California Fish and Game Commission

NOTICE OF FINDINGS

Tricolored Blackbird
(*Agelaius tricolor*)

NOTICE IS HEREBY GIVEN that the California Fish and Game Commission (Commission), at a meeting in Ventura, California on April 19, 2018, found pursuant to Fish and Game Code Section 2075.5, that the information contained in the petition to list tricolored blackbird (*Agelaius tricolor*) and other information in the record before the Commission, warrants adding tricolored blackbird to the list of threatened species under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.). (see also Cal. Code Regs., tit. 14, § 670.1, subsec. (i).)

NOTICE IS ALSO GIVEN that, at its August 23, 2018 meeting in Fortuna California, the Commission adopted the following findings outlining the reasons for its determination.

I. Background and Procedural History

Petition History

On August 19, 2015, the California Fish and Game Commission (Commission) received "A Petition to List Tricolored Blackbird (*Agelaius tricolor*) as Endangered under the California Endangered Species Act and Request for Emergency Action to Protect the Species", as submitted by the Center for Biological Diversity. Commission staff transmitted the petition to the California Department of Fish and Wildlife (Department) pursuant to Fish and Game Code Section 2073 on August 20, 2015, and published a formal notice of receipt of the petition on September 4, 2015 (Cal. Reg. Notice Register 2015, No. 36-Z, p. 1514).

The Commission formally received the Department's petition evaluation and recommendation, "Evaluation of the Petition from the Center for Biological Diversity to List Tricolored Blackbird (*Agelaius tricolor*) as Endangered Under the California Endangered Species Act," at a meeting on October 8, 2015 in Los Angeles, California (Fish & G. Code, §§ 2073.5 & 2074.2; Cal. Code Regs., tit. 14, § 670.1, subsecs. (d) & (e)). At its public meeting on December 10, 2015, in San Diego, California, the Commission considered the petition, the Department's petition evaluation and recommendation, and comments received. The Commission determined that sufficient information existed to indicate the petitioned action may be warranted and accepted the petition for consideration. Upon publication of the Commission's notice of its findings, tricolored blackbird was designated a candidate species on January 8, 2016 (Cal. Reg. Notice Register 2016, No. 2-Z, p. 57).

Status Review Overview

The Commission's action designating tricolored blackbird as a candidate species triggered the Department's process for conducting a status review to inform the Commission's decision on whether to list the species. At its scheduled public meeting on December 8, 2016, in San Diego, California, the Commission granted the Department a six-month extension to complete the status review and facilitate external peer review. The Commission formally received the

Department's report to the Commission titled "A STATUS REVIEW OF THE TRICOLORED BLACKBIRD (*Agelaius tricolor*) IN CALIFORNIA" on February 8, 2018. On April 19, 2018, in Ventura, California, the Commission found that the information contained in the petition to list tricolored blackbird and the other information in the record before the Commission warrants listing tricolored blackbird as a threatened species under the CESA.

Species Description

Tricolored blackbird was first collected by Thomas Nuttall in 1836 near Santa Barbara, California (Nuttall 1840, Baird et al. 1874). A male specimen was sent to John James Audubon who described it as a unique form of blackbird in his well-known *Ornithological Biography* (Audubon 1839).

Tricolored blackbird is sexually dimorphic, with the breeding male plumage entirely black except for the bright red lesser wing coverts forming a conspicuous red patch ("shoulder" or "epaulets") on the wing and white median coverts forming a distinct border to the red. The black body plumage is glossed bluish when viewed in sunlight. The female is mostly dark brown dorsally and heavily streaked ventrally with dark brown streaks merging to form a largely solid dark brown belly. The head of the female is indistinctly patterned with a whitish supercilium, malar, chin, and throat (Beedy et al. 2017).

Although similar in appearance to the related red-winged blackbird (*A. phoeniceus*), several features can be used to distinguish the two species in breeding plumage (described by Nuttall 1840, Cooper 1870, Baird et al. 1874). The black plumage of the tricolored blackbird male has a soft bluish luster that is lacking in the red-winged blackbird. The lesser wing coverts (the red "shoulder") on the breeding male tricolored blackbird are a much deeper red (described as crimson, carmine, or the color of venous blood) compared to the brighter red with a tinge of orange (vermilion or scarlet) in the red-winged blackbird. The median coverts in tricolored blackbird are white (pale-yellowish when fresh) and create a stark contrast between the black and red feathers on the wing, whereas in the red-winged blackbird they are generally yellowish (or black in the subspecies that breeds in much of the Central Valley). The bill of tricolored blackbird averages thinner and can appear more sharply pointed. In flight, the wings of tricolored blackbird appear to have a more pointed shape (versus rounded in the red-winged blackbird) due to differences in length of the primary flight feathers. Female tricolored blackbirds have darker plumage than most female red-winged blackbirds, although this difference is less pronounced in the Central Valley where the subspecies of red-winged blackbird is relatively dark (Beedy et al. 2017)

