Lake Elsinore Algae Treatability Pilot Study
Prop 1 Grant – Project Overview

Lake Elsinore/ Canyon Lake TMDL Task Force Meeting
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PROP 1
GOVERNOR EDMUND G. BROWN, JR.
WATER BOND 2014
RELIABILITY | RESTORATION | RESILIENCE

Funding and Partners

- State of California Department of Water Resources Integrated Regional Water Management (IRWM) Implementation Prop 1 Grant ($297k)
  - Santa Ana Water Project Authority (Grantee/ Manager)
  - City of Lake Elsinore (Local Project Sponsor/ Implementing Agency)
  - Wood Environment & Infrastructure (Consultant PM - Project Oversight and Implementation)
  - Aquatechnex – Field Support/ Chemical Treatment Application
  - Selected Vendors – Eutrophix, Biocleaner, & AECOM

Study Objectives

1. Explore and evaluate the use and effectiveness of a suite of in-situ algae removal/ reduction technologies at Lake Elsinore through a series of controlled pilot studies.
2. Ensure high quality water for people and the environment. Removal of algae will reduce concentrations of chlorophyll-a, increase water clarity, and reduce the potential release of harmful toxins. Physical extraction also removes nitrogen and phosphorus mass from the Lake.
3. Protect beneficial uses (recreation, warm aquatic freshwater habitat, and wildlife habitat) attain water quality standards, and total maximum daily loads (TMDLs).

Project Tasks

1) Research and review a variety of viable treatment technologies and interested vendors ✓
2) Solicit proposals and conduct vendor interviews ✓
3) Select and coordinate with vendors and the City of LE ✓
4) Collect empirical data using 3-5 different algal removal technologies (starting in September)
5) Use this data to analyze the feasibility of each removal technology at reducing water column chlorophyll-a, phosphorous, cyanobacteria, and cyanotoxins conc. and subsequent water quality responses
6) Assess the feasibility and cost-effectiveness of potential algal removal strategies scaled to the entire lake.
7) Propose recommendations for future larger scale pilot studies for technologies considered most promising
8) Community outreach and education

Vendors/ Treatments Considered

Vendor	Technology
AECOM	Hydronucelation Floatation Technology (HFT)
LG Sonic	Sonic waves
Weedo Boats	Physical removal - Boats/ skimmers
Electro-Aeration	Oxygenation of bottom layers of lake
BioCleaner	Microbial System/ aeration
Moleaer	Nanobubbles, OH radical formation. Oxygen and/or Ozone delivery
NABAS	Nanobubbles, OH radical formation. Oxygen and/or Ozone delivery
EutroPHIX (Div of SeaPro)	Chemical treatments
Blue-Green Water Technologies	Lake Guard® Oxy floating, time-releasing formulation - time release hydrogen peroxide or a copper-based product
Consultant/ Applicator	
Aquatechnex	Application expert - multiple technologies
Aquatic Treatment & Lake Management Services	Treatment Applicator
Short-Term Algae Removal Options	
Pak27 (peroxide-based), SeClear Algaecide (Cu-based), BlueGreen Tech Lake Guard®	
Long-Term Nutrient Suppression	
BioChar, EutroSORB/ Phoslock - Lanthanum modified bentonite by SeaPro	

Selected Vendors – Treatment Technologies

Vendors and Technologies Selected for Pilot Study

1. EutroPHIX/ SePro – Chemical Treatments
2. BioCleaner – Microbial Treatment
3. Moleaer/Aquatechnex - Nanobubble Technology
4. AECOM – Hydronucleation Floatation Technology. Algae Bioharvesting

Pilot Study Location – Launch Pointe Boat Ramp

Vendors and Technologies Selected (Cont)

