Department of Fish and Game
Sacramento, California

EVALUATION OF PETITION FROM CENTER FOR BIOLOGICAL DIVERSITY TO LIST TRICOLORED BLACKBIRD (*Agelaius tricolor*) AS ENDANGERED [1]

September 15, 2004

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[1] Gustafson, J. R., and D. T. Steele. 2004 (Sep 15.). 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.

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EXECUTIVE SUMMARY

The Center for Biological Diversity, Idyllwild, California, submitted a petition to the Fish and Game Commission (Commission) on April 8, 2004, to list the Tricolored Blackbird (*Agelaius tricolor*) (Tricolor) as an Endangered species, pursuant to the California Endangered Species Act (CESA: Fish and Game Code (FGC) Sections (§) 2050 - 2115.5.). The Commission received the petition on April 9, 2004. The Commission referred it for evaluation to the Department of Fish and Game (Department) on April 19, 2004.

The Petitioner requested that the Commission adopt emergency regulations to list the Tricolor, pursuant to CESA (FGC § 2076.5), stating (page 27 of the petition) that the Tricolor is "in immediate need of protection [in 2004] from the severe nesting failures caused each year by agriculture harvesting plowing activities". Under § 2076.5, the Commission may adopt emergency regulations if it finds that "there is an emergency posing a significant threat to the continued existence" of a species. The Department separately evaluated the request for emergency action and reported to the Commission that "while evidence exists of threats to, and losses of, populations of the tricolored blackbird (*Agelaius tricolor*) (blackbird), the petition does not present evidence of an emergency posing a significant threat to the continued existence of the blackbird, pursuant to Section 2076.5 of the Fish and Game Code (Adoption of Emergency Regulations)" (R. Broddrick *in litt.* 2004a). Subsequently, at its May 4, 2004, meeting in San Diego, California, the Commission accepted the Department's report and recommendation not to adopt emergency regulations to list and directed the Department to prepare a normal evaluation of the petition.

On May 6, 2004, the Department asked the Commission to grant the Department an additional 30 days, for a total 120 days, to evaluate the petition, pursuant to CESA (FGC § 2073.5(b)) (R. Broddrick *in litt.* 2004b). On July 1, 2004, the Commission granted this request (R. Treanor *in litt.* 2004).

The Department evaluated the petition, using the information in the petition and other available relevant information, and found that the scientific information presented in the petition is sufficient to indicate that the petitioned action may be warranted. Our

review of additional scientific information supports this finding. The Department recommends to the Commission that, pursuant to FGC § 2073.5(a), the Commission accept and consider the petition.

Summary of Department's Evaluation

In general, the Department found that the petition provides adequate information in the categories required by CESA. A petition to list or delist a species must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and other factors the petitioner deems relevant" (FGC § 2072.3).

The petition emphasizes the population status of the Tricolor in the Central Valley of California, which annually supports the largest breeding colonies and majority of potentially breeding birds. Although Tricolor populations have declined substantially in southern California as well as in the Central Valley, the petition focuses on Central Valley populations. For the purpose of this evaluation, the Central Valley is considered to consist of the Sacramento Valley in the north and the San Joaquin Valley in the south.

The Department believes that the petitioned action may be warranted based primarily on the scope and severity of the following threats which, with the exception of item number 7, are addressed by the petition.

1) Continuing loss of nesting substrate and associated wetlands, Himalayan blackberry (*Rubus discolor*) patches, and marsh vegetation in reservoirs and ponds.

2) Continuing loss of uplands used for foraging.

3) Declines in Tricolor populations in the past 10 years.

4) Significant, large-scale reproductive failures in Tricolor colonies nesting in agricultural areas of the San Joaquin Valley.

5) Limited, inconsistent, and usually ineffective protection of colonies nesting in agricultural settings.

6) Ineffectiveness of existing regulatory mechanisms to protect Tricolor breeding habitat and nesting colonies on privately-owned land.

7) Challenges in identifying and incorporating essential Tricolor breeding habitat components in local and regional conservation plans.

8) Predation by the black-crowned night heron (*Nycticorax nycticorax*), 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.

Summary of Life History, Distribution, Population Trend, and Management Status of the Tricolor

The Tricolor is nearly endemic to California, as more than 99% of the total population breeds in the State. Small nesting colonies have also been documented in Oregon, Washington, Nevada, and coastal Baja California. The species is a permanent resident within the lower-elevation portion of the breeding range. The Tricolor is the most colonial passerine bird in North America forming large colonies that may include thousands of birds at a single breeding site. Colonies usually nest near water in emergent tule or cattail marsh, in armored vegetation like Himalayan blackberry, or in agricultural settings. Colonies select sites near suitable foraging habitat. The Tricolor feeds on insects, seeds, and grains in agricultural fields and grasslands.

The overall range of the Tricolor apparently has changed very little since the mid-1930s (Figure 1). Since 1980, breeding colonies have been observed in 46 California counties, the largest being in the Central Valley. Historically, single colonies were estimated to reach up to several hundred thousand adults and cover over 50 acres. Using the size of the largest detected colonies as an indication of population size, recent censuses and surveys indicate significant declines in Tricolor populations from their former level of abundance. The total population of the Tricolor is now thought to be smaller than the historic size of some individual breeding colonies. The largest colonies of the Tricolor may provide the majority of the reproductive effort and success. However, these colonies may also serve as large population sinks, due to their vulnerability to reproductive failure as the result of disturbance, destruction, of lack of adequate forage. The size of the larger breeding colonies, and the number of these colonies, appear to have decreased over time (Figure 2). The size of the largest detected nesting colony probably is the best indicator of population status. Our analysis of Christmas Bird Count data for those surveys detecting the Tricolor in at least 35 years between 1963 and 2003 indicates a declining trend for the species (Figure 3).

The Tricolor is considered to be a Species of Special Concern in California. This is an administrative designation intended to alert biologists, land managers, and others to the declining status of a species and encourage them to provide additional management considerations. The species is also included on the U. S. Fish and Wildlife Service's (USFWS) informal list of Species of Concern. The USFWS also recently has received a petition to list this species as endangered.

Implications of Colonial Breeding

The phenomenon of birds congregating in large numbers for breeding may have evolved in response to shortages of suitable, safe nesting sites within a reasonable

commute to food sources. Colonial nesters may learn about spotty and scattered food supplies from observing the behavior of their neighbors. The presence of many individuals in close proximity to one another may result in earlier detection of predators. Also, an individual bird nesting in a colony may enjoy the safety of numbers, in that it is less likely to be taken by any particular predator.

Colonial breeding can have disadvantages. A large number of birds actually may attract predators and foster higher rates of disease or parasitism. Individuals may experience increased competition for nest materials and food. Coloniality also increases the risk to the entire population of a limited-range species such as the Tricolor, by concentrating birds in a small area. A single event of predation or an incident of disturbance can affect the nesting success of many birds, perhaps that of the entire colony. Natural threats to colonies, such as weather extremes and predators, always have existed. However, human activities have brought many new threats to colonial birds and have accentuated the role of predators in some cases. This is true for the Tricolor.

The colonial nesting behavior of the Tricolor makes the species vulnerable to nesting failures affecting thousands of nests at large colonies. The concentration of a high proportion of the known population of the Tricolor in a few breeding colonies increases the risk of major reproductive failures, especially in vulnerable habitats such as active agricultural fields.

Colonially-nesting birds especially are vulnerable to extinction. Recent examples are the passenger pigeon (*Ectopistes migratorius*), Carolina parakeet (*Conuropsis carolinensis*), and great auk (*Pinguinus impennis*). These colonial breeders each had a small number of colonies making up a relative larger proportion of the population. Human impacts to colonies or habitat resulted in the extinction of these North American species.

INFORMATION PROVIDED IN THE PETITION AND ADDITIONAL INFORMATION GATHERED BY THE DEPARTMENT OF FISH AND GAME

Range ("Range and Distribution" in the petition, beginning on page 8)

The petition states that the geographic range of the Tricolored Blackbird (*Agelaius tricolor*) (Tricolor) "has largely been 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". This general description of the breeding range was described by Bent (1958). Beedy *et al.* (1991) wrote that only the Oregon counties of Jackson and Klamath have documented historic and current nesting populations of the Tricolor. However, Beedy and Hamilton (1999) stated that breeding Tricolors have been reported from northwestern, central, and southern Oregon, western Nevada, and central Washington. These authors said that "the overall range of [the Tricolor] is little changed since the mid-1930s" (Beedy and Hamilton 1999). According to the American Ornithologists' Union (AOU 1998), the Tricolor breeds "from northwestern and eastern Oregon (east of the coast ranges) south through interior California, and along the coast from central California (Sonoma County) south to northwestern Baja California (south to lat. 30° N.)".

The petition states that the Tricolor has been found up to 4,200 feet at Klamath Lake. Grinnell and Miller (1944) listed a record of 4,400 feet on the "South Fork of the Pit River" in Modoc County.

Distribution ("Range and Distribution" in the petition, beginning on page 9)

Grinnell and Miller (1944) commented that the Tricolor 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". "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" (Grinnell and Miller 1944). In regard to reports of the Tricolor in the Lake Tahoe area and on the lower Colorado River, Grinnell and Miller (1944) said that the reports "are still thought by us to be doubtful with respect to identity".

For the purpose of this evaluation, the Central Valley is the Sacramento Valley in the north and the San Joaquin Valley in the south. Orians (1961b) stated that the breeding habitats of the Tricolor in the Central Valley "can be grouped into three main categories: the foothills, valley cropland with no rice, and the rice-growing country. Breeding begins first in the foothills and last in the rice-growing country. In the foothills, where there is little or no irrigation, the insect supply doubtless diminishes sharply when the grasses dry up in May or early June. In the valley, where much of the land is irrigated, the country remains productive of insects for a much longer period. Moreover, the rice fields are not seeded until late April or early May, and until the grass has sprouted and the water level in the fields lowered three weeks later, there are neither

feeding grounds nor food supplies for the birds. It is not until the vigorous growth of the crop in the warm shallow water is fully under way in June that the maximum feeding potential of the area is realized. Since the rice country provides the best conditions for the breeding of the Tricolor and supports the largest colonies, the larger colonies tend to start later".

