

Recovering the Tricolored Blackbird in California

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The Tricolored Blackbird (hereafter, also “tricolor”) is a near-endemic California passerine that forms the largest colonies of any North American landbird since the extinction of the passenger pigeon (*Ectopistes migratorius*) over 100 years ago (Beedy and Hamilton 1999). Tricolor numbers have plummeted recently, from an estimated 395,000 birds in 2008 (Kelsey 2008) to 145,000 in 2014 (Meese 2014) due to a variety of factors including widespread nesting and foraging habitat losses to agriculture and urbanization, destruction of nesting colonies during the routine harvest of their grain field nesting substrates, and shooting in autumn in paddies of ripening rice. This decline in abundance coincided with a period of chronically low reproductive success (Meese 2013), and led, in December 2014, to an emergency listing as an endangered species under the California Endangered Species Act (CESA).

POPULATION TARGET

A population target for the Tricolored Blackbird is essential to define “recovery”, guide recovery planning, and evaluate the results of recovery efforts. Members of the Tricolored Blackbird Working Group proposed a population target of a breeding population of 700,000 birds averaged over several years, although this target was never formally adopted (Tricolored Blackbird Working Group 2007, 2009).

We agree with the Working Group members and recommend that a population target of an average of 700,000 breeding birds, calculated over five annual monitoring efforts, be adopted as the recovery target. The 700,000 bird target represents a prudent population level that likely existed in the last decade of the 20th Century and is justified by:

- knowledge of the historical population (Meese 2015),
- the recent concentration of the majority of birds in a small number of colonies (Kelsey 2008, Kyle and Kelsey 2011),
- insufficiently documented but well-known fluctuations in annual population sizes and productivity (Neff 1937, DeHaven et al. 1975, Meese 2013, 2015), and
- on-going threats to the species' survival, including undetected (although now illegal) human-caused mortality during harvest of active colonies in grain fields adjacent to dairies, incidental shooting while in multi-species foraging flocks in autumn in fields of ripening rice, additional losses of breeding and foraging habitats due to development and conversion to nut orchards and other perennial crops, and the as-yet unstudied effects of insecticides in suppressing insect populations, which are required for breeding (Payne 1969, Meese 2013).

We further recommend a more definitive population modeling effort that incorporates existing bioregional information and an examination of banding data to evaluate the connectedness of the regional populations, estimation of adult and juvenile survival rates and the annual variance in regional and statewide population numbers, and a formal population viability analysis. Results of these analyses (i.e., effective population size, population size variance, annual productivity, annual survival rates) would provide additional metrics to incorporate into recovery goals.

Reaching this recovery goal will take an “all hands on deck” approach and require the efforts of many sympathetic landowners, agency staff, tricolor experts, and California citizens to create conditions throughout the range of the species that support, in perpetuity, breeding by this unique colonial passerine.

STRATEGY

The first element of an integrated recovery effort is to have a coherent strategy that has been developed by experts to address known anthropogenic sources of mortality, conflicts between Tricolored Blackbird conservation and other land uses, factors responsible for the recent chronic low reproductive success, and existing and potential land use changes. Widespread and on-going habitat losses have eliminated large parts of the tricolors' native nesting and foraging habitats in California's Central Valley and in southern California. These two regions are where the species was formerly the most abundant, as a year-round resident in southern California and during the breeding season in the San Joaquin Valley (Baird 1870, Neff 1937, Beedy and Hamilton 1999, Unitt 2004). Thus, it is essential that any recovery strategy address the needs of the birds in these two parts of its range. The options for tricolor conservation may be few in southern California due to likely irreversible

habitat losses. Given the 78% reduction in abundance from 2008-2014 in the San Joaquin Valley (Meese 2014), the door may be closing for conservation opportunities there, as well. Thus, time is of the essence in developing and implementing an integrated and effective recovery strategy.

IDENTIFYING PRIORITY SITES

Given the extraordinary natural diversity of California and the wide geographic range of the tricolor at lower elevations within the state, it is essential to take a bioregional or even county-by-county approach in reviewing the decline in abundance and identifying potential actions in specific locations that could benefit the species. The results of the recent Statewide Surveys and other studies suggest that the problems facing the species are not uniform across its range but rather regionally specific, although nowhere except possibly in the Sierra Nevada foothills does the species appear to be holding its own (Airola et al. 2015, Meese 2015, Meese et. al. 2015). The Southern California, Central California Coast, and San Joaquin Valley bioregions all support far fewer birds now than they did in the recent past, and analyses of potential actions to benefit the species should consider bioregional differences in the causes for and responses to the decline.

