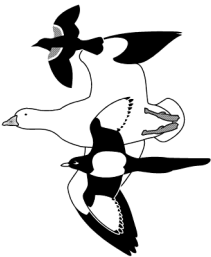




Central Valley Bird Club Bulletin



**Robert Ridgway and the 40th Parallel
Survey at Sacramento, 1867**

**Continuing Impacts of West Nile Virus
on Birds of California's Central Valley**

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Robert Ridgway and the 40th Parallel Survey at Sacramento, 1867

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In the summer of 1867, the 40th Parallel Survey party began what would become a five-year journey across the Great Basin of North America. The survey, established by an act of Congress on March 2, 1867, had the task of exploring the landscape and geological resources along the potential route of the transcontinental railroad. The concept for the survey was developed by Clarence King, who had been part of the Josiah Whitney's California Geological Survey. Under King's direction, particular attention was paid to geology and mineral resources, but a tremendous amount of data was collected on all natural resources, including birds.

The survey's ornithologist was Robert Ridgway, then 17 years old and embarking on his first professional employment. Ridgway would go on to become one of America's most eminent ornithologists (Wetmore 1931, Lewis 2012). The survey had the ambitious goal of studying a roughly 100 mile (160 km)-wide swath along the 40th parallel of latitude from the Sierra Nevada to the Rockies, roughly along the proposed route of the Union Pacific and Central Pacific Railroads. King's survey party was comprised of 15-20 members, including geologists, surveyors, support personnel such as teamsters and cooks, as well as Ridgway and the botanist William Bailey. The party was joined by a company of 20 U.S. Cavalry.

The survey party sailed to San Francisco and then set up a camp in the Sacramento area, spending from June 6 to July 4, 1867 there while preparing for the arduous journey ahead. The business of the survey lay primarily to the east of the Sierra Nevada, nonetheless Ridgway spent time collecting birds in the vicinity of Sacramento, and his observations while the party prepared for its journey offer a window into the avifauna of the region in 1867.

Results of the survey were published in eight volumes over the period 1870-1878. Volume IV, part III contained Ridgway's report on ornithology of the survey. This volume (Ridgway 1877) provided information on birds seen and collected along the survey route, as well as species accounts for all species encountered. King had asked that the report remain "within the compass of 200 pages" (Lewis 2012), but Ridgway's report grew to 366 pages. During the expedition, Ridgway collected 1,522 specimens, including 769 skins and 753 sets of nests and eggs. Two hundred sixty-two species of birds were

observed, mostly east of the Sierra Nevada. Ridgway's fieldwork spanned from the summer of 1867 through the fall of 1868, when he was called back to the Smithsonian, and again from May through July of 1869. Most of his time in the field on the survey was spent in the Great Basin, and the species accounts reflect the depth of knowledge that he acquired about avian habitat relationships and distribution in the Interior West.

BACKGROUND ON ROBERT RIDGWAY

Robert Ridgway was born July 2, 1850 in Mount Carmel, Illinois, a town of about 935 people at the time, located 240 miles (386 km) south of Chicago. The surrounding landscape had not yet experienced the intensive agricultural development that was to come. Ridgway grew up in a rural environment with old-growth hardwood forest. He spent much time hunting and exploring in this environment on his own, with his father, and with his boyhood friend Lucien Turner. Turner became a prominent naturalist in his own right, and together they published a paper on Alaska (Ridgway and Turner 1886). Ridgway drew and painted, primarily birds, from an early age. From his pharmacist father, he learned to mix pigments. He became a careful observer and, given the lack of access to existing works of ornithology, began to develop questions about the birds that he was observing.

In 1864, at the age of 13, Ridgway sent a letter to the director of the U.S. Patent Office asking about the identity of a particular bird. The Patent Office had had an extensive collection of bird specimens, but these had been relinquished to the relatively new Smithsonian Institution. Ridgway's letter was forwarded to the institution, where it found its way to Spencer Fullerton Baird, Assistant Secretary. This event launched a mentoring relationship between Baird and Ridgway that was fundamental to Ridgway's career. A correspondence developed in which Baird encouraged Ridgway's keen observational skills, use of technical descriptive language, and use of scientific nomenclature. In those days, scientific literature was not generally available, so Baird's correspondence with Ridgway created a bridge between rural Mount Carmel and the scientists and institutions of the east. Baird also encouraged Ridgway to paint as accurately as possible, though Baird did not consider illustrations to be essential in works of ornithology.

Based on his lengthy correspondence with Ridgway, and his confidence in the youth's developing abilities as an ornithologist, Baird offered him the position of ornithologist on the survey in March of 1867. Ridgway was then 16 years old. He arrived in Washington, D.C. on April 18, 1867, where he spent three weeks with Baird at the Smithsonian, learning to prepare study specimens and learning as much as he could about the workings of the Smithsonian. He must by then have had access to the Pacific Railroad Survey, volume IX (Baird et al. 1858), which would have represented the state of the art for California ornithology.

SACRAMENTO CAMP AND ENVIRONMENT

The survey party departed for the west by ship in two groups; Ridgway was part of the second group, with botanist William Bailey, photographer Timothy O'Sullivan, and King. The voyage provided Ridgway with his first exposure to the extravagant beauty and diversity of tropical America, which would lead ultimately to much further study (Lewis 2012). The group arrived in San Francisco on June 2, 1867. Ridgway remarked that “only Purple Martins and Cliff Swallows were seen while in the city”, though he also commented on hearing the songs of caged canaries while at that location. (I do not include scientific names of birds in this paper; common names are those of the A.O.S. checklist (American Ornithologists' Union 1998) and supplements, through the 58th Supplement (American Ornithologists' Union 2017).

The party established a camp at Sacramento on June 6, 1867. They remained in the vicinity of Sacramento from June 6 to July 4. The diary of William Bailey (1868), who was often Ridgway's companion, shows that the survey party spent most of this month gathering supplies and meeting with individuals with experience in the region, including the ornithologist James Cooper, geologist Josiah Whitney, and prominent California political and business figures, such as Senator John Conness. Various members of the party made excursions to San Francisco or eastward into the Sierra. Bailey often accompanied Ridgway on collecting trips, commenting that “Impossible cliffs, thorny trees, or dismal swamps alike fail to deter him when in pursuit of a bird”. The pair visited local ranches, riding mules which had been provided to the party. This too was a new experience for the easterners: “The latter (Ridgway) has very much my experience with this animal, the mule being the master spirit”.

Sacramento in its earliest decades was known as a location prone to flooding and infested with mosquitos. Major floods had occurred in 1850 and the winter of 1861-62. The city's first sewage and drainage system began construction in 1864, as did work on the raising of the grade of streets in the city and the movement of the channel of the American River (Castaneda and Simpson 2013). At the time of the 40th Parallel Survey's visit, streets in the city would have been at different grades. The previous decade's drought and flooding, combined with exotic invasion and widespread grazing, had already modified the environment to a considerable degree. There was already irrigated agriculture in the region, as well as grazing, and much of the grassland had been taken over by non-native plant species.

