Detection, Monitoring, and Fates of Tricolored Blackbird Colonies in California in 2015

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 and the chronic destruction of some of the largest breeding colonies during the harvest of their grain-field nesting substrates, 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.

I conducted field work between March 3 and July 5, 2015 to detect, monitor, and determine the fates of the largest tricolor breeding colonies in California's Central Valley. Where access permitted, I also estimated the reproductive success of successful colonies. I review this year's results, compare them to previous years, and provide some perspectives on actions that may help to stem the decline in the abundance of the species and lead to more positive conservation outcomes.

This was the 11th consecutive year that I have conducted field work with tricolors and the 9th 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 2015 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 March 3, 2015 in the San Joaquin Valley. I searched for tricolor 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 late April 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, non-governmental organization staff, readers of the Central Valley Birds Yahoo Group, birders) or entered into the Tricolored Blackbird Portal (http://tricolor.ice.ucdavis.edu).

Monitoring

I monitored all colonies until they failed or fledged their young. Colonies established on ephemeral substrates (e.g., grain fields adjacent to dairies) are most at risk of destruction due to harvest during normal agricultural activities, and thus are monitored to assess both the success of colony protection measures and to estimate reproductive success. Agricultural colonies most often occur in grain fields adjacent to or near dairies in the San Joaquin Valley and are often referred to as "silage colonies". 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 observed colonies approximately twice-weekly to assess current conditions as well as to best assess colony chronology to estimate optimal times for conducting reproductive success and breeding population size estimates.

Unlike in previous field seasons, I did not have access to silage colonies due to restrictions on access. Access was limited in part due to an agreement among the Tricolored Blackbird Working Group to designate representatives of the Farm Bureau or the Western United Dairymen as the initial point of contact to landowners. When silage colonies were discovered, they were therefore reported to these representatives rather than attempting to contact the landowner directly to inform them of the presence of the colony, to provide information on funding opportunities for protection of the colony, and to seek access for monitoring, as was the practice in years past. 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.

Estimating the Area Occupied

Where access permitted, I estimated the dimensions of the occupied areas of nesting substrates by one of two methods: visually estimating the area occupied or directly measuring the occupied area with a hand-held global positioning system (GPS) receiver. Both visual estimates and coordinates directly measured by GPS were placed into Google Earth to measure the dimensions of the occupied area.

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. One colony, in Kern County, was unique for the odd, dynamic behavior of the breeding birds. Estimates of the number of breeding birds at colonies at greater distances from the observation point as well as those with odd behavior were more difficult to obtain and hence took more time and account for the wide range in the time required to obtain an estimate.

Estimating Reproductive Success

I estimated reproductive success (RS), defined as the average number of young produced per nest, in one of two ways: by visual estimates of the numbers of fledglings or by nest sampling.

I derived visual estimates of RS by visually estimating the number of breeding birds and the number of fledglings. 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).

For colonies where permission to access had been obtained, I derived an estimate of RS by counting the contents of a random sample of nests when the average age of nestlings was 7 to 9 days old. It has been common practice to estimate RS during this portion of the nest cycle because entering colonies when nestlings are less than 7 days old will inflate the RS estimate by under-estimating nestling mortality and entering when greater than 9 days of age will cause the nestlings to jump from the nests prematurely, likely increasing nestling mortality.

Estimating the Number of Young Produced

I estimated the number of young produced at colonies by either or both of two methods: repeated observations of young in groups ("crèches") following fledging, and/or calculating the product of the number of nests constructed by reproductive success (see above).

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.

I report the number of fledglings produced by visual estimates of RS as falling into one of three categories, as defined as follows:

- Very low: less than 1 fledgling per 10 nests
- Modest: 1-5 fledglings per 10 nests
- Moderate: 6-10 fledglings per 10 nests

In cases where I estimated RS by sampling, I estimated the number of young produced by multiplying the estimate of the number of nests by the average number of young produced per nest (RS). This estimate of the number of young produced serves as an independent check on the visual estimate of the number of young produced (= number of fledglings observed).

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

I made one trip to northern Los Angeles County in April but corresponded with workers in southern California throughout the field season and summarize the results of their field work on one colony.

