

## Tricolored Blackbird (*Agelaius tricolor*)

### Status

**State:** Bird Species of Special Concern, Priority 1

**Federal:** None

### Population Trend

**Global:** Declining

**State:** Declining (Beedy and Hamilton 1997, 1999)

**Within Inventory Area:** Possibly declining (Beedy and Hamilton 1997).

The first systematic surveys of tricolored blackbird population status and distribution were conducted by Neff (1937, 1942). During a 5-year interval, he found 252 breeding colonies in 26 California counties; the largest colonies were in rice-growing areas of the Central Valley. He observed as many as 736,500 adults per year (1934) in just eight Central Valley counties. The largest colony he observed was in Glenn County; it contained more than 200,000 nests (about 300,000 adults) and covered almost 24 hectares (60 acres). Several other colonies in Sacramento and Butte Counties contained more than 100,000 nests (about 150,000 adults).

DeHaven et al. (1975a) estimated that the overall population size in the Sacramento and northern San Joaquin valleys had declined by more than 50% since the mid-1930s. They performed intensive surveys and banding studies in the areas surveyed by Neff (1937) and observed significant declines in tricolored blackbird numbers and the extent of suitable habitat in the period since Neff's surveys. Orians (1961a) and Payne (1969) observed colonies of up to 100,000 nests in Colusa, Yolo, and Yuba Counties, but did not attempt to survey the entire range of the species.

The U.S. Fish and Wildlife Service, the California Department of Fish and Game, and California Audubon cosponsored intensive, volunteer tricolored blackbird surveys in suitable habitats throughout California in 1994, 1997, 1999, and 2000 (Hamilton et al. 1995; Beedy and Hamilton 1997; Hamilton 2000). Local, regional, and statewide tricolored blackbird populations have experienced major declines since 1994. Statewide totals of adults in four late-April surveys covering all recently known colony sites were: 369,359 (1994); 237,928 (1997); 104,786 (1999); and 162,508 (2000). These surveys also identified several important distribution and population trends for tricolored blackbirds.

- Local, regional, and statewide populations and distributions vary from year to year.
- Sixty percent of all tricolored blackbirds located in all years were found in the 10 largest colonies.
- Seventy percent of all tricolored blackbird nests and 86% of all foraging by nesting birds were on private agricultural lands.

- In some portions of their range, tricolored blackbirds have declined or been eliminated; the species has been subject to local extirpation in most of Yolo County and portions of southern Sacramento County.

## Data Characterization

Statewide surveys were conducted for tricolored blackbirds (*Agelaius tricolor*) in California during 1994 and 1997 (Beedy and Hamilton 1999). Additional surveys include data on local distribution and population trends (Neff 1937, DeHaven et al. 1975a). Because this species is nomadic with erratic movement behavior, local occurrence data provides only limited information on long-term small area use patterns. This species forages and breeds in specific locations the inventory area with freshwater marshes dominated by cattails or bulrushes, or in areas with suitable willow, blackberry, thistle, or nettle habitat.

A moderate amount of literature is available for the tricolored blackbird because it is a highly visible colonial bird species commonly associated with wetland habitat. Beedy and Hamilton (1999) provide a comprehensive review of information available on general natural history, behavior, distribution and population changes, known demographics and population regulation, and conservation and management. No rangewide management plan has been developed.

## Range

Tricolored blackbirds are largely endemic to California, and more than 99% of the global population occurs in the state. In any given year, more than 75% of the breeding population can be found in the Central Valley (Hamilton 2000). Small breeding populations also exist at scattered sites in Oregon, Washington, Nevada, and western coastal Baja California (Beedy and Hamilton 1999).

The species' historical breeding range in California included the Sacramento and San Joaquin valleys, lowlands of the Sierra Nevada south to Kern County, the coast region from Sonoma County to the Mexican border, and sporadically on the Modoc Plateau (Dawson 1923; Neff 1937; Grinnell and Miller 1944).

