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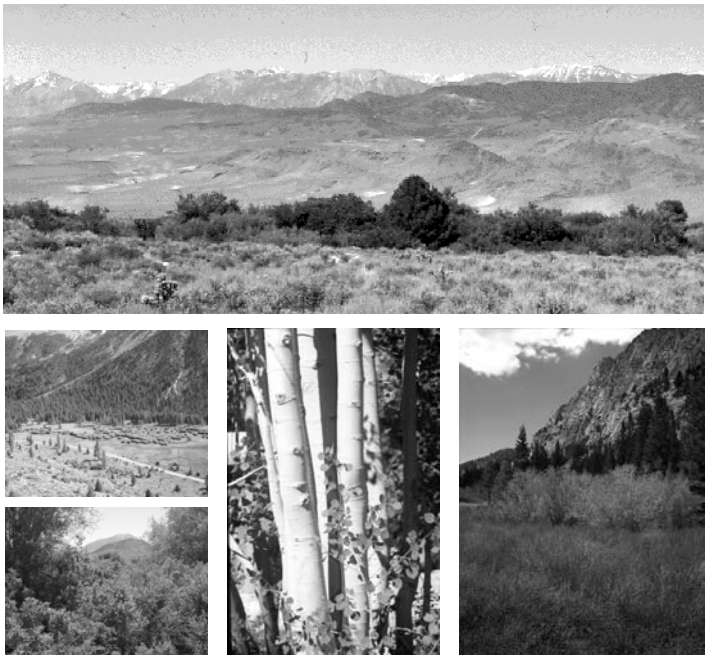
Riparian Songbird Monitoring in the Eastern Sierra Nevada

Results of the 2003 field season and selected 1998 - 2003 summary results



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SUMMARY

In 2003, PRBO Conservation Science (PRBO) completed the 6th field season of a riparian songbird monitoring program in the eastern Sierra Nevada. Results presented in this report are derived from extensive point count monitoring sites in the Owens River, Mono Basin and Hammil Valley watersheds 1998-2003 (Chapter I), our 4th year of effort at intensive riparian monitoring sites in the Mono Basin (Chapter II) and a three year summary of results from our work on nest searching plots at North Lake and Rock Creek, Inyo National Forest (Chapter III). Additional 2003 results from this monitoring program are presented in separate reports: A three year summary of our work in the West and East Walker River watersheds are presented in Heath (*in prep*). A two year summary of our work at Devils Postpile National Monument (on the west slope of the Sierra Nevada) are presented in Gates and Heath (2003). Results of our outreach and education efforts are presented in Gates et al. (2003). The most current results of our efforts on the Lower Owens River are presented in Heath and Gates (2002).

CHAPTER I: Riparian Bird Species Composition, Distribution, Breeding Status and Breeding Species Diversity in the Eastern Sierra Nevada 1998-2003.

We ranked breeding status for 177 species encountered at 16 locations in the Owens River and Hammil Valley watersheds and 205 species encountered at 12 sites in the Mono Lake watershed. Breeding status of the riparian and coniferous focal species was submitted for inclusion in the CalPIF statewide database to assist in documenting the most current California breeding distribution for these species.

We summarized breeding species diversity, by year, for riparian sites that we have monitored since 1998. Higher elevation sites in the Owens River and Mono Basin watersheds harbored the highest breeding bird diversity in the region over the course of the six year study, and these sites demonstrated no significant annual variation. We summarized breeding species diversity and richness, by year, for riparian sites that we established in 2001. Total transect species diversity and richness was high at Jordan Springs, Rock Creek and North Lake in most years.

CHAPTER II: Mono Basin Long Term Riparian Songbird Monitoring Plots: Mill, Wilson, Lee Vining and Rush Creeks. 2003 Progress Report.

We determined breeding bird species diversity for each of five or six years (1998-2003 and 1999-2003) for Lee Vining, Rush, Mill and Wilson Creeks. These sites demonstrated very little change in species diversity over the five or six year period, though Lee Vining Creek tended toward higher species diversity in 2003.

Mayfield estimates of nest success at Mono Basin sites in 2003 were: Yellow Warblers (25%), Song Sparrows (23%), Red-winged Blackbirds (12%) and Spotted Towhees (69%). Nest success for Yellow Warblers and Song Sparrows was not significantly different among Mill, Wilson, Rush or Lee Vining Creeks.

Predation accounted for 67% of all nest failure. With video surveillance system recordings and direct observation, we confirmed gopher snake, long-tailed weasel, raccoon, American Magpie,

Steller's Jay, Brown-headed Cowbird and an unidentified mouse species as nest predators in the Mono Basin in 2003.

52% of Yellow Warbler and 69% of Song Sparrow nests were parasitized by the Brown-headed Cowbird. There was no significant difference in Mayfield nest success for parasitized versus not-parasitized nests for either species. Parasitized Yellow Warbler nests tended to have lower nest success than not-parasitized nests while the opposite was the case for Song Sparrows, and this overall trend was opposite from what we found in 2002.

One hatch year Yellow Warbler banded at Rush Creek in 2002 was recaptured as a breeder at Lee Vining Creek in 2003. Individual adult Song Sparrows, Green-tailed Towhees, Savannah Sparrows, American Robins and Yellow Warblers were captured in four consecutive years at the same location as breeders (2000-2003).

CHAPTER III: Nest Success and Rates of Brown-Headed Cowbird Parasitism In Riparian Habitats at North Lake and Rock Creek, Inyo National Forest, Three Year Summary Report (2001-2003).

Mayfield estimates of nest survival at North Lake for Western Wood-Pewees (15%), Dusky Flycatchers (13%), Warbling Vireos (13%) and Brewer's Blackbird (17%) were low. Nest survival for Yellow Warbler (31%), American Robin (29%) and Song Sparrow (26%) were moderate. Mayfield estimates of nest survival at Rock Creek for Western Wood-Pewees (49%), American Robins (66%) and Warbling Vireos (32%) were moderate to high.

Predation was the leading cause of nest failure at both Rock Creek and North Lake in all years. Observed predation events included activities by Steller's Jays, a Northern Goshawk, Common Ravens and Belding's ground squirrels. Cars on the Rock Creek road accounted for the observed deaths of several adult birds that held territories on the nest plot: two Red-breasted Sapsuckers, one Red-shafted Flicker, one American Robin and two House Wrens.

Parasitism rates for all host species combined were 17% at North Lake and 30% at Rock Creek. 75% of Warbling Vireo nests were parasitized at North Lake. 34% of Warbling Vireo nests were observed parasitized at Rock Creek, but because not all nest contents were viewed, this rate should be considered a minimum. 15% of Yellow Warbler nests were parasitized at North Lake, compared to 50% at Mono Basin sites.

At both North Lake and Rock Creek, there were more Brown-headed Cowbirds congregated at horse corrals than in riparian habitats 0.15 km and 4.5 km away respectively. Differences were moderately significant at North Lake and significant at Rock Creek. There were significantly more adult cowbirds present at pack stations after the arrival of pack animals to the corrals at both Rock Creek and North Lake. There was no significant difference in adult cowbird numbers at riparian sites before and after pack animal arrival at nearby horse corrals.

BACKGROUND AND INTRODUCTION

The region of California where the Sierra Nevada meets the Great Basin offers unusual challenges and opportunities for songbird populations but was little studied in the past (but see Fisher 1893, Grinnell and Storer 1924, Dixon 1934, Rowley 1939, Gaines 1992). The Point Reyes Bird Observatory's (PRBO) songbird monitoring efforts in this unique region are a part of a statewide program to address the decline of breeding songbirds and their habitats throughout California (CalPIF 2002a). It is a highly collaborative effort among federal, state, county and private organizations that support the concept that songbirds are model organisms for monitoring the ecological health of various habitat types and the effects of land management and restoration practices.

2003 marked the sixth year of PRBO's songbird monitoring efforts in the eastern and southern Sierra. The Bureau of Land Management Bishop Field Office (BLM), Inyo National Forest (INF) and PRBO originally spearheaded the baseline songbird monitoring program exclusively in riparian habitats in 1998. Other partners at the time included California Department of Fish and Game (CDFG), Eastern Sierra Audubon Society (ESAS), Eastern Sierra Institute for Collaborative Education (ESICE) and the Mono Lake Committee (MLC). In subsequent years, additional partners included Los Angeles Department of Water and Power (LADWP), Mono Lake Tufa State Reserve (MLTSR), Mono County, Inyo County Water Department (ICWD), Humboldt-Toiyabe National Forest (HTNF), Devils Postpile National Monument (DEPO), environmental consulting firms (McBain and Trush and Ecosystem Sciences) and other researchers (Golondrinas de Las Americas Project - Cornell University and Sierra Nevada Aquatic Research Lab (SNARL)) and educators in the region. While most work has been conducted in riparian habitats, we are currently active in designing and initiating projects in other habitats as well, including sagebrush, montane meadow, and coniferous forest.

We conducted the original baseline project 1998-2000, when we established sites from the Mono Basin south to Owens Dry Lake. At this time, we executed our most intense efforts at BLM and INF sites in the Owens Valley alluvial fan, where very little previous information regarding songbird populations existed (Heath and Ballard 2003a). In 2000, we intensified efforts in the Mono Basin. We initiated nest searching plots and mist netting stations on Lee Vining and Rush Creek in order to monitor the success of and provide information to ongoing restoration activities (LADWP 1996). We also initiated nest searching plots and mist netting stations at Mill and Wilson Creek in order to provide information to water allocation discussions and to gather baseline data for proposed restoration and management efforts (Little 1997).

In 2001, we continued point counts and habitat assessments at a representative subset of the original 1998-2000 study area and continued intensive efforts in the Mono Basin with the intention to continue work there as a part of a long term bird monitoring program for the Sierra Nevada Bioregion. In the same year, we established point count stations on HTNF lands in the West and East Walker River watersheds to provide baseline riparian songbird information to managers in this mostly undocumented region (Heath and Ballard 2002). Additionally, we added new point count locations on BLM lands in the Mono Basin and East Walker River watershed to further investigate songbird populations in aspen riparian habitats, and to monitor possible effects of changes in sheep grazing intensity with the implementation of new BLM

grazing Standards and Guidelines (Heath et al. 2002a, BLM 1999). We also added nest searching plots at higher elevation INF-managed sites at North Lake and Rock Creek to investigate the effects of pack stations and campgrounds on adjacent riparian breeding songbirds (Heath et al. 2002a). In 2002, we continued the 2001 program and initiated 32 point count stations on CDFG lands as a part of the West Walker Grazing study in collaboration with SNARL and CDFG. Additionally, we implemented a songbird monitoring project in riverine / riparian habitats of the Lower Owens River as a part of the Lower Owens River Project (LORP 1999), and a monitoring and visitor education project in montane meadow and riparian habitats at DEPO (Heath and Gates (2002) and Gates and Heath (2003)). Lastly, in 2002 we applied a stronger outreach and education component to the project (Gates and Pitkin 2003).

In 2003, we duplicated the 2002 program, with the exception of the West Walker Grazing study sites. Results presented here are from extensive point count monitoring sites in the Owens River, Mono Basin and Hammil Valley watersheds 1998-2003 (Chapter I), our 4th year of effort at intensive riparian monitoring sites in the Mono Basin (Chapter II) and a three year summary of results from our work on nest searching plots at North Lake and Rock Creek, INF (Chapter III). A three year summary of our work in the West and East Walker River watersheds are presented in Heath (in prep). A two year summary of our work at DEPO are presented in Gates and Heath (2003). Results of our outreach and education efforts are presented in Gates and Pitkin (2003).

Through our past and current efforts, we seek to better understand the factors affecting riparian birds in the eastern Sierra Nevada bioregion. Through collaborative partnerships, we are providing data to local managers, planners and conservation organizations and actively participating in regional adaptive management efforts. By also providing information to CalPIF, we are filling statewide bird conservation information gaps and are testing assumptions and recommendations offered in the Riparian Bird Conservation Plan and other statewide bird conservation documents (RHJV 2000, CalPIF 2002a). Information garnered from this bird monitoring effort is continually incorporated into the new wave of interactive bird conservation documents and online databases (CalPIF 2002b) and is assisting in international efforts to reverse the decline of songbird populations (PIF 2002).

METHODS

Study area

The study area in 2003 encompassed riparian habitats of the Owens River, Mono Basin, East and West Walker River, Hammil Valley and San Joaquin Watersheds of Inyo, Mono and Madera Counties. A host of federal, state, county and city agencies manage study site lands including the BLM, INF, HTNF, LADWP, CDFG, MLTSR, DEPO and Mono County. Thirty-two separate creeks and three river systems were studied, totaling approximately 170 stream-km or 1,700 ha of riparian habitat, ranging in elevation from 1200 m to 2900 m (Figure 1, Table 1).

Figure 1. PRBO's songbird monitoring sites in the eastern and southern Sierra Nevada, 2003. Numbered regions are: 1. East and West Walker River watershed, 2. Mono Basin watershed, 3. Upper San Joaquin River watershed, 4. Hammil Valley, 5. Upper Owens River watershed, 6. Owens Valley alluvial fan and 7. Lower Owens River. Numbers correspond with Table 1. Dots represent study sites.

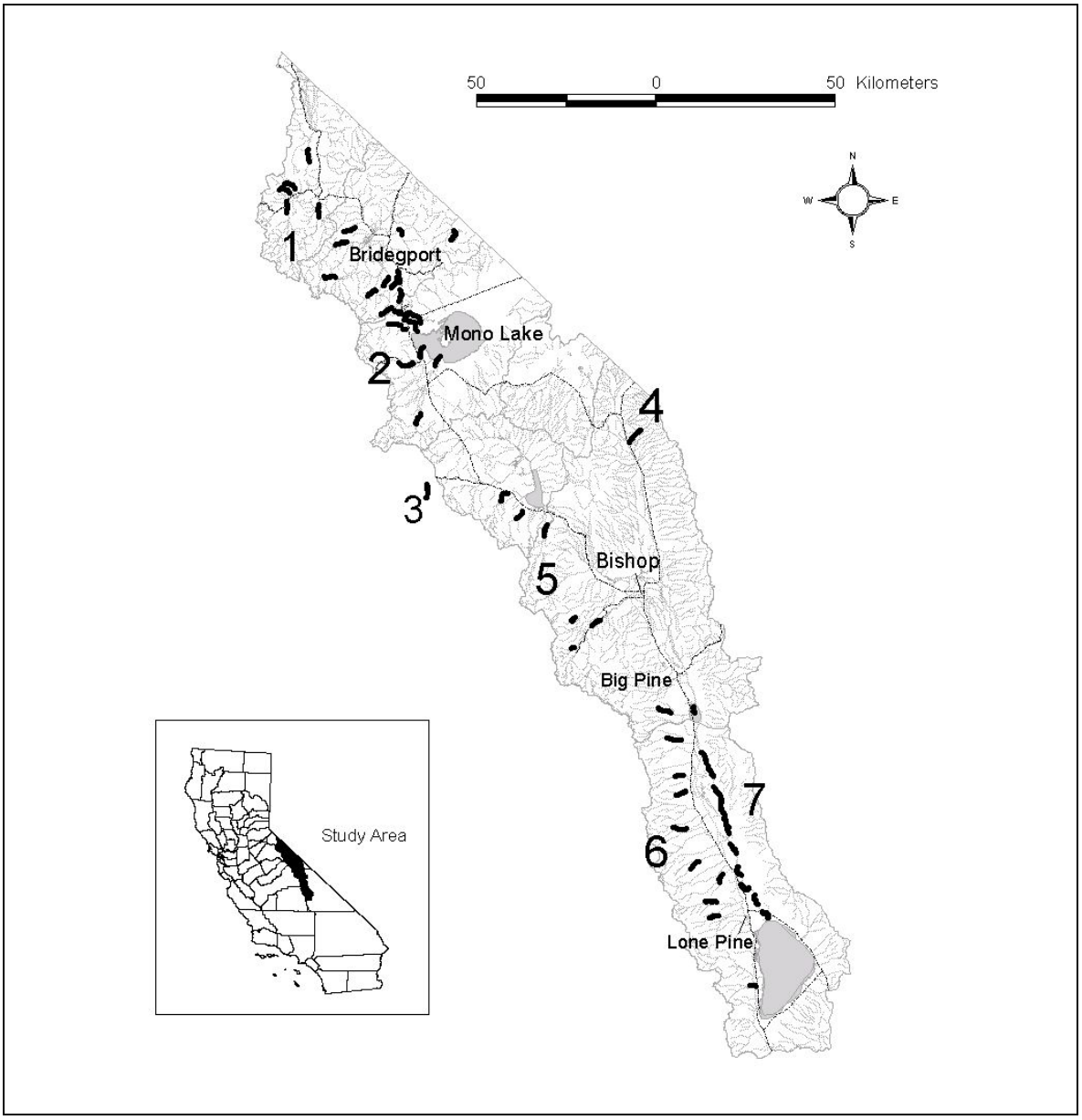


Table 1. Songbird census techniques conducted at each study site, eastern and southern Sierra Nevada, 2003. Sites listed from north to south. All nest monitoring efforts included a habitat assessment component. Last column indicates location of reported methods and results, by site (× = in this report, 1 = (Heath in prep), 2 = Gates and Heath (2003), 3 = not reported in 2003). Region column corresponds to Figure 1.

Study Site	Region (Key to Figure 1)	Bird Monitoring Techniques					2003 reporting
		point count	area search	nest monitor	spot map	mist net	
Mill Creek – North	1	×					1
Silver Creek	1	×					1
Wolf Creek	1	×					1
Upper West Walker River	1	×					1
Little Walker	1	×					1
Clark Canyon	1	×					1
By-Day Creek	1	×					1
Atastra Creek	1	×					1
Buckeye Creek	1	×					1
Robinson Creek	1	×					1
Green Creek	1	×					1
Dog Creek	1	×					1
Virginia Creek	1	×					1
Jordan Springs	2	×					×
Wilson Creek	2	×		×	×	×	×
Mill Creek – South	2	×		×	×	×	×
Dechambeau Creek	2	×					×
Thompson Ranch	2		×				×
Lee Vining Creek	2	×		×	×	×	×
Rush Creek	2	×		×	×	×	×
Marble Creek	4	×					×
San Joaquin River (DEPO)	3	×				×	2
Convict Creek	5	×					×
McGee Creek	5	×					×
Rock Creek – Upper	5	×		×	×		×
Buttermilk Country	5	×					×
Bishop Creek	5	×					×
North Lake	5	×		×	×		×
Birch Creek	6	×					×
Taboose Creek	6	×					×
Thibaut Creek	6	×					×
Independence Creek	6	×					×
Bairs Creek	6	×					×
Hogback Creek - Lower	6	×					×
Tuttle Creek	6	×					×
Ash Creek	6	×					×
Lower Owens River	7	×					3

Point Count Censuses

Observer Training

PRBO and BLM biologists, all trained in distance estimation and familiar with songs and calls of birds in the area, conducted all point count censuses. Additionally, all biologists practiced and

calibrated distance estimation and local bird identification for two weeks prior to censuses. Throughout the season, observers calibrated distance estimations on a weekly basis, and a Leica Range Finder ™ was rotated through observers for use during the censuses.

Censuses

In total, we conducted point count censuses at 795 independent point count stations on 56 transects. We censused stations initiated in 2001 and 2002 three times during the peak of the songbird breeding season (May 25 – July 5, 2003) and older established stations two times. We spaced each of two or three visits at least 7 days apart. Only results from Mono Basin, Hammil Valley, Upper Owens River watershed and Owens Valley alluvial fan sites are presented here (Appendix 1).

We censused all points using the five-minute variable circular plot (VCP) point count method (Rosenstock et al. 2002) and followed general guidelines outlined in Ralph et al. (1993). We estimated the distance to each bird in 10m increments out to 50m, in 25m increments out to 100m, and lumped all detections beyond 100m. We recorded all birds detected and type of initial detection (visual, song or call). To minimize observer bias, a different observer conducted each of the two or three censuses. Additionally, we conducted points in order from point 1 to 15 for one or two censuses and in the opposite direction (from point 15 to 1) for one census in order to minimize the effects of time of day on detection rates. We conducted censuses from within 30 minutes after local sunrise until approximately 4 hours later, and did not conduct counts in excessively windy or rainy conditions. In conditions where the creek was too loud for bird detections, observers stepped slightly away from the creek, but continued to census the 50 m radius circle with the original point as center.

A list of transects, transect codes and dates of censuses for sites reported here are presented in Appendix 1. GPS coordinates for 1998-2000 sites are presented in Heath et al. 2001, and transect descriptions for 1998-2000 sites are available in Heath and Ballard 1999a, 1999b. GPS coordinates and transect maps and descriptions for sites initiated in 2001 are presented in Heath and Ballard (2002) and Heath et al. (2002a).

Nest Monitoring

Nest searching began in early May and lasted until breeding activity declined in early August. We monitored two nest searching plots at each of the four Mono Basin sites (Lee Vining Creek, Rush Creek, Wilson Creek and Mill Creek) that were initiated in 2000, and one plot at both North Lake and Rock Creek that were initiated in 2001. See Appendix 2 for plot sizes and effort summaries. Nest plot maps and locations are presented in Heath et al. 2002a & 2002b.

PRBO biologists conducted all nest monitoring, following specific guidelines in Martin and Geupel (1993) and Breeding Bird Research and Monitoring Database (BBIRD) protocol (Martin et al. 1997). Special care was taken to minimize human induced predation probability and disturbance to the adults and nest site. Nests of all species were located at all stages (construction, egg laying, incubation, and nestling). Nest outcomes were determined by checking nests every 1 - 4 days until completion. Parasitism by Brown-headed Cowbirds and

types of nest predators were determined when possible. Mirror poles and Microcams™ on extension poles were used to check the contents of high nests when possible.

In order to find and monitor more open cup nests at Rock Creek and North Lake (where our study was designed to assess nest success and parasitism rates of open cup nesters), we did not monitor cavity nests in 2003 and only a few in 2002.

All data from nest monitoring were recorded and entered in a format compatible with the BBIRD program of the Fish and Wildlife Service Cooperative Unit at the University of Montana (Martin et al. 1997). Basic measurements of the nest and nest substrate were also recorded after outcome was determined. See Martin et al. (1997) for a complete list of data variables.

