

TITLE: Limnological Survey of Salton Sea

INTRODUCTION: A survey of the basic physical, chemical, and biological limnology of the Salton Sea is required to evaluate proposed solutions to prevent and eliminate ongoing fish and wildlife die-offs in the Sea. Fish and wildlife mortalities have been associated with physical stresses (high and low temperatures), chemical stresses (low dissolved oxygen, hydrogen sulfide, ammonia), and biological stresses (toxic algae, pathogenic bacteria and fungus).

There has been no systematic survey of these variables since the 1960's. The Salton Sea is truly a unique system. While it is often compared to the ocean and to other salt lakes, its inherent physical, chemical and biological components, as described by Walker (1961) are different and information from these other systems have little direct relevance to this system. For example, temperature/salinity relationships which determine water density are extremely volatile due to the shallowness of the sea and the arid desert basin it occupies (over 110 days per year with air temperatures exceeding 100 degrees F). Many of the planktonic organisms, especially toxic algae, are unidentified species.

JUSTIFICATION: These data are needed to understand the basic processes of the Salton Sea ecosystem. The fish and wildlife of the Salton Sea represent an "end-product" of a series of processes within the Salton Sea ecosystem. Problems within these fish and wildlife communities may originate anywhere within these complex processes. Solutions to-date have been of a "band-aid" nature (eg. removing carcasses of dead fish and birds), focusing more on the effect of the problem, not the cause. Effective, long-term solutions must be based on an understanding of those processes in order to focus on the earliest stage (causative agent).

OBJECTIVES: Major objectives of this program fall into three categories. One deals with the communities living within the water column and how they function in relation to the basic physical and chemical environments. A second area focuses on the animals associated with the Sea's bottom and their functions of transferring food, energy, pathogens, contaminants, etc up into the food chain. A third and final area, concerns the fact that many of these organisms have never been identified and a few are suspected to be some really bad dudes!

Specific objectives for each of these categories are as follows:

- A. Seasonal and spatial dynamics of plankton, nutrients and mixing regimes.**
- Conduct vertical profiles of dissolved oxygen, pH, temperature and salinity along the major and minor of the sea and at major point sources of water
 - Quantitative samples of phytoplankton and zooplankton sufficient to determine horizontal, vertical, and diel distribution
 - Assess macrodistribution of plankton through large scale observations of chlorophyll, temperature and turbidity through satellite imagery, aerial photography, towed spectrophotometers, etc.
 - Quantitative analyses of major nutrients and major ions sufficient to characterize primary production and eutrophication potential.

- **Assessment of Tilapia grazing on plankton dynamics and composition (ie. What happens if Tilapia dies off or increases? Does grazing increase or decrease abundance of toxic algae?)**
- B. Spatial and temporal distribution of benthic organisms.**
- **Density and diversity of organisms living within the mud/water interface.**
 - **Density and diversity of macroinvertebrates in shallow inshore areas (eg. corixids)**
- C. Biotic inventory of algae and invertebrates.**
- **Taxonomic identification of algal species with anotated listings regarding toxic potential, public health threats, etc.**
 - **Taxonomic identification of invertebrates (macroinvertebrates, microcrustacea, protozoa, etc.)**
 - **Artificial key to invertebrates of Salton Sea with photographs**

BUDGET:	Labor:		
	Field Crew	3 people x 3 yr = 9 man-years	\$450K
	Laboratory	2 people x 3 yr = 6 man-years	\$300K
	Co-Prinipals	3 people x 1.5 yr = 4.5 man-years	\$225K
	Consultant (taxonomic specialists) sub contracts		\$150K
	Equipment:		
	Boat/motor/trailor/marine radio/depth finder		\$50K
	Field measuring/sampling equipment		\$50K
	Field vehicle (2yr lease plus fuel)		\$30K
	Data-logging (laptop, data loggers, etc)		\$10K
	Misc. (Safety equipment, boat fuel, etc)		
	Sample containers, transport containers, lab chemicals		\$20K
	Travel and Per Diem		\$15K
	Data management		\$15K
		Sub-total	\$1.4 million
	TOTAL BUDGET (assuming 50% overhead)		\$2.1 million

SUBMITTED BY: Biology Environment Team