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2017 Tricolored Blackbird Monitoring Report

**Tricolored Blackbird Survey and Colony Protection
San Joaquin Valley, California**

**By
Colibri Ecological Consulting, LLC**

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San Joaquin Valley, California
Agreement Number P1680043



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Abstract

We located and monitored tricolored blackbird (*Agelaius tricolor*) nesting colonies in Merced, Madera, Tulare, and Kern counties, California, in agricultural fields and wetlands that have historically supported large colonies of nesting tricolored blackbirds. The surveys were performed between late March and early June under contract with the California Department of Fish and Wildlife, Agreement Number P1680043. As stipulated in the contract, we focused our monitoring efforts on tricolored blackbird colonies in grain crops adjacent to dairies. We located and monitored tricolored blackbird colonies at 13 sites throughout the San Joaquin Valley. Of these, eight colonies were in agricultural fields associated with dairies, four colonies were in wetlands, and one colony was in native pastureland. We documented an estimated total of 72,964–110,414 adult tricolored blackbirds. Tricolored blackbirds nested and successfully fledged young at 11 of the 13 colony sites. Agricultural activities adversely impacted two or three tricolored blackbird colonies, including one large colony that was destroyed by silage harvest.

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Introduction

The tricolored blackbird (*Agelaius tricolor*) is a colonially nesting songbird that is largely endemic to California, with more than 99% of its population occurring in the state (Meese et al. 2014). It is an itinerant breeder, capable of nesting multiple times each breeding season. It nests in wetlands and agricultural fields, where it forms the largest nesting colonies of any North American passerine bird (Meese et al. 2014).

Once abundant, the tricolored blackbird has undergone population declines throughout its historical range, especially in the San Joaquin Valley (Kyle and Kelsey 2011). Tricolored blackbird populations have declined owing to habitat loss resulting from water diversions, draining of wetlands, conversion to agriculture, conversion of row crops to orchards or other unsuitable crops, and urbanization (UC Davis 2017). Tricolored blackbirds are persecuted as agricultural pests and are sometimes shot or poisoned despite their legal protection under federal and state laws. Tricolored blackbirds are also vulnerable to the destruction of large breeding colonies during the harvest of grain crops in which they often nest.

The tricolored blackbird has been designated a Species of Conservation Concern by the United States Fish and Wildlife Service (USFWS 1995). It was state-listed as endangered in California under an emergency petition in 2014, but that status expired in 2015. It is currently a candidate species for listing under the California Endangered Species Act. It is also considered a Species of Special Concern by the California Department of Fish and Wildlife (CDFW) (Shuford and Gardali 2008).

In the San Joaquin Valley, tricolored blackbirds often associate with dairies and feedlots, where they form colonies in silage fields planted with triticale or other grain crops used as cattle forage. These dairy sites provide the three critical breeding habitat elements tricolored blackbirds require: suitable nesting substrate (grain crops), a water source (agricultural ditches or wastewater ponds), and an abundance of food (grain and insects) (Meese 2013). However, dairy sites also render tricolored blackbird colonies susceptible to destruction from grain harvest. Protecting these large colonies in agricultural fields associated with dairies is a main conservation focus of the Tricolored Blackbird Working Group. The tricolored blackbird Working Group is voluntary alliance of state and federal agency biologists, non-governmental organizations, industry representatives, and academic scientists who work cooperatively to help sustain and enhance tricolored blackbird populations and habitats. Through their efforts,

several silage-buyout and silage-harvest-delay programs have been established and implemented to encourage farmers to avoid harvesting fields containing tricolored blackbird colonies.

The CDFW has participated in developing a conservation plan for the tricolored blackbird. Among the tasks included in that plan are the annual detection and season-long monitoring of tricolored blackbird colonies to estimate colony size and reproductive success of the largest colonies. Fulfilling these tasks was the focus of our surveys and monitoring. We located and monitored tricolored blackbird colonies in California with emphasis on those in the San Joaquin Valley. We also assessed the productivity of these colonies and served as a colony evaluator for a multidisciplinary team addressing issues surrounding colonies established in grain fields. As specified in the contract, the focus of our surveys and monitoring was tricolored blackbird colonies established in agricultural grain fields associated with dairies. The surveys were performed under contract with CDFW, Agreement Number P1680043.

Methods

We detected tricolored blackbird colonies in portions of Madera, Merced, Tulare, and Kern counties, California, by driving public roads in and around silage fields associated with dairies, while actively searching for large concentrations of tricolored blackbirds and foraging flights indicative of colony establishment. In addition, we visited wetlands and agricultural fields that have historically supported large colonies of tricolored blackbirds (Figure 1).

Colibri Senior Scientist, Scott Frazer, conducted the field work, with ancillary support from Colibri Principal Scientist Jeff Davis. Historical tricolored blackbird colony sites were surveyed and monitored with varying levels of effort, beginning in late March and early April and continuing through early June. Priority was given to sites adjacent to dairies, where as many as nine site visits were made per site. Wetland sites were visited less frequently.

Each site was viewed from various vantage points using binoculars and a spotting scope to estimate colony size, determine ratios of male to female tricolored blackbirds, evaluate and characterize nesting activity, and identify and quantify any fledglings. Access to two colony sites was limited due to private property constraints. The Cherokee Forebay site and the Poso site were viewed from adjacent state-owned lands or duck clubs at a range of 0.2–0.5 miles. Determining sex ratios and identifying fledglings was generally not achievable under these circumstances.

