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Avian Studies of the McCormack Williamson Tract, Cosumnes River Preserve, 2000 and 2001

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INTRODUCTION

Riparian habitat in California has been identified as the single most important habitat for the conservation of Neotropical migratory birds (Miller 1951, Gaines 1974, Manley and Davidson 1993). Riparian habitat also provides critical habitat for resident songbirds, as well as for a host of other plant and animal life. Habitat loss due to agriculture and river stabilization in the Central Valley of California has been severe, particularly in riparian areas (Conard 1980). In some cases, such dramatic loss of habitat, often combined with the invasion of a brood parasite, the Brown-headed Cowbird (*Molothrus ater*), has led to severe bird population declines. Species that have been heavily impacted by riparian habitat loss and alteration include the Yellow-billed Cuckoo (*Coccyzus americanus*), the Warbling Vireo (*Vireo gilvus*), and the Yellow Warbler (*Dendroica petechia*) (Gaines 1974, 1980). In order to counteract bird population declines, as well as to provide breeding and wintering habitat for other organisms including fish, mammals and plants, habitat restoration has become an increasingly important management tool. The McCormack Williamson site, currently an active agricultural operation, is planned for eventual restoration to tidal marsh. The first phase of restoration, involving widening and reinforcing levees bordering the tract, was initiated in 2001. A portion of the current levee has been widened and planted with native riparian vegetation.

During the breeding seasons of 2000 and 2001, the Point Reyes Bird Observatory conducted a monitoring program on the levees of the McCormack Williamson tract (MW). The goal of this monitoring program was to gather baseline data on avian diversity, species richness and abundance at the tract in order to assess the success of any future restoration projects for riparian songbirds. To compare the importance of the tract at present relative to other riparian sites, songbird monitoring was implemented on the central portion of the Preserve as well as at MW.

METHODS

The McCormack Williamson tract is situated southwest of the Cosumnes River Preserve in the San Francisco bay delta along the Mokelumne River, and contains over eight miles of maintained levees. Much of the habitat on the slough- or river-side of the levees consists of fairly large trees including Valley oak (*Quercus lobata*) and Fremont's cottonwood (*Populus fremontii*) as well as a fairly developed understory. Levees on the tract are heavily used and are subject to periodic disturbance from levee maintenance work crews during the breeding season. Reference sites within the Cosumnes River Preserve include both maintained and unmaintained levee habitat, riparian habitat in a variety of stages of restoration, and mature riparian forest (Table 1).

Table 1. Study sites and their associated habitat types, as well as the number of points at each site.

Site	Abbrev.	Habitat	# Points
Department of Water Resources	DW	Maintained riparian levee	12
Fallow Field	FF	Passive restoration early succession	7
McCormack Williamson Tract	MW	Maintained riparian levee	40
Tall Forest	TF	Mature riparian forest	13
Valensin Forest	VA	Mature grazed riparian forest, savanna and woodland	17
Wendell's Levee	WL	Unmaintained riparian levee	8
Wendell's Road	WR	Unmaintained riparian levee	9
Willow Slough	WI	Habitat mosaic: riparian forest, savanna and woodland	15

The point count method was chosen as the most efficient way of censusing bird populations on MW. This method is one of the most efficient and data-rich methods of monitoring landbird populations. The data are used to calculate secondary population parameters, such as abundance, species richness and species diversity. Using the point count method, we can detect annual changes in bird populations, differences in species composition between different habitat types, and abundance patterns of species. Point count stations are at least 200 meters apart from each other along a transect. Each station is censused for a period of five minutes, during which all individual birds are recorded by species. Each detection is recorded as being within or outside a 50 m radius and the type of detection is noted (call, song, or visual). From this we can determine species that are definitely breeding at the site, likely to be breeding at the site, and species that are not likely to be breeding at the site.

To adequately sample the many miles of levees on the MW, a total of 40 points on 4 transects were established. These transects were sampled three times each during the 2000 and 2001 breeding seasons. Due to the steep, narrow levees at the site, as well as to the high degree of human activity at the site (the tract is actively farmed), the tract does not lend itself to methodologies such as mist netting or nest monitoring that are tailored towards gathering demographic information.

