Management implications of the 2004 Central Valley Tricolored Blackbird Survey

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Introduction

In this article I compare the reproductive success of Tricolored Blackbirds (*Agelaius tricolor*) in alternative nesting habitats in 2004 and consider the application of these findings to further management actions that will favor this species. I use data from the 2004 survey (hereafter, Survey) of Tricolored Blackbird (hereafter, Tricolor) colonies in the Central Valley (Green and Edson 2004) and my own observations of all Tricolor colonies I could locate or knew about during the remainder of the 2004 breeding season. I followed the fate of some of the colonies reported by Survey participants during and after the nesting season. Without these observers, who covered a broad geographic area, this expanded analysis would have been impossible. Observations by Central Valley Bird Club (CVBC) members and others play an important role not only in the management of tricolors but also in the protection of environmental sites of ephemeral or enduring beauty and grandeur, treasured places where Tricolor colonies choose to regularly settle.

The 2004 Survey focused on agricultural destruction of nests in large colonies in silage fields. Colonies in silage fields, mainly near dairies in the San Joaquin Valley, usually are lost to harvesting operations (Hamilton et al. 1995). Since harvesting of silage fields occurs in April, the Survey provided an opportunity to estimate the impact of silage colony losses upon the overall Tricolor nesting effort.

Methods

Identification of colonies and their size

As noted by Green and Edson (2004) the collective search for colonies during the Survey was neither comprehensive nor random. Surveyors were directed to look at sites where large colonies were seen in the past. It is thus likely that this account, relying heavily on the Survey, under-represents small colonies compared with other survey years. Observers also located additional previously utilized colony sites that were unoccupied by Tricolors at the time of the Survey.

My observations included season-long observation of colonies at the Wind Wolves Conservancy in the California Coast Range foothills, Kern County. Prior experience shows that Tricolor nesting in the Central Valley

moves northward in May and June (Hamilton 1998). My search for colonies after the Survey was also nonrandom. I located all colonies reported to me but searched selectively in the Sacramento Valley in portions of Yolo, Colusa, Glenn, Sutter and Butte counties, including some western Coast Range foothill sites in Glenn and Colusa counties. There was no report of breeding colonies in Sacramento County, a former stronghold of the species (Neff 1937, Beedy et al. 1991, Beedy and Hamilton 1997), but in 2004 some Tricolors probably nested there in Himalayan blackberry (*Rubus discolor*) copses.

Methods for estimating the numbers of birds attending colonies are summarized by Green and Edson (2004). All data from the Survey and from subsequent reports forwarded to Michael Green are included. Some of these counts are modified here based upon (1) personal counts of the number of nests in a colony after the breeding season, (2) discussion with the observers who made observations during the Survey, (3) more exact measurements of the areas occupied by colonies at some later date and (4) inclusion of the largest number of birds present at any time during the season, estimates at the time of the survey notwithstanding. When there were differences between the Survey reports by more than one observer for a colony I contacted the observers and made an effort to determine the basis for the differences. At the silage colonies at Producers Dairy, Fresno County, and the TeVelde Ranch, Tulare County, transects through colonies at the end of the season provided estimates of the number of nests and thus the maximum number of nesting females present. Many females re-nest at some sites and post-season nest counts cannot estimate the actual number of females attending a colony.

Since each female Tricolor will on the average build more than two nests per breeding season the numbers in tables may suggest an exaggerated abundance of Tricolors. Observations reported here do not account for as many as the 162,000 Tricolors located during the 2000 survey. It is not the intent of this paper to evaluate the status of Tricolors. A more thorough survey proposed by the United States Fish and Wildlife Service (hereafter, USFWS) for 2005 should determine the trend in overall abundance.

Measurements of reproductive success

Since I determine reproductive success by examining active nests, the production of nestlings by a colony does not depend upon counting the number of birds attending it. An analysis of the productivity of colonies in different habitats depends upon estimating the probability that nests in those habitats will fledge nestlings. To determine the number of chicks fledging in successful nests (RSS = Reproductive Success of Successful nests), i.e., reaching eight days of age, nests with chicks 6-8 days old are counted and the number of nestlings per nest is averaged. The number of nestlings in successful nests (RSS) is multiplied by number of successful nests, and then divided by the total number of nests. This gives the estimate

of mean reproductive success (RS) of all nests. The estimate of the number of fledglings produced by a colony is the mean RS times the number of nests at that colony. Neither maximum RS nor RSS can be determined after nestlings in some marked nests have fledged.

