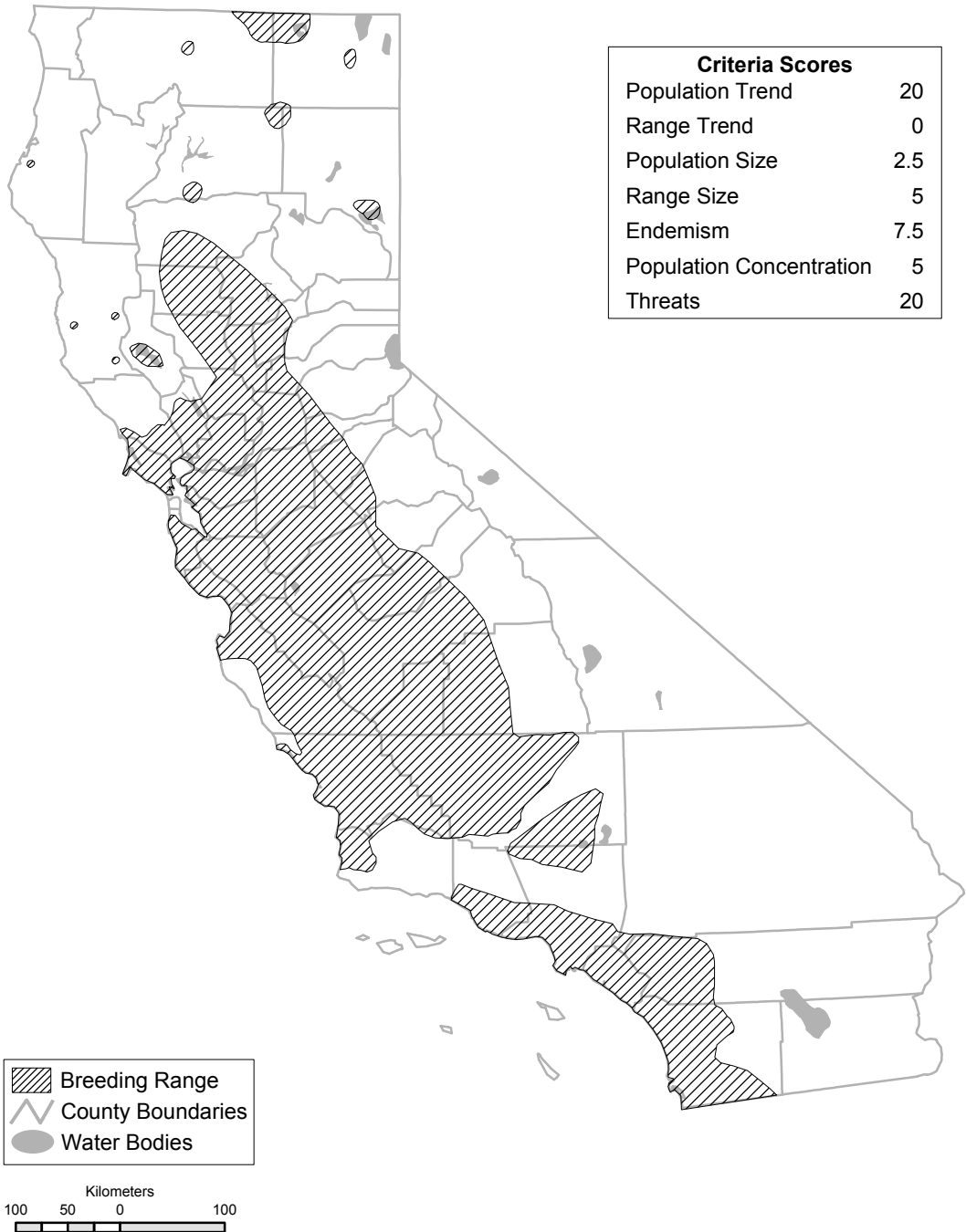


TRICOLORED BLACKBIRD (*Agelaius tricolor*)

EDWARD C. BEEDY



Breeding range of the Tricolored Blackbird in California. Overall outline of the range is stable, though numbers of breeders have declined dramatically. Colonies typically are largest in the Central Valley and are patchily distributed throughout, but particularly in the Coast Ranges and on the coastal slope.

