

again settled at Lakeport, in November, remaining until March, 1894. The three years spent in California resulted in an excellent series of bird skins. In 1892 Brett began a collection of mammals, with the measurements taken in inches and hundredths, but commenced the use of millimeters in January, 1894, though continuing to measure birds in inches as before. The mammal skulls were numbered and kept separate.

Brett was in 1892 a member of the California Academy of Sciences, the California Zoological Club, and a subscriber to *Zoe*. He was also in correspondence with the Smithsonian Institution: with Ridgway about the form of cormorant breeding at Clear Lake, which Brett believed to be new; with True about mammals; with Stiles about bird parasites; and I find a letter from Bendire asking for eggs of the White-tailed Kite. All this correspondence was between the years 1891 and 1895.

From California Brett removed to Halifax County, Nova Scotia, and remained there nearly five years; then back to Hastings County, Ontario, and in 1900 to Huns Valley, Manitoba, where collecting ceased after July 14. The field books record 1586 bird skins and 237 mammals collected between 1888 and 1900. In all, Brett collected 297 species of North American birds.

In a letter of November 11, 1910, Brett wrote: "I am on the verge of 74 years. I have no laurels to wear. But my bird life in the suburbs of London, England; then in Flanders, the Belgian Ardennes, and ultimately 40 years in North America, these are glorious years to refer to." Writing in November 3, 1916: "I am writing to let you know that I have reached 80 years and 6 months old, also my bird collections stayed at No. 1587, in Nova Scotia 1905."

I spent a day with Walter Brett in December, 1916, at Trenton, Ontario. He had written, "I will meet you, look out for an old chap with corduroy pants void of all fashion." I found him, as his letters had indicated, the perfect type of an English sportsman-naturalist, interested in wild life and in collecting, but beyond that a keen student of nature. Brett felt that he could no longer care for his collection and it passed into my hands by purchase; there were 1000 bird skins and 135 mammals. The birds were absorbed into my collection, and I have recently given the mammals to the Royal Ontario Museum of Zoology.

Walter Brett died at Bedford, Nova Scotia, September 18, 1917, aged 81 years and 5 months, and was interred at Trenton, Ontario. I am indebted for details of Brett's life to his two sons, both of whom shared their father's interest in natural history, Mr. Richard C. Brett of Steenburg, Ontario, and Mr. Harry W. Brett, of Niagara Falls, New York.

Toronto, Ontario, October 12, 1936.

NESTING DISTRIBUTION OF THE TRI-COLORED RED-WING

WITH MAP

By JOHNSON A. NEFF

Described by the taxonomist as a species of Central or South American origin, the Tri-colored Red-wing (*Agelaius tricolor*) is one of the most interesting of American bird species. In the autumn of 1930 the writer was assigned to the Sacramento Valley district of California to investigate the relationship of blackbirds to the rice industry. During the autumn and winter of 1930-31 general studies in the vicinity of Marysville, Yuba County, occupied the entire period; although a few Tri-colored Red-wings

were collected, the population was very light until late March, 1931, when great numbers of this species returned to the district. As studies continued, their immense numbers and unusual habits aroused keen interest, which was intensified by the field work of each succeeding season.

Perusal of ornithological literature has not satisfied the interest. Many records are old, in fact most of them date back to the days prior to widespread agricultural development in California. Up to 1930, only twenty-six published articles described specific nesting colonies of this species. Only two or three of them give so much as a hint as to the density of population in the days before industrial and agricultural development greatly changed the topography of much of the State. Great gaps appear in the geographic distribution of the species as represented in the literature, and for many of these there seemed no logical reason except that these areas were not sufficiently known by ornithologists.

From the preliminary studies of the species, came a desire to learn something of the present status of the bird. Several questions arose: What has been the effect of the development of California? Has industrial and agricultural development reduced the area favorable to nesting of this species? Has the species proved adaptable to changing conditions? About this time came criticism of the Biological Survey, based largely upon the supposed scarcity of this bird; indeed, it was charged that the species might even then (in 1931) be nearing extinction.

The original plan was to arrange for a complete survey of the nesting range of the species in California during one single nesting season. A start was made upon this, but we speedily learned that Tri-colored Red-wings existed in immense numbers, and that their nesting range covered so great a part of California that such a survey was humanly impossible. Observations continued during the ensuing six-year period covering whatever part of the range the time and funds permitted each nesting season.

ACKNOWLEDGMENTS

The writer greatly appreciates the assistance of a large number of persons who have given aid in this study. Without their assistance in the field the records could not have been gathered. Dr. Joseph Grinnell furnished a bibliography of the species, which has been of great value. Dr. Tracy I. Storer has been a major coöperator, with suggestions as to methods of handling the material and with his critical inspection of the manuscript. Mr. James Moffitt, of the California Academy of Sciences, made valuable suggestions with regard to presentation of material. The continued interest and coöperation of W. C. Jacobsen and H. A. Hunt, of the California State Department of Agriculture, has been invaluable. To the Chief of the Biological Survey and to others in the Washington office of the Bureau, appreciation for interest and assistance is also extended.

HISTORY

Agelaius tricolor was first collected in the vicinity of Santa Barbara by Nuttall in 1836. The original naming of the species is contained in Audubon's folio "Birds of America" (1837, pl. 388); the original description is contained in his "Ornithological Biography" (1839, p. 1).

In 1849, A. L. Heermann arrived on the Pacific Coast; for a time he was attached to the Williamson survey of the Cascade-Sierra Nevada region. Under date of 1853*b* (p. 268) he gave the first nesting record of the species, which is quoted here:

AGELAIUS TRICOLOR, Aud. This species collects in flocks of thousands in the fall season, and is shot in large numbers for the market. I once found one of their breeding places in the northern part of California, near Shasta city. They had chosen a space of several acres, covered with thickets of alder and willow bushes, in the immediate vicinity of a stream of water. The nests were placed so closely to each other that I could often, without advancing, put my hand in six or eight nests.

... When I discovered this breeding place the young were nearly all hatched, and nightly the wolves and foxes came to devour those which had fallen from their nests during the day.

This locality was in Shasta County, apparently on the Cottonwood Creek that is the present boundary between Shasta and Tehama counties, for Heermann wrote of making excursions to such a creek rising in the Coast range; the old mining town of Shasta, $6\frac{1}{2}$ miles west of Redding, is not far from some of the tributaries of this stream. Although Heermann (1853a, p. 17) catalogued eggs of the Tri-colored Red-wing in the Academy of Natural Sciences of Philadelphia, the first specimens of eggs in the United States National Museum were collected near Lakeside, San Diego County, on May 4, 1890 (Bendire, 1895, p. 458).

The A. O. U. Check-list of North American Birds (4th ed., 1931, p. 305) gives the range of *Agelaius tricolor* as follows: "Valleys of northwestern Oregon (west of the Cascade Range) south through California (west of the Sierra Nevada) to northwestern Lower California."

The range of the Tri-colored Red-wing extends well into Lower California. A. W. Anthony (Bendire, *op. cit.*, p. 467) reported it as "rather common along the northwest coast, breeding in all fresh-water marshes; and in San Rafael Valley Mr. L. Belding found a large colony nesting in the tules, May, 1885." Since the occurrence of the species in Mexico is incidental to the object of the present paper, it is not covered in detail here, although several other records for that area have been published since 1885.

Oregon is included in the range of the species on the basis of the following records: Bendire (*op. cit.*, p. 456) wrote: "Here [near Klamath Falls] it was first met with by Dr. J. S. Newberry, and later by Dr. J. C. Merrill, United States Army, who noticed a few among the common Red-winged Blackbirds there but did not find it breeding. I failed to observe it while stationed at Fort Klamath, and it is probably uncommon." Woodcock (1902, p. 64) lists it as having been observed "near Portland" by H. T. Bohlman, and wrote: "I have in my collection three specimens, one male and two females, which I think are referable to this species;" he did not list it as a breeding species. Numbers of qualified ornithologists have worked in Oregon in the interim; none listed the species in Oregon, and most ornithologists were ready to call these early identifications erroneous; there was no specimen in any museum or collection; the fate of Woodcock's supposed specimens is unknown.

The range in California is given by Grinnell in 1915 (p. 104) as follows:

Common resident locally in the interior valleys west of the Sierran divide and south through the San Diegan district. Recorded north to Shasta County, east to Lake Tahoe and near Weldon, Kern County . . . , and west to the coast district of central and southern California. The San Joaquin Valley seems to be now the metropolis of the species. Not recorded east of the Sierran divide, save as breeding at Lake Tahoe . . . , nor in northwestern California north of Marin County, where recorded only as a straggler . . . Westernmost breeding station: Sargents, Santa Clara County. . .