Point counts were also conducted at several reference sites on the central Preserve. These sites and their habitat associations are listed in Table 1. Further, one small wetland surrounded by agricultural fields at MW was monitored by absolute count for wetland bird species during each round of point counts. Nest monitoring and mist netting were implemented at the reference sites; although the habitat is not yet sufficient to use these methods at MW, this information will be important as a baseline reference when habitat is sufficiently restored.

ANALYSIS

We calculated species diversity, indices of abundance, and species richness from point count survey data. The mean number of individuals detected within 50 m is presented as an index of abundance. Species richness is defined here as the number of species

detected within the fixed 50 m radius. Species diversity measures ecological diversity based on the number of species detected within the fixed radius, weighted by the number of individuals of each species. A high score indicates high ecological (species) diversity. Species diversity was measured using a transformation of the usual Shannon-Weiner index, which is symbolized by H' (also called Shannon-Weaver index or Shannon index; Krebs 1989). 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 (Nur et al. 1999). Thus, N_1 is more easily interpreted, and species diversity (measured as N_1) and richness can be compared. Where S = total species richness and p_i is the proportion of the total number of individuals for the i species:

:

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

All indices were calculated by point as opposed to by transect which does not take into account the number of points per transect. In general, species diversity increases with the number of points in a transect regardless of habitat quality. For example, a site with many points in low-quality habitat may appear more diverse than a site with fewer points in high-quality habitat. In other words, there is a greater chance of detecting additional species when additional point count surveys are added regardless of habitat quality. The McCormack-Williamson site contains 40 points total whereas the average number of points at reference sites is less than 12. Thus, we calculate these indices for each point separately and present the mean value for each transect. This by-point method does not take into account the increase in species diversity that can occur when a transect contains more than one habitat type. Some of the reference sites (e.g., Willow Slough) would have much higher species diversity than other sites if transects were analyzed as a whole.

DATA MANAGEMENT

All data collected in the field for this project have been entered and proofed using Microsoft Visual Foxpro. Raw data forms and other hardcopies have been archived along with all electronic data at the PRBO Terrestrial Ecology Division Palomarin headquarters in Marin Co., CA. All pertinent electronic data collected on this project have been submitted to the Information Center for the Environment at the University of California, Davis.

RESULTS

A total of 69 species were detected on MW point count transects from 2000 to 2001. Overall, species diversity (Shannon-Weiner Diversity Index) at MW was 6.98 (two-year mean) was lower than other levee sites at the Preserve (Dept Water Resources 9.65, Wendel's Levee 7.73, and Wendel's Road 8.41) as shown in Table 2. Sites highest in species diversity were those with points in mature riparian forest, as demonstrated by Willow Slough and Tall Forest. The mean number of individuals per point (Abundance Index) was highest at Valensin Ranch and Wendel's Road (Table 2). MW along with Wendel's Levee site ranked lowest in abundance.

Table 2. Overall species diversity (Shannon-Weiner Diversity Index), mean abundance per point, and species richness. All indices calculated per point and averaged over transect. Point count data from 2000-2001 and two-year mean shown. Only individuals detected within 50 m used in analysis. Birds flying over the site were excluded from analysis.

Site	n	Species Diversity			Abundance Index			Species Richness		
		2000	Mean	2001	2000	mean	2001	2000	Mean	2001
Dept Water Resources	12	9.90	9.65	9.40	36.33	28.00	19.67	13.67	12.21	10.75
Fallow Field	8	3.78	3.69	3.60	27.14	21.32	15.50	5.14	4.70	4.25
McCormack-Williamson	40	7.63	6.98	6.33	21.98	19.83	17.68	9.53	8.59	7.65
Tall Forest	13	10.51	10.10	9.69	32.08	27.27	22.46	13.69	12.62	11.54
Valensin Ranch	17	8.53	8.58	8.63	38.47	31.94	25.41	12.06	11.35	10.65
Wendel's Levee	8	8.10	7.73	7.37	24.75	19.81	14.87	10.13	9.25	8.375
Wendel's Road	9	10.18	8.41	6.64	37.33	31.94	26.56	13.00	11.28	9.56
Willow Slough	15	11.01	9.25	7.49	33.07	25.13	17.20	14.40	11.63	8.87

