

State of California  
Department of Fish and Wildlife

## Memorandum

Date: March <sup>13</sup> 9, 2015

To: Sonke Mastrup  
Executive Director  
Fish and Game Commission

From: Charlton H. Bonham  
Director



Subject: **Petition from the Center for Biological Diversity to list the Tricolored Blackbird as Endangered under the California Endangered Species Act**

The Department of Fish and Wildlife (Department) prepared the attached petition evaluation report in response to a petition, dated October 8, 2014, received by the Fish and Game Commission (Commission) on October 8, 2014 (Petition) from the Center for Biological Diversity to list the Tricolored blackbird (*Agelaius tricolor*) as an endangered species under the California Endangered Species Act (CESA). (See generally Fish and Game code §2073.5, subd. (a); Cal Code Regs., title 14, §670.1, subd. (d)(1).)

In accordance with CESA, the attached petition evaluation report delineates the categories of information required in a petition, evaluates the sufficiency of the information in the Petition, and incorporates additional relevant information that the Department possessed or received during the review period. Based upon the information contained in the Petition, the Department has determined that there is sufficient information to indicate that the petitioned action may be warranted. The Department recommends that the Petition be accepted.

If you have any questions or need additional information, please contact Dan Yparraguirre, Deputy Director of Wildlife and Fisheries Division at (916) 653-4673 or Eric Loft, Chief of Wildlife Branch at (916) 445-3555.

Attachment

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**State of California  
Natural Resources Agency  
Department of Fish and Wildlife**

**REPORT TO THE FISH AND GAME COMMISSION**

**EVALUATION OF THE PETITION  
FROM THE CENTER FOR BIOLOGICAL DIVERSITY  
TO LIST TRICOLORED BLACKBIRD (*Agelaius tricolor*)  
AS ENDANGERED  
UNDER THE CALIFORNIA ENDANGERED SPECIES ACT**

**Prepared by  
California Department of Fish and Wildlife**

**March 2015**



**Table of Contents**

EXECUTIVE SUMMARY ..... 1

INTRODUCTION ..... 3

    Candidacy Evaluation ..... 3

    Petition History ..... 4

INFORMATION PROVIDED IN THE PETITION AND ADDITIONAL INFORMATION GATHERED BY THE  
DEPARTMENT OF FISH AND WILDLIFE ..... 5

    Population Trend ..... 5

    Range and Distribution ..... 9

    Abundance ..... 10

    Life History ..... 11

        Taxonomy and Genetics..... 11

        Habitat Requirements..... 11

        Colonial Breeding ..... 12

        Breeding and Post-Breeding Behavior ..... 12

Factors Affecting Ability of Population to Survive and Reproduce..... 13

    Habitat Loss..... 13

    Agricultural Activities ..... 13

    Low Reproductive Success ..... 14

    Predation..... 14

    Agricultural Contaminants ..... 14

    Weather Events..... 16

    Disease ..... 16

    Competition from Other Species ..... 17

    Brood Parasitism ..... 17

    Killing of Blackbirds to Protect Crops..... 17

Degree and Immediacy of Threat ..... 18

Impact of Existing Management Efforts ..... 20

Suggestions for Future Management ..... 22

Habitat Necessary for Survival ..... 23

Distribution Map ..... 24

CONCLUSIONS.....	24
LITERATURE CITED .....	27

**EVALUATION OF PETITION FROM CENTER FOR BIOLOGICAL DIVERSITY TO LIST THE  
TRICOLORED BLACKBIRD (*Agelaius tricolor*) AS ENDANGERED**

**CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE**

**EXECUTIVE SUMMARY**

On October 8, 2014, the Center for Biological Diversity (Petitioner) submitted a petition (Petition) seeking action by the California Fish and Game Commission (Commission) to list the tricolored blackbird (*Agelaius tricolor*) as endangered pursuant to the California Endangered Species Act (CESA) (Cal. Reg. Notice Register 2014, No. 44-Z, p. 1861; see also Cal. Code Regs., tit. 14, § 670.1, subd. (a); Fish & G. Code, § 2072.3). The Commission received the Petition on October 8, 2014 and referred it to the California Department of Fish and Wildlife (Department) for an initial evaluation on October 15, 2014. At its December 3, 2014 meeting in Van Nuys, California, the Commission voted to take emergency action to add tricolored blackbird to the list of endangered species pursuant to Fish and Game Code section 2076.5, with the related regulation as approved by the Office of Administrative Law taking effect for an initial term of six months beginning on December 29, 2014 (Cal. Reg. Notice Register 2015, No. 2-Z, p. 91).

This report presents the Department's initial scientific evaluation of the Petition as required by Fish and Game Code section 2073.5. (See also Cal. Code Regs., tit. 14, § 670.1, subd. (d).) Consistent with that authority, this report evaluates the scientific sufficiency of the Petition on its face and in relation to other relevant information the Department possesses or that it received during its review. To support the review, the Department gathered and reviewed the information referenced in the submitted Petition to the best of its ability. Not all references were available to the Department. In addition to the face value, and the material referenced in the Petition, the Department also considered other relevant information in its possession related to the tricolored blackbird populations. All sources of information considered by the Department in preparing this report, including those referenced in the Petition, are identified in the References Section. The Department's recommendation as to whether to make tricolored blackbird a candidate for listing under CESA is based on an assessment of whether the scientific information in the Petition is sufficient under the criteria prescribed by CESA to consider listing tricolored blackbird as endangered.

In completing its Petition Evaluation, the Department has determined there is sufficient scientific information to indicate that the petitioned action may be warranted. Therefore, the Department recommends that the Commission accept the Petition for further consideration under CESA.

**Summary of Department's Evaluation of the Petition**

A petition to list or delist a species under CESA must include information pursuant to Fish and Game Code section 2072.3 as follows:

- population trend;

- range;
- distribution;
- abundance;
- life history of a species;
- factors affecting the ability of the population to survive and reproduce;
- degree and immediacy of the threat;
- impact of existing management efforts, suggestions for future management;
- availability of and sources of information;
- habitat necessary for a species survival;
- detailed distribution map.

The Department finds that the Petition provides adequate information in the categories required by CESA and that the petitioned action may be warranted.

This report summarizes the Department's evaluation of the Petition and other available information. It follows the outline and summarizes relevant portions of the Department's 2004 evaluation of the petition to list the tricolored blackbird, which is incorporated by reference (Gustafson and Steele 2004).

The Department believes that the petitioned action may be warranted based on the degree and immediacy of the threats faced by the species which are addressed by the Petition, as follows:

- 1) Historical and continuing loss of nesting substrate, including wetlands, Himalayan blackberry (*Rubus discolor*) patches, upland weedy vegetation, and marsh vegetation in reservoirs and ponds.
- 2) Historical and continuing loss of uplands used for foraging.
- 3) Declines in tricolored blackbird populations in the past 80 years, including ongoing declines documented since 2008.
- 4) Significant, large-scale reproductive failures in tricolored blackbird colonies nesting in agricultural areas of the San Joaquin and Sacramento valleys.
- 5) Limited, inconsistent, and sometimes ineffective protection of colonies nesting in agricultural settings.
- 6) Ineffectiveness of existing regulatory mechanisms to protect tricolored blackbird breeding habitat and nesting colonies on privately-owned land.
- 7) Predation by the black-crowned night heron (*Nycticorax nycticorax*), cattle egret (*Bubulcus ibis*), common raven (*Corvus corax*), coyote (*Canis latrans*), and other predators, especially in areas in which predator populations may be artificially high due to concentrated food sources.

## INTRODUCTION

### Candidacy Evaluation

CESA sets forth a two-step process for listing a species as endangered. First, the Commission determines whether a species is a candidate for listing by determining whether “the petition provides sufficient information to indicate that the petitioned action may be warranted.” (Fish & Game Code, § 2074.2, subd. (a)(2).) Within 10 days of receipt of a petition, the Commission must refer the petition to the Department for evaluation (Fish & Game Code, § 2073.) The Commission must also publish notice of receipt of the petition in the California Regulatory Notice Register. (Fish & Game Code, § 2073.3.) Within 90 days of receipt of the petition, the Department must evaluate the petition on its face and in relation to other relevant scientific information and submit to the Commission a written evaluation report with one of the following recommendations:

- Based upon the information contained in the petition, there is not sufficient information to indicate that the petitioned action may be warranted, and the petition should be rejected; or
- Based upon the information contained in the petition, there is sufficient information to indicate that the petitioned action may be warranted, and the petition should be accepted and considered.

(Fish & Game Code, § 2073.5, subd. (a)(1).)

If the petition is accepted for consideration, the second step requires the Commission to determine, after a year-long “scientific-based review of the subject species,” whether listing as endangered is or is not actually warranted. (Fish & Game Code, § 2075.5.)

In *Center for Biological Diversity v. California Fish and Game Commission* (2008) 166 Cal.App.4th 597, the California Court of Appeals addressed the parameters of the Commission’s discretion in its application of the threshold candidacy test. The court began its discussion by describing the candidacy test previously set forth in *Natural Resources Defense Council v. California Fish and Game Commission* (1994) 28 Cal.App.4th 1104, 1114:

As we explained in *Natural Resources Defense Council* [citation], “the term ‘sufficient information’ in section 2074.2 means that amount of information, when considered with the Department’s written report and the comments received, that would lead a reasonable person to conclude the petitioned action may be warranted.” The phrase “may be warranted” “is appropriately characterized as a ‘substantial possibility that listing could occur.’” [citation] “Substantial possibility,” in turn, means something more than the one-sided “reasonable possibility” test for an environmental impact report but does not require that listing be more likely than not.

(*Center for Biological Diversity*, at pp. 609-10.) The court acknowledged that “the Commission is the finder of fact in the first instance in evaluating the information in the record.” (*Id.* at p. 611.) However, the court clarified:

[T]he standard, at this threshold in the listing process, requires only that a substantial possibility of listing could be found by an objective, reasonable person. The Commission is not free to choose between conflicting inferences on subordinate issues and thereafter rely upon those choices in assessing how a reasonable person would view the listing decision. Its decision turns not on rationally based doubt about listing, but on the absence of any substantial possibility that the species could be listed after the requisite review of the status of the species by the Department[.]

