

**Cook, C. B. 2000. Internal dynamics of a terminal basin lake: A numerical model for management of the Salton Sea. Ph.D. dissertation. University of California. Davis, California. 200 pp.**

Research presented in this dissertation outlines the extended development and application of a three-dimensional hydrodynamic model to the Salton Sea. The Sea's delicate ecosystem currently faces numerous environmental stresses, the greatest of which may be rising salinity levels. Several management alternatives have been identified by the Salton Sea Authority to alleviate this threat, however the final solution scenario has yet to be chosen. To improve understanding of how these management scenarios will impact circulation before the onset of construction, the extended hydrodynamic model was applied to the Sea under a variety of modified bathymetric and boundary conditions. A historical database of in situ field data was developed during this research. This database was essential for understanding characteristics of wind induced circulation patterns in the Sea, as well as for use in calibrating and verifying the hydrodynamic model. Time-series of water temperatures and velocities, plus numerous spot vertical profiles of water quality variables, were collected at various locations around the Sea during 1997. Time-series of meteorological data were obtained to complete the database and to support wind stress and heat budget calculations in the hydrodynamic model. The hydrodynamic model was modified to improve calculation of vertical turbulence and wind shear stress terms. Two methods of calculating vertical eddy viscosities were examined. A thorough sensitivity study was performed to assess the impacts of model parameters critical to simulation of circulation in the Sea. The finite element grids described the bathymetry of the water body, including the lower reaches of four primary tributaries. Provided with meteorological boundary conditions, the model calculated transport and distributions of salinity and heat within the modeled domain. After completion of model modifications, collection of field data, and calibration, the model was applied to simulate various management alternatives. Results indicate differences in water circulation patterns plus changes in salinities and temperatures under various structural modifications of the Sea's bathymetry. Management alternatives were evaluated at both the current water surface elevation and at future states when inflows and water surface elevations are expected to be reduced. Results of this research provide a scientifically sound base for quantitative determination of circulation patterns within the Sea. The hydrodynamic model also provides a practical means to quantify impacts of alternative management options that will change circulation patterns both under present conditions and for future reduced inflow levels. It is believed that advances made in this research will enhance and improve understanding of circulation in the Salton Sea and thereby aid in securing practical solutions for preservation and protection of the Sea's threatened ecosystem.