California Department of Fish and Wildlife
Waterfowl Program

Central Valley Midwinter Waterfowl Survey 2023 Results
August 25, 2023

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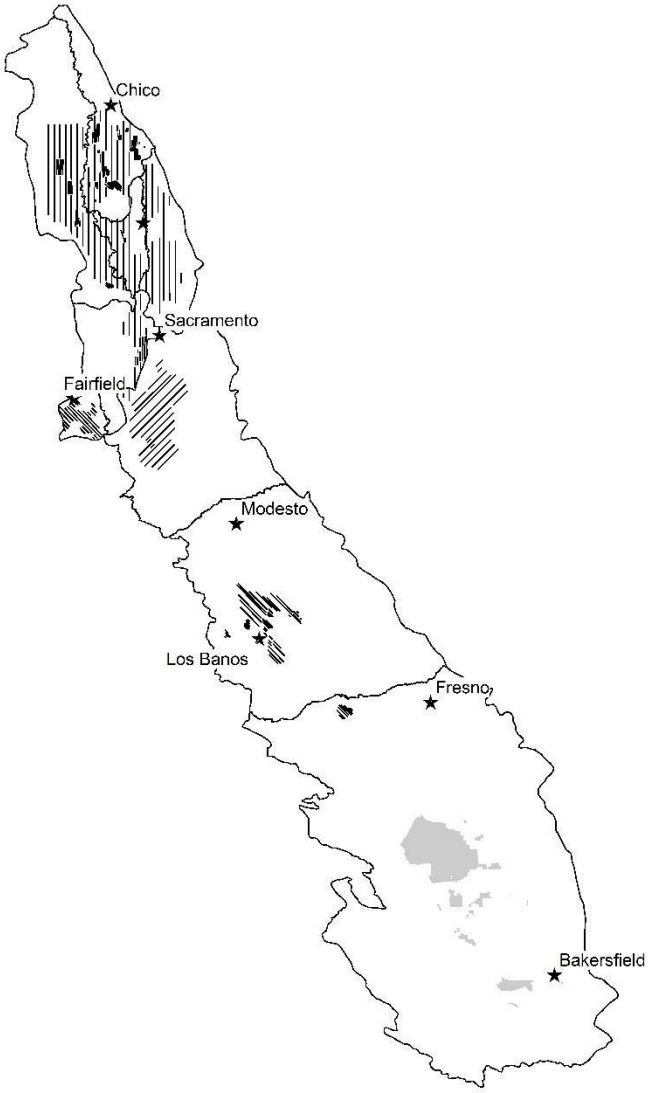

In cooperation with the United States Fish and Wildlife Service and the Central Valley Joint Venture.

Acknowledgments: We would like to thank our pilots Mike Breiling, Mike Greenhill, and Bob Van Wagenen and our observers Mike D'Errico,Greg Yarris, Evan King, Mark Abraham, and Miguel Jimenez.

Table of Contents

Tables and Figures

Abstract

The 2023 Midwinter Waterfowl Survey (MWS) was conducted 17-25 January by two crews. Weather and staffing constraints created few logistical problems, resulting in survey coverage of 99.6%. Although a near complete survey took place, minor loss occurred in the Yolo-Delta, San Joaquin Valley, and Tulare basins (range 0.8% - 4.4%). Total flight time for the survey was 47 hours. An estimate of 3.3 million waterfowl and a total of 3.8 million birds (i.e., ducks, coots, and cranes) were estimated across the entire Central Valley Joint Venture planning area. Most waterfowl were observed in Sacramento Valley (57%), followed by Yolo-Delta (29%), San Joaquin Valley (8%), Suisun Marsh (6%) and Tulare Basin (1%). Dabbling ducks comprised 82% of total waterfowl observed, followed by American coots (11%) and diving ducks (6%). Northern pintail (*Anas acuta*) were the most abundant species comprising 45% of total waterfowl, followed by Northern shoveler (*Spatula clypeata*) at 15%, American coot (*Fulica americana*) at 11%, American wigeon (*Mareca americana*) at 9%, and American green-winged teal (*Anas carolinensus*) at 9%. Mallards *(Anas platyrynchos)* comprised 2% of waterfowl observed. Canvasback (*Aythya valisineria*) were the most numerous diving duck species observed, comprising 2.0% of total waterfowl.