Population surveys and banding studies of tricolored blackbirds in the Central Valley from 1969 through 1972 concluded that their geographic range and major breeding areas were unchanged since the mid-1930s (DeHaven et al. 1975a). Since 1980, active breeding colonies have been observed in 46 California counties, including Alameda County. In recent decades, breeding colonies have been observed in all Central Valley counties and east into the foothills of the Sierra Nevada (Beedy and Hamilton 1997, 1999; Hamilton 2000). The species also breeds locally along the California coast from Humboldt to San Diego Counties; on the Modoc Plateau and western edge of the Great Basin (mostly Klamath Basin); in lowlands surrounding the Central Valley; and in western portions of San Bernardino, Riverside, and San Diego Counties. The species also

breeds in marshes of the Klamath Basin in Siskiyou and Modoc Counties and Honey Lake Basin in Lassen County (Figure 1). During winter, virtually the entire population of the species withdraws from Washington; Oregon (although a few remain); Nevada; and Baja California, and wintering populations shift extensively within their breeding range in California (Beedy and Hamilton 1999).

### Occurrences within the ECCC HCP/NCCP Inventory Area

The tricolored blackbird is a sporadic resident within the inventory area. California Natural Diversity Database records document 2 breeding colony occurrences along the northern border of the Los Vaqueros watershed. The Contra Costa County Breeding Bird Atlas shows additional breeding locations east and north of these areas (<http://www.flyingemu.com/ccosta>).

## Biology

### Habitat

Tricolored blackbirds have three basic requirements for selecting their breeding colony sites: open accessible water; a protected nesting substrate, including either flooded or thorny or spiny vegetation; and a suitable foraging space providing adequate insect prey within a few miles of the nesting colony (Hamilton et al. 1995; Beedy and Hamilton 1997, 1999). Almost 93% of the 252 breeding colonies reported by Neff (1937) were in freshwater marshes dominated by cattails and bulrushes (*Schoenoplectus* spp.). The remaining colonies in Neff's study were in willows (*Salix* spp.), blackberries (*Rubus* spp.), thistles (*Cirsium* and *Centaurea* spp.), or nettles (*Urtica* sp.). In contrast, only 53% of the colonies reported during the 1970s were in cattails and bulrushes (DeHaven et al. 1975a).

An increasing percentage of tricolored blackbird colonies in the 1980s and 1990s were reported in Himalayan blackberries (*Rubus discolor*) (Cook 1996), and some of the largest recent colonies have been in silage and grain fields (Hamilton et al. 1995, Beedy and Hamilton 1997, Hamilton 2000). Other substrates where tricolored blackbirds have been observed nesting include giant cane (*Arundo donax*); safflower (*Carthamus tinctorius*) (DeHaven et al. 1975a); tamarisk trees (*Tamarix* spp.); elderberry/poison-oak (*Sambucus* spp. and *Toxicodendron diversilobum*); and riparian scrublands and forests (e.g., *Salix*, *Populus*, *Fraxinus*) (Beedy and Hamilton 1999).

Foraging habitats in all seasons include annual grasslands; wet and dry vernal pools and other seasonal wetlands; agricultural fields (e.g., large tracts of alfalfa with continuous mowing schedules and recently tilled fields); cattle feedlots; and dairies. Tricolored blackbirds also forage occasionally in riparian scrub habitats and along marsh borders. Weed-free row crops and intensively managed vineyards and orchards do not serve as regular foraging sites (Beedy and Hamilton 1997, 1999). High-quality foraging areas include irrigated pastures,

lightly grazed rangelands, dry seasonal pools, mowed alfalfa fields feedlots, and dairies (Beedy and Hamilton 1999). Lower quality foraging habitats include cultivated row crops, orchards, vineyards, and heavily grazed rangelands.

## Foraging Requirements

Foods delivered to tricolored blackbird nestlings include beetles and weevils; grasshoppers; caddisfly larvae; moth and butterfly larvae (Orians 1961a; Crase and DeHaven 1977; Skorupa et al. 1980); and, especially in current rice-growing areas, dragonfly larvae (Beedy and Hamilton 1999). Breeding-season foraging studies in Merced County showed that animal matter makes up about 91% of the food volume of nestlings and fledglings, 56% of the food volume of adult females, and 28% of the food volume of adult males (Skorupa et al. 1980).