Where possible, RS values for 2004 colonies were determined by direct measurement (see below). When there was no measurement for RS for a colony I applied average RS values previously determined during a 12-year interval for specific kinds of habitat. The Himalayan blackberry RS estimates in Center for Biological Diversity (2004) are used for this substrate except for those colonies where I measured RS. None of my measurements in 2004 were as great as 2.0 and it is possible that the value quoted in Center for Biological Diversity (2004) suffers from local pseudo-replication. The cattail RS value of 0.5 is based upon 20 colonies measured by me between 1997 and 2003. The Tamarisk value of 1.8 is based upon a single measurement in 1997 at the same site where the 2004 colony was observed.

Direct measurements of reproductive success

No colony was entered when male song chorus was in progress, up to two weeks. Since incubation lasts 11 days (Beedy and Hamilton 1999) an observer can expect to find nests with eggs or small chicks about two weeks after the main male chorus ends. At this brief entry into the colony the approximate schedule for potential jumping and fledging can be determined. The colony needs to be revisited only once more, to measure RS just before the first jumpers are expected. If there are older nestlings in that part of the colony examined they may jump from their nests in response to an observer. If a jumper was encountered, measurements of RS were ended for the season at that colony.

At the time of the final entry into the colony there are some empty nests in most colonies. If there are no jumpers I assume that empty nests and nests with cold eggs were lost to predation, weather, infertility, abandonment or death of females. The measurement so determined is maximum success because there are nests with several days of remaining exposure to predation in the colony, including the 8-day-olds who will not voluntarily fledge for several more days. Depending upon the synchronicity of a colony there may be nests with eggs beside others near fledging. It is for this reason that the accurate determination of RS depends upon marked nests whose fate is determined.

Foraging habitat

Foraging habitat was determined by observation or by discussions with others reporting colonies. The setting of colonies often determines the characteristics of foraging habitat. Some colonies established in cattail (*Typha latifolia*) ponds surrounded by dry rangeland may commute to irrigated agriculture and ignore the surrounding livestock range, a relationship not observed in 2004. Observers need to follow foragers to be sure they

Table 1. Nesting success of Tricolored Blackbirds in 2004 using different nest substrates, based upon direct measurement. These values are included in Tables 2 and 3, along with data for other colonies where the numbers of fledglings were estimated using habitat-specific estimates of RS (= mean reproductive success of all nests; see text for details).

NESTING HABITAT	LOCATION, COUNTY	BIRDS	RS	FLEDGLINGS
Cattail	Delevan NWR, Colusa Co.	136,000	1.07	97,733
	Toledo Pit, Tulare Co.	100	0.00	0
	Saucido Rocks, Santa Barbara Co.	20	0.00	0
	Merced NWR, Merced Co.	25,000	0.00	0
	Subtotals	**161,120**		**97,733**
Himalayan blackberry	Butte hunting club, Butte Co.	25,000	1.50	25,000
	Meridian (partial), Sutter Co.	4,000	0.00	0
	O'Neill Forebay, Merced Co.	7,500	0.04	200
	Bryant, Sutter Co.	1,000	0.00	0
	Subtotals	**37,500**		**25,200**
Nettle	Wind Wolves, Kern Co.	9,915	2.00	13,220
	Subtotals	**9,915**		**13,220**
Silage	Road 88, Kern Co.	5,000	0.00	0
	TeVelde, Tulare Co.	36,000	0.30	7,200
	Producers Dairy, 3rd settlement, Fresno Co.	14,000	0.00	0
	Subtotals	**55,000**		**7,200**
Sandbar willow	Meridian (partial), Sutter Co.	17,000	1.00	11,333
	Subtotals	**17,000**		**11,333**
California blackberry	Meridian (partial), Sutter Co.	4,000	0.00	0
	Subtotal	**4,000**		**0**
Tree willow	Meridian (partial), Sutter Co.	30	0.07	2
	Subtotal	**30**		**2**
Totals		**284,565**		**154,688**
Percent of all observations in Tables 2 and 3		**71%**		**69%**

have identified foraging habitat. This is a more difficult task than one might imagine. While there are often concentrations of birds foraging near colonies, provisioning adults may range up to six km (Hamilton 2003) from their breeding colonies.

