

# Importance of Non-Native Himalayan Blackberry as Nesting Habitat for the Tricolored Blackbird in the Sierra Nevada Foothills, California

Daniel A. Airola, Conservation Research and Planning, Sacramento, CA 95864.  
d.airola@sbcglobal.net

*Peer Reviewed Article*

## ABSTRACT

Although the Threatened Tricolored Blackbird (*Agelaius tricolor*) historically nested primarily in emergent wetland vegetation, use of Himalayan blackberry (*Rubus armeniacus*) has increased in recent years. This species of blackberry is now a widely used nesting substrate, especially in the grassland-dominated lower foothills of the Sierra Nevada. This blackberry is a non-native invasive species in California, which has discouraged its protection and management as habitat for the blackbird. Himalayan blackberry patches used for nesting by Tricolored Blackbirds over 2014-2018 averaged only 0.24 ha in size and in aggregate occupied a total of only 17.5 ha within the 11,517 km<sup>2</sup> ha Sierra foothill area. Himalayan blackberry patches used for nesting by Tricolored Blackbirds occur mainly on private lands and in open areas that are managed to remain perennially wet, including irrigated pastures, ditches, stock ponds, and augmented streams. Under this altered summer water regime, Himalayan blackberry colony areas support mostly non-native plant species and high levels of livestock use. Characteristics that make Himalayan blackberry a superior upland nesting habitat for the blackbird include height, stem density, thorniness, stem robustness, and resulting resistance to grazing. Native plant species proposed as alternative nesting substrates are inferior in nearly all of these characteristics. Given the Tricolored Blackbird's predominant use of Himalayan blackberry, the small aggregate area of Himalayan blackberries used for nesting, and its superiority to native upland nesting alternatives, conservation efforts to enhance the Tricolored Blackbird population in this region should focus on maintaining the Himalayan blackberry as a nesting substrate and expanding it locally where nesting habitat is limiting.

The Tricolored Blackbird (*Agelaius tricolor*) has experienced a long-term decline in California (Clipperton 2018). For this reason, it was added to the list

of Threatened birds under the California Endangered Species Act in 2019. The historical decline is attributed to wetland and grassland habitat conversion to agriculture (Beedy et al. 2018). Recent declines have resulted from loss of grasslands and wetlands due to expansion of orchards and vineyards and urban and suburban development, and from destruction of breeding colonies during agricultural operations (Cook and Toft 2005; Graves et al. 2013; Meese 2014, 2015; Beedy et al. 2018). Recent studies showed that as much as one-fourth of the total breeding population nests in the grassland-dominated region in the Sierra foothills (Airola et al. 2015a b; 2016, 2018a). The non-native Himalayan blackberry (*Rubus armeniacus*) is recognized as an important nesting substrate for the Tricolored Blackbird (Cook and Toft 2005, Holyoak et al. 2014, Airola et al. 2015a b; 2016, 2018a b; Meese and Beedy 2015; Meese et al. 2015).

Contrary to its name, Himalayan blackberry is native to western Europe. It was apparently introduced to North America in 1885 as a cultivated crop and had become naturalized on the west coast by 1945 (Sawyer et al. 2009). It is widely recognized as an aggressive invasive species and is included on the California Exotic Pest Plant Council's (EPPCs') List 1-A (Hoshovsky 2000), signifying species that "are aggressive and widespread invaders that displace native plant species and disrupt natural habitats" (California Invasive Plant Council 1999). Himalayan blackberry can invade and occupy extensive areas, particularly disturbed areas with high soil moisture. Extensive invasions tend to occur broadly in areas of coastal Pacific Northwest states and provinces with high rainfall (Ashtley 2010, Gaire et al. 2015).