II. Statutory and Legal Framework

The Commission, as established by the California Constitution, has exclusive statutory authority under California law to designate endangered, threatened, and candidate species under CESA (Cal. Const., art. IV, § 20, subd. (b); Fish & G. Code, § 2070). The CESA listing process for tricolored blackbird began in the present case with the Petitioners' submittal of the Petition to the Commission on August 19, 2015. The regulatory and legal process that ensued is described in some detail in the preceding section above, along with related references to the Fish and Game Code and controlling regulation. The CESA listing process generally is also described in some detail in published appellate case law in California, including:

- *Mountain Lion Foundation v. California Fish and Game Commission* (1997) 16 Cal.4th 105, 114-116;
- *California Forestry Association v. California Fish and Game Commission* (2007) 156 Cal.App.4th 1535, 1541-1542;
- *Center for Biological Diversity v. California Fish and Game Commission* (2008) 166 Cal.App.4th 597, 600; and
- *Natural Resources Defense Council v. California Fish and Game Commission* (1994) 28 Cal.App.4th 1104, 1111-1116.

The "is warranted" determination at issue here for tricolored blackbird stems from Commission obligations established by Fish and Game Code Section 2075.5. Under this provision, the Commission is required to make one of two findings for a candidate species at the end of the CESA listing process; namely, whether listing a species is warranted or is not warranted. Here, with respect to tricolored blackbird, the Commission made the finding under Section 2075.5(e)(2) that listing the species as threatened is warranted.

The Commission was guided in making these determinations by statutory provisions and other controlling law. The Fish and Game Code, for example, defines an endangered species under CESA as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, over exploitation, predation, competition, or disease." (Fish & G. Code, § 2062.) Similarly, the Fish and Game Code defines a threatened species under CESA as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter." (*Id*., § 2067.)

The Commission also considered Title 14, Section 670.1, subsection (i)(1)(A), of the California Code of Regulations in making its determination regarding tricolored blackbird. This provision provides, in pertinent part, that a species shall be listed as endangered or threatened under CESA if the Commission determines that the species' continued existence is in serious danger or is threatened by any one or any combination of the following factors:

1. Present or threatened modification or destruction of its habitat,
2. Overexploitation,
3. Predation,
4. Competition,
5. Disease, or
6. Other natural occurrences or human-related activities.

Fish and Game Code Section 2070 provides similar guidance. This section provides that the Commission shall add or remove species from the list of endangered and threatened species under CESA only upon receipt of sufficient scientific information that the action is warranted. Similarly, CESA provides policy direction not specific to the Commission per se, indicating that all state agencies, boards, and commissions shall seek to conserve endangered and threatened species and shall utilize their authority in furtherance of the purposes of CESA.

(Fish & G. Code, § 2055.) This policy direction does not compel a particular determination by the Commission in the CESA listing context. Nevertheless, "'[l]aws providing for the conservation of natural resources' such as the CESA 'are of great remedial and public importance and thus should be construed liberally." (*California Forestry Association v. California Fish and Game Commission*, supra, 156 Cal. App.4th at pp. 1545-1546, citing *San Bernardino Valley Audubon Society v. City of Moreno Valley* (1996) 44 Cal.App.4th 593, 601; Fish & G. Code, §§ 2051, 2052.)

Finally in considering these factors, CESA and controlling regulations require the Commission to actively seek and consider related input from the public and any interested party (see, e.g., Id., §§ 2071, 2074.4, 2078; Cal. Code Regs., tit. 14, § 670.1, subsection (h)). The related notice obligations and public hearing opportunities before the Commission are also considerable (Fish & G. Code, §§ 2073.3, 2074, 2074.2, 2075, 2075.5, 2078; Cal. Code Regs., tit. 14, § 670.1, subsection (c), (e), (g), (i); see also Gov. Code, § 11120 et seq.). All of these obligations are in addition to the requirements prescribed for the Department in the CESA listing process, including an initial evaluation of the petition and a related recommendation regarding candidacy, and a review of the candidate species' status culminating with a report and recommendation to the Commission as to whether listing is warranted based on the best available science (Fish & G. Code, §§ 2073.4, 2073.5, 2074.4, 2074.6; Cal. Code Regs., tit. 14, § 670.1, subsection (d), (f), (h)).

III. Factual and Scientific Bases for the Commission's Final Determination

The factual and scientific bases for the Commission's determination that designating tricolored blackbird as a threatened species under CESA is warranted are set forth in detail in the Commission's record of proceedings including the Petition, the Department's Evaluation, the Department's status review, written and oral comments received from members of the public, the regulated community, tribal entities, the scientific community and other evidence included in the Commission's record of proceedings.

The Commission determines that the continued existence of tricolored blackbird in the state of California is in serious danger or threatened by one or a combination of the following factors as required by the California Code of Regulations Title 14, Section 670.1, subsection (i)(1)(A):

1. Present or threatened modification or destruction of its habitat,
2. Overexploitation,
3. Predation,
4. Competition,
5. Disease, or
6. Other natural occurrences or human-related activities.

The Commission also determines that the information in the Commission's record constitutes the best scientific information available and establishes that designating tricolored blackbird as a threatened species under CESA is warranted. Similarly, the Commission determines that tricolored blackbird, while not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by CESA.