I trapped and banded birds during the interval from late April to late June; the results of my banding activities are presented in separate reports (available from the author).

RESULTS

Colonies Detected

Field work started on March 3 and ended on July 5, 2015. During this interval I detected, or received reports of, a total of 34 occupied locations (Appendix I). Of these 34 locations, I confirmed occupancy by breeding tricolors at 33 locations; the remaining location had been reported to me via email by Cheryl

Johnson, a biological consultant, who documented occupancy by still photographs and video. I found the nesting substrate at this location to have been harvested within 3 days after I received the report of a breeding colony here. I or other field workers observed breeding activity to at least the nest-building stage at all 34 locations – aggregations of birds that were not believed to be breeding are not included in this total.

Colonies Monitored

I surveyed for colonies throughout the San Joaquin Valley beginning in early March, made a one-day trip to northern Los Angeles County on April 16, and began to survey Sacramento Valley locations on the first of May. I monitored 17 colonies in 2015 (Table 1). I determined the fates of all colonies monitored and estimated the reproductive success (RS) of five colonies (Table 1).

Table 1. Colonies monitored in 2015.

Location	County	Substrate	No. Breeding Birds[1]	Fate
West Poso	Kern	Triticale	25,000	Failed, abandoned.*
Deer Creek	Tulare	Triticale	10,000	Very low RS, not directly estimated, no access.
Combs Road	Merced	Triticale	7,000	RS unknown, no access.
Henry Miller and Cherokee	Merced	Triticale	7,500	RS unknown, no access.
Merced NWR, East Farmfield 3	Merced	Mustard, milk thistle	6,000	Modest RS, not directly estimated, 3 settlements, only first formed colony that fledged young, 2 failed.
Pete Miller East	Stanislaus	Mustard	7,500	Moderate RS, not directly measured, no access.
Sonora Road No. 3	Stanislaus	H. blackberry	7,000	Mostly destroyed while occupied.
Birch Ranch 1	Sacramento	H. blackberry	1,000	Abandoned
Birch Ranch 2	Sacramento	H. blackberry	1,000	Abandoned
Birch Ranch 3	Sacramento	H. blackberry	5,000	RS unknown, no access.
Five Palm Trees	Sacramento	H. blackberry	900	Moderate RS, not directly measured, no access.
Plumas Arboga 2	Yuba	H. blackberry	5,000	RS visually estimated at 0.6
Jasper Lane	Yuba	H. blackberry	7,000	RS visually estimated at 0.2
Plumas Arboga	Yuba	Cattails	7,500	RS visually estimated at 0.6
Conaway Ranch	Yolo	Cattails	7,500	RS estimated by nest inspection at 0.3
Capitol Outing Club	Colusa	Cattails	5,000	RS not estimated, no access.
Delevan T43	Colusa	Cattails	20,000	RS estimated by nest inspection at 0.33

*some observers are reported to have seen fledglings at this location, however, I did not observe any tricolored blackbird fledglings but did see Red-winged Blackbird (*Agelaius phoniceus*) fledglings here. [1] Maximum number observed post-settlement.

Colony Abandonment

A minimum of 5 colonies that had proceeded to at least the nest-building stage was abandoned, and these were geographically widespread: West Poso in Kern County, the 2nd and 3rd settlements at Merced N.W.R. East Farmfield 3 in Merced County, and Birch Ranch 1 and 2 and Rancho Seco Reservoir in Sacramento County. Of these, West Poso was by far the largest at up to 25,000 birds, and was the most intensively monitored. Merced N.W.R. East Farmfield 3 had 3 independent settlements, the first of which proceeded to fruition and the 2nd and 3rd of which failed and the birds abandoned the site. The Birch Ranch locations were abandoned well after the nest-building stage for the second year in a row, and Rancho Seco has a history of settlement followed by abandonment.

New Colony Locations

No fewer than 9 colonies in previously unknown locations were documented during the course of field surveys in 2015 (Table 2). One of these, Sandy Mush and 59, was reported to me via email by Cheryl D.

