



## SAN FRANCISCO BAY BIRD OBSERVATORY

Avian Disease Prevention Program  
Monitoring in Artesian and Alviso Sloughs  
June – November 2020



Prepared For:  
City of San Jose  
Environmental Services Department

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## Introduction

Avian botulism is a neurological disease caused by ingestion of a toxin produced by the bacterium *Clostridium botulinum*. Waterfowl and shorebirds are commonly affected and may be at greater risk of infection than many other species due to their dabbling and probing foraging behavior (Rocke and Friend 1999). Symptoms include inability to fly followed by paralysis of the legs. As the disease progresses, the inner eyelid and neck muscles are also paralyzed. Affected birds often drown as they are no longer able to hold their heads out of the water. Losses of waterfowl to avian botulism vary from year to year but can reach tens of thousands of birds and historically have reached hundreds of thousands (Hunter 1971, Woodin 1987). Environmental conditions that are favorable for *C. botulinum* growth and multiplication can increase the chances of an avian botulism outbreak. These conditions can include warm, shallow water, fluctuating water levels, high ambient temperatures, presence of vertebrate and invertebrate carcasses, high nutrient levels, and rotting vegetation. Early detection of the disease and removal of any carcasses found in the area can minimize outbreaks of avian botulism (Rocke and Friend 1999).

From June to November 2020, staff and volunteers of the San Francisco Bay Bird Observatory (SFBBO) monitored Alviso and Artesian Sloughs for the presence of avian botulism. The survey areas are tidal with fresh to brackish water. Artesian Slough also receives freshwater effluent from the San Jose-Santa Clara Regional Wastewater Facility (SJ-SC RWF). The SJ-SC RWF is a wastewater treatment facility that utilizes primary, secondary, and advanced treatment on influent wastewater before discharging freshwater effluent into Artesian Slough. We conducted this study under contract from the City of San Jose for the SJ-SC RWF as part of a long-term monitoring program that began in 1982, and to help the SJ-SC RWF fulfill an avian disease monitoring requirement in their regulatory discharge permit.

## Methods

Between 2 June and 23 November 2020, 25 surveys of Artesian Slough were conducted by boat, and 25 surveys of Alviso Slough were conducted by vehicle. The Artesian Slough survey area was divided into 9 fixed sections that aid in inter-annual data comparisons (Figs. 1-2). The Alviso Slough survey area has no section designations (Fig. 3-4).

Dead and diseased wildlife were collected whenever possible to prevent the spread of avian disease and to reduce the severity of a potential botulism outbreak. Dead vertebrates were kept frozen at SFBBO while awaiting proper disposal at a licensed facility (e.g., Koefran Services, Sacramento, California or San Jose Animal Control Services). Sick and injured wildlife that could

be captured were transported to a licensed wildlife rehabilitation facility (Wildlife Center of Silicon Valley [WCSV], San Jose, California) for first aid, diagnosis, and treatment.

For each animal collected, captured, or seen during surveys, the date, section where found, species, age, and sex (if known) were recorded.

## **Results**

### *Alviso Slough*

During 25 surveys between 2 June and 23 November 2020, twelve dead birds were observed within the survey area of Alviso Slough (Table 1).

### *Artesian Slough*

During 25 surveys between 2 June and 23 November 2020, eighteen dead and eleven sick birds were found within the survey area of Artesian Slough (Table 2). Two dead Unidentified Fish were also found. All of the dead vertebrates that could be collected were stored for proper disposal. Seven of the sick birds were taken to the WCSV – four died or were humanely euthanized and two were released. One bird is still at WCSV receiving treatment. Three collected birds died during transportation before they could be treated and one could not be captured. None of the sick birds were diagnosed with avian botulism.