The items highlighted here and detailed in the threats section represent only a portion of the complex issues aired and considered by the Commission during the CESA listing process for tricolored blackbird. Similarly, the issues addressed in these findings represent some, but not all of the evidence, issues, and considerations affecting the Commission's final determination. Other issues aired before and considered by the Commission are addressed in detail in the record before the Commission, which record is incorporated herein by reference.

Background

The Commission bases its "is warranted" finding for tricolored blackbird most fundamentally on the fact that tricolored blackbird nests and breeds in large colonies coupled with the current downward population trend influenced by a combination of other threats.

Social species might experience increased risk of population declines and extinction, and obligate colonial nesting birds may be especially vulnerable. In these species, there is generally a positive relationship between individual fitness (i.e., reproduction or survival) and population size or density, a concept which is broadly referred to as the Allee effect (Stephens and Sutherland 1999). In modern times, three colonial and highly social bird species have gone extinct in North America north of Mexico, including the Passenger Pigeon (*Ectopistes migratorius*), the Carolina Parakeet (*Conuropsis carolinensis*), and the Great Auk (*Pinguinus impennis*) (Cook and Toft 2005).

Tricolored blackbirds may benefit from social and colonial behaviors by reducing mortality due to predation during the nesting cycle and by facilitating food finding and information sharing. Smaller groups of birds would likely retain the ability to locate and use secure nesting substrates, but small colonies might lose the potential benefits of predator satiation and of social food finding and information sharing. (DFW Status Review 2018).

Although tricolored blackbird has been observed to nest in very small colonies (as few as 4 nests), the species has not been observed to nest as single pairs. Very small colonies (<100 birds) are quite rare, and although nesting success varies greatly across colonies of all sizes, there is evidence that small colonies are not as successful as larger colonies (Payne 1969), and that larger colonies produce more young per female (Hamilton 1993, Meese 2013, Weintraub et al. 2016). Reductions in population size may make tricolored blackbird more vulnerable to additional declines due to inherent natural history factors, but the degree to which a small population would limit the species' ability to survive and reproduce is not known.

The fact that half or more of the total tricolored blackbird population will often occur in a small number of large colonies in silage fields during the first nesting attempt makes the species vulnerable to losses of productivity (Cook and Toft 2005, Meese 2012, Beedy et al. 2017). In 2011, 65% of the total known population was located at only six colony sites in Merced, Kern, and Tulare counties (Kyle and Kelsey 2011). This concentration of large portions of the population makes the species vulnerable to a number of potential threats, especially colony destruction through harvest, predation, or extreme weather events (Weintraub et al. 2016).

Threats

Present or Threatened Modification or Destruction of Habitat

Of the estimated four million acres (16,187 square kilometers [km^2]) of wetlands that existed in the Central Valley in the 1850s that could have been available to tricolored blackbirds as nesting substrate, only about 5% remain. The conversion of wetland nesting habitat to agricultural and urban uses has been implicated in the long-term decline of the species: Neff (1937) observed, "[t]he destruction of [tricolored blackbird] nesting habitats by man is of most importance," and 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." Only about 15% of the four million acres (16,187 km^2) of wetlands that existed in the Central Valley in the 1850s remained when Neff conducted his work in the 1930s, and about 40% of those remaining wetlands were lost between 1939 and the 1980s (Frayer et al. 1989). Of the freshwater emergent wetlands most likely to be used by breeding tricolored blackbirds in the Central Valley, 50% were lost between 1939 and the 1980s, with an average loss of 5,200 acres (2,104 hectares) per year (Frayer et al. 1989). These losses were primarily due to conversion of wetlands to agriculture.

DeHaven et al. (1975b) found no nesting substrate at several locations in Los Angeles, Kern, Sacramento, and Yolo counties where earlier researchers had studied the species. Subsequent investigators have continued to document habitat loss at known prior breeding colony locations through the present. For example, Beedy et al. (1991) found that 9.3% (n = 17) of the 183 known colony locations used in the 1980s were extirpated by 1990 through permanent removal of nesting habitat. Hamilton et al. (1999) observed the removal of a wetland that had supported a productive breeding colony in 1998. DeHaven (2000) noted the loss of several breeding colonies in Sacramento County to urban development and the expansion of vineyards. Humple and Churchwell (2002) reported on the draining of a wetland and the removal of Himalayan blackberry that had previously supported breeding colonies. Hamilton (2004b) documented the loss or destruction of cattail nesting substrates that had supported 90,000 breeding birds between 1994 and 2004. During the 2017 statewide survey, local experts and survey participants were asked to score the suitability of nesting substrate for all sites visited. Of the 636 sites for which scores were reported during the survey or during pre-survey site visits, 70 sites (11%) were scored as permanently unsuitable, usually due to development or conversion to permanent crops like orchards or vineyards; an additional 80 sites had no nesting substrate present during the survey and 101 sites had vegetation present, but were considered unsuitable by the survey participant. Based on this habitat assessment, about 60% of known historical breeding sites supported suitable nesting substrate during the 2017 season. (DFW Status Review 2018).

