Central Valley Birds

Tricolored Blackbird Breeding Population in the Sierra Foothills over Nine Years

Waterbird Use of Off-channel Ponds along the American River

Vol. 26, No. 3, 2023

Central Valley Birds

Volume 26, Number 3, 2023

Published by the Central Valley Bird Club

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Photos by Daniel L. Brown.

December 2023 ISSN 1545-3197

Breeding Population Status of the Tricolored Blackbird in the Foothills of the Central Sierra Nevada, 2014–2022

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ABSTRACT

We report on Tricolored Blackbird (*Agelaius tricolor*) breeding surveys conducted from 2014 through 2022 in an eight-county area in the central Sierra Nevada foothills in California, including previously unpublished survey results from 2019, 2021, and 2022. The number of breeding colonies showed a slight, marginally significant decline, but the total number of breeding individuals did not decline over the study period, despite loss of habitat to development and conversion to unsuitable crops that eliminated some colonies. Numbers recorded in statewide surveys in April 2014, 2017, and 2022 varied substantially from the numbers of breeders we recorded over entire seasons in those years, illustrating the limitations of the statewide survey in assessing the species' breeding population status within this region. The lack of a trend in breeders in the central Sierra foothills differs from the San Joaquin Valley and the statewide population, which both showed substantial recent increases. A possible explanation for the lack of a population trend is that numbers were below the habitat-based carrying capacity during early years of our study, due to substantial reproductive losses over many years in the San Joaquin Valley, a source for foothill nesting birds. The lack of an increase in the number of birds in the foothills after 2018, when the size of the population in the San Joaquin Valley and statewide increased substantially, suggests that the foothill population may have reached a

limit imposed by available habitat. If so, results suggest that the size of the central Sierra foothills population may decline as habitat losses continue. We recommend continued monitoring of Tricolored Blackbird colonies and habitat losses in the foothill region and the conservation of colony sites and suitable foraging areas.

The Tricolored Blackbird (*Agelaius tricolor*) population has been in long-term decline, resulting in its listing in 2018 as a Threatened species under the California Endangered Species Act (Beedy et al. 2023, California Natural Diversity Database 2023). The species was recently identified as one of 70 "*tipping point species*," whose populations in the U. S. have declined by >50% since 1980 and could lose another half or more of their populations in the next 50 years (North American Bird Conservation Initiative 2022). Although recent surveys indicate some population recovery in the statewide population (Colibri Ecological Consulting 2022) associated with elimination of large-scale nest destruction of active colonies in agricultural fields in the San Joaquin Valley (Castañeda et al. 2023), the species' population remains vulnerable to continued land use changes and insecticide use (Beedy et al. 2023).

Over 2014–2022 (except in 2020), we and colleagues have conducted annual studies to describe the species' ecology and conservation status and determine the number of nesting birds in the central portion of the grassland-dominated region on the east side of the Central Valley and Sierra Nevada foothills (hereafter *central Sierra foothills).* We have previously presented information on breeding population size, reproductive success, nesting and foraging habitat selection, effects of foraging habitat amount on colony occurrence and size, effects of development on colony persistence, effects of direct disturbance on colonies, and predation (Airola 2021a, b; Airola et al. 2015a, b; 2016, 2018a, b; 2023). We last reported on the number of nesting birds in central Sierra foothills over 2014–2018 (Airola et al. 2018a, Airola et al. 2023).

Over the nine-year study period, Tricolored Blackbird nesting and foraging habitat in this region has been diminished by conversion to unsuitable perennial crops (orchards and vineyards), residential and commercial development, and mining (Airola et al. 2015a, 2023; Cameron et al. 2014), although recent losses have not been quantified. Additional information on the regional population status under these habitat changes is needed.

The species-wide status of the Tricolored Blackbird in California is evaluated through the comprehensive statewide survey. The survey is conducted on three days in mid-April every three years except for a recent five-year interval resulting from postponements due to the COVID-19

pandemic; Meese 2014, 2017; Colibri Ecological Consulting 2022). The statewide survey dates were selected as the period during which the species is most concentrated when breeding in the San Joaquin Valley in order to produce the most accurate range-wide population estimate (Meese 2015, Colibri Ecological Consulting 2022). Surveyors attempt to check all previously occupied sites, as identified in the Tricolored Blackbird Portal (https://tricolor.ice.ucdavis.edu/) and locate new colony sites on routes driven through suitable nesting habitat. The Tricolored Blackbird, however, typically breeds several times per year, and moves northward after their initial nesting effort to breed a second and sometimes a third time (Hamilton 1998, Robinson et al. 2018).

Airola et al. (2018a) previously compared the number of Tricolored Blackbirds recorded in the central Sierra foothills during the April 2014 and 2017 statewide surveys and numbers recorded during in our breeding-season-long surveys. Results showed that in the drier 2014, the species arrived early in the foothills, but only some of those birds initiated their first nesting attempts there (Airola 2018a). In contrast, in the wetter 2017, the size of the population recorded in the central Sierra foothills during the statewide survey was only one-third of the number that eventually nested there, suggesting that many birds bred first in the south before arriving to initiate a second nesting attempt in the foothills. We extended this comparison of population sizes recorded during 2022 on the statewide survey and our breeding surveys to further determine the accuracy of the statewide surveys in characterizing the central Sierra foothills breeding population and indicate annual patterns of breeding arrival and use in the foothill region.

Here, we add results of season-long population estimates from 2019, 2021, and 2022 to update the status of the population in this region, discuss potential population responses to habitat loss occurring over the nine-year survey period, and expand our comparisons of population sizes recorded in the statewide survey and breeding season surveys in the central Sierra foothills region. We use the term *population* in the general sense, to indicate the number of individuals and the group of individuals that occupy the central Sierra foothills region, rather than to suggest physical isolation or genetic distinctiveness.

STUDY AREA

We chose the central Sierra foothills for study because it appeared to support a substantial number of breeding Tricolored Blackbirds in a setting that was different from more intensively studied agriculture and wetland colonies in the Central Valley (e.g., see Beedy et al. 2023). This region differs from the valley both in its predominant habitat type (grassland) and breeding substrate (Himalayan blackberry, *Rubus armeniacus*). The study area is the same region surveyed consistently since 2014. It encompasses areas of

primarily grasslands east of lowlands dominated by cultivated agriculture in the central portion of the Central Valley, including portions of Placer, Sacramento, El Dorado, Amador, San Joaquin, Calaveras, Stanislaus, and Tuolumne counties. Elevations range from 15 to 550 m. In addition to grasslands, the area includes smaller amounts of urban land, oak savanna and woodland, chaparral, irrigated pasture, and cultivated agriculture (for a map of the study area see Figure 1 in Airola et al. 2023). Most of this area is privately owned, and much is used for cattle grazing.

Our definition of the central Sierra foothills differs from the foothill region used in the Tricolored Blackbird statewide survey (Colibri Ecological Consulting 2022); we included eastern Sacramento County, while the statewide survey treats the whole county as part of the Sacramento Valley region. Also, we included only those lands in the eastern (grassland-dominated) portions of San Joaquin and Stanislaus counties, while the statewide survey included all of both counties as part of the San Joaquin Valley. Individual colonies are referenced in italics by the names assigned in the Tricolored Blackbird Portal. We believe our study area encompasses a more uniform set of conditions and allows a more robust characterization of Tricolored Blackbird status in grassland-dominated areas.

METHODS

Experienced Tricolored Blackbird surveyors conducted surveys using standardize methods (Airola et al. 2018b). We drove survey routes on public roads at five-to-ten-day intervals from early April to early July during 2014–2022 (except 2020, due to the COVID-19 pandemic). Routes were designated to visit previously occupied colony sites and areas with suitable blackbird foraging habitat, consisting of areas where grassland, irrigated pasture, annual crops, and open woodland were predominant (Airola et al. 2015, 2023). On each visit we recorded the number of individuals and nesting stage and followed active colonies to determine if they were successful (i.e., some young fledged). Numbers of breeders were determined using counts and the amount of nesting habitat occupied (Airola et al. 2015a, 2018b). We also conducted all the April 2022 surveys for the portions of the statewide survey within our study area, except Placer County was surveyed by past breeding survey collaborator Deren Ross.

We evaluated whether the number of colonies, total number of breeding birds, and average colony sizes showed trends over the study period using linear regression (https://www.graphpad.com/quickcalcs/linear2/). We tested the significance of the regression slope using an F-test, in which a significant slope indicated a population increase (if positive) or decrease (if negative), with a test significance probability of 0.05. Probability values between 0.05 and 0.10 were considered marginally significant. We also compared the sizes of the populations recorded in our season-long breeding surveys to the

numbers reported within our study area during the April 2014, 2017, and 2022 statewide surveys to determine how well the statewide survey characterized the breeding population in the central Sierra foothills.

RESULTS

Numbers of Colonies and Breeding Birds

Over 2014–2022, we found an average of 26 breeding Tricolored Blackbird colonies (range = 21–31) in the central Sierra foothills (Table 1). The number of colonies declined over time (slope = −0.79) to a low of 21 colonies in 2022, but the decline was only marginally significant (R^2 = 0.44, F = 4.64, P = 0.07, Figure 1).

Colonies were most numerous in Sacramento and Placer counties, which together accounted for 56% of all colonies in the study area. In most years, two to five colonies were present in Amador, Calaveras, Stanislaus, and Tuolumne counties. Four colonies were present in El Dorado County in 2014, but as the grassland foraging habitat adjacent to breeding sites along Carson Creek in El Dorado Hills continued to be developed for commercial and residential use, the number declined to a single colony over the next two years, and then no colonies were active over the next five years. Groups initiated nesting early in 2021 (1 group) and 2022 (2 groups) at the former colony sites along Carson Creek but abandoned the sites before egg-laying. Other than one early nesting attempt that was abandoned, no nesting occurred in portions of the study area within San Joaquin County.