*(Ibid.)*

## **Petition History**

### **Previous State Petitions**

In 1991, based on information indicating that the tricolored blackbird's breeding population had fallen to about 35,000 adults in the late 1980s, the Yolo chapter of the National Audubon Society submitted a petition to the Commission, to list the species as Endangered. After reviewing the document and other available information, the Department determined that the petitioned action might be warranted and recommended to the Commission that it accept and consider the petition. In March 1992, the Commission voted to accept the petition and designated the tricolored blackbird as a candidate for State listing. Researchers working during the 1992 breeding season discovered that the population might exceed 300,000 adults. The Yolo Audubon Society withdrew the petition based on the new population data. The Commission allowed the petition to be withdrawn, but urged the Department to work with interested persons and groups to develop conservation measures for the tricolored blackbird. The species was again petitioned to be listed under CESA in 2004. The petition evaluation report by the Department (Gustafson and Steele 2004) stated there was sufficient information to indicate the petitioned action may be warranted; the Commission voted to reject the petition (Fish and Game Commission meeting, Feb. 3, 2005).

### **Federal Petitions**

In the late 1970s, the USFWS identified the tricolored blackbird as a candidate for federal listing. However, in the early 1990s, the USFWS eliminated its list of candidate species. In 1988, the USFWS contracted for a compilation of all historical information on distribution and abundance of the tricolored blackbird, resulting in the work of Beedy *et al.* (1991). In 1989, the USFWS modified two long-standing depredation orders, to prohibit killing the tricolored blackbird without a federal permit. The USFWS has also provided funds for tricolored blackbird survey efforts in several years beginning in 1993. In 2006, the USFWS in response to a listing petition issued a 90-day finding that listing the tricolored blackbird was not warranted. In 2008, the USFWS updated its Birds of Conservation Concern 2008 report, identifying "species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973" (USFWS 2008). The tricolored blackbird was included on two Bird Conservation Region lists (9, 32), the USFWS Region 8 list (California and Nevada) and the National list. On February 3, 2015, the Center for Biological Diversity submitted a petition to the USFWS to list the tricolored blackbird as an

endangered species under the federal endangered species act and to designate critical habitat concurrent with listing.

## **INFORMATION PROVIDED IN THE PETITION AND ADDITIONAL INFORMATION GATHERED BY THE DEPARTMENT OF FISH AND WILDLIFE**

### **Population Trend** (termed “Population Status and Trend” in the Petition, beginning on page 6)

The Petition states that based on extensive historical and recent statewide surveys, the tricolored blackbird “has experienced and is continuing to experience a precipitous population decline.” The Petition includes data from the various statewide surveys through the 2014 survey. Several major studies as well as smaller studies and summaries, beginning in the 1930s, have documented numbers and breeding colonies of the tricolored blackbird (Neff 1937, DeHaven *et al.* 1975a, Hosea 1986, Beedy *et al.* 1991, Hamilton *et al.* 1992, Hamilton 1993, Hamilton *et al.* 1995, Beedy and Hamilton 1997, Hamilton *et al.* 1999, Hamilton 2000, DeHaven 2000a, Humple and Churchwell 2002, Hamilton 2004, Green and Edson 2004, Cook and Toft 2005, Kelsey 2008, Meese 2009a, Meese 2010, Kyle and Kelsey 2011, Meese 2011, and Meese 2014). As noted in the Petition, survey effort, methods, coverage, and participants have varied over the years. Thus, it is difficult to compare total number of birds observed or population estimates across many of the survey years.

The Petition describes a decline in numbers of the tricolored blackbird since the 1930s, particularly for the Central Valley of California. Early research on the tricolored blackbird was carried out by Neff and colleagues in the 1930s (Neff 1937). Over a period of six years (1931-1936), Neff surveyed tricolored blackbird colonies across California and suggested that the species numbered in the millions. Neff located several breeding colonies of more than 100,000 nests in the Sacramento Valley, with the largest composed of greater than 200,000 nests (corresponding to approximately 300,000 adult tricolored blackbirds). Breeding colonies were located throughout the Central Valley and in a few additional locations in California and southern Oregon; however, Neff’s surveys focused on the Sacramento Valley in most years. An effort to cover the entire known range of the species was attempted by Neff in only one year (1932), with most areas outside the Sacramento Valley covered incidentally as “cooperators drove up or down the State in the performance of routine duties”. The highest concentration of colonies and breeding birds were located in the Sacramento Valley; the degree to which this was the result of increased effort there is not known. Based on his somewhat geographically limited efforts, Neff (1937) reported nesting birds in 26 California counties in the period of 1931-36. Working alone in 1934, Neff (1937) observed an estimated 491,250 nests, almost all of which were in the Sacramento Valley. As reported in the Petition, Beedy and Hamilton (1997) interpreted this to represent about 736,500 breeding adults. The presence of birds in the San Joaquin Valley and southern California was noted in the same year, but no effort was made to estimate numbers. Neff’s work in the 1930s, as interpreted by Hamilton *et al.* (1995), yielded an estimated maximum annual abundance of over 1,100,000 adult tricolored blackbirds in the Central Valley.

The Petition states that a history of market hunting and massive loss of native marshland habitat had drastically reduced the population of tricolored blackbirds by the mid-twentieth century. However, Neff (1937) concluded: "Destruction of the birds by man, of nesting sites through drainage or reclamation, of nests by predators or by the elements, and other factors, have played their part. All combined, however, they have made only fractional inroads on this species during the period covered by this report [1931-1936]". Neff (1937) was not convinced that the population size in the 1930s was less than that during "pioneer times". Being that the next comprehensive effort to survey tricolored blackbirds did not occur until the 1970s (DeHaven *et al.* 1975a), it is not known to what degree the population had been reduced by the mid-twentieth century. However, the estimate by Hamilton *et al.* (1995) of 1,100,000 tricolored blackbirds in the 1930s is subject to high uncertainty and the Department acknowledges that because of the relatively limited effort during the surveys of the 1930s, the number of birds present at that time could have been much higher. Also, there is evidence that the species had experienced declines in a large portion of its range in southern California, even by the 1930s (see discussion of distribution and abundance below).

From 1969-1972, DeHaven *et al.* (1975a) attempted to survey the entire range of the tricolored blackbird to document the distribution of the species and to compare estimates of abundance to those provided by Neff (1937). The surveys were carried out by a few individuals surveying vast areas by road, and were limited to one or two drives through each county where tricolored blackbirds were known to occur in California and southern Oregon. Still, the search effort was at least as extensive as that carried out by Neff in the 1930s, and included the benefit of improved transportation and an increased number of roads. In many counties the survey consisted of driving county roads with little knowledge of historical colony sites, but this was an improvement over much of the effort of the 1930s, when counties were considered covered if visited incidentally to other activities. Despite a greater search effort, all measures of abundance indicated a decline: number of colonies detected declined from 256 to 164; non-breeding birds encountered declined from >50,000 in a single year to <15,000 over four years; maximum colony size declined from hundreds of thousands to tens of thousands; number of birds observed per year within the study period declined from about 375,000 per year to about 133,000 per year (DeHaven *et al.* 1975a). Although no population estimate could be obtained from these surveys, the authors suggested that the population may have declined by more than 50% in 35 years. The distribution of colonies was similar to that in Neff (1937). The Petition states that DeHaven *et al.* (1975a) concluded that the downward trajectory of the population was continuing in the 1970s, however DeHaven *et al.* (1975a) expressed uncertainty about this, and recommended further research to determine whether the decline they observed was ongoing.

Since 1994, ten tricolored blackbird surveys have been conducted. However, as mentioned above, the survey effort, methods, coverage, and participants have varied (Kelsey 2008, Meese 2014) making it difficult to compare total population estimates across many of the survey years. Because of this, in evaluating the 2004 petition the Department used the largest detected colony size in any given year as an indicator of population status. This was based on the assumption that the largest colonies are most likely to be detected and largest colony size is correlated with total population size (Gustafson and Steele 2004). The Department also evaluated Christmas Bird Count data to evaluate trends in the non-

breeding season. Based on these sources of data, the Department found an apparent downward trend in the tricolored blackbird's breeding population from the 1930s to the 1970s, and again from the 1970s until 2004. At that time, the Department concluded that the extent of the decline between 1994 and 2004 was not clear.

Of the ten annual surveys conducted since 1994, two groups of survey years have been reported to be most comparable across years (years 1994, 1997, 2000; and years 2008, 2011, 2014) (Beedy and Hamilton 1997, Hamilton et al. 2000, Kyle and Kelsey 2011, Meese 2014). The degree to which these two groups of survey years are comparable to each other is not clear, although differences in methodology and effort between the groups suggest caution is warranted in making comparisons. Hamilton (2000) reported that statewide survey efforts in 1994, 1997, and 2000 followed similar methods in order to locate and survey as many colonies as possible. At the time, these three surveys had used the most consistent methods to date and focused the survey on a short time period in order to avoid double counting of birds. Compared to the surveys of the 1930s and 1970s, these surveys employed many more volunteer surveyors in order to cover as much of the state and known colonies as possible. Hamilton (2000) reported that "Serious amateur and professional birders located most of all birds recorded". Most large (>10,000 birds) and many smaller colonies reported during these survey years were revisited by tricolored blackbird experts. That said, inconsistencies in effort still occurred with the 1997 survey using fewer observers to visit fewer sites in fewer counties than the 1994 survey, and the 2000 survey using more observers to visit more sites than the other two survey years, but searching in fewer counties. These inconsistencies led the Department to conclude that the extent of decline during the period was unclear. Hamilton (2000) however, concluded:

"The central conclusion of the Census and survey is that tricolors [tricolored blackbirds] are continuing to decline precipitously in numbers, from millions in the 1930s (Neff 1937) to an estimated...162,000 in this account for 2000. The conclusion that tricolor numbers are plummeting is based not only upon these data, but also on the collective experience of local experts throughout California who have observed tricolors over long intervals."

"...the method of the Census and the survey, to reinvestigate all known breeding places and to search for new ones, has become an increasingly complete assessment of Tricolored Blackbird distribution and abundance. The 2000 Census probably located a greater proportion of the entire population than did censuses in previous years."

Based on their analysis of annual results from statewide surveys, Cook and Toft (2005) reported that the tricolored blackbird population had declined by approximately 56% between 1994 and 2000. They also determined that colony sizes were smaller on average in 2000 than in 1994, which they attributed to a declining overall population for the species.

It is possible that the size of the largest colony does not have a strong correlation with population size, especially over long periods of time when the population has shifted breeding distribution and choice of primary nesting substrate for large colonies (e.g. use of agricultural crops, particularly triticale (*Triticale hexaploide*) fields beginning sometime after the 1970s). The average of the largest several colonies

(three, five, and ten have been reported in the literature) might be a better correlate to population size, but it is important to compare colony size only for sites that are estimated during the same time period each year. Colony size can vary across the breeding season and therefore using different dates would likely obscure the relationship. In reports available to the Department, it is often unclear which data have been used to develop estimates of average colony sizes; this warrants additional work to evaluate trends presented by Hamilton (2000), Cook and Toft (2005), and those included in the Petition for the period of 1994-2000.

