2011 Avifauna Assessment of the Cache Creek Nature Preserve, 94B Restoration Site, and the Yolo County Flood Control Mitigation Site

Photo by Ryan DiGaudio

Western Kingbird with nesting material at Cache Creek

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Introduction

California's riparian habitat is known to support a wealth of biological diversity, including more than 225 species of birds, mammals, reptiles, and amphibians. However, over the past 150 years, riparian habitat has dramatically declined. For example, current estimates of the remaining riparian habitat in the Central Valley range from 2% to 7%, depending on geographic region (Katibah 1984, Dawdy 1989). The loss of riparian habitat may be the leading cause of population declines among land bird species in western North America (DeSante and George 1994). Thus, riparian areas have been identified as the most important habitat for the protection and conservation of songbirds in California (Manly and Davidson 1993, Davidson 1995).

Cache Creek is a perennial stream that runs from the Coastal Range into the west side of the Central Valley (Fig. 1), and extensive sections of the lower Cache Creek has been overwhelmed by invasive exotic vegetation, such as giant reed (*Arundo donax*), salt cedar (*Tamarix parviflora*), Ravenna grass (*Saccharum ravennae*), perennial pepperweed (*Lepidium latifolium*) , and yellow starthistle (*Centaurea solstitialis*). Given that extensive areas of formerly native vegetation have been replaced by these exotic plants, native wildlife habitat along Cache Creek has been greatly impacted. Furthermore, aggressive bank-stabilizing plants such as *Arundo* alter the stream hydrology and channel characteristics (Cal IPC 2011), which further degrades riparian habitat condition.

In 1999, the Cache Creek Conservancy initiated an intensive *Tamarix* and *Arundo* eradication program at the 130 acre Cache Creek Nature Preserve (hereafter CCNP). Extensive stands of the exotic plants were mechanically removed during the first year of the program, and targeted herbicide applications have been used in subsequent years to control re-growth. Over time, native vegetation has replaced much of the area formerly infested with *Tamarix* and *Arundo.*

One of the objectives of the *Tamarix* and *Arundo* eradication project was to improve habitat conditions for native wildlife. Bird monitoring is an excellent tool used for evaluating wildlife response to environmental change because birds are reliable indicators of ecosystem health, respond relatively fast to ecological changes, and compared to other taxa, are highly visible and thus relatively easy and cost effective to monitor. California Partners in Flight and the Riparian Habitat Joint Venture (RHJV 2004) have developed a suite of 16 riparian focal bird species (see http://www.prbo.org/calpif/htmldocs/riparian.html for more detailed accounts on each focal species). Habitat-specific focal species are meant to represent a variety of habitat elements or ecosystem attributes, and thus managing for the needs of these species

should also benefit the larger community, including species at risk. (Chase and Geupel 2005, Alexander et al. 2007). Monitoring biological outcomes also provides a necessary information feedback loop for evaluating and guiding restoration practices through adaptive management, and thus helps maximize project outcomes.

U.C. Davis conducted monitoring in 1999 and 2001 to assess the pre and post conditions of the avian community within the restoration area at the CCNP (Truan 2002), and found that bird species richness and abundance decreased in the year following *Tamarix* and *Arundo* removal. Short-term declines in bird abundance and species richness is a typical response immediately following large scale invasive plant removal projects because it can take up to several years for treated areas to recover and native vegetation becomes reestablished (Truan 2002).

In the spring and summer of 2011, PRBO Conservation Science conducted standardized bird surveys to document and assess the breeding avian community of the CCNP riparian area and also at two small adjacent riparian restoration plots adjacent to the CCNP- the 3.5 acre Yolo County Flood Control (YCFC) mitigation site, and the 1.3 acre 94B site (Fig 1). A summary of results, including a description of the avifauna from each of the three sites are described in this report.