The effects of Himalayan blackberry invasion on ecosystems have received little study. In Vancouver, British Columbia, areas dominated by Himalayan blackberry had less vegetation structural diversity and lower bird species diversity than adjacent native vegetation (Ashtley 1997). Also in British Columbia, Gaire et al. (2015) noted that native vegetation supports a higher diversity of native songbirds than blackberry and recommended "management to prevent excessive growth." In the Sierra foothills Himalayan blackberry provides breeding sites, cover, and food for many wildlife species, including carnivores, rabbits, California Quail (*Callipepla californica*), and many songbirds (Core 1974, Leopold 1977, Tirmenstein 1989, D. Airola pers. obs.).

Planting and managing to maintain or enhance Himalayan blackberry conflicts with federal and state policies and practices for management of invasive non-native species (Executive Order 13751, California Department of Food and Agriculture 2005). Despite documentation of the importance of the blackberry to the Tricolored Blackbird and many other native bird species, some conservation entities have been reluctant or unable to use the plant species in conservation programs because of its invasive status and have

suggested planting various native species as nesting habitat (Sacramento County 2018, R. Akiona, R. Cook, pers. comm., E. Beedy, pers. comm.). Evaluation is needed to assess whether substitution of native species for Himalayan blackberry would be effective in meeting the needs of breeding Tricolored Blackbirds.

Here, I summarize information on Tricolored Blackbird use of Himalayan blackberry for nesting in the grassland-dominated region of the Sierra Nevada foothills and adjacent eastern Central Valley (“Sierra foothills”), as determined through studies conducted during 2014-2018 (Airola et al. 2015a, b; 2016; 2018a, b). I describe ecological conditions that support Himalayan blackberry stands used for nesting by Tricolored Blackbirds. I also evaluate native species that have been proposed for use to enhance blackbird nesting habitat by comparing their characteristics to Himalayan blackberry. Based on this information and evaluation, I evaluate the importance of managing for Himalayan blackberry in the Sierra foothills and similar grassland-dominated regions to assist in the recovery of the Tricolored Blackbird, while minimizing conflicts with other resource values.

## STUDY AREA

I present information from studies conducted across the Sierra foothills from Tehama County in the north to Fresno County in the south (Airola et al. 2015a, b; 2016; 2018a, b), and especially from a 33,750 km<sup>2</sup> area in the central portion of the Sierra foothills of California (“central foothills”) within Placer, Sacramento, El Dorado, Amador, Calaveras, Stanislaus, and Tuolumne counties. These lands are generally open plains and rolling hills between 30 and 500 m elevation that border the extensive cultivated agricultural lands to the west in the Central Valley. Foothill lands support a predominant cover of annual grassland, with lesser amounts of oak and riparian woodland, chaparral, irrigated pasture, and various agricultural crops (Airola et al. 2015a).

## METHODS

I used information from publications (Airola et al. 2015a, b; 2016; 2018a, b), unpublished data, observations collected during these studies, and information from various sources on Himalayan blackberry natural history, status, and ecology and on growth characteristics of native species suggested as alternative nesting substrates.

### *Characterizing Nesting Habitat*

Here, colony sites are defined as those patches of vegetation in which nesting activity occurred. My collaborators and I recorded plant species used by 100 Tricolored Blackbird colony sites in the Sierra foothill region over 2014-2018 (Airola et al. 2016). I used the polygon measurement tool in Google

Earth Pro (earth.google.com) to measure the size of a sample of 31 blackberry patches in the central foothills where I had field-verified the patches of available blackberry that were used for nesting. I also characterized the general ecological characteristics of the 31 Himalayan blackberry stands used by Tricolored Blackbirds (i.e., water regime, vegetation characteristics, land uses) based on field observations.

Native woody plant species suggested as alternative nesting substrates were identified by individuals in natural resource agencies and environmental organizations who work with Tricolored Blackbirds and their habitats. I compared the suitability of native plant alternatives to the Himalayan blackberry based on their use by Tricolored Blackbirds for nesting, their prevalence at 100 sites where nesting substrates were identified in the foothills, and their characteristics. Use levels were determined based on the proportion of colonies and proportion of nesting individuals that used the plant species. Prevalence of native species was based on observations (or lack of observations) in areas of open grassland, pasture, and annual croplands determined suitable as Tricolored Blackbird habitat (Airola et al. 2014).