We used video surveillance systems to monitor and record songbird nests for the purpose of documenting nest predation events. We deployed six monitoring system on 24 nests at Rush and Lee Vining Creeks in 2003. We carefully monitored bird responses to the surveillance system to avoid excessive disruption of nesting behavior. We placed cameras within 1 foot of the nest sites and VCR's and solar panels at least 25m away from and out of site of the nest. We began recording nests during incubation when possible, and dismantled the system after nest completion.

Spot Mapping

PRBO biologists conducted spot mapping at each nest plot. The same biologist mapped all territorial individuals during each visit to her/his nest plot (see Nest Monitoring section), following guidelines discussed in Ralph et al. (1993) and International Bird Census Committee recommendations (IBCC 1970). At the end of the field season, daily spot maps were combined into single territory maps for each breeding species at each nest plot. Locations of transient species were noted to document their presence on the plots.

Constant Effort Mist Netting

Mono Basin mist netting stations at Rush, Lee Vining, Mill and Wilson Creeks, established in 2000, were continued in 2003. Mist netting procedures conformed to the guidelines described in Ralph et al. (1993) and Monitoring Avian Productivity and Survivorship (MAPS) protocol (DeSante et al. 2002). In summary, 10 mist nets were operated once every ten day period between May 5 and August 12, 2002. Nets were unfurled 15 minutes after local sunrise, checked every 30 minutes (more often in cold weather) and were operated for five hours during each census period. Birds captured were carefully removed from the net and processed nearby. Each bird captured (except game birds) received a United States Fish and Wildlife Service (USFWS) band for permanent identification and to enable estimates of survival from subsequent recaptures. Prior to releasing the bird, age, sex, wing length, breeding condition, weight, skull ossification, flight feather wear, molt, and fat score of each bird were recorded as described by Pyle (1997). Nets and poles were taken down immediately after netting concluded. USFWS-permitted PRBO biologists conducted all banding. See Appendix 3 for census dates. GPS coordinates and detailed maps of netting locations are presented in Heath et al. (2002).

All mist netting data has been submitted to the MAPS program of the Institute for Bird Populations (DeSante and O'Grady 2000) and the Bird Banding Lab (BBL, Patuxent, MD).

Area Searches

Three area search plots were censused at the Thompson Ranch site. Each was censused 2 times throughout the breeding season and censuses were spaced at least 10 days apart. In summary, each plot was censused for 20 minutes during the morning hours, and all birds detected within the plot and type of detection (song, visual, or call) were recorded (see Ambrose 1989, Ralph et al. 1993). Breeding behaviors were also recorded. Plot locations, numbers and census dates are in Appendix 4.

Brown-headed Cowbird Point Counts and Tallies

From the first week of May through the second week of August, we conducted paired, 5 minute, 50m fixed-radius cowbird censuses at the same point on each of ten nest searching sub plots – the first census conducted soon after sunrise and the second conducted between 11:00 and 15:00. At Rock Creek and North Lake, these counts were also conducted at pack stations 4.5 km and 0.15 km from the nest searching plots respectively. Protocol for all counts followed standardized point count procedure (described above), with the exceptions that: 1. only cowbird sightings were recorded, 2. censuses were conducted on a weekly basis, and 3. we only distinguished detections within 50m and outside of 50m. In addition, we kept daily tallies of cowbird encounters at each of ten nest searching sub plots, differentiating cowbird sex and age, when possible, and recording starting and ending times for the daily tallies.

Predator Area Searches and Tallies

We conducted predator area searches at Big Meadow Campground, adjacent to the Rock Creek nest plot. One area search was conducted each week between the second week of May and the second week of August within the boundaries of the campground. Protocol followed standard area search procedure (described above) with the exception that only non-avian potential predator taxa (mammals, reptiles) were recorded. In addition, we kept daily tallies of predator encounters at each of ten nest searching sub plots, differentiating species when possible, and recording starting and ending times for the daily tallies.

Nest Vegetation Assessment

We conducted nest vegetation assessments at all nest locations in 2003. Soon after the nesting attempt terminated, we measured the nest substrate and surrounding vegetation patch of each nest. A slightly modified version of the BBIRD method for vegetation measurements was used (Martin et al. 1997), which included variables for forb cover and average forb height by species. The basic units for vegetation sampling were a 5-meter radius plot (for shrubs, forbs and ground cover) and an 11.3-meter radius plot (for trees) centered on the nest. For a detailed description of measurements and estimations used see Martin et al. (1997). We did not conduct nest vegetation assessments on cavity nests at North Lake and Rock Creek in 2003 (see Nest Monitoring section above).

Nest Plot Vegetation Assessment

For each of six nest plot sites, 30 non-nest points were chosen randomly across the plot's area using ArcView (version 3.2a, ESRI 2000). Points were located in the field with Garmin Global Positioning System (GPS II+) receivers, and vegetation assessments were completed, parallel in protocol to the nest vegetation assessments.

Weather Data

Weather data including wind speed and direction, temperature, cloud cover and type and rain were recorded three times during each banding session. High and low temperatures, and time interval between temperature readings were recorded during each visit to the six nest plot sites.

Geographic Data

Location information was collected at all nests and newly established point count stations using a Garmin Global Positioning System (GPS II+) receiver. Positions were recorded in Decimal Degrees, NAD83 datum. All coordinates and estimated accuracy (figure of merit; FOM) were recorded. FOM of these points ranges from 0 to 10 meters. All maps are represented in UTM (Universal Transverse Mercator) coordinates, Zone 11, NAD83 datum.

Project Journal

A project journal was kept on a daily basis. Daily activity of all personnel was recorded in addition to a list of all birds detected at both on and off site locations. This journal is archived at the Eastern Sierra Field Station of PRBO, Mono County, CA.

Statistical Analysis and Definitions

Species Richness and Species Diversity
We summarized species diversity and species richness for breeding species detected during point counts at BLM and INF managed sites established in 2001 in higher elevation Owens River and Mono Basin watersheds. We also summarized breeding species diversity at sites we have monitored for 6 years. We excluded all non-breeding migrant or transient species. We further limited the species included in the summaries to those that we determined to be most reliably recorded with the point count protocol. Thus we also removed species whose territories are typically so large that we could not assure independence of individual observations among points (swallows [*Hirundinidae*], swifts [*Apodidae*], waterfowl [*Anatidae*], wading birds [*Ardeidae*], shorebirds [*Scolopacidae* and *Charadriidae*], vultures [*Cathartidae*], hawks [*Accipitridae*], falcons [*Falconidae*], Common Ravens [*Corvus corax*], and Clark's Nutcrackers [*Nucifraga columbiana*]). Nocturnal species were also excluded (owls [*Strigidae* and *Tytonidae*] and nightjars [*Caprimulgidae*]).

We summarized data for BLM and INF managed sites initiated in 2001 by transect. Total transect indices are the cumulative species richness or species diversity for each transect. We

also summarized data by point, by point per transect and by point per geomorphic region or point type (Owens Valley alluvial fan, Higher Elevation Owens River Watershed, Higher Elevation Mono Basin Watershed, Rush, Lee Vining, Mill and Wilson, and Marble Creek sites) for each year for sites initiated in either 1998 or 1999. We summarized species richness and diversity for each point individually for by-point summaries, and then took the mean of these for each transect for by-point per transect summaries. By-point per transect summaries are comparable with other similarly summarized transects with greater or fewer numbers of points. For by point per geomorphic region, we summarized species diversity by point, and took the mean of the points located in each region for each of 6 years (1998-2003).

Species diversity: We used Point Count 2.75 (Ballard 2002) to calculate breeding species diversity for each point count station using all detections within 50m summed over two or three visits. We used a transformation of Shannon's diversity index (or H', Krebs 1989) denoted N_1 (MacArthur 1965). The transformation expresses the data in terms of number of species and thus is more easily interpreted. Expressed mathematically:

$$N_1 = e^{H'} \text{ and } H' = \sum_{i=1}^{i=S} (p_i)(\ln p_i)(-1)$$

Where S = total species richness and p_i is the proportion of the total numbers of individuals for each species (Nur et al. 1999). High index scores indicate both high species richness and more equal distribution of individuals among species.

Species richness: We calculated the number of all breeding species for each point count station using all detections within 50m summed over three visits, using Point Count 2.75 (Ballard 2002).

Estimates of nest success

Nest success was calculated using two methods: Mayfield (1975), as recommended by Johnson (1979), and Proportion Successful (Martin 1992). The Mayfield method calculates the probability of nest success based on the daily survival rate of the given sample of nests. The method corrects for the fact that nests in any sample are likely to be found at various stages in the nest cycle. Proportion Successful is the percentage of successful nests out of all nests for that species. A successful nest is defined as a nest that fledges at least one host young. We limited proportional nest success calculations to nests with known outcome, and which were observed with at least one host egg or young. We calculated Mayfield estimates using all nests observed with at least one host young (including nests of unknown outcome). We compared nest success between plots and years using the program CONTRAST (Hines and Sauer 1989).

Brown-headed Cowbird presence

For comparisons between the mean number of cowbirds detected at pack stations versus the number of cowbirds detected at riparian sites, and morning cowbird detections versus afternoon detections, we summed all detections by site per week or by site per visit per week in each of three years (2001-2003), and averaged weekly counts by site or visit over three years. For comparisons of morning versus afternoon counts, we only used detections < 1000 am for morning counts and detections > 1200 for afternoon counts. For comparisons of number of cowbird detections before and after pack animal arrival, we summed all detections by site per week in each of three years (2001-2003), and averaged weekly counts by site and by time period (before pack animal arrival and after pack animal arrival) over three years. Because we did not

observe any cowbird adults (via any method) on or after August 2, we excluded all censuses after August 1 in our pack animal presence comparison. We used all adult cowbird detections (<50m & > 50m). We used Kruskall-Wallace equality of populations rank test to evaluate differences in mean cowbird detections.

Statistical calculations were performed using Stata Version 7.0 (Stata Corp. 1999) and CONTRAST (Hines and Sauer 1989). Significance was assumed at $P \leq 0.05$.

Breeding Status

We determined breeding status for all species encountered at all study sites between May 1 and August 15, 1998-2003. We used observations recorded before, during, and after all censuses and during project set up and vegetation assessments. We ranked species by site, using the following four criteria of the Riparian Habitat Joint Venture breeding scale, modified from breeding bird atlas criteria (http://www.prbo.org/CalPIF/criteria.html):

0 No evidence of breeding: Species not detected during breeding season, or species known not to breed within the general study area.
2 Possible breeding: Species encountered singing or acting territorial only once during the breeding season (in suitable habitat).
3 Probable breeding: Singing individual encountered on 2 or more different days of standardized censuses (at least one week apart); territorial behavior noted more than once at the same location; pair observed in courtship behavior.
1 Confirmed breeding: distraction display; nest building (except woodpeckers and wrens); nesting material or fecal sack being carried by adult; independent juveniles with adults; active territory observed on at least three days (at least one week apart); active nest observed.

Personnel

PRBO: All aspects of field work, project design and set-up were conducted by principal investigators Sacha Heath and Grant Ballard, staff biologist Chris McCreedy, and field biologists Leah Culp, Kiera Freeman, River Gates, Gernot Huber, Jennifer Kendrick, Jeff Maurer, Quresh Latif, David Lukas, Mike Prather, Chris Tonra and Simone Whitecloud.
BLM: Wildlife Biologist Joy Fatooh assisted in conducting point counts.
MLC: Staff member Lisa Cutting conducted area search censuses.
MLTSR: Staff member Dave Marquart conducted area search censuses.

CHAPTER I: RIPARIAN BIRD SPECIES COMPOSITION, DISTRIBUTION, BREEDING STATUS AND BREEDING SPECIES DIVERSITY IN THE EASTERN SIERRA NEVADA 1998-2003.

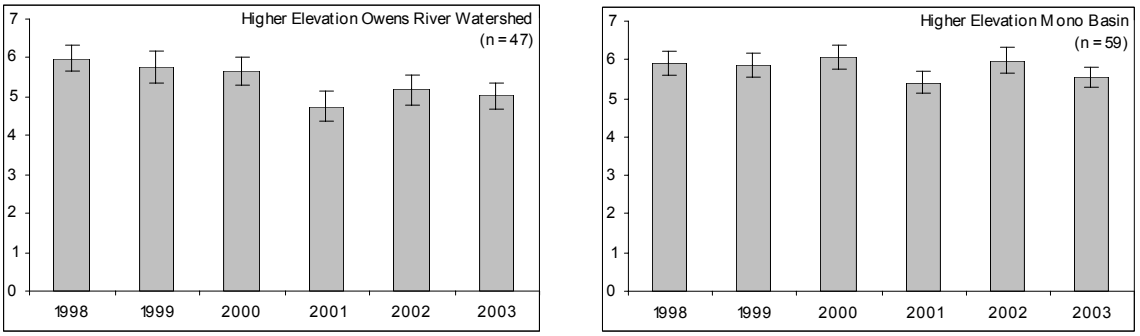
Bird species composition, distribution and breeding status

We ranked breeding status for 177 species encountered at 16 locations in the Owens River and Hammil Valley watersheds and 205 species encountered at 12 sites in the Mono Lake watershed using the RHJV breeding scale (Appendix 5). Breeding status of the riparian and coniferous focal species was submitted for inclusion in the CalPIF statewide database to assist in documenting the most current California breeding distribution for these species. Distribution maps for the focal species are periodically updated to incorporate the most current data. See http://www.prbo.org/CalPIF/livemaps.html for the most current and interactive California distribution maps for all CalPIF riparian and coniferous focal species and http://cain.nbii.gov/prbo/CalPIFmap/ for a database of CalPIF study sites. Breeding status lists for Lower Owens River are reported in Heath and Gates (2002), for DEPO in Gates and Heath (2003), and for the West and East Walker River watersheds in Heath (in prep).

A six-year view of breeding species diversity

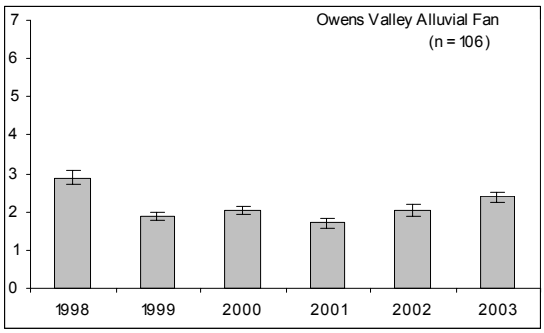
We summarized breeding species diversity, by year, for riparian sites that we have monitored since 1998 (Figure I-1 and I-2). Higher elevation sites in the Owens River and Mono Basin watersheds harbored the highest breeding bird diversity in the region over the course of the six year study, and these sites demonstrated no significant annual variation (Figure I-1). Five-year results from lower elevation Mono Basin sites are presented in Chapter II.

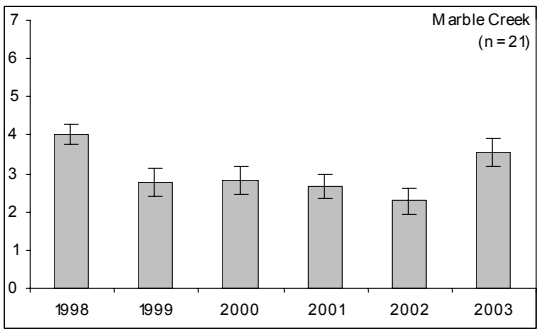
Figure I-1. Mean by point bird diversity and standard error bars for breeding species detected within 50m during 5-minute fixed radius point counts, at Higher Elevation Owens River and Mono Basin watershed sites 1998 – 2003. Breeding bird diversity (mean by point) on X axis, n = number of points for each grouping.



Bird species diversity at Owens Valley alluvial fan and Marble Creek sites was comparatively lower (Figure I-2) than at higher elevation sites. However, comparisons of this nature should be made with caution due to the geomorphological, elevational and habitat differences that occur within the eastern Sierra's various sub regions (Heath and Ballard 2003b). Breeding bird diversity at these lower elevation sites did vary slightly by year, with peaks in both 1998 and 2003.

Figure I-2. Mean by point bird diversity and standard error bars for breeding species detected within 50m during 5-minute fixed radius point counts, mean over 2 visits, at Owens Valley alluvial fan and Marble Creek sites 1998 – 2003. Breeding bird diversity (mean by point) on X axis, n = number of points for each grouping.





Breeding species diversity and richness at newly established sites

We summarized breeding species diversity and richness, by year, for riparian sites that we established in 2001 (Table I-1). Total transect species diversity and richness was high at Jordan Springs, Rock Creek and North Lake in most years. It is unclear why diversity and richness was so low at Jordan Springs in 2001, although we documented this similar pattern at other lower elevation Mono Basin sites (Figure II-2). However, in all years, BLM site Jordan Springs demonstrated higher bird diversity and richness than most other BLM sties censused since 1998 (Heath et al. 2001). North Lake demonstrated an especially high total transect diversity and richness for a site with only 5 points. Mean by point species diversity was similar to other high elevation sites as shown in Figure I-1.

Table I-1. Species diversity and richness by transect, mean by point by transect and standard error of the mean, for breeding species detected within 50m during 5-minute fixed radius point counts summed over 3 visits at Jordan Springs, Rock Creek and North Lake, 2001 - 2003.

Station	Species Diversity			Species Richness		
	Total transect	Mean by point	SE	Total transect	Mean by point	SE
Jordan Springs (n=14 points)						
2001	17.41	5.76	0.66	29	6.71	0.77
2002	23.17	8.23	0.58	36	9.43	0.72
2003	22.94	7.48	0.60	33	8.50	0.70
Rock Creek – Upper (n=15 points)						
2001	17.51	6.38	0.58	29	7.33	0.69
2002	17.54	5.44	0.63	27	6.07	0.73
2003	13.82	5.60	0.61	22	6.40	0.76
North Lake (n=5 points)						
2001	13.52	7.62	0.60	18	9.40	0.40
2002	14.46	8.68	0.97	21	10.80	1.16
2003	15.53	7.02	1.35	24	9.20	0.76

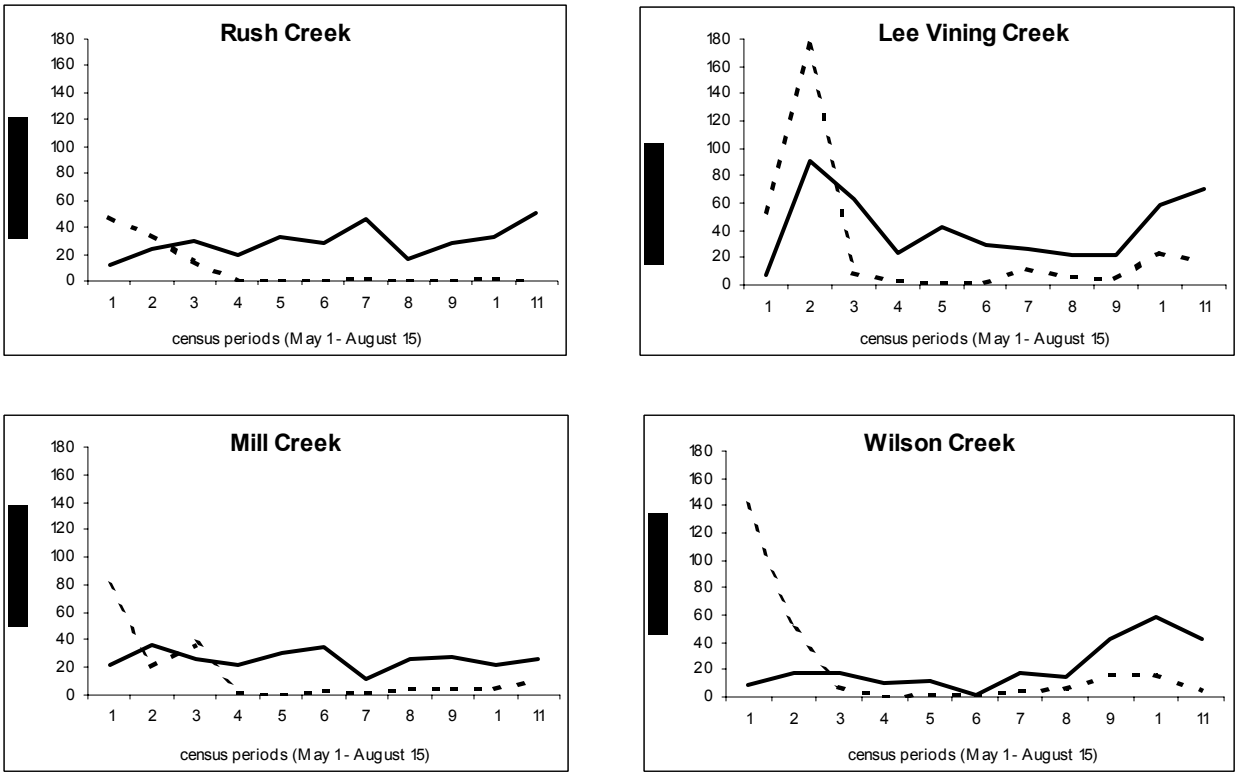
CHAPTER II: MONO BASIN LONG TERM RIPARIAN SONGBIRD MONITORING PLOTS: MILL, WILSON, LEE VINING AND RUSH CREEKS. 2003 PROGRESS REPORT.

Use of Mono Basin riparian sites by migrant and breeding species

Rush, Lee Vining, Wilson and Mill Creek provided both migratory stopover and breeding habitat for songbirds in 2003. Pulses in songbird numbers occurred during spring migration and summer dispersal of family groups in the Mono Basin, and each of the four study creeks exhibited different migratory and dispersal patterns during the time period of our mist netting operations (Figure II-1).

Migrant captures dropped off by late May / early June at all creeks. Lee Vining and Wilson Creeks exhibited the most dramatic spring migration pulse with 175.44 birds captured / 100 net hrs on 17 May and 141.20 birds captured / 100 net hrs on 7 May, respectively. Migrant bird numbers at Rush and Mill Creek were low, however it is possible that a peak occurred prior to our early May mist netting operations. As in other years, Wilson's Warbler was the most frequently captured migrant or transient species (Table II-2 and Heath et al. 2001, 2002b). Ruby-crowned Kinglets were also captured frequently at Wilson and Mill Creeks (Table II-2).