Of the 14 Partners in Flight (RHJV 2000) focal species designated in the Riparian Bird Conservation Plan, nine have been detected at MW during the two-year study. Of these nine, three are confirmed breeders (Song Sparrow, Black-headed Grosbeak, and Blue Grosbeak). There are several species that were not detected as breeders on MW transects but that do breed at some of the reference sites (Table 3). These include Bullock's Oriole (*Icterus bullockii*), Common Yellowthroat (*Geothlypis trichas*), and Swainson's Hawk (*Buteo swainsoni*). Further, there are several species that were not detected during surveys at MW that breed in nearby reference sites, including Black-chinned Hummingbird (*Archilochus alexandri*), Cooper's Hawk (*Accipiter cooperii*), Lark Sparrow (*Calamospiza melanocorys*) and others (Table 3).

Table 3. Species encountered but not confirmed as breeders or not detected during surveys. Column one lists species detected at MW but not detected as breeding based on point count survey results. The species in column one breed at the Preserve nearby. Column two lists species that breed in nearby reference sites but were not encountered during surveys at MW.

MW Non-breeders	MW Not Encountered
Bullock's Oriole	Black-chinned Hummingbird
Common Yellowthroat	Cooper's Hawk
Lazuli Bunting	Lark Sparrow
Northern Harrier	Red-shouldered Hawk
Oak Titmouse	Spotted Sandpiper
Pacific-slope Flycatcher*	Yellow-billed Magpie
Western Meadowlark	
Wood Duck	
Western Wood-Pewee	
White-tailed Kite	

*breeds in very low numbers at Cosumnes River Preserve

DISCUSSION

The McCormack Williamson tract did not compare favorably to the majority of reference sites within the Cosumnes River Preserve when the data were analyzed by point. The only site with lower diversity was Fallow Field, an early-successional restoration site characterized by herbaceous growth. The low species diversity at MW is not surprising, given that the levees are relatively narrow and are bordered on one side by water and on the other side by agricultural fields. Thus, the percent cover of riparian habitat is much less, in general, than at reference sites. Most of the reference levee sites have vegetation on both sides, which increases the likelihood of encountering additional species at any one point. Although the species diversity index is low for MW it is within the range of levee transects bordered on at least one side by early-successional habitat that typically yields lower species diversity (i.e., Wendel's Levee, and Wendel's Road). Given this low species diversity, it is not surprising that several species found breeding in many of the reference sites were either not detected enough to be considered potential breeders or missing completely from MW (Table 5). It is likely that these species do not breed at the site because the available habitat is too narrow to provide basic foraging and breeding needs for these species. Abundance indices for MW were also low but still in the range of the reference sites. The same factors affecting species diversity (narrow levees and lack of riparian habitat on one side) are likely to have affected abundance as well.

The species that were sampled by absolute count in the small wetland on the south side of the tract were not analyzed quantitatively due to their small sample size. However, it is clear that this area provides important breeding habitat for many species not found elsewhere on the tract, including Marsh Wren, Pie-billed Grebe, and Mallard. The continued monitoring of this site may provide valuable information on the success and importance to breeding birds of any future tidal marsh restoration projects.

Although MW does not contain as many birds and bird species as the reference sites we monitored within the Preserve, many species were detected as breeders indicating the site is an important area for birds. With restoration already in progress it is likely, given the proximity and connectivity of the site to larger tracts of riparian forest, that the full complement of riparian breeders that marks a healthy ecosystem could become established. We recommend re-initiating point count surveys to gauge the effect this restoration is having on the bird community.

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This is Point Reyes Bird Observatory contribution # ____.

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APPENDIX

Appendix 1. List of species detected during surveys at the McCormack Williamson tract, 2000 and 2001 data. Birds flying over not included. Status column described breeding and migratory status, where N= non-breeder, P= probable breeder, and B= breeder; M= migrant, and R= resident.