Tricolors in southern California, south of the Transverse Ranges, may represent a separate metapopulation (Beedy and Hamilton 1997, Hamilton 1998). A Tricolor metapopulation would freely exchange individuals among alternative colony sites. The number of individuals in a metapopulation "depends on survival of fledglings and adults throughout the region" (Beedy and Hamilton 1999). Banding studies by Neff (1942), DeHaven *et al.* (1975b), and DeHaven and Neff (1973) suggest that Tricolors breeding in southern California from Santa Barbara County south and east may not interchange with Tricolors to the north. Tricolors north of the Transverse Ranges may be part of a northern metapopulation (Beedy and Hamilton 1997).

Literally, a metapopulation is "a population of populations" (McCullough 1996), a population of discontinuous sub-populations of the same species. A metapopulation is "distributed over spatially disjunct patches of suitable habitat … separated by intervening unsuitable habitat … in which the animals [of the species] cannot survive. Because the risk of mortality in crossing hostile conditions …, movement of animals between [habitat] patches is not routine" (McCullough 1996). A key concept regarding metapopulations is that extinction in given habitat patches may be a common event. "A metapopulation's persistence depends on the combined dynamics of extinction within given patches and recolonization among patches by dispersal" (McCullough 1996).

During the winter, the Tricolor withdraws from those portions of its summer range in California (Figure 1) (see Appendix) outside of the Central Valley, from Santa Barbara County, and from eastern San Diego County (Beedy and Hamilton 1999). Although the Tricolor 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 Santa Cruz Co. and sporadically north to Del Norte Co." (Beedy and Hamilton 1999). The AOU stated that the Tricolor winters "from northern California (Glenn County southward) south throughout the breeding range and adjacent agricultural areas". Analysis of Christmas Bird Count data suggest Tricolors winter in both the Central Valley and Central and South Coast.

Population Trend (termed "Population Status and Trends" in the petition, beginning on page 12)

The petition presents information on the Tricolor population in California through the 2000 survey. Although a survey was conducted in 2001 (Humble and Churchwell 2002), it was not comparable in scope to the 2000 survey. Survey efforts for 2004 had

FIGURE 1

SUMMER RANGE OF THE TRICOLORED BLACKBIRD

Range created by following the protocol set forth in California Wildlife Habitat Relationships Program Range Map Review and Revision Project: Instructions for Revising Bird Range Maps, Kevin Hunting and Monica Parisi (May 2004). Tricolored blackbird data used to identify range include: California Natural Diversity Database (7/2004); Department of Fish & Game Tricolored blackbird Survey data 1994, 1995, 1996, 1997, and 1999; and Breeding Bird Survey data (1985 - 2003).

County Boundaries
Summer Range

N

0 20 40 80 Miles

Courtesy William J. Hamilton III

Prepared by
Ca Dept Fish and Game
Wildlife and Habitat Data Analysis Branch,
Sacramento, CA September 2004

Teale Albers, NAD27, meters.
WHDAB:KTIEN
(rev. ACM 9/07/2004)
SummerRange8x8.mxd

not been conducted at the time that the petition was prepared. Preliminary survey estimates for 2004 are now available but, as of yet, reports including discussion of methods and results have not been finished. Survey effort, methods, coverage, and participants have varied between years. It is difficult to evaluate total population estimates for any given year, because numbers are not always based on direct observations. Instead, numbers for larger colonies often are estimates based on extrapolation from partial counting. In 2003, the U. S. Fish and Wildlife Service (USFWS) established a working group, in which the Department of Fish and Game (Department) is included, to develop standard survey methods.

Hamilton (2003) wrote that the Tricolor is "North America's most rapidly declining songbird (down over 50% since 1994)". Further, "Tricolor habitats and tricolors today are a remnant [*sic*] of a once widespread and probably predominant songbird species in the Central Valley" (Hamilton 2003).

Several major studies beginning in the 1930s, those of Neff (1937), DeHaven *et al.* (1975a), Hamilton *et al.* (1995), Beedy and Hamilton (1997), and Hamilton (2000), have documented numbers and breeding colonies of the Tricolor. Smaller studies and summaries also have provided information on the species (Hosea 1986, Beedy *et al.* 1991, Hamilton *in litt.* 1991, Hamilton *et al.* 1992, Hamilton 1993, Hamilton *et al.* 1999, DeHaven 2000a, and Humble and Churchwell 2002).

The petition describes the decline in numbers of the Tricolor since the 1930s, particularly for the Central Valley of California.

Neff (1937), who began work on the Tricolor in the Central Valley in 1930, initially intended to conduct a complete survey of the species within its entire California range "during one single nesting season". However, he "speedily learned that Tricolored Red-wings existed in immense numbers, and that their nesting range covered so great a part of California that such a survey was humanly impossible". Neff (1937), having conducted more limited censuses over a six-year period, reported nesting birds in 26 California counties in the period of 1931-36, including a single colony of about 300,000 adults and other colonies having over 150,000 adults each. In 1934, he found over 700,000 adults in eight California counties (Neff 1937).

Although Neff (1937) desired to determine whether "industrial and agricultural development [had] reduced the area favorable to nesting" of the Tricolor, he was unable to find early, pre-1930 records of the Tricolor giving more than "a hint as to the density of [the] population in the days before industrial and agricultural development greatly changed the topography of much of [California]". Therefore, he was unable to compare his findings in the Central Valley of the 1930s with earlier populations of the Tricolor. He noted that, "during the last years of the 19th century and the earlier years of the present century, marshes were drained and reclaimed, and riparian jungles were cut away. Agricultural development was rapid, with the earlier stages of irrigation" (Neff 1937). However, he wrote that, in the first quarter of the 20th century, "irrigation has been widely extended and inadequate drainage facilities in many areas have permitted the

development of favorable palustrine habitat where before there were arid plains. Modern agriculture, with its new grain crops, has greatly increased the available food supply [for the Tricolor]. The growing of rice, beginning in 1910, has furnished both a favored food and, through the necessity for extensive irrigation, a regrowth of marsh vegetation for nesting and roosting" (Neff 1937).

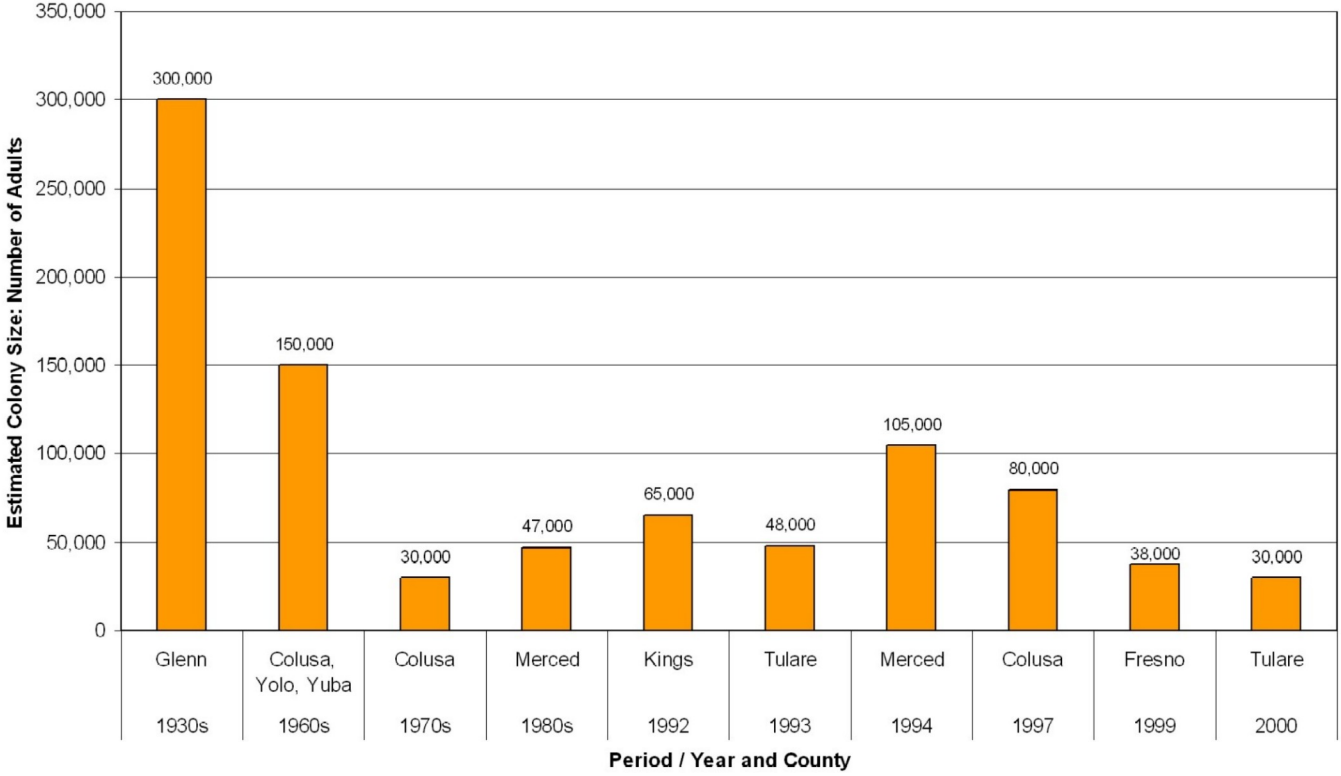
Limited written accounts of the Tricolor in the 19th Century indicate that it was a very abundant species in extensive marshland and grassland habitats. Neff's (1937) work, as interpreted by Hamilton *et al.* (1995), yielded an estimated maximum annual abundance of over 1,100,000 adult Tricolors in the Central Valley. DeHaven *et al.* (1975a), working in the Central Valley from 1969 through 1972, found fewer colonies than Neff (1937) and found no nesting areas near the size that Neff (1937) reported (DeHaven *et al.* 1975a). They concluded that the population of the Tricolor had been reduced by over 50% since Neff's (1937) work (DeHaven *et al.* 1975a). Cook and Toft (in press) found that the Tricolor population had further declined by approximately 56% between 1994 and 2000 based on their analysis of annual population estimates. They also found that colony sizes were smaller on average in 2000 than in 1994, which they attribute to a declining overall population for the species.

Cook *et al.* (undated - probably 1993; Hamilton *et al.* 1995 cites as Cook *et al.* 1993) attempted to conduct an analysis of the Tricolor population, using survey information obtained in 1992. Their general conclusion, "given currently available data, is that no population viability model can be provided which reliably predicts future risk of decline for tricolored blackbirds" (Cook *et al.* - probably 1993).

