

Detection, Monitoring, and Fates of Tricolored Blackbird Colonies in California in 2016

Final Report

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INTRODUCTION

The tricolored blackbird (*Agelaius tricolor*, hereafter tricolor) is a near-endemic California passerine that forms the largest breeding colonies of any North American songbird (Beedy and Hamilton 1999). Due primarily to range-wide habitat losses resulting from conversion of native habitats to agriculture and urbanization, the chronic destruction of some of the largest breeding colonies during the harvest of their grain-field nesting substrates, and autumnal shooting of birds while foraging in fields of ripening rice in mixed-species flocks with other blackbird species, the number of tricolors plummeted during the 20th Century (Neff 1937, Beedy and Hamilton 1999), leading, in December 2014, to an emergency listing as an endangered species under the California Endangered Species Act. This listing was allowed to expire at a subsequent meeting of the California Fish & Game Commission in June, 2015 but as of September, 2016 the species' status is under review for possible protection under the federal and California Endangered Species Acts.

I conducted fieldwork between February 21 and July 15, 2016 to detect, monitor, and determine the fates of the largest tricolor breeding colonies with an emphasis on the Central Valley but including visits to Wind Wolves Preserve in the Tremblor Range in southwest Kern County and the Santa Lucia Preserve in Monterey County and surveys of locations in the Central Sierra Foothills. I also banded tricolors adjacent to 4 of their breeding colonies. Where access permitted, I also estimated the reproductive success of successful colonies. I review this year's results, compare them to previous years, highlight significant features of the 2016 breeding season, and recommend actions that may help to stem the decline in the abundance of the species.

This was the 12th consecutive year that I have conducted field work with tricolors and the 10th year that I have banded tricolors. The results of this year's banding efforts are described in a separate report (available from the author).

METHODS

The methods I used in 2016 were essentially similar to those used in previous field seasons and thus are only briefly reviewed here. See Meese (2010) for a more thorough description of the methods used to detect, monitor, and estimate the reproductive success of successful colonies.

Colony Detection

I began to survey for colonies on February 21, 2016 in the San Joaquin Valley. I searched for tricolor settlements and colonies by driving on public roads to examine previously-documented colony locations and supplemented these searches by surveying appropriate regions consisting of silage fields adjacent to dairies in the region from Kern County in the south to Merced County in the north.

Sacramento Valley and central Sierra foothill colony surveys began in early May and consisted of targeted searches of previously-documented colony locations supplemented by searches of sites that have been reported by numerous collaborators (e.g., state and federal agency personnel, biological consultants, non-governmental organization staff, birders) or entered into the Tricolored Blackbird Portal (<http://tricolor.ice.ucdavis.edu>).

Monitoring

I monitored all at-risk colonies (e.g., those established in ephemeral substrates such as grain fields adjacent to dairies as well as several in stands of Eurasian weeds in pastures) until they failed or fledged their young. Colonies established on grain fields are most at risk of destruction due to harvest during normal agricultural activities, and thus are monitored to assess the success of colony protection measures. In most cases, I monitored colonies by observing them from the closest public road if located on private property where permission to access had not been obtained, or by observing from immediately adjacent roads if located on public property or on private property where permission to access had been obtained.

I did not have access to silage colonies due to landowner restrictions. In recent years the colony response process for silage colonies has been driven by an NRCS-funded agreement that designates representatives of the Farm Bureau or the Western United Dairymen as the initial points of contact to landowners. Due to agency privacy policy, site location and access is not shared by NRCS unless written permission is granted by the landowner. When silage colonies were discovered, they were therefore reported to these representatives. Thus, in all cases my monitoring of these silage colonies was done from the closest public roads and in many cases this restriction on access prevented me from making estimates of areas occupied and using these to confirm visual observations of the numbers of birds present at occupied sites.

I also monitored colonies located on secure substrates (i.e. that were not on agricultural fields) that were within the geographic scope of the silage colonies of the San Joaquin Valley and made one trip to Wind Wolves Preserve in southwestern Kern County to continue a collaboration with Preserve staff to conserve and enhance breeding opportunities for tricolors and one trip to the Santa Lucia Preserve in Monterey County to continue a collaboration to trap and band birds.

Estimating the Number of Breeding Birds

Visual estimates of the number of breeding birds were derived each time a colony was monitored by carefully observing a colony for from 5 to 30 minutes per visit. When possible, colonies were observed from multiple vantage points to most precisely estimate the number of birds present. Obtaining visual estimates of the number of breeding birds at some silage colonies was more difficult due to restrictions on access and the relatively greater distance from the observation point to the breeding birds. This was especially true for 3 colonies in Kern County (Poso NW, Poso WNW, and Daniel Farms) and 1 in Merced County (Cherokee Forebay), where access restrictions resulted in viewing distances of several hundred meters.