The suitability of potential native plant species for Tricolored Blackbird nesting was evaluated based on the following physical characteristics that may affect their nesting use and protection from predators or other sources of disturbance.

Height: Tall shrubs appear to be selected by Tricolored Blackbirds (Meese and Beedy 2015)

Stem Density: Plants with denser growth forms provide more protection from wind and from predators and livestock disturbance.

Stem Robustness: Plants with thicker, woodier stems provide more support for nests, protection from wind, and resistance to entry by predators, and greater protection from livestock browsing and disturbance.

Thorniness: I use this term generally to refer to both thorns, as occur on blackberries and roses, and the stinging hairs on stinging nettles. Plants with more and larger thorns or with stinging hairs were presumed to provide better protection from predators and livestock disturbance or browsing.

## RESULTS

### *Nesting Use of Himalayan Blackberry and Other Plant Species*

Tricolored Blackbirds nested in a variety of substrates within areas supporting substantial amounts of open grassland, pasture, and annual agricultural crops in the Sierra foothill region. Most nesting occurred in Himalayan blackberry. Seventy-three percent of 100 active nesting colony

sites identified within the entire Sierra foothills region during 2014-18 had nests in Himalayan blackberry, and Himalayan blackberry was the sole species used for nest placement at 61% of sites (Airola et al. 2016; 2018a, b). Other species used less frequently in this region, included cattail (*Typha latifolia*) and bulrush (*Schoenoplectus californicus*) (24%; 14% solely these species, 10% mixed with the blackberry), and the non-native milk thistle (*Silybum marianum*; 10%), native willow (2%), and non-native sweetbriar rose (*Rosa rubiginosa*) 1% mixed with the blackberry).

Tricolored Blackbird colonies in Himalayan blackberry have repeatedly been shown to have higher reproductive success than those in emergent wetland vegetation and, until recently, in agricultural fields (Cook and Toft 2005, Holyoak et al. 2014). This higher success presumably results from their greater protection from predators, grazing livestock, and adverse weather, especially windy conditions (Airola et al. 2016). The average size of colonies in Himalayan blackberry also has declined more slowly than those in other nesting substrates over 1935-2009 (Graves et al. 2013).

#### *Total Area of Himalayan Blackberry used for Nesting*

The size of Himalayan blackberry patches at the 31 colony sites in the central foothill region where Himalayan blackberry was used exclusively averaged 0.24 ha ( $\pm 0.22$  S.D, range = 0.04-1.10 ha). Based on reports from collaborators (J. Harris, C. Swarth, and D. Ross, pers. comm.), I believe that the patch sizes in this sample are representative of the 73 colony sites with Himalayan blackberry within the entire Sierra foothill study area. Therefore, the aggregate area of Himalayan blackberry used for nesting by Tricolored Blackbirds is estimated at 17.5 ha, which represents a miniscule 0.0016% of the land area within the 11,517 km<sup>2</sup> Sierra foothills region.

#### *Ecological Characteristics of Blackberry Sites Used by the Tricolored Blackbird*

Himalayan blackberry patches used by nesting Tricolored Blackbirds were all in open areas (i.e., areas lacking extensive overhead tree cover) within extensive grasslands (Airola et al. 2015, D. Airola et al. in prep.), which is a subset of all areas occupied by the blackberry. Near-saturated soil moisture conditions are required during the growing season to support healthy, tall patches of Himalayan blackberry that are favored by Tricolored Blackbirds (Meese and Beedy 2015, Airola et al. 2018b). Soils with saturated conditions are limited and localized in the Sierra foothills because of interior California's Mediterranean climate.

