

Tricolored Blackbird Breeding Status in the Central Sierra Nevada Foothills, California, in 2018

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The Tricolored Blackbird (*Agelaius tricolor*) was listed as Threatened under the California Endangered Species Act (CESA) in 2018, due to long-term population decline (Meese 2017, Beedy et al. 2018, Robinson et al. 2018). We and colleagues conducted field surveys during 2014-2017 to characterize Tricolored Blackbird breeding status and habitat within the grassland-dominated region that includes the east side of the Central Valley and lower foothills of the western Sierra Nevada (Figure 1) hereafter “Sierra foothills”; (Airola et al. 2015a, b; 2016; 2018).

In 2018, we estimated the number, sizes, and success of Tricolored Blackbird breeding colonies in the central portion of the Sierra foothills (“central Sierra foothills”). This portion of the larger Sierra foothill area has received the most consistent survey effort since 2014. Therefore, 2018 surveys provide the fifth year of population data for this region.

Study objectives were to:

- re-survey the central Sierra foothill area in 2018 to estimate breeding use by Tricolored Blackbirds,
- compare numbers of breeding birds observed in 2018 to numbers observed in previous years within the region,
- evaluate the effect of rainfall on the size of the annual breeding population in this region,
- document fates of colonies and estimate the proportion that produced young,
- assess use of nesting substrates, and
- document any observed land use conflicts with active colonies.

STUDY AREA

The 2018 study area consisted of the area previously described as the central Sierra foothills (Airola et al. 2016, 2018) that included lands at 15 to

550 m elevation dominated by annual grasslands in the lower foothills of the western Sierra Nevada and the eastern edge of the Central Valley, California (Figure 1). The central Sierra foothill study area includes portions of seven counties: Placer, El Dorado, Sacramento, Amador, San Joaquin, Calaveras, and Stanislaus counties (Airola et al. 2018). For this study, we also included Tuolumne County as part of the central Sierra foothill region; previously, it was included in the southern Sierra foothills subregion. This inclusion was made because its character is similar to other lands in the central region (especially in supporting more irrigated pasture within a grassland-woodland matrix) and it has been surveyed consistently since 2014. As in previous years (Airola et al. 2015a,b; 2016; 2018) surveys were conducted of lands accessible by public roads (see METHODS and RESULTS for details).

As previously, the term *survey area* refers to areas of suitable habitat within the study area and subregions that were surveyed during the study (see METHODS). We identify individual colonies in text in italics using names, as designated in the Tricolored Blackbird Portal (<http://tricolor.ice.ucdavis.edu>).

METHODS

Study methods in 2018 were consistent with those used in previous years (Airola et al. 2017). We, all experienced Tricolored Blackbird surveyors, surveyed for breeding Tricolored Blackbirds in 2018 from 3 April to 22 June, except at one late colony where surveys lasted until 20 July. We conducted surveys from public roads in areas previously identified as suitable foraging habitat (i.e., areas supporting grassland, irrigated pasture, and grain crop). We drove roads at 5-10 day intervals to look for colonies and foraging flocks, which were then tracked to colonies. Nest sites from previous years were checked for occupancy several times over the breeding season. We also surveyed sites where colonies and aggregations of Tricolored Blackbirds were reported by observers in eBird (<http://ebird.org/ebird/map/>). Once located, colonies were resurveyed regularly to record continued presence, nesting stage, and whether successful reproduction occurred. Additional details of methods specific to 2018 are noted below.

We summarized rainfall using data from eight weather stations in the central Sierra foothill study area at elevations of 30 to 460 m (<http://cdec.water.ca.gov/>). We quantified rainfall for October 2017–June 2018 (“2018 water year”) and compared it to previous water years and the 20-year average using these same stations.

We did not quantify the area surveyed in 2018, but it was similar to the 1,000 km² surveyed in the central Sierra foothill counties in 2017 (Airola et al. 2018), because we used a nearly identical set of survey routes.