Ridgway found time to explore the Sacramento region and to collect and observe birds despite the preparations for the survey party's departure. Nonetheless, he points out that the first “working camp” of the expedition was the camp established on the Truckee River in Nevada. No collections were made as the group progressed eastward from Sacramento through the

foothills and western slope of the Sierra, and Ridgway expressed regret at this circumstance. Ridgway remarked on the “parched” landscape at this time of year, away from water. Riparian forests of oak, sycamore, willow and cottonwood harbored more birds, and extensive marshes were found near the rivers. Ridgway described the riverine environment as: “Extensive marshes, connected with the river, were filled with tall rushes, or tule (*Scirpus validus*), and other aquatics, many of them being hemmed in by skirting jungles of willows and other shrubs, having a dense, often impenetrable, undergrowth.” He commented on the fact that there was more bird life near moist environments than in the dry plains, though the difference was less extreme than in the Interior. Bailey’s diary comments that the area around Sacramento was low-lying and prone to flooding, and that levees had begun to be built around the city. The party regarded the area as unhealthy and infested with mosquitos.

AVIFAUNA OF THE SACRAMENTO AREA

Ridgway’s (1877) report included a summary section for each field camp, in which he describes the environment of the camp and presents a summary of the avifauna. Ridgway’s table of birds found breeding in the vicinity of Sacramento listed 54 species (Table 1). He does not describe the criteria for including species on this list, but many are represented by specimens or nest and egg collections (Tables 1 and 2). He included a column giving an impression of each species’ abundance. Standardized survey techniques were not in use at this time, so these were impressions based on Ridgway’s limited time in the field in the Sacramento region, and may have included information gleaned from other naturalists. The species accounts include additional information on a number of other species encountered in the area that were not included in the table of breeding birds (Table 2). Some of these are explicitly identified as likely breeders, suggesting that Ridgway only included species in the table when he had direct evidence of breeding.

Several of the species that were common in 1867 are currently species of conservation concern. Riparian habitats and wetland habitats supported such birds as Yellow-billed Cuckoo, Willow Flycatcher, Least Bell’s Vireo, Bank Swallow, and Yellow Warbler. Ridgway noted that Bell’s Vireo was “the characteristic and most abundant species at Sacramento City, where it inhabited the dense willow copses along with *Empidonax pusillus* (Willow Flycatcher)”. Although his table indicated that Yellow-billed Cuckoos were rare, his species account stated that “At Sacramento City its well-known notes were heard on more than one occasion in June, among the oak groves in the outskirts of the city”. Willow Flycatchers were noted to be second only to Western Kingbirds as a breeding flycatcher, and Yellow Warblers were said to be one of the commonest breeding species in the Sacramento area. Loss of riparian and wetland habitats, combined with the diversion of water are no

doubt factors in the decline of these species, but it is also worth noting that the Brown-headed Cowbird was absent from the region then (Laymon 1987). Brood parasitism by Brown-headed Cowbirds has been implicated in the decline of several riparian species in California, notably Willow Flycatcher and Least Bell's Vireo (Gaines 1974). Cowbirds were not observed by the survey party until they crossed the Sierra Nevada.

One interesting aspect of the survey report is the frequent mention of relationships between birds and humans. Ridgway often comments on the adaptation of birds to the human environment, a prominent example being Purple Martins, which he describes as "swarming around old buildings" with Cliff Swallows. Captive birds were common. For example, Ridgway describes the sale of young Lark Sparrows (then called "Mexican Larks" by young boys in Sacramento City). The survey party itself travelled with two hand-reared Western Kingbirds. Though free-flying, the birds followed the survey party during all activities. Eventually, however, they were consumed by the party's two domesticated Swainson's Hawks. The party encountered a domesticated Sandhill Crane in Carson City that had learned to check the pockets of visitors.

Many birds that are common in the Sacramento area today are notably lacking from Ridgway's table. Examples include California Quail, California Scrub-Jay, Oak Titmouse, White-breasted Nuthatch, Bushtit, American Robin, and California Towhee. Some of these species are explicitly noted later in the report to have been encountered for the first time as the party climbed into the foothills east of Sacramento (e.g. California Quail, California Scrub-Jay, California Towhee). The American Robin was not encountered until the party reached conifer forests, and the species account for White-breasted Nuthatch appears to apply only to the interior form. Some of the species probably did not occur in the area of the city at that time. The city would not have had the well-developed urban forests and parks, golf courses, and other habitats that are available now.

One of the most surprising observations of Ridgway's in the Sacramento area is his conclusion that Brewer's Sparrow was an abundant breeder in the area, "quite common in the brushy fields". No specimens were collected, and it appears that Ridgway's characterization was not accepted by early California ornithologists. For example, Lyman Belding (1980) commented that he seldom found the Brewer's Sparrow in the Sacramento Valley, and then only in migration. Belding further commented that "The early explorers in their extensive marches seldom named the location where their specimens were obtained, a distance of one hundred or even five hundred miles seeming, apparently, but a trifle to them, and there have been changes to the outlines of States and Territories since their time." Grinnell and Miller (1944) thought that Ridgway's claim was "doubtful".

Table 1. Breeding bird species noted by Robert Ridgway (1877) in the vicinity of Sacramento, California, June 6 – July 4, 1867. Common names, and the sequence of species, are those of the A.O.S. checklist (American Ornithologists' Union 1998) and supplements, through the 58th Supplement (American Ornithologists' Union 2017). Abundance descriptions are those provided by Ridgway for species for which he had obtained evidence of breeding. The number of specimens collected in the Sacramento area is shown as nests with eggs (NE) or skins (SK). Species currently listed as Threatened or Endangered under Federal (ESA) or State (CESA) Endangered Species Acts, and those that are considered Species of Special Concern by the California Department of Fish and Wildlife (CSSC; Shuford and Gardali 2008) are indicated.

Common name	Abundance	Specimens	Notes
Mallard	Abundant	0	
Gadwall	Abundant	0	
Cinnamon Teal	Abundant	0	
Aythya spp.	Abundant	0	Probably Redhead, CSSC
Mourning Dove	Abundant	2 NE	
Yellow-billed Cuckoo	Rare	0	FT, SE
Black-chinned Hummingbird	Common	0	
Anna's Hummingbird	Common	1 NE	
Common Gallinule	Abundant	1 SK	
American Coot	Abundant	0	
Killdeer	Abundant	0	
Larus spp.	Abundant	0	
Black Tern	Abundant	1 SK	CSSC
Forster's Tern	Abundant	0	
Great Blue Heron	Common	0	
Great Egret	Rare	0	
Green Heron	Abundant	2 SK	
Black-crowned Night Heron	Common	0	
Long-eared Owl	Common	2 SK	CSSC
Burrowing Owl	Abundant	2 SK	CSSC
Northern Flicker	Rare	0	
American Kestrel	Abundant	1 SK	
Western Wood-Pewee	Abundant	1 N, 4 NE, 2 SK	
Willow Flycatcher	Abundant	3 NE, 2 SK	SE
Black Phoebe	Rare	0	

Table 1. (cont.). Breeding bird species noted by Robert Ridgway (1877) in the vicinity of Sacramento, California, June 6–July 4, 1867.

