Santa Clara County Tricolored Blackbird Nesting and Foraging Monitoring Project 2017-2018 Final Report

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California Department of Fish and Wildlife &
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ABSTRACT

During 2017 and 2018, Talon Ecological Research Group (Talon) conducted a comprehensive survey of Tricolored Blackbirds (*Agelaius tricolor*) throughout Santa Clara County. Financial support for this project was provided by a Natural Community Conservation Program Local Assistance Grant with a matching grant from the Santa Clara Valley Habitat Agency. The goal of the project was to determine the breeding status of the species and better understand their local ecology. Tricolored blackbirds have declined at an alarming rate throughout their range. Recent surveys have shown an 80% decline over the past 90 years and a 63% decline between 2008 and 2014. Within the past 40 years, seven historical nesting colonies were recorded in Santa Clara County. Talon monitoring during the 2017 breeding season found only two of those seven sites had nesting Tricolored Blackbirds. This is a 71.4% decline of nesting colonies in Santa Clara County. This study found that 29 sites had adequate breeding habitat. However, only 4 of those 29 sites (9%) had Tricolored Blackbirds present. Two historic sites and one newly identified site (75% of occupied sites) successfully fledged young in 2017. Two nesting colonies were located on private property (Del Puerto Canyon Road and Highway 130 in San Antonio Valley) and one on public property (Cañada de Los Osos Ecological Reserve). During the non-breeding season (August-February), 24 of 122 (19.7%) locations surveyed for foraging Tricolored Blackbirds had them present. San Antonio Valley, Coyote Valley and Cañada Road had the largest numbers of breeding and non-breeding Tricolored Blackbirds. These areas are critical for Tricolored Blackbird conservation in Santa Clara County and should be included in a comprehensive management plan for the species.

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INTRODUCTION

The tricolored blackbird (*Agelaius tricolor*) is a colonial nesting passerine largely endemic to California with small colonies (fewer than 100 individuals) occurring in Nevada, Oregon and Washington (Beedy et al. 2018, Meese 2017, Ammon and Woods 2008, Marshall et al. 2003). It is a habitat specialist restricted to wetland, grassland, and agricultural habitats (Tricolored Blackbird Portal 2019). During the mid-1800's, the tricolored blackbird was considered to be the most abundant avian species in California's Central Valley (Grinnell 1915), and coastal southern California (Bousman 2007). Conservative estimates of tricolored blackbirds in the 1930's were in the 2-3 million individuals in California (Neff 1937, Tricolored Blackbird Portal 2019). Recent statewide surveys have shown a 63% percent population decline between 2008 and 2014, and an 80% decline over the last 90 years (Meese 2014). The 2008 statewide Triennial Survey estimated the Statewide population at 400,000 individuals. The following survey in 2011 showed a dramatic decline with 258,000 individuals estimated. The 2014 survey depicted a similar declining trend with 145,000 tricolored blackbirds estimated. However, the 2017 survey showed a small increase with an estimated 177,600 individuals.

This alarming and precipitous decline is attributed to a myriad of threats including, but not limited to, habitat loss due to water diversions, agricultural expansion, and urbanization, direct persecution, destruction of nesting colonies due to agricultural operations, and the reduction in annual and perennial row crops (alfalfa). As a result, the already limited habitat for both breeding and foraging has dramatically declined and continues to do so. Therefore, the tricolored blackbird is a species of conservation concern with high research priority. The California Department of Fish and Wildlife Commission granted an emergency Endangered listing for the tricolored blackbird in 2014 and in 2018 the species was listed as Threatened under the California Endangered Species Act. The International Union for Conservation of Nature (IUCN) listed the Tricolored Blackbird as Endangered in 2006 due to a very rapid decline and on-going population decline in excess of 60%, based on repeated census of the California population (Birdlife International 2018). Surviving population clusters are declining rapidly and could become extirpated in the next 50 years; consequently, the tricolored blackbird has been selected as a covered species in the Santa Clara County's Natural Community Conservation Planning (NCCP). Conservation strategies under the Santa Clara Valley Habitat Conservation Plan's consists of monitoring nesting tricolored blackbird populations in Santa Clara County to determine occupied sites, population size, potential habitat area, quantity and quality of habitat, potential threats, breeding success and foraging patterns.

In California, the majority (>80%) of tricolored blackbird breeding colonies are found in the Central Valley (Meese 2017). However, smaller colonies can be found scattered throughout the Central Coast range, including Santa Clara County, as well as the South Coast and Sierra Foothills (Meese 2017). Records of tricolored blackbirds breeding in Santa Clara County date

back to the 1800's, but the species was considered to be uncommon and local breeders through the early 1900's (Bousman 2007). Recent breeding records (40 years) show a scattered distribution in Santa Clara Valley and the Diablo Range (Bousman 2007) with nesting colonies found at Calero Reservoir (2014, 1989), Lake Cunningham Park (1994), Coyote Percolation Ponds (1983, 1985), Coyote Ranch Park (1994), Del Puerto Canyon Road (2005, 2008, 2010, 2011), Cañada de Los Osos Ecological Reserve (2016) and Halls Valley (1982, 1983, 1987) (Tricolored Blackbird Portal 2019).

To our knowledge, a county-wide survey in Santa Clara of all suitable habitat had not been conducted in the county prior to this survey. The statewide surveys in prior years focused on re-visiting known historic and current breeding colonies, but did not survey all sites with potential breeding habitat. The objectives of this monitoring project were the following: 1) Survey all accessible sites with suitable breeding habitat during the 2017 breeding season throughout Santa Clara; 2) Monitor all active nesting colonies to obtain data on breeding ecology, phenology, colony size, foraging behavior, and reproductive success; and 3) Survey suitable foraging habitat during the non-breeding season (August-February) in 2017 and 2018 to obtain data on foraging locations, number of individuals, and habitat characteristics.

STUDY AREA

Tricolored blackbird surveys were conducted within Santa Clara County and the Santa Clara Habitat Conservation Plan permit area (Figure 1). Areas not included in the permit area, which were included in the surveys and monitoring consist of the following: the northeastern portion of the county known as San Antonio Valley, as well as the southern edge of the San Francisco Bay. Accessible and permitted, suitable habitat (wetland, grassland, oak savannah, and agriculture) throughout the study area was surveyed. The majority of the eastern portion of the county in the Diablo Range is privately owned and access was limited during this study. The county was divided into the following general categories; 1) East San Jose, 2) Milpitas, 3) Sunnyvale, 4) Almaden, 5) Coyote Valley, 6) Gilroy, and 7) San Antonio Valley.

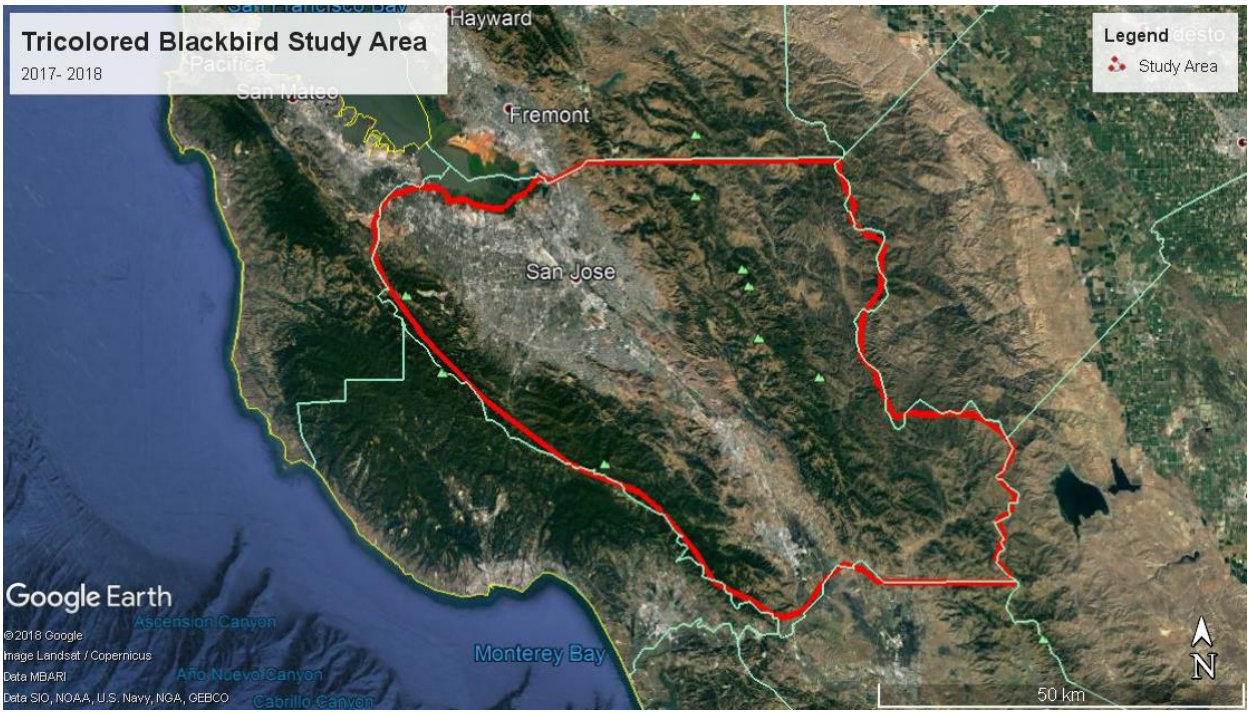

Figure 1. Map of tricolored blackbird monitoring and survey study area.

METHODS

Breeding Season

A team of two Talon Ecological Research Group (Talon) Wildlife Biologists (Ryan Phillips and Andrew Bradshaw) and two Talon Field Technicians (Katie Smith and Claire Ackland) conducted all the surveys with the occasional assistance from volunteers. Team members were trained extensively in tricolored blackbird ecology and survey protocols, including attendance at the tricolored blackbird workshops provided by Dr. Robert Meese at UC Davis. Dr. Meese is an authority on tricolored blackbirds and is the California statewide survey coordinator.

During the 2017 tricolored blackbird nesting season (March 1- July 31) all accessible and identified sites with suitable nesting habitat were surveyed a minimum of 2 and a maximum of 5 times. Prior to the surveys, areas with wetland, grassland, oak savannah, or agriculture that were in the vicinity (100 meters) of a water source (pond, creek, river, or reservoir) were categorized as possible nesting sites to be surveyed. A site that was surveyed and no nesting substrate was present was categorized as unsuitable and not re-revisited, unless there was potential for vegetation to change during the breeding season. We considered nesting substrate to be, but not limited to, any heavy vegetation along the edge of or in the near vicinity of a water source, which included cattails (*Typha spp.*), bulrush (*Schoenoplectus spp.*), willows (*Salix spp.*), *Baccharis*

spp., thistles (*Circium spp.*), mallow (*Malva spp.*), mustard (*Brassica spp.*), Himalayan blackberry (*Rubus armeniacus*), and various agricultural crop species.

When tricolored blackbirds were observed at a potential breeding site, monitoring of that site commenced with 2-4 visits weekly until tricolored blackbirds were not observed and breeding ceased. During each visit, by a minimum of two team members, a 1-hour survey was conducted. To obtain an accurate estimate of the number of individuals at the colony, two 20-minute surveys (the first and last 20 minutes) were conducted during the 1-hour survey. The high count of the two surveys was used as the estimate of the number of tricolored blackbirds present. Three assumptions were made for each 20 minute survey: 1) birds that leave the colony do not return during the 20 minutes, 3) birds that enter the colony do not leave during the 20 minutes, and 3) all birds are visible or vocalizing therefore were counted during the start or end count of the 20 minute survey (Appendix A). The limitations and the potential for violation of these assumptions was understood, but this protocol was considered the best way to achieve accurate results in a systematic method across all monitoring sites. If individuals were foraging in close proximity to the colony or females were incubating and were not vocal or leaving the colony during those 20 minutes the assumptions could be violated. We used the following formulas to estimate the number of individuals during the 20 minute surveys within the 1 hour monitoring block:

If # of OUT > number IN then use (total IN + total out) + (end count – total IN)

If # of IN > number OUT then use (total IN + total out) + (start count – total OUT)

During each 1 hour monitoring block the following data was obtained: estimated number of individuals present (sex ratio), number of behavior events by individuals observed (displaying, nest building, copulating, incubating, feeding young), direction of departing and arriving individuals, estimated distance and direction to foraging grounds, two 20 minute survey estimates, prey items brought back to nests, and weather at the start, middle and end. When a tricolored blackbird departed or arrived a bearing of the direction it was departing to or arriving from was taken. A sample of 30 directional bearings for each survey was taken if enough birds were observed (on occasion sample size was less than 30). One team member would follow the departing individual and record if and where it was observed foraging. Once a bird was observed to utilize the habitat or substrate it was considered foraging and a bearing and distance to foraging location was estimated. If the individual was not observed in the habitat due to losing a visual on the bird, foraging was not recorded.

The monitoring team avoided any disturbance of nesting birds by surveying from a minimum of 50 meters away from the closest substrate being used. Based on prior studies and our direct observations of disturbance levels, a distance of 50-100 meters sufficed (Meese 2017). No

change in tricolored blackbird behavior was observed at the distance monitored from. Observations were made using a 20-60x spotting scope and 10x binoculars. Monitoring distance that was too close (10-50 meters) made recording birds moving in and out of the colony difficult and estimates inaccurate. Therefore, we recommended that any monitoring at a colony to be done at a minimum distance of 50 meters depending on the size of the colony and location of nesting birds. We considered a breeding colony successful if at least one pair fledged young. Due to difficulty in determining the number of active nests in a colony we did not estimate the number of nests at all sites. Instead the number of fledglings and individuals in the colony was estimated.

Non-Breeding Season

During the non-breeding season (August 1- February 28) all accessible suitable foraging habitat throughout the study area was surveyed monthly. Areas that had current and historic records of tricolored blackbirds were given higher priority than other areas and more time was often spent in these areas. Information from the Tricolored Blackbird Portal, eBird, and California Natural Diversity Database assisted in the determination of high priority areas. The objectives of non-breading season surveys were to determine the presence or absence of tricolored blackbirds, number of individuals, sex ratios, and habitat characteristics being utilized (Appendix B).

Non-breading surveys were carried out by 2-4 team members in a single vehicle. Surveys were conducted using a road transect method with point-counts commencing once any blackbird species was observed. Blackbirds (flocks or individuals) that were within 500 meters beyond the vehicle were recorded. Point-count were used to determine the presence of tricolored blackbirds in that flock, number of individuals, how many males and females, and habitat characteristics directly where the birds were foraging or perched on the ground. Habitat characteristics that were recorded included the following: 1. Habitat Type (grassland, wetland, oak woodland, oak savannah, agriculture, fallowed agriculture, and cattle pasture) 2. Foliage Height (0= bare ground, 1= less than 6 inches, 2= 6 inches- 2 feet, 3= 2-3 feet, 4= 3-4 feet, 5= greater than 4 feet).

