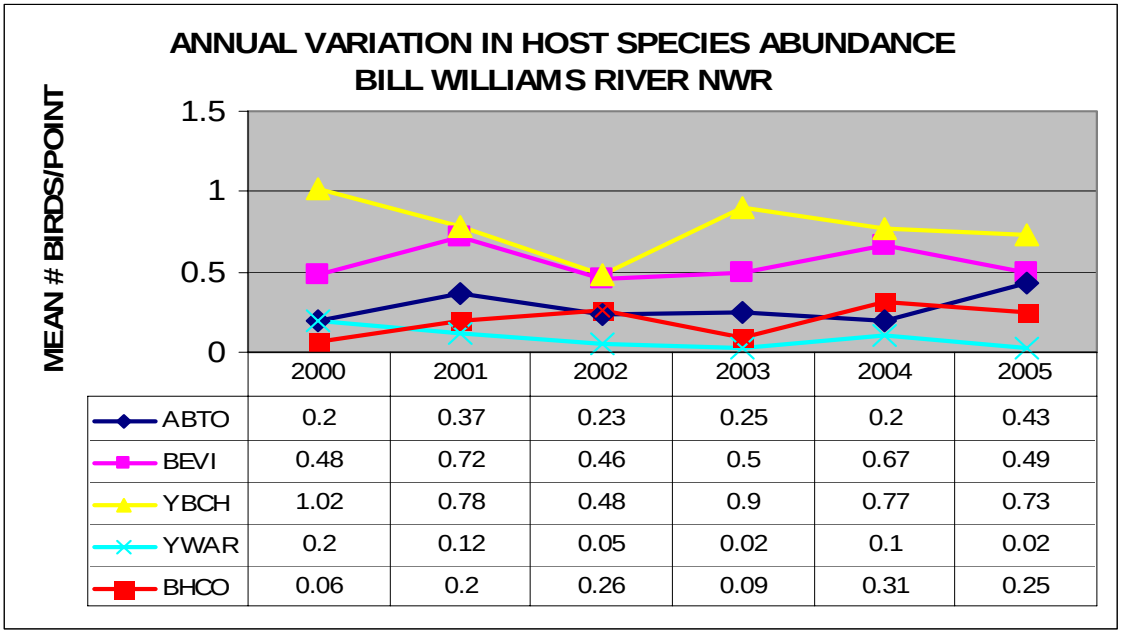


Figure 10. Mean number of neotropical migrants and riparian obligates detected during point counts on the Bill Williams River NWR.



	2000	2001	2002	2003	2004	2005
ABTO	0.2	0.37	0.23	0.25	0.2	0.43
BEVI	0.48	0.72	0.46	0.5	0.67	0.49
YBCH	1.02	0.78	0.48	0.9	0.77	0.73
YWAR	0.2	0.12	0.05	0.02	0.1	0.02
BHCO	0.06	0.2	0.26	0.09	0.31	0.25

Figure 11. Mean number of common host species and BHCO detected during point counts on Bill Williams River NWR.

Havasu NWR

Similar to the trends at Alamo Lake SWA and Bill Williams River NWR, the number of pooled bird group detections at the Havasus NWR, including neotropical migrants and riparian obligates, experienced a significant decline in 2002 (Figure 12). ANOVA indicated a significant reduction of neotropical migrants in 2002 and an increase by 2004 ($F = 7.33$, $df = 3, 236$, $P<0.001$). There was also a reduction in numbers of riparian obligate birds in 2002 ($F = 5.37$, $df = 3, 76$, $P<0.003$).

Most common host species during the study were consistently YBCH, red-winged blackbird (RWBL), common yellowthroat (COYE), and ABTO. YBCH mean detection rates ranged from 0.57 to 1.27 birds/point with the low in 2002; high value in 2005; RWBL from 0.22 in 2002 to 0.53 in 2004; COYE from 0.07 in 2002 to 0.57 in 2001; ABTO from 0.10 in 1999 to 0.53 in 2001 (Figure 13).

Statistical difference in the annual YBCH detection rates for low values in 2002 and increased values by 2004 were indicated by ANOVA ($f = 6.40$, $DF = 5, 12$, $P<0.005$). For ABTO, ANOVA indicated a statistical difference between the high value observed in 2001 and all other years ($F = 4.63$, $df = 5, 12$, $P<0.02$). Significant increases from the 2002 low values were also detected by t-tests for COYE ($t = -3.74$, $P = 0.02$) and RWBL ($t = -6.32$, $P = 0.003$). Detection rates for the YEWA (a species of regional concern) were relatively low, ranging from 0.03 (2005) to 0.23 (1999).

In 2005, the total number of individual host birds ranged from 72 on June 9 to 68 on June 18. In contrast to most previous years, BHCOs were <u>not</u> more abundant than

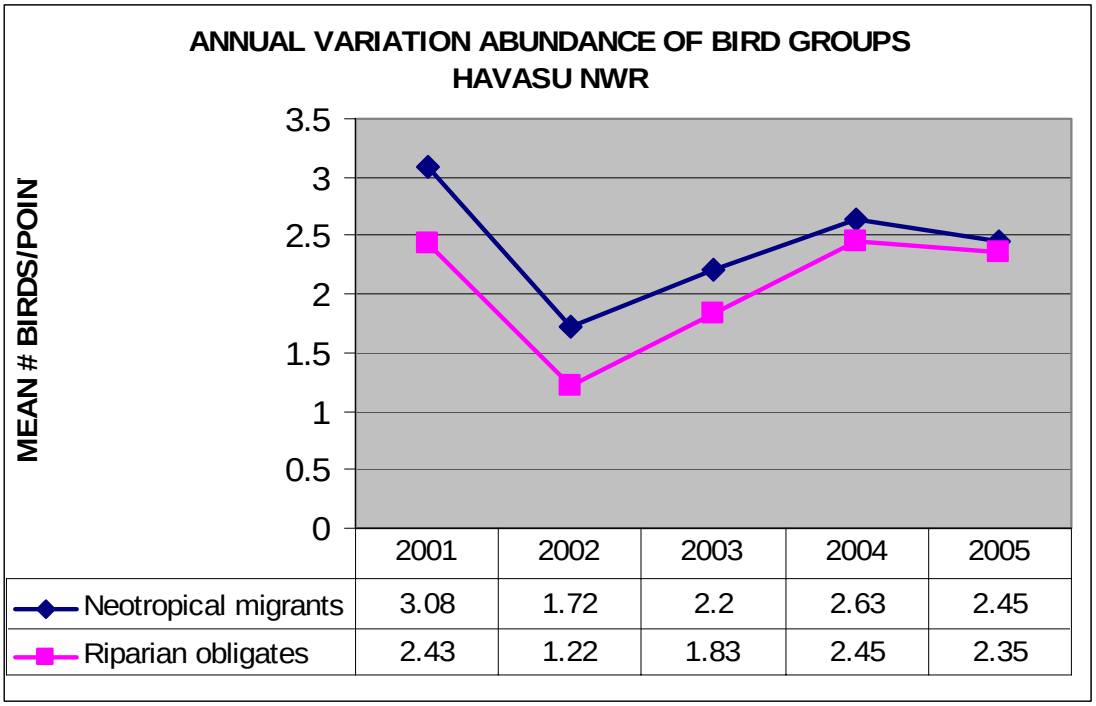


Figure 12. Mean number of neotropical migrants and riparian obligates detected during point counts on the Havasu NWR.

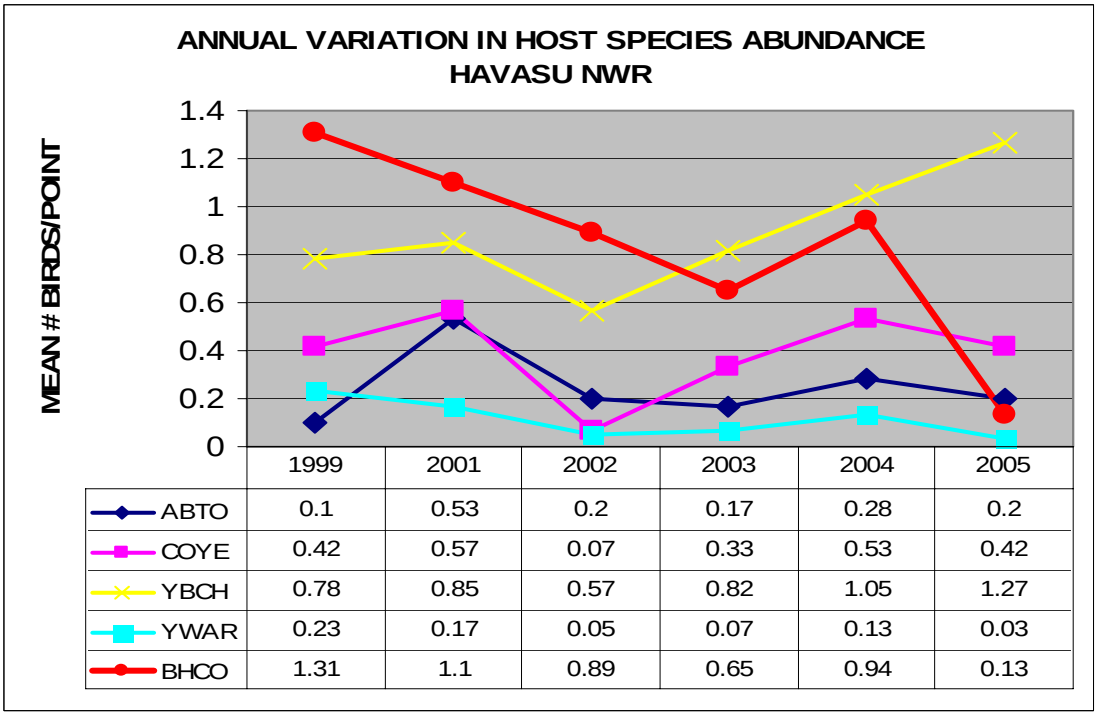


Figure 13. Mean number of common host species and BHCO detected during point counts on Havasu NWR**.**

common host species. BHCO detection rates ranged from 0.20 to 0, decreasing during the survey period. ANOVA indicated a significant difference in BHCO abundance between 2001 and 2005 ($F = 4.70$, $df = 5, 12$, $P<0.014$). Linear regression indicated a moderately strong declining trend from 1999 to 2005 at the 95 percent confidence level (R-squared = 0.488, slope = -3.26, $df = 1, 16$, $P<0.002$).

Numbers of BHCO females ranged from two to zero during 2005 point counts at Havasu which were much less than all surveys in previous years. We calculated an average cowbird female:host ratio of 0.02 which represented a decrease from 1999-2004 ratios. ANOVA indicated that the 2005 ratios had decreased significantly from the 1999 and 2002 ratios ($F = 3.29$, $df = 5, 12$, $P<0.05$). Linear regression indicated a moderately strong declining trend from 1999 to 2005 at the 95 percent confidence level (R-squared = 0.408, slope = -0.024, $df = 1, 16$, $P<0.005$).

Nest Monitoring

Alamo Lake SWA

During the 7 study years, a total of 424 nests of 15 species including 83 SWFL nests were monitored[2]. The number of SWFL nests found each year ranged from 9 to 24 with the high in 2001 and low in 2005. Table 4 and Figures 14 and 15 summarize the nest monitoring results from 1999-2005 for the four common host species (ABTO, BEVI, SWFL, YBCH). The Appendix contains detailed data on individual nests of those and other species.

During the 7 study years, combined parasitism rates for the four species ranged from 1 percent in 2001 to a high of 17 percent in 2004 with an increasing trend after the termination of the BHCO control program. BEVI nests experienced the overall highest parasitism with rates increasing from 0 percent in 1999 to 29 percent in 2004. One SWFL nest was parasitized in 1999 and 1 in 2004, which represents an overall 2.4 percent rate for the 83 SWFL nests monitored (7.7 percent in 1999; 10.0 percent for 2004). Of the nine SWFL nests monitored in 2005, none was parasitized. In addition to the four common host species, one song sparrow nest was parasitized in 2005.

Predation rates also increased during the post trapping years. BEVI nest predation increased from 11 percent in 2001 to 40 percent in 2002; YBCH increased from 4 percent in 2001 to 25 percent in 2005; ABTO increased from 13 percent in 2001 to 50 percent in both 2004 and 2005. Predation rates on SWFL nests increased from 8 percent to 17 percent in the trapping years; and in the post trapping years, predation rates increased to 33 percent in 2003, but decreased to 22 percent by 2005. Combined predation rates on the four common host species increased from a low of 4 percent in the 1999 to 30 percent in 2002, then decreased to 18 percent by 2005.

[2] The total does not include the 13 SWFL nests found but not monitored in year 2000.

Table 4. 1999-2005 nest monitoring results for Alamo Lake SWA

1999 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	2	0	0	0	2
Bell's vireo	5	0	0	0	5
Southwestern willow flycatcher	13	1	1	3	8
Yellow-breasted chat	8	1	0	3	4
TOTAL	**28**	**2 (7%)**	**1 (4%)**	**6 (21%)**	**19 (68%)**

2000 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	4	1	0	0	3
Bell's vireo	3	0	0	0	3
Southwestern willow flycatcher	13	**?**	**?**	**?**	**?**
Yellow-breasted chat	27	0	2	4	21
TOTAL	**34**	**1 (3%)**	**2 (6%)**	**4 (12%)**	**27 (79%)**

2001 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	8	0	1	0	7
Bell's vireo	9	1	1	0	7
Southwestern willow flycatcher	24	0	4	3	17
Yellow-breasted chat	28	0	1	1	26
TOTAL	**69**	**1 (1%)**	**7 (10%)**	**4 (6%)**	**57 (83%)**

2002 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	4	0	2	1	1
Bell's vireo	10	1	4	1	4
Southwestern willow flycatcher	12	0	3	1	8
Yellow-breasted chat	17	1	4	0	13
TOTAL	**43**	**2 (5%)**	**13 (30%)**	**3 (7%)**	**25 (60%)**

2003 Results:

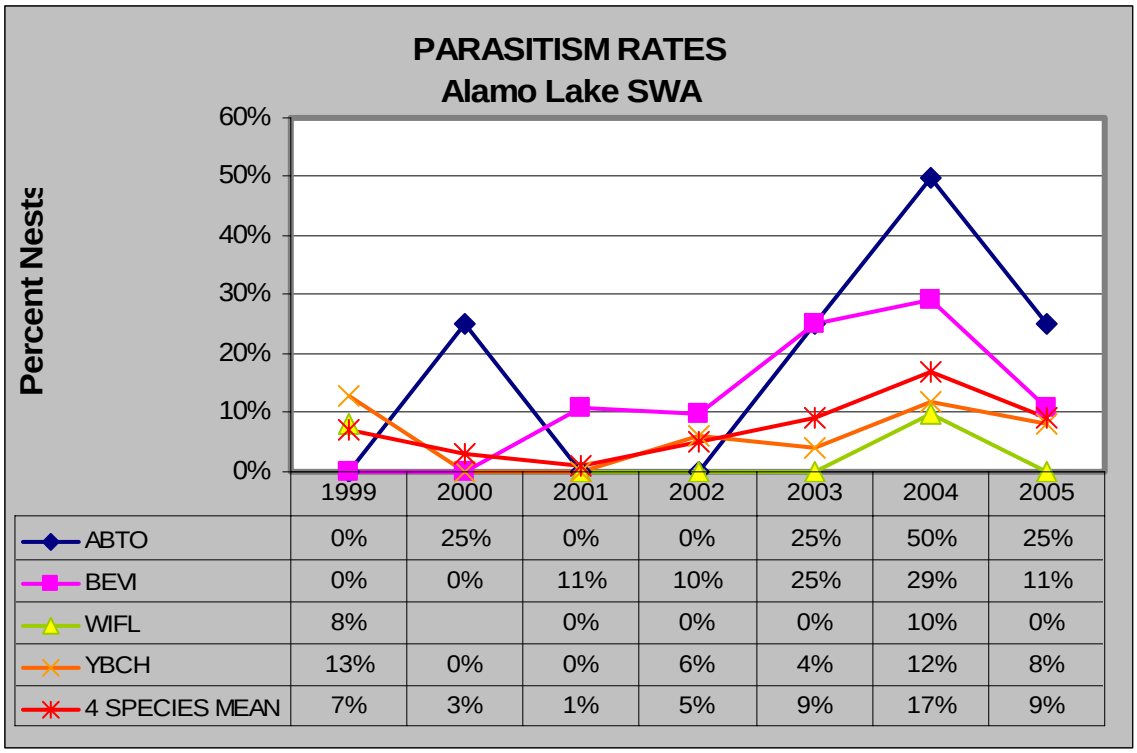
Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	4	1	2	0	1
Bell's vireo	12	3	1	2	6
Southwestern willow flycatcher	15	0	5	0	10
Yellow-breasted chat	25	1	4	2	18
TOTAL	**56**	**5 (9%)**	**12 (21%)**	**4 (7%)**	**35 (62%)**

2004 Results:

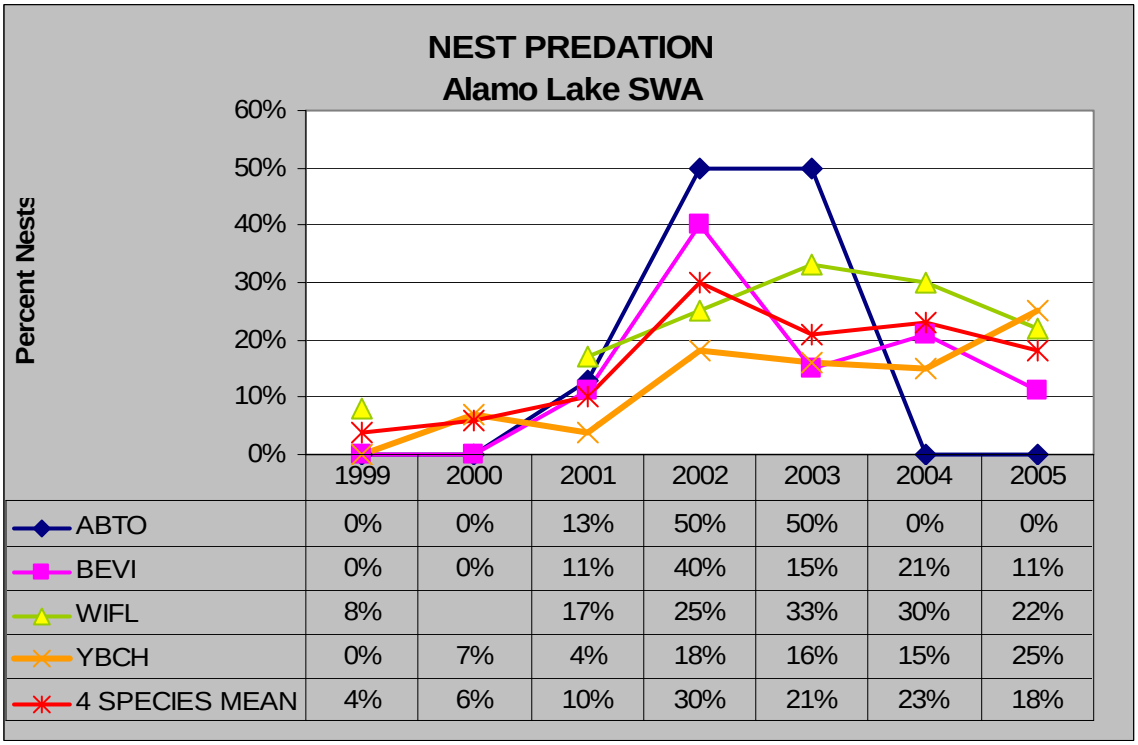
Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	2	1	0	0	2
Bell's vireo	14	4	4	1	9
Southwestern willow flycatcher	10	1	3	2	5
Yellow-breasted chat	26	3	5	4	16
TOTAL	**52**	**9 (17%)**	**12 (23%)**	**7 (13%)**	**32 (62%)**

2005 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	4	1	0	0	4
Bell's vireo	9	1	1	0	8
Southwestern willow flycatcher	9	0	2	1	6
Yellow-breasted chat	12	1	3	0	9
TOTAL	**34**	**3(9%)**	**6(18%)**	**1(3%)**	**27(79%)**

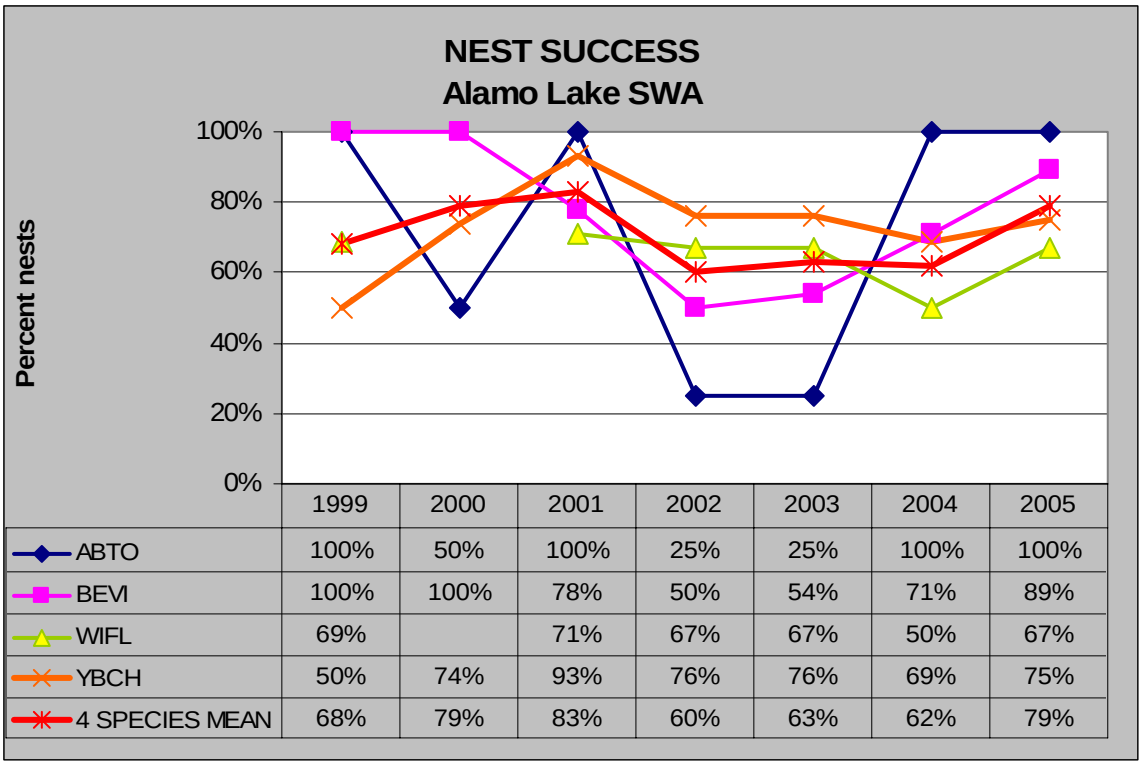


	1999	2000	2001	2002	2003	2004	2005
ABTO	0%	25%	0%	0%	25%	50%	25%
BEVI	0%	0%	11%	10%	25%	29%	11%
WIFL	8%		0%	0%	0%	10%	0%
YBCH	13%	0%	0%	6%	4%	12%	8%
4 SPECIES MEAN	7%	3%	1%	5%	9%	17%	9%

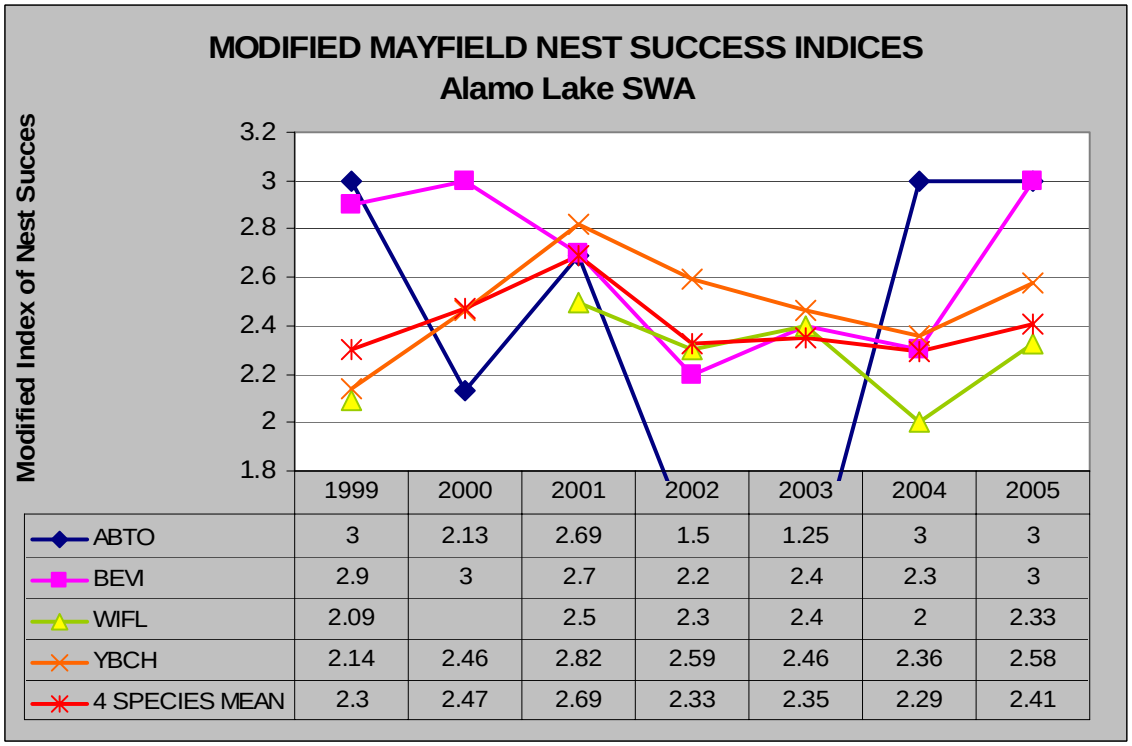


	1999	2000	2001	2002	2003	2004	2005
ABTO	0%	0%	13%	50%	50%	0%	0%
BEVI	0%	0%	11%	40%	15%	21%	11%
WIFL	8%		17%	25%	33%	30%	22%
YBCH	0%	7%	4%	18%	16%	15%	25%
4 SPECIES MEAN	4%	6%	10%	30%	21%	23%	18%

Figure 14. Parasitism and nest predation observed at Alamo Lake for four host species.



	1999	2000	2001	2002	2003	2004	2005
ABTO	100%	50%	100%	25%	25%	100%	100%
BEVI	100%	100%	78%	50%	54%	71%	89%
WIFL	69%		71%	67%	67%	50%	67%
YBCH	50%	74%	93%	76%	76%	69%	75%
4 SPECIES MEAN	68%	79%	83%	60%	63%	62%	79%



	1999	2000	2001	2002	2003	2004	2005
ABTO	3	2.13	2.69	1.5	1.25	3	3
BEVI	2.9	3	2.7	2.2	2.4	2.3	3
WIFL	2.09		2.5	2.3	2.4	2	2.33
YBCH	2.14	2.46	2.82	2.59	2.46	2.36	2.58
4 SPECIES MEAN	2.3	2.47	2.69	2.33	2.35	2.29	2.41

Figure 15. Nest success observed at Alamo Lake for four host species.

Nest success, as a measure of the percent of host nests that produce at least one host nestling, ranged from a high of 83 percent in 2001 to a low of 60 percent in 2002, and increased to 79 percent in 2005. During 2004, SWFLs experienced the lowest nest success rate of 50 percent. However, nest success for SWFLs increased in 2005 to 67 percent in 2005. The number of SWFL nests decreased to 9 in 2005 from 10 nests in 2004. In 2002, 24 SWFL nests were found which represented the highest number of nests during the 7 years of monitoring.

