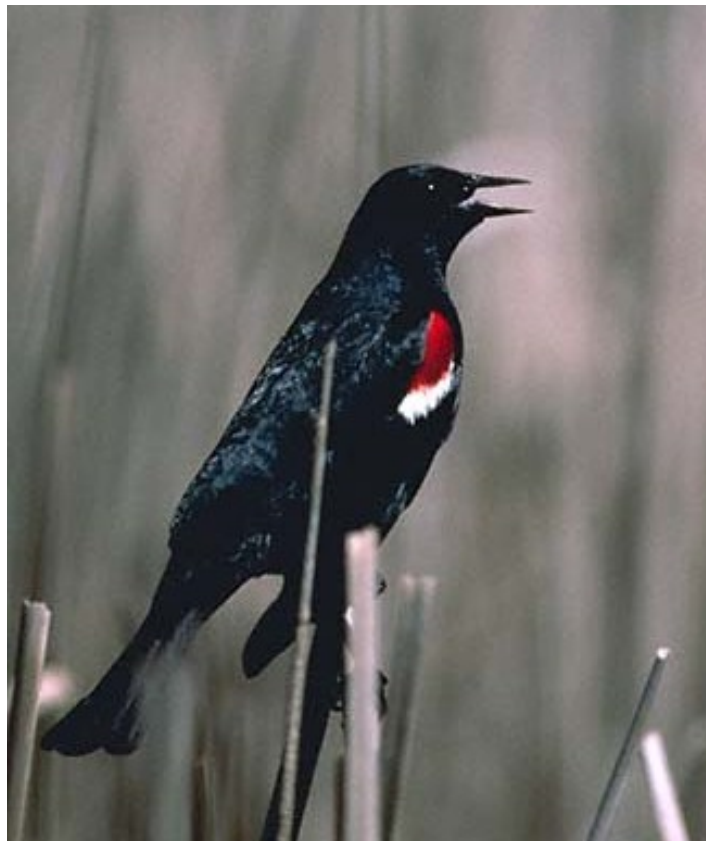


**Western Riverside County
Multiple Species Habitat Conservation Plan (MSHCP)
Biological Monitoring Program**

**Tricolored Blackbird (*Agelaius tricolor*)
Survey Report 2010
with
Overview of Recent History and Current Status in
Southern California**



28 March 2011

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NOTE TO READER:

This report is an account of survey activities conducted by the Biological Monitoring Program for the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). The MSHCP was permitted in June 2004. The Monitoring Program monitors the distribution and status of the 146 Covered Species within the Conservation Area to provide information to Permittees, land managers, the public, and the Wildlife Agencies (i.e., the California Department of Fish and Game and the U.S. Fish and Wildlife Service). Monitoring Program activities are guided by the MSHCP species objectives for each Covered Species, the information needs identified in MSHCP Section 5.3 or elsewhere in the document, and the information needs of the Permittees.

Reserve assembly of the MSHCP is ongoing and it is expected to take 20 or more years to construct the final Conservation Area. The Conservation Area includes lands acquired for conservation under the terms of the MSHCP and other lands that have conservation value in the Plan Area (called public or quasi-public lands in the MSHCP). In this report, the term “Conservation Area” refers to the Conservation Area as understood by the Monitoring Program at the time the surveys were planned and conducted.

We would like to thank and acknowledge the land managers in the MSHCP Plan Area, who in the interest of conservation and stewardship facilitate Monitoring Program activities on the lands for which they are responsible. A list of the lands where data collection activities were conducted in 2010 is included in Section 7.0 of the Western Riverside County Regional Conservation Authority (RCA) Annual Report to the Wildlife Agencies. Partnering organizations and individuals contributing data to our projects are acknowledged in the text of appropriate reports.

While we have made every effort to accurately represent our data and results, it should be recognized that data management and analysis are ongoing activities. Any reader wishing to make further use of the information or data provided in this report should contact the Monitoring Program to ensure that they have access to the best available or most current data.

If there are any questions about the information provided in this report, please contact the Monitoring Program Administrator. If you have questions about the MSHCP, please contact the Executive Director of the RCA. Further information on the MSHCP and the RCA can be found at www.wrc-rca.org.

Contact Information:

Executive Director
Western Riverside County
Regional Conservation Authority
4080 Lemon Street, 12th Floor
P.O. Box 1667
Riverside, CA 92502-1667
Ph: (951) 955-9700

Western Riverside County MSHCP
Monitoring Program Administrator
c/o Adam Malisch
4500 Glenwood Drive, Bldg. C
Riverside, CA 92501
Ph: (951) 248-2552

INTRODUCTION

The tricolored blackbird (*Agelaius tricolor*) is a medium-sized songbird in the family Icteridae and one of 45 bird species covered by the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) (Dudek & Associates 2003). A near-California endemic, with 95% of its historic breeding range within the state, the tricolored blackbird (or tricolor) holds the distinction of forming the largest breeding colonies of any North American land bird since the extinction of the passenger pigeon (*Ectopistes migratorius*). Colonies as large as 300,000 adult birds have been reported in the past (Neff 1937). These characteristics, along with its close relationship to the redwing blackbird (*Agelaius phoeniceus*), a solitary, territorial breeder, make the tricolor a rare and important subject for the evolutionary study of animal social systems, a significant contributor to the phenotypic diversity of California's avifauna (Hamilton 2000, Owens and Bennett 2000) and, perhaps no more, a true wildlife "spectacle" (Mittermeier et al. 2003, Hamilton and Meese 2005).

