



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Brian Zhang	Project Number S0809
Project Title Developing a Self Sufficient Estuary Mesocosm	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Providing vital services to a vast variety of species, salt marshes retain the distinction as one of the most productive ecosystems on the terrestrial biosphere. Due to increasing global warming and pollution, salt marshes decline at a rapid rate, decimating endangered animals species along with them. Thus, the purpose of this project is to develop a self sufficient estuary ecosystem aimed at restoration to improve the environment to its former condition.</p> <p>Methods/Materials First, various native species of each trophic level were collected from the local salt marsh and inner beach. Such organisms included sculpin, microalgae, macroalgae, zooplankton, phytoplankton, nitrogen fixing bacteria, swimming crabs, etc. Prior to collection, a tank was built with two separate tanks, one representing the ocean, and one full of mud serving as the marsh. A bridge between the two simulates a natural salt marsh in addition to a wave maker. The organisms were then placed inside of the ecosystem, where several at a time were added each week. Then, a light simulating the sun was placed above the tanks and accurately emulated wavelengths. After the biological ecosystem was set, a data sonde was obtained and programmed to collect data on abiotic factors such as pH, salinity, nitrates, and temperature.</p> <p>Results From analyzing the data, it was found that environmental equilibrium was obtained. Oxygen levels rose and fell depending on the time of day due to photosynthetic factors. There was a steady oscillation in salinity due to evaporation removing water, and various flora and fauna removing salt. Chemicals were kept stable largely by a combination of organisms such as nitrogen fixing bacteria and oysters that removed pollutants such as phosphates. All of the species remained robust, which provides qualitative evidence of a thriving ecosystem.</p> <p>Conclusions/Discussion Thus, the hypothesis that a self-sufficient ecosystem can be created through careful simulation of natural conditions. Since it is possible to create such mesocosms, salt marsh estuaries can be restored through production of these ecosystems on a large scale and can be applied to space exploration due to their low maintenance and high efficiency.</p>	
Summary Statement My project is about developing a self sufficient salt marsh ecosystem aimed at restoring salt marshes on the coast in addition to space exploration.	
Help Received Cabrillo Marine Aquarium provided funding, materials, and an area to work in, everything else was done by myself	