Due to the difficulty in differentiating female tricolored and female bicolored Red-winged Blackbirds, especially at a distance and in large flocks with rapid movements, it was challenging to get an accurate count of the number of Tricolored Blackbirds. Therefore, our estimates should be considered minimum numbers and not absolute.

Results

Breeding Season

During the 2017 breeding season (March 1-July 31) 44 sites that were categorized as potential nesting areas, based on habitat type and proximity to water, were surveyed (Table 1). Of those 44 sites, 29 (66%) had suitable breeding habitat with nesting substrate was present and 4 (9%) had tricolored blackbirds present (Figure 2 and 3). Of those 4 sites with tricolored blackbirds present, 3 (75%) successfully fledged young. At South Calero Reservoir, where tricolored blackbirds nested in recent years (Phillips et al. 2015), successful nesting was not observed during the 2017 monitoring assessment.

Table 1. Locations surveyed for nesting Tricolored Blackbirds in Santa Clara County in 2017.

Region/Location	Habitat	Suitable	Dominant Substrate Type
San Antonio Valley			
East Del Puerto Canyon Road	pond	yes	cattail
West Del Puerto Canyon Road	riparian	no	none
Mines Road	pond	yes	cattail/tule
San Antonio Valley 1	pond	no	none
San Antonio Valley 2	pond	no	none
Highway 130	pond	yes	tule
East San Jose			
Grant Lake	reservoir	yes	tule and cattail
Grant Ranch Pond 1	pond	no	none
Grant Ranch Pond 2	pond	no	none
Halls Valley	riparian	no	none
Lake Cunningham	reservoir	yes	cattail
Hellyer County Park	pond	yes	cattail
Milpitas			
Sandy Wool Lake- Ed Levin CP	reservoir	no	cattail
Spring Valley Golf Course	pond	yes	tule
Spring Valley- Ed Levin CP	pond	no	none
Summitpointe Golf Course	pond	yes	cattail
Dixon Landing	fresh wetland	yes	cattail/tule
Artesian Slough-Don Edwards NWR	saline wetland	yes	tule
N McCarthy Blvd	saline wetland	no	none
Sunnyvale			
Guadalupe River	creek	yes	tule
Highway 237 N	pond	yes	tule
Highway 237 South	pond	yes	cattail
Gold Street	fresh wetland	yes	cattail

Moffett Channel	saline wetland	yes	tule
Bay Trail	fresh wetland	yes	tule
Almaden			
Los Alamitos Perc Ponds	pond	yes	cattail
Los Alamitos Creek	creek	yes	cattail
Almaden Lake	reservoir	yes	cattail
Guadalupe Reservoir	reservoir	no	none
Almaden Reservoir	reservoir	no	none
Coyote Valley			
Calero Reservoir South	reservoir	yes	cattail
Calero Reservoir East	reservoir	yes	cattail
Calero Dam	reservoir	yes	cattail
Cherry Rd- Base of Calero Dam	pond	yes	cattail/tule
Metcalf Road	creek/pond	no	none
Coyote Ranch	pond	yes	tule
Ogier Ponds- Coyote CP	pond/creek	yes	cattail/tule
Chesbro Reservoir	reservoir	no	none
Gilroy			
Uvas reservoir	reservoir	no	none
Gilroy Wastewater Treatment Plant	pond	yes	cattail/fallow
Gold Club Drive North	pond	yes	cattail
Gold Club Drive South	pond	yes	cattail
Other			
Vasona Lake- CP	reservoir	yes	cattail
Oka Percolation Ponds	pond	yes	cattail
Shoreline Lake	reservoir	no	none

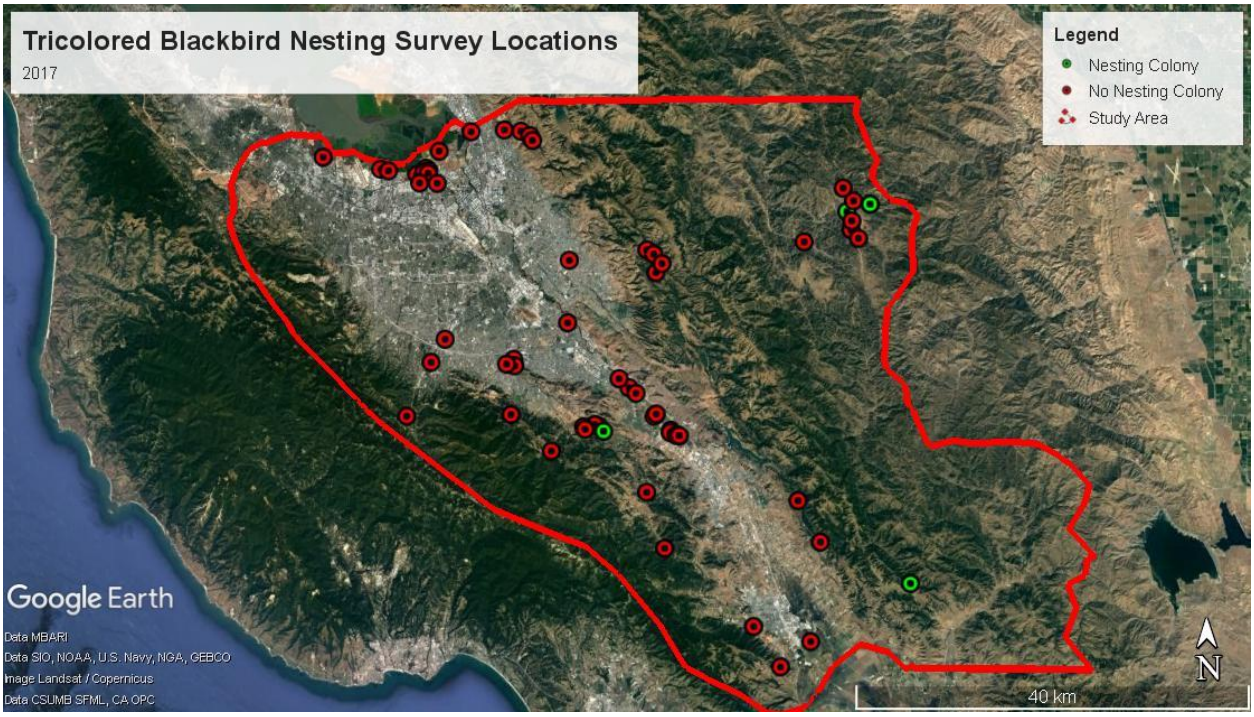

Figure 2. Map of tricolored blackbird nesting survey locations. Green: nesting colonies and red: potential nesting sites with no nesting observed.

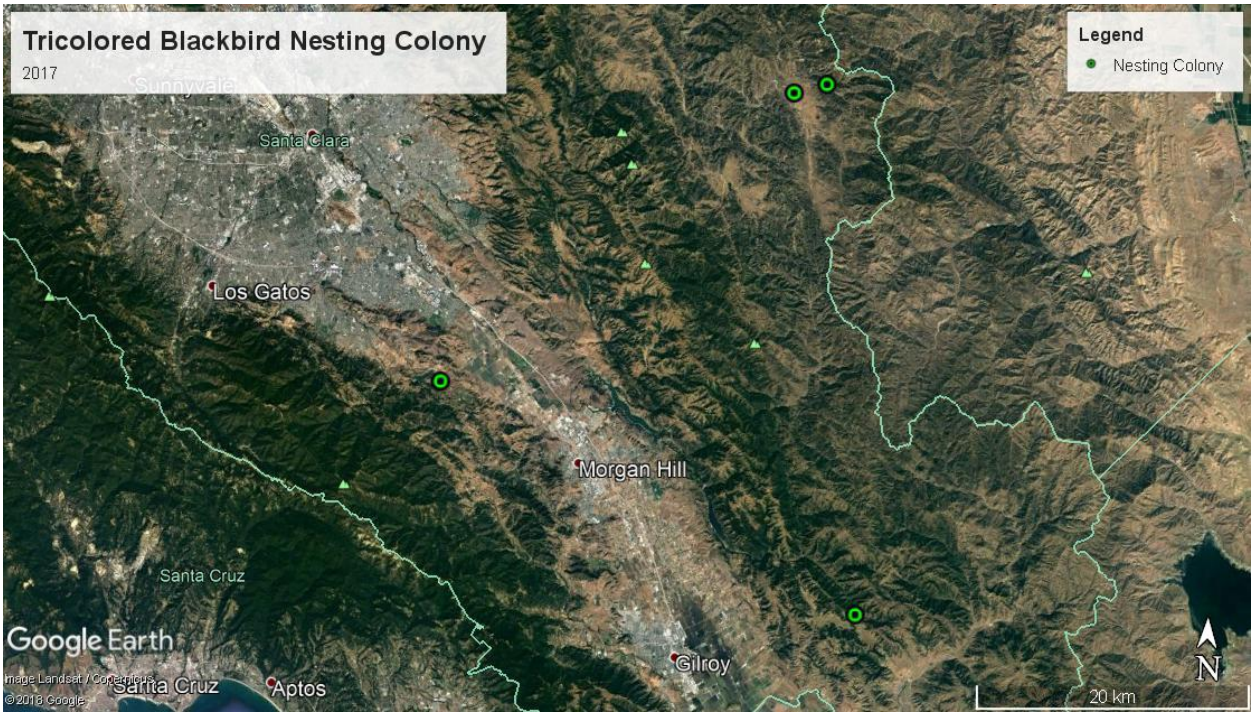

Figure 3. Map of the four of forty-four sites where tricolored blackbirds were present during the breeding season.

Tricolored blackbirds were first observed at nesting colonies on 29 March, when males and females were highly vocal with males displaying. Birds were observed copulating between 7 April and 12 June. Nest building commenced on 5 April and occurred through 5 June. Young in the nest and fledglings being fed occurred between 24 April and 6 July. After 12 July, no tricolored blackbirds were observed at any of the nesting colonies (Table 2).

Table 2. Phenology of the breeding events of tricolored blackbirds during 2017 in Santa Clara County.

Breeding Event	Phenology
Arrival at Nesting Colony	29 March
Displaying	29 March 29 - 19 June
Copulating	7 April – 12 June
Nest Building	5 April – 5 June
Feeding Young	24 April – 6 July
Fledging	29 May – 10 July

Del Puerto Canyon Road Nesting Colony

The Del Puerto Canyon colony, located in the northeast extreme of Santa Clara County (37.385128°, -121.462715°) and out of the Santa Clara Habitat Conservation Plan permit area, was the largest tricolored blackbirds nesting colony in the county during 2017 (Figure 4). This nesting colony was a seasonal creek that has been dammed to form a stock pond with the substrate consisting of 100% cattail (*Typha latifolia*). The surrounding habitat is a mosaic of oak-pine woodland, chaparral and oak savannah. The San Antonio Valley with expansive grassland habitat is 1.3 km from the nesting colony.

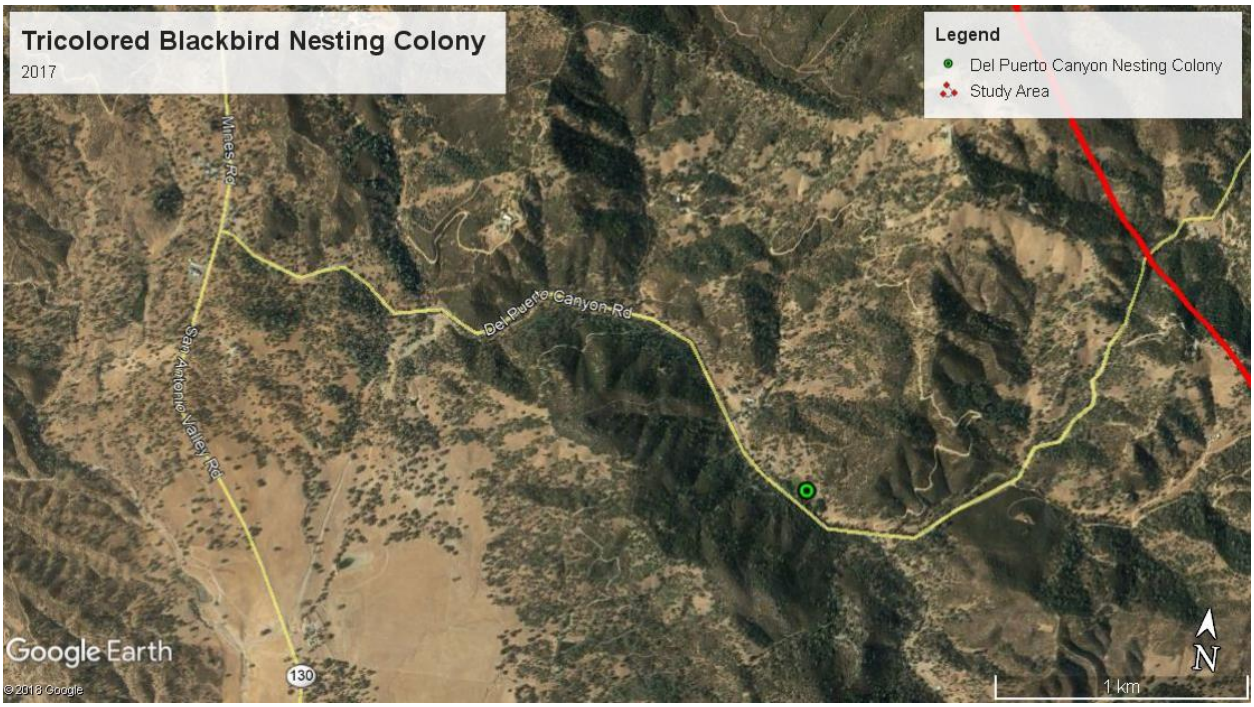

Figure 4. Map of the Del Puerto Canyon tricolored blackbird nesting colony in 2017.

During the breeding season, the Del Puerto Canyon Road nesting colony was surveyed during 26 days (1 hour monitoring block per day) between 8 March and 26 July. Tricolored blackbirds were first observed at the colony on 29 March with both males and females present. The last day that tricolored blackbirds were observed at this colony was 13 July. Nest building was first observed 5 April and the last nest building observation was on 5 June (n = 340). Feeding young commenced on 24 April and the last observation of feeding nestlings or recent fledglings was 6 July (n = 331) (Figure 5). During the displaying period females represented between 30-50% of the total individuals estimated. During nest building and the incubation period females represented about 20% of the observed individuals. When feeding nestlings commenced, the number of females observed increased to 50-66% (Figure 6 and 7).