## **Discussion**

While dead, sick, and injured waterbirds were observed throughout the course of the season, we found no evidence of an avian botulism outbreak at Alviso and Artesian Sloughs in 2020. Large gulls of the genus *Larus* comprised over half of dead, sick or injured birds found. This is not surprising since many gulls use the area, and sizable nesting colonies are located in close proximity to Alviso and Artesian Sloughs (Ackerman et al. 2006, Robinson-Nilsen and Demers 2012, Tarjan et al. 2019). During 2020 driving surveys, increased gull breeding activity was observed at the colony sites nearest to the sloughs.

We suggest continued monitoring during warm weather when many shorebirds and waterfowl are likely to be present and there is the potential for an avian botulism outbreak (Rocke and Friend 1999). Since the precise factors that lead to an avian botulism outbreak are not fully understood, ongoing vigilance and early detection of outbreaks followed quickly by a clean-up response if and when outbreaks occur is one of the best ways to limit the impact of these unpredictable events.

## Acknowledgments

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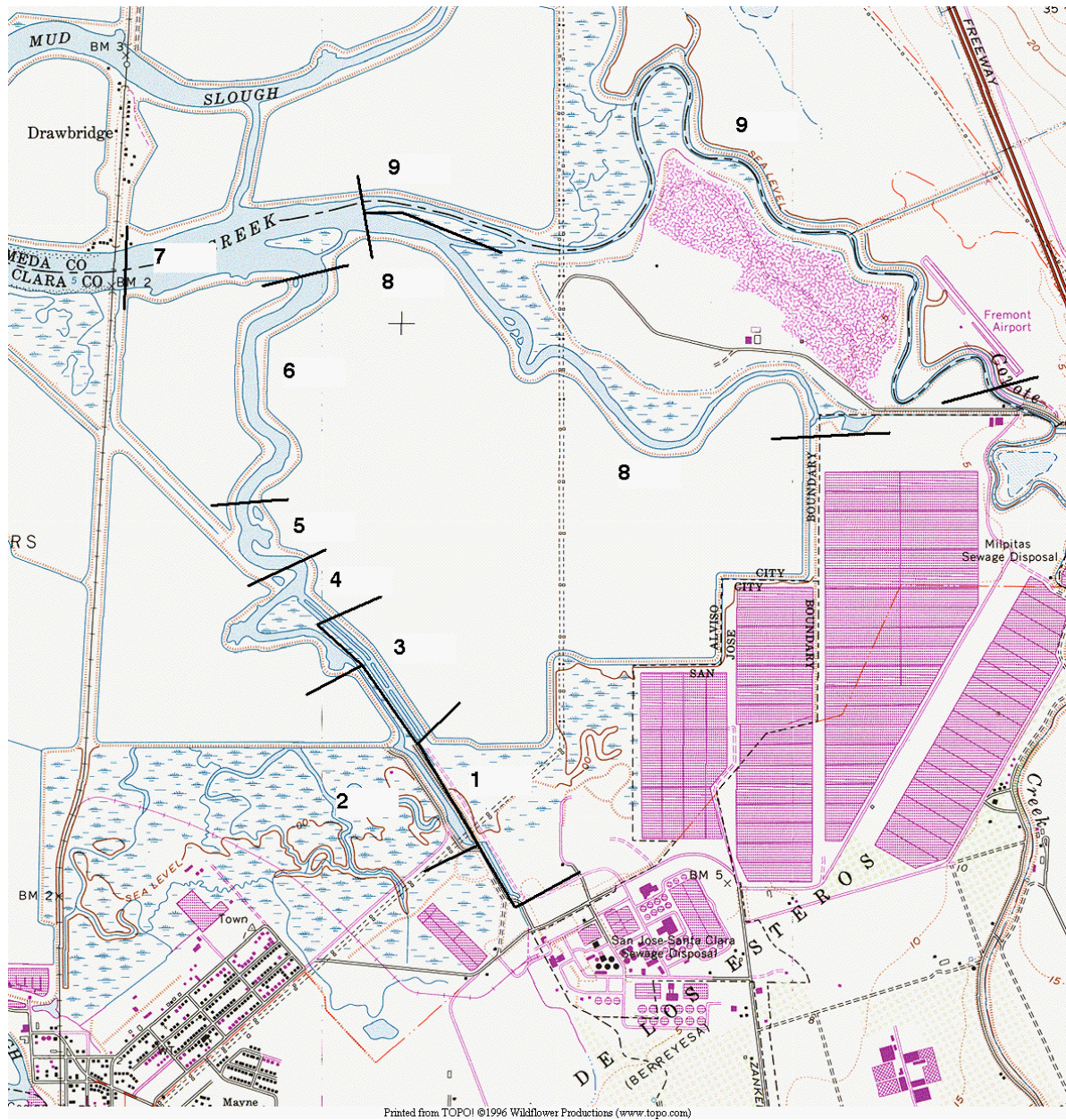
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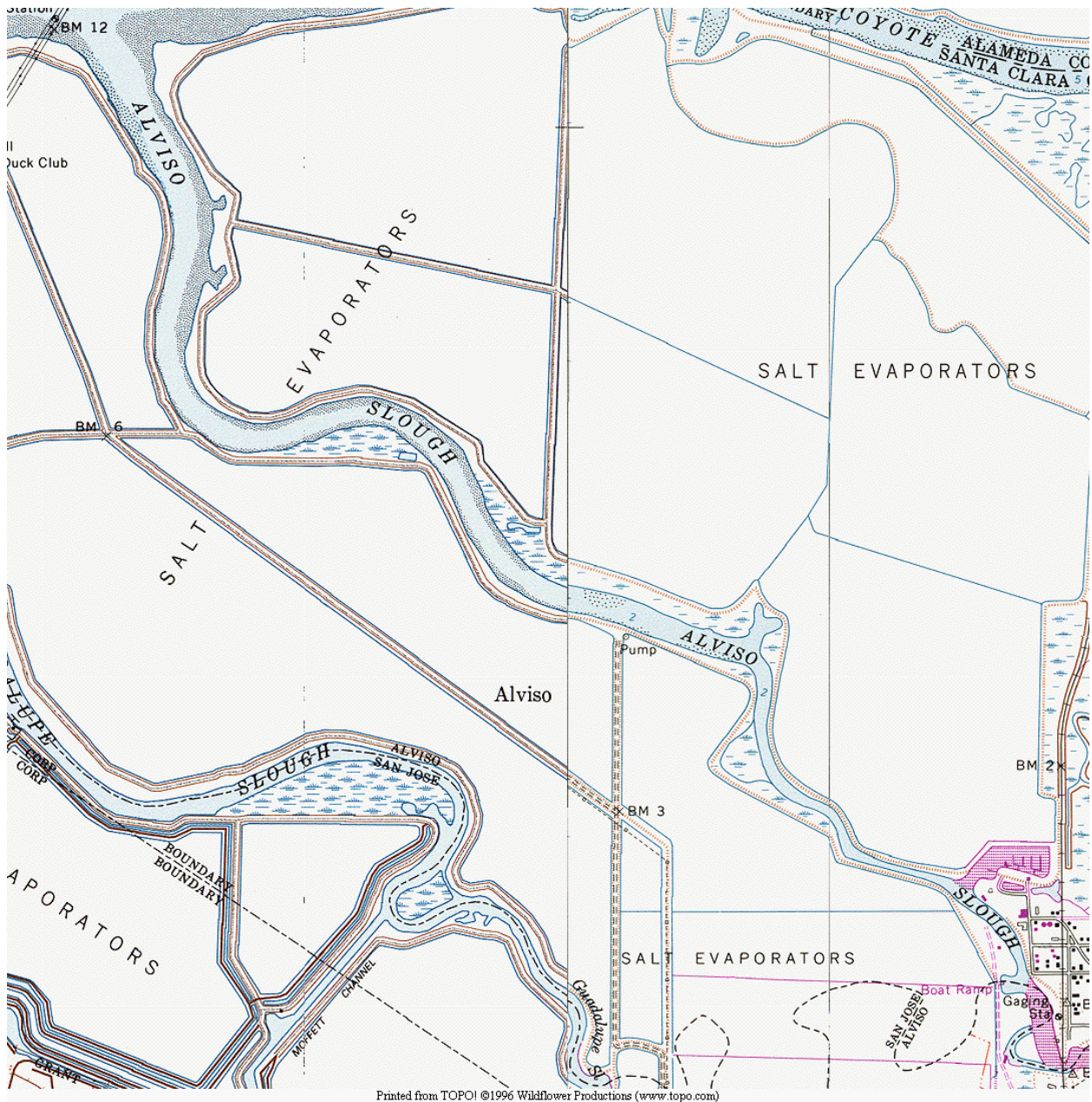
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**Figure 1.** Locations of all sections along Artesian Slough (#1-6) and Coyote Creek (#7-9) monitored for avian botulism for the SJ-SC RWF, June-November 2020. Also indicated are the SJ-SC RWF biosolids lagoons/ponds.