Grinnell and Wythe (1927, p. 105) record the species as an irregular resident or straggler in the San Francisco Bay region, and list nesting colonies as follows: Point Reyes, Mowry and near Irvington, and Sargent. Willett (1933, p. 153) describes the species as "formerly common resident of lowlands [coastal southern California], breeding locally in tule marshes from the latter part of April through May. . . Now rare throughout former ranges in southern California, excepting in some sections of San Diego County. According to L. M. Huey and J. B. Dixon (MS), still nests plentifully, though irregularly, at San Luis Rey, Lake Hodges, Sweetwater, and Lakeside." By way of contrast, Bendire (*loc. cit.*) quotes a letter from F. Stephens concerning Los Angeles and Orange counties prior to 1895: "In summer it is somewhat rarer, but several colonies are known to me to breed in tule marshes from sea level up to an altitude of 1,500 feet."

PUBLISHED NESTING RECORDS

The following table summarizes the entire record of the species insofar as definite nesting colonies are described in the literature.

Date of Observation	Location	Habitat	Observer and Citation	Remarks
Prior to 1853			A. L. Heermann (1853a)	Sets of eggs collected in California
Prior to 1853	Near Shasta City	Thickets of alders and willows near stream	A. L. Heermann (1853b)	(See text)
1875	Saticoy	Nettles	J. G. Cooper (1880)	Hundreds
1872-3; May 22	Near Saticoy		J. G. Cooper (1875)	No statement of numbers
June 21, 1872	Santa Clara Valley (Ventura County)	Patch of nettles and briars in a pasture	H. W. Henshaw (1876)	Two hundred pairs
May 10, 1879	Near Stockton	Tules	L. Belding (1890)	An immense colony; nests averaged one to each square yard
May 16, 1883	Bernardino River		F. E. Blaisdell (Belding 1890)	
	San Bernardino		F. Stephens (Bendire, 1895)	Breeds in the valley
1884	Santa Cruz County		J. Skirm (1884)	Listed as a breeding species
May 4, 1890	Near Lakeside		(Bendire, 1895)	Collection of sets of eggs
Before 1895	Los Angeles County		F. Stephens (Bendire, 1895)	Several colonies
May 26, 1895	Near Sargent	Tule patch	C. Barlow (1900)	Small colony
June 12, 1896	On shores of Lake Tahoe		R. H. Beck (Barlow, 1901)	
May 8, 1897	Near Compton		G. F. Morcom (Grinnell, 1898)	
1900, late April	Near northern Madera County line	In tules, a patch 30 yards across at an artesian well	J. Mailliard (1900)	A large colony; hundreds of birds
May 9 to 21, 1905	Noted at various points from Stockton to Porterville, breeding		M. S. Ray (1906)	
Prior to 1907, April 30 to May 26	San Diego County, Escondido and San Pasqual valleys, Bernarda Rancho		C. S. Sharp (1907)	A district list; apparently several colonies recorded in this area
April 30, 1907	30 miles southwest of Fresno	In nettles, willows, fox-tail grass, and on bare ground	J. G. Tyler (1907)	Hundreds in two localities about 200 yards apart
June 8, 1907	Near Letcher, Fresno County	Clump of rank tule	J. G. Tyler (1907)	About 200 nests
May 20 to June 16, 1907	Buena Vista Lake		C. B. Linton (1908)	Breeding colony
June 7, 1912	Buena Vista Lake		Lamb and Howell (1913)	Hordes
April 14, 1914	Rancho Dos Rios, Stanislaus County	Tules	J. Mailliard (1914)	Nesting area of several acres
1916	Near Los Banos	Tule and cattail	W. L. Dawson (1921)	Large numbers
May 27-June 13, 1916	Near Dos Palos	Swamps, tule and cattail	W. L. Dawson (1919)	Estimated 20,000 pairs
May 20, 1917; May 4, 1918; May 4, 1919	Near San Francisco (Newark, Alameda County)	Common nettles	B. W. Evermann (1919)	200-300 nests
May 7, 1919	2 miles southwest of La Grange	Cattails in dredger pits	Grinnell and Storer (1924)	About 25 pairs
April 2, 1921	Walker Basin, Kern County	Old dead tule patch	A. J. vanRossem, Dickey and vanRossem (1922)	About 20 pairs
April 17 to 20, 1926	Short distances north of Point Reyes	Dense growth of raspberry bushes	E. J. Booth (1926)	
May 20, 1931	12 miles northeast of Marysville	Willows and cattails	T. T. McCabe (1932)	
May 16, 1932	Near Anderson, Shasta County	Tule and cattails	Taylor and Neff (Neff, 1934)	(See text)
May 22, 1933	Near Glenburn, Shasta County	Tangle of <i>Rubus</i> , <i>Prunus</i> , and <i>Rosa</i> , on river bank	Olsen and Neff (Neff, 1934)	(See text)
June 13-16, 1933	26 miles north of Klamath Falls, Oregon	Nettle (<i>Urtica</i>)	Richardson and Neff (Neff, 1933)	(See text)
1933	Lakeside, San Diego County		Huey and Dixon (Willett, 1933)	Large number

No doubt local ornithologists and oologists have many records of the nesting of this species that are not available to the writer. One such is an extension of the recorded range. Prior to 1930, Jack Baker, Santa Rosa taxidermist, and Gurney Wells, found Tri-colored Red-wings nesting at Bodega Head, Sonoma County. Baker estimated there were about 1000 birds in the colony. Eggs and birds were collected; the writer has examined one of the specimens mounted in the collection of Agricultural Commissioner O. E. Bremner at Santa Rosa. This is at present the northwesternmost nesting record for the species.

Beck's record of nesting at Lake Tahoe, reported by Barlow (1901, p. 168) has been questioned. On April 7, 1936, I discussed this matter with Mr. Beck. While naturally he cannot recall the actual happenings of forty years ago, he sees no reason for questioning his record. Prior to 1896 he had collected extensively in the lowlands of California where this species was abundant. Following is the journal entry copied from Mr. Beck's original field diary; Tallac is the only locality mentioned on this date: "6-14-96. Lake Tahoe. Tricolored Blackbird. 2/5. In willows 1 ft. above water; 2 ft. of water. Nest mud bottom. Evidently last year on sides and top with lining of dry grass."

SIX SEASONS OF STUDY

Estimates of population are notoriously inaccurate, and are subject to wide variations. Dawson (1921) wrote of the ease of underestimating the number of Tri-colored Red-wings in a cattail or tule marsh; he described having counted from sixteen to thirty-two nests from one stand in a thick marsh. Heermann wrote of being able to put his hand into six or eight nests from one position. Belding (1890, p. 122) stated that in one colony the nests averaged one to each square yard. Taylor and Miller (Taylor, MS) counted the nests in a strip of cattails containing 1200 square feet; the occupied nests averaged one to each eight square feet.

The writer has noted almost every possible variation in density of population. Twelve nests were observed in one small willow, and thirty-six were counted in one clump of about four tall willows growing from the same root. In cattails, nests have been noted at least as numerous as one to each three square feet; from one stand in thick cattails, without moving the feet except to rotate, we counted from sixteen to thirty-six nests; the average of many counts ran well over twenty. A count made in a marginal colony averaged one nest to each nine square feet. In another colony sample counts, in a number of ten-foot squares, ranged from sixteen to thirty-four nests.

In the observations reported here several methods of arriving at population numbers have been used. The active population of various colonies has been checked again and again. Flight-line counts have been made at certain colonies, counting the birds flying in or out across a base line for

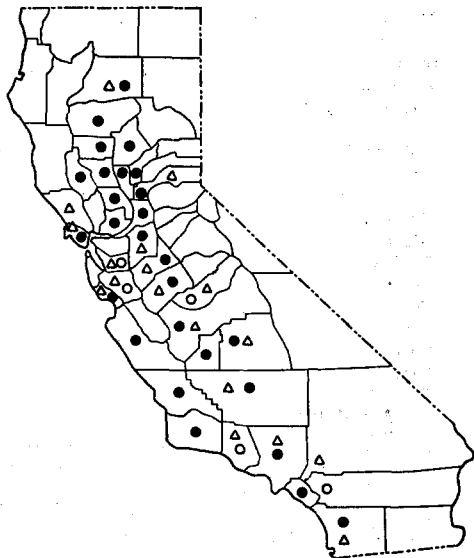


Fig. 21. Nesting range of Tri-colored Red-wing, by counties, in California. Triangles indicate nesting records from published sources prior to 1931; solid spots indicate distribution, 1931-1936, as shown in this report; circles indicate birds observed in nesting season, 1931-1936, but nesting site not found.

five-minute periods; checking the distances from base line to feeding ground or nesting site, and the probable time required for each trip, gave some idea of numbers. When time and terrain permit, the colony site can be stepped off, or estimated area recorded; sample counts then permit a reasonable estimate of numbers.