Researchers have reported a reduction in the size of the largest observed colonies, providing evidence of a declining population over short- and long-term time frames. The Department found information showing an apparent downward trend in the Tricolor's breeding population beginning in the 1930s. For a highly colonial species with clumped distribution like the Tricolor, the size of the largest detected nesting colony probably is the best indicator of population status. This size, and the number of larger breeding colonies, appear to have decreased over time, based on an examination of data in the Department's California Natural Diversity Data Base (CNDDB) and Biogeographic Information & Observation System (BIOS) (Figure 2) (see Appendix).

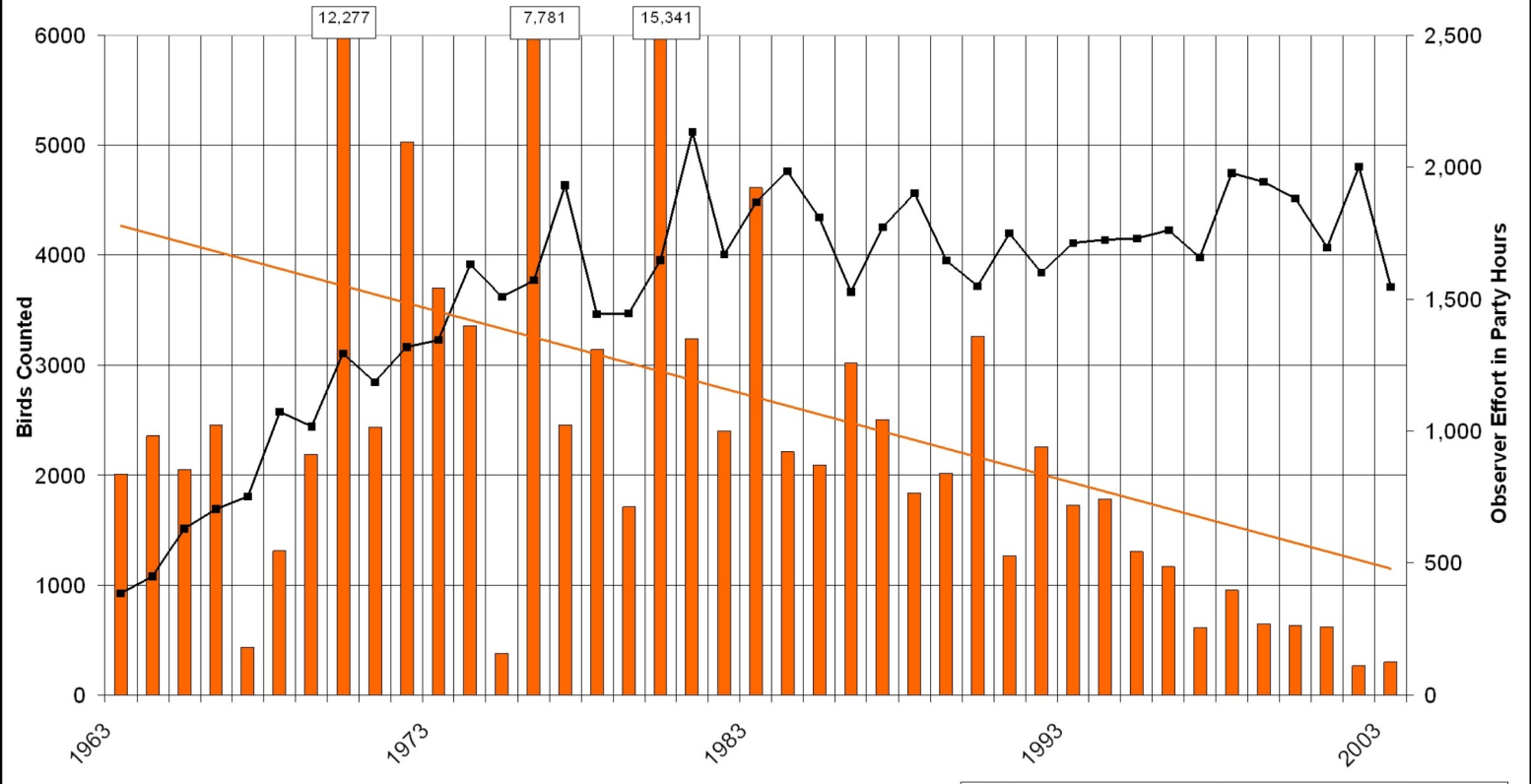
In addition to examining data on colony size and numbers of colonies by year, we analyzed Christmas Bird Count (CBC) data for the period of 1963 to 2003, to determine whether we could detect a trend in the Tricolor's winter population. CBC data are meant to be collected systematically and are intended to provide information on population trends of wintering birds. We selected eight CBC surveys that included detections of Tricolors for at least 35 years of the 1963-2003 period. For seven of these eight counts, the data indicate a declining trend for the species while survey effort in terms of numbers of observers increased (Figure 3) (see Appendix). However, the value of this information for determining a trend requires additional evaluation. Winter flocks of the Tricolor are nomadic over a large area in the Central Valley and central coast region, making finding birds at a given site problematic. In addition, the Tricolor sometimes is found in mixed

Figure 2
Tricolored Blackbird - Largest Reported Colony Size



Sources: Beedy and Hamilton 1997, Hamilton et al. 1999, and Hamilton 2000; Beedy and Hayworth 1992 and Hamilton et al. 1995

Figure 3
Christmas Bird Count and Observation Hours 1963-2003
Count With At Least 35 Years of Data (n = 8)



Source: National Audubon Society, http://www.audubon.org/bird/cbc

flocks of two or more species of blackbirds in winter, making identification of the Tricolor more difficult for the purpose of counting.

Abundance ("Population Status and Trends" in the petition, beginning on page 12)

The petition describes the historical and recent population estimates for the Tricolor and the decline that these estimates have revealed. In general, the Department found that the petition provides adequate information as to the historic and recent occurrences of the Tricolor.

Killing blackbirds of all species in California for food was a phenomenon in the mid-19th Century, continuing until at least the 1930s. Neff (1937, citing Heermann 1853 - not examined) wrote that the Tricolor "is shot in large numbers for the market". Neff (1942) reported that "market hunting of blackbirds in the interior valleys of California became a thriving business in 1928 or 1929, and a dependable market for them was developed largely through … produce firms in the larger cities". "One group of market hunters shipped nearly 400,000 dressed blackbirds from one Sacramento Valley shipping point in five seasons, and during the winter season of 1935-1936, they shipped about 88,000 birds" (Neff 1942). The latter figure is larger than any recently-reported Tricolor colony and would be a significant proportion of the existing population today.

The Tricolor also was killed in depredation efforts to reduce impact on rice and other crops. Neff (1942) wrote that "numerous blackbirds are shot by ranchers or by bird herders hired by them to drive the flocks away from their crops, which consist of rice, milo maize, soft-shelled almonds, and some others". Neff (1942) also found that Tricolors were being killed "by poison baits used as a means of blackbird control in fields of milo maize and rice". McCabe (1932) commented on the ease of poisoning Tricolors to protect rice crops. DeHaven (1971) noted that "examination of blackbird stomachs has shown that, even when blackbirds are feeding in rice, they also eat rice water weevils and other insects considered [to be] detrimental to the crop". Beedy and Hamilton (1997) reported that poisoning Tricolors "continued until the 1960s, and thousands of tricolors and other blackbirds were exterminated to control damage to rice crops in the Central Valley. However, improved harvesting methods, earlier[-]ripening rice varieties, and fewer blackbirds have resulted in few recent reports of blackbird crop depredation, and no control programs are currently operating".

Neff (1937), in the first major work on the Tricolor, did not estimate the overall breeding population in the Central Valley. However, in just eight counties in 1934, he estimated that there were more than 700,000 adults per year. Further, he reported a colony of 200,000 nests in Glenn County (Neff 1937), correlating to about 300,000 adult birds as determined by Hamilton *et al.* (1995).

Orians (1961a) reported that, in 1959 and 1960, there were four Tricolor colonies larger than 100,000 adults. All were in the rice-growing area in Colusa and Yolo counties. In the 1970s, the largest reported colony was one in Colusa County comprising an estimated 30,000 adults (Beedy and Hayworth 1992). 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 [Tricolor] 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 Tricolors. 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). Surveys conducted after 2000 were limited in extent and were conducted more or less opportunistically.

The Department is aware that two Tricolor survey efforts were conducted in 2004. However, we have not received a final estimate of adult Tricolors from either survey. Neither of the 2004 survey efforts was meant to be a comprehensive look State-wide or even Central Valley-wide or to gather information useful for determining a trend. The goals of the April survey sponsored by the USFWS were to visit all historic Central Valley breeding colonies in which 2,000 or more birds previously had been documented, estimate the sizes of any encountered colonies, and document habitat and occupation status of these sites. This survey departed in significant ways from April surveys in 1994, 1997, 1999, and 2000. The aims of those surveys were to locate all Tricolor colonies, estimate their numbers, and determine nesting outcomes where possible. In the second 2004 effort, data collection by USFWS personnel on several NWRs and by privately-employed persons continued at selected locations after the first survey had ended. The additional work was meant to further document additional and later colony locations, successes and failures of particular colonies, and habitat use.

Hamilton (*in litt.* 1991) wrote that "the limited information we were able to obtain in 1991 suggest the decline of tricolored blackbirds is continuing. Hamilton (2000) reported that numbers of the Tricolor "fell precipitously during the 1990s, from 370,000 estimated individuals in 1994 to 240,000 in 1997 and 162,000 in 2000". As a result of the 1999 survey, Hamilton *et al.* (1999) reported a population of "less than 110,000 individuals". These researchers believed that the basis of the decline in numbers between 1994 and 1997 was the following: "(1) loss of habitat to land use conversions for development, (2) intensification of agricultural operations[,]and (3) conversion of rangeland and pasture to vineyards and orchards" (Hamilton *et al.* 1999). They also stated that predation by the black-crowned night heron (*Nycticorax nycticorax*) and raccoon (*Procyon lotor*) in cattail marshes and by the common raven (*Corvus corax*) and coyote (*Canis latrans*) in other Tricolor habitats heavily impacts reproductive success (Hamilton *et al.* 1999). Hamilton (2000) said, "Tricolors are a diminished natural spectacle in the Central Valley and in southern California, the former strongholds of the species".

