Central Valley Landscape Conservation Project

Climate Change Vulnerability Assessment (January 2017 version)

Tricolored Blackbird

Vulnerability Assessment Summary

Overall Vulnerability Score and Components:

Vulnerability Component	Score
Sensitivity	Moderate-high
Exposure	Moderate-high
Adaptive Capacity	Moderate
Vulnerability	**Moderate**

Overall vulnerability of tricolored blackbird was scored as moderate. The overall score is the result of moderate-high sensitivity, moderate-high future exposure, and moderate adaptive capacity scores.

Drought is a key climate factor likely to impact tricolored blackbirds, and may affect nesting success by reducing suitable habitat and food resources.

Key non-climate factors for tricolored blackbirds include agricultural and rangeland practices, land use change, and pollution/poisons, with habitat loss, nest destruction during crop harvest, and pesticides causing the loss of entire colonies and contributing to significant population declines.

Key disturbance regimes for this species include flooding and wind, both of which can destroy nests and/or kill nestlings and fledglings. Tricolored blackbirds are colonial nesters, and females typically lay 3-4 eggs and may have up to two broods; however, multiple nesting failures may occur. This species is dependent on accessible water sources, protected nesting sites, and abundant insect prey during nesting season.

Tricolored blackbirds are geographically restricted to California and small portions of adjacent states, with the largest colonies occurring in the San Joaquin and Sacramento valleys. Total abundance has declined by 89% since the 1930s, with the average colony size declining by over 60% and extirpation occurring in some areas of the Central Valley and southern California. This species exhibits low-moderate genetic, phenological, and life history diversity, and has low resistance to climatic changes and human activities; this is due, in part, to the potential for colonies to be lost by a single adverse event.

Management potential for tricolored blackbirds was scored as low-moderate, and options may focus on ensuring the protection of nest sites and abundant insect prey. Increased regulatory support, such as obtaining protected status as a state-listed endangered species, would help protect remaining colonies.

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Introduction

Description of Priority Natural Resource

The tricolored blackbird (*Agelaius tricolor*) is primarily a resident species in the Central Valley, breeding in cattail (*Typha* spp.) or tule (*Schoenoplectus acutus*) emergent wetlands, thickets of Himalayan blackberry (*Rubus armeniacus*) or California wild rose (*Rosa californica*), and agricultural fields (Granholm 2008). The tricolored blackbird has been listed as both a California and USFWS bird species of special concern (Hamilton 2004; DiGaudio et al. 2015).

As part of the Central Valley Landscape Conservation Project, workshop participants identified the tricolored blackbird as a Priority Natural Resource for the Central Valley Landscape Conservation Project in a process that involved two steps: 1) gathering information about the species' management importance as indicated by its appearance in existing conservation plans and lists, and 2) a workshop with stakeholders to create the final list of Priority Natural Resources, which includes habitats, species groups, and species.

The rationale for choosing the tricolored blackbird as a Priority Natural Resource included the following: the species has high management importance, the species' conservation needs are not entirely represented within a single priority habitat or species group. Please see Appendix A: "Priority Natural Resource Selection Methodology" for more information.

Vulnerability Assessment Methodology

During a two-day workshop in October of 2015, 30 experts representing 16 Central Valley resource management organizations assessed the vulnerability of priority natural resources to changes in climate and non-climate factors, and identified the likely resulting pressures, stresses, and benefits (see Appendix B: "Glossary" for terms used in this report). The expert opinions provided by these participants are referenced throughout this document with an endnote indicating its source1. To the extent possible, scientific literature was sought out to support expert opinion garnered at the workshop. Literature searches were conducted for factors and resulting pressures that were rated as high or moderate-high, and all pressures, stresses, and benefits identified in the workshop are included in this report. For more information about the vulnerability assessment methodology, please see Appendix C: "Vulnerability Assessment Methods and Application." Projections of climate and non-climate change for the region were researched and are summarized in Appendix D: "Overview of Projected Future Changes in the California Central Valley".

Vulnerability Assessment Details

Climate Factors

Workshop participants scored the resource's sensitivity to climate factors and this score was used to calculate overall sensitivity. Future exposure to climate factors was scored and the overall exposure score used to calculate climate change vulnerability.