Keywords: aerial waterfowl survey, Central Valley Joint Venture, Midwinter Waterfowl Survey, North American Waterfowl Management Plan

Introduction

The MWS has been conducted throughout the United States since 1935 (Olson 2022), with the goal of estimating the abundance and distribution of waterfowl species in major wintering areas. This survey is one of the longest-running bird surveys in the United States and has been cited in numerous scientific publications (e.g., Afton and Anderson 2001, Johnson et al. 2011, Cramer et al. 2012). While the survey has provided valuable information about waterfowl populations and status, it has also been criticized due to the lack of a standardized protocol in some of the survey areas (Smith 1995, Heussman 1999, Sharpe et al. 1999).

Since 2015, constituents of the Central Valley Joint Venture (CVJV) made substantial changes to the MWS in the Central Valley of California that: 1) link results with specific habitat joint-venture implementation areas to support habitat management decisions; 2) improve sampling design and area coverage by standardization (i.e., transects); 3) excludes areas with low densities; and 4) improve safety.

Methods

Survey design.—The Central Valley Midwinter Waterfowl Survey [CVMWS] was designed using methodology similar to other published waterfowl surveys (United States Fish and Wildlife Service [USFWS] and Canadian Wildlife Service [CWS] 1987, Pearse et al. 2008, Lehnen 2013). The survey was stratified by CVJV Planning basins to provide information at the basin-level, to implement control for regional differences in abundance and to aid in flight planning (CVJV 2020). For survey efficiency, only portions of each basin with potential waterfowl habitat (i.e., wetlands and flooded agriculture) were included in the design. Areas with known high waterfowl densities were isolated as substrata. These substrata are termed “high-density” (HD) and are defined as an area within a basin with greater mean abundance and variance in relation to the overall basin. Transects represent the sampling unit of the survey. The CVMWS does not address visibility correction bias (Pearse et al. 2007, Koneff et al. 2008); thus, the numbers reported here should be viewed as indices and not estimates of abundance.

Survey timing.—The CVMWS is conducted in the first or second week of January and continues until complete, or until 30 January, whichever comes first. This timeframe ensures all waterfowl have arrived from northern latitudes and densities are at their peak (Fleskes et al. 2005). Surveys after 30 January could be biased, as some species may begin spring migration to or from the Central Valley after this date. The survey can be completed in one week; however, winter weather conditions often prevent flights on consecutive days. The survey is intended to be completed in the shortest timeframe possible, weather permitting.

Survey procedure.—The survey is conducted only during Visual Flight Rules conditions (i.e., ceiling of 1000–3000 ft and visibility of at least 5 mi.) and in wind speeds below 20 miles per hour (32 km/hr).The pilot maintains an altitude of 150 feet (45 m), where

possible, and a flight speed between 90 and 110 miles per hour (145 to 180 km/hr; USFWS and CWS 1987). Front-right and rear-left observers record duck species, American coots and Sandhill cranes (*Grus canadensis*) to a distance of 0.125 miles (200 m) on their respective sides of the aircraft, for a total survey width of 0.25 miles (400 m). Geese are not recorded during the CVMWS since other surveys are used to estimate their wintering abundance (see Olson 2022).

Population estimates.—Within strata, a density of each species was calculated by summing the total number of birds observed on each transect and dividing by the total transect area surveyed. The transect area was subtracted from the total stratum area to obtain an expansion factor (Smith 1995). The remaining stratum area was then multiplied by the mean waterfowl density, by species, to estimate the abundance index.

Habitat and weather conditions.—Weather data were gathered from multiple sources to provide habitat-related context to survey results. California Water Watch provides accumulated precipitation graphs to compare precipitation among areas and water years. Additionally, because the Central Valley is comprised of extensive water conveyance infrastructure, designed to remove floodwater from the landscape quickly, characterizing surface flooding at the time of the survey (data courtesy of Point Blue Conservation Science 2023) may be more indicative than long-term precipitation trends, formerly presented in this report.

Freezing conditions in other areas of the Pacific Flyway may impact the number of waterfowl observed in the CVMWS. For example, eastern Washington State supports large numbers of waterfowl during their migration in the Pacific Flyway. Freezing temperatures in this area often occur in December and extend into February; therefore, temperature data from the Moses Lake weather station (National Oceanic and Atmospheric Administration; NOAA) are included for reference.