Methods

For surveying the 130 acre CCNP, we used standardized 5-minute variable circular plot point count surveys during the breeding season. Point count surveys are designed to assess landbird presence/absence, diversity, and abundance (Ralph et al. 1995). We established a total of eight point count stations throughout the riparian areas of the CCNP, where points were established at least 200 meters apart from each other to ensure independence of observations between points (Fig. 1). Point count surveys began 15 minutes after local sunrise and were completed within 4 hours of the start time. Surveys were not conducted in weather conditions that could significantly influence observers' ability to detect birds such as rain or wind over 10mph. The point count stations were surveyed 2 times during the peak of the landbird breeding season (25 May 2011 and 28 June 2011). At each of the 8 point count stations, all birds seen or heard were recorded during a 5-minute sampling period, during which each individual bird was recorded as a separate observation. Each bird detection was classified according to the type of detection (visual, song or call) and were classified into a distance bin representing the distance away from the station the bird was first detected; the bin intervals were 0-10m, 10-20, 20-30, 30-40, 40-50, 50-75, 75-100, and greater

than 100m. Laser range finders were used to assist in determining the distance to each bird. Birds flying over were recorded as "flyover" and were not ascribed a distance. More specifics about the PRBO point count method can be found at http://data.prbo.org/cadc2/index.php?page=songbird-point-counts. All point count data was entered online at the California Avian Data Center (http://data.prbo.org/cadc2/) and has been made password protected. Access to the data may be granted by registering for a CADC account through the above link.

For the much smaller YCFC and 94B sites (1.29 acres and 3.47 acres, respectively), we used 20-minute standardized area search surveys, where area search plots were established to match the boundaries of each site (Ralph et al. 1993). The area search method yields many of the same data and community metrics that point counts do; however area searches are better suited for surveying small areas such as the YCFC and 94B sites.

Evidence of breeding for each species was noted during point count and area search surveys, where we considered a species a *confirmed* breeder if at least one of the following behaviors were observed: nest found, distraction display, copulation, feeding young or fledglings, and food or fecal sac carries. We considered a species as a *probable* breeder if observed exhibiting breeding behavior (singing, paired, courtship and/or territorial behavior) on both visits during the breeding season ≥ 10 days apart. Birds were considered *potential* breeders if observed singing or exhibiting breeding behavior in suitable habitat only one time during the breeding season.

Analysis

Point Count Data. Avian community indices calculated from the point count data were abundance, species richness, and species diversity. These community indices were calculated per point and averaged separately for each transect; averaging the indices in this manner controlled for the different number of point count stations between transects, and also provided a measure of variance within each site. *Abundance* is the total number of individual birds detected within 50 meters of a point count station for the two visits combined; *species richness* is the number of unique species detected within 50 m for the two visits combined; bird *species diversity* measures ecological diversity based on the number of species detected, weighted by the proportional abundance of each species. A high score indicates high ecological species diversity. Species diversity was measured using a transformation of the Shannon-Weiner index, which is symbolized by H' (also called the Shannon-Weaver index or Shannon index; Nur

et al. 1999). This transformed index, which was introduced by MacArthur (1965) is N_1 where $N_1 = e^{H'}$. The advantage of N_1 over H' is that N_1 is measured in terms of species, whereas H' is measured in terms of bits of information. Thus, N_1 is more easily interpretable, and species diversity (measured as N_1) and richness can be compared. P_i is the proportion of the total number of individuals for the *ith* species:

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

For calculating community indices, we only used detections from within 50 m of the point count stations in order to minimize detection variance. Furthermore, excluding fly-over detections and birds detected beyond 50 m removed most non-riparian bird species associated with adjacent upland habitats. 50 m circular buffers are shown on Figure 1 to indicate the habitat area included in this analysis (Fig. 1). In order to evaluate both the overall bird community within the restoration sites as well as the bird community of riparian obligate species, we calculated two different sets of avian community indices- one that took into account all species detected, and another that only included the RHJV riparian focal species (RHJV 2004).