During the 26 monitoring days throughout the breeding season, tricolored blackbirds were observed during 22 of those days. The mean number of tricolored blackbirds observed during a visit was 222 individuals (Figure 8). The minimum number of individuals estimated was 0 and the max number was 510. A total of 60 fledglings were observed between 29 May and 19 June.

Males and females were both observed departing the nest site to forage, either to feed themselves or to collect food for young. The mean direction of travel from the colony was 115.4 degrees with a minimum direction of 40 degrees and maximum of 350 degrees. During most departures, individuals would fly in groups, usually one behind the other in a flight line. The direction and

location of the flight line was consistent throughout the breeding season and 90% of the time they would travel out of sight and beyond 500 meters of the colony. The other 10% of the time, primarily females, would fly to nearby grassland and oak savannah habitats within 200 meters of the nest substrate to forage with relatively quicker returns to the colony.

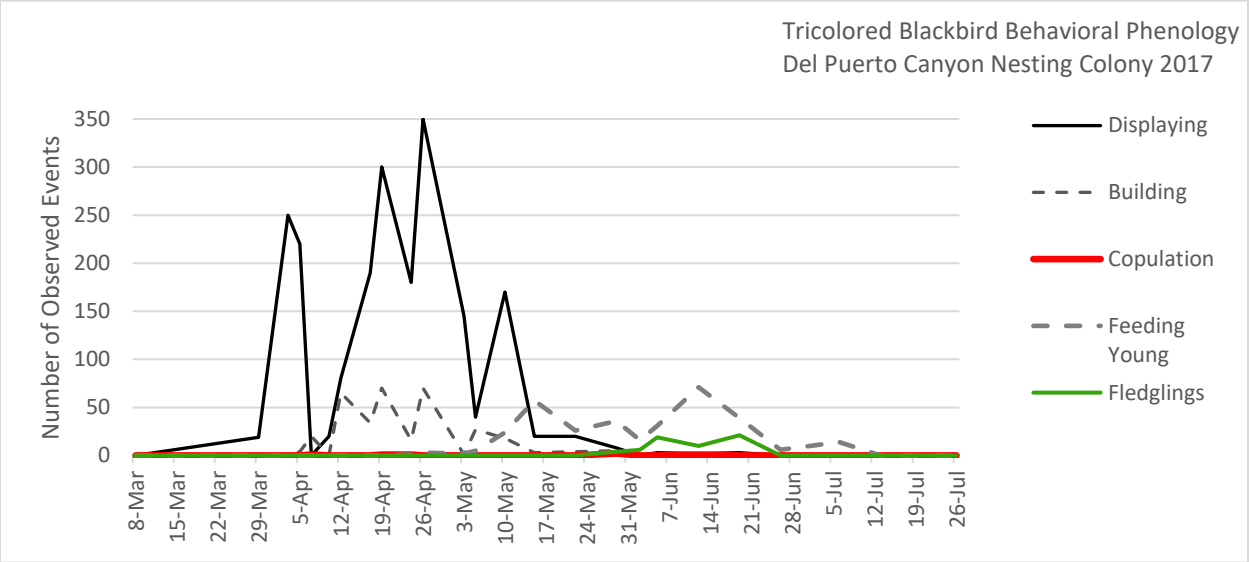

Figure 5. Behavioral phenology of the Del Puerto Canyon nesting colony.

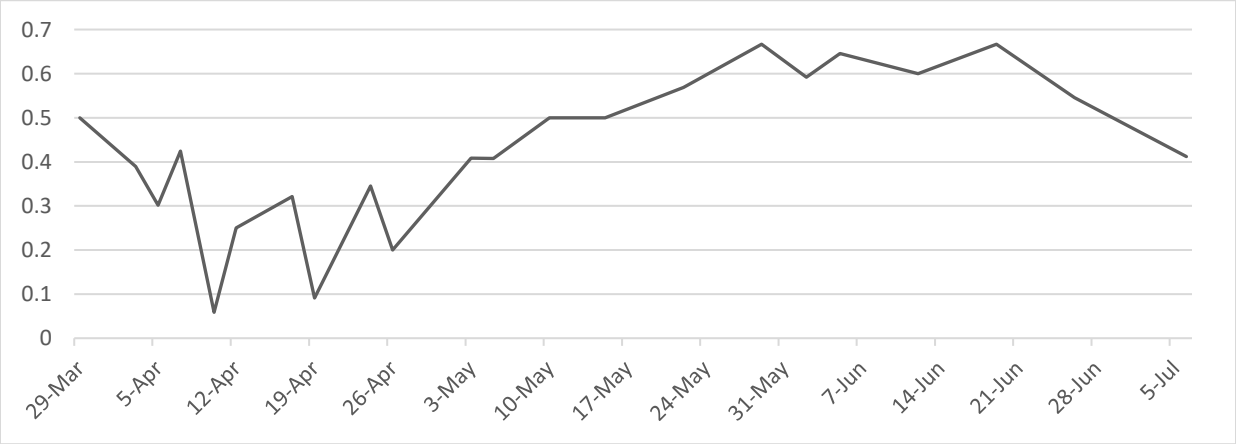

Figure 6. Female percentage observed over the breeding season at the Del Puerto Canyon colony.

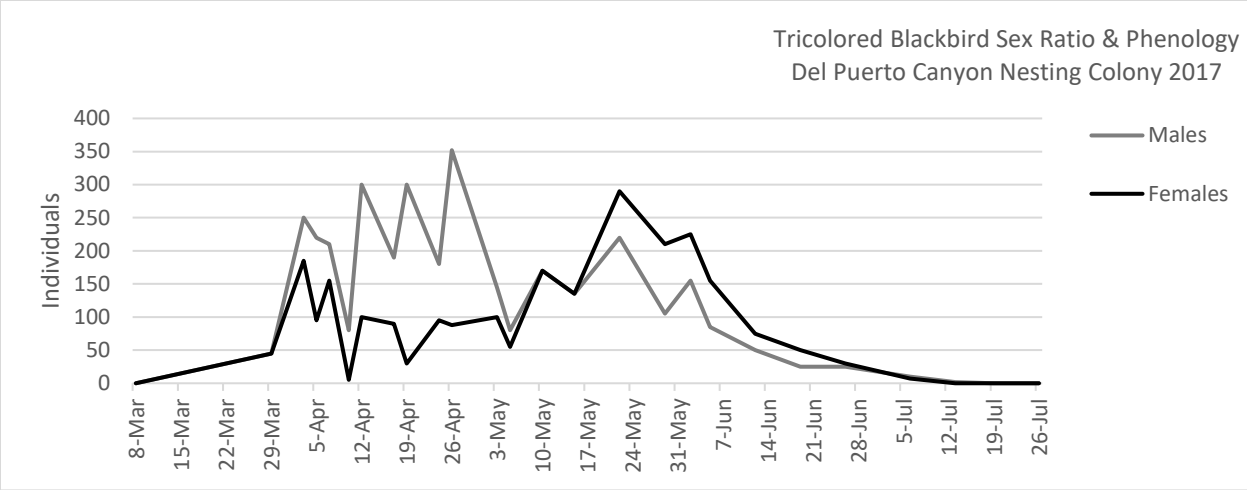

Figure 7. Tricolored blackbird sex ratio and phenology at the Del Puerto Canyon colony in 2017.

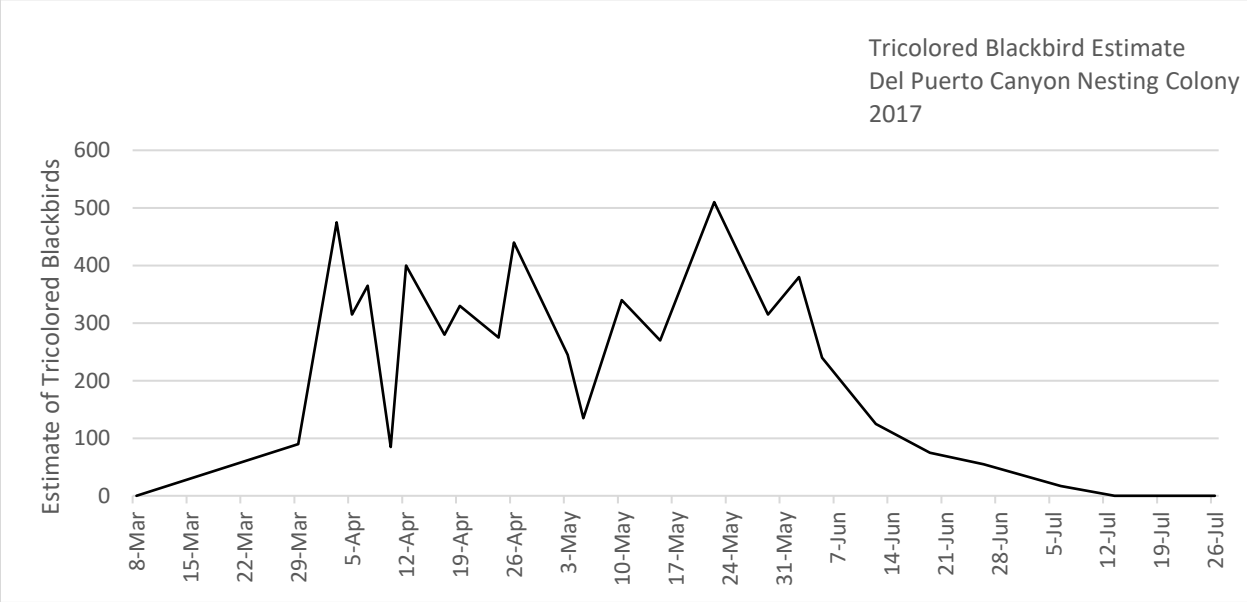

Figure 8. Estimated number of tricolored blackbirds during each monitoring block at the Del Puerto Canyon nesting colony in 2017.

San Antonio Valley Nesting Colony

On 22 May 2017, we observed males and females carrying food to a new nesting colony that was difficult to observe due to the distance from the public road and it being located on private land (37.378787°, -121.489347°) (Figure 9). This nesting colony was discovered during this survey and represents only the fourth tricolored blackbird nesting colony in recent years in Santa Clara County. Observations were made from the public road between 22 May 2017 and 26 July 2017

during 11 days (1 hour monitoring block per day). During these monitoring blocks we estimated between 0 and 90 individuals. However, this is likely not an accurate estimate due to the nesting substrate not being visible from the observation point. We consider the 90 individual estimated to be the minimum number of tricolored blackbirds nesting at this site. Using imagery maps it was determined the habitat of the nesting site to be a dammed creek forming a stock pond with what cattail as nesting substrate. The surrounding habitat was a mix of low-lying grasslands (with cattle grazing), oak savannah and pine-oak woodland. This nesting colony was 2.5 km from the Del Puerto Canyon nesting colony. The phenology of the breeding events was not documented at this colony due its discovery late in the breeding season and accessibility.

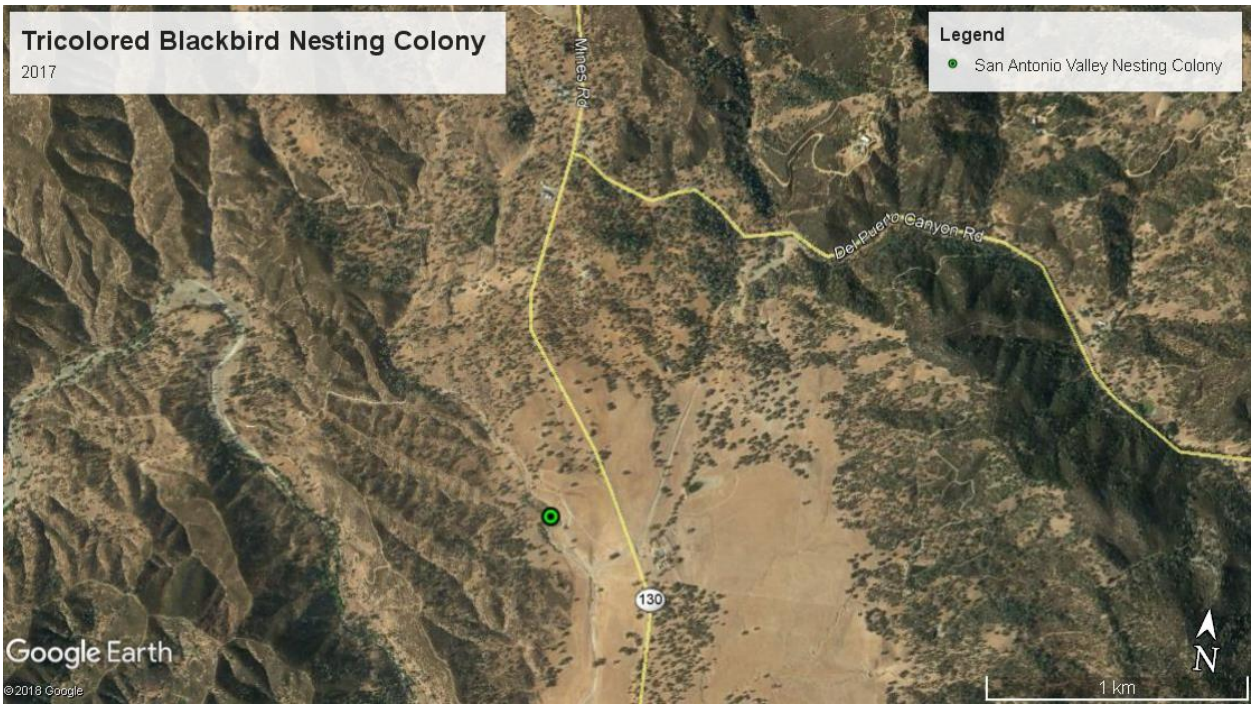

Figure 9. Map of the San Antonio Valley tricolored blackbird nesting colony in 2017.

Cañada de los Osos Ecological Reserve Nesting Colony

The Cañada de los Osos Ecological Reserve colony was the second largest breeding colony of tricolored blackbirds in the survey area during 2017. It was located in the Cañada de Los Osos Ecological Reserve directly on the boundary (37.040109°, -121.421059°) in a stock pond with cattail (Figure 10). The cattail nesting substrate was not as abundant and dense as other sites with cattail. The surrounding habitat is dominated by grassland, oak woodland and cattle pastures.