In my work a combination of all methods has been utilized in order to arrive at reasonable estimates. One common method was to walk into the cattails of a colony at random, then to stop, set the feet together, and turn around, counting each nest that could be reached. The average-sized man can hardly count the nests on more than eighty square feet by this method. The average of a large number of such counts in various marsh colonies has been close to twenty nests, or one to each four square feet. For the sake of conservatism, in many instances the estimated nesting population has been obtained by using the arbitrary figure of *one nest to each ten square feet*, although in many of the localities common sense told the observer that the nests were far closer together. Estimates are given in round figures, for the best that can be expected is a general idea of relative numbers.

Estimated Nesting Population of *Agelaius tricolor*
(Figures represent thousands of nests)

County	1931	1932	1933	1934	1935	1936
Butte (California)		28	106	32	3	4
Colusa		32	16	37	3	5
Fresno						.1
Glenn		68	61	282	4	4.5
Kern					2	.5
Kings		2				
Lake						.02
Los Angeles						.5
Merced		50	58	2	37	10
Monterey		4				2
Orange						.25
Placer			1			1.5
Sacramento		121	101	80	1	15.0
San Diego		3			.1	2.25
San Joaquin					.1	3.75
Santa Barbara						.3
Santa Cruz		.5				
Shasta		18	1			
Solano		.006				
Stanislaus		12			8	
Sutter		10	13	6	1	3
Tehama						.75
Tulare					2	
Yolo		10	38	3	2	10
Yuba		113	2	7	50	5
Klamath (Oregon)		6	.05			
Annual totals	123	388.5	367.	491.	67.2	63.4
Grand total, 1,500,100.						

The following tables summarize the nesting colonies observed each season for the last six years, with comment on personnel involved in the search, and the area covered. In the data covering annual surveys, estimates are in round figures of thousands of nests.

Approximate Man Days Expended in Studies

County	1931	1932	1933	1934	1935	1936
Alameda (California)				2	2	1
Butte	3	3	4	2	2	2
Calaveras					1	
Colusa	3	3	3	2	2	1
Contra Costa		1				
Eldorado		1	1	1		

County	1931	1932	1933	1934	1935	1936
Fresno		1	1	1	1	2
Glenn	3	6	10	45	2	2
Kern		3	1	1	2	4
Kings		1	1	1		1
Lake						1
Lassen	1					
Los Angeles		2	1	1	1	2
Madera		1	1	1	1	2
Merced		1	30	3	5	4
Modoc	2	1	1			
Monterey		2	1	3	3	2
Napa		1				1
Orange		1	1	1	1	2
Placer		1	1	1	1	2
Riverside			1	1		15
Sacramento	3	5	3	3	2	5
San Benito			1	1	3	2
San Bernardino						2
San Diego		4	2	1	2	3
San Joaquin		2	2	2	3	2
San Luis Obispo		1	1	10	3	2
Santa Barbara		1	1	10	3	2
Santa Clara		1	1	1	4	2
Santa Cruz		2	1	1	3	1
Shasta	1	3	2			1
Siskiyou	2		1			
Solano		1				1
Stanislaus		5	1	1	5	2
Sutter	3	2	2	1	1	1
Tehama	2	3	2			1
Tulare		1	1	1	1	1
Ventura				1	1	1
Yolo	60	3	3	2	2	2
Yuba	60	60	60	60	60	2
Jackson (Oregon)	2		3			
Klamath (Oregon)	5		4			

In the table of man days in the surveys, the data are approximate and are designed merely to give some idea of the time expended. In most instances the entire time indicated was not spent directly in search for colonies. Entries of "one day" often mean merely driving through a county in routine business; entries of from 5 to 60 days do not mean that all this period was expended in direct search for colonies. Indeed the only definite and specific searches for colonies are included in the entries of two, three, and four days.

The table of approximate man days clearly emphasizes that only a partial coverage of the range of the species has been attained.

1931

Date	Locality	County	Habitat		Estimated number of nests
			General	Specific	
May 31	5 mi. E Woodland	Yolo	Reservoir	Cattails	4,000
May 31	5 mi. E Woodland	Yolo	Canal	Cattails	3,000
May 31	5 mi. E Woodland	Yolo	Marsh	Cattails	3,000
April 12	12 mi. NE Marysville	Yuba	Slough	Cattails, tules	3,000
April 15	2 mi. W Hammonton	Yuba	Dredger pits	Cattails	10,000
April 23	12 mi. NE Marysville	Yuba	Slough	Cattails, tules	30,000
April 24	10 mi. NE Marysville	Yuba	Slough	Cattails, tules	10,000
May 4	12 mi. NE Marysville	Yuba	Slough	Willows, cattails, tules	50,000
May 26	9 mi. NE Marysville	Yuba	Canal	Cattails	2,000
June 1	1 mi. NW Hallwood	Yuba	Slough	Cattails, tules	3,000
June 17	8 mi. NE Marysville	Yuba	Slough	Cattails	3,000
June 20	14 mi. NE Marysville	Yuba	Dry Creek	Cattails, willows	2,000

Field work in the nesting season of 1931 centered in the Hallwood and Cordua Irrigation districts northeast of Marysville, Yuba County, and on the Conoway Ranch, Yolo County. Trips were made to others of the seven rice-growing counties, and, in the nesting period, birds were noted in colonies in Butte, Sutter, Colusa, and Glenn counties, but no effort was made to estimate populations.

On May 30 and 31, 1931, Dr. Storer and a group from the Museum of Vertebrate Zoology visited Glenn County; two colonies were found near Glenn and a third near Princeton. A total of 2150 nestlings was banded in the three colonies. Later, information was received as to the location of a colony in Sacramento County, but no inspection was made until the next season.

1932

Date	Locality	County	Habitat		Estimated number of nests
			General	Specific	
May 10	10 mi. W Biggs	Butte	Canal	Cattails	75
May 10	10 mi. W Biggs	Butte	Slough	Cattails	500
May 10	8 mi. W Biggs	Butte	Marsh	Cattails	200
May 10	4 mi. N Biggs	Butte	Marsh	Cattails	2,500
May 15	NE Butte City	Butte	Marsh, slough	Cattails	5,000 (3 localities)
June 17	10 mi. W Gridley	Butte	Marsh	Cattails	300
June 17	9 mi. W Gridley	Butte	Marsh	Cattails	2,000
June 17	4 mi. W Biggs	Butte	Marsh	Cattails	3,000
June 17	3 mi. N Biggs	Butte	Marsh	Cattails	1,000
June 17	E Butte City	Butte	Marsh, slough	Cattails	9,000 (4 localities)
June 17	E Butte City	Butte	Marsh, slough	Cattails	4,500 (3 localities)
June 24	NE Butte City	Butte	Marsh, slough	Cattails	100
June 24	NE Butte City	Butte	Marsh, slough	Cattails	500
May 12	SW Princeton	Colusa	Slough	Cattails	5,000
May 12	5 mi. NE Maxwell	Colusa	Slough	Cattails	75
May 12	5 mi. NE Maxwell	Colusa	Slough	Cattails	1,000
May 12	4 mi. NE Williams	Colusa	Marsh	Cattails	20,000
June 13	5 mi. SW Grimes	Colusa	Slough	Cattails	250
June 13	9 mi. SW Colusa	Colusa	Marsh	Cattails	750
June 20	3 mi. SW Maxwell	Colusa	Marsh	Cattails	1,000
June 20	2 mi. SW Maxwell	Colusa	Canal	Cattails	200
June 20	1 mi. W Maxwell	Colusa	Marsh	Cattails	500
June 23	4 mi. E Delevan	Colusa	Canal	Cattails	2,500
June 24	15 mi. W Biggs	Colusa	Marsh	Cattails	400
May 10	8 mi. SE Willows	Glenn	Marsh	Cattails	15,000
May 10	5 mi. E Butte City	Glenn	Slough	Cattails, tules	5,000
May 11	6 mi. SE Willows	Glenn		Willows	3,000
May 11	2 mi. W Sidde Landing	Glenn	Ditch	Cattails, tules	5,000
May 11	3 mi. S Fairview School	Glenn	Marsh	Cattails, tules	3,000
May 11	2 mi. E Fairview School	Glenn	Marsh	Cattails, tules	1,000
May 12	4 mi. E Norman	Glenn	Marsh	Cattails, tules	15,000
May 21	1 mi. S Fairview School	Glenn	Slough	Cattails, tules, sedges	8,000
June 21	3 mi. SE Fairview School	Glenn	Marsh	Cattails	1,000
June 21	3 mi. E Fairview School	Glenn	Marsh	Cattails	2,500
June 24	7 mi. NE Butte City	Glenn	Marsh	Cattails, tules	5,000
June 24	9 mi. NE Butte City	Glenn	Marsh	Cattails, tules	5,000
May 16	4 mi SW Corcoran	Kings	Canal	Tules	2,000
May 14	15 mi. NW Merced	Merced		Thistles	50,000
May 4	4½ mi. NW Salinas	Monterey	Slough	Cattails, tules	750
May 4	San Juan Grade	Monterey	Marsh	Cattails	400
May 21	3½ mi. NE Castroville	Monterey	Slough	Tules	3,000