Results

Data for analysis of productivity were based upon observations of nesting outcomes at known colonies (Table 1) and observations of colonies at other sites. Changes in the estimates made during the Survey to adjust for actual estimates of numbers of nests do not necessarily imply that errors were made in estimates of colony sizes. During the pre-breeding interval Tricolors may assemble at large dispersal centers in huge foraging flocks (on the order of tens of thousands of birds). This may account for the difference between what Scott Frazier (pers. comm.) found on the levees west of Corcoran Road in Kings County at the time of the Survey and the small number of nests found there after the breeding season. His post-season estimate of 400 nests (600 birds) contrasts with his April observation of about 10,000 birds. I use the nest count data here because I am evaluating reproductive success and estimated colony fledgling production, not the number of birds attending colonies.

Data applying direct measurements of RS for 2004 colonies (Table 1) were supplemented with average RS data. Table 2 includes all data from Table 1 plus means for RS from other years applied to all other 2004 data. Sixty-seven percent of all birds and 70% of all fledgling production values identified in Table 2 are based upon measurements made in 2004 (Table 1).

The number of fledglings in the totals in Tables 2 and 3 were not observed to actually fledge and are estimates of relative fledging success. They are estimates of the relative productivity of colonies observed in 2004. When fledging success is measured, it is measured prematurely to avoid excessive disturbance to older nestlings. Therefore, especially in colonies being preyed upon by coyotes, additional losses to predation undoubtedly were sustained before fledging was completed. At the TeVelde colony starvation strongly reduced fledgling cohorts. Most (72%) nests there during the final colony search contained only a single nestling and the only 8-day-old nestling found was dead.

In Table 3, data from Table 2 are summarized by land use, nesting substrates, foraging habitat types and other criteria. At many of the colonies foraging occurs on more than one category of foraging habitat. The allocation of colonies in Table 3 is to the most heavily utilized habitat in each case. The categorization of foraging habitats identifies Central Valley agricultural lands as pulsed wetlands, watered intermittently according to crop needs. Tricolors foraging from colonies often follow flooding in agricultural and natural settings.

Foraging habitat of the large colony at Delevan National Wildlife

Refuge (hereafter, NWR), Colusa County, could not be precisely determined during several visits to the colony. We (USFWS biologists and the author) saw large numbers of Tricolors from this colony foraging on the refuge in dry shallow seasonal pools, in dry grassy vegetation and off refuge in rice fields. In Table 3 this entire colony is allocated to rice foraging because rice fields surround the refuge in a pattern similar to that at other rice dependent colonies.

The huge reproductive output of the cattail colony at Delevan NWR (Table 1) biased the overall results towards cattail marsh success. This has not been the usual result in previous years, when predation losses reduced RS to a relatively low average value.

One striking feature of results summarized in Table 3 is that mean colony size of the 21 dry-land colonies was less than 2,000 (1,974). Colonies using wetland foraging habitats were on average much larger: four at dairies held 22,125 birds; eight near rice held 24,429 birds; and six in Central Valley agricultural areas held 12,233 birds. Nevertheless, we found more dry-land colonies and their measured and estimated productivity per breeding bird was greater than that of Tricolors using other foraging habitats.

Discussion

All of the relationships between foraging habitat and productivity and other differences between geographic regions are biased by the large number of failed or relatively unsuccessful birds in silage and the huge colony at Delevan NWR. These effects emphasize the importance of finding and measuring the productivity of the large colonies. It is possible that large colonies were not found in 2004 or were found and not reported. The analysis here is intended to summarize what was found and reported in 2004 and to suggest a pattern of analysis that can be applied to a more complete survey in the future, hopefully 2005.

Weather in the spring of 2004 in the San Joaquin Valley and in southern California was exceptionally dry (D. Clendennen, pers. comm.), impacting Tricolor settlement because access to nearby open water is an essential Tricolor habitat requirement. The dryness of the season limited the abundance and vigor of thistle (*Cirsium* spp.) and mustard (*Brassica* spp.) patches throughout California. The weak development of these habitats in 2004 may have concentrated birds at irrigated agricultural sites in the Central Valley. For example, the decline in the number of Tricolors at the Wind Wolves study area is entirely accounted for by the absence of spring water to fill a cattail pond (Sag Pond). In 2001, 4,000 Tricolors nested at this pond but it lacked water and Tricolors in 2004.