Colony size was generally estimated during the settlement and nestling stages, periods when most birds in the colony are visible (Meese 2017). However, due to delays in the contract and periods of inclement weather, this was not always possible. Colony sizes were estimated following the guidelines provided in *Tricolored Blackbird 2017 Statewide Survey Training* (Meese 2017). For smaller colonies, precise counts were made by counting individual tricolored blackbirds or by counting tricolored blackbirds in groups of fives or tens. For larger colonies, where precise counting is not feasible, scanning surveys were conducted. Such surveys were conducted by estimating the number of tricolored blackbirds in a defined fraction of the colony, then multiplying this estimate by the number of defined areas the colony occupies. Scanning surveys were also conducted of tricolored blackbirds in transit by estimating the number of tricolored blackbirds flying past a point during a specified interval of time then multiplying the resulting estimate by the number of time intervals needed for the flock to pass. Estimating sizes of larger colonies typically involved using both scanning survey techniques.



Figure 1. Survey area.

We confirmed nesting activity when female tricolored blackbirds were observed carrying nesting material into fields containing large numbers of tricolored blackbirds. Whenever a tricolored blackbird colony was detected in an agricultural field where routine crop harvest could destroy the colony, landowners were contacted by Tricolored Blackbird Working Group partner organizations (Audubon California, Western United Dairymen, National Resources Conservation Service) or CDFW contract manager Neil Clipperton to prevent colony destruction.

Reproductive success was categorized as low, moderate, or high based on observations of colony behavior, number of juvenile tricolored blackbirds, and the extent of the period during which tricolored blackbirds fledged from the colony. Nest census surveys were conducted at three sites (Cornerstone, Deer Creek Dairy, and Road 14 and Avenue 15), where tricolored blackbird nests were counted and characterized during walking transects.

Results

We detected and monitored 12 historical tricolored blackbird colonies in Merced, Tulare, and Kern counties, California, in and around agricultural fields or wetlands (Figure 1, Table 1). In addition, we detected and monitored a 13th colony site in an agricultural field at Avenue 14 and Road 15 in Madera County (Figures 1 and 2) that was previously undocumented and incidentally located on 08 April 2017. We surveyed and monitored five historical sites in Merced County, including two in fallow agricultural fields (Hulen Levee and Fahey South, Figures 3 and 4), one in a wetland (Marshall Levee Pond, Figure 5), one in native pasture (Cherokee Forebay, Figure 6), and one in an agricultural field planted with triticale (West of Lone Tree, Figure 7). We surveyed three historical sites in Tulare County, including two in agricultural fields planted with triticale (Cornerstone and Deer Creek Dairy, Figures 8 and 9) and one in a wetland (Atwell Island Ton Tache Unit 4, Figure 10). Four historical sites were surveyed in Kern County, including two in wetlands (Kern National Wildlife Refuge and Tule Road, Figures 11 and 12), one in an agricultural field planted with triticale (Poso, Figure 13), and one in an agricultural field planted with forage mix (Pond Road, Figure 14).

Eight tricolored blackbird colonies were in agricultural fields associated with dairies, four were in wetlands, and one was in native pastureland (Table 1). Of the eight colonies in agricultural fields, two colonies were in fallow fields, four colonies were in fields planted with triticale, and two colonies were in fields planted with forage mix (Table 1). We detected a total of 72,964 (low estimate) to 110,414 (high estimate) adult tricolored blackbirds at these 13 colony sites (Table 1). The largest colonies were Poso (with 30,000–35,000 adult tricolored blackbirds), Pond Road (with 12,000–20,000 adult tricolored blackbirds), and Road 14 and Avenue 15 (with 10,000–20,000 adult tricolored blackbirds). The smallest colony was at the Tule Road site, where only 14 adult tricolored blackbirds were detected.

We confirmed tricolored blackbird nesting at 12 of the 13 colony sites¹. Of the 12 known breeding sites, 11 successfully fledged young tricolored blackbirds. However, the reproductive output was minimal at the Road 14 and Avenue 15 colony due to grain harvest and at Cherokee Forebay due to heavy cattle grazing. We heard nestling tricolored blackbirds at the Tule Road site but were unable to confirm fledging there. Five of the 11 tricolored blackbird colonies that fledged young had high reproductive success. Those included the colonies at Marshall Levee Pond, Fahey South, Atwell Island Ton Tache Unit 4, Poso, and Pond Road.

¹ Audubon California (2017) independently documented nesting near the one site (West of Lone Tree) where we did not confirm nesting.

Table 1. Tricolored blackbird sites by habitat, nesting outcome, reproductive success, colony size, and adverse impacts from agriculture.

Site # (See Figure 1)	Site Name	Habitat	Nesting Outcome	Reproductive Success (RS)	Colony Size (# of breeding adults)	Adverse Impacts from Agriculture	Comments
1	Hulen Levee	Ag-Fallow	Fledged	Unknown	2,000–3,000	None	
2	Marshall Levee Pond	Wetland adjacent to a lagoon	Fledged	High (for a small colony)	150–200	None	Vigorous small colony
3	Fahey South	Ag-Fallow	Fledged (multiple cycles)	High	3,000–6,000	None Field untouched by farming operations for duration of nesting season	
4	Cherokee Forebay	Native Pasture	Fledged	Minimal	1,000–2,000	Colony adversely impacted by grazing activity	RS difficult to determine from distant vantage point
5	West of Lone Tree	Ag-Triticale at historical site; oats and mallow at occupied site	Fledged*	Minimal*	3,000	Possible impacts from harvest	*Successful nesting and fledging documented by Audubon California (2017)
6	Avenue 14 and Road 15	Ag-Forage Mix	Colony effectively destroyed by harvest	Minimal	10,000–20,000	Large portion of colony was harvested during nesting	Minimal nesting occurred in unharvested portion of field
7	Cornerstone	Ag-Triticale	Fledged	Low	800–1,200	None	Small colony size and patchy nest substrate

