



SAN FRANCISCO BAY BIRD OBSERVATORY

Avian Disease Prevention Program
Monitoring in Artesian and Alviso Sloughs
June – November 2021



Prepared For:
City of San Jose
Environmental Services Department

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13 December 2021

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 2021, 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 1 June and 22 November 2021, 24 surveys of Artesian Slough were conducted by boat, and 26 surveys of Alviso Slough were conducted by vehicle or on foot. 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 taken to San Jose Animal Control Services or kept frozen at SFBBO while awaiting proper disposal at a licensed facility (e.g., Koefran Services, Sacramento). 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 26 surveys between 1 June and 22 November 2021, six dead birds were observed within the survey area of Alviso Slough (Table 1).

Artesian Slough

During 24 surveys between 1 June and 22 November 2021, eight dead, one injured, and six sick birds were found within the survey area of Artesian Slough (Table 2). Nine dead fish were also found. All of the dead vertebrates that could be collected were brought to San Jose Animal Control Services or stored for proper disposal at a later date. Four of the sick or injured birds were taken to the WCSV – three were released and one was transferred to International Bird Rescue for further treatment. One collected bird died during transportation before it could be treated and two 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 2021. Large gulls of the genus *Larus* comprised almost 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. 2020).

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

We thank Anne Balis, Eric Dunlavey, Bryan Frueh, and the rest of the staff at the San Jose-Santa Clara Regional Wastewater Facility. We also thank the staff of the Wildlife Center of Silicon Valley. We are indebted to SFBBO's dedicated volunteers and staff who supported this monitoring program: Sahithi Adiraju, Rachel Chen, Angelo DiNardi, Jeff Englander, Jesse Fichman, Matt Hinshaw, Kaili Hovind, Francine Huang, Cole Jower, Katie LaBarbera, Sirena Lao, David Liu, Lori Liu, Eric Lynch, Parker Kaye, Samantha Marecek, Massimo Palumbo, Amy Parsons, Angela Petrice, Brad Speno, Neela Srinivasan, Lucy Sterba, Celia Tarcha, Asher Thompson, Samantha Tsang, Karl Voelker, and Nani Welsh. Finally, we would like to thank Cargill for donating our Achilles inflatable boat. The cover photo and photos below were taken by Gabbie Burns during the 2021 season.