Date	Locality	County	Habitat		Estimated number of nests
			General	Specific	
April 25	18 mi. E Sacramento	Sacramento	Reservoir	Cattails, tules	120,000
May 5	Near Folsom	Sacramento	Reservoir	Cattails	1,000
May 18	Lakeside Lake	San Diego	Lake	Tules	200
May 19	1 mi. W San Luis Rey	San Diego	Lake	Tules	1,000
May 27	San Dieguito Reservoir	San Diego	Reservoir	Tules, cattails	200
May 27	2 mi. NE San Luis Rey	San Diego	Estuary	Tules, cattails	1,200
April 30	5 mi. W Watsonville	Santa Cruz	Dry Marsh	Blackberries, nettles, cattails	500
May 16	½ mi. S Anderson	Shasta	Marsh	Cattails, tules, sedges	10,000
May 18	5 mi. SE Anderson	Shasta	Creek	Cattails, tules	5,000
May 18	5 mi. NE Cottonwood	Shasta	Marsh	Cattails, tules	2,000
June 14	6 mi. S Redding	Shasta	Marsh	Cattails, tules	1,000
May 6	2 mi. W Birds Landing	Solano	Marsh	Cattails	6
May 14	3 mi. E Patterson	Stanislaus	Ditch	Tules	2,500
May 14	Near preceding colony	Stanislaus	Ditch	Cattails, tules	10,000
May 5	20 mi. N Sacramento	Sutter	Marsh	Cattails, tules, thistles	5,000
May 21	5 mi. N Robbins	Sutter	Marsh	Cattails, tules	5,000
April 9	Northern County Line	Yolo	Canal	Cattails	5,000
May 21	6 mi. W Sacramento	Yolo	Levee	Thistles, mustard	5,000
May 24	Near Davis	Yolo	Field	Thistles	28,000
May 20	12 mi. NE Marysville	Yuba	Marsh	Cattails, tules	100
June 6	15 mi. S Marysville	Yuba	Marsh	Cattails, tules	2,000

This was the season when the attempt was made to cover the entire range of the species. The writer surveyed in rather detailed manner the valley from Sacramento north to Redding and east to Glenburn and McArthur; W. P. Taylor, A. H. Miller, W. C. Jacobsen, A. E. Morrison, H. A. Crane, R. B. MacMath, B. F. Stroup, C. E. Berry, W. G. Duncan, and others, assisted in parts of this large area. T. I. Storer investigated a colony near Davis.

Jacobsen, C. Olsen, and H. A. Hunt studied colonies in Monterey County. Jacobsen and Ira N. Gabrielson noted several colonies in the San Joaquin Valley counties, and in San Diego County visited other colonies found by S. E. Piper and J. C. LaForce. Piper also discovered a colony in Santa Cruz County.

Reference to the table of estimated man days spent in the survey clearly indicates the incompleteness of the survey, and it must be emphasized here that only two areas were surveyed in any detail: San Diego County, and the area from Sacramento and Davis to Redding. Even in these regions it was impossible to make a complete survey of all possible localities. Many of the colonies outside these two areas were discovered as our cooperators drove up or down State in the performance of routine duties.

Besides the colonies listed, bands of adult Tri-colors were noted at many points in the height of the breeding season, on occasions when it was not possible to search out the nesting sites. Piper found adult birds at Lake Hodges, at San Luis Rey Mission, in the dredger workings in the Otay River valley, and on the Santa Margarita Ranch, in San Diego County. He also noted several flying bands in the vicinity of Watsonville, Santa Cruz County, and in July, 1932, observed immature birds in the Buena Vista Lake basin, Kern County, and near Los Banos, Merced County. In none of these instances were nesting sites found.

In the Sacramento Valley, flying or feeding bands were seen at various points where no breeding colonies were noted. Of chief interest was a group of adults feeding in a field near Glenburn, eastern Shasta County. It is estimated that unattached bands observed during the field work totaled considerably more than 50,000 birds.

1933

Date	Locality	County	Habitat		Estimated number of nests
			General	Specific	
May 10	West of Gridley	Butte	Marsh	Cattails	2,500
May 18	Near Shippee Station	Butte	Reservoir	Cattails	50
May 18	6 mi. W Biggs	Butte	Ditch	Cattails	1,200
May 18	5 mi. N Biggs	Butte	Canal	Cattails	2,500
May 24	8 mi. N Oroville	Butte	Marsh	Cattails	200
May 20	NE Butte City	Butte and Glenn	Slough	Cattails, tules	150,000
April 28	Colusa Outing Club	Colusa	Marsh	Cattails	10,000
May 4	4 mi. S Maxwell	Colusa	Canal	Cattails	4,000
May 9	1 mi. SW Cortena	Colusa	Canal	Cattails	2,000
April 21	E of Willows	Glenn	Slough	Cattails	2,500
May 3	E of Willows	Glenn	Slough	Cattails, willows	500
May 4	6 mi. SE Willows	Glenn	Willows		5,000
May 10	2 mi. W Glenn	Glenn	Marsh	Cattails	1,500
May 10	5 mi. SW Glenn	Glenn	Marsh	Cattails	2,000
June 14	26 mi. N Klamath Falls	Klamath, Oregon	Levee	Nettles	50
April 23	8 mi. N Atwater	Merced	Marsh	Cattails	15,000
April 26	3 mi. SW Merced	Merced	Marsh	Cattails	100
April 27	N of Merced	Merced	Marsh	Cattails	250
April 27	Near Hoff Station	Merced	Marsh	Cattails	1,000
April 28	4 mi. SW Livingston	Merced	Marsh	Cattails	1,000
May 2	3 mi. NE Snelling	Merced	Slough	Cattails	2,500
May 2	2 mi. S Snelling	Merced	Marsh	Cattails	1,500
May 2	1 mi. E Snelling	Merced	Marsh	Cattails	500
May 4	2 mi. S Livingston	Merced	Slough	Cattails	4,000
May 4	8 mi. SW Livingston	Merced	Marsh	Cattails, willows	6,000
May 9	Near Merced	Merced	Canal	Cattails	2,500
May 10	Near Merced	Merced	Creek	Cattails	3,000
May 10	4 mi. NE Merced	Merced	Creek	Cattails, willows	5,000
May 12	15 mi. S Merced	Merced	Marsh	Cattails	7,500
May 12	Near El Nido	Merced	Reservoir	Cattails	300
May 19	SW Merced	Merced	Canal	Cattails	1,500
May 26	5 mi. NE Snelling	Merced	Creek	Willows	1,500
June 5	Near Delhi	Merced	Marsh	Cattails	2,000
June 5	4 mi. S Turlock	Merced	Marsh	Cattails	3,000
May 26	Lincoln	Placer	Canal	Cattails	1,000
May 28	Near Folsom	Sacramento	Marsh	Cattails	1,000
June 3	18 mi. E Sacramento	Sacramento	Reservoir	Cattails, tules	100,000
May 22	Near Glenburn	Shasta	Riverbank	Roses, wild plums, blackberries	100
June 30	SE Anderson	Shasta	Creek	Cattails	1,000
May 19	Near Meridian	Sutter	Lake	Cattails	500
May 19	N of Robbins	Sutter	Marsh	Cattails	5,000
May 26	20 mi. N Sacramento	Sutter	Marsh	Cattails	7,500
June 1	6 mi. SW Sacramento	Yolo	Marsh	Cattails	3,000
April 28	12 mi. NE Marysville	Yuba	Slough	Cattails, tules	2,500
May 4	12 mi. NE Marysville	Yuba	Marsh	Cattails	5,000

In 1933 there was no attempt at a statewide search. Piper casually noted the presence of the birds in San Diego County. M. R. Gross, temporarily employed as an assistant, in cooperation with Piper, made a survey of Merced County, east of the San Joaquin River. The writer spent about two weeks in the Sacramento Valley area from Sacramento north to Redding and east to McArthur. MacMath covered Yuba, Sutter, and parts of Butte and Colusa counties. Other surveys were made only in Klamath County, Oregon, and in parts of Jackson County, Oregon.