Site # (See Figure 1)	Site Name	Habitat	Nesting Outcome	Reproductive Success (RS)	Colony Size (# of breeding adults)	Adverse Impacts from Agriculture	Comments
8	Deer Creek Dairy	Ag-Triticale	Fledged	Low to Moderate	4,000–5,000	None	Nest substrate patchily distributed
9	Atwell Island Ton Tache Unit 4	Wetland	Fledged	High	4,000–10,000	None	Problem with water delivery prevented subsequent nesting activity
10	Kern NWR	Wetland/Slough	Fledged	Unknown	3,000–5,000	None	
11	Poso ²	Ag-Triticale	Fledged (Two cycles)	High	30,000–35,000	None Field untouched by farming operations for duration of nesting season	This site included four individual fields occupied by tricolored blackbirds.
12	Pond Road	Ag-Forage Mix	Fledged (Multiple cycles of nesting)	High	12,000–20,000	None Field untouched by farming operations for duration of nesting season	Asynchronous colony fledged young for over 30 days
13	Tule Road	Wetland	Likely fledged but unknown	Unknown	14	None	Only small portion of historical habitat suitable for nesting this year

² This site represents four occupied fields that are tracked as separate colony sites (Poso 2, Poso 5, Poso 6, and Poso 7) in the Tricolored Blackbird Portal (<http://tricolor.ice.ucdavis.edu>).

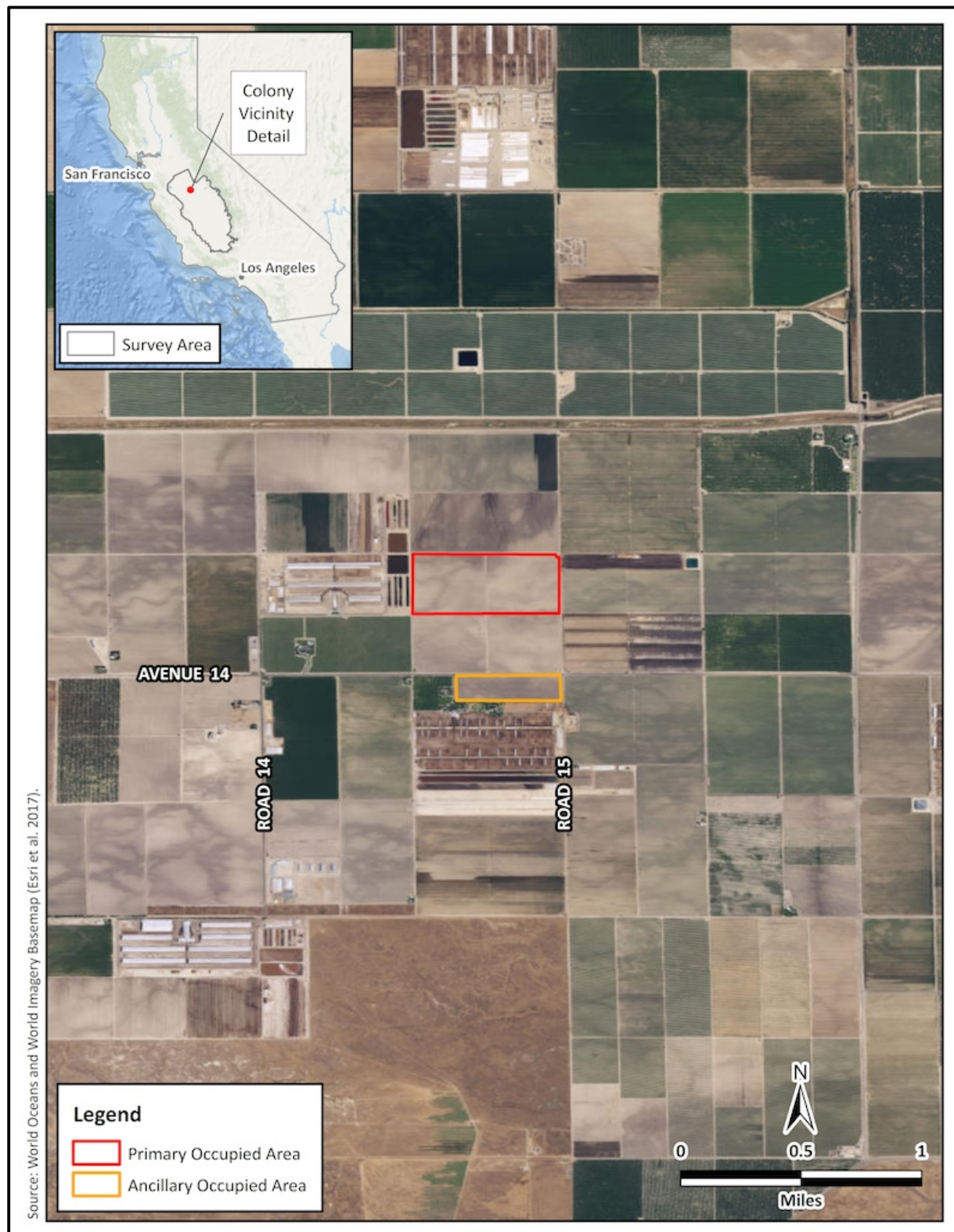


Figure 2. Avenue 14 and Road 15, Madera County. Agricultural field planted with forage mix.