Area Search Data. We used to same methodology for analyzing the area search data as we used for the point count data described above. Area search analysis included all detections from within the area search plot (excluding fly-overs), whereas point count analysis only included detections from within a 50 m radius of each station. To allow for comparisons between abundance indices derived from both point counts and area searches, we standardized abundance by transforming abundance (total individual birds detected) into a density index (total birds detected *per acre*).

Results

Species occurrence. Including all detection types and incidental observations, a total of 51 bird species were detected from all sites: 50 species from the Cache Creek Nature Preserve (CCNP), 22 from 94B, and 7 from YCFC (Appendix A). Of the 50 species detected at the CCNP, 2 were confirmed to be breeding (Tree Swallow and European Starling), 22 were probably breeding, and another 22 were potentially breeding (Appendix A). At the 94B restoration site, 1 species was confirmed breeding (Cliff Swallow, under the Road 94B bridge at plot border), 3 were probably breeding (Black-headed Grosbeak, Western Kingbird, and Bushtit), and the remaining 18 species were probably breeding (Appendix A). At the YCBC mitigation plot, 6 of the 7 species that were detected were considered potential breeders. At the CCNP, 7 out of the 16 California Partners in Flight riparian focal species were detected; these were Swainson's

Hawk, Warbling Vireo, Tree Swallow, Yellow Warbler, Wilson's Warbler, Song Sparrow, and Black-headed Grosbeak (Appendix A). Three riparian focal species were detected at the 94B site: Tree Swallow, Wilson's Warbler, and Black-headed Grosbeak; no riparian focal species were found at the YCFC site (Appendix A). Species of special management concern found at the CCNP include Swainson's Hawk (California State Threatened), Nuttall's Woodpecker (USFWS species of conservation concern), and 3 California bird species of special concern: Yellow Warbler, "Modesto" Song Sparrow (*M. m. mailliardi* race), and Yellow-headed Blackbird (Appendix A; Shuford and Gardali 2008). Only one species of management concern was found at the 94B site (Nuttall's Woodpecker) and none at the YCFC site (Appendix A).

Avian Community Indices. From the 8 point count stations surveyed at the CCNP, we found an average of 21.0 birds per point, or 10.8 birds per acre (Table 1). Average species richness (number of species detected per point) at the CCNP was 10.6, and the average Shannon diversity index was 8.3 (Table 1). Restricting this analysis to include only riparian focal species, we found that the CCNP supported an average of 2.3 birds per point count station (or 1.2 birds per acre), 1.9 species per station, and an average diversity index of 1.8 (Table 1).

The 94B restoration site supported a relatively high density of 20.2 birds per acre, whereas the YCFC mitigation site supported just 6.2 birds per acre (Table 2). With a species richness of 21 species, the 94B restoration site supported 3 times more species than the YCFC site (Table 2). Similarly, 94B supported a much higher species diversity index (14.4) than YCFC (6.7; Table 2).

Discussion

The riparian habitat and associated bird community at the Cache Creek Nature Preserve (CCNP) appears to be relatively healthy in terms of its diversity and abundance (Table 1 and Appendix A). However, the absence of certain species that are expected in riparian habitat for the region may indicate a deficiency of certain habitat elements. For example, the Spotted Towhee (*Pipilo maculates*) is a bird typically found in riparian forests around the Central Valley; however no Spotted Towhees were found at the CCNP. The Spotted Towhee is an understory ground nesting bird that requires an herbaceous understory interspersed with dense shrubs to provide cover. One possible explanation for their absence at the CCNP is that there is not sufficient understory habitat in the CCNP riparian forest. Alternatively, there could be other limiting factors, such as predation since ground nesting songbirds are particularly susceptible to predation.

The 3.47 acre 94B restoration site supported many riparian species, with the majority of the species being indicative of mid to late successional riparian forests. These species include mid-canopy nesters (e.g. Black-headed Grosbeak), canopy nesters (e.g. Western Kingbird), and several cavity nesting species (Nuttall's and Downy woodpeckers, Ash-throated Flycatcher). Lacking, however, were any early successional and understory nesting species, such as Spotted Towhee (see above paragraph), and Song Sparrow. Establishing more shrubs and herbaceous forbs in the understory, such as California Blackberry (*Rubus ursinus*), mulefat (*Baccharis salicifolia*), and mugwort (*Artemisia douglasiana*) may attract understory bird species and thus increase the overall riparian bird diversity at the 94B restoration site.