Figure II-1. Number of captures per 100 net hours by census period at Rush, Lee Vining, Mill and Wilson Creeks, Mono Basin May 1 – August 15, 2003. Broken line represents migrant, dispersing and transient species, solid line represents species that breed within 1 km of mist netting stations. Corresponding dates for census periods are in Appendix 3.



Breeding species captures increased throughout the season at Rush, Lee Vining and Wilson Creeks. Lee Vining Creek breeding bird numbers peaked in early June, probably representing captures of species that were present as breeders, but also occurred as migrants en route to other breeding locations. Peaks in late July and early August breeding bird numbers reflect captures of newly fledged birds and the dispersal of territorial birds.

Breeding species diversity, richness and abundance

Mist netting captures rates provide us with a measure of species richness and abundance for Mono Basin sites in 2003 (Table II-1). Lee Vining and Mill Creek had the highest richness of captured species, as they did in 2002 (Heath et al. 2002b). These differences probably reflect the structural diversity of the vegetation on both Lee Vining and Mill Creek and the predominantly homogenous vegetation composition of Rush and Wilson Creek.

Table II-1. Summary of constant effort mist netting during the breeding season at Mono Basin sites (May 1-August 15, 2003).

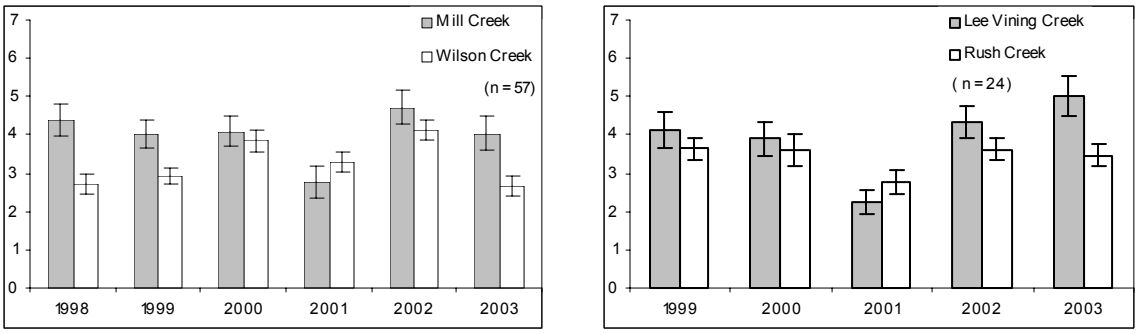
Station	Total birds	Birds/100 net hrs.	Number new birds banded	Number birds captured unbanded	Number recaptured birds	Number individuals recaptured	Species richness
Rush Creek	197	37.87	140	0	57	29	27
Lee Vining Creek	356	69.50	283	10	63	34	43
Mill Creek	214	40.04	147	7	60	21	39
Wilson Creek	234	43.28	199	7	28	20	31

The total number of individuals (migrants and breeders) / 100 net hrs at all Mono Basin sites, were higher than the 1996 national average of 37.2, for 410 MAPS stations across the United States (DeSante et al.1998), and Lee Vining Creek had the highest capture rate of 69.50 birds / 100 net hrs (Table II-1).

A six and five-year view of breeding species diversity at Mono Lake tributaries' lower reaches

Similar to patterns in abundance and species richness, as demonstrated by banding data, Lee

Figure II-2. Mean by point bird diversity and standard error bars for breeding species detected within 50m during 5-minute fixed radius point counts, mean over 2 visits, at Mill, Wilson, Lee Vining and Rush Creeks 1998 – 2003. Breeding bird diversity (mean by point) on X axis, n = number of points for each grouping.



Vining and Mill Creeks had higher species diversity than either Wilson or Rush Creeks in 2003 (Figure II-2). There has been little significant change in breeding species diversity since 1998 and 1999 at any four of the Mono Lake tributaries, though Lee Vining Creek is tending toward higher diversity in 2003. This probably reflects the new breeding species that have begun to occupy the restoring vegetation on Lee Vining Creek. In particular, high canopy nesters Warbling Vireo and Western Wood-Pewees were first documented as breeders on the PRBO Lee Vining Creek nest plots in 2002, and these species returned again in 2003 (Heath et al. 2002b). Diversity at Wilson Creek has fluctuated more than any other site over the course of the study. The 2003 dip may be attributed to the April 2003 fire that completely removed riparian vegetation at several of the point count locations.

Estimates of productivity

Yellow Warbler was the most frequently captured breeding species at all sites and demonstrated fair to high productivity ratios (Table II-2). With the exception of Lee Vining Creek, Song Sparrow productivity ratios were also high.

Productivity indices derived from mist netting data are helpful because they reflect the survival of hatch year birds after they have left the nest, whereas nest success determines successful fledging of nestlings. However, species and site comparisons must be interpreted with caution due to inherent differences in species capture probabilities and vegetation structure of each site (DeSante and Geupel 1987, PRBO data). In addition, juveniles at some sites may begin dispersing so quickly that they are missed when nets are operated once per ten-day period (PRBO data). It is therefore important to consider productivity indices in conjunction with results from nest monitoring efforts.

Nest Success

Mayfield estimates of nest success for select species

We determined Mayfield nest success estimates for four species with reasonable sample sizes at Mono Basin sites in 2003 (Table II-3). Song Sparrow nest success was not significantly different between creeks (χ^2=0.41, df=3, *P*=0.94). Yellow Warbler nest success was also not significantly different (χ^2=5.35, df=3, *P*=0.48).

Total nest survival for Yellow Warblers at Rush and Lee Vining Creeks, and for Song Sparrows at all Mono Basin sites was low in 2003 and was lower overall than in 2002, but not significantly so. Nest success for Song Sparrows on Rush Creek did increase in 2003 and was not as dismal as it had been in 2002, although these results were not significant (χ^2=1.52, df=1, *P*=0.22, Heath et al 2002b). Spotted Towhees had high nest success rates at all Mono Basin sites and was significantly higher than for the other three species analyzed (χ^2=25.42, df=3, *P*<0.01).
Most of the Red-winged Blackbird nests were located in a colony on the Lee Vining Creek delta. Fewer females nested there than in 2002 (25-35 compared to 40-60, PRBO data). However, they had slightly better nest success than in 2002. Females may have chosen to nest at other sites in

Table II-2: Species and age class of all birds banded at Rush, Lee Vining, Mill and Wilson Creeks during constant effort mist netting during the breeding season, (May 1 – August 15, 2003). Confirmed or probable breeding species (detected as breeders within 1 km of banding site) in bold. Total = migrants and breeders combined, adjusted total = breeding species only. Full species names associated with 4-letter AOU species codes in Appendix 6.

Rush Creek			
species	HY	AHY	ratio
RUHU	1	0	~
RSFL	**1**	**0**	**~**
WIFL	**0**	**2**	**0**
HAFL	0	1	0
GRFL	0	2	0
DUFL	**0**	**4**	**0**
BUSH	**0**	**4**	**0**
BEWR	**1**	**0**	**~**
RCKI	0	8	0
HETH	0	1	0
OCWA	0	1	0
YWAR	**20**	**38**	**0.53**
MGWA	**2**	**1**	**2.00**
COYE	0	2	0
WIWA	0	26	0
GTTO	**0**	**10**	**0**
SPTO	**0**	**5**	**0**
CHSP	0	1	0
BRSP	**2**	**4**	**0.50**
SAGS	**1**	**0**	**~**
SAVS	**0**	**1**	**0**
SOSP	**4**	**5**	**0.80**
LISP	0	1	0
BHGR	**0**	**3**	**0**
LAZB	0	1	0
BRBL	**0**	**2**	**0**
BHCO	**1**	**2**	**0.50**
Total	33	125	0.26
Adj. Total	**32**	**81**	**0.40**

Lee Vining Creek			
species	HY	AHY	ratio
ANHU	1	0	~
BTLH	1	0	~
RUHU	5	3	1.67
RBSA	**0**	**2**	**0**
HYSA	**0**	**1**	**0**
DOWO	**0**	**2**	**0**
RSFL	**2**	**0**	**~**
WEWP	**0**	**11**	**0**
WIFL	1	5	0.20
HAFL	0	3	0
UNEM	0	2	0
GRFL	1	6	0.17
DUFL	0	8	0
WEFL	1	0	~
BLPH	0	1	0
SWTH	0	1	0
CAVI	0	1	0
SOVI	0	1	0
WAVI	**1**	**6**	**0.17**
STJA	**0**	**1**	0
VGSW	**0**	**5**	0
MOCH	**0**	**3**	0
BEWR	**1**	**0**	~
HOWR	**0**	**4**	0
RCKI	0	9	0
AMRO	**0**	**1**	**0**
OCWA	1	3	0.33
YWAR	**35**	**37**	**0.95**
AUWA	0	5	0
TOWA	0	1	0
MGWA	3	2	1.50
COYE	0	1	0
WIWA	1	49	0.02
WETA	3	2	1.50
GTTO	**3**	**10**	**0.30**
SPTO	**4**	**9**	**0.44**
CHSP	0	1	0
BRSP	**5**	**3**	**1.67**
SOSP	**1**	**6**	**0.17**
MWCS	0	2	0
BHGR	0	3	0
LAZB	**0**	**5**	**0**
BHCO	**2**	**2**	**1.00**
BUOR	**2**	**5**	**0.40**
CAFI	**0**	**1**	**0**
Total	74	223	0.33
Adj. Total	**56**	**114**	**0.49**

Mill Creek			
species	HY	AHY	ratio
CAHU	0	1	0
RUHU	3	2	1.50
HAWO	**0**	**1**	**0**
RSFL	**0**	**2**	**0**
WEWP	**0**	**1**	**0**
WIFL	0	1	0
DUFL	0	4	0
WAVI	**0**	**4**	**0**
VGSW	1	0	~
MOCH	**0**	**3**	**0**
JUTI	**0**	**1**	**0**
WBNU	2	0	~
HOWR	**3**	**7**	**0.43**
RCKI	0	16	0
BGGN	1	0	~
AMRO	**0**	**5**	**0**
SATH	**1**	**0**	**~**
EUST	**0**	**2**	**0**
OCWA	0	1	0
YWAR	**4**	**12**	**0.33**
AUWA	0	1	0
TOWA	0	1	0
MGWA	0	1	0
COYE	0	3	0
WIWA	0	24	0
YBCH	0	1	0
GTTO	**2**	**2**	**1.00**
SPTO	**8**	**2**	**4.00**
SAGS	**0**	**1**	**0**
FOSP	1	0	~
SOSP	**3**	**4**	**0.75**
LISP	0	3	0
BHGR	0	1	0
LAZB	**1**	**1**	**1.00**
BRBL	**0**	**1**	**0**
BHCO	**1**	**2**	**0.50**
BUOR	**0**	**5**	**0**
HOFI	2	0	~
CAFI	**0**	**10**	**0**
Total	33	126	0.26
Adj. Total	**23**	**66**	**0.35**

Wilson Creek			
species	HY	AHY	ratio
ANHU	1	0	~
CAHU	2	0	~
RUHU	3	1	3.00
BEKI	**0**	**1**	**0**
WEWP	0	1	0
UNEM	0	1	0
GRFL	0	2	0
DUFL	0	8	0
WEFL	1	1	1.00
HETH	0	1	0
BEWR	**8**	**0**	**~**
HOWR	**1**	**1**	**1.00**
RCKI	0	25	0
AMRO	**1**	**0**	**~**
OCWA	3	2	1.50
YWAR	**19**	**30**	**0.63**
AUWA	0	4	0
MGWA	0	3	0
COYE	0	2	0
WIWA	0	30	0
WETA	0	1	0
GTTO	**4**	**4**	**1.00**
SPTO	**8**	**9**	**0.89**
BRSP	**1**	**2**	**0.50**
VESP	**0**	**3**	**0**
SOSP	**4**	**8**	**0.50**
LISP	0	3	0
BHGR	1	4	0.25
LAZB	0	1	0
RWBL	0	1	0
BHCO	**0**	**1**	**0**
BUOR	0	1	0
Total	57	151	0.38
Adj. Total	**46**	**59**	**0.78**

the Mono Basin this year due to the very poor success during 2002. Nests located in partially lake-submerged willows were not used in such high numbers, and Common Ravens were not observed as potential predators as frequently as in 2002 (PRBO data). Red-winged Blackbird nests were also found in smaller colonies on Rush and Wilson Creeks and they had low nest success.

Table II-3. Mayfield estimates of nest success for Yellow Warbler, Spotted Towhee, Song Sparrow, Red-winged Blackbird nests observed with at least one egg or young at Rush, Lee Vining, Mill, and Wilson Creeks, 2003. Nests of unknown outcome included in all calculations. Daily nest survival and standard error, and total nest survival.

	Number of Nests	Daily Nest Survival	SE	Total Nest Survival
Yellow Warbler				
Rush Creek	103	0.939	0.008	0.22
Lee Vining Creek	46	0.945	0.011	0.25
Mill Creek	10	0.976	0.014	0.55
Wilson Creek	6	0.952	0.027	0.30
All Creeks Combined	165	0.944	0.006	0.25
Spotted Towhee				
All Creek's Combined	20	0.986	0.008	0.69
Song Sparrow				
Rush Creek	26	0.942	0.016	0.22
Lee Vining Creek	29	0.947	0.012	0.25
Mill Creek	7	0.926	0.032	0.14
Wilson Creek	27	0.946	0.014	0.24
All Creeks Combined	89	0.944	0.008	0.23
Red-winged Blackbird				
Rush Creek	9	0.924	0.030	0.12
Lee Vining Creek	28	0.945	0.014	0.22
Wilson Creek	7	0.600	0.110	0.00
All Creeks Combined	44	0.922	0.014	0.12

Proportional nest success for all species

In 2003, we found 543 nests for 41 species at Mill, Wilson, Rush, and Lee Vining Creeks. We used 467 of these nests of known outcome and observed with at least one host egg or young for calculations of proportional nest success (Table II-4).

Proportional nest success rates typically differ from Mayfield success rates (Table II-3), as nests are located at different stages in their life cycles (Mayfield 1975). As such, proportional success often overestimates nest success (Martin 1992). With this in mind, proportional rates of nest success remain valuable for their insight into the breeding ecology of species with small sample sizes and/or difficult to monitor nests (such as cavity nesters).

Table II-3. Total number of nests observed with at least one egg or young and known outcome, and proportion successful at Mono Basin sites, 2003: Rush, Lee Vining, Mill and Wilson Creeks and all sites combined. Cowbird estimates calculated by parasitized nest, not by individual/young, and sample sizes include nests with and without host eggs/young. [1] Nest Types: A = open cup, scrape, saucer or platform; B = cavity, crevice or burrow; C = pendulum, sphere or dome.

Species	Nest Type[1]	Rush Creek		Lee Vining Creek		Mill Creek		Wilson Creek		All sites combined	
		# nests	proportion successful	# nests	proportion successful	# nests	proportion successful	# nests	proportion successful	# nests	proportion successful
Mallard	A	--	--	3	0.67	--	--	1	0.00	4	0.50
Gadwall	A	1	0.00	1	1.00	--	--	--	--	2	0.50
Northern Pintail	A	1	1.00	--	--	--	--	--	--	1	1.00
Green-winged Teal	A	--	--	--	--	--	--	2	0.00	2	0.00
American Kestrel	B	1	0.00	1	0.00	--	--	1	1.00	3	0.33
Killdeer	A	--	--	3	1.00	1	1.00	--	--	4	1.00
Spotted Sandpiper	A	5	0.60	11	0.91	--	--	--	--	16	0.81
Mourning Dove	A	14	0.21	--	--	--	--	1	1.00	15	0.27
Belted Kingfisher	B	--	--	--	--	2	0.50	--	--	2	0.50
Red-breasted X naped Sapsucker	B	--	--	1	1.00	--	--	--	--	1	1.00
Downy Woodpecker	B	--	--	1	1.00	--	--	--	--	1	1.00
Harry Woodpecker	B	--	--	--	--	1	1.00	--	--	1	1.00
Red-shafted Flicker	B	6	0.67	3	0.67	5	0.80	3	0.33	17	0.65
Western Wood-Pewee	A	--	--	2	1.00	1	1.00	--	--	3	1.00
Willow Flycatcher	A	6	0.33	--	--	--	--	--	--	6	0.33
Warbling Vireo	A	1	1.00	1	0.00	2	0.00	--	--	4	0.25
Steller's Jay	A	--	--	1	0.00	--	--	--	--	1	0.00
American Magpie	C	2	0.50	--	--	3	1.00	8	1.00	13	0.92
Violet-green Swallow	B	--	--	5	0.40	--	--	--	--	5	0.40
Northern Rough-winged Swallow	B	2	0.50	1	1.00	1	1.00	--	--	4	0.75
Cliff Swallow	B	--	--	--	--	--	--	3	1.00	3	1.00
Juniper Titmouse	B	--	--	--	--	1	0.00	--	--	1	0.00
Mountain Chickadee	B	--	--	1	1.00	--	--	--	--	1	1.00
Bushtit	C	7	0.86	1	0.00	--	--	--	--	8	0.75
Bewick's Wren	B	--	--	1	1.00	--	--	--	--	1	1.00
House Wren	B	--	--	1	0.00	10	0.60	--	--	11	0.55
American Dipper	B	--	--	1	0.00	--	--	--	--	1	0.00
American Robin	A	4	0.50	5	0.20	4	0.25	--	--	13	0.31
European Starling	B	--	--	--	--	2	1.00	--	--	2	1.00
Yellow Warbler	A	96	0.36	42	0.38	9	0.78	6	0.50	153	0.40
Green-tailed Towhee	A	--	--	2	0.00	--	--	--	--	2	0.00
Spotted Towhee	A	4	0.75	11	0.82	3	0.67	2	0.00	20	0.70
Song Sparrow	A	25	0.48	28	0.39	7	0.29	26	0.42	86	0.42
Black-headed Grosbeak	A	1	1.00	--	--	--	--	--	--	1	1.00
Lazuli Bunting	A	--	--	2	0.50	--	--	--	--	2	0.50
Red-winged Blackbird	A	7	0.00	27	0.26	--	--	4	0.00	38	0.18
Brewer's Blackbird	A	4	1.00	1	1.00	6	0.33	--	--	11	0.64
Brown-headed Cowbird	N/A	74	0.31	59	0.34	9	0.56	22	0.32	164	0.34
Bullock's Oriole	C	--	--	4	0.50	2	1.00	--	--	6	0.67
Lesser Goldfinch	A	--	--	1	1.00	--	--	--	--	1	1.00
Cassin's Finch	A	--	--	1	0.00	--	--	--	--	1	0.00
TOTAL		187	0.42	163	0.47	60	0.60	57	0.49	467	0.47

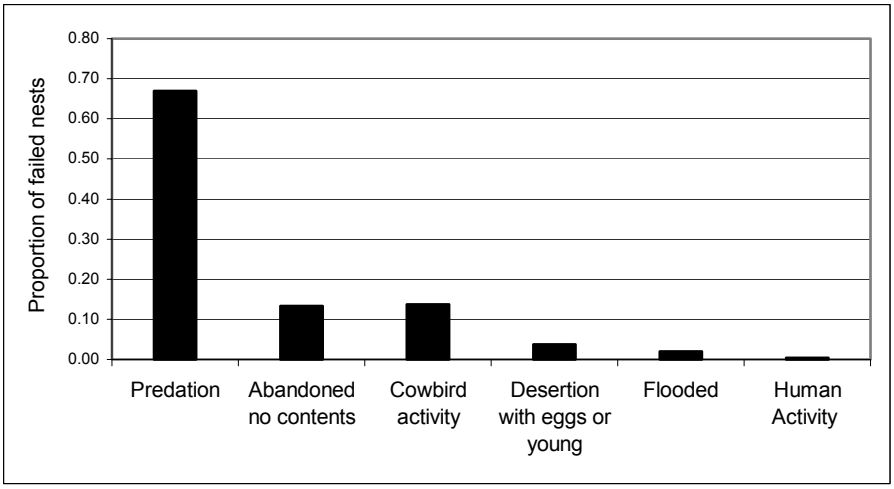
Open cup nest success was highest on Mill and Lee Vining Creeks (48% and 46%, respectively) and lowest on Rush and Wilson Creeks (40% and 36%, respectively). Overall, cavity and pendulum/sphere type nests had greater success than open cups (between 56% and 71% for cavities and between 40% and 100% for pendulum/spheres (PRBO data).

Factors influencing nest success

Nest mortality

Open-cup nest mortality factors in 2003 were similar in type and frequency to those factors identified in 2001 and 2002 (Heath et al 2002a & b). Predation was the most important threat to the survival of an open-cup nest, accounting for 67% of open-cup nest failures in 2003 (Figure II-3).

Figure II-3. Mortality factors of 300 failed open-cup nests at Lee Vining, Rush, Mill and Wilson Creeks, 2003.



Mammalian, reptilian and avian nest predators

Nest-searchers detected several potential mammalian, reptilian and avian nest predators throughout the breeding season at Mono Basin sites. These included least chipmunk (*Tamias minimus*), golden-mantled ground squirrel (*Spermophilus lateralis*), California ground squirrel (*Spermophilus beechyi*), mule deer (*Odocoileus hemionus*), long-tailed weasel (*Mustela frenata*), domestic dog (*Canis domesticus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), vole spp, domestic rat spp, gopher snake (*Pituophis melanoleucus*), and garter snake (*Thamnophis spp.*). Potential avian predators seen on plot include American Kestrel, American Magpie, Bewick's and House Wren, Steller's and Western-scrub Jay, Belted Kingfisher, Long-eared Owl, Great-horned Owl, Black-crowned Night Heron, Common Raven, Red-tailed and Cooper's Hawk, California Gull and Clark's Nutcracker.

Observed predation events

We deployed six video surveillance cameras on 24 nests in 2003. Of these, 16 nests fledged young, six had partial or complete predation events, one was abandoned, and one chick died from unknown causes (Table II-4).