Estimating Reproductive Success

I estimated reproductive success (RS), defined as the average number of young produced per nest, by counting the number of 7-9 day old young in a randomly selected sample of nests (Fahey South) or by visual estimates of the numbers of fledglings produced (Dalby East Hwy. 65 Bypass, both Plumas Arboga colonies). As one male breeds, on average, with two females (Beedy and Hamilton 1999), each two nests have three birds associated with them, so the product of the number of breeding birds multiplied by 2/3 (0.67) provides an estimate of the number of nests constructed. The visual estimate of the number of young fledged divided by the estimate of the number of nests constructed yields an estimate of the number of young fledged per nest (RS).

Estimating the Number of Young Produced

I estimated the number of young produced at colonies by making repeated observations of young in groups (“crèches”) following fledging.

For most colonies, the number of fledged birds may often be carefully counted, especially for colonies where access has been granted, as young tricolors spend a minimum of 4 days in groups perched and calling (“food begging”) conspicuously from the tops of vegetation at the margins of colonies (Beedy and Hamilton 1999, pers. obs.). Typically, groups of fledglings will begin to leave the nesting substrate and fly up to perch high in nearby shrubs or trees within two to four days of fledging. However, crèches remain within the colony boundaries for up to two weeks or more if there are no nearby taller shrubs or trees, as is often the case in colonies in fields of triticale in the “silage belt” of the southern San Joaquin Valley.

After the young had fledged and departed from colonies in the San Joaquin Valley, I repeated these activities, and responded to reports of aggregations of tricolors, in the Sacramento Valley and the central Sierra foothills.

I trapped and banded birds at 4 locations during the interval from mid-April to mid-July. The results of my banding activities are presented in separate reports (available from the author).

RESULTS

Locations Occupied

I surveyed for colonies throughout the San Joaquin Valley beginning in late February, made a two-day trip to Wind Wolves Preserve on April 25-26, a 5-day trip to Santa Lucia Preserve in Monterey County from May 3-7, and began to survey Sacramento Valley locations on May 10. I found 44 sites occupied and confirmed breeding at 43 sites (Table 1). An additional 70 locations were surveyed and found to be unoccupied (Appendix I). I determined the fates of all colonies monitored and estimated the reproductive success (RS) of 4 colonies (Table 1).

Table 1. Descriptions of occupied locations.

Location Name	County	Substrate	Maximum No. Birds¹	Comments
Colusa NWR T27	Colusa	cattails	10,000	new location; restoration
Norman Road	Glenn	<i>Arundo donax</i>	500	new location
Daniel Farms	Kern	triticale	7,500	new location
Pond Road	Kern	triticale	6,000	new location
Poso NW	Kern	triticale	20,000	new location
Poso WNW	Kern	triticale	10,000	new location
Wind Wolves: Echo Canyon	Kern	stinging nettle	850	
Wind Wolves: Little Lobo	Kern	stinging nettle	2,000	
Bear Creek	Merced	milk thistle	7,500	storm-caused mortality
Cherokee Forebay	Merced	milk thistle, mustard	10,000	new location
Childs Avenue East	Merced	mustard	10,000	new location; destroyed by cows
Childs Avenue West	Merced	mustard	6,000	new location; destroyed by cows
Cunningham Ranch Thistles	Merced	milk thistle	2,500	new location
Eagleton Pond	Merced	cattails	2,000	
East Le Grand Road	Merced	milk thistle	800	new location
East Le Grand Road 2	Merced	milk thistle	2,000	new location
Fahey South	Merced	milk thistle	12,000	new location; RS =0.67
Hulen Levee	Merced	Himalayan blackberries/ milk thistle	7,500	storm-caused mortality, near-complete failure
Marshall Levee Pond	Merced	cattails	200	
Merced NWR Chamberlain Road North	Merced	milk thistle	8,000	new location; storm-caused mortality
Merced NWR Chamberlain Road South	Merced	milk thistle	3,000	new location; storm-caused mortality
Merced NWR South Cackler	Merced	milk thistle	200	
Merced NWR West Farmfield	Merced	milk thistle, mustard	7,500	largely abandoned
Merced Power Plant	Merced	cattails	2,000	new location