Climate Factor	Sensitivity	Future Exposure
Extreme events: drought	Moderate-high	Moderate-high
Extreme events: storms	Moderate	-
Increased flooding	-	Moderate-high
Overall Scores	**Moderate-high**	**Moderate-high**

Forty-nine percent of this species' current summer range is expected to be lost by 2080, and 42% of this range will shift out of the Central Valley and toward the foothills of the Coast Range, with only 8% of the current area remaining as climatically suitable habitat (National Audubon Society 2013). Tricolored blackbirds are also expected to lose 33% of their winter range, with 54% of the current winter range remaining as climatically suitable habitat (National Audubon Society 2013).

Drought

Sensitivity: *Moderate-high (high confidence)*
Future exposure: *Moderate-high (moderate confidence)*
Potential refugia: *Riparian buffers provide proximity to stream water sources (dependent on flow).*

Over the coming century, the frequency and severity of drought is expected to increase due to climate change (Hayhoe et al. 2004; Cook et al. 2015; Diffenbaugh et al. 2015; Williams et al. 2015). Warming temperatures are likely to exacerbate dry conditions in years with low precipitation, causing more severe droughts than have previously been observed (Cook et al. 2015; Diffenbaugh et al. 2015). Regardless of changes in precipitation, warmer temperatures are expected to increase evapotranspiration and contribute to drier conditions (Cook et al. 2015). Recent studies have found that anthropogenic warming has already substantially increased the overall likelihood of extreme California droughts, which may include decadal and multi-decadal events (Cook et al. 2015; Diffenbaugh et al. 2015; Williams et al. 2015).

Since 2007, breeding tricolored blackbirds have been abandoning colonies every year, likely due to habitat loss and an inability to obtain enough insects to support the formation of eggs

(Meese 2007, 2013). Although this decline in reproductive success began before the current severe drought in California, suggesting that it is primarily due to habitat loss or other factors, drought may be contributing to an increase in the frequency of abandonment (Meese 2015). Drought may further reduce the extent of suitable nesting and insect-rich foraging habitat in the Central Valley, which is already severely limited by human activities (Belenky & Bond 2014).

Storms

Sensitivity: *Moderate (moderate confidence)*

Severe spring storms may cause the loss of fledglings, reducing or eliminating colony reproductive success within a given year (Meese 2010).

Climate change impacts on competing species

Interspecies interactions may be altered by climate change as the abundance and distribution of other species changes. For instance, the impact of habitat fragmentation on nesting success in birds is heavily influenced by altered predator/prey relationships (Stephens et al. 2003).

Non-Climate Factors

Workshop participants scored the resource's sensitivity and current exposure to non-climate factors, and these scores were then used to assess their impact on climate change sensitivity.

Non-Climate Factor	Sensitivity	Current Exposure
Agriculture & rangeland practices	High	High
Land use change	High	High
Pollution & poisons	Moderate	High
Overall Scores	**Moderate-high**	**High**

Agricultural & rangeland practices

Sensitivity: *High (high confidence)*
Current exposure: *High (high confidence)*
Pattern of exposure: *Variable*

Active removal of non-native vegetation (e.g., Himalayan blackberries, milk thistle) as well as harvest of agricultural lands contribute significantly to loss of breeding colonies and/or nestling deaths (Meese 2015). In addition, silage crop harvests coincide with breeding activity in tricolored blackbirds, leading to nest destruction and direct mortality of nestlings (DeHaven 2000). Domestic sheep grazing can also destroy tricolored blackbird colonies (Meese 2010).

Large numbers of wintering blackbirds are often associated with dairies attracted by livestock feed (Shuford & Gardali 2008); however, birds may depend on abundant feed rather than seek out insects, and these food sources do not provide adequate protein for breeding birds (Meese 2013).

Historically, blackbirds foraging on crops have been shot, often resulting in the mortality of thousands of tricolored blackbirds (Beedy & Hamilton 1997). This practice continues despite the protection of this species under the Migratory Bird Treaty Act (MBTA), and mortality is believed to be highest in the Sacramento Valley, where farmers shoot blackbirds around rice fields in the autumn (Belenky & Bond 2014). Some of these cases may be accidental, as tricolors are shot alongside red-winged blackbirds (*Agelaius phoeniceus*), which are exempt from the MBTA in California (Belenky & Bond 2014). For instance, one rice farm in Shasta County had over a thousand redwing blackbirds shot, and there were almost certainly some tricolored blackbirds included[1]. However, the shooting of tricolored blackbirds has not yet been quantified or formally studied (Belenky & Bond 2014).