Prior to the agricultural development of California's Central Valley and the urbanization of southern California, tricolors nested predominantly in freshwater and estuarine marshes. Subsequent to the loss of these habitats, at least half of all colonies statewide now utilize a diversity of upland habitats and agricultural areas. Of these, nesting occurs primarily in patches of spiny, protective vegetation such as milk thistle (*Silybum marianum*), Himalayan blackberry (*Rubus discolor*), and stinging nettle (*Urtica dioica*). Use of other species such as giant cane (*Arundo donax*), willows (*Salix* spp), mule fat (*Baccharis salicifolia*), mustards (*Brassica* spp.) and others has also been documented (Beedy and Hamilton 1999).

Adults feed chicks insects gathered from surrounding fields of irrigated pasture, lightly grazed rangeland, dry season pools, mowed alfalfa (*Medicago sativa*), native and non-native grass/forblands, and various scrub vegetation associations. Colonies are often located in the vicinity of feedlots and dairies, which provide grain for adults and, as an example, alfalfa fields, which provide insects for young. Poor quality foraging habitat includes row crops, orchards, vineyards, and heavily grazed rangelands.

Tricolors were described by J.G. Cooper in the 19th Century as "the most abundant species near San Diego and Los Angeles Counties" (Baird et al. 1874). Data collected from southern California and the Central Valley by Neff (1937), along with other information, led Collier (1968) and DeHaven et al. (1975) to suggest historic numbers may have well exceeded 1.5 million birds state-wide. That figure however had been reduced by half only 40 years later (DeHaven 1975). Further dramatic declines are evident from data collected between 1994 and 2000 (Cook and Toft 2005).

Tricolors are not covered under the state or federal endangered species acts, but are classified on the International Union for Conservation of Nature Red Data List as Globally Endangered (Birdlife International 2008) and are currently considered a California Species of Special Concern (Shuford and Gardali 2008), a federal Species of Conservation Concern (U. S. Fish and Wildlife Service 2002), and a Partners in Flight Watchlist species (Rich et al. 2004). The southern California population is considered to be the most at risk and rapidly declining (Tricolored Blackbird Working Group 2007).

MSHCP species-specific conservation objective 4 requires documenting the continued use and successful reproduction in at least 1 of 5 MSHCP-identified Core Areas at least once every 5 years. Core Areas include the San Jacinto floodplain, Mystic Lake/San Jacinto Wildlife Area, Collier Marsh and Lake Elsinore Grasslands, Alberhill, and Vail Lake/Wilson Valley/eastern Temecula Creek (Dudek & Associates 2003). Combined, they include most historic colony sites at the time the MSHCP was developed. All known historic colony sites in Riverside County are within the MSHCP Plan Area.

Prior Survey Efforts

Neff (1937) conducted the earliest known surveys for tricolors in southern California in 1932 and 1935 with apparent focus in Orange and Los Angeles Counties. Sporadic accounts of breeding colonies occurring in other counties were reported through the 1940s and 1950s with an absence of records from the 1960s. The earliest report from Riverside County was in 1950 from Lake Norconian near the town of Norco, but tricolors have not been documented at this site since then. DeHaven (1975) surveyed San Diego, Los Angeles, and Riverside Counties in 1971 and observed a small colony (750 birds) near the town of Alberhill in Riverside County, which also has not been confirmed since the initial report. Most reports made in the 1980s were from San Diego and Orange Counties.

Efforts to gather population data on an intensive, state-wide basis were begun by Bill Hamilton in 1992 but did not extend well into southern California until 1994 when Richard Grey surveyed a portion of the historic colony sites in all counties except San Bernardino (Hamilton et al. 1995). The survey effort was expanded in 1997 to include all counties and more historic sites in southern California. State-wide surveys have been conducted since 2005 at 3-yr intervals as part of the Conservation Plan for the tricolored blackbird (Tricolored Blackbird Working Group 2007). The first survey by the MSHCP Biological Monitoring Program occurred in 2005 in cooperation with the state-wide effort. The most recent state-wide survey was in 2008.

We present here results from Biological Monitoring Program surveys for tricolors in 2009 and 2010, along with an overview of the current status of the species. Specifically, our goals and objectives were as follows:

Goals and Objectives

1. Document the distribution of tricolored blackbird colonies within the MSHCP Plan Area during the 2009 and 2010 breeding seasons.
 - a. Determine the presence/absence of tricolors at historic breeding sites in each of the 5 identified Core Areas.
 - b. Determine the presence/absence of tricolors at all other historic breeding sites within the MSHCP Plan Area.
 - c. Search for tricolors at other potential habitat sites within the identified Core Areas and other locations in the Plan Area.
2. Document reproductive status of the tricolored blackbird within the MSHCP Plan Area.

