Western Riverside County Multiple Species Habitat Conservation Plan
Biological Monitoring Program
2022 Breeding Tricolored Blackbird Surveys

INTRODUCTION

The Tricolored Blackbird (*Agelaius tricolor*) is one of 45 bird species covered by the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP; Dudek & Associates 2003) and is a Threatened species in the State of California. Most (>90%) breeding Tricolored Blackbirds are found in California's Central Valley (Hamilton 2000), with the remaining birds occurring in other lowland areas west of the Cascade and Sierra Nevada mountains (Beedy 2008). The statewide population is considered seriously reduced (>80%) since population estimates reported by Grinnell and Miller (1944), with a current estimate of 100,000–1,000,000 birds. The range size of Tricolored Blackbirds in California is stable (≤10% reduced) or increasing since the publication of Grinnell and Miller (1944). Habitat loss, habitat degradation, or other human-induced threats are projected to seriously reduce (>20%) the species' population in California by 2028 (Beedy 2008).

Breeding Tricolored Blackbirds in California may nest in a variety of upland habitats including, but not limited to, freshwater marsh, cismontane alkali marsh, winter wheat (*Triticum* spp.) or triticale fields, or patches of Himalayan blackberry (*Rubus armeniacus*) that are oftentimes surrounded by annual grasslands. The species typically forage in agricultural land, grassland, playas and vernal pools, or riparian woodland and scrub (Dudek & Associates 2003; Beedy et al. 2020).

Tricolored Blackbirds are a colonial nesting species that generally nest from late March to April, until late July to early August (Beedy et al. 2020). Clutches typically contain three or four eggs (Payne 1969) that are incubated exclusively by females (Beedy et al. 2020), for 11–12 d (Emlen 1941; Orians 1961). Females provide nestlings protection from the elements (Beedy et al. 2020), and nestlings fledge 12–14 d post-hatching (Payne 1969).

The MSHCP identifies six species objectives for Tricolored Blackbirds. Objective 1 requires the conservation of ≥420 ac (≥170 ha) of primary habitat including freshwater marsh and cismontane alkali marsh within the Riverside Lowlands and Foothills Bioregions. Objective 2 requires the inclusion of five Core Areas, including Alberhill, Collier Marsh and Lake Elsinore grasslands, Mystic Lake/San Jacinto Wildlife Area, the San Jacinto River floodplain, and Vail Lake/Wilson Valley/eastern Temecula Creek (Figure 1). Objective 3 requires the conservation of ≥66,510 ac (≥26,916 ha) of secondary habitat including agriculture land; grasslands; playas and vernal pools; and riparian scrub, woodland, and forest. Objective 4 requires the continued use of, and successful reproduction within, at least one Core Area every five years. Objective 5 requires ensuring the maintenance, preservation, or restoration of hydrological processes and habitat within the designated Core Areas. Finally, Objective 6 requires the inclusion within the Conservation Area of any known nesting locations, including a 100-m buffer around such locations (Dudek & Associates 2003).

Biological Monitoring Program (BMP) biologists have detected Tricolored Blackbirds 90 times on Conserved Land within the prior five-year reporting period (2017–2021). Most (78.9%) of these detections were distributed among three of the five MSHCP-designated Core Areas for the species, specifically the Mystic Lake/San Jacinto Wildlife Area, San Jacinto River floodplain, and Vail Lake/Wilson Valley/eastern Temecula Creek Core Areas. Finally, we last documented successful nesting by Tricolored Blackbirds on Conserved Land in 2017, at the San Jacinto Wildlife Area (Biological Monitoring Program 2018).

For this project, we will survey for Tricolored Blackbirds by driving roads within apparently suitable breeding habitat in the five Core Areas identified by the MSHCP (Dudek & Associates 2003). We will attempt to locate flocks of Tricolored Blackbirds in these areas and determine the approximate number of Tricolored Blackbirds in each flock. If flocks are exhibiting nesting behavior, we will monitor the nesting colony until fledging or failure occurs. We will survey each point at least three times from April through August 2022.

Goals and Objectives

1. Determine whether Tricolored Blackbirds are using any of the five Core Areas identified in the MSHCP.

    a. Conduct driving surveys within apparently suitable habitat in the five Core Areas and estimate flock sizes when Tricolored Blackbirds are encountered.

2. Determine whether Tricolored Blackbirds are successfully nesting in any of the five Core Areas identified in the MSHCP.

    a. If Tricolored Blackbird colonies are exhibiting nesting behavior, monitor the site until nests fail or fledge young.