Location Name	County	Substrate	Maximum No. Birds ¹	Comments
Miles Creek	Merced	milk thistle	9,000	new location
Raynor Ranch Road	Merced	milk thistle	800	new location
Raynor Ranch Road East	Merced	Himalayan blackberry	300	new location
Laguna Seca	Monterey	cattails	600	
Ohlone Trace Pond	Monterey	bulrush	60	
Dalby East Hwy. 65 Bypass	Placer	Himalayan blackberry	5,000	RS=0.5
Elder Creek	Sacramento	Himalayan blackberry	7,000	
Triangle Rock Products	Sacramento	milk thistle	3,000	failed, abandoned
Pete Miller Road	Stanislaus	mustard	100	did not breed
Butte Sand and Gravel	Sutter	willows	4,000	new location; nests high in willows, aberrant colony
Atwell Island*	Tulare	bulrush	600	*single survey
Deer Creek North	Tulare	cheeseweed mallow	15,000	new location
GMC South	Tulare	triticale	2,000	new location; intense WFIB predation on eggs
Verhoeven East	Tulare	triticale	7,500	new location; intense WFIB predation on eggs
Brian Stucker Pond*	Yolo	cattails	1	*single survey
Conaway Ranch	Yolo	cattails	3,000	
Erle Road East	Yuba	cattails	6,000	new location
Jasper Lane	Yuba	Himalayan blackberry	3,000	
Plumas Arboga	Yuba	cattails	10,000	banding, RS=0.6
Plumas Arboga 5	Yuba	Himalayan blackberry	6,000	RS=0.4

¹ Maximum number of birds observed; number of breeding birds is lower in most cases. Locations surveyed once may have different numbers, as reported by other field workers.

Storm-related Effects

This field season was unique for its weather, a series of regular, intense storms that occurred roughly bi-weekly from March until late April and that were centered in the northern San Joaquin Valley. These storms had two major effects: the regular, late rains caused a conspicuous, but unquantified, increase in the number and vigor of milk thistle (*Silybum marianum*) patches, with

a less conspicuous increase in mustard (*Brassica* spp.) patches, and an apparent increase in storm-related mortality in occupied thistle patches in the same region. The later storms, in the second half of April, resulted in high apparent mortality of nestlings and the apparent desertion of the colonies by breeding birds as adults were observed feeding nestlings in the days prior to storms and immediately following (within 5 days of) storms the number of adults remaining in affected colonies dropped dramatically (a visually estimated 90% reduction in abundance post-storm at 2 colonies in Merced County). These storm-related reductions in abundance were observed at 4 colonies, all in Merced County: 1) Hulen Levee, 2) Merced NWR Chamberlain Road North, 3) Merced NWR Chamberlain Road South, and 4) Miles Creek.

Reproductive Failure due to White-faced Ibis Predation on Eggs

Two colonies in Tulare County, Verhoeven East and GMC South, were decimated by intense egg predation by white-faced ibis (*Plegadis chihii*). Weekly surveys documented continuous egg predation by a minimum of 2 and a maximum of 100 ibis simultaneously and no fledglings were observed to be produced at either colony. The apparent total reproductive failures of these colonies due to white-faced ibis predation on eggs has not been previously documented.

Reproductive Failures due to Cattle Grazing

Two colonies in new locations, Childs Avenue East and Childs Avenue West, that had been established in mustard (*Brassica* spp.) on a ranch in Merced County were largely (Childs Avenue West) or completely (Childs Avenue East) destroyed by disturbance due to cattle grazing. A third colony in a new location, Cherokee Forebay, also in Merced County, appeared to have also been disturbed by cattle grazing but due to an exceptionally long observation distance imposed by restricted access it was not possible to estimate the impacts of disturbance on reproduction.

Restoration Success

One colony, Colusa National Wildlife Refuge Tract 27 (Colusa NWR T27) occurred in a basin that was restored from a rice paddy beginning in autumn, 2013. This colony, and the observation of several thousand fledged young (Jennifer Isola via Mike Carpenter, pers. obs.), provides an example of the role that the restoration of wetlands may play in the conservation of tricolors in the Central Valley. Tricolors had been absent as a breeding species at Colusa National Wildlife Refuge since the 1980's (Mike Peters, pers. obs.).

Collaborations with Landowners

Fahey South, a colony in a new location in Merced County, was established in a fallow, weedy portion of a grain field. The owner of the property was identified and contacted and consulted

about the status of the species and efforts to conserve it and the adjacent grain was harvested while the birds were feeding young and no disturbance to the breeding birds was observed.

Four colonies were established on a large cattle ranch in Merced County and the owner was identified and contacted to request and coordinate access for monitoring. Although 2 of the 4 colonies were lost due to cattle grazing (see above), the others were conserved with the support of the landowner and a contractor on his property.