Figure 3. Hulen Levee, Merced County. Fallow agricultural field.



Figure 4. Fahey South, Merced County. Fallow agricultural field.



Figure 5. Marshall Levee Pond, Merced County. Wetland adjacent to a lagoon.



Figure 6. Cherokee Forebay, Merced County. Native pastureland.



Figure 7. West of Lone Tree, Merced County. Agricultural field planted with triticale.



Figure 8. Cornerstone, Tulare County. Agricultural field planted with triticale.

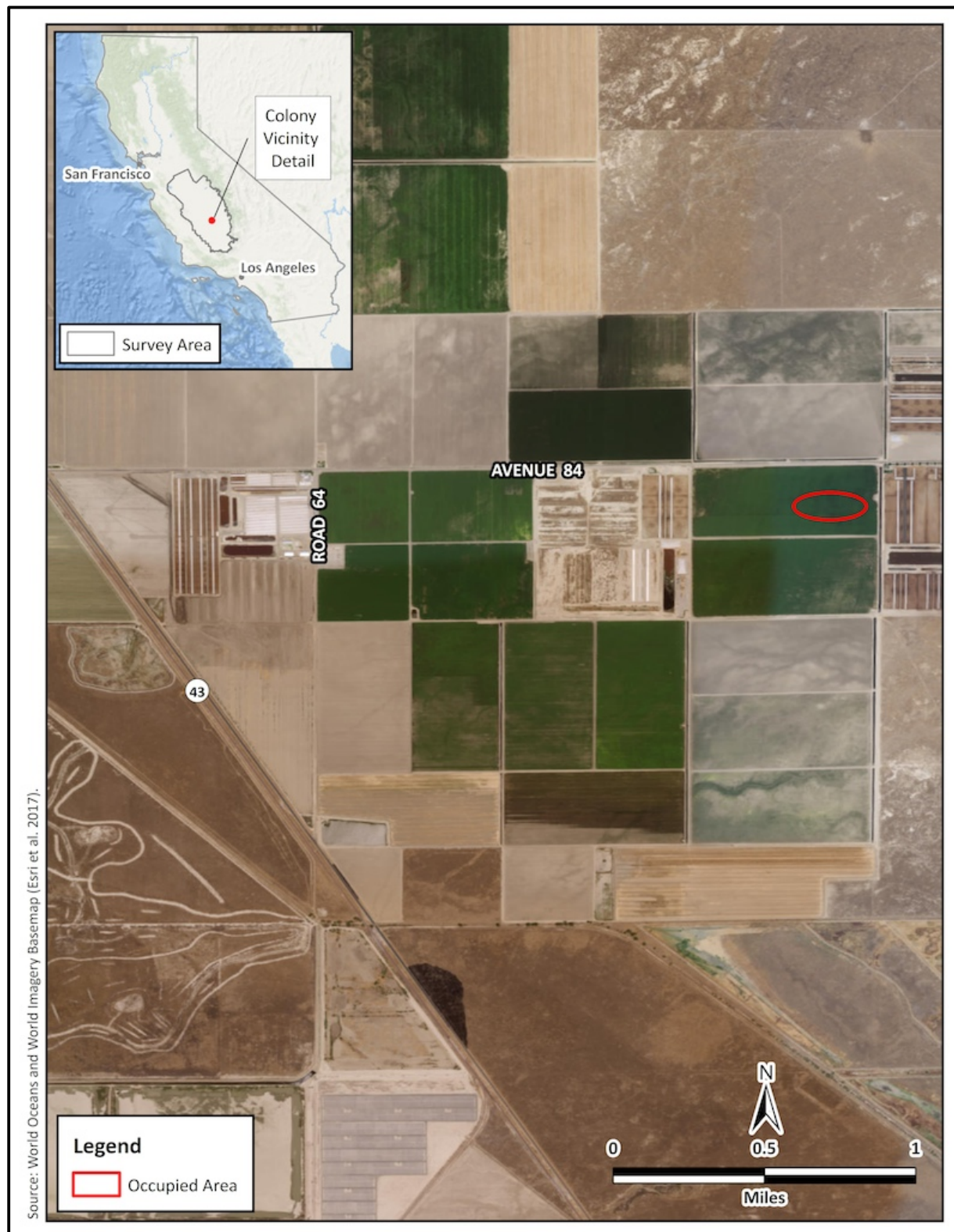


Figure 9. Deer Creek Dairy, Tulare County. Agricultural field planted with triticale.