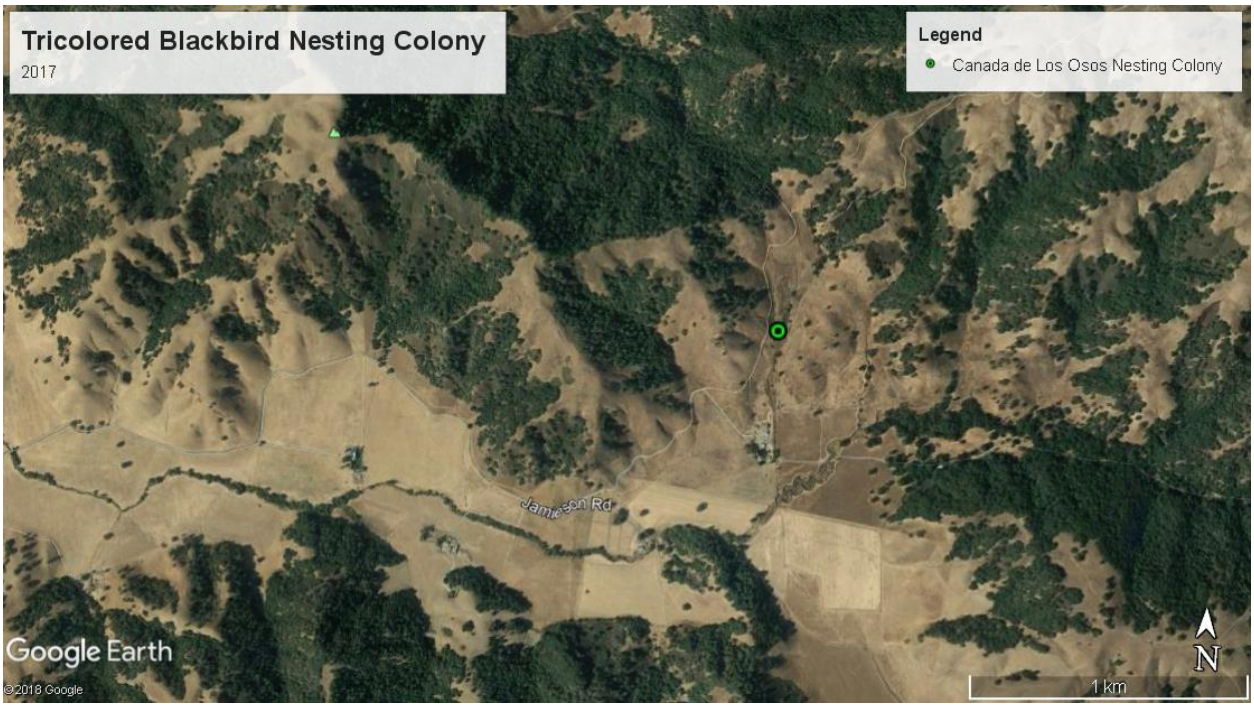

Figure 10. Map of the Cañada de Los Osos Ecological Reserve tricolored blackbird nesting colony in 2017.

The Cañada de Los Osos site was monitored for 15 days (1 hour monitoring block per day) between 14 April and 24 July. Tricolored blackbirds were observed during the first site visit on April 14, when a total of 16 individuals were observed. The number of individuals significantly declined from the colony by 29 June and the last day they were observed at the colony was 10 July. Nest building was first observed on 24 April, which was 19 days later than the Del Puerto Canyon colony. Nest building occurred during a much shorter period than the Del Puerto Canyon colony, which occurred between 24 April and 17 May. There were 10 copulation events observed between 8 and 17 May. Adults were first observed feeding young on 8 May and the last day of feeding nestlings occurred on 29 June (Figure 11). A total of 21 birds fledged from this successful breeding colony.

During the 15 monitoring days throughout the breeding season, tricolored blackbirds were observed during 13 of these days. The mean number of tricolored blackbirds observed during a visit was 82 individuals. The minimum number of individuals estimated during a monitoring block was 0 and the maximum number was 330 on 17 May (Figure 12).

Similar to the Del Puerto Canyon colony, the departing flight direction stayed consistent with a mean departing direction of 155 degrees and a mean range of 110- 240 degrees.

Females often foraged within 100 meters of the nesting substrate in grassland and oak savannah habitats.

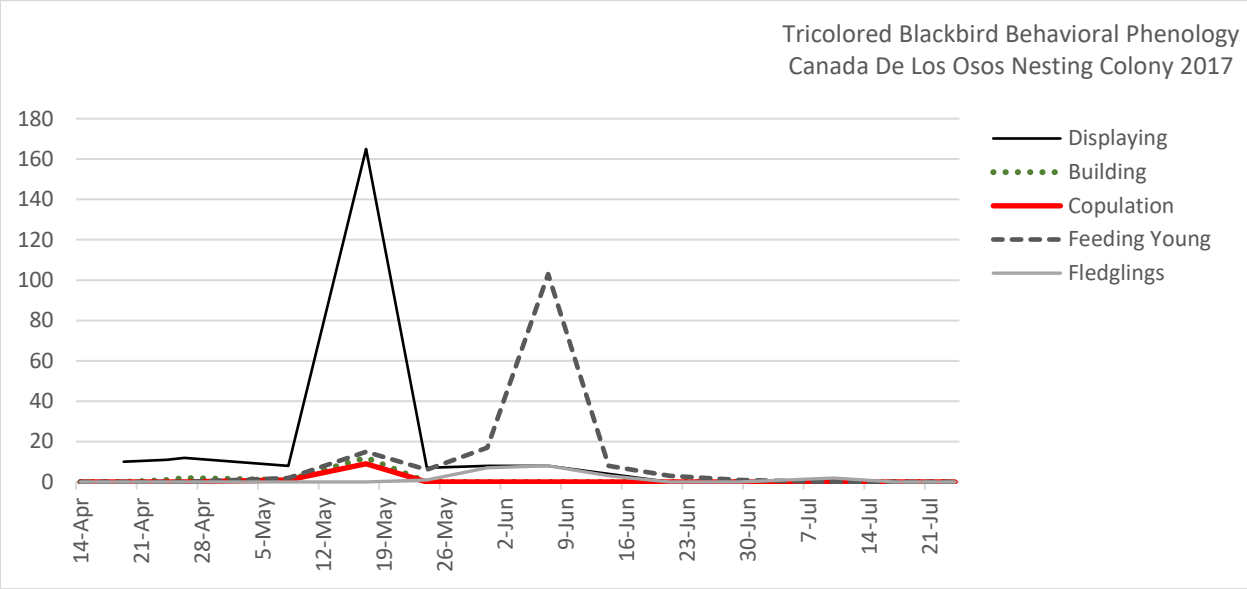

Figure 11. Behavioral phenology of the Canada de Lost Osos nesting colony in 2017.

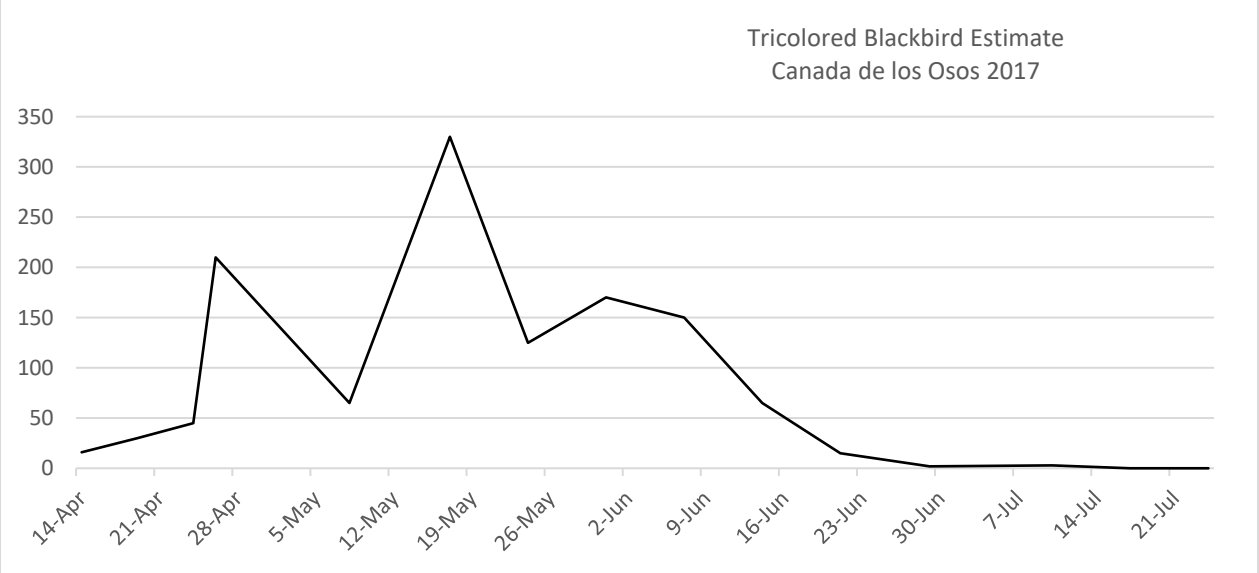

Figure 12. Estimated number of tricolored blackbirds during each monitoring block at the Canada de Los Osos Ecological Reserve nesting colony in 2017.

Calero Reservoir Nesting Colony

The Calero Reservoir nesting colony saw much lower numbers than in previously recorded years (Phillips et. al) The highest count recorded at this site was 4 individuals (3 males and 1 female) between 8 – 31 May, and no breeding was detected during our surveys in 2017. The substrate was dominated by Cattail (90%) with some Tule (*Schoenoplectus acutus*) (10%). Compared to other sites, this area appeared to have had the greatest density of nesting substrate.

Breeding Season Foraging and Prey

During the nesting season between 8 March 2017 and 26 July 2017, 61 observations were made of foraging tricolored blackbirds (Figure 13). The areas included San Antonio Valley (Figure 14), Del Puerto Canyon, Cañada de Los Osos Valley (Figure 15), and Coyote Valley (Figure 16). All were within 2 kilometers of a nesting colony except the Coyote Valley observations. Tricolored Blackbirds were observed in Coyote Valley between 24 May and 27 July during the nesting season. The nearest known nesting colony was approximately 30 kilometers away. These individuals were either non-breeding, there was a nesting colony nearby that was not located, or they were dispersing from the Central Valley after their first clutch. On 5 July, 55 tricolored blackbirds were observed in Coyote Valley, which was the highest count during the nesting season. The number of tricolored blackbirds foraging at one location ranged from 1 to 300. The greatest abundance was located within 200 meters of the Del Puerto Canyon colony.

Foraging during the nesting season occurred primarily in grassland (52%, *n*=32) and oak savannah (18%, *n*=11) habitats with a vegetation height less than 12 inches (Figure 14). The other habitats that were less utilized during the nesting season for foraging included: agriculture, horse stable or pasture, oak woodland, cattle pasture, and chaparral (Figure 17).

Direct observations of prey items was limited due to the difficulty in observing prey in the bill when a tricolored blackbirds returned to their nests or when it was foraging in substrate. Prey items that could be identified included grasshopper, caterpillar, crane fly, robber fly and midge fly. The most exceptional foraging observation we recorded was foraging in trees. On 3 April 2017, tricolored blackbirds were observed gleaning in a blue oak (*Quercus douglasii*), but the prey was not observed. On 10 April 2017, we observed a male Tricolored Blackbird flycatching an unidentified *Efferia* species (robber fly) approximately 5 meters high in a blue oak in San Antonio Valley. The oaks, with recent new growth, had an abundance of robber flies flying in and around them. The male would stand perched on small limbs and wait for a fly to pass by and make a stabbing motion towards them. Occasionally it would jump up to grab them. To our knowledge there are only two other records of tricolored blackbirds foraging in trees. One in a coast live oak (*Quercus agrifolia*) and the other in a Joshua tree (*Yucca brevifolia*) (Terrill et al. 2019). Tricolored blackbirds are opportunistic insectivorous foragers and take advantage of

abundant resources. Robber flies were abundant in the area for a short period of time and it appears that tricolored blackbirds were taking advantage of this abundance.

We observed a similar flycatching behavior, but from the ground, on 23 August 2017 at the Sunnyvale Landfill of a tricolored blackbird feeding on midge flies. From the ground it would hop into the air about 1 meter and grab flies.

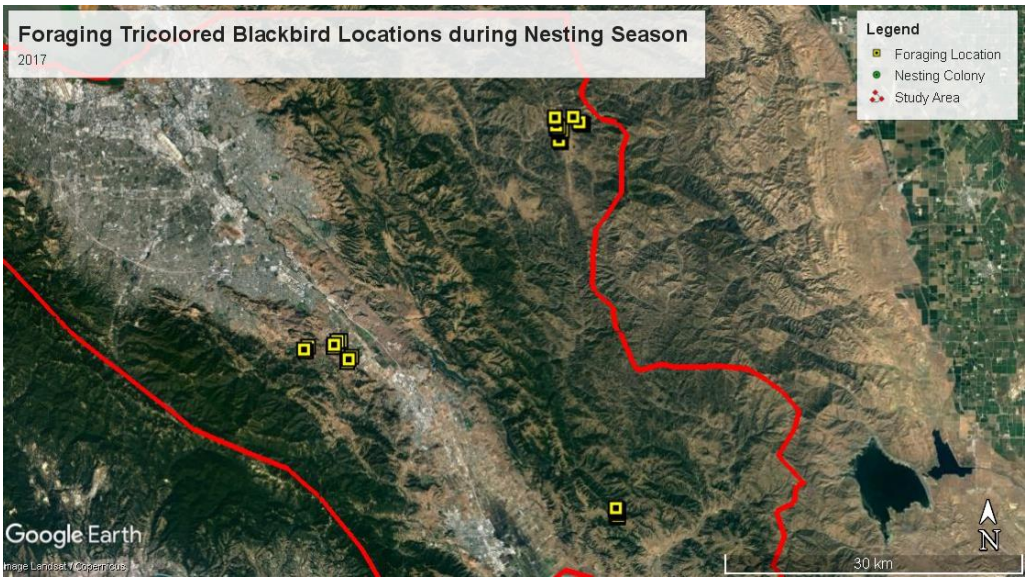

Figure 13. Map of foraging tricolored blackbirds during the 2017 nesting season.