Continuing Reductions in Abundance in Southern San Joaquin Valley

The number of birds, and the number of breeding colonies, in the southern San Joaquin Valley (Kern and Tulare counties) continued the pattern of severe decline. Four colonies were established on dairies in Kern County in grain fields in locations that were not known to have been occupied previously (Poso NW and Poso WNW, Daniel Farms, and Pond Road). Three colonies were established in new locations on dairies in Tulare County (Deer Creek North, Verhoeven East, and GMC south). Restrictions on access to all of these locations precluded on-site monitoring but breeding birds at the Verhoeven East and GMC South colonies both suffered reproductive failures due to intense white-faced ibis predation on their eggs (see above).

New Colony Locations

No fewer than 24 breeding colonies were established in new locations in 2016 (Table 1). Of these, the most unique was the colony at Butte Sand and Gravel in Sutter County, as this was the first colony I have ever documented where the nests were built high (3-8 m) up in willow (*Salix* spp.) trees. More than half of the new colony locations, 13 of 24, were located in Merced County and all of these were established in stands of Eurasian weeds, primarily milk thistle and mustard, that proliferated due to the frequency and intensity of late-season (March - April) storms (see Storm-related Effects, above).

DISCUSSION

This was my 12th year of field work with tricolored blackbirds and 3 features of the 2016 breeding season stood out: 1) the continuing downward trend in the abundance of the species in the southern San Joaquin Valley, 2) intense white-faced ibis predation on eggs, and 3) regular, intense precipitation in March and April that lead to a proliferation of stands of Eurasian weeds and utilization of many of these stands by nesting birds followed by high rates of mortality due to intense precipitation.

The tricolored blackbird was less than a decade ago most abundant during the breeding season in the southern San Joaquin Valley (Kelsey 2008, Kyle and Kelsey 2011). On-going habitat losses are the main driver of the decline in this region and additional habitat losses put the long-term persistence of the species in jeopardy in what was until recently the core of its range. The continued planting of nut trees that replace semi-natural shrublands or agricultural crops, such

as alfalfa (*Medicago sativa*), that may provide insects required for breeding, make permanently unsuitable entire regions which were occupied by tens of thousands of breeding birds less than a decade ago. Especially critical is the Valley floor in Kern County, where thousands of acres of pistachio (*Pistacia vera*) orchards have been planted in the past 5 years (Figure 1, pers. obs.) and where 42% of the statewide production occurred in 2012 (Geissler and Horwath 2016). Additional large pistachio orchards are planned in this region (Scott Frazer citing conversation with landowner, pers. com.).

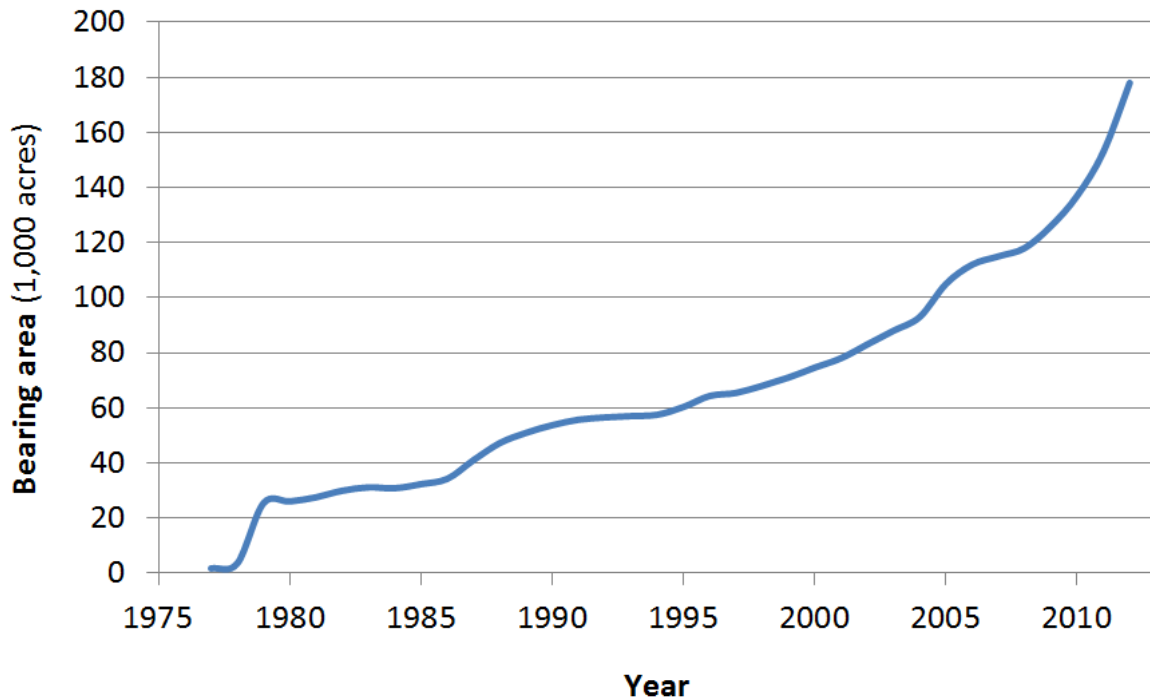


Figure 1: Area of bearing pistachio trees in California since 1977 (from Geissler and Horwath 2016).

