

State of California  
California Natural Resources Agency  
Department of Fish and Game

Detection, monitoring, and fates of  
Tricolored Blackbird colonies in 2009 in the  
Central Valley of California

By

Robert J. Meese, Ph.D.  
Department of Environmental Science & Policy  
University of California  
Davis, CA 95616

Wildlife Branch  
Nongame Wildlife Program Report 2009-03

Detection, Monitoring, and Fates of Tricolored Blackbird Colonies in  
2009 in the Central Valley of California

Final Report

Submitted to:

California Department of Fish & Game  
Wildlife Branch  
Nongame Wildlife Program  
1812 9<sup>th</sup> Street  
Sacramento, CA 95811

and

U.S. Fish & Wildlife Service  
Sacramento Fish & Wildlife Office  
2800 Cottage Way, W-2605  
Sacramento, CA 95825

Robert J. Meese, Ph.D.  
Department of Environmental Science & Policy  
University of California  
One Shields Avenue  
Davis, CA 95616

## Acknowledgments

I thank the California Department of Fish & Game, Nongame Wildlife Program and the U.S. Fish & Wildlife Service, Sacramento Fish & Wildlife Office for providing financial support for field work in 2009.

The U.S. Fish & Wildlife Service staffs at Kern (Dave Hardt, Scott Frazer, Pam Williams, Nick Stanley, and Jihadda Govan), San Luis (Dennis Woolington), and Sacramento (Mike Wolder, Mike Carpenter, and Rich Pence) National Wildlife Refuges contributed substantially to the 2009 field work, including informing me of settlements and colonies, assisting in estimating reproductive success and quantifying numbers of birds in colonies via nest transects, contacting landowners, facilitating access to private property, and banding.

I thank the landowners, who wish to remain anonymous, in Kern and Tulare counties for conserving and allowing access to monitor the tricolored blackbird colonies on their properties.

Thanks to Scott Menefee for allowing access to monitor the colony at the Honey Lake Duck Club in Merced County and to Art Grachez and Jim Roff, property owners in Stanislaus and Merced counties, respectively, who allowed access to their properties for monitoring.

Thanks to the owner, who wishes to remain anonymous, of the ranch in Yuba County on which occurs the Plumas-Arboga colony, for providing breeding habitat of exceptionally high quality and for again permitting me unlimited access for monitoring, trapping, and color-banding tricolors, and for stimulating conversation as well as interest in and support of my work.

Thanks to Steve Simmons, Merced, California, for assisting in colony surveys, for contacting landowners to obtain permission to access for monitoring, and providing information on settlements and colonies in Merced County.

Thanks to Dave Bogener, California Department of Water Resources, for again informing me of tricolor colonies in Butte County.

Thank you to Google, Inc. for providing a copy of Google Earth Pro<sup>®</sup>, which was used to precisely determine geographic coordinates and to calculate the areas occupied by nesting tricolors, necessary for estimating numbers of breeding birds and for calculating productivities of colonies.

## Table of Contents

Introduction .....	4
Methods.....	5
Results .....	7
Discussion.....	11
Management Considerations.....	19
Literature Cited.....	21
Appendix I .....	23

## Table of Figures

Figure 1. Lone Tree site, Merced County.....	11
Figure 2. ECLA South Pond, Kern County in late April, 2009.....	14
Figure 3. Chart of 5 Year Trend in Southern San Joaquin Valley Abundance.....	17
Figure 4. Chart of 5 Year Trend in Southern San Joaquin Valley Productivity.....	18

## Table of Tables

Table 1. Fates of colonies monitored in 2009.....	9
Table 2. Reproductive Success Measurements.....	10

## Introduction

This report describes field work conducted between late March and early August, 2009 to detect, monitor, and estimate the productivities of the largest breeding colonies of the tricolored blackbird (*Agelaius tricolor*, hereafter tricolor) in California's Central Valley, with an emphasis on colonies established in triticale, a wheat x rye hybrid grain, in the San Joaquin Valley. This is the fifth year that I have conducted field work with tricolors and the third year that I have banded tricolors. The results of this year's banding efforts are described in a separate report (Meese 2009).

The field work described here and in previous reports (Hamilton and Meese 2006, Meese 2006, 2007, 2008) emphasizes the Central Valley, although the tricolor has two distinct population segments: the Central Valley population and the southern California population (Beedy and Hamilton 1999), and historically has nested in large numbers in coastal marshes in southern California (Baird 1870, Neff 1937, Unitt 2004). Workers in southern California have documented severe population declines in the southern California population segment (Neff 1937, Beedy and Hamilton 1997, Unitt 2004, Kelsey 2008) and a dedicated, intensive survey in spring 2009 counted only ca. 5,200 birds in the six-county southern California region (Feenstra 2009). Small numbers of tricolors are also found in northern Baja California, western Nevada, southern Oregon, and, since 1998, southern Washington (Beedy and Hamilton 1999, Seattle Audubon Society Birdweb website, accessed September 2009), and as is the case in southern California, the Baja California population is in serious jeopardy (Erickson et al. 2007, Erickson and de la Cueva 2008).

The annual search for, monitoring, and conservation of the largest tricolor colonies on private property, especially those established in grain fields in the San Joaquin Valley, are essential components of recent attempts to stem the population decline of the Central Valley population segment and to increase the numbers of tricolors in California. However, stochastic events over which we exert no control may play an important role in tricolor population regulation and, hence, our efforts to conserve the species, as was documented in 2007 (Meese 2007), 2008 (Meese 2008) and again this year. The largest colony in the southern San Joaquin Valley in 2009, the Riverview Dairy colony in Tulare County, was spread between two sites on the same property, the first estimated to consist of 30,000 breeding birds and the second to consist of 50,000 breeding birds. Due to intense predation by cattle egrets (*Bubulcus ibis*), the productivity of both of these colonies was essentially eliminated, and consisted of no more than a few hundred fledglings. Further, the drought that is believed to have resulted in the near-complete range-wide reproductive failure in 2007 and much reduced productivity in 2008 continued this year, and three relatively disturbance-free colonies are known to have been abandoned more than two weeks after they formed, most likely due to a relative absence of insects upon which breeding birds depend.

Additional factors that are limiting tricolor productivity in the Central Valley include: 1) on-going conversions of formerly productive agricultural lands, primarily those planted in alfalfa, to perennial crops avoided by tricolors, primarily orchards (almonds and pistachios) and vineyards; 2) the planting of grains by San Joaquin Valley farmers that are not utilized by breeding tricolors, and 3) the shooting of adult tricolors in the Sacramento Valley during and after the breeding season. Reductions in the area of agricultural crops utilized by foraging tricolors via conversion to perennial crops shunned by foraging tricolors may reduce the suitability of an area for tricolor breeding to the point where, despite the presence of suitable nesting substrate, tricolors abandon an area due to an inability to find sufficient insects required for breeding. In the past two years, farmers in both Kern and Tulare counties have planted grains other than triticale on their properties where tricolors nested as recently as 2007 in an effort to eliminate the potential conflict between their need for silage for their cows and the needs of nesting tricolors. The shooting of tricolors in the Sacramento Valley was confirmed this year with the reporting by Sacramento National Wildlife Refuge staff of two birds that I banded that had been shot by a rice farmer in Butte County.