Johnson, a biological consultant, on March 23 and the site was found to have been destroyed by harvest between March 23 and March 26, when I surveyed the location.

In addition to these new colony locations, an additional 6 new locations were documented by Dan Airola while detecting and monitoring tricolor breeding colonies in central Sierra Nevada foothill locations, 1 new location was documented by Neil Clipperton and Lara Sparks during the sampling survey interval in April in Merced County, and 1 new location in San Benito County was reported to me by Debi Shearwater (Table 2).

Table 2. New colony locations.

Location Name	County	Substrate	No. Breeding Birds	Comments
Sandy Mush and 59	Merced	Triticale	Unknown	Destroyed by harvest
Combs Road	Merced	Triticale	7,000	Likely same birds as Sandy Mush and 59
Henry Miller and Cherokee	Merced	Triticale	7,500	Saved by law enforcement action
Pete Miller East	Stanislaus	Mustard	7,500	Successful
Dead Man Creek	Merced	Milk thistle	4,000	Abandoned
Eagleton Pond	Merced	Cattails	1,500	Recycled (2 nest attempts)
Marshall Levee Pond	Merced	Cattails	500	
Delta and Henry Miller	Merced	Triticale	1,000	Destroyed by harvest
Michigan Bar – Carbondale Mining Pit	Amador	Cattails (?)	3,000 (?)	No access, in mining pit, out of view.
DeMartini	Amador	Himalayan blackberry	4,000	Two blackberry copses.
Carbondale Road near RR Tracks	Amador	Himalayan blackberry	20	
Markham Ravine 3	Placer	Himalayan blackberry	4,200	
Horseless Carriage and Bradshaw	Sacramento	Himalayan blackberry	500	
Sloughhouse near Cresthill	Sacramento	Himalayan blackberry	4,000	
Excelsior and Eagles Nest	Sacramento	Cattails and bulrush	3,000	
Elder Creek 5	Sacramento	Himalayan blackberry	500	
Santa Ana Valley Road	San Benito	Unspecified grain	1,500	Saved by agreement with landowner.

Colonies Destroyed by Harvest

Two colonies in new locations in Merced County are known to have been destroyed by harvest: 1) Sandy Mush and 59, a colony that was originally detected by Cheryl D. Johnson, a biological consultant, on March 23 and destroyed by harvest before I surveyed the site on March 26, and 2) Delta and Henry Miller, a colony documented by Neil Clipperton and Lara Sparks, both of California Department of Fish and Wildlife, on the first day of the Sample Survey, April 17, and already mostly destroyed by harvest when discovered.

Colonies Being Threatened by Harvest but Saved by Law Enforcement Actions

There were two colonies in grain fields that were observed to be threatened by destruction by harvest: 1) on March 26 harvesters were observed in the field at Henry Miller and Cherokee in Merced County, and 2) on March 30 harvesters were observed in the field at Deer Creek Dairy in Tulare County. In both cases, the presence of harvesters in grain fields occupied by breeding tricolors was reported to Neil Clipperton, CDFW, who notified CDFW law enforcement and wardens were dispatched to investigate and harvesting operations were stopped, conserving the colonies.

Colony Saved by Farm Bureau Contact

On April 25, 2015 I along with several others received an urgent email from Debra Shearwater who informed us of a colony (named Santa Ana Valley Road in the Portal) in a new location in San Benito County that was in imminent danger of being lost due to the harvest of its grain field nesting substrate. I informed Neil Clipperton as well as a CDFW law enforcement officer via email of the threat and the local farm bureau was enlisted to try to negotiate a harvest delay with the land owner. The land owner agreed to delay the harvest of the field.

Colonies Destroyed by Vegetation Removal

Active breeding colonies were destroyed in at least two counties:

1. In Stanislaus County, the Sonora Road No. 3 colony, which had been visually estimated to consist of 7,000 breeding birds on April 28, 2015, was mostly destroyed when approximately one-half of the Himalayan blackberry (*Rubus armeniacus*) copse occupied by breeding birds was removed on May 24. Only 500 birds remained following the discovery of the vegetation removal.
2. During the first week of June, an estimated 5 acres of Himalayan blackberries that were occupied by breeding birds with nestlings within days of fledging were completely removed via vegetation masticator by a contractor working on Beale Air Force Base in Yuba County. I toured the site on June 12, 2015 and found approximately 50 nestlings or portions of nestlings killed during the vegetation removal process and a single fledgling in an emergent willow (*Salix* sp.) that was not removed by the process.

