Recent History and Current Status of the Tricolored Blackbird in Southern California

Western Riverside County
Multiple Species Habitat Conservation Plan
Biological Monitoring Program
4500 Glenwood Drive, Bldg C
Riverside, California 92501

July 20, 2010

INTRODUCTION

The Tricolored blackbird (*Agelaius tricolor*), a near-California endemic songbird with 95% of its historic breeding range within the state, holds the distinction of forming the largest breeding colonies of any North American songbird since the extinction of the Passenger pigeon (*Ectopistes migratirius*). Colonies consisting of 300,000 adult birds have been reported in the past (Neff 1937). Its close relationship to the Red-winged blackbird (*Agelaius phoeniceus*), a solitary, territorial breeder, makes the Tricolored blackbird (or 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 2006).

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, lead Collier (1968) and DeHaven et al. (1975) to suggest historic numbers may have well exceeded a million individuals 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 IUCN Red Data List as Globally Endangered (IUCN 2010) 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, widely considered to be the most at risk and rapidly declining (Tricolored Blackbird Working Group 2007), is also covered by the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) (DUDEK & Associates 2003).

The earliest known surveys for tricolors in southern California were conducted by Neff in 1932 and 1935 (Neff 1937) 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. 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 (Hamilton et al.1995) surveyed a portion of the historic colony sites in all counties except San Bernardino. The survey effort was expanded in 1997 to include all counties and more historic sites in southern California. Southern California has been a part of all subsequent state-wide surveys conducted since 1997. The MSHCP calls for surveys every five years; the first

conducted in 2005 as part of the larger state-wide survey that year. All known historic breeding locations in Riverside County are within the MSHCP Plan Area.

Although we know that tricolors were abundant in coastal southern California in the early survey years, we know little of the extent to which they occupied inland valley areas during the breeding season or over-wintered there at that time. It is clear however that between 1997 and 2005, the largest proportion of the southern California population was found in western Riverside County, particularly in the San Jacinto Valley area. In fact, one of the 10 largest colonies observed during the 2000 state-wide census occurred there (Hamilton 2000).

A recent analysis of survey data covering the period from 1994 to 2008 suggested no trend in the southern California population numbers as a whole (Kelsey 2008). In this study, we examine in greater detail, patterns of abundance and nest site selection in southern California using data gathered from surveys conducted between 1994 and 2010. We find that there is a strong negative trend in recent tricolor abundance in southern California as a whole and in Riverside County in particular.

METHODS

We compiled data from published reports of breeding tricolor colonies and non-breeding aggregates of birds from five statewide surveys conducted in southern California during the years 1994 (Hamilton et al. 1995), 1997 (Hamilton et al. 1999), 2000 (Hamilton 2000), 2005 (Hamilton and Meese 2006), and 2008 (Kelsey 2008). Much of the data contained in these reports are available directly to the public through the Tricolored Blackbird Portal hosted at the University of California, Davis (http://tricolor.ice.ucdavis.edu/copyright). All of these surveys were conducted over a three to four day period during the spring breeding season on the third weekend in April by coordinated groups of volunteers. Survey 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 (see the references above for more information on survey methodology). Colony size was estimated using methods outlined by Hamilton (2000). The narrow survey window was intended to capture the peak timing 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 (Hamilton 2000).

Additional data are available for Riverside County from surveys conducted from 2000 to 2010. We collected data following Hamilton (2000) during the third weekend in April in the years 2003, 2004, and 2009, and in the first week of May in 2010. We restricted our 2003 and 2004 surveys to the greater San Jacinto Valley area. Surveys in 2009 and 2010 were more extensive and included all known historic breeding sites, areas identified by the MSHCP as “core areas”, and other potential tricolor breeding habitat including private agriculture operations (dairies), marshlands, and fresh water bodies within western Riverside County (Table 1). All necessary and appropriate permissions and land access agreements were acquired from Reserve Managers or landowners before surveys were conducted. C. Rendon independently surveyed southern California in 2009 and reported results for San Bernardino, San Diego, and Riverside Counties (Tricolored Blackbird Portal). T. Paulek conducted surveys in Riverside, San Diego, Los

Angeles, and Orange Counties in 2007, and contributed accounts from Riverside for other years through the Tricolored Blackbird Portal.