Table II-4. Observed failed nest events, recorded by video surveillance systems, Mono Basin sites 2003.

Nest	Site	Documented Outcome
Song Sparrow 03A	Rush Creek B	Nest was depredated, but camera was knocked over by large animal and no footage was obtained.
Song Sparrow 05B	Rush Creek B	A long-tailed weasel visited during incubation but took nothing. The same morning, a Brown-headed Cowbird visited and layed an egg. That afternoon, the Song Sparrow removed an egg on her own, then the cowbird came, poked three eggs, and removed one egg. The Song Sparrow returned and removed the remaining two damaged eggs. After this day there were only cowbird eggs left in the nest. Two of these eggs hatched. The weasel came back ten days later and ate one of the cowbird chicks, and the other chick died in the nest.
Song Sparrow 05C	Rush Creek B	Song Sparrow egg and cowbird hatchling abandoned. Female cowbird came and removed an egg from the nest after abandonment.
Song Sparrow 11B	Rush Creek B	Song Sparrow egg ejected from the nest by cowbird. Two cowbird eggs hatched, and the remaining song sparrow egg did not. The two cowbird chicks remained. An unidentified mouse spp. ate one chick and force fledging the other chick.
Song Sparrow 13B	Rush Creek B	Nest found with only one cowbird chick. The chick was eaten by a raccoon.
Yellow Warbler 11B	Lee Vining Creek A	Gopher snake ate three chicks.
Yellow Warbler 19A	Lee Vining Creek A	A Steller's Jay ate 3 chicks.
Yellow Warbler 20A	Rush Creek B	Cowbird chick died in the nest. Some Yellow Warbler eggs were depredated before the camera was deployed. The remaining eggs never hatched.

In addition to video recorded predation events, nest searchers observed several other predation or predation-related events (Table II-5).

Table II-5. Predation or predation-related events observed by nest searchers, 2003.

Lee Vining Creek

- A Steller's Jay was seen depredating a Yellow Warbler nest.
- Another Steller's Jay was seen leaving a Yellow Warbler nest with an egg.
- Steller's Jays were also seen being scolded by Green-tailed Towhees and Warbling Vireos.
- A Steller's Jay was scolded by an American Robin near the robin's nest shortly before the nest was depredated.
- Steller's Jay incurred a broken wing display in a pair of Killdeer.
- We observed least chipmunks climbing trees of an American Kestrel nest and a Violet-green Swallow nest around the time they became inactive.
- A California ground squirrel was seen climbing a limb where a Red-shafted Flicker nest was depredated with eggs.
- California ground squirrels were observed climbing rose three times.
- Seven Red-winged Blackbird nests were depredated at one time. They were all in a clump and coyote tracks were seen leading up to them. One nest still had blood and feathers inside the nest.

Mill Creek

- An American Magpie was seen depredating an American Robin nest with eggs.
- Brewer's Blackbirds were mobbing the magpie just before it depredated the aforementioned robin nest.

Rush Creek

- A pair of Western-scrub Jays had a territory on the lower half of the plot. The parents brought their fledglings into the plot on a regular basis. A Yellow Warbler nest had chicks that were pecked to death, and Western-scrub Jays were in the area at the time. Yellow Warbler, Red-shafted Flicker, Brown-headed Cowbirds, Willow Flycatchers, and Spotted Towhees were all seen scolding the jays the day before this depredation.
- A least chipmunk had a burrow below a burrow that was used three times by Northern Rough-winged Swallows. The first two attempts failed.

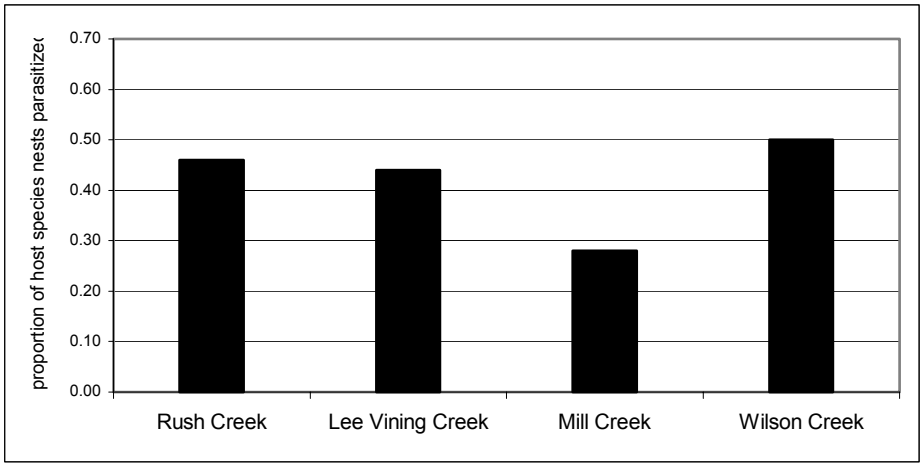
Wilson Creek

- Little evidence implicating any particular species as nest predators was observed, although a variety of potential nest predator species were observed on the creek.
- A gopher snake was observed with "a nestling size bulge".

Brown-headed Cowbirds

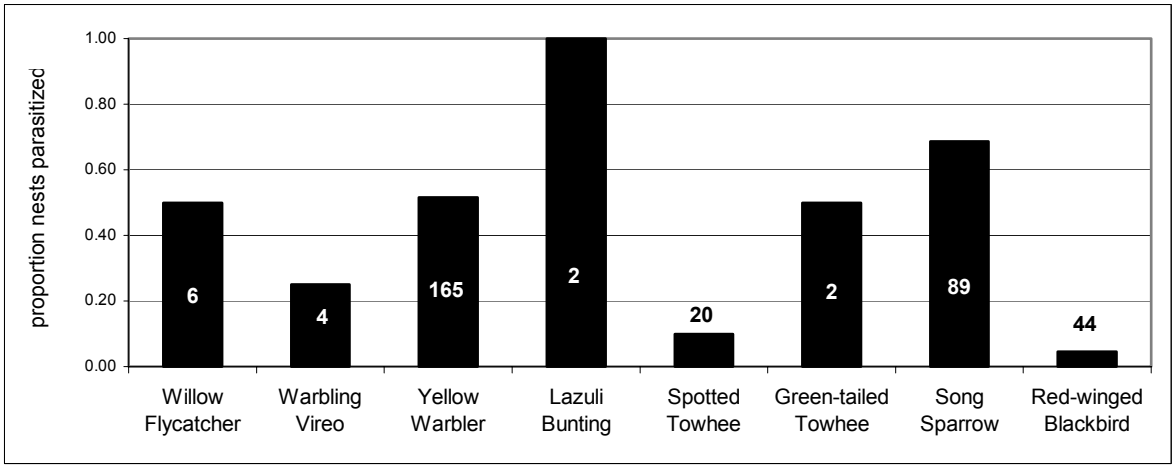
Between 28% and 50% of all host species' nests that were observed with at least one egg or young were parasitized at each creek in 2003 (Figure II-4). As in 2002, Wilson Creek had the highest parasitism rate among creeks, but the parasitism rate at Lee Vining Creek was 20 % higher in 2003 than in 2002.

Figure II-4. Proportion of host species' nests parasitized at each Mono Basin site, 2003. Host species defined as species observed as a cowbird host at eastern Sierra sites 1998-2003. Only nests observed with at least one host egg or young were used.



Eight species were observed as Brown-headed Cowbird hosts at Mono Basin sites in 2003 (Figure II-5). Of species with adequate sample sizes, Song Sparrows were parasitized most often. Parasitism rates for Song Sparrows and Yellow Warblers in 2003 were similar to past years (Heath et al. 2002b).

Figure II-5. Parasitism rates for 8 host species at Lee Vining, Rush, Mill and Wilson Creeks, 2003. Nest numbers shown on bars. Only nests observed with at least one host egg or young used.



In 2003, non-parasitized Yellow Warbler nests had higher survival than those parasitized, and non-parasitized Song Sparrow nests had lower success than parasitized ones, though not significantly so in either case (Table II-6). This pattern was opposite to that seen in 2002 (Heath et al. 2000b). There were no significant differences between any combinations of the six estimates presented in Table II-6.

Table II-6. Mayfield estimates of nest success for parasitized and non-parasitized Yellow Warbler and Song Sparrow nests at Mono Basin sites, 2003. Mayfield estimates for Brown-headed Cowbirds calculated by nest (not by individual egg/young). Host sample sizes restricted to nests with host eggs/young and include nests of unknown outcome. Brown-headed Cowbird sample sizes include nests with and without host eggs/young and include nests of unknown outcome.

	Number of Nests	Daily Nest Survival	SE	Total Nest Survival
Yellow Warbler				
Parasitized nests	85	0.939	0.008	0.22
Non-parasitized nests	80	0.950	0.008	0.29
Song Sparrow				
Parasitized nests	61	0.948	0.009	0.28
Non-parasitized nests	28	0.937	0.015	0.21
Brown-headed Cowbird				
Yellow Warbler host	94	0.928	0.009	0.21
Song Sparrow host	62	0.939	0.010	0.26

Brown-headed Cowbird success was comparable to that of host species success (for parasitized and unparasitized nests combined, Table II-7, Table II-3).

Table II-7. Mayfield estimates for Brown-headed Cowbirds by creek and all creeks combined, 2003. Estimates calculated by nest, not by individual/young. Sample sizes include nests with and without host eggs/young. Nests of unknown outcome included in all calculations. Daily nest survival and standard error, and total nest survival.

	Number of Nests	Daily Nest Survival	SE	Total Nest Survival
Rush Creek	77	0.928	0.010	0.21
Lee Vining Creek	59	0.929	0.011	0.21
Mill Creek	9	0.961	0.019	0.43
Wilson Creek	22	0.925	0.019	0.19
All Creeks Combined	167	0.930	0.006	0.22

During The 2003 field season Brown-headed Cowbirds were color-banded and blood samples were taken as part of a collaborative Humboldt State University, University of California and PRBO pilot Graduate study examining territoriality and host selection in this species. In addition we identified afternoon foraging areas used by cowbirds that breed on the project nest plots. An abstract of this pilot study is presented in Appendix 7.

Site fidelity, dispersal and recruitment

A total of 54 individuals of 17 species that were originally banded in 2000, 2001 or 2002 were recaptured in mist nets at Mono Basin sites in 2003 (Table II-8).

Table II-8. Total individuals banded in 2000, 2001 and 2002 and recaptured in 2003 by location and species. Count represents year of original banding and location of recapture. Results of constant effort mist netting at Mono Basin sites. Full species names associated with 4-letter AOU species codes in Appendix 6.

Species	Rush Creek			Lee Vining			Mill Creek			Wilson Creek			Total		
	2000	2001	2002	2000	2001	2002	2000	2001	2002	2000	2001	2002	2000	2001	2002
RBSA	--	--	--	--	--	1	--	--	--	--	--	--	--	--	1
HYSA	--	--	--	--	--	1	--	--	--	--	--	--	--	--	1
DOWO	--	--	--	--	--	1	--	--	--	--	--	--	--	--	1
HAWO	--	--	--	--	--	--	1	--	---	--	--	--	1	--	--
WEWP	--	--	--	--	--	1	--	--	1	--	--	--	--	--	2
WIFL	--	1	--	--	--	--	--	--	--	--	--	--	--	1	--
MOCH	--	--	--	--	--	1	--	--	--	--	--	--	--	--	1
HOWR	--	--	--	--	--	1	--	--	1	--	--	--	--	--	2
AMRO	--	--	--	--	--	--	1	--	1	--	--	--	1	--	1
OCWA	--	--	--	--	--	--	--	--	--	1	--	--	1	--	--
YWAR	3	3	3	1	--	5	--	1	--	--	1	1	4	5	9
GTTO	2	1	--	2	3	1	--	--	--	--	--	2	4	4	3
SPTO	--	--	2	--	--	--	--	1	--	1	--	1	1	1	3
SAVS	1	--	--	--	--	--	--	--	--	--	--	--	1	--	--
SOSP	--	0	--	--	--	--	--	--	1	1	0	1	1	--	2
BHCO	--	--	--	--	--	--	--	1	--	--	--	--	--	1	--
BUOR	--	--	--	--	--	1	--	--	1	--	--	--	--	--	2
Total	6	5	5	3	3	13	2	3	5	3	1	5	14	12	28

Over three years of between-year captures, 6 individuals of 3 species were captured as young birds in their original year of banding and were recaptured at different creeks as confirmed breeders in 2001, 2002 or 2003 (Table II-9). This movement and recruitment of breeding birds is rarely documented for migratory species by mist nets.

Table II-9. Individual that were captured as hatching year birds and moved in subsequent years to breed on different creeks, Mono Basin sites 2000 - 2003.

	Original band location (HY)			Recapture location (AHY)		
Species	2000	2001	2002	2001	2002	2003
Song Sparrow	Lee Vining	--	--	Rush	--	--
Yellow Warbler	Lee Vining	--	--	Rush	--	--
Song Sparrow	Wilson	--	--	--	Mill	--
Yellow Warbler	Lee Vining	--	--	--	Rush	--
House Wren	--	Wilson	--	--	Mill	--
Yellow Warbler	--	--	Rush	--	--	Lee Vining

Eight individuals of 5 species were recaptured as breeders for 4 consecutive years at Mono Basin sites (Table II-10).

Table II-10. Individuals that were captured at creeks of their original capture as breeders for four consecutive years (2000 – 2003), Mono Basin sites.

Species	Rush Creek	Lee Vining Creek	Mill Creek	Wilson Creek	Total
Yellow Warbler	3	1	--	--	4
Song Sparrow	--	--	--	1	1
Savannah Sparrow	1	--	--	--	1
American Robin	--	--	1	--	1
Green-tailed Towhee	--	1	--	--	1
Total	4	2	1	1	8

CHAPTER III: NEST SUCCESS AND RATES OF BROWN-HEADED COWBIRD PARASITISM IN RIPARIAN HABITATS AT NORTH LAKE AND ROCK CREEK, INYO NATIONAL FOREST, THREE YEAR SUMMARY REPORT (2001-2003).

BACKGROUND

This chapter presents summary results of a three-year riparian breeding songbird monitoring effort at Rock Creek and North Lake, Inyo National Forest (INF). Riparian Conservation Objectives (RCO's) in the Record of Decision for the Sierra Nevada Forest Plan Amendment (January 2001) identify the importance of maintaining riparian habitats for dependent species on National Forest lands. INF chose North Lake and Rock Creek as study sites primarily because each experiences a high level of recreational use and development in the form of pack station horse corrals, campgrounds, and the visitors that use these sites for fishing, camping, and wilderness trail-head access. An overarching goal of this investigation was for PRBO to provide INF with baseline data on riparian breeding songbirds in order for INF to prescribe, assess, evaluate, and monitor management activities within Riparian Conservation Areas (RCAs) on their lands. The primary objective of this study was to establish baseline rates of songbird nest success and cowbird parasitism, and to determine primary causes of songbird nest failure at North Lake and Rock Creek.

Past investigations on INF lands (Rothstein et al. 1980, 1984) provided evidence that Brown-headed Cowbirds detected in the morning at forested or riparian breeding areas traveled 2.1 – 4.0 km to congregate at pack station horse corrals, campgrounds, roads and bird feeders for afternoon foraging in the eastern Sierra. PRBO's North Lake riparian nest plot is located within 4 km of 7 USFS campgrounds, and two large wilderness trail-head parking lots and North Lake Pack Station are located within the nest plot boundaries. The Rock Creek nest plot is located 4.5 km from Rock Creek Pack Station's lower corral, 7 km from the upper corral, within 4 km of 6 USFS campgrounds (one of which is located within the nest plot boundary) and a heavily used paved road runs through the nest plot. As Brown-headed Cowbird parasitism poses a threat to the breeding success of riparian breeding songbirds, we attempted to determine whether nest parasitism rates are elevated at the high recreational use areas of Rock Creek and North Lake. We also attempted to corroborate whether pack station horse corrals at these areas provided foraging areas for cowbirds as Rothstein et al. (1980 & 1984) suggested.

SUMMARY OF RESULTS

Because of the wide assortment of human uses within close proximity to the nest plots, it was not possible to draw direct causal relationships between *specific* Forest uses and impacts on riparian songbirds during the breeding season. Further, funding limitations did not allow for control sites nor replicates within similar habitat types and elevation. Lastly, limited sample sizes do not yet allow for reliable results for some species (see Monitoring Recommendation below).

However, we were able to compare rates of nest success and cowbird parasitism for several species at North Lake and Rock Creek to those at other eastern Sierra sites in the Mono Basin

(2000 – 2003) and Owens Valley alluvial fan (1998 – 2000), and determine whether rates at North Lake and Rock Creek are lower or elevated, a cause of concern, or in need of further investigation. Further discussion of results is presented in the Results and Discussion section of this chapter. A summary of our findings derived from data with adequate sample sizes is as follows:

- Mayfield estimates of nest survival at North Lake for Western Wood-Pewees (15%), Dusky Flycatchers (13%), Warbling Vireos (13%) and Brewer's Blackbird (17%) were low. Nest survival for Yellow Warbler (31%), American Robin (29%) and Song Sparrow (26%) were moderate.
- Mayfield estimates of nest survival at Rock Creek for Western Wood-Pewees (49%), American Robins (66%) and Warbling Vireos (32%) were moderate to high.
- Predation was the leading cause of nest failure at both Rock Creek and North Lake in all years. Observed predation events included activities by Steller's Jays, a Northern Goshawk, Common Ravens and Belding's ground squirrels. Cars on the Rock Creek road accounted for the observed deaths of several adult birds that held territories on the nest plot: two Red-breasted Sapsuckers, one Red-shafted Flicker, one American Robin and two House Wrens.
- Parasitism rates for all host species combined were 17% at North Lake and 30% at Rock Creek. Mono Basin rates of parasitism in 2003 were 28% - 50%.
- 75% of Warbling Vireo nests were parasitized at North Lake and 34% were observed parasitized at Rock Creek. Because not all nest contents were seen at Rock Creek, this should be considered a minimum parasitism rate.
- 15% of Yellow Warbler nests were parasitized at North Lake. The Mono Basin parasitism rate for Yellow Warbler nests in 2003 was just over 50%.
- At both North Lake and Rock Creek, there were more Brown-headed Cowbirds congregated at horse corrals than in riparian habitats 0.15 km and 4.5 km away respectively. Differences were moderately significant at North Lake and significant at Rock Creek.
- There were significantly more adult cowbirds present at pack stations after the arrival of pack animals to the corrals at both Rock Creek and North Lake. There was no significant difference in adult cowbird numbers at riparian sites before and after pack animal arrival at nearby horse corrals.

MONITORING AND RESEARCH RECOMMENDATIONS

- One more year of data collection at Rock Creek and North Lake, replicating the 2001-2003 efforts, should occur in 2004. Nest numbers for several species are just under the recommended minimum for Mayfield analysis (Nur et al. 1999). An additional year of data will allow for stronger comparisons and conclusions.
- After the 4th year of data collection concludes, the baseline monitoring study should be discontinued. Using the data provided in these monitoring efforts as background, we recommend that INF design a research study that will document the response of riparian breeding songbirds to a specific change in management, perhaps based on management recommendations provided in the final analysis of the four-year monitoring effort.

RESULTS

Nest Success - *Proportional nest success*

During our 2001 – 2003 nest searching efforts at Rock Creek and North Lake, we found 206 and 284 nests respectively. We used 152 Rock Creek and 241 North Lake nests of known outcome and observed with at least one host egg or young for calculations of proportional nest success (Table III-1 and Table III-2).

Proportional nest success of open cup nesters was 56% at Rock Creek (Table III-1) and 40% at North Lake (Table III-2) for all years combined (2001-2003). These rates are within range of those reported for open cup riparian nesters in the Mono Basin during the same time period (2001-2003, 35% - 56%, PRBO data) and in the Owens Valley alluvial fan (1998-2000, 40% - 57%, Heath et al. 2001). Martin (1992) presented 44% as the mean proportional nest success of 32 open cup nesting neotropical migrant species, derived from several studies in North America.

Table III-1. Total number of nests observed with at least one egg or young and known outcome, and proportion successful at Rock Creek, 2001-2003.

Species	Nest Type[1]	2001		2002		2003		2001-2003 combined	
		# nests	proportion successful	# nests	proportion successful	# nests	proportion successful	# nests	proportion successful
Blue Grouse	A	1	1.00	--	--	--	--	1	1.00
Red-breasted Sapsucker	B	3	0.00	1	1.00	--	--	4	0.25
Red-shafted Flicker	B	1	1.00	1	1.00	--	--	2	1.00
Western Wood-Pewee	A	3	1.00	4	0.50	8	0.38	15	0.53
Dusky Flycatcher	A	1	1.00	--	--	5	0.60	6	0.67
Warbling Vireo	A	3	0.67	13	0.31	10	0.30	26	0.35
Steller's Jay	A	--	--	1	1.00	1	1.00	2	1.00
Violet-green Swallow	B	3	0.67	1	1.00	--	--	4	0.75
House Wren	B	5	0.80	1	1.00	--	--	6	0.83
Mountain Chickadee	B	1	1.00	1	1.00	--	--	2	1.00
White-breasted Nuthatch	B	--	--	1	1.00	--	--	1	1.00
Brown Creeper	B	1	1.00	1	1.00	--	--	2	1.00
American Robin	A	8	0.88	7	0.43	6	1.00	21	0.76
Yellow Warbler	A	2	0.50	1	1.00	4	0.50	7	0.57
Audubon's Warbler	A	--	--	--	--	1	1.00	1	1.00
Western Tanager	A	--	--	1	1.00	1	1.00	2	1.00
Black-headed Grosbeak	A	--	--	--	--	1	0.00	1	0.00
Fox Sparrow	A	--	--	1	0.00	3	0.33	4	0.25
Song Sparrow	A	2	1.00	2	1.00	5	0.80	9	0.89
Lincoln's Sparrow	A	1	0.00	--	--	--	--	1	0.00
Oregon Junco	A	2	0.50	4	0.50	8	0.50	14	0.50
Brewer's Blackbird	A	4	0.50	1	1.00	12	0.50	17	0.53
Brown-headed Cowbird[2]	N/A	5	0.60	6	0.33	17	0.24	28	0.32
Cassin's Finch	A	2	0.50	--	--	2	0.50	4	0.50
TOTAL TYPE A NESTS		29	0.72	35	0.49	67	0.54	131	0.56
TOTAL TYPE B NESTS		14	0.64	7	1.00	*	*	21	0.76
TOTAL ALL NESTS		43	0.70	42	0.57	67	0.54	152	0.59

[1] Nest Types: A = open cup, scrape, saucer or platform; B = cavity, crevice or burrow;
[2] Brown-headed Cowbird nests not included in totals
* Only type A nests monitored in 2003

Table III-2. Total number of nests observed with at least one egg or young and known outcome, and proportion successful at North Lake, 2001-2003.