Some agricultural and rangeland practices can support tricolored blackbird colonies; for instance, rice croplands that are managed organically may be rich in insects, which would likely increase reproductive success (Belenky & Bond 2014). Consistent water sources may be associated with dairies (e.g., stock ponds), and non-native vegetation such as milk thistle and Himalayan blackberries often found near agricultural areas now supports most colonies[1]. In addition, rangelands may provide greater support to tricolored blackbird colonies, as they are less disturbed and may provide more abundant and/or more consistent insect prey (Meese 2014).

Land use change

Sensitivity: *High (high confidence)*
Current exposure: *High (high confidence)*
Pattern of exposure: *Localized impacts (more critical in rural areas than urban areas); however, impacts are occurring throughout the Central Valley.*

Breeding colonies have rapidly declined since 2008, particularly in the southern San Joaquin Valley (Meese 2015). Wetland conversion (especially permanent wetlands) to agricultural and urban development has significantly reduced range-wide habitat and increased the loss of breeding colonies (Meese 2015). In addition, the conversion of grasslands and shrublands to vineyards and nut orchards has led to the widespread loss of foraging habitats, likely contributing to population declines and further reducing conservation options for this species within their core range (Belenky & Bond 2014; Meese 2015).

Although habitat conversion and loss appears to be an important factor affecting tricolored blackbird declines, it appears that other unknown factors such as insufficient insect prey base to support successful reproduction are also contributing significantly to population reductions and/or lack of recovery (Belenky & Bond 2014).

Pollution & poisons

Sensitivity: *Moderate (moderate confidence)*
Current exposure: *High (high confidence)*
Pattern of exposure: *Consistent across the landscape.*

Neonicotinoid insecticides are likely contributing to population decline, especially in San Joaquin Valley and along the Central Coast (Cousens et al. 2015). In areas where neonicotinoids are not commonly used, such as the central Sierra foothills and the Sacramento Valley, tricolored blackbird populations remain relatively stable[1]. Pesticides reduce insect prey by killing both target and non-target insects (Hallmann et al. 2014); they may also be directly toxic to birds (Belenky & Bond 2014). However, research has not yet determined whether the link between neonicotinoid use and population decline is causal[1].

Tricolored blackbirds have also experienced mass mortality events from intentional poisoning, as they are sometimes considered agricultural pests (Shuford & Gardali 2008). Poisoning can cause nesting failure, birth deformities, and mortality (Beedy & Hamilton 1997; Belenky & Bond 2014).

Disturbance Regimes

Workshop participants scored the resource's sensitivity to disturbance regimes, and these scores were used to calculate climate change sensitivity.

Overall sensitivity to disturbance regimes: *Moderate (moderate confidence)*

Although this species is likely adapted to periodic disturbance events common to their endemic range (e.g., storms), human activity has severely limited habitat availability for tricolored blackbirds (Belenky & Bond 2014). As a result, disturbances may prevent colonies from finding suitable nesting sites, or from finding a new site if the first is abandoned (Belenky & Bond 2014).

Flooding

Future exposure: *Moderate-high (high confidence)*
Potential refugia: *Agricultural lands.*

Within marshes, nests are typically located 0.5-1.5 m above the ground and may be inundated during a flood event (Hamilton 2004).

Wind

Severe spring storms with high winds can cause significant reproductive failures within tricolored blackbird colonies, which nest in tall vegetation within open landscapes where winds can be high (Meese 2010; Belenky & Bond 2014). Damage can include mortality of over 50% of nestlings and hundreds of nests ejected onto the ground (Meese 2010; Belenky & Bond 2014), with the greatest losses occurring in agricultural and non-native plant nesting areas[1].

Life history and reproductive strategy

Workshop participants scored the resource's life history and reproductive strategy, and these scores were used calculate climate change sensitivity.

> ***Species reproductive strategy, representing generation length and number of offspring**: Mid-range reproductive strategy (high confidence)*
> ***Average length of time to reproductive maturity:** 1 year*

Tricolored blackbirds are a colonial species with a polygynous mating strategy (e.g., several females to one male; Hamilton 2004). Evidence suggests that first-year females breed, while first-year males defer breeding until their second year (Payne 1969; Hamilton 2004). Females typically lay 3-4 eggs and incubate for 11 days while males forage nearby (Hamilton 2004). Nestlings are fed by both parents, and fledge at 10-14 days, either staying in the colony or dispersing several kilometers away while still being fed by their parents (Hamilton 2004). Females may have a second brood, and sometimes make several nesting attempts following losses, either in the same location or after traveling elsewhere (Hamilton 2004).