- a. Determine the success or failure of any located breeding colonies within the 5 identified Core Areas. Success is defined by the MSHCP as a nest which fledged at least 1 young.
- b. Determine the success or failure of any other breeding colonies within the MSHCP Plan Area.
3. Assess population trends in Riverside County and southern California as a whole.
 - a. Determine whether local and regional tricolor populations are stable, increasing, or decreasing.
4. Examine recent and historic patterns of colony site selection within Riverside County with respect to current MSHCP reserve boundaries and potential future reserve lands.

METHODS

Surveys prior to 2009

We compiled data from two principal sources including 1) original reports of state-wide survey efforts and 2) the Tricolored Blackbird Data Portal (data portal) (<http://tricolor.ice.ucdavis.edu>). The portal is a centralized repository of occurrence data, news, and information established as part of the Conservation Plan for the Tricolored Blackbird (Tricolored Blackbird Working Group 2007). The website is administered by the University of California, Davis Information Center for the Environment; contact Robert Meese (rjmeese@ucdavis.edu) for questions about this resource.

State-wide surveys were conducted in 1994 (Hamilton et al. 1994), 1997 (Hamilton et al. 1997), 2000 (Hamilton 2000), 2005 (Hamilton and Meese 2005), and 2008 (Kelsey 2008). All took place over 3-4 days during the spring breeding season on the third or fourth weekend in April by coordinated groups of volunteers. Effort focused on historic breeding sites although volunteers were also asked to search the vicinity of previously reported but unconfirmed breeding colonies as well as the landscape along driving routes between colony sites. Methods for estimating colony size are outlined by Hamilton (2000). The narrow survey window was intended to capture the peak of the breeding season in the Central Valley and southern California and to avoid double-counting of birds. This is important because tricolors will relocate and settle in other colonies if their nesting efforts are disturbed or destroyed (Beedy and Hamilton 1997, Hamilton 1998).

All the reports produced from these surveys are available for download from the data portal, along with data from additional surveys that can be obtained by query. These include records of accounts made prior to 1994, along with results of more recent surveys made of the greater San Jacinto Valley area in 2001, 2003, 2004, and 2006, and portions of Riverside, San Diego, Los Angeles, and Orange Counties in 2007 (Paulek and Nash 2007).

2009 – 2010 Surveys

We surveyed all historic colony sites within the 5 identified MSHCP Core Areas, the Plan Area as a whole, and other areas of potential habitat during the springs of 2009 and 2010 (Table 1; Figure 1). We considered potential habitat to include private dairies,

marshlands, and fresh water bodies within the Riverside Lowlands and Foothills Bioregions of the MSHCP Plan Area. We acquired all necessary and appropriate permissions and land access agreements before surveys began.

Table 1. Areas of Riverside County searched for Tricolored blackbirds in 2009 and 2010. Search areas in bold are MSHCP Core Areas. The column “Historic” shows those breeding colony sites known prior to 2009 [Tricolored Blackbird Data Portal (<http://tricolor.ice.ucdavis.edu>)].

| Search Area | 2009 | 2010 | Historic |
|--|-------------|-------------|-----------------|
| Alberhill | X | X | X |
| Diamond Valley | X | | |
| Garner Valley/Lake Hemet | | X | X |
| Lake Elsinore Grasslands and Collier Marsh | X | X | |
| Lake Mathews/Cajalco Canyon | | X | |
| Lake Norconian | X | | X |
| Lake Perris | X | X | |
| Lake Skinner | X | X | X |
| Perris Valley | X | X | X |
| Prado Flood Control Basin | | X | |
| San Jacinto River Floodplain | X | X | X |
| San Jacinto Wildlife Area, Davis Unit/Mystic Lake | X | X | X |
| San Jacinto Wastewater Treatment Plant | X | | X |
| San Jacinto Wildlife Area, Potrero Unit | X | X | X |
| San Timoteo Canyon | X | X | X |
| Santa Ana River Parkway | | X | |
| Sycamore Canyon | X | X | X |
| Temescal Canyon | | X | |
| Vail lake/Wilson Valley/Eastern Temecula Creek | | X | X |
| Winchester/Warm Springs | X | X | X |
| Totals | 13 | 17 | 13 |

We conducted surveys April 24-26, 2009, and May 3-5, 2010. The 2010 survey was the most complete and included all but 3 historic localities (Lake Norconian, Diamond Valley, San Jacinto Wastewater Treatment Plant). No colonies have been reported at Lake Norconian since 1950 and there have never been any reports from Diamond Valley. Neither site appeared to support appropriate habitat for tricolors in 2009. The treatment plant was inaccessible due to roadwork in 2010.

In a separate effort, Jon Feenstra organized teams of volunteers for surveys throughout southern California with funding from the US Fish and Wildlife Service and Audubon California. Their surveys were conducted between April 20-26, 2009, and April 21-28, 2010, with the intent of visiting all known colony sites in Los Angeles, San Bernardino, San Diego, and Riverside Counties (Feenstra 2009, 2010).