Results

Survey results.—Two crews, composed of CDFW and USFWS biologists, conducted the CVMWS from 17–25 January 2023. The survey consisted of 47 flight hours and was 99.6% complete. Survey completion varied by basin (Table 1) and was largely affected by weather conditions. As such, some transects were randomly skipped to provide time to survey as much of the study area as possible.

The CVMWS was not conducted in 2019 due to the federal government shutdown, in 2021 due to COVID-19 Pandemic, or in 2022 due to weather, so comparisons of in-season estimates are made based on averages from the five years the survey has been standardized (i.e., 2016, 2017, 2018, 2020 and 2023). Amongst standardized survey areas, total waterfowl (i.e., ducks) were down 25% from the survey average ($\bar{x}$ = 4.504 million). Similarly, dabbling ducks (-27%), diving ducks (-6%) and coots (-32%) were down compared to the survey average.

Comparing all strata, including unstandardized areas (i.e., Kern NWR), waterfowl distribution was as follows; Sacramento Valley (57%), followed by the Yolo-Delta (29%), San Joaquin Valley (8%), Suisun Marsh (6%) and the Tulare Basin (1%; Table 2). Dabbling ducks comprised 81% of total birds observed (3.863 million), followed by coots (11%; 417,775) and diving ducks (6%; 225,015). Of the five most numerous duck species, northern pintails were the most abundant (1.705 million) and comprised 44% of total waterfowl. The remaining top-five species, in order of abundance, were: northern shoveler (15%), American coot (11%), American wigeon (9%), American green-winged teal (9%), and mallard (2%). Gadwalls were the sixth most numerous species, comprising 2% of total waterfowl observed. Canvasbacks were the most abundant diving duck, comprising 2.1% of total waterfowl observed.

Sandhill crane abundance in 2023 was estimated at 25,000 cranes which is below the 2016-2020 average of 39,000. The Yolo–Delta Region supported the most (75%), followed by the Sacramento Valley (23%) and the San Joaquin Valley (1%, Table 2).

Habitat and weather conditions.—The state experienced the third consecutive year of drought, resulting in a 55% reduction in planted rice acres. Minor storms in November were followed by a series of substantial precipitation events in December and January throughout the Central Valley (California Water Watch, Figure 3). The bypass systems within the Sacramento and San Joaquin valleys were full and flowing as precipitation flooded agricultural fields and vernal pools in much of the survey area. Flooding in the San Joaquin Valley was substantial and expansive compared to the previous two survey years; conditions were similar those observed 2017.

On 2 November 2022, a cold weather system occurred at Moses Lake, Washington, where minimum temperatures were at, or below, freezing for the months of November and December, punctuated by four days above freezing (NOAA 2023, Fig. 3.).

Discussion

Winter waterfowl distribution in the Central Valley is mainly influenced by flooded habitat (i.e., post-harvested rice and managed marsh) and the quality and juxtaposition of that habitat across the landscape (Miller *et al.* 2010, Fleskes *et al.* 2005). The former practice occurs mostly in the Sacramento Valley and is likely the main factor enabling the region to sustain the highest densities of wintering waterfowl in the Central Valley. Other influences are weather (i.e., fog and wind), hunting pressure, closed zone area, and more recently, reduced flooded habitat (rice fields and managed wetlands) due to drought.

Habitat acres and distribution prior to December storm events was reduced and irregular, with substantial rice and wetland acres fallowed throughout the Sacramento Valley, most notably on the west side. State and Federal refuge managers throughout the Central Valley endured a challenging winter during 2022 as water allocations were

reduced to the point that public land managers were forced to decide between summer irrigation of moist soil units and winter flooding. Reductions in flooding of private wetlands ranged from partial to complete inability to flood due to logistical constraints or regulatory issues. Funding from drought programs helped to mitigate some of these losses, flooding fallowed acres with groundwater prior to storm systems arriving, but food quality and availability remained depressed. Habitat within the survey area increased throughout December and January as atmospheric rivers continued to swell waterways and flood additional habitats.

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Tables and Figures

Table 1. Midwinter Survey hours, distances flow, area covered, and percent completed by Central Valley Joint Venture planning Region and Basin, January 2023.