Common name	Abundance	Specimens	Notes
Western Kingbird	Abundant	5 NE, 2 SK	
Loggerhead Shrike	Common	0	CSSC
Bell's Vireo	Common	2 SK	FE, SE
Warbling Vireo	Common	0	
Purple Martin	Abundant	0	CSSC
Barn Swallow	Abundant	0	
Northern Rough-winged Swallow	Common	0	
Bank Swallow	Common	0	ST
Cliff Swallow	Abundant	0	
Bewick's Wren	Common	0	
House Finch	Abundant	9 NE, 1 SK	
American Goldfinch	Abundant	7 NE	
Common Yellowthroat	Abundant	0	
Yellow Warbler	Abundant	5 NE	CSSC
Yellow-breasted Chat	Abundant	1 NE, 1 SK	CSSC
Spotted Towhee	Common	1 NE	
Chipping Sparrow	Common	0	
Brewer's Sparrow	Common	0	
Lark Sparrow	Abundant	6 NE	
Grasshopper Sparrow	Common	0	CSSC
Song Sparrow	Common	0	
Black-headed Grosbeak	Common	1 NE, 2 SK	
Blue Grosbeak	Common	5 NE, 2 SK	
Lazuli Bunting	Common	3 NE	
Western Meadowlark	Common	0	
Red-winged Blackbird	Abundant	0	
Tricolored Blackbird	Abundant	0	CSSC, candidate SE
Yellow-headed Blackbird	Abundant	1 NE	
Bullock's Oriole	Abundant	1 NE	

Table 2. Additional species observed by Ridgway in the Sacramento area but not included in his table of breeding birds. All specimens were collected as skins . Abundance is indicated if mentioned in the species account, and some additional notes from the species accounts are provided. None of these species are listed as Threatened or Endangered under Federal or State Endangered Species Acts, or are considered Species of Special Concern by the California Department of Fish and Wildlife.

Common name	Abundance	Specimens	Notes¹
Ruddy Duck	Common	0	Lagoons near Sacramento
Turkey Vulture	Rare	0	Rare in SV: edge of foothills
Red-shouldered Hawk	Common	0	Among trees near the river
Barn Owl		0	One individual near Sacramento
Western Screech Owl		3	Collected in Sacramento
Acorn Woodpecker		0	Present in SV
Lewis's Woodpecker		2	Mated pair in Sacramento
Nuttall's Woodpecker		0	Present in SV
Ash-throated Flycatcher		0	Plains from Sacramento to SN
Yellow-billed Magpie	Abundant	11	Nests observed, SV only
American Crow		0	Plains from Sacramento to SN
Tree Swallow	Common	0	Common in SV

¹SV = Sacramento Valley; SN = Sierra Nevada

In any event, no Brewer's Sparrow specimens were collected in the Sacramento area, although a number were collected once the expedition crossed the Sierra Nevada and entered the Great Basin. It is worth noting that the state of knowledge of this species at the time that Ridgway was in Sacramento was rudimentary at best. The distribution of the species was characterized in the Pacific Railroad Survey as "Rocky Mountains of U.S. to Pacific Coast" (Baird 1858). Baird thought that it might not be distinct from the Clay-colored Sparrow, commenting that "This species, if really distinct, is so very similar to the *S. pallida* (what we now as the Clay-colored Sparrow) as to require very close and critical comparison to separate it". Thus, some confusion about these taxa at the beginning of the survey might be expected.

Like other ornithologists learning about the American West, Ridgway often compared the avifauna of a region with eastern avifaunas at a similar latitude. His description of the Sacramento avifauna ends by comparing the area with the Mississippi Valley. He noted similarities, but that a similar area in the Mississippi Valley would have more breeding species. Of the species in

his table of Sacramento breeding species, 16 would not be found in the Mississippi Valley, but 12 of those had related eastern equivalents, for example Eastern and Western Wood-pewees, Black and Eastern Phoebes, Baltimore and Bullock's Orioles.

From Sacramento the party travelled eastward through the foothills and across the Sierra, establishing the first real working camp along the Truckee River. Thus began five long years of travel and fieldwork. Following completion of the 40th Parallel Survey, Ridgway returned to the Smithsonian, where he was employed by Baird preparing species descriptions and drawings for the publication *A History of North American Birds* (Baird et al. 1874) while beginning to publish lists of the birds observed at the field camps during the 40th Parallel Survey (Ridgway 1874, 1875). His official employment at the Smithsonian began in 1874, where he rose to become the Curator of Birds, a position he held until his death in 1929.

Ridgway was a seminal figure in the development of ornithology in the United States, producing hundreds of scientific papers including the magisterial eight-volume *Birds of Middle and North America*, published as Bulletin 50 of the U.S. National Museum from 1901-1919. The survey report of the 40th Parallel survey gives a glimpse into the early professional life of this remarkable man and a window into the avifauna of a part of the Central Valley in the mid-1800s.

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Continuing Impacts of West Nile Virus on Birds of California's Central Valley

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ABSTRACT

West Nile virus activity has continued in California's Central Valley since the first outbreaks in 2004 and 2005 and, based on rates of human infections, activity increased again in 2012. I used data from Central Valley Christmas Bird Counts and reports of human cases of West Nile virus infection to look for correlations between virus activity and bird abundance from 2004 through 2016. Declines in Yellow-billed Magpie (*Pica nuttalli*) observations were strongly correlated with the number of human infections. Magpie numbers declined to nearly half their pre-West Nile levels in the winter following the summer (2005) with the highest number of human infections and remained relatively stable through the winter of 2011–12. Following the increase in virus activity in 2012, magpie numbers declined steadily through 2016. During the years of stable Yellow-billed Magpie numbers, numbers of human cases were also stable with annual cases at around one-seventh of the peak in 2005. California Scrub-Jay (*Aphelocoma californica*) and American Crow (*Corvus brachyrhynchos*) numbers were also correlated with virus activity, but, correlations were weaker suggesting apparent impact of the 2012 outbreak was less than for the magpie. The Oak Titmouse (*Baeolophus inornatus*) appeared relatively unaffected by the new outbreak. These observations are consistent with the hypothesis that a significant subset of the Central Valley's scrub-jays, crows, and titmice have developed resistance to West Nile virus, while resistance has yet to develop in Yellow-billed Magpies.

INTRODUCTION

Declines in Yellow-billed Magpie (*Pica nuttalli*) numbers following the first outbreaks of West Nile virus (WNV) in the Central Valley (CV) and elsewhere in California in 2004-05 have been well-documented (Airola et al. 2007, Koenig et al. 2007, Pandolfino 2007, Crosbie et al. 2008, Pandolfino 2008a, Wheeler et al. 2009, Smallwood and Nakamoto 2009). As of 2010, numbers had shown no signs of recovery (Pandolfino 2013). Declines in populations of

the California Scrub-Jay (*Aphelocoma californica*), American Crow (*Corvus brachyrhynchos*), and Oak Titmouse (*Baeolophus inornatus*) were also documented following the 2005 outbreak (Airola et al. 2007, Smallwood and Nakamoto 2009). However, these three species showed evidence of recovery after 2005 (Pandolfino 2008b, 2009, 2010).