Cattails

In 2004, no Tricolors nested in the complex of duck clubs located adjacent to rice fields near Williams, Colusa County. A large Tricolor colony

Table 2. Estimated distribution of a sample of nesting Tricolored Blackbirds and fledglings they produced in 2004 by nesting habitat based upon direct measurement (71% of birds, 69% of fledglings) and estimation (*) from measurements of reproductive success (= RS) in the same kind of nesting habitat in other years.

NESTING HABITAT	FORAGING HABITAT+	LOCATION#	BIRDS	RS	FLEDGLINGS
Cattail					
	REF, RICE	Delevan NWR	136,000	1.07	97,013
	CVAG	Gun Club Rd.	25,000	0.50*	8,333*
	CVAG	Meadowlark	25,000	0.00	0
	CVAG	Glory Hole	12,000	0.50*	4,000*
	DRY	Potter Valley (1)	400	0.50*	133*
	DRY	Marsh Creek	3,000	0.50*	1,000*
	RICE	Sunsweet	400	0.50*	133*
	DAIRY	Toledo Pit	100	0.00	0
	DRY	Saucido Rocks	20	0.00	0
	UNK	Kern	2,000	0.50*	667*
	RICE	Conaway Ranch	2,000	0.50*	667*
Subtotals			**205,920**		**111,946***
(% of total)			**(51)**		**(50)**
Himalayan blackberry					
	RICE	Butte h.c.	25,000	1.50	25,000
	DRY	Milton	17,500	2.00*	20,000*
	CVAG	O'Neill Forebay	7,500	0.04	200
	DRY	Potter Valley (2)	300	2.00*	400*
	CVAG	Highway 140	3,000	2.00*	4,000*
	CVAG	Highway 165	900	2.00*	1,200*
	RICE	Colusa Drain	3,000	2.00*	4,000*
	RICE	Roads P and 60	500	2.00*	667*
	RICE	Harter Land Co.	2,500	2.00*	3,333*
	RICE	Bryant	1,000	0.00	0
	UNK	Yreka (2 broods)	150	2.00*	200*
	RICE	Meridian (partial)	4,000	0.00	0
Subtotals			**65,350**		**59,000***
(% of total)			**(16)**		**(26)**
Nettle					
	DRY	Wind Wolves (7)	9,915	2.00	13,220
	DRY	Wind Wolves (1)	100	2.00*	133*
	DRY	Santiago Springs	6,750	2.00*	9,000*
	DRY	Maricopa W. B.	2,000	2.00*	2,667*
	DRY	Klipstein Canyon	50	2.00*	67*
	UNK	Klamath	350	2.00*	467*
	UNK	Kern 4/8	100	2.00*	133*
Subtotals			**19,265**		**25,687***
(% of total)			**(5)**		**(12)**

Table 2. (cont.)

NESTING HABITAT	FORAGING HABITAT+	LOCATION#	BIRDS	RS	FLEDGLINGS
Silage					
	DAIRY	Road 88	5,000	0.00	0
	DAIRY	TeVelde	36,000	0.30	7,200
	DAIRY	Producers Dairy (two fields)	33,500	0.30*	6,600*
	DAIRY	Producers Dairy (third settlement)	14,000	0.00	0
	Subtotals		**88,500**		**13,80***
	(% of total)		**(22)**		**(6)**
Willow					
	RICE	Meridian (partial)	**17,000**	1.00	**11,333**
	(% of total)		**(4)**		**(5)**
California blackberry					
	RICE	Meridian (partial)	**4,000**	0.00	
	(% of total)		**(1)**		
Tamarisk					
	UNK	Corcoran Rd	**600**	1.80*	**720***
Bulrush					
	DRY	Monterey (1)	200	0.50*	67*
	DRY	Monterey (2)	600	0.50*	200*
	DRY	Solano	300	0.50*	100*
	Subtotals		**1,100**		**367***
Desert olive					
	DRY	Monterey (3)	300	1.00*	200*
	DRY	Monterey (4)	20	1.00*	14*
	Subtotals		**320**		**214***
Tree willow		Meridian (partial)	**30**	0.07	**2**
TOTAL			**402,085**		**223,069**

+=Foraging habitats are primary habitat; rice fields (RICE), Central Valley irrigated agriculture (CVAG) exclusive of fields near dairies (DAIRY) and dry rangeland (DRY). REF is the dry complex of vegetation at Delevan NWR. UNK is unknown to the author.
#=See appendix for further information on colonies, including county.
*=RS values based upon average performance in other years. RS values for colonies with no asterisk were measured (Table 1).