The first nesting colony in Oregon was found (Neff, 1933, p. 234), and the first nesting records east of the Sierran summit in northeastern California also were made (Neff, 1934, p. 42).

Flocks of Tri-colors were seen in a number of places where no nesting site was observed. Small groups were noted in two places near Klamath Falls, Oregon, on June 14 and 16, 1933. Other bands were seen in the vicinity of McArthur and Glenburn,

Shasta County, California, on May 23; these were not trailed to their nesting grounds. Other small flocks were noted near Anderson in the same county.

In the vicinity of Richvale, Butte County, large numbers of the birds were seen flying northeastward from the village; no nesting site was discovered. Flying bands of Tri-colors were noted in the height of the nesting season at several points along the western edge of the Sierran foothills. There is no doubt that if time had permitted, a few colonies could have been found in the foothill districts of Eldorado, Amador, Calaveras, Tuolumne, and Mariposa counties. C. W. Feltes, of Modesto, reports in a letter dated March 24, 1936, that he observed a colony near La Grange, on land owned by the La Grange Gold Dredging Company; the location was in tules growing in a dredger cut.

John Cushing, of San Francisco, wrote under date of October 21, 1936, that on May 14, 1933, he found a breeding colony of Tri-colors at the mouth of White Gulch, Tomales Point, Marin County: "the parents were quite tame and the females sat in anxious groups at one end of the thicket while I searched the other."

1934					
Date	Locality	County	Habitat		Estimated number of nests
			General	Specific	
May 23	Butte Creek	Butte	Sloughs	Cattails	4,000
May 23	SW Richvale	Butte	Canal	Cattails	6,000
May 23	SW Richvale	Butte	Slough	Cattails	20,000
May 23	4 mi. N Biggs	Butte	Marsh	Cattails	300
May 23	2 mi. N Biggs	Butte	Marsh	Cattails	1,000
May 23	1 mi. N Biggs	Butte	Marsh	Cattails	1,000
June 6	5 mi. W Colusa	Colusa	Marsh	Cattails	15,000
June 6	5 mi. W Colusa	Colusa	Marsh	Cattails	7,500
June 6	3 mi. SE Maxwell	Colusa	Marsh	Cattails	7,500
June 6	7 mi. NE Maxwell	Colusa	Slough	Cattails	7,500
April 25	2 mi. S Willows	Glenn	Ditch	Cattails	250
April 25	3 mi. SE Willows	Glenn	Canal	Cattails	2,000
May 9	8 mi. NE Butte City	Glenn	Slough	Cattails	6,000
May 9	8 mi. NE Butte City	Glenn	Marsh	Cattails	2,500
May 10	3 mi. S Willows	Glenn	Ditch	Cattails	1,000
May 10	1 mi. W Norman	Glenn	Marsh	Cattails	1,000
May 10	1 mi. E Norman	Glenn	Canal	Cattails	1,000
May 10	4 mi. E Norman	Glenn	Marsh	Cattails, tules	200,000
May 10	6 mi. SE Willows	Glenn	Marsh	Cattails	750
May 10	6 mi. SE Willows	Glenn	Marsh	Cattails	500
May 10	6 mi. SE Willows	Glenn	Marsh	Cattails	1,000
May 15	3 mi. W Glenn	Glenn	Marsh	Cattails	2,500
May 16	2 mi. E Norman	Glenn	Canal	Cattails	500
May 16	4 mi. SE Willows	Glenn	Slough	Cattails	30,000
May 16	8 mi. NE Norman	Glenn	Canal	Cattails	750
May 21	4 mi. E Willows	Glenn	Sloughs	Cattails, willows	200
May 21	7 mi. SE Willows	Glenn	Slough	Cattails	1,500
May 22	4 mi. NW Princeton	Glenn	Marsh	Cattails, tules	3,000
May 22	2 mi. NW Princeton	Glenn	Sloughs	Cattails, tules	400
May 22	2 mi. NW Princeton	Glenn	Sloughs	Cattails, tules	7,500
May 30	3 mi. NE Norman	Glenn	Creek	Cattails	750
June 1	3 mi. NW Princeton	Glenn	Canal	Cattails	600
June 1	8 mi. NE Norman	Glenn	Canal	Cattails	1,250
June 2	3 mi. S Willows	Glenn	Marsh	Cattails	1,000
June 4	3 mi. SW Willows	Glenn	Marsh	Cattails	10,000
June 5	4 mi. SW Willows	Glenn	Marsh	Cattails	5,000
June 5	2 mi. E Norman	Glenn	Creek	Cattails	1,000
June 11	Merced	Merced	Canal	Cattails	1,000
June 12	Near El Nido	Merced	Reservoir	Cattails	500
May 10	17 mi. E Sacramento	Sacramento	Reservoir	Cattails	75,000
May 15	18 mi. N Sacramento	Sacramento	Marsh	Cattails	5,000
May 24	Near Meridian	Sutter	Lake	Cattails, tules	2,500
May 24	N of Sutter Causeway	Sutter	Marsh	Cattails	3,500
June 4	6 mi. W Sacramento	Yolo	Marsh	Cattails	2,000
May 1	10 mi. S Marysville	Yuba	Marsh	Cattails	35,000
May 15	2 mi. W Hammonton	Yuba	Pits	Cattails	15,000

The season of 1934 was a busy one, and the only survey was made by the writer. The area covered was the seven-county Sacramento Valley rice district; the Glenn County rice area, comprising about one-fourth of the County, was surveyed in greatest detail. On July 11, 1934, a large population of birds was observed near the lake in Los Osis Valley, a few miles southwest of San Luis Obispo. Great numbers of young birds were scattered among the feeding flocks, but apparently all had left the nesting area in the heavy tules surrounding the lake, for no flight was noted into them. No estimate was made of the size of the band, but the age of many of the youngsters made it certain that they were hatched in this place and could not have flown in from any other known marsh.

The presence of the birds in several San Joaquin Valley counties, and in San Diego County, was noted, but time did not permit close inspection and the making of estimates. Feltes reported that the dredger cut near La Grange was again occupied by Tri-colors in 1934.