RESULTS

The total number of tricolors breeding in southern California has declined from a recent high in 1997 to lows in 2007 and 2009 (Figure 1). Although some counties were not surveyed in all years (Orange in 2008 and 2009, Los Angeles in 2009, and San Bernardino in 1994 and 2007), they represent a relatively small proportion of the southern California population since 1994 (Figure 2).

The overall trend in southern California is strongly dominated by Riverside County, where the number of birds observed during spring surveys has declined more than 95% since 1997 (Figure 3). Counts from 2003 and 2004 are probably underestimated because surveys were restricted to the San Jacinto Wildlife Area and vicinity in those years. San Diego and Orange Counties also exhibit a negative abundance trend since 1994 (Figure 2). Except for a very small colony of 14 individual tricolors observed at one site in Orange County in June of 2005, no birds have been reported from Orange County during surveys since 2000 (including 2005 and 2007). A negative trend is apparent across all counties even when Riverside colonies are excluded from the totals (Figure 4).

The majority (over 70%) of breeding colonies in every county over the study period were located in emergent freshwater vegetation including pure and mixed stands of cattails (*Typha* spp.) and bulrush (*Scirpus* spp.) (Table 2). One colony in one year at the San Jacinto Wildlife Area in Riverside County utilized willows (*Salix* spp.). Approximately 21% of colonies in San Diego were established in Himalayan blackberry (*Rubus armeniacus*), but this species was not used by tricolors for nesting in any other county. Nesting in silage (triticale, a wheat x rye hybrid grain grown for dairy cattle) was only reported at one site (and in one year) in Riverside County. Nesting occurred to a limited extent in other upland habitats which included patches of cheeseweed (*Malva parviflora*), prickly lettuce (*Lactuca viminea*), nettles (*Urtica* sp.), and mustard (*Brassica* spp.).

Abundance patterns of tricolors in Riverside County have been dominated by the single largest breeding colony of the year since surveys began in 1994 (Figure 5). Until 2006, this colony had always occurred somewhere within the San Jacinto River Valley in or near the Davis Unit of the San Jacinto Wildlife Area. The specific location has varied with respect to Reserve lands since 1994 (Figure 6). Between 1997 and 2001, the vast majority of birds (90%) occurred within a single colony outside of established Reserve lands in a created wetland at a sewage treatment plant near the city of Hemet. Between 2003 and 2005, the colony was located within the San Jacinto Wildlife Area, and in 2006, it had moved to a private dairy nearby.

In 2006 the last colony of more than 1000 birds was reported from Riverside County. Much of southern California, including Los Angeles and Orange Counties and the Inland Empire experienced a severe drought in 2007 and reproductive failure was nearly complete region-wide (Paulek and Nash 2007). Since that time, colony sizes in Riverside County have been greater than zero but substantially smaller than previous years. In 2009, only 200 birds were found at a

single site, the Potrero Unit of the San Jacinto Wildlife Area. The total was greater at 1485 in 2010 and more colonies were observed, although only 25 birds nested inside Reserve lands (also the Potrero Unit).

DISCUSSION

Tricolor abundance data collected in the past several years indicate a precipitous decline of the southern California population between 1997 and 2006, followed by a collapse in or after 2007. The large number of birds observed in Riverside County in 1997 was unlikely due to an influx from the Central Valley population (Kelsey 2008). Evidence for large scale immigration from the north is not available and is not suggested by recent genetic work on the species. Rather, empirical patterns of seasonal movement and migration of tricolors throughout the state suggest little interchange (DeHaven and Neff 1973, Hamilton and Meese 2006). More likely, these birds had been undetected in earlier surveys. Data from the 1994 state-wide survey are not comparable and are incomplete with respect to later surveys. This is evident in the fact that many sites where tricolors are known to have nested since 1997 were not known to earlier surveyors, or if known, were never mentioned in any of their accounts or reports. And, of the sites that were known, some apparently were not visited in 1994 (Lake Norconian, San Timoteo Valley, Alberhill, Sycamore Canyon).

The overall temporal pattern of abundance is dominated by Riverside County in the years since 1997, and in Riverside prior to 2007 by a single predominant breeding colony located in the San Jacinto Valley. In 1997, 90% of the observed southern California population (35,000 birds) nested in a single colony in a created wetland at the Hemet sewage treatment plant operated by the Eastern Municipal Water District (EMWD). They continued to use this site through 2001. No survey data are available for 2002.