Both efforts followed the data collection protocol outlined by Kelsey (2008) using field data sheets from the 2008 statewide survey (Appendix). We estimated the size of tricolor colonies during the provisioning stage of nesting and in the early morning (0600-0900 h) and just before dusk when foraging activity is greatest. Since both sexes provision young, reasonable estimates of colony size can be made by observing over a period of 5-10 min, the number of adult birds returning to nests within a specific field of

view and extrapolating over the area occupied by the colony at approximately the same density. We determined reproductive success by returning to the colony at intervals of several days to observe the presence of fledglings at or near the colony site.

Data Storage

Our data are stored in the MSHCP Biological Monitoring Program database and the Tricolored Blackbird Data Portal. Jon Feenstra's reports are available for download from the data portal.

RESULTS

2009 Surveys

We did not find tricolored blackbirds in any of the MSHCP-identified Core Areas in 2009. The only colony observed was at the Potrero Unit of the San Jacinto Wildlife Area (Potrero) in a small cattail (*Typha* spp.) marsh along Potrero Creek. This colony was first documented during the MSHCP Monitoring Program survey for tricolors in 2005 (Escobar and Miller 2005). We estimated colony size on April 25, 2009, at 200 (± 50) adults, occupying an area of approximately 900 m², and in the provisioning stage of nesting. Adults were collecting caterpillars and other insect prey from grasslands within the wildlife area. Breeding success was confirmed on a second visit to the colony on May 2nd.

Feenstra (2009) reported a total of 2880 breeding birds in Riverside County in 2009, all outside of tricolor Core Areas: 150 at Potrero, 2000 at the San Jacinto Wastewater Treatment Plant which is operated by the Eastern Municipal Water District, and 730 at Lake Riverside Estates, a private lakeside community near the town of Aguanga in the Wilson Valley area.

2010 Surveys

We located 4 tricolor colonies in 2010, with an estimated total of 1385 adults distributed among the 4 colonies. However, none of these were located within MSHCP-identified cores for the species.

Potrero: This colony comprised approximately 25 adults and was in the nestling stage on May 4th. Reproductive success was confirmed in a subsequent visit to the site on May 9th. The condition of the nesting substrate was generally poor (many of the cattails were dry and bent over) by comparison with 2009. Feenstra (2010) reported 75 birds at this site in their April survey, half as many as in 2009.

Lake Riverside Estates: This colony was first reported in 2005 by the Monitoring Program, which participated in the state-wide survey that year. Tricolors were observed nesting at this site again in 2008 (Kelsey 2008). We did not gain access to the property during the present survey but rather based our estimate of 260 on the number of birds traveling to and from the lake to forage in cattle pasture along Highway 371, approximately 0.5 km away. Feenstra (2010) reported 800 adults although their visit was at least 9 days prior to ours and it is possible that some birds had completed nesting during that period. We did observe 2 small flocks (20-30 birds) of juveniles and adults foraging in fields within 4 km of the lake on the survey date. These birds were likely

from the Lake Riverside Estates colony which suggests that some reproduction had been successful.

Fisherman's Retreat: Fisherman's Retreat is a private campground and man-made lake in San Timoteo Canyon. A tricolor colony was first observed in a small cattail marsh on the eastern side of the lake in 2008. We estimated there were 1000 (\pm 200) adults and nests were in the nestling stage on May 3rd. Males and females were provisioning chicks with caterpillars and unidentified flying insects collected from surrounding grasslands managed by the Western Riverside County Regional Conservation Authority and Riverside County Regional Parks and Open Space District. Reproductive success was confirmed in a subsequent visit on May 9th.

Lake Hemet: No birds were present during the survey; however we did observe a colony of approximately 80 adults and juveniles in the post-nesting stage on May 22nd. This marks the first occurrence at this site on record. Lake Hemet is located just off Highway 74 in Garner Valley. The colony site is a freshwater marsh comprising primarily bulrush (*Scirpus* spp.) along the inlet to the lake. Foraging occurred in surrounding cattle pasture and open grasslands to the south and east of the colony. The area had been searched during the late April surveys of 2005 (Escobar and Miller 2005) and 2008 (Kelsey 2008) without success. However, it is likely that nesting begins later in the season at this higher elevation where snow can be still present on the ground in late April.

Population Trends

Results of region-wide surveys conducted in 2009 and 2010, including our surveys in western Riverside County, indicate that the population of tricolored blackbirds in southern California is at its lowest level since recent surveys began (Figure 2). We omitted surveys prior to 1997 in this analysis because of their relatively incomplete coverage of southern California. Region-wide, population numbers have been strongly dominated by Riverside County, where the number of birds observed during spring surveys has declined more than 95% since 1997 (Figure 3). The total number of breeding birds in Riverside County, and the MSHCP Plan Area, has declined by 88% since 2005 alone. A negative trend is also apparent across all other counties in southern California when Riverside colonies are excluded from the totals (Figure 4).