Discussion

Perhaps the most notable feature of the 2015 breeding season was the small number of breeding colonies, and the small number of breeding birds, in the "silage belt" of Kern and Tulare counties. In the very recent past, these 2 counties supported breeding by over 160,000 birds, accounting for over 41% of the statewide population (Kyle and Kelsey 2011). This year, I observed only 2 colonies, one in each county, accounting for approximately 35,000 breeding birds and the West Poso colony in Kern County failed to produce a single fledgling, so the decline in abundance in the southern San Joaquin Valley continues. Figure 1 shows the trend in abundance in Kern and Tulare counties in the decade from 2005 until 2015 and clearly illustrates the rapid decline since 2008 and the consistently low number of birds since 2010. Given the widespread and on-going losses of foraging habitats, primarily due to the conversion of semi-natural shrublands to nut orchards, options to conserve the species in what has for decades been the core of its distribution have been severely reduced and the dramatic decline in the number of birds in the region where less than a decade ago it was most abundant may never be reversed.

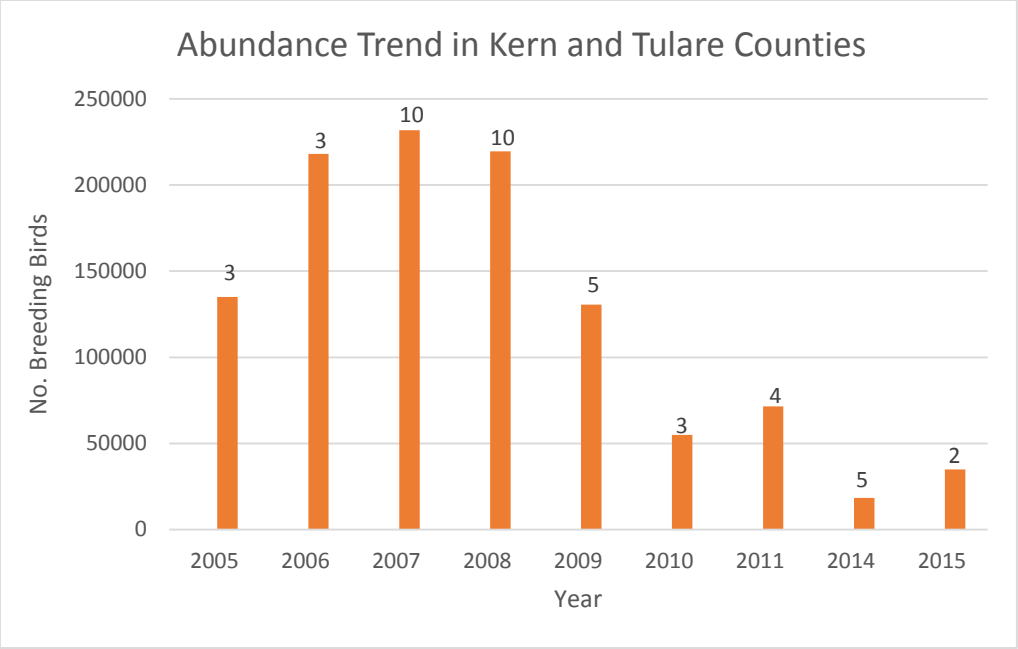

Figure 1. Trend in numbers of breeding birds in "silage belt" of Kern and Tulare counties. Numbers above bars indicate number of colonies.

Colony abandonment was again a conspicuous feature of the 2015 breeding season and likely reflects the inability of nesting females to obtain enough insects to form eggs (Meese 2013). Breeding birds have been documented to abandon active colonies annually since 2007 (Meese 2007, Meese 2013) and the chronic nature of this phenomenon suggests a systemic (e.g., habitat loss) vs. environmental (e.g., drought) cause, as colony abandonment has been documented long before the current drought began. It is likely, however, that both factors contribute to colony abandonment and the on-going drought may be increasing the frequency of this phenomenon.