Region	Basin	Hours	Miles Flown	Total Area (sq-mi)	Area Flown (sq-mi)	Percent Complete
Sacramento Valley	American	2.2	147.08	233,475.80	233,475.80	100%
	Butte	7	277.51	254,516.88	254,516.88	100%
	Glenn-Colusa	7	423.06	440,959.13	440,959.13	100%
	Sutter	2.3	121.04	175,900.03	175,900.03	100%
Yolo-Delta	Yolo	4.5	205.80	310,509.71	307,988.42	99.2%
	Delta	3.5	68.41	85,669.90	85,669.90	100%
Suisun	Suisun	5.5	97.06	64,640.30	64,640.30	100%
San Joaquin	San Joaquin	7	175.27	157,373.99	153,687.59	97.7%
Tulare	Mendota WA	0.75	25.09	4,174.02	3,991.08	95.6%
	Kern NWR	7	450.00			100%
Total	----------	46.75	1,990.3	1,727,219.76	1,720,829.14	99.6%

Table 2. Total estimated waterfowl by species and Central Valley Joint Venture Region, January 2023.

Species	Sacramento Valley	San Joaquin Valley	Suisun	Tulare [a]	Yolo-Delta	Total
American Green-winged teal	200,401	58,588	16,826	11,216	51,413	333,104
American wigeon	178,346	28,759	47,738	444	87,259	342,545
Cinnamon teal	124	60	590	412	961	2,148
Gadwall	69,020	8,029	6,412	134	4,206	87,801
Mallard	57,741	7,323	2,574	1,111	19,342	88,091
Northern pintail	1,059,684	45,471	66,745	12,143	521,218	1,705,261
Northern shoveler	253,065	91,720	40,982	15,661	163,013	564,442
Wood duck	867	-	-	-	173	1,040
Dabblers	**1,819,249**	**239,951**	**181,868**	**41,121**	**847,583**	**3,124,433**
Bufflehead	6,300	10	1,732	84	11,829	19,913
Canvasback	1,244	11,889	666	946	63,962	78,312
Common merganser	175	10	-	25	41	252
Goldeneye	1,444	-	84	-	1,321	2,848
Redhead	226	-	-	7	-	233
Ring-necked duck	33,517	3,758	151	1,146	7,014	45,586
Ruddy duck	51,491	5,000	2,139	729	4,798	64,155
Scaup	2,152	-	967	-	10,159	13,278
Divers	**96,549**	**20,668**	**5,737**	**2,937**	**99,123**	**224,578**
Unidentified Duck	2,595	-	837	-	36,406	39,837
Total Waterfowl	**1,918,393**	**260,619**	**188,442**	**44,058**	**983,112**	**3,388,848**
Coots	190,614	168,256	17,412	19,092	22,401	417,660
Sandhill cranes	5,933	349	-	18	19,051	25,342
TOTAL BIRDS	**2,114,940**	**429,224**	**205,855**	**63,168**	**1,024,563**	**3,837,750**

[a] Tulare Basin complete count and transect strata combined.

Table 3. Estimated area of surface water (in hectares) by Central Valley Joint Venture region 2013 – 2023, Point Blue Water Tracker (Extracted August 2023).

	Sacramento Valley	San Joaquin Valley	Suisun	Tulare	Yolo-Delta	Total
Basin Area	1,017,496.2	1,151,278.7	61,604.9	2,693,232.3	888,305.3	5,811,917.5
2014	179,754.1	75,711.4	23,327.3	226,070.8	89,388.3	594,251.9
2015	260,471.8	103,476.8	38,764.1	110,968.5	113,111.9	626,793.1
2016	273,988.6	103,271.9	25,396.7	192,757.1	114,809.4	710,223.6
2017	318,188.7	68,842.5	22,181.2	188,219.6	94,483.2	691,915.2
2018	278,521.1	69,616.2	26,994.7	174,859.4	140,299.6	690,290.9
2019	286,477.4	70,084.7	27,002.9	183,117.1	138,800.8	705,482.9
2020	237,910.5	69,288.6	26,094.8	131,731.2	110,169.7	575,194.8
2021	237,115.8	82,841.5	25,988.5	53,806.7	110,512.5	510,265.0
2022	228,249.3	82,306.8	25,306.4	161,831.1	118,236.8	615,930.4
2023	257,036.3	78,918.8	24,697.7	54,788.5	96,441.9	511,883.3
LTA	255,771.3	80,435.9	26,575.4	147,815.0	112,625.4	623,223.1
% Flooded 2023	25%	7%	40%	2%	11%	9%
% Change LTA	0.5%	-2%	-7%	-63%	-14%	-18%
% Change 2022	13%	-4%	-2%	-66%	-18%	-17%