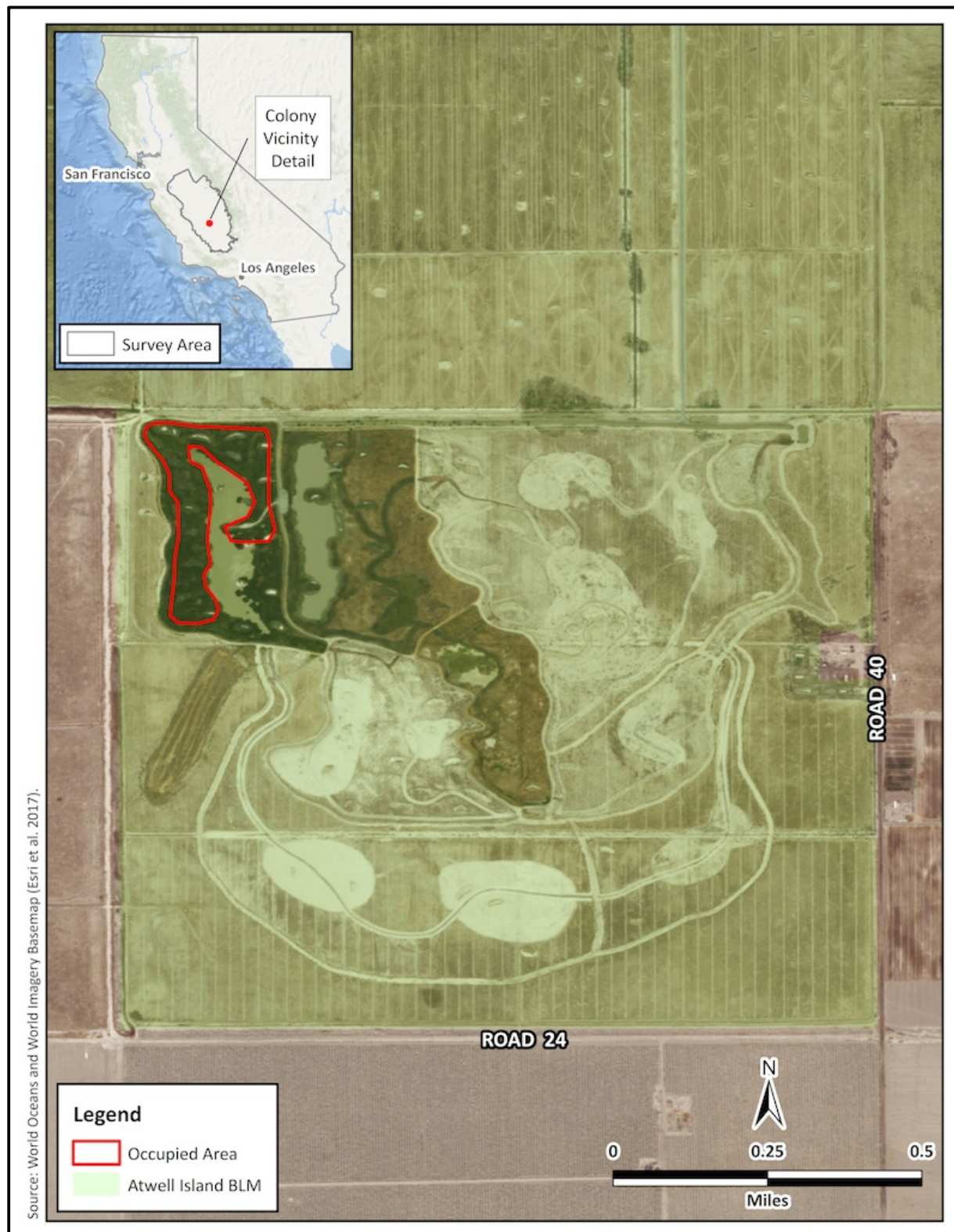


Figure 10. Atwell Island Ton Tache Unit 4, Tulare County. Wetland.



Figure 11. Kern National Wildlife Refuge, Kern County. Wetland.



Figure 12. Tule Road, Kern County. Wetland.