Hamilton *et al.* (1995) wrote that overall numbers of the Tricolor are "limited by density[-]dependent competition for resources, especially foraging habitats near colonies".

There is no question that the Tricolor experienced a substantial reduction in numbers in the Central Valley from the 1930s to the 1970s, and again from the 1970s to the present. What is not clear is the extent of the decline since 1994, the date of the

first major survey after the work of DeHaven *et al.* (1975a). The Department believes that the April single-day or single-week surveys of Tricolor colonies by volunteer bird watchers and personnel from several organizations and agencies have little value in estimating population size. For the more-rigorous surveys done in 1994, 1997, and 2000, we see a potential for large variations in the results of counts due to the degree of each observer's experience, the area covered in each count, and the possibility that some colonies are not counted. Due to these factors, it is difficult to compare results from one count to another. For this reason (see page 9), we have concluded that the largest detected colony size is the best indicator of population status for the Tricolor. It is unlikely that moderately-large colonies would be missed, as individuals from these colonies form a more or less continuous and characteristic stream of birds between foraging and nesting areas sometimes miles apart.

In coastal southern California, historically, the Tricolor occurred throughout the region and was considered locally common to abundant. Grinnell and Miller (1944) described the status of the Tricolor 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 (Beedy unpublished ms., citing Baird 1870 and Baird *et al.* 1874 - neither examined). Cooper (1870) described Tricolors as "the most abundant species near San Diego and Los Angeles and not uncommon in Santa Barbara …". By the late 1970s, the Tricolor 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). Grinnell and Miller (1944) wrote that numbers of the Tricolor "have in general decreased in southern California and increased in the Sacramento Valley as a result of human management of water supplies".

Campbell (undated but after 1998) wrote that "a clear peak in Tricolored Blackbird records in desert areas [of southern California] occurs in spring, especially April and May, with a smaller peak in September and October, with [a] small number of birds through the winter". Campbell (undated) also reported that, for the western Mojave Desert, "no definite pattern is evident in population trends, but based on known losses of wetland habitats and population declines elsewhere [within its California range], it appears likely that there has been a significant decrease in the total number of Tricolored Blackbirds in the [western Mojave Desert] over the last several decades".

The Department reviewed available records and, based on a county-by-county assessment of the current status of the species in this region, found that the Tricolor has experienced a range reduction in southern California and is no longer found in much of the region's coastal zone. It appears that population numbers and numbers of colonies have declined sharply. The species has now become rare and sporadic at sites formerly supporting robust populations.

As mentioned above, the Tricolors in southern California and in Baja California (southern population) may represent a metapopulation separate from that in the Central

Valley (northern population) (Beedy and Hamilton 1997). If this is so, losses or gains in the southern population may not affect a northern metapopulation; the reverse also may be true. Neff (1937) estimated the abundance of Tricolors in California at 252 colonies and reported many quite large colonies. DeHaven *et al.* (1975a) located 168 breeding colonies, about 78% of which were in the Central Valley.

Life History ("Description, Taxonomy, and Natural History" in the petition, beginning on page 4)

Description

The adult male of the Tricolor is entirely black, glossed bluish (in full sunlight), with brownish-red feathers forming a reddish patch on wing shoulders (epaulets) and buffy-white to pure-white feathers providing a lower border to the red (Mailliard 1910; Beedy and Hamilton 1999, citing DeHaven 1975 - not examined). The adult female "is mostly black, with distinct grayish streaks; relatively whitish chin and throat, rarely with faint pinkish or peach wash; and small but distinct reddish shoulder patch" (Beedy and Hamilton 1999, citing DeHaven 1975 - not examined). Although the Tricolor is most similar to the red-winged blackbird (*Agelaius phoeniceus*) (Red-wing), the Tricolor's markings are different enough to be distinguished from that of other blackbirds by experienced observers.

Taxonomy

The Tricolor is a full species of bird, being placed by taxonomists in the avian family Icteridae (blackbirds, cowbirds, meadowlarks, and orioles). There are no recognized subspecies. The Tricolor is a sister taxon to the Red-wing (Beedy and Hamilton 1999, citing Lanyon 1994 - not examined). This means that taxonomists have hypothesized that the Red-wing is the closest genealogical relative of the Tricolor.

Colonial Breeding

The Tricolor is the most highly colonial of North American passerine birds (song birds) (Neff 1937, Lack and Emlen 1939). Further, it "forms the largest colonies of any North American passerine bird [song bird]. Breeding colonies may attract thousands of birds to a single site. In the 1930s, one colony was estimated to include more than 200,000 nests" (Beedy and Hamilton 1999). Hamilton (2000) observed that "Tricolor colonies vary in size from 100 or even less … to as many as 105,000 individuals (1994, San Luis [NWR]) and in the past to as many as 300,000 individuals" (in Glenn County in the 1930s).

The colonial breeding system of the Tricolor probably evolved in the Central Valley where the locations of surface waters and rich sources of insect food were ephemeral and varied annually (Orians 1961a). Before its rivers were dammed and channelized, the Central Valley flooded in many years, forming a vast mosaic of seasonal wetlands, freshwater marshes, alkali flats, native grasslands, riparian forests, and oak savannas.

Most of these habitats supported nesting and foraging Tricolors (Orians 1961). The evolution of a colonial breeding system enabled the Tricolor to assess changing local conditions rapidly, and to exploit outbreaks of locusts and other ephemeral insects over large areas to meet their food demands.

Colonial breeders may include a small number of colonies that make up a relative larger proportion of the population and impacts to adults, offspring, or habitat can have catastrophic effects on the species. Beedy and Hamilton (1999) wrote that the status of the Tricolor is of concern, "because its population has declined and its colonial nesting behavior makes it vulnerable to nesting failures affecting thousands of nests at large colonies". Cook and Toft (in press) concluded that colonially-nesting birds especially are vulnerable to extinction and cite the passenger pigeon (*Ectopistes migratorius*), Carolina parakeet (*Conuropsis carolinensis*), and great auk (*Pinguinus impennis*) as recent examples.

Habitat Requirements

Hamilton (2003) summarized Tricolor habitat requirements as a nesting substrate that is relatively impenetrable or is flooded, is adjacent to water, and is within a 15-minute commute of foraging areas such as rangeland, alfalfa or cut hay, or irrigated. Despite the simplicity of these habitat requirements they are, in aggregate, different from those of all other California bird species (Hamilton 2003).

Nesting Habitat, Nests, and Eggs

Beedy and Hamilton (1999) stated that the Tricolor colonies require nearby water, a suitable nesting substrate, and open-range foraging habitat of natural grassland, woodland, or agricultural cropland. Tyler (1907), in examining a Tricolor colony in Fresno County, found several nests "built on the bare ground". However, most nests were attached to stems between one and three feet from the ground. Many nests "were ten and twelve feet up in the willows" (Tyler 1907).

Bent (1958) wrote that the Tricolor "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". These authors described Tricolor habitat as being, "in nesting season, [in] 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." (Grinnell and Miller 1944).

Hamilton *et al.* 1995 found that "ungrazed grassland, especially that released from grazing within the year, is ideal foraging habitat" for a Tricolor colony. Hamilton (2003)

described the Tricolor's native nesting habitat as "emergent marsh vegetation and spiny vegetation near water and nearby suitable foraging habitat". Beedy and Hamilton (1999) wrote that "virtually all suitable habitats in the form of perennial grasslands, marshlands, and riparian habitats in [the] Central Valley once supported foraging and nesting Tricolored Blackbirds". In some parts of the Central Valley, most historical foraging and nesting habitats have been eliminated (Beedy and Hamilton 1997).

For southern California, Garrett and Dunn (1981) wrote that "Tricolored Blackbirds breed in dense colonies in extensive reed beds".

Hamilton *et al.* (1995) found that dairies and feedlots were components of many breeding-season habitats. Tricolor nesting in cereal crops and dairy silage was known in the 1950s (Bent 1958). Several authors, including Bent (1958) and Hamilton *et al.* (1995) have described the destruction of nests and nest contents in agricultural operations. "Harvesting of silage and plowing of weedy fields currently are the most common reasons for destruction of [Tricolor] nesting colonies" (Beedy and Hamilton 1999).

Harrison (1979) described the nest of the Tricolor as being made of "freshly[-] pulled grass, forb stems, lashed to surrounding vegetation, lined with fine grasses", and as indistinguishable from the nest of the Redwing. Baicich and Harrison (1997) wrote that the female Tricolor builds the nest, which is described as a "deep cup, bound to upright stems of growing plants, the outer layer of long leaves and stems woven tightly around supports, and long coiled leaves inside. There is a middle layer of broken and decayed leaves, roots, and muddy plant material, compacted together; and an inner lining of fine grasses".

Harrison (1979) described Tricolor eggs as being "commonly 4" in a nest, "Oval. Shell smooth, moderately glossy. Pale green; sharply, sparingly marked with blotches, scrawls of browns, black", and stated that the eggs are indistinguishable from those of the Red-wing. Baicich and Harrison (1997) stated that Tricolor eggs are "usually 4, rarely 5-6" and are similar in appearance to those of the Red-wing: "subelliptical to long subelliptical [in shape]. Smooth and glossy. Very pale blue, sometimes tinted pinkish or purplish; sparingly scribbled, scrawled or with a few blotches or spots of black, blackish-brown, or blackish-purple, and paler purple and gray".

Only the female builds the nest (Lack and Emlen 1939), and only the female incubates the eggs (Lack and Emlen 1939, Harrison 1979, Baicich and Harrison 1997). The young Tricolors are tended by the "female alone or by both parents" (Baicich and Harrison 1997).

Breeding and Post-Breeding Behavior

The Tricolor is highly nomadic (Neff 1937, 1942; DeHaven and Neff 1973). A flock of Tricolors can appear in an area in which it has been absent for months and begin to form a nesting colony (Orians 1961b). DeHaven (2000a) noted that, during his work on

the Tricolor in the Central Valley in the1970s, “it was common for Tricolors to travel from place to place, perhaps in somewhat of a regular circuit or pattern, during the breeding season. The general picture … was that of large, semi-nomadic congregations of birds nesting, renesting, and intermingling, until at least one (and possibly more) successful nesting occurred”.