In 2003, the largest colony, consisting of 6,750 birds, was located at the San Jacinto Wildlife Area and chicks were provisioned with food collected from both the Wildlife Area and a private dairy operation nearby. An estimated 10,000 birds (82% of the Riverside County total) were reported at this site during the statewide survey in 2005. However, the following year they were absent from the San Jacinto Wildlife Area, and the colony (estimated at 8180 birds; Meese 2006) was established in a wheat field adjacent to a nearby dairy. It was rescued from destruction through a buyout arranged with the owner.

Since the drought of 2007, when reproductive success appeared to be near zero, only small colonies ($\leq$ 1000 adults) have been located, all outside of the San Jacinto Valley, and with the exception of the Potrero Unit of the San Jacinto Wildlife Area (200 birds in 2009 and 25 in 2010), all on private land. These lands, including sites in Garner Valley, San Timoteo Canyon, and Wilson Valley, do not appear to have been surveyed prior to 2005 and it is likely that they previously supported undetected colonies. A small flock of about 100 birds was observed at a dairy near the Davis Unit of the San Jacinto Wildlife Area in 2010 during an early May 2010 survey, but the birds did not appear to be nesting.

It is possible that the steep negative abundance trend reported here for Riverside County and southern California as a whole, although dramatic, is an underestimate because survey effort,

knowledge of breeding localities, and presumably, the experience of volunteer observers has increased through the years. The 2003 and 2004 Riverside County surveys were limited to the San Jacinto Wildlife Area and vicinity and were thus incomplete. However, Riverside County surveys conducted in 2009 and 2010 were probably among the most thorough, covering all known historic breeding sites and other likely potential habitats within the county.

The reason for the Tricolored blackbird's decline in southern California is likely due in large part to negative population growth through insufficient reproductive success caused by a combination of habitat loss and predation. Grey (Hamilton et al. 1995) described in detail the direct threats to colony sites in Orange County. All other counties in southern California have undergone explosive development in recent decades. Urbanization and agriculture have increased in the San Jacinto Valley as well, leading to the loss of essential grassland foraging habitat.

Increased predation, ultimately due also to habitat loss, may have played an important role in recent years. Approximately 70% of Riverside County colonies have utilized emergent freshwater plants (mostly cattails and bulrush) as nesting substrate, mainly at two sites, the Hemet water treatment plant and the Davis Unit of the San Jacinto Wildlife Area. Although this kind of habitat offers protection from mammals such as coyotes and raccoons when water is present, it provides no refuge from birds that prey on tricolor nestlings, one of the most significant of which is the Black-crowned night heron (*Nycticorax nycticorax*). Wetland habitats that also contain nest and roost sites for avian predators have become population sinks for tricolors where complete nest failure is typical (Cook and Toft 2005).

The unfortunate history of the tricolor colony at the Hemet water treatment plant underscores the problem. This 60-acre wetland had originally been planted in 1994 with bulrush (*Scirpus* spp.) for a target marsh-to-open water ratio of 80%. Tricolors colonized the site that year and by 1997 the colony had grown to 35,000 birds, one of the largest in the state (Hamilton 2000). Reproductive success was not determined that year although the site was described as "high quality tricolor habitat" by Hamilton and Meese (2006). However, changes in management to increase species diversity shortly afterward resulted not only in large reductions of bulrush habitat, but occupation by several species of heron, including Black-crowned night herons. In 2000, 10,000 tricolors nested at the wetland but reproductive success was only 4% due to predation (Hamilton 2000). T. Paulek reported no birds nesting at this site in 2005 (Hamilton and Meese 2006). Small flocks of about 100 – 200 birds have been observed at the site during the winter and early spring in the last few years, though it is unclear if they attempt to nest there. The wetlands are closed to visitors after April 1.

The drought of 2007 appears to have had a significant negative impact on the southern California tricolor population. Paulek (2007) reported finding no tricolors in Riverside County that year. No colonies have been found in the San Jacinto Valley area in succeeding years, despite above-average rainfall in 2010 and extensive searches. There is no evidence to suggest that these birds have moved to other parts of the county or elsewhere in southern California.