Nest success measured by modified Mayfield indices for combined four species means (ABTO, BEVI, YBCH and SWFL) showed increasing trends during trapping, followed by a decreasing trend post trapping (Figure 15). T-tests indicated a statistical reduction of mean Mayfield indices between 2001 and 2004 for SWFL at 90 percent confidence ($t = 1.98$, $P<0.06$). Mann-Whitney test indicated a significant increase in nesting success between 1999 and 2001 for YBCH ($w = 68.0$, $P<0.09$).

Bill Williams River NWR

During the 7 study years a total of 158 nests of 13 species including 12 SWFL nests were monitored[3]. The number of SWFL nests that was found each year ranged from zero to four; none were found in 2000 and 2004, and two were monitored in 2005. Table 5 and figures 16 and 17 summarize the nest monitoring results from 1999-2005 for the four common host species. The Appendix contains detailed data on individual nests of all species monitored.

Parasitism rates for all species was zero during the 1999-2001 BHCO trapping years with an increasing trend after the termination of the BHCO control program. The combined rates for ABTO, BEVI, YBCH, and SWFL were 10 percent in 2002, 20 percent in 2003, 21 percent in 2004, and 15 percent in 2005. BEVIs experienced the highest overall parasitism in 2005, with a 25 percent rate. BEVI nest parasitism rates increased from 0 percent during the trapping years to 26.3 percent post trapping years; YBCH nests also increased from 0 percent during trapping years to 14 percent in the post trapping years. None of the 11 SWFL nests were parasitized. In addition to the four common host species used for this analysis, one Blue Grosbeak nest was found to be parasitized and abandoned in 2005.

Nest predation also increased after 2001 from 0 percent to 22 percent during the post trapping years. No SWFL nests were predated. However, predation rates for BEVIs were 22 percent in 2002, and 25 percent in both 2004 and 2005, compared to 0 percent during trapping years; rates for YBCH increased from 0 percent for the trapping years to 28.6 percent post trapping years.

Nest success measured by modified Mayfield indices for the combined three species means (BEVI, SWFL, YBCH) and SWFL means showed no apparent trends during trapping, followed by a decreasing trend post trapping (Figure 17). W-test indicated a statistical decrease in the four-species mean Mayfield index from 2001 to 2004 ($W = 462$, $P<0.05$).

[3] SWFL nests monitored by SBCM and SWCA contractors.

Table 5. 1999-2005 nest monitoring results for Bill Williams River NWR

1999 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Abert's towhee	1	0	0	0	1
Bell's vireo	4	0	0	1	3
Southwestern willow flycatcher	1	0	0	0	1
TOTAL	**6**	**0**	**0**	**1 (17%)**	**5 (83%)**

2000 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Bell's vireo	4	0	0	2	2
Yellow-breasted chat	1	0	0	0	1
TOTAL	**5**	**0**	**0**	**2**	**3 (60%)**

2001 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Southwestern willow flycatcher	2	0	0	0	2
Yellow-breasted chat	8	0	0	0	8
TOTAL	**10**	**0**	**0**	**0**	**10 (100%)**

2002 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Bell's vireo	9	2	2	0	5
Southwestern willow flycatcher	4	0	0	2	2
Yellow-breasted chat	8	0	5	0	3
TOTAL	**21**	**2 (10%)**	**7 (33%)**	**2 (10%)**	**10 (50%)**

2003 Results:

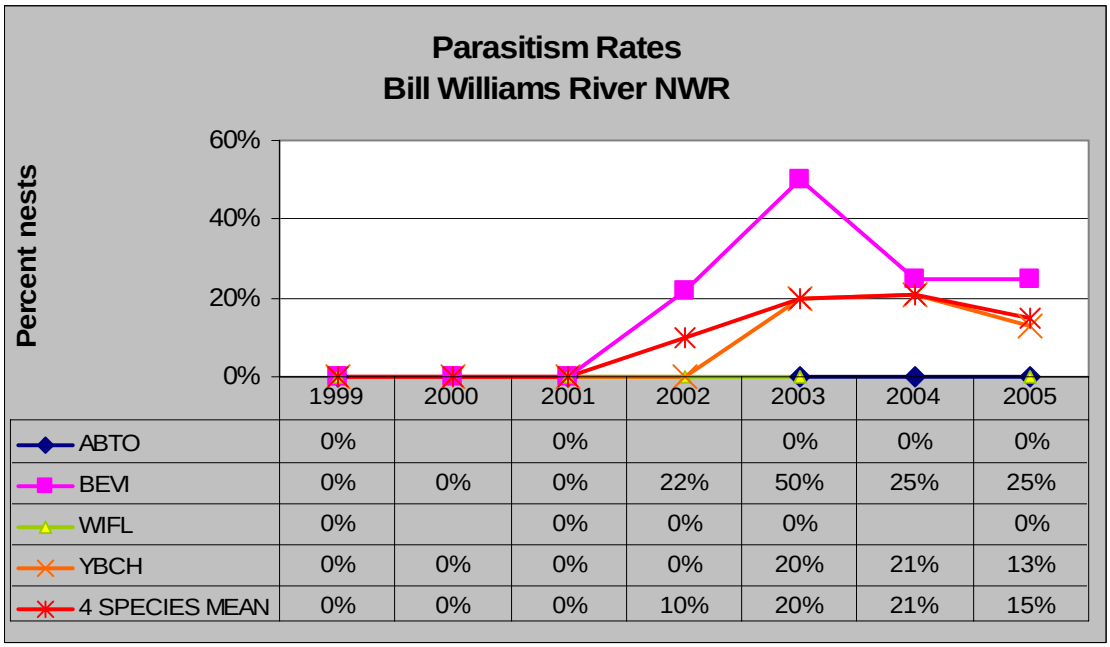
Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Abert's towhee	1	0	0	0	1
Bell's vireo	2	1	0	1	1
Southwestern willow flycatcher	2	0	0	0	2
Yellow-breasted chat	5	1	0	1	4
TOTAL	**10**	**2 (20%)**	**0**	**2 (20%)**	**8 (80%)**

2004 Results:

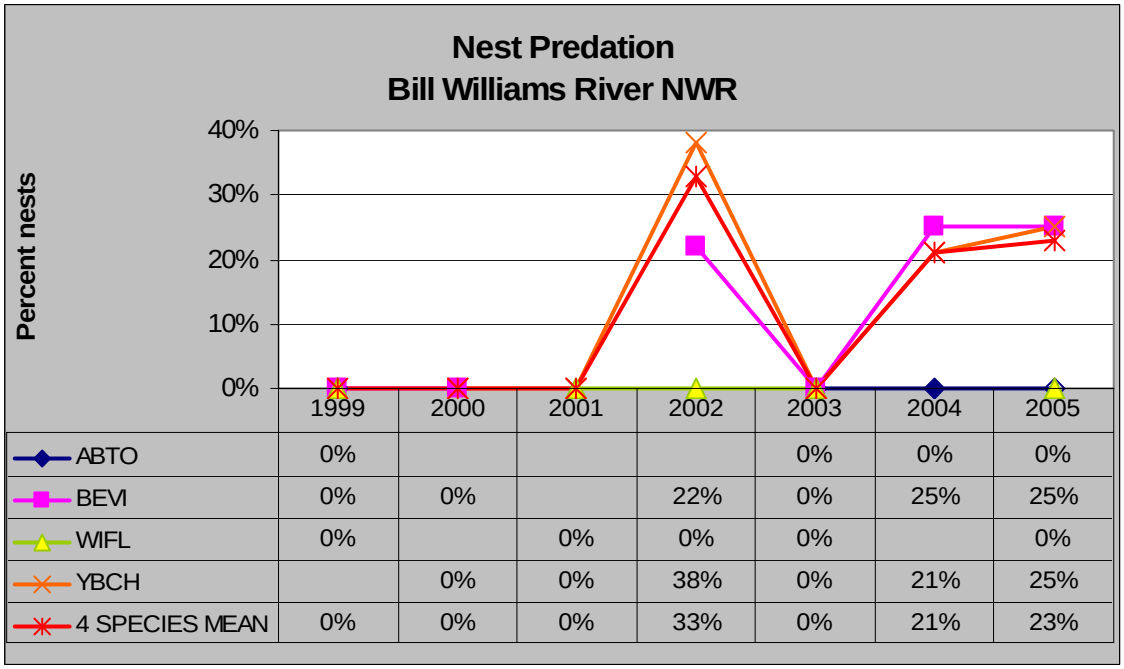
Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Abert's towhee	1	0	0	0	1
Bell's vireo	4	1	1	0	3
Yellow-breasted chat	14	3	3	2	9
TOTAL	**19**	**4 (21%)**	**4 (21%)**	**2 (11%)**	**13 (68%)**

2005 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Abert's towhee	1	0	0	0	1
Bell's vireo	4	1	1	0	3
Yellow-breasted chat	8	1	2	0	6
TOTAL	**13**	**2(15%)**	**3(23%)**	**0**	**10(77%)**

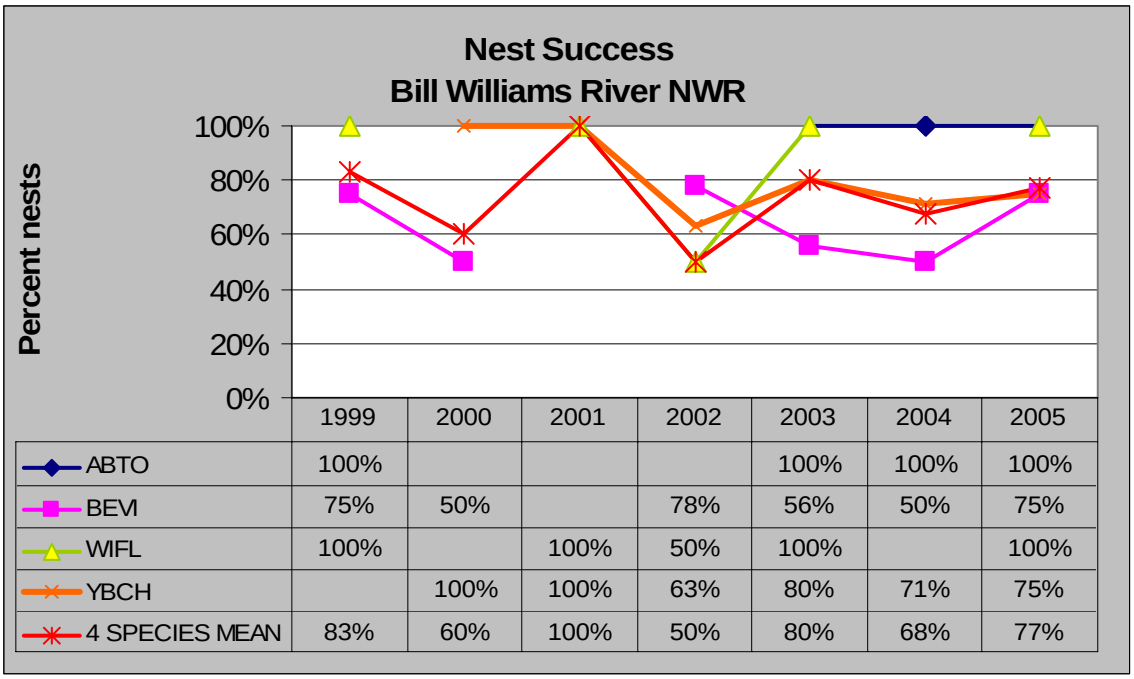


	1999	2000	2001	2002	2003	2004	2005
ABTO	0%		0%		0%	0%	0%
BEVI	0%	0%	0%	22%	50%	25%	25%
WIFL	0%		0%	0%	0%		0%
YBCH	0%	0%	0%	0%	20%	21%	13%
4 SPECIES MEAN	0%	0%	0%	10%	20%	21%	15%

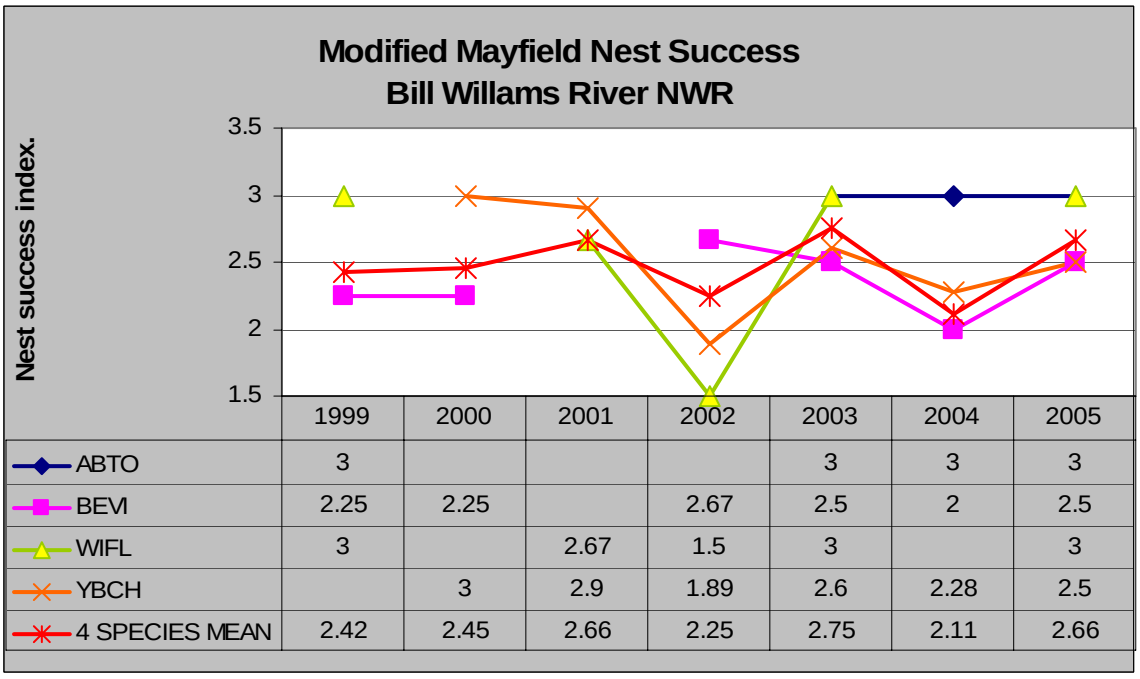


	1999	2000	2001	2002	2003	2004	2005
ABTO	0%				0%	0%	0%
BEVI	0%	0%		22%	0%	25%	25%
WIFL	0%		0%	0%	0%		0%
YBCH		0%	0%	38%	0%	21%	25%
4 SPECIES MEAN	0%	0%	0%	33%	0%	21%	23%

Figure 16. Parasitism and nest predation observed at Bill Williams River NWR for four host species.



	1999	2000	2001	2002	2003	2004	2005
ABTO	100%				100%	100%	100%
BEVI	75%	50%		78%	56%	50%	75%
WIFL	100%		100%	50%	100%		100%
YBCH		100%	100%	63%	80%	71%	75%
4 SPECIES MEAN	83%	60%	100%	50%	80%	68%	77%



	1999	2000	2001	2002	2003	2004	2005
ABTO	3				3	3	3
BEVI	2.25	2.25		2.67	2.5	2	2.5
WIFL	3		2.67	1.5	3		3
YBCH		3	2.9	1.89	2.6	2.28	2.5
4 SPECIES MEAN	2.42	2.45	2.66	2.25	2.75	2.11	2.66

Figure 17. Nest success observed at Bill Williams River NWR for four host species.

Discussion

BHCO Abundance

Compared to sites on the mainstem Colorado River, BHCO numbers have remained relatively low during and following trapping at the Alamo Lake SWA and the Bill Williams River NWR. The number of cowbirds observed during our point counts at the Alamo Lake SWA and Bill Williams River NWR during 1999-2005 is less than 30 percent of what had been observed along the mainstem lower Colorado River. During our study, annual mean BHCOs abundance ranged from 0.01 to 0.35 at Alamo Lake and 0.06 to 0.35 at Bill Williams River, with the highest values in 2005 at both sites. In contrast, point counts conducted by Averill (1996) in 1994 and 1995 found that BHCO abundance averaged 1.24 BHCOs per point along the lower Colorado River.

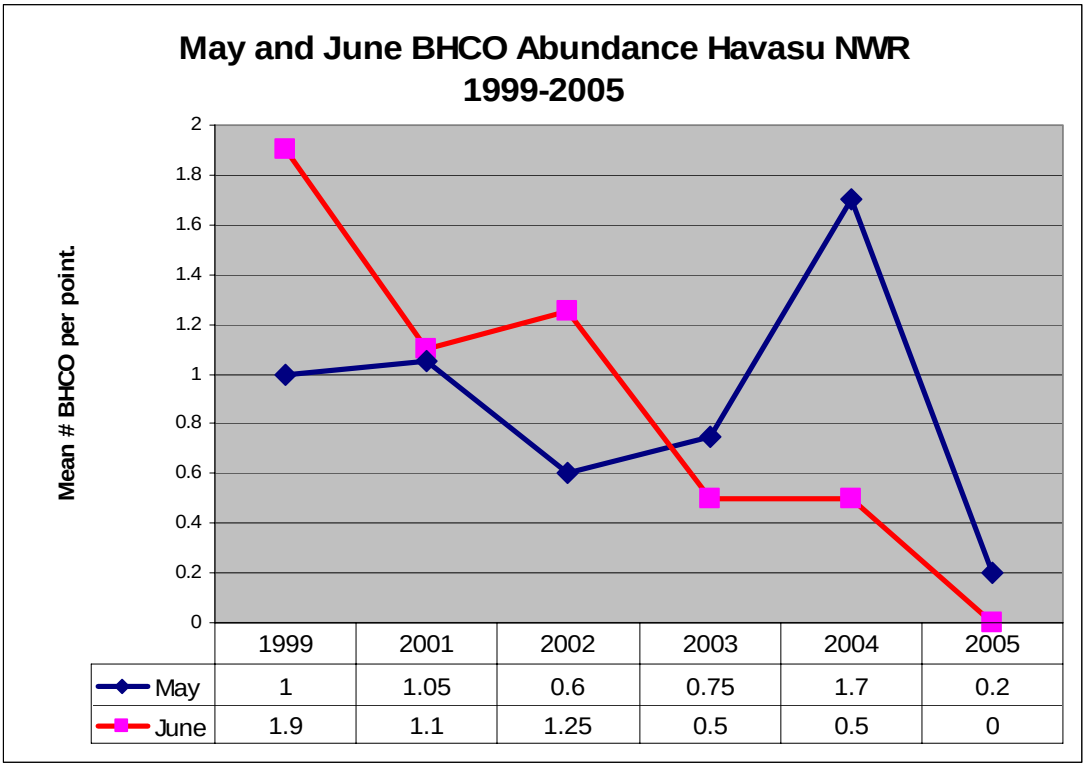
During the trapping years of 1999 to 2001, BHCO abundance declined at the Alamo Lake SWA. This trend may represent BHCO population reduction during the trapping years and correlates with the decrease in numbers of trapped BHCOs each year from 1999-2001. After trapping was terminated, there was an increase in BHCO abundance from 2002 to 2004, followed by a slight decrease in 2005. No difference in BHCO abundance was indicated between the first year of trapping (1999) and the third and fourth year of post-trapping monitoring (2004-2005), indicating that BHCO numbers are returning to pre-trapping levels after 3 years following termination of trapping. No data on BHCO abundance prior to the start of our BHCO control are available. The gradual increase in BHCO numbers following trapping may indicate a relatively slow immigration rate of BHCOs in an area somewhat isolated from a major BHCO population center, agricultural area, and migration corridor such as the Colorado River.

At the Bill Williams River NWR, mean BHCO values actually increased during the 1999 to 2001 trapping period. The first year of trapping (1999) resulted in the lowest BHCO abundance. Except for the decrease observed in 2003, BHCO numbers continued to increase after trapping, and the 2004 abundance exceeded all other years including 1999. Similar to what occurred at Alamo Lake, BHCO abundance dropped slightly in 2005. There was relatively lower BHCO abundance at Bill Williams during the first year of trapping in 1999 compared to Alamo Lake ($t = 3.18$, $P<0.008$). This may reflect reduction of BHCOs from the 1996-1998 trapping effort at the Bill Williams River NWR, which occurred prior to our study. Morrison and Averill (2002) found that the earlier trapping efforts from 1996 to 1998 and decrease in local irrigated agriculture probably resulted in reduced cowbird abundance along the lower Bill Williams River. The closer proximity of the Bill Williams site to the mainstem Colorado River compared to Alamo Lake may result in faster recruitment of BHCOs.

Much higher BHCO numbers have been found at the Havasu NWR, but with a decreasing trend later in the 2003, 2004, and especially during the 2005 breeding seasons. In 1999, 2001, 2002, late-May 2003, and late-May 2004, BHCO abundance ranged from 0.6 to 1.90 along our host species point count route at the Havasu NWR. In mid-June 2003 and 2004, following the start of trapping, the abundance dropped to 0.50. And

finally in 2005, the 3-survey average was 0.13, and no BHCOs were detected during point counts on June 23, 2005.

Compared to the Alamo Lake SWA and the Bill Williams River NWR, much higher BHCO abundance was observed at the Havasu NWR during host species point counts from 1999 to 2004. However, except for a spike in May 2004, BHCO overall abundance decreased after 2002 which may be the result of trapping starting in 2003 (Figure 18).



	1999	2001	2002	2003	2004	2005
May	1	1.05	0.6	0.75	1.7	0.2
June	1.9	1.1	1.25	0.5	0.5	0

Figure 18. Comparison of May and June BHCO point count detection rates at Havasu NWR.

The decrease in abundance of BHCOs at the Alamo Lake SWA following trapping is similar to a cowbird control program in California which showed significant decline in the number of BHCOs captured from year to year over a 5-year period (Whitfield et al. 1999). However, Reclamation's BHCO control program on the mainstem Rio Grande in New Mexico showed a relatively constant capture rate from 1996 to 2001 (Ahlers and Tisdale-Hein 2001). These contrasting results could indicate that (1) a constant annual immigration of BHCOs occurs along a major north-south oriented continuous migration corridor such as the Rio Grande and Colorado River and (2) lower BHCO immigration occurs in certain riparian areas off the mainstem of such rivers. Ongoing and future BHCO control programs along the mainstem Colorado River could further test this hypothesis.

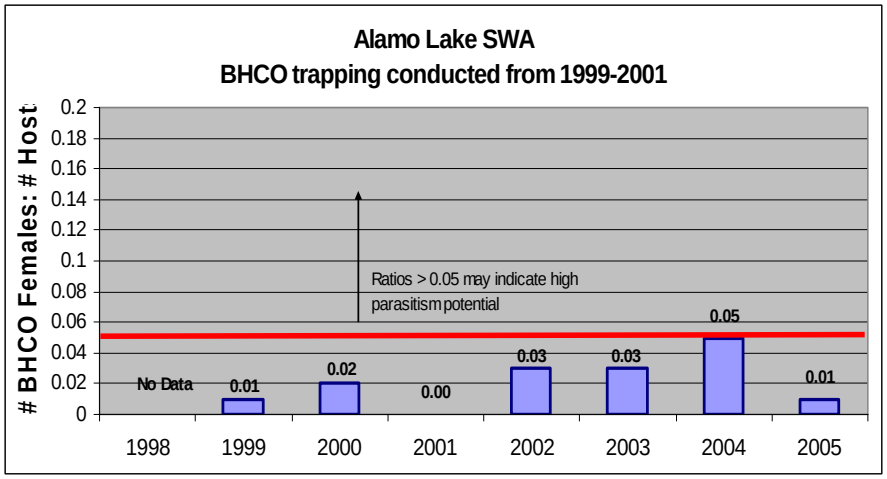
Host Species Abundance and BHCO Ratios

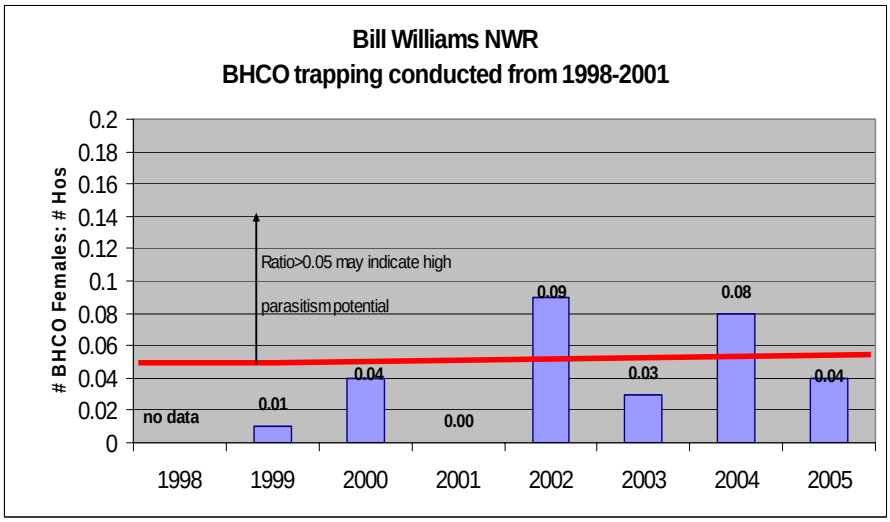
Our point counts at the Alamo Lake SWA, Bill Williams River NWR, and Havasu NWR documented the continued occurrence of a diverse population of late spring migrants and breeding songbirds including potential host species, riparian obligates, and neotropical migrants. The abundance of several species of songbirds, especially neotropical migrants and riparian obligates, experienced declines in 2002 at Alamo Lake SWA, Bill Williams River NWR, and Havasu NWR. By 2003 or 2004 abundances for many species were increasing toward 2001 levels. Overall, the pooled means of all birds, neotropical migrants, and riparian obligates were higher in all three areas in 2004 compared with 2002. Many species such as YBCH approached or exceeded 2001 levels, while others such as blue grosbeak and YWAR continued declines at some or all of our study sites. In 2005, the abundance of neotropical migrants and riparian obligates indicated a continued increase at Alamo Lake while numbers dropped slightly at Bill Williams River and Havasu NWR. The most dramatic change was increases in YBCH which was the most abundant riparian obligate at all three sites. Species that were detected for the first time in 2005 during our 7-year record of point counts include a yellow-billed cuckoo at Alamo Lake SWA and a zone-tailed hawk at Bill Williams River NWR.

BHCO abundance followed a different pattern than neotropical migrants and riparian obligates. BHCO abundance decreased to low values in 2001 at Alamo Lake SWA and increased by 2002 at Brown's Crossing and 2003 at Santa Maria River. At Bill Williams River NWR, BHCO abundance increased through 2002, decreased in 2003, reached high values in 2004, and leveled off by 2005. At Havasu, mid-June BHCO abundance was relatively high in 2002, then decreased from 2003 through 2005. Therefore, we cannot necessarily correlate the decrease in BHCO abundances with the decrease in overall avian abundances.

However, the increase in the ratio of BHCO females to host birds beginning in 2002 may be attributable to the decline in abundance of host species in relationship to higher numbers of BHCOs. Our data indicate that the mid-June ratio of female BHCOs to host birds at Alamo Lake and Bill Williams had increased in 2001 (Figure 19). The ratios at Alamo Lake SWA and the Bill Williams River NWR had showed increases that correlated with the increase of parasitism that started in 2002 at these sites.

The ratios at Havasu NWR decreased starting in June 2003, but parasitism had continued to increase (Figure 19). The ratio had remained high from 1999 to 2002 at the Havasu NWR which correlates with the much higher parasitism in the SWFL population observed by McKernan and Braden (2002). The decrease in the host ratio from 2003 through 2005 at the Havasu NWR may correlate with the BHCO control that started in June 2003. The 47 percent parasitism rate observed in SWFL nests in 2005 at Havasu NWR is the highest since 1999 and represents an increasing trend. This may be a result of a larger population of BHCOs, or it may represent a lag effect of BHCO control.