The Yolo County Flood Control (YCFC) mitigation site supported very few birds, both in terms of abundance and number of species. In fact, this site did not support any of the California Partners in Flight riparian focal species. This is largely due to this site's very small size (1.29 acres), but also due to the fact that this site is predominantly a "weedy" field composed of exotic annual grasses and supports very little riparian vegetation, with the exception of a few willow trees on the plot creek-side border. As this site has yet to be restored, our bird survey data from 2011 thus will serve as a baseline which can be compared with against future bird surveys subsequent to restoration.

Table 1. Average abundance, species richness, and Shannon index species diversity (standard errors in parentheses) at the Cache Creek Nature Preserve in 2011.

	All species	Riparian Focal species
Abundance	21.0 (3.8)	2.3 (0.4)
Density (birds per acre)	10.8 (2.0)	1.2 (0.2)
Species Richness	10.6 (0.9)	1.9 (0.2)
Species Diversity	8.3 (0.5)	1.8 (0.2)

Table 2. Abundance, species richness, and Shannon index species diversity at the 94B restoration site and YCFC mitigation site in 2011.

	94B Restoration (3.47 ac)	YCFC Mitigation (1.29 ac)
Density (birds per acre)	20.2	6.2
Species Richness	21	7
Species Diversity	14.4	6.7

Recommendations

The following are general recommendations for improving habitat conditions for birds along Cache Creek:

- **Restore riparian corridor width and connect habitat patches with corridors.** The effect of riparian corridor width varies by bird species and riparian type. In general, a width of at least 100 meters (approximately 330 feet) is considered optimal for creating quality riparian habitat, though narrower corridors are still beneficial for wildlife movement and dispersal (RHJV 2004, Gardali et al. 2004).
- **Focus habitat restoration projects near existing riparian habitat patches.** Mature riparian patches can act as a source of birds for newly restored riparian patches. PRBO's work in the Sacramento Valley indicates that the greater the amount of riparian habitat near a restoration site results in a greater abundance of birds (Gardali and Holmes 2011).
- **Diversify and enhance surrounding habitats.** Preserve and restore the transitional and upland habitats adjacent to riparian corridors. Along Cache Creek, this may include oak woodlands, oak savannah, chaparral, and grasslands. Birds are not confined to any one habitat type, and species that regularly nest in riparian may use adjacent habitats for foraging (White et al. 2005).
- **Provide brushpiles for cover.** A brushpile can provide cover from predators, loafing cover, nesting location, and protection from inclement weather. Artificial brushpiles should be large and tall (at least 3 feet), close to existing cover (e.g. blackberry bushes), and contain primarily branches, limbs, and few logs (Gorenzel et al. 1995).
- **Focus on increasing the number and diversity of fruiting plant species.** Fruiting plants will increase food resources for birds, especially for wintering birds. Examples of fruiting riparian plants important to birds include California grape (*Vitis californica*), blue elderberry (*Sambucus Mexicana*) and California blackberry (*Rubus ursinus*).
- **Promote diverse vegetation structure.** A diversity of plant species, ages, shapes, and sizes will provide more nesting and feeding sites for a greater variety of birds (RHJV 2004, Griggs 2009).
- **Plant native plants from local stocks.** Plant native grasses, shrubs, and trees that are adapted to local conditions. Use plant material (seeds, cuttings, divisions, etc.) preferably from adjacent riparian areas if not from within the Cache Creek watershed. Planting with locally derived plant stocks is important for maintaining the natural genetic diversity of the Cache Creek watershed. Furthermore, using local

plant stocks ensures greater success with restoration projects, because local plant stocks are best adapted to site-specific conditions, such as soil pH (Griggs 2009).