## **Methods**

*Colony Detection.* Field work began on 29 March, 2009 with surveys of the southern San Joaquin Valley to detect settlements and colonies following the methods developed in 2006 (Meese 2006, 2007) and refined last year (Meese 2008). One day was spent in northern Los Angeles County to meet the landowner who had reported an observation of a color-banded tricolored blackbird on her property outside Leona Valley and to investigate reports of tricolor breeding in the vicinity.

Colony detection efforts continued for two weeks and consisted of:

- surveys of all previously documented colony locations in the San Joaquin Valley
- additional targeted surveys in Kern, Tulare, Kings, Fresno, Merced, and part of Madera counties.

*Monitoring.* Coincident with field surveys intended to detect settlements and colonies, I reported the results of my surveys to National Wildlife Refuge staff. Where birds were settling or breeding on private property, typically Refuge staff would identify and contact the landowner to:

1. report the occurrence of the birds
2. explain the dependence of the birds on the nesting substrate
3. estimate the amount of time it would take for the young birds produced to leave the nest and become independent of the site
4. attempt to negotiate an agreement to conserve the breeding colony, and
5. obtain permission for both U.S. Fish & Wildlife staff and myself to monitor and study the colony.

In at least one instance in Merced County, rather than attempting to negotiate an agreement to conserve the colony, U.S. Fish & Wildlife Service staff recommended the

harvest of the substrate after nest-building had begun but prior to the initiation of egg-laying.

I revisited all occupied sites until a colony failed, was destroyed through harvest, or fledged its young. In most cases, colonies were monitored (i.e. observed from the closest public road if located on private property where permission to access had not been obtained, or by immediately adjacent roads if located on public property or on private property where permission to access had been obtained) 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.

These activities were repeated when most breeding in the southern San Joaquin Valley had been completed, or grain fields harvested, and birds flew north into the Sacramento Valley.

*Estimating Area Occupied.* The dimensions of all colonies were visually estimated or directly measured via GPS. Dimensions of colonies are reliably estimated by careful observation of birds viewed from outside the colony. In nearly all cases, this consists of quietly observing a colony through binoculars from a vehicle parked or slowly driven around the perimeter of the substrate used by the breeding birds. Birds will leave and then return to nests at intervals defined by the stage of the breeding cycle, with longest intervals when females are incubating eggs and shortest intervals when both adults are feeding young. The perimeter initially determined by the birds' behavior is confirmed through subsequent monitoring activities, including on-site estimates of reproductive success (RS; see below) and colony population size (see below). Both visual estimates and coordinates directly measured by GPS were placed into Google Earth Pro to create a bounding box corresponding to the perimeter of the colony. The area occupied by the breeding birds was defined as the area within this perimeter. In addition, in wetland colonies, areas believed to be unoccupied were searched after birds had finished breeding to confirm the absence of nests.

*Estimating Reproductive Success.* For colonies where permission to access had been obtained, I entered colonies when the average age of nestlings was believed to be 7-9 days old. Nestling age is determined by carefully observing the behavior of the adult birds, which changes from relatively inconspicuous and sedentary, indicating that they are incubating eggs, to conspicuous and highly mobile, with frequent, directional flights out from and back to the colony, indicating that they are feeding young (that is, that the eggs have begun to hatch). I counted the contents of a sample of 30 or more nests per colony to estimate the number of young produced per nest (= reproductive success, RS).

*Estimating Breeding Colony Population Size.* For colonies where permission to access had been obtained, I re-entered colonies after the young had fledged and conducted nest counts along line transects. Transect lengths are variable and typically range from

50 to 300 feet. Start and end points are marked by GPS and linear distance is computed by the GPS or calculated using Google Earth Pro. The transect width is always 6 feet, approximately the width of my outstretched arms. From the line transect nest counts is derived an estimate of the number of nests per unit area (typically the number of nests per acre). The number of nests constructed is then estimated as the product of the estimate of the number of nests constructed per acre multiplied by the number of acres occupied by breeding birds. Assuming that each male breeds, on average, with two females, the number of nests multiplied by 1.5 yields an estimate of the number of breeding birds at a colony. This quantity then provides an independent estimate of the number of breeding birds, as the numbers of breeding birds are also visually estimated during monitoring activities.

*Estimating the Number of Young Produced.* The number of young produced at a colony is visually estimated by repeated observations of young in groups (“crèches”) following fledging. In practice, 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 several days in groups perched and calling conspicuously from the margins of colonies (Beedy and Hamilton 1999, pers. obs.). Where estimates of RS and of the number of nests built are available, an estimate of the number of young produced is derived as the product of the number of nests multiplied 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).

Following the completion of first breeding bouts in the San Joaquin Valley, I repeated these activities, and responded to reports of aggregations of tricolors, in the Sacramento Valley (Yolo, Sacramento, Yuba, Colusa, Glenn, and Butte counties), where tricolors typically (Hamilton 1998), but not always (e.g., Meese 2006) move to breed again. I began to survey for settlements and colonies in the Sacramento Valley in mid-May and monitored colonies until the young had fledged. The last young were observed at the Yolo Bypass Wildlife Area colony in Yolo County in early August.

I trapped and banded birds during the interval from mid-April to late July; the banding results are presented elsewhere (Meese 2009).

## **Results**

*Colonies Studied.* Field work started on March 29<sup>th</sup> and ended on August 3<sup>rd</sup>, 2009. During this time a total of 32 sites was detected (Appendix I); of these, 13 were monitored (Table 1). Despite intensive, targeted searches using dairies as surrogates for colony locations (see Meese 2006, 2007), no settlements nor breeding colonies were detected in Kings County and only one each was detected in Fresno (Producer’s Dairy) and Madera (Milktime Dairy) counties.

*Early Initiation of Breeding.* Several colonies in Kern and Tulare counties were already well-established by the time field work began in late March. As recently as 5 years ago, nearly all settlements could be detected through field work beginning on or about the 1<sup>st</sup> of April, so there appears to be a trend toward earlier breeding among birds breeding in the southern San Joaquin Valley. For example, when I checked the El Cinco Duck Club and ECLA Ponds colonies in Kern County on March 30<sup>th</sup>, both had sections of the colony that were already quiet, indicating that females were incubating eggs, and the first fledgling was observed at El Cinco Duck Club on April 14<sup>th</sup>. These colonies had to have formed by mid-March. At the GMC colony in Tulare County, adults were feeding young on April 7<sup>th</sup>; thus, given the time required for nest building and incubation, this colony had to have formed no later than the 3<sup>rd</sup> week of March.