Many areas in the Sierra foothills with adequate soil moisture to support Himalayan blackberry are in riparian woodland habitat that is seldom used for nesting by Tricolored Blackbirds (Airola et al. 2018b, Beedy et al. 2018). Himalayan blackberry patches that occur in open lands are often associated

with augmented water to provide livestock drinking water or irrigated green forage during the dry period from late spring to fall. Seventy percent of 46 colony sites that supported Himalayan blackberry in the central foothills that I examined were associated with augmented water sources, including irrigated pastures, stock ponds and other impoundments, or along irrigation ditches or streams with augmented flows, while only 30% occurred at natural springs or stream courses (Figure 1).

Himalayan blackberry colony sites often occur within larger irrigated areas that are dominated by non-native herbaceous species. These non-natives are better adapted to the augmented summer soil moisture conditions and heavy grazing than are native or naturalized species typical of California’s annual grasslands. Himalayan blackberry also is one of the few woody species able to grow in areas with high grazing pressure. Thus, Himalayan blackberry in suitable open nesting areas generally does not exclude native plant species, but rather occupies areas that have already been occupied by nonnative herbaceous species.

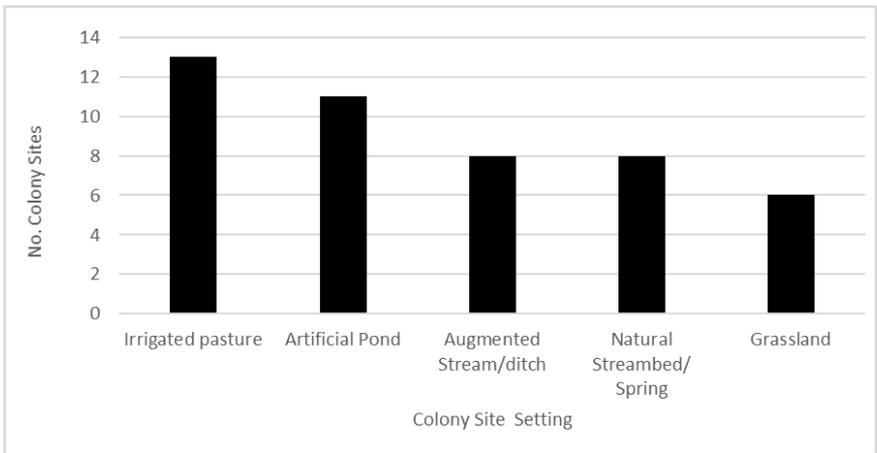


Figure 1. Ecological setting of Himalayan blackberry patches used by nesting colonies of the Tricolored Blackbird in the central portion of the Sierra Nevada foothills and adjacent eastern Central Valley, 2014-2018.

Because Tricolored Blackbirds prefer to nest in areas lacking overhead tree cover (R. Meese pers. comm., D. Airola pers. obs.), stands of Himalayan blackberry growing in riparian areas with trees or in oak woodlands, where the potential for this plant species to degrade ecological values is greatest, are typically not suitable for nesting. Therefore, control of Himalayan blackberries to encourage woody vegetation in riparian habitats poses little or no risk of detrimental effects to Tricolored Blackbirds. The presence of

Himalayan blackberry in open areas, however, has potential to increase its colonization of higher value riparian areas through seed dispersal, but potential sources of dispersants are widely available in the foothills and thus likely already widely dispersed by mammalian and avian consumers.

### *Evaluation of Plant Species Considered as Alternative Nesting Substrates*

Concerns about the impacts of invasive Himalayan blackberry have led to proposals to use of native species to create nesting habitat for the Tricolored Blackbird. Most advocates have identified natives such as California blackberry (*Rubus ursinus*), California wild rose (*Rosa californica*), stinging nettle (*Urtica dioica*), and sandbar willow (*Salix exigua*) as candidates to use in creating nesting habitat (Tricolored Blackbird Working Group 2017). With the possible exception of stinging nettle, to my knowledge no projects using these species have been accomplished, so there are no data on which to assess the success of such efforts.

My evaluation of suitability of native plant species suggested as alternative nesting substrate for the Tricolored Blackbird in foothill grasslands, and a comparison of their qualities to the Himalayan blackberry is summarized in Table 1 and described in the following sections.

