Results of the Tricolored Blackbird 2008 Census

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Introduction

The Tricolored Blackbird (*Agelaius tricolor*) is a near endemic with at least 95% of the population restricted to California. Smaller breeding colonies are also known to occur in Nevada, Oregon, Washington, and Baja California, Mexico. Tricolored Blackbirds are also the most colonial terrestrial bird in North America (Orians 1961, Beedy and Hamilton 1999). This combination of narrow geographic range and highly colonial breeding make Tricolored Blackbirds particularly susceptible to disturbance and habitat loss. As a result, the population has declined dramatically over the last 70 years (DeHaven et al. 1975, Beedy and Hamilton 1997, 1999), from an estimated millions of birds in the 1930's (Neff 1937) to 370,000 birds in 1994 (Hamilton et al. 1995), when the first formal statewide census was carried out, to a low estimate of 162,000 in 2000 (Hamilton 2000).

Detailed accounts of the natural history of this species, its population biology and historical status are provided elsewhere (Beedy and Hamilton 1999, Beedy 2008, Cook et al. 1993, Orians 1961), but central to this decline has been large-scale loss of natural habitat, primarily young freshwater marsh, within the Central Valley where this species is most concentrated (Hamilton 2000, Beedy and Hamilton 1997). Presumably in response to loss of natural habitat, Tricolored Blackbirds now form "mega-colonies" in grain fields (silage), usually associated with dairy farms in the San Joaquin Valley. Silage fields are attractive habitat due to the structure they provide for building nests and their usual proximity to open water and irrigated pasture for foraging. In addition, dairies typically have piles of stored grain (e.g. corn) that are an attractive food source for adult, breeding Tricolored Blackbirds. These mega-colonies can include over 100,000 birds, representing approximately 25% of the world's population. Unfortunately, the timing of harvest in these grain fields is usually prior to young birds fledging and, as a result, a large portion of the reproductive effort for this species is frequently lost during harvest of these large colonies.

In response, the Tricolored Blackbird Working Group was formed as a collaborative consortium of state and federal agencies, Audubon California, UC Davis, and the agricultural community to address protection of large colonies in silage fields, promote further research and monitoring of this species to improve conservation, and seek to implement habitat protection and restoration for Tricolored Blackbirds. An important part of this effort has been statewide censuses of the Tricolored Blackbird population in California every few years, funded by the U.S. Fish and Wildlife Service. Statewide volunteer-based censuses were carried out in 1994, 1997, 1999, 2000, 2001, and 2005 (Hamilton et al. 1995, Hamilton et al. 1999, Beedy and Hamilton 1997, Hamilton 2000, Humple and Churchwell 2002, USFWS unpublished data). In addition, a census limited to the Central Valley was conducted in 2004 (Green and Edson 2004) and more detailed studies of breeding activity in the Central Valley have been carried out in 2006,2007, and 2008 (Meese 2006, 2007, 2008)

The 2008 statewide survey was coordinated by Audubon California. The goal of this survey was to develop the best statewide population estimate possible, using volunteers across the state. We placed particular emphasis on expanding overall geographic coverage in the state and thorough surveys in Southern California counties due to concern for this sub-population. This report summarizes the 2008 survey results including comparison to past surveys, overall population status, regional variation in abundance, and breeding substrates.

Methods

Survey methods and timing were similar to past statewide census efforts, allowing for direct comparison among years.

Coordinators and Volunteers

The 2008 survey was sponsored by the USFWS and coordinated by Rodd Kelsey and Jon Feenstra for Audubon California. One primary coordinator (RK) was responsible for general organization and oversight, as well as coordinating the effort north of Kern County. Jon Feenstra was responsible for organizing the effort in southern California. Having a part-time coordinator in southern California was a significant benefit to the overall survey by increasing recruitment of volunteers and improving survey coverage based on local knowledge.

As with past surveys, this was a volunteer-based effort. Volunteers were initially recruited beginning in November 2008 using the database of 2005 survey volunteers provided by the USFWS. Announcements seeking additional volunteers were sent out to Audubon Chapter representatives around California and posted on prominent bird watching listservs; including Central Valley Birds, South-Bay Birds, Birding California, and Shasta Birds. Also, a flier announcing the survey was distributed at the Central Valley Bird Symposium in November 2007 and posted on the eBird California website. Volunteers were asked to specify the county or counties in which they preferred to survey and assigned to known colony sites and the areas surrounding those colonies. The total area covered by each volunteer (or team of volunteers) varied substantially based on the time they were able to dedicate for the survey. In addition, willing volunteers were designated as County Leaders who were instrumental in ensuring that their county was well surveyed by local volunteers and coordinating data entry following the survey.

Survey Timing

The 2008 survey was carried out April 25 to 27, consistent with similar three day windows during late April for past surveys. This timing is selected to capture as many birds as possible on colonies during their first breeding attempt of the year. Tricolored Blackbirds and colonies can shift locations over relatively short periods of time during the breeding season. Making sure that a comprehensive count is made in a narrow time window helped ensure we were not counting the same birds more than once. The survey window was selected to be between Friday and Sunday to accommodate volunteers who were doing the survey on their own time. Observations of historic sites by local experts where no birds were present immediately prior to and following the formal survey time window were included in our results, since these allowed for additional coverage of new sites/areas during the survey without expending time on sites that were already known to be unused in 2008.

Survey Locations and Priorities

Our goal was to cover as many existing and new sites as possible. Our priorities for survey locations were as follows:

> Priority One: survey all known past colony locations based on a database of colony sites provided by Dr. Bob Meese (n=208). These included all past colony sites reported in 2005 and in the California Natural Diversity Database (CNDDB) for which Meese could confirm the geographic location. Also, volunteers were asked to add additional colony sites that they were aware of that were not on the initial list. Volunteers added an additional 98 sites to the list prior to the survey. Each volunteer was assigned to one or more of these colony sites, for which they were responsible to conduct a census during the survey window.
>
> Priority Two: survey suitable habitat in the vicinity of known sites as well as at previously reported but unconfirmed locations of Tricolored Blackbird Breeding colonies.

Priority Three: search other suitable habitats in the region for new colony sites.

Maps

All confirmed colony locations from the initial database were mapped using ArcMap 9.2 (ESRI). For each known colony (or set of colonies in close proximity), we created a 1:100,000 scale map that showed primary and secondary roads, county boundaries, and colony locations (e.g. Figure 1). A total of 158 maps were created and named according to the county in which they are located. These maps were converted to pdf format and uploaded onto the Tricolored Blackbird Portal for download and use by volunteers during the survey.

Survey Protocol

We provided a survey protocol (Appendix 1) for each volunteer that outlined survey priorities, guidelines for viewing colonies and duration of site visits, estimating the size of colonies, behavioral observations, and recording colony characteristics (e.g. substrate).

Training

Three training sessions were held for volunteers at three different locations: Kern National Wildlife Refuge, Merced National Wildlife Refuge, and the Yolo Bypass Wildlife Area in Yolo County. Training sessions included an indoor session and site visits to local colonies. The objectives of these training sessions were to help volunteers distinguish Tricolored Blackbirds from Red-winged Blackbirds, introduce the survey protocol and online database, and to visit local colonies to practice identification and colony size estimation. A total of 45 volunteers were able to attend these trainings.

Colony Size Estimation

Estimating the number of birds in a Tricolored Blackbird colony that is relatively large is a challenging task and accurate counts of large colonies are nearly impossible. For small colonies (fewer than 100 birds) volunteers were asked to count all individuals (precise count). For larger colonies, scanning counts were used to estimate the number of birds present (see Protocol-Appendix 1). Three estimates of colony size were reported: minimum number, maximum number, and best estimate. While these are still based on visual estimates, they provide a range that reflects the likely precision of the estimates. Many of the major colonies in the San Joaquin Valley were visited at least once by Bob Meese during his intensive surveys of settlement and breeding by Tricolored Blackbirds. Colony size estimates for these colonies were adjusted based on Meese's own observations at those colonies.

In addition to visual estimates of the number of birds, volunteers were asked to report the approximate area of occupied substrate for each colony. These data have been entered along with the visual estimates and can be used in future analyses as a secondary estimate of colony size. However, using a similar comparison, Hamilton (1998) reported that visual estimates of colony size only varied from estimates based on nest density by an average of 15%.

Colony Observations

For each colony, volunteers were asked to record colony attributes, including: primary and secondary substrate, dimensions of the physical area occupied, presence and distance to open water, and the presence of stored grains. Also, volunteers were asked to record behavioral observations for Tricolored Blackbirds using the colony sites. These included whether the birds were singing or carrying food and if the colony was quiet (indicating period of incubation). These behavioral observations are important for understanding the status of colonies and also help evaluate the

precision of the colony size estimate, since the activity of birds at the colony influences their detection and thus the numbers estimated.

Results

Abundance

A total of 155 volunteers participated in the 2008 survey, visiting 361 historic and new sites in 38 counties within California (Figure 1, Table 1). The census total was 394,858 birds at 155 sites (Tables 1 and 2, Appendices 2 and 3). During this year's survey, 135 sites were documented as breeding colonies with an estimated 392,581 birds (Appendix 2).