The majority of the wetlands in the Central Valley are managed lands that are maintained by application of water, and many areas undergo occasional land recontouring or vegetation control to maintain desired conditions. As of 2006, there were about 205,000 acres (830 km^2) of managed wetlands in the Central Valley (CVJV 2006). Most managed wetlands (approximately 90%) are flooded primarily in the fall and winter for wintering waterfowl (i.e., seasonal wetlands) and are unlikely to provide suitable nesting substrate for tricolored blackbirds. A small proportion are managed as semi-permanent or permanent wetlands that hold water during the spring and summer (Iglecia and Kelsey 2012) and are often managed to support brood habitat for waterfowl. The small proportion of semi-permanent and permanent

wetlands may provide suitable nesting substrate for breeding tricolored blackbirds, depending on management practices.

The availability of novel, nonnative upland nesting substrates may have lessened the impact of the decline in Central Valley wetlands to the tricolored blackbirds population (Cook and Toft 2005). However, these nonnative vegetation types are often considered undesirable and are frequently removed (DFW Status Review 2018).

The extent of foraging habitat required for successful breeding is much greater than the extent of nesting substrate (DFW Status Review 2018). The abundance of insect prey in foraging habitat has been linked to reproductive success, and tricolored blackbirds may choose breeding locations in part based on the local prey populations (DFW Status Review 2018). Because insect populations are variable and unpredictable from year to year, the tricolored blackbird population likely requires much more foraging habitat on the landscape than is used in any given year, and once lost, large landscapes with suitable habitat are difficult to replace (DFW Status Review 2018). For these reasons, loss of foraging habitat is likely as important, or more so, than the documented losses of nesting substrate to the long-term viability of tricolored blackbirds (DFW Status Review 2018).

The loss of foraging habitat has been suggested as a likely cause of decline in southern California (Hamilton et al. 1995, Cook 2010). The extirpation of colonies from most of the coastal lowlands in southern California, despite the presence of more numerous marsh habitats relative to inland areas, suggests that foraging habitat sufficient to support breeding colonies is the population's limiting factor (Unitt 2004). Loss of habitat, particularly foraging habitat, has been suggested as the greatest threat to the survival of the species in southern California. In western Riverside County, where the majority of the southern California population occurs, large residential and commercial developments are planned for much of the San Jacinto Valley. This will likely result in substantial loss of dairy lands and the alfalfa fields used by tricolored blackbirds that nest both on and off the San Jacinto Wildlife Area (R. Cook pers. comm.).

Hamilton et al. (1992) reported on the pervasive loss of foraging habitat near breeding colony sites due to expansion of cultivated agriculture and the conversion of existing agriculture to incompatible crops in the Central Valley, and considered this the primary threat to population abundance. DeHaven (2000) observed widespread habitat loss due to urban expansion and agricultural conversions to vineyards and orchards relative to the 1970s when he and others conducted tricolored blackbird research across the state, and suggested that habitat loss was a primary driver of continued population declines. Conversion of pastures and crops suitable for foraging by tricolored blackbirds was observed in Placer, Sacramento, Stanislaus, and Tulare counties. DeHaven (2000) noted especially extensive losses in Sacramento County, where urban development and expansion of vineyards had removed thousands of acres of high-quality habitat. More than 5,000 acres (20 km^2) of habitat had been converted to vineyards in just a two-year period from 1996 to 1998, resulting in the loss of known breeding colony locations.

Grasslands have been identified as one of the most vulnerable habitats across North America, and many grassland species have experienced steep population declines in recent decades (NABCI 2016). A great deal of effort has been expended on conserving the grasslands in the central part of North America from the Great Plains to northern Mexico (Knopf and Skagen

2012). The grasslands of California have not received the same level of conservation attention, although losses of grasslands in California have been extensive.

Soulard and Wilson (2015) used Landsat (satellite) data to analyze land-use and land-cover change in the Central Valley from 2000 to 2010, and compared this to changes in the valley since 1973. The largest land-cover trend from 2000 to 2010 occurred in grassland/shrubland habitats. During this 10-year period, an estimated 79,200 acres (321 km^2) of grasslands and shrublands were lost, representing a 5% decrease in the Central Valley over 10 years. Over the longer period from 1973 to 2010, grasslands and shrublands declined by 22% (a loss of 476,900 acres [1,930 km^2]), due mainly to conversions to more intensive agriculture and urban development. Although many of the grassland losses were due to agricultural intensification, losses of agriculture to urban development resulted in relatively little net change in area of agriculture in the Central Valley from 1973 to 2010. (DFW Status Review 2018).