Of great concern is whether a “tipping point” has already been reached in the southern San Joaquin Valley which precludes efforts to conserve the species and to restore its abundance to levels considered sustainable (e.g., Meese et al. 2015). Although the birds continue to nest in weedy grain fields adjacent to dairies, the numbers and sizes of these so-called “silage colonies” continue to decline as does the amounts of nearby foraging habitats as these are converted to nut orchards. The rapid, severe decline in abundance of tricolors in this region has been well documented (Meese 2014, Meese 2015) and losses of nesting and foraging habitats continue. Without a robust, effective conservation effort, the species may decline to extirpation in that part of its range where it was most abundant less than a decade ago (Figure 2).

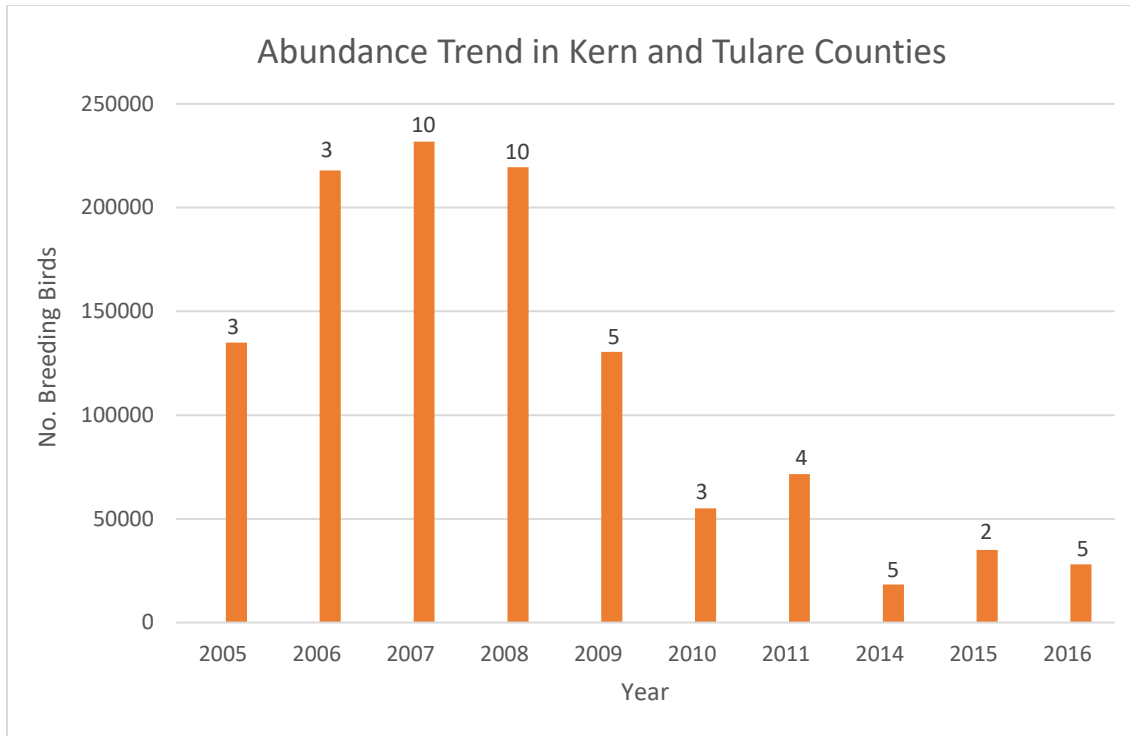


Figure 2. Trend in size and numbers of silage colonies in Kern and Tulare Counties. Numbers above bars represent numbers of colonies.

Egg predation by white-faced ibises is a new and potentially very serious threat, as 1) ibis populations have been on the rebound (California Rice Commission 2016), 2) the species occurs in many of the same locations with tricolors, 3) shares similar breeding site preferences (freshwater marshes and grain fields), and 4) also breeds in colonies (Zeiner et al. 1988-1990). Some predation on tricolor eggs has been suspected (Meese, unpubl.) and documented by tricolor researchers (Weintraub, unpubl.), but total reproductive failure due to egg predation has not been previously reported. This threat differs from that posed by cattle egrets (*Bubulcus ibis*) in that the cattle egrets nest in colonies with other herons and egrets and do not share breeding sites with tricolors. Thus, cattle egrets must commute between their breeding colonies and those of the tricolors and appear to time their predation on tricolor eggs to when they have young in their nests (Meese 2012). The white-faced ibis predation on the two colonies in Tulare County was well documented by more than one researcher over several weeks, and the white-faced ibis appeared to occur daily in the tricolor colonies although they were not observed to nest nearby. It is a curious anomaly that the reproductive failures caused by egg predation on nesting tricolors by both cattle egrets and white-faced ibis occurred in Tulare County.