*California Blackberry.* California blackberry occurs primarily in the Coast Range and lowlands of the Central Valley (<https://calscape.org/Rubus-ursinus>). In the Sierra Nevada, it grows at mid-elevation in moist areas and areas with partial shade. I have not observed it growing in open areas in the foothill grasslands. California blackberry usually grows at a height of <1 m, although it can use plants or other supports to reach a taller form. Its stems and thorns are less robust than the Himalayan blackberry. The species is not identified as a browse species to deer or livestock (Sampson and Jeperson 1963), so presumably is at least somewhat grazing resistant. The species has not been reported as a nesting substrate used by the Tricolored Blackbirds (Beedy and Hamilton 1999, Airola et al. 2015a, b; 2016, 2018a, b; Wilson et al. 2016).

*California Rose.* California rose grows in moist areas including creek bottoms, stream terraces, and channel edges (Sampson and Jespersion 1963, Sawyer et al. 2009). It is widespread but uncommon in foothill grassland areas I surveyed for Tricolored Blackbirds. It favors shaded wet riparian areas that may also be occupied by Himalayan Blackberry. Its stems and thorns are less robust than those of Himalayan blackberry. It may be moderately resistant to grazing, as it is considered fair-to-poor quality browse for deer and livestock (Sampson and Jespersion 1963). I never observed it used for nesting by Tricolored Blackbirds.

Table 1. Ratings of native plant species as Tricolored Blackbird nesting habitat, compared to Himalayan blackberry based on occurrence, use, and structure. Blue shading indicates lower value than Himalayan blackberry; pink indicates higher value.

| Plant Species         | Comparison of Species Characteristics to Himalayan Blackberry |                                  |            |              |            |                 |  |                                       |  |  |
|-----------------------|---|----------------------------------|------------|--------------|------------|-----------------|--|---------------------------------------|--|--|
|                       | Prevalence in Open Areas in the Foothills                     | Use Level in Foothills 2014-2018 | Height     | Stem Density | Thorniness | Stem Robustness | Resistance to Browsing and Livestock Disturbance | Overall Rating as a Nesting Substrate |  |  |
| California Blackberry | Much Lower  | None                             | Much Lower | Lower        | Lower      | Lower           | Lower  | Much Lower                            |  |  |
| California Rose       | Much Lower  | None                             | Lower      | Lower        | Lower      | Lower           | Lower  | Lower                                 |  |  |
| Stinging Nettle       | Lower   | None                             | Lower      | Lower?       | Lower?     | Much Lower      | Lower  | Lower                                 |  |  |
| Sandbar Willow        | Lower   | Much Lower                       | Taller     | Lower        | Much Lower | Higher          | Lower  | Lower                                 |  |  |

Several biologists with whom I consulted (and I initially) confused the non-native sweetbriar rose for the native California rose. Sweetbriar rose grows in irrigated pastures and other areas that receive high grazing use. It was used only at one colony site during two years, as an “overflow” nesting substrate after areas of Himalayan blackberry were fully occupied.

Stinging Nettle. Stinging nettle is a perennial broadleaf plant that grows on low floodplains, reservoir margins and other areas with deep saturated soils (Meese and Beedy 2015). Nettles generally grow to 1-3 m height, but occasionally taller (Schellman and Shrestha 2008). Stinging nettles often grow as a dense mass of stems but are not rigid enough to withstand livestock disturbance. Rather than thorns, stinging nettle protects itself from grazing and disturbance with stinging hairs that cause itching and irritation. Stinging nettle is locally distributed in the Sierra foothills, and no nesting use by Tricolored Blackbirds was observed there during 2014-2018. Small stands of nettles have been reported to be used by nesting colonies (Meese and Beedy 2014).