The abundance of tricolors in Riverside County has been dominated by the size of the single largest colony in any given year since 1997 (Figure 5). Until 2006, the location of that colony had always been somewhere within the San Jacinto Valley in and near the Davis Unit of the San Jacinto Wildlife Area. Specific locations have included the San Jacinto Wastewater Treatment Plant (1997, 2000, 2001, 2009), the San Jacinto Wildlife Area (2003, 2004, 2005), and a private dairy (2006) nearby. Throughout this time, colony size declined from a high of 35,000 birds in 1997 (one of the 10 largest state-wide that year) to 2000 birds in 2009. Breeding effort was not observed in 2007 (Paulek and Nash 2007), a year of severe drought, and only small colonies of 200-1000 birds were found anywhere in Riverside County in 2010, all outside of the San Jacinto Valley. Overall, the mean size of tricolor colonies in Riverside County (Figure 6) has shown a significant decline, from 5110 birds in 1997-2006 to 426 birds in 2007-2010 (Mann-Whitney U Test, $P < 0.01$).

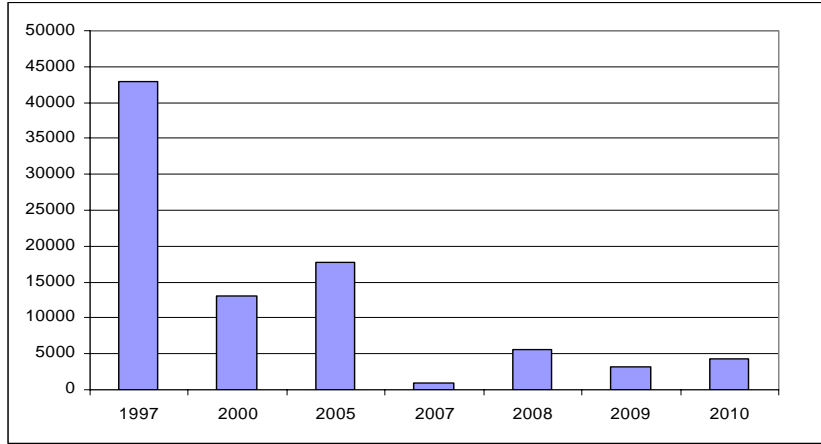


Figure 2. Total counts of tricolored blackbirds in San Diego, Los Angeles, Orange, San Bernardino, and Riverside Counties from 1997 to 2010.

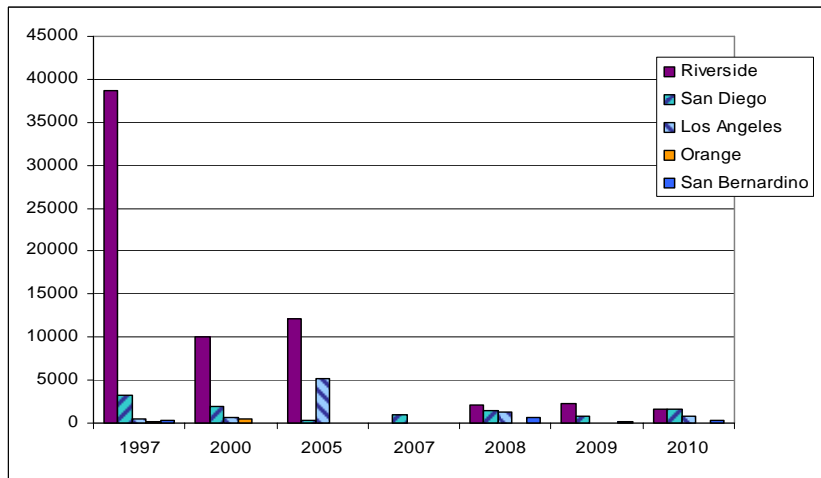


Figure 3. Counts of tricolored blackbirds in 5 southern California counties between 1997 and 2010.

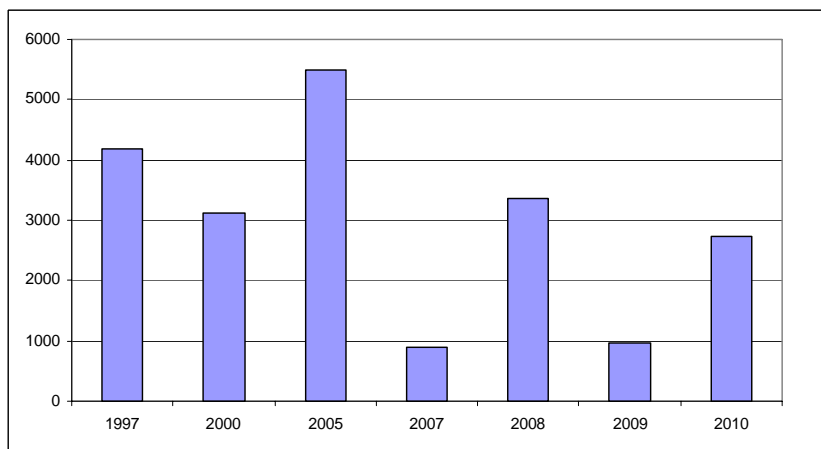


Figure 4. Total counts of tricolored blackbirds in San Diego, Los Angeles, Orange, and San Bernardino Counties from 1997 to 2010.