The aberrant weather in 2016 that was exemplified by the recurring and remarkably regular and intense late-season rain events appeared to create numerous opportunities for tricolor nesting (it appeared to greatly increase the amount of milk thistle, and to a lesser extent, mustards, in low elevation sites) while subsequently directly threatening those colonies that established in the ephemeral vegetation it helped to produce. The heavy, regular rains in March and April led to the formation of colonies in several new, previously undocumented locations, primarily in central and eastern Merced County, that were heavily impacted by mortality due to intense

rainfall in late April. Thus, this extreme weather event provided opportunities for nesting in the form of vigorous stands of Eurasian weeds that are attractive to nesting birds but subsequent storms caused elevated rates of mortality in these same locations.

Cattle grazing impacted tricolor breeding at several locations in Merced County. Colonies in mustard stands in 2 new locations, Childs Avenue East and Childs Avenue West, which together accounted for a visually estimated 16,000 breeding birds, were disturbed by cattle grazing and the productivity of these sites was reduced to near-zero (Table 1). Cattle were present in the pasture at Pete Miller East in Stanislaus County and although at least 100 tricolors were seen here on March 14, no birds were observed on March 24 and no nesting occurred here, where 7,500 birds nested last year, when cows were absent (Meese 2015). Education and outreach are needed with key landowners to try to create secure nesting opportunities in such vulnerable substrates. Discussions to investigate possible policy initiatives that may provide directions to landowners and field staff as well as on-the-ground conservation responses (e.g., fencing) may be required in specific instances where at-risk substrates (mustards primary among these) are occupied by thousands of breeding birds.

I emphasize that the impacts on tricolor nesting due to cattle grazing were observed in vulnerable substrates only, specifically mustard stands. Cattle were observed to avoid grazing in and disturbing tricolor colonies established in several milk thistle (*Silybum marianum*) stands in eastern Merced and western Mariposa counties, and this year's as well as previous research has indicated that birds nesting in milk thistle and Himalayan blackberries (*Rubus armeniacus*) are not subject to disturbance due to cattle grazing as the cattle actively avoid moving through stands of these plants.

The relatively large number of new colony locations, especially in the San Joaquin Valley, suggests that landscape features utilized by nesting birds are highly variable through space and time and that nesting opportunities will continue to arise in novel locations as rare precipitation events, such as occurred this year, result in the vigorous growth of potential nesting substrates in areas where they were previously absent. Thus, annual efforts to detect and monitor colonies by trained and experienced field workers should remain an essential component of tricolored blackbird conservation efforts, as having up-to-date, comprehensive knowledge of where the birds breed is essential to accurately determine the status of the species, and colonies formed in ephemeral, vulnerable substrates, like mustards, may be effectively conserved if appropriate measures, such as exclusion of cattle by fencing, are taken.

Habitat restoration may play a large role in tricolored blackbird conservation efforts. The return of tricolors as a breeding species to Colusa National Wildlife Refuge, from where it had been absent for 30 years, illustrates the value and effectiveness of habitat restoration in tricolor conservation. Colusa NWR Tract 27 was a rice paddy in 2013, but only 3 years later it supported breeding by an estimated 10,000 tricolored blackbirds, and these produced a visually estimated 5,000 young (Jen Isola via Mike Carpenter, pers. comm.). Given the conflicts between dairies and birds inherent in so-called silage colonies in the San Joaquin Valley, as well as the near-absence and continuing decline in the availability of nearby foraging habitats, habitat restoration is likely to be required to play a major role if the species is to be restored to a core portion of its range in Kern and Tulare counties. The opportunities for habitat restoration in the southern San Joaquin Valley ought to be identified immediately as habitat losses due to

conversions to nut orchards are rapidly reducing the area available to support the species. Given these on-going habitat losses, future habitat restoration efforts may require the conversion of what is now productive agricultural land back into semi-natural conditions, such as occurred at Colusa NWR Tract 27.

Collaborations with landowners must play a key role in tricolor conservation efforts. This year, active outreach and communication with landowners resulted in the conservation of one large colony (Fahey South, Merced County) that may have been lost due to harvest, another (Cherokee Forebay, Merced County) that may have been lost to disturbance due to cattle grazing, and to the monitoring of several others (on several ranches around LeGrand, Merced County) that enabled field staff to document their fates. The need for a formal protocol for these kinds of outreach and education/communication activities is great and this ought to replace the existing ad-hoc approach to contacts with local landowners.