Following the 2000 survey, triennial statewide surveys were reestablished in 2005. However, a rigorous and consistent methodology has been used only since 2008 (see Kelsey 2008, Kyle and Kelsey 2011, Meese 2014). These recent surveys employ hundreds of volunteers over a three day period in an attempt to visit and estimate numbers of tricolored blackbirds at all known historical and current colony sites. The effort in each county was coordinated by a county coordinator in 2008 and 2014, with a statewide coordinator overseeing the entire effort in all years. In each of the three most recent survey years (2008, 2011, and 2014), volunteers have been provided with training in tricolored blackbird identification, estimation of colony size, use of maps on online tools, and a standard survey protocol. Many of the participants, especially those coordinating county efforts, have been knowledgeable observers with experience participating in multiple survey years. The Department acknowledges that the lack of error estimation in the census method makes it difficult to assess the accuracy of results for any given year, however the increase in knowledge in recent years on historical and current colony sites, along with consistent methodology and increased participation and effort has likely resulted in an increased ability to detect a downward trend over the past six year period. The statewide survey protocol is available at <http://tricolor.ice.ucdavis.edu/content/2014-statewide-survey>.

In the most recent years, the number of birds observed on statewide surveys declined 63% from 395,000 birds in 2008 to about 145,000 birds in 2014. In this same time period, maximum colony size has declined from 80,000 to less than 30,000 birds (Kelsey 2008, Kyle and Kelsey 2011, Meese 2014). Although not a statistical estimate of population size, the census provides an index of population size by attempting to visit all known sites, including new sites that are established by colony movement. This effort to visit all known sites, along with a continual increase in knowledge about historical and current colony sites has resulted in an increase in survey effort with each statewide survey. For example, more counties were surveyed in 2014 than on any previous survey and the number of observers participating on the 2014 survey (143) was exceeded on only one previous survey (155 observers in 2008). Perhaps most importantly, the number of colony sites visited in 2014 far exceeded any other survey, with a large increase in sites visited each survey year since 2008 (Figure 1); this reflects not only a sharp increase in knowledge of colony sites, but also an enormous effort to visit as many as possible during the count period. The number of birds observed has declined despite the increase in effort.

Small breeding colonies are likely missed during each survey, especially in areas where small colonies might occur distant from any known colony site, and therefore are not located within the focused search area. Because tricolored blackbird colonies are extremely conspicuous leading up to and throughout most of the nesting cycle, most large colonies that would contribute substantially to the overall statewide estimate are likely to be observed during the three day search window. 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), Kelsey (2008) concluded that “it is unlikely that large numbers of Tricolored Blackbirds go undetected during the statewide surveys”. Additionally, in areas of the state where most of the population breeds early in the nesting season (San Joaquin Valley), extensive pre-survey scouting occurs in an attempt to locate colonies, both for survey purposes and to initiate colony protection efforts where colonies occur on agricultural fields. Even if a colony site is not visible from a road, large colonies can be detected and identified by the species’ diagnostic feeding flights as they move between the colony location and foraging habitat. The density of roads may limit observation of some portion of the landscape; this is a limitation common to all survey years.

The Department finds the Petitioner submitted sufficient information to demonstrate or create a reasonable inference that tricolored blackbirds have experienced historic declines and may continue to do so.

### **Range and Distribution** (beginning on page 17)

The Petition provides a description of the tricolored blackbird’s range. The Petition also provides information on the species’ distribution throughout portions of its range and states that historical distribution and population abundance of tricolored blackbirds prior to widespread loss of their native wetland and grassland habitats are unknown..

The Petition provides the following information regarding the tricolored blackbird range. The Petition characterizes the geographic range of the tricolored blackbird as “largely restricted to southernmost Oregon and the Modoc Plateau of northeastern California south through the lowlands of California west of the Sierra Nevada to northwestern Baja California” with rare reports of tricolored blackbird from Nevada and Washington. Overall, the range of the tricolored blackbird has not appreciably changed since the mid-1930s (Meese *et al.* 2014). The Petition states that the tricolored blackbird has been found from sea level up to 4,200 feet (1280 meters) at Klamath Lake. Grinnell and Miller (1944) included a record of 4,400 feet on the “South Fork of the Pit River” in Modoc County.

Grinnell and Miller (1944) wrote that the tricolored blackbird is “resident within [California], but partly migratory within Sacramento-San Joaquin drainage system; all populations are in some degree nomadic and in fall and winter normally leave the immediate vicinity of the nesting colonies”. DeHaven *et al.* (1975a) reported that 78% of colonies located between 1968 and 1972 were in the Central Valley. Counties where most colonies were found in a single season during this time period were Sacramento, Merced, Stanislaus, Glenn, and Colusa. According to Beedy (2008), since 1980, active breeding colonies have been observed in 46 California counties. Colonies are typically largest in the Central Valley and are patchily distributed throughout but particularly in the Coast Ranges and on the coastal slope.

In all statewide surveys conducted since 1994, the majority ( $\geq 90\%$  in all years but 1997) of the population has occurred in the Central Valley counties during the April breeding season, with much of the population and the largest colonies in agricultural fields (see below).

During the winter, the tricolored blackbird withdraws from those portions of its summer range in California outside of the Central Valley, from Santa Barbara County, and from eastern San Diego County (Meese *et al.* 2014). Although the tricolored blackbird is a year-round resident of the remainder of its summer range in California, “it largely withdraws in winter from [the southern] San Joaquin Valley and [northern] Sacramento Valley ([becoming] rare in Sacramento Valley north of Sacramento Co.), concentrating in and around Sacramento-San Joaquin River Delta and coastal areas, including Monterey and Marin Cos. [*sic*]. Small flocks may appear at other coastal locations from Sonoma Co. south to San Diego County and sporadically north to Del Norte Co.” (Unitt 2004, Meese *et al.* 2014). This is consistent with the winter distribution reported by Grinnell and Miller (1944): “Many individuals move northwestward in San Joaquin Valley and south in Sacramento Valley to form concentrations in the delta [of the Sacramento and San Joaquin rivers] regions and in vicinities of Suisun, San Pablo, and San Francisco bays”. Wintering flocks numbering 12,000-14,000 assemble near dairies on Point Reyes Peninsula, Marin Co., by mid-October. Some individuals also winter in central and [southern] San Joaquin Valley (Meese *et al.* 2014).

The Petition presents evidence that tricolored blackbirds have declined or disappeared from portions of their range including portions of the Central Valley where the species was once abundant. The species no longer occurs at many historical sites in coastal southern California, including Los Angeles and San Diego where the tricolored blackbird was once described as the most abundant species. Additional assessment of distributional changes and shifts in centers of abundance is warranted.

While the Department finds minor inconsistencies in the Petition’s assessment of Range and Distribution, the Department nonetheless concludes that Petitioners have submitted sufficient information to demonstrate or create a reasonable inference that the tricolored blackbird has experienced a reduction in distribution in a portion of its range in California and may continue to do so.

**Abundance** (termed “Population Status and Trends” in the Petition, beginning on page 6 and “Abundance” in the Petition, beginning on page 23)

Grinnell and Miller (1944) described the status of the tricolored blackbird as “common to abundant locally” but noted a general decrease in southern California. Dawson (1923) reported the species as “locally abundant...in the San Diegan district...” The species was considered “not rare” in Santa Barbara County, abundant near Los Angeles, and the most abundant species near San Diego (Cooper 1870, Baird 1870 and Baird *et al.* 1874 in Beedy 2008). Neff (1937), in the first major work on the tricolored blackbird, did not estimate the overall breeding population in the Central Valley. However, in just eight counties in 1934, he estimated the abundance of tricolored blackbirds in California at 252 colonies, many of which were quite large, and that there were more than 700,000 adults per year. Orians (1961a) reported that, in 1959 and 1960, there were four tricolored blackbird colonies larger than 100,000 adults. All were in the rice-growing area in Colusa and Yolo counties. By the late 1970s, the tricolored blackbird was characterized as a local resident in the southern California coastal district and the Antelope Valley, generally common where they occurred (Garrett and Dunn 1981). Meese (2014) documented 12,386 birds for the southern California region as compared to fewer than 6,000 in 2011 as reported by Kyle and Kelsey (2011).

The largest reported colony in the 1970s was one in Colusa County comprising an estimated 30,000 adults (Beedy and Hayworth 1992). DeHaven *et al.* (1975a) located 168 breeding colonies, about 78% of which were in the Central Valley. In the 1980s, the largest reported colony was one at Kesterson Reservoir in 1986, with an estimated 47,000 adults (Beedy and Hayworth 1992). Beedy *et al.* (1991) stated that the “average [tricolored blackbird] colony size has declined dramatically since the 1930s”. In 1994, Hamilton *et al.* (1995) found that the largest colony, at San Luis National Wildlife Refuge (NWR), numbered about 105,000 adult tricolored blackbirds. In 1997, Beedy and Hamilton (1997) reported the largest colony to contain about 80,000 adults. By 2000, surveyors found that the largest colony comprised about 30,000 birds (Hamilton 2000). Since 2008, the population estimate declined 63% from 395,000 birds in 2008 to about 145,000 birds in 2014 (Kelsey 2008, Kyle and Kelsey 2011).

The Petitioner has described many relevant sources of information on historical and recent abundance to adequately describe much of the historical and recent work on population abundance. As discussed in the population trends section, issues of comparability across survey years and the degree to which surveys produce accurate rangewide population estimates warrant further evaluation.

### **Life History** (in the Petition, beginning on page 25)

The Department found the Petition provided sufficient information to demonstrate or create a reasonable inference that some tricolored blackbird life history traits render them particularly vulnerable to natural and anthropogenic threats. Additional information is provided by the Department under the select subheadings, as follows.

#### **Taxonomy and Genetics**

The tricolored blackbird is a species in the avian family Icteridae (blackbirds, cowbirds, grackles, meadowlarks, and orioles). No subspecies are recognized (AOU 1957).

Although Berg *et al.* (2010) found no significant population structuring between southern and northern California populations of tricolored blackbirds, they found higher allelic diversity in the southern population. This suggests the southern population is an important genetic reservoir for the species.

#### **Habitat Requirements**

According to Grinnell and Miller (1944), tricolored blackbird habitat in the nesting season was found in the “vicinity of fresh water, especially marshy areas. The most favored sites for colonies are heavy growths of cattails and tules, but even when these are available, other vegetation may be resorted to for nesting: sedges, nettles, willows, thistles, mustard, blackberry, wild rose, foxtail grass, barley, etc.” Meese *et al.* 2014 summarized tricolored blackbird breeding habitat requirements as a nesting substrate that is relatively impenetrable or is flooded, is adjacent to water, and is within a few kilometers of foraging areas such as rangeland, alfalfa or cut hay, or irrigated pasture, with adequate insect prey. Tricolored blackbird nesting in cereal crops and dairy silage was not known until after the 1970s.