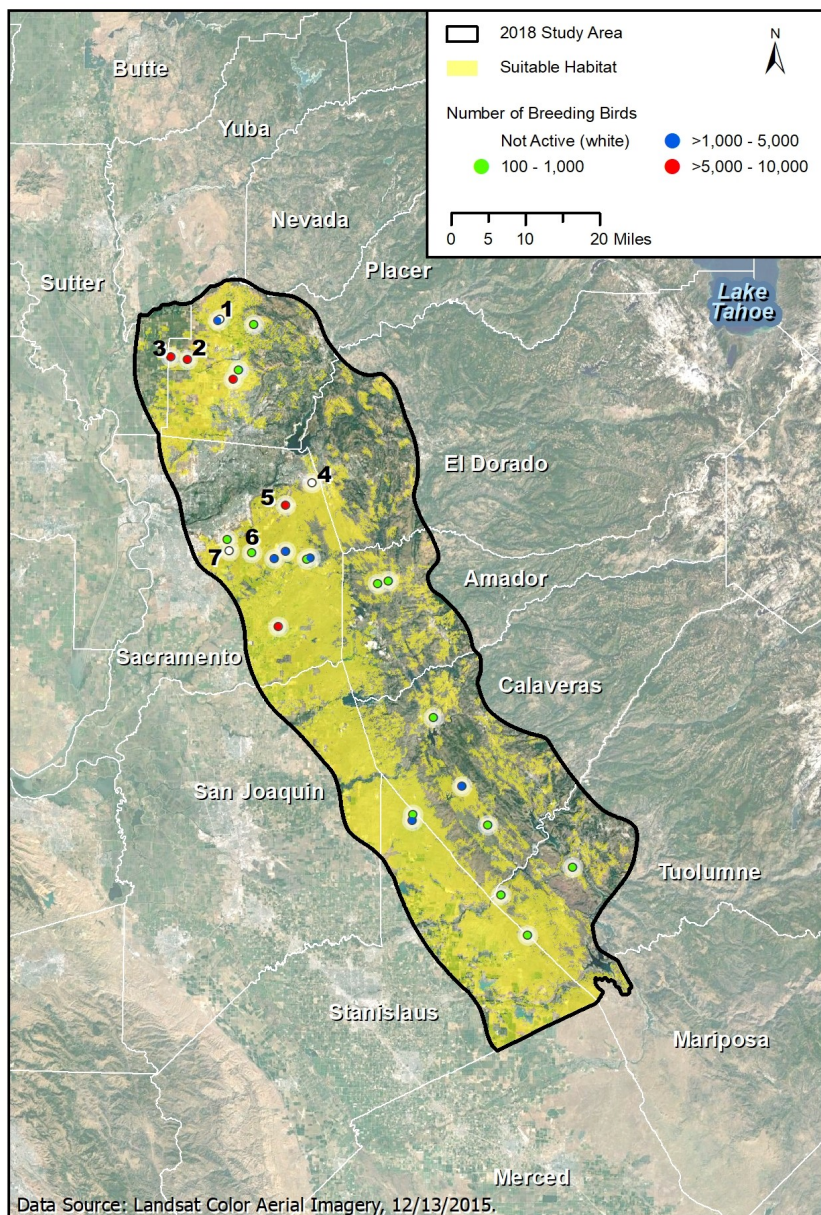


Figure 1. 2018 Tricolored Blackbird breeding survey study area and colony locations and sizes in the central Sierra foothills. Numbered colonies are those referred to in the text: 1) Yankee Slough Preserve, 2) Markham Ravine Westland Road South, 3) Markham Ravine 2, 4) Iron Point Rd, 5) Just West of Prairie City SVRA, 6) Jackson Highway Quarry, 7) Elder Creek colony complex.

Our reported counts of breeding birds is the estimated total number of birds at active colonies (i.e., those that proceeded at least to the egg-laying stage; Airola et al. 2018). Thus, we cannot exclude the possibility that the same birds bred at more than one colony over the season and were counted twice.

RESULTS

Precipitation

Rainfall in the central Sierra foothills during the 2018 water year was 63 cm (25.0 in), 42% less than in the very wet 2017 year, but 17% higher than the 1996-2018-year average (Figure 2).

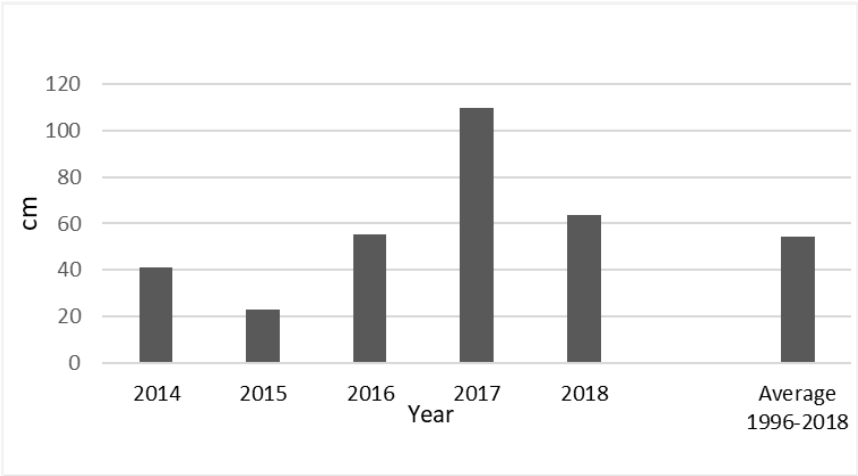


Figure 2. Annual precipitation (October-June) in the central Sierra Nevada foothill study area over 2014-2018 and the most recent 23-year average.