**Figure 2.** Another view of the survey sections along Artesian Slough (1-6) and Coyote Creek (7-9) monitored for avian botulism for the SJ-SC RWF, June-November 2020. Also indicated are the SJ-SC RWF biosolids lagoons/ponds.



**Figure 3.** Area of Alviso Slough monitored for avian botulism for the SJ-SC RWF, June-November 2020. Guadalupe Slough is located south of the contracted study area and is monitored by SFBBO for the City of Sunnyvale.





**Figure 4:** Another view of the section of Alviso Slough monitored for avian botulism through vehicle surveys, June-November 2020. Driving survey start/endpoint is dependent on levee drivability.

**Table 1.** Surveys of Alviso Slough (by vehicle) from June-November 2020 and associated dead, sick or injured vertebrates found. Causes of injury, illness or death were unknown unless otherwise stated.

Date	Species	Age	# Dead	# Sick	# Injured	Section	Condition/Notes
6/2/2020	GULL	A	1	0	0		Levee. Wings only.
6/2/2020	GULL	U	1	0	0		Levee
6/9/2020	GULL	A	1	0	0		Levee. Wings and feathers, likely predation.
6/19/2020	CAGU	A	1	0	0		Levee. Wings only, likely predation
6/23/2020	CAGU	A	1	0	0		Levee. Likely predation - carcass torn apart, entrails exposed
6/30/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
7/8/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
7/16/2020	CAGU	I	1	0	0		Levee. Wings only.
7/20/2020	CAGU	I	1	0	0		Levee
7/29/2020	CAGU	I	1	0	0		Levee, mostly wings
7/29/2020	CAGU	I	1	0	0		Levee, mostly wings
7/29/2020	CAGU	I	1	0	0		Levee, mostly wings
7/29/2020	CAGU	I	1	0	0		Levee, mostly wings
7/29/2020	UNBI	U	1	0	0		Unknown Corvid, Levee
8/5/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
8/13/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
8/25/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/2/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/10/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/16/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/25/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/30/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/6/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/12/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/23/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/27/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/3/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found

Date	Species	Age	# Dead	# Sick	# Injured	Section	Condition/Notes
11/10/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/16/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/23/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found

**Table 2.** Surveys of Artesian Slough (by boat) from June-November 2020 and associated dead, sick or injured vertebrates found. Causes of death, injury or illness were unknown, unless otherwise stated.