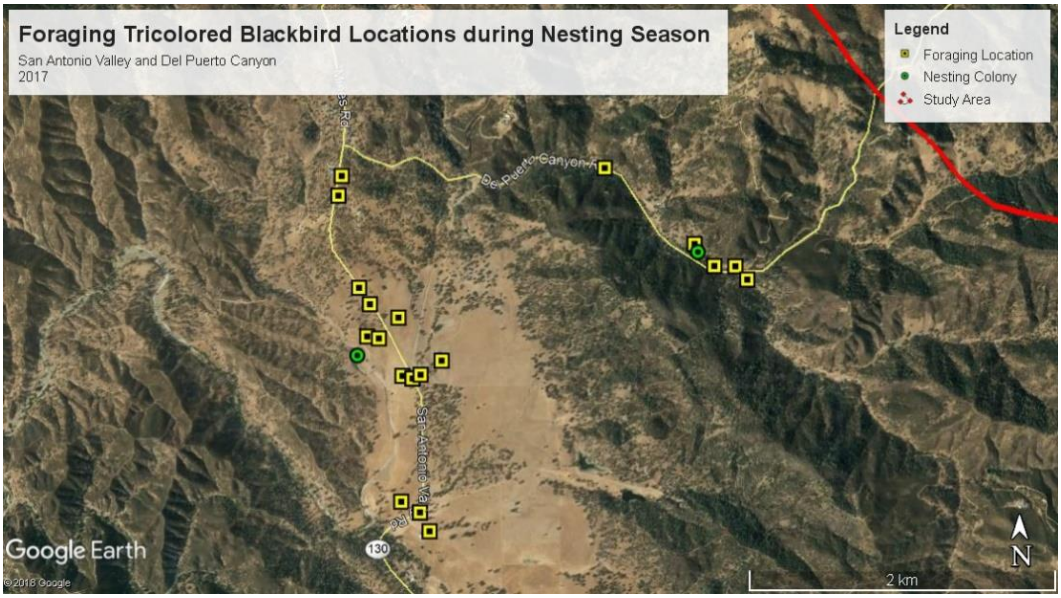

Figure 14. Observations of foraging tricolored blackbirds during the 2017 nesting season in San Antonio Valley and Del Puerto Canyon.

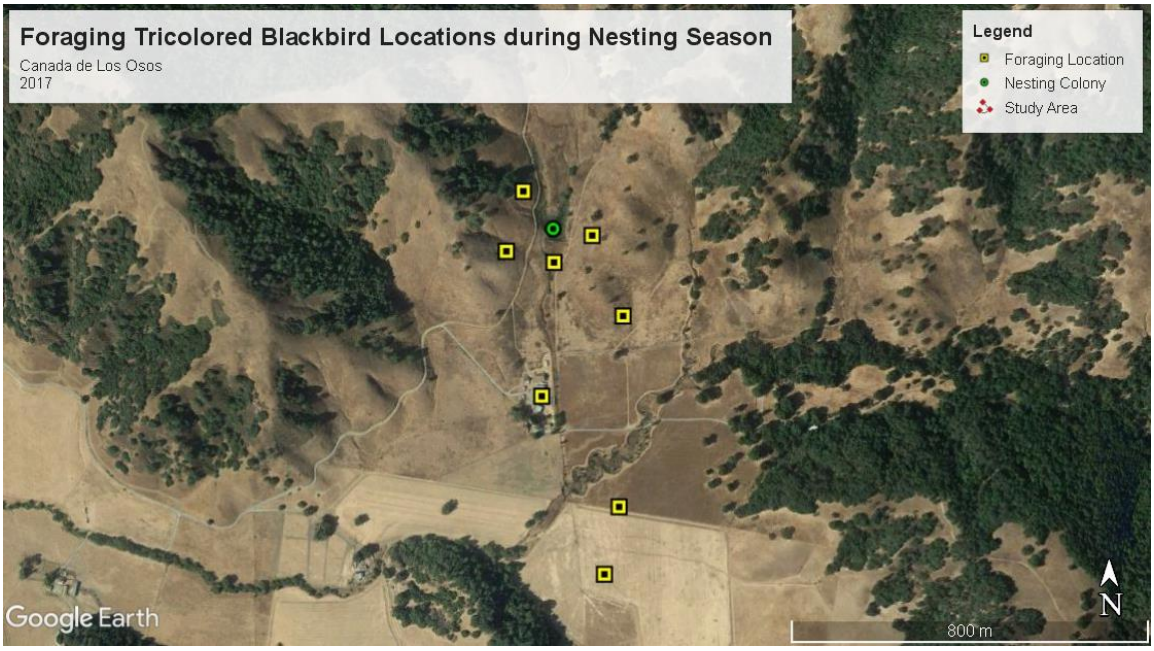

Figure 15. Observations of foraging tricolored blackbirds during the 2017 nesting season around the Cañada de Los Osos nesting colony.

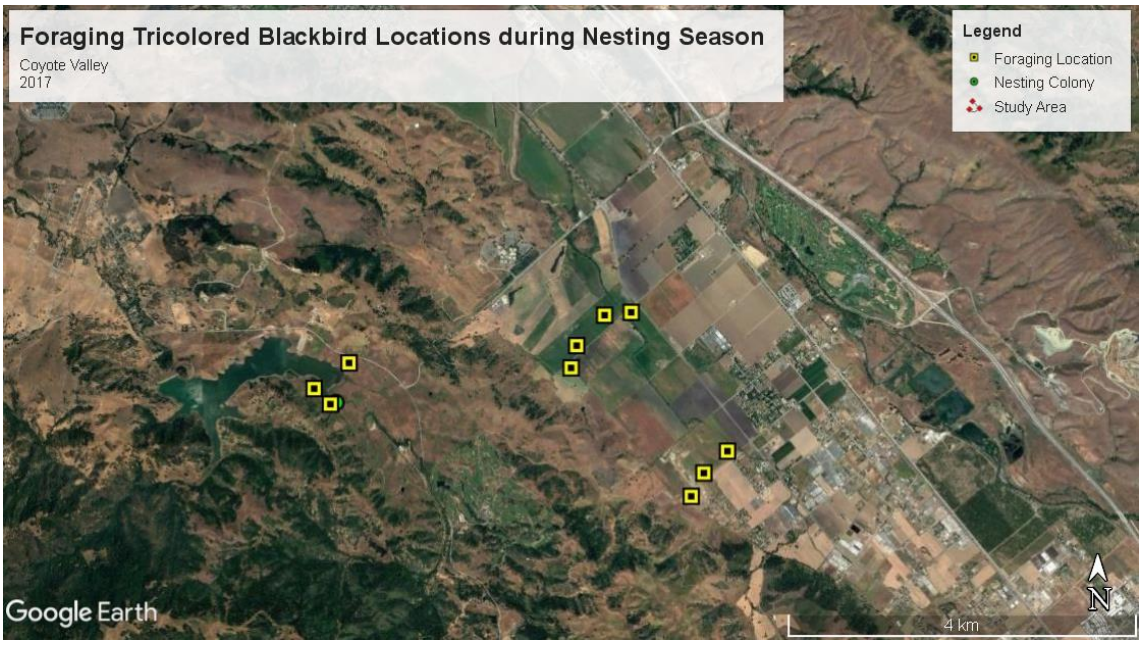

Figure 16. Observations of foraging tricolored blackbirds during the 2017 nesting season in Coyote Valley.

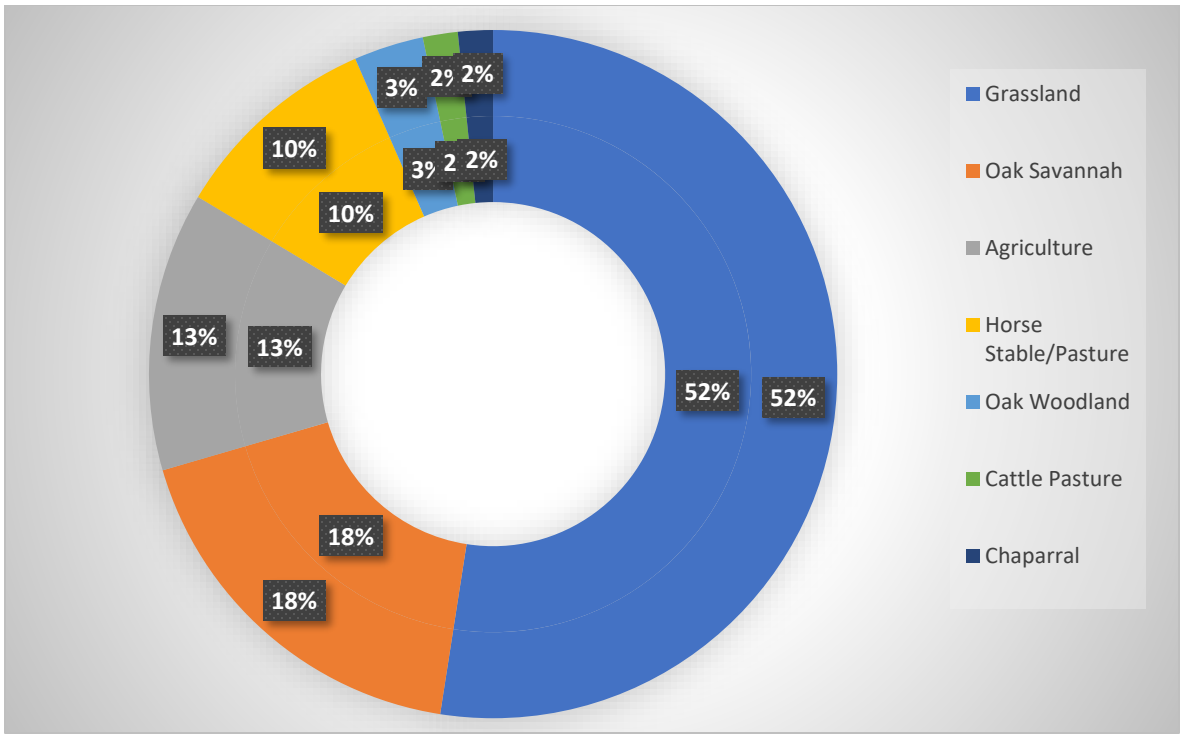

Figure 17. Percentage of habitat type utilized by tricolored blackbirds for foraging during the 2017 nesting season.

Non-breeding Season

Between 24 August 2017 and 5 March 2018 during the non-breeding season, 122 locations throughout the study area were surveyed for foraging tricolored blackbirds. Of those 122 locations, 24 of them (19.7%) had tricolored blackbirds present (Figure 13). The number of tricolored blackbirds observed at the 24 locations on a monitoring day ranged from 1-140 (mean = 22.1).

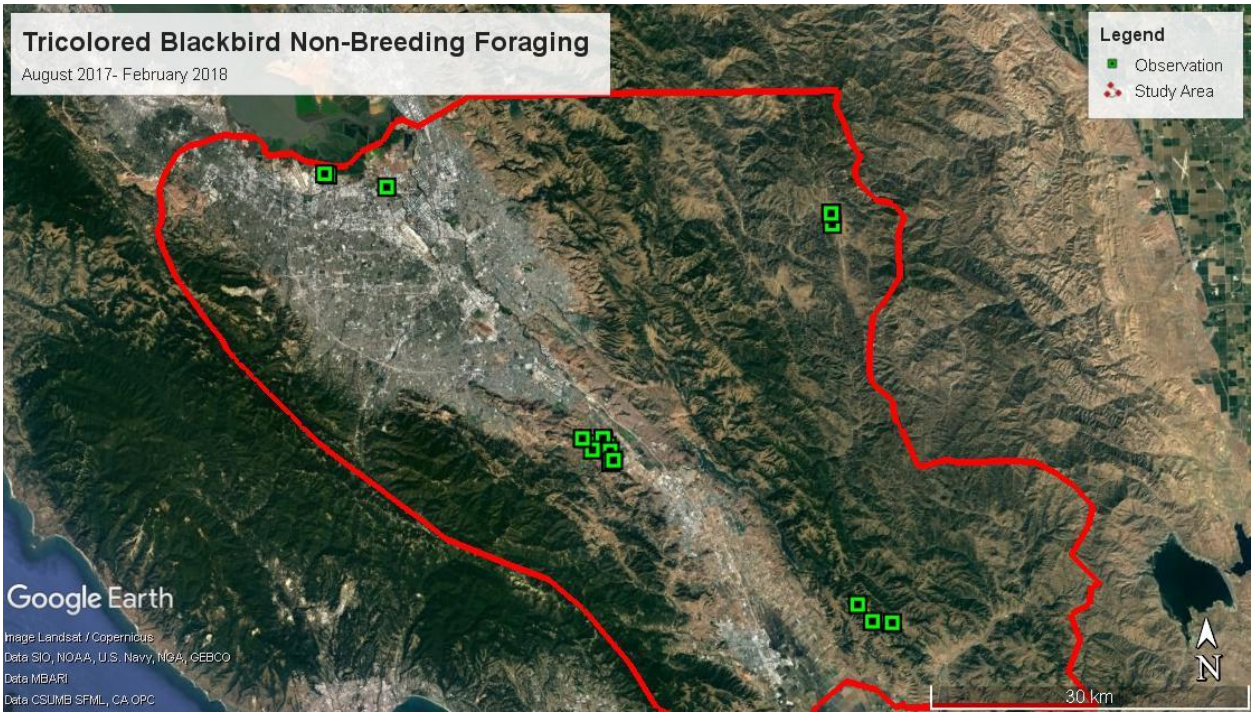

Figure 18. Tricolored blackbird locations during the non-breeding season from September 2017 – February 2018.

The habitat used during the non-breeding season included agriculture, domestic animal pasture, grassland, and oak savannah. The most common habitats used were agriculture (35%) and domestic animal pastures (30%). Agriculture included corn, fallowed alfalfa and walnut orchard. The most common domestic animal pasture used was cattle pasture, with horse pastures and goat stables also utilized for foraging. All foraging observations were within 500 meters to a water source. The water sources in general varied from a watering trough to a flooded field. Vegetation height in habitat where tricolored blackbirds were observed was measured on a scale of "0" to "5" (0 = bare ground, 1 = <6", 2 = 6"-2", 3 = 2"-3", 4 = 3'-4', 5 = >4') with a mean of approximately 9 inches

Table 3. Observations of tricolored blackbirds during the non-breeding season.