Observed Breeding Population

We recorded an estimated 58,500 breeding birds at 24 nesting colonies in the central Sierra foothills (Figure 1), which was within 1% of the 2017 total (Table 1). As in all previous years (Airola et al. 2018), the counties with the largest nesting populations were Sacramento (44%) and Placer (43%). Compared to 2017, numbers in 2018 increased substantially in Placer (+156%) and Calaveras County (by +226%) and decreased substantially in Stanislaus (-76%) and Sacramento (-20%). We found no breeding birds in El Dorado County for the second consecutive year, which has coincided with continued residential and industrial development of much of the foraging habitat previously used there by Tricolored Blackbird colonies.

Major concentrations of breeding birds occurred at three sites in Placer County: *Markham Ravine Westland Rd South* and *Markham Ravine 2*, where the assumed same group of 7,500-8,000 birds nested twice, and *Orchard Creek*, where 5,000 birds nested (Figure 1). Large colonies also were observed in Sacramento County at *Silva Ranch* (10,000 breeders) and *Just West of Prairie City SVRA* (8,000 birds). Thus, 66% of the total breeding effort in the central foothills (38,500 birds) occurred at the five largest colonies.

Nesting Colony Success

We identified 31 occupied sites (i.e., where Tricolored Blackbirds were observed) in 2018 in the central Sierra foothills. Twenty-four sites (77%) supported colonies that reached the active stage (egg-laying or beyond; Table 2). Twenty-three active sites (96%) were considered successful based on the observation of fledged young (10 sites) or adults feeding young (13 sites). (See Airola et al 2015a for rationale for classifying colonies with adults feeding young as successful). One colony, *Yankee Slough Preserve*, Placer County, failed during the active stage for undetermined reasons (See *Nesting Colony Disturbances and Responses*).

Nesting Substrate

We were able to identify the nesting substrates at 22 active colony sites but could not determine the nesting substrate at two sites, due to access limitations and visual screening. As in previous years (Airola et al. 2018), Tricolored Blackbirds in the central Sierra foothills nested predominantly in Himalayan blackberry (*Rubus armeniacus*). Himalayan blackberry was used at 17 (77%) of the 22 visible active colony sites and was the sole substrate at 14 sites (64%). Colonies in Himalayan blackberry supported 41,450 nesting individuals, or 78% of the total population at the 22 sites where nesting substrate was known. Cattails (*Typhus sp.*) and bulrush (*Schoenoplectus acutus* var. *occidentalis*) were used at six sites (27%), and was the sole substrate at two sites (9%). Milk thistle (*Silybum marianum*) was the only substrate used at two sites (9%).

Nesting Colony Disturbances and Responses

We observed several colonies in 2018 where nesting may have been disrupted by disturbance before we confirmed they were active.

Iron Point Rd., Sacramento County. Iron Point Rd, where 4,500 Tricolored Blackbirds were nest-building on 22 April, was abandoned around 1 May while heavy earth-moving activity was occurring within 80 m (240 ft) of the colony site. At this site, we examined 11 nests at various early nesting stages including: three incompletely constructed nests, five completed empty nests, and three completed nests with incomplete clutches. Single eggs in two nests were pierced or broken by other birds, suggesting that some eggs may have been removed by predators before we arrived. We did not count this colony

Table 1. Numbers of Tricolored Blackbird nesting colonies and breeding birds by county within the central Sierra foothill study area, California, 2014-2018.

County	Number of Active Colonies					Number of Breeding Birds				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
Placer	6	5	7	6	6	12,473	19,200	19,900	9,750	25,000 ¹
El Dorado	4	1	1	0	0	5,800	2,900	1,000	0	0
Sacramento	9	12	7	9	8	11,000	19,300	17,150	33,800	26,600
Amador	3	4	3	5	2	6,375	6,320	1,140	1,500	1,200
San Joaquin	0	0	0	0	0	0	0	0	0	0
Calaveras	3	2	3	4	3	760	350	1,300	720	2,350
Stanislaus	4	1	4	3	3	6,601	7,000	4,550	11,000	2,600
Tuolumne ²	0	0	2	4	2	0	0	2,300	1,140	750
Total	29	25	27	31	24	43,009	55,070	47,340	57,910	58,500

¹Placer County total includes numbers breeding at colonies at both the *Markham Ravine Westland Road South* and *Markham Ravine 2* sites; it appears likely that many of the same birds may have bred sequentially at both sites.