Figure 1. Estimated area of surface water (in hectares) by Central Valley Joint Venture planning region January 2020 – February 2023. Available at: http://data.pointblue.org/apps/autowater/?page_id=201

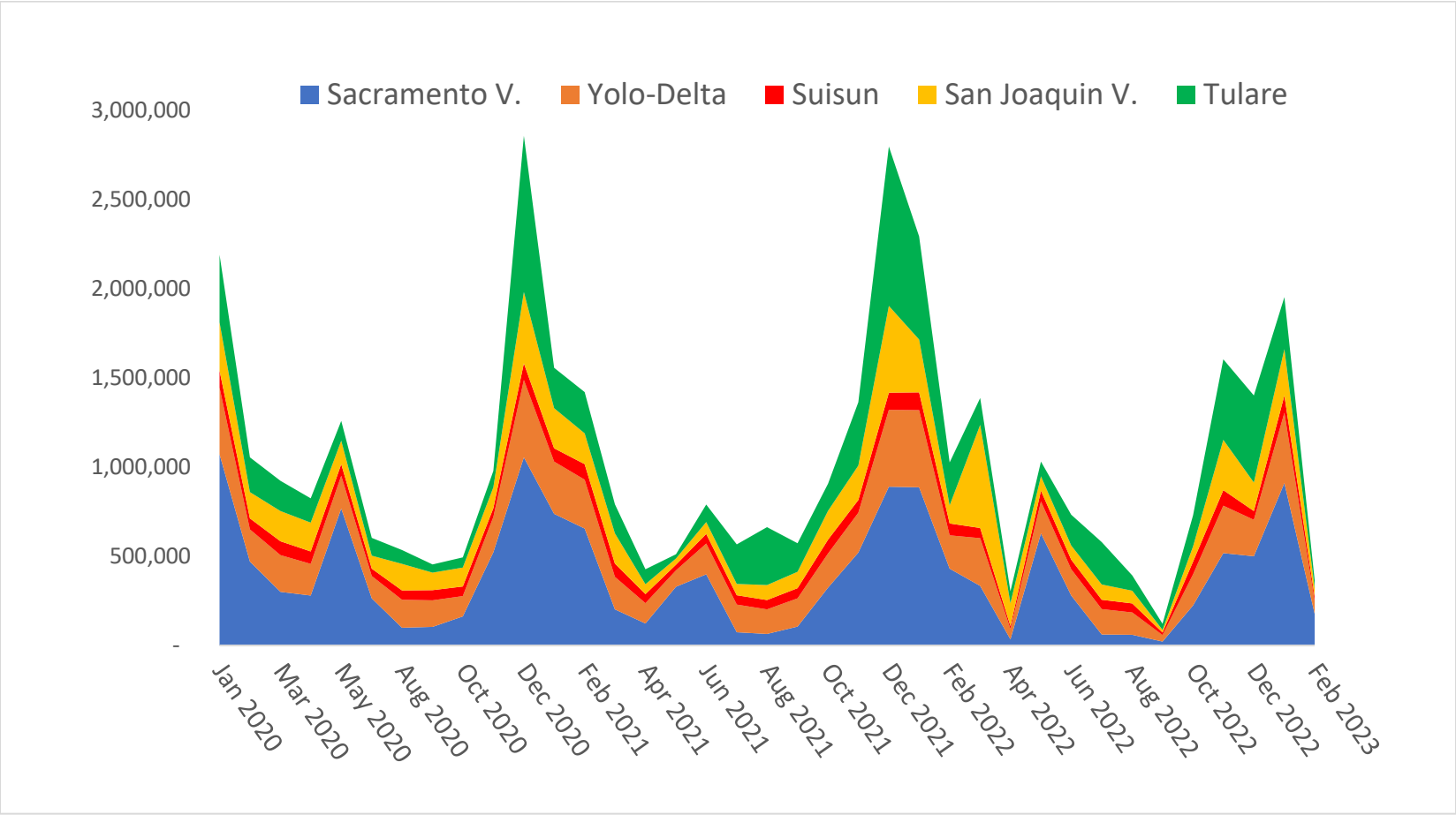

Figure 2. Statewide annual accumulated precipitation for 2022 and 2023 Water Yeas. Available at: https://cww.water.ca.gov/regionscale

Figure 3. Minimum temperatures from 1 November to 31 December at Moses Lake, Washington, during the past 4 survey years.