Data from the summer of 2012 revealed an increase in the number of infected birds and human infection cases (Center for Disease Control [CDC] 2012, Foss et al. 2015), which prompted me to examine Christmas Bird Count (CBC) data to determine if this increased level of virus activity had affected CV magpies or other species. Crosbie et al. (2008) found little evidence of immunity among the magpies that survived the 2004-05 virus outbreaks, raising the possibility that continued exposure to WNV could result in further population declines or continued population depression (Wheeler et al. 2009, Ernest et al. 2010, Pandolfino 2013). These results suggest the possibility that, while WNV-resistance may have developed in populations of the scrub-jay, crow, and titmouse, no resistance may exist among the magpies. By examining abundance changes during the recent resurgence of the virus I hoped to test this hypothesis.

METHODS

I obtained CBC data from National Audubon Society (2010) and data on WNV infections from the California Department of Public Health (<http://westnile.ca.gov/>). I used data from the 17 CV CBC circles that reported data consistently during the period covered by my analyses (Figure 1). Of those 17 CBCs, only the Red Bluff count failed to report data for each year, (i.e. 2006—07 through 2009—2010). All CBC data were normalized for relative effort using the number of birds observed per party hour for each circle. I used the total number WNV human infection cases reported from the following counties: Butte, Colusa, Fresno, Glenn, Kern, Kings, Madera, Merced, Placer, Sacramento, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Yolo, and Yuba.

The number of human WNV cases used is the total for each calendar year, with nearly all of those cases occurring during summer months. The yearly bird species abundance from CBC data is based on the numbers from the following winter.

I used Pearson correlation coefficient (r) to determine strength of associations between virus activity and bird numbers. The number of human infection cases in a given year was the effect and the change in bird abundance from CV CBCs from the previous year was the response variable. Correlations were considered significant when the probability of non-correlation was <5% ($p < 0.05$). I used the period starting with the year of first human cases, 2004, through 2016 for these analyses. I tested correlations for the four species that have been shown to be WNV-sensitive (Yellow-billed

Magpie, California Scrub-Jay, American Crow, and Oak Titmouse) as well as 10 species known to be resistant to WNV. The resistant species were selected based on the risk assessment (lowest risk) of Wheeler et al. (2009) as well as their presence in the CV year-round.

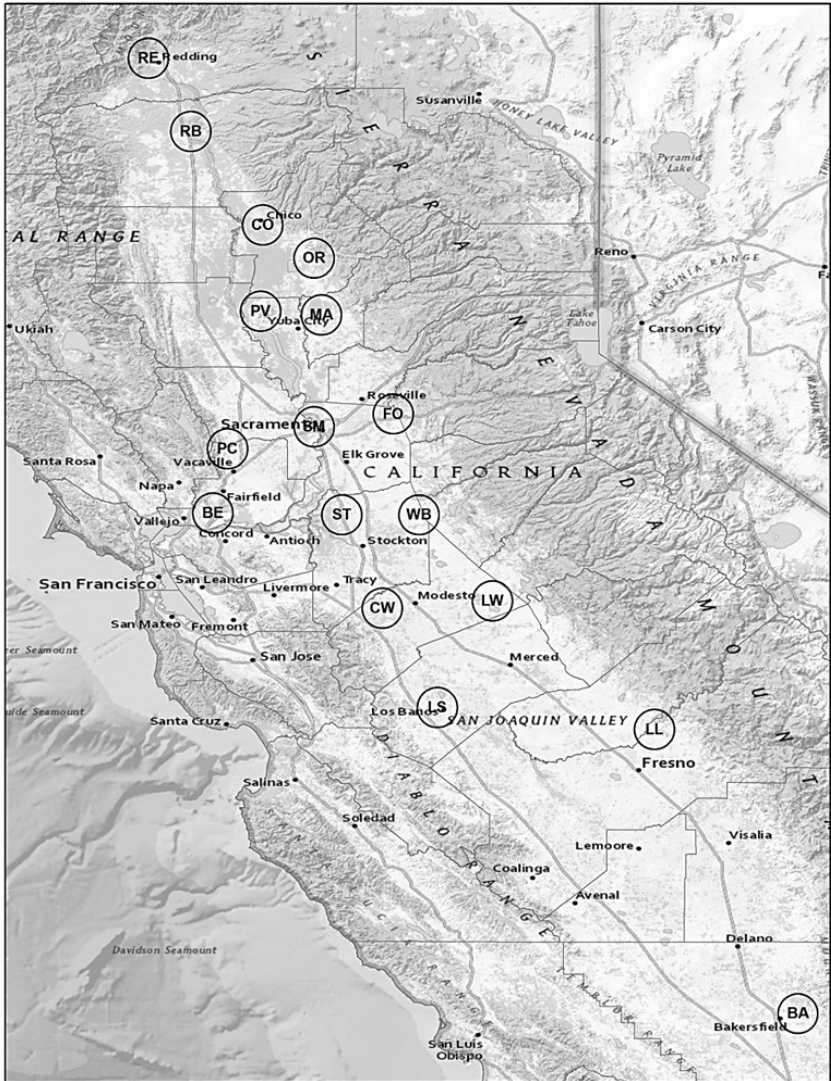


Figure 1. Location of the 17 Christmas Bird Count circles in the Central Valley, California, used for analyses. From north to south they are: RE = Redding; RB = Red Bluff; CO = Chico; OR = Oroville; PV = Peace Valley; MA = Marysville; FO = Folsom; SM = Sacramento; PC = Putah Creek; BE = Benicia; ST = Stockton; WB = Wallace-Bellota; CW = Caswell-Westley; LW = LaGrange-Waterford; LS = Los Banos; LL = Lost Lake; BA = Bakersfield.

RESULTS

Abundance of the Yellow-billed Magpie based on CBC data from 2000-16 (Figure 2) shows the previously documented decreases following the 2005 WNV peak, relatively steady numbers at lower abundance from 2006-11, and renewed declines coincident with the resurgence of WNV infections in 2012. California Scrub-Jay numbers (Figure 3) showed a sharp decline in 2005, followed by a rapid recovery, with much less dramatic declines starting in 2012. Abundance data for the American Crow (Figure 4) suggest declines pre-dating WNV, continuing with some fluctuation through 2007, with rebounding numbers during 2008-2011, and additional declines beginning in 2012. The pattern for the Oak Titmouse (Figure 5) showed the declines of 2004-05 rapidly reversed and relatively steady numbers through 2016. Comparing average abundance during the lowest period of WNV activity (2008-2011) to the period of renewed activity (2012-16) showed that magpie abundance declined by 45%, scrub-jay by 7%, crow by 35%, and titmouse by 11%. Interpreting these data for the American Crow may be more difficult as the CV wintering population may consist of significant numbers of birds breeding elsewhere (Verbeek and Caffrey 2002).