Cameron et al. (2014) analyzed time series land cover data from the California Farmlands Mapping and Monitoring Program collected between 1984 and 2008 to evaluate rangeland habitat (grassland, shrubland, and woodland) conversion in California. The area evaluated covers much of the breeding range of tricolored blackbird except for southern California. About 483,000 acres (1,955 km^2) of rangelands were converted during this 20+ year period, with urban and rural development and conversion to more intensive agricultural uses accounting for most (approximately 90%) of the rangeland loss. Agricultural intensification was primarily due to increases in vineyards and orchards, but smaller amounts of other agricultural crops that may provide foraging habitat for tricolored blackbirds were also responsible for grassland loss. The San Joaquin Valley region, which in recent decades has been the center of abundance for breeding tricolored blackbirds during the early nesting season, experienced the largest amount of rangeland conversion (DFW Status Review 2018).

Due to the continued expansion of nut trees and vineyards that replace grasslands, shrublands, or agricultural crops that provide insects required for breeding (e.g., alfalfa), regions that were previously occupied by thousands of birds have now become permanently unsuitable for breeding because of insufficient foraging habitat (Meese 2016). For example, the acreage of pistachio orchards in the Central Valley has grown exponentially in recent years and the acreage of almonds continues to increase. The five leading pistachio producing counties in California have also supported a large proportion of the tricolored blackbird breeding population in recent years (Kern, Tulare, Kings, Fresno, and Madera counties), with Kern County alone supporting 42% of pistachio production in 2012 (Geisseler and Horwath 2016). These regions of habitat loss in the San Joaquin Valley have also experienced the largest regional declines in the tricolored blackbird breeding population. In the central Sierran foothills, many colony sites and the surrounding foraging landscape are zoned for development, and several development projects that may affect tricolored blackbird habitat have moved forward in recent years (Airola et al. 2015a, 2016). Statewide, the proportion of grasslands within 3 miles (4.8 km) of occupied breeding colony locations declined significantly from 2008 to 2014 (from about 30% to 25%; NAS 2017).

Future development in California is projected to be concentrated in several core areas of the tricolored blackbird range, including the Central Valley, the foothills of the Sierra Nevada, and on both sides of the Transverse Ranges in southern California (Jongsomjit et al. 2013), which would further reduce or degrade the available foraging landscape for breeding colonies. The proportion of grasslands in the landscape surrounding potential breeding sites has been shown

to be the most important land cover type in predicting the occurrence of breeding tricolored blackbirds, and the proportion of alfalfa in the foraging landscape is highly correlated with colony size during the early nesting season (NAS 2017). Combined with regular loss of nesting substrate, the ongoing loss of foraging habitat makes it less likely that these essential breeding habitat requirements will co-occur on the landscape, with the result being a reduced number of locations suitable for successful breeding and foraging by tricolored blackbird colonies (DFW Status Review 2018).

Overexploitation

The tricolored blackbird colonies that form on agricultural grain fields early in the breeding season are often the largest colonies formed each year, and the complete destruction of these colonies due to harvest can be especially damaging to annual blackbird productivity (Arthur 2015). Normal harvesting activities typically coincide with the breeding season and the harvest of fields that contain nesting colonies results in nest destruction and the loss of eggs or nestlings. The cutting of grain has also killed adult tricolored blackbirds but most adults appear to survive harvest operations.

Shortly after the discovery of grain colonies in the San Joaquin Valley, Hamilton et al. (1992) observed the loss of a 15,000-bird colony to harvest. As early as 1993, the USFWS intervened to encourage harvest delays and protect the largest known breeding colony (Hamilton 1993). Since then, colony protection through crop purchase or delayed harvest has been the primary conservation action implemented for the species (see Existing Management section), with mixed success. Despite annual attempts to locate and protect large colonies since the early 1990s, losses to harvest have occurred in most years, with 2010 and 2016 being the only years with no known losses to harvest. For context, a brief list of some of the known large losses follows. Two large colonies representing more than 60,000 breeding birds were lost due to harvest in 1994 (Hamilton et al. 1995). The two largest breeding colonies in 1995 were destroyed during harvest of the grain nesting substrate (Beedy and Hamilton 1997). At least one colony of 14,000 birds was harvested in 1999 and four colonies were lost to harvest operations in 2000 (Hamilton et al. 1999, Hamilton 2000). Two colonies totaling approximately 80,000 breeding birds were lost to harvest operations in 2003 (Cook and Toft 2005). Especially large losses occurred in 2004, 2006, 2007, and 2008, when the largest colonies or the majority of grain colonies were lost (Meese 2009b). In 2008, several of the largest known colonies were destroyed, with six colonies being cut that hosted 140,000 breeding birds (Meese 2008). At least three colonies were lost to harvest in 2011, including the largest known colony, which supported 17% of the total known population (Kyle and Kelsey 2011, Meese 2011). The largest colony in southern California in 2013, which contained most of the southern California population, suffered complete reproductive failure when the field was cut (WRC-MSHCP 2014). At least two colonies in grain fields were destroyed in 2014 during the harvest of nesting substrate and at least three colonies were partially or totally destroyed due to harvest in 2015 (Meese 2014a, 2015b). After a breeding season with no known harvest losses in 2016, a large colony (estimated at up to 12,500 birds) was mostly lost in 2017 when the grain nesting substrate was cut in preparation for harvest (Colibri 2017).