1935

Date	Locality	County	Habitat		Estimated number of nests
			General	Specific	
May 21	E Butte City	Butte	Slough	Cattails	500
May 21	SE Richvale	Butte	Slough	Cattails	1,000
May 21	E Riceton Station	Butte	Marsh	Cattails	250
May 21	SW Richvale	Butte	Marsh	Cattails	1,000
May 22	E Willows	Glenn	Slough	Cattails	1,000
May 22	SW Glenn	Glenn	Marsh	Cattails	2,500
May 22	W Glenn	Glenn	Marsh	Cattails	400
May 22	W Glenn	Glenn	Marsh	Cattails	200
April 30	Near Wasco	Kern	Reservoir	Cattails	1,500
April 25	S of Livingston	Merced	Canal	Cattails	150
May 27	4 mi. N Merced	Merced	Canal	Cattails	1,250
May 28	2 mi. S Snelling	Merced	Marsh	Cattails	5,000
May 28	1 mi. S Snelling	Merced	Slough	Cattails	600
May 28	8 mi. N Atwater	Merced	Marsh	Cattails	1,000
May 28	Near Hoff Station	Merced	Marsh	Cattails	400
May 28	Near Merced	Merced	Canal	Cattails	1,500
May 28	Near El Nido	Merced	Reservoir	Cattails	1,000
May 28	Near Livingston	Merced	Canal	Cattails	1,000
May 28	Near Livingston	Merced	Slough	Cattails, willows	1,500
May 28	S of Livingston	Merced	Canal	Cattails	4,000
May 28	S of Livingston	Merced	Marsh	Cattails	3,000
May 28	S of Livingston	Merced	Marsh	Cattails	1,500
May 28	S of Livingston	Merced	Marsh	Cattails	5,000
May 28	NE Los Banos	Merced	Marsh	Cattails	2,500 (3 localities)
May 28	San Joaquin River bridge	Merced	Canal, river bank	Cattails, willows	7,500
May 26	Nimbus Ranch	Sacramento	Reservoir	Cattails	1,000
May 12	Near San Clemente	San Diego	Swamp	Cattails	100
May 17	Near Escalon	San Joaquin	Marsh	Cattails	150
May 15	W Mt. View School	Stanislaus	Marsh	Cattails	2,500
May 15	Near Jennings School	Stanislaus	Canal	Cattails	5,000
May 17	E Oakdale	Stanislaus	Slough	Cattails	250
May 20	W Crows Landing	Stanislaus	Canal	Cattails	750
May 20	Sutter Basin	Sutter	Canal	Cattails	500
May 20	Near Meridian	Sutter	Canal	Cattails	750
May 13	Near Pixley	Tulare	Marsh	Cattails	1,500
May 24	S Elkhorn	Yolo	Levee	Thistles	5,000
June 18	SW Verona	Yolo	Pothole	Cattails	5,000
May 20	NE Marysville	Yuba	Slough	Cattails, tules	2,000
May 21	S Marysville	Yuba	Slough	Cattails	3,000

All of the observations of 1935 were made by the writer, except those in Stanislaus County which were made by Gross. Little time was spent in the search. Parts of five days were spent in the Sacramento Valley rice fields, and two days in Merced County in actual search for colonies. Other colonies were found while I was driving through the State. On May 10, Tri-colors were noted along the Santa Clara River valley near Piru.

Particular attention was paid to the eastern part of Merced County in order to compare the situation there with that recorded by Gross in 1933. Many other bands of birds were observed flying in the area between the Los Banos-Gustine Highway and the San Joaquin River. In mid-July, once again, young birds just out of the nest were noted at the lake in Los Osis Valley near San Luis Obispo.

1936

Date	Locality	County	Habitat		Estimated number of nests
			General	Specific	
May 27	Near Biggs	Butte	Canal	Cattails	1,000
May 27	Near Butte City	Butte	Slough	Cattails	3,000
May 28	Near Williams	Colusa	Marsh	Cattails	3,000
May 28	Near Williams	Colusa	Marsh	Cattails	2,000
June 6	Near Firebaugh	Fresno	Canal	Cattails	100 (see notes)
May 27	Near Butte City	Glenn	Marsh	Cattails	1,000
May 27	Near Artois	Glenn	Creek	Willows	1,000
May 28	Near Willows	Glenn	Marsh	Cattails	2,500
May 6	Near Tupman	Kern	Slough	Cattails, tules	500
May 6	Connors Station	Kern	Slough	Cattails	50
May 29	Near Lakeport	Lake	Marsh	Cattails	50
May 17	1 ½ mi. E Kemp Station	Los Angeles	River jungles	Cattails, willows	500
June 5	Near Merced	Merced	Canal	Cattails	2,000
June 6	Near Dos Palos Junction	Merced	Riverbank jungles	Cattails, willows	1,000
June 6	Lucerne Ranch	Merced	Marsh	Cattails	2,000
June 7	Near Snelling	Merced	Slough	Cattails	2,000
June 7	Arundel Station	Merced	Marsh	Cattails	1,500
June 7	Near Merced	Merced	Canal	Cattails	1,000
May 20	Near Salinas	Monterey	Marsh	Cattails, tules	2,000
May 10	Near Laguna Beach	Orange	Swamp	Cattails	250
May 26	Near Lincoln	Placer	Canal	Cattails	1,500
May 31	Near Folsom	Sacramento	Reservoir	Cattails	3,000
May 31	Near White Rock Station	Sacramento	Reservoir	Cattails	5,000
May 31	Near Ney School	Sacramento	Reservoir	Cattails	7,500
May 15	Near San Pasqual	San Diego	Marsh	Cattails	1,000
May 16	East edge Chula Vista	San Diego	Reservoir	Cattails	750
May 17	Near San Luis Rey	San Diego	Reservoir	Cattails	500
June 3	Near Lodi	San Joaquin	Canal	Cattails	100
June 3	Near Tracy	San Joaquin	Sloughs	Cattails	750
June 3	E of Tracy	San Joaquin	Railway slough	Cattails, willows	2,500
June 3	S of Manteca	San Joaquin	Canal	Cattails	500
May 18	Near Los Alamos	Santa Barbara	Marsh	Cattails, tules	3,000
June 4	Near Oakdale	Stanislaus	Canal	Cattails	7,500
June 4	Near Oakdale	Stanislaus	Canal	Cattails	500
June 4	Near Oakdale	Stanislaus	Lake	Cattails	500
June 4	S Oakdale	Stanislaus	Canal	Cattails	200
June 4	Near Roberts Ferry	Stanislaus	Marsh	Cattails, willows	1,000
June 4	Near La Grange	Stanislaus	Dredger pits	Cattails	3,000
May 25	Near Verona	Sutter	Marsh	Cattails, tules	3,000
May 27	Near Orland	Tehama	Creek	Cattails	750
June 1	Near Woodland	Yolo	Canal	Cattails, tules	1,000
June 1	Near Woodland	Yolo	Marsh	Cattails	1,000
May	Composite of all areas	Yuba			5,000

During the nesting season of 1936 the writer and all coöperators were so occupied with other duties that the Tri-color survey was a by-product. It was not possible to make any nest counts in any of the areas; estimates are based solely on experience in other seasons. Field observations were largely by Jacobsen and Hunt, of the State Department of Agriculture, and by the writer, with many others recording observations in restricted areas.

In the table for 1936, the entry for Yuba County is a composite figure including a number of small colonies scattered over a wide area. Agricultural Inspector MacMath assisted the writer in this compilation. Likewise in the 1936 table, a 100-nest colony is reported near Firebaugh, in Fresno County. This was apparently merely a remnant of a much larger colony, the major part of which had already left the nests.

Roving bands of birds were noted in many localities where we were unable to find nesting sites. In some instances, during June, these feeding groups were composed largely of vociferous youngsters. On April 19, Jacobsen observed a small band of Tri-colors near Milpitas, Santa Clara County. Hunt observed scattered Tri-colors in Monterey County at several points in addition to the one colony actually found; these were seen near Prunedale on June 10, and near Moss Landing on June 12.

In San Luis Obispo County on June 11, Agricultural Commissioner Chalmers and Hunt found a few adult Tri-colors entering the tule border of Laguna Lake. On the same day a band of well over 1000 adults and young was observed in fields of the Waller-Franklin Seed Company just south of San Luis Obispo. On the same date occasional birds were observed by Hunt between Pismo and Arroyo Grande. Gross also saw a definite flight in the Arroyo Grande area, and noted a colony in Orange County.

On May 30, Hunt closely studied a group of about 35 Tri-colors feeding about a marshy swale four miles south of Murrietta, Riverside County. In San Diego County, the writer encountered roving Tri-colors near Lake Hodges and near San Dieguito reservoir on May 15, and near Vista on June 22.

In Fresno County, roving bands of adults were noted at several points on May 5 and on June 6 and 8. Several flocks were observed in western and northwestern Madera County on June 5. On June 8, several feeding bands were seen near Hanford, Kings County, and near the old Tulare Lake bed; on this date three roving groups were observed between Tulare and Earlimart.

Large numbers of roving and feeding flocks were noted in Kern County. On May 6, the writer estimated that 10,000 adult birds were feeding in the section between Connors Station and Buena Vista Reservoir. Other bands were observed occasionally in the Wasco area on both May 5 and June 8. On June 10, a group of about 30 adults and young was seen feeding in a pasture on the Matilija Ranch near Ojai, Ventura County. Gross reports a flying band at Ventura about July 9. On May 15, a flying band of Tri-colors was noted by the writer between Santa Ana and Costa Mesa, Orange County. Other feeding, or flying, flocks were observed by Jacobsen in Solano County in June.

John Cushing reported by letter that he observed Tri-colors at White Gulch, Marin County on the week end of April 11, 1936. Calvin Stevens of Le Grand, Merced County, late in May found a deserted thistle nesting-site of large size east of that place; the young had left the nests.