Date	Species	Age	# Dead	# Sick	# Injured	Section	Condition/Notes
6/2/2020	CAGU	A	1	0	0	1	On the levee leading to boat launch
6/9/2020	GULL	A	1	0	0	1	On the levee leading to boat launch, by gate
6/19/2020	CAGU	A	0	1	0	3	Wet, bedraggled appearance. Dead on arrival at WCSV
6/19/2020	CAGU	A	0	1	0	4	Completely docile, weak. Euthanized.
6/23/2020	GULL	I	0	1	0	3	Wet, flapping but couldn't lift off. Died after 24 hours.
6/23/2020	UNFI	U	1	0	0	3	
6/23/2020	CAGU	A	0	1	0	3	Classic botulism signs - couldn't keep head up.
6/23/2020	CAGU	A	1	0	0	9	
6/23/2020	GULL	A	1	0	0	9	Covered in mud/algae
6/23/2020	GULL	I	0	1	0	4	No resistance, neck flopping during capture. Died in transit to WCSV
6/23/2020	GULL	I	0	1	0	4	Could lift off, but not fly, wet and bedraggled. Released
6/30/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
7/8/2020	GULL	I	0	1	0	6	Standing on mud by reeds, no resistance. Died before it could be brought for treatment
7/8/2020	MALL	A	1	0	0	9	
7/16/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
7/22/2020	GULL	I	1	0	0	6	
7/22/2020	GULL	A	1	0	0	4	
7/29/2020	GULL	I	1	0	0	6	In vegetation

Date	Species	Age	# Dead	# Sick	# Injured	Section	Condition/Notes
7/29/2020	CAGU	A	1	0	0	1	On the levee leading to boat launch
7/29/2020	CAGU	A	0	1	0	6	On land originally, feisty but couldn't fly, wet. Released
8/5/2020	CAGU	A	1	0	0	9	
8/5/2020	CAGU	A	0	1	0	2	Low in water, zero resistance. Died before it could be brought for treatment
8/13/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
8/27/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/2/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/10/2020	GULL	I	0	1	0	4	Wet looking, in same spot at start and end of survey. Down a side channel, couldn't retrieve
9/10/2020	AWPE	A	1	0	0	3	Loop of fishing line around bill
9/16/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/25/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/30/2020	UNFI	A	1	0	0	8	4-6ft long, too large to collect with our tools available
9/30/2020	GULL	U	1	0	0	6	On shore by A17, could not reach
10/6/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/12/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/20/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/27/2020	CAGU	I	1	0	0	6	Head down, botulism signs
10/27/2020	AGWT	A	1	0	0	6	Partially eaten
11/3/2020	RUDU	U	1	0	0	9	No sign of predation
11/3/2020	UNDU	U	1	0	0	9	Small. Much of head and torso missing. Light blue/gray bill. Not RUDU
11/10/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/19/2020	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/23/2020	AMCO	A	1	0	0	6	
11/23/2020	CAGU	I	0	1	0	3	Wet and bedraggled. Flapping, but couldn't take off. Currently at WCSV receiving treatment.

**Table 3.** Fate of vertebrates found in Alviso Slough from June to November 2020.

Species	Dead	Sick	Botulism Diagnosed	Injured	Not Captured	Died in Transit	Brought to Rehab	Fate at Rehab		
								Dead	Released	Awaiting Release
California Gull	8	0	0	0	0	0	0	0	0	0
Gull	3	0	0	0	0	0	0	0	0	0
Unidentified bird	1	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Table 4:** Fate of vertebrates found in Artesian Slough from June to November 2020.

Species	Dead	Sick	Botulism Diagnosed	Injured	Not Captured	Died in Transit	Brought to Rehab	Fate at Rehab		
								Dead	Released	Awaiting Release
American Coot	1	0	0	0	0	0	0	0	0	0
American Green-winged Teal	1	0	0	0	0	0	0	0	0	0
American White Pelican	1	0	0	0	0	0	0	0	0	0
California Gull	5	6	0	0	0	1	5	3	1	1
Gull	6	5	0	0	1	2	2	1	1	0
Mallard	1	0	0	0	0	0	0	0	0	0
Ruddy duck	1	0	0	0	0	0	0	0	0	0
Unidentified duck	1	0	0	0	0	0	0	0	0	0
Unidentified fish	2	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>19</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>7</b>	<b>4</b>	<b>2</b>	<b>1</b>