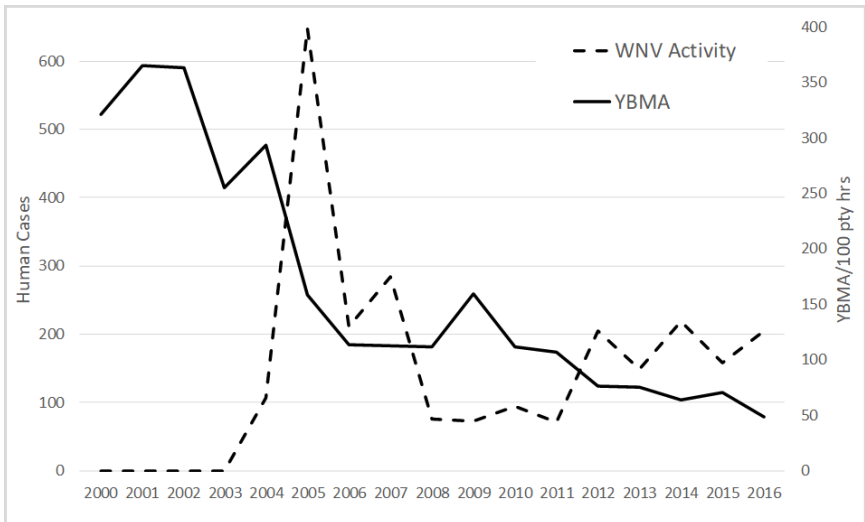


Figure 2. Yellow-billed Magpie (YBMA) abundance (birds/100 party hours) from CBC data and total human cases of WNV reported in the Central Valley counties for that calendar year. For CBC data, the years correspond to the winter at the end of each calendar year (e.g. 2005 is the winter of 2005–06).

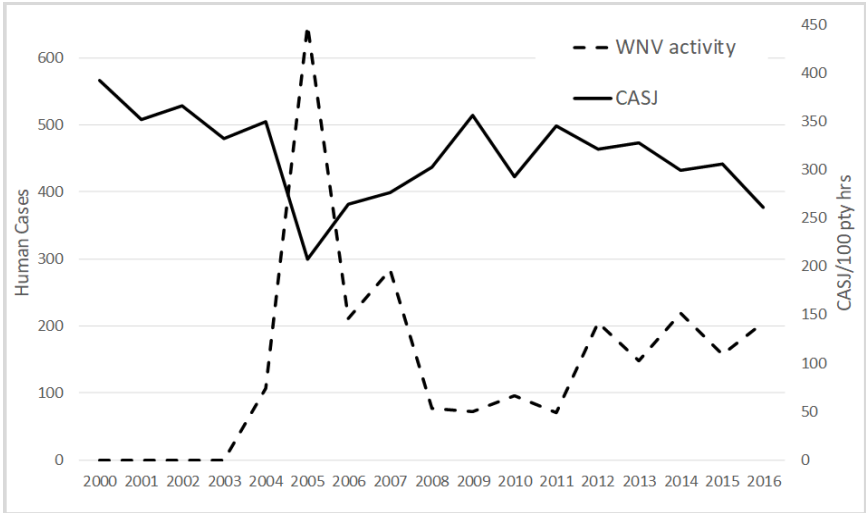


Figure 3. California Scrub-Jay (CSJA) abundance (birds/100 party hours) from CBC data and total human cases of WNV reported in the Central Valley counties for that calendar year. For CBC data, the years correspond to the winter at the end of each calendar year (e.g. 2005 is the winter of 2005—06).

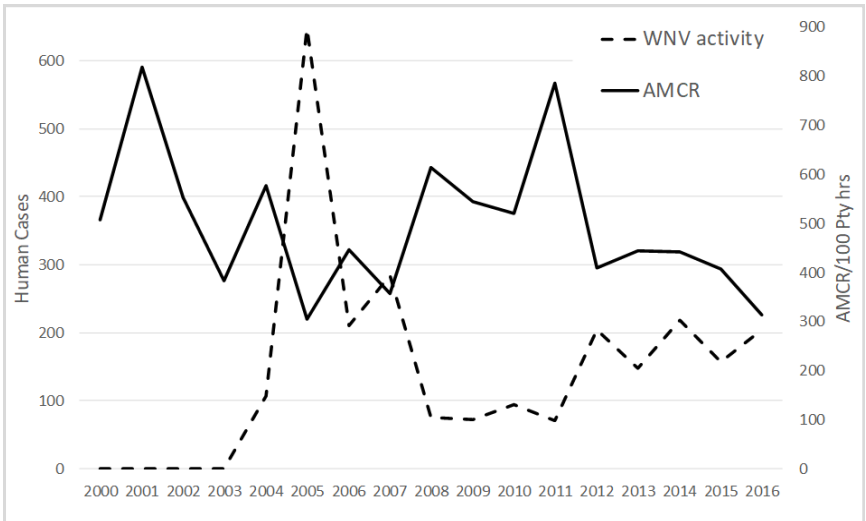


Figure 4. American Crow (AMCR) abundance (birds/100 party hours) from CBC data and total human cases of WNV reported in the Central Valley counties for that calendar year. For CBC data, the years correspond to the winter at the end of each calendar year (e.g. 2005 is the winter of 2005—06).

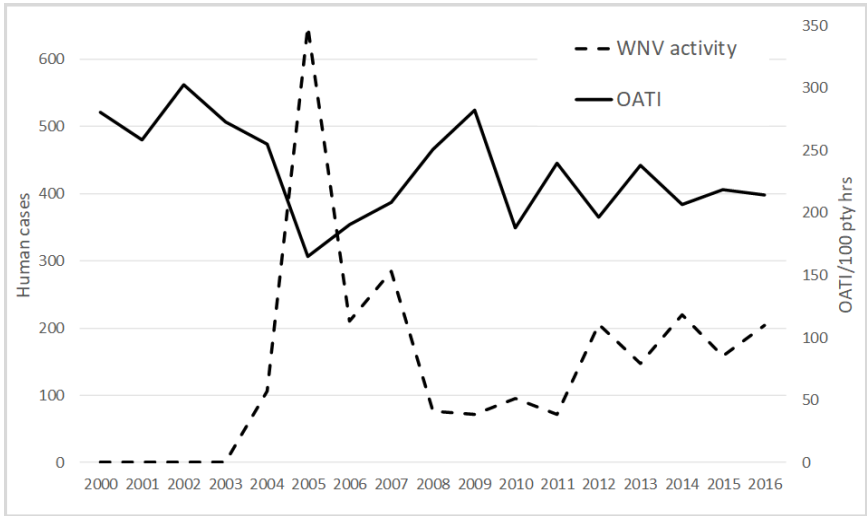


Figure 5. Oak Titmouse (OATI) abundance (birds/100 party hours) from CBC data and total human cases of WNV reported in the Central Valley counties for that calendar year. For CBC data, the years correspond to the winter at the end of each calendar year (e.g. 2005 is the winter of 2005–06).