Orians (1961a) interpreted fluctuations in numbers of Tricolors 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 Tricolor 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 (Beedy and Hamilton 1999). In southern California, the tricolor may nest anytime throughout April and May. Smaller colonies in foothill and other locations may not form “until as late as [the] end of May” (Beedy and Hamilton 1999). Orians (1960) reported successful autumnal breeding in the Tricolor 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 Tricolors breeding in August 1993 “along the Marin coast”.

DeHaven *et al.* (1975b) found that the Tricolor exhibits a major postbreeding-season movement into the Sacramento Valley. In winter, Tricolor 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). According to Beedy and Hamilton (1999), by late October “large foraging flocks occur in pasturelands in southern Solano County. 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. Nonbreeding flocks of [over] 15,000 individuals may gather at one location and disperse to foraging sites”. These flocks can consist of only Tricolors in either mixed-sex or single-sex groups, or they can be Tricolors mixed with the Red-wing, Brewer’s blackbird (*Euphagus cyanocephalus*), and European starling (*Sturnus vulgaris*). Beedy and Hamilton (1999) wrote that the Tricolor’s preferred winter roosting sites included “cattail and bulrush marshes near suitable foraging areas in pasturelands and croplands”.

Food and Foraging

The Tricolor is ecologically adapted to exploiting an abundant food supply, such as

highly-cyclic insects injurious to crops (Orians 1961a, Skorupa *et al.* 1980). The local abundance of such insects may trigger nesting by a large group of birds. Although adult Tricolors eat seeds as well as animal matter, they feed primarily insects and other animal matter to nestlings. Skorupa *et al.* (1980) found that Tricolor nestlings in a Merced County colony ate animal foods from 20 insect families representing 10 insect orders. "The most often consumed (percentage incidence) were: beetles and weevils (order Coleoptera), cutworms and loopers (order Lepidoptera), and various flies (order Diptera). Animal matter made up 91% of the food volume [for] nestlings and fledglings, 56% of the volume of the adult female food volume, and 28% of the adult male food volume. These differences reflect the nutritive requirement of developing birds for a rich protein diet to support their rapid growth" (Skorupa *et al.* 1980). Crase and DeHaven (1977) found that animal matter constituted 86% by volume of food of nestling Tricolors in the rice area of the southern Sacramento Valley and northern San Joaquin Valley. Tyler (1907) found that Tricolors at a Fresno County colony were gathering "a short, heavy worm".

Crase and DeHaven (1978) studied food habits of five species of blackbirds in Colusa, Glenn, and Butte counties, "the major rice-growing areas of the Sacramento Valley. This area is intensely farmed. Rice is the primary crop, but grain sorghum, safflower, barley, wheat, and fruit and nuts crops are also grown". These workers found that rice seed was an important food for the Tricolor, ranking first in volume of the annual diet. Second in importance was seed of water grass. Of cultivated plants, sorghum seed was second in volume for the Tricolor (Crase and DeHaven 1978). Insects made up most of the animal food of the Tricolor, with the larvae of both ground-dwelling and water-dwelling beetles being the most important. Mailliard (1914), examining a colony in Stanislaus County, observed adults eating barley kernels in the pulpy stage and bringing these "milk" kernels to nestlings.

Besides rice and sorghum, other crops suitable for foraging Tricolors include alfalfa, safflower, sunflowers, and grains (Hamilton 2000). Tricolors occasionally forage in orchards and in most row crops (tomatoes, cotton, sugar beets, etc.), but they spend no substantial time doing so. Rangeland and oak-woodland are important foraging habitats at some locations. Vineyards are not used for foraging. "All colonies require nearby water sources" (Hamilton 2000).

Predation

Mailliard (1900) reported the killing of nestling Tricolors by a Swainson's hawk (*Buteo swainsoni*) and a black-crowned night heron. Neff (1937) documented predation on Tricolor nestlings by the Cooper's hawk (*Accipiter cooperii*), burrowing owl (*Athene cunicularia*), American crow (*Corvus brachyrhynchos*), and mink (*Mustela vison*). Payne (1969) added the feral domestic cat (*Felis catus*), northern harrier (*Circus cyaneus*), barn owl (*Tyto alba*), short-eared owl (*Asio flammeus*), yellow-billed magpie (*Pica nuttalli*), and several species of snakes to the list of Tricolor predators. Beedy and Hamilton (1997) listed the coyote, wolf (*Canis lupus*), and gray fox (*Urocyon cinereoargenteus*) (citing Hermann 1853 - not examined), and merlin (*Falco columbarius*), as predators of the Tricolor. Hamilton *et al.* (1995) believed that the marsh wren

(*Cistothorus palustris*) was responsible for breaking Tricolor eggs through pecking. The non-native red fox (*Vulpes vulpes*) has established breeding populations in the Sacramento Valley and has spread considerably across the State. Although the red fox has not been identified as a predator of the Tricolor, it is known to prey on sensitive species including several colonial-nesting marine birds.

Beedy and Hamilton (1999) reported that the response of the Tricolor to predators such as the American crow, common raven, and northern harrier is to sit silently, unlike the Red-wing in the same marshes which may fly up and attack these predators. Nesting Tricolor adults may leave when humans enter active colonies. However, when older nestlings are present, individual Tricolors or groups of birds may mob human intruders.

Factors Affecting Ability of Population to Survive and Reproduce ("Satisfaction of Federal and State ESA Petition and Listing Factors" in the petition, beginning on page 16)

The petition provides adequate information in general on 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 Tricolors 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, starvation of young, possible removal of live young from nests by female Tricolors, and possible or future competition with species such as the great-tailed grackle (*Quiscalus mexicanus*). The petition also asserts that "the Tricolored Blackbird is not protected by existing regulatory mechanisms".

Habitat Loss

Neff (1937), observing that "the destruction of [Tricolor] 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, Beedy and Hamilton 1999, DeHaven 2000, Humble and Churchwell 2002). Beedy and Hamilton (1999) stated simply that declines of the Tricolor "can be attributed to loss of nesting and foraging habitat throughout the breeding distribution of this species in the Central Valley of California and in s[outhern] California".

Beedy *et al.* (1991) found that the Tricolor had disappeared from some areas in which the species once was numerous. Hamilton *et al.* (1995) believed that "most or all suitable breeding habitats within the geographic distribution of Tricolored Blackbirds are saturated". The chief evidence for this was that "most habitats with suitable nesting sites,

open water and foraging areas (ungrazed grassland or the equivalent) are occupied by nesting colonies at some time during the breeding season" (Hamilton *et al.* 1995).

Beedy et al (1991) reported that a principal factor implicated in the decline of Tricolor populations and the loss of individual colonies is elimination of wetland habitat, which greatly reduced available nesting and foraging habitat. The smaller colonies that have resulted from reduced nesting and foraging habitat may be more vulnerable to disturbance by natural predators and less able to compete with other species for limited wetland nesting habitat. Beedy and Hamilton (1997) wrote that a decline of 37% in numbers of the Tricolor was documented in 1997, from numbers in comparable counts in 1994. "Rangewide declines have followed the continuing and widespread losses of nesting and foraging habitats, as wetlands, grasslands, irrigated pastures, and rangelands are converted to vineyards, orchards, and cotton fields. Evidence exists that recent, local extirpations have occurred in Yolo County, portions of Sacramento County, and Southern [*sic*] California (Santa Barbara, Ventura, Los Angles, Orange, and San Diego Counties [*sic*])".

Hamilton (2000) speculated, "Perhaps tricolor population decline is the outcome of habitat loss and largely independent from fledgling losses" at colony sites due to such factors as agricultural activities, predation, or weather events.

The Department believes that habitat loss continues and is the most serious threat to Tricolor populations.

The Department was not able to examine thoroughly information on conversion of crop- and pasture-lands to non-agricultural uses, which has occurred throughout the range of the Tricolor. Such conversion is reported in the Farmland Mapping and Monitoring Program of the California Department of Conservation. For the period of 1998-2000, ninety-one thousand acres of farm lands were converted to urban uses statewide. This was a 30% increase from 1996-1998; 27% of this total was conversion of irrigated farmlands. In the six-county Sacramento region (El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba counties), urbanization totaled nearly 60,000 acres (about 94 square miles) in the approximate period of 1984-2000. Although we do not have similar information for the San Joaquin Valley, we are aware that similar habitat changes have occurred there. We did not find information on conversion of agricultural types used by the Tricolor to unsuitable types, such as vineyards. Due to the lack of specific information on the extent of type-to-type conversion, the Department cannot determine the significance of this factor or whether it and conversion of agriculture to non-agriculture by themselves pose a population-level threat to the Tricolor. This area requires more attention.

Agricultural Activities

The petition provides an adequate review of the phenomenon of Tricolors nesting in grain silage fields and the fact that normal harvesting activities typically occur at the same time. Harvesting fields containing nesting colonies results in nest destruction and

direct Tricolor mortality. Table 4 in the petition summarizes at least some of the losses of colonies due to harvesting thought to have occurred between 1993 and 2003.

Entire Tricolor colonies (up to thousands of nests) in cereal crops and silage have been destroyed by harvesting and plowing of agricultural lands (Beedy and Hamilton 1999). Hamilton (2003) noted that, despite intervention in the 1990s by the Department and the USFWS "to protect several of the largest colonies in agricultural habitats about to be destroyed by agricultural operations", tricolor numbers continued to decline.

The Department believes that harvesting of fields containing Tricolor colonies continues to occur and is a serious threat to Tricolor populations. To suggest how to reduce the impact of harvesting effectively, the Department needs further information about the practice and about the Tricolor's breeding dynamics in agricultural settings.

Predation

Predation has been considered to be a major cause of complete nesting failure in some colonies of the Tricolor (Beedy and Hayworth 1992, Hamilton *et al.* 1995). Describing a typical natural system, Beedy and Hamilton (1999) wrote that, in general, "[Tricolor] nesting sites are protected from terrestrial predators by flooded or spiny vegetation. Numerous flooded plant species may serve as nesting sites, especially cattails, bulrushes, and willows". However, Neff (1937) found that "aquatic sites may experience increased predation if they dry out before a Tricolor colony completes nesting".