In winter, tricolored blackbirds often congregate with other species of icterids and European starlings (*Sturnus vulgaris*) that forage in grasslands, agricultural fields with low-growing vegetation, and at dairies and feedlots (Beedy 2008, Meese *et al.* 2014). Meese *et al.* (2014) wrote that the tricolored blackbird's preferred winter roosting sites included "cattail and bulrush marshes near suitable foraging areas in pasturelands, recently cultivated croplands, and livestock feedstores".

### Colonial Breeding

The tricolored blackbird is the most highly colonial of North American passerine birds (Neff 1937, Lack and Emlen 1939, Meese *et al.* 2014). Bent (1958) found that the tricolored blackbird "nests in enormous, most densely populated colonies, the nests being placed more closely together than in any other colonies of marsh-nesting blackbirds". Grinnell and Miller (1944) stated that "one essential would seem to be provision at the site of the colony for a large number of individuals. Nests apparently must be close together and pairs usually [must be] in excess of 50 in order to meet the instinctive requirements of the species". Meese *et al.* (2014) wrote that the status of the tricolored blackbird is of concern, "because its population has declined and its colonial nesting behavior makes it vulnerable to nesting failures affecting thousands of nests at a single colony".

### Breeding and Post-Breeding Behavior

The tricolored blackbird is highly nomadic (Neff 1937, 1942; DeHaven and Neff 1973). A flock of tricolored blackbirds can appear in an area in which it has been absent for months and begin to form a nesting colony (Orians 1961b). Orians (1961a) interpreted fluctuations in numbers of tricolored blackbirds during the breeding season to be responses to local abundance of insects. Hamilton (1998) suggested that these fluctuations are due to "itinerant breeding", describing the possibility that "variable local abundance between years is the result of itinerant breeding movements during the breeding season after predators, agricultural operations, and adverse weather destroyed colonies". Itinerant breeding applies to those individuals "nesting at more than one geographic location in the same year" (Hamilton 1993). A noted pattern is for individuals to move northward after their first nesting efforts in the San Joaquin Valley and in Sacramento County into the Sacramento Valley, northeastern California, and southern Oregon (Beedy and Hamilton 1997). In the spring, the tricolored blackbird vacates its wintering areas and arrives at nesting locations in Sacramento County and the San Joaquin Valley in the period from early March to early April (DeHaven *et al.* 1975b). In the Sacramento Valley, the largest colonies are formed during May and early June (Meese *et al.* 2014). In southern California, the tricolored blackbird may nest anytime throughout April and June (Unitt 2004). Orians (1960) reported successful autumnal breeding in the tricolored blackbird in colonies in the Sacramento Valley. Payne (1969) believed that autumnal nesting was related to rainfall and abundance of insect food and/or abundance of rice. Hamilton *et al.* (1995) reported tricolored blackbirds breeding in August 1993 "along the Marin coast". DeHaven *et al.* (1975b) found that the tricolored blackbird exhibits a major postbreeding-season movement into the Sacramento Valley. In winter, tricolored blackbird numbers decline in the Sacramento Valley and increase in the delta of the Sacramento and San Joaquin rivers (Neff 1937, Orians 1961b, DeHaven *et al.* 1975b). Nonbreeding flocks can consist of only tricolored blackbirds in either mixed-sex or single-sex groups, or they can be tricolored blackbirds mixed with the

red-winged blackbird (*Agelaius phoeniceus*), Brewer's blackbird (*Euphagus cyanocephalus*), and European starling, and other species (Meese *et al.* 2014).

### **Factors Affecting Ability of Population to Survive and Reproduce** (in the Petition, beginning on page 36)

The Petition addresses the loss of nesting and foraging habitat throughout the breeding distribution of the species including the destruction of native wetland and suitable upland breeding habitats, and nesting colony destruction by agricultural activities during the breeding season that results in direct mortality of nestlings. The Petition also describes early market-hunting and poisoning of tricolored blackbirds and provides information on predation and on mortality due to contaminants. The Petition also lists causes of mortality such as exposure to inclement weather, predation (under Life History section in the Petition, page 30), starvation of young, and possible removal of live young from nests by female tricolored blackbirds. The Petition also asserts that “the Tricolored Blackbird is not protected by existing regulatory mechanisms”.

#### **Habitat Loss**

Neff (1937), observing that “the destruction of [tricolored blackbird] nesting habitats by man is of most importance”, cited “reclamation and drainage” as key factors in the loss of many favorable sites, along with “dredging or cleaning of reservoirs, marshes, and canals in order to destroy the growths of cattails and tules”. Subsequent workers have documented or commented upon habitat loss continuing through the present (Beedy *et al.* 1991, Hamilton 1993, Hamilton *et al.* 1999, Meese *et al.* 2014, DeHaven 2000a, Humple and Churchwell 2002, Beedy 2008). In the year 2000, DeHaven (2000a) observed widespread habitat loss due to urban expansion and agricultural conversions relative to the 1970s when he and others conducted tricolored blackbird research. Survey participants in recent years continue to document changes in the landscape at or around tricolored blackbird colony sites, with both nesting and foraging habitat being removed or converted to other uses. Meese *et al.* (2014) stated that the “greatest effects of human activity [affecting the tricolored blackbird] are related to habitat loss and alteration”. The Department believes breeding and foraging habitat loss represents a threat to tricolored blackbird populations.

#### **Agricultural Activities**

The Petition describes the use of grain silage fields for nesting by tricolored blackbirds and the fact that normal harvesting activities typically coincide with the breeding season. Harvesting of fields that contain nesting colonies results in nest destruction and direct tricolored blackbird mortality. Table 4 and Figure 4 in the Petition summarize at least some of the losses of colonies due to harvesting thought to have occurred between 1993 and 2013. Entire tricolored blackbird colonies (up to thousands of nests) in cereal crops and silage have been destroyed by harvesting and plowing of agricultural lands (Meese *et al.* 2014). The Department believes that harvesting of fields containing tricolored blackbird colonies continues to occur and is a threat to tricolored blackbird populations.

## Low Reproductive Success

Meese (2013) found widespread reproductive failures at tricolored blackbird colonies in the Central Valley from 2006 to 2011. Relatively high reproductive success was observed only when nearby foraging areas supported high insect abundance, suggesting that many tricolored blackbird colonies may be food limited. Cook and Toft (2005) noted that between 1992 and 2003, “Reproductive success was significantly higher in upland non-native vegetation (primarily Himalayan blackberry *Rubus discolor*) than in native emergent cattail *Typha* spp. and bulrush *Scirpus* spp. marshes”, and concluded that low reproductive success had contributed to recent declines.

## Predation

Various workers provided evidence for predation on tricolored blackbirds, their eggs or nestlings by gopher snake (*Pituophis catenifer*), king snake (*Lampropeltis* sp.), black-crowned night-heron, Cooper’s hawk (*Accipiter cooperii*), Swainson’s hawk (*Buteo swainsoni*), merlin (*Falco columbarius*), burrowing owl (*Athene cunicularia*), northern harrier (*Circus cyaneus*), barn owl (*Tyto alba*), short-eared owl (*Asio flammeus*), yellow-billed magpie (*Pica nuttalli*), American crow (*Corvus brachyrhynchos*), coyote, wolf (*Canis lupus*), gray fox (*Urocyon cinereoargenteus*), and possibly mink (*Mustela vison*) and raccoon (*Procyon lotor*), and feral domestic cat (*Felis catus*), showing that predation on breeding tricolored blackbirds by a diverse set of predators has occurred throughout the historical record (Mailliard 1900, Neff 1937, Payne 1969, Beedy and Hamilton 1997, Meese *et al.* 2014). Beedy and Hamilton (1997) reported that more recently, black-crowned night-herons have eliminated all or most nests at several freshwater marsh breeding colonies. Meese (2012) described the increasing pressure on tricolored blackbird colonies by cattle egrets. The Department believes that predation poses a threat to the success of some tricolored blackbird nesting colonies and that the type of nesting substrate can influence vulnerability to predation. Predation is a natural occurrence, 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 as cited in Kelsey 2008). The Department recognizes that small areas of native vegetation are especially vulnerable to predation, especially if they are near sites at which predator populations are at artificially-high levels due to the availability of augmented food sources from human activities. The drastic reduction in extent of spring and summer wetlands in California may have also concentrated predator populations in the remaining wetlands more than was true historically (Cook and Toft 2005).

## Agricultural Contaminants

The Petition provides a summary of pesticide use in Sacramento, San Joaquin, Merced, Fresno, and Tulare counties under the heading Poisons and Contaminants (beginning page 45); information provided in the Petition is from year 2002 California Department of Pesticide Regulation data. Much of the discussion previously appeared in the 2004 petition to the State to list the tricolored blackbird (CBD 2004). The Department’s earlier evaluation of the information (Gustafson and Steele 2004) is relevant and excerpted below:

“The loss of Tricolor [tricolored blackbird] breeding effort due to application of herbicides at colony sites has been documented (Hosea 1986, Hamilton *et al.* 1995, Beedy and Hamilton 1999). Hosea (1986) reported that two colonies in Colusa and Sacramento counties near rice fields were oversprayed during aerial application of herbicides resulting in the poisoning of almost all the nestlings. However, Hamilton *et al.* (1995) stated, “Despite the limited evidence that Tricolored Blackbirds are suffering some mortality as a result of patterns of chemical use in agricultural areas, poisons do not appear to be inducing a serious population problem for Tricolored Blackbirds”.

The petition does not analyze the data available in the pesticide-use reporting database of the California Department of Pesticide Regulation. The database contains types and quantities of pesticides applied to crops utilized by the Tricolor. The petition does not evaluate pesticide-use patterns in relation to historical locations of Tricolor nesting colonies. Instead, the petition’s focus is on individual pesticides that have high use rates or that are toxic to birds. The assessment is not representative of the risk posed by pesticides to the Tricolor. The majority of the pesticides cited in Table 5 of the petition are not expected to have a significant impact on the species. The use of the following chemicals listed in the petition, if they are applied as required, may not pose a significant risk to the Tricolor: methyl bromide, metam-sodium, aluminum phosphide, oryzalin copper sulfate, chlorophacinone, diphacinone, strychnine, zinc phosphide, and petroleum oil.