Out of 38 counties surveyed, there were 32 in which Tricolored Blackbirds were detected (Tables 1 and 2, Figure 2). Regional distribution was similar to that reported from previous surveys with the vast majority of birds (86.4%) occurring in the San Joaquin Valley (Tables 3 and 4). Nine of the top 10 and 15 of the top 20 colonies were in the San Joaquin Valley (Table 5, Figure 2) with 63% of the population occurring at only five colony sites (Table 5) in Merced, Tulare, and Kern counties (Table 2).

The southern California population is of particular concern due to recent dramatic declines. In 2008 volunteers counted 6,132 birds at 22 sites (Tables 2 and 3). Several known historic sites occur on private land and volunteers were unable to gain access. As a result, this may be an underestimate of the number of birds, but there is no reason to suspect that a large number of birds were left uncounted in southern California.

Substrates

As previously documented, Tricolored Blackbirds use a range of native and non-native vegetation substrates for breeding. The majority of colonies in 2008 were formed in cattail marsh (35%) and Himalayan blackberry brambles (28%) (Table 6, Figure 3). However, this percentage is based on the number of colonies that occur in different substrates. For the number of birds, nearly 50% of the total estimated population occurred in colonies within triticale grain fields associated with dairies (Table 6). Of the top 20 colonies, five (174,000 birds – 44% of the total population) were in triticale on private dairies.

In addition to using grain fields for nesting, the majority of birds counted were at colonies where stored grain was nearby (Figure 4), even though this accounted for a smaller percentage of all the colonies. Fourteen of the top 20 colonies were in locations associated with stored grain (Table 5).

Discussion

As with any large-scale survey using multiple observers and crude estimates of the number of birds in large colonies, the population estimate from the 2008 survey should be considered with caution. However, this estimate can be reasonably compared to estimates from previous surveys, with the exception of the 2001 survey when fewer volunteers were used and a smaller geographic area was covered (Table 2). A concerted effort was made in 2008 to cover as many known and probable Tricolored Blackbird breeding sites/areas as possible. As a result, more sites (361) were visited by volunteers than in previous surveys (although we were unable to determine the total number of sites visited by volunteers in 2005). As a result, some portion of the increase in population size documented during the 2008 survey may be attributable to increased effort. A number of new, small colony sites were discovered by volunteers reflecting the fact that many more small colonies remain undetected on private land and in other un-surveyed portions of the Tricolored Blackbirds range. However, given the concentration of birds in relatively few

large colonies and within a few well known and well surveyed portions of their range (especially the San Joaquin Valley), it is unlikely that large numbers of Tricolored Blackbirds go undetected during the statewide surveys. Most new colonies detected in 2008 and during previous surveys, represent smaller colonies at the periphery of this species' range that were probably occupied historically (Hamilton 2000, 2004, Green and Edson 2004, Beedy 2008). Thus, we don't feel that the increase in population size in 2008 can be fully attributed to increased effort. This is supported by the fact that there is only a weak positive relationship between the number of sites visited during the survey and the number of birds detected (Figure 5).

Population Trend

There have been striking declines in the abundance of Tricolored Blackbirds over the last 70 years (Beedy and Hamilton 1991, Hamilton et al. 1994, 1997, 1999, Hamilton 2000, Green and Edson 2004, Cook and Toft 2005) and continued declines have been documented in previous statewide surveys. Between the 1994 and 2000 surveys, the number of birds counted declined from 370,000 birds to around 162,000, with only 104,000 recorded in 1999 (Tables 2 and 3, Figure 6; Hamilton et al. 1995, 1999, Hamilton 2000). The primary reasons for this have been widespread loss of native breeding habitat and, more recently, the concentration of large colonies in agricultural fields where colonies are subject to reproductive failure for a large portion of the population (Hamilton et al. 1999, Hamilton 2000). In addition, predation by nest predators, specifically Black-crowned night herons and cattle egrets has been a significant source of mortality (Hamilton 2000, Meese 2007). Such predation is probably natural, but there has been a steady increase in population sizes of several major avian predators in California (black-crowned night heron, cattle egret, American crow, and common raven) over the last 40 years (Sauer et al. 2008) and the increasing concentration of birds in mega-colonies may have increased their susceptibility to nest predation when colonies are found by predators.

Despite the clear declines from historical numbers, the 2005 and 2008 surveys indicate a recent increase in population size that may not be entirely a byproduct of increased survey effort. There are a couple of potential explanations for this trend. As noted by Hamilton (2000), the population estimate in 1999 may have been an underestimate due to an inability to track the fate of a large flock (~75,000) detected prior to the survey. This flock was not included in the total survey estimate for 1999. Even if these birds were added to the total estimate, this would still be considerably lower than the population estimate for 1997, but comparable to the estimate from the 2000 survey, indicating a more stable rather than declining population. Second, changes in climate may have resulted in decreased reproduction and lower detection rates of Tricolored Blackbirds during 1999 and 2000. One of the strongest El Nino events on record occurred in 1997, followed in the 1998/1999 season by an equally strong La Nina event that carried over into the 1999-2000 season (Figure 7). La Nina years are characterized by cooler temperatures and lower than average rainfall, which can be seen in the precipitation record for the Los Banos area (Figure 7). This dramatic decline in precipitation may have had two effects that contributed to lower estimated numbers of Tricolored Blackbirds in 1999 and 2000. First, reduced insect abundance may have forced birds to search more widely for suitable areas to breed resulting in fewer large colonies in traditionally surveyed areas. This is supported by Hamilton et al.'s (1999) observation that the 1999 season was unusual in that colonies tended to form later in the season and there were still many birds moving around (unsettled and ultimately unaccounted for) in April when colonies are normally established. Second, lower precipitation may have reduced food availability to such a level that reproduction was low in 1999 and 2000. Lower colony detection plus reduced reproductive success combined with the now regular disturbances associated with agriculture and predation could explain the dramatic dip in numbers detected during 1999 and 2000 (2001 was also low but was a year when less volunteer effort was dedicated to the survey so a direct comparison cannot be made).

Finally, recent conservation efforts may also explain increased population estimates in 2005 and 2008. Efforts to protect the Tricolored Blackbird in response to the declines documented since the 1970's began in the early 1990's.

Working with landowners to either change management of crops or to buy the crop in a field to protect colonies have both been used successfully since 1991 (Hamilton et al. 1994, Hamilton 2000, Meese 2007, Meese pers. comm..). In 1994 a crop was bought to protect a 28,000 bird colony. In 1999 the USFWS and CDFG negotiated with a landowner to buy a crop that protected the reproductive effort of a 35,000 bird colony (resulting in approximately 32,250 fledglings – Hamilton et al. 1999). Since then several more silage buyouts or negotiated management changes with private landowners have occurred in 2000, 2005 and 2007. Losses to harvest of agricultural fields certainly have continued – there have been several known cases of colony destruction and presumably many more that went undetected. However, silage buyout arrangements with willing landowners may have contributed significantly to stemming the steady decline in Tricolored Blackbirds and, possibly, allowed this species to recover from losses that occurred during the 1999 – 2000 dry years. In addition, the efforts of the Tricolored Blackbird Working group to promote vegetation management and protection of colonies may have also had an influence on the apparent population increases. Numerous federal land managers now actively protect and manage for Tricolored colonies (e.g. Kern and Merced NWR).

In 1994 and 2000 the top 10 colonies accounted for 60% and 59% of the total population estimate, respectively. In 2008, this has increased to 77.5%. This increase in concentration of individuals at fewer colonies increases the chances of reproductive failure for a significant proportion of the population in any given year. The cause of such concentration is due to large-scale habitat loss and attraction to agricultural fields where food and water are abundant. Long-term conservation will need to address this issue and work towards providing suitable habitat in more places and attracting birds to those sites.

Regional Shifts in Population Concentration

In addition to increased concentration in particular colonies, there has been an increase in the proportion of the population using the San Joaquin Valley (where mega-colonies in agricultural fields tend to form; Figure 8). Hamilton et al. (1995) noted that populations in the Sacramento Valley and San Joaquin Valley in 1994 were 27% and 230% of what Neff (1937) documented, respectively. This increasing concentration in the San Joaquin Valley seems to have continued. In 1994, 64% of the estimated population occurred in the San Joaquin Valley; as of the 2008 survey this had increased to 84%. Along with this there has been a steady decline in the population using the Sacramento Valley during the census window and an overall decline in the Southern California population (Figure 8, Tables 3 and 4). Large colonies are still seen in the Sacramento Valley, particularly late in the season when birds have finished breeding at more southern colonies (Hamilton 2000, Beedy 2008). Birds may still be habitually using colony sites in the Sacramento Valley early in the breeding season (Mar – Apr), but now a greater proportion settle in the San Joaquin Valley during the early part of the year. Agriculture, in particular the expansion of dairy operations in this region, may be responsible for this shift.