Date	Location	# of TRBL	Habitat	Height of Substrate
23 Aug 2017	Coyote Valley- E Laguna Ave.	1	agriculture-corn	0
23 Aug 2017	Coyote Valley- Santa Teresa	10	horse stable	1
14 Sep 2017	San Antonio Valley	140	grassland/cattle	0
14 Sep 2017	San Antonio Valley	36	oak savannah	1
14 Sep 2017	Coyote Valley- W Laguna Ave	20	fallowed agriculture	0
14 Sep 2017	Coyote Valley- W Laguna Ave	30	cattle pasture	1
14 Sep 2017	Coyote Valley- IBM	1	fallowed agriculture	2

14 Sep 2017	Coyote Valley- E Laguna Ave	3	agriculture- corn	1
14 Sep 2017	Coyote Valley- Santa Teresa	30	goat farm	0
14 Sep 2017	Coyote Valley- Santa Teresa	25	walnut orchard	0
14 Sep 2017	Coyote Valley- Palm Ave	4	horse stable	0
14 Sep 2017	Cañada Road	1	oak savannah	2
9 Oct 2017	San Antonio Valley	36	cattle pasture	0
27 Oct 2017	Coyote Valley- E Laguna Ave	6	agriculture- corn	1
27 Oct 2017	Coyote Valley- Palm Ave	1	horse pasture	0
13 Nov 2017	Sunnyvale Landfill	14	grassland	1
13 Nov 2017	Sunnyvale Landfill- parking	1	treatment plant	0
20 Nov 2017	San Antonio Valley	5	grassland	1
14 Dec 2017	San Antonio Valley	25	grassland	1
10 Jan 2018	Coyote Valley- Bailey/Santa Ter	50	agriculture	0
11 Jan 2018	Ulistac Natural Area	250	riparian	5
26 Feb 2018	Coyote Valley- Palm Ave	2	cattle pasture	2
26 Feb 2018	Cañada Road	40	cattle pasture	0
26 Feb 2018	Hot Springs Road	75	oak savannah	1

Height of substrate scale: 0 = bare ground, 1 = <6”, 2 = 6”-2”, 3 = 2”-3”, 4 = 3’-4’, 5 = >4’

DISCUSSION

Of the seven historical nesting sites within the last 40 years, only two of these sites had nesting tricolored blackbirds during our monitoring in the 2017 breeding season. This is a 71.4% decline of nesting colonies in Santa Clara County. Furthermore, of the successful nesting colonies that were monitored, Del Puerto Canyon and Cañada de Los Osos, maximum estimates of tricolored blackbirds were 510 and 330 individuals respectively. In the 1990’s, two nesting colonies in Santa Clara County had an estimated 1,350 and 2,000 individuals. The loss of large nesting colonies is indicative of a significant decline for the species (Tricolored Blackbird Portal 2019). However, the discovery of a new nesting colony is a good indicator for the species locally. The proximity of the new San Antonio Valley nesting colony to the Del Puerto Canyon Road nesting colony (currently the largest colony in Santa Clara County) may indicate that the Del Puerto Canyon colony has reached its carrying capacity and tricolored blackbirds are dispersing from it to colonize new areas with suitable nesting habitat.

This monitoring was only conducted during a single breeding season and areas on private property where suitable habitat is suspected were not surveyed. Throughout the Central Valley tricolored blackbirds are known to move between breeding sites after nesting attempts in a single breeding season, as well as between breeding sites from year to year. Therefore, future annual surveys within Santa Clara County are critically important as tri-annual statewide breeding surveys may miss tricolored nesting sites and nesting seasons.

In 2017, Santa Clara Valley Water District Biologist, Shawn Lockwood, observed a female tricolored blackbird carrying food to a potential nest at the Calero County Park historic nesting colony (S. Lockwood pers. comm, Appendix C.1.9). During our surveys at this site we observed multiple males and a single female, but did not observe any evidence of nesting. S. Lockwood's observation is important to note in this report as they may indicate that at least one pair did nest at this location in 2017 warranting protection of the Calero County Park historic nesting site as it may have future nesting attempts.

It has been hypothesized (R. Meese pers. comm) that Central Coast breeding tricolored blackbirds may be individuals that first make a breeding attempt in the Central Valley then after the first brood or unsuccessful first brood they move to coastal areas and attempt a second brood. We do not suspect this to be occurring in Santa Clara County due to the fact that birds were observed early in the nesting season when the species commences breeding. We first observed birds in the nesting colonies on 29 March and 14 April and observed them within 3 miles of a nesting colony throughout the year.

Many sites with suitable breeding habitat (nesting substrate present and close proximity to a water source) were identified throughout the study area. However, a potential limiting factor could be food availability in the surrounding landscape or lack of foraging habitat. Future research should be conducted on prey structure and availability in foraging grounds during the breeding season and how land use impacts their foraging and success. We identified Coyote Valley, San Antonio Valley and Cañada Road as key non-breeding foraging areas for Tricolored Blackbirds in Santa Clara County. Unfortunately, these areas are primarily on private property making further research difficult.

With the recent decline and local loss in breeding colonies of tricolored blackbirds we recommend that any nesting or foraging areas be protected in Santa Clara County and through partnerships with private land owners that have tricolored blackbirds on their property. Currently, only one nesting colony of tricolored blackbirds is on public land, Cañada de Los Osos Ecological Reserve. Land managers of public lands that have suitable breeding habitat for Tricolored Blackbirds should protect this habitat and maintain the nesting substrate (cattail or tule). These areas include Calero County Park, where tricolored blackbirds have nested in recent years, and Coyote Creek County Park in Coyote Valley at Ogier Ponds and Coyote Ranch Road where currently high quality nesting substrate exists. These areas have higher quality (greater abundance of substrate) and more expansive potential for foraging habitat compared to other areas in Santa Clara County. Furthermore, we recommend that foraging habitat in Coyote Valley, San Antonio Valley and Cañada Road be protected through land acquisition or conservation easements with a combination of protecting nesting habitat adjacent to these areas to ensure that

enough habitat for Tricolored Blackbirds exists to prevent their extirpation in Santa Clara County.

RECOMMENDATIONS

1. Continuous biological monitoring during both the breeding and non-breeding seasons of Tricolored Blackbirds in Santa Clara County and surrounding areas with suitable habitat
2. Research on the limiting factors of Tricolored Blackbird breeding success and presence, such as prey and habitat availability.
3. The protection of areas with breeding colonies and foraging Tricolored Blackbirds through land acquisition or conservation easements with subsequent management for nesting Tricolored Blackbirds.
4. Areas already protected throughout Santa Clara County with suitable or potential Tricolored Blackbird habitat should manage the wetlands and foraging habitats to encourage Tricolored Blackbirds establishment. This includes restoring wetland, riparian and grasslands ecosystems.
5. Potential foraging habitat near and surrounding suitable breeding sites should be enhanced for insects to increase prey availability for Tricolored Blackbirds.
6. Alfalfa farmers throughout Santa Clara County, specifically in Coyote Valley, should be incentivized to continue farming alfalfa and a coalition between alfalfa farmers and Tricolored Blackbird conservationists and land managers should be established.
7. Establish a working relationship with private land owners in Santa Clara County that have Tricolored Blackbirds on their land.

ACKNOWLEDGEMENTS

This monitoring project was supported by a Natural Community Conservation Program Local Assistance Grant (Grant Agreement Number P1682902) with a matching grant from the Santa Clara Valley Habitat Agency. Talon Ecological Research Group is thankful for the agencies support in this project and understanding the importance to monitor this declining species. We would like to thank Ryan Bourbour, Stephanie Klein, Breanna Martinico, and Kate Matthews for volunteering their time to assist with conducting surveys.

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APPENDIX A: DATA SHEETS

A-1.1. Tricolored Blackbird nesting colony monitoring data sheet for the 1 hour surveys.

Tricolored Blackbird Monitoring Field Data Sheet

TALON ECOLOGICAL RESEARCH GROUP

SITE: _____
DATE: _____
OBSERVERS: _____
START TIME: _____ END TIME: _____
Start: %cc ____ wind: ____ Temp: ___ Precip: _____
Middle: %cc ____ wind: ____ Temp: ___ Precip: _____
End: %cc ____ wind: ____ Temp: ___ Precip: _____

NESTING SHEET

Field Equipment List:

- Binoculars, spotting scope, data sheets and compass

**Each site visit is a 1 hour monitoring block, but it can exceed the hour to obtain all data*
***For the two surveys, visually count or estimate number of individuals at the start and end of the 20 min counts. Then to obtain estimate use the following formulas:*
IF total birds out>in then use this formula: Estimate=(Total in+Total out)-(End count-total in)
IF total birds in>out then use this formula: Estimate=(Total in+Total out)-(Start count-total out)

TRICLORED BLACKBIRD DATA

Number of TRBL Present:	Males:		Females:	
Number of active nests estimated:				
Number of Individual's Behaviors	Territorial Males (Singing & Displaying):	Females Nest Building/ Incubating:	Copulations:	Adults Carrying Food/Feeding Young:
Adult Flight Directions (compass bearing) Record the first adult seen every 2 minutes	Arriving (n=30) ____		Departing (n=30) ____	
Estimated distance to foraging grounds	Direction (n=30) ____		Distance (n=30) ____	
Start Count:_____ **Colony Survey 1 First 20 minutes** **End Count:_____**	Female Out: Total: _____	Female In: Total: _____	Male Out: Total: _____	Male In: Total: _____
Start Count:_____ **Colony Survey 2 Last 20 minutes** **End Count:_____**	Female Out: Total: _____	Female In: Total: _____	Male Out: Total: _____	Male In: Total: _____
Number of Fledglings being fed:				

NOTES:

A.1.2. Tricolored Blackbird non-breeding season monitoring data sheet for field surveys.

Tricolored Blackbird Monitoring Field Data Sheet
Foraging/Wintering Monthly Surveys

TALON ECOLOGICAL RESEARCH GROUP

Directions:
For each site visited record the below data. Describe in as great of detail the habitat. For each site visit include a thorough description of the location along with a GPS point. For agricultural habitats describe what type of agriculture it is. Ex. recently plowed oats, alfalfa, corn, etc. For foliage heights estimate the height of the immediate area where blackbirds are foraging, not the entire area. Estimate the total number of all blackbirds in area, including non-Tricolored. For recording Tricolored include the number of females, males, juveniles and unknown. For all sites visited you must record the data even if no blackbirds are observed. **FOR ALL SITES TAKE A PHOTO SO WE CAN OBSERVE CHANGE OVER SEASON.**

Habitat Types:
Grassland, wetland, oak woodland, oak savannah, agriculture, fallowed agriculture, cattle pasture, other
Foliage Height Categories
0: bare ground 1: less than 6" 2: 6"-2' 3: 2'-3' 4: 3'-4' 5: >4'

				# of Tricolored							
Site (Description and GPS)	*Date*	*Time*	*Observers (Initials)*	*F*	*M*	*J*	*U*	*# of Blackbirds*	*Habitat*	*Height*	*Comments (Photo #'s)*

APPENDIX B: PHOTOS OF BREEDING SEASON

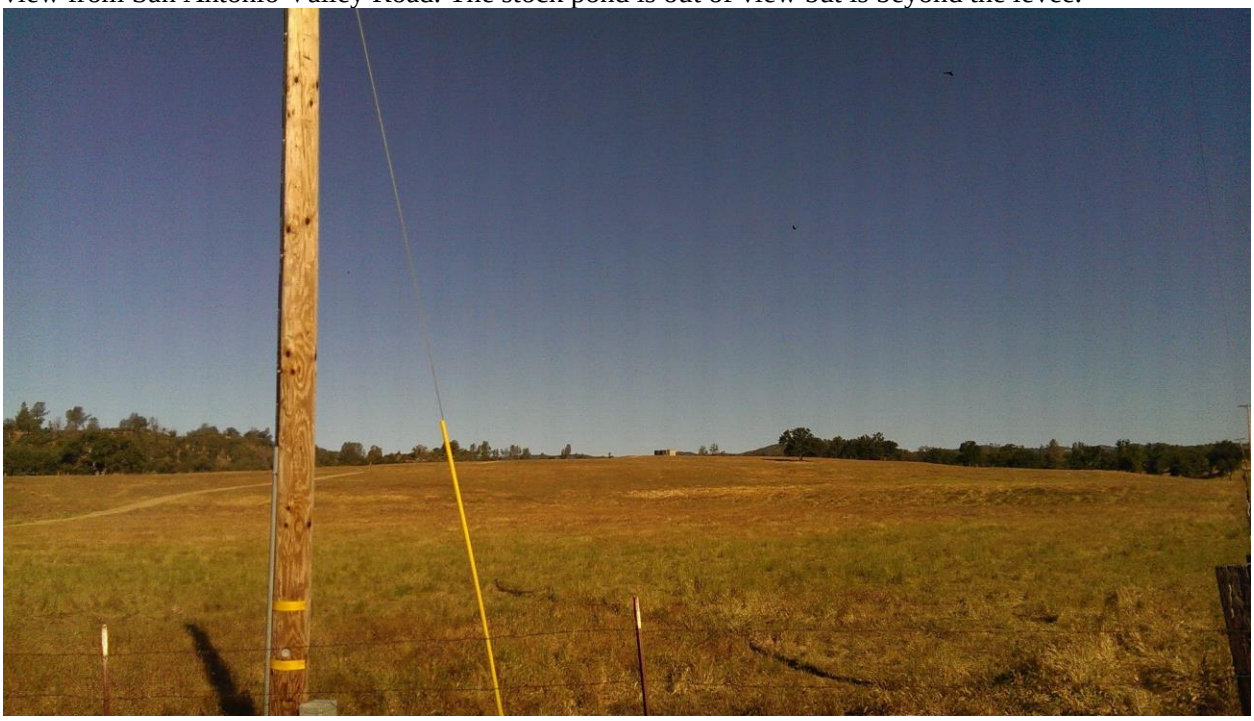
B.1.1. Flock of ~175 tricolored blackbirds in San Antonio Valley on 8 March 2017.

B.1.2. Male and female tricolored blackbirds at Del Puerto Canyon nesting colony on 29 March 2017.

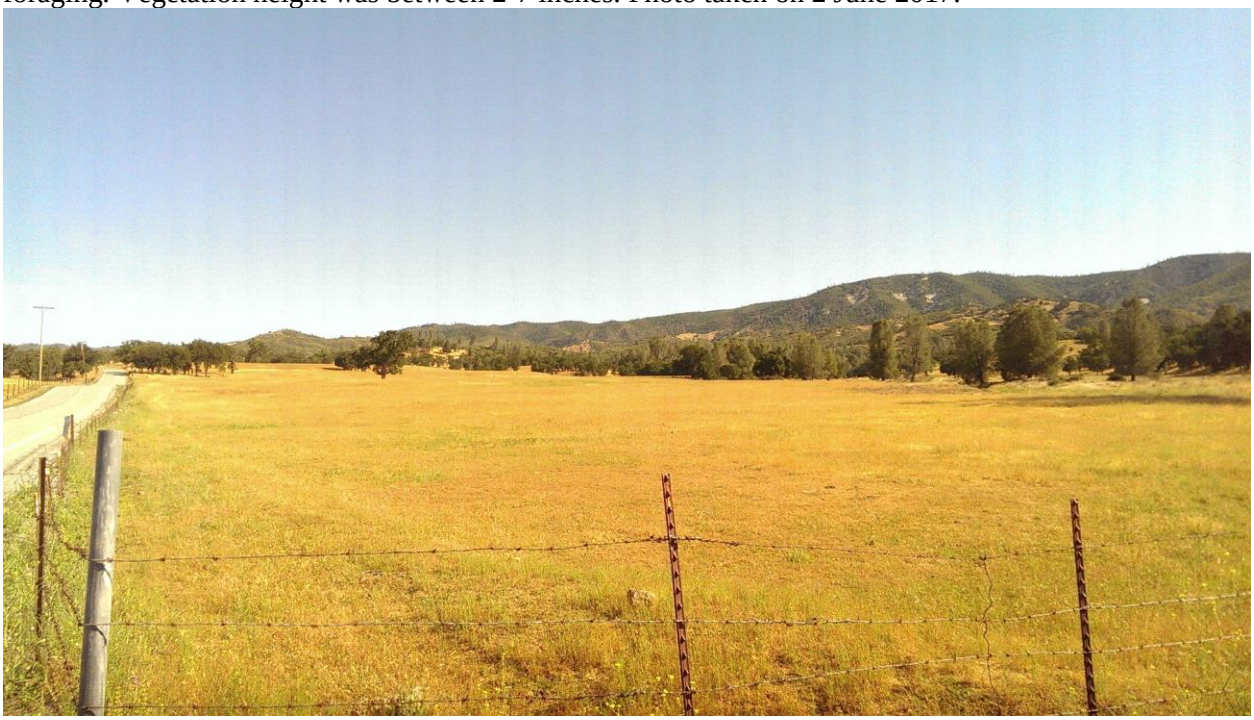
B.1.3. Del Puerto Canyon tricolored blackbird nesting colony habitat on 29 March 2017.