These widely scattered bands during the nesting season give proof of a distribution far more widespread than the actual nesting-site records show.

SAMPLE DESCRIPTIONS OF COLONIES

For the sake of brevity no more than general information on the colonies is entered in the tables. The writer has in his files, however, detailed data relative to all of the colonies listed in this report, with detailed localities and further notes on the activities of the birds. The following sample descriptions of some of the colonies illustrate variations shown by this species.

About twenty miles east of Sacramento a reservoir, on what is known as the Nimbus Ranch, owned by the Natomas Company, was dammed or dug, about 1912, as a source of water supply for gold dredgers. Cattail and tule growth developed about 1916, and since 1920 or 1921 blackbirds have inhabited the area in great numbers. Marsh growth in 1932 covered 30 to 40 acres. On March 4, 1932, the roosting population of this area, estimated at "nearly a half-million birds," fed over an area fully forty miles in diameter. By April 25, 1932, nesting was under way, and by May 1 many of the nests held full sets of eggs. In May, 1932, many trips were made to this marsh, and the estimate of several coöperators was placed at 100,000 nests. By June 1 most of the young were leaving the nests, and by June 10 many new nests were noted with fresh clutches of eggs. After close inspection of the area, the number of new nests in the marsh appeared close to 20,000. Again in 1933, this spot was densely inhabited. In a series of ten-foot squares stepped off in the cattails, the writer counted from sixteen to thirty-six nests, all occupied; the average was twenty-six. The total was placed at approximately 100,000 nests. By 1935, dredgers had so changed the terrain that only 2000 to 3000 birds returned to this place; the feeding area was too far away. In 1936 this locality was deserted; three smaller marshes a few miles away were densely occupied by a population totaling about 100,000.

On April 30, 1932, at a point five miles west of Watsonville, Piper found a colony of about 1000 Tri-colors nesting in a rather dry marshy area; there was no standing water, but there was a thick tangle of blackberry vines, nettles, and rather sparse cattails. Nests were uniformly in early stages of construction, with no eggs.

On May 14 and 15, 1932, Gabrielson and Jacobsen found a nesting colony in a patch of thistles on a small slough about fifteen miles northwest of Merced on the Crane Ranch road. The thistle patch was from 75 to 125 feet wide, forming an almost impenetrable jungle. Nests held eggs or young. These observers estimated that the birds numbered between 60,000 and 75,000 pairs.

On May 19, 1933, the writer discovered a huge flight of Tri-colors on the holdings of the Dodge Land Company and the Perriott Grant ranch which overlap the Glenn-Colusa county line northeast of Butte City. Here there are a number of sloughs which are not continuously filled with water; their width varies greatly, and it is virtually impossible to estimate the total area. On May 20, 1933, tens of thousands of birds were flying back and forth into the cattails and tules in these sloughs, carrying nesting materials. The birds were active over an area roughly four miles east and west by six miles north and south. The number of birds, apparently all nesting in the slough area, was so far beyond comprehension that after spending parts of three days here the writer gave up in despair with the thought that an estimate of 250,000 adults was ridiculously low. On July 18, 1933, another visit to the section disclosed a general area of about forty square miles centering around these sloughs which literally teemed with squalling young Tri-colors and adults hustling for food for the immense aggregation.

On May 10, 1934, a nesting colony was noted in marshes which extend from the Culver Ranch into the Cross Ranch, four miles east of Norman, Glenn County. About

two weeks later, after nesting was under way in the entire marsh, an irrigation company official, practiced in judging land areas, estimated that nesting covered virtually sixty acres. During the nesting period many nest counts were made on sample areas; all averaged close to one nest for each five square feet. Even at one to ten square feet, the nests in this marsh would number about 260,000. As the estimated number of nests listed in this report is 200,000, this permits sufficient allowance for any parts of the marsh not so heavily populated.

On May 19, 1932, Piper found a colony on the ranch of Douglas Whelan near Mission San Luis Rey, San Diego County, in a sheltered lake with a luxuriant tule margin on the south and east sides. He estimated that 2000 adult birds occupied the area, many of them busily engaged in carrying food to young.

NESTING ACTIVITIES

It is not the purpose of this article to go extensively into habits. Dawson (1921, p. 107) gives such a true and picturesque description of the general habits of nesting Tri-colored Red-wings that parts of it are quoted here.

Agelaius tricolor is intensely gregarious, more so perhaps than any other American bird. Every major act of its life is performed in close association with its fellows. Not only does it roost, or ravage grain fields, or foregather for nesting, in hundreds and thousands, but the very day of its nesting is agreed upon in concert. In continuous procession the individuals of a colony repair to a field agreed upon in quest of building material; and when the babies are clamoring the loudest for food, the deploying foragers join their nearest fellows and return to the swamps by platoons and volleys, rather than as individuals.

Dawson's description of a large colony is especially accurate, and the writer has come well to appreciate his statement of the ease of underestimating the population of a colony which is described in the following words:

A prosperous colony of Tri-colored Red-wings is an enormous affair. At the height of building activities it seems a perfect bedlam, and the composite roar can be heard a mile away. At the same time, one rather wonders at the mildness and restraint of the individual utterance. The flock noise at its worst suggests a colony of a thousand birds, whereas there are in reality tens of thousands—say thirty thousand birds in a typical citadel. . . Excited platoons and hurrying companies of birds sweep over the ground with rapid undulating flight, and lose themselves immediately in the all-devouring green.

The spontaneity of nest building has been observed on various occasions. It has sometimes been definitely known that no Tri-colors frequented a certain marsh for weeks. Suddenly—within a few hours—a horde of the birds arrives and deploys to feed; within four hours of arrival the entire band has been busily engaged in gathering nest material, and by the end of the second day eggs have been noted in the nests. Indeed, on several occasions the birds appear to have dallied along the way, and eggs were deposited in unfinished nests, and in a few instances upon the ground close to the marsh.

Tyler (1907, p. 177) and Dawson (*loc. cit.*) describe another trait that is commonly noted. In brief, in a small colony, all nests are of approximately the same age, and egg deposition starts in all nests within a two-day period. In a large colony, however, this is not always true. In one section of the marsh may be found fledglings, in another incubated eggs, and in another fresh-laid eggs. Sometimes these groups will be found in different sections of the marsh. In colonies of smaller area, however, the newer nests are more likely to be found in concentric rings about the original nesting site, the newest nests sometimes being found in weeds on the margins of the marsh, or, as Tyler found them, even on the bare ground at the margin.

In one or two instances the writer observed nesting birds in a colony over a period

of seventy-five days. In such a colony all stages of nesting could be found after about fifty days; the original nests were at that time deserted by the young, as were the second stage nests; yet in some sections of the marsh there were relatively fresh eggs, or nests just being built. Some of the late activity may be true second nesting; it may be nesting of late arrivals. The writer has the impression that colonies nesting early in the season may subsequently change their habitat, and some of them may nest again in different localities.

MORTALITY AND DESTRUCTION OF COLONIES

Of interest is the question of destruction of nesting sites and mortality of young. Heermann (1853*a*, p. 17) wrote of wolves and foxes eating young birds that fell out of the nests. Belding (1890, p. 122) wrote of a colony near Stockton where many of the young were dead. Evermann (1919, p. 3) found that skunks disturbed the nests. Mailliard (1914, p. 204) wrote of the Swainson Hawk feeding upon young birds.

The destruction of nesting habitats by man is of most importance. Reclamation and drainage have destroyed many favorable habitats. Areas in the vicinity of San Francisco and Los Angeles are now so highly developed that it is doubtful whether or not any colonies could exist there. Other habitats have been destroyed by the dredging or cleaning of reservoirs, marshes, and canals in order to destroy the growths of cattails and tules.

In the present studies many instances of destruction of colonies have been observed. Certain localities have been drained; others have been burned out. In the Sacramento Valley area, burning of cattails in the winter and early spring does not deter the birds, if the marshes or canals are burned *before* the start of new growth. In one marsh the ground was absolutely bare on April 1, but on May 20 the cattails were six feet high and teeming with birds and nests.