Southern California

Tricolored Blackbirds were historically very abundant in Southern California, with large colonies in coastal marshes (Beedy and Hamilton 1999), but there has been a steady and dramatic decline in the southern California population since the early 20th century (Neff 1937, Beedy and Hamilton 1997, Unitt 2004). Since the statewide surveys began in 1994, however, the population has fluctuated between around 6,000 and 13 – 17,000 birds for most survey years, with no obvious negative trend (Table 3, Figure 9). The population estimate in 2001 was lower (1,130 birds), but this is due to reduced effort in Southern California during 2001 (only 4 sites were visited). The one exception is in 1997 when the estimated population size was much larger than in the other survey years (42,500 birds). The increased southern California population in 1997 was the result of a larger proportion of the overall population nesting in Southern California during April that year. This increase coincided with the strong El Nino event in 1997, which increased

rainfall and may have improved breeding conditions in Southern California. Also, the larger number of birds in 1997 is mostly due to one colony (Hemet Sewage) where there were an estimated 35,000 birds. In other years, this colony varied between 0 and 10,000 birds. If the large number of breeding birds in Southern California in 1997 represents individuals that would have otherwise moved into the San Joaquin Valley (this is indicated by the increased percentage of overall population in Southern California during April 1997, Table 4), this suggests that a large number of birds may move between southern and northern breeding sites annually. Currently ongoing genetic analyses should shed some light on the degree of genetic exchange among these regions. While there is no obvious negative decline since 1994, there is considerable variation in number and relatively few birds overall. Thus, the population may be too small to be viable given how susceptible this species is to environmental and anthropogenic disturbance. Continued loss of habitat and water in Southern California may result in this species being extirpated from this region.

Trends in Substrate Use

Previous surveys and studies have documented the steady decline in use of freshwater marsh habitat for nesting, with a shift to using non-native vegetation (e.g. Himalayan blackberry) and agricultural fields. This shift has continued. In the 1930's 93% of colonies were in freshwater marsh (Neff 1937). In the 1970s this had declined to 53% (DeHaven 1975) and in 2008 only 35% of colonies were established in freshwater marsh (Table 6, Figure 3). This is mostly due to large-scale loss of freshwater marsh habitat in California. In addition, the freshwater marsh that remains is frequently senescent due to a lack of disturbance. Tricolored Blackbirds are attracted to young emergent marsh and appear to avoid using senescent marsh. In fact, regular disturbance of freshwater marsh colony sites can promote regular annual use of a site, contrary to the perception that Tricolored Blackbirds are purely nomadic, rarely using the same site annually (Meese pers. comm.). Loss and decline in suitability of remaining marsh have resulted in increased use of non-native vegetation, with Himalayan Blackberry and grain fields associated with dairies now critically important breeding habitat. Short-term conservation efforts will need to continue protecting colonies in these habitats, while long-term efforts should focus on creating and managing for suitable freshwater marsh.

Recommendations

Previous authors and the Tricolored Blackbird Working Group have developed a comprehensive list of detailed recommendations for research, monitoring, outreach, and conservation (Beedy and Hamilton 1991, Hamilton et al. 1994, 1997, 1999, Hamilton 2000, Green and Edson 2004, Cook and Toft 2005, Meese 2006, 2007, Tricolored Blackbird Working Group 2007). I will not repeat those here, but recommend that they continue to guide conservation efforts. The following are some additional recommendations for ongoing efforts to monitor the Tricolored Blackbird population, as well as additional opportunities for research and conservation action:

1) Triennial Surveys

I recommend that the triennial survey be continued indefinitely. The triennial statewide census has become an important tool for monitoring the overall status and distribution of tricolored blackbirds and is essential for developing an estimate of population size for this species. In addition, conducting a statewide, as opposed to more local surveys of important colonies, is an important way to track changes in distribution, range boundaries, and habitat use over time. Tracking these large-scale changes will be particularly important as climate change, water use, and habitat loss alter the spatial distribution of suitable habitat across the state. An understanding of shifts in distribution and habitat use will be essential for identifying opportunities for habitat restoration and protection.

One limitation to the triennial survey as it has been implemented in most years is the focus on early season breeding. Tricolored blackbirds are itinerant breeders (Hamilton 1998) and so a limited survey window is necessary to avoid

double counting birds that move over short periods of time to new colonies. For this reason, early season breeding in April has been the traditional focus. However, this limits our understanding of seasonal shifts in habitat use and range that may be important for future conservation efforts (Hamilton 2000). The current survey protocol results in an emphasis on colonies in the San Joaquin Valley, however, large portions of the population move north for breeding later in the season. Given the potential for colony failure following natural or human disturbance early in the season and the potential importance of late season reproductive success to population viability, a better understanding of the size and location of late season colonies will be important for long-term protection of this species. For this reason, I recommend that a late season survey be formally incorporated as part of the triennial survey, similar to what was attempted in 2005 and the limited late season surveys by Hamilton et al. in other surveys (1995, 1999). While this would increase the total level of effort and cost of the survey, the incremental increase should be relatively small given that the volunteer network, training, and survey materials will have already been developed in the process of organizing the April survey. The following is a proposed schedule with recommendations for future triennial surveys:

- **Volunteer Recruitment (January – March)**: early and comprehensive recruitment of volunteers is essential to cover the entire state well. There are many volunteers who have participated in most or all of the surveys to date. So, there is considerable expertise and enthusiasm among potential volunteers. Every effort should be made to attract the many local experts from around the state to participate. However, many will also have conflicts that prevent them from participating and it is important to have them get engaged early.

- **Engage Landowners (January – March)**: a more deliberate effort to make contact with landowners, particularly in the agricultural community, should be made prior to the survey. Many colonies occur on private land and so access will allow volunteers to count more colonies and get better estimates at colonies not near public access points. The survey may be the best opportunity to engage landowners and provide them with information about this species. It is also be an important way for the conservation community to be made more aware of landowner concerns. I recommend that survey coordinators work with the USFWS, other agencies, and the Farm Bureau to identify ways that agricultural landowners can be made aware of the survey. One or more presentations to the agricultural community in important parts of the Tricolored Blackbird breeding range could be particularly valuable.

- **Training (Early April)**: volunteers were appreciative of the training received in 2008. Approximately 1/3 of the volunteers attended one of three training sessions provided. These are important opportunities to meet with volunteers, address any of their concerns, and provide survey materials in person. These trainings should cover: visual and behavioral identification of Tricolored Blackbirds and how they are different from Red-winged Blackbirds; Tricolored Blackbird natural history; a review of past surveys and the current status of Tricolored Blackbirds; and survey methods and data entry via the Tricolored Blackbird Data Portal. Also, having a portion of the training dedicated to field visits at known colonies is especially valuable to the volunteers. Pre-survey scouting will be useful for identifying suitable colonies for training. Ideally, volunteers can be taken to colonies of varying size where they can practice estimating the number of birds.

- **Pre-survey scouting (April 1 – 15)**: pre-survey visits to known or potential colony sites are an important way to maximize the effectiveness of the survey. Pre-survey scouting can help identify sites worth visiting during the survey and those that should not be surveyed due to habitat loss. In addition, pre-survey scouting can provide valuable information on the timing of colony formation, since this can vary significantly from year to year. The Tricolored Blackbird Data Portal that is now online provides the ideal mechanism for volunteers to record observations from any time of year and, in particular, to log observations from pre-survey scouting.

Also, pre-survey scouting may help volunteers identify sites on private land prior to the survey so that they can work with the USFWS or survey coordinators to gain access during the formal survey.

- **April Survey (late April)**: conduct early season survey similar to those that have already been done. This survey would place particular emphasis on southern California and the San Joaquin Valley, but also attempt to get as many other areas surveyed as possible.

- **June Survey (late June)**: conduct a late season colony survey, with additional effort dedicated to portions of the range in the Sacramento Valley north to southern Oregon.

2) Annual Surveys

Triennial surveys are not suitable for capturing more detailed patterns of population fluctuations in response to environmental change or disturbance. I recommend that annual surveys of key colonies or areas be carried out. Many of the important colonies, particularly those on and around federal land (e.g. on and around Kern NWR) are currently being monitored every year so that massive colony failures in grain fields can be avoided. Annual surveys using methods similar to those for the triennial surveys should be established for these important colonies (e.g. areas around the top 10 or 20 colonies reported from the last triennial survey). Standardized the methods will allow comparison of annual estimates to those from the triennial survey. Also, annual surveys will provide a more detailed view of population fluctuations that can then be examined in relation to temperature and precipitation patterns or other important environmental factors. Annual surveys will also be important for identifying and avoiding impacts to major colonies. Finally, annual surveys will provide the kind of data on population dynamics that can be used to develop population models and viability analyses.

3) Intensive breeding surveys and banding

Information on breeding success and movement of individuals are critical for identifying important habitat characteristics and areas where habitat restoration and protection are needed. One of the critical pieces of information needed for analysis of population viability is survival. Banding individuals at colonies and encouraging volunteers from across the state to report observed banded birds on the Tricolored Blackbird Data Portal will be an important source of survival and movement data. I recommend that the current banding efforts and studies of settlement and breeding (Meese 2006, 2007) be continued. Annual surveys of important colonies (see #2 above) could possibly be combined with this or be a separate but complimentary effort.