*Productivity.* Overall, 2009 was again a year of limited productivity, but not as poor as the drought-induced statewide reproductive failure of 2007 (Table 1; Figure 4; Meese 2007). There were only three colonies in the lower San Joaquin Valley that were documented to have had average productivity: the Costa's NE and NW colonies in Kern County and the GMC colony in Tulare County. These colonies, consisting of fewer than 50,000 breeding birds in aggregate, were all conserved through harvest delays and were estimated to have fledged 32,000 young. In contrast, the larger 30,000 and 50,000 breeding bird Riverview colonies in Tulare County fledged no more than several hundred young, due primarily to severe losses to cattle egret (*Bubulcus ibis*) predation.

In the Sacramento Valley, both the number of large colonies as well as the productivities of colonies was well below average for the third year in a row, and a large colony at Rancho Seco Park abandoned its breeding attempt (Table 1, Appendix I). For the second straight year, there were no colonies in the Capital Outing Club/Pioneer Duck Club/Acre Farms complex in Colusa County, a trio of duck clubs where, prior to 2008, birds had bred successfully for several successive years; however, the nearby (4 miles north) Delevan T43 colony consisted of 75,000 birds. It is believed that continuing drought conditions reduce the availability of the animal foods, primarily insects, required by breeding tricolors (e.g., Ramsay and Houston, 1998; Skorupa et al. 1980) and that insect abundance has recently been insufficient in parts of the Sacramento Valley to sustain breeding by tricolors.

An exception to this pattern was the Conaway Ranch in Yolo County, where fresh, dense cattails in their second year of growth supported a large colony that fledged the largest number of young in the Central Valley this year (Table 1). The Conaway Ranch is situated within a rich matrix of foraging habitats containing rice paddies, upland habitats, protected grasslands, and productive agricultural fields including alfalfa and sunflowers.

**Table 1:** Fates of colonies monitored in 2009.

Colony	County	Substrate	No. of Breeding Birds	Fate
ECLA Ponds	Kern	Cattails	ca. 5,000	Both ponds modestly productive, ca. 500 young produced by both basins. Some re-nesting reported by Scott Frazer, Kern NWR, not documented.
El Cinco Duck Club	Kern	Cattails	1,500	Modestly productive, with 2-300 young produced.
Costa's Dairy NW	Kern	Silage	4,700	Conserved via harvest delay, relatively productive, ca. 3,000 young produced.
Costa's Dairy NE	Kern	Silage	13,300	Conserved via harvest delay, relatively productive, ca. 9,000 young produced.
Riverview	Tulare	Silage	60,000	Near-complete reproductive failure due to intense cattle egret predation; 2-300 young fledged.
Riverview 5-6	Tulare	Silage	50,000	Complete reproductive failure due apparently to heavy cattle egret predation but colony highly disturbed; hazing attempted but failed.
GMC	Tulare	Silage	31,500	Conserved through harvest delay. Productive, estimated 20,000 fledglings produced.
Producer's	Fresno	Silage	30,000	Ambiguous; no access to site.
Milktime	Madera	Silage	15,000	Apparently productive, several hundred fledglings seen in foraging flights with adults
Rancho Seco Park	Sacramento	Himalayan blackberry	30,000	Complete failure, abandoned.
Conaway Ranch	Yolo	Cattails	57,000	Relatively productive; ca. 30,000 young produced.
Yolo Bypass Wildlife Area	Yolo	Cattails	5,600	Relatively productive; ca. 3,000 young produced.
Plumas Arboga	Yuba	Cattails	20,000	Ambiguous, severe storm on 6/14/09 causes much mortality, results in much re-nesting; likely < 1,000 young produced.
Delevan T43	Colusa	Cattails	75,000	Modestly productive, ca. 13,000 young produced.

*Reproductive Success.* Reproductive success (RS), defined as the average number of young produced per nest, was estimated at both Costa's Dairy colonies in Kern County, GMC in Tulare County, and Delevan T43 in Colusa County (Table 2). Reproductive

success could not be reliably estimated at several other colonies due to extended or multiple settlements and a severe storm at the Plumas Arboga colony in Yuba County. A reliable measurement of RS depends upon a large percentage of the young in nests containing young being between 7 and 10 days old. To reliably determine RS, a colony must be synchronous, with the contents of most nests developing at about the same rate (Hamilton and Meese 2006). Asynchronous colonies contain nests with contents developing at different rates, and at any one time, nests containing eggs and nestlings of a wide range of ages may be present, thus making the fates of the nest contents difficult to determine.

**Table 2:** 2008 Reproductive Success Measurements

Colony	Number of nests	Number of adults	Number of young/nest (RS)	Number of young produced
Costa's Dairy NE	8,867	13,300	1.02	9,000
Costa's Dairy NW	3,100	4,700	0.95	3,000
GMC	21,000	31,500	1.05	20,000
Delevan T43	50,000	75,000	0.26	13,000

*Colony Abandonment.* Three colonies that were confirmed to have been active were abruptly abandoned: Los Banos Wildlife Area in Merced County, Milton Road in Stanislaus County, and Rancho Seco Park in Sacramento County. In all cases, the most likely cause of colony abandonment was the lack of insects required by females to form eggs and by nestlings during their first nine days of life (Ramsay and Houston 1998, Skorupa et al. 1980).

*New Colonies.* Twelve colonies were detected by or reported to me in previously unknown locations:

1. Ritter Pond, Los Angeles County
2. Southlake, Tulare County
3. Amsterdam Road, Merced County
4. Youd Road, Merced County
5. Hulen Levee, Merced County
6. Crane Ranch North, Merced County
7. Lone Tree, Merced County
8. Mitchell Avenue, Stanislaus County
9. Patterson Road, Stanislaus County
10. Rancho Seco Park, Sacramento County
11. Yolo Bypass Wildlife Area, Yolo County
12. Western Triangle, Butte County

The new colony at Yolo Bypass Wildlife Area reflects the utilization of 2 year old nesting substrate that did not previously exist at this site and results from the work of Wildlife Area Manager Dave Feliz to provide wetland habitat attractive to nesting tricolors.

*Colonies Destroyed by Harvest.* Unlike in previous years, only one settlement, and no active colonies, was known to have been destroyed by the harvest of the grain crop that had provided the nesting substrate. Only the Lone Tree site in Merced County was known to have been harvested, and the harvest of this site occurred within days of the settlement of tricolored blackbirds as documented by staff of San Luis National Wildlife Refuge (Figure 1). It is believed that the nesting substrate was harvested before egg-laying had begun.



Figure 1. Lone Tree site, Merced County, hours after harvest of triticale substrate. Weeds including mallow (*Malva* spp.) in foreground.