RECOMMENDATIONS

1. Identify willing landowners in the southern San Joaquin Valley (lower-elevation locations in Kern and Tulare counties) and pay them to 1) not spray herbicides on key grain fields in order to encourage the growth of weeds preferred by nesting birds, and 2) grow insecticide-free alfalfa in fields adjacent to dairies where birds are known to have nested within the past 10 years; this is a stop-gap measure but may serve to maintain the species in a region where it is rapidly disappearing while efforts are made to provide secure nesting and foraging habitats. The mechanism(s) by which secure nesting and foraging habitats are provided need to be actively described, documented, and pursued.
2. Expand Kern NWR to include duck clubs or restored wetlands in the region around Gun Club Road and Pond Road in Kern County to provide secure wetlands in conditions preferred by nesting tricolored blackbirds. Seek and identify nearby foraging habitats, including alfalfa fields and dedicated refuge lands, which may be managed to provide relatively rich insect populations.
3. Work with willing landowners to compensate them to provide nesting substrates for breeding tricolored blackbirds (e.g., Fahey South in Merced County)
4. Continue to recruit and encourage an “army” of volunteers to continue to feed information to dedicated researchers/field personnel and to enter records of locations and observations at locations into Portal. Excellent examples: Cheryl D. Johnson, who has reported several new colony locations in Merced County to field staff, and Debi Shearwater, San Benito County, who identified and monitored several colonies in 2015 and 2016.
5. Recruit environmental scientists, wildlife biologists and other professional field personnel from state (DWR, CDFW, CDPR) and federal (USFWS) agencies to help to monitor and report observations of tricolors.
6. Develop and implement a formal protocol that defines roles and responsibilities when tricolor colonies are identified on private property, especially those established on ephemeral at-risk substrates or where access to monitor is desired.

LITERATURE CITED

- Beedy, E. C. and W. J. Hamilton III. 1999. Tricolored blackbird (*Agelaius tricolor*) in A. Poole and F. Gill (eds.), *The Birds of North America*, No. 423. Philadelphia, PA: Academy of Natural Sciences and Washington, DC: American Ornithologists Union.
- California Rice Commission Website. 2016. <http://calrice.org/pdf/publications/species-in-focus/lbis.pdf>. Accessed 9/12/2016.
- Geisseler, D. and W.R. Horwath. 2016. Pistachio production in California. California Department of Food and Agriculture Fertilizer Research and Education Program. Available at: https://apps1.cdfa.ca.gov/FertilizerResearch/docs/Pistachio_Production_CA.pdf.
- Kelsey, R. 2008. Results of the 2008 tricolored blackbird census: population status and an analysis of statewide trends. Report submitted to the U.S. Fish & Wildlife Service, Portland, OR.
- Kyle, K. and R. Kelsey. 2011. Results of the 2011 Tricolored Blackbird Statewide Survey. Audubon California, Sacramento, CA. Available on the Tricolored Blackbird Portal at: <http://tricolor.ice.ucdavis.edu/reports>.
- Meese, R.J. 2010. Detection, monitoring, and fates of Tricolored Blackbird Colonies in 2010 in the Central Valley of California. California Department of Fish and Game, Wildlife Branch, Sacramento, CA and U.S. Fish and Wildlife Service, Sacramento, CA. Available on the Tricolored Blackbird Portal at: <http://tricolor.ice.ucdavis.edu/reports>.
- Meese, R.J. 2012. Cattle egret predation causing reproductive failures of nesting tricolored blackbirds. *Calif. Fish and Game* 98: 47-50.
- Meese, R.J. 2014. Results of the 2014 Tricolored Blackbird Statewide Survey. Available on the Tricolored Blackbird Portal at: <http://tricolor.ice.ucdavis.edu/reports>.
- Meese, R.J. 2015. Detection, monitoring, and fates of tricolored blackbird colonies in California in 2015. *Calif. Dep. of Fish and Wildlife, Wildlife Branch, Nongame Wildlife Program Report 2015-03*, Sacramento, CA. 13 pp. + appendices.
- Meese, R.J., D.A. Airola, E.C. Beedy, and R. Cook. 2015. Restoring the Tricolored Blackbird in California. *Central Valley Bird Club Bull.* 17: 97-109.
- Neff, J. 1937. Nesting distribution of the Tricolored Red-wing. *Condor* 39: 61-81.
- Zeiner, D.C., W.F.Laudenslayer, Jr., K.E. Mayer, and M. White, eds. 1988-1990. *California's Wildlife*. Vol. I-III. California Depart. of Fish and Game, Sacramento, California.