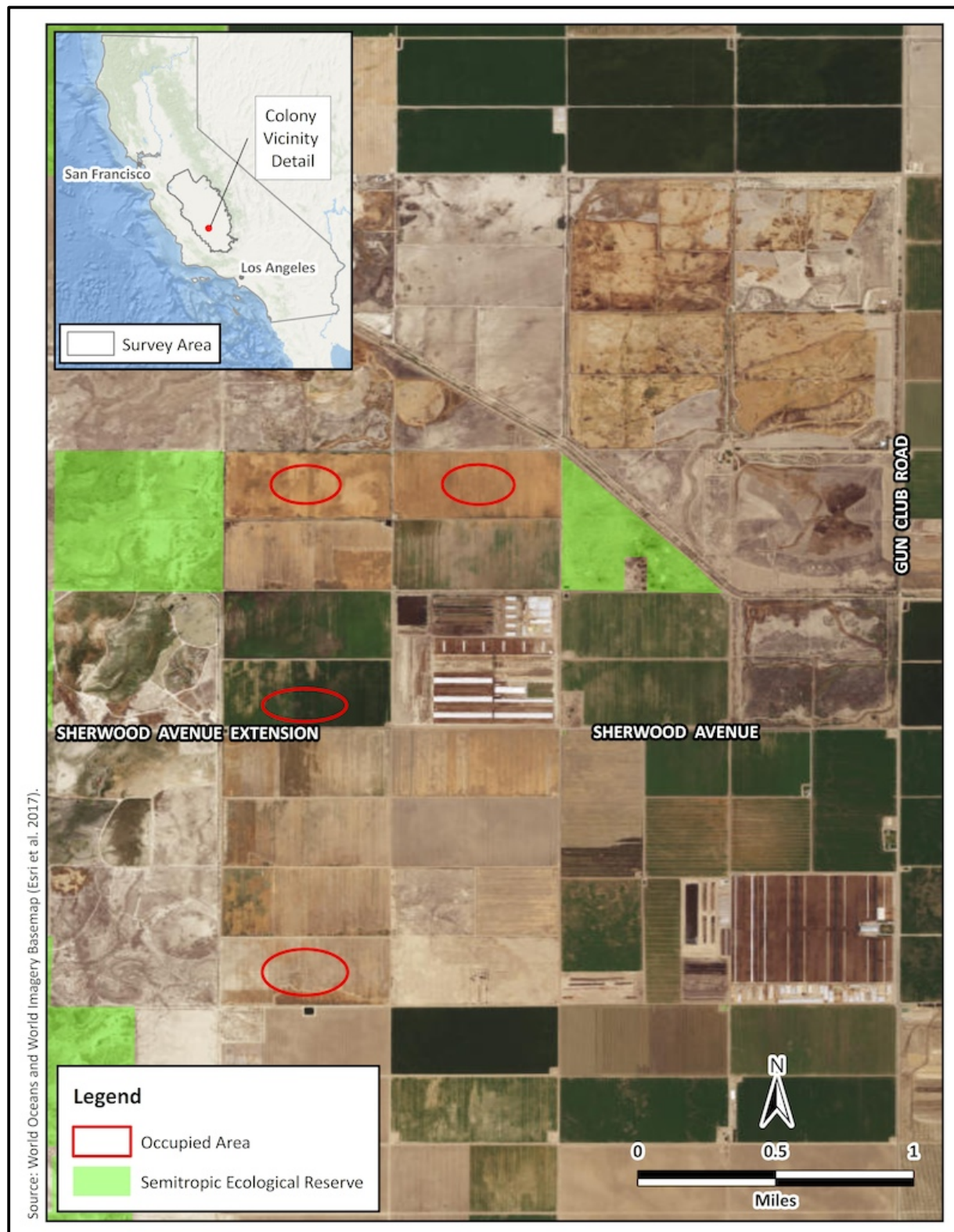


Figure 13. Poso, Kern County. Agricultural fields planted with triticale.

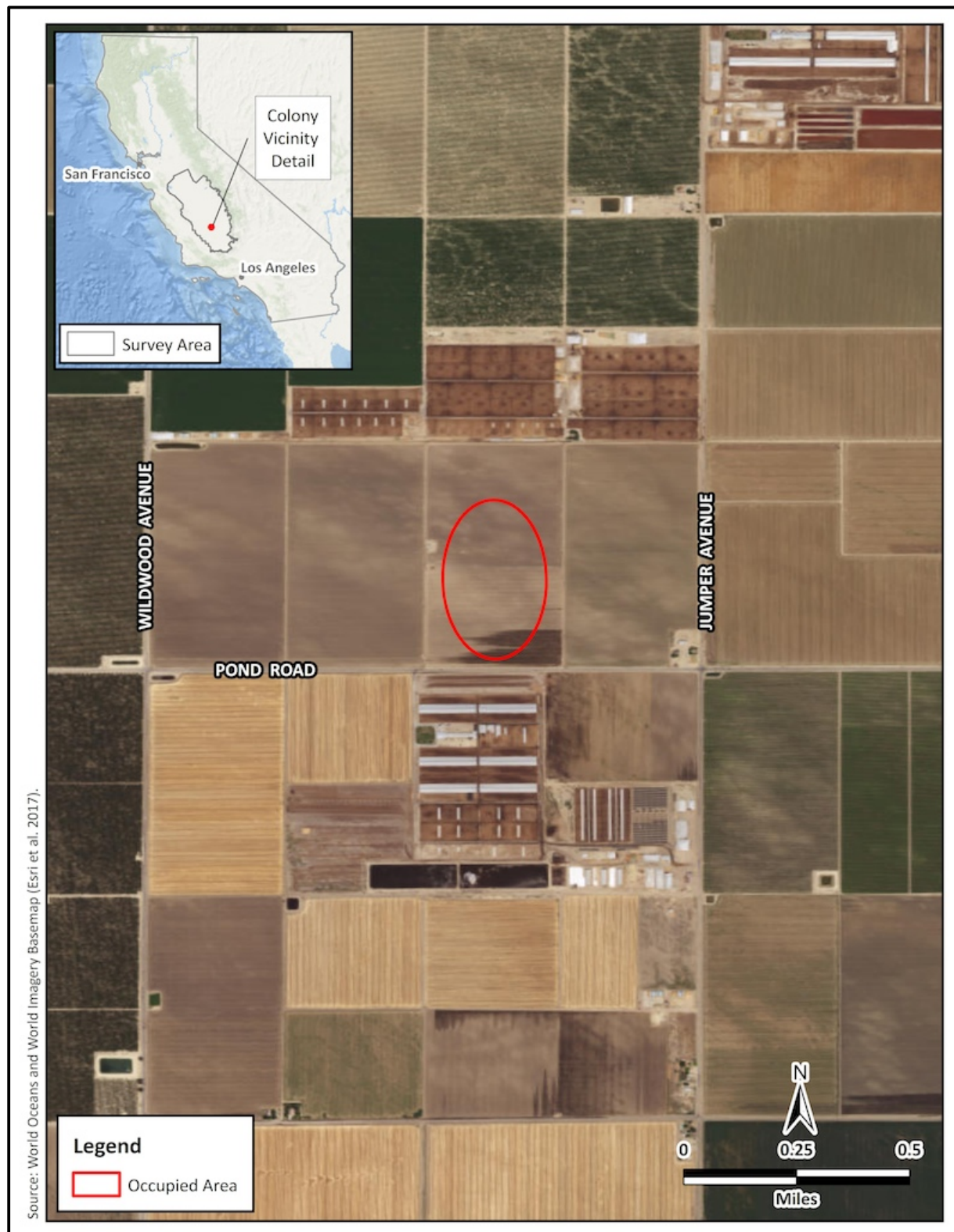


Figure 14. Pond Road, Kern County. Agricultural field planted with forage mix.