There were no fewer than 17 colonies documented in new locations in 2015. The documentation of colonies in 7 new locations in Merced County is surprising given the intensive survey work that is annually done there and likely reflects the movements of birds in response to landscape changes, where conditions at sites previously occupied are worse than are those at potential new colony locations and birds move in response to local changes. The documentation of new colony locations in the Central Sierra Foothills reflects the more intensive survey and monitoring work that is being done there by Dan Airola, a wildlife biologist from Sacramento with family ties to the ranching industry who began to work with tricolored blackbirds in 2014. Thoroughly documenting colony locations is essential to allow researchers to make current, accurate estimates of abundance, and gives a more complete picture of the distribution and habitat affinities of the species.

The destruction of colonies in grain fields continued despite the emergency listing of the species as a California endangered species in December, 2014. Two silage colonies were destroyed by the harvest of their grain field nesting substrates and two other colonies that were threatened by destruction by harvesters in the fields were saved by timely law enforcement actions. These examples illustrate the continuing threat to the species posed by the harvest of its nesting substrate when it nests in ephemeral

habitats adjacent to dairies as well as the inability of the emergency listing to ensure the protection of all at-risk colonies.

Beginning in 2015, Audubon California, California Farm Bureau Federation, Dairy Cares, Sustainable Conservation, and Western United Dairymen began working under a Natural Resources Conservation Service (NRCS) funded grant to detect silage colonies and to compensate dairy operators for losses incurred when conserving Tricolored Blackbird colonies in their fields. Participants in the grant program are bound by the NRCS confidentiality policy and so once colonies are reported to representatives of these groups for landowner contact, there is no return of information regarding the status of negotiations with the landowners or monitoring activities. Silage colonies detected by grant participants were also not shared outside this group, making for a frustrating one-way flow of information.

This asymmetry in responsibilities was further compounded by the fact that unlike in all previous field seasons, I had no access to properties on which silage colonies were located and thus had to monitor these colonies from the nearest public road. In all cases I reported silage colonies to a member of the dairy group by phone call within minutes of their discovery, as was the formal mechanism, but in one case, the Combs Road location, I contacted both the dairy group as well as staff at Merced National Wildlife Refuge, as Combs Road is nearly adjacent to Merced N.W.R. and I knew from prior experience that Merced N.W.R. staff had worked with the landowners, the Homen family, on tricolored blackbird issues several times before. It turned out that the landowner had already scheduled the harvest of his grain field for the morning following the discovery of the birds in the field, so the site faced an imminent threat and it was saved only by my calls and subsequent quick action by the dairy group and Merced N.W.R. staff.

An example of a novel mechanism of colony conservation was provided by a site in San Benito County, which was first reported to me (and to several others) via email by Debra Shearwater, a local resident and well-known birder and pelagic trip leader, on Saturday, April 25. Debra had earlier in the day observed a colony established in a grain field that was surrounded by grain fields that had recently been harvested and believed that the colony was in imminent danger. I replied to her email the same day and suggested that she inform the local CDFW warden and forwarded her email to Neil Clipperton, CDFW non-game bird biologist, and to a colleague who had introduced me to a CDFW warden in Placer County in autumn 2013. I received a reply from Debra on Sunday, April 26 and she informed me that she had already been contacted by Neil by phone and that efforts were underway to conserve the colony. The landowner was contacted by the local farm bureau representative on Monday, April 27 and was informed of the protected status of the birds and was requested to delay the harvest of the field until the birds had finished nesting and left the area. The landowner agreed to the harvest delay. Thus, the email on Saturday put into place a mechanism that included CDFW law enforcement but contact with the landowner was made by a local farm bureau representative and the colony was conserved and the landowner financially compensated for financial losses incurred by delaying the harvest of the grain field. This mechanism may serve as a kind of template for similar efforts in the future and suggests that a more robust education and outreach effort include local farm bureaus.