SUGGESTED MANAGEMENT ACTIONS

In southern California, the Tricolored blackbird is currently largely dependent upon managed habitats and will require active management to survive. The Western Riverside County MSHCP describes five Core Areas for this species:

San Jacinto Wildlife Area and Mystic Lake
San Jacinto River floodplain
Alberhill
Lake Elsinore and Collier Marsh
Vail Lake/ Wilson Valley/ Eastern Temecula

Two of these (Lake Elsinore/Collier Marsh and Alberhill) are probably no longer suitable for nesting tricolors due to one or more factors (small size, lack of nesting substrates, abundance of predators including Night and Great blue herons, and loss of foraging habitat to urbanization). A small colony has been discovered in the Wilson Valley area in recent years and others might occur there, although there are no records prior to 2005.

The San Jacinto Wildlife Area/Mystic Lake complex is the 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 forging habitat on the Davis and Potrero Units of the Wildlife Area. Additional foraging habitat in the vicinity of the Wildlife Area should be considered high priority for acquisition and incorporation into the MSHCP Reserve system or other protection.

In addition to restoration, it is critically important to protect all colonies no matter how small, including both their nesting and surrounding foraging habitats. The value of small colonies should not be overlooked. Colonies at sites large enough to support only one or a few thousand birds may be at lower risk from predators like herons if they lack sufficient roost or nest sites for these species. Further, multiple small colonies can be more widely distributed throughout the landscape, helping to buffer the population as a whole from localized stochastic events such as variation in rainfall and insect production.

Most currently active tricolor colony sites are on private land, and their protection will require the cooperation of land owners. The San Timoteo Canyon site is on private land but the birds forage extensively in the surrounding grasslands which are under conservation and part of the MSHCP. These lands should be targeted for continued management as tricolor foraging habitat. Additional opportunities might exist in the Wilson Valley area to protect existing known colonies and their foraging habitats and possibly to purchase land with additional potential habitat. Any action must be taken soon lest we lose such an important component of southern California's avian diversity.

ACKNOWLEDGEMENTS

We thank Robert Meese and Tom Paulek for comments on an earlier version of this report.

REFERENCES

Baird, S.F, T.M. Brewer, and R. Ridgeway. 1874. A History of North American Birds. Landbirds, volume II. Boston, Massachussetts. Little, Brown.

Beedy, E.C. and W.J. Hamilton. 1997. Tricolored Blackbird Status Update and Management Guidelines. Jones and Stokes Associates, Inc. 97-099, Sacramento, California. Prepared for the U.S. Fish and Wildlife Service, Portland, Oregon and the California Department of Fish and Game, Sacramento, California.

Cook, L.F. and C.A. Toft. 2005. Dynamics of extinction: Population decline in the colonially nesting Tricolored Blackbird *Agelaius tricolor*. Bird Conservation International 15:73-88.

DeHaven, R.W., F.T. Crase, and P.P. Woronecki. 1975. Breeding status of the Tricolored blackbird, 1969-1972. California Department of Fish and Game 61:161-180.

Dudek & Associates. 2003. Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). Final MSHCP, Volumes I and II. Prepared for County of Riverside Transportation and Lands Management Agency. Prepared by Dudek & Associates, Inc. Approved June 17, 2003.

Hamilton W.J. III, L. Cook, and R. Grey. 1995. Tricolored blackbird project 1994. Prepared for the U.S. Fish and Wildlife Service, Portland, Oregon.

Hamilton, W.J. III, L. Cook, and K. Hunting. 1999. Tricolored blackbirds 1999 status report. Report prepared for Calif. Dept. of Fish and Game, Sacramento, California, and U.S. Fish and Wildlife Service, Portland, Oregon.

Hamilton, W.J. III. 2000. Tricolored blackbird breeding season census and survey observations and recommendations. Report prepared for the U.S. Fish and Wildlife Service, Portland, Oregon. 61 pages.

Hamilton, W.J. III and R.J. Meese. 2006. Habitat and Population Characteristics of Tricolored Blackbird Colonies in California. Prepared for the California Department of Fish and Game, Habitat Conservation Planning Branch. Sacramento, California.

IUCN 2010. IUCN Red List of Threatened Species. Version 2010.2.

Kelsey, R. 2008. Results of the Tricolored Blackbird 2008 Census. Landowner Stewardship Program, Audubon Society. Winters, California. 43 pages.