Table 3. Estimated distribution of a sample of nesting Tricolored Blackbirds and fledglings they produced in 2004 based upon direct measurement (71% of all birds) and estimation from measurements of reproductive success in other years (29%).

CATEGORICAL DIVISIONS OF ALL OBSERVATIONS	BIRDS(%)	FLEDGLINGS(%)
By foraging habitat		
Wetlands and irrigated lands		
Foraging in rice and on Delevan NWR near rice	195,430 (49)	142,148 (64)
Agricultural, pulsed irrigated wetland	73,400 (18)	17,733 (8)
Pulsed irrigated wetland near dairies and silage	88,600 (22)	13,800 (6)
Dryland foraging, grasslands, mostly cattle rangeland	41,455 (10)	47,068 (21)
Unknown	3,200 (1)	2,187 (1)
By primary foraging habitat origin		
Native plants	0	0
Exotic plants	402,085 (100)	222,936 (100)
By nesting habitat origin		
Native plants, mainly emergent marsh vegetation	247,645 (62)	149,416 (67)
Introduced plants	154,440 (38)	73,520 (33)
By ownership of colony site		
Private	221,535 (55)	121,656 (55)
Public	180,550 (45)	101,280 (45)
National Wildlife Refuges and State Wildlife Areas		
NWRs	173,000 (43)	101,013 (45)
California State Wildlife Areas	7,500 (2)	200 (<1)
Other	221,585 (55)	121,723 (55)
Sacramento, San Joaquin valleys		
Sacramento Valley	195,430 (49)	142,148 (64)
San Joaquin Valley	164,600 (41)	32,920 (15)
Mountain foothills, San Joaquin Valley	36,315 (9)	45,554 (20)
Other	5,740 (1)	2,314 (1)
Totals, within each category	**402,085**	**222,936**

historically settles this site but usually fails to produce substantial numbers of fledglings due to diurnal predation by Black-crowned Night-Herons (*Nycticorax nycticorax*). Due to management changes in individual marshes, the large cattail marsh site at the Capitol Outing Club was drained at the usual time of Tricolor settlement in May and June. Dry cattail marshes are not colonized by Tricolors. However, the Delevan NWR colony is only 7 km north of this site.

Himalayan blackberry

Himalayan blackberries are exotic invasive plants particularly difficult to control in riparian settings. Himalayan blackberries were a commonly used nesting substrate adjacent to rice fields in 2004 (Table 2). In 1994 we found over 119,000 Tricolors foraging in rice settings, but only 7,250 of them were based in Himalayan blackberry colonies (Hamilton et al. 1995). The difference between these years may be a response to overwhelming Black-crowned Night-Heron predation in cattail marshes, losses of cattail substrates or increases in the distribution and robustness of Himalayan blackberry thickets. Specific cattail sites where 90,000 Tricolors nested in 1994 were either not maintained or were destroyed by 2004.

The 36,000 estimated Tricolors found in six colonies nesting in Himalayan blackberries in the midst of rice included one highly successful colony as well as several smaller colonies that lost nestlings to night-herons. Some of the difference between colonies in susceptibility to night-heron predation may be stochastic, but differences may also be attributed to variations in blackberry copse configuration. Tricolors tend to select dense broad blackberry thickets cascading into canals (pers. obs., Sacramento Valley). This configuration supported the largest successful colony (Table 2) and other colonies where RS was not measured. The blackberry component of one large blackberry-willow colony (Table 2) was completely destroyed by night-herons that stood on these brambles and probed to extract eggs and small chicks (pers. obs., May 2004). The portion of this colony in limber sandbar-type willows (*Salix* sp.) successfully fledged chicks. Only one of 30 nests in a tree-type willow at this colony was successful (Tables 2, 3).