4) Tricolored Blackbird Data Portal

The newly developed online data portal is a significant benefit for monitoring Tricolored Blackbird populations. I recommend that a concerted effort be made to advertise its existence to birders around California and Oregon, encouraging them to report observations via the portal. If the portal is used extensively, these data will become an essential part of tracking spatial and temporal changes in the Tricolored Blackbird population. Also, I recommend that the methods from the triennial surveys be prominently displayed on the portal as methods that individual observers should use whenever possible, including use of the datasheet. This will help improve the quality of observations submitted and allow them to be compared with observations from formal censuses.

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Thank you to Larry Serpa and The Nature Conservancy for providing access to the Simon Newman Ranch, where we did indeed find a large colony of Tricolored Blackbirds.

Thank you to Dr. Bob Meese for his valuable guidance before and during the survey, as well as his help in conducting the volunteer training session in Merced. Also, his leadership in guiding the development of the Tricolored Blackbird Data Portal helped make sure it was ready for the survey.

Thank you to Dave Waetjen for development of the Tricolored Blackbird Portal. Dave was tireless in working with the survey coordinators to make sure that the online data entry system was running prior to the survey and designed so that volunteers would use it.

Tables

Table 1. Number of counties and sites surveyed by region and total number of birds counted per region during 2008 Tricolored Blackbird Survey.

Region	No. Counties	Occupied Counties	Sites Visited	Occupied Sites	Occupied Colony Sites
Central Coast	5	5	54	16	16
North Coast	3	2	13	8	7
Northeast Interior	1	1	3	2	1
Sacramento Valley	9	7	82	37	28
San Joaquin Valley	6	4	22	6	4
SF Bay	9	8	147	62	57
Southern California	5	5	40	24	22
TOTAL	**38**	**32**	**361**	**155**	**135**

Table 2. Number of Tricolored Blackbirds counted by region and county during Tricolored Blackbird Surveys 1994 – 2008.

Region/County	1994	1997	1999	2000	2001	2004	2005	2008
Central Coast								
Monterey	2,220	5,900	2,436	1,018	3,595		30	50
San Benito	0	778	160	1,420				66
San Luis Obispo	0	660	511	1,000			4,210	6,242
Santa Barbara	2,000	0	0	0	80		2,900	500
Santa Cruz	0	0	300	200			0	220
North Coast								
Humboldt	100	0	0	0	0		0	
Lake	0	60	0	0			0	711
Mendocino	0	12	15	0	0		0	835
Sonoma	30	0	0	0			0	0
Northeast Interior								
Lassen	0	6	0	309			0	
Modoc	250	250	0	0		1,120	0	
Shasta	2,585	0	0	0			20	1,030
Siskiyou	947	250	0	0			0	
Sacramento Valley								
Amador								6,600
Butte	0	0	5,958	5,434	500		0	2,541
Colusa	27	4,175	1,031	2,500	13,000		0	301
El Dorado	0	200	0	0			250	0
Glenn	2,000	0	0	0			0	
Placer	1,000	658	4,500	6,200	2,800		1,600	12,050
Sacramento	94,028	31,338	12,859	16,383			16,400	3,551
Sutter	235	0	400	200			0	0
Tehama	0	35	0	0				
Yolo	475	200	0	80	400	400	3,070	1,900
Yuba	597	950	0	0			250	10,405
San Francisco Bay								
Alameda	24	1,200	4,000	0			200	28
Contra Costa	400	0	0	0		3,000	0	358
Marin	400	0	0	0			0	0
Napa	11	400	680	104			300	0
Santa Clara	3,500	550	0	0			100	50
Solano	5	75	33	0	0	300	2,000	200
San Joaquin Valley								
Calaveras	0	8,313	0	760			30	385
Fresno	21,150	2,550	40,040	5,061	10,000	11,000	1,550	1,000
Kern	72,255	17,000	3,350	10,650	21,051	13,065	155,407	69,702
Kings	10,000	33,300	0	10,000	950	10,000	0	2,500
Madera							2,960	117
Mariposa							0	
Merced	79,100	13,000	3,961	27,100	39,070	71,500	17,900	154,674
San Joaquin	15,978	11,857	0	7,073			0	0
Stanislaus	3,928	150	4,126	15	550		12,180	21,910
Tulare	50,000	55,500	14,000	53,300	53,000	20,100	18,500	90,800
Southern California								
Los Angeles	815	430	1,125	610			5,100	1,270
Orange	1,034	231	106	495			0	
Riverside	2,175	38,356	4,000	10,000	430		12,200	2,150
San Bernardino	0	300	1,000	0			0	700
San Diego	2,000	3,236	195	2,021	150	400	395	1,367
Tuolomne	0	0	0	575	550		250	645
Ventura	90	0	0	0			0	
TOTAL	**369,359**	**231,920**	**104,786**	**162,508**	**146,126**	**130,885**	**257,802**	**394,858**

Table 3. Total Tricolored Blackbirds counted across regions in statewide surveys 1994 - 2008

Region	1994	1997	1999	2000	2001	2005	2008
Central Coast	4,220	7,338	3,407	3,638	3,675	7,140	7,078
North Coast	130	72	15	0	0	0	1,546
Northeast Interior	3,782	506	0	309		20	1,030
Sacramento Valley	98,362	37,556	24,748	30,797	16,700	21,570	37,348
San Joaquin Valley	252,411	141,670	65,477	113,959	124,621	208,527	341,088
SF Bay	4,340	2,225	4,713	104	0	2,600	636
Southern California	6,114	42,553	6,426	13,701	1,130	17,945	6,132
TOTAL	**369,359**	**231,920**	**104,786**	**162,508**	**146,126**	**257,802**	**394,858**

Table 4. Percent of total number of birds in each region for Tricolored Blackbird Surveys 1994 - 2008

Region	1994	1997	1999	2000	2001	2005	2008
Central Coast	1.1%	3.2%	3.3%	2.2%	2.5%	2.8%	1.8%
North Coast	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Northeast Interior	1.0%	0.2%	0.0%	0.2%	0.0%	0.0%	0.3%
Sacramento Valley	26.6%	16.2%	23.6%	19.0%	11.4%	8.4%	9.5%
San Joaquin Valley	68.3%	61.1%	62.5%	70.1%	85.3%	80.9%	86.4%
San Francisco Bay	1.2%	1.0%	4.5%	0.1%	0.0%	1.0%	0.2%
Southern California	1.7%	18.3%	6.1%	8.4%	0.8%	7.0%	1.6%

Table 5. Top twenty colonies in terms of number of birds estimated at colony during 2008

County	Colony Name	Number	Cum. % of Total	Substrate	Grains Present
Tulare	Riverview Dairy	80,000	20.3%	Triticale	Yes
Kern	Costa's Dairy	60,000	35.5%	Triticale	Yes
Merced	Crane Ranch	50,000	48.1%	Himalayan blackberry	Yes
Merced	Honey Lake	33,000	56.5%	Cattails	Yes
Merced	El Nido Road	25,000	62.8%	Triticale	Yes
Merced	Merced NWR Duck Slough Farmfield 1	16,500	67.0%	Milk thistle	Yes
Stanislaus	Road J14	12,500	70.2%	Cattails	No
Merced	Owens Creek	10,000	72.7%	Milk thistle	Yes
Yuba	Hallwood Boulevard	10,000	75.2%	Himalayan blackberry	No
Merced	Los Banos Wildlife Area 42	9,000	77.5%	Cattails	Yes
Stanislaus	Ag Slough	7,500	79.4%	Bulrush/Tule	No
Amador	Old Stockton Road	6,000	80.9%	Himalayan blackberry	No
Tulare	Vander Eyk Dairy	6,000	82.4%	Triticale	Yes
Placer	Dowd and Waltz	5,000	83.7%	Himalayan blackberry	Yes
San Luis Obispo	Davis Road #1	4,400	84.8%	Willows	No
Merced	Merced NWR: West Farmfield	4,000	85.8%	Milk thistle	Yes
Placer	Gleason Ranch Sunset Blvd. West	4,000	86.8%	Himalayan blackberry	Yes
Tulare	Cornerstone 1	3,000	87.6%	Triticale	Yes
Kern	ECLA Pond	2,500	88.2%	Cattails	Yes
Kings	Naval Air Station Lemoore II	2,500	88.9%	Cattails	No

Table 6. Use of substrates by breeding Tricolored Blackbirds during 2008 survey.

Region	Bulrush/Tule	Cattails	Himalayan blackberry	Milk thistle	Mustard	Nettles	Triticale	Willows	N
Central Coast	16.7%	58.3%	0.0%	0.0%	16.7%	0.0%	0.0%	8.3%	12
North Coast	0.0%	85.7%	14.3%	0.0%	0.0%	0.0%	0.0%	0.0%	7
Northeast Interior	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1
Sacramento Valley	4.2%	20.8%	66.7%	8.3%	0.0%	0.0%	0.0%	0.0%	24
San Francisco Bay	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2
San Joaquin Valley	10.0%	22.5%	25.0%	10.0%	2.5%	12.5%	17.5%	0.0%	40
Southern California	25.0%	50.0%	6.3%	0.0%	6.3%	12.5%	0.0%	0.0%	16
% Colonies	**11.76%**	**35.29%**	**28.43%**	**5.88%**	**3.92%**	**6.86%**	**6.86%**	**0.98%**	102
# Birds	**2.8%**	**15.6%**	**23.4%**	**9.0%**	**0.1%**	**1.2%**	**46.7%**	**1.2%**	

Figures

Figure 1. Locations visited during the 2008 statewide survey.