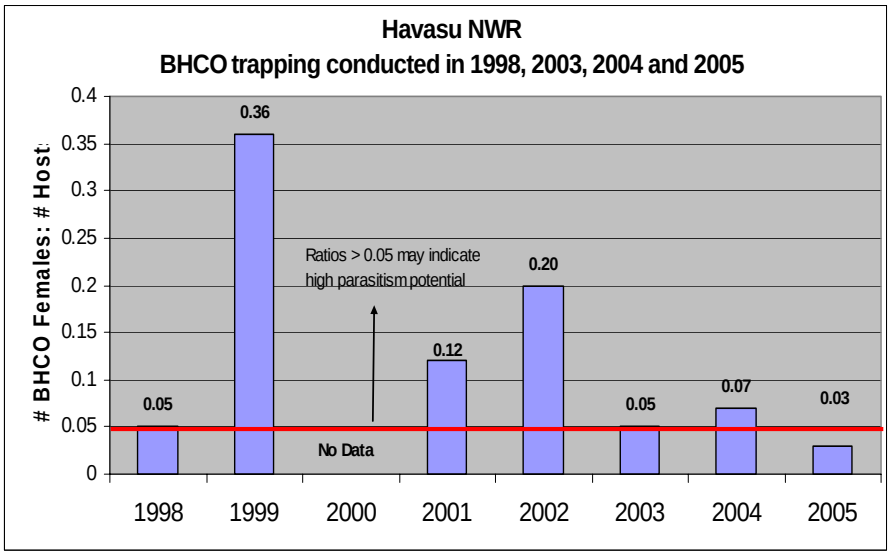


Figure 19. Ratio of numbers of BHCO females to host species detected during point counts – 1998-2003.

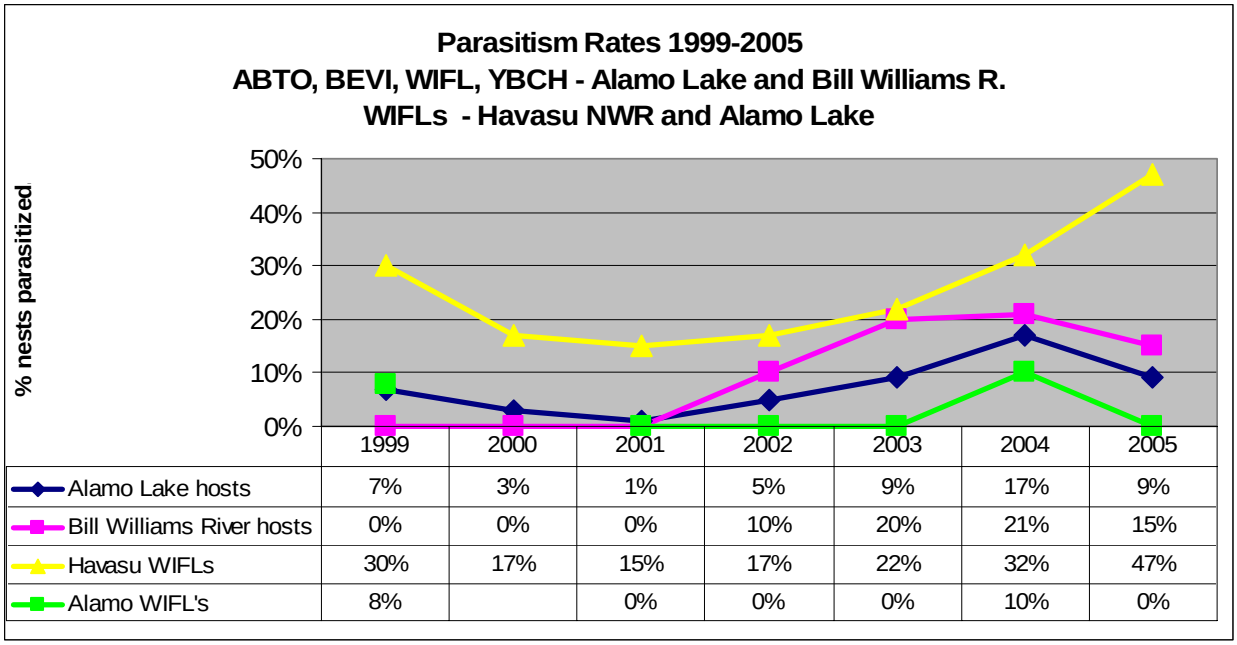
BHCO Parasitism and Nest Success

By 2004, it appeared that parasitism rates for the four host species, including SWFLs, had increased within our nest monitoring plots during 3 years after termination of BHCO trapping. However, parasitism decreased in 2005 at the Alamo Lake SWA and the Bill Williams River NWR to 9 percent and 15 percent, respectively. The 2002-2005 parasitism rates of 5 percent to 17 percent for four host species exceeded rates observed during the 1999-2001 trapping years at Alamo Lake (Figure 20). It is possible that the 2002-2004 increase in parasitism is attributable to cessation of trapping, and that the 2005 decrease may be a result of inundation of habitat.

It has been estimated that parasitism rates greater than 25 percent could threaten the long-term survival of certain localized populations of host species (Smith 1999). Only 1 of the 54 SWFL nests found at Alamo Lake and Bill Williams sites were parasitized following cessation of trapping. During the 1999-2001 BHCO control program, parasitism rates for host species ranged from 0 percent to 5 percent and from 0 percent to 8 percent for SWFLs. Only 1 of the 37 SWFL nests monitored was parasitized during the trapping years at Alamo Lake, and that occurred during the first trapping year.

Unfortunately, no pre-trapping parasitism data are available specifically for our study plots at the Alamo Lake SWA or Bill Williams River NWR. However, during the 1997 to 1998 trapping seasons in Bill Williams River NWR, parasitism rates ranged from 11 percent to 27 percent for BEVI and 0 percent to 12 percent for YBCH in other nearby plots (Morrison and Averill-Murray 2002). Parasitism rates for SWFL nests at Havasu NWR ranged from 15 percent to 30 percent from 1998-2001 (McKernan and Braden 2002). Averill (1996) found parasitism rates in the Lower Colorado River Valley ranged from 40 percent to 90 percent for three same common host species during 1994-1995; the Bill Williams River NWR was included in her study area. If parasitism rates were in that range prior to the start of our trapping, we conclude that trapping may have reduced parasitism during the trapping years extending into the third year after the cessation of trapping. However, previous agricultural practices may have contributed to the higher BHCO abundance and parasitism rates of the past.

At Havasu NWR parasitism increased dramatically from 15 percent in 2001 to 47 percent in 2005 (Figure 20) in spite of extensive BHCO trapping from 2003 to 2005 (SWCA 2005). Cowbird control obviously had not yet reduced parasitism of SWFL nests at Havasu NWR in 2005. A possible explanation could involve a high immigration rate of BHCOs during the breeding season along the mainstem Colorado River coupled with a lag effect where the effect of control would not be observed until after several years of trapping. What is more puzzling is the dramatic reduction of BHCO detections during point counts. We expected that this decrease would correlate with the trapping as it did at Alamo Lake. However, the increase in nest parasitism at Havasu is in contrast with what we observed at Alamo where both BHCO point count detections and parasitism rates decreased during BHCO control. Our speculation is that only a few remaining female BHCOs did most of the parasitism within the SWFL habitat at Havasu in 2005 and/or intensive human activity within nesting territories may have attracted BHCOs.



	1999	2000	2001	2002	2003	2004	2005
Alamo Lake hosts	7%	3%	1%	5%	9%	17%	9%
Bill Williams River hosts	0%	0%	0%	10%	20%	21%	15%
Havasu WIFLs	30%	17%	15%	17%	22%	32%	47%
Alamo WIFL's	8%		0%	0%	0%	10%	0%

Figure 20. Parasitism observed in nest monitoring plots from 1999 to 2003. (Havasu data from McKernan and Braden 2002, SWCA 2005).

While parasitism rates were low at the Alamo Lake SWA and the Bill Williams River NWR, the four-species nest success rate increased in 2005 from previous years. Nest success at Alamo ranged from a low of 60 percent in 2002 to 79 percent in 2005; at Bill Williams from a low of 50 percent in 2002 to 77 percent in 2005. For comparison, nest success of SWFLs at Havasu NWR decreased from 78 percent in 2003, 45 percent in 2004, and 24 percent in 2005 (SWCA 2005). Nest success for SWFLs ranged from 49 percent (2004) to 54 percent (2002) along the Rio Grande in New Mexico from 2002 to 2005 (Bureau of Reclamation 2005).

The decreasing trend in nest success for four common host species in Alamo Lake SWA from 2001 to 2004 was the result of both increasing parasitism and nest predation. Combined predation rates increased from 10 percent in 2001 to 23 percent in 2004. However, predation rate for SWFLs increased from 17 percent in 2001 to 33 percent in 2003, and then dropped to 22 percent by 2005. This recent decrease may be attributable to reservoir inundation.

An important finding of our 2005 monitoring is the continued SWFL nesting at Alamo Lake through the 2005 season at essentially the same sites which were inundated by at least 4 m of water. However, there has been a reduction of the number of SWFL nests from 24 nests in 2001 to 9 in 2005 (Figure 21). The reduced number of SWFL nests may be a result of the drought, reduced flooding and soil moisture in the breeding habitat, and increasing distance between the habitat and Alamo Lake pool which occurred through 2004. Subsequently, after the breeding habitat was flooded in 2005, the number of nests remained low. This may be a lag effect from the previous year. Reservoir inundation in 2005 may have also contributed to the reduced parasitism and nest predation at Alamo

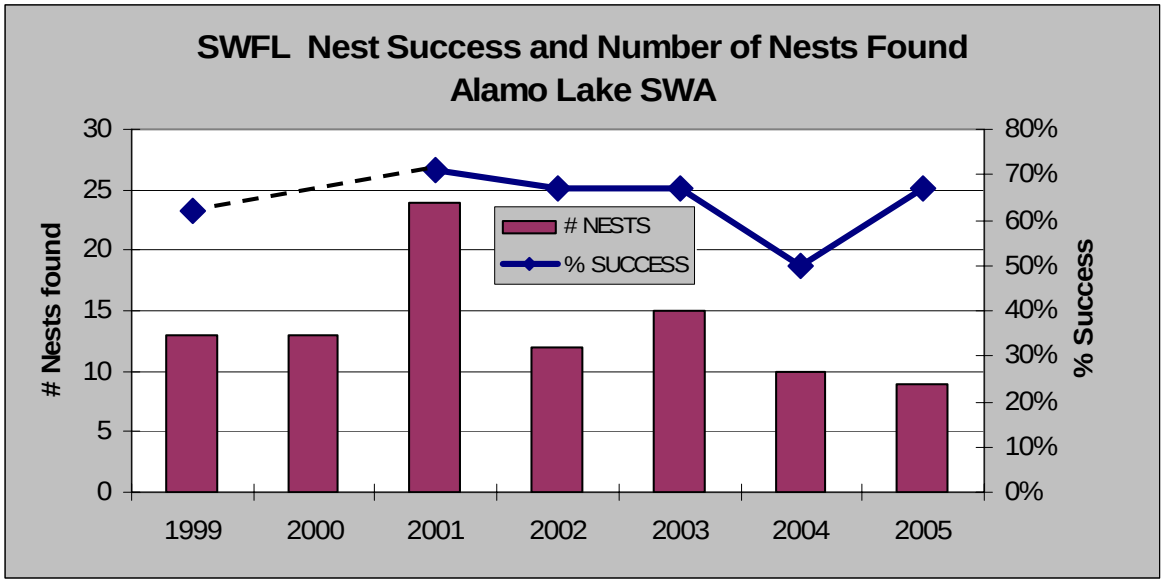


Figure 21. Relation of SWFL nesting success and number of nests at Alamo Lake from 1999 to 2004.

Lake in 2005. Future monitoring is needed to determine how the recent reservoir inundation will affect SWFL breeding and habitat suitability at Alamo Lake.

In contrast to our observations of an increase in parasitism in 2004 (Ryan and White 2004), there was a decrease in 2005, especially in the flooded pool of Alamo Lake. However, BHCO abundance continued to increase along the adjacent Brown's Crossing route. It is possible that both BHCO numbers and parasitism levels may continue to increase, especially at Alamo Lake SWA. Future monitoring is needed to confirm this, help direct any future management actions, and contribute to the recovery of the SWFL.

Conclusions and Recommendations

Our study at the Alamo Lake SWA and Bill Williams River NWR indicates that following the cessation of trapping in 2001, there has been an increase in BHCO abundance through 2005. In addition, the reduction in the number of SWFL nests at Alamo Lake continued into 2005. Although, we also observed an increase of parasitism rates and BHCO/host ratios along with decreasing nesting success through 2004, these factors showed a slight reverse in 2005. Our finding that SWFLs continued to nest at Alamo Lake through the 2005 season at sites which were inundated by at least 4 m of water has important implications for other SWFL populations that nest in habitat created in reservoir pools and could be potentially flooded.

Throughout the study, parasitism rates remained relatively low and below effect levels for SWFLs at Alamo Lake SWA and Bill Williams River NWR. However, there should

be some concern if the post-trapping increases continue in the future. Therefore, we recommend that nest monitoring should continue during the 2006 breeding season, especially for SWFLs at Alamo Lake SWA, where there is a viable but declining SWFL breeding population and reservoir inundation will greatly alter habitat characteristics. As part of nest monitoring, the altered habitat characteristics of SWFL breeding sites should be measured. In addition, a study could be set up to quantify and monitor the survival and condition of new stands of riparian plants that germinated upstream of Alamo Lake as a result of the high flows during the previous winter.

Any future BHCO control programs at new sites should be preceded by pre-trapping baseline studies, including study designs that would determine the effectiveness of trapping on the long-term reproductive success and population trends of the SWFL and other host species (Siegle and Ahlers, 2004).

Ongoing studies at Havasu NWR should investigate the factors that have caused a dramatic increase of nest parasitism at Havasu in spite of three seasons of BHCO control. In addition, we could set up a study to determine the recent inverse relationship between BHCO point count results and parasitism rates at Havasu NWR.

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APPENDICES

APPENDIX A

NEST MONITORING DATA
ALAMO LAKE SWA 1999-2004
BILL WILLIAMS RIVER NWR 1999-2004

Nest Monitoring Results 1999-2004
Bill Williams River NWR

1999 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Abert's towhee	1	0	0	0	1
Ash-throated flycatcher	1	0	0	0	1
Bell's vireo	4	0	0	1	3
Black phoebe	2	0	0	0	2
Bewick's wren	1	0	0	0	1
Mourning dove	2	0	0	2	0
Vermilion flycatcher	1	0	0	0	1
Verdin	3	0	0	1	2
Southwestern Willow-flycatcher	1	0	0	0	1
TOTAL	16	0 (0%)	0 (0%)	4 (25%)	12 (75%)

2000 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Ash-throated flycatcher	1	0	0	0	1
Bell's vireo	4	0	0	2	2
Black phoebe	1	0	0	0	1
Great-tailed grackle	2	0	1	0	1
Verdin	2	0	0	0	2
White-winged dove	1	0	0	0	1
Yellow-breasted chat	1	0	0	0	1
TOTAL	12	0 (0%)	1 (8%)	2 (17%)	9 (75%)

2001 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Black-tailed gnatchatcher	1	0	0	0	1
Cordilleran flycatcher	1	0	0	0	1
Common yellwothroat	1	0	0	0	1
Great-tailed grackle	12	0	0	0	12
Mourning dove	8	0	0	0	8
Verdin	2	0	0	0	2
Southwestern Willow-flycatcher	2	0	0	0	2
White-winged dove	3	0	0	0	3
Yellow-breasted chat	8	0	0	1	7
TOTAL	38	0 (0%)	0 (0%)	1 (2%)	37 (97%)

2002 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Bell's vireo	9	2	2	0	7
Blue grosbeak	1	0	0	0	1
Common yellwothroat	3	0	1	0	2
Green Heron	1	0	0	0	1
Mourning dove	3	0	1	0	2
Song sparrow	1	0	0	0	1
Verdin	2	0	0	0	2
Southwestern Willow-flycatcher	4	0	0	2	2
White-winged dove	1	0	0	0	1
Yellow-breasted chat	8	0	3	0	5
TOTAL	**33**	**2 (6%)**	**7 (2%)**	**3(1%)**	**24 (73%)**

2003 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Abert's towhee	1	0	0	0	1
Bell's vireo	2	1	1	0	1
Blue grosbeak	1	0	0	0	1
Common yellwothroat	1	0	0	0	1
Mourning dove	2	0	0	0	2
Southwestern Willow-flycatcher	2	0	0	0	2
White-winged dove	2	0	0	0	2
Yellow-breasted chat	5	1	1	0	4
TOTAL	**16**	**2 (12%)**	**2 (12%)**	**0 (0%)**	**14 (87%)**

2004 Results:

Species	# Nests	Parasitzed	Predated	Abandoned/Other	Successful
Abert's towhee	1	0	0	0	1
Bell's vireo	4	1	2	0	2
Common yellwothroat	2	0	1	0	1
Mourning dove	1	0	1	0	0
Song sparrow	3	0	1	0	2
Verdin	2	0	0	0	2
White-winged dove	1	0	0	0	1
Yellow-breasted chat	14	3	2	2	10
Yellow warbler	1	0	0	0	1
TOTAL	**29**	**4 (14%)**	**6 (20%)**	**2 (7%)**	**21 (69%)**

1999-2004 Nest Monitoring Results
Alamo Lake SWA

1999 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	2	0	0	0	2
Bell's vireo	5	0	0	0	5
Common yellowthroat	2	0	0	0	2
Mourning dove	4	0	0	3	1
Song sparrow	8	0	1	0	7
Southwestern Willow-flycatcher	13	1	1	3	9
Yellow-breasted chat	8	1	0	3	4
TOTAL	**42**	**2 (4%)**	**2 (5%)**	**9 (21%)**	**30 (71%)**

2000 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	4	1	0	2	2
Bell's vireo	3	0	0	0	3
Blue grosbeak	3	0	0	0	3
Common yellowthroat	1	0	0	0	1
Mourning dove	1	0	0	0	1
Pyrrhuloxia	1	0	0	1	0
Song sparrow	5	0	1	0	4
Southwestern Willow-flycatcher	13	N/A	N/A	N/A	N/A
White-winged dove	1	0	0	0	1
Yellow-breasted chat	27	0	2	5	20
Yellow warbler	1	1	0	1	0
TOTAL	**47**	**2 (4%)**	**3 (6%)**	**7 (15%)**	**35 (74%)**

2001 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	8	0	1	0	7
Bell's vireo	9	1	1	0	8
Black-tailed gnatcher	1	0	0	0	1
Blue grosbeak	2	0	0	0	2
Common yellowthroat	10	0	1	1	8
Mourning dove	4	0	0	0	4
Song sparrow	5	0	1	0	4
Southwestern Willow-flycatcher	24	0	4	3	17
White-winged dove	1	0	0	0	1
Yellow-breasted chat	28	0	1	1	26
Unkown species	5	0	4	1	0
TOTAL	**97**	**1 (1%)**	**13 (13%)**	**6 (6%)**	**78 (80%)**

2002 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	4	0	2	1	1
Bell's vireo	10	1	4	1	5
Mourning dove	2	0	0	0	2
Song sparrow	2	1	1	0	1
Summer tanager	1	0	0	0	1
Verdin	5	0	0	0	5
Southwestern Willow-flycatcher	12	0	3	1	8
Yellow-breasted chat	17	1	3	0	14
Yellow warbler	2	1	1	0	1
Unkown species	1	0	1	0	0
TOTAL	**56**	**4 (7%)**	**15 (27%)**	**3 (5%)**	**38 (68%)**

2003 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	4	1	2	0	2
Bell's vireo	13	3	2	4	7
Blue grosbeak	3	0	1	1	1
Common yellowthroat	11	0	2	0	9
Song sparrow	4	2	0	2	2
Southwestern Willow-flycatcher	15	0	5	0	10
White-winged dove	7	0	1	0	6
Yellow-breasted chat	25	1	4	2	19
Unkown species	2	0	1	0	1
TOTAL	**84**	**7 (8%)**	**18 (21%)**	**9 (11%)**	**57 (68%)**

2004 Results:

Species	*Total Nests*	*Parasitzed*	*Predated*	*Abandoned/Other*	*Successful*
Abert's towhee	2	1	0	0	2
Bell's vireo	14	5	3	1	10
Blue grosbeak	5	2	1	1	3
Common yellowthroat	2	0	0	0	2
Mourning dove	1	0	1	0	0
Song sparrow	3	1	0	0	3
Southwestern Willow-flycatcher	10	1	3	2	5
White-winged dove	1	0	0	0	1
Yellow-breasted chat	26	3	4	4	18
Yellow warbler	2	0	0	0	2
TOTAL	**66**	**13 (20%)**	**12(18%)**	**8 (12%)**	**46 (70%)**

1999 Bill Williams and Alamo Lake nest monitoring log

Abbreviations: he = host egg, hc = host chick, be = broken egg, ce = cowbird egg, cc = cowbird chick, con. = nest under construction, dc= dead host chick, unk = unable to see nest contents, ? = unsure of nest contents, nf = nest not found, pred.= predated, do = #days old hef = host egg failed, hf = host fledglings

lird species

ABTO=	Abert's towhee	WWDO=	White-winged dove
BCHU	Black-chinned hummingbird		
BEVI=	Bell's vireo	YBCH=	Yellow-breasted chat
BLGR=	Blue grosbeak	WIFL=	Willow flycatcher
COYE=	Common yellowthroat	YEWA=	Yellow warbler
MODO=	Mourning dove	UNK.=	Unknown songbird
SOSP=	Song sparrow	BHCO=	Brown-headed cowbird

ubstrate sp

GOWI	Godding willow	SBME	Screwbean Mesquite
SACE	Saltcedar	CATT	Cattails
COWO	Cottonwood	HOME=	Honey Mesquite
		SEWI=	Seep willow
		PAVO=	Paloverde

**** = Nest Parasitized**

Alamo Lake 1999

Nest ID	Species	Substrate sp.	Nest height (m)	Overstory sp.	Substrate height (m)	Fate	Comments
BCA-1	SOSP	SACE	2m	SACE	2.5m	Fledged	3 hosts fledged
BCA-2	SOSP	SACE	1.5m	SACE	3m	Predated	Egg predated, shell remained in nest
BCA-3	SOSP	SACE	2m	GOWI/SACE	6m	Fledged	2 of 3 fledged, 1 egg never hatched
BCA-4	YBCH	SACE	1.5m	GOWI/SACE	7m	Fledged	3 hosts fledged
**BCA-5	YBCH	SACE	0.5m	GOWI	10m	Fledged	Nest parasitized, 3 hosts & 1 BHCO fledged
BCA-6	MODO	GOWI	7m	GOWI	10m	Abandoned	Nest blown down, 2 host eggs failed
**BCA-7	WIFL	SACE	2.5m	GOWI/SACE	7m	Predated	Parasitized, 3 hosts/1BHCO egg failed
BCA-8	MODO	GOWI	3m	GOWI	12m	Abandoned	2 host eggs failed, nest blown down
BCA-9	WIFL	SACE	3m	GOWI	10m	Fledged	1 host fledged, 1 host egg failed
BCA-10	WIFL	SACE	2.5m	GOWI/SACE	10m	Fledged	1 host fledged, 1 host egg failed
BCA-11	WIFL	SACE	3m	GOWI/SACE	10m	Abandoned	3 host eggs remained, re-nested in territory
BCA-12	WIFL	SACE	3m	GOWI/SACE	12m	Predated	2 host eggs predated
BCA-13	WIFL	SACE	3m	GOWI/SACE	12m	Fledged	3 hosts fledged
BCA-14	WIFL	GOWI	3m	GOWI/SACE	12m	Abandoned	Assume abandoned, no eggs laid
BCA-15	WIFL	GOWI	3m	GOWI	10m	Fledged	3 hosts fledged
BCA-16	WIFL	SACE	2.5m	GOWI/SACE	12m	Fledged	3 host chicks freshly hatched when found
BCA-17	COYE	SACE	1m	GOWI/SACE	8m	Fledged	4 hosts fledged
BCA-18	WIFL	SACE	2.5m	SACE	4m	Fledged	3 hosts fledged

BCA-19	SOSP	SACE	2.5m	SACE	4	Fledged	3 hosts fledged
BCA-20	SOSP	SACE	2.5m	SACE	4m	Fledged	2 hosts fledged
BCA-21	WIFL	SACE	2.5m	GOWI/SACE	15m	Fledged	3 hosts fledged
BCA-22	ABTO	SACE	2m	GOWI/SACE	12m	Fledged	3 hosts fledged
BCA-23	WIFL	SACE	2m	GOWI/SACE	10m	Abandoned	3 host eggs remained in nest
BCA-24	WIFL	GOWI	3m	GOWI/SACE	12m	Fledged	2 hosts fledged
BCA-25	Unk. Spp.	SACE	2m	GOWI/SACE	8m	Abandoned	No eggs laid
BCB-1	SOSP	SACE	2m	SACE	3m	Fledged	2 hosts fledged
BCB-2	BEVI	SACE	1.5m	GOWI/SACE	4m	Fledged	4 hosts fledged
BCB-3	MODO	GOWI	2.5m	GOWI	8m	Fledged	2 hosts fledged
BCB-4	Unk. Spp.	SACE	2m	SACE	3m	Abandoned	1 egg never hatched
BCB-5	ABTO	GOWI	2.5m	GOWI/SACE	8m	Fledged	2 hosts fledged
BCB-6	YBCH	SACE	1.5m	GOWI/SACE	8m	Fledged	4 hosts fledged
SMA-1	SOSP	SACE	1.5m	SACE/COWO	2m	Fledged	3 hosts fledged
SMA-2	BEVI	GOWI	0.5m	GOWI/CATT	2m	Fledged	1 host fledged
SMA-3	YBCH	SACE	2m	SACE/SBME	3m	Abandoned	No eggs laid, nest abandoned
SMA-4	SACE	SACE	2m	SACE	3m	Fledged	2 hosts fledged, 1 egg never hatched
SMA-5	BCHU	SACE	1.5m	SACE	4m	Fledged	2 hosts fledged
SMA-6	YBCH	SACE	3m	SACE/HOME	4m	Fledged	2 hosts fledged. 1 egg never hatched
SMA-7	COYE	SACE	3m	SACE/SBME	4m	Fledged	3 hosts fledged
SMA-8	BEVI	SACE	2.5m	SACE	5m	Fledged	1 host fledged, 2 eggs failed
SMA-9	MODO	GOWI	2.5m	GOWI	5m	Unknown	2 eggs in nest, never rechecked
SMA-10	YBCH	SACE	3.5m	GOWI/SACE	12m	Unknown	1 egg, nest never rechecked
SMA-11	YBCH	SACE	1.5m	GOWI/SACE	12m	Unknown	1 egg, nest never rechecked

BILL WILLIAMS RIVER 1999

BW1-1	BEVI	SEWI	0.5m	GOWI/COWO	6m	Abandoned	Nest construction abandoned
BW1-2	VEFL	COWO	12m	COWO/HOME	20m	Fledged	2 hosts fledged
BW1-3	HOWR	Rock cavity	1.5m	COWO/GOWI	12m	Fledged	6 hosts fledged
BW1-4	BLPH	Rock wall	1m	N/A	N/A	Fledged	3 hosts fledged
BW1-5	MODO	SACE	4.5m	HOME/COWO	10m	N/A	Nest could not be rechecked
BW1-6	MODO	SACE	7m	HOME/GOWI	15m	N/A	Nest could not be rechecked
BW2-1	BEVI	SEWI	1m	GOWI/SACE	12m	Fledged	2 host chicks fledged
BW2-2	VERD	HOME	1.5m	HOME/SACE	4m	Fledged	2 hosts fledged, 1 host egg never hatched
BW2-3	ATFL	GOWI	4m	COWO/SACE	9m	Fledged	3 fledglings seen outside nest
BW2-4	BLPH	Rock wall	1m	COWO/GOWI/SACE	9m	Fledged	3 hosts fledged
BW3-1	VERD	GOWI	3m	GOWI/SEWI	10m	N/A	Nest was not rechecked after 2 eggs laid
BW3-2	BEVI	HOME	1m	HOME/SACE	4m	Fledged	3 hosts fledged
BW3-3	VERD	PAVE	1m	PAVE/HOME	4m	Fledged	3 hosts fledged
BW4-1	LBWO	Saguaro	3.5m	HOME/Saguaro	4m	Fledged	Fledged 2 hosts
BW4-2	BEVI	SEWI	1m	SEWI/GOWI/SACE	18m	Fledged	3 hosts fledged
BW4-3	WIFL	SACE	3m	CATT/GOWI	6m	Fledged	3 hosts fledged