All analyses of suitable actions should consider:

- history of use of location;
- current and future suitability;
- history of productivity;
- suitable nearby foraging habitats;
- surrounding land uses; and
- known, proposed, or potential threats to nesting and foraging habitats.

It is essential to establish site priorities based upon an expectation of their use, and perhaps the best indicator of the potential for use of a site is its recent history. Where possible, it is important to consider both how many birds nested and how many young were fledged, because low reproductive success has been a chronic problem for at least several years (Cook and Toft 2005, Meese 2013). All else being equal, locations with relatively higher average reproductive success should be preferred targets for conservation investments (Holyoak et. al 2014). Land cover and uses within a 5 km radius of the nesting substrates, the distance within which the vast majority of foraging typically occurs (Beedy and Hamilton 1999), should be considered as equally important as nesting vegetation. This is especially important where past reproductive success is unknown, as tricolors are insectivorous during the breeding season and reproductive success is correlated with insect abundance (Meese 2013). High quality nesting habitat surrounded by low quality foraging habitats may create ecological traps where birds form

colonies but breeding efforts are relatively unsuccessful (Meese 2013), and such situations will likely do little to reverse the species' decline in abundance. Any changes to both nesting and foraging habitats that may have made the site less suitable since previous use also should be considered, and known, proposed, or potential threats assessed.

The Tricolored Blackbird Conservation Plan, signed by over 30 agencies and organizations in 2007 (Tricolored Blackbird Working Group 2007) and updated in 2009 (Tricolored Blackbird Working Group 2009), was intended to provide planning guidance for conservation. It did not, however, provide the kind of site-by-site or county-by-county recommendations that are needed, and many of its recommendations were not adopted and others were implemented inconsistently. The number of birds has decreased alarmingly since the Plan was adopted (Meese 2014).

IMPLEMENTATION: ON-THE-GROUND ACTIONS

The recovery of the Tricolored Blackbird will require site-specific actions in strategic locations to stem the decline in abundance and increase the number of birds. In all cases, implementing actions appropriate for local conditions will be needed to provide for the long-term needs of the species. What follows is a bioregional assessment of needed actions, with the bioregions defined according to Meese (2015).

Southern California

Southern California may be the most threatened of the bioregions, as the greatest obstacle to tricolor conservation in this portion of the species' range is the ongoing habitat loss due to urbanization (Unitt 2004, Cook 2010). This area, along with the Central Coast, is possibly where the greatest percentage of the historic population has been lost. Although no complete estimate of the number of birds in southern California was provided by early investigators, knowledgeable ornithologists considered the tricolor to be the most abundant land bird in southern California around the end of the 19th Century (Baird 1870, Unitt 2004). During the 2014 Statewide Survey, however, only about 12,000 birds were observed from the Tehachapis south to the Mexican border (Meese 2014).

Due to the intense and ongoing urbanization in southern California, the conservation of tricolors there will likely depend disproportionately upon protected areas including state wildlife areas and remnant or anthropogenic "natural areas" including flood retention basins and constructed wetlands associated with water treatment facilities. In a few strategic locations (e.g., the region around Palomar Mountain in northern San Diego County), active collaborations with private landowners may help to conserve remnant colony locations with adjacent foraging habitats.

Southern California also has a remnant dairy industry, and in Riverside County, in particular, there recently have been wholesale losses of breeding efforts when grain fields occupied by breeding birds were harvested during normal agricultural operations (Cook, unpub. data). It is imperative that all known anthropogenic sources of egg, nestling, and adult mortality be eliminated and all breeding colonies in southern California be preserved. Specific efforts to identify and conserve at-risk colonies that establish in grain fields adjacent to dairies, with compensation to affected landowners, are essential components of recovery efforts.

In southern California, it may be especially important to emphasize the review of all development proposals to include possible detrimental effects, including cumulative impacts, on required tricolor nesting and foraging habitats. An excellent, current example of cumulative impacts are the threats posed by alternative energy developments such as those in the Antelope Valley in northern Los Angeles County and southeastern Kern County, where the installation of photovoltaic panels has eliminated large portions of potential foraging habitats east of Holiday Lake, a site that was utilized by 5,000 breeding birds in 2014 (Meese 2014, unpub. data).

San Joaquin Valley

The San Joaquin Valley is California's "Dairy Belt," and for decades tricolors have been most abundant during the breeding season in this portion of their range (Beedy and Hamilton 1999, Kelsey 2008). This abundance apparently has resulted from the rise in the dairy industry during the 1980s and the attraction of the breeding birds to the essentially *ad libitum* amounts of stored grains there. As recently as 2006, a colony established in triticale (a wheat x rye hybrid grain grown as forage for dairy cows) adjacent to a dairy consisted of an estimated 138,000 breeding birds (Meese 2006). The number of tricolors in this region, however, has declined by an estimated 78% from 2008 to 2014 (Meese 2014).