Table 1. Numbers of Tricolored Blackbird breeding colonies in the central Sierra foothills by county and year.

	Year								
County	2014	2015	2016	2017	2018	2019	2021	2022	Avg.
Placer	6	5	7	6	6	4	8	4	5.8
Sacramento	9	12	7	9	8	7	6	9	8.4
El Dorado	4	1	1	0	0	0	0	0	0.8
Amador	3	4	3	5	2	3	3	3	3.3
San Joaquin	0	0	0	0	0	0	0	0	0.0
Calaveras	3	2	3	4	3	4	5	3	3.4
Stanislaus	4	1	4	3	3	2	1	1	2.4
Tuolumne	0	0	2	4	2	2	2	1	1.6
Total	29	25	27	31	24	22	25	21	25.5

The central Sierra foothill breeding population fluctuated between about 36,000 and 58,000 adults per year over the nine-year study period (Figure 1, Table 2). No significant trend in numbers was evident (R^2 = 0.02, F = 0.13, P = 0.63).

Table 2. Numbers of breeding Tricolored Blackbirds by county and year in the central Sierra Nevada foothills study area.

	Year								
County	2014	2015	2016	2017	2018	2019	2021	2022	Average
Placer	12,473	19,200	19,900	9,750	25,000	9,900	8,640	6,400	13,908
Sacramento	11,000	19,300	17,150	33,800	26,600	19,200	13,250	37,625	22,241
El Dorado	5,800	2,900	1,000	0	0	0	0	0	1,213
Amador	6,375	6,320	1,140	1,500	1,200	5,520	4,900	4,200	3,894
San Joaquin	0	0	0	0	0	0	0	0	0
Calaveras	760	350	1,300	720	2,350	2,550	2,200	3,400	1,704
Stanislaus	6,601	7,000	4,550	11,000	2,600	9,300	6,500	1,200	6,094
Tuolumne	0	0	2,300	1,140	750	650	850	200	736
Total	43,009	55,070	47,340	57,910	58,500	47,120	36,340	53,025	49,789

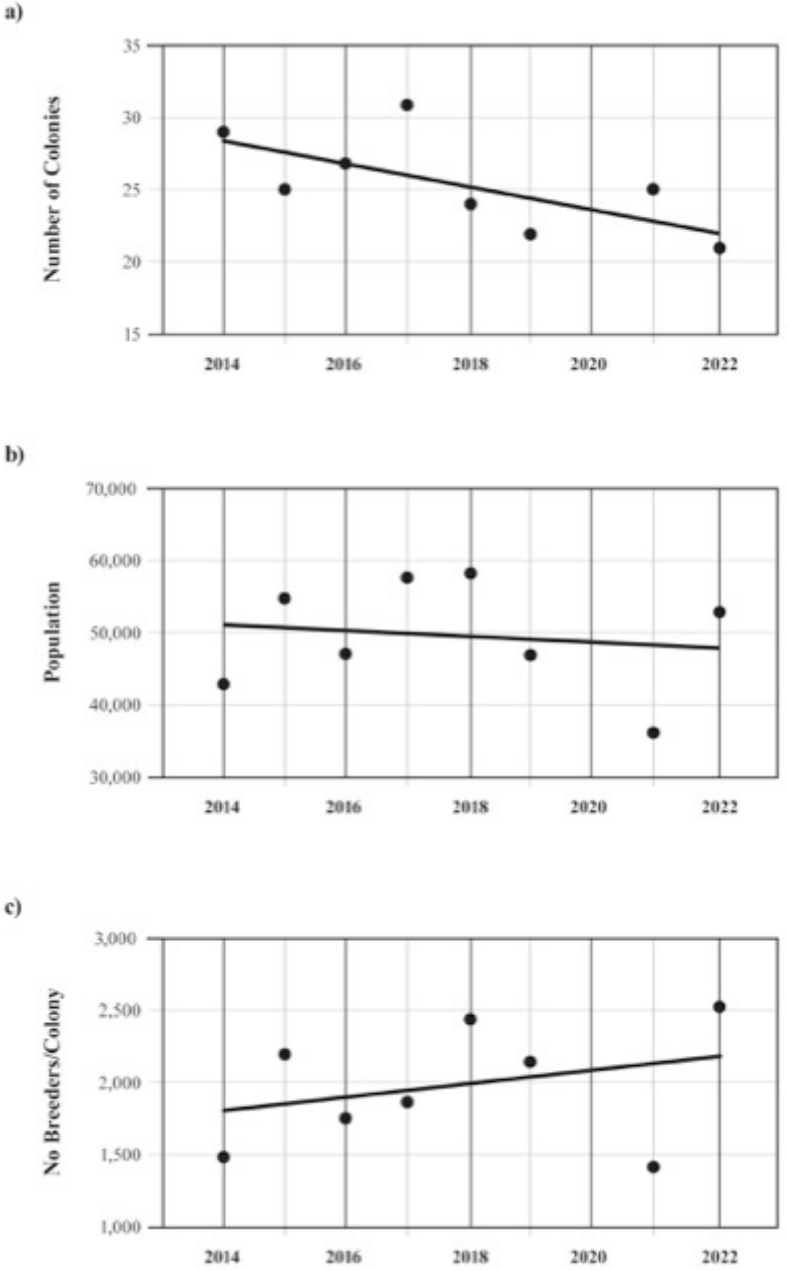

Figure 1. Annual numbers of a) colonies, b) breeding birds, and c) average number of bird colonies in the central Sierra foothills over the nine-year study period.

Sacramento and Placer counties were the most important areas in the study area, with an average of over 22,000 breeders (45% of the total) in Sacramento and nearly 14,000 in Placer (28% of total numbers; Table 2). Stanislaus and Amador counties supported an intermediate number of breeders (12% and 9% of the total, respectively). Remaining occupied counties supported low-to-moderate population sizes throughout, except El Dorado County, which had no breeders after 2016, and San Joaquin, which had none for the study period. Some annual fluctuation in numbers within counties reflected apparent movements of birds among nearby colony sites in different counties, including between Sacramento and Placer counties and between Calaveras and Stanislaus counties.

Colony sizes varied from 20 to 9,300 birds over the study period and averaged 1,910 birds over all survey years, with the annual average size varying from about 1,500–2,500 birds (Figure 2). Although a generally increasing trend in colony size was evident over the nine-year study period, the relationship was not significant ($R^2 = 0.09$, $F = 0.63$, $P = 0.46$).

Habitat Loss

Airola et al. (2023) summarized habitat losses during 2014 through 2018, which included elimination or degradation of 13 (17%) of 78 colony sites used in this period. Over 2019–2022, we located 13 new colony sites within previously surveyed areas, for a total of 91 colony sites. During 2019–2022, we observed that vegetation used for nesting was removed during the non-nesting period at three additional colony sites, and additional foraging habitat was eliminated around 10 of the previously degraded colony sites, due to continued development and mining. Thus, over the 2014–2022 period, 16 (18%) of 91 colony sites were eliminated or degraded through development, mining, or vegetation control.

Comparison of Breeding Population and Statewide Survey Numbers

Total numbers recorded within the study area during the three April statewide surveys did not match those we recorded in breeding-season surveys (Table 3). The population recorded in the 2014 breeding season surveys was only two-thirds of the number recorded in the statewide survey. In 2017, breeding survey totals were nearly 2.5 times higher than statewide survey numbers, whereas in 2022 numbers were similar, with 25% more birds found in breeding season surveys. Considerable variation also occurred between numbers recorded in individual counties in the two different surveys.

Most of the sites that were occupied by Tricolored Blackbird groups during the April statewide survey were in the settling stage (i.e., selecting nest sites and attracting mates). Many of these early-occupied sites ultimately did not become active breeding colonies, and numerous other colonies were

Table 3. Comparison of numbers of Tricolored Blackbirds recorded during 2014, 2017, and 2022 statewide surveys and central Sierra foothills breeding season surveys.

	2014		2017		2022	
County	Statewide Survey[a]	Foothill Breeding Survey	Statewide Survey[a]	Foothill Breeding Survey	Statewide Survey[a]	Foothill Breeding Survey
Placer	17,600	12,473	960	9,750	2,250	6,400
Sacramento	29,272	11,000	12,455	33,800	27,690	37,625
El Dorado	1,375	5,800	100	0	1,336	0
Amador	5,500	6,375	420	1,500	854	4,200
San Joaquin	500	0	0	0	0	0
Calaveras	404	760	1,570	720	2,240	3,400
Stanislaus	8,852	6,601	742	11,000	7,800	1,200
Tuolumne	825	0	850	1,140	200	200
Total	64,328	43,009	17,097	57,910	42,370	53,025
% difference	+50%		−70%		−20%	

[a]Sources: Meese 2014, Meese 2017; Colibri Ecological Consulting 2022

established after the statewide survey weekend. For example, 22 foothill sites were occupied during the 2022 statewide survey, but only 15 (65%) proceed to incubation. Twelve additional sites not occupied during the statewide surveys were visited subsequently by Tricolored Blackbirds and six ultimately hosted successful breeding colonies.

DISCUSSION

Breeding Population Trend

Our results show that the numbers of colonies and breeding birds in the central Sierra foothills did not significantly change over the nine-year study period. The marginally significant decline in the number of colonies was offset by a slight, but non-significant increase in average colony size. The lack of a decline in colony size in the central Sierra foothills region differs from the declining trend reported statewide over 1935–1975 (Graves et al. 2013) and as recently as through 2017 (Meehan et al. 2018). This difference may reflect the inclusion of surveys over 2018–2022 in our analysis, during which an increase in the statewide population and average colony size occurred (Colibri Ecological Consulting 2022).