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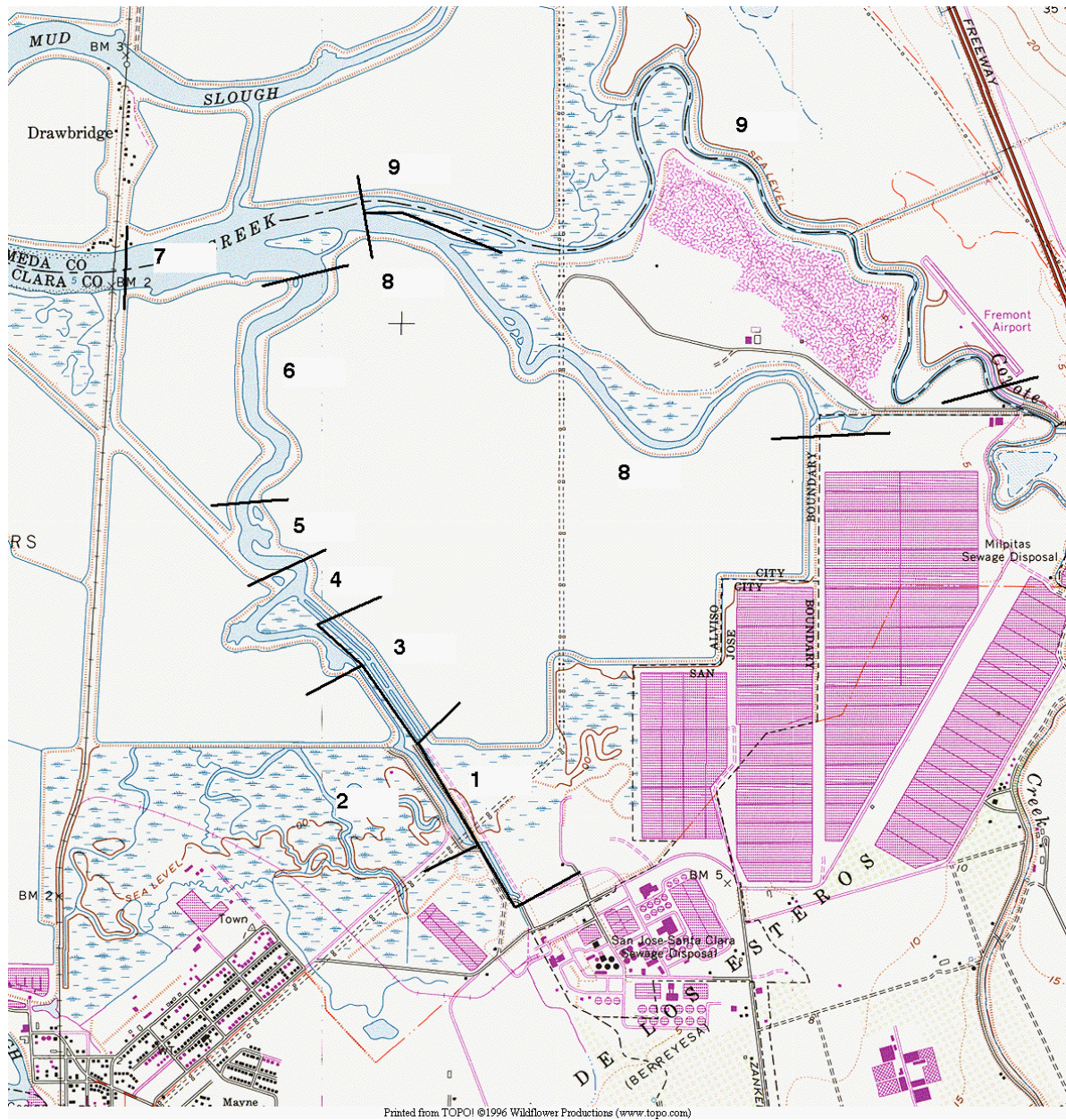


Figure 1. Locations of all sections along Artesian Slough (#1-6) and Coyote Creek (#7-9) monitored for avian botulism for the SJ-SC RWF, June-November 2021. Also indicated are the SJ-SC RWF biosolids lagoons/ponds.



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 2021. Also indicated are the SJ-SC RWF biosolids lagoons/ponds.