Beginning in 2016, a new partnership was created through a grant from the U.S. Department of Agriculture's Natural Resources Conservation Service, with Audubon California, dairy trade organizations, and agencies working together to conduct outreach to dairy owners and to detect and protect breeding colonies. The program succeeded in enrolling all landowners with

tricolored blackbird colonies identified on their property in 2016, and 100% of known agricultural colonies were protected through delay of harvest. In 2017, most colonies on grain fields at dairies were again protected, but at least one large colony in Madera County was destroyed when the grain was cut (Colibri 2017).

Clutch size has been observed to decline in second nesting attempts (Beedy et al. 2017). The only study to evaluate reproductive success over the course of a breeding season, which was carried out on silage and wetland colonies in the San Joaquin Valley, showed that reproductive success declined as the season progressed (Weintraub et al. 2016). The elimination of a first breeding attempt may cause breeding colonies to miss the period of peak prey abundance, thereby reducing seasonal reproductive success, as has been observed in other species (Martin 1987). Colony destruction through harvest typically occurs well after females have laid eggs and often after eggs have hatched, so the lost energetic input to a failed breeding attempt and the delay before a second attempt likely reduce total annual productivity, even if birds attempt to nest a second time (Meese 2008). Most adult tricolored blackbirds appear to nest at least twice during the breeding season, and destruction of colonies late in the nesting cycle could eliminate one of these attempts. In addition to the loss of eggs and nestlings, adult birds are known to have been killed when colonies are harvested. Because nest survival and reproductive success rates were similar in silage and wetland colonies in the San Joaquin Valley, Weintraub et al. (2016) suggested that payments to farmers who delay harvest is a viable conservation action for increasing productivity.

Tricolored blackbird was shown to have experienced low reproductive success from at least 2006 to 2011 (Meese 2013). A number of factors have been shown to influence reproductive success, including predation and shortage of food, but reproductive failures caused by harvest at breeding tricolored blackbird colonies on agricultural fields of the San Joaquin Valley may have contributed to population declines through loss of much of the annual reproductive potential of the species in several years. (DFW Status Review 2018).

Destruction of colonies in agricultural fields has been occurring since tricolored blackbirds were discovered nesting in this substrate type in the early 1990s. In recent years (2015– 2017), the protections provided to tricolored blackbird as a candidate under CESA, the availability of funds to implement colony protection programs, law enforcement actions conducted by the Department, and a coordinated effort by agencies, the dairy and farming industries, and nonprofit groups, have led to a dramatic decline in this source of mortality (DFW Status Review 2018). These protections, and a resulting increase in productivity, may have contributed to population stability observed between 2014 and 2017 (DFW Status Review 2018). However, losses of large colonies to grain harvest have continued and the future success of breeding colonies on agricultural crops will depend on the availability of funds to continue programs that locate and monitor breeding colonies on grain fields early in the nesting season and compensate farmers for delaying harvest. If the recent reinterpretation of the MBTA by the U.S. Department of the Interior solicitor removes the prohibition on incidental take, protection under CESA may be necessary in order to ensure continued participation in colony protection programs.

Predation

In the early 1990s, Hamilton and others found that many breeding colonies in emergent wetland nesting substrates suffered partial or complete destruction by predation (primarily by

black-crowned night-herons; Hamilton et al. 1992, 1995, Hamilton 1993), resulting in consistently lower reproductive success in wetlands compared to other nesting substrates. Beedy and Hamilton (1997) reported that more recently, black-crowned night-herons eliminated all or most nests at several freshwater marsh breeding colonies. Hamilton (2000) later reported that wetland colonies with no black-crowned night-heron predation were highly successful. DeHaven (2000) reported that he also observed high rates of colony failure due to predation in the 1970s, a time when the majority of the population still bred in wetland substrates. Whether recent rates of loss to predation are similar to historical rates of loss is unknown.

In recent decades, complete nesting failures have been caused by novel predators on agricultural grain fields, and the increasing concentration of birds in mega-colonies may have increased their susceptibility to nest predation (Kelsey 2008). Cattle Egrets from a single rookery caused complete or near-complete failure of large breeding colonies in Tulare County from 2006 to 2011 (Meese 2012). White-faced ibis prey on the eggs of tricolored blackbird, and in 2016 caused the complete failure of a large breeding colony on a silage field in Tulare County (Meese 2016, Beedy et al. 2017).

Although many species have been documented as predators of tricolored blackbirds, most have not had severe effects on the population or on the breeding success at nesting colonies. However, a few species have caused the complete failure of entire breeding colonies through heavy predation on eggs and nestlings. In recent decades, the predators that have destroyed entire colonies have usually been wading birds that hunt in large groups (i.e., black-crowned night-heron, cattle egret, and white-faced ibis). These species have had significant negative impacts on the overall productivity rate of tricolored blackbirds in several years over the last three decades (Hamilton et al. 1995, Cook and Toft 2005, Meese 2012). A few other species, including common raven, raccoon, and coyote have had large effects on breeding success, but these predators have typically not caused complete colony failure or have had less widespread effects (DFW Status Review 2018).