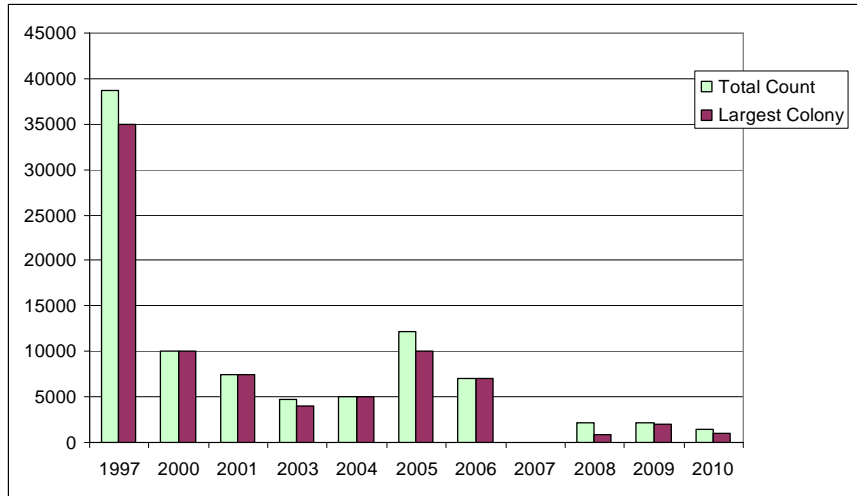


Figure 5. Total counts and largest colony size of tricolored blackbirds in Riverside County between 1997 and 2010.

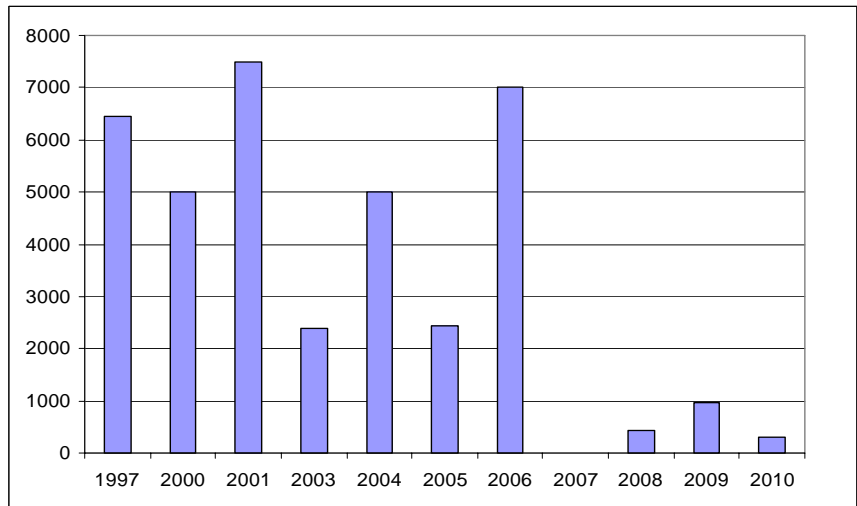


Figure 6. Mean tricolored blackbird colony size in Riverside County between 1997 and 2010.

The distribution of occupied colony sites exhibits a marked reduction and geographic shift toward the eastern side of the Plan Area since the first documentation of tricolored blackbirds in Riverside County at Lake Norconian in 1950 (Figure 7). Furthermore, most historic colony sites lie outside of the MSHCP-listed Core Areas for this species. No colonies have been reported from the Alberhill Core Area since 1997.

Colonies were concentrated within the San Jacinto Wildlife Area/Mystic Lake Core Area until 2005 but have since been absent. Smaller new colonies (< 1000 birds) were discovered in the Winchester Valley and near Lake Skinner in 2008 but were

not found there in 2009 or 2010. Only a single colony has ever been reported from the San Jacinto River Valley Core Area, near the Perris Airport in 2005, and there are no records of occurrence from the Lake Elsinore Grasslands/Collier Marsh Core Area. Tricolor colonies have been found only on the eastern side of the Plan Area since 2008 and, with the exception of Potrero, all on private land. No colonies have been found within any of the 5 Core Areas since 2005.

Nesting Substrates

The majority ($\geq 70\%$) of breeding colonies found in every county since 1997 were located in emergent freshwater vegetation including pure and mixed stands of cattails and bulrush (Table 2). One colony utilized willows (*Salix* spp.) at the San Jacinto Wildlife Area. Twenty-one percent of colonies in San Diego nested in Himalayan blackberry (*Rubus discolor*). Nesting in silage (triticale wheat grown for dairy cattle) was only reported at one site, in 1 year, in Riverside County. Nesting occurred to a limited extent in other upland habitats which included patches of Cheeseweed mallow (*Malva parviflora*), Prickly lettuce (*Lactuca viminea*), nettles (*Urtica* sp.), and wild mustard (*Brassica* spp.).