Although tricolors are believed to subsist largely on grains during the non-breeding season (Beedy and Hamilton 1999), grains alone apparently do not support successful breeding (e.g., Meese 2009a, 2013), and this is also the region where for decades, a conflict between so-called "silage colonies" and normal agricultural operations has resulted in the mortality of tens of thousands of eggs and nestlings when their triticale nesting substrate is harvested during the breeding season (Meese 2009a).

Conservation actions in this region must focus on the resolution of the "harvest conflict" by providing secure nesting habitats surrounded by or close to productive foraging habitats so that breeding birds have an alternative to silage nesting. In the interim, while permanent nesting and foraging habitats are being provided, a policy of zero loss of silage colonies with compensation to the few affected landowners must be adopted to ensure that all silage

colonies are conserved and fledge their young before the harvest of the triticale nesting substrate occurs.

Examples of possible conservation scenarios in this region include a private duck club, which could provide cattail (*Typha latifolia*) nesting habitat and water, adjacent to or within 3 miles of 80-160 acres of unsprayed alfalfa. Alfalfa can support large insect populations, and tricolor reproductive success is highly correlated with insect abundance (Meese 2013). Another potential conservation scenario may be a National Wildlife Refuge or sympathetic landowner with appropriate nesting substrate and open water (See Meese and Brady 2015) that is adjacent to open rangeland or similar foraging habitats. In some cases, the National Wildlife Refuges themselves may be managed to provide insect-rich foraging habitats such as appropriate native plants or unsprayed alfalfa. Lands in permanent conservation easements or other forms of permanent protection should be evaluated for their potential to contribute to tricolor conservation and recovery.

Coastal Locations

Tricolors have been nearly extirpated from the Central California Coast region. In the April 2014 Statewide Survey, only 627 birds were seen in six counties from Alameda to San Luis Obispo, a reduction of 91% since 2008 (Kelsey 2008, Meese 2014). In this region, the birds nest primarily in marshes on private property; thus, conservation actions involve working with property owners to restore or properly manage nesting substrates (Meese et al. 2015) at sites with adjacent or nearby secure, potentially productive foraging habitats. Colony locations and surrounding foraging habitats must be provided long-term protection from land use changes including the planting of additional vineyards and residential developments, so all potential conservation investments should include assessments of susceptibility to habitat loss through reviews of County and City General Plans and other environmental planning documents.

Sacramento Valley

Most birds that breed first in the San Joaquin Valley are believed to move north in May and breed again in the Sacramento Valley (Hamilton 1998, Meese unpub. data). The Tricolored Blackbird Statewide Survey is conducted in mid-to-late April, and does not estimate the number of breeding birds in the Sacramento Valley. However, the severity of losses of breeding tricolors in the Sacramento Valley is indicated by the fact that there were no colonies known in all of Colusa County in 2014 (Meese pers. obs.), where in the very recent past, colonies of 80,000 breeding birds had formed (e.g., Meese 2009b).

The Sacramento Valley is dominated by agriculture, and major portions of the floor of the Sacramento Valley are covered by rice and nut orchards.

Conservation efforts here should focus on providing high quality foraging habitats rather than nesting habitats (see Meese and Beedy 2015), as many National Wildlife Refuges, State Wildlife Areas, and private duck clubs in this region provide excellent potential nesting habitat. The area has a well-documented history of use by large numbers of breeding birds, but with very low reproductive success due to the extremely limited nearby foraging habitats. For example, the 75,000 birds that bred at Delevan National Wildlife Refuge in 2009 produced only 13,000 young, or only 0.26 young per nest (Meese 2009b). Options to provide additional foraging opportunities include providing insect-attracting plants on state and federal refuges and other protected areas to increase insect prey populations near nesting birds, and growing more organic or insecticide-free rice, as organic rice cultivation is believed to provide sufficient insect abundance to support relatively high reproductive success (Meese unpub. data).