Other Natural Events or Human-Related Activities

Contaminants—In the two decades since their introduction, neonicotinoid insecticides have become some of the most widely used insecticides in the world, including in California. (Goulson 2013). They are highly effective at killing insects and have relatively low mammal and bird toxicity; however, at higher concentrations they can have lethal and sublethal impacts to vertebrates (Mineau and Palmer 2013). Neonicotinoids have been implicated in the decline of invertebrate communities and, in a few cases, the decline of insectivorous birds. Ingestion of only a few neonicotinoid-coated seeds (a single seed in the case of corn) might be sufficient to kill a songbird, but there has been little work conducted on the availability and consumption of treated seeds by vertebrates, and no data are available on the acute toxicity of any neonicotinoid insecticide specifically to tricolored blackbirds (Goulson 2013, Mineau and Palmer 2013; DFW Status Review 2018). Neonicotinoids may also have chronic toxicity effects (exposure over longer time periods) on reproductive success, but chronic effects are even less studied than acute effects (Mineau and Palmer 2013).

Neonicotinoids have been shown to have adverse effects on a number of non-target invertebrate species, and may indirectly affect tricolored blackbirds through suppression of insect prey populations (DFW Status Review 2018). They have been shown to have adverse

effects on a number of non-target invertebrate species, with most studies focusing on bees (Hopwood et al. 2012, Godfray et al. 2014). In California, long-term observational data have revealed declines in the number of butterfly species and declines in abundance for many butterfly species in the Central Valley, both of which were negatively associated with annual application rates of neonicotinoid insecticides (Forister et al. 2016). Imidacloprid was shown to have a negative association with a wide variety of insectivorous bird populations in the Netherlands, suggesting that the pesticide may have led to food deprivation in birds (Hallmann et al. 2014).

Drought, Water Availablility, and Climate Change— Drought reduces water supply reliability and has far-reaching impacts on most habitat types in California (DWR 2014, 2015a). Several significant statewide droughts have occurred in California over the last century (1928–1934, 1976–1977, 1987–1992, and 2007–2009) (DWR 2015a), and California recently experienced the three driest consecutive years of statewide precipitation in the historical record between 2012 and 2014. The winter of 2015 produced a record low statewide mountain snowpack of only 5% of average.

Tricolored blackbirds have adapted to use a variety of novel vegetation types as nesting substrate, but wetlands continue to support the largest number of breeding colonies each year. Because of the need for wetlands that are flooded during the spring and summer breeding season, the various approaches to wetland management, and the dependence on water deliveries to maintain wetland habitats in most of the tricolored blackbird's range, assessing the availability of suitable wetland nesting substrate in a given year is difficult. A recent method applied reflectance to satellite imagery to identify areas of open surface water in the Central Valley (Reiter et al. 2015). Although not an ideal approach to quantifying and assessing distribution of wetlands, the method would identify wetlands with large amounts of open water. In addition, identification of open water on the landscape during the tricolored blackbird breeding season is likely a good proxy for the availability of water for wetland management. Reiter et al. (2015) showed that open surface water declined across the Central Valley between 2000 and 2011. Drought had a significant negative effect on open surface water in the late summer and early fall. Cumulative years of drought resulted in a noticeable reduction in surface water. Although not a direct measure of tricolored blackbird breeding habitat, declines in surface water during the drought likely resulted in reduced availability of wetlands with sufficient water to provide high quality nesting substrates.

Although more resilient to dry conditions than wetland vegetation, plants species that provide upland nesting substrate for tricolored blackbird colonies also experience negative effects due to drought. After several years of dry conditions during California's most recent drought, many Himalayan blackberry copses that have historically supported tricolored blackbird colonies were observed to be dry and mostly barren of leaves. In a few cases, extremely dry blackberry bushes continued to be used by breeding colonies, but many were unoccupied. Milk thistle, which provides high-quality nesting substrate across much of the tricolored blackbird range when annual precipitation patterns support vigorous growth, was largely absent from historically used areas until California experienced an average water year in the winter of 2015–2016 (Airola et al. 2016). The wetter weather created nesting substrate in areas that had not been used by tricolored blackbirds in several years, and breeding colonies once again occupied these areas.

The availability of large insect prey is an important factor in tricolored blackbird reproductive success, and may influence colony site selection. Large landscapes with suitable foraging habitat are strong drivers of colony site occupancy and abundance (NAS 2017).

Insect abundance is strongly related to biomass of herbaceous vegetation, including important tricolored blackbird prey items like grasshoppers in grasslands (Falcone 2010). Climate, especially drought, is thought to play a key role in abundance of grasshoppers and other insect species in grasslands (Vose et al. 2016). The response of insect populations can differ depending on drought severity. For example, non-severe drought and warm temperatures can have a positive effect on grasshopper populations through increased survival and faster population growth (Kemp and Cigliano 1994). However, extreme or prolonged drought can negatively affect grasshopper populations through desiccation of eggs or through decreased biomass of primary producer food sources (i.e., grasses and forbs) (Vose et al. 2016). Reductions in precipitation not only lead to reductions in the abundance of insects in grasslands, but may also make insect prey less accessible through changes in behavior (e.g., moving underground) (Barnett and Facey 2016). Severe droughts likely have strong negative effects on grasshoppers and insect prey in general (Kemp and Cigliano 1994, Vose et al. 2016).