SPECIAL CONCERN PRIORITY

Currently considered a Bird Species of Special Concern (breeding), priority 1. Included on the previous special concern list (CDFG 1992).

BREEDING BIRD SURVEY STATISTICS FOR CALIFORNIA

Data inadequate for trend assessment (Sauer et al. 2005).

GENERAL RANGE AND ABUNDANCE

Except for small nesting colonies found locally in Oregon, Washington, Nevada, and coastal Baja California, the Tricolored Blackbird is native to California. Of a global population estimated at about 163,000 adults in 2000, >99% were in California; in most years, the Central Valley alone holds >90% of all breeding adults (Hamilton 2000). The species also breeds locally in other lowland areas of California west of the Cascade-Sierra axis and in valleys at higher elevations in northeastern California, as described in greater detail in sections below. During winter, virtually all birds from outside the state, except a few in Oregon, withdraw to concentrate in the California breeding range (Beedy and Hamilton 1999).

Although no subspecies are recognized (AOU 1957, Pyle 1997), banding studies (Neff 1942, DeHaven and Neff 1973, DeHaven et al. 1975a) indicate that birds from Santa Barbara County south to Baja California and east to the Sonoran Desert remain within that area year round and could represent a separate metapopulation.

SEASONAL STATUS IN CALIFORNIA

Tricolored Blackbirds are permanent residents of California, but birds make extensive migrations and movements, both in the breeding season and in winter, within their restricted range (DeHaven et al. 1975a, Hamilton 1998). Banding studies (Neff 1942, DeHaven and Neff 1973) and observations of unbanded birds (Payne 1969, Orians 1961), however, demonstrate that some Tricolored Blackbirds reside in the Central Valley throughout the year. Breeding extends from mid-March through early August (Beedy and Hamilton 1999); autumnal breeding (Sep through Nov) has been documented at several sites in the Central Valley (Orians 1960, Payne 1969) and at Point Reyes, Marin County (Jul through Sept; Stallcup 2004). During the breeding season, the species often exhibits itinerant breeding (Hamilton 1998). Individuals usually move north after first

nesting efforts (Mar–Apr) in the San Joaquin Valley and Sacramento County to new breeding locations in the Sacramento Valley, northeastern California, and rarely Oregon, Nevada, and Washington. Although later nesting is typical in the north, small colonies may form during April to June throughout the breeding range.

HISTORIC RANGE AND ABUNDANCE IN CALIFORNIA

The Tricolored Blackbird's known historic breeding range in California (see map) included the Sacramento and San Joaquin valleys, the foothills of the Sierra Nevada south to Kern County, the coastal slope from Sonoma County south to the Mexican border, and, sporadically, the Modoc Plateau (Dawson 1923, Neff 1937, Grinnell and Miller 1944). Historical surveys, however, did not include large areas of the species' currently known breeding range and consequently did not document its full extent at the time (see below).

Few 19th-century accounts exist of the abundance of Tricolored Blackbirds in California. Heermann (1859:53) described fall flocks of thousands in the Shasta region and a wintering flock in Solano County "numbering so many thousands as to darken the sky for some distance by their masses." Belding (1890) observed an "immense" colony in San Joaquin County. According to J. G. Cooper, the Tricolored Blackbird was "the most abundant species near San Diego and Los Angeles, and not rare at Santa Barbara" (Baird 1870:266; Baird et al. 1874:166). Grinnell (1898) reported them in "considerable numbers" throughout the year in Los Angeles County.

Neff (1937) conducted the first systematic surveys of the species' population status and distribution. In 1934, he observed as many as 736,500 adults in just eight Central Valley counties. From 1931 to 1936, he found 252 colonies in 26 California counties. The largest colony, in Glenn County, contained >200,000 nests (about 300,000 adults) and covered almost 24 ha; several others in Sacramento and Butte counties contained >100,000 nests (about 150,000 adults). Most large colonies were associated with freshwater emergent wetlands in rice-growing areas of the Sacramento Valley.