APPENDIX I. Locations surveyed, found to be unoccupied. Location names follow those used in the Tricolored Blackbird Portal, <http://tricolor.ice.ucdavis.edu>.

Location Name	County	Comments
Carbondale Road near RR Tracks	Amador	Habitat appears suitable.
Dave Brubeck Road	Amador	Habitat appears suitable.
DeMartini	Amador	Habitat appears suitable.
Michigan Bar/Carbondale Mining Pit	Amador	Habitat condition unknown, unseen.
Acre Farms	Colusa	Habitat unsuitable, basin dry.
Capital Outing Club	Colusa	Habitat appears suitable.
Delevan T43	Colusa	Habitat unsuitable, basin drained for maintenance.
Delevan T45.1	Colusa	Habitat appears suitable.
Pioneer Duck Club	Colusa	Habitat unsuitable, basin dry.
4 Mile Slough	Fresno	Habitat appears suitable.
Producer's Dairy	Fresno	Habitat appears suitable, but lacks weeds.
Producer's NW	Fresno	Habitat appears suitable.
ECLA Ponds	Kern	Habitat unsuitable, no water, 100% decadent cattails.
El Cinco	Kern	Habitat unsuitable, no water, 100% decadent cattails.
Lawrence Duck Club	Kern	Habitat unsuitable, no water, 100% decadent cattails.
Poso I	Kern	Habitat appears suitable.
Poso II	Kern	Habitat appears suitable.
Poso North	Kern	Habitat appears suitable.
Poso West	Kern	Habitat unsuitable, immature.
Avenue Road 14	Madera	Habitat appears suitable.
Milktime Dairy	Madera	Habitat appears suitable.
Road 12 Avenue 24	Madera	Habitat appears suitable.
Road 12 Avenue 24 2	Madera	Habitat appears suitable.
Road 12 Avenue 24 3	Madera	Habitat appears suitable.
A&O Sousa	Merced	Habitat appears suitable.
Basalt Road	Merced	Habitat appears suitable.

Location Name	County	Comments
Combs Road	Merced	Unsuitable, planted in oats, no weeds.
Crane Ranch	Merced	Some suitable habitat, some unsuitable.
Crane Ranch North	Merced	Habitat appears suitable.
Dead Man Creek	Merced	Habitat appears suitable.
Dickenson Ferry	Merced	Habitat unsuitable.
Ellsworth	Merced	Habitat permanently unsuitable.
Frog Pond	Merced	Habitat appears suitable.
Homen Dairy	Merced	Habitat unsuitable.
Honey Lake Duck Club	Merced	Habitat unsuitable.
Lone Tree	Merced	Habitat appears suitable.
Los Banos W.A.	Merced	Habitat appears suitable.
Main Canal	Merced	No habitat.
Merced NWR: Duck Slough	Merced	Habitat unsuitable.
Merced NWR: East Farmfield 3	Merced	Habitat unsuitable.
Merced NWR: East Farmfield 5	Merced	Habitat unsuitable.
Owens Creek	Merced	Habitat permanently unsuitable: almond orchard.
Plainsburg Road	Merced	Habitat permanently unsuitable: pistachio orchard.
San Felipe Ranch	Merced	Habitat unsuitable.
Second and Edminster	Merced	Habitat appears suitable.
South of Childs	Merced	Habitat permanently unsuitable, grain fields.
5 Palm Trees	Sacramento	Habitat appears suitable.
Birch Ranch	Sacramento	Habitat appears suitable.
Alvin Souza Dairy	Tulare	Habitat appears suitable.
Angiola's	Tulare	Habitat appears suitable.
Cornerstone 1,2,3	Tulare	Habitat appears suitable.
Cornerstone Marsh	Tulare	No habitat, removed.
Costa's Dairy (several locations)	Tulare	Habitat appears suitable, prospecting and foraging birds seen, no evidence of breeding.

Location Name	County	Comments
Deer Creek Dairy	Tulare	Habitat appears suitable.
East Toledo	Tulare	Habitat appears suitable.
GMC	Tulare	Habitat appears suitable.
North Toledo	Tulare	Habitat appears suitable.
Riverview 6	Tulare	Habitat appears suitable.
Riverview Dairy	Tulare	Habitat appears suitable.
Semi-tropic Storage Pond	Tulare	Habitat unsuitable, no water, 100% decadent cattails.
TeVelde Dairy	Tulare	Habitat appears suitable.
Toledo Pit	Tulare	No habitat, removed.
Vander Eyk	Tulare	Habitat appears suitable.
Voice of America	Tulare	Habitat appears suitable.
Plumas Arboga 2,3,4	Yuba	Habitat appears suitable.
Schuster Ranch 2	Yuba	Habitat appears to be perfect.