METHODS

Survey Design

We began study site selection by selecting Tricolored Blackbird habitats that were identified as suitable primary breeding habitat (i.e., freshwater marsh or cismontane alkali marsh) or secondary foraging/breeding habitat (i.e., agricultural land; grassland; playas and vernal pools; and riparian scrub, woodland, and forest) by the MSHCP (Dudek & Associates 2003) within our ArcGIS (ESRI 2019) vegetation layer (CDFG et al. 2005). After we identified appropriate Tricolored Blackbird habitat in GIS, we clipped that layer to a separate GIS layer consisting of Conserved Land within the five Core Areas identified by the MSHCP (Dudek & Associates 2003). Finally, we generated survey points along roadways within the secondary habitat, separated from one another by at least 500 m.

We will conduct roadways surveys for Tricolored Blackbirds by making single visits to survey points ($n = 99$ points) within the five MSHCP-identified Core Areas (Figure 1). We visited all survey points during our wintering Tricolored Blackbird surveys in November 2021 and confirmed their suitability for Tricolored Blackbirds, and to verify that they were accessible and within the aforementioned habitat types.

Field Methods

We will define individual survey efforts by a single survey point from which we will survey for Tricolored Blackbirds. We will survey each site at least three times during this project and our surveys will occur from April through August 2022. We will conduct surveys in the morning, no earlier than 1 hour after sunrise, by which time Tricolored Blackbirds have usually left their overnight roost sites to forage (Beedy et al. 2020). Finally, we will not conduct surveys during periods of rain or heavy fog, either of which will reduce our ability to detect Tricolored Blackbirds.

Surveys will begin when a pair of observers reaches a survey point. Upon arrival, observers will record on the datasheet (Appendix A) the date, their initials, and the survey point number. Next, observers will record the starting weather, temperature, and wind speed. After these initial data are recorded, observers will record on their datasheet the survey start time. Observers shall spend 5–10 min at each survey point, during which time they will scan the surrounding habitat for the presence of Tricolored Blackbirds. If no Tricolored Blackbirds are detected during this time, observers will move on to the next survey point after completing the datasheet.

If observers detect Tricolored Blackbirds, they will spend an additional 10 min at the survey point. During this time the two observers will independently estimate the number of Tricolored Blackbirds that are present. Observers will then agree upon an overall estimate of the number of Tricolored Blackbirds present, and this estimate will be recorded on the datasheet.

Additionally, observers will record information on their datasheet for all bird species detected while at the survey point. For non-Covered Species, observers will record the four-letter species code, age class information, and sex for only the first individual of that species detected, which provides species richness data for the site. For Covered Species, observers will record the four-letter species code, age class, and sex for every individual detected during the survey. If observers are unsure whether they have already recorded data on an individual (i.e., they are double-counting), they will err on the side of caution and record information on that individual.

If observers see Tricolored Blackbirds exhibiting nesting behavior (e.g., carrying nest material, copulation, or food carries), observers will complete a nesting datasheet (Appendix B) for the entire colony. Observers will agree upon a likely nesting stage that characterizes the majority of the colony, and they will estimate the number of adult females and males present. We will revisit active nesting colonies weekly until the colony has completed nesting. Finally, at no time will observers approach active nests to inspect contents; rather, active colonies will be observed from a distance of ≥50 m.

TRAINING

All field personnel will demonstrate proficiency at visual and aural identification of Tricolored Blackbirds prior to conducting surveys. Additionally, observers will demonstrate

the ability to identify bird species likely to be detected near the survey points. To demonstrate this, observers will pass a quiz consisting of photographs and audio recordings of 89 bird species. Observers must correctly identify every covered species on the quiz and ≥85% of the non-covered species before being allowed to participate in surveys. All personnel will also demonstrate proficiency with survey techniques before field surveys commence.

DATA MANAGEMENT

While observers are in the field, they will collect data on paper datasheets that are designed to correspond with a data entry form within the MSHCP electronic database. This will assure inferential integrity of collected data. After observers have returned to the office, they will enter their field data into an electronic Microsoft Access database, after which the data sheet will be marked as having been entered. Datasheets that have been entered into the database will be double-checked by another biologist and subsequently certified by the data manager.

DATA ANALYSIS

If we have sufficient data, we will estimate per-visit detection probabilities (p) of Tricolored Blackbirds using a closed-capture occupancy model available in Program MARK (White and Burnham 1999; MacKenzie et al. 2006). Next, we will construct a candidate set of models that examines the time-varying (i.e., among visits) effect on p, but will model estimates of occupancy ($\hat{\psi}$) as being constant across n visits because we will be assuming a closed population of Tricolored Blackbirds within our study areas and throughout our survey period.