RECENT RANGE AND ABUNDANCE IN CALIFORNIA

The overall range of the species is little changed since the mid-1930s (Beedy and Hamilton 1999), though more recent surveys have documented

occurrence in some areas lacking extensive prior coverage that likely were occupied historically (Hamilton et al. 1995; Beedy and Hamilton 1997; Hamilton 2000, 2004; Green and Edson 2004). This mostly includes documentation of local populations at the periphery of the range, such as those on the coast north to Humboldt County, in northeastern California, and in the western Mojave desert, and of new colony sites within the overall historic range (see map). Since 1980, active breeding colonies have been observed in 46 California counties; all of the largest (>20,000 adults) were in the Central Valley or at the Toledo Pit, Riverside County.

Recent statewide censuses have shown dramatic declines in Tricolored Blackbird numbers in the Central Valley (Beedy and Hamilton 1997, Hamilton et al. 1999, Hamilton 2000, Green and Edson 2004, Cook and Toft 2005). Statewide totals of adults in four late-April surveys covering all recently known colony sites were 369,359 in 1994, 237,928 in 1997, 104,786 in 1999, and 162,508 in 2000 (Hamilton 2000). In April 2004, statewide surveys focused on only those colonies that had supported >2000 adults in at least one previous year. Of 184 sites surveyed, only 33 supported active colonies at the time of the survey (Green and Edson 2004). Of the 33, 13 held >2000 adults each, collectively representing >96% of the census total.

Although resident in California, wintering Tricolored Blackbird populations move extensively throughout their range in the nonbreeding season. Major wintering concentrations occur in and around the Sacramento–San Joaquin River Delta and coastal areas, including Monterey and Marin counties, where they are often associated with dairies. Small flocks also may appear at scattered coastal locations from Sonoma County south to San Diego County, and sporadically north to Del Norte County (Beedy and Hamilton 1999, Unitt 2004). They are rare in winter in the southern San Joaquin Valley and in the Sacramento Valley north of Sacramento County (Beedy and Hamilton 1999).

ECOLOGICAL REQUIREMENTS

The Tricolored Blackbird forms the largest breeding colonies of any North American landbird (Cook and Toft 2005). As many as 20,000 to 30,000 nests have been recorded in cattail (*Typha* spp.) marshes of 4 ha or less, with individual nests <0.5 m from each other (Neff 1937, DeHaven et al. 1975b). Nest heights range from a few centi-

meters to about 1.5 m above water or ground at colony sites in freshwater marshes (Neff 1937) and up to 3m in the canopies of willows (*Salix* spp.) and other riparian trees; rarely, they are built on the ground. The species' basic requirements for selecting breeding sites are 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 kilometers of the nesting colony (Beedy and Hamilton 1999).

The colonial breeding system of the Tricolored Blackbird probably evolved in the Central Valley, where the locations of surface waters and rich sources of insect food were ephemeral and varied annually (Orians 1961). 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. Virtually all these habitats once supported nesting or foraging Tricolored Blackbirds. The evolution of a colonial breeding system enabled this species to assess changing local conditions rapidly and exploit outbreaks of locusts and other ephemeral insects over large areas to meet their food demands. Nomadic, colonial social organization in birds evolves most frequently in semiarid areas with great annual fluctuations in climate (Orians 1961).

Historically, most colonies were in freshwater marshes dominated by cattails or tules (*Scirpus* spp.), but some were in nettles (*Urtica* spp.), thistles (*Cirsium* spp.), and willows (*Salix* spp., Neff 1937). However, the use of freshwater marshes as breeding colony sites decreased from 93% ($n = 252$ colonies) in the 1930s (Neff 1937) to 54% ($n = 158$ colonies) in the 1970s (DeHaven et al. 1975b). An increasing percentage of colonies since the 1970s have been reported in Himalayan Blackberry (*Rubus discolor*) and thistles (DeHaven et al. 1975b, Cook 1996), and some of the largest recent colonies were in silage and grain fields near dairies in the San Joaquin Valley (Hamilton et al. 1995, Meese 2006). Other less commonly used nesting substrates include Safflower (*Carthamus tinctorius*), tamarisk (*Tamarix* spp.), elderberry/Western Poison Oak (*Sambucus* spp. and *Toxicodendron diversilobum*), Giant Reed (*Arundo donax*), and riparian scrublands and forests (e.g., *Salix* spp., *Populus* spp., *Fraxinus* spp.; Beedy and Hamilton 1999).