## Discussion

*Timing of settlements in the southern San Joaquin Valley.* Over the past decade, the timing of settlements in the southern San Joaquin Valley (Kern and Tulare counties) has advanced from an average of the first of April to mid-March, with several colonies initiating breeding even earlier. My field work used to commence on the Monday closest to the first of April and during my first days in the field I would see large flocks of hundreds to thousands of birds prospecting for appropriate breeding sites. For each of the past five years I have begun field work at nearly the same Julian date, yet each year the birds are farther and farther along in a breeding cycle by my first day in the field, and this year, by the time I began surveys at the end of March, most colonies in Kern and Tulare counties had already formed, and many females were already incubating their first clutch of eggs.

It is tempting to attribute this pattern of earlier breeding to global climate change, but the underlying mechanism(s) producing this trend are poorly understood. The earlier initiation of breeding is of conservation concern as if the birds' breeding should continue to advance while the maturation of their triticale nesting substrate does not, or if grain maturation advances at a slower rate, the conflict between the nesting of tricolors and the harvest of the triticale would be reduced. Perhaps at some point in the future these two events will be uncoupled, so that the birds can complete their breeding before the triticale is ready for harvest. Annual monitoring should include documentation of dates of initiation of breeding and include, to the extent possible, dates of optimal harvest of triticale to more thoroughly document any trend toward an uncoupling of blackbird nesting and triticale harvest.

*Low Productivity.* The 2009 field season, as the 2007 and 2008 field seasons, was characterized by below-average reproductive output. The three most important factors causing this low reproductive output are:

1. severe predation by cattle egrets
2. drought-induced reduction of insects
3. reduction in area planted in alfalfa

The reduction of potential reproduction by intense predation by cattle egrets was the most significant factor in reducing the productivity of the southern San Joaquin Valley tricolors in 2009, as it was in 2008 (Meese 2008). As the southern San Joaquin Valley is, historically, the region where the vast majority of birds are found during the March to mid-May interval, when most first breeding attempts occur (Meese 2008; Kelsey 2008), the rapid increase in egg and nestling mortality due to cattle egret predation is of great conservation concern. Cattle egrets were unknown as tricolor predators until documented in Tulare County in 2006 by myself and Scott Frazer of Kern National Wildlife Refuge (Meese 2006), but since 2006 they have become the tricolor's most serious predator, capable of reducing to near-zero the reproductive output of colonies consisting of tens of thousands of birds. It is strongly recommended that the problem of cattle egret predation in the southern San Joaquin Valley receive immediate attention, and that plans to reduce cattle egret depredation be formulated and implemented during the 2010 breeding season.

The drought that began late in 2006 continued this year and is believed to be reducing the abundance of insects throughout the Central Valley. The continuing drought, coupled with the recent planting to pistachios and vineyards of hundreds of acres that had previously been planted to alfalfa, are believed to be severely limiting the numbers of insects available for breeding tricolors.

*Vegetation Condition and Productivity of Wetland Colonies.* The continuing drought and high cost of pumping ground water continue to negatively affect San Joaquin Valley wetlands formerly utilized by breeding tricolors. ECLA Ponds in Kern County again received Landowner Incentive Program (LIP) funding to pay for groundwater pumping to

provide nesting habitat for tricolors and the ponds were intentionally burned in November, 2008 to try to remove dead cattail stems. The U.S. Fish & Wildlife Service has a contract with the Lower Tule Irrigation District to pump water to provide cattail nesting substrate in one of the four basins in Toledo Pit in Tulare County. Yet despite these efforts, ECLA Ponds supported a colony of only 5,000 breeding birds in 2009 and Toledo Pit was completely dry and utterly unsuitable for tricolor breeding.

The relatively small number of birds supported at ECLA Ponds is due to two factors:

1. the rapid accumulation, since 2006, of primarily dead (horizontal and vertical) stems in both the north and the south ponds (despite the November, 2008 burn) due to summer and fall drought, and
2. the lack of young, dense cattails known to be preferred by nesting tricolors due to the lack of summer and fall water and to the delay in the development of the year's new growth after water is provided early in the year.

For the second straight year, it was not until the middle of May that the height of the current year's cattail growth approached the height that is typically utilized by breeding birds (Figure 2).

The vast majority of the 5,000 birds seen at ECLA Pond in 2009 attempted to nest in the south pond, which had pockets of lush growth, but this breeding population is less than 1/10<sup>th</sup> that observed in the south pond in 2006 (Meese 2006), when fresh, lush growth of cattails provided ideal breeding conditions for 60,000 birds.



*Figure 2. ECLA South Pond, Kern County, in late April, 2009. Note height of new growth relative to the previous years' growth.*

Essentially similar conditions exist at Toledo Pit in Tulare County, and in both cases, the proper management of these marshes may support breeding by tens of thousands of tricolors and severely reduce if not eliminate the conflicts between farmers and breeding tricolors by drawing breeding birds off of grain fields and into dedicated tricolor breeding habitats. The proper management of these marshes will require enough water, provided at the appropriate times, to slow the rate at which dead stems accumulate and the removal of the dead stems when they do accumulate. Previous experience at both of these locations has demonstrated that if young, dense cattail stands of 5' or higher are provided by early April, tricolors will utilize these stands for breeding rather than the surrounding grain fields and thereby eliminate the conflict between birds and farmers.

*New Colony Locations.* The 12 new breeding locations found this year compare to 4 new locations found in 2005 (Hamilton and Meese 2006), 15 in 2006 (Meese 2006), 3 in 2007 (Meese 2007), and 21 last year (Meese 2008), for a total of 55 new locations in 5 years. The detection of additional colony locations suggests that annual surveys by dedicated field personnel and outreach to other field workers continue to provide information on tricolor breeding colony movements and more thoroughly document the

breeding distribution and abundance of the species. The detection of the new Hulen Levee location in Merced County is especially significant, as it was detected on the 4<sup>th</sup> year of surveys at this location, and during this interval it was confirmed to be unoccupied. Its detection confirms that surveys are effective at detecting year-to-year changes, and that annual surveys in appropriate habitats are an essential part of efforts to monitor the Central Valley population.

The 12 new colony locations documented this year follow no obvious geographic pattern, and are distributed from Los Angeles County in the south to Butte County in the north. Tricolor colony locations are known to move from year to year (Neff 1942, Hamilton et al. 1995, Meese 2006); however, these changes in colony locations do not appear to be random and without apparent cause as has previously been reported (e.g., Neff 1942), but rather appear to be due to inter-annual landscape changes in potential nesting substrates and the birds' close tracking of these changes. The detection of additional colony locations helps to further target survey activities, and may thus increase annual survey efficiency by allowing field workers to survey and monitor a larger proportion of the Central Valley population each year.