Meese, R.J. 2006. Settlement and Breeding Colony Characteristics of Tricolored Blackbirds in 2006 in the Central Valley of California. Prepared for the U.S. Fish & Wildlife Service, Sacramento, California and Audubon California, Emeryville, California.

Mittermeier, R.A.P. G. Robles, C.G. Mettermeier, T. Brooks, M. Hoffman, W.R. Konstant, G.A.B. Fonseca, and R.B. Mast. 2003. Wildlife Spectacles. CEMEX-Agrupación Sierra Madre-Conservation International, Mexico, 324 pp.

Neff, J.A. 1937. Nesting distribution of the Tri-colored Red-wing. Condor 39(2): 61-81.

Owens, I.P.F. and P.M. Bennett. 2000. Quantifying biodiversity: a phenotypic perspective. Conservation Biology 14:1014-1022.

Paulek, T. and S. Nash. 2007. 2007 Nest Colony Monitoring of Tricolored Blackbirds in Southern California. Unpublished Report.

Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, and T.C. Will. 2004. Partner's in Flight North America Landbird Conservation Plan. Cornell Laboratory of Ornithology, Ithaca, New York.

Shuford W.D. and T Gardali, eds. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarilla, California, and California Department of Fish and Game, Sacramento.

Tricolored Blackbird Working Group. 2007. Conservation Plan for the Tricolored Blackbird (*Agelaius tricolor*). Susan Kester (ed.). Sustainable Conservation. San Francisco, California. 54 pages.

Unitt, P. 2004. San Diego County Bird Atlas. San Diego Natural History Museum. San Diego, California.

U. S. Fish and Wildlife Service 2002. Birds of Conservation Concern: Prepared by the Division of Migratory Bird Management. U.S. Fish and Wildlife Service, Arlington, Virginia.

Table 1. Areas of Riverside County searched for Tricolored blackbirds by R. Cook between 2003 and 2010 and colonies located (solid background). 1: Present. 0: Absent. Search Areas in bold are MSHCP Core Areas. Historic: Breeding colony sites known prior to 1994 surveys. Recent: Breeding colony sites reported for the first time in 1994 or later years.

Search Area	2003	2004	2009	2010	Recent	Historic
Alberhill			0	0	No	Yes
Diamond Valley	0	0				
Garner Valley/Lake Hemet				1	Yes	No
Lake Elsinore and Collier Marsh	0	0	0	0	No	No
Lake Mathews/Cajalco Canyon	0	0		0		
Lake Norconian			0		No	Yes
Lake Perris	0	0	0	0		
Lake Skinner			0	0	Yes	No
Perris Valley			0	0	Yes	No
Prado Flood Control Basin	0	0		0		
San Jacinto River Floodplain	0	0	0	0	Yes	Yes
San Jacinto Wildlife Area, Davis Unit/Mystic Lake	1	1	0	0	Yes	Yes
San Jacinto Wildlife Area, Potrero Unit			1	1	Yes	Yes
San Timoteo Canyon			0	1	Yes	Yes
Santa Ana River Parkway				0		
Sycamore Canyon	0	0	0	0	No	Yes
Temescal Canyon	0	0		0		
Vail lake/ Wilson Valley/ Eastern Temecula				1	Yes	No
Winchester / Warm Springs			0	0	Yes	No
Number of Areas Searched	9	9	12	17		

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).

	Total	Emergent marsh			Himalayan blackberry			Silage			Other protective vegetation		
County	No. of colonies	No. of colonies	% of colonies	% of birds	No. of colonies	% of colonies	% of birds	No. of colonies	% of colonies	% of birds	No. of colonies	% of colonies	% of birds
San Diego	29	22	76%	99%	6	21%	<1%				1	3%	<1%
Los Angeles	20	17	85%	99%							3	15%	<1%
Orange	7	7	100%	100%									
San Bernardino	3	3	100%	100%									
Riverside	27	19	70%	81%				1	4%	<1%	7	26%	19%

Figure 1. Total combined counts of Tricolored blackbirds in five southern California counties from 1994 to 2009.