Survey results show that Sacramento and Placer counties consistently supported the highest number of colonies and breeding birds in the central Sierra foothills region. These counties are also subject to the greatest development pressure in the region (Airola et al. 2023). Our annual survey results strengthen previous conclusions (Airola et al. 2023) that development of the Carson Creek Valley area south of Highway 50 in El Dorado Hills, El Dorado County, as well as in adjacent areas in Folsom, Sacramento County, appears to have reduced the amount of grassland foraging habitat to a level insufficient to sustain the Tricolored Blackbird breeding colonies that once occurred there.

The absence of colonies in San Joaquin County during our surveys is notable. Seventeen sites were reported to be occupied during 1994–2000 within the portions of our study area in the county (https://tricolor.ice.ucdavis.edu). Since then, no active colonies have been observed, despite our substantial survey effort. The species' disappearance as a breeder occurred prior to our study period when grasslands and other open habitats in San Joaquin County were widely converted to vineyards, making San Joaquin County one of California's top wine-producing counties (Volpe et al. 2010, Geisseler and Horwath 2016). Our survey results in Folsom and El Dorado Hills and evaluation of the species' recent history in San Joaquin County demonstrate the local impacts of habitat loss on the breeding Tricolored Blackbird population within the central Sierra foothills.

Implications of Differences between Breeding Population and Statewide Survey Numbers

The statewide survey is the only comprehensive survey of the species population size throughout California. The survey has been conducted in April, when Tricolored Blackbirds are most concentrated in the southern portion of their range, especially in the San Joaquin Valley (Meese 2014). Compared to our breeding survey numbers, the numbers recorded in the central Sierra foothills during the statewide surveys, covering the same areas in both surveys, were substantially higher in one year (by 50%), substantially less in another (−70%), and reasonably close in another (−20%). These results demonstrate that the statewide survey numbers, as valuable as they are in characterizing the statewide population, do not accurately characterize the breeding status of the portion of the population that breeds in the central Sierra foothills region and presumably throughout the central and northern portions of the species' California breeding range. Thus, our study results complement those of the statewide survey, as have similar season-long surveys in the San Joaquin Valley (Castañeda et al. 2023) and central California Coast (Wilson et al. 2016).

Conservation Implications

Many declining bird species may become isolated and genetically depauperate, which increases their risk of extinction (Evans and Sheldon 2008). Despite its past declines, the Tricolored Blackbird is a genetically panmictic population (i.e., lacking differentiation geographically; Berg et al. 2010, Barr et al 2020). The panmixia likely results from the wide-ranging habits of groups of individuals that move annually between multiple nesting regions and non-breeding habitats (Hamilton 1998, Airola et al. 2023, Beedy et al. 2023), which prevents geographic differentiation and promotes genetic diversity (Berg 2020). Panmixia thereby reduces the chances of inbreeding and maintains greater ability to adapt to environmental change. Tricolored Blackbirds that nest in the central Sierra foothills are believed to nest in some years (especially wetter ones) first in the San Joaquin Valley or southern Sierra Nevada foothills before moving to nest again in the central Sierra foothills (Airola et al. 2016, 2018a) such as occurred in 2017 (Table 3). In drier years, it appears that many Tricolored Blackbirds overfly the San Joaquin Valley and move earlier to the foothills or further north to initiate their first breeding (i.e., 2014, Table 3).

The central Sierra foothills region has been considered high quality habitat for the Tricolored Blackbird for several reasons. Colonies mostly occur in patches of Himalayan blackberry, which are highly protective from predators (Cook and Toft 2005, Airola 2021a) so that a high proportion of colonies successfully fledge young (Airola et al. 2018). Also, insecticide use in

this grassland-dominated region is likely lower than in agricultural regions (Airola et al. 2015, Beedy et al. 2023). This lower use could result in lower direct exposure to blackbirds or maintenance of higher insect prey populations required for reproduction. Although an initial evaluation of direct accumulation of neonicotinoid insecticides in tissues of Tricolored Blackbirds collected in agricultural regions found the insecticide in only 2 of 85 individuals sampled (Graves et al. 2022), the study did not address reduction of insect prey, which has been suspected to cause low reproduction of blackbirds at agricultural colonies in the Central Valley (Meese 2013). Colony sizes in the foothills, however, tend to be smaller than in agricultural habitats (Figure 2; Airola et al. 2023, Castañeda et al. 2023).

The lack of a decline in the number of breeding Tricolored Blackbirds in the central Sierra foothills is paradoxical, considering that a substantial amount of habitat in the region has been lost to development and conversion to orchards and vineyards (Cameron et al. 2014, Airola et al. 2023) and colonies have been eliminated in Folsom and El Dorado Hills. Our survey period, however, coincided with the establishment of a successful program to protect Tricolored Blackbird colonies in agricultural fields in the San Joaquin Valley (Colibri Ecological Consulting 2022, Castañeda et al. 2023). Prior to 2015, colonies supporting 50,000 to 150,000 breeding birds were regularly destroyed by harvest, resulting in total nesting failure. Presumably partly in response to these losses, the population declined statewide through at least 2014 (Meese 2014, 2017) and in the San Joaquin Valley through 2015 (Castañeda et al. 2023). Following enactment of protection of most agricultural colonies in 2015, the number of Tricolored Blackbirds nesting in the San Joaquin Valley, and then presumably those nesting elsewhere during a second nesting period, increased by an estimated 99,000 (127%) over 2017–2021, and total numbers recorded in the statewide survey over 2014–2022 increased by 73,000 (50%; Colibri Ecological Consulting 2022). Thus, while the population increased substantially elsewhere over our study period, the number of breeding birds in the central Sierra foothills did not.

One potential explanation for the lack of a decline in the central Sierra foothill population during our study period, despite ongoing habitat loss, is that during the early years of our study the number of breeding birds may have been constrained by colony losses to agricultural harvest in the San Joaquin Valley (Castañeda et al. 2023) rather than availability of suitable habitat. During the early years of our survey the statewide population was at its lowest recorded level (Meese 2017, Colibri Ecological Consulting 2022), which likely affected the pool of breeders available to use the central Sierra foothills. Therefore, as occupied areas were eliminated, such as in Folsom and El Dorado Hills, birds that used those sites were able to relocate to other suitable areas that were not fully occupied.

The lack of an increase in the central Sierra foothill population after 2017, when the breeding populations San Joaquin Valley and statewide increased substantially, is consistent with an explanation the population became limited by the available habitat, which prevented its increase. If this hypothesis is correct, and the population is currently at its habitat-based limit during favorable years, then a population decline may be observed in the future as suitable habitat continues to be converted to unsuitable development and orchards and vineyards. The modest decline in the annual number of colonies we observed may be an initial indication of a regional decline, particularly if efforts to protect remaining colony sites and surrounding foraging areas are not undertaken.

Other factors also may have affected numbers of breeders we recorded in the central Sierra foothills, as indicated by the variation in numbers in adjacent years (e.g., a 46% increase from 2021 to 2022). Drought has been suggested as affecting numbers found in the foothills during the statewide survey, through its effects on food supply, drinking water, and nesting habitat (Colibri Ecological Consulting 2022). We did not find declines in this region during the dry 2014–2015 years but observed a sharp decline during the dry 2021 (Table 1; Airola et al 2018a). Incomplete sampling is also an unavoidable source of variation, as in some years colonies could have moved to areas that were inaccessible to surveyors.

The ultimate fate of the Tricolored Blackbirds in the central Sierra foothills region is concerning, given the species' need for large amounts of foraging habitat (Airola et al. 2023) and the continued conversion of occupied and suitable habitat to unsuitable uses, even under established regional conservation plans (Sacramento County 2018, Placer County 2020). Our lack of detection of a population decline over our nine years of monitoring should not foster complacency, considering the complicated set of external and internal factors that appears to have produced it. Rather, these factors and the lack of a recent population increase, as has occurred elsewhere, raise concerns about the future of the species in the central Sierra foothills. Although we ended our annual breeding surveys after the 2022 season, we recommend regular periodic breeding season surveys (i.e., at least every three years, in association with the statewide survey) to track the breeding population trend. More importantly, we encourage enactment of more comprehensive conservation measures to protect the Tricolored Blackbird and its habitat in this region.

ACKNOWLEDGEMENTS

We again thank the many co-authors of earlier articles produced during this study and the many field surveyors acknowledged therein, especially Deren Ross for long-term contributions. We thank Robert J. Meese for

maintenance of and access to the Tricolored Blackbird Portal data source and Chris Swarth for valuable advice over the years and for serving as editor for peer review of this article. We thank two anonymous reviewers for useful comments. The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the U. S. Fish and Wildlife Service.

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The Importance of Off-Channel Ponds to Wintering Waterbirds along the American River in Sacramento, California: An Initial Assessment

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ABSTRACT

We studied waterbird use of ponds adjacent to the Lower American River in Sacramento County, California during the winters of 2021–2022 and 2022–2023. We surveyed waterbirds at Arden and Urrutia ponds, the two largest ponds along the river, which have been proposed at various times for elimination or modification to mitigate for impacts of riverine flood control work. We summarized numbers recorded at Urrutia Pond during 2010–2017 Christmas Bird Counts (CBCs) and compared numbers of waterbirds using ponds to the numbers recorded during 2014–2022 counts of the entire Lower American River. Our surveys showed that the ponds were used by a high diversity and abundance of waterbirds, including geese, ducks, cormorants, coots, and a newly established pair of Bald Eagles (*Haliaeetus leucocephalus*). The CBCs recorded an average of >2,000 Canvasbacks (*Aythya valisineria*) at Urrutia Pond, nearly the entire population on the Lower American River. Our surveys found that high numbers of diving ducks moved daily from daytime foraging areas on the river to ponds for night-roosting, presumably to conserve energy and avoid predation. Peak numbers of the Bufflehead (*Bucephala albeola*), Common Goldeneye (*B. clangula*), and Common Merganser (*Mergus merganser*) on ponds represented 91–134% of the total populations of these species counted on the entire Lower American River. Our results are preliminary because of the relatively few surveys over only a few years but they suggest that the currently proposed elimination of Urrutia Pond has the potential to affect the Lower American River populations of diving ducks and other waterbirds. Retention of Arden Pond and a portion of Urrutia Pond, would reduce the potential for impacts to diving ducks and other waterbirds that currently use the ponds.