Species	Nest Type[1]	2001		2002		2003		2001-2003 combined	
		# nests	proportion successful	# nests	proportion successful	# nests	proportion successful	# nests	proportion successful
American Green-winged Teal	A	1	1.00	---	--	1	1.00	2	1.00
Calliope Hummingbird	A	--	--	1	0.00	--	--	1	0.00
Red-breasted Sapsucker	B	2	1.00	--	--	--	--	2	1.00
Red-shafted Flicker	B	1	1.00	1	1.00	--	--	2	1.00
Western Wood-Pewee	A	4	0.50	2	0.00	8	0.13	14	0.21
Dusky Flycatcher	A	6	0.00	12	0.25	17	0.35	35	0.26
Warbling Vireo	A	3	0.00	6	0.17	5	0.20	14	0.14
House Wren	B	3	0.67	4	1.00	--	--	7	0.86
Mountain Bluebird	B	1	0.00	1	0.00	--	--	2	0.00
American Robin	A	11	0.64	22	0.32	15	0.53	48	0.46
Yellow Warbler	A	5	0.80	11	0.45	14	0.50	30	0.53
Audubon's Warbler	A	--	--	--	--	2	0.50	2	0.50
MacGillivray's Warbler	A	--	--	--	--	1	0.00	1	0.00
Mountain White-crowned	A	1	1.00	--	--	1	0.00	2	0.50
Fox Sparrow	A	--	--	--	--	1	0.00	1	0.00
Song Sparrow	A	2	0.00	3	0.00	10	0.70	15	0.47
Oregon Junco	A	--	--	2	0.00	2	0.00	4	0.00
Red-winged Blackbird	A	3	0.67	9	0.56	4	0.75	16	0.63
Brewer's Blackbird	A	9	0.78	16	0.06	7	0.43	32	0.34
Brown-headed Cowbirds[2]	N/A	11	0.36	15	0.33	20	0.45	46	0.39
Cassin's Finch	A	4	1.00	3	0.67	2	0.00	9	0.67
Pine Siskin	A	--	--	1	0.00	--	--	1	0.00
TOTAL TYPE A NESTS		42	0.57	88	0.27	90	0.42	227	0.40
TOTAL TYPE B NESTS		14	0.64	7	0.86	*	*	14	0.79
TOTAL ALL NESTS		56	0.59	95	0.32	90	0.42	241	0.42

[1] Nest Types: A = open cup, scrape, saucer or platform; B = cavity, crevice or burrow
[2] Brown-headed Cowbird nests not included in totals
* Only type A nests monitored in 2003

Because our efforts at Rock Creek and North Lake were primarily geared toward determining rates of nest success and Brown-headed Cowbird parasitism for open cup nesters, we maximized the number of open cup nests found by not monitoring cavity nesters in 2003, and only a few in 2002. This change in effort resulted in over twice as many open cup nests found in 2003 compared to 2001 for both plots (Tables III-1 and III-2).

Proportional nest success rates typically differ from Mayfield success rates (Table III-3), as nests are located at different stages in their life cycles (Mayfield 1975). As such, proportional success often overestimates nest success (e.g. Martin 1992). With this in mind, proportional rates of nest success remain valuable for their insight into the breeding ecology for small sample sizes and/or difficult to monitor nests (such as cavity nesters).

Mayfield estimates of nest success for select species

Mayfield nest success was significantly higher at Rock Creek than at North Lake for Western Wood-Pewees ($\chi^2 = 3.88$, $P = 0.049$), Dusky Flycatchers ($\chi^2 = 8.32$, $P < 0.01$), American Robins ($\chi^2 = 6.76$, $P = 0.01$) and Song Sparrows ($\chi^2 = 4.77$, $P = 0.03$). Nest success for Warbling

Vireos, Yellow Warblers and Brewer's Blackbirds was higher at Rock Creek than at North Lake, but not significantly so ($P = 0.18$ to 0.66).

Table III-3. Mayfield estimates of nest success for Western Wood-pewee, Dusky Flycatcher, Warbling Vireo, American Robin, Yellow Warbler, Song Sparrow and Brewer's Blackbird nests observed with at least one egg at Rock Creek and North Lake, 2001-2003 (nests of unknown outcome included). Daily nest survival and standard error, and total nest survival.

	Number of Nests	Daily Nest Survival	SE	Total Nest Survival
Western Wood-pewee				
Rock Creek	17	0.978	0.008	0.49
North Lake	15	0.941	0.017	0.15
Dusky Flycatcher				
Rock Creek	8	0.986	0.010	0.61
North Lake	38	0.945	0.011	0.13
Warbling Vireo				
Rock Creek	29	0.964	0.009	0.32
North Lake	16	0.937	0.018	0.13
American Robin				
Rock Creek	24	0.987	0.006	0.66
North Lake	48	0.961	0.008	0.29
Yellow Warbler				
Rock Creek	7	0.964	0.020	0.32
North Lake	30	0.963	0.010	0.31
Song Sparrow				
Rock Creek	9	0.992	0.008	0.81
North Lake	16	0.949	0.018	0.26
Brewer's Blackbird				
Rock Creek	17	0.959	0.014	0.28
North Lake	38	0.944	0.012	0.17

Mayfield nest success at North Lake for Western Wood-Pewees (15%), Dusky Flycatchers (13%) Warbling Vireos (13%) and Brewer's Blackbirds (17%) was very low and is a cause for concern. Western Wood-Pewees have demonstrated high nest success at other eastern Sierra locations (63%, Heath et al. 2001). Reported nest success rates for Dusky Flycatchers at other California locations were higher than those found at North Lake (proportional success 58.3%, Sedgewick 1993), but we have no eastern Sierra data for comparison.

Warbling Vireos demonstrated very low nest success at most PRBO study plots in the eastern Sierra, including the Owens Valley alluvial fan (12%) and the Mono Basin (15%). Overall, success for 77 Warbling Vireo nests in the eastern Sierra region was 19% (Table III-4).

Warbling Vireos are experiencing significant population declines in coastal California populations (Gardali et al. 2001) and presumably throughout California as a whole (Ballard et al. 2003). Causes for this have been attributed to low productivity on the breeding grounds (Gardali et al. 2001, Ortega and Ortega 2003). Rock Creek had the highest nest success for Warbling Vireos (32%) among all eastern Sierra sites (Tables III-3 and III-4)

Table III-4. Mayfield estimates of nest success for Warbling Vireo nests observed with at least one egg at Owens Valley alluvial fan sites (1998-2000), Mono Basin sites (2000-2003), and all sites combined (including North Lake and Rock Creek). Nests of unknown outcome included. Daily nest survival and standard error, and total nest survival.

	Years	Number of Nests	Daily Nest Survival	SE	Total Nest Survival
Owens Valley alluvial fan	1998 - 2000	25	0.933	0.014	0.12
Mono Basin	2000- 2003	7	0.941	0.023	0.15
All Sites Combined	1998 - 2003	77	0.948	0.007	0.19

Factors influencing nest success

Nest mortality

As at other eastern Sierra sites, predation was the leading cause of nest failure at both Rock Creek and North Lake in all years (Figure III-1 and Figure III-2)

Figure III-1. Mortality factors of 78 failed open-cup nests at Rock Creek, 2001-2003.

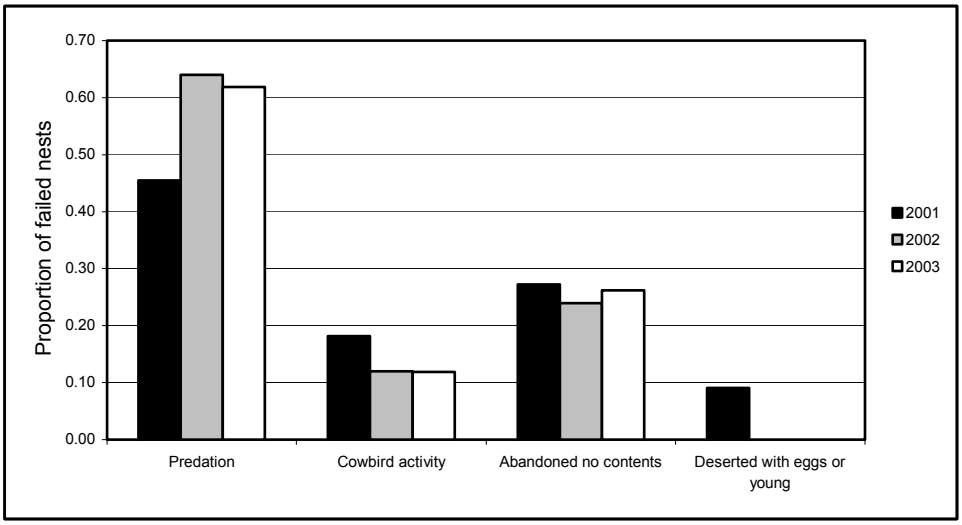
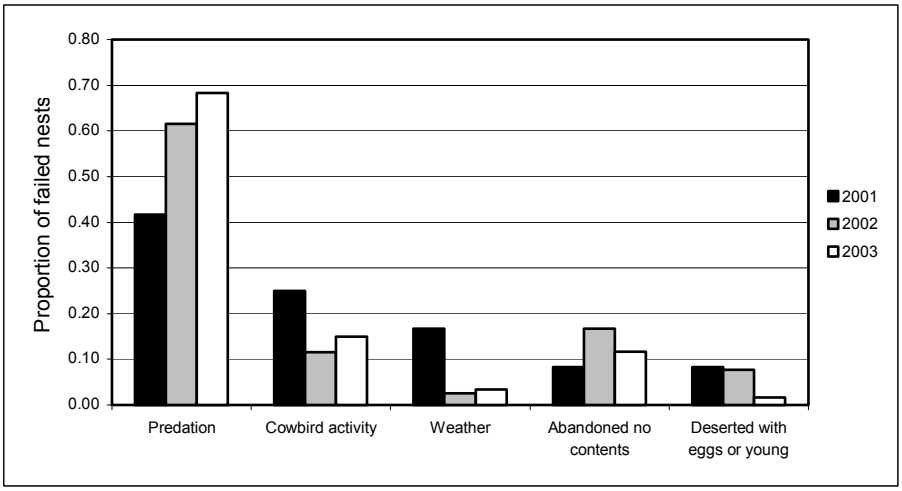


Figure III-2. Mortality factors of 162 failed open-cup nests at North Lake, 2001-2003.



Nest Predators

Several mammalian, reptilian and avian nest predators were detected throughout the breeding season at Rock Creek and North Lake. These included California ground squirrels, least chipmunks, golden-mantled ground squirrels, Belding's ground squirrel (*Spermophilus beldingi*), western gray squirrels, long-tailed weasels, coyotes, raccoons (*Procyon lotor*) and chickarees (*Tamiasciurus douglasii*). Avian predator species observed include Steller's Jay, House Wren, Common Raven, Red-tailed Hawk, Northern Goshawk and Clark's Nutcracker. Nest searchers observed several actual predation or predation-related events (Table III-5).

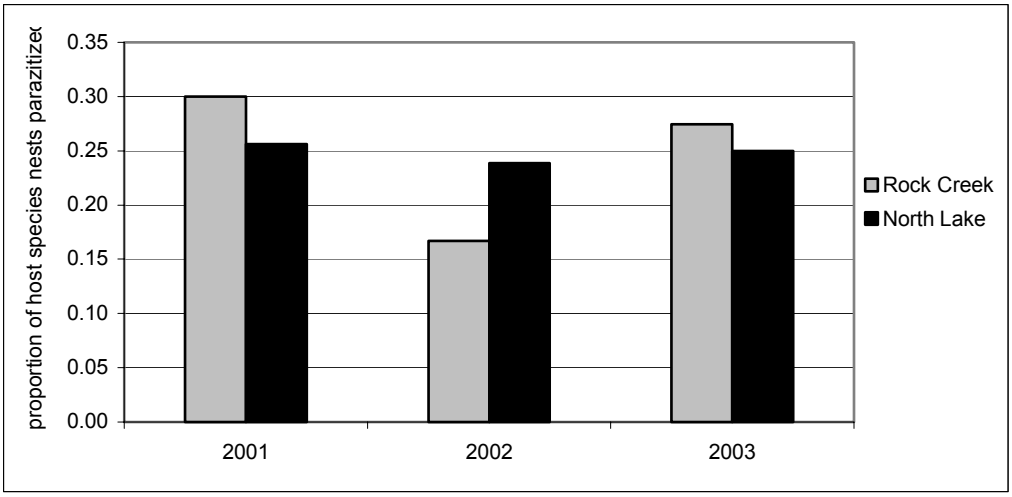
Table III-5. Predation or predation-related events observed by nest searchers at North Lake and Rock Creek, 2001-2003.

North Lake
• A Steller's Jay was seen hopping onto a Cassin's Finch nest shortly after the nest had been depredated.
• A Northern Goshawk was seen carrying an unidentified black object in its talons with Brewer's Blackbirds mobbing it.
• A Common Raven was observed flying over nest plot with American Robin egg in mouth.
• Belding's ground squirrels were observed climbing shrubbery, and one was observed entering an inactive Brewer's Blackbird nest after the entire Brewer's Blackbird colony had been depredated.
• A Steller's Jay moving through an area with a number of active nests, was mobbed for an extended period of time by several species. Four days later, all the nests being monitored in that area were no longer active, and the Steller's Jay was still in the area.
Rock Creek
• Steller's Jays were seen moving through willow and aspen groves, harassed by other birds. Nests were found depredated several times after these events.
• An Oregon Junco pair spent 10 minutes scolding a Belding's ground squirrel.
• A Common Raven was seen being chased by a Brewer's Blackbird.
• Cars hit and killed two House Wrens, two Red-breasted Sapsuckers, one Red-shafted Flicker and one American Robin.
• A Steller's Jay was seen eating a Western Wood-Pewee nestling.

Brown-headed Cowbirds

Between 17% and 30% of all host species' nests that were observed with at least one egg or young were parasitized at North Lake and Rock Creek (Figure III-3). Mono Basin nests in 2003 were parasitized 28% - 50% of the time.

Figure III-3. Proportion of host species' nests parasitized at Rock Creek and North Lake, 2001-2003. Host species defined as species observed as a cowbird host at all eastern Sierra sites 2000-2003. Only nests observed with at least one host egg or young were used.



Ten species at Rock Creek and nine species at North Lake were parasitized 2001 – 2003 (Figure III-4 and Figure III-5). Warbling Vireos had a very high parasitism rate at North Lake (75%). Rock Creek rates should be considered a minimum (34%) because not all nest contents were viewed.

Figure III-4. Parasitism rates for 10 host species at Rock Creek, 2001-2003. Nest numbers shown on bars. Only nests observed with at least one host egg or young used.

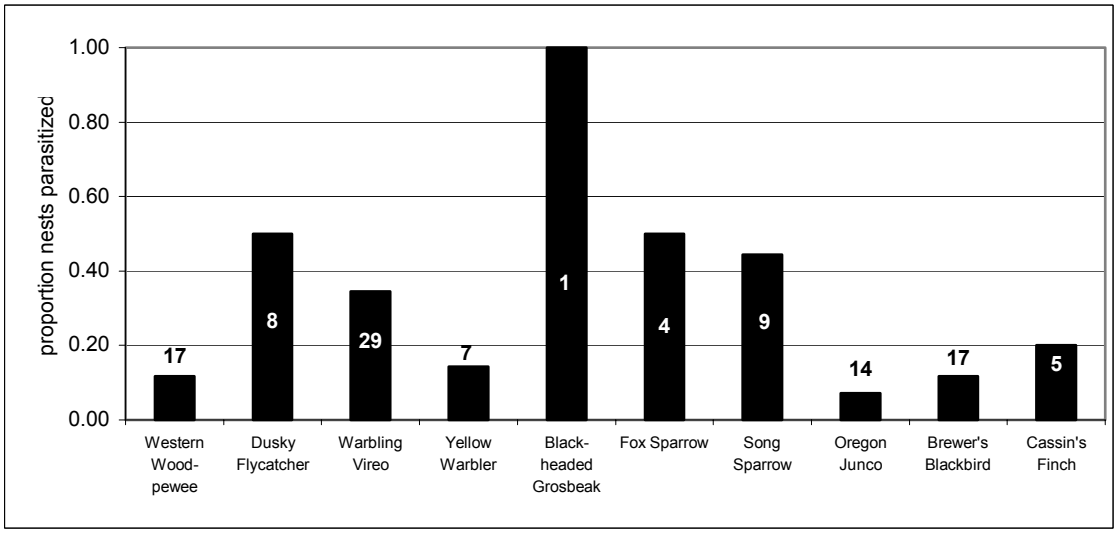
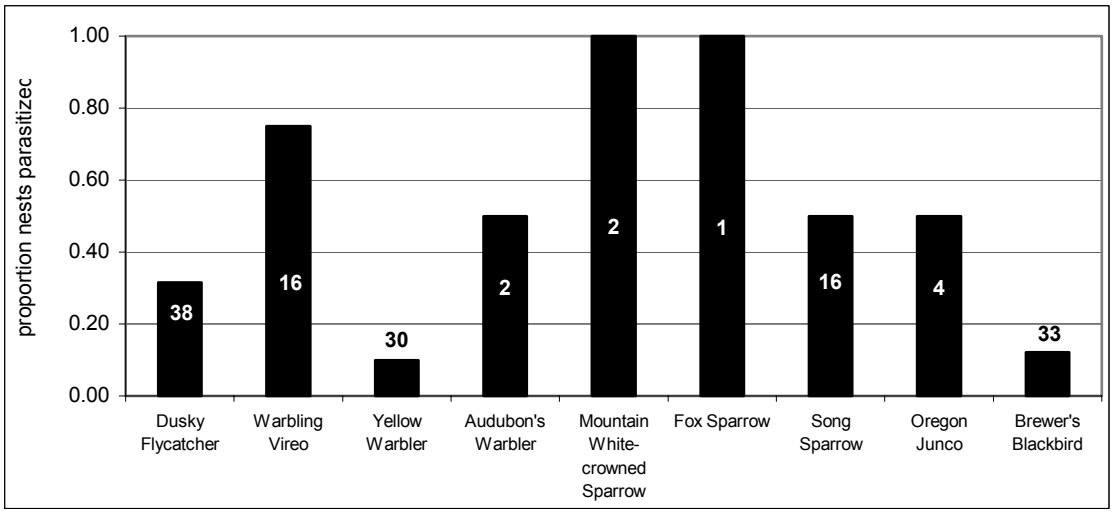


Figure III-5. Parasitism rates for 9 host species at North Lake, 2001-2003. Nest numbers shown on bars. Only nests observed with at least one host egg or young used.



Nest survival for Brown-headed Cowbirds was 29% at Rock Creek and 33% at North Lake, and was generally higher than at Mono Basin sites in 2003 (Table III-6 & Table II-7).

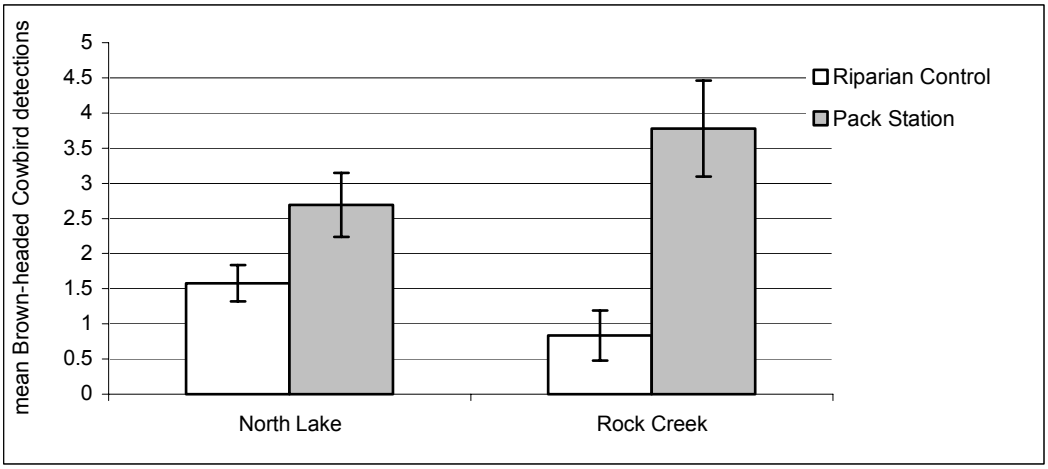
Table III-6. Mayfield estimates for Brown-headed Cowbirds at North Lake, Rock Creek, and both sites combined, 2001-2003. Estimates calculated by nest, not by individual/young. Sample sizes include nests with and without host eggs/young. Nests of unknown outcome included in all calculations. Daily nest survival and standard error, and total nest survival.

	Number of Nests	Daily Nest Survival	SE	Total Nest Survival
Rock Creek	29	0.943	0.013	0.29
North Lake	48	0.949	0.009	0.33
Both Sites Combined	77	0.947	0.008	0.32

Rothstein et al. (1980, 1984) provide evidence that Brown-headed Cowbirds detected in the morning at forested or riparian breeding areas traveled 2.1 – 4.0 km to congregate at horse corrals, campgrounds, roads and bird feeders for afternoon foraging in the eastern Sierra. Our data from horse corrals at pack station sites, and nearby riparian areas at North Lake and Rock Creek corroborate some of these results (Figure III-6 and Figure III-7).