A further, poorly documented source of mortality to nesting birds and to the availability of high-quality nesting substrate is the removal of vegetation used by nesting birds. During spring 2015, vegetation supporting tricolor colonies was removed at 2 locations while birds were still in their nests, one on a private ranch in Stanislaus County and the other on Beale Air Force Base in Yuba County. In the

Stanislaus County case, the landowner does not appear to have been aware of the presence of the nesting birds prior to the removal of the vegetation, but in the Beale AFB case, the vegetation was removed specifically because it was being used as nesting substrate and the breeding birds were believed to constitute a risk to planes taking off or landing nearby. In both cases, the vegetation removal operations caused direct mortality to nestlings and reduced the amount of high-quality nesting substrate available to nesting birds in the future. These events suggest that a great need exists for an expanded education and outreach program to land owners, especially in the foothills and in regions of the valley floor where stands of Himalayan blackberries provide tricolor nesting substrate, to inform them of the importance of nesting substrates to the presence of the species in regions where it is relatively scarce. Landowners who may be reluctant to conserve nesting substrates due to perceived conflicts between ranching or other land uses should be informed of the benefits of having nesting tricolored blackbirds on their properties and, where possible, offered financial compensation for conserving existing nesting substrates (Airola and Young 2015).

The conservation of California's blackbird will take a sustained effort supported by all stakeholders, including industry, private landowners, agency staff, and an informed and highly motivated public. The actions needed to stem the steep decline in abundance and increase the numbers of birds are well known and will not be repeated here except to reference my review of these steps in Appendix II (derived from Meese 2014) and to refer to Meese et al. (2015).

Literature Cited

Airola, D.A. and L. Young. 2015. Protecting nesting habitat for the Tricolored Blackbird on private rangelands in the foothill grassland region of the Sierra Nevada. Central Valley Bird Club Bulletin 17: 116-121.

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.

Kyle, K and R. Kelsey. 2011. Results of the 2011 Tricolored Blackbird statewide survey. Audubon California, Sacramento. Available from the Tricolored Blackbird Portal at: http://tricolor.ice.ucdavis.edu/reports.

Meese, R.J. 2007. Settlement, Breeding, Productivity, and Color-banding of Tricolored Blackbirds in 2007 in the Central Valley of California. U.S. Fish & Wildlife Service, Portland, OR and Audubon California, Emeryville, CA. Available from 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. Report submitted to California Department of Fish & Game and U.S. Fish & Wildlife Service. Available on the Tricolored Blackbird Portal at: http://tricolor.ice.ucdavis.edu/reports.

Meese, R. J. 2013. Chronic low reproductive success of the colonial Tricolored Blackbird from 2006-2011. Western Birds 44: 98-113.

Meese, R.J. 2014. Results of the 2014 Tricolored Blackbird Statewide Survey. Available from the Tricolored Blackbird Portal at: http://tricolor.ice.ucdavis.edu/reports.

Meese, R.J., D.A. Airola, E.C. Beedy, and R. Cook. 2015. Recovering the Tricolored Blackbird in California. Central Valley Bird Club Bulletin 17: 97-109.

Appendix I. Characteristics and fates of tricolored blackbird colonies detected in 2015.