B.1.4. Del Puerto Canyon tricolored blackbird nesting colony survey point on 10 May 2017.

B.1.5. Newly discovered tricolored blackbird nesting colony in San Antonio Valley on 15 May 2017. The view from San Antonio Valley Road. The stock pond is out of view but is beyond the levee.



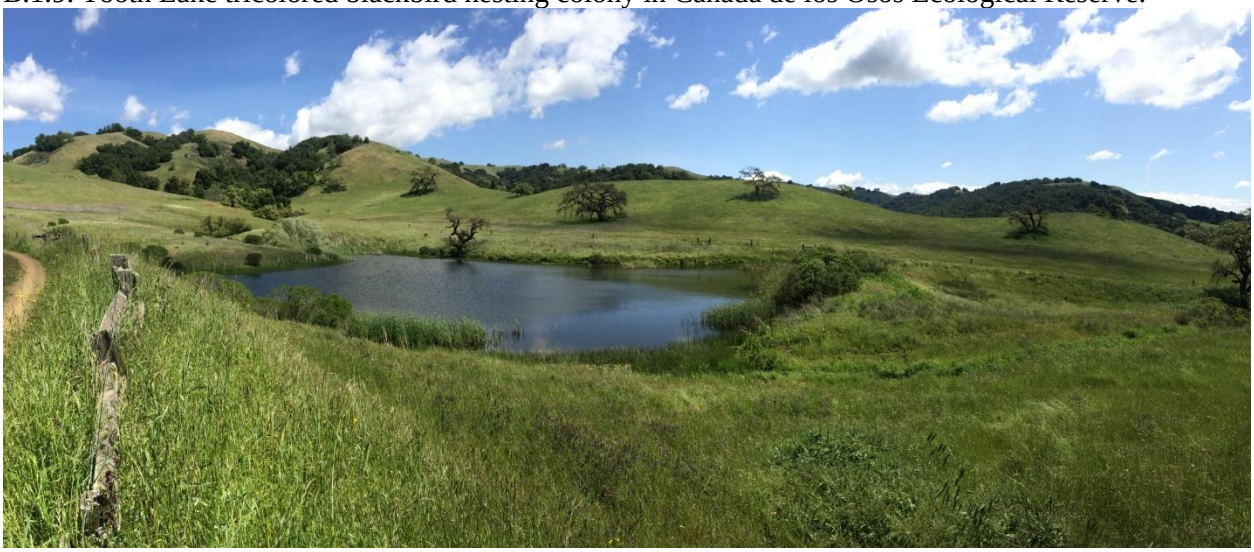
B.1.6. Grassland habitat in San Antonio Valley where a majority of tricolored blackbirds were observed foraging. Vegetation height was between 2-7 inches. Photo taken on 2 June 2017.



B.1.7. Tricolored blackbirds foraging in San Antonio Valley on 10 April 2017.

B.1.8. Cattle grazing on nesting substrate (cattail) at the Del Puerto Canyon nesting colony.

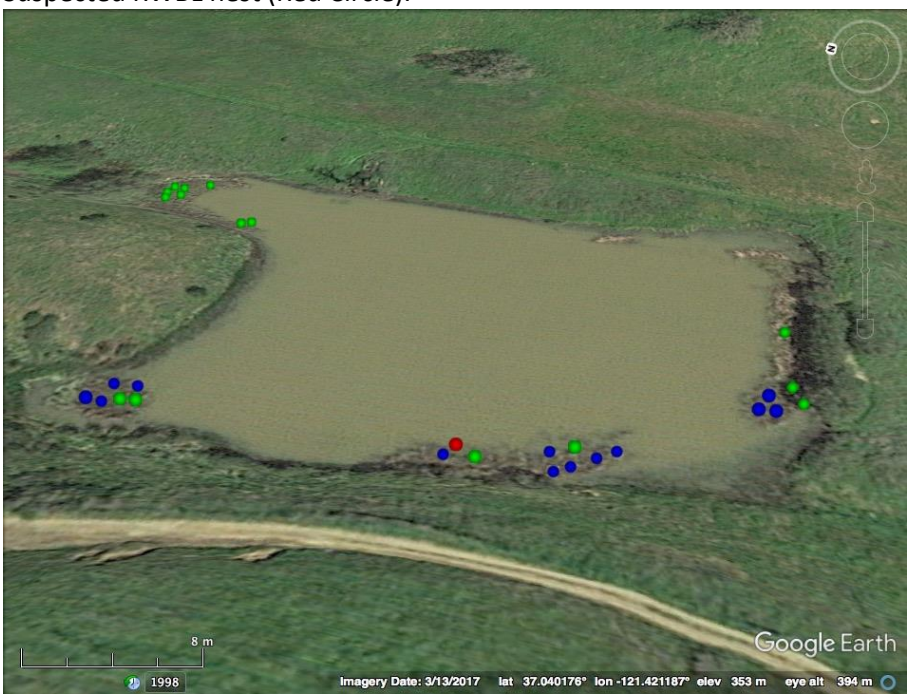
B.1.9. Tooth Lake tricolored blackbird nesting colony in Cañada de los Osos Ecological Reserve.



B.2.0. The North side of Tooth Lake tricolored blackbird nesting colony in Cañada de los Osos Ecological Reserve where most of the activity occurred.

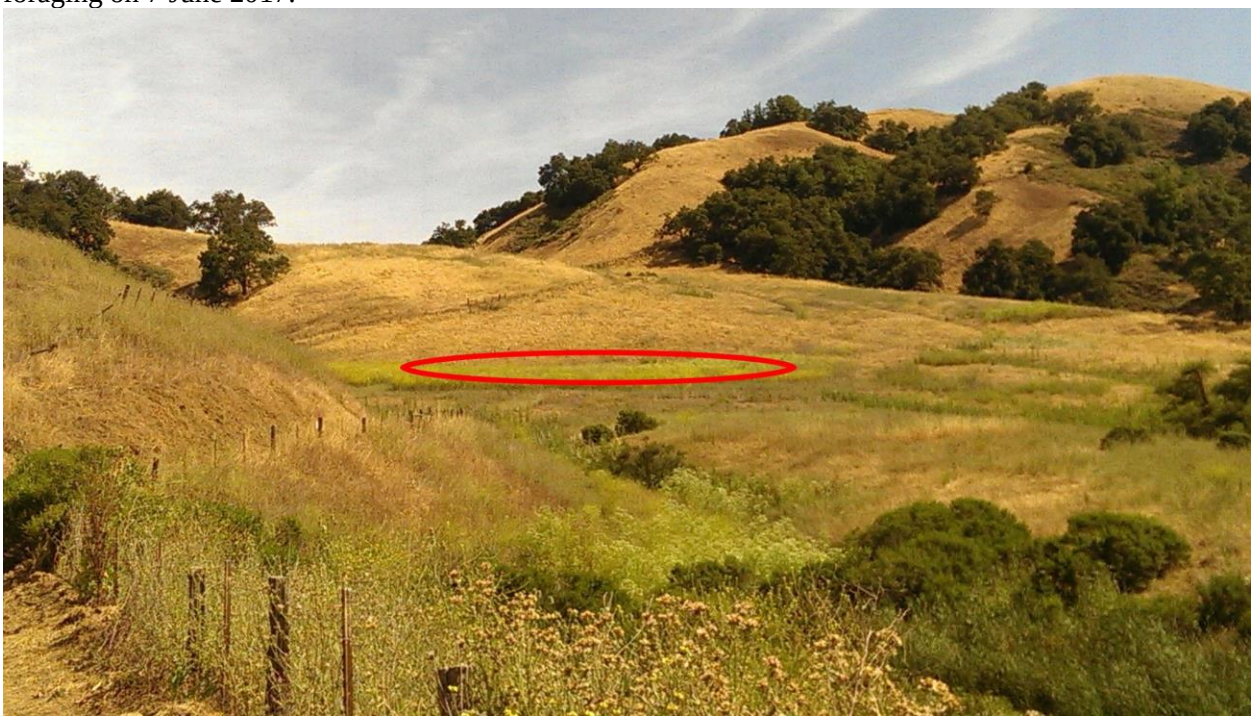
B.2.1. Male and female tricolored blackbird at a nest located in northwest corner of Tooth Lake.

B.2.2. Tooth Lake nest. Visually confirmed TRBL nest (Blue Circle). Suspected TRBL nest (Green Circle). Suspected RWBL nest (Red Circle).



B.2.3. Tricolored blackbird foraging area directly west across the trail from Tooth Lake. Photo taken on 24 May 2017.

B.2.4. Patch of mustard 200 meters north of Tooth Lake colony where tricolored blackbird was observed foraging on 7 June 2017.

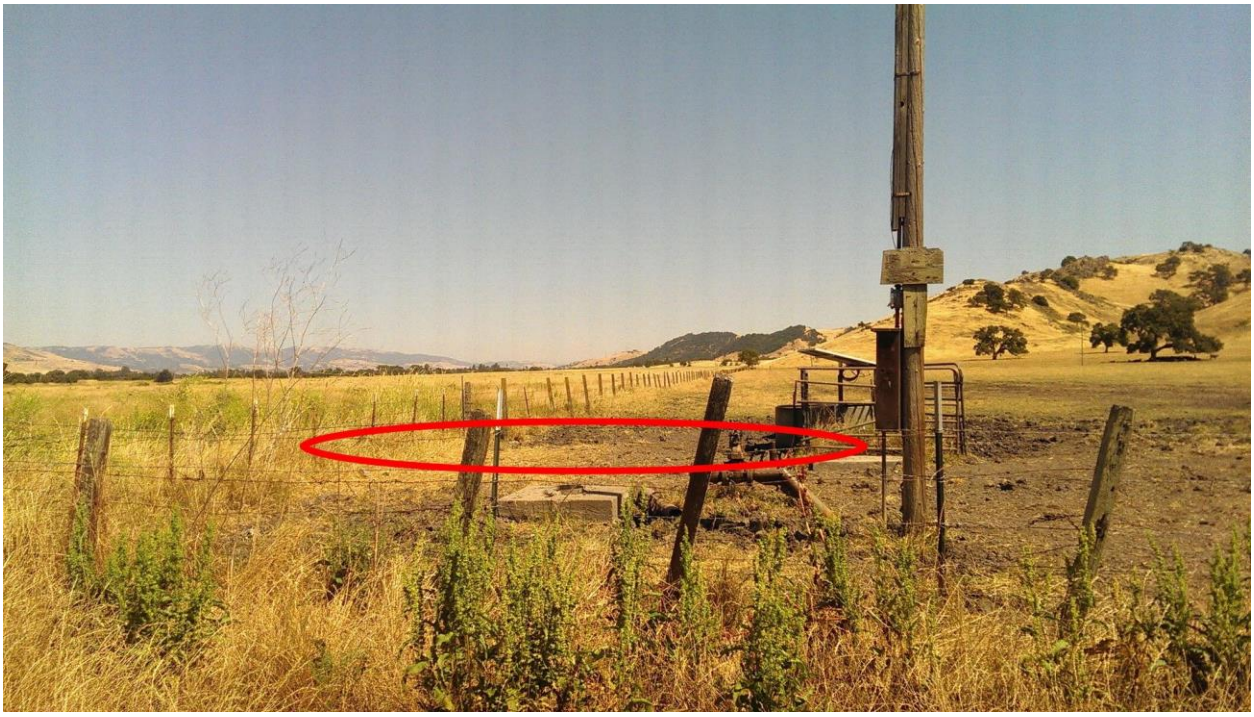


B.2.5. Male tricolored blackbird at Tooth Lake with small unknown prey item on 7 June 2017.

B.2.6. Tricolored blackbird food soliciting fledgling perched on cattail in the east end of Del Puerto Canyon nesting colony on 12 June 2017.

B.2.7. View north of south Calero Reservoir colony. The area of cattail occupied by tricolored blackbirds (red circle) during monitoring on 12 May 2017.

B.2.8. Cattail occupied by tricolored blackbirds at south Calero Reservoir.

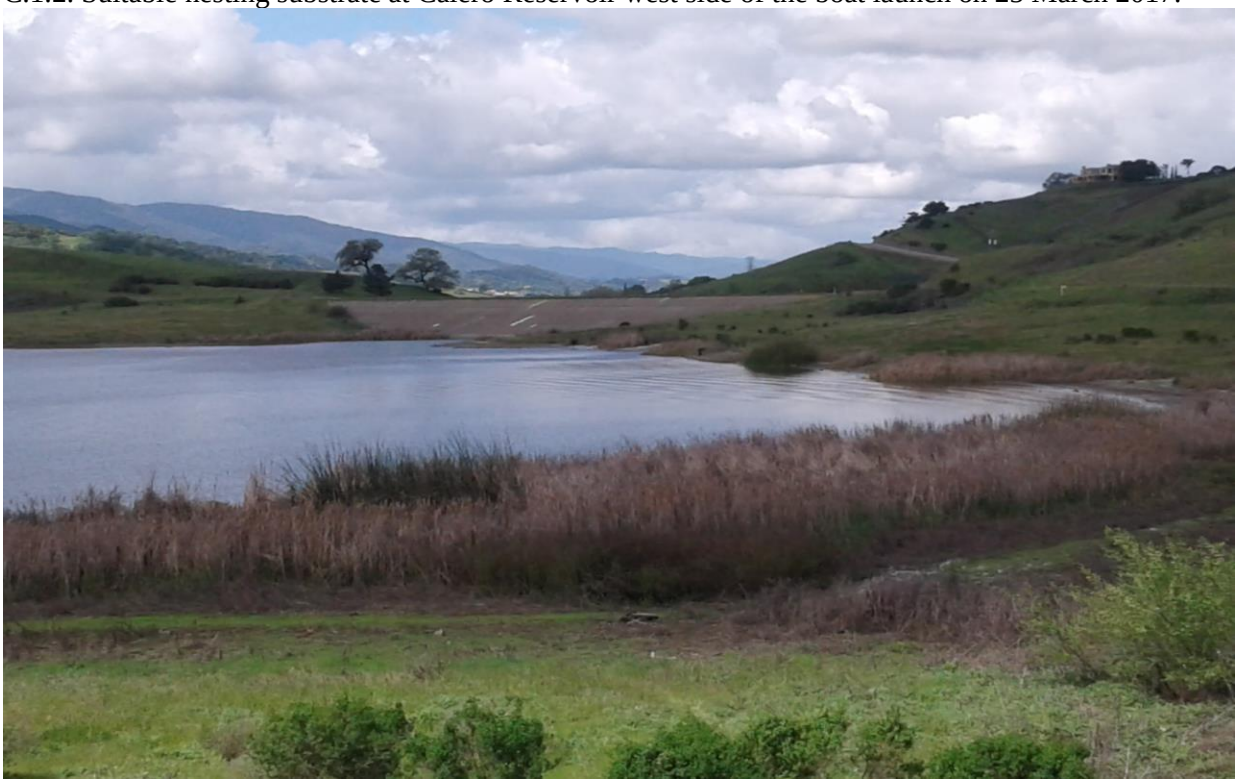


B.2.9. Location and habitat occupied by tricolored blackbirds on Laguna Avenue in Coyote Valley on 21 June 2017.