- **Remove non-native vegetation.** Non-native vegetation can out-compete and hinder the establishment of native plant species thereby reducing vegetation structure, and thus reduces habitat quality for birds. Removal of invasive non-native vegetation will facilitate growth of native vegetation and subsequently provide more riparian habitat for birds.
- **Consider the timing of management activities.** Disturbances during the breeding season may result in nest abandonment, the elimination of nest sites, destroying nests, exposing nests to predators, and decreasing food sources such as insects. Habitat enhancement and management activities, such as grazing, disking, herbicide application, and mowing should therefore be limited to the non-breeding season, which in Northern California is generally between September and February.
- **If mowing is necessary, mow early and often.** Many songbirds nest very close to the ground in grasses and 'weedy' areas. If mowing is necessary, mow early (beginning in February) and often, as this will prevent birds from nesting where mowing occurs.
- **Modify grazing practices.** Modify timing, duration, and frequency of grazing to ensure plant vigor, re-growth and reproduction, as well as meeting the habitat requirements of target wildlife species. Rotate grazing away from riparian areas just prior to and during the breeding season (March – August) to protect ground and shrub-nesting birds. Providing alternate sources of water away from watercourses and riparian vegetation, as well as fencing-off of riparian areas can be an effective means of improving the quality of riparian habitat.
- **Use wildlife-friendly fences.** Where fencing is used to exclude livestock from riparian corridors, wildlife-friendly fencing techniques should be used such that the fencing allows the free passage of wildlife movement and/or prevents entanglement and mortality (Harrington and Conover 2006). For detailed guidelines, see http://knowledge.sonomacreek.net/files/FencingGuidelines.pdf.
- **Encourage native cavity nesting birds.** Retain snags and woody material, as decaying trees and limbs provide nesting and food storage sites for cavity nesting birds (e.g. woodpeckers, wrens, bluebirds, and others). Allowing dead limbs to remain on living trees and retaining dead trees will allow birds to excavate cavities in rotting wood. The use of nest boxes can also increase the number of native cavity nesting birds.
- **Manage non-native animals and nest predators.** Eliminate sources of food such as open garbage cans, open compost piles, or outdoor pet food dishes that attract and

increase the number of feral cats and other nest predators, such as rats, raccoons and opossums.

- **Plan for future needs.** Restoration plans should address the long-term management and maintenance needs well into the future. Long-term needs may include weed management, irrigation, livestock fence maintenance, and additional plantings to achieve restoration goals.

Figure 1. Cache Creek Nature Preserve eight point count station locations (station number and 50 meter buffers shown), and area search plots at the 94B restoration and Yolo County Flood Control mitigation sites.

Appendix A. Species and total individuals detected at the Cache Creek Nature Preserve point count stations (8 total) and area search plots at the 94B restoration and YCFC mitigation sites from 2011 breeding season surveys. Total individuals from the Cache Creek Nature Preserve only reflect detections from within 50 m of a point count station, and an "x" reflects species detected from beyond 50 m of stations or as a fly-over only. Breeding status codes: B = confirmed; b = probable; p = potential (black = no evidence).
Emboldened names = special management status species and/or California Partners in Flight riparian focal species.