Location Name (as used in Portal)	**County**	**Nesting Substrate**	**Date Detected**	**Detected by**	**Area occupied (Ac)**	**No. of Breeding Birds**	**Comments**
Hulen Levee	Merced	Himalayan blackberry	3/3/2015	Meese	0.2	400	Substrate nearly eliminated by herbicides
West Poso	Kern	Triticale	3/3/2015	Meese	Unknown	25,000	Failed, abandoned by 4/15/2015
Deer Creek	Tulare	Triticale	3/3/2015	Meese	Unknown	10,000	
Sandy Mush and 59	Merced	Triticale	3/23/2015	Cheryl D. Johnson	Unknown	Unknown	New location. Destroyed by harvest between 3/23 and 3/26/2015.
Combs Road	Merced	Triticale	3/26/2015	Meese	Unknown	7,000	New location
Henry Miller and Cherokee	Merced	Triticale	3/26/2015	Meese	Unknown	7,000	New location being harvested upon discovery, saved by law enforcement
Merced NWR, East Farmfield 3	Merced	Mustard, milk thistle	3/26/2015	Meese	1	1,000	Minimum of 3 separate settlements, 2nd and 3rd failed.
Pete Miller East	Stanislaus	Mustard	3/26/2015	Meese	15	7,500	New location
Wind Wolves Preserve	Kern	Stinging Nettle	3/31/2015	Peppel	N/A	6,000	6, perhaps 7, colonies; monitored once, 2 colonies fledging young on 3/31/2015
Atwell Island Ton Tache Unit 4	Tulare	Bulrush, cattails	4/8/2015	Meese		4,500	Reportedly occupied continuously for 3+ months
Dead Man Creek	Merced	Milk thistle	4/9/2015	Meese	1	4,000	New location
Holiday Lake	Los Angeles	Cattails	4/16/2015	Meese	4	2,000	500 fledglings seen on day of survey
Branch Park Pond	Kern	Cattails	4/16/2015	Wanda Deal	2	600	Observed on single day
Eagleton Pond	Merced	Cattails	4/23/2015	Meese	2	1,500	New location
Marshall Levee Pond	Merced	Cattails	4/23/2015	Meese	1	500	New location in tiny pond behind Joe V. Silveira Dairy
Sonora Road No. 3	Stanislaus	Himalayan blackberry	4/27/2015	Meese	2	7,000	Half of occupied substrate destroyed by harvest, reported by Dan Airola
Rancho Seco Reservoir	Sacramento	Himalayan blackberry	4/27/2015	Meese	2	3,000	Settlement, abandoned.
Birch Ranch 1	Sacramento	Himalayan blackberry	4/27/2015	Meese	1	1,000	Settlement, abandoned.
Birch Ranch 2	Sacramento	Himalayan blackberry	4/27/2015	Meese	1	1,000	Settlement, abandoned.
Birch Ranch 3	Sacramento	Himalayan blackberry	4/27/2015	Meese	2	5,000	Productivity unknown.
Five Palm Trees	Sacramento	Himalayan blackberry	5/1/2015	Meese	.5	900	RS not measured but 300 fledglings seen 5/13 so at least moderately productive.
Plumas Arboga 2	Sacramento	Himalayan blackberry	5/5/2015	Meese	1.5	5,000	RS visually estimated at 0.6
Ohlone Trace Pond	Monterey	Bulrush	5/6/2015	Meese	1	60	Poor nesting substrate quality.
Laguna Seca	Monterey	Cattails	5/9/2015	Meese	3	1,500	
Sonora Road and Littlejohn Creek	Stanislaus	Himalayan blackberry	5/13/2015	Meese		800	Abandoned < 2 weeks after settlement.
Michigan Bar – Carbondale Mining Pit	Amador	Cattails	5/13/2015	Meese	Unknown	3,000(?)	New colony location in mining pit, nesting substrate out of view from public road.
DeMartini	Amador	Himalayan blackberry	5/13/2015	Meese	2	4,000	New colony location.
Schuster Ranch	Yuba	Cattails	5/18/2015	Meese	3	3,000	
Jasper Lane	Yuba	Himalayan blackberry	5/18/2015	Meese	3	7,000	Access difficult, obtained on single occasion on 6/10 to inspect nests.
Plumas Arboga	Yuba	Cattails	5/26/2015	Meese	3	7,500	RS = 0.6
Conaway Ranch	Yolo	Cattails	5/28/2015	Meese	3	20,000	RS=0.3
Capitol Outing Club	Colusa	Cattails	6/4/2015	Meese	1	5,000	Previously occupied in 2005.
Delevan T43	Colusa	Cattails	6/10/2015	Meese	5	20,000	First colony since 2010.
Beale A.F.B.	Yuba	Himalayan blackberry	6/12/2015	Meese, Kirk	5	Unknown, likely ca. 10,000	Tour destruction of occupied copses following removal via vegetation masticator at base commander's orders

Appendix II. Recommendations for the Conservation of Tricolored Blackbirds (Meese 2014).

1. Eliminate all known sources of mortality, including the losses of eggs and young via harvest of their nesting substrate and adults in autumn when causing depredations in rice.