The writer has noted a number of colonies which deserted full sets of eggs without apparent cause. In other places, which were unprotected, high winds caused such damage to the cattails and tules as to cause desertion. A large gopher snake was taken from the center of one marsh with a nestling in its jaws and two more already swallowed. In other instances snakes have been observed feeding upon young birds which had flown to the margins of the marsh. Many instances have been observed of nests pulled down or tipped over; the prevalence of raccoon, mink, and other predatory mammals in the rice-field district leads to the conclusion that they were the probable cause. Crows were observed eating eggs and destroying nests in one colony. Cooper Hawks fed upon the adults of one colony until it deserted the nests. About the mouth of a Burrowing Owl den in Colusa County were found the remains of twelve fully-feathered juvenal Tri-colors from a colony a few yards away.

It has been noted that there is heavier mortality in dense marshes late in the nesting season than early. Evidently the steamy heat of the marsh in mid-June and late June is so great that incubation begins with the deposition of the first egg. In a number of late colonies it has been possible easily to distinguish variation in size of the three or four nestlings, the largest being partly pin-feathered, while the smallest was apparently freshly hatched. In such instances the youngest, and smallest, nestling is frequently found dead, from starvation or suffocation; usually only the larger two survive. Mortality seems to be heavier in larger, denser colonies after the weather becomes warm.

Gross (MS) reported a nesting site near Livingston, Merced County, which was deserted after a heavy windstorm. Another colony showed destruction of many nests. Trails led through the tules and near the entrance to the marsh he found tracks of a

dog or coyote. Of another colony he wrote: "For some reason a large majority of the young birds had died. Most of the nests contained only one young bird, occasionally two, and rarely three. A few dead nestlings were found in the nests and dozens were observed in the tules and on the ground on the outer edges of the marsh." Olsen and Hunt, in Monterey County, found a Boyle king snake feeding upon young Tri-colors.

ADAPTABILITY IN NESTING

Surprising adaptability has been noted in the choice of nesting sites. While the true marsh habitat with its rank growth of cattails and tules is strongly favored, the frequency of nesting in other cover, even where favorable cattail swamps are closely adjacent, strongly endorses the conclusion that marshes are not necessary for the continued nesting of the species; nor does this study lead to the conclusion that there has been any marked change in preference during the history of the species. Nesting is herein reported in the following situations:

Cattails and tules (most favored habitat).	Thistles and mustard.
On the ground.	Alder and willow bushes.
Sedge grasses.	Foxtail grasses.
Marsh weeds.	Raspberry bushes.
Nettles.	Rose, wild plum, and blackberry thicket.
Nettles and briars.	Blackberry tangle, nettles, and sparse cattails.
Willows.	Barley.
Thistles.	Grapevine and willow jungle.

ADVERSE FACTORS AFFECTING ABUNDANCE

Heermann wrote in 1853 of the large numbers of Tri-colored Red-wings shot for the market. This practice still continues, and during the past five years it is probable that fully 300,000 blackbirds of the combined red-winged group have been marketed from the Sacramento Valley, with no apparent change in the status of any of the kinds involved. During the winter season of 1935-36, 88,000 blackbirds were shipped from Biggs alone.

Current weather cycles have unquestionably played a part. The past twenty-year period has in general been one of dwindling rainfall and lessened water supplies. Many acres of previously irrigated land reverted to nature for lack of water. Marsh areas in these districts disappeared, although thistles, nettles, and other nesting habitats remained.

Destruction of the birds by man, of nesting sites through drainage or reclamation, of nests by predators or by the elements, and other factors, have played their part. All combined, however, they have made only fractional inroads on this species during the period covered by this report.

FAVORABLE FACTORS

Rice culture, extensive irrigation in many districts often without parallel drainage facilities, and the development of many acres of marsh habitat through irrigation water, have gone far toward furnishing these birds with favorable nesting locations, even in some districts which before irrigation were arid plains. Rice culture began in 1910 to 1912, and gave these birds a marked advantage not previously known.

Heavy rainfall in the season of 1934-35 did much to replenish the water supply in some of these areas, and resulted in a noticeable increase in the nesting of the Tri-colors. Continuation of annual precipitation in normal or more than normal amounts for a few more seasons will assist greatly in furnishing nesting sites in areas which have been dry.

DISCUSSION

The following hypothetical history of the species may well be true:

(1) There were available up to 1880, according to the most accurate topographic maps of the period, extensive nesting areas composed of thousands of acres of true marsh growth and large areas of dense riparian associations. Nesting area was almost limitless, but little is known of the actual density of occupancy. Probably the limiting factor was the available food supply.

(2) During the last years of the 19th century and the earlier years of the present century, marshes were drained and reclaimed, and riparian jungles were cut away. Agricultural development was rapid, with the earlier stages of irrigation. It seems probable that in some part of this period the species reached its lowest ebb.

(3) With the development of the last quarter century, even though rainfall was light, conditions undoubtedly changed for the better. Irrigation has been widely extended and inadequate drainage facilities in many areas have permitted the development of favorable palustrine habitat where before there were arid plains. Modern agriculture, with its new grain crops, has greatly increased the available food supply. The growing of rice, beginning in 1910, has furnished both a favored food and, through the necessity for extensive irrigation, a regrowth of marsh vegetation for nesting and roosting.

It is not unreasonable to assume that during the pioneer period in California the distribution of this species was regulated by the food supply. There was so large an area of favorable nesting that the birds were unable to increase past an optimum point because of scarcity of food. During the second period nesting sites became progressively more scarce, without any marked increase in the available food supply. The modern period has brought about a marked increase in the available food supply which has enabled this species to regain lost ground and to extend its range into areas which before did not favor its existence. It may well be more abundant today than it was in pioneer times.

SUMMARY

Published literature on the Tri-colored Red-wing does not substantiate the fears expressed in 1931 for the welfare of the species. The records then available were too sparse to provide a justifiable basis of opinion. Specific records of nesting colonies are noted in only twenty-six publications.

During the six-year period from 1931 to 1936, inclusive, colonies observed by the writer and coöperators have totaled an estimated 1,500,000 nests. In addition, there were several thousands of adults each season which were not traced to their nesting sites. Colonies have been observed in 26 counties in California, and the survey of the range is still incomplete.

The first positive nesting record of the species in Oregon and the first Oregon-collected skins of the species now known have been reported. The first nesting colony east of the Sierran summit in California (excepting the questionable record at Lake Tahoe) was observed near Glenburn, Shasta County.

Colonies have been studied ranging in number from a low of about six pairs in Solano County to a probable high of well over 200,000 pairs in Glenn County; another colony of like size, in Butte County, has been noted, and others of 100,000 or more in other counties.

Large areas of probable nesting range have not yet been surveyed. The outer limits of nesting range as shown in the present report indicate that breeding Tri-colors should be found at least occasionally in fifteen California counties from which there are at present no published records.

Published records indicated an altitudinal distribution of the species that ranged from approximately sea level to 1500 feet; the questionable Lake Tahoe record was at approximately 6225 feet. During the six years of work herein reported, the species has been found to range from sea level in San Diego and Santa Cruz counties to approximately 4000 feet elevation at Glenburn, Shasta County, and about 4200 feet on Klamath Lake. Occurrence at the higher elevations is probably erratic and intermittent, possibly because of paucity of favorable nesting sites at these elevations.

In 1915 the San Joaquin Valley was called the metropolis of the species. While this probably was true at the time, it must be remembered that much less field work had been done in the great Sacramento Valley area than in the San Joaquin Valley. Reference to the distribution map (fig. 21) in this report shows Tri-color nesting places in eleven Sacramento Valley counties where there were no previous published records.

The chief result of these studies has been the demonstration of the extremely erratic nature of the species, both in winter and in summer. In one season nesting colonies have been found widely scattered over a large part of the State; in another there have been great concentrations in relatively restricted districts; in 1934, Glenn County might have been called the metropolis of the species. In 1933 and again in 1935 a large number of colonies was found in that part of Merced County east of the San Joaquin River. It seems possible that observations have not covered a sufficient part of the range in one nesting season to permit final conclusions as to the true status of the species.

There is no indication that the Tri-colored Red-wing is losing ground, even in the face of modern development; rather, the indications are that it is at least holding its own, and is probably on the upgrade. Unquestionably, certain areas have been altered so that no suitable nesting sites remain, but these areas constitute a small part of the entire nesting range.

The evidence produced during the period indicates that the Tri-colored Red-wing as a species is thriving, nesting in almost every county in which it nested forty to seventy years ago, in numbers nearly as great as ever known. Great adaptability in nesting has been shown, and marsh growth does not appear to be a positive necessity for survival over short periods of drought or change. There is a probability that the species is even now extending its range from a low point reached in the period of most restricted habitat, and that it may be found shortly in some areas now considered marginal.

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