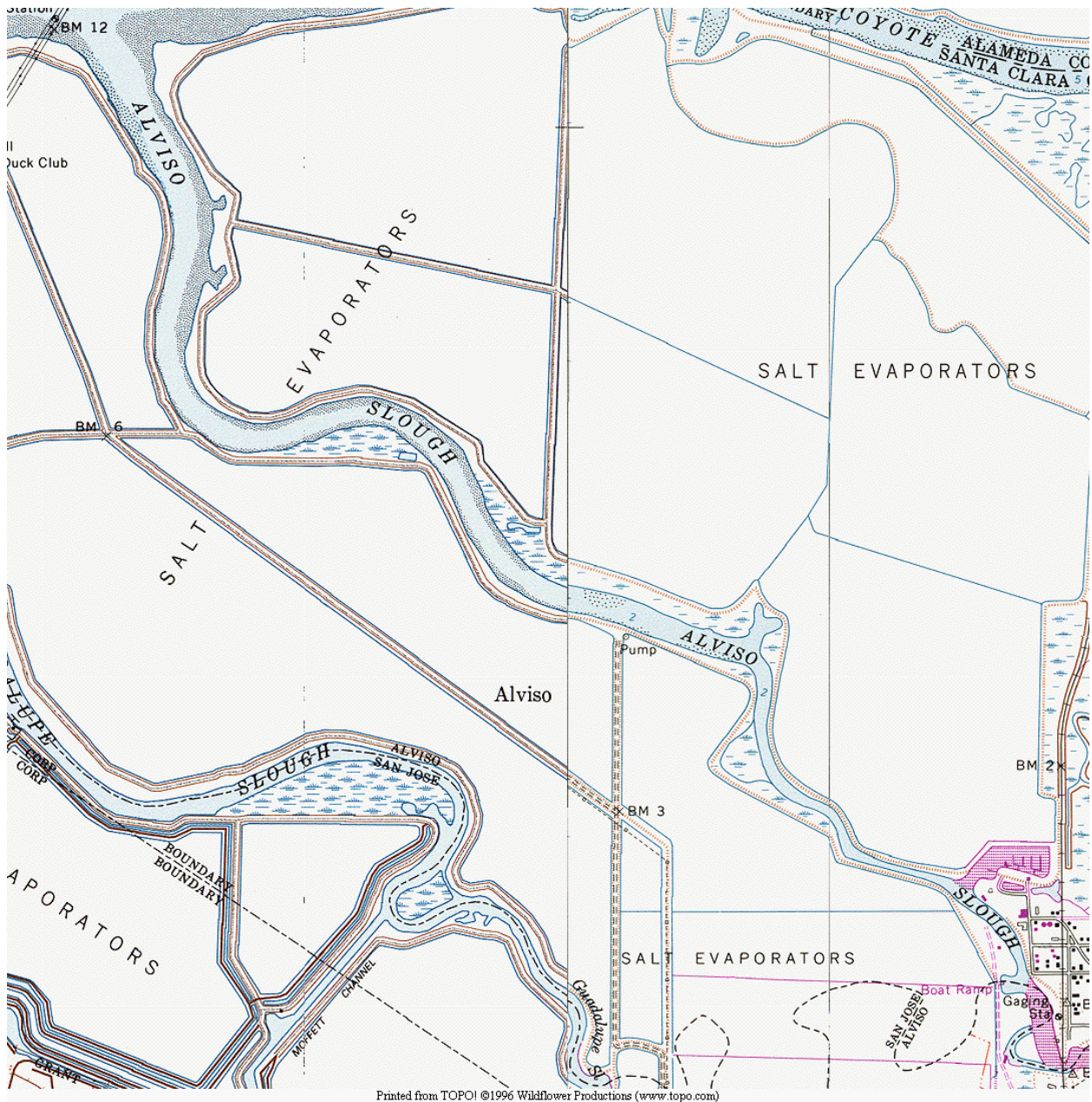


Figure 3. Area of Alviso Slough monitored for avian botulism for the SJ-SC RWF, June-November 2021. Guadalupe Slough is located south of the contracted study area and is monitored by SFBBO for the City of Sunnyvale.



Figure 4: Another view of the section of Alviso Slough monitored for avian botulism through vehicle and walking surveys, June-November 2021. Driving survey start/endpoint is dependent on levee drivability.

Table 1. Surveys of Alviso Slough (by vehicle/on foot) from June-November 2021 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
6/1/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
6/10/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
6/15/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
6/22/2021	CAGU	A	1	0	0		Levee. Predated, partially consumed
6/28/2021	GULL	I	1	0	0		Levee
7/8/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
7/15/2021	GULL	A	1	0	0		Wings and feathers in the marsh, couldn't retrieve
7/15/2021	GULL	I	1	0	0		Levee, wings only
7/21/2021	CAGU	I	1	0	0		Levee, wings only
7/21/2021	CAGU	A	1	0	0		Levee
7/26/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
8/4/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
8/9/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
8/19/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
8/23/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/1/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/7/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/16/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/23/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/29/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/4/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/12/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/19/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/29/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/2/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/11/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/15/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found

Date	Species	Age	# Dead	# Sick	# Injured	Section	Condition/Notes
11/22/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found