Central Sierra Foothills

The number of birds seen in this region over the past three Statewide Surveys increased by about 25%, from 22,586 birds in 2008 to 28,281 birds in 2014. This increase and a recent breeding season survey in the region (Airola et al. 2015), suggest that conditions in this bioregion may continue to support successful breeding by tricolors. The dominant land-use in areas occupied by tricolors is ranching, and birds breed primarily in isolated stands of Himalayan blackberries (*Rubus armeniacus*) and small cattail (*Typha latifolia*) and bulrush (*Schoenoplectus maritimus*) marshes in stock ponds (Airola et al. 2015). Most of the ground cover near colonies is open rangeland dominated by introduced Eurasian grasses, with lesser amounts of irrigated pasture, dryland hayfields, other agriculture, oak savanna and woodland, shrublands, and urban development. However, nearly 37% of colony locations studied by Airola et al. (2015) in this bioregion are threatened by approved or proposed development, so all proposed conservation investments should include assessments of susceptibility to habitat loss through reviews of general plans and other environmental planning documents.

Ranching appears to be beneficial to breeding tricolors (Airola et al. 2015), but many private landowners may be wary of maintaining habitat for an endangered species. Therefore, conservation actions here must include vigorous education and outreach efforts to explain to landowners the importance of the resources that they are providing to breeding birds and the benefits that the breeding tricolors provide by consuming large numbers of grasshoppers (Payne 1969, Meese 2013, Airola et al. 2015) that would otherwise compete with cattle for forage. Voluntary programs such as conservation easements may protect rangeland resources and benefit both birds and ranchers.

plight. These education and outreach efforts should engage the widest possible audience, including:

- direct contacts with representatives in those industries likely to be most affected by Tricolored Blackbird recovery efforts, including developers and agriculture, especially the dairy industry, nut orchard owners, vineyard owners, ranchers, and rice farmers;
- targeted presentations to industry groups, local Resource Conservation District staff, local Audubon chapters, County Agricultural Commissioners, state and federal agencies, NGO staff, and others interested in or affected by recovery efforts;
- responses to requests for assistance from industry groups, local Audubon chapters, non-governmental organizations, biological consultants, and others to inform experts of settlements, colonies, and aggregations of birds, especially in new or at-risk locations, as well as habitat management techniques.

MONITORING

For over 20 years, Tricolored Blackbird conservation efforts have included an annual monitoring effort to gauge the breeding status of the species; however, these efforts have been conducted mostly by a few individuals working primarily in southern California and the Central Valley. Annual monitoring efforts should be expanded to include Sierra Nevada foothill and coastal locations and should emphasize use of the Tricolored Blackbird Portal as both a data entry tool and a device to coordinate and encourage “citizen science” efforts to engage motivated citizens to generate knowledge of breeding status and numbers across a wider geographical area.

Monitoring efforts should be especially focused on documenting the results of conservation actions, including harvest delays, establishment or enhancement of nesting substrates, experimental manipulations of nesting or foraging habitats, and other recovery efforts. Potential detrimental effects of species listing on habitat conditions on private lands also should be monitored.

Since 1994, the status of the statewide population has been assessed by the triennial Tricolored Blackbird Statewide Survey. However, this effort relies upon a large number of volunteers and risks losing some of the most experienced participants due to “participant fatigue” (Meese et al. 2015) and the increasingly precarious status of the species requires the development and implementation of an annual survey based on a statistically valid subset of locations to provide more current information (Meese et al. 2015).

RESEARCH

The recovery of the Tricolored Blackbird in California will take many efforts from many individuals throughout the range of the species and a

commitment to research that annually provides information on key parameters, including:

- site occupancy,
- estimates of numbers of birds at a sample of occupied sites,
- relative rates of reproductive success at a sample of colonies,
- relative insect abundances in foraging habitats near occupied sites, and
- results of site-specific conservation actions.

Some effort has been made to investigate these parameters, but a greater and more consistent effort is required if the species is to recover to the target of 700,000 birds. In addition to these areas of investigation, additional research is needed to evaluate the:

- possible roles of insecticides in the decline and reproductive success,
- factors that contribute to colony site selection,
- factors that contribute to relatively high reproductive success,
- foraging ecology of tricolors,
- resources and patterns of resource utilization around a sample of colonies in a diversity of areas, and
- use and reproductive consequences of conventional vs. organic culture in crops, especially alfalfa and rice, including estimates of the relative rates of foraging and reproductive success.

FUNDING

None of the work described above is possible without a significant and stable funding source. A part of the overall recovery strategy should be to estimate the funding needed to implement various conservation actions and to determine the funding sources available for those actions. Potential funding sources include agency appropriations; state and federal agency conservation programs, including the Wildlife Conservation Board's conservation programs; mitigation payments; crop insurance programs; and private individuals, organizations, and foundations. We stress that funding stability is paramount, as we believe the recovery of the tricolor will take a sustained effort spanning many years across numerous locations and inadequate or irregular funding jeopardizes the entire recovery effort.