²Tuolumne County was previous included in the southern foothill region (Airola et al. 2018), but was incorporated into the central foothill study area for the 2018 survey because of similarity in habitat conditions and consistent survey coverage over 2014-2018.

as active due to the early stage of nesting. The abandonment of this colony coincided with the establishment of a group of similar size in milk thistle within the already-established *Just West of Prairie City SVRA* colony, 7.7 km (4.75 mi) from *Iron Point Rd*; we interpreted this later group within the colony as a likely relocation by the birds from *Iron Point Rd*. This relocated group nested successfully.

We previously expressed concern regarding the long-term viability of this colony due to development around the colony site and within foraging habitat and predicted that the colony would relocate itself to a nearby area (Airola et al. 2018). Grading by heavy equipment and removal of grassland for the Folsom Ranch development grew to 185 ha (450 ac) as of 2 February 2018 (measured from Google Earth; <https://www.google.com/earth/>). This foraging habitat loss and construction activity adjacent to the colony could have caused the 2018 abandonment of *Iron Point Rd*, and possible relocation to join the colony at *Just West of Prairie City SVRA*. We have shown, however, that Tricolored Blackbirds regularly abandon sites that are not disturbed during the early portion of the nesting season, presumably in response to an insufficient supply of insect foods (Airola et al. 2018, Beedy et al. 2018).

Jackson Highway Quarry, Sacramento County. Airola observed settling behavior at this mining area on 21 April but the area was reported to be abandoned on 5 May following herbicide spraying to control milk thistle (R. Meese, pers. comm.). Tricolored Blackbirds, however, were observed settling again on 17 May and had proceeded at least to the early nestling stage on 10 June.

Elder Creek Complex, Sacramento County. No birds nested at the Elder Creek complex of colonies in Sacramento County in 2018. This 135-ha (330 ac) area supported 13,500 breeders at four colonies in 2017 and has supported a high density of nesting blackbirds since at least 2014 (Airola et al. 2018). Although approved aggregate mining did not begin during the 2018 nesting season, elimination of irrigation to the pasture severely stressed the Himalayan blackberries used for nesting there. Despite installation of drip irrigation to a portion of the nesting habitat at the regularly-used *Elder Creek #4* colony site, the blackberry canopy did not recover in 2018.

Markham Ravine 2. In contrast to other examples of construction impacts to colonies, a late colony of 7,500 birds was observed establishing a colony on 12 June at *Markham Ravine 2*, immediately following fledging by young at the nearby *Markham Ravine Westland Rd South*. The area immediately adjacent to the colony was under active construction to restore wetlands by Westervelt Ecological Services. Airola worked with Westervelt to establish a site-specific construction buffer for the nesting birds and a construction schedule to protect the colony. The colony showed no sign of disturbance and successfully fledged at least several thousand young.

DISCUSSION

The 2018 results continue to demonstrate that central Sierra foothills support a large population of breeding Tricolored Blackbirds. The area supported over 58,000 breeding individuals, which while discounting 8,000 birds that may have bred twice, still represents 28% of the 178,000 individuals estimated in the 2017 Statewide Survey (Meese 2017).

The 2018 survey results reinforce previous findings (Airola et al. 2018) that the size of the annual central Sierra foothill breeding population does not appear to be correlated with rainfall in the central Sierra foothills, possibly due to the presence of irrigated pasture. The numbers of breeders recorded in 2018 was virtually identical to that of 2017, despite a 42% reduction in rainfall between the two years.

Despite the wide distribution of colonies in the region, the presence of two-thirds of the breeding population at five colony sites is concerning. This concentration and the recorded conflicts between colony reproduction and development and mining lands uses indicates the sensitivity of the population to future land uses. Airola et al. (2015) showed that 40% of 2014 colonies and 47% of the nesting population that year were on or immediately adjacent to lands that were either under active construction or mining, approved for development, or proposed for rezoning for development purposes. As of 2018, four (5%) of 79 sites that supported active colonies since 2014 in the central Sierra foothills have been made unsuitable by development and eight additional sites (10%) have been substantially reduced in value by adjacent development or removal of irrigation. Surveys results from 2015-2018 could provide a more robust basis for identifying areas of high habitat value to Tricolored Blackbirds in the region. Further assessment of approved and proposed land use changes and land conservation plans, and their potential effects on Tricolored Blackbird habitat and populations, is a high priority to guide land use planning and conservation efforts.

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