Discussion

Agricultural Impacts

Two or three tricolored blackbird colonies were adversely impacted by agricultural activities.

Road 14 and Avenue 15

Despite early colony detection and communication between the Natural Resources Conservation Service (NRCS) and the landowner, one of the largest tricolored blackbird colonies detected during the 2017 field season (Road 14 and Avenue 15) was essentially destroyed by grain harvest. The landowner was informed of silage-harvest-delay programs but moved forward with the harvest rather than receiving payment and delaying harvest. The landowner indicated post-harvest that he was unaware of the legal protected status of the tricolored blackbird. This breakdown in communication highlights the need for an improved process to prevent such destruction of tricolored blackbird colonies in the future.

During a 19 April 2017 field visit to the Road 14 and Avenue 15 site, we estimated 5,000 to 10,000 tricolored blackbird nests based on the area occupied. However, shortly after this visit, a large portion of the field containing the colony was harvested. Scott Frazer met with CDFW Warden Garrett Lenz on 27 April 2017 to assess the impact of the harvest on the colony. Mr. Frazer walked 200 feet into the unharvested portion of the field and documented three nests with eggs, two nests with nestlings, seven empty nests, one partial nest, two juvenile tricolored blackbirds, and one nest that had been destroyed by harvesting. Although the colony was quiet, the unharvested portion of the field remained at least partially occupied. Nevertheless, the reproductive success of this colony was minimal due to the harvest activities. All monitoring at this site ceased following this site visit due to the initiation of a CDFW law enforcement investigation. Consequently, the estimated number of tricolored blackbirds fledged from the unharvested portion of the field was not determined.

Cherokee Forebay

The Cherokee Forebay colony site was heavily grazed throughout the tricolored blackbird nesting period, which adversely impacted the nesting substrate and disrupted nesting activities. In addition, a silage field near the Cherokee Forebay colony that contained male tricolored blackbirds during an early season visit was harvested four to six weeks early, prior to colony establishment. Although the extent of the impact was not quantifiable, the minimal reproductive success of this colony is likely attributable to the grazing disturbance.

West of Lone Tree

During a 06 April 2017 field visit to the West of Lone Tree site, we found that a portion of the grain crops there had recently been harvested. Tricolored blackbirds at the site were behaving chaotically, consistent with behavior observed at colonies immediately following colony destruction by harvest. We did not confirm nesting at this site and had assumed the colony was disrupted or destroyed by harvest operations. However, Audubon California (2017) independently documented breeding about 0.1 miles north of this historical colony location. Therefore, we cannot confirm whether a colony was ever present at the historical location in 2017.

Nest Transects

With few exceptions, nest transects were not conducted during the 2017 field season due to extenuating circumstances. The vegetation at some sites (e.g., Pond Road) was determined to be so dense that conducting transect surveys would incidentally damage tricolored blackbird nests. Access to other sites (e.g., Poso and Cherokee Forebay) was not authorized. We did not enter asynchronous colonies (e.g., Fahey South) to avoid triggering premature fledging. And we did not enter wetland colonies (e.g., Marshall Levee Pond, Atwell Island Ton Tache Unit 4, Kern National Wildlife Refuge, and Tule Road) as they were not the focus of the contract. Nest surveys were conducted at three sites (Cornerstone, Deer Creek Dairy, and Road 14 and Avenue 15). However, these were not protocol level nest transects, and the results provided only anecdotal information on the reproductive success at these sites.

Field Types

Two of the largest tricolored blackbird colonies (Avenue 14 and Road 15 and Pond Road) were in agricultural fields planted with forage mix. More typically, the largest colonies in agricultural fields are in fields planted with triticale. While the Avenue 14 and Road 15 site was largely destroyed by harvest, the Pond Road colony was successful and had high reproductive success. This suggests that early breeding season reconnaissance surveys for tricolored blackbird colonies should not overlook fields planted with forage mix as potential tricolored blackbird nesting habitat.

Conservation Successes

The colonies at Fahey South, Pond Road, and Poso represent substantial conservation successes. These large colonies were untouched by farming operations for several months throughout the duration of the breeding season, and multiple cycles of breeding occurred, resulting in high reproductive success. These colonies serve as good examples of how communication and cooperation between regulators and landowners can result in a positive conservation outcome for tricolored blackbirds.

Conclusion

Monitoring of San Joaquin Valley tricolored blackbird colonies throughout the breeding season and communication between Tricolored Blackbird Working Group partners and landowners of silage fields resulted in conservation successes at most of the eight dairy-associated colonies. The large tricolored blackbird colony at Road 14 and Avenue 15 in Madera County, however, was largely destroyed by harvest despite early detection and communication between NRCS and the landowner.

Recommendations for Conservation

Early Colony Detection

Due to delays in contracting, tricolored blackbird surveys were not initiated until late March. However, tricolored blackbird colonies can become established well before late March, and large colonies can be overlooked in the incubation phase (Hamilton 2004). In addition, based on nest records, nesting colonies from 2000 to present have initiated earlier in the season than they did historically (Frazer 2016). To locate and monitor colonies that initiate early, we recommend that future contracts start at the beginning of March to minimize the potential for large colonies to go undetected, as early colony detection is key to their conservation.