The silage issue

Hamilton (2003) showed that saving silage colonies had no demonstrable effect upon the rapid decline of the global Tricolor population and suggested that habitat losses might be more destructive to Tricolor populations than catastrophic nesting mortality. An alternative hypothesis, represented by the petition to list Tricolors as endangered (Center for Biological Diversity 2004), is that silage colony nest losses are a sink (e.g., Pulliam 1988), destroying enough nests to induce global population decline and create the potential for imminent extinction. Supporters of both alternatives agree that a steady and rapid population decline is in progress.

So the issue is not whether or not to emphasize protection or management of Tricolors. Instead, alternative population regulation hypotheses suggest alternative management priorities. If silage colonies are sinking the global Tricolor population a concerted effort needs to be made to find and protect all such colonies, and there may not be resources to do anything else. If habitat loss is eroding populations it is essential to identify all actual and potential habitat and to protect it from loss.

Silage nesting was initiated as early as March 25 (Kern County) and as late as April 20 (TeVelde, Tulare County). Within large colonies nesting may be initiated for up to three weeks. If conditions within a colony are favorable, re-nesting may occur, extending the interval protection is required to protect nests. This broad range means that any program to protect silage colonies cannot rely upon a one-weekend survey. A group of observers would be needed to hunt for colonies from late March throughout April.

The TeVelde colony was observed to produce low RS (0.3, Table 1) and the Producers Dairy is presumed also to have failed based upon predator trails and the small number of fledglings seen there (Table 2).

Rice

Rice is unavailable as a habitat at the beginning of the San Joaquin Valley breeding season in late March through April (Hamilton 1998) and is therefore not an alternative to silage nesting. Rice nesting cannot be observed by a survey conducted in April. In 1994 we noted that "rice habitat Tricolored Blackbirds were 19.2% of all Tricolored Blackbirds observed nesting in 1994" (Hamilton et al. 1995, p. 27). This is certainly an underestimate of the proportion of all nests made in the vicinity of rice because nesting in the rice areas came late in the season in the Sacramento Valley and we could not "generate the kind of coverage we put into the San Joaquin Valley" (Hamilton et al. 1995, p. 27). The comparable figure for the far *more* limited search for rice colonies in 2004 is 49% of a substantially smaller and less randomly acquired sample. Despite these caveats, it is possible that rice now is providing half of all breeding Tricolor foraging habitat (Table 3). It will take a season-long survey to make a reliable estimate.

Rice is a favorable habitat for Tricolor management because impacts of nesting Tricolors upon the crop are light compared with silage. Damage to rice is primarily loss of seeds and germinated seedlings when water is drawn down early in the cultivation cycle. Throughout the Sacramento Valley a few Tricolors may forage on rice fields soon after flooding but they do not arrive *en masse* to nest for several weeks. In this analysis I found an estimated 64% of all fledglings produced in colonies adjacent to rice cultivation, with 44% of that total attributable to a single cattail colony on Delevan NWR. This site, dried and re-contoured after the 2000 breeding season, is maintained as a permanent wetland until August after other wetlands on the refuge are drained from mid-March through May (Mike

Wolder, USFWS, pers. comm.).

The extent to which rice-related colonies should be managed may depend upon the status of the global population and what we find in 2005 and subsequent years to be the importance of rice to the overall Tricolor population. The only current limitation to use of rice by Tricolors seems to be the absence of suitable nesting sites in the immediate vicinity of rice fields. The principal deterrent to Tricolor productivity in the rice nesting areas is predation by Black-crowned Night-Herons.

Dry-land habitats

The estimate that 22% of Tricolors in 2004 fledged in colonies where dry rangeland provided the primary foraging habitat is a particularly hopeful discovery. Development of these sites, particularly in the foothills of the San Joaquin Valley, may be more cost effective than attempting to create suitable habitats near dairies. However Beedy (pers. comm.), reading this account, noted that there are "large areas in the foothills (e.g., Yuba County) where extensive Himalayan blackberries, canals, and wet pastures appear to provide highly suitable breeding and foraging habitat but where colonies have not been reported." There was a 13,500-bird colony in Yuba County in 1994 (Hamilton et al. 1995).