Table 2. Numbers of tricolored blackbird colonies and proportion of colonies and individuals nesting by substrate type during the state-wide survey years 1994, 1997, 2000, 2005 and 2008. Riverside colonies include data from additional years (see Methods for explanation).

| County | Total colonies | Emergent marsh | | | Himalayan blackberry | | |
|----------------|----------------|-----------------|---------------|------------|----------------------|---------------|------------|
| | | No. of colonies | % of colonies | % of birds | No. of colonies | % of colonies | % of birds |
| San Diego | 29 | 22 | 76% | 99% | 6 | 21% | <1% |
| Los Angeles | 20 | 17 | 85% | 99% | - | - | - |
| Orange | 7 | 7 | 100% | 100% | - | - | - |
| San Bernardino | 3 | 3 | 100% | 100% | - | - | - |
| Riverside | 27 | 19 | 70% | 81% | - | - | - |

| County | Total colonies | Silage | | | Other protective vegetation | | |
|----------------|----------------|-----------------|---------------|------------|-----------------------------|---------------|------------|
| | | No. of colonies | % of colonies | % of birds | No. of colonies | % of colonies | % of birds |
| San Diego | 29 | - | - | - | 1 | 3% | <1% |
| Los Angeles | 20 | - | - | - | 3 | 15% | <1% |
| Orange | 7 | - | - | - | - | - | - |
| San Bernardino | 3 | - | - | - | - | - | - |
| Riverside | 27 | 1 | 4% | <1% | 7 | 26% | 19% |

DISCUSSION

Survey Results and Population Trends

Results of the current surveys and analysis of recent historic trends reveal substantial changes in the population size of tricolored blackbirds and distribution of breeding colonies within the MSHCP Plan Area since 1997, when organized surveys began. The total number of tricolors breeding in Riverside County has declined by approximately 95% over this time period, with < 1600 birds counted in 2010. The loss does not appear to have been offset by increases elsewhere in southern California, nor has the decline of birds breeding in the San Jacinto Valley area been offset by increases in other parts of the Plan Area.

These results strongly suggest that the MSHCP conservation and management objectives for tricolored blackbird are not currently being met. We found no colonies in tricolor Core Areas in 2009 or 2010. Independent surveys conducted by Feenstra (2009, 2010) produced similar results. Surveys conducted by the Monitoring Program in 2005 documented settlement of a colony at the San Jacinto Wildlife Area, however reproduction was unsuccessful (Escobar and Miller 2005).

The primary reason for the decline of the tricolored blackbird in Riverside County and southern California as a whole is most likely habitat loss. Richard Grey (Hamilton et al. 1995) described in detail the direct threats to colony sites in Orange County. No tricolor colonies have been found there since 2000. All other counties have undergone explosive urban development in recent decades as well. It is possible that these changes account for the change in distribution of tricolor colonies within the MSHCP Plan Area. Areas to the west such as Alberhill and Lake Elsinore no longer appear to provide sufficient foraging habitat.

As important as total population numbers and number of breeding colonies is the size of those colonies. In fact, colony size itself may be a contributing factor to population decline in a species whose reproductive success is associated positively with population density. Such inverse density dependence has been linked with the extinction of the passenger pigeon (*Ectopistes migratorius*), another highly colonial avian species (Blockstein 2002, Stephens and Sutherland 1999, Wilcove 1999). The decline of the tricolored blackbird in southern California, and Riverside County in particular, has coincided with a significant reduction in mean colony size. The loss of tricolors from the San Jacinto Valley, an area that has supported the single largest colony in southern California since organized surveys began, is therefore a cause for great concern. The reasons are unclear, although urbanization and the loss of important grassland foraging habitat have increased, as has the loss of dairies which can provide an important supplemental food source during nesting and probably the winter as well. Most recently, the drought of 2006 appears to have had a profound impact.

Predation may have played a role in recent years as well. Seventy percent of Riverside colonies have utilized emergent freshwater plants (mostly cattails and bulrush) as nesting substrate mainly at 2 sites, the San Jacinto Wastewater Treatment Plant and the Davis Unit of the San Jacinto Wildlife Area. Although wetlands offer protection from mammals such as coyotes and raccoons when water is present, they provide little refuge

from birds that prey on tricolor nestlings, most notably herons (e.g., Hamilton 2000). Large-scale habitat loss has caused a concentration of predators and prey in remaining wetlands to the extent that those habitats containing nest and roost sites for avian predators have become population sinks for tricolors; total nest failure is typical (Cook and Toft 2005). Cattle egrets (*Bubulcus ibis*) have emerged as a new and very serious threat to tricolors in the Central Valley (Meese 2010) and may become problematic throughout southern California as well.

Recommendations for Future Surveys

Given the rapid rate of decline of the tricolored blackbird within the Plan Area, it is essential that monitoring be conducted with surveys for breeding colonies every year rather than every 5 yrs. Annual surveys could be coordinated with the state-wide surveys run every 3 yrs. The survey protocol should also include an assessment of non-occupied historical sites for future breeding potential. Such an assessment should include availability of water and foraging habitat and its persistence throughout the breeding season. Monitoring should also be designed to fill critical gaps in our knowledge of reproductive success with respect both to nesting substrate and colony size. For these reasons, the survey period must be extended to allow multiple visits to active sites before, during, and after nesting. Great care must be taken to avoid disturbance to colonies, particularly during settlement and nest construction phases, and should occur 8 days after chicks have hatched (Hamilton et al. 1995).