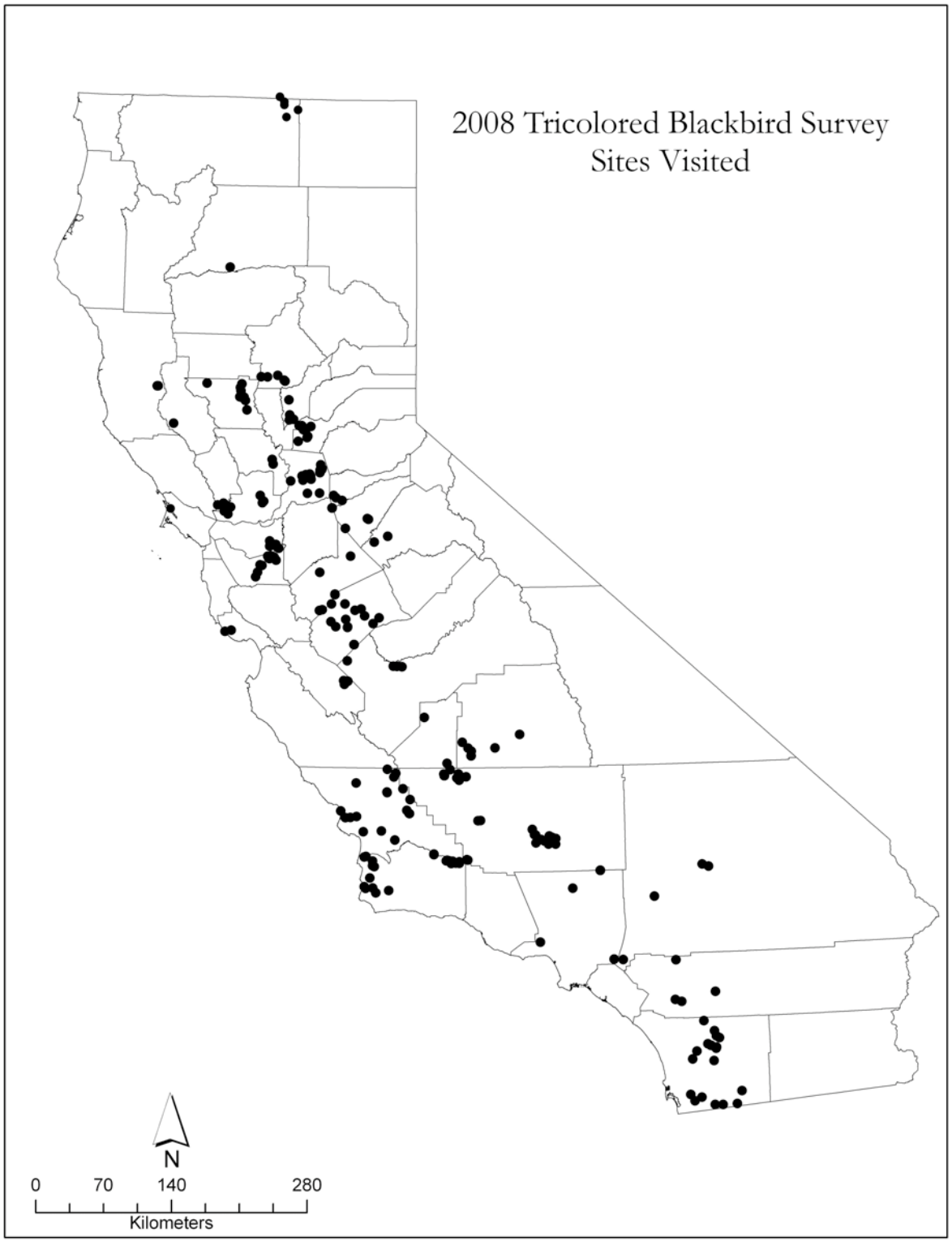


Figure 2. Abundance of Tricolored Blackbirds in 2008 by County (grey indicates counties that were not surveyed.

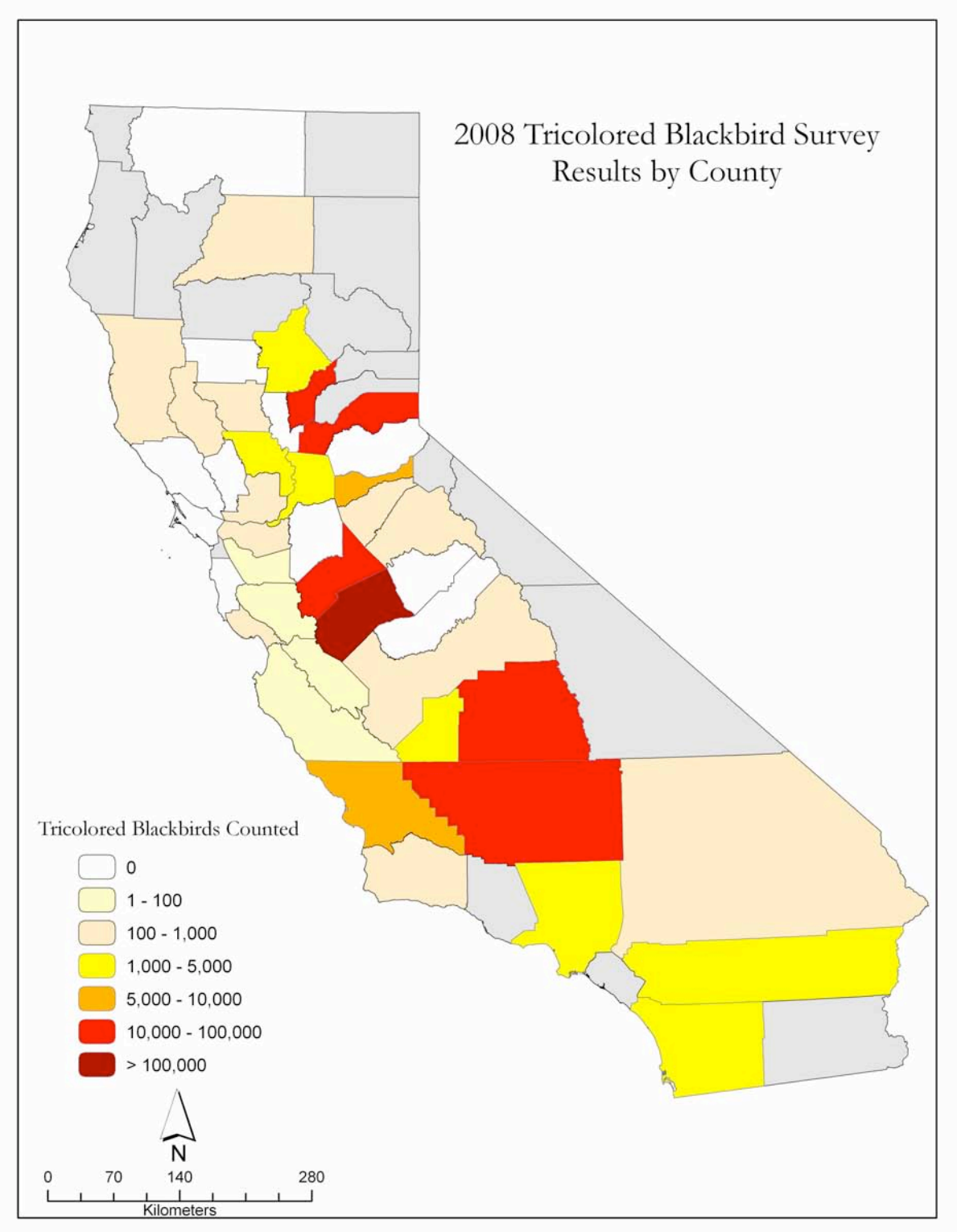


Figure 3. Percent colonies and birds using different breeding substrates in 2008.