Hamilton *et al.* (1995) wrote that "catastrophic losses of Tricolored Blackbird nestlings and eggs to native predators are commonplace. Predators probably congregate and have greater impacts upon colonies in agricultural settings than in more natural areas". These authors, describing results of the Tricolor survey in 1994, reported that predation was the primary cause of losses of nests. They also observed predation by the coyote on a Tricolor colony, the first such report. Beedy and Hamilton (1999) reported that depredations by the black-crowned night heron and common raven have resulted in "losses of nest contents of entire colonies (up to 100% of nests)". Colonies of any size can apparently be heavily impacted by predation.

Commenting upon the loss of Tricolor reproduction to predators in 1993 in the Central Valley, Hamilton (1993) said, "Predators once again … savaged most deep[-] water cattail marsh tricolor colonies, resulting in negligible fledging success on the national wildlife refuges (Kern, Kesterson, San Luis, Delevan) where tricolors select cattail nesting substrates. These cattail sites situated in the Valley appear to be detracting from rather than contributing to the maintenance of tricolored blackbird numbers". More mature stands of cattails may allow better perching access by predators. Some Tricolor colonies associated with nesting colonies of the white-faced ibis (*Plegadis chihi*) appear to receive some protection from night heron predation.

The Department believes that predation is a major threat to the success of some

Tricolor nesting colonies and that agricultural crops as a nesting substrate may not provide the level of protection found in native vegetation or the Himalayan blackberry (*Rubus discolor*). We recognize 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.

Agricultural Contaminants

The petition, while acknowledging that "the link between environmental contaminants and nesting failure of Tricolors is largely unstudied", provides a summary of pesticide use in Sacramento, San Joaquin, Merced, Fresno, and Tulare counties. The loss of Tricolor 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 data-base 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-wings". 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

Hamilton *et al.* (1995) stated that high mortality of Tricolor 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). The Department believes that the impacts of weather events on reproductive success in any year typically are local and do not comprise a major threat to survival of the Tricolor.

Starvation of Nestling Tricolors and Removal of Young from Nests by Females

The petition reports that there may be some correlation between the size of

foraging area and nestling starvation as adults may travel greater distances to find food. Beedy *et al.* (1991) reported that an abundant concentrated supply of insects is clearly important to the success of tricolor breeding colonies. Orians (1961a) and others have documented unexplained abandonment of entire Tricolor colonies at advanced states of nesting. These mass desertions occur most frequently in the early and late periods of the breeding season, suggesting that insect food supplies may be insufficient to support the breeding adults and their young. Although Beedy and Hamilton (1999) reported brood reduction through starvation of nestlings and infanticide (removal of living young from nests), the Department has no reason to believe that these factors are major threats to the Tricolor.

Disease

The petition has a section on "Disease or Predation" (page 23) but does not discuss any known or potential disease issues for the species. Campbell (undated, after 1998) suggested that distribution of the Tricolor could be an adaptation to conditions influenced by parasite or disease epidemiology. Beedy and Hamilton (1999) stated that no diseases have been reported for the Tricolor but that in some years many nestlings have mites. The Brewer's blackbird has been found dead from West Nile virus around the State in 2004, but not nearly in the numbers seen in corvids (crows, ravens, and jays). Nationwide, blackbirds and grackles have been confirmed as being susceptible. Since the Red-wing is affected by the West Nile virus, the Tricolor likely would be affected also. However, any dead Tricolors are less likely to be collected, since the species usually is not found near towns and cities where nearly all sampling of birds is being done for the virus.

The impact of disease and parasites on breeding or wintering Tricolors is unknown. The Department recognizes the potential for these factors to affect local populations of this highly-social species significantly.

Competition from Other Species

The Department is aware that the great-tailed grackle has experienced a population expansion in Los Angeles County, a phenomenon which ultimately could negatively influence success of Tricolor colonies of the southern population. Beedy and Hamilton (1999) reported that grackles "are aggressive toward nesting Tricolored Blackbirds and may be a serious future threat". However, data are lacking on any current impact of the grackle. Thus, we have no reason to believe that this species comprises a major threat to survival of the Tricolor.

Degree and Immediacy of Threat ("Satisfaction of Federal and State ESA Petition and Listing Factors" in the petition, beginning on page 16)

The Department concurs with the petition that habitat loss and fragmentation has resulted in a decline in the population of the Tricolor since the 1930s, and that these factors continue to operate. The persistent use by the Tricolor of attractive alternative

habitats such as agricultural fields, where reproduction often fails due to human activities and to increased predation, also may be contributing to this decline. When other habitat is unavailable, agricultural fields may provide the best conditions for breeding and/or foraging.

Hamilton (2003) compared the plight of the Tricolor to the fate of the Carolina parakeet and passenger pigeon, "two abundant widespread colonial Eastern North American species, once central features of the North American avifauna", which became extinct early in the 20th century. "Passenger pigeons and Carolina parakeets were ignored during several decades prior to their extinction, in part because their abundance seemed to preclude any possibility of extirpation. Like tricolors, passenger pigeons were colonial itinerant breeders, repeating reproductive efforts at several locations in the same year" (Hamilton 2003).

Hamilton *et al.* (1995) stated that "Tricolored Blackbird populations today are heavily dependent upon agricultural activities. Nesting in native plants has shifted to exotic species, and colonies supported by the combination of natural vegetation and natural water flows are uncommon. Foraging activities of Tricolored Blackbirds at many colonies depend upon crops such as alfalfa. Nesting Tricolored Blackbirds sometimes obtain major supplements from feedlot and dairy rations. While these colonies in agricultural areas can contribute strongly to Tricolored Blackbird numbers[,]they are often at high risk from routine agricultural operations such as harvesting."

DeHaven (2000b) wrote, "Today, a new phenomenon – [Tricolor] 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 Tricolors are still present. This may cause both nest destruction and direct mortality". The Tricolor experiences "large annual losses of reproductive effort to crop-harvesting activities and suffer habitat losses to land conversions from rangeland to vineyards, orchards, and urban development" (Beedy and Hamilton 1999).

In the 2000 survey, Hamilton (2000) found that over 90% of all Tricolor foraging activity was on private property. As of July 2004, CNDDB had 329 identified summer occurrences for Tricolors. Of these records, only fifty-nine (18%) seem to be on public lands.

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 Tricolor]. 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".

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 (in press) found that reproductive success varied among nesting substrates and that significantly more offspring were fledged in non-native Himalayan blackberry and that many additionally-used 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 (Cook and Toft in press).

Impact of Existing Management Efforts ("Satisfaction of Federal and State ESA Petition and Listing Factors" in the petition, beginning on page 16)

This section describes existing efforts as well as past attempts to manage or conserve the Tricolor.

Purchasing Agricultural Crops

The petition states that the existing but intermittent practice by the USFWS and the Department, to purchase agricultural crops in which the Tricolor is nesting, is not adequate to prevent the loss of Tricolor 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 Tricolor 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 have contributed to crop purchases in each year from 1999 through 2004. In 2004, silage purchases by the Department and USFWS protected three colonies totaling over 100,000 adult Tricolors. Several parcels containing large breeding colonies in Fresno and Tulare counties were the focus of this effort. Tricolor nesting success at these locations as a result of these purchases is still being analyzed. Predators and contaminants may have affected the overall success at one or more of these locations.

DeHaven (2000a) questioned the biological value (to the Tricolor) of having State and federal agencies pay dairies to delay or forgo silage harvesting in fields in which the Tricolor is nesting. DeHaven (2000b) commented that providing monetary payments to dairies "sets an undesirable precedent". He recommended that Tricolors be lured away from nesting in grain and silage fields through "making key San Joaquin Valley dairy

silage fields less attractive to breeding Tricolors; and providing alternative, low-risk nesting substrates in these areas" (DeHaven 2000b).

In 2004, the USFWS established a collaborative working group comprised of representatives of various agricultural organizations, government agencies, and other entities to address the vulnerability of the Tricolor to agricultural operations in the San Joaquin Valley during the breeding season. The Department is participating in this group. An effort in the early 1990s to develop a conservation plan for the Tricolor using agricultural lands did not succeed. The USFWS sponsored a meeting in July 2000 to address the Tricolor's use of silage fields, but no action resulted.

Regulatory Mechanisms

The petition addresses enforcement of the federal Migratory Bird Treaty Act (MBTA) and, in regard to unfair competition derived from violating the MBTA, of California's Business and Professions Code. Other regulatory mechanisms include Fish and Game Code (FGC) § 3503, which makes it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird except as otherwise provided by the FGC or any regulation made pursuant to it, and FGC § 3513, which makes it unlawful to take any nongame bird as designated in the MBTA.

The petition notes that the Department has designated the Tricolor as a species of special concern, a designation not having the force of law but triggering consideration of the species "during project actions subject to the California Environmental Quality Act (CEQA)". The petition states that CEQA protections "have not been implemented with regards to protection of the Tricolor".

Conservation Planning

The petition does not discuss current or proposed conservation planning efforts that include the Tricolor. Cook and Toft (in press) indicated that the Tricolor is a potentially important test case for the conservation community, because recovery of this species presents possible conservation policy conflicts.

Hamilton (2000) stated, "Tricolored Blackbirds deserve to be given a higher priority in conservation affairs than they have so far been given". Hamilton (2003) commented that "conservation planning for [non-hunted] birds now favors long-distance migrants, exclusively riparian or grassland species and highly localized or scarce species and subspecies. Tricolors are at best tangentially included in these activities and do not benefit from most restoration and preservation initiatives". Hamilton *et al.* (1995), in speaking of the Tricolor, commented that "there is no other colonial bird species known to us whose colonies are not protected from deliberate destruction".

"Although some vineyards, orchards, and crops are designated as compensation for tricolor habitat losses in [the] San Joaquin and Yolo County draft Habitat Conservation Plans[,]breeding tricolors seldom forage in these crops" (Hamilton 2003). The final San

Joaquin Multi-Species Conservation Plan (SJMSCP), which is a Habitat Conservation Plan (HCP), does not identify vineyards or orchards as habitat for the Tricolor. It does identify certain preserve types that may benefit the species. However, as with most conservation planning efforts, the SJMSCP does not consider fully the availability, quality, and relative proximity of essential Tricolor habitat features. Some preserve types do feature active agriculture that benefits species such as the Swainson's hawk, giant garter snake, greater sandhill crane, and Tricolor. Factors identified in the SJMSCP for selecting, enhancing, and managing preserves for the Tricolor include presence of the following: 1) nesting substrate, blackberry thickets, cattails, tules, 2) foraging habitat consisting of annual grasslands, irrigated pasture, and alfalfa, and 3) wintering habitat, particularly in the Delta of the Sacramento and San Joaquin rivers, harvested grain fields, and irrigated pasture.