The Lower American River in Sacramento County supports a diverse and abundant waterbird population that has not been extensively studied. Two off-channel water bodies, Arden and Urrutia ponds, were created by past aggregate mining and receive substantial use by waterbirds, but this use has not been well-documented. The ponds are recognized as two of the few large calm water bodies along the American River and have been identified as possible important roosting areas for waterfowl, especially diving ducks, that feed diurnally on the American River.

The Lower American River supports runs of anadromous steelhead (*Ochorynchus mykiss*) and fall-run Chinook salmon (*O. tshawytscha)*. As part of mitigation for effects of ongoing American River flood protection activities on these fish, the U.S. Army Corps of Engineers (Corps) and the Sacramento Area Flood Control Agency (SAFCA) have, at various times, proposed to modify Arden and Urrutia ponds to create salmon spawning and rearing habitat (U.S. Army Corps of Engineers 2020, ESA 2021, K. Sorgen, pers. comm.).

Modification of the off-channel ponds along the American River has raised concerns because of their rarity and the potential effects on wintering and breeding waterbirds. Use of calm-water areas for night-roosting by waterbirds that forage in the American River during the daytime suggest that they may be important in minimizing energy expenditure and reducing predation risk, especially for diving ducks (subfamilies Aythyinae, Merginae, Oxyurinae). These concerns, however, have been based on anecdotal observations of waterbird use, many of which have been recorded in eBird (ebird.org) but not summarized or analyzed. We were particularly interested in patterns of pond use by diving ducks that commonly use the American River for foraging during the day, including the Bufflehead, Common Goldeneye, and Common Merganser (scientific names of major waterbird species are in Table 2).

The Corps' proposals to modify off-channel ponds prompted us to collect available and new information on waterbird use of the Arden and Urrutia ponds. We particularly focused on documenting pond use by night-roosting birds because of its potential importance to the American River waterbird population. Objectives of the study were to quantify diurnal and nocturnal use of the ponds by wintering waterbirds and use this and other available information to evaluate the importance of pond habitat to waterbirds of the American River and the potential effects of the proposed mitigation program.

STUDY AREA

We studied waterbird use at the two larger ponds along the Lower American River, Sacramento County that the Corps has proposed modifying at various times recently to mitigate for impacts of flood control projects on

anadromous fish, riparian birds, and the valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*).

Lower American River

The Lower American River flows 37 km west from Folsom Dam and then through Lake Natoma to its confluence with the Sacramento River, passing through the cities of Folsom, Rancho Cordova, and Sacramento, and unincorporated areas of Sacramento County (Figure 1). The river is leveed for flood control to protect the surrounding residential, commercial, and industrial development. Flow volumes in the American River vary during winter based on precipitation and upstream reservoir operations at Folsom Dam. Lands immediately adjacent to the river form the American River Parkway (hereafter, "the Parkway"), a 1,950-ha property managed by the Sacramento County Department of Parks and Open Space that supports a variety of woodland, shrub, and herbaceous plant communities and a high level of recreational use. The river is used for spawning and rearing by anadromous fish species, including the green sturgeon (*Acipenser medirostris*) and Central Valley population of steelhead (both federally threatened), and fall-run Chinook salmon.

Arden Pond

Arden Pond is within the William B. Pond Recreation Area, a portion of the Parkway on the north side of the American River (Figure 1). The 13.3-ha pond was created by past aggregate mining. It supports an elongated 0.36 ha island that is separated into more islands at low water and inundated during high water. A diverse mix of aquatic habitats is present, including open and vegetated shoreline, shallow waters, and deep water (>2.3 m; ESA 2021). The pond is connected to the American River, with low or subsurface flow entering during low river flows and higher through-flow when the river is at higher flow stages. The pond is well known as an area where waterbirds concentrate (https://ebird.org/barchart?r=L225812&yr=all&m=; see RESULTS). A large rookery about 200 m east of the pond is used mainly by Great Blue Herons (*Ardea heriodias*), Great Egrets (*A. alba*), and a few Double-crested Cormorants.

Urrutia Pond

The 22.5-ha Urrutia Pond is upstream of Discovery Park on the north side of the American River near its confluence with the Sacramento River (Figure 1). The pond was created by aggregate mining and was privately owned during our surveys but was subsequently purchased by the SAFCA for use in mitigating impacts of flood control work along the Lower American River. The pond is mostly steep-sided and deep (>6m) with a narrow fringe of riparian and wetland vegetation. It is fed by subsurface flow from the American River but is not directly connected to the river except during infrequent high-water

events. Due to restricted public access, information on bird use of the pond has mostly been limited to twice-annual December surveys conducted for the Sacramento Christmas Bird Count (CBC) and the American River Natural History Association's (ARNHA) wildlife count (see RESULTS) and our recent surveys. General public access is prohibited and with strict enforcement.

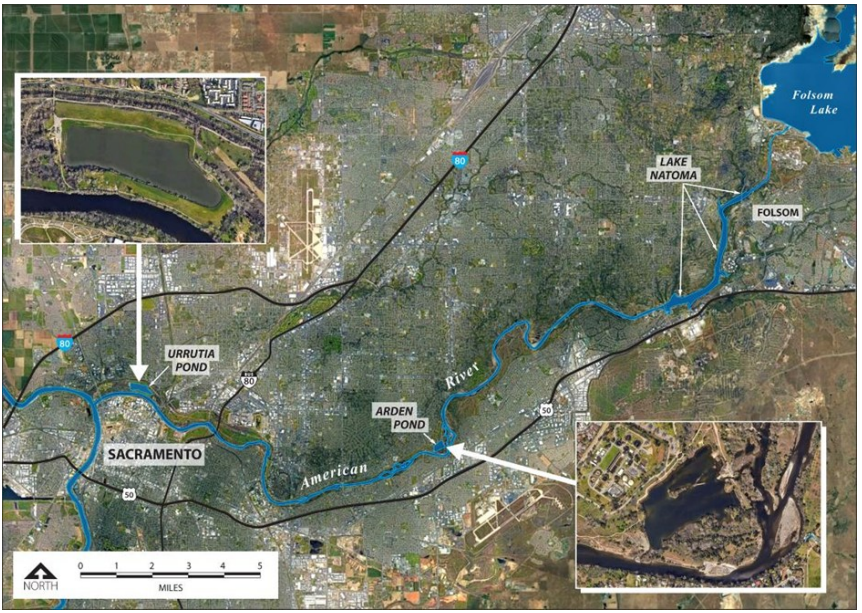

Figure 1. The American River and off-channel Urrutia and Arden ponds, and other lacustrine areas.

METHODS

Daytime and Nighttime Surveys

We counted waterbirds during the daytime and at dusk ("nighttime surveys") at Arden and Urrutia ponds to quantify daytime and night-roosting use. The term *Waterbirds* is broadly defined here to include waterfowl, wading birds, gulls, shorebirds, grebes, cormorants, coots, Bald Eagles, and Belted Kingfishers (*Megaceryle alcyon*). It was impractical to conduct nighttime surveys to record night use of the ponds by waterbirds, but we believe that our counts at dusk reflect nighttime use for diving ducks (except for possible undercount due to inability to count arrival under darkening conditions) based on several lines of evidence. Both the Common Goldeneye and Common Merganser typically feed during the daytime (Eadie et al. 1995, Pearce et al. 2015). Also, we received reports of Common Goldeneyes flying from off-channel ponds to the American River in the early morning,

suggesting that they remained on ponds through the night (L. Douglas, pers. comm.). Although Buffleheads have been reported to feed at night in winter (Gauthier 2014), we do not believe that they were doing so within the Lower American River.

Surveys were conducted by walking portions of the shoreline as needed to have a full view of the water surface. M. Geiger and S. Goodrich conducted nine surveys at Urrutia Pond (accompanied by D. Airola on three surveys) from 10 November 2022 to 26 January 2023 (see Appendix 1 for survey dates and daily results). Daytime and nighttime surveys were conducted on different days except for one pair of daytime and nighttime surveys conducted on 19 December 2022. We could not survey at Urrutia Pond after the end of January due to flooding. D. Airola conducted 16 wintering waterbird surveys over two winters at Arden Pond including six dates during January and February 2022 (five each of daytime and nighttime surveys) and six surveys (three each of daytime and nighttime surveys) on four dates over November 2022 to February 2023 (see Appendices 2 and 3 for survey dates). Paired surveys were conducted in the afternoon and at dusk on four days in early 2022 and two days during 2022–2023.

We compared the average ($\bar{x}$) numbers of birds of each species recorded during daytime and nighttime surveys to determine if differences in numbers existed, and especially to identify the extent of night-roosting use. In some cases, our counts are underestimates of the numbers of night-roosting birds because we could hear birds arriving after it was too dark to identify the species or to count individuals.

Other Available Data Sources

Christmas Bird Counts. We summarized data available from the Sacramento CBC (also recorded in eBird) recorded at the Urrutia Pond by M. Geiger from 2010 to 2017. These surveys were conducted between 12:15 and 14:45, thus representing daytime waterbird use levels.

American River Natural History Association Data. ARNHA has organized an annual count of birds and other wildlife along the entire Lower American River since 1984. The Parkway is divided into sections that are assigned to small groups who attempt to count all species. We summarized numbers reported on the survey from 2014 to 2022 and compared the average numbers of waterbirds on the ARNHA counts to those we made at Urrutia and Arden ponds to determine the relative importance of the ponds to populations of key waterbird species and groups that use the Lower American River. Notably, surveyors conduct ARNHA counts on each side of the river and so may be counting the same waterbirds on the river. The counts are not screened for duplication (J. Langham, pers. comm.), so reported numbers may be overestimates.