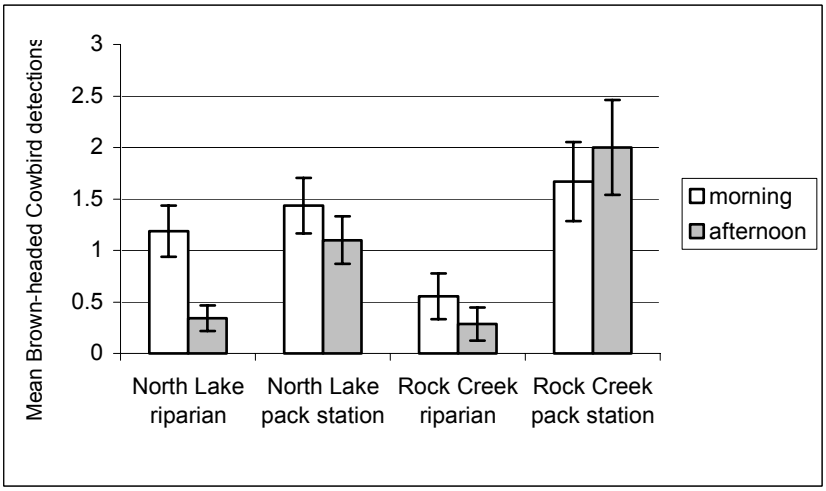
At both North Lake and Rock Creek, there were more Brown-headed Cowbirds congregated at horse corrals than in riparian habitats 0.15 km and 4.5 km away respectively. Differences were just non significant at North Lake ($\chi^2 = 3.37$, $P = 0.07$), and significant at Rock Creek ($\chi^2 = 18.32$, $P = 0.0001$) (Figure III-6).

Figure III-6. Mean numbers of adult Brown-headed Cowbirds at riparian areas and horse corrals at pack stations near North Lake and Rock Creek. Based on nine to fourteen weekly, 5 minute, unlimited distance, morning and afternoon point counts at paired riparian and pack station sites, each year (2001-2003).



The diurnal pattern of cowbird movement demonstrated by Rothstein et al. (1984) was corroborated at our North Lake riparian site, where numbers of cowbirds detected in the morning were higher than those counted in the afternoon ($\chi^2 = 7.28$, $P = 0.007$). However we found no difference in cowbird numbers between morning and afternoon cowbird counts at either horse corrals or at the riparian sites at Rock Creek (Figure III-7).

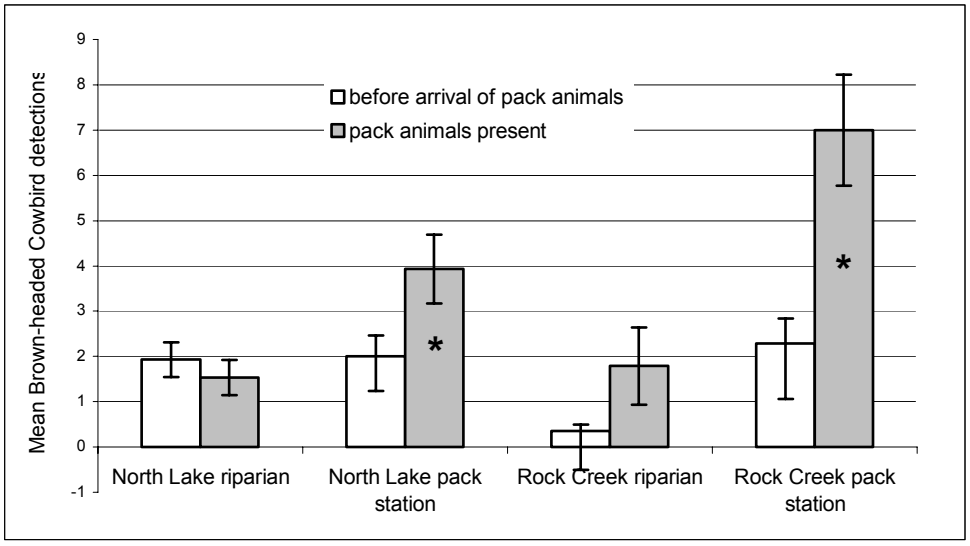
Figure III-7. Morning (< 1000) versus afternoon (>1200) mean adult Brown-headed Cowbird detections at riparian areas and horse corrals at pack stations near North Lake and Rock Creek. Based on nine to fourteen weekly, 5 minute, unlimited distance, morning and afternoon point counts at paired riparian and pack station sites, each year (2001-2003).



Although adult cowbirds were present at riparian and pack station sites at both North Lake and Rock Creek May 9 (our earliest arrival on site) through late July, there were more adult cowbirds present at pack stations after the arrival of pack animals to the corrals (Figure III-8, NOLA: $\chi^2 = 4.44$, $P = 0.004$, ROCU: ($\chi^2 = 8.52$, $P = 0.004$). Pack animals were observed at pack stations

during counts between June 19 and July 4 (PRBO data). There was no significant difference between before and after pack animal arrival at riparian sites.

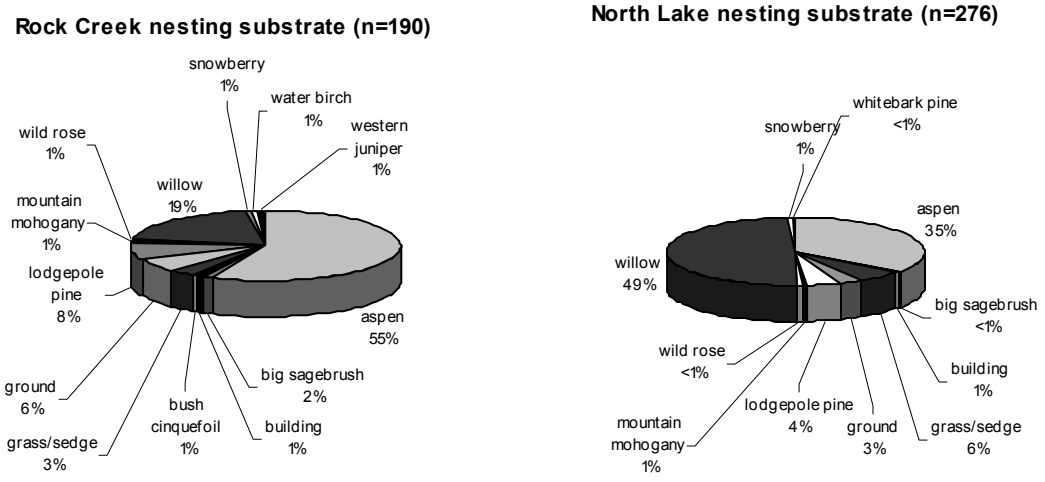
Figure III-8. Comparison of mean adult Brown-headed Cowbird detections before and after the arrival of pack animals at horse corrals at pack stations near North Lake and Rock Creek. Based on nine to twelve weekly, 5 minute, unlimited distance, morning and afternoon point counts at paired riparian and pack station sites, each year (2001-2003). * = significant differences ($P < 0.05$).



Nest substrate

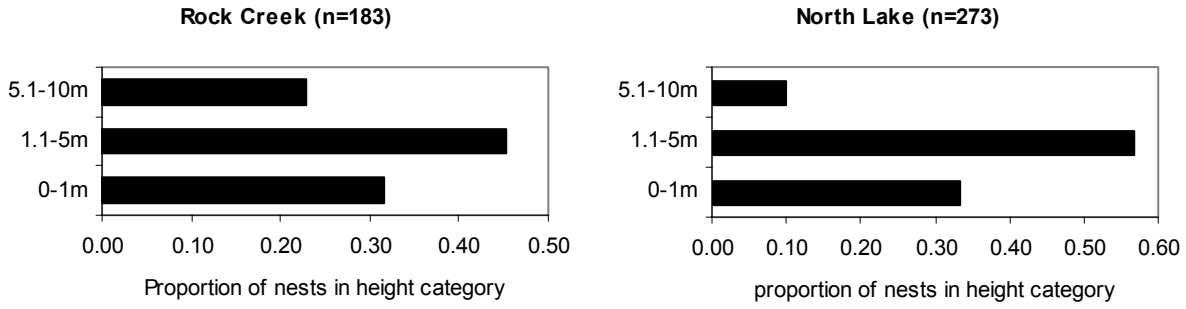
Birds used a variety of nesting substrates with Aspen (*Populous tremuloides*) and Willow shrub (*Salix* spp.) supporting most nests (Figure III-9).

Figure III-9. Nesting substrates at Rock Creek and North Lake, 2001-2003 (n = number of nests).



Over 30& of nests were placed within 1 m of the ground at both North Lake and Rock Creek (Figure III-10).

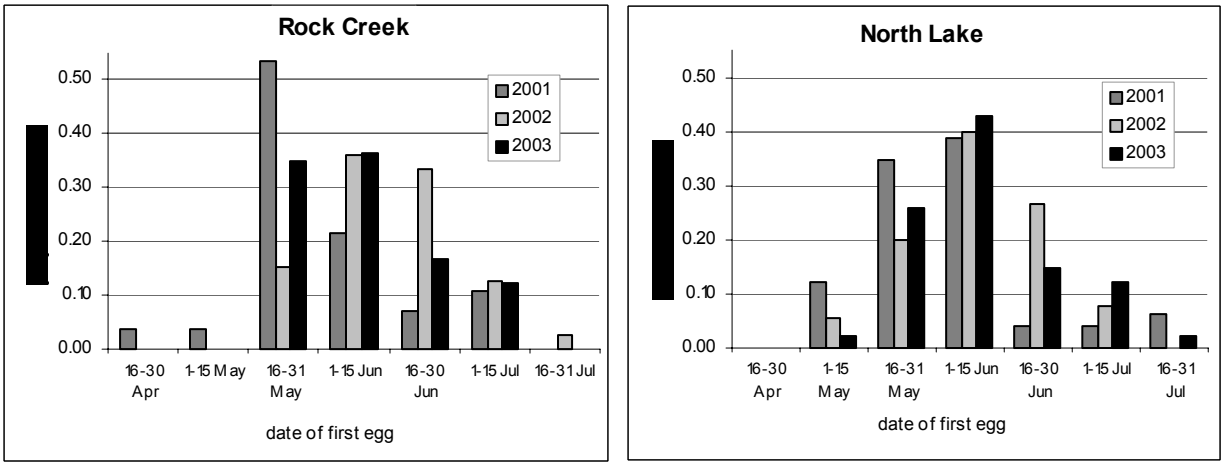
Figure III-10. Nest height categories for all nests found at Rock Creek and North Lake, 2001-2002 (n = number of nests).



Nest timing

Nest initiation ranged from second week of April to last 2 weeks of July in all years, peaking during end of May and throughout June (Figure III-11). In 2001, the peak in nest initiation was earlier and condensed to just to one month.

Figure III-11. Dates of first egg laid at Rock Creek and North Lake, 2001-2003.



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Appendix 1. Point count transect information: All transects, 4-letter codes, number of points and census dates for all point count transects conducted in 2003.

Appendix 1 - Table A. Point count transects, 4-letter codes, number of points, and census dates in 2003.

Site	Code	# points	Visit 1	Visit 2	Visit 3
Ash Creek	ASHC	9	June 4	June 16	--
Bairs Creek - South Fork	BAIR	15	June 9	June 25	--
Birch Creek - Lower	BIRL	9	June 10	June 26	--
Birch Creek - Upper	BIRU	10	June 11	June 26	--
Bishop Creek	BISH	13	June 15	June 24	--
Buttermilk Country	BUTT	8	June 15	June 24	--
Convict Creek	CONV	12	June 12	June 25	--
Dechambeau Creek	DECH	5	June 14	June 26	--
Hogback Creek - Lower	HOGL	15	June 8	June 30	--
Independence Creek	INDE	15	June 8	June 25	--
Jordan Springs	JORD	14	June 6	June 22	June 30
Lee Vining Creek - Lower	LEEL	15	June 8	June 20	--
Lee Vining Creek - Middle	LEEM	11	June 10	June 20	--
Lee Vining Creek - Upper	LEEU	13	June 10	June 25	--
Marble Creek	MARB	21	June 13	July 1	--
McGee Creek	MCGE	15	June 10	June 23	--
Mill Creek - Lower	MILL	21	June 9	June 29	--
Mill Creek - Upper	MILU	15	June 9	June 19	--
North Lake	NOLA	5	June 15	June 24	July 4
Rock Creek - Upper	ROCU	15	June 6	June 15	June 23
Rush Creek - Lower	RUSL	15	June 8	June 21	--
Rush Creek - Upper	RUSU	17	June 12	June 20	--
Taboose Creek	TABO	19	June 13	June 25	--
Thibaut Creek	THIB	15	June 14	June 23	--
Tuttle Creek	TUTT	15	June 8	June 25	--
Wilson Creek - Lower	WILL	18	June 10	June 19	--
Wilson Creek - Upper	WILU	18	June 11	July 1	--

Appendix 2. Nest plot information.

Appendix 2 – Table A. Nest plot sites, sizes of plots in creek kilometers and hectares, census dates, total hours, and total number of visits at Mono Basin and Rock Creek and North Lake sites 2003.

Site	Creek Kilometers	Size of Plot (ha)	#sub plots	Year	Census Period	Total Hours	Total Visits
Mono Basin							
Rush Creek	2.2	39	2	2003	May 2 - August 9	435.25	81
Lee Vining Creek	2	28	2	2003	May 2 - August 12	466.99	86
Wilson Creek	2.4	15	2	2003	May 5 - August 15	387.60	73
Mill Creek	3	15	2	2003	May 2 - July 31	341.75	67
Inyo National Forest							
North Lake	1.2	24	1	2003	May 17 – August 8	250.75	37
Rock Creek	1	18	1	2003	May 13 – August 9	254.5	37

Appendix 3 and 4. Mist net and area search information.

Appendix 3. Constant effort mist netting locations and census dates per period at Mono Basin sites in 2003.

	Census periods										
Site	1	2	3	4	5	6	7	8	9	10	11
Rush Creek	6 May	14 May	21 May	4 June	12 June	21 June	5 July	10 July	20 July	30 July	9 Aug
Lee Vining Creek	10 May	17 May	28 May	3 June	14 June	22 June	7 July	13 July	23 July	2 Aug	12 Aug
Mill Creek	5 May	15 May	22 May	1 June	10 June	24 June	4 July	11 July	21 July	31 July	10 Aug
Wilson Creek	7 May	16 May	24 May	2 June	11 June	23 June	6 July	12 July	25 July	1 Aug	8 Aug

Appendix 4 – Table A. Area search site, number of sub-plots, total plot size, year and census dates, 2003.

Site	# Sub plots	Total plot size (ha)	Visit 1	Visit 2
Thompson Ranch	3	6	June 14	June 26

Appendix 5. **Owens River and Hammil Valley Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	ASHC	BAIR	BIRL	BIRU	BISH	BUTT	CONV	HOGL	INDE	MARB	MCGE	NOLA	ROCU	TABO	THIB	TUTT
Common Loon	*Gavia immer*	~	~	~	~	~	~	~	~	~	~	~	0	~	~	~	~
Great Blue Heron	*Ardea herodias*	~	~	~	~	0	~	~	~	0	~	~	~	~	0	~	~
Black-crowned Night Heron	*Nycticorax nycticorax*	~	~	~	~	~	~	0	~	~	~	~	~	~	~	~	0
Turkey Vulture	*Cathartes aura*	~	0	0	0	0	0	0	~	0	~	0	0	~	0	0	0
Gadwall	*Anas strepera*	~	~	0	~	~	~	~	~	~	~	~	~	~	~	~	~
Mallard	*Anas platyrhynchos*	~	~	0	0	~	~	~	~	0	~	0	1	0	~	~	~
Northern Pintail	*Anas acuta*	~	~	~	~	~	~	~	~	~	~	0	~	~	~	~	~
Green-winged Teal	*Anas crecca*	~	~	~	~	~	~	~	~	~	~	~	1	0	~	~	~
Common Merganser	*Mergus merganser*	~	~	~	~	~	~	0	~	~	~	~	~	0	~	~	~
Osprey	*Pandion haliaetus*	~	~	~	~	~	~	0	~	~	~	~	~	~	~	~	~
Northern Harrier	*Circus cyaneus*	~	~	0	1	~	3	~	0	0	~	~	0	~	0	0	0
Sharp-shinned Hawk	*Accipiter striatus*	~	~	0	0	~	0	~	~	0	~	~	~	~	~	~	~
Cooper's Hawk	*Accipiter cooperii*	~	~	~	~	~	~	~	0	0	~	~	2	~	~	~	0
Northern Goshawk	*Accipiter gentilis*	~	~	~	~	~	~	~	~	~	~	~	2	~	~	~	~
Swainson's Hawk	*Buteo swainsoni*	~	~	0	~	~	~	~	0	~	~	~	~	~	~	~	~
Red-tailed Hawk	*Buteo jamaicensis*	0	0	0	1	0	0	0	0	0	~	1	0	0	0	~	~
Golden Eagle	*Aquila chrysaetos*	0	0	0	0	~	0	~	0	0	0	0	~	0	0	0	0
American Kestrel	*Falco sparverius*	~	0	2	~	2	2	2	1	0	0	1	~	~	0	~	2
Prairie Falcon	*Falco mexicanus*	~	~	~	~	0	0	~	~	0	~	~	0	~	0	~	~
Chukar	*Alectoris chukar*	~	0	2	3	~	~	~	3	~	~	~	~	~	0	~	0
White-tailed Ptarmigan	*Lagopus leucurus*	~	~	~	~	~	~	~	~	~	~	~	2	~	~	~	~
Blue Grouse	*Dendragapus obscurus*	~	~	~	~	~	1	~	~	~	~	2	3	1	~	~	~
Mountain Quail	*Oreortyx pictus*	~	1	~	~	2	2	~	0	2	~	~	~	2	2	2	2
California Quail	*Callipepla californica*	2	1	2	2	2	1	2	1	1	1	2	~	2	1	1	1
Killdeer	*Charadrius vociferus*	~	~	~	~	~	~	~	~	~	~	1	~	~	~	~	~
Willet	*Catoptrophorus semipalmatus*	~	~	~	~	~	~	~	~	~	~	0	~	~	~	~	~
Spotted Sandpiper	*Actitis macularia*	~	~	~	~	2	~	~	~	~	~	~	0	~	0	~	~
Wilson's Snipe	*Gallinago delicata*	~	~	~	~	~	~	~	~	~	~	2	0	~	~	~	~
Ring-billed Gull	*Larus delawarensis*	~	~	~	~	~	~	0	~	~	~	~	~	~	~	~	~
California Gull	*Larus californicus*	~	~	~	~	~	~	0	~	~	~	~	0	0	0	~	~

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~ (see methods for further explanation of codes)

Appendix 5. **Owens River and Hammil Valley Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	ASHC	BAIR	BIRL	BIRU	BISH	BUTT	CONV	HOGL	INDE	MARB	MCGE	NOLA	ROCU	TABO	THIB	TUTT
Rock Dove	*Columba livia*	~	~	~	~	~	~	~	~	0	~	~	0	~	0	~	~
Mourning Dove	*Zenaida macroura*	3	1	1	1	3	3	0	1	0	3	0	0	0	1	2	1
Yellow-billed Cuckoo	*Coccyzus americanus*	~	~	0	~	~	~	~	0	0	~	~	~	~	~	~	~
Greater Roadrunner	*Geococcyx californianus*	2	0	0	2	~	~	~	~	~	2	~	~	~	3	2	0
Great Horned Owl	*Bubo virginianus*	~	~	2	0	~	~	~	0	~	~	~	~	~	~	~	~
Long-eared Owl	*Asio otus*	~	~	~	~	~	3	~	~	~	~	~	~	~	0	~	0
Lesser Nighthawk	*Chordeiles acutipennis*	~	~	0	~	~	~	~	0	0	~	~	~	~	0	~	~
Common Nighthawk	*Chordeiles minor*	~	0	0	0	~	0	0	0	0	0	0	~	0	0	~	~
Common Poorwill	*Phalaenoptilus nuttallii*	~	~	2	2	~	2	~	~	~	~	~	~	~	~	~	~
Black Swift	*Cypseloides niger*	~	0	0	~	~	~	~	~	0	~	~	~	~	0	0	~
Vaux's Swift	*Chaetura vauxi*	~	0	0	0	~	~	~	~	0	~	~	~	~	0	~	0
White-throated Swift	*Aeronautes saxatalis*	0	0	0	0	~	0	0	0	0	0	~	~	0	0	0	0
Black-chinned Hummingbird	*Archilochus alexandri*	2	1	1	1	2	1	2	1	1	~	2	~	~	1	2	2
Anna's Hummingbird	*Calypte anna*	2	2	0	~	0	~	~	~	2	0	~	~	2	0	~	2
Costa's Hummingbird	*Calypte costae*	1	1	1	1	~	~	~	0	3	3	1	~	~	1	3	3
Calliope Hummingbird	*Stellula calliope*	~	1	1	1	1	3	1	~	1	~	1	1	1	1	~	0
Broad-tailed Hummingbird	*Selasphorus platycercus*	~	0	~	0	~	~	~	~	0	~	~	~	0	0	~	2
Rufous Hummingbird	*Selasphorus rufus*	~	0	0	0	~	~	~	~	0	~	~	0	0	0	~	0
Belted Kingfisher	*Ceryle alcyon*	0	~	0	0	0	0	1	~	0	~	~	0	2	0	~	~
Lewis' Woodpecker	*Melanerpes lewis*	~	~	~	0	~	~	1	~	~	~	1	~	~	~	~	~
Acorn Woodpecker	*Melanerpes formicivorus*	~	~	~	~	~	~	~	~	1	~	~	~	~	~	~	~
Williamson's Sapsucker	*Sphyrapicus thyroideus*	~	~	~	~	~	~	~	~	~	~	0	~	~	~	~	~
Red-naped Sapsucker	*Sphyrapicus nuchalis*	~	~	~	~	~	~	~	~	~	~	0	2	0	~	~	~
Red-breasted Sapsucker	*Sphyrapicus ruber*	~	~	~	0	3	3	1	~	0	~	2	1	1	0	~	~
Nuttall's Woodpecker	*Picoides nuttallii*	~	0	~	~	0	~	~	3	0	~	~	~	~	0	~	0
Downy Woodpecker	*Picoides pubescens*	~	0	~	~	0	~	~	~	0	~	1	~	~	0	~	0
Hairy Woodpecker	*Picoides villosus*	~	1	0	0	2	~	2	~	1	~	1	1	1	0	~	2
Red-shafted Flicker	*Colaptes auratus*	~	1	0	1	2	1	1	1	1	2	1	1	1	0	~	2
Olive-sided Flycatcher	*Contopus cooperi*	0	0	0	0	0	0	2	0	0	~	0	2	1	0	0	0
Western Wood-pewee	*Contopus sordidulus*	0	0	0	3	1	3	1	2	1	0	1	1	1	0	2	0
Willow Flycatcher	*Empidonax traillii*	0	0	0	0	0	0	0	0	0	~	0	0	0	0	~	0