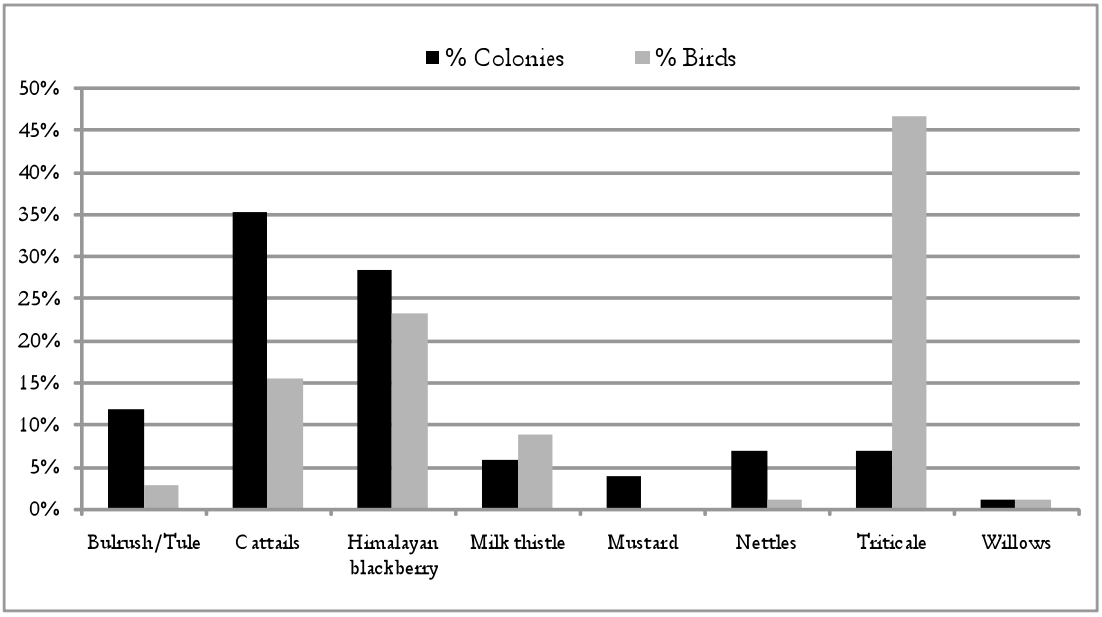
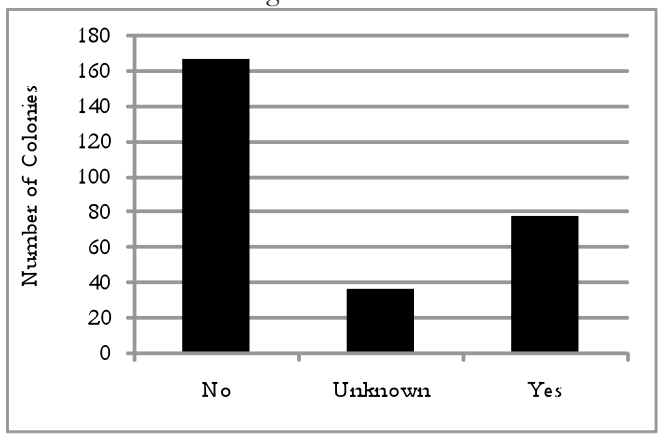


Figure 4. Number of birds and colonies at locations associated with stored grains in 2008.



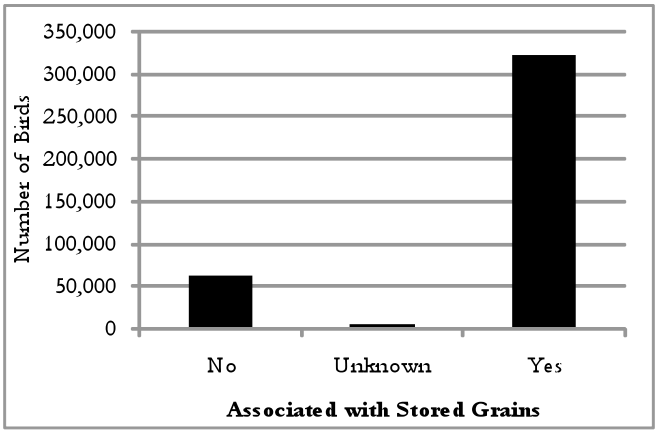
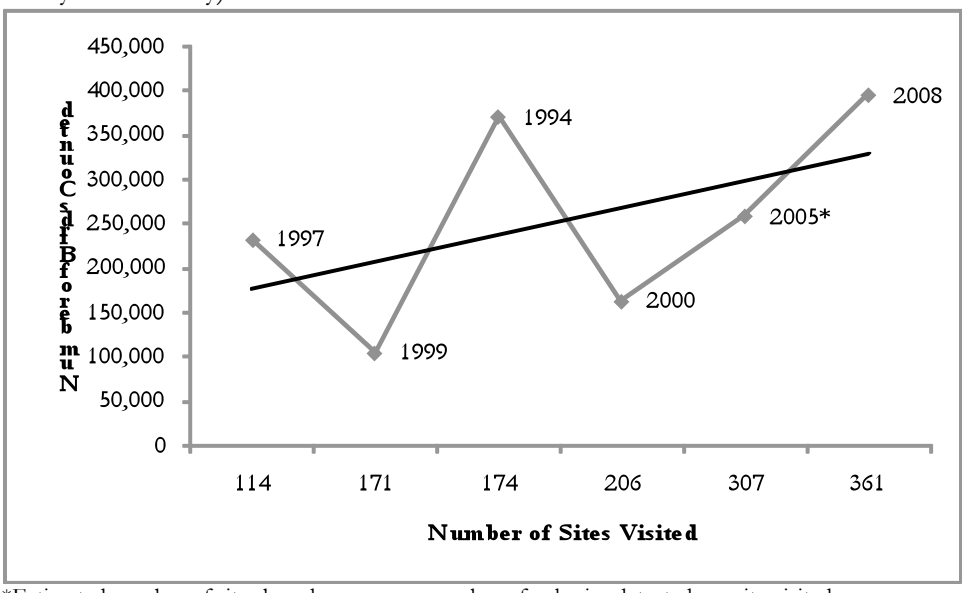


Figure 5. Number of birds counted as a function of sites visited (points labeled with year of survey).



*Estimated number of sites based on average number of colonies detected per site visited.

Figure 6. Population size estimates from statewide surveys 1994 - 2008

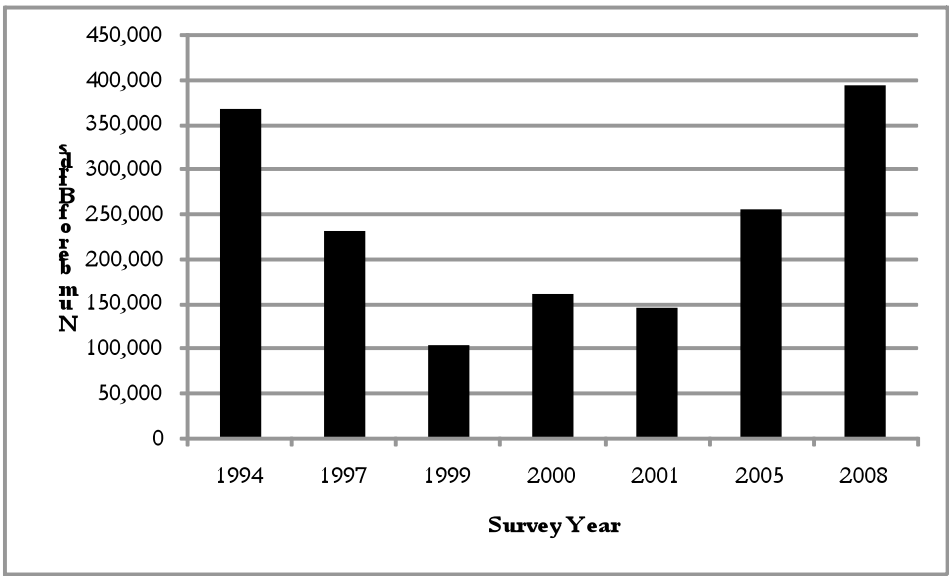


Figure 7. Precipitation and El Nino Southern Oscillation Index over years between statewide Tricolored Blackbird Surveys

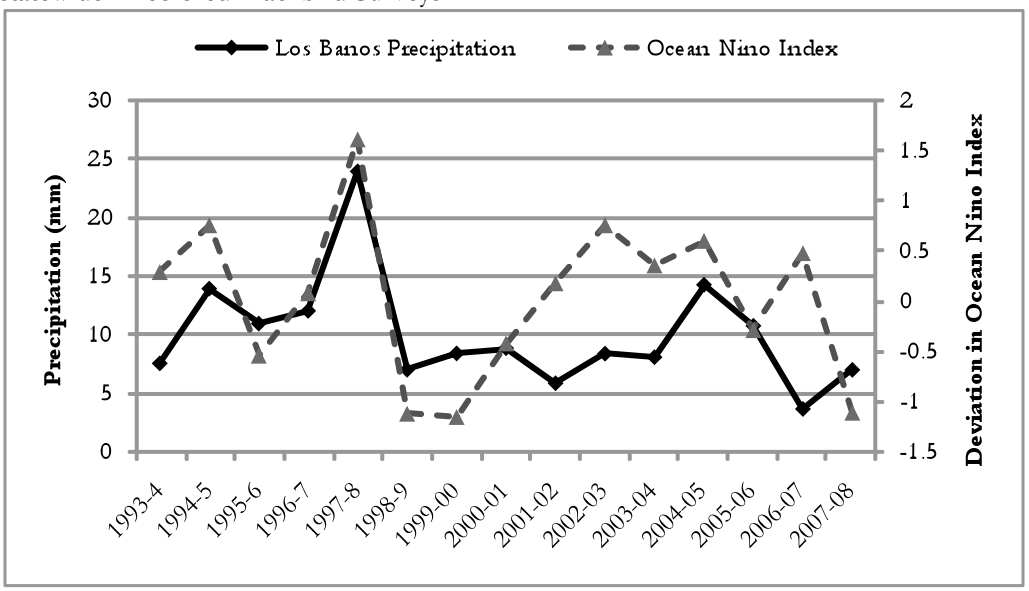


Figure 8. Proportion of Tricolored Blackbird population detected in Sacramento Valley, San Joaquin Valley and southern California 1994 – 2008.