Alternative Measure of Reproductive Success

We recommend that an alternative quantitative measure of reproductive success be developed in addition to or instead of current nest transect protocol surveys. During nest transect protocol surveys, the number of 7-9-day-old tricolored blackbird chicks is documented along a specified transect. The number of 7-9-day-old tricolored blackbird chicks detected is assumed to represent the number of tricolored blackbirds that will successfully fledge from a given area in the colony (Meese et al. 2014). However, fragile or patchy nest substrate, asynchronous colonies, and limited access to colonies on private lands can render nest transect surveys inadequate or infeasible. Transects in dense, intertwined nesting substrate can be difficult to walk and may cause inadvertent damage to nest structures. Transects in patchy nest substrate, where waking is less impeded, may not be representative of the entire colony. Asynchronous tricolored blackbird colonies may contain large numbers of 10-12-day-old tricolored blackbird chicks, which tend to jump from nests when approached by human observers. These “jumper” chicks may not survive once outside the immediate protection of the nest.

We propose exploring the use of an unmanned aerial vehicle (UAV) to capture aerial imagery of tricolored blackbird nesting colonies during the 2018 field season, then reviewing these images using software such as Timelapse Image Analyzer (Greenberg 2015) to determine the number of nests. We suggest conducting same-day walking nest transects in addition to aerial image analysis to ground truth the potential usefulness of UAV technology in determining the number

of nests. Similar methods are currently used with great success for colonial nesting seabirds (e.g., Hodgson et al. 2016), and UAV technology has also been used to count songbirds (Wilson et al. 2017). We recommend that the Tricolored Blackbird Working Group discuss this strategy and alternative strategies for quantitatively measuring reproductive success at problematic tricolored blackbird colonies. Accurate and reproducible measures of reproductive success across the range of colony types are critical for informing conservation based management decisions for the tricolored blackbird.

Landowner Education

To prevent the destruction of known tricolored blackbird colonies in silage fields, we propose that the Tricolored Blackbird Working Group in collaboration with CDFW draft a flyer or brochure on tricolored blackbird life history, breeding phenology, and legal protections under the California Endangered Species Act, other sections of the California Fish and Game Code, and the Migratory Bird Treaty Act. We propose that NRCS share this brochure with landowners when they initiate contact to discuss silage-harvest-delay and silage-buyout programs. This brochure would help educate landowners on tricolored blackbird colonies and their legal protection status and would help NRCS successfully implement silage-harvest-delay and silage-buyout programs. Preventing destruction of large colonies in silage fields is critical to the conservation of tricolored blackbirds in the San Joaquin Valley.

Timing of Water Deliveries

Lastly, the timing and quantity of water deliveries affect the suitability of ephemeral wetland habitats for nesting by tricolored blackbirds (Frazer 2016). For example, during the 2017 field season, the Atwell Ton Tache Unit 4 site hosted a vigorous tricolored blackbird colony with high reproductive success. However, due to water delivery issues, the wetland dried up and prevented subsequent breeding efforts. Likewise, the Tule Road tricolored blackbird colony occupied only a small portion of the historical colony area due to the lack of well-timed water deliveries. To help promote the success of tricolored blackbird nesting colonies at wetland sites, we recommend that ensuring adequate and well-timed water deliveries at known wetland colony sites be a focus of Tricolored Blackbird Working Group conservation efforts.

Literature Cited

- Audubon California. 2017. Tricolored blackbird monitoring – Sandy Mush (Soars) Dairy in Merced County. Unpublished report. 4 pages.
- Frazer, S. 2016. 2016 Tricolored Blackbird Monitoring Report. Prepared for the California Department of Fish and Wildlife. 19 pages + 13 maps.
- Greenberg, S. 2015. Timelapse Image Analyzer. Version 1. University of Calgary. Available online at: <http://saul.cpsc.ucalgary.ca/timelapse>.
- Hamilton, W. J. 2004. Tricolored Blackbird (*Agelaius tricolor*). In The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian-associated birds in California. California Partners in Flight. Available online at: http://www.prbo.org/calpif/html/docs/riparian_v-2.html.
- Hodgson, J. C., S. M. Baylis, R. Mott, A. Herrod, and R. H. Clarke. 2016. Precision wildlife monitoring using unmanned aerial vehicles. Scientific Reports 6:22574.
- Kyle, K. and R. Kelsey. 2011. Results of the 2011 Tricolored Blackbird statewide survey. Sacramento: Audubon California.
- Meese, R. J. 2013. Chronic low reproductive success of the colonial Tricolored Blackbird from 2006 to 2011. Western Birds no. 44:98–113.
- Meese, R. J., E. C. Beedy, and W. J. Hamilton III. 2014. Tricolored Blackbird (*Agelaius tricolor*), The Birds of North America (P. G. Rodewald, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America: <https://birdsna.org/Species-Account/bna/species/tribla>.
- Meese, R. J. 2017. Tricolored Blackbird 2017 Statewide Survey Training. University of California Davis.
- Shuford, W. D., and T. Gardali. 2008. California bird species of special concern. A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Vol. 1, Studies of Western Birds. Camarillo and Sacramento: Western Field Ornithologists and California Department of Fish and Game.

University of California Davis. 2017. Tricolored Blackbird Portal. Available online at: <http://tricolor.ice.ucdavis.edu/>.

U.S. Fish and Wildlife Service. 1995. Migratory nongame birds of management concern in the United States: the 1995 list. Washington, D.C: Office of Migratory Bird Management, U.S. Fish and Wildlife Service.

Wilson, A. M., J. Barr, and M. Zagorski. 2017. The feasibility of counting songbirds using unmanned aerial vehicles. *The Auk* 134:350–362.