Common Name	Scientific Name	Breeding status	Cache Creek Nature Preserve (point count station #)								94B restoration	YCFC mitigation
			1	2	3	4	5	6	7	8		
Wood Duck	*Aix sponsa*	p	x									
California Quail	*Callipepla californica*	b	21			x	3	x	x	1	13	
Wild Turkey	*Meleagris gallopavo*	p								10		
Double-crested Cormorant	*Phalacrocorax auritus*	p					x					
Great Blue Heron	*Ardea herodias*	p			x							
Great Egret	*Ardea alba*	p	x									1
Cattle Egret	*Bubulcus ibis*	p		x		x		x				
Red-shouldered Hawk	*Buteo lineatus*	p					x					
Swainson's Hawk[CalPIF, ST]	*Buteo swainsoni*	b	1		1			x		1		
Killdeer	*Charadrius vociferus*	b	x				x		x			
Eurasian Collared-Dove	*Streptopelia decaocto*	b	x	x	1				x			
Mourning Dove	*Zenaida macroura*	b		1	x		x		x	1	2	
Black-chinned Hummingbird	*Archilochus alexandri*	p					2					
Anna's Hummingbird	*Calypte anna*	p							x		1	1
Belted Kingfisher	*Megaceryle alcyon*	p	1								2	
Acorn Woodpecker	*Melanerpes formicivorus*	b			2							
Nuttall's Woodpecker[CC]	*Picoides nuttallii*	b	2	1	1			x		1	3	
Downy Woodpecker	*Picoides pubescens*	b								x	2	
Northern Flicker	*Colaptes auratus*	p			x		1			1		
Western Wood-Pewee	*Contopus sordidulus*	p								x		
Black Phoebe	*Sayornis nigricans*	p										1
Ash-throated Flycatcher	*Myiarchus cinerascens*	b				x			3	x	3	1
Western Kingbird	*Tyrannus verticalis*	B	3	x	1	x		2		x	10	
Warbling Vireo[CalPIF]	*Vireo gilvus*								1			
Western Scrub-Jay	*Aphelocoma californica*	p	3	2	4	2	2	x	1	1	8	2

Common Name	Scientific Name	Breeding status	Cache Creek Nature Preserve (point count station #)								94B restoration	YCFC mitigation
			1	2	3	4	5	6	7	8		
American Crow	*Corvus brachyrhynchos*	p						x		x		
Tree Swallow[CalPIF]	*Tachycineta bicolor*	B	x	x	x		x			2	2	
Cliff Swallow	*Petrochelidon pyrrhonota*	B*			x	x		x		x	*	
Barn Swallow	*Hirundo rustica*	p	x	x								
Bushtit	*Psaltriparus minimus*	b	2	1		1	1		2		2	1
White-breasted Nuthatch	*Sitta carolinensis*	b				x	1		1			
Bewick's Wren	*Thryomanes bewickii*	b	1		2	2	1	2	3	1		
House Wren	*Troglodytes aedon*	b	1	x	1	2	1	3	x	6	1	
American Robin	*Turdus migratorius*	b		x							1	
California Thrasher	*Toxostoma redivivum*	p						x			1	1
European Starling	*Sturnus vulgaris*	B		2	1		4	2	x	6	2	
Yellow Warbler[CalPIF, BSSC]	*Setophaga petechia*	p			x		1		x			
Townsend's Warbler	*Setophaga townsendi*								1			
Wilson's Warbler[CalPIF]	*Cardellina pusilla*			1	x					1	1	
California Towhee	*Melozone crissalis*	b	2		2	2				x	1	
Song Sparrow[CalPIF, BSSC]	*Melospiza melodia mailliardi*	b	2	x	1	x		1		x		
Western Tanager	*Piranga ludoviciana*				1				1			
Black-headed Grosbeak[CalPIF]	*Pheucticus melanocephalus*	b		1		1		2	1		5	
Lazuli Bunting	*Passerina amoena*	p	1									
Red-winged Blackbird	*Agelaius phoeniceus*	b	1	x					x	x		
Western Meadowlark	*Sturnella neglecta*	p			x							
Yellow-headed Blackbird[BSSC]	*Xanthocephalus xanthocephalus*	p	x									
Brown-headed Cowbird	*Molothrus ater*	b	1	x		x	2	x		x		
Bullock's Oriole	*Icterus bullockii*	b		1		1	x	x			2	
House Finch	*Carpodacus mexicanus*	b	1	4		x		2	1	x	7	
Lesser Goldfinch	*Spinus psaltria*	p		1					1		1	

ST = State Threatened; CC = USFWS conservation concern; BSSC = California Bird Species of Special Concern; CalPIF = California Partners in Flight riparian focal species

* A Cliff Swallow colony of at least 100 pairs was located under the Road 94B bridge at the border of the 94B restoration plot.

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