Adults may continue to consume plant foods throughout the nesting cycle but also forage on insects and other animal foods. Immediately before and during nesting, adult tricolored blackbirds are often attracted to the vicinity of dairies, where they take high-energy items from livestock feed rations. Adults with access to livestock feed, such as cracked corn, begin providing it to nestlings when they are about 10 days old (Hamilton et al. 1995). More than 88% of all winter food in the Sacramento Valley is plant material, primarily seeds of rice and other grains but also weed seeds (Crase and DeHaven 1978). In winter, tricolored blackbirds often associate with other blackbirds, but flocks as large as 15,000 individuals (almost all tricolored blackbirds) may congregate at one location and disperse to foraging sites (Beedy and Hamilton 1999).

## Reproduction

Tricolored blackbirds are closely related to Red-winged Blackbirds (*Agelaius phoeniceus*), but the two species differ substantially in their breeding ecology. Red-winged Blackbird pairs defend individual territories, while tricolored blackbirds are among the most colonial of North American passerine birds (Bent 1958; Orians 1961a, 1961b, 1980; Orians and Collier 1963; Payne 1969; Beedy and Hamilton 1999). As many as 20,000 or 30,000 tricolored blackbird nests have been recorded in cattail marshes of 4 hectares (9 acres) or less (Neff 1937; DeHaven et al. 1975a), and individual nests may be built less than 0.5 meter (1.5 feet) apart (Neff 1937). Tricolored blackbird's colonial breeding system may have adapted to exploit a rapidly changing environment where the locations of secure nesting habitat and rich insect food supplies were ephemeral and likely to change each year (Orians 1961a; Orians and Collier 1963; Collier 1968; Payne 1969).

Tricolored blackbird nests are bound to upright plant stems from a few centimeters to about 1.8 meters (6 feet) above water or ground (Baicich and Harrison 1997); however, nests in the canopies of willows and ashes may be more than 3.7 meters (12 feet) high (Hamilton pers. comm.). Their nests are rarely built on the ground (Neff 1937). Deep cup nests are constructed with outer layers of long leaves (e.g., cattail thatch, annual grasses, or forbs) woven tightly

around supporting stems. The inner layers are coiled stems of grasses lined with soft plant down, mud, or algal fibers. Nest building takes about 4 days (Payne 1969).

Egg laying can begin as early as the second day after nest initiation but ordinarily starts about 4 days after the local arrival of tricolored blackbirds at breeding sites (Payne 1969). One egg is laid per day, and clutch size is typically three to four eggs (Payne 1969; Hamilton et al. 1995). Emlen (1941) and Orians (1961b) estimated the incubation period at 11 or 12 days, while Payne (1969) estimated it to be 11–14 days. About 9 days generally elapse from hatching until the oldest nestling is willing to jump from the nest when disturbed. Young require about 15 days from this pre fledging date until they are independent of their parents. Thus, one successful nesting effort for a reproductive pair takes about 45 days (Hamilton et al. 1995). Synchronized second broods within a colony may be initiated as little as 30 days after the first brood. Individual pairs may nest 2 or more times per year.

## Demography

Banding studies, summarized by Neff (1942) and DeHaven and Neff (1973), indicated that tricolored blackbirds can live for at least 13 years, but most live for much shorter periods. There are no annual survivorship studies of tricolored blackbird, and available banding data are inadequate to provide this information (Beedy and Hamilton 1999).

## Behavior

During the breeding season, tricolored blackbirds exhibit itinerant breeding, commonly moving to different breeding sites each season (Hamilton 1998). In the north Central Valley and northeastern California, individuals move after first nesting attempts, both successful and unsuccessful (Beedy and Hamilton 1997). Banding studies indicate that significant movement into the Sacramento Valley occurs during the postbreeding period (DeHaven et al. 1975b).

In winter, numbers of tricolored blackbirds decrease in the Sacramento Valley and increase in the Sacramento–San Joaquin River Delta and north San Joaquin Valley (Neff 1937; Orians 1961a; Payne 1969; DeHaven et al. 1975b). By late October, large flocks also congregate in pasturelands in southern Solano County and near dairies on Point Reyes Peninsula in Marin County (Beedy and Hamilton 1999). Other birds winter in the central and southern San Joaquin Valley. Concentrations of more than 15,000 wintering tricolored blackbirds may gather at one location and disperse up to 32 kilometers (20 miles) to forage (Neff 1937; Beedy and Hamilton 1999). Individual birds may leave winter roost sites after less than 3 weeks and move to other locations (Collier 1968), suggesting winter turnover and mobility. In early March/April, most birds vacate the wintering areas in the Central Valley and along the coast and move to breeding locations in the Sacramento and San Joaquin Valleys (DeHaven et al. 1975b).