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Appendix 5. **Owens River and Hammil Valley Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	ASHC	BAIR	BIRL	BIRU	BISH	BUTT	CONV	HOGL	INDE	MARB	MCGE	NOLA	ROCU	TABO	THIB	TUTT
Hammond's Flycatcher	*Empidonax hammondii*	~	0	0	0	~	0	0	0	0	~	0	0	0	0	0	0
Gray Flycatcher	*Empidonax wrightii*	~	0	~	0	~	0	~	~	0	~	~	0	0	0	~	0
Dusky Flycatcher	*Empidonax oberholseri*	0	0	0	0	0	1	2	0	0	~	1	1	1	0	0	0
Pacific Slope Flycatcher	*Empidonax difficilis*	~	~	~	~	*0*	~	~	~	~	~	~	~	~	~	~	~
Western Flycatcher	*E. occidentalis* or *difficilis*	0	0	0	0	0	0	~	0	0	~	3	~	~	0	~	0
Black Phoebe	*Sayornis nigricans*	0	0	2	0	2	~	~	~	0	~	0	~	~	0	~	0
Say's Phoebe	*Sayornis saya*	~	~	0	~	2	2	~	2	~	~	~	~	~	~	~	~
Ash-throated Flycatcher	*Myiarchus cinerascens*	2	~	0	0	0	~	~	3	0	~	~	~	~	0	2	~
Western Kingbird	*Tyrannus verticalis*	0	0	0	1	0	0	0	0	0	~	~	~	0	0	0	0
Loggerhead Shrike	*Lanius ludovicianus*	~	0	0	1	~	~	~	0	0	2	~	~	~	1	0	2
Cassin's Vireo	*Vireo cassinii*	~	~	~	~	~	~	~	~	*0*	~	~	~	2	~	~	~
Solitary Vireo	*Vireo cassinii* or *plumbeus*	~	0	0	0	2	0	2	0	0	~	2	~	~	0	~	0
Warbling Vireo	*Vireo gilvus*	0	0	0	1	3	3	1	2	1	3	3	1	1	0	0	3
Steller's Jay	*Cyanocitta stelleri*	3	1	0	0	3	0	3	~	1	~	3	3	1	1	2	1
Western Scrub-Jay	*Aphelocoma californica*	0	1	0	0	~	~	~	0	1	2	~	~	~	1	2	1
Pinyon Jay	*Gymnorhinus cyanocephalus*	~	~	0	0	2	~	~	~	~	2	~	~	~	~	~	0
Clark's Nutcracker	*Nucifraga columbiana*	~	0	0	0	2	0	1	~	0	0	~	0	3	0	~	0
American Magpie	*Pica hudsonia*	~	~	0	0	2	1	1	2	~	2	2	0	0	0	~	~
American Crow	*Corvus brachyrhynchos*	~	~	0	0	0	~	~	~	0	~	~	~	~	0	~	0
Common Raven	*Corvus corax*	0	1	0	1	1	2	1	0	1	0	1	3	2	0	1	0
Horned Lark	*Eremophila alpestris*	~	0	0	0	~	~	~	~	~	0	~	~	~	0	0	~
Tree Swallow	*Tachycineta bicolor*	~	~	~	~	2	~	1	~	~	~	0	~	0	0	~	~
Violet-green Swallow	*Tachycineta thalassina*	0	0	0	0	2	0	1	0	3	0	1	1	1	0	~	0
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	0	~	~	~	~	~	0	~	~	~	~	0	~	0	~	~
Cliff Swallow	*Petrochelidon pyrrhonota*	1	0	0	0	~	~	0	0	0	~	0	~	~	0	~	~
Barn Swallow	*Hirundo rustica*	0	0	0	0	0	~	~	0	0	~	~	~	~	0	~	~
Mountain Chickadee	*Poecile gambeli*	~	0	~	~	3	2	1	~	2	~	2	3	1	~	~	0
Bushtit	*Psaltriparus minimus*	3	1	1	1	1	~	~	1	1	1	~	~	1	1	1	1
Red-breasted Nuthatch	*Sitta canadensis*	~	~	0	~	~	~	~	~	0	~	~	~	0	~	~	~
White-breasted Nuthatch	*Sitta carolinensis*	~	0	~	~	~	~	0	~	~	~	~	0	1	~	~	~
Pygmy Nuthatch	*Sitta pygmaea*	~	~	~	~	~	~	~	~	~	~	~	0	~	~	~	~

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Brown Creeper	*Certhia americana*	~	~	~	~	~	~	~	~	0	~	1	3	1	~	~	~
Rock Wren	*Salpinctes obsoletus*	1	~	1	3	1	2	1	~	0	~	0	0	2	2	2	2
Canyon Wren	*Catherpes mexicanus*	~	~	0	3	~	~	~	~	~	~	~	~	~	~	~	3
Bewick's Wren	*Thryomanes bewickii*	2	1	1	1	2	3	2	3	1	3	2	0	~	1	1	1
House Wren	*Troglodytes aedon*	~	2	0	1	1	1	1	1	1	~	1	1	1	0	~	0
American Dipper	*Cinclus mexicanus*	~	2	3	~	1	~	1	~	1	~	1	2	1	2	~	~
Ruby-crowned Kinglet	*Regulus calendula*	~	0	0	0	~	~	~	~	0	~	~	~	~	0	~	0
Blue-gray Gnatcatcher	*Polioptila caerulea*	~	1	1	1	2	2	0	1	1	2	~	~	0	1	2	0
Western Bluebird	*Sialia mexicana*	~	~	~	~	0	~	~	~	1	~	~	~	~	0	~	~
Mountain Bluebird	*Sialia currucoides*	~	~	~	~	0	1	1	~	~	~	1	1	~	~	~	~
Townsend's Solitaire	*Myadestes townsendii*	~	0	~	0	2	~	~	~	0	~	0	2	2	~	~	~
Swainson's Thrush	*Catharus ustulatus*	~	0	0	0	~	0	0	~	0	~	2	0	~	0	~	0
Hermit Thrush	*Catharus guttatus*	0	~	0	0	0	0	0	~	0	~	3	1	2	0	~	0
American Robin	*Turdus migratorius*	~	1	2	1	1	1	1	1	1	2	1	1	1	1	~	2
Wrentit	*Chamaea fasciata*	~	~	~	~	~	~	~	3	~	~	~	~	~	~	~	~
Gray Catbird	*Dumetella carolinensis*	~	~	~	~	~	~	~	~	~	~	~	~	~	0	~	~
Northern Mockingbird	*Mimus polyglottos*	~	~	~	~	~	2	~	2	0	~	~	~	~	~	~	~
Sage Thrasher	*Oreoscoptes montanus*	~	~	~	~	~	1	0	~	~	~	~	~	~	~	0	~
European Starling	*Sturnus vulgaris*	0	~	0	1	~	0	1	0	0	~	1	~	~	~	~	~
Cedar Waxwing	*Bombycilla cedrorum*	0	0	0	~	~	~	0	0	0	~	~	~	~	0	~	0
Phainopepla	*Phainopepla nitens*	0	~	0	0	~	~	~	1	~	~	~	~	~	0	~	~
Tennessee Warbler	*Vermivora peregrina*	~	~	~	~	~	~	~	~	0	~	~	~	~	~	~	~
Orange-crowned Warbler	*Vermivora celata*	~	1	1	3	2	3	3	2	1	~	3	2	1	0	2	1
Nashville Warbler	*Vermivora ruficapilla*	~	~	0	0	~	~	~	~	0	~	~	~	~	~	~	0
Northern Parula	*Parula americana*	~	~	~	~	~	~	~	~	~	~	~	~	~	~	~	
Yellow Warbler	*Dendroica petechia*	0	0	1	1	3	1	1	3	0	2	1	1	1	0	0	0
Chestnut-sided Warbler	*Dendroica penylvanica*	~	~	~	~	~	~	~	~	0	~	~	~	0	~	~	~
Magnolia Warbler	*Dendroica magnolia*	~	~	~	~	~	~	~	~	~	~	0	~	~	~	~	~
Audubon's Warbler	*Dendroica coronata auduboni*	~	~	~	~	~	3	~	~	~	~	0	1	1	~	~	~
Yellow-rumped Warbler	*Dendroica coronata*	~	0	0	0	3	0	2	~	0	~	0	~	~	0	~	0
Black-throated Gray Warbler	*Dendroica nigrescens*	~	0	0	0	~	~	~	~	0	~	~	~	~	0	0	0

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Townsend's Warbler	*Dendroica townsendi*	0	0	0	0	0	0	0	~	0	0	0	0	~	0	~	0
Hermit Warbler	*Dendroica occidentalis*	~	0	0	0	~	~	~	~	0	~	~	~	~	~	~	0
Palm Warbler	*Dendroica palmarum*	~	~	~	~	~	~	~	~	~	~	~	0	~	~	~	~
Black-and-White Warbler	*Mniotilta varia*	~	~	~	~	0	~	~	~	0	~	0	~	~	0	0	0
American Redstart	*Setophaga ruticilla*	~	~	0	0	~	0	~	~	~	~	0	~	~	~	~	~
Northern Waterthrush	*Seiurus noveboracensis*	~	~	~	~	~	~	~	~	~	~	~	0	~	~	~	~
Kentucky Warbler	*Oporornis formosus*	~	~	~	0	0	~	~	~	~	~	~	~	~	~	~	~
Mac Gillivray's Warbler	*Oporornis tolmei*	0	1	2	2	2	2	2	~	3	3	2	1	1	0	2	2
Common Yellowthroat	*Geothlypis trichas*	~	0	~	~	~	~	~	~	~	~	~	2	~	~	~	~
Wilson's Warbler	*Wilsonia pusilla*	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Yellow-breasted Chat	*Icteria virens*	~	~	0	0	~	~	~	1	0	~	2	~	~	0	~	~
Summer Tanager	*Piranga rubra*	~	~	~	~	~	~	0	~	0	~	~	~	~	0	~	~
Western Tanager	*Piranga ludoviciana*	0	1	0	0	3	2	2	2	1	0	0	2	1	0	0	2
Green-tailed Towhee	*Pipilo chlorurus*	~	2	2	3	1	3	3	~	3	~	1	3	1	0	~	2
Spotted Towhee	*Pipilo maculatus*	1	1	1	1	1	3	1	1	1	1	3	2	1	1	1	1
Chipping Sparrow	*Spizella passerina*	~	1	0	2	0	2	~	1	0	~	~	0	~	0	~	0
Brewer's Sparrow	*Spizella breweri*	2	1	0	3	2	1	3	0	0	2	1	1	2	3	3	2
Black-chinned Sparrow	*Spizella atrogularis*	~	~	~	0	2	~	~	~	~	~	~	~	~	~	~	0
Vesper Sparrow	*Pooecetes gramineus*	~	~	~	~	~	2	0	~	0	~	~	~	~	2	0	~
Lark Sparrow	*Chondestes grammacus*	1	~	~	~	~	2	~	~	~	~	~	~	~	~	~	~
Black-throated Sparrow	*Amphispiza bilineata*	1	2	1	1	2	2	~	2	1	1	~	~	~	1	1	3
Sage Sparrow	*Amphispiza belli*	3	1	1	3	~	0	0	2	3	1	2	2	~	1	1	3
Savannah Sparrow	*Passerculus sandwichensis*	~	~	~	~	~	1	~	~	~	~	~	0	~	0	~	~
Fox Sparrow	*Passerella iliaca*	~	~	~	~	2	1	3	~	0	~	3	1	1	0	~	0
Song Sparrow	*Melospiza melodia*	~	~	1	1	2	1	1	1	1	1	1	1	1	0	2	2
Lincoln's Sparrow	*Melospiza lincolnii*	~	~	~	~	~	0	~	~	0	~	~	1	1	0	~	~
White-throated Sparrow	*Zonotrichia albicollis*	~	~	~	~	~	~	~	~	0	~	~	~	~	~	~	~
Mtn. White-crowned Sparrow	*Zonotrichia leucophrys oriantha*	~	~	~	~	~	1	~	~	~	~	~	1	0	~	~	~
White-crowned Sparrow	*Zonotrichia leucophrys*	~	0	0	0	~	1	~	~	0	~	~	0	0	0	0	~
Golden-crowned Sparrow	*Zonotrichia atricapilla*	~	~	~	~	~	~	~	~	0	~	~	~	~	0	~	~
Oregon Junco	*Junco hyemalis thurberi*	~	0	~	~	2	2	0	~	0	~	~	1	1	~	~	0

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~ (see methods for further explanation of codes)

Appendix 5. **Owens River and Hammil Valley Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	ASHC	BAIR	BIRL	BIRU	BISH	BUTT	CONV	HOGL	INDE	MARB	MCGE	NOLA	ROCU	TABO	THIB	TUTT
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	~	~	0	0	~	~	~	~	~	~	~	~	~	~	~	~
Black-headed Grosbeak	*Pheucticus melanocephalus*	0	1	1	1	2	1	3	2	1	3	2	2	1	1	2	1
Blue Grosbeak	*Guiraca caerulea*	~	~	1	0	~	2	~	2	0	1	~	~	~	1	3	0
Lazuli Bunting	*Passerina amoena*	3	1	1	1	3	1	3	0	1	3	1	2	0	1	2	3
Indigo Bunting	*Passerina cyanea*	0	~	1	0	2	~	~	~	2	~	~	~	~	0	~	0
Indigo x Lazuli Bunting Hybrid	*Passerina cyane/amoena*	~	~	0	0	2	~	~	~	~	~	~	~	~	~	~	~
Dickcissel	*Spiza americana*	~	~	~	~	~	~	~	~	~	~	~	~	~	0	~	~
Red-winged Blackbird	*Agelaius phoeniceus*	~	~	0	0	~	0	0	~	0	~	1	1	~	~	~	~
Western Meadowlark	*Sturnella neglecta*	~	~	0	0	~	1	2	~	0	2	~	~	~	0	~	~
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	~	~	~	~	~	~	~	~	~	~	0	~	~	0	~	~
Brewer's Blackbird	*Euphagus cyanocephalus*	~	0	~	~	~	1	1	2	0	1	1	1	1	0	~	0
Brown-headed Cowbird	*Molothrus ater*	3	1	1	1	3	1	1	3	1	3	3	1	1	1	3	2
Hooded Oriole	*Icterus cucullatus*	~	0	~	~	~	~	~	~	~	~	~	~	~	~	~	~
Bullock's Oriole	*Icterus bullockii*	0	0	2	1	1	3	1	3	1	2	3	0	2	2	2	0
Scott's Oriole	*Icterus parisorum*	~	~	~	0	~	~	~	~	~	~	~	~	~	~	~	~
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	~	~	0	~	~	~	~	~	~	~	~	0	~	0	~	~
Cassin's Finch	*Carpodacus cassinii*	~	0	~	~	1	2	1	0	0	0	2	1	1	~	0	~
House Finch	*Carpodacus mexicanus*	0	~	0	0	0	3	~	2	~	1	~	~	~	0	~	~
Red Crossbill	*Loxia curvirostra*	~	0	~	~	~	~	~	~	~	~	~	0	~	~	~	~
Pine Siskin	*Carduelis pinus*	~	~	~	~	~	0	~	~	~	~	0	1	0	~	~	~
Lesser Goldfinch	*Carduelis psaltria*	2	2	1	1	2	3	0	3	2	2	2	2	2	1	2	2
American Goldfinch	*Carduelis tristis*	~	~	~	~	~	~	~	~	~	~	~	0	~	0	~	~
Evening Grosbeak	*Coccothraustes vespertinus*	~	~	~	0	~	~	~	~	0	~	~	~	~	~	~	~
House Sparrow	*Passer domesticus*	~	~	~	~	~	~	~	~	0	~	~	~	~	~	~	~

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~ (see methods for further explanation of codes)

Appendix 5. **Mono Lake Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	DECH	JORD	LEEL	LEEM	LEEU	MILL	MILU	RUSL	RUSU	THOM	WILL	WILU
Common Loon	*Gavia immer*	~	~	~	~	~	~	~	0	~	~	~	~
Eared Grebe	*Podiceps nigricollis*	~	~	0	~	~	0	~	~	~	~	~	~
Western Grebe	*Aechmophorus occidentalis*	~	~	0	~	~	~	~	~	~	~	~	~
Double-crested Cormorant	*Phalacrocorax auritus*	~	~	~	~	~	0	~	0	~	~	~	~
Great Blue Heron	*Ardea herodias*	~	~	0	~	~	0	0	0	~	~	0	0
Great Egret	*Ardea alba*	~	~	~	~	~	0	~	0	0	~	~	0
Snowy Egret	*Egretta thula*	~	~	0	~	~	0	~	0	~	~	0	0
Green Heron	*Butorides virescens*	~	~	~	~	~	0	~	0	~	~	~	0
Black-crowned Night Heron	*Nycticorax nycticorax*	~	~	0	~	0	0	0	0	0	~	0	0
Turkey Vulture	*Cathartes aura*	~	~	0	0	~	0	0	0	~	~	0	0
Canada Goose	*Branta canadensis*	~	~	~	~	~	0	~	~	~	~	~	~
Wood Duck	*Aix sponsa*	0	~	~	~	~	~	~	~	~	~	~	~
Gadwall	*Anas strepera*	~	~	1	~	~	0	~	1	~	~	0	0
American Wigeon	*Anas americana*	~	~	~	~	~	~	~	0	~	~	~	~
Mallard	*Anas platyrhynchos*	~	~	1	~	0	1	0	1	3	~	1	1
Blue-winged Teal	*Anas discors*	~	~	0	~	~	~	~	~	~	~	~	~
Cinnamon Teal	*Anas cyanoptera*	~	~	~	~	~	~	~	0	~	~	~	0
Northern Shoveler	*Anas clypeata*	~	~	~	~	~	0	~	~	~	~	~	~
Northern Pintail	*Anas acuta*	~	~	0	~	~	0	~	1	~	~	0	0
Green-winged Teal	*Anas crecca*	~	~	1	~	~	0	~	1	0	~	1	1
Redhead	*Athya americana*	~	~	0	~	~	0	~	~	~	~	~	~
Common Merganser	*Mergus merganser*	~	~	0	~	~	~	~	0	~	~	~	~
Red-breasted Merganser	*Mergus serrator*	~	~	0	~	~	~	~	~	~	~	~	~
Ruddy Duck	*Oxyura jamaicensis*	~	~	~	~	~	0	~	~	~	~	~	~
Osprey	*Pandion haliaetus*	~	~	0	~	~	0	~	0	~	~	0	0
Bald Eagle	*Haliaeetus leucocephalus*	~	~	~	~	~	0	~	0	~	~	~	~
Northern Harrier	*Circus cyaneus*	~	0	1	~	~	0	~	0	~	~	0	~
Cooper's Hawk	*Accipiter cooperii*	0	~	0	~	~	0	2	0	~	~	~	~
Red-shouldered Hawk	*Buteo lineatus*	~	~	0	~	~	0	~	0	~	~	~	~

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~

Appendix 5. **Mono Lake Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	DECH	JORD	LEEL	LEEM	LEEU	MILL	MILU	RUSL	RUSU	THOM	WILL	WILU
Swainson's Hawk	*Buteo swainsoni*	~	~	0	~	~	0	~	~	~	~	0	
Red-tailed Hawk	*Buteo jamaicensis*	0	0	0	2	0	1	1	0	0	1	0	1
Golden Eagle	*Aquila chrysaetos*	~	~	~	~	~	0	~	0	0	~	0	0
American Kestrel	*Falco sparverius*	1	1	1	1	2	1	3	1	~	1	2	1
Prairie Falcon	*Falco mexicanus*	~	~	0	0	~	~	~	0	~	~	0	0
Greater sage Grouse	*Centrocercus urophasianus*	~	~	~	~	~	0	~	~	~	~	0	0
Blue Grouse	*Dendragapus obscurus*	3	1	~	~	~	0	~	~	2	~	~	~
Mountain Quail	*Oreortyx pictus*	3	2	0	~	~	2	2	0	3	~	1	0
California Quail	*Callipepla californica*	1	2	1	~	~	3	~	3	2	~	1	2
Virginia Rail	*Rallus limicola*	~	~	0	~	~	~	1	~	~	~	~	~
Sora	*Porzana carolina*	~	~	~	~	~	~	~	~	~	~	~	0
American Coot	*Fulica americana*	~	~	0	~	~	~	~	~	~	~	~	~
Killdeer	*Charadrius vociferus*	~	~	1	~	~	1	~	1	2	~	1	3
Black-necked Stilt	*Himantopus mexicanus*	~	~	~	~	~	~	~	0	~	~	~	~
American Avocet	*Recurvirostra americana*	~	~	0	~	~	0	~	2	~	~	~	~
Spotted Sandpiper	*Actitis macularia*	~	~	1	0	2	3	~	1	2	~	2	0
Long-billed Curlew	*Numenius americanus*	~	~	0	~	~	~	~	0	~	~	~	~
Least Sandpiper	*Calidris minutilla*	~	~	0	~	~	~	~	~	~	~	~	~
Wilson's Snipe	*Gallinago delicata*	~	~	0	~	0	2	~	0	~	~	2	2
Red-necked Phalarope	*Phalaropus lobatus*	~	~	0	~	~	~	~	~	~	~	~	~
Wilson's Phalarope	*Phalaropus tricolor*	~	~	0	~	~	~	~	2	~	~	~	~
Bonaparte's Gull	*Larus philadelphia*	~	~	0	~	~	~	~	0	~	~	~	~
Ring-billed Gull	*Larus delawarensis*	~	~	0	~	~	~	~	~	~	~	~	~
California Gull	*Larus californicus*	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	*Sterna caspia*	0	~	~	~	~	0	~	0	0	~	0	0
Forster's Tern	*Sterna forsteri*	~	~	~	~	~	~	~	0	~	~	0	0
Rock Dove	*Columba livia*	~	~	0	~	~	0	~	0	~	~	~	~
Mourning Dove	*Zenaida macroura*	2	0	0	~	0	2	0	1	2	3	1	1
Yellow-billed Cuckoo	*Coccyzus americanus*	~	~	~	~	~	~	~	0	~	~	~	~
Barn Owl	*Tyto alba*	~	~	~	~	~	0	~	~	~	~	~	~
Great Horned Owl	*Bubo virginianus*	~	~	0	~	~	1	0	0	~	2	2	0