Common name	Scientific name	Breeding and Migratory status
Pied-billed Grebe	<i>Podilymbus podiceps</i>	B, R
Great Blue Heron	<i>Ardea herodias</i>	N, R
Great Egret	<i>Ardea alba</i>	N, R
Green Heron	<i>Butorides virescens</i>	N, R
Turkey Vulture	<i>Cathartes aura</i>	N, M
Wood Duck	<i>Aix sponsa</i>	N, R
Mallard	<i>Anas platyrhynchos</i>	N, R
White-tailed Kite	<i>Elanus leucurus</i>	N, R
Northern Harrier	<i>Circus cyaneus</i>	P, R
Swainson's Hawk*	<i>Buteo swainsoni</i>	N, M
Red-tailed Hawk	<i>Buteo jamaicensis</i>	N, R
American Kestrel	<i>Falco sparverius</i>	N, R
California Quail	<i>Callipepla californica</i>	B, R
Common Moorhen	<i>Gallinula chloropus</i>	N, R
American Coot	<i>Fulica Americana</i>	N, M
Killdeer	<i>Charadrius vociferous</i>	N, R
Rock Dove	<i>Columba livia</i>	N, R
Mourning Dove	<i>Zenaida macroura</i>	P, R
Great Horned Owl	<i>Bubo virginianus</i>	N, R
Belted Kingfisher	<i>Ceryle alcyon</i>	N, R
Nuttall's Woodpecker	<i>Picoides nuttallii</i>	B, R
Downy Woodpecker	<i>Picoides pubescens</i>	B, R
Northern Flicker	<i>Colaptes auratus</i>	B, R
Western Wood-Pewee	<i>Contopus sordidulus</i>	N, M
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	N, M
Black Phoebe	<i>Sayornis nigricans</i>	B, R
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	P, M
Western Kingbird	<i>Tyrannus verticalis</i>	P, M
Warbling Vireo*	<i>Vireo gilvus</i>	N, M
Western Scrub-Jay	<i>Aphelocoma californica</i>	B, R
American Crow	<i>Corvus brachyrhynchos</i>	N, R
Horned Lark	<i>Eremophila alpestris</i>	N, R
Tree Swallow	<i>Tachycineta bicolor</i>	P, M
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	N, M
Barn Swallow	<i>Hirundo rustica</i>	P, M
Oak Titmouse	<i>Baeolophus inornatus</i>	N, R
Bushtit	<i>Psaltirparus minimus</i>	B, R

Appendix 1. Continued.

Common name	Scientific name	Breeding and Migratory status
White-breasted Nuthatch	<i>Sitta carolinensis</i>	N, R
Bewick's Wren	<i>Thryomanes bewickii</i>	P, R
House Wren	<i>Troglodytes aedon</i>	B, M
Marsh Wren	<i>Cistothorus palustris</i>	P, R
Western Bluebird	<i>Sialia mexicana</i>	N, R
Swainson's Thrush*	<i>Catharus ustulatus</i>	N, M
American Robin	<i>Turdus migratorius</i>	P, R
Wrentit	<i>Chamaea fasciata</i>	B, R
Northern Mockingbird	<i>Mimus polyglottos</i>	N, R
European Starling	<i>Sturnus vulgaris</i>	P, R
Cedar Waxwing	<i>Bombycilla cedrorum</i>	P, M
Orange-crowned Warbler	<i>Vermivora celata</i>	N, M
Yellow Warbler*	<i>Dendroica petechia</i>	N, M
Townsend's Warbler	<i>Dendroica townsendi</i>	N, M
Common Yellowthroat*	<i>Geothlypis trichas</i>	N, M
Wilson's Warbler*	<i>Wilsonia pusilla</i>	N, M
Yellow-breasted Chat	<i>Icteria virens</i>	N, M
Western Tanager	<i>Piranga ludoviciana</i>	N, M
Spotted Towhee	<i>Pipilo maculatus</i>	B, R
California Towhee	<i>Pipilo crissalis</i>	B, R
Song Sparrow*	<i>Melospiza melodia</i>	B, R
Black-headed Grosbeak*	<i>Pheucticus melanocephalus</i>	P, M
Blue Grosbeak*	<i>Passerina caerulea</i>	B, M
Lazuli Bunting	<i>Passerina amoena</i>	N, M
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	B, R
Western Meadowlark	<i>Sturnella neglecta</i>	N, R
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	B, R
Brown-headed Cowbird	<i>Molothrus ater</i>	B, M
Bullock's Oriole	<i>Icterus bullockii</i>	N, M
House Finch	<i>Carpodacus mexicanus</i>	B, R
American Goldfinch	<i>Carduelis tristis</i>	P, R
House Sparrow	<i>Passer domesticus</i>	N, R

* Denotes PIF riparian focal species