2. It is essential to develop a mechanism for conserving at-risk colonies. A mechanism is required that consists of 1) field workers who *detect settlements* of birds in ephemeral nesting substrates (e.g., triticale fields), 2) a person or persons to whom the field worker *reports the presence of birds in ephemeral, at-risk locations* and who has the responsibility of contacting landowners and informing them of the protected status of the birds and of funding available to compensate them, 3) a cooperative extension specialist or other independent expert who *estimates the loss in value* of the crop as a result of the harvest delay, 4) a field worker who *monitors and documents the results* of conservation actions (successful delay until a week past average date of fledging, an estimate of the number of young fledged, a description of the process of harvest in those cases where fledglings are still present in the field when it is being harvested with an emphasis on the effects on the behavior of the fledglings post-harvest). 5) All of these *actions should be documented and then be reported* to a meeting of the Working Group and provided in a report that is posted to the Portal.

3. A legislative fix to eliminate exemption of protection under the MBTA is needed for red-winged blackbirds in California. If red-wings cannot be shot and shooting stops in autumn in rice, this will also save the lives of an unknown number of post-breeding adult tricolors that are shot by "mistake" as tricolors and red-wings are superficially nearly identical in appearance and flock together during autumn.

4. Better document conditions which result in relatively high reproductive success. Examine patterns in RS to determine whether, on a time-averaged basis, there is relatively higher RS in colonies in some geographic regions or that are established in different nesting substrates. Use these insights to make recommendations for management actions.

5. Study the effects of harvest on populations of fledglings in crèches that persist on nesting substrates until moments before they're harvested to best document effects on birds. In some situations, fledglings persist on the original nesting substrates until moments before the substrates are harvested. Study these colonies and document where the birds go when the harvester shows up and what do they do when they return to the just-harvested field.

6. Take an 'all hands on deck' approach to tricolored blackbird conservation that includes representation by all industries that may be affected by a listing and all systems of protected areas, including the National Wildlife Refuge System, State Wildlife Areas, DOD installations, and private preserves.

7. Work with landowners in foothill and other locations with extensive rangelands where the availability of nesting substrate may be limiting reproduction; add nesting substrates where they are lacking, enhance nesting substrates where they are limiting, and protect nesting substrates where necessary. Fund landowners who want to conserve tricolors but who incur a cost in doing so.

8. Provide supplemental insect foods (meal worms, possibly others) to investigate whether supplemental feeding may increase RS.

9. Provide meal worms or other insects to settling birds at desired locations to see whether the supplemental foods may influence breeding site selection.

10. Focus efforts on regions with a recent history of successful reproduction (e.g., Sierra Nevada foothills) and, where appropriate, seek to create additional breeding sites.

11. Expand monitoring and research into regions which have historically been under-studied (central Sierra foothills, coastal locations) and suggest strategies to sustain or increase reproductive output in these regions. Perhaps fund a volunteer effort by reimbursing volunteers for food and mileage costs for monitoring efforts.

12. Encourage and/or provide monetary incentives to farmers to grow alfalfa, sunflowers, and rice within 3 miles of active tricolored blackbird colonies without insecticides or to delay their use until after the young have fledged and left the area.

13. Investigate the relative abundance of insects in rice paddies under organic culture to that in commercial rice paddies to document whether organic rice provides a better foraging substrate than does commercial rice (as has been suggested by relatively high RS at the Conaway Ranch in Yolo County, where both organic and commercial rice is grown).

14. Provide additional funding and guidance for landowners to provide essential resources for nesting tricolors on private property.

15. Actively maintain all wetlands recently used by breeding tricolors, and especially those in coastal locations, to provide the youthful conditions preferred by nesting birds.

16. Develop and disseminate via the Portal handbooks that illustrate best practices for maintaining wetlands and other nesting substrates for breeding by tricolored blackbirds.

17. Conduct threat assessments of all areas currently used by breeding tricolors and work with local officials to identify these threats and seek ways to reduce or eliminate them.

18. Assess the concentrations of neonicotinoid insecticides in regions with the lowest insect abundances and highest rates of decline in tricolored blackbirds.