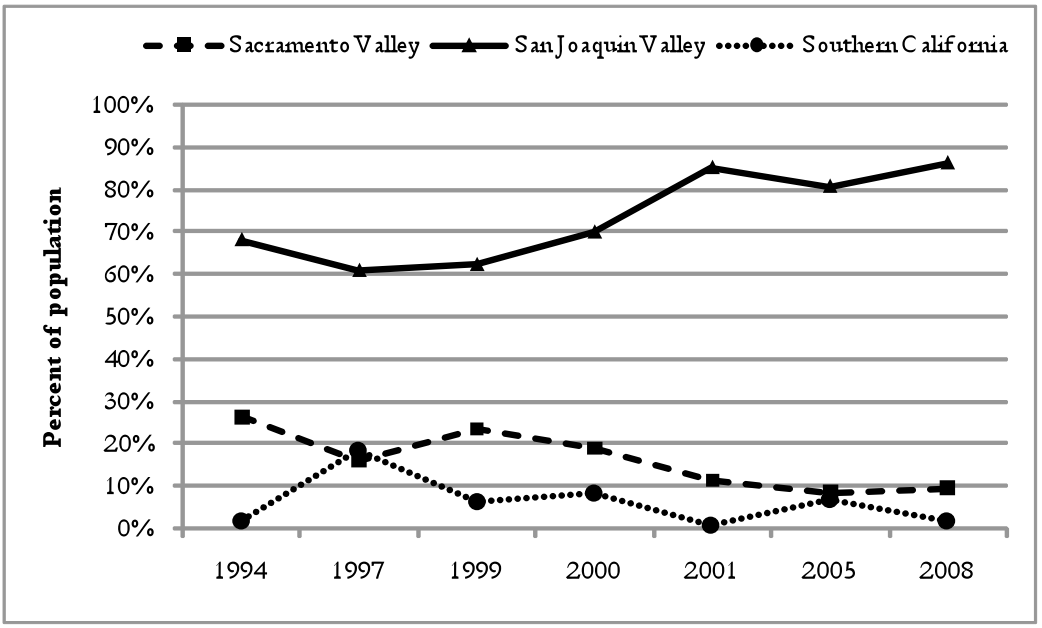
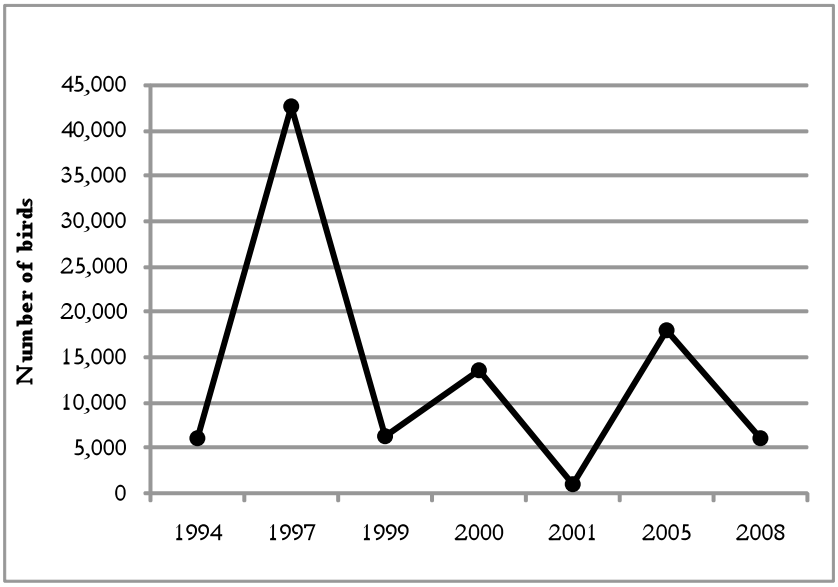


Figure 9. Southern California Tricolored Blackbird survey population estimates 1994 - 2008



Appendices

Appendix 1. Survey Protocol provided to volunteers

2008 Tricolored Blackbird Survey Protocol

Thank you for volunteering to participate in the 2008 Tricolored Blackbird Survey. This survey is conducted every three years in order to estimate population size and track changes in the status of the Tricolored Blackbird population. This information is critical for guiding our conservation efforts and could not be accomplished without your help and the extensive efforts of other citizen scientists across the state. The following protocol outlines the methods to be used during the survey and how to report your observations.

Our goal is to develop the best estimate of the statewide population as possible. The more areas that are surveyed where the presence and number (or absence) of Tricolored Blackbirds is recorded, the better the estimate will be.

I. Scouting

It is very useful to check on nearby sites and search the surroundings before the dates of the official survey. This will streamline the survey and allow you to spend more time at the colonies that require the most effort to observe and count. By April 1 most colonies will be active for their first round of breeding. In the more southerly colonies some nests will already have hatched young. It appears that 2008 is an 'early' year for Tricolors. Estimating the colony size and observing the behavior and habits of the Tricolored Blackbirds at this point is interesting and good practice.

II. Timing

The 2008 survey window is April 25th to 27th. All observations that will be reported as part of the 2008 survey should be carried out on one or more days between April 25 and 27. Tricolored Blackbirds and colonies can shift locations over relatively short periods of time during the breeding season. Making sure that a comprehensive count is made in a narrow time window helps ensure we are not counting the same birds more than once.

Subsequent observations at any future date should also be noted and can be submitted via the Tricolored Blackbird Portal (http://tricolor.ice.ucdavis.edu).

III. Survey Locations and Priorities

Breeding colony locations are on maps provided to you were all discovered on previous censuses dating back to the early 1990's, or incidentally discovered and documented at other times. Some sites were found during the last statewide census in 2005. Each volunteer team has been asked to survey a specific area within their county and, in most cases, to visit specific colony sites that were reported in 2005. The following are the areas that should be surveyed in priority order:

> Priority One: visit and document the number (or absence) of Tricolored Blackbirds at assigned colonies and in the immediate vicinity of those colonies. These are those 2005 colony sites that you have been specifically asked to survey and are labeled with the colony name on the maps that have been provided.
>
> Priority Two: survey suitable habitat in areas around assigned colonies and in areas where Tricolored Blackbirds have been reported or seen before, as indicated by the unlabeled points on the maps provided and/or based on observations by you and/or other local experts.
>
> Priority Three: survey other areas in the county where there is suitable habitat.

Ideally you are already familiar with these former colony locations, but if not, the locations of 2005 colonies and other reported sites should be easy to find from the maps we provide.

IV. Survey Protocol

Viewing the colony

In general, it is best to avoid any disturbance of nesting birds, as the disturbance can cause nest failure. This is especially true for Tricolored Blackbirds and other colony nesting species, since pairs are in close proximity to each other, and single disturbance can cause the failure of many nests. Under no circumstances should volunteers enter the colony. Colonies should be surveyed from a distance at which the birds are unaffected by the surveyor's presence. Since colonies may be located in a variety of contexts, it is up to the observer to determine how close is too close. Under most circumstances, colonies can be surveyed from just outside the boundaries of the vegetation in which the birds are nesting. The majority of sites will be readily viewable from public roads and allow close and thorough study. Sometimes roadsides provide an elevated view of a colony, and thus a better perspective from which to estimate colony dimensions and numbers of birds.

Private property should also be respected. Do not enter private property unless you have received permission. A Fact Sheet about the survey has been prepared and is available for you to give interested landowners (or others) to inform them about the survey.

Duration

Be sure to record the amount of time you spend at each colony site (including those where there are no Tricolored Blackbirds this year). Spend as much time at each colony as you need to get your best estimate of the number of birds. If after 10 to 15 minutes at a known colony site you have not seen any Tricolored Blackbirds, move on to survey new sites or areas. If Tricolored Blackbirds are present, use your own judgment about how much time to spend at the colony. In general, prolonged viewing of a colony will improve your estimate and the larger the colony the more time should be spent. This is particularly true for very large colonies (> 10,000) where it may take some time to evaluate the number of birds. With such large colonies, the more time you spend at the colony, the more the apparent chaos will give way to a semblance of order, enabling you to better estimate the size of the colony and gather observations of singing males, nest-building females, adults feeding chicks, or fledglings.

However, the time spent at one colony is at the expense of visiting more areas and documenting additional colonies. Do not spend too much time at small colonies where you can estimate the number of birds quickly. In this case, finding and counting new birds will be more valuable for the statewide estimate.

Colony Size

A Tricolored Blackbird colony can range from 20 birds to 100,000 or more birds. For this survey, all estimates will be based on visual counts of the birds at a colony. For small colonies, precise counts can be made, but in larger colonies a visual estimate will be necessary. The method used should be indicated on the data sheet.

<u>Precise Counts</u>

For small colonies (approximately less than 200 birds), a precise count of the number of birds will usually be feasible. With care, this should provide a very precise estimate of the number of birds present.

<u>Scanning Surveys</u>

When large numbers of birds are streaming by, dropping into vegetation, and are otherwise extremely active, precise counts will be impossible.