Wintering Tricolored Blackbirds often congregate in huge, mixed-species blackbird flocks that forage in grasslands and agricultural fields with low-growing vegetation and at dairies and feedlots. In February, however, this species segregates

into pure Tricolored Blackbird flocks, which may subdivide further into age- and sex-specific flocks. At this time, foraging flocks roam across the landscape until they find a suitable nesting substrate with an abundant insect source nearby. The most important prey for adults provisioning nestlings include Coleopterans (beetles), Orthopterans (grasshoppers, locusts), Hemipterans (true bugs), other larval insects, and Arachnids (spiders and allies; Crase and DeHaven 1977).

With the loss of a natural flooding cycle and most native wetland and upland habitats in the Central Valley, Tricolored Blackbirds now forage primarily in artificial habitats. Ideal foraging conditions for this species are created when shallow flood-irrigation, mowing, or grazing keeps the vegetation at an optimal height (<15 cm). Preferred foraging habitats include crops such as rice, alfalfa, irrigated pastures, and ripening or cut grain fields (e.g., oats, wheat, silage), as well as annual grasslands, cattle feedlots, and dairies (Beedy and Hamilton 1999). These blackbirds also forage in remnant native habitats, including wet and dry vernal pools and other seasonal wetlands, riparian scrub habitats, and open marsh borders. Vineyards, orchards, and row crops (tomatoes, sugar beets, corn, peas, beets, onions, etc.) do not provide suitable nesting substrates or foraging habitats for Tricolored Blackbirds.

Most Tricolored Blackbirds forage within 5 km of their colony sites (rarely up to 13 km; Orians 1961, Beedy and Hamilton 1997). Proximity to suitable foraging habitat appears to be extremely important for the establishment of colony sites, as Tricolored Blackbirds usually forage, at least initially, in the field containing the colony site (Cook 1996). However, often only a minor fraction of the area within the commuting range of a colony provides suitable foraging habitat (Beedy and Hamilton 1999).

THREATS

The greatest threats to this species are the direct loss and degradation of habitat from human activities (Beedy and Hamilton 1999). Most native habitats that once supported nesting and foraging Tricolored Blackbirds in the Central Valley have been replaced by urbanization and agricultural croplands unsuited to their needs. In Sacramento County, a historic breeding center of this species, the conversion of grassland and pastures to vineyards expanded from 3050 ha in 1996 to 5330 ha in 1998 (DeHaven 2000) to 6762 ha in 2003 (Calif. Agri. Statistics Serv., www.nass.usda.gov/ca/). Conversions of pastures and grasslands

to vineyards in Sacramento County and elsewhere in the species' range in the Central Valley have resulted in the recent loss of several large colonies and the elimination of extensive areas of suitable foraging habitat for this species (Cook 1996, DeHaven 2000, Hamilton 2004, Messe 2006).

Entire colonies (up to tens of thousands of nests) in cereal crops and silage are often destroyed by harvesting and plowing of agricultural lands (Beedy and Hamilton 1999, Hamilton 2004, Cook and Toft 2005, Messe 2006). Concentration of a high proportion of the known population in a few breeding colonies increases the risk of major reproductive failures, especially in vulnerable habitats such as active agricultural fields.

Historical accounts documented the destruction of nesting colonies by a diversity of avian, mammalian, and reptilian predators (Beedy and Hamilton 1999). Recently, especially in permanent freshwater marshes of the Central Valley, entire colonies have been lost to Black-crowned Night-Herons (*Nycticorax nycticorax*) and Common Ravens (*Corvus corax*). Some large colonies (up to 100,000 adults) may lose >50% of nests to Coyotes (*Canis latrans*), especially in silage fields, but also in freshwater marshes when water is withdrawn (Hamilton et al. 1995). Thus, water management by humans often has the effect of increasing predator access to active colonies.