We will then rank models in each candidate set according to Akaike's Information Criterion (AIC$_c$) for small samples, calculate Akaike weights (w_i), and average estimates of p across the entire candidate set (Burnham and Anderson 2002). We will then calculate cumulative detection probabilities (P^*) across visits according to the following formula, where p_i is the detection probability on a given visit or shift: $P^* = 1 - (\prod_{i=1}^{n}(1 - p_i))$.

TIMELINE

- Winter 2021–2022: GIS work, specifically identifying habitat, assigning survey points.
- February and March 2022: Distribution of study materials, getting access to survey areas, and ground-truthing potential survey sites.
- April 2022–August 2022: Surveys will be conducted. Data will be entered concurrently with surveys.
- Fall 2022: Report writing.

LITERATURE CITED

Beedy EC. 2008. Tricolored Blackbird (*Agelaius tricolor*). Pages 437–443 in Shuford WD, Gardali T, editors. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.

Beedy EC, Hamilton WJ, III, Meese RJ, Airola DA, Pyle P. 2020. Tricolored Blackbird (*Agelaius tricolor*), version 1.0. In Rodewald PG, editor. Birds of the World. Cornell Lab of Ornithology, Ithaca, New York. Available from https://doi.org/10.2173/bow.tribla.01 (accessed March 2022).

Biological Monitoring Program. 2018. Western Riverside County MSHCP Biological Monitoring Program 2017 Tricolored Blackbird (*Agelaius tricolor*) survey report. Prepared for the Western Riverside County Multiple Species Habitat Conservation Plan. Riverside, California. Available from https://wrc-rca.org/species/surveys/Tricolored_Blackbird/2017_Tricolored_Blackbird_Report.pdf (accessed March 2022).

Burnham KP, Anderson DP. 2002. Model selection and multimodel inference: A practical information-theoretic approach. 2nd edition. Springer-Verlag, New York.

[CDFG] California Department of Fish and Game, Aerial Information Systems, California Native Plant Society. 2005. Vegetation - Western Riverside Co. [ds170]. Publication Date: 2005-07-31. Available from https://www.wildlife.ca.gov/Data/BIOS (accessed November 2020).

Dudek & Associates. 2003. Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). Final MSHCP, Volumes I and II. Prepared for County of Riverside Transportation and Lands Management Agency, Prepared by Dudek & Associates, Inc. Approved June 17, 2003.

Emlen JT. 1941. An experimental analysis of the breeding cycle of the Tricolored Red-wing. Condor 43:209–219.

[ESRI] Environmental Systems Research Institute ArcGIS: Release 10.7.1 [software]. 2019. Redlands, California: Environmental Systems Research Institute, 1999–2019.

Grinnell J, Miller AH. 1944. The distribution of the birds of California. Pacific Coast Avifauna 27.

Hamilton WJ, III. 2000. Tricolored Blackbird 2000 breeding season census and survey—Observations and recommendations. Available from Division of Environmental Studies, University of California, Davis.

MacKenzie DI, Nichols JD, Royle JA, Pollack KH, Bailey LL, Hines JE. 2006. Occupancy estimation and modeling: Inferring patterns and dynamics of species occurrence. Elseiver, London.

Orians GH. 1961. Social stimulation within blackbird colonies. Condor 63:330–337.

Payne RB. 1969. Breeding seasons and reproductive physiology of Tricolored Blackbirds and Red-winged Blackbrids. University of California Publications in Zoology 90:1–137.