2000 Bill Williams and Alamo Lake nest monitoring log

Abbreviations: he = host egg, hc = host chick, be = broken egg, ce = cowbird egg, cc = cowbird chick, con. = nest under construction, dc= dead host chick, unk = unable to see nest contents, ? = unsure of nest contents, nf = nest not found, pred.= predated, do = #days old hef = host egg failed, hf = host fledglings

Bird species:

ABTO=	Abert's towhee	WWDO=	White-winged dove
BEVI=	Bell's vireo	YBCH=	Yellow-breasted chat
BLGR=	Blue grosbeak	WIFL=	Willow flycatcher
COYE=	Common yellowthroat	YEWA=	Yellow warbler
MODO=	Mourning dove	UNK.=	Unknown songbird
SOSP=	Song sparrow	BHCO=	Brown-headed cowbird

Substrate sp:

GOWI	Godding willow	SBME	Screwbean Mesquite
SACE	Saltcedar	CATT	Cattails
COWO	Cottonwood	HOME=	Honey Mesquite
		SEWI=	Seep willow

**** = Nest Parasitized**

ALAMO LAKE 2000

Nest ID	Species	Substrate sp.	Nest height (m)	Overstory sp.	Substrate height (m)	Fate	Comments
BCA-1	MODO	GOWI	3m	SACE/GOWI	10m	Fledged	Fledged 2 hosts
BCA-2	YBCH	SACE	2.5m	SACE/GOWI	15m	Fledged	Fledged 2 hosts
BCA-3	YBCH	SACE	0.75m	SACE/GOWI	15m	Fledged	Fledged 4 hosts
BCA-4	YBCH	SACE	2m	SACE/GOWI	7m	Fledged	Fledged 3 hosts
BCA-5	YBCH	SACE	2m	SACE	3.5m	Fledged	Fledged 3 hosts
BCA-6	YBCH	SACE	2m	SACE/GOWI	10m	Fledged	Fledged 3 hosts
BCA-7	YBCH	SACE	1.5m	SACE/GOWI	8m	Fledged	Fledged 4 hosts
BCA-8	BEVI	GOWI	1.5m	SACE/GOWI	10m	Fledged	Fledged 3 hosts
BCA-9	YBCH	SACE	2m	SACE/GOWI	10m	Fledged	Fledged 3 hosts
BCA-10	ABTO	SACE	2m	SACE/GOWI	10m	Fledged	Fledged 3 hosts
BCA-11	ABTO	SACE	2m	SACE/GOWI	8m	Fledged	Fledged 2, maybe 3 host chicks
BCA-12	WWDO	SACE	3m	SACE	5m	Fledged	Fledged 2 hosts
BCA-13	YBCH	SACE	2m	SACE/GOWI	10m	Abandoned	1 egg laid, unknown failure.
BCA-14	SOSP	SACE	1.75m	SACE	3.5m	Predated	All 3 host eggs predated
BCB-1	YBCH	SACE	1.5m	SACE/GOWI	10m	Fledged	Fledged 3 hosts
BCB-2	YBCH	SACE	3m	SACE	4m	Abandoned	1 host egg never hatched, abandoned
BCB-3	YBCH	SACE	3m	SACE	10m	Fledged	Fledged 2 hosts
BCB-4	YBCH	SACE	3m	SACE/GOWI	7m	Fledged	Fledged 2 hosts
SMB-1	SOSP	SACE	2.5m	SACE/COWO/GOWI	10m	Fledged	Fledged 3 hosts
SMB-2	SOSP	SACE	1.5m	SACE/COWO/GOWI	10m	Fledged	Fledged 3 hosts

SMB-3	YBCH	COWO	2.5m	SACE/COWO/GOWI	10m	Fledged	Fledged 3 hosts
**SMB-4	YEWA	GOWI	2m	SACE/COWO/GOWI	10m	Abandoned	1 host egg & 3 BHCO eggs abandonded
SMB-5	BEVI	SACE	1.75m	SACE/GOWI	8m	Fledged	Fledged 1 host chick
SMB-6	ABTO	GOWI	4m	SACE/GOWI/COWO	8m	Abandoned	2 host eggs left abandoned
SMB-7	YBCH	SACE	1.5m	SACE/COWO	6m	Fledged	Fledged 3 hosts
SMB-8	YBCH	GOWI	1.75m	SACE/GOWI/COWO	7m	Fledged	Fledged 2 hosts, 2 eggs never hatched
SMB-9	YBCH	SACE	1.5m	SACE/GOWI/COWO	7m	Fledged	Fledged 4 hosts
**SMB-10	ABTO	GOWI	3m	SEWI/GOWI	7m	Unknown	2 BHCO eggs & 1 host egg, no time to recheck
SMA-1	YBCH	SACE	4m	SACE/GOWI	10m	Fledged	Fledged 3 hosts
SMA-2	YBCH	SACE	1.5m	SACE/GOWI	10m	Fledged	1 egg never hatched, 1 most likely fledged
SMA-4	YBCH	SACE	3m	SACE/HOME	8m	Abandoned	1 egg left in nest, unknown failure.
SMA-5	COYE	SACE	2.5m	SACE/HOME	5m	Fledged	4 host chicks fledged
SMA-6	YBCH	SACE	2m	SACE/GOWI/COWO	5m	Fledged	3-4 hosts fledged
SMA-7	YBCH	SACE	4m	SACE	7m	Predated	All 3 host eggs predated
SMA-8	YBCH	SACE	2m	SACE/GOWI/COWO	7m	Fledged	3 hosts fledged
SMA-9	YBCH	COWO	1m	GOWI/COWO	8m	Predated	All 4 host eggs predated
SMA-10	SOSP	SACE	2m	SACE/COWO/GOWI	10m	Fledged	Assume all 3 fledged, no time to recheck
SMA-12	YBCH	SACE	1m	SACE/COWO/GOWI	9m	Fledged	Fledged 4 hosts
SMA-13	SOSP	SACE	2m	HOME/SACE	5m	Fledged	3 hosts fledged
SMA-14	PYRR	HOME/SACE	2m	HOME/SACE	5m	Abandoned	All 3 host eggs abandoned
SMA-15	BLGR	GOWI	2m	GOWI	8m	Fledged	3 hosts, 1 egg when last checked
SMA-16	YBCH	SACE	2m	SACE	5m	Abandoned	1 host egg left in nest, unk. Failure.
SMA-17	YBCH	SACE	3m	SACE/HOME	5m	Fledged	4 hosts fledged
SMA-18	BLGR	SEWI	1.5m	SEWI/SACE	3m	Fledged	Fledged 3 hosts
SMA-19	YBCH	GOWI	2.5m	SACE/GOWI	7m	Unknown	3 host eggs, no further rechecks.
SMA-20	BLGR	SEWI	1.5m	COWO/SEWI	4m	Fledged	Fledged 3 hosts
SMA-21	BEVI	SACE	1.75m	SACE/GOWI	8m	Fledged	2 hosts fledged
BILL WILLIAMS RIVER 2000							
BW1-1	BEVI	SEWI	1m	COWO/SACE/SEWI	18m	Fledged	Fledged 4 hosts
BW1-2	YBCH	SEWI	2m	COWO/GOWI	20m	Fledged	Fledged 4 hosts
BW1-3	GTGR	GOWI	2m	COWO/GOWI/SACE	15m	Unknown	3 0f 4 eggs remained, unable to recheck
BW1-4	VERD	SACE	3m	HOME/GOWI/SACE	15m	Fledged	3 hosts fledged
BW1-5	BEVI	HOME	1.5m	GOWI/HOME/SACE	20m	Fledged	3 hosts fledged
BW1-6	VERD	GOWI	1.5m	COWO/GOWI	20m	Fledged	Observed all (2) fledglings
BW1-7	GTGR	GOWI	2m	COWO/GOWI/SACE	15m	Unknown	3 eggs in nest, unable to recheck
BW2-1	ATFL	Rock wall	2.5m	SACE/COWO	18m	Fledged	Fledged 3 hosts chciks
BW2-2	VERD	GOWI	2m	GOWI/SACE/HOME	15m	Fledged	Fledged 3 hosts chciks
BW2-3	BEVI	SEWI	1.5m	COWO/CATT/GOWI	12m	Unknown	Unable to recheck, had 3 host eggs
BW2-4	BEVI	HOME	1m	HOME/SACE	6m	Unknown	Unable to recheck, had 3 host eggs
BW2-5	Unk. Dove	SACE	2m	GOWI/SACE	8m	Fledged	2 hosts fledged
BW3-1	BLPH	Rock wall	1.5m	GOWI/SACE	15m	Fledged	3 host chicks fledged

2001 Bill Williams and Alamo Lake nest monitoring log

Abbreviations: he = host egg, hc = host chick, be = broken egg, ce = cowbird egg, cc = cowbird chick, con. = nest under construction, dc= dead host chick, unk = unable to see nest contents, ? = unsure of nest contents, nf = nest not found, pred.= predated, do = #days old hef = host egg failed, hf = host fledglings

Bird species:	ABTO=	Abert's towhee	WWDO=	White-winged dove
	BEVI=	Bell's vireo	YBCH=	Yellow-breasted chat
	BLGR=	Blue grosbeak	WIFL=	Willow flycatcher
	COYE=	Common yellowthroat	YEWA=	Yellow warbler
	MODO=	Mourning dove	UNK.=	Unknown songbird
	SOSP=	Song sparrow	BHCO=	Brown-headed cowbird
	COMO=	Common Moorhen	VEFL=	Vermillion flycatcher

Substrate sp:	GOWI	Godding willow	SBME	Screwbean Mesquite
	SACE	Saltcedar	CATT	Cattails
	COWO	Cottonwood	HOME=	Honey Mesquite
			SEWI=	Seep willow

**** = Nest Parasitized**

ALAMO LAKE 2001

Nest ID	Species	Substrate sp.	Nest height (m)	Overstory sp.	Substrate height (m)	Fate	Comments
BCA-1	YBCH	SACE	2.5m	SACE/GOWI	7m	Fledged	3 host chicks fledged
BCA-2	Unk. Spp.	SACE	1.75m	SEWI/SACE/GOWI	8m	Abandoned	3 host eggs left unhatched, abandoned
BCA-3	COHU	SACE	5m	SACE/GOWI	20m	Nest damage	2 host chicks found dead on ground
BCA-4	BTGN	SACE	2.5m	SACE/GOWI/COWO	8m	Fledged	3-4 host chicks fledged
BCA-5	Unk. spp.	SACE	4m	SACE/GOWI	8m	Predated	3 eggs all predated
BCA-6	COHU	SACE	3m	SACE/GOWI	8m	Fledged	1 host chick fledged
BCA-7	ABTO	SACE	1m	SACE/GOWI	7m	Fledged	Fledged 3 hosts
BCA-8	ABTO	SACE	2.25m	SACE	5m	Fledged	Fledged 3 hosts
BCA-9	YBCH	SACE	3m	SACE	7m	Fledged	Fledged 3 hosts
BCA-10	YBCH	SACE	1.5m	SACE	5m	Fledged	Fledged 4 hosts
BCA-12	YBCH	SACE	2m	SACE	4m	Abandoned	1 egg only that never hatched
BCA-13	YBCH	SACE	2.5m	SACE/GOWI	9m	Fledged	2 host chicks fledged
BCA-14	WWDO	SACE	2m	SEWI/SACE/GOWI	8m	Fledged	Fledged 2 hosts
BCA-15	COYE	GOWI	1.5m	GOWI	10m	Fledged	3 hosts fledged
BCA-16	SOSP	SACE	2m	SACE	5m	Fledged	Fledged 3 hosts
BCA-17	COYE	SACE	1.5m	SACE	5m	Fledged	Fledged 3 hosts
BCA-18	SOSP	SACE	4m	SACE	5m	Fledged	Fledged 3 hosts
BCA-19	ABTO	SACE	1.25m	SACE/GOWI	8m	Fledged	Fledged 3 hosts
BCA-20	BEVI	SACE	2m	SACE/GOWI	8m	Fledged	3 hosts fledged
BCA-22	MODO	SACE	2m	SACE	4m	Fledged	2 hosts fledged
BCA-23	YBCH	SACE	2m	SACE	5m	Fledged	2 of 3 hosts fledged, 1 egg failed
BCA-24	YBCH	SACE	1.75m	SACE/GOWI	9m	Fledged	4 hosts fledged nest
BCA-25	COYE	SACE	1.5m	SACE/COWO	7m	Fledged	3 hosts fledged
BCA-26	ABTO	GOWI	2m	GOWI	10m	Predated	All 3 host eggs predated
BCA-27	COYE	SACE	1.5m	SACE	5m	Fledged	2-3 host chicks fledged
BCA-28	COYE	SACE	1.5m	SACE	4m	Predated	All 4 host eggs predated
BCA-29	YBCH	SACE	1.75m	SACE/GOWI	5m	Fledged	Fledged 2 hosts
BCA-30	YBCH	SACE	1.5m	SACE/GOWI	6m	Fledged	2-3 host chicks fledged
BCA-31	SOSP	SACE	1.75m	SACE/GOWI	7m	Fledged	Fledged 1 host, 2 eggs failed

BCA-32	COYE	SACE	3m	SACE/GOWI	9m	Abandoned	3 host eggs abandoned
BCA-33	ABTO	SACE	1.75m	SACE/GOWI	7m	Fledged	1 host fledged, 1 egg was predated
BCA-34	COYE	SACE	1.75m	SACE	4m	Fledged	Fledged 2 hosts
BCA-35	YBCH	SACE	3m	SACE/GOWI	4m	Unknown	Nest had 2 host chicks, ran out of time
BCA-36	YBCH	GOWI	2.2m	GOWI	10m	Fledged	Fledged 3 hosts
SMA-1	YBCH	GOWI	3m	SEWI/SACE/COWO	9m	Fledged	Fledged 3 host chicks
SMA-2	MODO	GOWI	4m	SACE/GOWI/COWO	7m	Fledged	1 host chick fledged, 1 egg never hatched
SMA-3	BEVI	GOWI	1.25m	CATT/GOWI	7m	Fledged	3 host chicks fledged
SMA-4	BEVI	SACE	2m	HOME/SACE	8m	Fledged	3 host chicks fledged
SMA-5	YBCH	SACE	1.5m	HOME/SACE	7m	Fledged	3-4 hosts fledged
SMA-6	BEVI	SACE	1.5m	SACE/HOME/COWO	10m	Predated	4 host chicks all predated
SMA-7	Unk. Spp.	SACE	5m	SACE	6m	Predated	2 hosts eggs predated
SMA-8	YBCH	GOWI	1.25m	SEWI/GOWI	6m	Fledged	3 host chicks fledged
SMA-9	Unk. Spp.	SACE	4m	HOME/GOWI	5m	Predated	Nest destroyed with 1 host egg only
SMA-10	YBCH	SACE	2m	SACE	6m	Fledged	Hard to see in nest, 2-3 hosts fledged
SMA-11	YBCH	SACE	2m	HOME/SACE/GOWI	6m	Fledged	3 host chicks fledged
SMA-12	MODO	GOWI	3.5m	SACE/GOWI/COWO	6m	Fledged	Fledged 2 hosts
SMA-13	COYE	SACE	2m	SACE	5m	Fledged	2 hosts fledged, 1 unknown failure
SMA-14	BEVI	SACE	3.75m	HOME/SACE	6m	Fledged	2 host chicks fledged
SMA-15	YBCH	SACE	1.5m	HOME/SACE	5m	Fledged	3-4 host chicks fledged
SMA-16	YBCH	SACE	3.5m	SACE	6m	Fledged	Fledged 3 host chicks
SMA-17	ABTO	SACE	2m	HOME/SACE	5m	Fledged	2 fledged, 1 egg never hatched
SMA-18	BETH	GOWI	1.75m	GOWI/COWO	7m	Fledged	2 fledged, 2 eggs never hatched
**SMA-19	BEVI	HOME	0.5m	SACE/HOME/COWO	8m	Unknown	Were 2 host chicks, 1 BHCO egg, unable to recheck
SMA-20	BLGR	GOWI	2m	GOWI/COWO	7.5m	Unknown	Were 4 host eggs, unable to recheck
BCB-1	YBCH	SACE	1.5m	SACE/GOWI	7m	Fledged	Fledged 3 host chicks
BCB-2	BEVI	SACE	0.3m	SACE/GOWI	7m	Fledged	At least 2 fledged, nest well hidden
BCB-3	SOSP	SACE	1.75m	SACE/GOWI	8m	Fledged	4 hosts fledged
BCB-4	YBCH	SACE	4m	SACE	5m	Fledged	High nest, 2-3 hosts fledged
BCB-5	BEVI	SACE	1m	SACE/COWO	7m	Fledged	Fledged 3 host chicks
BCB-6	MODO	GOWI	3m	GOWI	8m	Fledged	Fledged 2 hosts
BCB-7	YBCH	SACE	1.5m	SACE	4m	Fledged	2 host chicks fledged
BCB-8	COYE	SACE	2.5m	SACE/COWO/GOWI	12m	Fledged	3 host chicks fledged
BCB-9	ABTO	SACE	2m	SACE/GOWI	8m	Fledged	Fledged 3 host chicks
BCB-10	ABTO	SACE	1.5m	SACE	5m	Fledged	Appeared that 2 host chicks fledged
BCB-11	BEVI	SACE	1.3m	SACE	5m	Fledged	3 host chicks fledged
BCB-12	YBCH	SACE	1.5m	SACE	5m	Fledged	3 host chicks fledged
BCB-13	YBCH	SACE	2.5m	SACE/GOWI	8m	Fledged	4 host chicks fledged
BCB-14	YBCH	SACE	2m	SACE/GOWI	8m	Fledged	fledged 3 hosts
BCB-15	SOSP	SACE	1.75m	SACE/GOWI	6m	Predated	All 3 host eggs predated
BCB-16	YBCH	SACE	1.5m	SACE/GOWI	8m	Fledged	Fledged 3 host chicks
BCB-17	YBCH	SACE	1.75m	SACE	5m	Fledged	2 fledglings seen on branches near nest
BCB-18	YBCH	SACE	2m	SACE	5m	Predated	All 3 host eggs predated
BCB-19	LEGO	SACE	2.5m	SACE	5m	Predated	2 host eggs predated
BCB-20	YBCH	SACE	2.2m	SACE	6m	Fledged	Fledged 3 host chicks
BCB-21	COYE	SACE	2m	SACE	5m	Fledged	Fledged 3 host chicks
BC-7A	WIFL	SACE	2.5m	SACE	4m	Abandoned	Storm killed all 4 host chicks
BC-8A	WIFL	SACE	2m	SACE	5m	Abandoned	Storm killed 2 chicks, 1 egg
BC-9A	WIFL	SACE	3m	SACE/GOWI	8m	Predated	All host chicks predated (2)
BC-1A	WIFL	GOWI	3m	GOWI	8m	Predated	All 4 host chicks predated
BC-4A	WIFL	SACE	4m	SACE/GOWI	8m	Fledged	1, maybe 2 hosts fledged.
BC-7B	WIFL	SACE	2.5m	SACE	5m	Fledged	2-3 hosts fledged
BC-8B	WIFL	SACE	2m	SACE	4m	Fledged	1, possibly 2 hosts fledged

BC-9B	WIFL	SACE	4m	SACE/GOWI	8m	Abandoned	Abandoned with 3 host eggs left
BC-12A	WIFL	SACE	3m	SACE	5m	Predated	Nest predated, were 3 host chicks
BC-13A	WIFL	SACE	3m	SACE	5m	Fledged	Saw 2 fledglings, may be 3 total
BC-14A	WIFL	SACE	4m	SACE/GOWI	8m	Fledged	All 3 hosts fledged
BC-16A	WIFL	SACE	3m	SACE	5m	Fledged	Fledged 2-3 host chicks
BC-18A	WIFL	SACE	3m	SACE	4m	Fledged	Fledged 2 host chicks
BC-19A	WIFL	SACE	2m	SACE	4m	Fledged	2 hosts fledged, 1 egg never hatched
BC-20A	WIFL	SACE	2.5m	SACE	5m	Fledged	Saw 2 fledglings, may be 3 total
BC-21A	WIFL	SACE	4m	SACE/GOWI	10m	Fledged	3 fledglings seen on branch
BC-12B	WIFL	SACE	3.75m	SACE/GOWI	7m	Fledged	Were 3 host chicks, 2 fledglings confirmed
BC-2B	WIFL	SACE	2m	SACE	5m	Fledged	All 3 hosts fledged
BC-9B	WIFL	SACE	3.75m	SACE/GOWI	9m	Unknown	2 host chicks, no time to recheck
BC-18B	WIFL	SACE	3m	SACE	4m	Unknown	2 host chicks, no time to recheck
BC-19B	WIFL	SACE	2m	SACE	4m	Unknown	1 egg, 1 host chick, unable to recheck
BC-20B	WIFL	SACE	3m	SACE/GOWI	6m	Unknown	2 host chicks, no time to recheck
BC-1B	WIFL	GOWI	5.75m	GOWI	10m	Predated	2 host chiks both predated
BC-21B	WIFL	SACE	3m	SACE/GOWI	10m	Unknown	2-3 host chicks, unable to recheck
BILL WILLIAMS RIVER 2001							
BW1-1	BTGN	SACE	2m	SACE/GOWI	8m	Fledged	Fledged 3 host chicks
BW1-2	GTGR	CATT	2m	CATT/GOWI	4m	Fledged	Fledged 2 host chicks
BW1-3	MODO	GOWI	2m	GOWI/SACE	5m	Fledged	Fledged 2 host chicks
BW1-4	MODO	SACE	4m	GOWI/SACE	8m	Fledged	Fledged 2 host chicks
BW1-5	GTGR	CATT	2m	CATT	4m	Fledged	Fledged 3 host chicks
BW1-6	GTGR	CATT	2m	CATT	4m	Fledged	Fledged 3 host chicks
BW1-7	WWDO	GOWI	7m	GOWI/SACE	10m	Fledged	1 host fledged
BW1-8	MODO	GOWI	5m	GOWI	8m	Fledged	2 host fledglings seen
BW1-9	MODO	GOWI	4m	GOWI/CATT	8m	Fledged	Fledged 2 host chicks
BW1-10	MODO	GOWI	5m	GOWI	8m	Fledged	Fledged 1 host
BW1-11	VERD	SACE	1.5m	SACE/GOWI	8m	Fledged	3 host chicks fledged
BW1-12	COMO	CATT	0.1m	SACE	2m	Fledged	Fledged 1 host
BW1-13	WWDO	GOWI	3m	GOWI	8m	Fledged	2 hosts fledged
BW1-14	MODO	SACE	2m	SACE/GOWI	4m	Fledged	Fledged 2 host chicks
BW1-15	YBCH	SACE	3m	SACE/GOWI	4m	Fledged	3 host chicks fledged
BW2-1	COFL	GOWI	5m	GOWI/HOME/SACE	8m	Fledged	Fledged all 3 host chicks
BW2-2	MODO	SACE	6m	GOWI/SACE	6m	Fledged	2 host chicks fledged
BW2-3	WWDO	SACE	3m	SACE/GOWI	8m	Fledged	Fledged 2 host chicks
BW2-4	GTGR	CATT	2.5m	CATT	5m	Fledged	Fledged all 4 host chicks
BW2-5	GTGR	CATT	2.5m	CATT	5m	Fledged	Fledged all 4 host chicks
BW2-6	GTGR	CATT	2.5m	CATT	5m	Fledged	2 of 3 host chicks fledged, 1 failed
BW2-7	GTGR	CATT	2.5m	CATT	5m	Fledged	2 of 3 host chicks fledged, 1 failed
BW2-8	BUOR	COWO	10m	COWO/SEWI/SACE	15m	Fledged	2 fledglings observed
BW2-9	YBCH	SACE	2m	SACE/GOWI/COWO	8m	Fledged	Fledged 3 host chicks
BW2-10	YBCH	SACE	2.5m	SACE/GOWI/COWO	8m	Fledged	Fledged 3 host chicks
BW2-11	VEFL	GOWI	11m	GOWI/SACE/COWO	14m	Fledged	Observed 2 fledglings
BW3-1	WIFL	SACE	2m	SACE	4m	Fledged	1 confirmed fledgling, 2 unknown
BW3-2	WIFL	SACE	4.5m	SACE	6m	Unknown	Unable to recheck, had 3 host chicks
BW3-3	YBCH	GOWI	3m	GOWI/SACE/CATT	15m	Unknown	Unable to recheck, had 2 host eggs, 1 host chick
BW3-4	YBCH	SACE	3m	SACE	8m	Fledged	Fledged 3 host chicks
BW3-5	YBCH	SACE	2m	SACE	10m	Fledged	Fledged 3 host chicks
BW3-6	YBCH	SACE	1.5m	SACE/CATT	5m	Fledged	2 hosts fledged
BW3-7	COYE	CATT	1m	CATT/GOWI	8m	Fledged	Fledged 2 host chicks
BW3-8	YBCH	CATT	3m	GOWI/CATT	8m	Fledged	2 hosts fledged
BW3-9	VERD	GOWI	3m	GOWI	10m	Fledged	Fledglings observed leaving nest

2002 Bill Williams and Alamo Lake nest monitoring log

Abbreviations: he = host egg, hc = host chick, be = broken egg, ce = cowbird egg, cc = cowbird chick, con. = nest under construction, dc= dead host chick, unk = unable to see nest contents, ? = unsure of nest contents, nf = nest not found, pred.= predated, do = #days old hef = host egg failed, hf = host fledglings

Bird species:	ABTO=	Abert's towhee	WWDO=	White-winged dove
	BEVI=	Bell's vireo	YBCH=	Yellow-breasted chat
	BLGR=	Blue grosbeak	WIFL=	Willow flycatcher
	COYE=	Common yellowthroat	YEWA=	Yellow warbler
	MODO=	Mourning dove	UNK.=	Unknown songbird
	SOSP=	Song sparrow	BHCO=	Brown-headed cowbird
			BCHU=	Black-chinned hummingbird
Substrate sp:	GOWI	Godding willow	SBME	Screwbean Mesquite
	SACE	Saltcedar	COWO	Cottonwood
	COWO	Cottonwood	CATT	Cattails
	PAVE=	Paloverde	HOME=	Honey Mesquite