Tricolored blackbirds breed in synchronous events, which may be an adaptation that allowed them to take advantage of changing abundance and composition of insect prey, such as grasshopper outbreaks (Orians 1961; Beedy & Hamilton 1997). Colony reproductive success is strongly influenced by insect availability, and disturbance events can cause the catastrophic loss of nestlings and eggs (Beedy & Hamilton 1997; Belenky & Bond 2014). Abandonment of nest sites is less likely to occur after breeding has begun, likely because of the high parental investment involved in feeding nestlings/fledglings for an extended period of time[1].

Dependency on habitat and/or other species

Workshop participants scored the resource's dependency on habitat and/or other species, and these scores were used calculate climate change sensitivity.

> ***Overall degree of specialization**: Moderate-high (high confidence)*
> ***Dependency on one or more sensitive habitat types:** High (high confidence)*
> > ***Description of habitat:** This species requires a water sources near nesting habitat, which may be provided by wetlands, streams, or anthropogenic sources (e.g., irrigation ponds). They are also dependent on nesting substrate, including cattails, thistles (Cirsium spp.), blackberries (Rubus spp.), and silage crops.*
> ***Dependency on specific prey or forage species:** Low-moderate (high confidence)*
> ***Dependency on other critical factors that influence sensitivity:** High (high confidence)*
> > ***Description of other dependencies:** This species requires nesting and foraging habitat in close proximity to one another. The dairy industry often provides these*

habitats in the San Joaquin Valley, and rice cropland is also a common foraging habitat.

Tricolored blackbirds require accessible water, protected nesting sites (e.g., flooded, thorny, or spiny vegetation), and suitable foraging space with adequate insect prey within a few kilometers (<3 km) of breeding colony sites (Belenky & Bond 2014). Historically, most tricolor colonies occurred in native marshlands, riparian and upland shrubby habitats, and grasslands; however, the loss of these native habitats to agricultural and urban development has led to a shift toward nesting in non-native vegetation such as milk thistle (*Silybum marianum*), Himalayan blackberry, and silage crops (Shuford & Gardali 2008; Belenky & Bond 2014). Preferred foraging habitats include crops (e.g., rice, alfalfa, irrigated pastures, ripening or cut grain fields), annual grasslands, cattle feedlots, dairies, and remnant native habitats (e.g., wet and dry vernal pools, other seasonal wetlands, riparian scrub habitats, open marsh borders; Belenky & Bond 2014).

Dairies and silage fields around dairies are a critical habitat component for tricolors, particularly for nest site selection (Beedy & Hamilton 1997; Beedy & Hamilton III 1999; Meese 2007, 2014). Dairies and associated silage fields provide protection from predators, abundant grain sources at their feedlots, reliable water supplies, and large amounts of nearby foraging habitat for insects (Belenky & Bond 2014). Additionally, silage crops at a single location may cover tens of acres, providing enough habitat for colonial nesting by tricolors (Belenky & Bond 2014). However, the timing of silage harvest coincides with the late nestling/early fledgling stage of tricolor offspring, resulting in significant breeding failures (i.e., mortality of offspring, loss of thousands of nests; Belenky & Bond 2014).

In general, tricolors are opportunistic feeders (Beedy & Hamilton III 1999; Hamilton 2004), foraging in all seasons on locally abundant insects such as grasshoppers, beetles and weevils, caddis flies, moths, butterfly and dragonfly larvae, and midges (Orians 1961; Payne 1969). Female tricolored blackbirds require a high-protein diet to form eggs, and so are insect-dependent during the breeding season; nestlings also require insects for the first 9 days of life (Meese 2014). Adults can also utilize grains and seeds, especially outside of the breeding season when they less dependent on protein-rich food sources (Beedy & Hamilton 1997; Hamilton 2004). Early studies attribute tricolor population declines between the 1930s-70s to the loss of grasslands and subsequent reduction in grasshopper abundance (Belenky & Bond 2014). Neonicotinoid insecticides are likely contributing to population decline, especially in San Joaquin Valley and along Central Coast, by eliminating insect food sources (Meese 2014; Cousens et al. 2015).

Adaptive Capacity

Workshop participants scored the resource's adaptive capacity and the overall score was used to calculate climate change vulnerability.