Another large and critical information gap is winter distribution and habitat use. Tricolors often travel in mixed flocks during the winter and can be more difficult to detect at that time of year. All Monitoring Program crews should be trained to identify tricolors and instructed to remain vigilant while conducting other surveys throughout the Plan Area. Small winter flocks have been observed incidentally during other survey efforts in the Wilson Valley area and the vicinity of the San Jacinto Wildlife Area but more information is needed.

To date, no tricolor colonies have been found within the Vail Lake/Wilson Valley/Eastern Temecula Creek Core Area although it appears to contain quality breeding habitat. The colony at Lake Riverside Estates, another observed from Hwy 371 on the Cahuilla Indian Reservation (Escobar and Miller 2005), and winter flocks observed in this area are all outside the boundaries of the Core Area. Unfortunately, they are also outside of the MSHCP Criteria Area. We recommend that targeted searches for tricolor colonies be expanded within the Core Area, and perhaps within the San Jacinto River Valley Core Area as well.

Suggestions for Conservation and Management

The tricolored blackbird currently depends on managed habitats and will require active management to survive. Management must aim for a rapid restoration of population numbers and multiple large breeding colonies (5000 birds or more). The San Jacinto Wildlife Area/Mystic Lake complex is the single most important site for the restoration of the tricolor population in Riverside County and southern California as a whole. The data presented here strongly support the need for rapid improvement and expansion of secure nest sites and foraging habitat in this area. Additional foraging

habitat in the vicinity of the Wildlife Area should be considered high priority for acquisition and incorporation into the MSHCP Conservation Area or other form of long-term protection.

Lake Elsinore/Collier Marsh and Alberhill probably do not support suitable breeding habitat for tricolors and we recommend that their status as Core Areas for tricolored blackbirds be re-evaluated and possibly replaced by one or more other sites, such as the Potrero Unit of the San Jacinto Wildlife Area. The small colony there has been observed in all surveys since 2005, however the number of birds breeding at this site has declined from approximately 500 to 50. This site could benefit the species with proper management which should include, but not necessarily be limited to, maintaining fresh growth of emergent vegetation, increasing the amount of open water at the current colony site by enlarging the pond, and creating additional nesting habitat.

Protection of all active tricolor colony sites no matter how small, including their nesting and foraging habitat is critically important until we know more about the factors affecting reproductive outcome and the relation between colony size and success. Most currently-active colony sites are on private land, and their protection will require the cooperation of land owners. The Fisherman's Retreat site is private but the birds forage extensively in the surrounding grasslands which are currently in conservation as part of the MSHCP. These lands should be maintained as important tricolor foraging habitat. Similarly, the San Jacinto Wastewater Treatment Plant has provided important breeding habitat for tricolors in the past (Hamilton et al. 1994, 1997). The Tricolored Blackbird Working Group is working with the managers of these wetlands to improve nesting habitat. However, the value of this site as breeding habitat will also depend on the protection of surrounding grassland foraging habitat, some of which lies within the MSHCP Criteria Area.

Also important is that all historic colony sites within MSHCP conservation lands be evaluated as potential nesting and foraging habitat and improvements made as soon as possible to attract tricolors. Since many of these sites are likely no longer adequate, it may be necessary to create new habitat. Suitable breeding habitat includes upland as well as wetland habitats located within 0.5 km of a water source and 1-5 km from quality foraging habitat. Wetlands large enough to support only a few hundred to a few thousand birds could be beneficial if they lack sufficient roost or nest sites for avian predators. The value of upland nesting habitat should not be underestimated. Although usually comprising non-native plants such as bull thistle, nettles, and Himalayan blackberry, nest density can be very high. In fact, the highest density on record (6 nests per m²) and greatest reproductive success is in Himalayan blackberry (Cook and Toft 2005). Such habitats could sustain large numbers of young in a concentrated and manageable area. Habitat should be widely distributed throughout the landscape to buffer the population as a whole from localized stochastic events such as variation in rainfall and insect production. Useful guidelines for tricolor habitat management have been developed by Audubon California (Kyle in prep.)

We recommend that the tricolor species account in the MSHCP be modified to recognize loss of foraging habitat as a significant threat to the survival of tricolored blackbirds and that the stated management objectives be reconsidered as well. In

particular, the prescription for managing "... this species in order to maintain (once every five years) the continued use of, and successful reproduction within at least one of the identified Core Areas" (Dudek & Associates 2003) is likely insufficient for a rapidly declining species that is dependent on patchy and unpredictable breeding habitats which are rapidly being lost throughout the Plan Area. Given the limited number of active colony sites, we recommend that management seek to maintain suitable breeding and foraging habitat at all recent historic and potential colony sites.

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