We did not use the large number of eBird records available (other than those from the CBCs, ARNHA counts, and our surveys) because we did not know if the numbers reported complete counts.

Water flows

We characterized water levels based on heights reported at the Fair Oaks gauge (https://waterdata.usgs.gov/monitoring-location/11446500/#parameterCode=00065&period=P365D) located about 11 km upstream of Arden Pond.

RESULTS

River Conditions during Surveys

Water elevations and resulting habitat conditions in the American River and at Arden Pond differed substantially during the two winter periods we surveyed. Based on observations made during surveys and river elevation measures, flows were moderate in early 2022 (2.1–3.0 m), with a small amount of water flowing into and out of the pond. Flows were much higher (2.3–5.4 m) in January 2023, which created fast-moving flows in the river and a substantial flow of fast-moving water through the south side of the pond.

Urrutia Pond

2010–2017 CBC Counts. Daytime counts conducted in December for the Sacramento CBC at Urrutia Pond showed substantial numbers of all waterbirds ($\bar{x}$ = 2,503 per survey), waterfowl (2,369), and diving ducks (2,269; Table 1). The most abundant species by far was the Canvasback which numbered 2,000–4,500 individuals in four of seven years. Although species' use levels were variable, high peak daytime numbers were recorded for Canada Geese (119), Common Goldeneyes (80), Common Merganser (121), Ruddy Ducks (60), American Coot (132), various gulls (200), and Double-crested Cormorants (140). No Bald Eagles were observed during these surveys.

2022–2023 Winter Waterbird Surveys. We observed a total of 27 waterbird species during daytime and nighttime surveys at Urrutia Pond, with nearly equal numbers of species during each period (Table 2; Appendix 1). In contrast to past years (Table 1), few Canvasbacks were seen during our surveys, but substantial numbers of other waterbirds used Urrutia Pond for roosting at night. The average number of waterbirds occurring at night was at least 62% higher than during the daytime, with over three times as many diving ducks using the pond for night roosting than during the daytime.

Major increases in numbers between daytime and nighttime occurred for Common Goldeneye (nearly 1000%), Bufflehead (233%), and Common Mergansers (85%), as well as substantial proportional increases in the less-

Table 1. Numbers of waterbirds observed during the daytime Christmas Bird Counts at Urrutia Pond, 2010–2017.

Species[1]	12/26 2010	12/1 2012	12/7 2013	12/6 2014	12/5 2015	12/27 2015	12/17 2017	Average
Canada Goose	123	35	71	119	95	139	24	87
Mallard	33	0	36	30	0	6	11	17
Green-winged Teal	0	0	0	5	2	2	0	1
Canvasback	3	3	2,000	4,000	4,500	4,500	50	2,151
Bufflehead	5	0	0	6	20	20	0	7
Common Goldeneye	36	0	80	15	21	1	1	22
Common Merganser	1	5	121	2	72	0	79	40
Ruddy Duck	0	0	24	33	60	40	35	27
Other waterfowl species	1	2	18	7	46	32	12	17
American Coot	8	0	15	59	100	132	7	46
Gulls	1	0	1	0	36	20	200	37
Double-crested Cormorant	4	80	34	3	15	4	140	40
Bald Eagle	0	0	0	0	0	0	0	0
Other waterbirds	8	5	9	3	33	13	5	11
Total Waterbirds	223	130	2,409	4,282	5,000	4,909	564	2,503
Total Waterfowl	202	45	2,350	4,217	4,816	4,740	212	2,369
Total Diving Ducks	45	10	2,201	4,023	4,642	4,529	130	2,226
Waterbird Species	15	7	12	17	26	19	14	
Waterfowl Species	7	4	6	11	11	11	6	

[1]Scientific names in text or Table 2.

abundant Green-winged Teal, Ruddy Ducks, and "other waterfowl species" (Table 2). The recorded numbers are underestimates of true values because an unknown number of unidentifiable species were seen returning after it was too dark to identify and count them. Conversely, Double-crested Cormorants used the pond only during the day, presumably for feeding and resting (Table 2). At least some of the cormorants that use the Lower American River roost at night in trees 5 km downstream from Arden Pond (D. Airola, eBird data, https://ebird.org/hotspot/L4406789).

Table 2. Summary of numbers of waterbirds during five daytime and five nighttime surveys at Urrutia Pond from 10 November 2022 to 26 January 2023. See Appendix 1 for survey dates and numbers recorded for all species.

	Average Number		
Species/Group	Daytime	Nighttime	% difference
Canada Goose (*Branta canadensis*)	20	25	24%
Mallard (*Anas platyrhynchos*)	15	6	−57%
Green-winged Teal (*Anas crecca*)	1	23	2175%
Canvasback (*Aythya valisineria*)	4	0	−100%
Bufflehead (*Bucephala albeola*)	13	42	233%
Common Goldeneye *(Bucephala clangula*)	15	166	992%
Common Merganser (*Mergus merganser*)	23	43	87%
Ruddy Duck (*Oxyura jamaicensis*)	2	18	629%
Other waterfowl species	4	37	825%
American Coot (*Fulica americana*)	21	23	6%
Gulls	10	6	−40%
Double-crested Cormorant (*Nannopterum auritum*)	102	0	−100%
Bald Eagle (*Haliaeetus leucocephalus*)	2	2	-6%
Other waterbirds	9	2	−74%
Total Waterbirds	239	391	63%
Total Waterfowl	96	359	273%
Total Diving Ducks	57	268	372%
Total Waterbird Species	25	24	−4%
Total Waterfowl Species	12	12	0%

Bald Eagles began constructing a nest at Urrutia pond in fall of 2022 in a large western sycamore (*Platanus racemosa*) that had been previously used as a rookery tree by Great Blue Herons. The eagle pair were seen regularly during both daytime and nighttime surveys (Table 2). Numbers of Canada Geese, Mallards, coots, gulls, and other species were low and relatively similar during day and night.

Arden Pond

We recorded 20 waterbird species during winter 2021–2022 and 2022–2023 waterbird surveys at Arden Pond, with slightly more species observed during daytime than nighttime surveys (Table 3, Appendices 2 and 3). Total waterbirds were 1.5 times as abundant at night than during the day in 2021–2022 but were 4.5 times more abundant in nighttime surveys in 2022–2023. All waterfowl and diving ducks were substantially more abundant at night than during the day, but especially in December and early January when river flows were higher (Appendix 3).

Waterbird use was lower during the day in 2021–2022 than in 2022–23, but numbers were substantially higher at night in 2022–2023, especially on those days when flows were high in the American River. Nighttime numbers were over six times higher at night in 2022–2023 than in 2021–2022. Substantially more individuals occurred at night than during the daytime for Common Goldeneye (by 11 times and 8.6 times over 2021–2022 and 2022–2023, respectively), Bufflehead (2.2 and 2.3 times more), and Common Mergansers (5 and 2.5 times more), as well as substantial increases for all other less abundant waterfowl species (Table 3). Pond use by Common Goldeneye was especially high during 2022–2023 high water conditions in the American River, with the highest individual nighttime count at 385 individuals (Appendix 3). Night-roosting diving ducks concentrated in the deepest, south-central part of the pond, at least 40 m from the nearest shoreline area.

Other waterbird species appeared to have relatively equal abundance during the daytime and nighttime. The lower number of coots observed in nighttime surveys were likely underestimates due to low light, distance, aggregation of individuals, or use of vegetative cover, as we never observed coots leaving the pond.

Comparison of Waterbird Abundance at Arden and Urrutia Ponds

Waterbird use of Urrutia and Arden ponds showed both similarities and differences. Most of the species recorded used both ponds, and both had substantially more bird use at night than during the day. Most use of both ponds was by the Common Goldeneye, Bufflehead, and Common Merganser, with the goldeneye as the most abundant species. The occurrence and abundance of some species differed between the two ponds. Double-crested Cormorants were abundant during the daytime at Urrutia Pond, with a peak

Table 3. Summary of waterbird use at Arden Pond during the daytime and nighttime over two winter survey periods.

	Daytime		Nighttime		% change between daytime and nighttime	
Species	2021–2022	2022–2023	2021–2022	2022–2023	2021–2022	2022–2023
Canada Goose	8	14	32	27	310%	95%
Wood Duck	11	1	13	6	21%	467%
Mallard	11	14	18	28	72%	100%
Bufflehead	6	13	20	42	227%	234%
Common Goldeneye	3	24	36	232	1107%	867%
Common Merganser	1	1	7	5	500%	250%
Ruddy Duck	0	0	0	0	0%	0%
Other Waterfowl	1	5	0	1	−67%	−90%
American Coot	111	21	103	56	−7%	165%
Gulls	0	0	0	13	0%	100%
Double-crested Cormorant	2	1	0	1	−100%	0%
Other Waterbird	5	8	5	2	4%	−74%
Total Waterbirds	158	94	234	551	48%	488%
Total Waterfowl	40	67	126	482	214%	623%
Total Diving Ducks	11	38	63	410	496%	970%
Total Waterbird Species	14	15	12	12		
Total Waterfowl Species	9	8	7	7		

number of 300 on 10 November 2022, but no more than six were seen at Arden Pond. Wood Ducks (*Aix sponsa*) were relatively common at Arden Pond but not seen at Urrutia Pond. Bald Eagles were seen only at Urrutia Pond.