Adaptive Capacity Component	Score

Extent, Status, and Dispersal Ability	Moderate
Intraspecific Species Diversity	Low-moderate
Resistance	Low-moderate
Other Adaptive Capacity Factors	Moderate-high
Overall Score	**Moderate**

Extent, status, and dispersal ability

Overall degree of extent, integrity, connectivity, and dispersal ability: *Moderate (high confidence)*
Geographic extent: *Occurs beyond small area but still quite limited (high confidence)*
Health and functional integrity: *Declining (high confidence)*
Population connectivity: *Continuous with some breaks (high confidence)*
Dispersal ability: *High (high confidence)*
Maximum annual dispersal distance of species: *>100 km (high confidence)*

The tricolored blackbird is geographically restricted to California (more than 99% of blackbirds live in the state) and small portions of adjacent states (Oregon, Washington, Nevada, and Baja California (Hamilton 2004), and can be found from sea level to approximately 1280 m (4200 ft; Neff 1937). Most of the tricolor blackbird population and largest colonies are currently found in the San Joaquin and Sacramento valleys, although have historically been documented in the Sierra Nevada foothills, Modoc Plateau, and along the coastal slope (Neff 1937; Orians 1961; Beedy & Hamilton III 1999). The species also breeds in several southern California counties, however, the southern California population appears to have been geographically isolated since the 1970s-80s (Belenky & Bond 2014).

From the 1930s to 1980s, tricolored blackbirds experienced an ~89% decline in total abundance and an over 60% decline in average colony size from 1930-1970 (Beedy et al. 1991; Graves et al. 2013), with near or complete extirpation in portions of the Central Valley and in coastal southern California counties (Beedy & Hamilton 1997; Belenky & Bond 2014; Meese 2014). In 2014, only 50% of the population was documented in the San Joaquin Valley, with more birds seen in the Sacramento Valley than at any time since the 1990s (Meese 2014).

Tricolored blackbirds are nomadic and highly colonial; wintering populations move extensively throughout their range with major wintering concentrations occurring in the Sacramento-San Joaquin River Delta and coastal areas (Belenky & Bond 2014). Colony territories are small (<1-10 m.) and do not include foraging areas (Hamilton 2004). Fledglings travel up to several kilometers from their breeding colony, but continue to be fed by their parents (Hamilton 2004).

Landscape permeability

Overall landscape permeability: *No landscape barriers were identified by workshop participants, and landscape permeability was not assessed.*

The Tehachapi Mountains may act as a potential barrier to dispersal between Central Valley and southern California populations of tricolored blackbirds (Berg et al. 2010).

Resistance

Resistance to stresses/maladaptive human responses: *Low-moderate (moderate confidence)*

As a whole, tricolored blackbirds are not very resistant to climatic and anthropogenic stresses. As colonial nesters, tricolored blackbirds are vulnerable to mass mortality and/or nest destruction events resulting from disturbance, agricultural activities, and poisons (Beedy & Hamilton 1997; Belenky & Bond 2014). Given the high degree of dependence on insects for breeding females and nestlings/fledglings, they are also very vulnerable to the loss of insect prey, and females that are not consuming enough insects may not be able to nest successfully (Belenky & Bond 2014; Meese 2014). However, tricolored blackbirds have demonstrated some flexibility in nest site selection, allowing non-native species (e.g., Himalayan blackberry) and agricultural sites to increase available habitat area (Belenky & Bond 2014).

Species diversity

Overall species diversity: *Low-moderate (moderate confidence)*
Diversity of life history strategies: *Moderate (high confidence)*
Genetic diversity: *Unknown (low confidence)*
Behavioral plasticity: *Low (high confidence)*
Phenotypic plasticity: *Low-moderate (moderate confidence)*

The southern California population of tricolored blackbirds appears to have higher allelic diversity compared to the Central Valley population, despite having a smaller population size (Berg et al. 2010). This suggests that the southern California population may serve as an important reservoir of genetic variation for the species overall.

Most breeding colonies of tricolors exhibit extreme synchrony, where all eggs may be laid within one week (Orians 1961). Tricolors also exhibit itinerant breeding, where individuals may move after their first nesting attempts and breed again in a different location. However, tricolors may also be philopatric to more than one nesting site, using the same nesting site year after year – a trend that may be increasing despite poor breeding outcomes (Belenky & Bond 2014). The species is extremely skittish on the nest and will abandon nestlings[1].

Management potential

Workshop participants scored the resource's management potential.