A gap-analysis of the southwestern California region by Davis *et al.* (1994) identified the Tricolor as one of the wildlife species at highest risk from inadequate habitat protection. Since then, the Tricolor has been proposed as a covered species under the East Contra Costa, Yolo County, and Placer County Natural Community Conservation Plans (NCCP) and the Natomas Basin and Yuba-Sutter HCPs. Because these plans are in various stages of development, the Department does not yet know how conservation of the Tricolor might be accomplished. The NCCP standard is to provide for the conservation and management of covered species. This equates to an ecosystem approach to recovery in the plan area. In southern California, coverage for the Tricolor has been provided in some existing planning efforts.

The recently approved Western Riverside NCCP/Multi-Species HCP (MHSCP) includes specific conservation objectives developed for the Tricolor, based on the best available scientific information. One element of this MSHCP/NCCP is an adaptive management program that will be used to identify alternative strategies for meeting biological goals and objectives and adjusting them if necessary. The MSHCP/NCCP specifies maintaining and monitoring the continued use by the Tricolor of, and successful reproduction within, at least one of the identified core areas. Functioning habitat is to be ensured by maintaining, preserving, and/or, if feasible, restoring hydrological processes and suitable habitat within the following core areas: 1) San Jacinto River floodplain, 2) Mystic Lake/San Jacinto Wildlife Area, 3) Collier Marsh, 4) Alberhill, and 5) Vail Lake/Wilson Valley/eastern Temecula Creek. The Department encourages other local planning efforts to develop NCCPs, where they are appropriate, that include similar specific conservation objectives for the Tricolor.

Management on Public Lands

Beedy and Hamilton (1997) wrote that “management actions [for the Tricolor] on [federal] public lands have focused primarily on basic protection, reduction of disturbance, and water management. NWR staff routinely monitor tricolor breeding colonies and provide protection for these sites from disturbance or habitat loss. Active management of water levels to maintain stable conditions for breeding colonies during

the breeding season has been implemented on Kern NWR, San Luis NWR Complex, and Sacramento NWR Complex".

DeHaven (2000a) noted that, while there had been a "dramatic expansion" of managed wetlands in the northern San Joaquin Valley since Tricolor studies were done in the area in the 1970s, "unfortunately, Tricolors have not, in my view, benefited proportionally". His reasoning was that management of these State, federal, and private wetlands is for waterfowl, which results in most wetlands being either dry or already flooded "at the time large insect supplies are needed most by nesting Tricolors" (DeHaven 2000a). Hamilton *et al.* (1995) noted that "cattails are the most extensive nesting habitat available at the national and state wildlife refuges", pointing out that "reproductive success in most cattail marshes of the Central Valley is so poor [due to predation] that these cattail colonies bear a sink relationship … to overall Tricolored Blackbird numbers".

The Department has limited information regarding the current presence of Tricolors or management activities for the species on Department and other State lands. The Tricolor apparently does not nest on Department lands in the San Francisco Bay area and central coast area. Tricolors have not been identified as breeding on the Yolo Basin Wildlife Area in Yolo County in recent years. The Tricolor nests on restored wetlands at the San Jacinto Wildlife Area (SJWA) in Riverside County. Except in drought years, the species has nested at SJWA over most of the last ten to twelve years. The habitats used by the Tricolor at SJWA were created by the Department and are part of the wetland management programs there.

Nesting colonies of the Tricolor at Mendota Wildlife Area (MWA) in Fresno County have been located in green cattails over water that is semi-permanent or summer wetland only. No nesting of tricolors was confirmed at MWA this year, but small numbers were seen throughout the spring and early summer, usually in close proximity to two nesting colonies of the white-faced ibis. Nesting on MWA can be subject to heavy predation by the black-crowned night heron. Large portions of decadent cattail stands in the traditional ibis nesting area were mowed this year, and irrigation will be used to stimulate new cattail growth. This management technique should benefit the Tricolor as well, reducing the ability of night herons to perch on nests and encouraging continued ibis protection. Also, barley planted in the fall as a management method to return wetland areas to early successional habitat has appeared to be a preferred forage area for adult Tricolors.

Species of Special Concern

In considering California's avian species for inclusion on the first list of special concern sponsored by the Department, Remsen (1978) recommended further study to determine whether the decline of the Tricolor noted by DeHaven *et al.* (1975) is continuing, "particularly since this species is virtually endemic to California and is a potentially vulnerable, colonial breeder". After further decline of population numbers in the 1980s, the Department added the Tricolor to its list of Bird Species of Special Concern in 1990.

California Environmental Quality Act (CEQA)

Local governments typically act as the lead agency for conducting CEQA review of projects to convert native vegetation. As a trustee agency, the Department must consider an environmental document prepared by the lead agency but does not typically prepare its own environmental documents. We consider the potential impacts of the proposed project and provide information to the lead agency about possible impacts to wildlife species and habitat. We often provide recommendations for avoiding, minimizing, and mitigating impacts of the project. In the CEQA process, the Department's recommendations are advisory. Thus, Department-recommended measures to reduce or avoid impacts do not become mandatory, unless adopted by the lead agency. Changes in agricultural uses, including those that may result in impacts to Tricolors, do not typically trigger CEQA requirements or allow for Department review.

Previous Petition

In 1991, based on information indicating that the Tricolor'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 Fish and Game Commission (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 Tricolor 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 wrote to the Commission, saying that "based on this [*sic*] new population data, we no longer believe that this species is in danger of extinction and we withdraw our petition" (S. D. Sanders and E. C. Beedy *in litt.* 1992). 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 Tricolor. A working group for the Tricolor already in existence committed to this task, but it made limited progress in developing such measures and dissolved in the mid-1990s.

Federal Efforts

In the late 1970s, the USFWS responded to knowledge of the Tricolor's population decline by identifying the species 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 historic information on distribution and abundance of the Tricolor, resulting in the work of Beedy *et al.* (1991). In 1989, the USFWS modified two long-standing depredation orders, to prohibit killing the Tricolor without a federal permit. In 1992, the USFWS believed that it had on file "enough substantial information on biological vulnerability and threats to support proposals to list [the Tricolor] as

threatened or endangered" (W. S. White *in litt.* 1992). The USFWS has also provided funds for Tricolor survey efforts in several years beginning in 1993.

In December 2002, the USFWS distributed its Birds of Conservation Concern 2002 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 2002). Among the species named in the report is the Tricolor.

Other Conservation Efforts

Partners in Flight (PIF), an international coalition of agencies and organizations engaged in conservation of landbirds and terrestrial habitats for birds in North and South America, has named the Tricolor as a Species of Continental Importance in the North American Landbird Conservation Plan (Rich *et al.* 2004). The Tricolor is one of 28 species identified as needing immediate action to reverse or stabilize significant, long-term population declines. PIF also has identified the Tricolor as a focal species in its Riparian Bird Conservation Plan for California.

The National Audubon Society has included the Tricolor on its "WatchList", a listing of American bird species facing population declines and/or threats such as habitat loss.

Suggestions for Future Management (in the petition, beginning on page 26)

The petition contains suggestions for future management of the Tricolor, calling for the following general measures proposed by Beedy and Hamilton (1999):

1) Maintaining a viable, self-sustaining population throughout the geographic range.

2) Avoiding losses of colonies and associated habitats.

3) Increasing the breeding population on suitable public and private lands managed for the Tricolor.

4) Enhancing public awareness and support for protection of colonies and habitat.

The petition supports the recommendation of DeHaven (2000b; cited in the petition as USFWS 2000), to create "low-risk nesting substrates such as marshes and blackberries within key dairy regions" of the Central Valley. The petition cautions that creation of alternative nesting sites should not be done to allow destruction of colonies using agricultural fields. The petition, following Beedy and Hamilton (1999), recommends that, at duck clubs and reservoirs having nesting colonies of the Tricolor, those management and maintenance activities involving mowing, plowing, or burning marsh vegetation be delayed until the breeding cycle is complete.

The petition calls for funding to monitor the status of the Tricolor population and its

pattern of habitat use and to conduct certain research projects to determine survival, reproduction, and population changes, the relationship of site fidelity to reproductive success, and aspects of foraging ecology.

Beedy and Hamilton (1997) recommended habitat restoration efforts, including "management of foraging areas, the development of productive nesting habitat, and a coordinated, partnership approach to protecting large nesting colonies located in agricultural cropland". On public land, conservation efforts for the Tricolor should focus on " maintaining and enhancing existing habitat suitable for nesting and foraging; creating and acquiring additional habitat; and improving reproductive success of [existing] colonies" (Beedy and Hamilton 1997).

Among a number of recommendations, Hamilton *et al.* (1999) included the following:

1) Incorporating specific measures for managing Tricolor breeding and foraging habitat into HCPs throughout California.

2) Protecting "all existing colonies and repeatedly[-]used colony sites.

3) Incorporating Tricolor habitat requirements into CEQA-compliance processes.

DeHaven (2000a) recommended the following actions:

1) Prepare and implement a plan "to create additional, strategically[-]located natural (including exotics, if necessary) nesting substrates (marshes, blackberries, giant cane, etc.) … in the appropriate large dairy regions of the southern San Joaquin Valley".

2) Prepare and implement a plan for conservation easements to protect known Tricolor nesting habitat.

3) Prepare an analysis identifying "the key geographic and site-specific areas where funds can best be spent to achieve long-term preservation and enhancement of Tricolor habitat".

4) Prepare and implement a plan to manage and enhance State, federal, and private managed wetlands for the Tricolor.

5) Prepare written criteria to guide agency payment to dairy farmers "for delaying or foregoing harvest of silage crops to benefit nesting Tricolors".

6) Conduct and report research to investigate certain aspects of the Tricolor's life history, including identifying characteristics of silage fields attracting the species for nesting, and identifying the foraging characteristics of the Tricolor in successful and unsuccessful colonies.

DeHaven (2000b) suggested developing a plan to haze birds, “to discourage Tricolors from nesting in silage fields”.