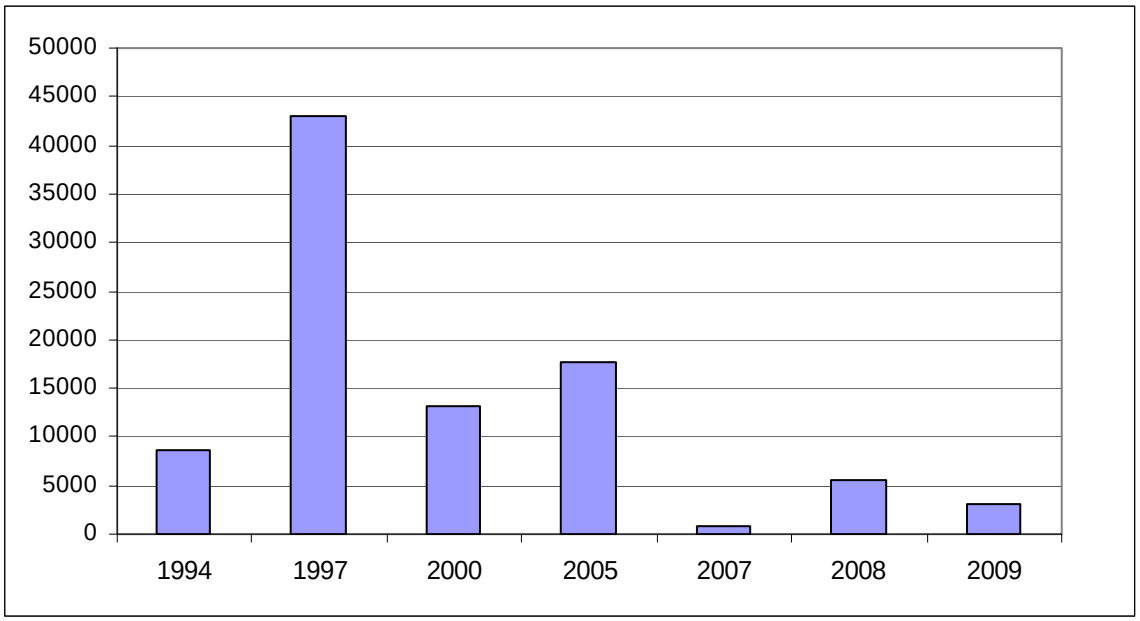

Figure 2. Counts of Tricolored blackbirds by county for five southern California counties between 1994 and 2010.

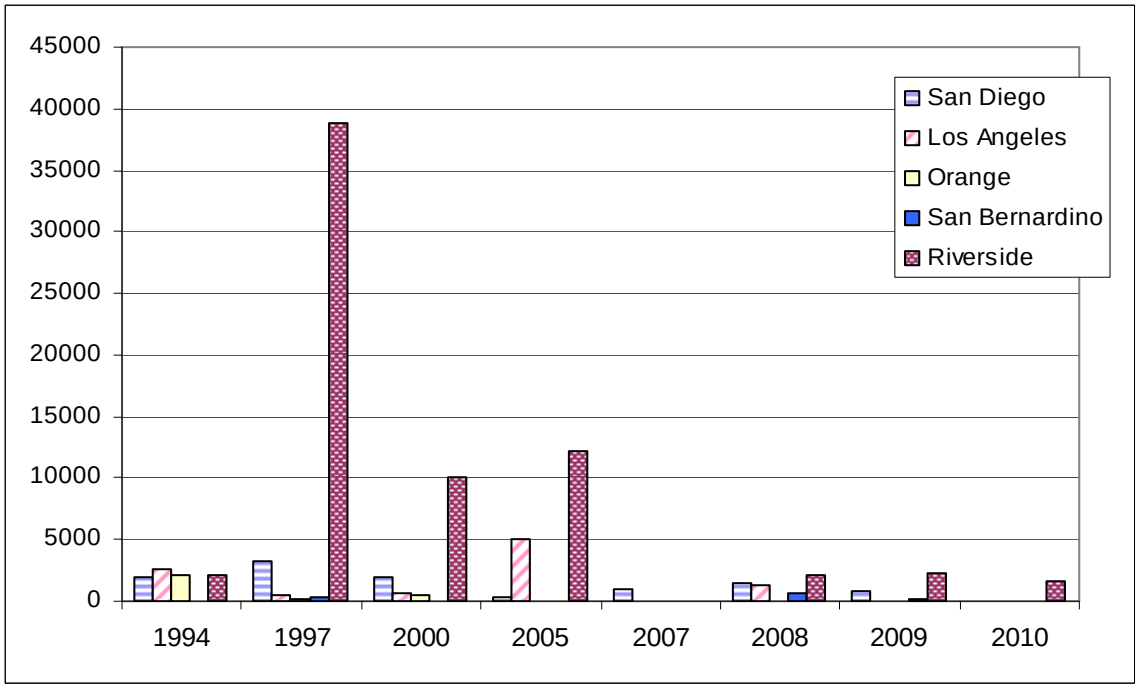

Figure 3. Total combined counts of Tricolored blackbirds in four southern California counties from 1994 to 2009; Riverside County omitted.