*Access to "Silage Colonies".* The silage colony reporting mechanism, and communication between myself and U.S. Fish & Wildlife Service staff, is not uniform, and varies from region to region. In the southern San Joaquin Valley, most colonies are detected through an active collaboration between Kern National Wildlife Refuge staff and me, whereby all colonies detected by Kern staff are reported to me, and I report all colonies that I detect to Kern staff. Kern staff then identifies landowners on whose properties tricolors are nesting and contacts landowners to attempt to negotiate a resolution to the impending conflict between the needs of the birds and the needs of the dairyman. This resolution is intended to conserve the breeding colonies while meeting the needs of the dairyman.

In the northern San Joaquin Valley, I survey for and detect nearly all silage colonies (colonies on dairies adjacent to Merced NWR and some non-silage colonies are typically reported to me by San Luis NWR staff) and then report these to San Luis NWR staff. In 2009, I reported, via email, colonies at Producer's Dairy in Fresno County and Milktime Dairy in Madera County and requested Service assistance in obtaining permission to access to monitor these colonies, but received no reply. Thus, the fate of the Producer's Dairy colony in 2009 is uncertain, as I was restricted to viewing this colony from the shoulder of the nearest public road (Hwy. 180), approximately a half-mile away. My attempts to monitor the Milktime Dairy colony were made somewhat easier by closer access via public roads.

A more consistent mechanism for the reporting of silage colonies, the sharing of information, and efforts by USFWS staff to contact affected landowners and attempt to negotiate the conservation and on-site monitoring of all vulnerable colonies, as currently exists in the southern San Joaquin Valley, would likely greatly reduce losses due to

destruction through harvest and stabilize or increase the number of tricolors in the Central Valley.

*Shooting Tricolored Blackbirds in the Sacramento Valley.* Colonies in the Sacramento Valley are much less dependent upon ephemeral substrates than are those in the San Joaquin Valley, but Sacramento Valley birds have their own serious threats. This year, two birds that I banded in 2008 were shot by a rice farmer outside Richvale in Butte County and subsequently reported to me by staff at Sacramento National Wildlife Refuge. Although only two tricolors were confirmed killed, these were apparently turned in to federal wildlife officials because of the bands that were found on their legs and serve to suggest a potentially much larger problem. One wonders how many tricolors are shot each summer in the Sacramento Valley? Previously, in 2006, I was told by two Colusa County staff that flocks of blackbirds were annually shot in Colusa County and that such shooting did not require a permit. This is true for most blackbird species, but not for tricolors, which are protected under the Migratory Bird Treaty Act. Additionally, a rice farmer in Yuba County told me in July, 2008 that he knows of several rice farmers who annually “herd” and then shoot blackbirds. The shooting of blackbirds during the breeding and post-breeding seasons is in all probability a source of additive mortality, that is, mortality in addition to that which would normally occur due to other factors (starvation, disease, etc.), as it involves primarily breeding and post-breeding adults, and thus may be especially important as a limiting factor in population growth in tricolors.

*Five Year Trend in Abundance in Southern San Joaquin Valley.* The southern San Joaquin Valley is especially well-surveyed on an annual basis, and it is unlikely that a large colony has been undetected in the past five years in this region (the Central Valley portions of Kern and Tulare Counties). In this 5 year interval, there has been a trend toward fewer breeding birds in the Central Valley portions of Kern and Tulare counties (Figure 3). This trend may be exacerbated by the on-going drought that began in late 2006, but is unlikely due exclusively to this one factor. Likely, reductions in nesting substrate due to the planting of non-attractive crops as well as reductions in foraging habitats due to conversions of agricultural fields from alfalfa to nuts and grapes also play important roles. It will be important to examine trends in breeding abundance throughout the Central Valley in coming years to determine whether there is a shift in the numbers of breeding birds from the southern San Joaquin Valley to more northerly locations.

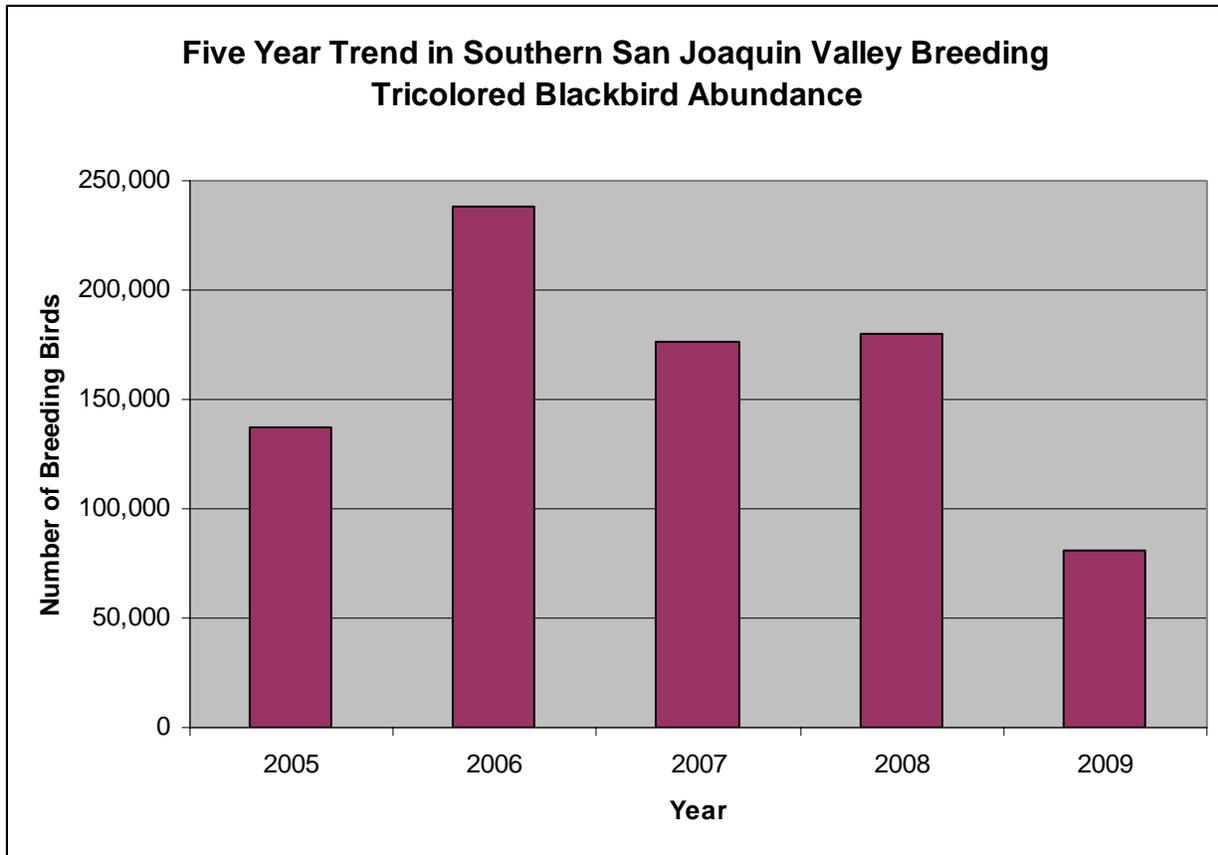


Figure 3. Chart of 5 Year Trend in Abundance of Breeding Tricolors in Kern and Tulare Counties.