Proportional Use of Off-Channel Ponds by Waterbirds Using the Lower American River

The proportion of the total counts of waterbird species on the Lower American River that used Urrutia and Arden ponds varied substantially among species (Table 4). A high proportion of the Lower American River populations of diving ducks and the Double-crested Cormorant occurred at the two off-channel ponds. Although we did not record Canvasbacks during our surveys, the average number from CBC counts (Table 1) at Urrutia Pond is nearly identical to that recorded during the ARNHA count, indicating that nearly all the Canvasbacks seen along the American River occur at that pond. Compared to average numbers, high proportions of Lower American River Buffleheads (48%), Common Goldeneye (42%), and Common Merganser (32%) used the two off-channel ponds. Compared to the average annual ARNHA counts, the high counts from our pond surveys exceeded the total Lower American River population for the Bufflehead (134%) and nearly equaled the total count for the Common Goldeneye (96%) and Common Merganser (91%). Average counts at the ponds showed that they supported a high proportion of Lower American River populations of Double-crested Cormorants (56%, almost entirely at Urrutia Pond during the daytime) and American Coots (55%, mainly at Arden Pond; Table 4).

Relatively low proportions (<10%) of some species' Lower American River populations used the off-channel ponds, including Canada Goose, Wood Duck, gulls, other waterfowl, and other waterbirds. The population of Green winged Teal on off-channel ponds exceed ARNHA counts for the entire Lower American River, but numbers still were low ($\bar{x}$ = 26 birds). The proportion of Ruddy Ducks using ponds also was high (63%), but their total number on ponds was small (47 individuals).

DISCUSSION

Importance to Waterbird Species

Diving Ducks. Our study demonstrates that off-channel ponds are important waterbird habitats for birds along the American River, especially for night-roosting by Common Goldeneyes, Buffleheads, and Common Mergansers. Night use of ponds presumably benefits diving ducks by reducing energy expenditure, providing protection from predation, or both, compared to remaining on the flowing American River. The ecology of these species in winter is poorly understood but recognized as a time when survival may be strongly influenced by habitat quality and the effects of environmental stress (Eadie et al. 1995).

Table 4. Comparison of waterbird use of Arden and Urrutia Ponds and total populations recorded on the American River Natural History Association's annual December wildlife count.

Species/Group	ARNHA Count Average	Arden 2021–2023		Urrutia 2022–2023		% of ARNHA Total in both ponds
		Average[a]	%	Average[a]	%	
Canada Goose	911	21	2%	25	3%	5%
Wood Duck	135	12	9%	0	0%	9%
Mallard	548	28	5%	15	3%	8%
Green-winged Teal	7	0	0%	23	321%	321%
Canvasback	2106	0	0%	4	0%	0%
Bufflehead	146	28	19%	42	29%	48%
Common Goldeneye	707	128	18%	166	23%	42%
Common Merganser	149	4	3%	43	29%	32%
Ruddy Duck	29	0	0%	18	62%	62%
Other waterfowl	392	3	1%	37	9%	10%
American Coot	238	107	45%	23	10%	55%
Gulls	1926	7	0%	10	1%	1%
Double-crested Cormorant	185	1	1%	102	55%	56%
Bald Eagle	2	0	0%	2	86%	86%
Other waterbirds	348	5	1%	9	3%	4%
Total Waterbirds	7830	344	4%	519	7%	11%
Total Waterfowl	5130	224	4%	373	7%	12%
Total Diving Ducks	3136	160	5%	273	9%	14%
Total Diving Ducks without Canvasback	1030	160	16%	269	26%	42%

[a]Numbers show the highest of the average value of either the daytime or nighttime counts at each site

Night-roosting behavior and habitats used by the Common Goldeneye, Bufflehead, and Common Merganser, the three principal diving duck species, has received little or no attention (e.g., by Erskine 1971, Bellrose 1976, Gauthier 2014, Pearce et al. 2015). Eadie et al. (1995) reported that ocean-wintering Common Goldeneyes congregated offshore at night, and movements to calm nighttime roosting areas has been reported for the Long-tailed Duck (*Clangula hyemalis*; Allison et al. 2009). We have been unable to locate documentation of movements by these species between riverine habitats during the day to congregate at ponds at night, although such use is not unexpected.

The use of Urrutia Pond by large numbers of Canvasbacks is of regional importance. The species has declined substantially through much of its range, although populations have recently stabilized or increased somewhat (U.S. Fish and Wildlife Service 2023). Canvasbacks are relatively uncommon in the Central Valley, so remaining use areas are important to the species. Canvasbacks rest together in groups in deep-water areas (Cogswell 1977) consistent with their use of Urrutia Pond. Their behavior (i.e., resting or foraging) when they were present in large numbers at the pond is unreported. Factors responsible for the annual variability in use of Urrutia Pond by Canvasback are unknown but fluctuations could result from changes in availability of suitable habitat in the Central Valley or elsewhere as a result of weather conditions or habitat management at wildlife refuges and duck hunting clubs (Fleskes et al. 2018).

Urrutia and Arden ponds appear to be regionally important to diving ducks, which comprise only 3% of the total number of wintering waterfowl in the Central Valley (Fleskes et al. 2018), although larger numbers of goldeneyes and Buffleheads occur in San Francisco Bay and off the California coast (Erskine 1971, Bellrose 1976, Cogswell 1977). It appears likely that the two off-channel ponds we studied serve as roost sites for most of the divers using the adjacent section of the American River, although a small contingent of 30–60 goldeneyes and other divers appear to fly nightly 1.6 km south to roost on ponds at Granite Regional Park (D. Kopp, pers. obs.) and some also appear to use ponds at Cal Expo at night (L. Douglas, pers. comm.).

Bald Eagle. The Bald Eagle nest at Urrutia Pond is the first nest established on the lower portion of the American River below Lake Natoma. Reasons why the eagles selected the area adjacent to Urrutia Pond cannot be known with certainty, but likely factors may include the presence of a suitable large nest tree, availability of both riverine and lacustrine water for foraging, the presence of waterbird concentrations on the pond, and low human disturbance due to enforcement by private ownership. At least one member of the pair of eagles that nested in 2023 was believed to be a five-year-old bird in its first breeding season, based on the presence of a bird in four-year-

old plumage in the area in 2022 (K. Kayner, pers. comm.). Successful nesting in its first year suggests that the site was at least moderately suitable for the species.

Other Waterbirds. Urrutia and Arden ponds provide important habitat for birds that use it diurnally or continuously. Many Double-crested Cormorants foraged at Urrutia Pond, but left at night, presumably to roost in trees, as has been observed downstream of Arden Pond (D. Airola, unpub. data). American Coots occurred on both ponds in moderate abundance. Many other species were seen on ponds in low numbers. These individuals contribute to regional populations and to the value of the American River as a source of wildlife viewing recreation.

Potential Impacts of Proposed Habitat Changes

Specific plans for use of off-channel ponds have not been made available to the public by the Corps, thereby impeding the ability to evaluate potential impacts of the proposed American River Bank Protection and its mitigation measures. Based on discussions with Sacramento County Regional Parks Department staff (K.C. Sorgen, pers. comm.), the proposed plan to create spawning and rearing habitat at Arden Pond (ESA 2021) is in hiatus. The specifics of proposed plans at Urrutia Pond apparently do not match the plans released in 2008 (City of Sacramento 2008). The reported focus on mitigation needed for impacts to rearing habitat for anadromous fish, the valley elderberry longhorn beetle, and Yellow-billed Cuckoo (*Coccyzus americanus)* has led to a plan to fill Urrutia Pond to create seasonally flooded riparian wetland habitat and upland. Therefore, we briefly describe the potential impacts of changes to ponds on waterbirds species to inform the impact assessment in environmental documents.

Removal of pond habitat by filling to created seasonally flooded habitat would eliminate night-roosting habitat for diving ducks and other waterbirds. The level of impact depends on the amount of pond habitat removed but also the size and configuration of a residual pond. Considering that diving ducks selected areas within Arden Pond at least 40 m from the shoreline, the evaluation of project effects should consider shoreline areas as unsuitable for night-roosting in both the existing pond and any pond considered in the mitigation design.

It is unknown to what extent existing populations using Urrutia and Arden ponds depend upon this habitat to maintain their populations. The fact that use levels are similar to the total counts made for the Common Goldeneye and other diving duck on the ARNHA Wildlife Count suggests that Arden and Urrutia ponds serve species' needs better than other potential alternative roosting habitat. This may be particularly true in high flow conditions, when use levels increased at Arden Pond (Urrutia Pond could not be surveyed under high water conditions). It is possible that the proportional loss of the

available off-channel pond habitat could result in a proportional reduction in population of diving ducks that use the American River. If so, the elimination of the 22.5-ha Urrutia pond would eliminate at least 43% of off-channel pond habitat suitable for night-roosting and potential loss of similar proportions of diving duck populations through displacement to less suitable habitats with resulting mortality. Such population losses could result in unknown ecosystem consequences and would reduce wildlife viewing recreation value.

The proposed mitigation needs for the Corps and SAFCA's American River flood control project apparently could be met using only a portion of the Urrutia property, especially if upland elderberry mitigation were moved elsewhere (K.C. Sorgen pers. comm.). Sacramento County Regional Parks has suggested an alternative plan for the Urrutia property that would meet the mitigation needs and reduce impacts to Parkway resources. The plan would retain a smaller pond of about 12 ha on the west side of the property. While this plan would likely reduce waterbird use of the site, if it were optimally configured (i.e., roughly circular to minimize the amount of shoreline area that is avoided by diving ducks), it could partly reduce the substantial effects of eliminating pond habitat. It would certainly have more value to the species that use Urrutia Pond than the proposed complete pond elimination. Retention of some pond habitat on the Urrutia property and all of Arden Pond would also reduce potential burdens on the Corps to provide new mitigation elsewhere to offset the effects of removing Urrutia Pond on diving ducks and other waterbird species if these effects are determined to be significant.