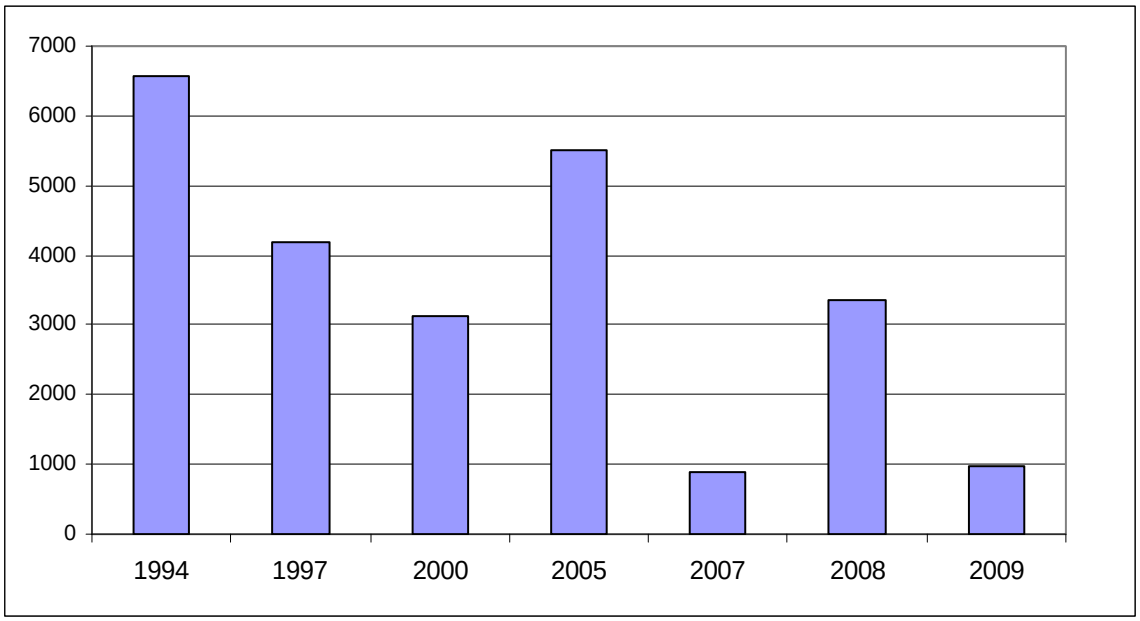

Figure 4. Counts of Tricolored blackbirds by county for four southern California counties between 1994 and 2009. Riverside County omitted.