*Five Year Trend in Productivity in Southern San Joaquin Valley.* From a conservation perspective, the number of breeding birds may not be as important as is the number of young produced per year. Figure 4 shows a chart of the numbers of young fledged from the Central Valley portions of Kern and Tulare counties during the 5 year interval of 2005 – 2009. There has been a quite dramatic decline in the number of young fledged during this interval, with a low during the interval reached during 2007 when the effects of the drought were most pronounced. What is perhaps most worrisome in this trend is the fact that increasing numbers of colonies have been saved from destruction through harvest during the 2005-2009 interval, yet this has not been reflected in the number of young produced.

I believe that the southern San Joaquin Valley is at a tipping point, and that trends in land use that have been on-going for decades in concert with more recent events have made this region increasingly unsuitable for breeding by tricolors, and although relatively large numbers of birds have continued to settle into colonies in the Central Valley portions of Kern and Tulare counties, the productivity of these colonies has recently been greatly diminished. Tricolor breeding abundance in the southern San Joaquin Valley increased dramatically in the 1980's when the dairy industry moved into the region (Beedy and Hamilton 1999) and since that time, colonies established in

silage fields in the southern San Joaquin Valley have dominated early-season breeding (e.g., Beedy and Hamilton 1997, Hamilton and Meese 2006). The tricolor requires large foraging areas surrounding its breeding colonies, both to support egg production by females as well as to meet the nutritional requirements of nestlings (see Meese 2008, Skorupa et al. 1980). In an agricultural landscape, the most productive foraging habitats are alfalfa fields (Beedy and Hamilton 1999), especially while these are being flood-irrigated (pers. obs.). In the region between the Costa's Dairy colony locations and the ECLA Ponds/Poso Creek colony locations (Poso 1, Poso 2, West Poso) in Kern County, hundreds of acres of formerly productive alfalfa fields have recently, within the past three years, been planted to pistachio orchards and vineyards, habitats unsuitable for foraging tricolors (Beedy and Hamilton 1999). In addition, hundreds of acres that had formerly been planted to triticale, the grain most commonly used by nesting tricolors, have for each of the past two years been planted to wheat, oats, or other alternative grain varieties to eliminate the possibility of conflict with nesting tricolors. And finally, since 2006 the cattle egret has been causing near-complete elimination of productivity in the largest colonies in Tulare County. Each of these impacts could, individually, reduce tricolor productivity; collectively, they are having dramatic region-wide effects and the future of the tricolor as a breeding species in this region is uncertain.

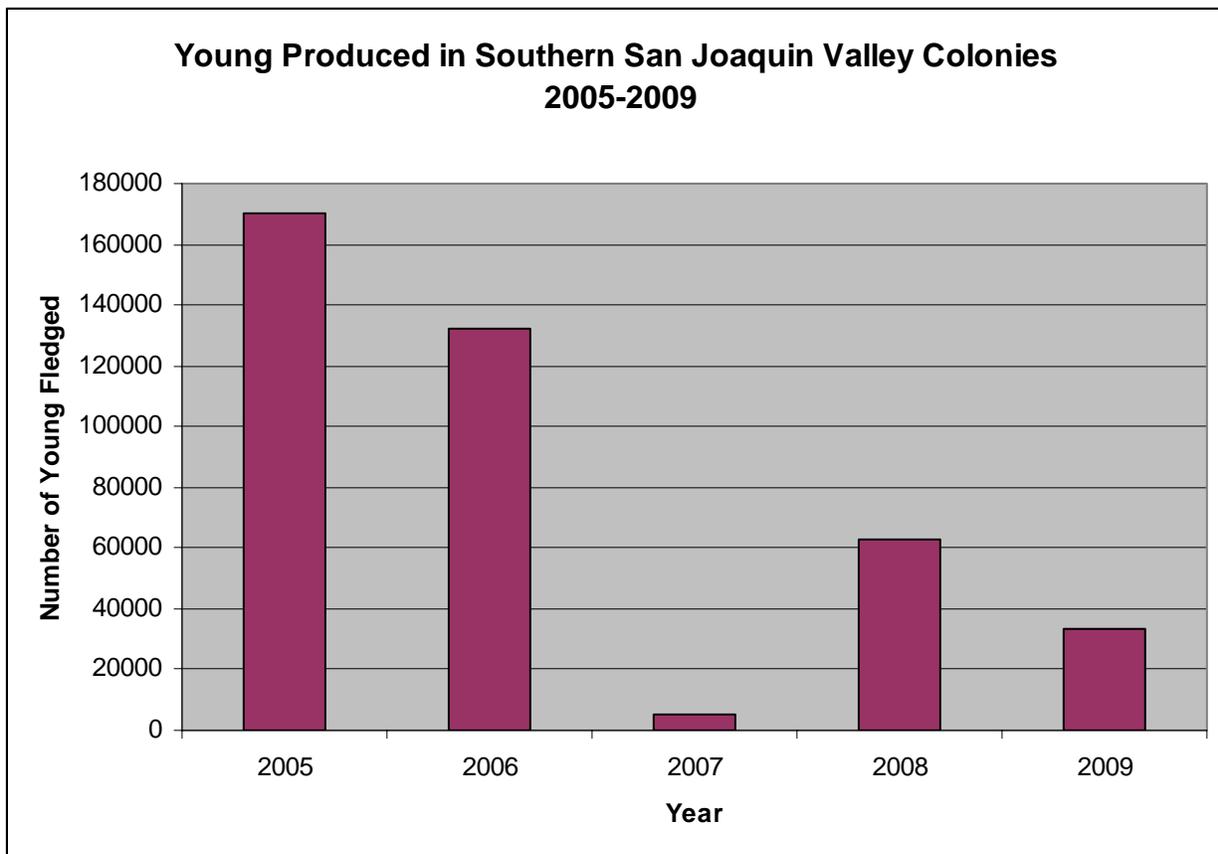


Figure 4. Chart of Five Year Trend in Productivity in Kern and Tulare Counties.