**** = Nest Parasitized**

ALAMO LAKE 2002

Nest ID	Species	Substrate sp.	Nest height (m)	Overstory sp.	Substrate height (m)	Fate	Comments
BCA-1	BCHU	SACE	2m	SACE/COWO	5m	Predated	3 host eggs all predated
BCA-2	YBCH	SACE	3m	SACE/GOWI	7m	Fledged	3 fledglings observed
BCA-3	YEWA	SACE	5m	SACE/GOWI	12m	Fledged	2-3 fledged, difficult to see in nest
**BCA-4	YBCH	SACE	4m	SACE/GOWI	6m	Fledged	1 BHCO, 3 hosts all fledged
BCA-5	Unk. Spp.	SACE	2m	SACE/GOWI	8m	Predated	2 eggs both predated
BCA-6	YBCH	SACE	2m	GOWI/SACE	7m	Predated	All 3 eggs gone, assume predation
BCA-7	YBCH	GOWI	2m	GOWI/SACE	5m	Fledged	3 hosts all fledged
BCA-8	YBCH	SACE	2.5m	SACE/GOWI	6m	Fledged	3 hosts all fledged
BCA-9	YBCH	SACE	2m	SACE/GOWI	10m	Fledged	3 hosts all fledged
BCA-10	WIFL	SACE	5m	COWO/SACE	9m	Fledged	2-3 hosts fledged, difficult to see nest
BCA-11	WIFL	SACE	5.5m	SACE/GOWI	9m	Fledged	Fledged all 3 hosts
BCA-12	WIFL	SACE	2.5m	SACE/GOWI/COWO	8m	Predated	All 3 host eggs gone, assume predation
BCA-13	WIFL	SACE	2.3m	SACE/GOWI	10m	Fledged	2 hosts fledged, 1 egg never hatched
**BCA-14	SOSP	SACE	2.2m	SACE	4m	Predated	All 3 host eggs & 1 BHCO egg predated
BCA-15	WIFL	SACE	5m	SACE/COWO/GOWI	7m	Predated	3-4 host eggs predated
BCA-16	WIFL	SACE	2.5m	SACE/GOWI	7m	Fledged	Fledged 2 host chicks
BCA-17	WIFL	SACE	3.5m	GOWI/SACE	9m	Abandoned	Nest destroyed, all 3 eggs failed
BCA-18	WIFL	SACE	5m	SACE/COWO	8m	Fledged	3 hosts fledged nest

BCA-19	WIFL	SACE	2.75m	SACE/COWO	7m	Fledged	Fledged 3 host chicks
BCA-20	SOSP	SACE	2.3m	SACE/COWO	5m	Fledged	3 fledglings observed
BCA-21	WIFL	SACE	4.5m	SACE/GOWI	5m	Fledged	All 3 hosts fledged
BCA-22	WIFL	SACE	4m	SACE	7m	Predated	2 host eggs predated
BCA-24	BEVI	GOWI	1.75m	COWO/GOWI	6m	Abandoned	Nest destroyed, 3-4 host eggs failed
BCA-25	WIFL	SACE	2m	SACE/GOWI	5m	Fledged	Fledged 2 host chicks
BCA-26	ABTO	SACE	2.75m	SACE	4m	Abandoned	3 eggs never hatched
SMA-1	YBCH	GOWI	1.5m	GOWI/COWO	6m	Fledged	All 3 hosts fledged
SMA-2	YBCH	GOWI	2.5m	GOWI/COWO	6m	Fledged	Fledged all 3 host chicks
SMA-3	VERD	PAVE	1.75m	PAVE	6m	Fledged	2-4 hosts fledged, difficult to confirm #
**SMA-4	YEWA	GOWI	2m	GOWI/SACE	8m	Predated	1 BHCO egg & 2 host eggs all predated
SMA-5	ABTO	SACE	1.5m	SACE/COWO	4m	Predated	2 host eggs both predated
SMA-6	YBCH	SACE	2m	SACE/COWO	5m	Fledged	2 fledged, 1 egg never hatched
SMA-7	ABTO	SACE	1.5m	SACE/HOME	4.5m	Fledged	Fledged 2 hosts
SMA-8	YBCH	SACE	2.3m	SACE	7m	Fledged	All 3 hosts fledged
SMA-9	VERD	GOWI	2m	GOWI/SACE	8m	Fledged	2-4 hosts fledged, difficult to confirm #
SMA-10	BEVI	SACE	1.5m	SACE/GOWI	4m	Fledged	3 host chicks all fledged
SMA-11	YBCH	GOWI	2m	GOWI/COWO	5m	Fledged	3 fledglings observed
SMA-12	ABTO	GOWI	1.5m	GOWI	7m	Predated	3 host eggs predated
SMA-13	SUTA	GOWI	6m	GOWI	10m	Fledged	3-4 hosts fledged, very high nest
SMA-14	BEVI	SACE	1m	SACE/GOWI	4m	Predated	Predated, all 3 host eggs are gone
SMA-15	VERD	SACE	1.75m	SACE	4m	Fledged	Fledged 3-4 hosts
SMA-16	MODO	HOME	4m	SACE/HOME	6m	Fledged	2 hosts both fledged
SMA-17	BEVI	GOWI	1m	GOWI/COWO	3.5m	Fledged	Fledged all 3 host chicks
SMA-18	YBCH	SACE	1.75m	SACE/GOWI	5m	Predated	3 host eggs predated
**SMA-19	BEVI	GOWI	1.5m	GOWI	6m	Predated	2 host eggs, 1 BHCO egg all predated
SMA-20	VERD	GOWI	3m	GOWI	5m	Fledged	Fledged 3-4 host chicks
SMA-21	VERD	GOWI	3.5m	GOWI	5m	Fledged	3-4 fledged, difficult to confirm #
BCB-1	BEVI	SACE	1.5m	GOWI/SACE	10m	Predated	All 3 host eggs predated
BCB-2	YBCH	SACE	3.5m	GOWI/SACE	6.5m	Predated	3 host eggs all predated
BCB-3	BEVI	SACE	1m	GOWI/SACE	6m	Fledged	Fledged 2 host chicks
BCB-4	YBCH	SACE	3m	HOME/SACE	7m	Predated	Nest predated, 2 host eggs missing
BCB-5	YBCH	SACE	3m	COWO/SACE	9m	Fledged	Observed 3 nestlings leave nest
BCB-6	BEVI	SACE	2.5m	SACE	4.5m	Fledged	Fledged all 3 hosts
BCB-7	MODO	GOWI	2m	SACE/GOWI	7m	Fledged	2 hosts fledged
BCB-8	MODO	GOWI	3m	GOWI	6m	Fledged	Fledged 2 host chicks
BCB-9	YBCH	SACE	1.3m	SACE/GOWI	4m	Fledged	Fledged 3-4 host chicks
BCB-10	BEVI	SACE	1.75m	SACE	4m	Fledged	3 hosts all fledged
BCB-11	YBCH	SACE	1.75m	GOWI/SACE	9m	Fledged	2 fledglings observed

BILL WILLIAMS RIVER 2002							
BW1-1	GRHE	SACE	1.5m	SACE	7m	Fledged	2 hosts both fledged
BW1-2	YBCH	SACE	3m	SACE/COWO	7m	Fledged	2-3 fledged, difficult to confirm all 3
BW1-3	BEVI	SACE	1.5m	COWO/SACE	8m	Fledged	All 3 host chicks fledged
BW1-4	YBCH	SACE	2.5m	SACE	6m	Predated	All 3 eggs predated
BW1-5	MODO	SACE	3m	SACE/GOWI	5m	Predated	2 host eggs predated
BW1-6	BEVI	SACE	2m	HOME/SACE	4m	Fledged	Fledged 3 hosts
BW1-7	BEVI	SACE	1.5m	SACE	4.5m	Fledged	3 hosts fledged
BW1-8	BEVI	HOME	2m	SACE/HOME	5.5m	Fledged	Observed 3 fledglings
BW1-9	MODO	SACE	3m	HOME/SACE	6m	Unknown	Unable to recheck, nest had 2 nestlings
**BW2-1	BEVI	SACE	2m	SACE	7m	Predated	1 BHCO egg & 3 host eggs predated
BW2-2	COYE	SACE	0.25m	SACE	4m	Predated	All 3 host eggs destroyed/eaten
BW2-3	BLGR	GOWI	2.5m	GOWI/COWO	6m	Fledged	Fledged 2 host chicks
BW2-4	VERD	HOME	1.75m	HOME	4m	Fledged	3-4 fledged nest
BW2-5	YBCH	GOWI	1.5m	GOWI	5m	Predated	All 4 host eggs predated
BW2-6	VERD	GOWI	3m	GOWI	6m	Fledged	3-4 hosts fledged
BW2-7	MODO	SACE	2.25m	SACE	4m	Fledged	Fledged 2 host chicks
BW2-8	COYE	CATT	1.25m	GOWI	7m	Fledged	3 nestlings fledged as I appraoched the nest
BW2-9	WWDO	GOWI	4.5m	GOWI/COWO	8m	Fledged	Fledged 2 host chicks
BW3-1	YBCH	GOWI	3m	GOWI/SACE	10m	Predated	3 host eggs were all predated
BW3-2	BEVI	SACE	1.5m	GOWI/SACE	6m	Fledged	Observed 3 fledglings
BW3-3	YBCH	SACE	4m	SACE/GOWI	8m	Fledged	3 hosts fledged
BW3-4	YBCH	SACE	2m	SACE	5m	Predated	3 hosts eggs predated
BW3-5	BEVI	SEWI	1.5m	SEWI/COWO	6m	Predated	1 egg laid then predated & abandonded
BW3-6	SOSP	SACE	2.3m	GOWI/SACE	7m	Fledged	Fledged 3 host chicks
BW3-7	BEVI	GOWI	2m	GOWI/SACE	5m	Fledged	Fledged 3, 1 egg never hatched
BW3-8	YBCH	GOWI	3m	GOWI	6m	Predated	2 eggs both predated
**BW3-9	BEVI	GOWI	1m	GOWI	4m	Fledged	Fledged 3 hosts & 1 BHCO
BW3-10	YBCH	GOWI	2.5m	GOWI	6m	Fledged	Fledged 3 host chicks
BW3-11	COYE	CATT	0.75m	GOWI	6m	Fledged	Fledged 3 host chicks

2003 Bill Williams and Alamo Lake nest monitoring log

Abbreviations: he = host egg, hc = host chick, be = broken egg, ce = cowbird egg, cc = cowbird chick, con. = nest under construction, dc= dead host chick, unk = unable to see nest contents, ? = unsure of nest contents, nf = nest not found, pred.= predated, do = #days old hef = host egg failed, hf = host fledglings

Bird species:

ABTO=	Abert's towhee	WWDO=	White-winged dove
BEVI=	Bell's vireo	YBCH=	Yellow-breasted chat
BLGR=	Blue grosbeak	WIFL=	Willow flycatcher
COYE=	Common yellowthroat	YEWA=	Yellow warbler
MODO=	Mourning dove	Unk. Spp.=	Unknown songbird
SOSP=	Song sparrow	BHCO=	Brown-headed cowbird
ATFL=	Ash-throated flycatcher		

Substrate sp:

GOWI	Godding willow	SBME	Screwbean Mesquite
SACE	Saltcedar	COWO	Cottonwood
COWO	Cottonwood	CATT	Cattails
		HOME=	Honey Mesquite

**** = Nest Parasitized**

ALAMO LAKE 2003

Nest ID	Species	Substrate sp.	Nest height (m)	Overstory sp.	Substrate height (m)	Fate	Comments
BCA-1	YBCH	SACE	1.75m	SACE	5m	Predated	4 host eggs all predated
BCA-2	WWDO	SACE	3m	GOWI	5m	Fledged	Fledged 2 host chicks
BCA-3	WWDO	SACE	4m	SACE	6m	Fledged	Fledged 2 host chicks
BCA-4	YBCH	SACE	1.75m	SACE/GOWI	4m	Fledged	Fledged 4 host chicks
BCA-5	YBCH	SACE	1.5m	SACE	4m	Fledged	4 hosts fledged
BCA-6	COYE	SACE	2m	SACE	5m	Fledged	2 hosts fledged
BCA-7	YBCH	SACE	2m	SACE	4m	Predated	All 3 host eggs predated
BCA-8	COYE	SACE	2m	SACE	5m	Predated	2 host eggs were both predated
BCA-9	WWDO	SACE	2.5m	SACE	6m	Fledged	Fledged 2 host chicks
BCA-10	YBCH	SACE	1.75m	COWO/SACE	4m	Fledged	Fledged 3 hosts
**BCA-11	BEVI	SACE	1.75m	GOWI/SACE	3.5m	Abandoned	Host laid 3 eggs, then abandoned after BHCO laid 2 eggs
BCA-12	YBCH	SACE	3m	SACE	7m	Predated	1 host egg laid, then predated & nest abandoned
BCA-13	YBCH	SACE	2m	GOWI	4m	Predated	Nest predated
**BCA-14	BEVI	SACE	2m	SACE	4m	Abandoned	1 host egg abandoned after 1 BHCO was laid
**BCA-15	BEVI	SACE	1m	GOWI	4m	Fledged	2 hosts fledged, 1 failed & 1 BHCO egg failed too
**BCA-16	SOSP	SACE	1.5m	SACE	5m	Abandoned	1 BHCO egg laid, then nest was abandoned
BCA-17	YBCH	SACE	2m	GOWI/SACE	5m	Fledged	Fledged 3 host chicks
BCA-18	ABTO	SACE	2.25m	SACE/GOWI	6m	Fledged	2 hosts fledged, 1 egg never hatched
BCA-19	YBCH	SACE	2.5m	GOWI/COWO	4m	Fledged	Fledged 3 host chicks

BCA-20	BEVI	SACE	1m	SACE	3m	Predated	2 host eggs predated
BCA-21	BLGR	SACE	2m	SACE	4m	Predated	1 host predated, then 2 eggs abandoned
BCA-22	YBCH	SACE	3m	SACE	6m	Fledged	Fledged 3 host chicks
BCA-23	COYE	SACE	1.5m	SACE	4m	Fledged	3 fledglings observed
BCA-24	YBCH	SACE	1.5m	GOWI	5m	Fledged	Fledged 2 hosts
BCA-25	COYE	SACE	2m	SACE	3m	Fledged	Fledged 3 hosts
BCA-26	YBCH	SACE	2m	SACE	3m	Fledged	3 hosts fledged
BCA-27	BEVI	SACE	1.5m	SACE/GOWI	3m	Abandoned	1 host egg abandoned
BCA-28	COYE	SACE	2m	SACE	3m	Fledged	Fledged 2 hosts
SMA-1	WWDO	SACE	3m	GOWI/SACE	5m	Fledged	Fledged 2 host chicks
SMA-2	WWDO	SACE	2.5m	COWO	3m	Fledged	Observed 2 host fledglings
**SMA-3	ABTO	SACE	1.5m	SACE	4m	Fledged	2 hosts fledged, 1 BHCO fledged, 1 host egg failed
SMA-4	BEVI	COWO	3.5m	COWO/HOME	4.5m	Fledged	1 host fledged, maybe 2, difficult to confirm #
SMA-5	BCHU	SACE	3m	SACE/HOME	3m	Fledged	Fledged 2 host chicks
SMA-6	WWDO	SACE	2.5m	SACE	5m	Fledged	2 host chicks fledged
SMA-7	SOSP	SACE	1.25m	COWO/SACE	3m	Fledged	Fledged 3 hosts
SMA-8	WWDO	SACE	4m	SACE	6m	Fledged	1 host fledgling confirmed
SMA-9	Unk. Spp.	GOWI	1.75m	GOWI/COWO	3m	Fledged	3 hosts fledged
SMA-10	BLGR	SACE	1.5m	COWO	3m	Fledged	Fledged 3 host chicks
SMA-11	COYE	SACE	2.5m	SACE	6m	Fledged	2 hosts fledged
SMA-12	BEVI	SACE	1.25m	SACE	5m	Predated	3 host eggs predated
**SMA-13	SOSP	SACE	1.75m	SACE	5m	Abandoned	2 BHCO eggs & 3 host eggs abandoned
SMA-14	YBCH	SACE	2m	SACE/COWO	7m	Fledged	Fledged 2 of 3 host chicks
SMA-15	BEVI	SACE	1.5m	GOWI	5m	Fledged	Fledged 3 hosts
SMA-16	YBCH	SACE	1m	SACE/GOWI	3m	Fledged	Fledged 3 hosts
SMA-17	COYE	SACE	2m	SACE	5m	Predated	2 host eggs predated
SMA-18	YBCH	SACE	3m	SACE	4m	Fledged	Fledged 3 host chicks
SMA-19	YBCH	SACE	4m	SACE	6m	Fledged	3 host chicks fledged
SMA-20	YBCH	GOWI	1m	GOWI	9m	Abandoned	2 eggs laid, then abandoned
SMA-21	YBCH	SACE	1.5m	COWO/GOWI	3m	Fledged	3 hosts fledged
SMA-22	BEVI	HOME	1.25m	COWO/HOME	3m	Fledged	2 hosts fledged, 1 egg never hatched
SMA-23	Unk. Spp.	GOWI	1m	GOWI	6m	Predated	1 egg laid, then predated
**SMA-24	COYE	SACE	3m	SACE	3.5m	Predated	2 host chicks, 1 BHCO egg all predated
SMA-25	BLGR	SACE	2m	SACE/COWO	4m	Fledged	Fledged 2 host chicks
BCB-1	WWDO	SACE	3m	SACE	4.5m	Fledged	Fledged 2 hosts
BCB-2	BEVI	SACE	1.25m	SACE/GOWI	5m	Fledged	2 hosts fledged nest
**BCB-3	COYE	SACE	1.5m	SACE	5.5m	Fledged	Fledged 2 host chicks & 1 BHCO chick
BCB-4	COYE	SACE	1m	GOWI	4m	Fledged	Fledged 3 hosts
BCB-5	ATFL	SACE	2.5m	SACE	4m	Fledged	3-4 hosts fledged
BCB-7	WWDO	SACE	2.5m	SACE/GOWI	4m	Fledged	Fledged 2 host chicks
BCB-8	YBCH	SACE	2.5m	GOWI	5m	Fledged	Fledged 3 hosts
BCB-9	YBCH	SACE	2m	GOWI/SACE	4m	Fledged	3 hosts fledged nest

BCB-10	BEVI	SACE	2.25m	SACE	5m	Fledged	2-3 hosts fledged nest
BCB-11	YBCH	SACE	2.25m	SACE	4m	Fledged	Fledged 3 host chicks
BCB-12	BEVI	SACE	2.25m	SACE/HOME	4.5m	Fledged	2-3 host chicks fledged
BCB-13	YBCH	SACE	2m	SCE/GOWI	4m	Fledged	Fledged 3 host chicks
BCB-14	BEVI	GOWI	1.75m	SACE/GOWI	5m	Abandoned	Nest abandoned, 1 host egg left
**BCB-15	YBCH	SACE	1.5m	SACE	4m	Abandoned	Nest parisitized(1BHCO egg) then abandoned
BCB-16	SOSP	SACE	2.5m	SACE/GOWI	4m	Fledged	Fledged 3-4 host chicks
BCB-17	ABTO	SACE	2.5m	SACE	5m	Predated	1 host egg laid, then predated
BCB-18	COYE	SACE	4m	SACE	6m	Fledged	Fledged 3 host chicks
BCB-19	ABTO	SACE	2m	SACE/GOWI	6m	Predated	3 host eggs all predated
BCB-20	YBCH	GOWI	2.5m	GOWI/SACE	5m	Fledged	2-4 host chicks fledged
BCB-21	YBCH	SACE	1.5m	SACE	6m	Unknown	Unable to recheck nest, had 2-3 host chicks
BCB-22	BEVI	SACE	1.5m	SACE	5m	Fledged	Fledged 3 host chicks
BCB-23	YBCH	SACE	1.5m	SACE/GOWI	4m	Fledged	Fledged 3 host chicks
BCB-24	BLGR	SACE	1.75m	COWO/SACE	5m	Predated	2 host eggs both predated
BCB-25	WIFL	SACE	4m	SACE/GOWI	7m	Fledged	Fledged 2 host chicks
BILL WILLIAMS RIVER 2003							
**BW1-1	YBCH	SACE	1.75m	GOWI/SACE	4m	Predated	3 host eggs, 1 BHCO all predated
BW1-2	YBCH	SACE	1.5m	SACE	5m	Fledged	Fledged 3 host chicks
BW1-3	YBCH	SACE	2.25m	GOWI/SACE	5m	Fledged	Fledged 3 host chicks
**BW1-4	BEVI	SACE	0.5m	SACE/COWO	7m	Predated	3 host eggs Predated, 1 BHCO egg left unhatched
BW1-5	WIFL	SACE	3m	SACE/GOWI	6m	Fledged	Fledged 3 host chicks
BW1-6	YBCH	SACE	2m	SACE	6m	Fledged	Fledged 3 host chicks
BW1-7	BLGR	SACE	2.5m	SACE/COWO	4m	Fledged	3 host chicks fledged
BW2-1	YBCH	GOWI	2m	SACE/GOWI	6m	Fledged	Fledged 2-4 host chicks
BW2-2	MODO	HOME	2m	HOME	4m	Fledged	2 host chicks fledged
BW2-3	WWDO	HOME	2.5m	HOME/SACE	5m	Fledged	Fledged 2 host chicks
BW2-4	MODO	SACE	2m	SACE/GOWI	4m	Fledged	Observed 2 fledglings
BW2-5	COYE	CATT	1m	CATT	2m	Fledged	Fledged 3 host chicks
BW3-1	ABTO	GOWI	2m	SACE/GOWI	6m	Fledged	Fledged 2 host chicks
BW3-2	WWDO	SACE	4m	SACE	5.5m	Unknown	Nest had 2 host eggs, unable to rechceck
BW3-3	BEVI	SACE	1.5m	SACE/GOWI	7m	Fledged	Fledged 3 host chicks

2004 Bill Williams and Alamo Lake nest monitoring log

Abbreviations: he = host egg, hc = host chick, be = broken egg, ce = cowbird egg, cc = cowbird chick, con. = nest under construction, dc= dead host chick, unk = unable to see nest contents, ? = unsure of nest contents, nf = nest not found, pred.= predated, do = #days old hef = host egg failed, hf = host fledglings

Bird species:

ABTO=	Abert's towhee	WWDO=	White-winged dove
BEVI=	Bell's vireo	YBCH=	Yellow-breasted chat
BLGR=	Blue grosbeak	WIFL=	Willow flycatcher
COYE=	Common yellowthroat	YEWA=	Yellow warbler
MODO=	Mourning dove	UNK.=	Unknown songbird
SOSP=	Song sparrow	BHCO=	Brown-headed cowbird

Substrate sp:

GOWI	Godding willow	SBME	Screwbean Mesquite
SACE	Saltcedar	COWO	Cottonwood
COWO	Cottonwood	CATT	Cattails
		HOME=	Honey Mesquite

**** = Nest Parasitized**

ALAMO LAKE 2004

Nest ID	Species	Substrate sp.	Nest height (m)	Overstory sp.	Substrate height (m)	Fate	Comments
SMA-1	BEVI	GOWI	2	GOWI	4	fledged	3 host chicks fledged
SMA-2	YBCH	GOWI	2.5	GOWI	6	predated	All 3 host eggs predated
SMA-3	YBCH	GOWI	2.75	GOWI	7	fledged	3 host chicks fledged
**SMA-4	BLGR	GOWI	2.5	GOWI/SACE	8	predated	All 3 host eggs; 1 BHCO egg predated
SMA-5	YBCH	SACE	1.5	SBME/SACE	5	fledged	3 host chicks fledged
SMA-6	BEVI	GOWI	2	GOWI	6	fledged	3 to 4 hosts fledged
SMA-7	COYE	GOWI	0.2	GOWI	4	predated	2 host chicks both predated
SMA-8	BLGR	COWO	2	COWO/SACE	6	fledged	3-4 Host chicks fledged when I approached
SMA-9	SOSP	SACE	4	GOWI/SACE	7	fledged	4 host chicks all fledged
SMA-10	YBCH	SACE	2	SACE/COWO	6	fledged	3 Host chicks all fledged
SMA-11	BEVI	HOME	3.5	HOME/SACE	5	fledged	Assume fledged(end of season)
SMA-12	YBCH	SACE	2.5	SACE	8	predated	Broken egg shells on ground!
SMA-13	COYE	SACE	1	SACE	5	fledged	2 host chicks fledged
SMA-14	YBCH	SACE	3	SACE	6	fledged	At least 2, maybe 3 hosts fledged
**SMA-15	YBCH	SACE	4	SACE	7	fledged	2 of 3 hosts fledged; 1 dead below nest
**SMA-16	SOSP	SACE	3	COWO	6.5	predated	3 host chicks/1 BHCO chick all predated
SMA-17	BLGR	SACE	2	COWO/SACE	7	fledged	2 host chicks fledged

**SMA-18	YBCH	SACE	2	SACE/GOWI	9	predated	Broken egg shells in and below nest
SMA-19	YEWA	GOWI	2	GOWI	4.5	fledged	4 host chicks all fledged
**SMA-20	ABTO	COWO	2.3	COWO	7	fledged	2 of 3 hosts dead, 1 fledged
**SMA-21	BLGR	SACE	3	SBME/SACE	6	abandoned	1 host egg, 1 BHCO laid/abandoned
SMA-22	YBCH	SACE	1.5	SACE/GOWI	5	fledged	3 Host chicks fledged
SMA-23	YBCH	SACE	2	GOWI/SACE	4	fledged	3 Host chicks fledged
**SMA-24	BEVI	SACE	2	SACE	5	abandoned	2 BHCO Eggs laid, nest abandoned
SMA-25	YBCH	SACE	1.5	SACE/GOWI	4.5	fledged	4 host chicks all fledged
BCB-1	BLGR	SACE	2.5	SACE	3	fledged	2 host chicks fledged
BCB-2	ABTO	SACE	1.5	SACE/GOWI	8	fledged	2, maybe 3 host chicks fledged
**BCB-3	BEVI	SACE	1.5	SACE	5	fledged	2 of 3 hosts fledged & 1 BHCO fledged
BCB-4	YBCH	SACE	1.3	SACE	6	fledged	3 host chicks all fledged
BCB-5	WIFL	SACE	4	SACE	5	abandoned	1 host egg left abandoned
BCB-6	BEVI	SACE	1.5	SACE	4	fledged	3 host chicks all fledged
BCB-7	YBCH	SACE	1.2	SACE/GOWI	4	abandoned	Nest abandoned, only broken egg shells remaining
BCB-8	YBCH	SACE	2	SACE	5	fledged	3 host chicks all fledged
**BCB-9	YBCH	SACE	1	SACE	4	fledged	2 of 4 host chicks, 1 BHCO chick fledged
BCB-10	YBCH	SACE	3	COWO/SACE	6	fledged	3 host chicks all fledged
BCB-11	YBCH	SACE	1	SACE	3	abandoned	Still 2 eggs in nest - Abandoned
BCA-1	WIFL	SACE	3	GOWI	7	predated	2 eggs both predated
BCA-2	YBCH	SACE	2	SACE	5	fledged	3 hosts chicks fledged
BCA-3	BEVI	SACE	1.5	SACE	4	predated	1 egg predated
BCA-4	BEVI	SACE	1	SACE/SBME	3	fledged	2 hosts fledged nest
BCA-5	YBCH	SACE	2	SACE	4	fledged	3 hosts fledged nest
BCA-6	WIFL	SACE	4	GOWI	10	fledged	3 hosts fledged nest
BCA-7	BEVI	SACE	3.5	SACE/GOWI	4	predated	All 3 host chicks predated, nest damaged
**BCA-8	BEVI	SACE	1.5	SACE/GOWI	10	fledged	1 of 3 hosts fledged & 1 BHCO fledged
BCA-9	YBCH	SACE	2.7	SACE	4	predated	2 eggs laid, then were predated
BCA-10	YEWA	SACE	3	SACE/GOWI	7	fledged	3 hosts fledged nest
BCA-11	YBCH	SACE	3	SACE	7	fledged	2 hosts fledged nest
BCA-12	WIFL	SACE	4	SACE	7	predated	2 host eggs laid, then found broken shells on the ground
BCA-13	SOSP	SACE	2.5	HOME/SACE	8.5	fledged	2 hosts fledged nest
BCA-14	BEVI	SACE	2	SACE	6	predated	2 eggs both predated
**BCA-15	WIFL	SACE	5	SACE	10	predated	Predated. Some pieces of eggshells found
BCA-16	WIFL	SACE	7	SACE	11	fledged	3 host chicks fledged nest
BCA-17	WIFL	SACE	4	SACE	7	abandoned	Nest abandoned with 1 egg left
BCA-18	WIFL	SACE	5	SACE	7	fledged	2 hosts fledged nest
**BCA-19	BEVI	GOWI	1	GOWI	6	predated	Predated, all 3 host eggs now gone
**BCA-20	BEVI	SACE	1.75	GOWI/SACE	4	fledged	2 hosts fledged, 1 dead hc on ground, & 1 BHCO fledged
BCA-21	YBCH	SACE	2	SACE	5	abandoned	Nest abandoned, 3 eggs left in nest.