Table 2. Surveys of Artesian Slough (by boat) from June-November 2021 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
6/1/2021	STBA	U	1	0	0	3	
6/1/2021	AMWI	A	1	0	0	9	
6/10/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
6/15/2021	MALL	A	0	1	0	4	Lethargic, easy to catch. Died before being brought to rehab
6/15/2021	CAGU	A	1	0	0	6	Partially eaten
6/22/2021	CAGU	A	1	0	0	5	
6/22/2021	CANG	U	0	1	0	8	Wet looking, sitting low in the water, couldn't fly. Dove and
7/1/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
7/21/2021	CANG	A	1	0	0	1	Along boat launch road, just inside the gate
7/27/2021	CAGU	I	0	1	0	3	Took off, but no sustained flight. Scruffy
8/4/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
8/9/2021	CAGU	I	0	1	0	3	Could take off, but not sustain flight. Feisty in net
8/19/2021	CAGU	I	0	1	0	3	Couldn't fly, wet and scraggly
8/23/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
8/30/2021	CAGU	A	1	0	0	5	
9/7/2021	AWPE	A	1	0	0	1	At water's edge on road to launch
9/16/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/20/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
9/29/2021	AGWT	A	1	0	0	9	Headless, likely predation
10/4/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found

Date	Species	Age	# Dead	# Sick	# Injured	Section	Condition/Notes
10/14/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/19/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
10/26/2021	UNFI	U	1	0	0	9	Salmon, carcass mostly intact
10/26/2021	UNFI	U	1	0	0	9	Carp, carcass mostly intact
10/26/2021	HERG	A	0	1	0	3	Low in water, couldn't fly
10/26/2021	UNFI	U	1	0	0	9	Carp, carcass mostly intact
10/26/2021	UNFI	U	1	0	0	9	Salmon, carcass mostly intact
10/26/2021	UNFI	U	1	0	0	9	Carp-esque, carcass mostly intact
10/26/2021	UNFI	U	1	0	0	9	Carp, carcass mostly intact
10/26/2021	STBA	U	1	0	0	9	Carcass mostly intact
11/2/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/9/2021	GREG	A	1	0	0	8	Mostly eaten, up on bank
11/9/2021	EAGR	A	0	0	1	8	Wing injured, but able to dive. Could not retrieve, dove
11/9/2021	UNFI	U	1	0	0	8	Up on bank, couldn't retrieve. ID'd as sturgeon from photos
11/15/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found
11/22/2021	NONE		0	0	0		No dead, sick, or injured vertebrates found

Table 3. Fate of vertebrates found in Alviso Slough from June to November 2021.

Species	Dead	Sick	Injured	Botulism Diagnosed	Not Captured	Died in Transit	Brought to Rehab	Fate at Rehab		
								Dead	Released	Awaiting Release
California gull	3	0	0	0	0	0	0	0	0	0
Unidentified gull	3	0	0	0	1	0	0	0	0	0
Total	6	0	0	0	0	0	0	0	0	0

Table 4: Fate of vertebrates found in Artesian Slough from June to November 2021.

Species	Dead	Sick	Injured	Botulism Diagnosed	Not Captured	Died in Transit	Brought to Rehab	Fate at Rehab		
								Dead	Released	Awaiting Release
American green-wing teal	1	0	0	0	0	0	0	0	0	0
American wigeon	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	3	3	0	0	0	0	3	0	3	0
Canada goose	1	1	0	0	1	0	0	0	0	0
Eared grebe	0	0	1	0	1	0	0	0	0	0
Great egret	1	0	0	0	1	0	0	0	0	0
Herring gull	0	1	0	0	0	0	1	0	0	1
Mallard	0	1	0	0	0	1	0	0	0	0
Striped bass	2	0	0	0	0	0	0	0	0	0
Unidentified fish	7	0	0	0	1	0	0	0	0	0
Total	17	6	1	0	4	1	4	0	3	1