Various poisons and contaminants have caused mass mortality of Tricolored Blackbirds. McCabe (1932) described the strychnine poisoning of 30,000 breeding adults as part of an agricultural experiment. Neff (1942) considered poisoning to regulate numbers of blackbirds preying upon crops (especially rice) to be a major source of mortality. This practice continued until the 1960s, and thousands of Tricolored Blackbirds and other blackbirds were exterminated to control damage to rice crops in the Central Valley.

Beedy and Hayworth (1992) observed a complete nesting failure of a large colony (about 47,000 breeding adults) at Kesterson Reservoir, Merced County, and selenium toxicosis was diagnosed as the primary cause of death. At a Kern County colony, all eggs sprayed by mosquito abatement oil failed to hatch (Beedy and Hamilton 1999). Hosea (1986) attributed the loss of at least two colonies to aerial herbicide applications.

MANAGEMENT AND RESEARCH RECOMMENDATIONS

The maintenance of a viable, self-sustaining population distributed throughout the current range

of the species will require a coordinated mix of management, monitoring, and research activities implemented on both public and private lands. Because the species' population is distributed in various habitats and landownerships, public and private partnerships to fund and implement these activities will be crucial. The Tricolored Blackbird Conservation Plan (TBWG 2007) includes many of the following management and research recommendations:

- Incorporate population and habitat conservation actions for the Tricolored Blackbird in habitat conservation plans, natural communities conservation plans, and other multispecies conservation plans and in ongoing private land agricultural and conservation easement programs.
- Restore habitat by promoting the growth of secure nesting substrates (e.g., nettles, thistles, and other naturally armored native plants) near productive foraging habitats to increase the potential carrying capacity for this species. Restored nesting habitats should be situated on protected public and private lands, especially in agricultural areas of the Central Valley and surrounding foothills.
- On refuges and other public lands that support Tricolored Blackbird colonies in irrigated pastures, manage irrigation to permit a sequential flooding regime in adjacent land parcels at the time they are breeding to enhance insect productivity. Incorporate carefully managed grazing of these parcels to maintain an average vegetation height of 15 cm to provide optimal Tricolored Blackbird foraging habitat.
- Lure nesting Tricolored Blackbirds, when possible, away from dairies and other agricultural operations to secure habitats where they are more likely to succeed; where colonies establish, defer harvest of grain and silage crops, if feasible, until after the breeding season.
- Investigate predator-prey relationships, especially the ongoing effects of Black-crowned Night-Herons and Coyotes and the responses of individuals and colonies to predators.
- Perform demographic research to determine whether reproductive success of freshwater marsh colonies varies with respect to wetland size and spatial relationships with other wetlands.
- Use genetic studies to determine the taxo-

nomie status of the southern California breeding population.

- Analyze depletion of food resources by blackbirds near breeding colonies and quantify the extent and character of foraging habitats near colonies.
- Evaluate habitat selection mechanisms and the relative value of alternative foraging habitats to breeding birds.
- Use banding and radiotelemetry to measure adult and juvenile dispersal from several colonies.
- Evaluate the distribution, resource utilization, and survival of wintering birds.

MONITORING NEEDS

The Breeding Bird Survey is inadequate for monitoring changes in the population size and distribution of the Tricolored Blackbird (Sauer et al. 2005). The ongoing volunteer surveys, initiated in 1994 and sponsored by California Department of Fish and Game and U.S. Fish and Wildlife Service, have been useful for documenting long-term population trends of this species. The primary objectives of a Tricolored Blackbird monitoring program are to track annual distribution and population trends; document the presence (or absence), location, and size of breeding colonies throughout the historic range; and monitor reproductive success to assess population viability and determine habitat characteristics associated with nesting success.

The volunteer survey should be conducted at least once every three years. Participants should visit previously documented colony locations, explore other potentially suitable nesting habitats, and gather data on specific colony location, acreage, vegetative substrate, breeding behavior, and total number of adults (estimated from about 25 m from the nesting area). Repeat visits later in the breeding season are recommended to determine the fate of active colonies; entry into active colonies is discouraged. The surveys will be especially valuable if conducted over a period of years, using consistent methods and an increasing core of experienced observers, thereby documenting new breeding localities and lost habitats, increasing observer skills in species and habitat identification, and enhancing public awareness of this unique species.

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