Table 1 shows the correlations between the numbers of WNV human infections in CV counties and year-to-year declines in the CBC abundance for the four WNV-sensitive species and the 10 WNV-resistant species. Only the magpie, scrub-jay, and crow showed significant correlations, with the magpie showing the strongest correlation and the crow the weakest. Correlation for the Oak Titmouse approached significance. None of the 10 WNV-resistant species showed significant correlations with WNV activity, and only the Nuttall’s Woodpecker approached significance.

DISCUSSION

The fact that some WNV-sensitive species were able to recover following the initial outbreak in the CV, in spite of the continued (though lower) level of virus activity, suggests that a significant subset of those species may have survived exposure and developed (or are developing) immunity. In contrast, the Yellow-billed Magpie did not appear to recover to pre-WNV numbers. Further, the observation that the species that recovered after 2005 also declined less than the magpie after the 2012 resurgence also indicates a relative dearth of resistant individuals within the magpie population. All of this, coupled with the observation of Crosbie et al. (2008) that very few magpies showed immunity after 2005, and the rapid onset of mortality following infection inferred by Ernest et al. (2010), supports the hypothesis that the Yellow-billed Magpie has yet to develop a significant WNV-resistant

Table 1. Correlations (r) and statistical significance (p) between bird species abundances and human cases of West Nile virus for species considered sensitive to and resistant to the virus. Significant negative correlations (indicating significant population declines when human cases were more abundant) are shown in **bold**.

WNV-Sensitive Species	Scientific name	r	p
Yellow-billed Magpie	<i>Pica nuttalli</i>	-0.81	<0.001
California Scrub-Jay	<i>Aphelocoma californica</i>	-0.74	<0.01
American Crow	<i>Corvus brachyrhynchos</i>	-0.58	<0.04
Oak Titmouse	<i>Baeolophus inornatus</i>	-0.53	0.07
WNV-Resistant Species	Scientific name	r	p
California Quail	<i>Callipepla californica</i>	-0.17	0.57
Rock Pigeon	<i>Columba livia</i>	-0.12	0.70
Mourning Dove	<i>Zenaida macroura</i>	0.30	0.31
Anna's Hummingbird	<i>Calypte anna</i>	-0.15	0.61
Nuttall's Woodpecker	<i>Picoides nuttallii</i>	-0.50	0.08
Black Phoebe	<i>Sayornis nigricans</i>	0.03	0.91
European Starling	<i>Sturnus vulgaris</i>	0.01	0.98
American Goldfinch	<i>Spinus tristis</i>	-0.22	0.48
Song Sparrow	<i>Melospiza melodia</i>	0.25	0.41
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	0.28	0.35

population. Therefore, ongoing activity of the virus is likely to continue to produce declines in the magpie population, or, at minimum, hold the population below pre-WNV levels. This hypothesis could be further tested by trapping and assessing large numbers of WNV-sensitive species to see if they show the presence of anti-WNV antibodies.

This lack of a resistance in the magpie population could be a result of the extremely high mortality rate among the magpies (Ernest et al. 2010), such that very few, if any, birds are surviving exposure. Alternatively, it is possible that this species displays immune tolerance to WNV (i.e., an inability of an organism to mount any immune response to a given antigen; Benacerraf and Unanue 1979). In that case, even if some birds survive infection, they are still sensitive to re-infection upon subsequent exposure to the virus. In any case,

the survival of a viable population of this California endemic rests on the hope that the very strong selective pressure of this virus will enable a WNV-resistant population to ultimately develop. The fact that a substantial amount of good quality habitat for this species remains (Pandolfino 2013) is also reason for some optimism.

ACKNOWLEDGEMENTS

I am indebted to all those who faithfully gather data through their participation in CV Christmas Bird Counts and, in particular, to all the CBC circle compilers who organize, supervise, and manage these counts. The clarity and focus of this manuscript was improved by the comments and suggestions of John Harris and Dan Airola.

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Vermilion Flycatcher
(*Pyrocephalus rubinus*).
1 Jan 2017. Maxwell
Cemetery, Colusa Co.

Photo © Chris Conard.

Central Valley and Foothills Bird Highlights: June through July 2016

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Two **Least Bitterns** were at Mather Lake, Sacramento County on 26 June –3 July (DK) and another pair at the Davis Wetlands this summer were breeding there. Another was flushed on China Island Unit of the North Grasslands WA in Merced County on 28 June (SA). This secretive species is a rare and highly local in the valley with few documented reports each summer. The usual rare but regular southward migrant shorebirds moved through in July. An **Pacific Golden-Plover** photographed at the Yolo Bypass WA on 10 July (LS) was a migrant, but one photographed at the Los Banos WTP with **Black-bellied Plovers** in Merced County on 23 July (LKh) may have arrived to overwinter with that flock as they often do in that area. A **Snowy Plover** hid among a flock of **Semipalmated Plovers** at the Yolo Bypass WA on 21 July (SCH) where this species has been found regularly in recent years. Adult **Semipalmated Sandpipers** migrated through with two at the Sacramento WTP on 6-7 July (CCo), one at the Ripon WTP (DGY), San Joaquin County, one at the Fresno WTP on 18 July (JSy), one at the Arbuckle WTP in Colusa County on 18-20 July (KS, KD). Juveniles don't arrive until the end of July, so two at the Arbuckle WTP on 27 July (LKh) were right on time. An early **Baird's Sandpiper** visited the Yolo Bypass WA on 11 July (GEw). Another there on 31 July (TC) was a more typical southward arrival time for this rare migrant. The best shorebird sighting of the season was the adult **Stilt Sandpiper** at the Anatolia Vernal Pool Preserve in Sacramento County on 22 July (GEw, SSA).

White-winged Dove is a rare post-breeding visitor to the valley, so one at a yard in Porterville in Tulare County was a big surprise on 20 July (SDS). A juvenile **Northern Saw-whet Owl** perched in a church in Ceres in Stanislaus County also was a big surprise. This montane species was documented nesting in a wood duck nest box in Merced County a few years ago. Perhaps there is a regular breeding population that has yet to be discovered. Also rare anywhere in the valley, a male **Allen's Hummingbird** was along Alpine Road near Stockton in San Joaquin County on 15 June (LP). An unfortunate **Calliope Hummingbird** crashed into a window in Sacramento on 22 July (DA) documented one of few records in July for the valley. A **Cassin's Kingbird** at the Cosumnes River Preserve on 9 July (JTr) was one of few ever reported from Sacramento County. Another was in western Bakersfield, Kern County on 24 July. This is a rare species in the valley with most records in canyons

along the eastern and western edges of the valley south of San Joaquin County. Crossing the El Dorado and Sacramento county lines for several days, an **Eastern Kingbird** was along Payen Road on 5-10 June (DK, CCo). During a regular survey at the Cosumnes River Preserve in Sacramento County, a **Gray Catbird** was found on 14 June (JTr) for only the second county record. A few other eastern vagrants were found highlighted by a **Worm-eating Warbler** along Bear Creek on the valley floor on 4 June (TEa) for the first El Dorado County record. Yuba County's first recorded **Hooded Warbler** was a singing male at Beale Air Force Base on 1 July (MO). A second-year singing male **American Redstart** lived up a backyard in Sacramento on 3 June (MM). Another singing eastern warbler, an **Ovenbird**, was heard in Sacramento along Goethe Road on 15 June (CH). Finally, the male **Summer Tanager** found at the Cosumnes River Preserve continued to sing there through 25 June (CCo, JTr).