Since 2000, ongoing management of the San Emigdio Ranch, Kern County, by the Wind Wolves Conservancy has enhanced its Tricolor breeding productivity. In 2004 it produced 8% of all observed and estimated Tricolor productivity (Tables 2 and 3). Actions favoring Tricolors there include livestock exclusion from core wetland vegetation at some springs, ponds, and narrow gully riparian watercourses vegetated with cattails and nettles (*Urtica holosericea*). Livestock gain access to water downstream from springs. Similar management could be implemented on private ranchlands lining both sides of the Central Valley.

Conclusions

Absence of Tricolors from any fully suitable habitat within the geographic distribution of this species is a matter of concern. Are suitable habitats unused because overall numbers are suppressed, e.g., because of breeding colony failures? A better resolution of this question requires a full season intensive search. Large colonies may develop and fail in less than three weeks, leaving the impression to anyone observing at any other time that no birds attempted to nest there.

Active colonies settled in silage need to be protected, but the implication that the ongoing decline of Tricolor populations is mostly due to harvesting of silage fields by dairy farmers (Center for Biological Diversity 2004) is not based upon a comprehensive analysis of existing data. Important conservation priorities of Tricolors are not limited to protection of the silage field nesting colonies in the San Joaquin Valley.

Opportunities to manage, create, and maintain Tricolors throughout their distribution are being overlooked. We need to respond to the collapse of the southern California (Unitt 2001) and Sacramento County (Beedy and Hamilton 1997) populations. There is a loss of colony nesting sites and foraging habitats in progress throughout most of the distribution of the species (Hamilton 2003). This persisting loss of habitat needs to be identified and places where Tricolors can reproduce successfully need to be maintained. Numbers in this report suggest Tricolored Blackbird reproductive success can be supported with a variety of proactive management practices throughout the distribution of the species. Private ranchlands lining both sides of the valley have the potential to benefit Tricolors and other declining bird species. A vast expanse of suitable foraging habitat is also present in the millions of acres of California rice fields. The National Wildlife Refuges are a source of core support for Tricolor populations. In some cases colony production at these sites can be increased if the species is identified as a management priority. Declaration of Tricolor habitat as a priority is also necessary to get planning agencies in southern California to commit to habitat development.

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APPENDIX. Colonies listed in Table 2 are as follows: Delevan NWR = Delevan National Wildlife Refuge, Colusa County; Gun Club Rd. = site in Merced County; Meadowlark = site on Merced National Wildlife Refuge, Merced County; Glory Hole = site on Merced National Wildlife Refuge, Merced County; Potter Valley (1) = cattail marsh in Potter Valley, Mendocino County; Marsh Creek = site in Contra Costa County; Sunsweet = site in Yolo County; Toledo Pit = Toledo Pit storage basin of the Lower Tule Irrigation District, Tulare County; Saucido Rocks = site in Santa Barbara County; Kern = a site reported in Kern County; Conoway Ranch = site in Yolo County; Butte h. c. = Butte hunting club in Butte County; Milton = Rock Creek, Milton, Tehama County; O'Neill Forebay = site in Merced County; Potter Valley (2) = site in Mendocino County; Highway 140 = a site along this highway in Merced County; Highway 165 = a site along this highway in Merced County; Colusa Drain = site in Colusa County; Road P and 60 = intersection these roads in Glenn County; Harter Land Co. = Harter Land Company, Glenn County; Bryant = a site in Sutter County; Yreka = a site along Interstate 5 south of Yreka in Siskiyou County; Meridian = site in Sutter County; Wind Wolves (7) = sum of seven colonies at Wind Wolves Conservancy, San Emigdio Ranch, Kern County, where RS was measured in 2004; Wind Wolves (1) = one colony at Wind Wolves where RS was not measured; Santiago Springs = site in Kern County; Maricopa W. B. = Maricopa Water Bank, Kern County; Klipstein Canyon = site in Kern County; Klamath = site in Klamath County (OR); Kern 4/8 = a site in Kern County; Road 88 = site in Kern County; TeVelde = site in Tulare County; Producers Dairy = site in Fresno County; Corcoran Road = TLDD levee, Kings County; Banks (1 through 4) = four sites surveyed by James Banks in Monterey County; Solano = site in Solano County.