The established impacts of precipitation on insect populations in grasslands, especially grasshoppers, suggests a mechanism for drought impacts on tricolored blackbird productivity. Research is needed that measures grasshopper and other prey abundance relative to precipitation and primary productivity around occupied tricolored blackbird colonies, and evaluates the effect on tricolored blackbird reproductive success.

Average annual temperatures have been rising in California in recent decades, and climate models are in broad agreement that temperatures in California will rise significantly over the next century (DWR 2015b). The average temperature is expected to rise by approximately 2.7°F (1.5°C) by 2050, and depending on the emissions scenario, average temperatures could increase by 4.1–8.6°F (2.3–4.8°C) by the year 2100 (Moser et al. 2012). Summer temperatures will rise more than winter temperatures, and the increases will be greater in inland California. As a result, the average number of extremely hot days (at least 105°F [41°C]) per year in Sacramento is expected to increase fivefold (up to 20 days) by the middle of the century, and may increase to as many as 50 days per year by 2100 (Moser et al. 2012). Tricolored blackbirds have been observed to cease initiation of breeding when temperatures exceeded 90°F (32°C), although care of existing nests continued in temperatures over 100°F (38°C) (Hamilton et al. 1995). Extremely high temperatures have also caused colony failure. Rising temperatures may directly affect annual tricolored blackbird productivity by truncating or interrupting the breeding season, although more work is needed on the effect of temperature on initiation and success of nesting attempts. Tricolored blackbirds have begun nesting earlier in the year, perhaps in response to climate change (e.g., see Tottrup et al. 2010, Mazerolle et al. 2011). Between 1939 and 2009, the mean date of first breeding date has shifted to occur about 22 days earlier (M. Holyoak pers. comm.).

Along with projected negative impacts to tricolored blackbird foraging habitat due to housing and agricultural development discussed above, the areas of California with the largest climate-projected effects on a variety of bird species are largely concentrated within the tricolored blackbird range in the Central Valley (Jongsomjit et al. 2013). A suite of analyses integrating the effects of climate change and land use changes in California's rangelands concluded that

grassland habitat loss in California could reach 37% by the year 2100 (Byrd et al. 2015). Thorne et al. (2016) estimated the vulnerability of California's natural communities to climate change by examining how a range of climate change scenarios would change the spatial distribution of those communities. Two important tricolored blackbird communities, grassland and freshwater marsh, were projected to be among the most affected natural communities in California, with freshwater marsh being one of only four communities receiving the highest vulnerability rank. Under multiple emission scenarios, the regions modeled as being most highly stressed by future climate change include much of the tricolored blackbird's core range in the Central Valley and surrounding foothills. The extent of freshwater marsh was projected to decrease by 71%–97% by year 2100. Of the area currently occupied by grassland in California, 16%–48% is expected to no longer be suitable, depending on the climate change scenario. The current level of emissions is on track with the higher-impact scenarios (Thorne et al. 2016).

The recent severe drought in California was at least partially due to, and made more severe by, climate change (Diffenbaugh et al. 2015). Climate change is projected to bring longer and more severe droughts to California in the future (Diffenbaugh et al. 2015, Williams et al. 2015), exacerbating the impacts to tricolored blackbird habitat described above. The Central Valley may be particularly vulnerable to warming-driven drought increases in the future (Williams et al. 2015), and water deliveries are projected to be reduced by 5.6% from 2013 to 2033 due to climate change effects on reliability (DWR 2014). Climate change effects on water supplies and stream flows are expected to increase competition among urban and agricultural water users and environmental needs (Moser et al. 2012). This competition may lead to decreases in available wetland nesting substrate provided by private and public land managers. Declines in the availability of water for agriculture may also reduce prey populations provided by high quality crops like alfalfa and rice.

IV. Final Determination by the Commission

The Commission has weighed and evaluated the information for and against designating tricolored blackbird as a threatened species under CESA. This information includes scientific and other general evidence in the Petition; the Department's Evaluation; the Department's status review; the Department's related recommendations; written and oral comments received from members of the public, the regulated community, various public agencies, and the scientific community; and other evidence included in the Commission's record of proceedings.

Based upon the evidence in the record the Commission has determined that the best scientific information available indicates that the continued existence of tricolored blackbird is in serious danger or threatened by present or threatened modifications or destruction of the species' habitat, predation, competition, disease, or other natural occurrences or human-related activities, where such factors are considered individually or in combination (see generally Cal. Code Regs., tit. 14, § 670.1, subsection (i)(1)(A); Fish & G. Code, §§ 2062, 2067).

The Commission determines that there is sufficient scientific information to indicate that designating tricolored blackbird as a threatened species under CESA is warranted at this time and that, with adoption and publication of these findings, tricolored blackbird for purposes of its legal status under CESA and further proceedings under the California Administrative Procedure Act, shall be listed as threatened.

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