BCA-22	BEVI	SACE	2	SACE	7	fledged	4 hosts all fledged nest
BCA-23	MODO	SACE	2.5	SACE	8.5	predated	2 eggs laid, then were predated
BCA-24	WIFL	SACE	6.5	SACE	11	fledged	Saw 2 nestlings flee nest, heard 1 other.
BCA-25	YBCH	SACE	2.2	SACE	5	fledged	3 hosts all fledged nest
BCA-26	YBCH	SACE	2.5	SACE/GOWI	9	predated	All 3 host chicks predated, vocal adult near nest
BCA-27	YBCH	SACE	4	SACE	6	abandoned	Nest abandoned, 2 eggs still in nest
BCA-28	WIFL	SACE	5	SACE/GOWI	13	fledged	3-4 host chicks fledged
BCA-29	WWDO	GOWI	2.3	GOWI	9	Fledged	All 4 host chicks fledged
BILL WILLIAMS RIVER 2004							
NP3-1	MODO	SACE	4	SACE	6	predated	2 eggs both predated
NP3-2	BEVI	SACE	3	SACE	7	fledged	3 host chicks all fledged
NP3-3	VERD	PAVE	1.3	PAVE	2	fledged	Could not see in nest, but heard fledglings nearby
NP3-4	SOSP	SACE	2	SACE	5	fledged	3 hosts fledged nest
NP3-5	COYE	SACE	1.75	SACE	5	predated	eggs predated, some damage to nest
**NP3-6	BEVI	SACE	1.5	SACE/COWO	6	predated	egg shell piece on ground, all 3 eggs damaged
NP3-7	VERD	PAVE	2	PAVE	5	fledged	Cannot see in nest, vocal nestlings heard
NP2-1	YBCH	SACE	2.5	SACE	5	fledged	3 host chicks fledged
**NP2-2	YBCH	GOWI	2	GOWI	6	predated	All eggs gone, signs of predation
NP2-3	COYE	CATT	0.75	CATT/GOWI	5	predated	Nest damaged and all eggs missing
NP2-4	SOSP	SACE	2.7	GOWI/SACE	4.5	fledged	4 hosts all fledged
NP2-5	BEVI	SACE	1.3	COWO/SACE	4	fledged	4 hosts all fledged
NP1-1	YEWA	SACE	3	SACE/GOWI	8	predated	2 eggs now gone-predated
NP1-2	YBCH	SACE	1.5	SACE	4	fledged	3 host chicks fledged
NP1-3	YBCH	SACE	4	SACE/GOWI	5	fledged	Fledged 2-4 hosts. Too difficult to see in nest.
NP1-4	YBCH	SACE	1.5	SACE/GOWI	8.5	fledged	3 hosts fledged nest
NP1-5	YBCH	SACE	2.5	SACE/GOWI	10	predated	Vocal adult near nest, a few egg shell pieces found.
NP1-6	YBCH	SACE	3	SACE	5	fledged	3 hosts all fledged
NP1-7	BEVI	GOWI	1.5	GOWI	4	predated	All 3 eggs predated
NP1-8	YBCH	GOWI	2.8	GOWI	10	fledged	assume fledged, end of season.
NP1-9	YBCH	SACE	2.5	SACE	4	predated	Nest had 1 egg, now is empty
NP1-10	YBCH	SACE	2.7	SACE	8	fledged	3 hosts all fledged
NP1-11	ABTO	GOWI	2.5	GOWI	5	fledged	assume fledged, end of season. Were 2 host chicks still
NP1-12	SOSP	SACE	4	SACE	4	predated	3-4 eggs were all predated
**NP1-13	YBCH	SACE	1	SACE/GOWI	10	fledged	2 out of 3 hosts fledged, I died; I BHCO fledged also
NP1-14	YBCH	SACE	2.5	SACE/GOWI	9	fledged	3 host chicks fledged
**NP1-15	YBCH	SACE	2.5	SACE/GOWI	9	predated	3 host eggs, I BHCO egg all predated.
NP1-16	YBCH	SACE	1.5	SACE	1.5	fledged	3 hosts chicks fledged
NP1-17	WWDO	SACE	2	SACE	6	fledged	2 hosts fledged

2005 Bill Williams and Alamo Lake nest monitoring log

Bird species: ABTO = Abert's towhee
ATFL = Ash-Throated flycather
BEVI = Bell's vireo
BLGR = Blue Grosbeak
COYE = Common yellowthroat
SOSP = Song sparrow
YBCH = Yellow-breasted chat
WIFL = Willow Flycather
YEWA = Yellow warbler

Substrate sp.: GOWI = GOODING WILLOW - *Salix gooddingii*
COWI = COYOTE WILLOW -*Salix exigua*
SACE = SALT CEDAR -*Tamarisk spp.*
SBME = SCREWBEAN MESQUITE - *Prosopis pubescens*
VEME = VELVET MESQUITE *Prosopis pubescens*
COWO = COTTONWOOD - *Populus fremontii*
CATT = CATTAILS - *Typhaceae spp.*

* = Parasitized Nest
BC = Brown's Crossing
BW-1= Bill Williams Nest Plot 1
SMA = Santa Maria

Nest ID (plot)	Species	Nest height (m)	Substrate sp.	Overstory sp.	Overstory height (m)	Fate	Comments
BC-N1	YBCH	1.75m	SACE	GOWI	3m	Fledged	Fledged 3 hosts
BC-N2	YBCH	2m	SACE	GOWI	4m	Fledged	Fledged 3 hosts
BC-N3	WIFL	2.25m	SACE	GOWI	5-6m	Fledged	2 of 3 fledged
BC-N4	BEVI	1.25m	GOWI	GOWI	4m	Fledged	Fledged 4 hosts
BC-N5	BEVI	2m	GOWI	GOWI	7m	Fledged	Fledged 3 hosts
BC-N6	BEVI	1.25m	SACE	SACE	3.5m	Fledged	Fledged 3 hosts
BC-N7	YBCH	2m	SACE	GOWI	4.5m	Fledged	Fledged 3 hosts
BC-N8	YEWA	4.5m	SACE	GOWI	6.5m	Fledged	Fledged 4 hosts
BC-N9	YBCH	3.5m	GOWI	GOWI	5m	Fledged	Fledged 2 of 3 hosts
BC-N10	WIFL	6-7m	GOWI	GOWI	8m	Fledged	Nest to high to determine # fledged
BC-N11	BEVI	1.5m	GOWI	GOWI	5m	Fledged	Fledged 3 hosts
BC-N12	WIFL	3m	SACE	GOWI	5-8m	Predated	3 hosts eggs all predated
BC-N13	YEWA	3m	SACE	GOWI	6m	Fledged	Fledged 4 hosts
BC-N14	WIFL	3m	SACE	SACE/GOWI	2m/8m	Fledged	Fledged 3 hosts
BC-N15	WIFL	2m	GOWI	GOWI	4m	Nest Detroyed	Nest detroyed by high wind; 4 eggs failed
BC-N16	WIFL	1m	GOWI	GOWI	3-10m	Fledged	Fledged 3 hosts
BC-N17	YBCH	2.5m	GOWI	GOWI	3.5m	Predated	Nest Predated with 1 host egg
* BC-N18	BEVI	1m	GOWI	GOWI	5m	Parasitized/Fledged	Fledged 1 host, and 1 BHCO
BC-N19	ATFL	2.5m	SACE	SACE	3m	Fledged	Fledged 4 hosts
BC-N20	WIFL	3m	SACE	GOWI	4.5m	Fledged	Fledged 3 hosts
BC -N21	COYE	1m	GOWI	GOWI/SACE	2m	Fledged	Fledged 4 hosts
BC-N22	YEWA	3m	GOWI	GOWI	5-9m	Fledged	Fledged 4 hosts
BC-N23	WIFL	2.25m	GOWI	GOWI	5-7m	Fledged	Fledged 3 hosts
BC-N24	WIFL	2m	SACE	GOWI	6-7m	Predated	Nest Predated with 1 host egg; 1 host nestling
BC-N25	BEVI	1.25m	SACE	GOWI/SACE	4m	Predated	Nest predated with 4 host eggs.
SMA-N1	BLGR	1.75m	SACE	SACE	3.5m	Fledged	Fledged 2 hosts
SMA-N2	SOSP	1.75m	SACE	GOWI/COWO	5m	Predated	Nest Predated with 3 host eggs
* SMA-N3	ABTO	2.2m	SACE	GOWI	4.5m	Fledged	2 hosts fledged, and 1 BHCO fledged
SMA-N4	YBCH	2m	SACE	SACE/COWO	5m	Fledged	Fledged 3 hosts

SMA-N5	COYE	1m	COWI	COWI/COWO	2-4m	Fledged	Fledged 4 hosts
SMA-N6	SOSP	1.25m	COWI	GOWI	4.5m	Fledged	Fledged 4 hosts
SMA-N7	YEWA	2m	SACE	GOWI/COWO	6m	Fledged	Fledged 4 hosts
SMA-N8	ABTO	2.75m	GOWI	GOWI	5m	Fledged	Fledged 3 hosts
SMA-N9	BLGR	3m	GOWI	GOWI	5.5m	Fledged	Fledged 2 hosts
* SMA-N10	YBCH	2.5m	SACE	GOWI/SACE	4m	Parasitized/Fledged	Predated; 3 host eggs and 1 BHCO egg failed
SMA-N11	BEVI	1.5m	GOWI	GOWI/SACE	3-5m	Fledged	Fledged 3 hosts
SMA-N12	ABTO	2m	SACE	SACE/COWO	5m	Fledged	Fledged 3 hosts
SMA-N13	YBCH	3m	GOWI	GOWI/SACE	5-6m	Predated	4 host eggs predated
SMA-N14	BEVI	1m	SACE	SACE/GOWI	3-5m	Fledged	Fledged 3 hosts
SMA-N15	YBCH	2m	SACE	SACE/COWO	4m	Fledged	Fledged 3 hosts
SMA-N16	YBCH	1.75m	GOWI	GOWI	5m	Fledged	Fledged 4 hosts
SMA-N17	SOSP	2m	SACE	SACE/GOWI	4.5m	PREDATED	3 host nestling's,1 BHCO predated
SMA-N18	ABTO	2.5m	SACE	SACE/GOWI	5m	Fledged	3 hosts fledged
SMA-N19	YBCH	2m	SACE	SACE/GOWI	4-5m	Fledged	Fledged 3 hosts
SMA-N20	YBCH	1.5m	SACE	SACE/GOWI	5m	Fledged	4 hosts fledged
SMA-N21	BEVI	1m	GOWI	GOWI/SACE	3-5m	Fledged	Fledged 3 hosts
BILL WILLIAMS RIVER NWR 2005							
NP1-N1	ABTO	3m	GOWI	GOWI/COWO	4-7m	Fledged	3 hosts fledged
NP1-N2	SOSP	2m	SACE	GOWI	6m	Fledged	Fledged 4 hosts
NP1-N3	YBCH	4m	GOWI	GOWI/SACE	5.5m	Fledged	4 hosts fledged
NP1-N4	SOSP	2.2m	GOWI	GOWI	6m	Predated	3 host eggs predated
* NP1-N5	YBCH	3m	SACE	SACE/GOWI	7m	fledged 1	1 of 2 hc's and 1 BHCO fledged
NP1-N6	YBCH	2m	SACE	BLWI	6m	Predated	3 host eggs predated
NP1-N7	BEVI	1m	GOWI	GOWI	5m	Fledged	Fledged 3 hosts
NP1-N8	BEVI	3m	SACE	SACE/GOWI	6.5m	Fledged	Fledged 4 hosts
NP1-N9	YBCH	2.5m	SACE	SACE/GOWI	6m	Fledged	3 hosts fledged
NP1-N10	BEVI	1.5m	SACE	SACE	4m	Parasitized/Predated	3 host eggs/1BHCO egg Predated
NP1-N11	YBCH	2m	SACE	SACE/GOWI	6.5m	Fledged	Fledged 4 hosts
NP1-N12	SOSP	2.5m	SACE	SACE	5m	Fledged	4 hosts fledged
* NP1-N13	BLGR	3m	GOWI	GOWI	4-6m	Abandoned	1 he, 1 BHCO egg abandoned. No adults present
NP1-N14	YBCH	2.25m	SACE	SACE/GOWI	4m	Fledged	Fledged 3 hosts
NP1-N15	BEVI	1.25m	GOWI	GOWI/SACE	4-5m	Fledged	Fledged 4 hosts
NP1-N16	YBCH	2.25m	SACE	SACE/GOWI	5m	Fledged	4 hosts fledged
NP1-N17	YBCH	2m	GOWI	GOWI/SACE	4-5m	Predated	3 host eggs predated

APPENDIX B

POINT COUNT DATA
ALAMO LAKE SWA 1999-2004

Santa Maria River (SAM01)	May 1, 99		May 18, 99		June 15,99	
5 Minute point count (<60m)						
BHCO host species						
Host species detected	no. birds	Mean	no. birds	Mean	no. birds	Mean
Abert's towhee	1	0.05	3	0.15	9	0.45
Brown-crested flycatcher	1	0.05	2	0.1	3	0.15
Bell's vireo	9	0.45	18	0.9	18	0.9
Bewick's wren	1	0.05	0	0	0	0
Brown-headed cowbird F	**0**	**0**	**8**	**0.4**	**1**	**0.05**
Brown-headed cowbird M	2	0.1	5	0.25	2	0.1
Brown-headed cowbird T	**1**	**0.05**	**13**	**0.65**	**3**	**0.15**
Black-headed grosbeak	1	0.05	0	0	0	0
Blue grosbeak	0	0	7	0.35	1	0.05
Black phoebe	1	0.05	0	0	0	0
Black-tailed gnatcatcher	0	0	0	0	1	0.05
Bullock's oriole	0	0	0	0	1	0.05
Cassin's kingbird	0	0	0	0	1	0.05
Common ground dove	0	0	1	0.05	0	0
Common yellowthroat	3	0.15	5	0.25	2	0.1
House finch	0	0	3	0.15	8	0.4
Lesser goldfinch	9	0.45	11	0.55	3	0.15
Lucy's warbler	1	0.05	2	0.1	3	0.15
Mourning dove	0	0	1	0.05	1	0.05
Phainopepla	1	0.05	1	0.05	0	0
Red-winged blackbird	2	0.1	0	0	1	0.05
Song sparrow	2	0.1	8	0.4	0	0
Summer tanager	4	0.2	5	0.25	4	0.2
Unidentified songbird	0	0	2	0.1	1	0.05
Vermilion flycatcher	2	0.1	2	0.1	2	0.1
Verdin	1	0.05	1	0.05	1	0.05
White-breasted nuthatch	0	0	1	0.05	0	0
Western kingbird	3	0.15	2	0.1	2	0.1
Wilson's warbler	1	0.05	0	0	0	0
Western wood pewee	0	0	1	0.05	0	0
Yellow-breasted chat	6	0.3	23	1.15	17	0.85
Yellow warbler	0	0	5	0.25	2	0.1
Point count summary						
Total # host birds	49		107		81	
Total # host species	19		21		20	
Mean # host birds (s.d.)	2.45 (1.79)		5.35 (2.50)		4.05 (2.16)	
Mean # host species (s.d.)	2.35 (1.63)		3.90 (1.80)		3.40 (1.43)	
Min/Max # birds per point	0 - 7		1 - 9		1- 10	
Min/Max # species per point	0 - 7		1 - 8		1 - 6	
BHCO F:# hosts	**0**		**0.075**		**0.012**	
BHCO: # hosts	0.041		0.121		0.037	
BHCO F freq	0		0.3		0.05	
BHCO freq	0.05		0.35		0.05	

Santa Maria River (SAM01)	Apr. 26, 00		May 24, 00		June 14,00	
5 Minute point count (<60m)						
BHCO host species						
Host species detected	no. birds	Mean	no. birds	Mean	no. birds	Mean
Abert's towhee	0	0	4	0.2	16	0.8
Ash-throated flycatcher	4	0.2	7	0.35	6	0.3
Brown-crested flycatcher	1	0.05	4	0.2	2	0.1
Bell's vireo	14	0.7	21	1.05	11	0.55
Bewick's wren	2	0.1	0	0	1	0.05
Brown-headed cowbird F	**0**	0	**0**	0	**2**	0.1
Brown-headed cowbird M	0	0	1	0.05	0	0
Brown-headed cowbird T	**0**	0	**1**	0.05	**2**	0.1
Blue grosbeak	0	0	0	0	3	0.15
Black-tailed gnatcatcher	0	0	0	0	3	0.15
Bullock's oriole	0	0	0	0	3	0.15
Chipping sparrow	2	0.1	0	0	0	0
Common ground dove	0	0	1	0.05	0	0
Common yellowthroat	0	0	2	0.1	4	0.2
House finch	0	0	1	0.05	0	0
Lucy's warbler	2	0.1	4	0.2	2	0.1
MacGillviray's warbler	0	0	2	0.1	0	0
Mourning dove	3	0.15	0	0	4	0.2
Northern cardinal	2	0.1	0	0	3	0.15
Red-winged blackbird	2	0.1	14	0.7	7	0.35
Song sparrow	4	0.2	3	0.15	3	0.15
Summer tanager	7	0.35	1	0.05	3	0.15
Unidentified songbird	2	0.1	2	0.1	0	0
Unidentified warbler	1	0.05	0	0	0	0
Vermilion flycatcher	3	0.15	1	0.05	4	0.2
Verdin	1	0.05	0	0	0	0
White-breasted nuthatch	1	0.05	0	0	0	0
Western kingbird	0	0	1	0.05	0	0
Western wood pewee	0	0	1	0.05	0	0
Yellow-breasted chat	8	0.4	21	1.05	29	1.45
Yellow warbler	5	0.25	4	0.2	1	0.05
Point count summary						
Total # host birds	64		94		105	
Total # host species	18		18		18	
Mean # host birds (s.d.)	3.2 (1.94)		4.7 (2.79)		5.25 (2.81)	
Mean # host species (s.d.)	2.65 (1.66)		3.3 (1.34)		3.65 (1.57)	
Min/Max # birds per point	0 - 6		1 - 13		0 - 10	
Min/Max # species per point	0 - 5		1 - 5		0 - 6	
BHCO F:# hosts	**0**		**0**		**0.02**	
BHCO: # hosts	0		0.01		0.02	
BHCO F freq	0		0		0.01	
BHCO freq	0		0.01		0.01	

SANTA MARIA RIVER 5 MIN POINT COUNT	YEAR 2001								
DETECTIONS WITHIN 60 METERS	8-May n=20			23-May n=20			13-Jun n=20		
	# found	Mean	sd	# found	Mean	sd	# found	Mean	sd
Abert's towhee	4	0.2	0.52	8	0.4	0.60	26	1.30	1.17
Ash-throated flycatcher	3	0.15	0.37	7	0.35	0.49	4	0.20	0.41
Bell's vireo	16	0.8	0.77	21	1.05	0.69	15	0.75	0.79
Black-chinned hummingbird	2	0.1	0.31	2	0.1	0.31	3	0.15	0.37
Black-tailed gnatcatcher	0	0	0.00	1	0.05	0.22	1	0.05	0.22
Blue grosbeak	8	0.4	0.60	5	0.25	0.55	9	0.45	0.60
Brown-crested flycatcher	3	0.15	0.67	4	0.2	0.52	5	0.25	0.55
Brown-headed cowbird	**1**	**0.05**	**0.22**	**7**	**0.35**	**0.99**	**0**	**0.00**	**0.00**
Brown-headed cowbird F	**1**	**0.05**	**0.22**	**3**	**0.15**	**0.37**	**0**	**0.00**	**0.00**
Brown-headed cowbird M	0	0	0.00	4	0.2	0.70	0	0.00	0.00
Common nighthawk	0	0	0.00	1	0.05	0.22	12	0.60	0.88
Common yellowthroat	6	0.3	0.73	3	0.15	0.37	5	0.25	0.55
Gambel's quail	0	0	0.00	0	0	0.00	2	0.10	0.31
House finch	0	0	0.00	1	0.05	0.22	0	0.00	0.00
Killdeer	3	0.15	0.49	1	0.05	0.22	2	0.10	0.31
Lesser goldfinch	0	0	0.00	4	0.2	0.52	0	0.00	0.00
Lucy's warbler	2	0.1	0.31	2	0.1	0.31	1	0.05	0.22
Mourning dove	8	0.4	0.94	15	0.75	1.25	12	0.60	1.23
Northern cardinal	3	0.15	0.49	0	0	0.00	0	0.00	0.00
Northern rough-winged swallow	2	0.1	0.45	0	0	0.00	3	0.15	0.67
Red-winged blackbird	1	0.05	0.22	0	0	0.00	0	0.00	0.00
Say's phoebe	0	0	0.00	1	0.05	0.22	0	0.00	0.00
Song sparrow	6	0.3	0.66	1	0.05	0.22	5	0.25	0.64
Spotted towhee	0	0	0.00	0	0	0.00	0	0.00	0.00
Summer tanager	1	0.05	0.22	1	0.05	0.22	7	0.35	0.59
Tree swallow	0	0	0.00	0	0	0.00	1	0.05	0.22
Unidentified songbird	1	0.05	0.22	2	0.1	0.31	2	0.10	0.31
Verdin	1	0.05	0.22	1	0.05	0.22	0	0.00	0.00
Vermilion flycatcher	0	0	0.00	1	0.05	0.22	0	0.00	0.00
White-winged dove	5	0.25	0.44	4	0.2	0.52	2	0.10	0.31
Yellow warbler	9	0.45	0.76	8	0.4	0.60	5	0.25	0.44
Yellow-breasted chat	22	1.1	0.85	32	1.6	1.14	32	1.60	1.19
NUMBER OF SPECIES	21	4.00	1.78	24	4.7	1.38	21	5.20	1.85
NUMBER OF BIRDS	107	5.35	2.64	133	6.65	2.23	154	7.70	3.45
NUMBER OF NEOTROPIC SPECIES	11	2.90	1.45	14	3.4	1.05	13	3.45	1.28
NUMBER OF NEOTROPIC BIRDS	77	3.85	2.21	94	4.7	1.38	101	5.05	1.99
NUMBER OF RIPARIAN OBLIGATE SPECIES	10	2.75	1.29	10	2.7	1.17	9	2.85	1.18
NUMBER OF RIPARIAN OBLIGATE BIRDS	73	3.65	2.37	78	3.9	1.77	84	4.20	1.82
NUMBER OF BHCO HOST SPECIES	15	3.10	1.62	17	3.55	1.57	18	4.00	1.56
NUMBER OF BHCO HOST BIRDS	92	4.60	2.44	106	5.3	2.00	126	6.30	3.03
RATIO - # BHCO FEMALES:# HOSTS	**0.01**			**0.03**			**0**		
SPECIES RICHNESS	21.00			24.00			21.00		
SIMPSON'S INDEX OF DIVERSITY	0.90			0.89			0.89		
SHANNON-WIENER INDEX	2.64			2.57			2.58		
SPECIES EVENNESS	0.87			0.81			0.85		

Santa Maria River Point Count 5 minute point counts Detections within 60 meters Year 2002	Survey 1 14-May			Survey 2 29-May			Survey 3 18-Jun		
	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
Abert's towhee*	8	0.40	0.75	2	0.10	0.31	9	0.45	0.60
American goldfinch*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Ash-throated flycatcher	10	0.50	0.61	3	0.15	0.37	4	0.20	0.41
Brown-crested flycatcher	2	0.10	0.45	4	0.20	0.52	5	0.25	0.64
Black-chinned hummingbird	2	0.10	0.31	4	0.20	0.41	0	0.00	0.00
Bell's vireo*	11	0.55	0.69	12	0.60	0.50	15	0.75	0.72
Bewick's wren*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Brown-headed cowbird	0	0.00	0.00	2	0.10	0.31	2	0.10	0.45
Black-headed grosbeak*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Blue grosbeak*	4	0.20	0.52	8	0.40	0.75	3	0.15	0.49
Black-tailed gnatcatcher*	3	0.15	0.37	0	0.00	0.00	1	0.05	0.22
Bullock's oriole*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Common yellowthroat*	2	0.10	0.31	5	0.25	0.55	4	0.20	0.52
Gambel's quail	1	0.05	0.22	2	0.10	0.45	0	0.00	0.00
House finch*	3	0.15	0.49	0	0.00	0.00	2	0.10	0.45
Lesser goldfinch*	0	0.00	0.00	0	0.00	0.00	2	0.10	0.45
Lesser nighthawk	1	0.05	0.22	2	0.10	0.31	1	0.05	0.22
Lucy's warbler*	0	0.00	0.00	3	0.15	0.37	1	0.05	0.22
Mourning dove*	5	0.25	0.55	0	0.00	0.00	5	0.25	0.72
Phainopepla*	2	0.10	0.31	0	0.00	0.00	0	0.00	0.00
Pacific-slope flycatcher*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Ruby-crowned kinglet*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Red-winged blackbird*	1	0.05	0.22	3	0.15	0.49	6	0.30	1.13
Song sparrow*	3	0.15	0.67	1	0.05	0.22	1	0.05	0.22
Summer tanager*	1	0.05	0.22	2	0.10	0.31	5	0.25	0.55
Unidentified songbird	8	0.40	0.68	2	0.10	0.31	1	0.05	0.22
Vermilion flycatcher*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Verdin*	1	0.05	0.22	1	0.05	0.22	2	0.10	0.45
Warbling vireo*	2	0.10	0.31	0	0.00	0.00	0	0.00	0.00
Western kingbird*	0	0.00	0.00	4	0.20	0.89	0	0.00	0.00
Wilson's warbler*	4	0.20	0.52	0	0.00	0.00	0	0.00	0.00
White-winged dove	4	0.20	0.41	1	0.05	0.22	2	0.10	0.31
Yellow-breasted chat*	16	0.80	0.89	15	0.75	0.85	17	0.85	0.75
Yellow warbler*	3	0.15	0.37	3	0.15	0.37	1	0.05	0.22
TOTAL SPECIES	30	4.25	2.45	20	3.30	1.59	21	3.30	1.56
TOTAL BIRDS	104	5.20	3.35	79	3.95	2.35	89	4.45	2.91
NEOTROPICAL MIGRANT SPECIES	18	2.90	1.89	13	2.80	1.28	12	2.30	1.30
NEOTROPICAL MIGRANT BIRDS	71	3.55	2.68	67	3.35	1.95	59	2.95	1.96
RIPARIAN OBLIGATE SPECIES	10	1.65	1.35	9	2.25	1.16	9	2.00	1.21
RIPARIAN OBLIGATE BIRDS	44	2.20	2.14	53	2.65	1.60	52	2.60	1.79
INVASIVE SPECIES	0	0.00	0.00	1	0.10	0.31	1	0.05	0.22
INVASIVE BIRDS	0	0.00	0.00	2	0.10	0.31	2	0.10	0.45
BHCO HOSTS*	76			59			74		
Brown-headed cowbird (female)	0	0.00	0.00	0	0.00	0.00	2	0.10	0.45
RATIO of BHCO FEMALES:HOSTS	0			0			0.03		

