U.S. Fish & Wildlife Service - Pacific Region

Salton Sea National Wildlife Refuge

California Nevada Idaho Oregon Washington Hawaii Pacific Islands

SALTON SEA NATIONAL WILDLIFE REFUGE

SUMMARY OF 1996 AVIAN BOTULISM EVENT

Beginning on August 15, 1996, U.S. Fish and Wildlife Service and California Department of Fish and Game staff responded to an outbreak of avian botulism at the Salton Sea. Botulism is caused by a toxin produced by a naturally-occurring bacterium that develops during periods of high temperatures and the presence of a suitable nutrient medium in an environment devoid of oxygen. Botulism kills birds quickly by paralyzing the muscles.

The botulism diagnosis was made by the National Biological Service's National Wildlife Health Research Center in Madison, Wisconsin. Management actions consisted of picking up dead birds and incinerating the carcasses, and transporting sick brown pelicans, an endangered species, and sick white pelicans to a wildlife rehabilitator for treatment and eventual release. Such clean-up efforts are necessary to stop the spread of the disease since dead birds provide a nutrient medium for the spread of botulism.

Due to the extensive shoreline and large water area, the majority of clean-up work was conducted from airboats. Aerial surveys every other day were used to monitor the success of the clean-up and identify areas needing attention. After November 12, the Fish and Wildlife Service assumed sole responsibility for the clean-up work and reduced airboat patrols of the Salton Sea to two days a week due to low numbers of dead birds being recovered.

The most affected birds in this botulism outbreak, which normally targets waterfowl, were American white pelicans and brown pelicans. This is the largest known die-off of these species.

On September 11, wildlife disease specialists with the U.S. Geological Survey's National Wildlife Health Center in Madison, Wisconsin, announced that both dead and live tilapia, an African fish species introduced to the Salton Sea and the most common fish present, had tested positive for avian botulism. They believe

to the Salton Sea and the most common fish present, had tested positive for avian botulism. They believe that fish were the source of botulism in pelicans and other waterbirds.

On October 2, scientists with the U.S. Geological Survey's Northwest Biological Science Center in Seattle, Washington, announced that all sick and dead tilapia examined from the Salton Sea had acute bacterial infections. The primary bacteria responsible for the infections and deaths was identified as *Vibrio alginolyticus*. This microbe is known to inhabit salt water and has been previously associated with disease in fish.

Outbreaks of fish diseases are often triggered and sustained by environmental stresses, including pollution, overcrowding, and high temperatures or salt levels. All of these factors are present in the Salton Sea. The Northwest Biological Science Center plans continued monitoring of Salton Sea fish to determine if the disease outbreak in fish is a one-time event or a chronic problem.

Although the link between bacterial infection in tilapia and botulism poisoning in birds is not proven, scientists from both laboratories suspect the bacterial disease may produce conditions in the intestinal tract of sick fish that allow botulism spores to germinate and produce toxin. The spores themselves are likely to be widely present in both the Salton Sea and the fish. The dying fish become easy prey for pelicans, herons, and other fish-eating birds that then ingest fatal doses of toxin. Scientists will be conducting additional studies to determine if and how botulism toxin is actually produced in the sick fish.

As of October 29, a total of 819 sick brown pelicans and 203 white pelicans have been sent to the Pacific Wildlife Project in Laguna Niguel, California, for treatment.

Release of rehabilitated brown pelicans began on September 19 at Seal Beach National Wildlife Refuge, Seal Beach, California. Brown pelicans also have been released on other Southern California beaches. Rehabilitated white pelicans are being released at Loveland Reservoir. As of November 25, 350 brown pelicans and 137 white pelicans have been released.

MORTALITY ROSTER BY SPECIES AS OF 11/21/96

Common Loon	= 3
Pied-billed Grebe	= 4
Eared Grebe	= 144
Western Grebe	= 46
Clarks Grebe	= 2
Sooty Shearwater	= 2
Blue-footed Booby	= 1
American White Pelican	=8538

Brown Pelican =1129
Double-crested Cormorant = 122
American Bittern = 11
Least Bittern = 5
Great Blue Heron = 172
Great Egret = 779
Snowy Egret = 271
Cattle Egret = 55
Unidentified Egrets = 287
Green Heron = 5
Black-crowned Night Heron = 169
White-faced Ibis = 7
Fulvous Whistling Duck = 1
Brant = 1
Green-winged Teal = 53
Mallard = 5
Northern Pintail = 27
American Wigeon = 1
Blue-winged Teal = 1
Cinnamon Teal = 9
Northern Shoveler = 78
Gadwall = 7
Canvasback = 2
Redhead Duck = 12
Lesser Scaup = 5
Common Merganser = 2
Red-Breasted Merganser = 5
Ruddy Duck = 27
Unidentified Ducks = 37
Osprey = 2
Sora Rail = 1
American Coot = 104
Black-bellied Plover = 4
Semipalmated Plover = 8
Killdeer = 1
Black-necked Stilt = 125
American Avocet = 107
Greater Yellowlegs = 1
Lesser Yellowlegs = 6
Willet = 31
Spotted Sandpiper = 1
Whimbrel = 10
Long-billed Curlew = 6
Marbled Godwit = 11
Ruddy Turnstone = 1

Western Sandpiper = 190
Dowitcher = 73
Sanderling = 4
Wilson's Phalarope = 2
Unident. Phalarope = 9
Unident. Shorebird = 60
Bonaparte's Gull = 23
Ring-billed Gull = 614
California Gull = 25
Yellow-footed Gull = 3
Herring Gull = 86
Unident. Gull = 27
Gull-billed Tern = 1
Caspian Tern = 32
Forster's Tern = 8
Unident. Tern = 18
Black Skimmer = 18
American Crow = 1
Belted Kingfisher = 1

1996 TOTALS:
White Pelicans =8538
Brown Pelicans =1129
64 Misc Species =4464

Total Birds 14131
Total Pelicans 9667

1997 Fish and Wildlife Mortality Events

Summary of 1996-1997 Fish Pathology Findings

Why is the Salton Sea Important?

Wildlife Mortality Estimates 1987-1996