Hamilton *et al.* (2000) believed that the Tricolor is “an excellent candidate for active management programs”, due to its “unique adaptations including itinerant breeding and its ability to rapidly exploit freshwater marsh and agricultural breeding habitats which are spatially and temporally unpredictable”. Hamilton (2003) stated that “a major research effort is needed to inform current tricolored blackbird management plans”. He described in detail eleven management actions needed to protect the Tricolor, as follows (Hamilton 2003):

1) Monitor the status of Tricolor colonies and associated habitats to identify opportunities for management and affordable protection, so that the fate of large colonies is not left to chance.

2) Designate specific tricolor habitat, both nesting and nearby foraging, for mitigation in planning efforts.

3) Identify and protect ephemeral (irregularly-used) habitats.

4) Arrange for the accommodation of large Tricolor colonies near cultivated rice.

5) Develop Tricolor habitats away from the vicinity of dairies.

6) Provide water and nesting-habitat requirements on rangeland, to attract the Tricolor.

7) Preserve existing colonies in the heart of, and near, urban communities.

8) Design and reconfigure reservoirs to accommodate Tricolor habitat, through providing a shore-shelf to encourage natural establishment of emergent vegetation.

9) Design and restore marshes to deter terrestrial predators, by surrounding emergent vegetation with deep water.

10) Emphasize native plants in restoration efforts.

11) Reduce the number of conflicting native predators now maintained at artificially-high and damaging numbers.

The Department believes that joint ventures, particularly the Central Valley Habitat Joint Venture, serve as very effective models for a public/private conservation partnership that could address the needs of the Tricolor.

Habitat Necessary for Survival ("Habitat Use and Home Range" in the petition, beginning on page 5)

The petition adequately describes the existing situation, in which the Tricolor nests in native vegetation, introduced vegetation, and crops.

The AOU (1998) described the habitat of the Tricolor as "fresh-water marshes of cattails, tule, bulrushes, and sedges". Beedy and Hamilton (1999) 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.), 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 Tricolor 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".

"Tricolors do not form breeding colonies if water is not available within about one kilometer and open water usually is closer [than one kilometer] to colony sites. Pools in seasonal streams suffice as water sources, but most colonies depend upon ponds, rivers, marshes and canals. Despite the simplicity of [the Tricolor's] habitat requirements[,]they are in the aggregate different from those of all other California bird species" (Hamilton 2003).

Hamilton (2003) stated that "to be suitable[,]components of tricolor habitats must be close to one another to allow tricolors to commute to water and foraging areas from colony nesting places". "Tricolored blackbird colony sites require nesting substrates offering protection from predation. These include emergent marsh vegetation (cattails, *Typha latifolia*, less frequently *T. angstifolia*), bulrushes (*Schoenoplectus californicus, S. acutus*) and Himalayan blackberries (*Rubus discolor*) thickets, thistle, and nettles. Tricolors 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" (Hamilton 2003).

"In recent decades, many colonies have been reported in Himalayan blackberries (*Rubus discolor*). In their 1994 Tricolor survey, Hamilton *et al.* (1995) found that "23% of all colonies were in Himalaya berries [*sic*], an exotic plant deliberately introduced into California by Luther Burbank around 1885. These blackberry colonies were typically far more successful than those in cattails. Blackberry colonies, especially in Sacramento County, were population sources for Tricolored Blackbirds in all years of this study".

Tricolor colonies in blackberries "are found throughout the northern part of [California], from Merced County northward. Tricolored Blackbird colonies nesting this substrate have on the average greater reproductive success than elsewhere" (Hamilton *et al.* 1995).

Hamilton *et al.* (1995) stated that "cattails, the preferred native plant nesting substrate [for the Tricolor], are a sink [habitat]". In population dynamics, a sink population is a population or subpopulation "in which deaths exceed births and immigration exceeds emigration" (Pulliam 1996). A sink habitat is "a place harboring a sink population" (Pulliam 1996, citing Pulliam and Dunning 1994 - not examined). In their work in 1994, Hamilton *et al.* (1995) found that "most cattail colonies suffered severe (>90%) losses of nest contents to predation".

Distribution Map

The distribution map included in the petition is one that is available on the website of the East Contra Costa County NCCP. It is based on an older map originally prepared for the Department's Wildlife Habitat Relationships program. Although the map generally illustrates the California breeding and winter ranges of the Tricolor, it does not include all areas in which nesting Tricolors have been documented (*e.g.*, in Shasta, Humboldt, Mendocino, Lake, and Napa counties. The Department used additional available data in preparing Figure 1.

Availability and Sources of Information ("Literature Cited" in the petition, beginning on page 27)

The petition includes most of the major references on the Tricolor. However, the cited references do not include the following significant documents: DeHaven *et al.* (1975b), Hamilton (2003), Hamilton (2004), Hosea (1986), and Skorupa *et al.* (1980). The petition cites DeHaven (2000b) as "USFWS 2000". The petition, on page 19, cites "Collier 1963"; this reference is not in the petition's Literature Cited section. The petition does not cite Campbell's undated report, available online, which has useful information on the Tricolor in southern California.

CONCLUSIONS

Based on our review of the petition and other available information, the Department concludes there is sufficient information to indicate that the petitioned action may be warranted.

Three major factors have operated, and continue to operate, to reduce the population of the Tricolor. These major threats to the Tricolor are as follows:

Loss and Fragmentation of Habitat

This factor appears to be the most serious one threatening the Tricolor. Hamilton e*t al.* (1995) wrote that "nesting Tricolored Blackbirds saturate all suitable habitats within

their area of geographic distribution. Local declines in numbers [of the Tricolor in the breeding season] are entirely attributable to losses of suitable habitat [in which to nest and forage], not to nesting failures". Hamilton (2003) states that habitat losses account for some or all declines in Tricolor numbers. 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 Tricolor 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 Tricolor population likely will continue to decline.

Agricultural Operations

This appears to be the second most-serious factor threatening the Tricolor. Beedy and Hamilton (1997) illustrated the potential magnitude of this problem, writing that, "in 1994, approximately 70% of tricolor nesting colonies and 86% of tricolor foraging activities occurred on private agricultural lands". These authors noted that "the most significant shift in habitat use [by the Tricolor] has been the occurrence of large breeding colonies in silage and grain fields. These colonies are particularly vulnerable to destruction during crop harvest" (Beedy and Hamilton 1997). Nest abandonment also can result from the disturbance of nearby human activities.

Predation

This may be a serious factor threatening the Tricolor. 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 Tricolor breeding colonies.

Other Factors

The degree of threat of agricultural contaminants or disease to the survival of the Tricolor is unknown. Further investigation is required. The remaining factors discussed in the petition as threats to survival of the Tricolor seem to be minor ones, if they play a role at all in population regulation.

In summary, the Tricolor 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 Tricolor 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.

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Appendix

Datasets Used In Developing Figures for the following report: Evaluation of petition from Center for Biological Diversity to list tricolored blackbird (*Agelaius tricolor*) as endangered.

California Natural Diversity Database of the Department Fish and Game (Department), July 2004 (cnddb.shp)

The California Natural Diversity Database (CNDDB) is both a manual and computerized library of the status and locations of California's rare species and natural community types. The CNDDB includes in its inventory all federally- and State-listed plants and animals, all species which are candidates for listing, all species of special concern, and those species that are considered to be "sensitive" by government agencies and the conservation community. The computerized information is available for a fee in hardcopy and digital forms. The CNDDB is a dynamic system with information continually being added and upgraded. The CNDDB contains over 40,000 locational records for over 2,000 elements.

The Department's Biogeographic Information and Observation System, the U. S. Fish and Wildlife Service (Service), and numerous cooperators, tricolored blackbird breeding surveys, 1980-2000

These data come from breeding season observations of the tricolored blackbird (Tricolor). There are 1,091 observation records, with over 1,020 from 1992 through 2000. However, less than 35 records are from years prior to 1992. There are from 113 to 202 records per year from 1993 through 2000, except for considerably fewer records in 1993 and only four records from 1998. Major surveys were conducted in 1994, organized by California Audubon, and in 1997, co-sponsored by the Department and the Service. Less-comprehensive surveys were conducted in 1995, 1996, and 1999. These data do not include a survey organized by the Point Reyes Bird Observatory in 2001. Records include information on observer, date, size of colony, and nesting substrate.

U. S. Department of Agriculture (USDA) - Forest Service, Ecoregions for California, 1994 (usdaeco.shp)

These are a digital map and database of California-wide ecological units based on the interagency (U. S. Forest Service, U. S. Bureau of Land Management, USDA's Natural Resources Conservation Service) national mapping project, known as ECOMAP.

The Department's Lands Program, 2003 (dfg_lands.shp)

This is a digitized geographical inventory of selected lands administered and/or owned by the Department. Properties such as ecological reserves, wildlife areas,

undesignated lands containing biological resource values, public and fishing access lands, and fish hatcheries are among those lands included in this inventory. Types of properties owned or administered by the Department which may not be included in this coverage are parcels less than one acre in size, such as fishing piers, fish spawning grounds, fish barriers, and other minor parcels.

The Service and the U. S. Bureau of Reclamation, Joint Venture Program Areas, 1998 (stfedease.shp)

This layer shows joint venture program areas within California.

Development of Figure 1

The range map shown in Figure 1 was created specifically for the Department's review of the petition to list the Tricolor, to match the scale and precision of data and information used in the evaluation and for consistency with Department terrestrial-species mapping standards. The range was created by selecting and modifying USDA Ecological Region subsections (Miles and Goudey 1997) that were judged to support habitat for the species, as evidenced by recent occurrence data or through professional judgement. The approach is consistent with standards created for other Department programs, including the California Wildlife Habitat Relationships program (Hunting and Parisi 2004).

The range map is intended to depict the maximum geographic extent of the Tricolor's occurrence in California, at a scale of 1:24,000. At that scale, the range polygon will contain areas of unsuitable habitat and, in a few instances, occurrence data will fall outside of the range polygon. For the Tricolor, these data usually represent very small historic colony sites established opportunistically at small ponds surrounded by land uses incompatible with Tricolor occurrence.

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Development of Figure 3

Figure 3 is based on Christmas Bird Count information available from the National Audubon Society at http://www.audubon.org/bird/cbc.