Study Limitations

This study was a pilot project intended to provide timely information from which to evaluate potential effects of proposed pond elimination on waterbirds. Although we have demonstrated the substantial value of off-channel ponds to wintering waterbirds, we consider this a preliminary study because of several limitations. First, surveys were conducted only over two years at Arden Pond (16 surveys) and over one year at Urrutia Pond (9 surveys in addition to previous CBC surveys there). Numbers of waterbirds using the off-channel ponds likely vary annually due to a wide variety of factors, including species populations, differences in seasonal movement patterns, and availability of alternative resting habitat as affected by rainfall and river operations. Although our surveys encompassed substantial variability in numbers (Tables 1–4 and Appendices 1–3), it is possible that more surveys would have changed the numbers from what we reported.

A second limitation involves assumptions regarding the timing of species movements and the timing of our surveys. We generally conducted daytime surveys in the afternoons but did not verify that the birds we observed there had spent most of the daytime at the ponds. It is possible that some birds we

counted in daytime counts had recently returned to ponds for the evening. If so, our diurnal counts were inflated. We believe the incidence of early arrival was not substantial but did not verify that assumption. Also, as noted, we did not verify that the birds we observed arriving at ponds at dusk remained there for the night, but we believe that this is highly likely.

Another limitation is that we did not survey all potential off-channel habitats along the American River or the impounded Lake Natoma at the east end of the Lower American River. A few smaller ponds along the river include Bushy Lake (4.6 ha), Cal Expo Pond (4.5 ha), Sacramento Bar (4.1 ha in 4 ponds), and Sailor Bar (3 ha among 4 ponds). Although our observations of avoidance of shoreline areas suggest that small ponds may receive lower night-roosting use, we did not verify that. The nighttime use of slow-moving sections of river, such as between Estates Drive and Rio Americano High School, and ponds at Granite Regional Park 1.6 km south of the river, at the Cal Expo Racetrack, and across from the Sacramento-American River confluence in West Sacramento, also deserve further study.

Finally, more study is warranted of the differences in the patterns of the availability and waterbird use of off-channel pond habitat during various river stages. While we observed higher diving duck use at Arden Pond when flows were high, high flows often follow heavier precipitation, which may inundate temporary pond habitats in other areas that birds may use. Responsibility for fully assessing the waterbird use of off-channel pond habitat and potential impacts of proposed elimination of this habitat should rest with the responsible agencies, the Corps and SAFCA.

ACKNOWLEDGEMENTS

We thank Vic Urrutia and Tim Flock for permission to access the Urrutia Pond to conduct surveys and Troy Perez for onsite assistance. Chris Conard provided information and useful advice. We thank Jaqueline Ramirez for providing ARNHA count data, Jeri Langham for information on ARNHA count procedures, Kathy Kayner for information on the Bald Eagles at Urrutia Pond, and Cliff Feldheim for peer review comments. Dan Kopp provided information on movements of diving ducks to other areas. K.C. Sorgen provided information on the Corps mitigation proposal. Thanks to Lily Douglas for ably serving as the guest editor for peer review of this paper.

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Appendix 1. Numbers of waterbirds during daytime and nighttime surveys at Urrutia Pond during winter 2022–2023.

Species	Daytime Surveys				
	11/10	12/2	12/9	12/19	12/26
Greater White-fronted Goose					
Canada Goose	32	8	37		22
American Wigeon	2				
Gadwall			4		
Mallard	20	2	15	16	20
Green-winged Teal					5
Canvasback	3				15
Ring-necked Duck	1			7	
Lesser Scaup	4				
Bufflehead	1		7	20	35
Common Goldeneye	36			34	6
Hooded Merganser				2	
Common Merganser			2	107	6
Ruddy Duck				11	1
Duck sp.					
Pied-billed Grebe	2				
American Coot	1	8	25	38	34
Killdeer		3		1	
Greater Yellowlegs					
Ring-billed Gull			1		1
California Gull	25	12	3		1
Herring Gull	1				
Double-crested Cormorant	300	110	90	1	11
Great Blue Heron	1	1	1	1	
Great Egret	8	1	1		
Osprey	1				
Bald Eagle	2	2	1	2	1
Belted Kingfisher	1		1		
Total Waterbirds	441	145	188	240	158
Total Waterfowl	99	10	65	197	110
Total Diving Ducks	45	0	9	181	63
Number Waterbird Species	18	8	13	12	13
Number Waterfowl Species	8	2	5	7	8

Appendix 1. (cont.) Numbers of waterbirds during daytime and nighttime surveys at Urrutia Pond during winter 2022–2023.

	Nighttime Surveys			
Species	12/12	12/19	1/1	1/26
Greater White-fronted Goose	30		1	
Canada Goose		36	2	60
American Wigeon				2
Gadwall				
Mallard	3	16	6	
Green-winged Teal			80	11
Canvasback				
Ring-necked Duck		7		
Lesser Scaup	2			
Bufflehead	1	33	120	14
Common Goldeneye	100	294	200	70
Hooded Merganser	2	2		
Common Merganser	30	107	18	15
Ruddy Duck	24	11	35	60
Duck sp.	100			
Pied-billed Grebe			2	
American Coot	27	38	25	
Killdeer		1		2
Greater Yellowlegs				1
Ring-billed Gull				20
California Gull	3			
Herring Gull				
Double-crested Cormorant		1		
Great Blue Heron		1		
Great Egret	1			
Osprey				
Bald Eagle	1	2	1	2
Belted Kingfisher				1
Total Waterbirds	324	549	490	258
Total Waterfowl	292	506	462	232
Total Diving Ducks	159	454	373	159
Number Waterbird Species	10	12	8	12
Number Waterfowl Species	8	7	8	7

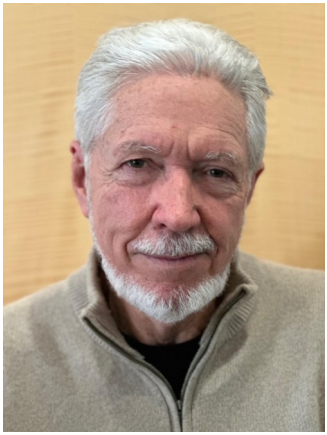
Appendix 2. Numbers of waterbirds during daytime and nighttime surveys at Arden Pond during winter 2021–2022.

	Daytime					Nighttime				
Species	1/9	1/14	1/19	2/3	2/23	1/9	1/14	1/19	1/26	2/23
Canada Goose	4	5	9	7	14	25	35	22	31	47
Wood Duck	6	28	19	0	0	25	27	4	7	1
Mallard	10	9	11	15	8	30	21	11	19	10
Northern Shoveler	0	0	2	0	0	0	0	0	0	0
American Wigeon	0	0	1	0	0	0	0	0	0	1
Bufflehead	6	4	9	7	4	25	17	20	17	19
Common Goldeneye	4	4	2	4	1	67	45	24	27	18
Common Merganser	0	0	2	4	0	2	22	2	10	0
Ruddy Duck	1	0	1	0	0	0	0	0	0	1
American Coot	110	60	110	105	170	130	40	60	145	140
Pied-billed Grebe	1	3	5	4	4	1	2	2	2	4
Double-crested Cormorant	2	6	3	0	1	0	0	0	0	0
Great Blue Heron	0	1	1	1	0	1	4	1	3	1
Great Egret	1	2	0	0	0	1	1	0	1	0
Total Waterbirds	145	122	175	147	202	307	214	146	262	242
Total Waterfowl	31	50	56	37	27	174	167	83	111	97
Total Diving Ducks	11	8	14	15	5	94	84	46	54	38
Number Waterbird Species	10	10	13	8	7	10	10	9	10	10
Number Waterfowl Species	6	5	9	5	4	6	6	6	6	7

Appendix 3. Numbers of waterbirds during daytime and nighttime surveys at Arden Pond during winter 2022–2023.

	Daytime			Nighttime		
Species	11/9	12/28	1/8	12/28	1/6	2/21
Canada Goose	20	19	2	40	20	20
Wood Duck	3	0	0	0	6	11
Mallard	19	11	12	75	3	6
Northern Shoveler	14	0	0	0	0	0
American Wigeon	0	0	0	0	0	0
Ring-necked Duck	0	1	0	0	0	0
Bufflehead	5	1	32	75	40	12
Common Goldeneye	0	9	63	385	305	6
Common Merganser	2	0	2	2	12	0
Ruddy Duck	0	0	0	1	0	0
Pied-billed Grebe	10	2	2	1	0	1
American Coot	0	42	21	90	47	30
Spotted Sandpiper	2	0	0	0	0	0
Ring-billed Gull	0	0	0	0	0	40
California Gull	0	0	1	0	0	0
Double-crested Cormorant	2	0	0	0	0	2
Great Blue Heron	0	0	0	0	1	1
Great Egret	2	0	2	1	1	0
Belted Kingfisher	2	0	1	0	0	0
Total Waterbirds	81	85	138	670	435	129
Total Waterfowl	63	41	111	578	386	55
Total Diving Ducks	7	11	97	463	357	18
Number Waterbird Species	11	7	19	9	9	10
Number Waterfowl Species	6	5	5	6	6	5

Steve Chainey: 2023 Central Valley Bird Club Conservation Award



The Central Valley Bird Club recognizes Steve Chainey with its 2023 Conservationist of the Year Award. Steve is highly deserving of this award for his long and distinguished career in restoring and protecting ecosystems in California's Central Valley. He applied his skills for nearly 35 years for a variety of environmental and engineering consulting firms in Northern and Central California.

Steve is truly unique for his depth and breadth of knowledge of natural systems, his commitment to improving the natural world, and his ability to bring people together to build consensus and enthusiasm for big ideas. Along with several others, Steve is widely recognized as a foundational figure in the practice of land and habitat restoration in Northern California. His knowledge of landscapes, physical processes, and ecosystems, and his vision and influence, propelled many important restoration projects since the 1990s.