White GC, Burnham KP. 1999. Program MARK: Survival estimation for populations of marked animals. Bird Study 46 Supplement:120–138. Downloaded August 2009.
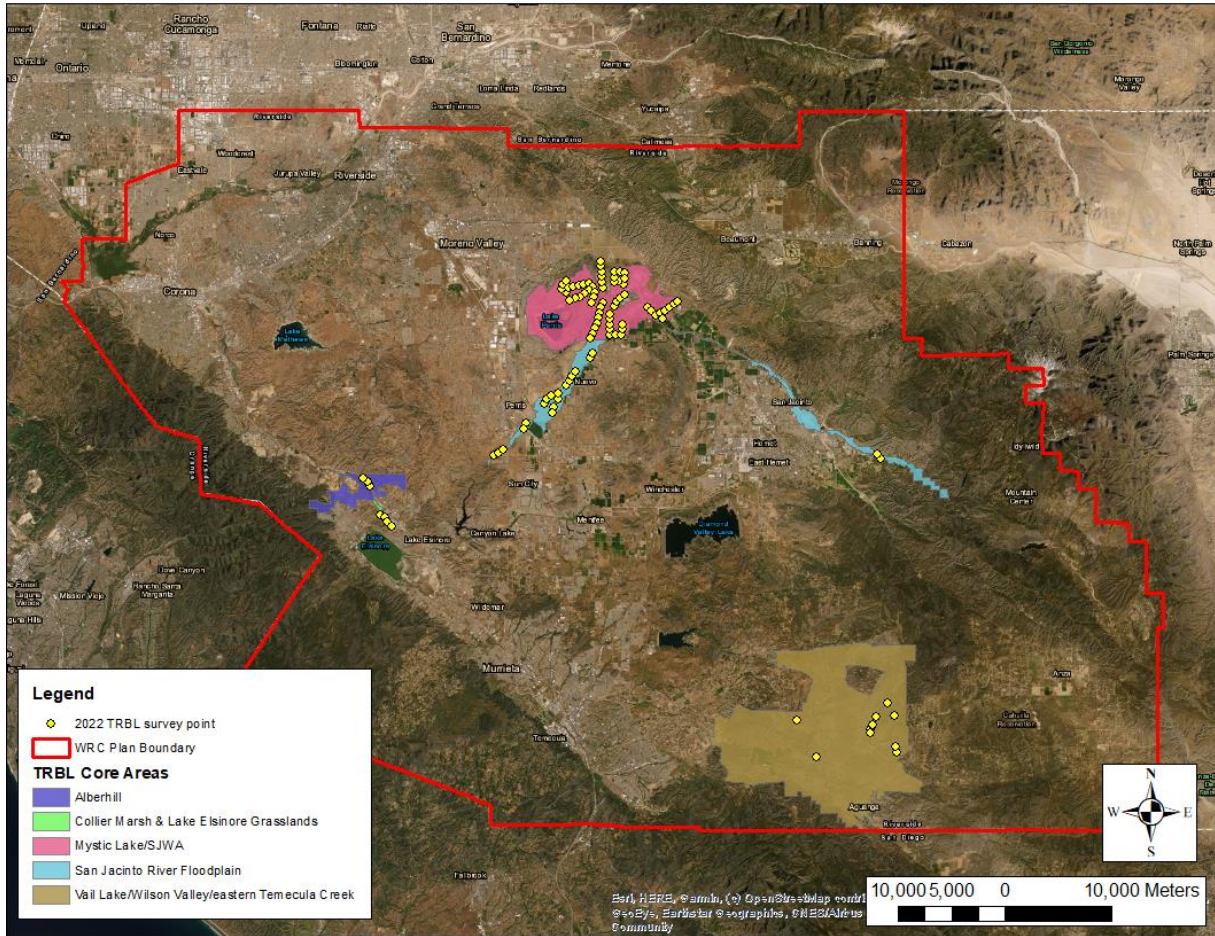
Figure 1. Locations of 2022 Tricolored Blackbird (TRBL) survey points within the Core Areas identified by the MSHCP.

Appendix A. 2022 Tricolored Blackbird survey datasheet.

MSHCP Tricolored Blackbird Survey Data Sheet, 2022

Transect ID:	**TB21-**	Visit #:		Site conditions			
Date:					Interval	Result	Units
				Avg. wind	@ start		km/h
Observers:				Max. wind	@ start		km/h
				Temperature	@ start		°C
				Sky Code	@ start		N/A
Start time:				Noise	@ start		N/A
End time:							

Species code	Sex (M, F, U)	Age (Ad, Ju, Fl, U)	Notes

Notes, species observed in transit, etc.

Sky Condition Codes: 0 = clear or few clouds; 1 = partly cloudy; 2 = overcast; 3 = fog or smoke; 4 = light drizzle; 5 = constant snow; 6 = constant rain.
Noise Codes: 0 = no noise; 1 = noise, but not affecting bird detection; 2 = moderate noise, may be affecting detection; 3 = loud noise, reducing ability to detect birds; 4 = very loud noise, difficult to hear anything at all.

Appendix B. Nesting colony monitoring datasheet for 2022 Tricolored Blackbird surveys.

MSHCP Biological Monitoring Program
2022 Nest Monitoring Data Sheet – TRICOLORED BLACKBIRD

General Nest Information

Species:	ID:
Nesting substrate:	Substrate height (m): variable
Nest height (m): variable	XY coordinates of colony:

Visit Information

Observer	Date (mm/dd/yyyy)	Nest status[2] of colony	Behavior[1] and count		Target Species			BHCO	
			Male	Female	# eggs	# nestlings	# fledglings	# eggs	# nestlings

Notes:

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[1] Visible, Singing, Calling, Carry nest material, Carry/give Food, Incubating, Carry fecal sac, Brooding, or NL (Not Located)
[2] Construction, Laying, Incubating, Nestlings, Fledged, Depredated, Abandoned, Failed, Unknown, or NL (Not Located)

Data entered by _____ on _____   Data checked by _____ on _____