Tricolored blackbirds are highly colonial and sometimes polygynous, with 1 to 4 females pairing with 1 male (Payne 1969). Historic colonies of over 200,000 pairs have been documented occupying a 24 hectares of cattail marsh (Neff 1937). This social cohesion is retained during the nonbreeding season with birds forming large foraging and roosting flocks. These flocks may be all tricolors, or mixed flocks with Red-winged Blackbirds, Brewer's Blackbirds, Brown-headed Cowbirds, and European Starlings (Beedy and Hamilton 1999).

Males defend only the immediate areas around the nests. Male territory size ranges from 1.8 square meter (m<sup>2</sup>) (19.38 square feet) (Lack and Emlen 1939) to 3.25 m<sup>2</sup> (35 square feet) (Orians 1961b). Average size of recently established territories of six banded males at two different colonies was 3.25 m<sup>2</sup> (35 square feet); volumetric territories in willows were calculated to be 8.5–11.3 cubic meters (300–400 cubic feet) (Collier 1968). Some Himalayan blackberry colonies have nesting densities up to six nests/m<sup>2</sup> (0.56 nest/square foot) (Cook and Hamilton pers. comms.). After 1 week of nest-building and egg-laying, males may cease territorial defense (Orians 1961b).

Most tricolored blackbirds forage within 5 kilometers (3.1 miles) of their colony sites (Orians 1961a), but commute distances of up to 15 kilometers (9.3 miles) have been reported (Beedy and Hamilton 1999). Short-distance foraging (i.e., within sight of the colony) for nestling provisioning also is common. Both sexes are known to provision the nestlings (Beedy and Hamilton 1999).

Proximity to suitable foraging habitat appears to be extremely important for the establishment of colony sites, as tricolored blackbirds always forage, at least initially, in the field containing the colony site (Cook 1996). However, usually only a minor fraction of the area within the commuting range of a colony provides suitable foraging habitat. For example, within a 5-kilometer (3-mile) radius there may be low-quality foraging habitats such as cultivated row crops, orchards, vineyards, and heavily grazed rangelands in association with high-quality foraging areas such as irrigated pastures, lightly grazed rangelands, vernal pools, and recently mowed alfalfa fields (Beedy and Hamilton 1999; Cook 1999).

## Ecological Relationships

Tricolored blackbirds occupy a unique niche in the Central Valley/coastal marshland ecosystems. In areas where numbers are high, they are both aggressively and passively dominant to, and often displace, sympatric marsh nesting species, including red-winged and yellow-headed blackbirds (Orians and Collier 1963, Payne 1969).

## Threats

The greatest threats to this species are the direct loss and alteration of habitat, but other human activities and predation also threaten tricolored blackbird populations in the Central Valley (Beedy and Hamilton 1999).

## Habitat Loss and Alteration

Most native habitats that once supported nesting and foraging tricolored blackbirds in the Central Valley have been altered by urbanization and unsuitable agricultural uses, including vineyards, orchards, and row crops (Frayser et al. 1989; Wilen and Frayer 1990). In Sacramento County, a historic breeding center of the species, the conversion of grassland and pastures to vineyards expanded from 3,050 hectares (7,536 acres) in 1996 to 5,330 hectares (13,171 acres) in 1998 (DeHaven 2000). Many former agricultural areas within the historical range of tricolored blackbird are now being urbanized; in western Placer County, where tricolored blackbirds forage in the ungrazed annual grasslands associated with rural subdivisions, suitable habitat will be largely eliminated as current land conversion patterns continue.

In some places, most historical tricolored blackbird breeding and foraging habitats have been eliminated and there is currently little or no breeding effort where there once were large colonies (Orians 1961a; Beedy et al. 1991). Elsewhere, tricolored blackbirds have shifted from cattails as a primary nesting substrate (Neff 1937) to Himalayan blackberries (DeHaven et al. 1975a), and more recently to cereal crops and barley silage (Hamilton et al. 1995).