Sandbar Willow. Sandbar willow grows in wet areas, including floodplains, depositions along streams, springs, and other areas with fully saturated soils (Sawyer et al. 2009). The species lacks thorns and usually grows 2-4 m tall but occasionally up to 8 m. Its stems are woody, but younger stems are more pliable than Himalayan blackberry stems of a similar diameter. It is considered poor to fair browse for livestock and fair for deer (Sampson and Jespersen 1963). In my surveys of foothill grasslands, it is mostly absent or heavily hedged in areas heavily used by livestock. Over the three-year study, Airola et al. (2016) observed only 2 of 100 nesting colonies in willow (*Salix* sp.), one of which was of sandbar willow growing in standing water.

Conclusions. All the native species proposed as alternative nesting substrates have characteristics that make them inferior to the Himalayan blackberry as nesting habitat (Table 1). The prevalent use of Himalayan blackberry by Tricolored Blackbird demonstrates that its characteristics are important to the species and are the basis for its selection.

## DISCUSSION

The native ecosystem conditions under which the Tricolored Blackbird evolved, including the historical occurrence of extensive perennial grasslands, extensive flooding from unregulated streams, abundant permanent and seasonal wetlands, and probably lower grazing and browsing pressure from native ungulates (Beedy et al. 2018), are mostly gone (Garone 2011). Restoration of these conditions is no longer feasible, except in limited areas usually managed for portions of the overall needs of Tricolored Blackbirds including wetlands at federal National Wildlife Refuges, State Wildlife Areas,

and by local land trusts, or in foothill grassland conservation areas that tend to be isolated from extensive lowland wetlands by areas of extensive cultivated agriculture or urbanization.

Fortuitously, Tricolored Blackbirds have responded to the loss of their historical habitat by adopting new nesting and foraging habitats. Adoption of dairy silage crops as a nesting substrate in the San Joaquin Valley, however, has resulted in massive losses of nesting birds and their young when the crops are harvested before nesting was completed (Meese et al. 2014, Beedy et al. 2018). These losses have only recently been curtailed by substantial efforts and costs following active efforts to list the species under the California Endangered Species Act (Arthur 2005, Clipperton 2008, Beedy et al. 2018). The other major nesting area for the Tricolored Blackbird is the grassland-dominated foothills surrounding the Central Valley.

Disproportionate use of Himalayan blackberry in the foothill grassland region, which supports about one-fourth of the statewide nesting population, as well as apparent high nesting success there (Cook and Toft 2005, Holyoak et al. 2014, Airola et al. 2014a) demonstrates the importance of this plant to Tricolored Blackbird conservation. In addition, Himalayan blackberry is also widely reported as used in other portions of the species' range (Meese and Beedy 2015, Beedy et al. 2020). Low use levels or absence of use of suggested native species alternatives as nesting substrates, as well as examination of relevant characteristics of the species, demonstrates that, with the possible exception of stinging nettle, they are inferior as nesting substrates.

Recommendations have been made to encourage limited establishment of Himalayan blackberry to encourage expansion of the Tricolored Blackbird population in extensive grassland areas, where suitable nesting habitat is absent (Airola et al. 2016). Even though Himalayan blackberry habitat used by Tricolored Blackbirds occupies a miniscule proportion of foothill lands, and that most blackberry colonies are located in highly disturbed areas that are dominated by other non-native species, resource management agencies are reluctant to maintain or enhance Himalayan blackberry for Tricolored Blackbirds (Sacramento County 2018, R. Akiona, pers. comm.). Most colony sites in the foothills are on private lands, and so are not highly subject to government control, but many of these sites are under long-term threat of development and conversion to unsuitable woody crops (Cameron et al. 2014; Beedy et al. 2018; D. Airola, unpub. data).