APPENDIX C. PHOTOS OF NON-BREEDING SUITABLE HABITAT SITES

C.1.1. Suitable nesting habitat for tricolored blackbirds at Cherry Canyon Road Pond below the Calero Reservoir dam on 25 March 2017.

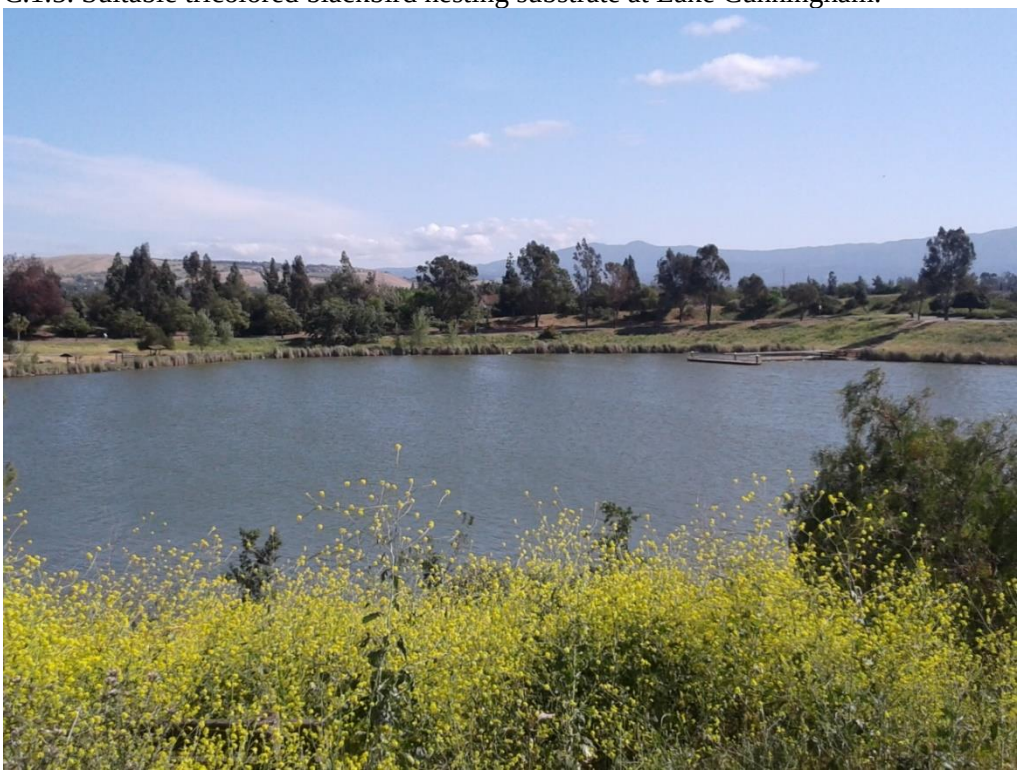
C.1.2. Suitable nesting substrate at Calero Reservoir west side of the boat launch on 25 March 2017.



C.1.3. Suitable nesting substrate at Calero Reservoir east side of the boat launch on 25 March 2017.

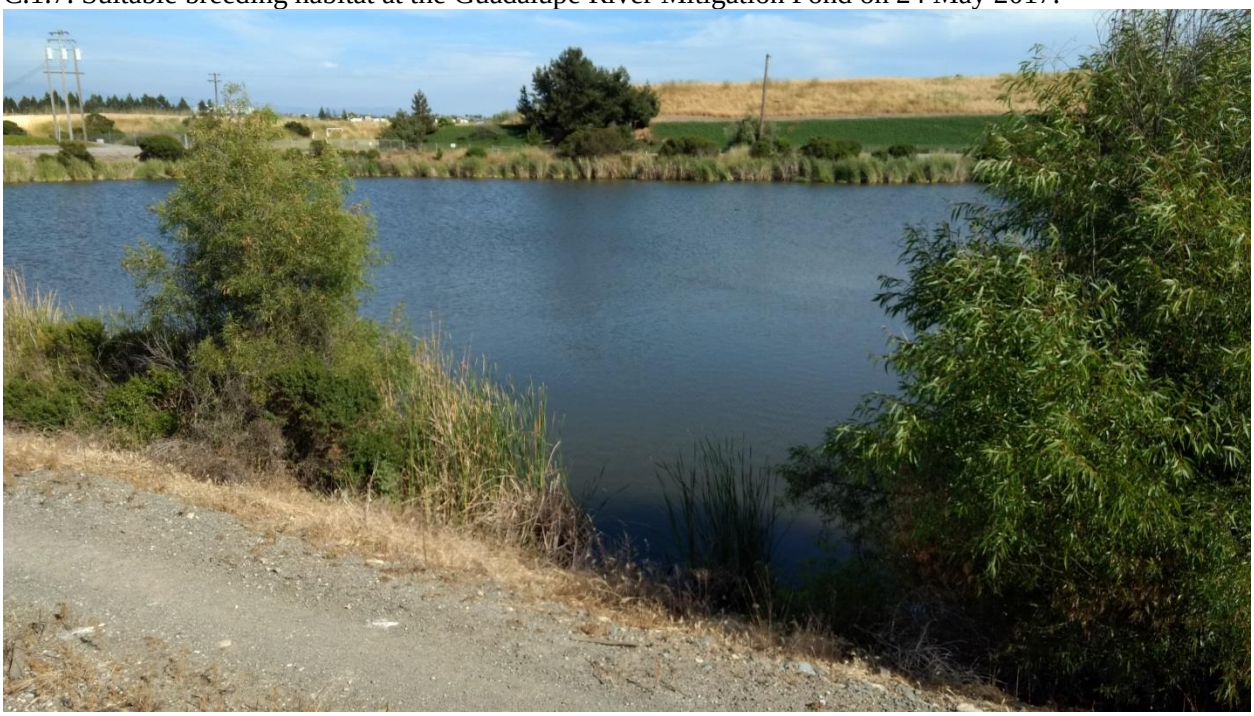
C.1.4. Suitable tricolored blackbird nesting substrate at Grant Lake (tule).

C.1.5. Suitable tricolored blackbird nesting substrate at Lake Cunningham.



C.1.6. Tricolored blackbird suitable nesting habitat at Polycom Pond off Highway 237 on 24 May 2017.

C.1.7. Suitable breeding habitat at the Guadalupe River Mitigation Pond on 24 May 2017.



C.1.8. Gold Street pond with an abundance of cattail and suitable breeding habitat on 24 May 2017.

C.1.9. Female tricolored blackbird carrying food to a probable nest at Calero nesting colony on 29 May 2019. Observation and photo by Shawn Lockwood, Santa Clara Valley Water District Biologist.

APPENDIX D. PHOTOS OF OTHER INTERESTING WILDLIFE OBSERVED

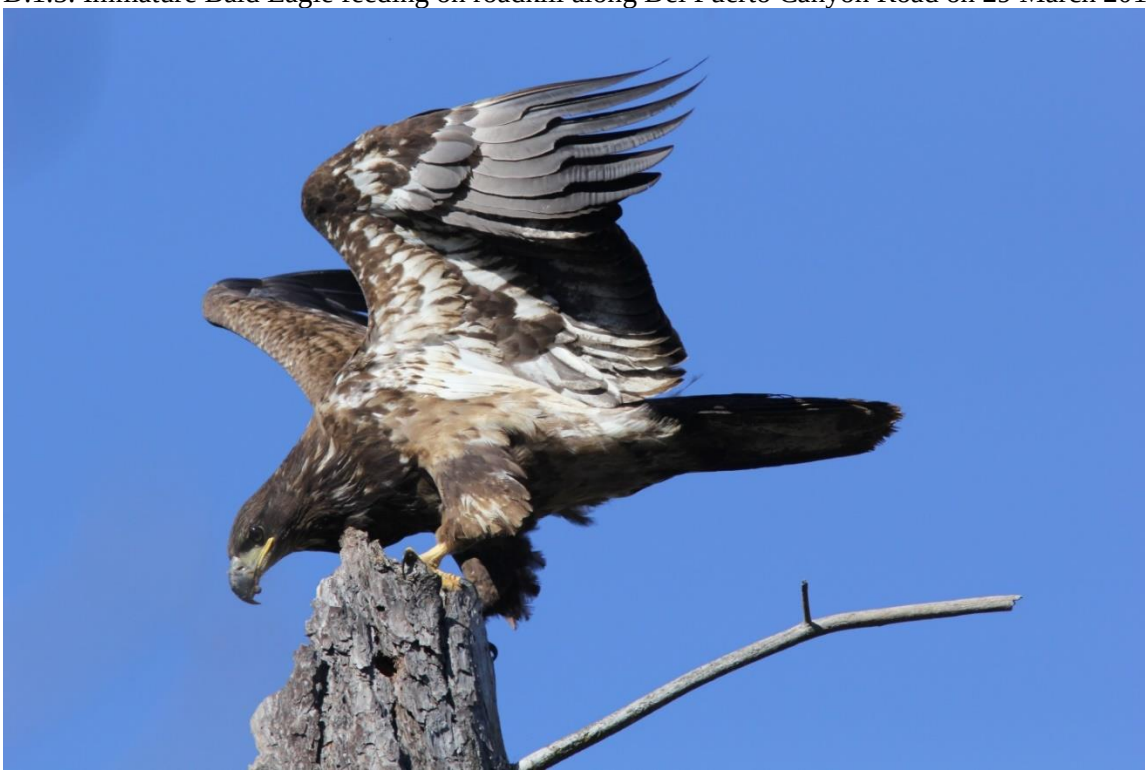
D.1.1. One of two Burrowing Owls observed on Laguna Avenue in Coyote Valley on 1 March 2017.

D.1.2. Tule Elk observed in San Antonio Valley on 8 March 2017, 24 individuals.

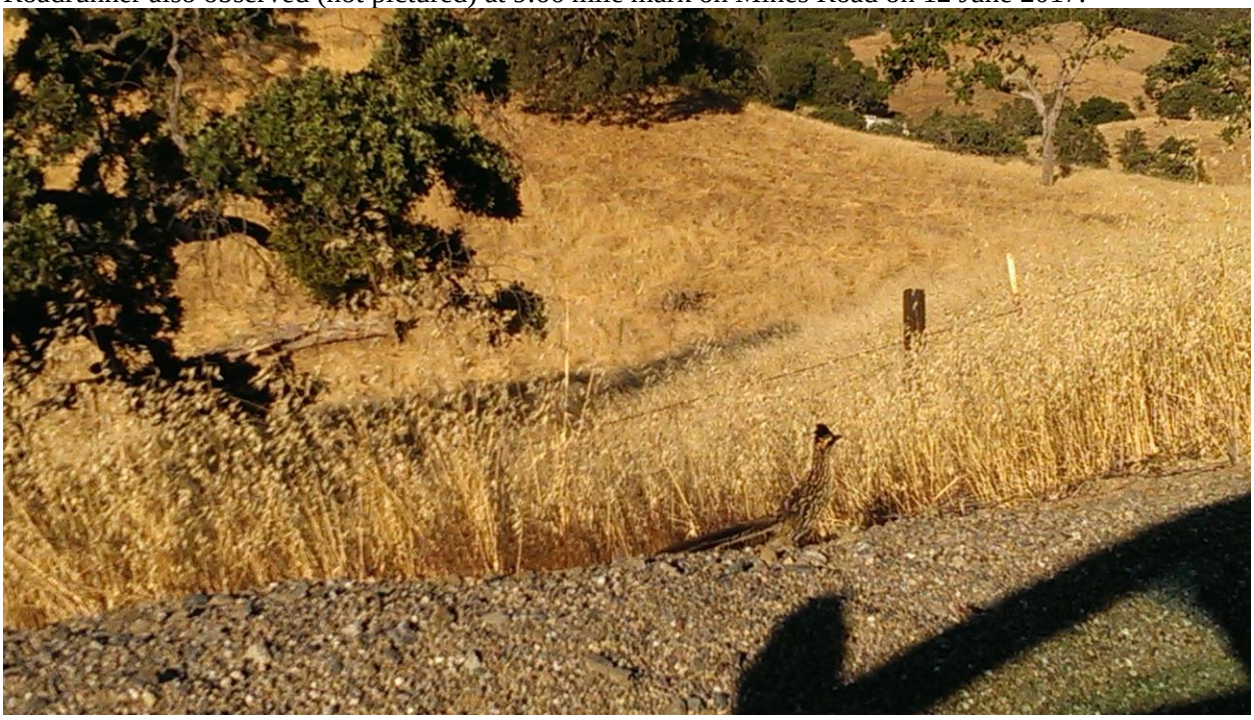
D.1.3. Pair of Bald Eagles at Grant Lake on 8 March 2017.

D.1.4. Bobcat along Highway 135.

D.1.5. Immature Bald Eagle feeding on roadkill along Del Puerto Canyon Road on 29 March 2017.



D.1.6. Greater Roadrunner near 6.51 mile mark on Mines Road on 12 June 2017. A second Greater Roadrunner also observed (not pictured) at 9.66 mile mark on Mines Road on 12 June 2017.



D.1.7. A large group of Wild Boar at 11305 Del Puerto Canyon Road on 12 June 2017.