## Other Human Activities

Nests and nest contents in cereal crops and silage are often destroyed by agricultural operations (Hamilton et al. 1995; Beedy and Hamilton 1997). Harvesting of silage and plowing of weedy fields are currently the most common reasons tricolored blackbird nesting colonies are destroyed on agricultural lands. Other factors that may affect the nesting success of colonies in agricultural areas include herbicide and pesticide applications and spraying for mosquito abatement (Beedy and Hamilton 1999).

## Predation

Predation is at present (i.e., 1985–2002) a major cause of complete nesting failure at some tricolored blackbird colonies in the Central Valley. Historical accounts documented the destruction of nesting colonies by a diversity of avian, mammalian, and reptilian predators. Recently, especially in permanent freshwater marshes of the Central Valley, entire colonies (>50,000 nests) have been lost to Black-crowned Night-Herons, Common Ravens, coyotes, and other predators (Beedy and Hamilton 1999).

## Conservation and Management

The tricolored blackbird is a bird species of special concern in California (California Department of Fish and Game and Point Reyes Bird Observatory 2001). Management goals that have been proposed include maintaining a viable

self-sustaining population throughout the species' current geographic range, avoiding losses of colonies and their associated habitats, increasing breeding populations on suitable public and private lands managed for this species, and enhancing public awareness and support for protection of habitat and active colonies. A California Department of Fish and Game and U.S. Fish and Wildlife Service program for purchasing portions of crops to preserve several large colonies of tricolors in Kings, Fresno, and Tulare Counties was implemented in 1993 and 1994 with significant conservation results. These actions and participation by landowners in delaying harvest to protect active nesting colonies resulted in an addition of an estimated 37,000 and 44,000 first-year added to the 1994 and 1995 breeding seasons (Beedy and Hamilton 1999). Similar conservation measures could be used in the inventory area to enhance populations.

## Modeled Species Distribution

### Model Description

#### Assumptions

1. Core Breeding Habitat: Wetland, pond, and sloughs/channels in grassland, alkali grassland, cropland, pastures, ruderal, urban, and oak savanna land-cover types.
2. Primary Foraging Habitat: Pastures, grassland, seasonal wetlands, cropland.
3. Secondary Foraging Habitat: Orchards, vineyards.

#### Rationale

Tricolored blackbirds historically occurred within the Central Valley associated with emergent freshwater marshes dominated by cattails or bulrushes, with some colonies occurring in willows, blackberries, thistles, and nettles associated with sloughs and natural channels (Neff 1937). More recent colonies have been observed in a diversity of upland and agricultural areas (Collier 1968, Cook 1996), riparian scrublands and woodlands Orians 1961a; DeHaven et al 1975a; Beedy et al. 1991; Hamilton et al. 1995; Beedy and Hamilton 1999).

Small breeding colonies have been documented at public and private lakes, reservoirs, and parks surrounded by shopping centers, subdivisions, and other urban development. Adults from these colonies generally forage in nearby undeveloped upland areas. Beedy and Hamilton (1999) predict that these small, urban wetlands and upland foraging habitats may continue to accommodate tricolored blackbirds in the future unless they are eliminated entirely by development. High-quality foraging areas include irrigated pastures, lightly grazed grasslands, dry seasonal pools, mowed alfalfa fields feedlots, and dairies (Beedy and Hamilton 1999). Lower quality foraging habitats include cultivated row crops, orchards, vineyards, and heavily grazed rangelands.

## Model Results

Figure 2 shows the modeled potential habitat of the tricolored blackbird within the inventory area. The modeled habitat is extensive because it includes a wide range of land-cover types. The documented occurrences of tricolored blackbirds in east Contra Costa County clearly are limited, in part due to the nomadic behavior of the species, but are consistent with the modeled habitat. The model may overestimate suitable core habitat in urban areas. It is likely that a small subset of ponds within urban areas actually provide suitable habitat due to requirements of suitable foraging habitat nearby. We conservatively assumed that all urban ponds are potentially suitable because of the lack of data on pond conditions. The model may overestimate suitable core habitat outside urban area because the condition of ponds (e.g, vegetation, ponding duration, etc.) is unknown. The model does not include reservoirs as suitable habitat, although tricolored blackbird may use emergent vegetation around the margins of some reservoirs (e.g., Contra Loma, Antioch, Marsh Creek, but not Los Vaqueros) for breeding. We did not map emergent vegetation around the margins of reservoirs because it fell below our minimum mapping unit.

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