Policies or attitudes that discourage long-term protection and management of Himalayan blackberry as nesting habitat could limit options for achieving Tricolored Blackbird recovery. Flexibility is warranted in recognizing the value of the very small amounts of Himalayan blackberry on disturbed lands for species conservation. Such consideration could be

harmonized with the need to periodically control Himalayan blackberry in areas where its growth poses problems for flood protection, water delivery, forage production, and other habitat values. My evaluation indicates that efforts to maintain and enhance the small amount of existing and potential Himalayan blackberry nesting habitat under prescribed conditions, and establishment of Himalayan blackberry in areas where nesting habitat is limiting, could contribute to conservation and recovery of the species, while having negligible detrimental effects to native species and ecosystems.

#### ACKNOWLEDGEMENTS

I thank the many collaborators on related studies of the Tricolored Blackbird in the Sierra foothills, especially John Harris, Deren Ross, and Chris Swarth. Thanks to Reyn Akiona, Rosemond Cook, Samantha Arthur, E.C. (Ted) Beedy, and Robert Meese for useful discussions. Thanks also to Sid England for serving as guest editor to coordinate the peer review of this article. Comments from Ted Beedy, Gerrit Platenkamp, and anonymous reviewer greatly improved the manuscript.

#### LITERATURE CITED

- Airola, D.A., J. Harris, and D. Ross. 2018a. Tricolored Blackbird breeding status in the central Sierra Nevada foothills, California, in 2018. *Central Valley Bird Club Bulletin* 21:66-74.
- Airola, D.A., R.J. Meese, and D.E. Krolick. 2015a. Tricolored Blackbird conservation status and opportunities in the Sierra Nevada foothills of California. *Central Valley Bird Club Bulletin* 17:57-78.
- Airola, D.A., R.J. Meese, E.C. Beedy, D. Ross, D. Lasprugato, W. Hall, C. Conard, C. Alvarado, J. Harris, M. Gause, L. Pittman, K. Smith, L. Young, and J. Pan. 2015b. Tricolored Blackbird breeding status in 2015 in the foothill grasslands of the Sierra Nevada, California. *Central Valley Bird Club Bulletin* 18:96-113.
- Airola, D.A., D. Ross, C.W. Swarth, D. Lasprugato, R.J. Meese, and M.C. Marshall. 2016. Breeding status of the Tricolored Blackbird in the grassland-dominated region of the Sierra Nevada, California in 2016. *Central Valley Bird Club Bulletin* 19:82-109.
- Airola, D.A., C.W. Swarth, J. Harris, E.C. Beedy, G. Woods, K. Smith, D. Ross, and D. Lasprugato. 2018b. Breeding status of the Tricolored Blackbird in the foothill grasslands of the Sierra Nevada, California, in 2017. *Central Valley Bird Club Bulletin* 21:1-24.
- Arthur, S. 2015. Protecting, restoring, and enhancing Tricolored Blackbird habitat on agricultural lands through the Regional Conservation Partnership Program. *Central Valley Bird Club Bulletin* 17:122-125.