## Management Considerations

1. Management of Nesting Substrates. Observations in this and several prior years suggest strongly that breeding tricolors actively select young, rapidly-growing plants irrespective of type (silage, milk thistle, mustard, cattails, or bulrush). Land managers who seek to provide habitat for breeding tricolors must be informed of their strong preference for young, rapidly-growing vegetation and incorporate active vegetation management into their management plans to attempt to provide the conditions preferred by nesting tricolors. Marsh vegetation (cattails and bulrush) is especially dependent upon adequate water supplies, and where these supplies are deficient and/or intermittent, dead stems, shunned by nesting tricolors, can rapidly accumulate, making marshes unsuitable for tricolor breeding. Where air quality regulations allow, marshes with dead and lodged stems should be burned during the late fall or early winter to remove senescent vegetation and to promote the vigorous growth of new plants that will mature when tricolors arrive to nest. The Plumas Arboga marsh in Yuba County, Conaway Ranch and Yolo Bypass Wildlife Area in Yolo County and Delevan T43 in Colusa County all provided examples of 2009 tricolor colonies established in young, dense, vigorously-growing cattails.

2. Shooting of Tricolors. The number of tricolors killed by property owners in the Sacramento Valley is unknown but deserves greater attention due to the confirmation of the shooting of two banded birds in Butte County in June. One could make various assumptions about the proportion of banded birds in the population (.017 at the beginning of the 2009 breeding season, 0.066 at the end) and couple these with the two banded birds that were killed to estimate the number of birds that may be killed in the Sacramento Valley on rice farms each year, but the killing of tricolors in the Sacramento Valley by rice farmers has now been confirmed, and that is perhaps what is of greatest importance, and what needs to be addressed by those with regulatory and management authority for the species. At a minimum, those involved in the shooting should be informed of the protected status of the species and of the voluntary, non-regulatory approach being taken to try to conserve it. Efforts ought to be made to enlist their support in conservation efforts. It would be useful, perhaps, to engage the industry in more aggressive education and outreach activities, as although the California Rice Commission was represented at most meetings of the Tricolored Blackbird Working Group, the Commission is not a signatory to the Conservation Plan's Memorandum of Agreement. Perhaps the Commission could fund a part-time position to enhance existing outreach efforts.

3. Fates of Fledgling Tricolors. The fates of young that are produced in silage colonies are unknown, and until we have intensive observations of behavior of young during and immediately after harvest of conserved colonies we will have no idea of how harvest of substrate affects birds that have recently fledged. To fledge simply means to leave the nest, but what is important is for the young to be independent, if not of the care and feeding of adults then of the nesting substrate (for cover, roosting, protection from sun, etc.). In most cases, the harvest of the nesting substrate occurs within a few days of

the fledging of most of the young, but while the young are still in the immediate vicinity of, and potentially still dependent upon, the nesting substrate. It would be extremely informative to know how the grain harvest affects the behavior of the recently-fledged young and obtaining in-depth observations of the behavior of young during and immediately after harvest should be a priority.

4. Radio or Geolocator-tagging of Young and Adults. Although the banding and color-banding of adult, and a small number of hatch-year, tricolors has begun to shed light on tricolor movements within and among breeding seasons, we have essentially no information on the movements of young following fledging nor on the movements of adults during the non-breeding season. It is suggested that either conventional radio transmitters or the recently-developed geolocators (Afanasyev 2004) be used to study long-distance movements of adult and fledgling birds. A project leading to a master's degree at a Central Valley academic institution would likely help to fill in many of the gaps in our understanding of tricolor movements and help to inform decisions intended to benefit the species.

## Literature Cited

- Afanasyev, V. 2004. A miniature daylight level and activity data recorder for tracking animals over long periods. *Mem. Nat. Inst. Pol. Res. Special Issue* 58:227–33.
- Baird, S.F. (ed.). 1870. *Ornithology of California, Vol. 1: Land Birds*. From the manuscript and notes of J.G. Cooper, U.S. Geologic Survey of California. Cambridge, MA: Welch Bigelow and Co.
- Beedy, E. C. and W. J. Hamilton III. 1997. *Tricolored Blackbird Status Update and Management Guidelines*. Jones & Stokes Associates, Inc. 97-099, Sacramento, CA. Prepared for U.S. Fish and Wildlife Service, Portland, OR, and California Department of Fish and Game, Sacramento, CA.
- 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.
- Erickson, R.A., H. de la Cueva, and M.J. Billings. 2007. Nesting tricolored blackbird survey: Baja California 2007. Report submitted to the U.S. Fish & Wildlife Service. Available for download from the Tricolored Blackbird Portal at: <http://tricolor.ice.ucdavis.edu/downloads>, accessed 8/26/08.
- Erickson, R.A. and H. de la Cueva. 2008. Nesting Tricolored Blackbird Survey: Baja California 2008. Report submitted to the U.S. Fish & Wildlife Service. Available for download from the Tricolored Blackbird Portal at: <http://tricolor.ice.ucdavis.edu/downloads>. Accessed 9/24/2009
- Feenstra, J. 2009. Results of Southern California Tricolored Blackbird Survey 2009, via email, June, 2009.
- Hamilton, W.J. III. 1998. Tricolored Blackbird Itinerant Breeding in California. *Condor* 100: 218-226.
- Hamilton, W.J. III, L. Cook, and R. Grey. 1995. Tricolored blackbird project 1994. Report submitted to U.S. Fish & Wildlife Service, Portland, OR.
- Hamilton, W.J. III and R.J. Meese. 2006. Habitat and population characteristics of Tricolored Blackbird colonies in California. Report submitted to California Department of Fish & Game.
- 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.

- Meese, R.J. 2006. Settlement and Breeding Colony Characteristics of Tricolored Blackbirds in 2006 in the Central Valley of California. Report submitted to the U.S. Fish & Wildlife Service, Sacramento, CA and to Audubon California, Emeryville, CA.
- Meese, R.J. 2007. Settlement, Breeding, Productivity, and Color-banding of Tricolored Blackbirds in 2007 in the Central Valley of California. Report submitted to the U.S. Fish & Wildlife Service, Portland, OR and to Audubon California, Emeryville, CA.
- Meese, R.J. 2008. Detection, monitoring, and fates of Tricolored Blackbird Colonies in 2008 in the Central Valley of California. Report submitted to California Department of Fish & Game and U.S. Fish & Wildlife Service and available on the Tricolored Blackbird Portal at: <http://tricolor.ice.ucdavis.edu/downloads>.
- Meese, R.J. 2009. Trapping and banding of tricolored blackbirds (*Agelaius tricolor*) in the Central Valley in 2009. Report submitted to California Department of Fish & Game and U.S. Fish & Wildlife Service and available on the Tricolored Blackbird Portal at: <http://tricolor.ice.ucdavis.edu/downloads>.
- Neff, J.A. 1937. Nesting distribution of the tri-colored red-wing. Condor 39: 61-81.
- Neff, J.A. 1942. Migration of the Tricolored Red-wing in central California. Condor 44: 45-53.
- Ramsay, S.L. and D.C. Houston. 1998. The effect of dietary amino acid composition on egg production in blue tits. Proc. R. Soc. Lond. B. 265: 1401-1405.
- Skorupa, J., R.L. Hothem, and R.W. DeHaven. 1980. Foods of breeding tricolored blackbirds in agricultural areas of Merced County, California. Condor 82: 465-467.
- Unitt, P. 2004. San Diego County bird atlas. Proceedings of the San Diego Society of Natural History 39.