Corrections from the Spring 2016 and Winter 2015-16 reports: The three migrant Snowy Plovers were at the Modesto WTP on May 8 (RB), not the Modesto NWR which doesn't exist. Also the Red Crossbills at Jacob Myers Park on 15-22 December were in San Joaquin, not Stanislaus County. Thanks for Sal Salerno for alerting me to these mistakes.

Thanks to Chris Conard (CCo), Steve Hampton (SCH), John Harris and Bruce Deuel (BED) for summaries of several county records and to the following observers who reported their significant findings to the Club's listserver; Dan Airola, Stuart Angerer (SA), Terry Colborn (TC), Kris Dunlap, Todd Easterla (TEa), Gil Ewing (GEw), Cliff Hawley, Logan Kahle (LKh), Dan Kopp, Michelle Ocken, Sonia Santa Ana (SSA), Ken Schneider, Jeff Seay (JSy), Lindsey Smith, Steve Summers (SDS), John Trochet (JTr), and David Yee (DGY).

Abbreviations used: WA=State Wildlife Area; WTP=Wastewater Treatment Ponds; NWR=National Wildlife Refuge; Res.=Reservoir.

Swamp Sparrow
(*Melospiza georgiana*) 9
Dec 2017. Yolo Bypass
Wildlife Area, Yolo, Co.

Photo @ Chris Conard.



Central Valley Bird Highlights: August through November 2016

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Kutras Lake, part of the Sacramento River in Redding, Shasta County, is a magnet for rare waterbirds and gulls. Three **Surf Scoters** were there on 23 October (BMcD). A **Surf Scoter** at the Marysville WTP on 6-21 November (IG) provided one of few records for Yuba County and another was in Stanislaus County at the Modesto WTP on 13 November (HR). A rare inland **Brant** was photographed with Cackling Geese at the San Joaquin River NWR in Stanislaus County on 3-18 November (*fide* SSa, DG) and another was at Staten Island in San Joaquin County on 22 November (BS). The only reported **Red-breasted Merganser** was at O'Neill Forebay in Merced County on 29 November where they are somewhat regular (KVV). A lost **Brown Pelican** visited Lake Success on 31 August to 17 September (*fide* SDS, JSL+). A rare Amador County **Cattle Egret** found refuge at the Lone WTP on 18 September (LMcK).

The first **Pacific Golden-Plover** arrived on 14 August with two on 11 September along with a **Sanderling** at the Modesto WTP (HR). A **Semipalmated Sandpiper** at the Arbuckle WTP in Colusa County was joined by a **Baird's Sandpiper** on 1 August (KSc). Two more **Baird's** were at the Lincoln WTP in western Placer County on 5-8 August (JSp); and a single was at the Fresno WTP on 6 August (MH). A **Semipalmated Sandpiper** stopped at the Ripon WTP in San Joaquin County on 19-22 August (DG+), while singles were at the Fresno WTP on 9 August (MH) and 22 August (RSx). The Sacramento County Regional WTP hosted a **Sanderling** on 1 September (CCo). Four **Stilt Sandpipers** were together in Kings County on 6th Ave on 22 October (MSy). A scattering of **Solitary Sandpipers** included one at the Lone WTP in Amador County (JH+) on 22-23 August, and one at the Davis WTP in Yolo County on 26 September to 2 October (KB+). A **Red Phalarope** photographed at the Yolo Bypass W.A on 27 November (KDeF) was the first Yolo County record in 14 years. Two were along Abel Road in Colusa NWR 20-24 November (TB, GF+) for the first Colusa County record. And one more was at Staten Island in San Joaquin County on 29 November (IS-C). Although this is the most expected phalarope species in late fall and winter in the region, it is very rare.

Also rare but nearly annual in the valley, a **Long-tailed Jaeger** visited the Yolo Bypass W.A. on 2 September (KSw) and Fresno County's second ever was at the Fresno WTP on 9-25 September (GW+). As expected, a few rare inland

Sabine's Gulls were found in the valley. Two were at San Luis Reservoir in Merced County on 4 October (JLD), and one was at the Sacramento County Regional WTP on 26 September to 1 October (CCo+). Only one reported **Franklin's Gull**, a low number compared to recent falls, was at the Fresno WTP on 19 October (GW). The northernmost **Mew Gull** was at Kutras Lake on 30 November (B&CY)—this species is rare north and south of the Delta and American River–Davis area. A rare Kings County **Western Gull** was photographed on the TLDD ponds on 7 August (MSy). Now a regular rare visitor to the region, a **Lesser Black-backed Gull** was at the canal west of the Recology plant at Gaffery Road on Stanislaus County on 20-27 November (EC+). Two **Common Terns** were discovered at the Madera WTP on 11 September (GW), one visited Bravo Lake in Tulare County on 11 October (DF), while three **Common** and one **Arctic Tern** were attracted to bait fish at San Luis Reservoir in Merced County on 2 October (PD). The latter was the second Merced County record.

A **Hammond's Flycatcher** at Clear Creek WTP, Shasta County on 30 November (MG) may have been attempting to over-winter, as was one at the San Joaquin River NWR in Stanislaus County on 18 November (LW+). Glenn County's first record of a **Cassin's Kingbird** surprised birders at the Sacramento NWR on 27 November into December (PS, ML+). The only **Vermilion Flycatchers** reported were a pair at the Buena Vista Aquatic Recreation Area south of Buttonwillow in Kern County on 30 November (BDp). **Plumbeous Vireos** are rare but regular in the valley in late fall and winter. One in north Davis on 5-23 November (CD+) remained to the middle of the month and was one of few documented in Yolo County. Equally rare in late fall and winter, a **Cassin's Vireo** was in Woodland on 30 November (BC). A montane **Townsend's Solitaire** descended to the Sacramento City Cemetery on 5 October (MSw).

Babel Slough in Yolo County once again hosted vagrant warbler species with a **Blackpoll Warbler** on 23 September (MSw) and an **American Redstart** on 2 October (GEw). And once again, San Luis Reservoir Wildlife Area in Merced County hosted vagrant species, with a **Chestnut-sided Warbler** on 11 September (RE), a **Magnolia Warbler** on 13 September (DSw, KVV), a **Rose-breasted Grosbeak** on 14 September (PD), and a **Costa's Hummingbird** on 28 October (KVV). Regular checking of these and other similar sites in the valley may yield consistent results in finding vagrant birds. An **Ovenbird** visiting a backyard in Woodland on 18 September (IS-C) provided Yolo with only its third county record. A **Chestnut-sided Warbler** visited a yard in Modesto, Stanislaus County on 24 September (HR), and another visited the Big Sycamore Trial below Lake Success in Tulare County on 28-29 September (DF+). An **American Redstart** graced the American River Parkway in Sacramento County on 1 October (KK). Very rare inland in late fall and winter, a **Nashville Warbler** was at Clear Creek WTP on 23 November (MG). A

Northern Waterthrush in nw Roseville on 4 September (CW) was only the third record for Placer County. Solano County's first **Canada Warbler** stopped over at the Lake Solano County Park on 7 September (SHu).