- Ashtley, C. 2010. How Does Himalayan Blackberry (*Rubus armenicus*) Impact Breeding Bird Diversity? A Case Study of the Lower Mainland of British Columbia. M.S. Thesis, Royal Roads University, Victoria, British Columbia.
- Beedy, E.C., W.J. Hamilton, III, R.J. Meese, D.A. Airola and P. Pyle. 2018. Tricolored Blackbird (*Agelaius tricolor*) version 1.0. In *Birds of the World* (P.G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. <https://doi.org/10.2173/bow.tribla.01>
- California Department of Food and Agriculture. 2005. California Noxious and Invasive Weed Action Plan. Sacramento CA.
- California Invasive Pest Council. 1999. The Cal EPPC List: Exotic pest plants of greatest ecological concern in California. <https://www.cal-ipc.org/docs/ip/inventory/pdf/Inventory1999.pdf>
- Cameron, D.R., J. Marty, and R.F. Holland. 2014. Whither the rangeland?: Protection and conversion in California's rangeland ecosystems. *PLoS One*: 9(8):1-12. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0103468>
- Clipperton, N. 2018. A status review of the Tricolored Blackbird (*Agelaius tricolor*) in California. Report to the Fish and Game Commission. California Department of Fish and Wildlife, Sacramento.
- Cook, L.F., and C.A. Toft. 2005. Dynamics of extinction: Population decline in the colonially nesting Tricolored Blackbird, *Agelaius tricolor*. *Bird Conservation International* 15:73–88.
- Core, E.L. 1974. Brambles. P.16-19. in: Gill, J.D. and Healy, W.M., (compilers). *Shrubs and vines for northeastern wildlife*. U. S. Department of Agriculture, Forest Service General Technical Report NE-9. Broomall, PA.
- Gaire, R., C. Astley, M.K. Upadhyaya, D.R. Clemens, and M. Bargen. 2015. The biology of Canadian weeds 154. Himalayan blackberry. *Canadian Journal of Plant Sciences* 95:557-570.
- Garone, P. 2011. *The Fall and Rise of Wetlands of California's Great Central Valley*. UC Press, Berkeley, CA.
- Graves, E.E., M. Holyoak, T.R. Kelsey, and R.J. Meese. 2013. Understanding the contribution of habitats and regional variation to long-term population trends in Tricolored Blackbirds. *Ecology and Evolution* 3:2845-2858. <http://onlinelibrary.wiley.com/doi/10.1002/ece3.681/full>
- Holyoak, M., R.J. Meese, and E.E Graves. 2014. Combining site occupancy, breeding population sizes, and reproductive success to calculate time-averaged reproductive output of different habitat types: an application to Tricolored Blackbirds. *PLoS One* 9(5): e96980. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0096980>

- Hoshovsky, M.C. 2000. *Rubus discolor*. P.227-282. in: C.C. Bossard, J.M. Randall, and M.C. Hoshovsky (Editors). *Invasive Plants of California Wildlands*. University of California Press. Berkeley.
- Leopold, A.S. 1977. *The California Quail*. University of California Press, Berkeley.
- Meese, R.J. 2014. Results of the 2014 Tricolored Blackbird Statewide Survey. Available from the Tricolored Blackbird Portal: <http://tricolor.ice.ucdavis.edu/reports>.
- Meese, R.J. 2015. Efforts to assess the status of the Tricolored Blackbird from 1931 to 2014. *Central Valley Bird Club Bulletin* 17:37-50.
- Meese, R.J, and E.C. Beedy. 2015. Managing nesting and foraging habitats to benefit breeding Tricolored Blackbirds. *Central Valley Bird Club Bulletin* 17:79-96.
- Meese, R.J, D.A. Airola, E.C. Beedy, and R. Cook. 2015. Recovering the Tricolored Blackbird in California. *Central Valley Bird Club Bulletin* 17:97-109.
- Sacramento County. 2018. *South Sacramento County Habitat Conservation Plan*. Sacramento, CA.
- Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation*. 2<sup>nd</sup> Edition. California Native Plant Society, Sacramento, CA.
- Schellman, A. E. and A. Shrestha. 2008. Burning and stinging nettles. Publication 74146 in *Pest Notes*. M.L. Flint (Tech. Editor). University of California Agriculture and Natural Resources. <http://ipm.ucanr.edu/PDF/PESTNOTES/pnburningnettles.pdf>
- Tirmenstein, D. 1989. *Rubus armeniacus*. In: *Fire Effects Information System*, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory' <http://www.fs.fed.us/database/feis/plants/shrub/ruburs/all.html> (Accessed 6 February 2017).
- Tricolored Blackbird Working Group. 2017. *Tricolored Blackbird Habitat Management Recommendations Matrix*. Audubon California, Sacramento.
- Wilson, C.R., R.J. Meese, and A.C. Wyckoff. 2016. Breeding chronology, movements, and novel natural history observations of Tricolored Blackbirds in the California Central Coast. *California Fish and Game* 102:162-174.



Himalayan blackberry

Female Tricolored Blackbird (*Agelaius tricolor*) with food for the nestlings.



Tricolored Blackbird nest in the blackberry patch.

*Photos by Frances Oliver*