

# Andrée Clark Bird Refuge FactSheet

## **Background to the Bird Refuge**

The Andrée Clark Bird Refuge is a 42.4-acre open space, including a 29-acre lake, in the City of Santa Barbara. The park provides passive recreational opportunities and is home to over 200 species of birds and the federally protected tidewater goby fish. The Bird Refuge is located at the site of a former estuary that received freshwater input from Sycamore Creek and discharged to the ocean at East Beach. Development in the late 1800s cut off the freshwater supply, and when the Bird Refuge was established in the early 1900s, the tidal connection to the ocean was also blocked. Now the lake has silted in and is only 2-5 feet deep. The lake receives water from storm culverts, including high-nutrient watershed runoff during storms. The high nutrients and shallow depth lead to highly “eutrophic” conditions and periodic “stink events.”

## **What causes the stink events?**

During warm, sunny conditions intense algae blooms form throughout the Bird Refuge, causing the water to turn a bright, opaque green that we call “pea soup.” When these microscopic algae die, natural bacteria decompose the organic material, using up oxygen in the process (eutrophication). When the low-oxygen water and sediment is “turned,” hydrogen sulfide and/or methane reaches the surface, causing a smell much like rotten eggs. While we do understand this general phenomenon, we do not know the specifics weather patterns and water-quality conditions that set off a stink event, or what the water quality looks like during an event. Creeks Division staff are gathering data that will enable us to better understand the events and prescribe solutions.

## **What has the City done in the past to prevent or treat stink events?**

Past efforts included the addition of copper sulfate to prevent algae blooms, addition of freshwater to increase the oxygen content in the surface waters, and driving of power boats to increase the water circulation. Addition of algacide is no longer accepted, and the City seeks to avoid unsustainable cost of adding freshwater (\$30,000+/year).

## **What is the City doing now to prevent stink events?**

The City is conducting a pilot project in the outlet arm of Bird Refuge to test the ability of enhanced circulation to improve water quality and prevent odors. Perforated tubing and compressed air provide micro-aeration, designed to increase vertical and horizontal circulation. Increased circulation is predicted to raise oxygen levels throughout the water and to disrupt stagnant conditions that can lead to noxious algal blooms. The City also completed a vegetation removal project to increase water circulation into and within the lake.

## **Is the pilot project working?**

We know that the pilot project is creating some increase in circulation and a change in oxygen levels. However, we do not yet know if the differences are great enough to prevent odors.

## **What else can be done?**

**Beneficial Microbes:** Experts agree that increased circulation is the key to preventing odors in environments like the Bird Refuge. However, the shallow depths of the lake preclude the use of all circulation options besides micro-aeration. A possible next step is to add beneficial microbes (much like probiotics for the body) to the pilot project, in an effort to increase the breakdown of organic material on the lake bottom and increase water depth. If water depth can be increased to seven feet, additional circulation options will become available.

**Dredging:** Dredging could certainly increase the lake depth enough to install circulation devices that may succeed in preventing odors. However, dredging would cost at least \$2-3 million and require a long period of malodorous conditions to complete.

**Restore freshwater inputs and restore tidal circulation:** Restoring the estuary, including circulation to the ocean, is the best long-term solution, one that would require great community support, extensive permitting, and high capital investment. In addition, natural salt marshes generally exhibit periods of organic odors, albeit far milder than the existing stink events.