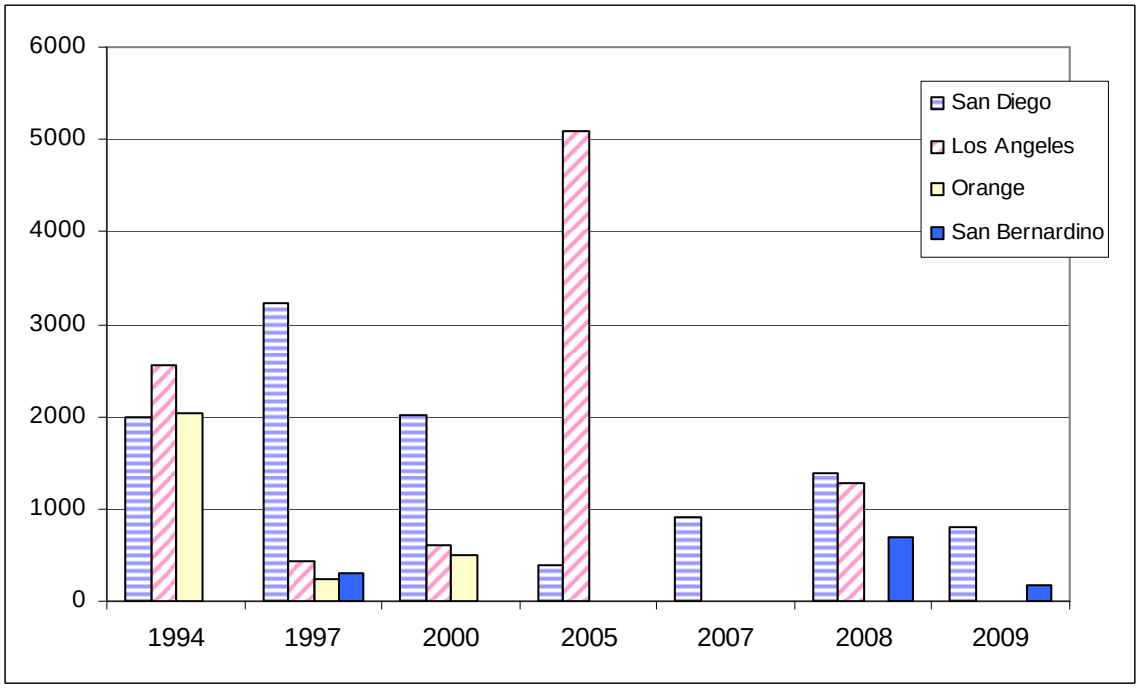

Figure 5. Total counts and largest colony size of Tricolored blackbirds in Riverside County between 1994 and 2010.

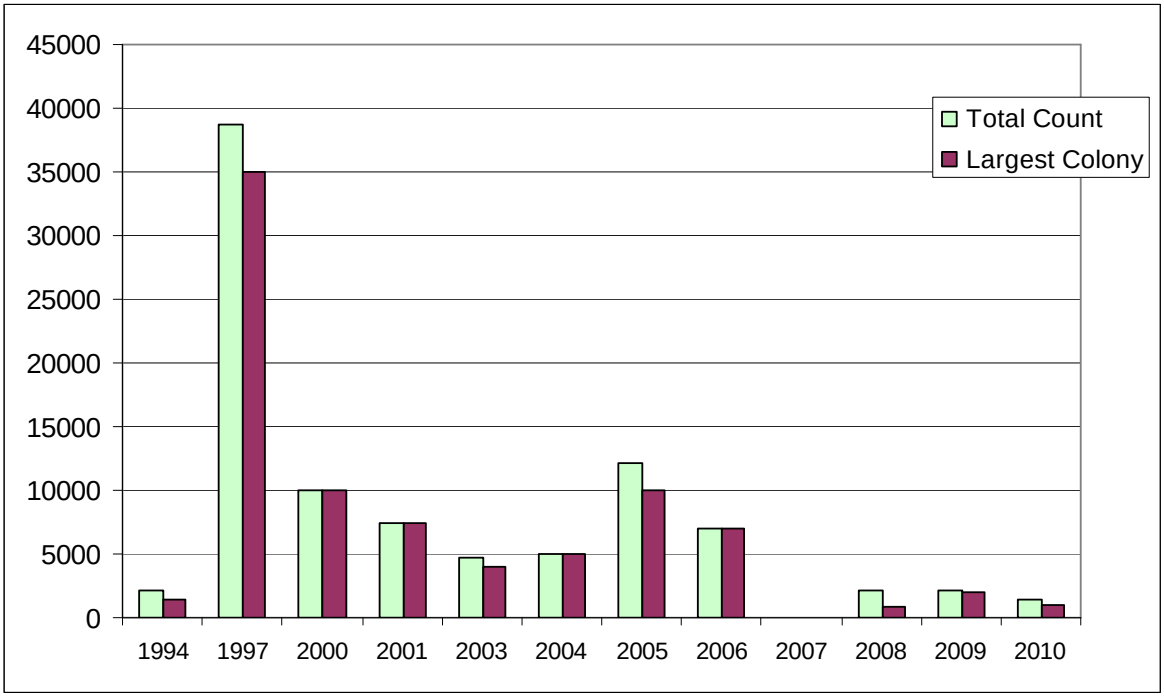

Figure 6. Counts of Tricolored blackbirds inside and outside reserve lands in Riverside County from 1994 to 2010. Reserve lands currently include approximately 350,000 acres within the MSHCP Plan Area.