The petition, citing Beedy and Hayworth (1992), describes the effects of possible selenium toxicosis on a Tricolor colony. Hamilton (2000) knew of “no evidence that toxic contaminants have adversely affected” the Tricolor since the work of Beedy and Hayworth (1992). Beedy and Hayworth (1992), working in the Central Valley in 1987, compared the reproductive success of the Tricolor colony at Kesterson Reservoir in Merced County, which had a history of selenium contamination, with the success at four other colonies. Although Beedy and Hayworth (1992) noted nesting failure at colonies in addition to the one at Kesterson, they concluded that “further research is needed to determine whether the nesting failures observed were isolated phenomena or indicative of a more widespread general decline of this species”. The deformities observed in Tricolor chicks in the nesting colonies at Kesterson, which have been attributed to selenium, occurred in the 1980s prior to the cleanup of the area and prior to cessation of the use of selenium-laden agricultural drain water to maintain the wetlands at Kesterson. Since that time, no impact of contaminants such as selenium on Tricolor nesting success has been documented.

The petition reports that a biologist observed a colony sprayed by mosquito abatement operators in Kern County and that all sprayed eggs failed to hatch. The Department does not know whether any eggs from this colony were tested to determine a cause for the failure to hatch. We also are unaware of whether the spraying equipment disturbed the colony to the extent that adult birds abandoned their nests. In any case, we do not know whether application of mosquito larvicides or adulticides poses a direct threat to the Tricolor. The potential impact of these chemicals on other invertebrates that make up much of the food sources of Tricolors is

apparently not known. In addition, the physical disturbance resulting from applications of mosquito-control pesticides in the immediate vicinity of a nesting colony may result in the abandonment of the colony. The Tricolor is quite sensitive to disturbance during certain phases of the breeding cycle and will readily abandon an established colony, even with young in the nests. Additional impacts to the Tricolor could result from increased spraying and physical disturbance activities undertaken to control the spread of the West Nile virus.

Among the pesticides discussed in the petition is phosmet, a chemical said by the petition to be “highly toxic” in red-winged blackbirds. Phosmet is one of the organophosphate insecticides, which are moderately to highly toxic to birds. In California, the primary application of phosmet is in orchards and vineyards. The flocking behavior, choice of nesting habitat, and typical choice of feeding areas appears to minimize the risk of exposure to the Tricolor of agricultural applications of these insecticides during the nesting season. Because the Tricolor forages in mixed-species flocks with the European starling and other species of blackbirds in the non-breeding season, and because these flocks forage at dairies and/or feed lots, the Tricolor may be exposed to avicides intended to control nuisance and depredating flocks of blackbirds.

Due to the lack of specific information on the effect of agricultural contaminants, the Department cannot judge whether these chemicals pose a local or population-level threat to the Tricolor. This is an area requiring more attention.”

## Weather Events

The Petition includes a section entitled Storms and Droughts (beginning page 44). Hamilton *et al.* (1995) stated that high mortality of tricolored blackbird nestlings can result from severe or prolonged storms and that some observed reproductive failure may be the result of chilling of adult and nestling tricolors. Also, “some adult female mortality at nests appears to have been induced by cold and rainy weather” (Hamilton *et al.* 1995). A recent exercise by Department staff to evaluate drought risk for 358 special status taxa (species or subspecies that are listed under the federal Endangered Species Act or CESA, proposed or candidates for listing, fully protected species, or species of special concern) found the tricolored blackbird to be among those at most risk due to the ongoing drought.

## Disease

The Petition includes a section on “Disease or Predation” (page 42). The Petition does not discuss any known or potential disease issues for the species. Meese *et al.* (2014) stated that no diseases have been reported for the tricolored blackbird but that in some years many nestlings have mites. Avian pox is prevalent in tricolored blackbirds in the Sacramento Valley, much less so in the San Joaquin Valley (Meese *et al.* 2014). Nationwide, blackbirds, orioles and grackles including the tricolored blackbird have been confirmed as being susceptible to West Nile Virus (WNV; [www.cdc.gov/westnile/resources/pdfs/Bird%20Species%201999-2012.pdf](http://www.cdc.gov/westnile/resources/pdfs/Bird%20Species%201999-2012.pdf)). Adult tricolored blackbirds tested positive for WNV antibodies in 2009 but did not show symptoms of the disease (Meese *et al.* 2014). The impact of disease and parasites on breeding or wintering tricolored blackbirds is unknown.

The Department recognizes the potential for these factors to significantly affect local populations of this highly-social species.

### Competition from Other Species

The Department is aware that the great-tailed grackle (*Quiscalus mexicanus*) has experienced a population expansion in California, a phenomenon which ultimately could negatively influence success of tricolored blackbird. Meese *et al.* (2014) reported that grackles may be aggressive towards nesting tricolored blackbirds but did not consider the impacts severe. White-faced ibis (*Plegadis chihi*) may destroy tricolored blackbird nests when in the process of constructing their own nests. Additionally, they are known to prey on eggs of the tricolored blackbird (Meese *et al.* 2014). Marsh wren (*Cistothorus palustris*) may destroy eggs in tricolored blackbird nests if the nest is in proximity to its own nest (Meese *et al.* 2014).

### Brood Parasitism

The Petition does not include information about impacts of brood parasitism on the tricolored blackbird. The brown-headed cowbird (*Molothrus ater*) is known to rarely parasitize nests of tricolored blackbirds (Meese *et al.* 2014). The Department does not consider brood parasitism to be a major threat to the tricolored blackbird.

### Killing of Blackbirds to Protect Crops

Meese (2009, 2014) discussed shooting of blackbirds to protect agricultural crops as a potential threat to the tricolored blackbird. The Petition discusses the historical lethal control of blackbirds to protect crops and considers historical poisoning and shooting of tricolored blackbirds to have contributed to the long-term decline of the species. The Petition states that continued killing of blackbirds to protect ripening rice in the Sacramento Valley is a known but unquantified source of mortality. The Department agrees that an unknown number of tricolored blackbirds are likely killed each year due to activities that are implemented to protect agricultural crops. Meese (2009) reported on the shooting of two tricolored blackbirds by a rice farmer in Butte County. A depredation order under the federal Migratory Bird Treaty Act allows for the control of several species of blackbirds and corvids in agricultural situations without a permit from the U.S. Fish and Wildlife Service (USFWS) (when birds are causing serious injuries to agricultural or horticultural crops or to livestock feed; 50 CFR 21.43). Although tricolored blackbird is not covered by the depredation order, it is possible that misidentification of tricolored blackbirds when they occur in mixed flocks in the fall and winter leads to unintentional mortality of the species. The number of tricolored blackbirds killed annually is unknown. Landowners are required to report on activities and on the number of birds captured or killed under the depredation order, and a recent revision to the depredation order requires expanded reporting on non-target species (50 CFR 21.43, Nov 5, 2014). This may lead to an increase in knowledge upon which an assessment of impacts to non-target species, including tricolored blackbird, can be based.

While the Department disagrees with portions of the Petitioner's assessment of the factors affecting the tricolored blackbird's ability to survive and reproduce, the Department nonetheless concludes that the

Petitioner has submitted sufficient information to demonstrate or create a reasonable inference that tricolored blackbirds are subject to numerous threats that may have the potential to adversely affect their ability to maintain self-sustaining populations within California.

**Degree and Immediacy of Threat** (termed “Degree and Immediacy of Threat and Request for Emergency Action” in the Petition, beginning on page 49; also covered, in part, under the heading “Factors Affecting the Ability to Survive and Reproduce”, in the Petition, beginning on page 36)

The Petition provides adequate information regarding degree and immediacy of threat under two headings as indicated above. The Department finds the following key factors pose serious threats to the tricolored blackbird:

Breeding Habitat Loss and Fragmentation: The Department believes that habitat loss and fragmentation have resulted in a decline in the population of the tricolored blackbird since the 1930s, and continues to affect the species. DeHaven (2000a) stated that, “as measured by their breeding abundance, Tricolored Blackbirds have experienced a long-term population decline which continues today. Much of this decline stems from losses of breeding habitat to urban expansion and changes in agricultural land uses. Conversions of pasturelands, both irrigated and non-irrigated, and hay crops (alfalfa and others) to vineyards and orchards has been, and will likely continue to be, one of the most damaging forms of land-use change [to the tricolored blackbird]. Because of the severe losses of habitat, which are likely irreversible, there is little likelihood that any historic population level - or indeed, even a more recent level can ever be restored and maintained”. Nesting substrate at known breeding colony sites continues to be lost on a regular basis; statewide survey participants regularly report on loss of nesting substrate when visiting historical breeding locations.

Loss of Upland Foraging Habitat: Because of their colonial breeding nature, foraging habitats that support highly productive insect populations are required for successful reproduction. For much of the year, adult tricolored blackbirds feed mainly on grains and other plant seeds (Crase and DeHaven 1978). However, females require large amounts of insect prey for egg production and both sexes provision young with insects during at least the first nine days of development (Crase and DeHaven 1977). Colonies consisting of many thousands of birds require an immense amount of insect prey during short windows of time, putting a large burden on the landscape surrounding the colony. Habitats that can support high insect production include grasslands, pasture, and certain agricultural crops. These land cover types are regularly converted to incompatible land cover types such as orchards, vineyards, and urban development as agricultural practices evolve and cities continue to expand in the Central Valley. With regular loss of breeding substrate and foraging habitat, the co-occurrence of these essential habitat requirements across the landscape becomes less and less common, resulting in limited places where tricolored blackbirds can successfully breed.

The Department was not able to thoroughly examine information on conversion of suitable breeding and foraging habitat to unsuitable land cover types. The degree to which urbanization and conversion of

compatible agricultural land to incompatible crop types continues to impact the species has not been assessed. This area requires additional review and analysis.

Loss of Reproduction to Triticale Harvest: The Department believes that the use by the tricolored blackbird of agricultural fields, where reproduction often fails due to human activities and to increased predation, may be contributing to the population decline. When other habitat is unavailable, agricultural fields may provide attractive alternative habitats for breeding and/or foraging. DeHaven (2000b) wrote, “Today, a new phenomenon – [tricolored blackbird] nesting in grain silage fields of dairies – has emerged. Unfortunately, such fields are often subject to harvest (done in relation to moisture content of the forage) while nesting tricolored blackbirds are still present. This may cause both nest destruction and direct mortality”. The tricolored blackbird experiences “losses [of reproductive effort] to crop-harvesting activities and insufficient insect food and suffer habitat losses to land conversions from rangeland to vineyards, orchards, other agricultural crops and urban development” (Meese *et al.* 2014). In the 2000 survey, Hamilton (2000) found that over 90% of all tricolored blackbird observed foraging activity was on private property. Hamilton (2003) wrote that his “measurements of reproductive success (mean number of fledglings per successful nest, per colony) reveal huge population sinks that may be depleting tricolor numbers. Massive reproductive failures in the agricultural fields of the San Joaquin Valley in particular suggest that the reproductive potential of this species may be swamped by losses to agricultural harvesting practices. This relationship is exacerbated by the attractiveness of productive agricultural habitats to breeding tricolors despite repeated reproductive failures”. Cook and Toft (2005) found that reproductive success varied among nesting substrates and that significantly more offspring were fledged per nest in non-native Himalayan blackberry and that many occupied sites have been lost in recent years. They concluded that silage colonies, when not destroyed by harvest, fledge more young per nest than do native marsh habitat and that this recruitment could be considerable and play a large role in stabilizing the population.