We believe that a timely, vigorous, strategic, and effective recovery program can increase the number of tricolors and provide a bright and secure future for California's blackbird. Anything less than this will hasten the species' current rapid decline toward extinction.

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Additional conservation actions include encouraging or financially rewarding ranchers to continue to maintain and enhance existing nesting substrates, and creating new, additional nesting substrates in suitable areas that currently lack them (Airola and Young 2015). Efforts should incentivize practices that benefit breeding and foraging birds, and indemnify ranchers who provide essential resources. The absence of any potential for “take” (or mortality to breeding birds) from routine ranching activities should be emphasized, as should the ability of landowners to control blackberry patches during the non-breeding season.

ADMINISTRATIVE AND LEGISLATIVE ACTIONS

In addition to on-the-ground actions to benefit the birds and to help restore their populations, additional legal and administrative actions are needed. The recent CESA listing should serve to eliminate the destruction of “silage colonies” in southern California and the San Joaquin Valley as long as an effective mechanism is put in place that will conserve at-risk colonies. A mechanism is required to provide:

- field workers to detect settlements of birds in ephemeral nesting substrates (e.g., triticale fields);
- a person or persons to whom the field worker reports the presence of birds in ephemeral, at-risk locations and who has the responsibility of contacting landowners and informing them of the protected status of the birds and of funding available to compensate for any losses incurred in delaying the harvest of occupied substrates;
- a cooperative extension specialist or other independent expert who estimates the loss in value of the crop as a result of the harvest delay; and
- a field worker who monitors and documents the results of conservation actions (successful delay until a week past average date of fledging, an estimate of the number of young fledged, and a description of the process of harvest in those cases where fledglings are still present in the field when it is being harvested, with an emphasis on the effects on the post-harvest behavior of the fledglings).

Implementing these steps would ensure that nearly all silage colonies are conserved while landowners are compensated for any costs incurred due to the delay in the harvest of their grain fields, and eliminate the need for enforcement actions.

Additional legislative or administrative actions may be needed to eliminate incidental mortality of adults in autumn while they are foraging in paddies of ripening rice in the Sacramento Valley with Red-winged (*Agelaius phoeniceus*) and Brewer’s (*Euphagus cyanocephalus*) Blackbirds, European Starlings (*Sturnus vulgaris*), and other species for which depredation killing is

authorized under the federal Depredation Order for Blackbirds, Cowbirds, Grackles, Crows, and Magpies (50 CFR 21.43). Tricolors have been shot incidentally when in multi-species foraging flocks with other blackbird species and starlings to prevent depredation to ripening rice (e.g., USDA 2013, Meese unpub. data). The tricolors that use Sacramento Valley ricefields are largely comprised of post-breeding adults (Meese, unpub. data). The loss of post-breeding adults in autumn is especially detrimental since these adults contribute experienced breeders to the breeding population the following spring.

The incidental killing of Tricolored Blackbirds under the depredation order appears to be a violation of take prohibitions of CESA and is contrary to the species' overall recovery goals. The U.S. Fish and Wildlife Service is evaluating options for addressing Tricolored Blackbird take under the depredation order, particularly in light of a petition to list the species under the federal Endangered Species Act (R. Doster pers. comm.). The depredation order should be modified to prevent take of tricolors (e.g., by excluding California from the order or excluding take of all blackbirds and similar species within California) to eliminate adult mortality due to incidental shooting until species recovery is achieved.

LAND USE PLANNING

It is essential that the tricolor recovery effort anticipate land use changes, as many of the threats faced by the species are on-going and accelerating. At a minimum, all existing colony locations should be evaluated for known or anticipated development threats, including land use changes that would negatively impact both nesting and foraging habitats. Consultations with Resource Conservation District personnel in areas of potential conservation investments should consider City and County General Plans, regional Habitat Conservation Plans (HCPs), California Environmental Quality Act (CEQA) compliance documents (e.g., EIRs), and similar documents to identify land use changes that may negatively affect the species. The listing of the species also should result in more thorough re-evaluation of adopted and in-progress open space and conservation elements in General Plans and HCPs to ensure that they conserve tricolor habitat.

Region-specific mitigation guidelines should be developed for General Plans and project-specific plans to conserve, provide, or enhance high quality nesting and/or foraging habitats. Mitigation banks, conservation easements, and other mechanisms need to be developed to encourage conservation of large blocks of habitat containing nesting and foraging habitat.

EDUCATION AND OUTREACH

A very important element of tricolor conservation efforts is the education of a much larger number of Californians to its native blackbird species and its

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