Summer Tanagers are rare but increasingly reported vagrants in the valley. One was photographed at Putah Creek in Yolo/Solano counties on 5 August (KSw), another was along Putah Creek on 19 August (GB), an adult male was at the Tuolumne River Regional Park in Modesto, Stanislaus County on 18-25 September (HR+), and Tehama's first was in Red Bluff on 19-27 August (DSx+). An amazing find was the adult male **Orchard Oriole** in Madera, found on 25 August (IM+) and remained through the winter for the first Madera County record. Yolo County's fourth **Black-throated Sparrow** was at the Yolo Bypass W.A. on 30 August (LM+) and two along Madera Canal at mile 28 on 11 September remained through the winter and may have been the first records for Madera County (GW). Another was found nearby on Road 607 in Madera County on 20 October (TW). A **Sagebrush Sparrow** joined the Madera canal sparrow flock on 3 October (RSx+), as did a **Clay-colored Sparrow** on 13 October (ADEM+). Two **Clay-colored Sparrows** at Clear Creek WTP on 16 October (MG) were a first record for Shasta County and another was at Michigan Bar in Sacramento County on 11 September (SF). A **Harris's Sparrow** briefly visited Clear Creek WTP on 14 October (GH).

The observers are: Keith Bailey, Gordon Barrett, Ted Beedy, Eric Caine, Brent Campos, Chris Conard (CCo), Kathy DeFay, Al DeMartini (ADEM), Bill Deppe (BDp), Chris Dunford, Jon Dunn (JLD), Pete Dunton, Richard Edden, Dane Fagundes, Stephen Fettig, Gary File, Dan Gilman, Ian Gledhill, Matt Gould, John Harris, Mark Haywood, Geoffrey Helmbold, Stanton Hunter (SHu), Keith Kwan, Melissa Lea, John Luther (JSL), Brook McDonald (BMcD), Lisa McKenzie (LMcK), Irene Moon, Harold Reeve, Sal Salerno (SSa), Xavier Sandoval, Ben Sandstrom, Mark Sawyer (MSw), D. Saxelby (DSx), Rick Saxton (RSx), Ken Schneider (KSc), Ian Sousa-Cole (IS-C), Judy Spitler (JSp), Mark Stacey (MSy), Pam Starr, Steve Summers (SDS), Dale Swanberg (DaS), Kirk Swensen (KSw), Kent Van Vuren, Charles Walker, Torin Waters, Liz West, Gary Woods, and Bob and Carol Yutzy.

Abbreviations used: WA=State Wildlife Area, WTP=Wastewater Treatment Plant; CBRC=California Bird Records Committee; NWR=National Wildlife Refuge; TLDD=Tulare Lake Drainage District.

2017 Central Valley Photo Highlights

Compiled by Dan Brown and Frances Oliver

We had many great birds in the Central Valley in 2017. Here are photos of some of the rare bird highlights from the past year. Please, all Central Valley bird photographers, submit your photos of rarities encountered in 2018 for possible publication in 2018/2019. Please send photographs to photo editor Dan Brown at Naturestoc@aol.com.



An incredible find for the Central Valley was California's first Citrine Wagtail (*Motacilla citreola*) found by Maurice DeMille, a visiting Utah birder, at the Yolo Bypass Wildlife Area on 15 Dec 2017. Unfortunately, only two birders saw this Central Asian bird the following day!

Photo @ Steve Hampton.

Another amazing find for the Central Valley, and a first for Northern California was a Curve-billed Thrasher (*Toxostoma curvirostre*) reported on eBird on 8 Jan 2018 in a yard in Woodland, Yolo Co. Though it was reported in January, residents had noticed it was coming to their chicken coop in October.



Photo © Dan Brown.



A juvenile Long-tailed Jaeger (*Stercorarius longicaudus*) was discovered at the Tulare Lake Drainage District South Evaporation Ponds by Mark Stacy on 20 Aug 2017. He watch it fly back and forth across the Kings and Kern county line. A two county record!

Photo © Mark Stacy.

An American Golden-Plover (*Pluvialis dominica*) was found by Gary Woods on 31 Oct 2017 at the Fresno WTP. It was in a mixed flock of plovers including both Black-bellied Plovers and a Pacific Golden-Plover.



Photo @ Gary Woods.



A Black Skimmer (*Rynchops niger*) was discovered in a group of Caspian Terns by Ed Harper and Hugh Dingle on 4 Jul 2017 at the Yolo Bypass Wildlife area. A first county record for Yolo Co. Unfortunately it was just a one day wonder.

Photo @ Ed Harper.

A heavily molting female Hooded Warbler (*Setophaga citrina*) was found by Steve Hampton in a North Davis Farms subdivision on 16 Aug 2017. It continued to be reported on eBird through 27 Oct 2017. This warbler is probably a second county record for Yolo Co.



Photo @ Susie Nishio.



On 25 Dec 2017, Matt Forster discovered a non-breeding adult Harris's Sparrow (*Zonotrichia querula*) feeding with chickens in Meridian, Sutter Co. It continued to delight birders though 22 Jan 2018. A long awaited first county record for Sutter!

Photo © J.T. Lewis.

On 2 Apr 2017, Jim Rowoth found a Palm Warbler (*Setophaga palmarum*) in the willows at White Slough Wildlife Area, San Joaquin Co. Palm Warblers continued to be reported throughout the CV during 2017.



Photo © Liz West.

An Indigo Bunting, (*Passerina cyanea*) was originally discovered by Ian Gledhill on 3 Jun 2017 along the Sacramento River in Red Bluff, Tehama Co. It was refound the next day and seen by many observers. This was a first county Tehama record.

Photo © Michele Swartout



On 13 Dec 2017 Geoffrey Helmbold found a Scarlet Tanager (*Piranga olivacea*) in Redding. This was a first for Shasta County. Unfortunately, it was a one day wonder.

Photo © Michele Swartout.

On 30 Nov 2017, Steve Hampton found an Orchard Oriole (*Icterus spurius*) foraging in the fruiting Chinese pistache trees in North Davis, Yolo Co. It continued to be reported on eBird through 12 Dec. Probably a second county record.

Photo @ Ed Harper.



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Dan Brown & Frances Oliver

Front Cover:

Curve-billed Thrasher (*Toxostoma curvirostre*).
16 January 2018.
Woodland, Yolo Co., California.
Photo © Dan Brown.

Back Cover:

Scissor-tailed Flycatcher (*Tyrannus forficatus*).
24 September 2017.
Utica Avenue, King Co., California.
Photo © Gary Woods.