SeClear/ EutroPHIX – Chemical Treatments

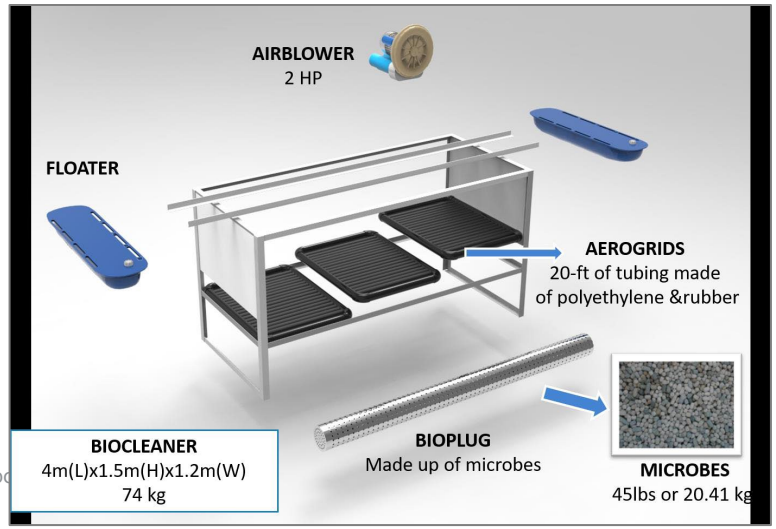
- EutroSORB G / Phoslock - Lanthanum modified bentonite. Phosphorus binding in water and sediments
- SeClear Algaecide & Water Quality Enhancer – Copper based algaecide + phosphorus binding. Controls cyanobacteria & algae and binds additional P.
- PAK 27 / Phycomycin Algaecide - 2 weeks after SeClear. Peroxide based algaecide to control cyanobacteria & algae.
- EutroSORB WC - 7 days after PAK 27 / Phycomycin. Bind available phosphorus in water column.

Lakewide Estimate - $100k - 200k per application. 3-4 applications/yr suggested

Vendors and Technologies Selected (Cont)

BioCleaner – Microbial Treatment

- Portable and modular microbe seeder reactor.. U.S. Green Patent A
- Microbes compete for nutrients and suppress cyanobacteria reproduction
- No chemical treatments
- Would need many units to treat entire lake



Vendors and Technologies Selected (Cont)

Moleaer/Aquatechnex- Nanobubble Technology

Nanobubbles:

- Remain suspended and disperse to deliver gas throughout the liquid volume.
- Remain stable in liquid with a negative charge until they interact with surfaces or contaminants
- Produce hydroxy radicals on collapse which interacts with cells and organics - oxidation

Vendors and Technologies Selected (Cont)

AECOM – Hydronucleation Floatation Technology + Algae Bioharvesting.

- Physically removes algae from the water column, associated nutrients (P and N), cyanotoxins, and carbon.
- Pilot Study – Site visit and bench-scale testing and screened for their response to coagulation and flocculation by various commonly used water treatment conditioners. Results of the testing will be used to identify candidate water treatment chemicals and dosages for optimal system performance specific to water quality conditions at Lake Elsinore. Will report on scalability/ feasibility + future monitoring needs.

Treatment Effectiveness Monitoring

- In-situ mesocosm technologies/ treatments will be conducted over a 4-6 week period simultaneously (Biocleaner, Moleaer, and EutroPHIX).
- Weekly sampling inside and outside each boomed area (mesocosm) with 2 field replicates collected per event.
  - Analytical: Water column nutrients, chlor-a, & algae comunity and cyanotoxins. Sediments – labile P (EutroPHIX only).
  - Field Water Quality Parameters: DO, pH, temp (depth profiles) + turbidity (Secchi disk) and water color (EyeonWater app)
  - Bench-scale Treatability Studies and Column Studies: AECOM

Project Timeline

- Vendor ID and Selection – July (Completed)
- Project Work Plan – In Progress
- Pilot Study – Sept 2022 to Nov 2022
- Data Analysis and Reporting – October 2022 – April 2023
  - Field Data Report
  - Treatment Feasibility Report
  - Project Completion Report
  - Grant Completion Report
  - Post Performance Report