Of the nesting substrates used by tricolored blackbirds, triticale is unique in that it is available in abundance each year in the San Joaquin Valley, and in recent years, many of the largest colonies have occurred on triticale fields. The increase in dairies in the San Joaquin Valley and the associated expansion of triticale fields may have contributed to a shift in the center of population abundance from the Sacramento Valley to the San Joaquin Valley over the last few decades. The breeding season corresponds to the period of harvest for the triticale crop, and many colonies are disturbed each year due to the harvest of the nesting substrate before the nesting cycle is completed. Harvesting destroys the nests and any eggs or young present in the nests, often resulting in zero productivity for the nesting effort. Fifty percent of the breeding tricolored blackbirds detected in California in 2008 were observed nesting in triticale fields during the 2008 statewide survey (Kelsey 2008).

Low Reproductive Success: Recent research has shown that most of the larger tricolored blackbird colonies in the Central Valley exhibited chronically low reproductive success from 2006 to 2011 (Meese 2013), even at sites not harvested during the breeding period. Incidental observations in 2012 and 2013 suggest that this trend has continued. Meese (2013) linked reproductive success at Central Valley colonies to relative abundance of insect prey at foraging sites. Insect prey availability may be suppressed by drought, changes in surrounding vegetation, or by application of pesticides. Regardless of

cause, low insect abundance near colonies in the Central Valley appears to have resulted in very little reproductive output from the largest colonies in the state, at least in recent years. The limited reproduction at the largest colonies over a seven year period has likely resulted in an age structure skewed toward older adults. The maximum life span observed in tricolored blackbirds is 12 years (Meese *et al.* 2014), and much of the current population may be approaching or exceeding the average life span.

Predation: The Department believes that predation is a threat to the success of some tricolored blackbird nesting colonies. Small areas of native vegetation are recognized to be especially vulnerable to predation, especially if they are near sites at which predator populations are at artificially-high levels due to the availability of augmented food sources from human activities.

While the Department disagrees with portions of the Petitioner’s assessment of the relative degree and immediacy of threats to the tricolored blackbird, the Department nonetheless concludes that the Petitioner has submitted sufficient information to demonstrate or create a reasonable inference that the threats tricolored blackbirds are subject to have the potential to adversely affect their ability to maintain self-sustaining populations within California.

### **Impact of Existing Management Efforts** (in the Petition, beginning on page 50)

The Petition presents information on existing efforts as well as past attempts to manage or conserve the tricolored blackbird.

#### **Silage Buy-outs and harvest delays**

The Petition states that the existing but intermittent practice by the USFWS and the Department, to purchase agricultural crops in which the tricolored blackbird is nesting, is not adequate to prevent the loss of tricolored blackbird colonies. The USFWS has contributed funding for crop payment in several years. The first such purchases were in 1993 and 1994, preserving several large colonies in Fresno, Kings, and Tulare counties. Earlier, in 1992, interested persons intervened to prevent destruction of tricolored blackbird colonies by agricultural operators. Hamilton *et al.* (1995) calculated that interventions in 1992, 1993, and 1994 may have been responsible “for the presence of over 75,000 adult Tricolored Blackbirds in 1995 [which had been nestlings in the three previous years], about 25% of the known population”. One or both of the wildlife agencies and/or the Natural Resources Conservation Service (through the Delayed Silage Harvest EQIP program in 2012-2014) have contributed to crop purchases/harvest delay in each year from 1999 through 2014. In 2004, silage purchases by the Department and USFWS protected three colonies totaling over 100,000 adult tricolored blackbirds. From 2005-2009, silage buy-out and/or harvest delay contributed to the productivity of the species, varying annually. During this time period, 11 breeding colonies consisting of 546,000 birds subsequently produced 396,025 young through this process (Meese 2009b).

DeHaven (2000a) questioned the biological value (to the tricolored blackbird) of having State and federal agencies pay dairies to delay or forgo silage harvesting in fields in which the tricolored blackbird is nesting. DeHaven (2000b) commented that providing monetary payments to dairies “sets an

undesirable precedent". He recommended that tricolored blackbirds be lured away from nesting in grain and silage fields through "making key San Joaquin Valley dairy silage fields less attractive to breeding tricolored blackbirds; and providing alternative, low-risk nesting substrates in these areas" (DeHaven 2000b).

### Tricolored Blackbird Working Group

Following the 1991 petition to list the tricolored blackbird under CESA, the Department committed to participation on a multi-stakeholder working group to plan for and implement conservation actions. This resulted in the first of many statewide surveys, the first silage buyout to protect a breeding colony, and ongoing research. However, the working group made limited progress in developing comprehensive conservation measures for the tricolored blackbird and eventually dissolved in the mid-1990s. In 1997, a status update and management guidelines for the tricolored blackbird was completed as per Department and USFWS guidance (see Beedy and Hamilton 1997). The species was again petitioned to be listed under CESA in 2004. The petition evaluation report by the Department stated there was sufficient information to indicate the petitioned action may be warranted; the Commission voted to reject the petition (Fish and Game Commission meeting, Feb. 3, 2005). A new multi-stakeholder Tricolored Blackbird Working Group was formed in 2005 and the group released a conservation plan in 2007 detailing the conservation and management, research and monitoring, data management, and education and outreach goals for the species (TBWG 2007). Working group members, including the Department, signed a Memorandum of Understanding (agreeing to implement the actions in the conservation plan. Most of the goals and objectives in the plan are still relevant today. Progress toward meeting objectives by Department, USFWS, and partners on the working group have focused on expanding knowledge through research and protecting large breeding colonies that are threatened by harvest of triticale fields. New information gathered during many years of research can inform the modification of specific tasks, but the broader goals in the conservation plan remain relevant. The tricolored blackbird has been a high priority California Species of Special Concern since the list was revised in 2008 and the Department has continued to pursue conservation actions for the species.

Among the conservation and management goals in the 2007 Conservation Plan for the Tricolored Blackbird, the goal to "*Protect silage-nesting tricolors until sufficient, permanent breeding habitat is available to maintain viable self-sustaining populations*" is considered to be a near-term need until adequate natural habitats can be protected or restored and tricolored blackbirds are no longer dependent on silage crops. With the declining population and the continued use of triticale by large colonies, this goal remains a high priority. The state and federal governments have provided funding to implement voluntary efforts to compensate willing farmers for delaying harvest until after the breeding season. These efforts have resulted in the protection of several large colonies, but colonies continue to be lost to harvest. Although protection of breeding colonies does not represent a permanent solution to the loss of colonies to harvest, it has resulted in the protection of hundreds of thousands of nests. Without these protective measures, the population likely would have experienced even more dramatic declines in recent years.

The long-term goal to “*Protect, create, restore, and manage habitats needed to support viable, self-sustaining populations of tricolors*” is considered to be of highest priority for species conservation (N. Clipperton, pers. comm., based on priority setting exercise at May, 2014 Tricolored Blackbird Working Group meeting). Some progress has been made on implementing this goal, including an assessment of opportunities for enhancing habitat on Department-owned lands, incorporating the needs of multiple species, including tricolored blackbirds, into habitat incentive programs for private lands, and management of wetland habitat on Department and National Wildlife Refuge lands to benefit nesting tricolored blackbirds. Until more extensive habitat restoration and protection of both nesting substrate and high quality foraging habitat can be achieved, the population will likely remain small and ongoing efforts to protect colonies on agricultural fields will likely need to be continued.

### Species of Special Concern

The Department issued the first Bird Species of Special Concern in California report in 1978 (Remsen 1978). Although the tricolored blackbird was not included on the special concern list, it was recommended for further study to determine whether the decline of the tricolored blackbird noted by DeHaven *et al.* (1975a) was continuing. After further decline of population numbers in the 1980s, the Department added the tricolored blackbird to its list of Bird Species of Special Concern in 1990. The most recent revision of the list found the tricolored blackbird merited inclusion in the highest conservation category (Shuford and Gardali 2008).

While the Department questions portions of the Petitioner’s assessment of the impacts of existing management efforts, the Department nonetheless concludes that the Petitioner has submitted sufficient information to demonstrate or create a reasonable inference that those management efforts may not be adequate to maintain self-sustaining populations in California.

### **Suggestions for Future Management** (in the Petition termed “Recommended Management and Recovery Actions”, beginning on page 54)

The Petition contains specific suggestions for the future management of the tricolored blackbird (Beedy 2014, Meese 2014). The Department believes these recommendations and others (e.g., Beedy and Hamilton 1997, Hamilton *et al.* 1999, DeHaven 2000a, DeHaven 2000b, Hamilton 2003, TBWG 2007, Beedy 2008) should be carefully considered, evaluated for efficacy and prioritized for implementation.

The Tricolored Blackbird Conservation Plan (TBWG 2007) included many of the following management and research recommendations:

1. Incorporate population and habitat conservation actions for the Tricolored Blackbird in habitat conservation plans, natural community conservation plans, and other multispecies conservation plans and in ongoing private land agricultural and conservation easement programs.
2. Restore habitat by promoting the growth of secure nesting substrates (e.g., nettles, thistles, and other naturally armored native plants) near productive foraging habitats to increase the potential carrying capacity for this species. Restored nesting habitats should be situated on

protected public and private lands, especially in agricultural areas of the Central Valley and surrounding foothills.

3. On refuges and other public lands that support Tricolored Blackbird colonies in irrigated pastures, manage irrigation to permit a sequential flooding regime in adjacent land parcels at the time they are breeding to enhance insect productivity. Incorporate carefully managed grazing of these parcels to maintain an average vegetation height of 15 cm to provide optimal Tricolored Blackbird foraging habitat.
4. Lure nesting Tricolored Blackbirds, when possible, away from dairies and other agricultural operations to secure habitats where they are more likely to succeed; where colonies establish, defer harvest of grain and silage crops, if feasible, until after the breeding season.
5. Investigate predator-prey relationships, especially the ongoing effects of black-crowned night-herons and coyotes and the responses of individuals and colonies to predators.
6. Perform demographic research to determine whether reproductive success of freshwater marsh colonies varies with respect to wetland size and spatial relationships with other wetlands.
7. Analyze depletion of food resources by blackbirds near breeding colonies and quantify the extent and character of foraging habitats near colonies.
8. Evaluate habitat selection mechanisms and the relative value of alternative foraging habitats to breeding birds.
9. Use banding and radiotelemetry to measure adult and juvenile dispersal from several colonies.
10. Evaluate the distribution, resource utilization, and survival of wintering birds.