To estimate the number of birds in large groups during this survey there are two ways to estimate number depending on whether birds are flying by or within the colony.

1) *Within the colony*: for birds that are perched or flying around within the colony, it is effective to count the number of birds that fill a specific, repeatable field of view, such as the field of view in your binoculars. Within this field of view, either count precisely or by fives or tens for more dense concentrations, to obtain a reasonable estimate of the number of birds within that view. Then, multiply that number by the number of fields of view that comprise the entire flock or colony.

2) *Flying in Transit*: Depending on the time of day and colony status, there may be streams of birds flying between the colony and an off-colony food or water source. In this case, the number of birds in these flight paths can be estimated by counting the number of birds that move by in a given amount of time and multiplying this by the total time it takes for the flock to pass.

In many cases observers will need to employ both strategies. Position yourself somewhere with good visibility and use a timed count of the flying birds as they leave the colony. Once the flow of leaving birds has dropped off, then conduct a scanning count of the visible birds remaining within the colony itself. The scanning count of the colony should be repeated a few times to improve the estimate. Add the estimate of birds flying away from the colony to the count of birds within the colony. There is space on the data sheet to record your best estimate of birds, as well as what you think the minimum and maximum number of birds are at the colony. These minimum and maximum estimates will give us some sense of how accurate you feel your best estimate is.

Estimating the size of large colonies can be very challenging, and for some, frustrating. Remember that you are providing us with an approximation of colony size and not an exact count. All large colonies that you find will be revisited by one or more experts, regardless.

Sex Ratio

The accuracy of the count will also depend on the sex ratio of birds observed and this depends on activity at the colony. Some colonies that are just forming will have both males and females active so that most individuals can be seen. Once incubation begins however, it will be mostly males that are seen. *This information is critical to record.* The data sheet includes space for specifying the ratio of males to females seen and whether the colony is active but quiet (indicating incubation may have begun). Tricolored Blackbird flocks often separate into groups of males and females. A quick estimation of the numbers in each sub-flock can be used to determine an overall sex ratio. Estimate the ratio of males to females in several sub-flocks or fields of view and average them to come up with an estimate.

Colony Observations

Locating new colonies and estimating colony sizes are the primary goals of the survey; however, the characteristics of colonies, the surrounding environment, and the behavior of the birds are all valuable for assessing the status and health of colonies.

Nest Substrate

Observers should record the nesting substrate of observed colonies. There is space on the data sheet to record both primary (dominant) and secondary substrates. Tricolored Blackbird native habitat consists of young, freshwater marsh dominated by tules or cattails, but they also nest in a variety of other vegetation types that provide enough structure and cover to build nests. In addition, they also now regularly nest in grain crops, particularly triticale fields in association with dairy farms. Likely substrate plants are: bulrush/tule, cattails, blackberry, milk thistle, nettle, and grains like triticale, wheat and barley. Other substrates include: willows, cottonwood, *Arundo*, desert olive, mustard, prickly lettuce, mule fat, coyote brush, raspberry, rice, tamarisk, and poison hemlock.

Colony Surroundings

In addition to locating and viewing the colony, it is useful to describe the surroundings. In addition to nesting substrate, Tricolored Blackbirds also require a source of open water and suitable foraging areas (e.g. upland pasture, grassland, and alfalfa). They can fly several miles to sources of abundant food (like farms with stored grains). Knowing about these locations will assist in future surveys and may help observers find additional breeding colonies as birds move between various nesting sites and a centralized food source. **Any stream of blackbirds is worth following!** On the data sheet, if source of water or stored grains are identified, please record the presence of stored grains nearby and the distance to water. Also, note the dominant land use surrounding the colony (type of agricultural crop, natural vegetation type, etc).

Colony Area

Observers should try to record the approximate length and width of the breeding substrate within the colony. These measures will be used to calculate the total area of the colony. Since breeding substrate often occurs in patches over a larger area, size estimation is approximate. Colony area will be used with what is known about the average nest density within Tricolored Blackbird colonies to develop a secondary estimate of the number of birds in the colony.

- *Measuring Width and Length:* Where possible, observers should pace out two sides of the colony, using strides that approximate one meter. Record the number of meters for these two sides on the data sheet.

- *Aerial Photos*: Using satellite photos that are provided, observers can highlight the boundaries of the colony being used. These marked-up photos should be sent in with paper copies of datasheets following the surveys. These will provide a means for mapping the extent and calculating the total area of colonies observed.

Behavior and Colony Status

Behavior of birds at a colony and the current activity at the colony are also important sources of information for understanding the seasonal timing of breeding and success of particular colonies. Important observations to record on the datasheet include:

- *Singing*: pronounced chorus of males heard singing at a colony
- *Carrying Nest Material*: females observed carrying nest material (e.g. grass)
- *Carrying Food*: adults observed carrying food (usually insects protruding from bill)
- *Colony Quiet*: if the colony is relatively quiet (no singing or large groups of males and females moving about) and primarily males are visible, this may indicate that incubation has begun and females are on nests.
- *Fledglings*: observed young birds in association with adults.

Mapping New Colonies

In order to better ensure that we record the location of new colonies accurately, please use the street and colony maps provided (or another map you have available and can copy) to mark the location of new colonies you find and visit. These will be stored and used later for data quality checking.

Survey Routes

Using the maps provided or other maps you have available to indicate the routes taken during the survey by highlighting the roads and areas surveyed. These should be sent in with the datasheets and aerial photos following the survey.

Appendix 2. 2008 Tricolored Blackbird Survey Report Form and Instructions

Visit Information

Date: _____ Time on Site: _____

Observer Name: _____

Telephone _____ Email: _____

Colony Information

Colony Name: _____

County Name: _____ Landowner/Contact: _____

Directions: _____

_____

Latitude _____ Longitude _____ Datum _____

Colony Size

Minimum # Birds _____ Type of Estimate: **Visual**

Best Estimate # Birds _____ Precision of Estimate: Scanning / Precise Count (circle one)

Maximum # Birds _____ Approximate Sex Ratio (Males/Females): _____

Colony Observations

Primary Nest Substrate: _____ Secondary Nest Substrate: _____

Nearby Stored Grains: Yes / No Dominant Surrounding Landuse: _____

Distance to water: _____ meters / feet (or N/A) Type of water: _____

Colony Width: _____ meters / feet Colony Length: _____ meters / feet

Carrying nest material Yes / No Singing Yes / No

Carrying Food Yes / No Colony Quiet Yes / No

Fledglings Yes / No

Notes

Date Entered in Tricolored Data Portal: Yes / No

2008 Tricolored Blackbird Survey Datasheet Instructions

One datasheet should be completed for each colony site visited, including if no birds were observed at a colony (record zero birds observed). Fill out each section as completely as possible.

Visit Information - Please provide the date, names of observers, contact information for one observer, and total time spent at that colony

Colony Information – Provide the accepted colony name, if known, or a descriptive name based on the location for colonies where the name is not known or it is a new colony. Provide the county where the colony is located and a detailed description of where the colony is located using cross streets, landmarks, and/or approximate mileage (e.g. 1.2 miles SE of intersection of Road 26 and Avenue 88). Record the latitude and longitude if possible. This can be done using a GPS in the field. Alternatively, coordinates can be obtained using a mapping program like Google Earth or when entering data in the Tricolored Blackbird Portal after the survey (see the survey protocol).

Colony Size – Provide your best estimate of the number of adults at the colony, as well as the minimum and maximum number of birds (as described in the survey protocol). Be sure to specify the precision of your estimate (precise count or a scanning estimate). Also, record an estimate the sex ratio (males/females) observed at the colony.

Colony Observations – Tell us whether there was a pronounced song chorus (most males singing), whether you saw females carrying nest materials into the colony, whether you saw adults bringing food for nestlings into the colony, and whether you observed fledglings. Please tell us in what substrate(s) the nests are constructed, and estimate the total length and width of substrate available. Areas will be automatically calculated. Please estimate the distance to nearest water and the type of water (e.g., marsh, stock pond, drainage ditch) and tell us whether you saw the breeding birds utilizing stored grains (e.g., cattle or horse feed). Lastly, describe the surrounding land uses, including the kinds of crops, where possible and appropriate. Place any additional notes in the Notes field.

Maps – Use the street and colony location maps provided to highlight areas/roads surveyed and the location of any new colonies located. These should be sent in with the datasheets.

Aerial Photos – If you were provided with aerial photos of specific colonies, please highlight the colony boundaries (nesting area used) on those photos and also send those in with the datasheets.

Data Submittal

1) Review datasheets to ensure all required information is recorded.
2) Enter these data into the Tricolored Blackbird Portal (http://tricolor.ice.ucdavis.edu). This has been developed as the online clearinghouse for data entry and information exchange about Tricolored Blackbirds. Instructions for data entry should have been provided; if needed they can be downloaded from the website. Be sure to indicate on the datasheet that the observation has been entered online.
    a. If you cannot enter your survey data online, skip to step 3.
3) Make copies of your datasheets and maps (this is not required, but will be very valuable if the datasheets are lost in the mail).
4) Mail the paper datasheets, maps with new colonies marked on them, and aerial photos with colony boundaries clearly marked to the coordinator:

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