**Appendix I: Characteristics and Fates of Tricolored Blackbird Settlements and Colonies Detected in 2009.**

Name	County	Substrate	Date Detected	Detected By	Area Occupied (Ac)	Size (no. adults)	Comments
Costa's Dairy NE	Kern	silage	Mid-March	Frazer	15	Ca. 20,000	In field heavily infested with mallow; I've not seen this field occupied previously
Costa's Dairy NW	Kern	Silage	Mid-March	Frazer	15	10,000	Colony with birds displaying very odd behavior, as though repeatedly disturbed; large proportion of birds in flight above colony at any given time
El Cinco Duck Club	Kern	Cattails and bulrush	Mid-March	Frazer	3	1,000	Small colony in same portion of marsh occupied last year, but broken into two parts, with SE and SW corners of basin occupied; these are only portions with any water and are also were only green cattails occur
ECLA Ponds	Kern	Cattails and bulrush	Late March	Frazer	10	3,500	500 birds in north pond, 3,000 in south pond; nesting substrate in poor condition, mostly dead stems with new growth coming up beneath
Tule Road	Kern	Bulrush	April	Frazer	3	1,000	First time to this site, monitored annually by Scott Frazer
Holiday Lake	Los Angeles	Cattails and bulrush	April	Meese	1	400	First visit to Los Angeles County sites. This is considered to be the most important tricolor breeding site in Los Angeles County.
Ritter Pond	Los Angeles	Cattails	early April	Meese	0.1	100	Access provided by adjacent landowner. Majority of birds were males.
Riverview	Tulare	Silage	Mid-March	Frazer	40	30,000	To be conserved by buyout; near-complete nesting failure due to intense cattle egret predation
Riverview 5-6	Tulare	Silage	Mid-March	Frazer	20	20,000	detected by Scott Frazer in early March, who contacted owner to negotiate harvest delay
GMC	Tulare	Silage	Late March	Frazer	28	20,000	In silage field not previously known to host tricolor colony
Southlake	Tulare	Silage	April	Frazer	10	2,500	<b>New colony location</b> ; mixed colony of tricolors and white-faced ibis
Producer's Dairy	Fresno	Silage	April	Meese	30	35,000	Permission to access and monitor colony sought from members of Working Group via email; never received a reply. Fate of colony uncertain.
Milktime Dairy	Madera	Silage	April	Meese	20	15,000	Permission to access and monitor colony sought from members of Working Group via email; never received a reply
Owens Creek	Merced	Weedy field with	April	Meese and	10	3,000	Milk thistle substrate sparse and short when site

		milk thistle, fiddleneck		Simmons			initially surveyed
Amsterdam Road	Merced	Himalayan blackberry and cattails	April	Meese and Simmons	3	2,000	<b>New colony location</b> ; on private property, permission to access obtained from owner
Youd Road	Merced	Himalayan blackberry	April	Meese and Simmons	3	2,000	<b>New colony location</b> on private property; owner reported to be hostile and permission to access not requested
Crane Ranch North	Merced	Himalayan blackberry	May	Simmons	1	3,000	<b>New colony location</b> reported by Steve Simmons in early May.
Honey Lake	Merced	Cattails	April	Meese	10	2,000	Mostly males seen settling, loud song chorus; poor productivity.
Los Banos Wildlife Area	Merced	Cattails and bulrush	April	Meese	3 acres	2,000	Mostly males seen settling, loud song chorus. Colony abandoned.
Hulen Levee	Merced	Himalayan blackberry	April	Meese	0.5	20,000	<b>New colony location.</b> Large, active colony, adults feeding young on day detected; area surveyed each year for 4 years and flocks of 100's of birds seen in area, but no colony known at this site until this year; meet owners, obtain permission to monitor and to trap and band birds
Lone Tree	Merced	Silage	April	Rich Albers	30	20,000	<b>New colony location.</b> Reported to me by Dennis Woolington on 4/21 as a settlement, cut morning of 4/23 hours before I arrive to monitor, thousands of birds still present
Merced NWR West Farmfield 3	Merced	Milk thistle, mustard	April	Meese	3	400	Very small colony in relatively poor substrate.
Central American 1	Stanislaus	Himalayan blackberry	April	Meese	2	2,000	Small colony in location originally documented last year
Mitchell Avenue	Stanislaus	Himalayan blackberry	April	Meese	2	2,000	<b>New colony location</b> in area with several small colonies in isolated Himalayan blackberry copses
Ag Slough	Stanislaus	Bulrush, cattails	April	Meese	5	10,000	Not closely observed until mostly finished and after most birds had departed; meet adjacent landowner, obtain permission to drive through his property to access for monitoring, am told by him that this had been a large, noisy colony this year
Patterson Road	Stanislaus	Himalayan blackberry	May	Meese	0.5	2,500	<b>New colony location.</b> Colony 2.5 miles SW of Oakdale found by looking in appropriate habitat while en route to Milton Road site (found abandoned)
Rancho Seco	Sacramento	Willows,	April	Dunn via	10	30,000	<b>New colony location.</b> Birds extremely active and

Park		Himalayan blackberry, California rose, cattails		Simmons to Meese			vocal, using a variety of substrates for nesting, asynchronous. Colony fails, birds abandon, likely due to lack of insects in surrounding grasslands.
Conaway Ranch	Yolo	Cattails, bulrush	Late April	Meese	15	57,000	Largest colony in this site for many years, likely decades, directly due to renovation activities in 2007 that resulted from heavy rains in January, 2007 that threatened to undercut ranch road; cattails especially thick and lush this year
Delevan NWR T43	Colusa	Cattails, bulrush	Late May	Pence, Meese	20	80,000	Settlement originally reported by Rich Pence, maintenance chief, to Mike Wolder, supervisory wildlife biologist, who reported settlement to me; no birds present 3 days before report; banded > 5,400 birds here
Plumas Arboga	Yuba	Cattails, bulrush, Himalayan blackberry	Late May	Meese	12	20,000	Monitored closely prior to, during, and after settlement; intensive monitoring and banding for 3 <sup>rd</sup> successive year; banded 2,600 birds here
Yolo Bypass Wildlife Area	Yolo	Cattails, bulrush	Late May	Rocco, Meese, Schiedt	10	5,000	<b>New colony location</b> the direct result of management actions undertaken by area manager Dave Feliz
Western Triangle	Butte	Himalayan blackberry	June	Bogener	0.5	400	<b>New colony location.</b> Reported by Dave Bogener, DWR.