Finally, spatial analyses to estimate losses in nesting substrate or foraging habitat have not been conducted. Data have not been systematically collected, but incidental observations during species surveys are available and could inform an analysis of recent changes in extent and distribution of nesting substrate. Agriculture land use data for the Central Valley could be used to estimate changes in foraging habitat over time (e.g. DWR land use data; <http://www.water.ca.gov/landwateruse/lusrvymain.cfm>).

**Habitat Necessary for Survival** (“Kind of Habitat Necessary for Survival” in the Petition, beginning on page 30)

The Petition describes the existing situation in which the tricolored blackbird nests in native vegetation, introduced vegetation, and crops. For successful breeding, tricolored blackbirds require nesting substrate, a water source, and an extremely abundant insect food source in proximity to the breeding colony. Historically, tricolored blackbirds nested in natural wetlands of the Central Valley and in a few native upland plant species; early declines in the population most likely resulted from declines in this natural habitat. As extensive wetlands and other native substrates were lost, tricolored blackbirds expanded use to alternative nest substrates, including nonnative upland plants such as Himalayan blackberry, milk thistle (*Silybum marianum*), and the agricultural crop triticale, which is grown as a food source for dairy cattle. Historically, most colonies were in freshwater marshes. Meese *et al.* (2014) wrote that, historically, “almost 93% of 252 breeding colonies observed in the Sacramento Valley, from 1931 to 1936, were in freshwater marshes dominated by cattails (*Typha* spp.) or bulrushes (*Schoenoplectus* spp.); remaining colonies were in willows (*Salix* spp.), blackberries (*Rubus* spp.), thistles

(*Cirsium* and *Centaurea* spp.), and nettles (*Urtica* sp). By the 1970s, DeHaven *et al.* (1975a) found that only 53% of colonies in the Sacramento and San Joaquin valleys were in cattails and bulrushes. Since at least the 1970s, the breeding habitat of the tricolored blackbird has included upland and agricultural areas (DeHaven *et al.* 1975a, Beedy *et al.* 1991). Hamilton (2003), citing Kreissman (1991 - not examined), wrote that “most Central Valley grasslands are now gone, lost to cattle rangeland, irrigated crops (pasture, row crops, orchards, rice , grapes) and development. Modern tricolor habitats are agricultural land, especially rice and nearby duck club cattail and bulrush marshes, dairies and their associated hay fields and cattle rangeland wherever there is suitable nesting habitat and water”. Hamilton (2003) stated that “Tricolored blackbird colony sites require nesting substrates offering protection from predation. These include emergent marsh vegetation (cattails, *Typha latifolia*, less frequently *T. angustifolia*), bulrushes (*Schoenoplectus californicus*, *S. acutus*) and Himalayan blackberries (*Rubus discolor*) thickets, thistle, and nettles. Tricolored blackbirds do not settle in grain, hay, silage, or cut-feed fields before grain forms seed awns or spiny or prickly weeds develop in them. We assume that grain fields are identified as spiny vegetation by tricolors”.

The Department concludes that the Petitioner has submitted sufficient information to describe the habitat needs for tricolored blackbird.

### **Distribution Map**

The distribution map included in the Petition on page 61 contains a sufficient illustration of the California breeding and winter ranges of the tricolored blackbird. The Department further recommends assessment and incorporation of other existing data sets (e.g., eBird, California Natural Diversity Database, Christmas Bird Count, Breeding Bird Survey) which may have additional tricolored blackbird records into the distribution map.

### **Availability and Sources of Information** (in the Petition, beginning on page 57)

The Petition includes most of the major references on the tricolored blackbird.

### **CONCLUSIONS**

The tricolored blackbird is the most colonial land bird in North America and nearly is endemic to California, with more than 99% of the total breeding population in the State. As a colonial breeder, the tricolored blackbird nests in a small number of larger colonies comprising a significant proportion of the population. The concentration of a high proportion of the total population at a few sites increases the risk of a catastrophic effect on the species as a whole, due to nesting failure in, or destruction of, a single large colony.

At least three major factors have operated, and continue to operate, to reduce the population of the tricolored blackbird. These major threats to the tricolored blackbird are as follows:

Loss and Fragmentation of Habitat: This factor appears to be the most serious one threatening the tricolored blackbird. The availability of suitable nesting and foraging habitat, including food resources,

appears to limit the population. Local declines across the range of this species over time apparently have cumulatively resulted in the decline in tricolored blackbird numbers since the 1930s. The loss of habitat continues, both in the Central Valley and in southern California. As the amount of habitat is reduced through human activities, the tricolored blackbird population likely will continue to decline.

Agricultural Operations: The shift in breeding habitat use by the tricolored blackbird from native habitats to silage and grain fields makes these colonies vulnerable to destruction during crop harvest. Nest abandonment also can result from the disturbance of nearby human activities.

Predation: Predators attack colonies of any size but are especially effective in reducing or eliminating the reproductive effort of small colonies in remnant native vegetation such as cattails. Predation can have a significant effect on the reproductive success of tricolored blackbird breeding colonies.

Having reviewed and evaluated relevant information, including the material referenced in the Petition and other information in the Department's possession, the Department believes there is sufficient scientific information available at this time to indicate that the petitioned action may be warranted. (See Fish & G. Code, § 2073.5, subd. (a)(2); Cal. Code Regs. tit. 14, § 670.1, subd. (d).)

## **Preparers**

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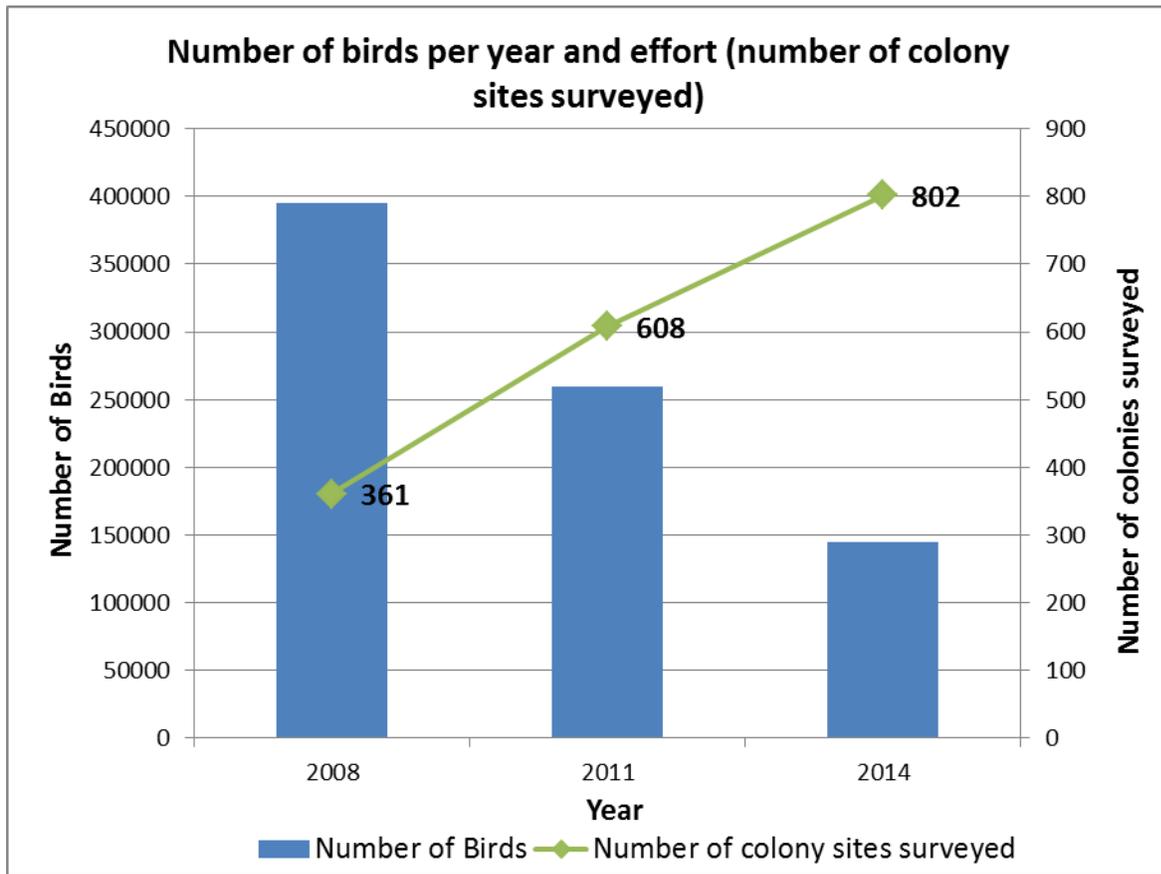


Figure 1. Number of birds detected per year during statewide surveys, and number of colony sites surveyed during each survey.

