






## RESEARCH RELATED TO SEA OTTER RECOVERY

- **Anthropogenic Risks to Sea Otters Re-settling San Francisco Bay** (2018; \$14,770)  
For sea otter population recovery, research (see Sea Otter Population Study, below) shows sea otters need to expand their range into new resource-abundant territories. San Francisco Bay, the largest estuary in California, has been identified as a potential location for sea otter recolonization due to successes in other estuaries, such as Elkhorn Slough. SF State University is undertaking a study to determine what human-induced threats sea otters may face in San Francisco Bay such as vessels, oil spills, and contaminants. This spatially-explicit analysis will inform managers on challenges sea otters will face as they reoccupy their range.
- **Investigating Sea Otter Use of Elkhorn Slough to Inform Restoration** (2013-2018; \$121,562).  
Over the past decade, sea otter use of Elkhorn Slough has increased dramatically. Since 2013 researchers at U.C. Santa Cruz and the Elkhorn Slough National Estuarine Research Reserve have been investigating otter feeding habits and behavior, and prey availability and are developing guidelines for future management and restoration of the slough in order to support continued recovery of the otters. This information will be useful to inform sea otter recolonization of other estuaries.  

- **Investigating Sea Otter Mortality Patterns (1998-2012)** (2013-2017; \$165,543).  
Researchers at U.C. Davis undertook extensive epidemiological analyses on 560 deceased otters from fifteen years of samples to provide a broader understanding of drivers of sea otter mortality. Primary causes of death include shark bite, *Ancanthocephalan peritonitis* parasitic worms, domoic acid, and cardiomyopathy. This study was able to pinpoint “hot spots”, risk factors, and interactions between key causes of death. Early findings from this study identified microcystin, a freshwater toxic algae, as a cause of otter deaths and linked them to drainage from Pinto Lake in Watsonville (see Pinto Lake Carp Removal project, above).
- **Risk Factors for Shark Bite Mortality in Southern Sea Otters** (2012-2014; \$59,447).  
From 2009 through 2013, researchers observed a 30-40% increase in sea otter mortality as a result of shark bites, unprecedented in over 35 years of data collection. Particularly in southern portions of the range, shark bite mortality was the single biggest cause of death. Researchers at U.C. Davis investigated if environmental and health-related risk factors were associated with these attacks to help management agencies take appropriate action. The study did not find any correlation between shark bite mortality and underlying infections; however, it did reveal a distinct temporal trends consistent with periods of the year when great white sharks are closer inshore.
- **Sea Otter Population Biology at Big Sur & Monterey CA: Investigating Consequences of Resource Abundance and Anthropogenic Stressors for Sea Otter Recovery** (2008-2013, \$498,690). Researchers at U.C. Santa Cruz examined the effects of contaminants and human-caused stressors on southern sea otter populations, testing if population success would be lower for otters living in areas with more exposure to anthropogenic stressors, such as water quality toxins and pollutants. Unexpectedly, this study found that overall food availability was the most significant limiting factor on sea otter populations. Conclusions of the study included that in order to increase the population of southern sea otters to achieve recovery, their range and thus food availability will need to expand. Exposure to contaminants do effect survival, but the interaction is complex and needs to be addressed at a site specific, not regional, level.