Management Potential Component	Score
Species value	Low
Societal support	Moderate
Agriculture & rangeland practices	Moderate
Extreme events	Low-moderate
Converting retired land	Low-moderate
Managing climate change impacts	Moderate
Overall Score	**Low-moderate**

Value to people

Value to people: *Low (high confidence)*
Description of value: *People are not aware of the problem because there are large colonies; also, people perceive them as pests.*

Support for conservation

Degree of societal support for management and conservation: *Moderate (moderate confidence)*
Description of support: *Candidate for state listing and already protected by the Migratory Bird Treaty Act. There are financial programs with the NRCS; for example, an NRCS program compensates dairy operators with tricolor blackbird colonies to delay harvest, but does not provide secure habitat for nesting or foraging. Thus it keeps in place a highly conflicted relationship between birds and dairies.*

Degree to which agriculture and/or rangelands can benefit/support/increase resilience: *Moderate (not assessed)*
Description of support: *There is potential for creating habitat with easements where there are nests; however, high site fidelity means that new habitat cannot be created anywhere, as tricolors may not come.*

Degree to which extreme events (e.g., flooding, drought) influence societal support for taking action: *Low-moderate (low confidence)*
Description of events: *Negative reaction, particularly with drought.*

Likelihood of converting land to support species

Likelihood of (or support for) converting retired agriculture land to maintain or enhance species: *Low-moderate (low confidence)*
Description of events: *Highly unlikely. Even if new habitat is created, the birds may not utilize it.*

Likelihood of managing or alleviating climate change impacts: *Moderate (moderate confidence)*
Description of likelihood: *Strategic management of wetlands and localized foraging sites may be effective, as well as policy-level water security actions. Long-term management of the species relies on the dairy industry.*

Management options for this species should focus on reducing mortality (including eggs and young) and nest abandonment in order to increase the population of tricolored blackbirds (Belenky & Bond 2014). Ensuring an adequate water source near known colonies may reduce the impacts of future drought, and suitable cover and insect prey is vital to nesting success. Reducing the use of pesticides and herbicides would increase food availability and nesting sites, as would preventing the removal of Himalayan blackberry and other non-native species that provide nesting and foraging areas (Belenky & Bond 2014). Because large colonies nest in silage fields and harvest of these fields has the potential to contribute significantly to population declines, efforts are now underway to detect silage colonies and compensate dairy operators for losses incurred due to nesting tricolors (Belenky & Bond 2014; Meese 2015). These programs encourage farmers to delay harvest, plant alfalfa and sunflowers in fields near colonies, and reduce the use of pesticides, which has likely increased reproductive success in some areas, and these programs may provide a way engage farmers in habitat protection (Meese 2009). Some farmers have also been paid to not eradicate milk thistle, because it supports high numbers of breeding tricolors, despite its status as an invasive plant[1]. Planting alfalfa instead of triticale helps provide good foraging habitat if insecticides are not applied too frequently[1].

There is some evidence that “apparently suitable” nesting sites are unused by tricolors. For example, tricolored blackbird colonies – both average colony size and total breeding population – declined in the Sacramento Valley from 1907-2009 despite the fact that many of the marsh sites occurred in wildlife refuges and were protected from modification (Belenky & Bond 2014). However, it is difficult to get the water needed for habitat restoration, and fall and winter water for duck habitat is often prioritized over the summer water allocations needed for tricolored blackbirds[1].

Tricolored blackbirds receive some legal protection under the Migratory Bird Treaty Act, which prohibits the “take” of both birds and nests. However, this is rarely enforced, and additional regulatory mechanisms are needed (Belenky & Bond 2014). As of December 2015, the California Department of Fish & Wildlife has decided to undertake a review of this species and it is currently listed under the CESA (Belenky & Bond 2014).

Other Factors

Overall degree to which other factors affect adaptive capacity: *Moderate-high (moderate confidence)*

Phenology

Predation

Phenology

Tricolored blackbirds are now breeding ~17 days earlier than it was 80 years ago (R. Meese, pers. obsv., 2016).

Predation

In many tricolor colonies, especially those nesting in native emergent marshes, predation by raccoons (*Procyon lotor*), herons (*Ardeidae*), cattle egrets (*Bubulcus ibis*), and coyotes (*Canis latrans*) is a major cause of large-scale nesting failures (Belenky & Bond 2014). An especially large number of black-crowned night herons may prevent a settlement from becoming a colony[1]. Predation by cattle egrets has had huge impacts in Tulare County but is unknown elsewhere[1]. Predation can also have large impacts in stock ponds and duck clubs[1].

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