## LITERATURE CITED

- AOU (American Ornithologists' Union). 1957. Check-list of North American birds, 5th ed. American Ornithologists' Union, Baltimore.
- Baird, S.F., ed. 1870. Ornithology of California. Land birds. Vol. 1. From the manuscript and notes of J. G. Cooper. U.S. Geologic Survey of California. Welch Bigelow and Co. Cambridge, MA.
- Baird, S.F., T. M. Brewer, and R. Ridgway. 1874. A history of North American birds. Land birds. Vol. 2. Little, Brown and Co., Boston.
- Beedy, E. C. and W. J. Hamilton III. 1997. Tricolored blackbird status update and management guidelines. Jones & Stokes Assoc. Inc., Sacramento CA, Rep. 97-099. Prepared for U. S. Fish and Wildl. Service, Sacramento CA, and Calif. Dep. of Fish and Game, Sacramento CA.
- Beedy, E. C. and W. J. Hamilton III. 1999. Tricolored Blackbird (*Agelaius tricolor*). Account no. 423, 24 pp, in A. Poole and F. Gill (eds.), The Birds of North America, Philadelphia PA.
- Beedy, E. C. and A. Hayworth. 1992. Tricolored blackbird (*Agelaius tricolor*) nesting failures in the Central Valley of California: general trends or isolated phenomena? Pp. 33-46 in D. F. Williams, S. Byrne, and T. A. Rado (eds.), Endangered and sensitive species of the San Joaquin Valley, California: their biology, management, and conservation. Rep. based on 1987 conf., The Wildl. Soc. - Western Section, Bakersfield CA. Calif. Energy Commission, Sacramento CA.
- Beedy, E. C., S. D. Sanders, and D. Bloom. 1991. Breeding status, distribution, and habitat associations of the tricolored blackbird (*Agelaius tricolor*), 1850-1989. Jones & Stokes Assoc. Inc., Sacramento CA, Rep. 88-187, ii + 42 pp. + tables, figures, append. Prepared for U. S. Fish and Wildl. Service, Sacramento CA.
- Beedy, E.C. Tricolored Blackbird species account in Shuford, W. D. and T. Gardali. 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, Camarillo, CA and California Department of Fish and Game, Sacramento.
- Beedy, E. C. 2014. Comments in Support of the Emergency Listing of the Tricolored Blackbird. August 2, 2014 letter to the California Fish and Game Commission.
- Bent, A. C. 1958. Life histories of North American blackbirds, orioles, tanagers, and allies. Bull. of U. S. Natl. Mus. 211:179-190, 1958. [The commonly-available Dover edition is an unaltered republication of the original museum bulletin; Dover Publications Inc., New York NY, x + 549 pp + plates.]
- Berg, E.C., J.P. Pollinger, and T.B. Smith. 2010. Population structure of the Tricolored Blackbird (*Agelaius tricolor*) in California: are northern and southern populations genetically distinct? Calif. Dept. Fish and Game, Nongame Wildlife Program Rpt. 2010-05 and Audubon California, Sacramento, CA. 25 pp.

CBD (Center for Biological Diversity). 2004. Petition to list Tricolored Blackbird under the State and Federal Endangered Species Acts and request for emergency action to protect the species. Center for Biological Diversity, Idyllwild, CA.

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.

Cooper, J. G. 1870. Geological survey of California. Ornithology. S. F. Baird (ed.). University Press, Cambridge, MA.

Crase, F. T. and R. W. DeHaven. 1977. Food of nestling tricolored blackbirds. *Condor* 79(2):265-269.

Crase, F. T. and R. W. DeHaven. 1978. Food selection by five sympatric California blackbird species. *Calif. Fish and Game* 64(4):255-267.

Dawson, W. L. 1923. The birds of California. 4 Vols. South Moulton Co., San Francisco CA.

DeHaven, R. W. 1975. Plumages of the tricolored blackbird. *West. Bird Bander* 50:59-61.

DeHaven, R. W. 2000a. Breeding tricolored blackbirds in the Central Valley, California: a quarter-century perspective. Unpubl. rep., 22 pp. U. S. Fish and Wildl. Service, Sacramento CA.

DeHaven, R. W. 2000b. Strategy for exit from the dilemma of tricolored blackbirds nesting in dairy silage fields in the San Joaquin Valley, California. "White paper and briefing statement" (unpubl. rep.), 2 pp. U. S. Fish and Wildl. Service, Sacramento CA.

DeHaven, R. W. and J. A. Neff. 1973. Recoveries and returns of tricolored blackbirds, 1941-1964. *West. Bird Bander* 50:59-61.

DeHaven, R. W., F. T. Crase, and P. D. Woronecki. 1975a. Breeding status of the tricolored blackbird, 1969-1972. *Calif. Fish and Game* 61(4):166-180.

DeHaven, R. W., F. T. Crase, and P. D. Woronecki. 1975b. Movements of tricolored blackbirds banded in the Central Valley of California. *Bird-Banding* 46:220-229.

Garrett, K. and J. Dunn. 1981. Birds of southern California. Los Angeles Audubon Soc., Los Angeles CA.

Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. *Pac. Coast Avifauna* 27.

Green, M. and L. Edson. 2004. The 2004 Tricolored Blackbird April survey. *Central Valley Bird Club Bull.* 7:23-31.

- Gustafson, J. R. and D. T. Steele. 2004. Evaluation of petition from Center for Biological Diversity to list Tricolored Blackbird (*Agelaius tricolor*) as endangered. Calif. Dep. of Fish and Game, Habitat Conservation Planning Branch, Sacramento, 42 pp. + append.
- Hamilton, W. J., III. 1993. Tricolored Blackbird. Rep. prepared for U. S. Fish and Wildl. Service, Portland OR, and Calif. Dep. of Fish and Game, Sacramento CA.
- Hamilton, W. J., III. 1998. Tricolored blackbird itinerant breeding in California. Condor 100(2): 218-226.
- Hamilton, W. J., III. 2000. Tricolored blackbird 2000 breeding season census and survey - observations and recommendations. Rep. prepared for U. S. Fish and Wildl. Service, Portland OR, 61 pp.
- Hamilton, W. J., III. 2003. Current policies and programs affecting tricolored blackbird (*Agelaius tricolor*) restoration. Pp. 201-207 in P. M. Faber (ed.), California riparian systems: processes and floodplain management, ecology, and restoration. Proceedings of 2001 Riparian Habitat and Floodplains Conf., Riparian Habitat Joint Venture, Sacramento CA. Pickleweed Press, Mill Valley CA.
- Hamilton, W. J., III. 2004. Tricolored Blackbird (*Agelaius tricolor*). Online account in The Riparian Bird Conservation Plan: a strategy of reversing the decline of riparian associated birds in California. Calif. Partners in Flight, available at [http://www.prbo.org/calpif/htmldocs/species/riparian/tricolored\\_blackbird.htm](http://www.prbo.org/calpif/htmldocs/species/riparian/tricolored_blackbird.htm).
- Hamilton, W. J., III, R. Bowen, and L. Cook. 1992. Nesting activities of tricolored blackbirds, *Agelaius tricolor*, in the Central Valley, California, 1992. Rep. prepared for U. S. Fish and Wildl. Service, 27 pp.
- Hamilton, W. J., III, L. Cook, and R. Grey. 1995. Tricolored blackbird project 1994. Rep. prepared for U. S. Fish and Wildl. Service, 69 pp + append.
- Hamilton, B. [W. J., III], L. Cook, and K. Hunting. 1999. Tricolored blackbirds 1999 status report. Rep. prepared for Calif. Dep. of Fish and Game, Sacramento CA, and U. S. Fish and Wildl. Service, Portland OR. [This document is the expanded version of the following published report.]
- Hosea, R. C. 1986. A population census of the tricolored blackbird, *Agelaius tricolor* (Audubon), in four counties in the northern Central Valley of California. M. A. thesis, Calif. State Univ., Sacramento CA.
- Humble, D. and R. Churchwell. 2002. Tricolored blackbird survey report 2001. Point Reyes Bird Observatory draft rep., 61 pp. Prepared for U. S. Fish and Wildl. Service.
- Kelsey, R. 2008. Results of the tricolored blackbird 2008 census. Report submitted to the U.S. Fish & Wildlife Service, Portland, OR.

- Kyle, K. and R. Kelsey. 2011. Results of the 2011 Tricolored Blackbird Statewide Survey. Audubon California, Sacramento, CA.
- Kressman, B. 1991. California: An environmental atlas and guide. Bear Klaw, Davis CA, 255 pp.
- Lack, D. and J. T. Emlen Jr. 1939. Observations on breeding behavior in tricolored red-wings. Condor 41(6):225-230.
- Mailliard, J. 1900. Breeding of *Agelaius tricolor* in Madera Co., Cal. Condor 2(6):122-124.
- Meese, R. J. 2009a. Detection, Monitoring, and Fates of Tricolored Blackbird Colonies in 2009 in the Central Valley of California. Final Report to California Department of Fish and Game and U.S. Fish and Wildlife Service.
- Meese, R. J. 2009b. Contribution of the Conservation of Silage Colonies to Tricolored Blackbird Conservation from 2005-2009. Final Report to U.S. Fish and Wildlife Service.
- Meese, R. J. 2010. Detection, Monitoring, and Fates of Tricolored Blackbird Colonies in 2010 in the Central Valley of California. Final Report to California Department of Fish and Game and U.S. Fish and Wildlife Service.
- Meese, R. J. 2011. Reproductive Success of Tricolored Blackbird Colonies in 2011 in the Central Valley of California. Final Report to California Department of Fish and Game.
- Meese, R. J. 2012. Cattle egret predation causing reproductive failures of nesting tricolored blackbirds. Calif. Fish and Game 98(1): 47-50.
- Meese, R.J. 2013. Chronic low reproductive success of the colonial tricolored blackbird from 2006 to 2011. Western Birds 44(2):98-113.
- Meese, R. J. 2014. Results of the 2014 Tricolored Blackbird Statewide Survey. U.C. Davis.
- Meese, R. J., E. C. Beedy and W. J. Hamilton, III. 2014. Tricolored Blackbird (*Agelaius tricolor*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/423> doi:10.2173/bna.423
- Neff, J. 1937. Nesting distribution of the tricolor-colored redwing. Condor 39(2):61-81.
- Neff, J. A. 1942. Migration of the tricolored red-wing in central California. Condor 44(2):45-53.
- Orians, G. H. 1960. Autumnal breeding in the tricolored blackbird. Auk 77:379-398.
- Orians, G. H. 1961a. The ecology of blackbird (*Agelaius*) social systems. Ecol. Monogr. 31(3):285-312.

Orians, G. H. 1961b. Social stimulation within blackbird colonies. *Condor* 63(4):330-337.

Payne, R. B. 1969. Breeding seasons and reproductive physiology of tricolored blackbirds and redwinged [sic] blackbirds. *Univ. of Calif. Publ. in Zoology* 90.

Remsen, J. V., Jr. 1978. Bird species of special concern in California: an annotated list of declining or vulnerable bird species. *Wildl. Management Branch Administrative Rep. 78-1*, ii + 54 pp. Proj. W-54-R-9. Calif. Dep. of Fish and Game, Sacramento CA.

Sauer, J. R., J.E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, results and analysis 1966–2007, version 5.15.2008. USGS Patuxent Wildlife Research Center, Laurel, MD. Available at [www.mbrpwrc.usgs.gov/bbs/bbs.html](http://www.mbrpwrc.usgs.gov/bbs/bbs.html).

Shuford, W. D. and T. Gardali. 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, Camarillo, CA 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, CA.  
[http://tricolor.ice.ucdavis.edu/files/trbl/Conservation\\_Plan\\_MOA\\_2009\\_2.0\\_update.pdf](http://tricolor.ice.ucdavis.edu/files/trbl/Conservation_Plan_MOA_2009_2.0_update.pdf)

Unitt, P. 2004. San Diego County bird atlas. *Proc. San Diego Soc. Nat. Hist.* 39.

USFWS (U.S. Fish and Wildlife Service). 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at <<http://www.fws.gov/migratorybirds/>>].