Steve was a leader or major collaborator on the following major habitat restoration and protection projects in the Central Valley. All these project sites are designated as birding hotspots in eBird (ebird.org) and widely valued and visited for their wildlife values.

Putah Creek Restoration

Putah Creek drains from Lake Berryessa through the west side of Yolo County and through the University of California Davis campus before emptying into the Yolo Bypass. The creek was dewatered most years during spring through fall by irrigation diversions. After observing the ecosystem response to an unusually wet year, in 1988 Steve co-founded the citizen-based Putah Creek Council with Susan Sanders and others, which undertook a 10-year successful legal challenge to the diversions under the Public Trust Doctrine. This success guaranteed year-round flows to lower Putah Creek, resulting in large-scale restoration of a riparian and aquatic ecosystem including annual runs of salmon and steelhead. In subsequent years, Putah Creek Council inspired many volunteers and creekside landowners to plant native riparian and grassland vegetation and remove exotic invasive plants between Winters and Davis.

Yolo Bypass Wildlife Area

Through work on Putah Creek, Steve recognized the tremendous potential to improve wildlife habitat in the Yolo Bypass, a wide 40-mile-long flood bypass facility between Sacramento River and the Delta that skirts past Woodland, Sacramento, Davis, and many large duck clubs in the lower Yolo Basin. Most lands were privately owned with flood easements on them. Steve spearheaded an effort to create a state wildlife area. He, and long-time bird club member Ted Beedy, led preparation of an initial acquisition, restoration, and management plan. Despite initial widespread opposition from flood control agencies, agricultural landowners, and local politicians, Steve and his small group of visionaries persisted. After receiving key support from Vic Fazio, the local Congressman, the idea for the wildlife area was widely embraced, and it was dedicated onsite by President Bill Clinton in 1997. Since its establishment, the Yolo Bypass Wildlife Area has grown to 16,000 acres and hosts thousands of birders, wildlife sightseers, and school children annually, as well as a managed hunting program (Brice 2017). Today, it is co-managed as wetland, grassland, and agricultural habitats to support a wide range of breeding, migratory, and wintering wildlife species, and as rearing habitat for out-migrating juvenile salmon and steelhead.

Stone Lakes National Wildlife Refuge

The U.S. Fish and Wildlife Service's (USFWS') Stone Lakes NWR was proposed in the 1980s to help implement the Central Valley Joint Venture plan and provide wildlife habitat close to the Sacramento urban area. The refuge was fashioned from a variety of local and state public lands and acquired private lands. The refuge proposal was highly controversial, particularly over potential federal land condemnation. Steve led the preparation of the USFWS' EIS on refuge establishment. He met with landowners and guided USFWS managers in modifying the refuge proposal to acquire lands only from willing sellers, which reduced landowner antagonism. The refuge was established in 1994 and now provides over 17,000 acres of managed habitats, including agricultural lands, as wildlife and migratory shorebird and waterfowl habitat, and a robust public education program for area schools.

Sacramento County Sanitation District Bufferlands

The Sanitation District owns 2,650 ac of land around its regional wastewater treatment facility, as a buffer from adjacent developed residential areas (Conard 2007). The bufferlands were used for agriculture, but portions were subject to flooding. The district initially considered converting the area to a eucalyptus plantation to produce pulp for paper. Steve was brought into the project and proposed an alternative land use - the restoration of high quality permanent and seasonal wetlands and riparian habitat and wildlife-

friendly farming. Steve led project planning and design and supervised the construction process, resulting in creation of a de-facto wildlife refuge occupied by a variety of sensitive species including Burrowing Owls, Swainson's Hawks, Loggerhead Shrikes, and colonial waterbirds.

Davis Stormwater Detention Habitats

Steve pioneered the design of multi-use stormwater facilities in the City of Davis that provided floodwater detention, wildlife habitat, and nature-based recreation and education. By careful hydrologic analysis and grading design, the West Davis and Northstar ponds provide wetland, riparian, and grassland habitat that receives high wildlife use and are treasured by the local community. Steve's designs have served as prototypes for similar wildlife-friendly stormwater detention conversion designs elsewhere.

Natomas Levee Improvement Project Habitat Design

Steve led a planning and restoration design team for over 10 years for the Sacramento Area Flood Control Agency (SAFCA). Over 20 miles of levees surrounding the Natomas Basin were extensively widened, raised, and strengthened to protect the City of Sacramento, Interstate 5, and Sacramento International Airport from catastrophic flooding. The unprecedented project scale required unavoidable land disturbance including removal of several hundred mature valley oak trees, relocation of historic irrigation canals that sustained wetlands and pond habitats, and loss of croplands. Project impacts were compensated by 10 major habitat restoration projects that have successfully established over 700 acres of managed wetlands for the giant garter snake, planted and transplanted over four linear miles of valley oak and riparian woodlands along the Sacramento River levees, established conservation easements on annual croplands for Swainson's Hawks and other raptors, and created native perennial grassland throughout the Natomas Basin. For bunchgrass restoration, Steve co-designed a novel conversion of a large rice-planting roller to make a 'Ridger-Roller-Seeder' with a bank of native grass seeding equipment pulled behind a D8 dozer to stabilize miles of levee slopes and setback corridors. Most of these restored or created habitats can be viewed from public roads on the levee system or throughout the westside of Natomas Basin.

Cache Creek Conservancy and Gravel Mine Reclamation

Cache Creek is a major westside tributary of the Sacramento River and Yolo Basin. The Cache Creek Conservancy was established by Yolo County and the Cache Creek Aggregate Producers Association to implement a new regional mining ordinance that ended the legacy of in-channel mining of the alluvial stream and restored creek habitats in exchange for permitting off-channel mining. Steve was a founding member of the Conservancy's board

after he developed mine reclamation plans that restored in-channel riparian habitats, off-channel wetlands and ponds, and post-mining reclaimed agricultural fields.

For these many contributions to restoration and productive management of so many natural areas in the Central Valley, the Central Valley Bird Club is happy to recognize Steve Chainey with its 2023 Conservation Award.

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Yolo Bypass Wildlife Area, Yolo County, California. 10 September 2010.
Photo by Susie Nishio.

Christmas Bird Counts 2023–24

CBC Name (count code)	2023/24 Dates	Contact Person/email/Phone
Auburn (CAAA)	16-Dec-23	Sarah Roeske: roeske.sarah@gmail.com
Bakersfield (CABA)	16-Dec-23	John Wilson: jcwilson@lightspeed.net
Caswell/Westley (CACW)	31-Dec-23	Harold Reeve: Birder@sbcglobal.net (209-552-6189)
Chico (CACO)	16-Dec-23	Mary Muchowski: director@altacal.org (530-228-0625)
Folsom (CAFO)	31-Dec-23	Chris Conard: conardc@gmail.com (916-203-1610)
LaGrange Waterford (CALW)	16-Dec-23	Jim Gain: jimgain@sbcglobal.net
Lake Yosemite-Merced	18-Dec-23	Nathan Parmeter: nathanparmeter@yahoo.com
Lincoln (CALC)	28-Dec-23	Ed Pandolfino: ERPfomCA@aol.com
Los Banos (CALS)	28-Dec-23	John Fulton: Merced_birding@hotmail.com (209-826-1101)
Lost Lake/Fresno (CALL)	16-Dec-23	Rachel Clark: tanagergirl@gmail.com
Marysville (CAMA)	18-Dec-23	Asher Perla: asher.perla@gmail.com (916-485-9009)
Merced NWR (CAMW)	2-Jan-24	Larry Parmeter: lanpar362@gmail.com (559-288-3456)
Oroville (CAOR)	30-Dec-23	Gaylord Grams: gg2kayak@gmail.com (530-533-1624)
Peace Valley (CASV)	21-Dec-23	Laura Lush: llush@mac.com (530-301-7371)

Christmas Bird Counts 2023–24

CBC Name (count code)	2023/24 Dates	Contact Person/email/Phone
Pixley NWR (CAPX)	20-Dec-23	Joan Parker: blueoakpark@gmail.com (559-359-0517)
Putah Creek (CAPC)	17-Dec-23	Bart Wickel: bartwickel@gmail.com
Red Bluff (CARB)	30-Dec-23	Michele Swartout: Michele31@sbcglobal.net
Redding (CARE)	26-Dec-23	Randy Bush: rbush10@hotmail.com
Rio Cosumnes (CARC)	2-Jan-24	Andrew Engilis, Jr.: aengilisjr@ucdavis.edu (530-902-1881)
Sacramento (CASM)	23-Dec-23	Dan Williams: Jaegermaestro@yahoo.com
Sherman Island (CASX)	2-Jan-24	Logan Kahle: shermanislandcbc@gmail.com
Stockton (CAST)	17-Dec-23	Jim Rowoth: rowoth@icloud.com Donna Marciano: paulmarciano@att.net
Wallace-Bellota (CAWC)	30-Dec-23	Kasey Foley: kaseyfoley@sbcglobal.net

* Info from Nature Ali webpage: *https://natureali.org/index.html*

Geese in flight. 12 January 2021. Bruceville Rd., Sacramento County, California.

Photo by Susie Nishio.

Great Gray Owl (*Strix nebulosa*) at Lema Ranch, Redding, Shasta Co., California over 19-23 January 2022. *Photo by Eric Ongman.*

Errata for Volume 26, No. 2.

Several errors appeared in the article *Low elevation winter record of a Great Gray owl in Redding, California*. On page 39, elevations reported for Lassen Volcanic National Park should have been reported as "above 3,000 m" not "above 3,000 km". Also on that page, the elevation of Lema Ranch is 190 m, not 30 m as reported. These errors will be corrected in the online version of the article, when it is posted. The editor regrets the errors.

Central Valley Birds

Volume 26, Number 3, 2023

Published by the Central Valley Bird Club

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