Santa Maria River Point Count 5 minute point counts Detections within 60 meters Year 2003	Survey 1 14-May			Survey 2 29-May			Survey 3 18-Jun		
	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
Abert's towhee*	9	0.45	0.76	6	0.30	0.57	22	1.10	1.29
American robin*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Ash-throated flycatcher	9	0.45	0.69	4	0.20	0.41	10	0.50	0.76
Brown-crested flycatcher	0	0.00	0.00	3	0.15	0.37	2	0.10	0.45
Black-chinned hummingbird	3	0.15	0.37	2	0.10	0.31	2	0.10	0.31
Bell's vireo*	12	0.60	0.88	18	0.90	0.97	14	0.70	0.66
Bewick's wren*	3	0.15	0.37	0	0.00	0.00	1	0.05	0.22
Brown-headed cowbird	2	0.10	0.31	2	0.10	0.31	4	0.20	0.41
Blue grosbeak*	5	0.25	0.44	3	0.15	0.37	7	0.35	0.59
Black-tailed gnatcatcher*	4	0.20	0.41	6	0.30	0.47	1	0.05	0.22
Bullock's oriole*	1	0.05	0.22	0	0.00	0.00	3	0.15	0.37
Common yellowthroat*	8	0.40	0.68	9	0.45	0.83	7	0.35	0.59
Gambel's quail	3	0.15	0.37	6	0.30	0.57	5	0.25	0.64
House finch*	2	0.10	0.31	2	0.10	0.31	4	0.20	0.41
Killdeer	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Ladder-backed woodpecker	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Lesser goldfinch*	4	0.20	0.89	4	0.20	0.70	0	0.00	0.00
Lesser nighthawk	0	0.00	0.00	4	0.20	0.89	7	0.35	0.75
Lucy's warbler*	4	0.20	0.62	1	0.05	0.22	6	0.30	0.47
Mourning dove*	9	0.45	0.69	18	0.90	1.80	7	0.35	0.59
Northern cardinal*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Olive-sided flycatcher*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Phainopepla*	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Red-winged blackbird*	5	0.25	0.79	5	0.25	0.64	2	0.10	0.45
Song sparrow*	4	0.20	0.41	3	0.15	0.49	1	0.05	0.22
Summer tanager*	0	0.00	0.00	1	0.05	0.22	1	0.05	0.22
Unidentified songbird	0	0.00	0.00	2	0.10	0.45	0	0.00	0.00
Vermillion flycatcher*	1	0.05	0.22	1	0.05	0.22	2	0.10	0.45
Virgina rail	0	0.00	0.00	1	0.05	0.22	1	0.05	0.22
Wilson's warbler*	2	0.10	0.31	0	0.00	0.00	0	0.00	0.00
White-winged dove	1	0.05	0.22	2	0.10	0.31	3	0.15	0.49
Yellow-breasted chat*	22	1.10	0.85	24	1.20	1.01	25	1.25	1.02
Yellow warbler*	9	0.45	0.83	5	0.25	0.44	0	0.00	0.00
Yellow-headed blackbird*	2	0.10	0.45	0	0.00	0.00	0	0.00	0.00
TOTAL SPECIES	26	4.75	2.20	26	4.95	1.43	23	5.25	1.80
TOTAL BIRDS	127	6.35	3.53	134	6.75	3.02	139	6.95	2.37
NEOTROPICAL MIGRANT SPECIES	14	2.95	1.39	14	2.95	1.47	12	3.30	1.38
NEOTROPICAL MIGRANT BIRDS	83	4.15	2.70	81	4.05	2.65	86	4.30	1.75
RIPARIAN OBLIGATE SPECIES	8	2.35	1.35	9	2.50	1.36	9	2.55	1.10
RIPARIAN OBLIGATE BIRDS	65	3.25	2.63	67	3.35	2.18	66	3.30	1.53
INVASIVE SPECIES	1	0.10	0.31	1	0.10	0.31	1	0.20	0.41
INVASIVE BIRDS	2	0.10	0.31	2	0.10	0.31	4	0.20	0.41
BHCO HOSTS*	109			107			103		
Brown-headed cowbird (female)	1	0.05	0.22	1	0.05	0.22	3	0.15	0.37
RATIO of BHCO FEMALES:HOSTS	0.01			0.01			0.03		

Santa Maria River Point Count 5 minute point counts Detections within 60 meters Year 2004	Survey 1 18-May			Survey 2 2-Jun			Survey 3 16-Jun		
	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
Abert's towhee*	10	0.5	0.69	6	0.3	0.57	11	0.55	0.69
Ash-throated flycatcher	9	0.45	0.69	10	0.5	0.76	13	0.65	0.88
Brown-crested flycatcher	0	0	0.00	0	0	0.00	3	0.15	0.49
Black-chinned hummingbird	2	0.1	0.31	0	0	0.00	1	0.05	0.22
Bell's vireo*	13	0.65	0.59	18	0.9	0.91	12	0.6	0.60
Brown-headed cowbird	5	0.25	0.55	6	0.3	0.57	6	0.3	0.73
Blue grosbeak*	4	0.2	0.41	1	0.05	0.22	3	0.15	0.49
Black-tailed gnatcatcher*	1	0.05	0.22	1	0.05	0.22	0	0	0.00
Cassin's kingbird*	1	0.05	0.22	0	0	0.00	0	0	0.00
Cooper's hawk	1	0.05	0.22	0	0	0.00	0	0	0.00
Common raven	2	0.1	0.45	0	0	0.00	0	0	0.00
Common yellowthroat*	2	0.1	0.31	3	0.15	0.37	6	0.3	0.47
Gambel's quail	26	1.3	5.58	1	0.05	0.22	0	0	0.00
House finch*	0	0	0.00	1	0.05	0.22	0	0	0.00
Ladder-backed woodpecker	1	0.05	0.22	0	0	0.00	3	0.15	0.37
Lesser goldfinch*	0	0	0.00	2	0.1	0.45	0	0	0.00
Lesser nighthawk	0	0	0.00	1	0.05	0.22	12	0.6	1.43
Lucy's warbler*	3	0.15	0.37	3	0.15	0.37	10	0.5	0.89
Mourning dove	3	0.15	0.37	3	0.15	0.37	0	0	0.00
Olive-sided flycatcher*	1	0.05	0.22	0	0	0.00	0	0	0.00
Pacific-slope flycatcher*	2	0.1	0.31	1	0.05	0.22	0	0	0.00
Red-winged blackbird*	1	0.05	0.22	2	0.1	0.45	2	0.1	0.45
Say's phoebe*	1	0.05	0.22	0	0	0.00	0	0	0.00
Song sparrow*	2	0.1	0.45	3	0.15	0.49	0	0	0.00
Summer tanager*	1	0.05	0.22	4	0.2	0.70	2	0.1	0.31
Unidenified songbird	3	0.15	0.49	0	0	0.00	1	0.05	0.22
Vermilion flycatcher*	2	0.1	0.45	3	0.15	0.49	2	0.1	0.45
Virginia rail	1	0.05	0.22	0	0	0.00	0	0	0.00
Western kingbird*	0	0	0.00	0	0	0.00	1	0.05	0.22
Wilson's warbler*	1	0.05	0.22	1	0.05	0.22	0	0	0.00
White-winged dove	6	0.3	0.57	6	0.3	0.47	5	0.25	0.44
Yellow-breasted chat*	24	1.2	1.01	23	1.15	0.88	27	1.35	1.04
Yellow warbler*	10	0.5	0.61	6	0.3	0.66	5	0.25	0.44
TOTAL SPECIES	28	4.65	2.41	22	3.85	1.46	19	4.35	1.81
TOTAL BIRDS	138	6.90	6.75	105	5.25	2.36	125	6.25	2.94
NEOTROPICAL MIGRANT SPECIES	16	3.20	1.99	14	2.65	0.99	14	3.30	1.42
NEOTROPICAL MIGRANT BIRDS	79	3.95	2.67	77	3.85	1.81	98	4.90	2.51
RIPARIAN OBLIGATE SPECIES	9	2.40	1.39	9	2.05	0.60	8	2.45	1.19
RIPARIAN OBLIGATE BIRDS	60	3.00	2.00	71	3.05	1.39	68	3.40	1.73
INVASIVE SPECIES	2	0.25	0.44	1	0.25	0.44	1	0.15	0.37
INVASIVE BIRDS	7	0.35	0.67	6	0.30	0.57	6	0.30	0.73
BHCO HOSTS*	82			81			81		
Brown-headed cowbird (female)	4	0.2	0.41	4	0.2	0.41	4	0.2	0.52
RATIO of BHCO FEMALES:HOSTS	0.05			0.05			0.05		

APPENDIX C

POINT COUNT DATA
BILL WILLIAMS RIVER NWR 2000-2004

Bill Williams River (BWR01)	Apr. 27, 00		May 25, 00		June 15,00	
5 Minute point count (<60m)						
BHCO host species						
Host species detected	no. birds	Mean	no. birds	Mean	no. birds	Mean
Abert's towhee	1	0.05	7	0.33	4	0.19
Ash-throated flycatcher	8	0.38	1	0.05	4	0.19
Brown-crested flycatcher	1	0.05	8	0.38	5	0.24
Bell's vireo	9	0.43	11	0.52	9	0.43
Bewick's wren	6	0.29	6	0.29	6	0.29
Brown-headed cowbird F	**0**	0.00	**0**	0.00	**3**	0.14
Brown-headed cowbird M	0	0.00	1	0.05	2	0.10
Brown-headed cowbird T	**0**	0.00	**1**	0.05	**5**	0.24
Blue grosbeak	0	0.00	2	0.10	0	0.00
Black phoebe	0	0.00	2	0.10	1	0.05
Black-tailed gnatcatcher	0	0.00	3	0.14	2	0.10
Bullock's oriole	2	0.10	1	0.05	3	0.14
Canyon wren	0	0.00	1	0.05	3	0.14
Common grackle	0	0.00	3	0.14	1	0.05
Common yellowthroat	6	0.29	3	0.14	4	0.19
House finch	1	0.05	0	0.00	1	0.05
Lazuli bunting	0	0.00	0	0.00	1	0.05
Lucy's warbler	1	0.05	14	0.67	7	0.33
Mourning dove	1	0.05	1	0.05	0	0.00
Pacific-slope flycatcher	0	0.00	2	0.10	0	0.00
Phainopepla	11	0.52	2	0.10	2	0.10
Say's phoebe	0	0.00	0	0.00	1	0.05
Song sparrow	6	0.29	7	0.33	7	0.33
Summer tanager	8	0.38	4	0.19	6	0.29
Unidentified empidonox	0	0.00	1	0.05	0	0.00
Unidentified songbird	2	0.10	2	0.10	2	0.10
Unidentified warbler	1	0.05	1	0.05	0	0.00
Vermilion flycatcher	2	0.10	0	0.00	2	0.10
Verdin	2	0.10	0	0.00	0	0.00
Warbling vireo	1	0.05	0	0.00	1	0.05
Western kingbird	1	0.05	0	0.00	0	0.00
Western tanager	0	0.00	1	0.05	0	0.00
Wilson's warbler	1	0.05	1	0.05	0	0.00
Yellow-breasted chat	10	0.48	25	1.19	26	1.24
Yellow warbler	3	0.14	7	0.33	2	0.10
Point count summary						
Total # host birds	85		117		101	
Total # host species	22		26		23	
Mean # host birds (s.d.)	4.05 (2.13)		5.57 (2.18)		4.81 (2.02)	
Mean # host species (s.d.)	3.10 (1.58)		4.33 (1.62)		3.86 (1.68)	
Min/Max # birds per point	0 - 8		2 - 10		2 - 10	
Min/Max # species per point	0 - 7		2 - 8		2 - 8	
BHCO F:# hosts	**0**		**0**		**0.03**	
BHCO: # hosts	0		0.009		0.05	
BHCO F freq	0		0		0.14	
BHCO freq	0		0.05		0.19	

BILL WILLIAMS RIVER NWR 5 MIN POINT COUNT DETECTIONS WITHIN 60 M	YEAR 2001 9-May n=20			24-May n=20			14-Jun n=20		
	# found	Mean	sd	# found	Mean	sd	# found	Mean	sd
Abert's towhee	11	0.55	0.83	6	0.3	0.57	5	0.25	0.44
Ash-throated flycatcher	4	0.2	0.41	16	0.8	0.70	3	0.15	0.37
Bell's vireo	15	0.75	0.85	16	0.8	0.83	12	0.6	0.75
Belted kingfisher	0	0	0.00	0	0	0.00	3	0.15	0.67
Bewick's wren	0	0	0.00	4	0.2	0.41	3	0.15	0.37
Black phoebe	1	0.05	0.22	2	0.1	0.45	0	0	0.00
Black-chinned hummingbird	3	0.15	0.49	5	0.25	0.55	0	0	0.00
Black-tailed gnatcatcher	1	0.05	0.22	3	0.15	0.37	6	0.3	0.57
Blue grosbeak	7	0.35	0.59	3	0.15	0.37	2	0.2	0.31
Brown-crested flycatcher	3	0.15	0.37	3	0.15	0.37	5	0.25	0.55
Brown-headed cowbird	**1**	**0.05**	**0.22**	**7**	**0.35**	**0.67**	**0**	**0**	**0.00**
Brown-headed cowbird F	**1**	**0.05**	**0.22**	**3**	**0.15**	**0.37**	**0**	**0**	**0.00**
Brown-headed cowbird M	0	0	0.00	4	0.2	0.41	0	0	0.00
Bullock's oriole	1	0.05	0.22	1	0.05	0.22	2	0.1	0.31
Canyon wren	0	0	0.00	0	0	0.00	2	0.1	0.31
Great-tailed grackel	4	0.2	0.52	7	0.35	0.75	8	0.4	1.14
Common yellowthroat	3	0.15	0.49	3	0.15	0.37	7	0.35	0.59
Common raven	0	0	0.00	1	0.05	0.22	0	0	0.00
Gila woodpecker	3	0.15	0.37	6	0.3	0.57	4	0.2	0.41
Greater roadrunner	0	0	0.00	0	0	0.00	1	0.05	0.22
Gambel's quail	0	0	0.00	9	0.45	0.76	11	0.55	2.24
House finch	8	0.4	0.99	15	0.75	1.45	8	0.4	0.99
House wren	0	0	0.00	1	0.05	0.22	0	0	0.00
Killdeer	1	0.05	0.22	0	0	0.00	0	0	0.00
Ladder-backed woodpecker	0	0	0.00	1	0.05	0.22	1	0.05	0.22
Lesser goldfinch	26	1.3	2.13	7	0.35	1.18	0	0	0.00
Lucy's warbler	12	0.6	0.88	9	0.45	0.60	8	0.4	0.99
Mourning dove	7	0.35	0.67	5	0.25	0.44	3	0.15	0.49
Northern cardinal	0	0	0.00	0	0	0.00	1	0.05	0.22
Northern flicker	0	0	0.00	0	0	0.00	1	0.05	0.22
Northern rough-winged swallow	2	0.1	0.45	0	0	0.00	0	0	0.00
Phainopepla	7	0.35	0.75	4	0.2	0.52	0	0	0.00
Red-winged blackbird	0	0	0.00	1	0.05	0.22	1	0.05	0.22
Say's phoebe	1	0.05	0.22	2	0.1	0.31	0	0	0.00
Song sparrow	6	0.3	0.80	6	0.3	0.57	13	0.65	1.23
Spotted towhee	0	0	0.00	2	0.1	0.45	0	0	0.00
Summer tanager	0	0	0.00	1	0.05	0.22	2	0.1	0.31
Unidentified songbird	2	0.1	0.45	6	0.3	0.92	4	0.2	0.52
Violet-green swallow	3	0.15	0.67	0	0	0.00	0	0	0.00
Warbling vireo	3	0.15	0.49	0	0	0.00	0	0	0.00
Western kingbird	0	0	0.00	0	0	0.00	0	0	0.00
White-winged dove	6	0.3	0.92	10	0.5	0.69	7	0.35	0.49
Wilson's warbler	0	0	0.00	1	0.05	0.22	0	0	0.00
Yellow warbler	3	0.15	0.37	2	0.1	0.31	2	0.1	0.31
Yellow-breasted chat	19	0.95	0.89	16	0.8	0.70	12	0.6	0.82
NUMBER OF SPECIES	28	5.05	1.57	33	6.85	2.30	28	4.80	1.99
NUMBER OF BIRDS	163	8.15	3.20	181	9.05	3.05	137	6.85	4.26
NUMBER OF NEOTROPIC SPECIES	15	3.25	1.25	15	3.65	1.84	11	2.45	1.05
NUMBER OF NEOTROPIC BIRDS	108	5.4	2.84	91	4.55	2.54	62	3.10	1.65
NUMBER OF RIPARIAN OBLIGATE SPECIES	9	2.45	0.94	11	2.60	1.50	11	2.35	1.35
NUMBER OF RIPARIAN OBLIGATE BIRDS	69	3.45	1.76	61	3.05	1.57	65	3.25	2.45
NUMBER OF BHCO HOST SPECIES	21	4.2	1.32	23	4.40	1.76	18	3.30	1.72
NUMBER OF BHCO HOST BIRDS	141	7.05	2.74	117	5.85	2.58	95	4.75	3.08
RATIO - 3 BHCO FEMALES:# HOSTS	**0.01**			**0.03**			**0**		
SPECIES RICHNESS	28			33			28		
SIMPSON'S INDEX OF DIVERSITY	0.93			0.95			0.94		
SHANNON-WIENER INDEX	2.93			3.18			3.06		
SPECIES EVENNESS	0.88			0.91			0.92		

Bill Williams River NWR 5 minute point counts Detections within 60 meters Year 2002	Survey 1 15-May			Survey 2 30-May			Survey 3 19-Jun		
	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
Abert's towhee*	8	0.40	0.50	4	0.20	0.41	2	0.10	0.31
American kestrel	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Ash-throated flycatcher	5	0.25	0.44	4	0.20	0.41	3	0.15	0.37
Brown-crested flycatcher	0	0.00	0.00	1	0.05	0.22	4	0.20	0.41
Black-chinned hummingbird	5	0.25	0.72	4	0.20	0.41	0	0.00	0.00
Bell's vireo*	8	0.40	0.60	10	0.50	0.61	10	0.50	0.69
Bewick's wren*	4	0.20	0.41	4	0.20	0.52	3	0.15	0.49
Brown-headed cowbird	5	0.25	0.44	3	0.15	0.49	5	0.25	0.44
Brown-headed cowbird (female)	0	0.10	0.30	2	0.20	0.52	4	0.20	0.41
Black-headed grosbeak*	1	0.05	0.22	0	0.00	0.00	1	0.05	0.22
Blue grosbeak*	4	0.20	0.52	0	0.00	0.00	2	0.10	0.31
Black phoebe*	3	0.15	0.37	2	0.10	0.31	0	0.00	0.00
Black-tailed gnatcatcher*	4	0.20	0.41	1	0.05	0.22	0	0.00	0.00
Bullock's oriole*	0	0.00	0.00	1	0.05	0.22	1	0.05	0.22
Cedar waxwing*	0	0.00	0.00	3	0.14	0.65	0	0.00	0.00
Common raven	0	0.00	0.00	0	0.00	0.00	2	0.10	0.45
Common yellowthroat*	0	0.00	0.00	1	0.05	0.22	1	0.05	0.22
Gambel's quail	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Gila woodpecker	4	0.20	0.41	7	0.35	0.49	7	0.35	0.49
Great-tailed grackle	5	0.25	0.55	4	0.20	0.52	10	0.50	1.24
House finch*	1	0.05	0.22	1	0.05	0.22	0	0.00	0.00
Ladder-backed woodpecker	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Lucy's warbler*	0	0.35	0.49	5	0.25	0.44	0	0.05	0.22
MacGillivray's warbler*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Mourning dove*	0	0.00	0.00	0	0.00	0.00	3	0.15	0.37
Olive-sided flycatcher*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Phainopepla*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Pacific-slope flycatcher*	2	0.10	0.31	1	0.05	0.22	0	0.00	0.00
Red-winged blackbird*	1	0.05	0.22	2	0.10	0.31	0	0.00	0.00
Song sparrow*	5	0.25	0.55	6	0.30	0.47	7	0.35	0.81
Solitary vireo*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Summer tanager*	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Unidentified songbird	5	0.25	0.55	1	0.05	0.22	3	0.15	0.67
Vermilion flycatcher*	0	0.00	0.00	1	0.05	0.22	1	0.05	0.22
Verdin*	1	0.05	0.22	1	0.05	0.22	2	0.10	0.45
Violet-green swallow	2	0.10	0.45	0	0.00	0.00	0	0.00	0.00
Warbling vireo*	3	0.15	0.37	0	0.00	0.00	0	0.00	0.00
White-breasted nuthatch	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Western tanager*	2	0.10	0.31	0	0.00	0.00	0	0.00	0.00
Wilson's warbler*	6	0.30	0.73	1	0.05	0.22	0	0.00	0.00
White-winged dove	7	0.35	0.59	3	0.15	0.37	7	0.35	0.59
Western wood pewee*	2	0.10	0.31	0	0.00	0.00	0	0.00	0.00
Yellow-breasted chat*	11	0.55	0.69	7	0.35	0.75	11	0.55	0.69
Yellow warbler*	2	0.10	0.31	0	0.00	0.00	1	0.05	0.22
TOTAL SPECIES	32	5.30	2.08	27	3.65	1.18	22	3.50	1.47
TOTAL BIRDS	112	5.95	2.37	78	4.05	1.54	89	4.50	1.93
NEOTROPICAL MIGRANT SPECIES	19	3.10	1.59	15	1.90	1.12	12	1.75	0.79
NEOTROPICAL MIGRANT BIRDS	65	3.60	1.85	41	2.05	1.36	41	2.10	1.07
RIPARIAN OBLIGATE SPECIES	8	1.75	1.33	8	1.45	0.89	10	1.70	1.03
RIPARIAN OBLIGATE BIRDS	33	2.00	1.65	32	1.60	1.05	41	2.10	1.41
INVASIVE SPECIES	2	0.45	0.60	2	0.25	0.44	3	0.50	0.69
INVASIVE BIRDS	10	0.50	0.69	7	0.35	0.67	17	0.85	1.46
BHCO HOSTS*	69			52			45		
Brown-headed cowbird (female)	0			2			4		
RATIO of BHCO FEMALES:HOSTS	**0**			**0.04**			**0.09**		

Bill Williams River NWR 5 minute point counts Detections within 60 meters Year 2003	Survey 1 15-May			Survey 2 29-May			Survey 3 18-Jun		
	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
Abert's towhee*	1	0.05	0.22	8	0.40	0.68	6	0.30	0.57
Ash-throated flycatcher	9	0.45	0.69	7	0.35	0.59	11	0.55	0.51
Brown-crested flycatcher	2	0.10	0.31	4	0.20	0.52	3	0.15	0.49
Black-chinned hummingbird	1	0.05	0.22	1	0.05	0.22	0	0.00	0.00
Bell's vireo*	9	0.45	0.76	10	0.50	0.69	11	0.55	0.76
Bewick's wren*	4	0.20	0.41	5	0.25	0.44	6	0.30	0.73
Brown-headed cowbird	6	0.30	0.80	3	0.15	0.49	3	0.15	0.37
Blue grosbeak*	4	0.20	0.41	4	0.20	0.41	1	0.05	0.22
Black phoebe*	1	0.05	0.22	0	0.00	0.00	1	0.05	0.22
Black-tailed gnatcatcher*	3	0.15	0.37	3	0.15	0.37	1	0.05	0.22
Bullock's oriole*	2	0.10	0.31	0	0.00	0.00	1	0.05	0.22
Canyon wren	1	0.05	0.22	0	0.05	0.22	1	0.05	0.22
Common yellowthroat*	2	0.10	0.31	2	0.10	0.31	4	0.20	0.52
Gambel's quail	3	0.15	0.49	1	0.05	0.22	11	0.55	2.24
Gila wodpecker	7	0.35	0.59	2	0.10	0.31	9	0.45	0.69
Great-tailed grackle	1	0.05	0.22	3	0.15	0.49	4	0.20	0.52
House finch*	9	0.45	1.10	0	0.00	0.00	0	0.00	0.00
Ladder-backed woodpecker	2	0.10	0.31	0	0.00	0.00	1	0.05	0.22
Lesser goldfinch*	6	0.30	0.73	9	0.45	1.47	0	0.00	0.00
Lesser nighthawk	0	0.00	0.00	0	0.00	0.00	1	0.05	0.22
Lucy's warbler*	0	0.20	0.41	3	0.15	0.67	0	0.35	1.14
Mourning dove*	6	0.30	0.92	5	0.25	0.55	3	0.15	0.37
Northern flicker	0	0.00	0.00	0	0.00	0.00	0	0.00	0.00
Northern mockingbird*	0	0.00	0.00	0	0.00	0.00	1	0.05	0.22
Phainopepla*	6	0.30	0.92	3	0.15	0.67	0	0.00	0.00
Pacific-slope flycatcher*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Say's phoebe*	0	0.00	0.00	0	0.00	0.00	2	0.10	0.31
Song sparrow*	9	0.45	0.94	8	0.40	0.68	8	0.40	0.82
Summer tanager*	2	0.10	0.31	1	0.05	0.22	1	0.05	0.22
Swainson's thrush*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Unidentified songbird	4	0.20	0.62	1	0.05	0.22	0	0.00	0.00
Verdin*	0	0.00	0.00	3	0.15	0.49	0	0.00	0.00
Violet-green swallow	0	0.00	0.00	6	0.30	0.98	3	0.15	0.49
Warbling vireo*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Wilson's warbler*	3	0.15	0.37	0	0.00	0.00	0	0.00	0.00
White-winged dove	9	0.45	0.83	5	0.25	0.64	7	0.35	0.59
Western wood pewee*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Yellow-breasted chat*	16	0.80	0.83	19	0.95	0.89	19	0.95	1.00
Yellow warbler*	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
TOTAL SPECIES	31	4.90	2.05	25	4.20	2.46	25	4.50	1.91
TOTAL BIRDS	132	6.80	3.37	117	5.90	3.64	119	6.30	2.79
NEOTROPICAL MIGRANT SPECIES	17	2.70	1.17	13	2.30	1.17	11	2.35	1.27
NEOTROPICAL MIGRANT BIRDS	65	3.45	1.57	68	3.40	2.23	57	3.20	1.91
RIPARIAN OBLIGATE SPECIES	8	1.90	1.41	9	2.00	1.08	8	1.80	1.24
RIPARIAN OBLIGATE BIRDS	46	2.50	1.85	52	2.60	1.73	48	2.75	2.10
INVASIVE SPECIES	2	0.20	0.41	2	0.20	0.52	2	0.30	0.57
INVASIVE BIRDS	7	0.35	0.81	6	0.30	0.80	7	0.35	0.67
BHCO HOSTS*	87			84			65		
Brown-headed cowbird (female)	4	0.20	0.52	3	0.15	0.49	2	0.10	0.31
RATIO of BHCO FEMALES:HOSTS	**0.05**			**0.04**			**0.03**		