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~

Appendix 5. **Mono Lake Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	DECH	JORD	LEEL	LEEM	LEEU	MILL	MILU	RUSL	RUSU	THOM	WILL	WILU
Long-eared Owl	*Asio otus*	~	0	~	~	~	0	~	0	~	~	~	1
Northern Saw-whet Owl	*Aegolius acadicus*	~	~	0	~	~	~	~	~	~	~	~	~
Common Nighthawk	*Chordeiles minor*	0	0	0	~	~	0	~	0	~	~	1	0
Common Poorwill	*Phalaenoptilus nuttallii*	1	~	~	~	~	2	2	2	~	~	2	~
Vaux's Swift	*Chaetura vauxi*	~	~	0	~	~	~	~	0	~	~	~	~
White-throated Swift	*Aeronautes saxatalis*	~	~	~	~	~	0	~	0	~	~	~	~
Black-chinned Hummingbird	*Archilochus alexandri*	~	~	~	~	~	~	~	0	~	~	0	0
Anna's Hummingbird	*Calypte anna*	~	~	0	0	~	0	~	~	~	~	0	0
Costa's Hummingbird	*Calypte costae*	~	0	0	~	~	0	0	~	~	~	~	~
Calliope Hummingbird	*Stellula calliope*	~	3	0	~	2	0	3	~	~	~	0	0
Broad-tailed Hummingbird	*Selasphorus platycercus*	0	~	0	~	~	~	0	~	~	~	~	~
Rufous Hummingbird	*Selasphorus rufus*	0	0	0	0	0	0	0	0	~	~	0	0
Belted Kingfisher	*Ceryle alcyon*	0	~	0	~	2	1	2	1	~	~	2	1
Lewis' Woodpecker	*Melanerpes lewis*	1	~	~	~	~	0	~	0	~	~	0	
Acorn Woodpecker	*Melanerpes formicivorus*	~	~	~	~	~	~	~	~	0	~	~	~
Red-naped Sapsucker	*Sphyrapicus nuchalis*	~	0	0	~	~	~	~	~	~	~	~	~
Red-naped/breasted Sapsucker	*Sphyrapicaus nuchalis/ruber*	1		1	~	~	~	~	~	~	1	~	~
Red-breasted Sapsucker	*Sphyrapicus ruber*	1	1	2	1	1	0	1	0	3	~	0	2
Nuttall's Woodpecker	*Picoides nuttallii*	~	~	~	~	~	0	~	~	~	~	~	~
Downy Woodpecker	*Picoides pubescens*	2	0	1	0	1	3	1	0	2	3	0	0
Hairy Woodpecker	*Picoides villosus*	1	1	2	3	3	1	3	0	2	1	0	0
White-headed Woodpecker	*Picoides albolarvatus*	~	~	~	~	~	~	0	0	~	~	~	~
Red-shafted Flicker	*Colaptes auratus*	1	1	1	3	1	1	1	1	1	3	1	1
Olive-sided Flycatcher	*Contopus cooperi*	0	2	0	2	3	0	2	~	3	~	0	0
Western Wood-pewee	*Contopus sordidulus*	3	3	1	1	1	1	1	0	1	3	0	0
Willow Flycatcher	*Empidonax traillii*	0	~	0	0	~	0	0	1	0	~	~	0
Hammond's Flycatcher	*Empidonax hammondii*	0	~	0	~	0	0	~	0	0	~	0	0
Gray Flycatcher	*Empidonax wrightii*	0	~	0	~	~	0	2	3	2	~	0	0
Dusky Flycatcher	*Empidonax oberholseri*	0	1	0	2	1	0	3	1	3	~	0	0
Pacific Slope Flycatcher	*Empidonax difficilis*	~	~	~	~	~	0	~	0	~	~	~	~
Western Flycatcher	*E. occidentalis* or *difficilis*	0	0	0	~	0	0	0	0	2	~	0	0

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~

Appendix 5. **Mono Lake Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	DECH	JORD	LEEL	LEEM	LEEU	MILL	MILU	RUSL	RUSU	THOM	WILL	WILU
Black Phoebe	*Sayornis nigricans*	~	~	0	~	~	0	~	0	~	~	~	0
Say's Phoebe	*Sayornis saya*	~	~	~	~	~	0	~	0	~	~	~	~
Ash-throated Flycatcher	*Myiarchus cinerascens*	~	~	~	~	~	0	~	0	~	~	0	0
Western Kingbird	*Tyrannus verticalis*	~	0	0	~	~	0	~	0	~	~	0	0
Eastern Kingbird	*Tyrannus tyrannus*	~	~	~	~	~	~	~	0	~	~	~	~
Loggerhead Shrike	*Lanius ludovicianus*	~	~	0	~	~	0	~	0	~	~	2	~
Yellow-throated Vireo	*Vireo flavifrons*	~	~	0	~	~	~	~	~	~	~	~	~
Cassin's Vireo	*Vireo cassinii*	0	~	0	~	~	0	0	0	~	~	~	~
Solitary Vireo	*Vireo cassinii* or *plumbeus*	~	~	0	~	0	0	2	0	~	~	~	~
Warbling Vireo	*Vireo gilvus*	1	3	1	3	1	1	3	1	1	3	0	0
Steller's Jay	*Cyanocitta stelleri*	3	1	1	1	1	3	1	0	1	2	~	2
Western Scrub-Jay	*Aphelocoma californica*	~	~	0	~	~	0	~	1	~	~	2	0
Pinyon Jay	*Gymnorhinus cyanocephalus*	~	~	0	0	~	0	~	0	~	~	0	~
Clark's Nutcracker	*Nucifraga columbiana*	0	0	2	0	0	0	2	0	0	0	0	0
American Magpie	*Pica hudsonia*	0	2	1	~	0	1	0	1	~	1	1	1
American Crow	*Corvus brachyrhynchos*	~	~	~	~	~	~	~	~	~	~	~	0
Common Raven	*Corvus corax*	0	~	0	0	0	0	0	0	0	~	0	0
Horned Lark	*Eremophila alpestris*	~	~	~	~	~	~	~	0	~	~	~	~
Tree Swallow	*Tachycineta bicolor*	0	~	0	1	1	2	0	~	2	~	~	0
Violet-green Swallow	*Tachycineta thalassina*	1	2	1	1	1	1	1	1	1	1	2	0
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	0	~	1	~	~	1	~	1	2	~	2	1
Bank Swallow	*Riparian riparia*	~	~	0	~	~	~	~	~	~	~	~	~
Cliff Swallow	*Petrochelidon pyrrhonota*	~	~	0	~	~	0	~	0	~	~	1	0
Barn Swallow	*Hirundo rustica*	~	~	0	~	~	0	~	0	~	~	0	0
Mountain Chickadee	*Poecile gambeli*	1	1	1	1	1	1	1	0	1	0	0	0
Juniper Titmouse	*Baeolophus ridgwayi*	~	~	~	~	~	1	~	0	~	~	~	~
Bushtit	*Psaltriparus minimus*	1	~	1	~	~	1	~	1	0	~	1	0
White-breasted Nuthatch	*Sitta carolinensis*	0	0	0	2	2	0	1	~	~	~	~	~
Pygmy Nuthatch	*Sitta pygmaea*	~	~	~	~	1	~	0	~	1	~	~	~
Brown Creeper	*Certhia americana*	~	~	0	3	1	0	1	~	1	~	~	~
Rock Wren	*Salpinctes obsoletus*	1	1	0	~	~	0	0	~	2	~	0	2

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~

Appendix 5. **Mono Lake Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	DECH	JORD	LEEL	LEEM	LEEU	MILL	MILU	RUSL	RUSU	THOM	WILL	WILU
Canyon Wren	*Catherpes mexicanus*	~	~	~	~	~	~	~	~	2	~	~	~
Bewick's Wren	*Thryomanes bewickii*	2	~	3	3	0	1	0	1	2	3	3	3
House Wren	*Troglodytes aedon*	1	1	1	1	1	1	1	1	1	1	2	3
Marsh Wren	*Cistothorus palustris*	~	~	~	~	~	~	~	0	~	~	~	0
American Dipper	*Cinclus mexicanus*	~	~	1	1	1	1	3	1	3	~	~	~
Golden-crowned Kinglet	*Regulus satrapa*	~	~	~	~	2	~	0	~	~	~	~	~
Ruby-crowned Kinglet	*Regulus calendula*	~	~	0	~	~	0	~	0	~	~	0	~
Blue-gray Gnatcatcher	*Polioptila caerulea*	~	~	0	~	~	1	~	1	~	~	1	2
Western Bluebird	*Sialia mexicana*	~	~	~	~	~	0	~	~	~	~	~	~
Mountain Bluebird	*Sialia currucoides*	1	1	0	~	1	0	0	0	2	3	~	~
Townsend's Solitaire	*Myadestes townsendii*	~	~	0	0	1	~	0	~	2	~	~	~
Swainson's Thrush	*Catharus ustulatus*	0	0	0	~	2	0	~	0	2	~	0	0
Hermit Thrush	*Catharus guttatus*	0	~	0	~	2	0	2	0	3	~	0	~
American Robin	*Turdus migratorius*	1	1	1	1	1	1	1	1	1	3	1	1
Varied Thrush	*Ixoreus naevius*	~	~	~	~	~	0	~	~	~	~	~	~
Gray Catbird	*Dumetella carolinensis*	~	~	~	~	0	~	~	~	~	~	~	~
Sage Thrasher	*Oreoscoptes montanus*	~	0	0	~	~	2	~	1	~	~	1	2
European Starling	*Sturnus vulgaris*	1	1	1	~	0	1	~	0	1	1	0	1
American Pipit	*Anthus rubescens*	~	~	0	~	~	~	~	~	~	~	0	0
Cedar Waxwing	*Bombycilla cedrorum*	0	~	0	~	~	0	0	0	~	~	0	~
Phainopepla	*Phainopepla nitens*	~	~	~	~	~	~	~	0	~	~	~	0
Orange-crowned Warbler	*Vermivora celata*	3	1	0	0	2	0	1	2	2	~	0	2
Nashville Warbler	*Vermivora ruficapilla*	~	~	0	~	~	0	~	~	~	~	~	~
Virginia's Warbler	*Vermivora virginiae*	~	~	0	~	~	~	~	~	~	~	~	~
Northern Parula	*Parula americana*	~	~	0	~	~	0	~	0	~	~	0	~
Yellow Warbler	*Dendroica petechia*	1	3	1	3	1	1	1	1	1	1	1	1
Chestnut-sided Warbler	*Dendroica penylvanica*	~	~	~	~	~	0	~	~	~	~	~	~
Magnolia Warbler	*Dendroica magnolia*	~	~	0	~	~	~	~	0	~	~	~	~
Black-throated Blue Warbler	*Dendroica caerulescens*	~	~	~	~	~	0	~	~	~	~	~	~
Audubon's Warbler	*Dendroica coronata auduboni*	0	2	0	3	3	0	2	0	0	~	0	~
Myrtle Warbler	*Dendroica coronata coronata*	~	~	0	~	~	0		0	~	~	0	~

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~

Appendix 5. **Mono Lake Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	DECH	JORD	LEEL	LEEM	LEEU	MILL	MILU	RUSL	RUSU	THOM	WILL	WILU
Yellow-rumped Warbler	*Dendroica coronata*	0	~	0	3	3	0	2	0	3	~	0	0
Black-throated Gray Warbler	*Dendroica nigrescens*	~	~	~	0	~	~	0	~	~	~	~	~
Townsend's Warbler	*Dendroica townsendi*	~	~	0	~	0	0	~	0	0	~	0	0
Hermit Warbler	*Dendroica occidentalis*	~	~	0	~	~	~	~	~	~	~	~	~
Bay-breasted Warbler	*Dendroica castanea*	~	~	~	~	~		0	~	~	~	~	~
Black-and-White Warbler	*Mniotilta varia*	~	~	0	~	~	0	~	0	~	~	~	0
American Redstart	*Setophaga ruticilla*	~	~	~	~	~	0	~	~	~	~	~	0
Ovenbird	*Seiurus aurocapillus*	~	~	~	~	~		0	~	~	~	~	~
Kentucky Warbler	*Oporornis formosus*	~	~	~	~	~	0	~	~	~	~	~	~
Mac Gillivray's Warbler	*Oporornis tolmei*	3	3	1	3	2	0	3	1	2	2	0	2
Common Yellowthroat	*Geothlypis trichas*	~	~	0	~	0	0	~	0	0	~	2	1
Hooded Warbler	*Wilsonia canadensis*	~	~	~	~	~	~	0	~	~	~	~	~
Wilson's Warbler	*Wilsonia pusilla*	0	0	0	0	0	0	2	0	2	~	0	0
Yellow-breasted Chat	*Icteria virens*	~	~	0	~	~	0	0	0	~	~	~	0
Summer Tanager	*Piranga rubra*	~	~	~	~	~	~	~	0	~	0	~	~
Western Tanager	*Piranga ludoviciana*	2	2	2	1	1	0	3	0	3	2	0	0
Green-tailed Towhee	*Pipilo chlorurus*	1	1	1	1	3	1	1	1	3	3	1	1
Spotted Towhee	*Pipilo maculatus*	1	3	1	0	2	1	2	1	2	2	1	1
Chipping Sparrow	*Spizella passerina*	0	~	0	2	2	0	0	0	~	~	0	0
Brewer's Sparrow	*Spizella breweri*	3	1	1	0	3	1	3	1	3	~	1	1
Vesper Sparrow	*Pooecetes gramineus*	~	~	0	~	~	2	~	~	~	~	3	1
Lark Sparrow	*Chondestes grammacus*	~	~	0	~	~	0	~	~	~	~	0	~
Black-throated Sparrow	*Amphispiza bilineata*	~	2	~	~	~	0	~	0	~	~	0	~
Sage Sparrow	*Amphispiza belli*	0	0	0	~	~	3	0	3	~	~	2	0
Savannah Sparrow	*Passerculus sandwichensis*	~	~	0	~	0	0	~	1	~	~	0	1
Fox Sparrow	*Passerella iliaca*	3	3	0	~	3	2	1	0	3	~	0	0
Song Sparrow	*Melospiza melodia*	1	3	1	3	1	1	1	1	1	2	1	1
Lincoln's Sparrow	*Melospiza lincolnii*	~	~	0	~	~	0	~	0	~	~	~	0
Swamp Sparrow	*Melospiza georgiana*	~	~	~	~	~	0	~	~	~	~	~	~
Mtn. White-crowned Sparrow	*Zonotrichia leucophrys oriantha*	~	2	0	~	~	0	~	0	0	~	0	0
Gambel's White-crowned Sparrow	*Zonotrichia leucophrys gambelii*	~	~	0	~	~	0	~	0	~	~	0	~

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~

Appendix 5. **Mono Lake Watershed Sites.** Breeding status of all species detected at all sites using all methods and observations, May 1 – August 15, 1998-2003.

Common name	Latin name	DECH	JORD	LEEL	LEEM	LEEU	MILL	MILU	RUSL	RUSU	THOM	WILL	WILU
White-crowned Sparrow	*Zonotrichia leucophrys*	~	2	0	~	0	0	~	0	0	~	0	0
Golden-crowned Sparrow	*Zonotrichia atricapilla*	~	~	~	~	~	0	~	~	~	~	~	~
Oregon Junco	*Junco hyemalis thurberi*	~	~	0	1	1	0	1	~	3	~	~	0
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	~		0	~	~	~	0	~	~	~	0	0
Black-headed Grosbeak	*Pheucticus melanocephalus*	1	2	0	1	3	0	1	1	1	~	0	2
Blue Grosbeak	*Guiraca caerulea*	~		~	~	~	0	~	0	~	~	~	~
Lazuli Bunting	*Passerina amoena*	3	3	1	2	2	1	2	2	2	3	0	0
Indigo Bunting	*Passerina cyanea*	0	~	0	~	~	~	~	~	~	~	~	~
Red-winged Blackbird	*Agelaius phoeniceus*	0	~	1	~	1	1	3	1	1	~	1	1
Western Meadowlark	*Sturnella neglecta*	1	2	0	~	~	3	~	0	~	2	2	1
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	~	~	0	~	1	0	~	0	0	~	0	0
Brewer's Blackbird	*Euphagus cyanocephalus*	1	~	1	1	1	1	1	1	1	1	1	1
Great-tailed Grackle	*Quiscalus mexicanus*	~	~	~	~	~	0	~	~	~	~	~	~
Brown-headed Cowbird	*Molothrus ater*	3	3	1	3	3	1	1	1	1	1	1	1
Bullock's Oriole	*Icterus bullockii*	1	1	1	0	0	1	3	1	1	3	0	2
Cassin's Finch	*Carpodacus cassinii*	0	1	1	1	1	1	1	0	3	~	0	0
House Finch	*Carpodacus mexicanus*	~	2	0	~	~	0	0	2	~	~	0	0
Purple Finch	*Carpodacus purpureus*	~	~	~	~	~	~	~	0	~	~	~	~
Pine Siskin	*Carduelis pinus*	0	2	0	2	~	0	0	0	~	~	0	~
Lesser Goldfinch	*Carduelis psaltria*	0	2	1	0	~	0	0	2	0	2	0	0
American Goldfinch	*Carduelis tristis*	~	~	0	~	~	0	~	0	~	~	~	~
House Sparrow	*Passer domesticus*	~	~	0	~	~	2	~	~	~	~	~	~

Confirmed Breeding - 1 Probable Breeding - 3 Possible Breeding - 2 No Evidence of Breeding, Migrant, Transient, or Disperser - 0 Not Detected - ~

Appendix 6 – Table A. Common names and 4-letter AOU codes for birds caught during constant effort mist netting at Mono Basin sites, 2003.

AOU 4-letter Code	Common Name	AOU 4-letter Code	Common Name
ANHU	Anna's Hummingbird	SATH	Sage Thrasher
BTLH	Broad-tailed Hummingbird	SWTH	Swainson's Thrush
CAHU	Calliope Hummingbird	HETH	Hermit Thrush
RUHU	Rufuos Hummingbird	EUST	European Starling
BEKI	Belted Kingfisher	OCWA	Orange-crowned Warbler
RBSA	Red-breasted Sapsucker	YWAR	Yellow Warbler
HYSA	Red breasted/naped Sapsucker	AUWA	Audubon's Warbler
DOWO	Downy Woodpecker	TOWA	Townsend's Warbler
HAWO	Hairy Woodpecker	MGWA	MacGillivray's Warbler
RSFL	Red-shafted Flicker	COYE	Common Yellowthroat
WEWP	Western Wood-Pewee	WIWA	Wilson's Warbler
UNEM	Empidonax sp.	YBCH	Yellow-breasted Chat
WEFL	Western Flycatcher	WETA	Western Tanager
WIFL	Willow Flycatcher	BHGR	Black-headed Grosbeak
HAFL	Hammond's Flycatcher	SPTO	Spotted Towhee
DUFL	Dusky Flycatcher	GTTO	Green-tailed Towhee
GRFL	Gray Flycatcher	SAGS	Sage Sparrow
BLPH	Black Phoebe	BRSP	Brewer's Sparrow
WAVI	Warbling Vireo	SAVS	Savannah Sparrow
CAVI	Cassin's Vireo	VESP	Vesper Sparrow
SOVI	Solitary Vireo	MWCS	Mountain White-crowned Sparrow
STJA	Steller's Jay	FOSP	Fox Sparrow
VGSW	Violet-green Swallow	SOSP	Song Sparrow
MOCH	Mountain Chickadee	LISP	Lincoln Sparrow
BUSH	Bushtit	CHSP	Chipping Sparrow
JUTI	Juniper Titmouse	LAZB	Lazuli Bunting
WBNU	White-breasted Nuthatch	BHCO	Brown-headed Cowbird
BEWR	Bewick's Wren	RWBL	Red-winged Blackbird
HOWR	House Wren	BRBL	Brewer's Blackbird
RCKI	Ruby-crowned Kinglet	BUOR	Bullock's Oriole
BGGN	Blue-gray Gnatcatcher	HOFI	House Finch
AMRO	American Robin	CAFI	Cassin's Finch

APPENDIX 7. MONO BASIN BROWN-HEADED COWBIRD STUDY: SUMMARY OF THE PILOT STUDY YEAR, 2003.

CHRISTOPHER M. TONRA

ABSTRACT

During The 2003 field season we color-banded and took blood samples of Brown-headed Cowbirds (Molothrus ater) as part of a pilot study examining territoriality and host selection in this species. We also attempted to identify afternoon foraging areas used by cowbirds that breed on the project nest plots. We banded a total of 34 adults (16 males and 18 females) and 43 nestlings/fledglings. We captured cowbirds using three different methods; target netting on the nest plots, a funnel trap set at a feed station in Mono City, and constant-effort mist netting. When nestlings reached seven days old, we color-banded them and extracted blood. We resighted or recaught 17 individual adult Brown-headed Cowbirds. We resighted nine post-fledged birds that we originally banded as nestlings. We were able to generate territories for two adult females on Lee Vining Creek and found evidence of one female returning to breed at Mill Creek for three consecutive years. Lastly, through captures and subsequent resightings or recaptures, we have preliminary evidence that cowbirds foraging at Mono City are breeders at Mill Creek and Wilson Creek.