Bill Williams River NWR 5 minute point counts Detections within 60 meters Year 2004	Survey 1 19-May			Survey 2 3-Jun			Survey 3 17-Jun		
	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
~~Abert's towhee*~~	~~2~~	~~0.1~~	~~0.31~~	~~7~~	~~0.35~~	~~0.59~~	~~3~~	~~0.15~~	~~0.37~~
Ash-throated flycatcher	5	0.25	0.44	10	0.5	0.76	10	0.5	0.83
Brown-crested flycatcher	4	0.2	0.41	2	0.1	0.31	5	0.25	0.55
Bell's vireo*	17	0.85	0.81	13	0.65	0.88	10	0.5	0.76
Bewick's wren*	7	0.35	0.49	6	0.3	0.57	2	0.1	0.31
Brown-headed cowbird	14	0.7	1.03	8	0.4	0.68	10	0.5	0.83
Blue grosbeak*	1	0.05	0.22	1	0.05	0.22	0	0	0.00
Black phoebe*	2	0.1	0.31	1	0.05	0.22	1	0.05	0.22
Black-chinned hummingbird	1	0.05	0.22	0	0	0.00	0	0	0.00
Bullock's oriole*	1	0.05	0.22	0	0	0.00	0	0	0.00
Canyon wren	1	0.05	0.22	0	0	0.00	2	0.1	0.31
Common Raven	0	0	0.00	2	0.1	0.31	3	0.15	0.67
Common yellowthroat*	0	0	0.00	3	0.15	0.37	0	0	0.00
Gambel's quail	1	0.05	0.22	2	0.1	0.45	1	0.05	0.22
Gila wodpecker	7	0.35	0.59	5	0.25	0.55	10	0.5	0.76
Great-tailed grackle	0	0	0.00	1	0.05	0.22	0	0	0.00
House finch*	4	0.2	0.52	0	0	0.00	3	0.15	0.49
Ladder-backed woodpecker	3	0.15	0.37	2	0.1	0.45	0	0	0.00
Lesser goldfinch*	4	0.2	0.89	0	0	0.00	0	0	0.00
Lesser nighthawk	0	0	0.00	0	0	0.00	2	0.1	0.45
Lucy's warbler*	0	0.1	0.31	4	0.2	0.41	0	0	0.00
Mourning dove*	1	0.05	0.22	3	0.15	0.49	6	0.3	0.57
Northern rough-winged swallow	0	0	0.00	0	0	0.00	3	0.15	0.67
Olive-sided flycatcher*	1	0.05	0.22	0	0	0.00	0	0	0.00
Phainopepla*	0	0	0.00	1	0.05	0.22	1	0.05	0.22
Pacific-slope flycatcher*	3	0.15	0.37	0	0	0.00	0	0	0.00
Song sparrow*	6	0.3	0.57	4	0.2	0.52	7	0.35	0.99
Summer tanager*	4	0.2	0.41	1	0.05	0.22	1	0.05	0.22
Unidentified songbird	3	0.15	0.67	0	0	0.00	0	0	0.00
Vermilion flycatcher*	1	0.05	0.22	0	0	0.00	5	0.25	0.72
Wilson's warbler*	3	0.15	0.37	0	0	0.00	0	0	0.00
White-winged dove	12	0.6	0.99	18	0.9	0.85	11	0.55	0.69
Yellow-breasted chat*	17	0.85	0.88	18	0.9	0.91	11	0.55	0.51
Yellow warbler*	2	0.1	0.31	3	0.15	0.49	1	0.05	0.22
TOTAL SPECIES	27	5	2.00	23	4.4	1.57	23	4.15	2.16
TOTAL BIRDS	127	6.45	2.87	116	5.8	2.40	110	5.5	3.27
NEOTROPICAL MIGRANT SPECIES	16	2.8	1.44	10	2.15	0.99	10	1.9	1.37
NEOTROPICAL MIGRANT BIRDS	69	3.55	2.14	56	2.8	1.58	49	2.45	2.21
RIPARIAN OBLIGATE SPECIES	8	2.15	1.18	9	1.85	1.14	6	1.4	1.23
RIPARIAN OBLIGATE BIRDS	52	2.7	1.72	49	2.45	1.47	35	1.75	1.62
INVASIVE SPECIES	1	0.4	0.50	3	0.45	0.51	2	0.35	0.49
INVASIVE BIRDS	14	0.7	1.03	11	0.55	0.69	13	0.65	0.99
BHCO HOSTS*	76			65			51		
Brown-headed cowbird (female)	6	0.3	0.57	5	0.25	0.55	4	0.2	0.41
RATIO of BHCO FEMALES:HOSTS	**0.08**			**0.08**			**0.08**		

APPENDIX D

POINT COUNT DATA
HAVASU NWR 1998-2004

Havasu NWR	n=20								
5 minute point counts	Survey 1			Survey 2			Survey 3		
Detections within 60 meters	20-May			4-Jun			18-Jun		
Year 2004	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
Abert's towhee*	4	0.20	0.41	3	0.15	0.37	10	0.5	0.83
Ash-throated flycatcher	7	0.35	0.67	2	0.1	0.31	4	0.2	0.41
Brown-crested flycatcher	0	0.00	0.00	2	0.1	0.31	0	0	0.00
Black-chinned hummingbird	2	0.10	0.31	2	0.1	0.31	5	0.25	0.55
Bewick's wren*	8	0.40	0.68	6	0.3	0.57	2	0.1	0.31
Brown-headed cowbird	34	1.70	2.70	12	0.6	0.99	10	0.5	0.76
Blue grosbeak*	8	0.40	0.75	4	0.2	0.41	7	0.35	0.59
Black-tailed gnatcatcher*	1	0.05	0.22	0	0	0.00	1	0.05	0.22
Common yellowthroat*	7	0.35	0.75	14	0.7	0.73	10	0.5	0.61
Gambel's quail	0	0.00	0.00	1	0.05	0.22	0	0	0.00
Great-tailed grackle	15	0.75	1.02	7	0.35	0.81	5	0.25	0.55
House finch*	0	0.00	0.00	8	0.4	1.79	0	0	0.00
Ladder-backed woodpecker	1	0.05	0.22	1	0.05	0.22	1	0.05	0.22
Lucy's warbler*	0	0.00	0.00	0	0	0.00	3	0.15	0.37
Mourning dove	7	0.35	0.49	4	0.2	0.41	7	0.35	0.49
Red-winged blackbird*	19	0.95	1.79	19	0.95	1.10	14	0.7	0.92
Song sparrow*	4	0.20	0.41	4	0.20	0.41	9	0.45	0.60
Summer tanager*	1	0.05	0.22	1	0.05	0.22	0	0	0.00
Unidentified warbler*	2	0.10	0.31	0	0	0.00	0	0	0.00
Willow flycatcher*	0	0.00	0.00	1	0.05	0.22	1	0.05	0.22
Wilson's warbler*	1	0.05	0.22	0	0	0.00	0	0	0.00
White-winged dove	25	1.25	1.37	23	1.15	1.14	20	1	0.86
Western wood pewee*	1	0.05	0.22	0	0	0.00	0	0	0.00
Yellow-brested chat*	22	1.10	0.97	23	1.15	0.88	18	0.9	0.91
Yellow warbler*	2	0.10	0.31	3	0.15	0.49	3	0.15	0.37
Yellow-headed backbird*	0	0.00	0.00	2	0.1	0.31	0	0	0.00
TOTAL SPECIES	20	5.05	1.73	21	4.85	1.50	18	5.1	1.77
TOTAL BIRDS	171	8.55	4.72	142	7.1	3.42	130	6.5	2.44
NEOTROPICAL MIGRANT SPECIES	10	1.90	1.17	10	2.1	0.97	8	2.1	1.25
NEOTROPICAL MIGRANT BIRDS	53	2.65	1.79	54	2.7	1.42	51	2.55	1.43
RIPARIAN OBLIGATE SPECIES	6	1.55	1.00	8	2	1.03	7	2.1	1.07
RIPARIAN OBLIGATE BIRDS	44	2.20	1.61	52	2.6	1.39	51	2.55	1.50
INVASIVE SPECIES	2	1.00	0.56	2	0.6	0.60	2	0.55	0.60
INVASIVE BIRDS	49	2.45	3.14	19	0.95	1.23	15	0.75	0.91
BHCO HOSTS*	87			92			85		
Brown-headed cowbird (female)	16	0.80	1.24	2	0.1	0.31	6	0.3	0.47
RATIO of BHCO FEMALES:HOSTS	**0.18**			**0.02**			**0.07**		

Havasu NWR	n=20								
5 minute point counts	Survey 1			Survey 2			Survey 3		
Detections within 60 meters	16-May			30-May			19-Jun		
Year 2003	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	MEAN	SD
Abort'c towhoo*	4	0.2	0.41	4	0.2	0.41	2	0.10	0.45
Ash-throated flycatcher	5	0.25	0.55	3	0.15	0.37	5	0.25	0.55
Brown-crested flycatcher	1	0.05	0.22	0	0	0.00	0	0.00	0.00
Black-chinned hummingbird	2	0.1	0.31	2	0.1	0.31	3	0.15	0.49
Bewick's wren*	6	0.3	0.47	2	0.1	0.31	3	0.15	0.37
Brown-headed cowbird	15	0.75	1.29	14	0.7	1.08	10	0.50	0.95
Black-headed grosbeak*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Blue grosbeak*	7	0.35	0.67	4	0.2	0.41	3	0.15	0.49
Black-tailed gnatcatcher*	1	0.05	0.22	0	0	0.00	1	0.05	0.22
Bullock's oriole*	0	0	0.00	2	0.1	0.31	4	0.20	0.52
Cassin's kingbird*	0	0	0.00	1	0.05	0.22	0	0.00	0.00
Common yellowthroat*	7	0.35	0.59	8	0.4	0.50	5	0.25	0.44
Gila woodpecker	1	0.05	0.22	0	0	0.00	0	0.00	0.00
Great-tailed grackle	0	0	0.00	7	0.35	1.14	8	0.40	1.57
House finch*	0	0	0.00	3	0.15	0.49	1	0.05	0.22
Ladder-backed woodpecker	2	0.1	0.31	0	0	0.00	0	0.00	0.00
Lesser goldfinch*	1	0.05	0.22	0	0	0.00	0	0.00	0.00
Lesser nighthawk	0	0	0.00	1	0.05	0.22	0	0.00	0.00
Lucy's warbler*	1	0.05	0.22	0	0	0.00	4	0.20	0.62
Mourning dove	7	0.35	0.81	4	0.2	0.52	7	0.35	0.93
Red-winged blackbird*	10	0.5	0.76	4	0.2	0.52	10	0.50	1.36
Song sparrow*	1	0.05	0.22	3	0.15	0.37	1	0.05	0.22
Summer tanager*	1	0.05	0.22	2	0.1	0.31	1	0.05	0.22
Unidentified warbler*	0	0	0.00	0	0	0.00	1	0.05	0.22
Verdin*	1	0.05	0.22	3	0.15	0.49	0	0.00	0.00
Warbling vireo*	1	0.05	0.22	0	0	0.00	0	0.00	0.00
Willow flycatcher*	0	0	0.00	0	0	0.00	1	0.05	0.22
Wilson's warbler*	1	0.05	0.22	0	0	0.00	0	0.00	0.00
White-winged dove	14	0.7	0.80	9	0.45	0.51	7	0.35	0.49
Yellow-brested chat*	11	0.55	0.51	15	0.75	0.72	23	1.15	0.59
Yellow warbler*	3	0.15	0.49	1	0.05	0.22	0	0.00	0.00
Yellow-headed backbird*	2	0.1	0.31	0	0	0.00	0	0	0.00
Yellow-rumped warbler*	1	0.05	0.22	0	0	0.00	0	0.00	0.00
TOTAL SPECIES	26	4.2	2.40	21	3.75	1.77	20	3.45	1.32
TOTAL BIRDS	107	5.35	3.65	92	4.6	2.44	100	5.00	2.55
NEOTROPICAL MIGRANT SPECIES	14	1.9	1.29	10	1.8	1.06	10	1.95	1.05
NEOTROPICAL MIGRANT BIRDS	43	2.15	1.60	39	1.95	1.05	50	2.50	1.47
RIPARIAN OBLIGATE SPECIES	9	1.45	0.89	7	1.6	0.94	8	1.65	0.88
RIPARIAN OBLIGATE BIRDS	33	1.65	1.18	35	1.75	0.97	42	2.10	1.29
INVASIVE SPECIES	1	0.35	0.49	2	0.55	0.51	2	0.40	0.50
INVASIVE BIRDS	15	0.75	1.29	21	1.05	1.39	18	0.90	1.71
BHCO HOSTS*	60			52			60		
Brown-headed cowbird (female)	6	0.3	0.57	3	0.15	0.37	3	0.15	0.49
RATIO of BHCO FEMALES:HOSTS	**0.10**			**0.06**			**0.05**		

Havasu NWR 5 minute point counts Detections within 60 meters Year 2002	Survey 1 16-May			Survey 2 31-May			Survey 3 20-Jun		
	TOTALS	MEAN	SD	TOTALS	MEAN	SD	TOTALS	AVERAGE	SD
Abert's towhee*	3	0.15	0.49	5	0.25	0.55	4	0.20	0.52
Ash-throated flycatcher	3	0.15	0.37	3	0.15	0.49	1	0.05	0.22
Brown-crested flycatcher	3	0.15	0.49	0	0.00	0.00	2	0.10	0.45
Black-chinned hummingbird	2	0.10	0.45	5	0.25	0.44	1	0.05	0.22
Bell's vireo*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Bewick's wren*	3	0.15	0.37	2	0.10	0.31	4	0.20	0.52
Brown-headed cowbird	12	0.60	1.43	16	0.80	1.06	25	1.25	1.71
Blue grosbeak*	6	0.30	0.57	5	0.25	0.55	4	0.20	0.41
Black-tailed gnatcatcher*	1	0.05	0.22	0	0.00	0.00	1	0.05	0.22
Common yellowthroat*	0	0.00	0.00	3	0.15	0.37	1	0.05	0.22
House finch*	1	0.05	0.22	1	0.05	0.22	0	0.00	0.00
Ladder-backed woodpecker	2	0.10	0.45	1	0.05	0.22	3	0.15	0.37
Lesser goldfinch*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Lesser nighthawk	3	0.15	0.67	0	0.00	0.00	1	0.05	0.22
Mourning dove*	8	0.40	0.94	7	0.35	0.67	8	0.40	0.94
Ruby-crowned kinglet*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Red-winged blackbird*	2	0.10	0.31	6	0.30	0.66	5	0.25	0.44
Song sparrow*	1	0.05	0.22	3	0.15	0.37	3	0.15	0.49
Summer tanager*	1	0.05	0.22	1	0.05	0.22	1	0.05	0.22
Unidentified songbird	4	0.20	0.41	0	0.00	0.00	1	0.05	0.22
Verdin*	1	0.05	0.22	0	0.00	0.00	3	0.15	0.37
Warbling vireo*	1	0.05	0.22	0	0.00	0.00	0	0.00	0.00
Willow flycatcher*	0	0.00	0.00	1	0.05	0.22	0	0.00	0.00
Wilson's warbler*	6	0.30	0.47	1	0.05	0.22	0	0.00	0.00
White-winged dove	9	0.45	0.76	9	0.45	0.83	9	0.45	0.51
Western wood pewee*	2	0.10	0.31	1	0.05	0.22	0	0.00	0.00
Yellow-breasted chat*	10	0.50	0.51	13	0.65	0.81	11	0.55	0.69
Yellow warbler*	0	0.00	0.00	3	0.15	0.37	0	0.00	0.00
TOTAL SPECIES	26	3.45	1.61	20	3.40	1.67	21	3.40	1.88
TOTAL BIRDS	89	4.45	2.33	87	4.35	2.52	93	4.65	3.42
NEOTROPICAL MIGRANT SPECIES	14	1.95	1.50	10	1.55	1.10	9	1.00	0.86
NEOTROPICAL MIGRANT BIRDS	44	2.20	1.82	36	1.80	1.32	23	1.15	1.09
RIPARIAN OBLIGATE SPECIES	6	1.00	0.86	7	1.25	0.72	6	0.90	0.79
RIPARIAN OBLIGATE BIRDS	22	1.10	1.07	29	1.45	0.89	22	1.10	1.07
INVASIVE SPECIES	2	0.35	0.59	2	0.55	0.51	2	0.70	0.57
INVASIVE BIRDS	14	0.70	1.63	17	0.85	1.04	29	1.45	1.96
BHCO HOSTS*	48			52			45		
Brown-headed cowbird (female)	10	0.50	0.95	6	0.30	0.57	9	0.45	0.69
RATIO of BHCO FEMALES:HOSTS	**0.21**			**0.12**			**0.20**		

HAVASU NWR 5 MIN POINT COUNT	YEAR 2001								
DETECTIONS WITHIN 60 M	10-May n=20			25-May n=20			15-Jun n=20		
	# found	Mean	sd	# found	Mean	sd	# found	Mean	sd
~~Abert's towhee~~	~~10~~	~~0.5~~	~~0.89~~	~~14~~	~~0.70~~	~~0.92~~	~~8~~	~~0.40~~	~~0.60~~
Ash-throated flycatcher	3	0.15	0.37	2	0.10	0.31	0	0.00	0.00
Bewick's wren	11	0.55	0.76	7	0.35	0.49	11	0.55	0.76
Black phoebe	0	0	0.00	2	0.10	0.45	0	0.00	0.00
Black-chinned hummingbird	2	0.1	0.31	4	0.20	0.52	3	0.15	0.49
Black-tailed gnatcatcher	2	0.1	0.31	2	0.10	0.31	0	0.00	0.00
Blue grosbeak	6	0.3	0.66	2	0.10	0.31	9	0.45	0.69
Brown-crested flycatcher	0	0	0.00	2	0.10	0.31	0	0.00	0.00
Brown-headed cowbird	**23**	**1.15**	**1.57**	**21**	**1.05**	**1.67**	**22**	**1.10**	**1.48**
Brown-headed cowbird F	**13**	**0.65**	**0.81**	**10**	**0.50**	**0.89**	**12**	**0.60**	**0.88**
Brown-headed cowbird M	10	0.5	1.05	11	0.55	0.89	10	0.50	0.76
Bullock's oriole	1	0.05	0.22	1	0.05	0.22	1	0.05	0.22
Cliff swallow	0	0	0.00	1	0.05	0.22	0	0.00	0.00
Great-tailed grackel	9	0.45	0.69	5	0.25	0.64	14	0.70	0.98
Common ground dove	0	0	0.00	1	0.05	0.22	0	0.00	0.00
Lesser nighthawk	0	0	0.00	1	0.05	0.22	1	0.05	0.22
Common yellowthroat	12	0.6	0.82	9	0.45	0.76	13	0.65	0.67
Killdeer	0	0	0.00	0	0.00	0.00	1	0.05	0.22
Lesser goldfinch	2	0.1	0.31	1	0.05	0.22	0	0.00	0.00
Lucy's warbler	1	0.05	0.22	2	0.10	0.31	1	0.05	0.22
Mourning dove	8	0.4	0.99	4	0.20	0.52	7	0.35	0.67
Northern rough-winged swallow	0	0	0.00	0	0.00	0.00	1	0.05	0.22
Phainopepla	0	0	0.00	1	0.05	0.22	0	0.00	0.00
Red-winged blackbird	11	0.55	0.76	12	0.60	0.99	16	0.80	0.89
Song sparrow	6	0.3	0.57	7	0.35	0.59	8	0.40	0.50
Tree swallow	0	0	0.00	0	0.00	0.00	1	0.05	0.22
Unidentified songbird	2	0.1	0.45	3	0.15	0.49	1	0.05	0.22
Unidentified warbler	0	0	0.00	2	0.10	0.45	0	0.00	0.00
Verdin	3	0.15	0.49	0	0.00	0.00	0	0.00	0.00
White-winged dove	14	0.7	0.86	16	0.80	1.15	15	0.75	0.85
Willow flycatcher	1	0.05	0.22	1	0.05	0.22	2	0.10	0.31
Yellow warbler	1	0.05	0.22	5	0.25	0.64	4	0.20	0.41
Yellow-breasted chat	15	0.75	0.85	15	0.75	0.79	21	1.05	0.89
NUMBER OF SPECIES	21	4.85	2.25	27	4.80	1.88	21	5.65	2.43
NUMBER OF BIRDS	143	7.15	3.95	143	7.15	3.59	160	8	4.22
NUMBER OF NEOTROPIC SPECIES	10	2.05	1.23	14	2.15	1.31	11	2.65	1.66
NUMBER OF NEOTROPIC BIRDS	56	2.8	1.99	60	3.00	2.08	69	3.45	2.50
NUMBER OF RIPARIAN OBLIGATE SPECIES	8	1.6	1.10	9	1.70	1.13	8	2.35	1.50
NUMBER OF RIPARIAN OBLIGATE BIRDS	43	2.15	1.63	44	2.20	1.40	59	2.95	2.09
NUMBER OF BHCO HOST SPECIES	16	3.05	1.64	20	3.50	1.36	16	3.75	2.27
NUMBER OF BHCO HOST BIRDS	99	4.95	2.68	94	4.70	1.89	101	5.9	2.95
RATIO - #BHCO FEMALES:#HOSTS	**0.13**			**0.11**			**0.12**		
SPECIES RICHNESS	21			27			21		
SIMPSON'S INDEX OF DIVERSITY	0.92			0.92			0.91		
SHANNON-WIENER INDEX	2.69			2.84			2.63		
SPECIES EVENNESS	0.88			0.86			0.87		

Havasu NWR (HAV01)	April 30,1999		n=21		May 19, 99		n=20		June 16,99		n=20	
5 Minute point count (<60m)	LW				LW				LW			
BHCO host species												
Host species detected	no. points	Freq	no. birds	Mean	no. points	Freq	no. birds	Mean	no. points	Freq	no. birds	Mean
Abert's towhee	2	0.1	2	0.01	3	0.15	3	0.15	1	0.05	1	0.05
Brown-crested flycatcher	0	0	0	0	0	0	0	0	3	0.15	3	0.15
Bell's vireo	2	0.1	3	0.14	2	0.1	2	0.1	0	0	0	0
Bewick's wren	5	0.24	6	0.29	7	0.35	8	0.4	1	0.05	1	0.05
Brown-headed cowbird F	**6**	**0.29**	**9**	**0.43**	**8**	**0.4**	**11**	**0.55**	**10**	**0.5**	**22**	**1.1**
Brown-headed cowbird M	8	0.38	12	0.57	7	0.35	9	0.45	11	0.55	16	0.8
Brown-headed cowbird T	**8**	**0.38**	**21**	**1**	**10**	**0.5**	**20**	**1**	**13**	**0.65**	**38**	**1.9**
Blue grosbeak	2	0.1	5	0.24	6	0.3	7	0.35	3	0.15	5	0.25
Black-headed grosbeak	1	0.05	2	0.1	0	0	0	0	0	0	0	0
Black-tailed gnatcatcher	2	0.1	2	0.1	1	0.05	1	0.05	0	0	0	0
Cassin's kingbird	0	0	0	0	2	0.1	2	0.1	1	0.05	1	0.05
Common yellowthroat	6	0.29	8	0.38	6	0.3	9	0.45	6	0.3	8	0.4
Common ground dove	0	0	0	0	1	0.05	1	0.05	0	0	0	0
House finch	0	0	0	0	1	0.05	1	0.05	0	0	0	0
Lesser goldfinch	0	0	0	0	1	0.05	1	0.05	0	0	0	0
Lucy's warbler	2	0.1	2	0.1	0	0	0	0	2	0.1	3	0.15
Mourning dove	4	0.19	4	0.19	1	0.05	1	0.05	3	0.15	5	0.25
Pacific-slope flycatcher	1	0.05	1	0.05	0	0	0	0	0	0	0	0
Red-winged blackbird	6	0.29	10	0.48	6	0.3	15	0.75	7	0.35	9	0.45
Song sparrow	6	0.29	10	0.48	5	0.25	6	0.3	4	0.2	7	0.35
Summer tanager	0	0	0	0	1	0.05	1	0.05	0	0	0	0
Unidentified warbler	1	0.05	1	0.05	2	0.1	2	0.1	0	0	0	0
Verdin	1	0.05	1	0.05	1	0.05	1	0.05	2	0.1	2	0.1
White-crowned sparrow	1	0.05	2	0.1	0	0	0	0	0	0	0	0
Willow flycatcher	0	0	0	0	0	0	0	0	2	0.1	2	0.1
Wilson's warbler	0	0	0	0	4	0.2	7	0.35	0	0	0	0
Yellow-breasted chat	13	0.62	16	0.76	12	0.6	13	0.65	14	0.7	18	0.9
Yellow warbler	3	0.14	3	0.14	6	0.3	6	0.3	4	0.2	5	0.25
Point count summary												
Total # host birds	78				88				71			
Total # host species	17				19				14			
Mean # host birds (s.d.)	3.7 (2.5)				4.35 (2.06)				3.55 (2.42)			
Mean # host species (s.d.)	2.8 (1.7)				3.4 (1.64)				2.65 (1.42)			
Min/Max # birds per point	0 - 10				2 - 9				1 - 8			
Min/Max # species per point	0 - 6				2 - 7				1 - 5			
BHCO F:# hosts	**0.12**				**0.125**				**0.31**			
BHCO: # hosts	0.27				0.227				0.54			
BHCO F freq	0.29				0.4				0.5			
BHCO freq	0.38				0.5				0.65			

HAV 01 SUMMARY 1998	April 16,1998	n=20			May 11, 1998	n=20			June 19,1998	n=20		
5 Minute point count (<60m)	LW & JS				LW & JS				LW & EB			
BHCO host species												
Host species detected	**no. points**	**Freq**	**no. birds**	**Mean**	**no. points**	**Freq**	**no. birds**	**Mean**	**no. points**	**Freq**	**no. birds**	**Mean**
Abert's towhee	4	0.2	5	0.25	1	0.05	1	0.05	2	0.1	2	0.1
Ash-throated flycatcher		0		0	2	0.1	3	0.15		0		0
Bell's vireo	1	0.05	3	0.15	1	0.05	2	0.1	2	0.1	3	0.15
Bewick's wren	7	0.35	8	0.4	5	0.25	5	0.25	2	0.1	2	0.1
Brown-headed cowbird F		**0**		**0**	**6**	**0.3**	**8**	**0.4**	**3**	**0.15**	**4**	**0.2**
Brown-headed cowbird M	2	0.1	4	0.2	6	0.3	7	0.35	5	0.25	8	0.4
Brown-headed cowbird sex-?	2	0.1	2	0.1		0		0		0		0
Brown-headed cowbird T	**3**	**0.15**	**6**	**0.3**	**7**	**0.35**	**15**	**0.75**	**5**	**0.25**	**12**	**0.6**
Blue-grosbeak		0		0	3	0.15	4	0.2	4	0.2	5	0.25
Black-tailed gnatcatcher		0		0	5	0.25	5	0.25	4	0.2	4	0.2
Common grackel		0		0		0		0	1	0.05	2	0.1
Common yellowthroat	6	0.3	7	0.35	2	0.1	2	0.1	7	0.35	8	0.4
Lucy's warbler	1	0.05	1	0.05		0		0		0		0
Mourning dove		0		0	1	0.05	1	0.05	2	0.1	4	0.2
Northern oriole	2	0.1	2	0.1	1	0.05	1	0.05		0		0
Red-winged blackbird	8	0.4	26	1.3	8	0.4	26	1.3	7	0.35	14	0.7
Song sparrow	1	0.05	1	0.05	2	0.1	3	0.15	9	0.45	15	0.75
Summer tanager		0		0		0		0	1	0.05	1	0.05
Unidentified empidox flycatcher	1	0.05	1	0.05		0		0		0		0
Unidentified warbler		0		0		0		0		0		0
Verdin	4	0.2	4	0.2	5	0.25	6	0.3		0		0
White-crowned sparrow		0		0	1	0.05	1	0.05		0		0
Western kingbird		0		0		0		0	1	0.05	1	0.05
Wilson's warbler		0		0	1	0.05	3	0.15		0		0
Western wood pewee		0		0	1	0.05	1	0.05		0		0
Yellow-breasted chat	1	0.05	1	0.05	6	0.3	22	1.1	13	0.65	19	0.95
Yellow warbler		0		0	6	0.3	6	0.3	3	0.15	3	0.15
Yellow-headed blackbird	1	0.05	1	0.05		0		0	1	0.05	1	0.05
Point count summary												
Total # host birds	60				92				84			
Total # host species	12				17				15			
Mean # host birds (s.d.)	3.0 (2.2)				4.6 (2.5)				4.2 (2.7)			
Mean # host species (s.d.)	1.9 (1.2)				3.1 (1.1)				2.95 (1.7)			
Min/Max # birds per point	1 - 8				1 - 11				0 - 9			
Min/Max # species per point	1 - 5				1 - 5				0 - 6			
BHCO F:# hosts	**0.0**				**0.087**				**0.048**			
BHCO: # hosts	0.05				0.16				0.14			
BHCO F freq	0				0.3				0.15			
BHCO freq	0.15				0.35				0.25			