## Existing Climate Change Assessment Programs and Tools

Climate change assessment programs and tools in existence or in development are alphabetically listed below. The SFBJV climate change focus team will determine in the next M&E plan planning phase how these programs and tools can best be utilized, expanded upon, and integrated with the outlined monitoring and evaluation objectives and research needs.

*Existing Programs*

* [*Applied California Current Ecosystem Studies (ACCESS*](http://www.accessoceans.org/)*) -* ACCESS focuses on the oceanic habitats in Federal and State waters of northern and central California. ACCESS partners have been investigating the spatial and temporal relationships between oceanographic processes, zooplankton, and marine birds and mammals in the region surrounding Cordell Bank and the Gulf of the Farallones. Ongoing surveys started in May 2004.  Four to five cruises are conducted annually between April and October.
* [*Central & North Coast Ocean Observing System (CeNCOOS)*](http://www.cencoos.org/at_a_glance.shtml) - CeNCOOS is focused on provision of physical parameter datasets for coast and San Francisco water quality information, salinity temperatures, surface currents, and is working with National Weather Service on atmospheric elements.
* [*Gulf of the Farallones National Marine Sanctuary (GFNMS) - Beach Watch Program*](http://farallones.noaa.gov/research/beachwatch.html) – The program can provide long-term data on changes in beach profile, bird and mammal assemblages, etc. for outer coastal areas.
* [*National Park Service - Vital Sign Monitoring Framework*](http://science.nature.nps.gov/im/index.cfm) – This program is not specifically targeted at climate change adaptation, but there may be useful indicators to work with.
* [*National Estuarine Research Reserves (NERR*](http://www.nerrs.noaa.gov/)*)* - track effects of climate change on tidal marshes. Their goal is to utilize the 28 NERRs into a network of "sentinel sites" for climate change impacts. NERR long-term system-wide monitoring program is in place focused on water quality & biological monitoring of two San Francisco Bay NERR sites
	+ [*San Francisco BAY NERR*](http://www.nerrs.noaa.gov/Reserve.aspx?ResID=SFB) is implementing a project quantifying suspended sediment concentrations in China Camp marsh channels – this should be expanded to other areas throughout San Francisco Bay
* *Regional Water Quality Control Board – San Francisco Bay Nutrient Numeric Endpoint Project* - To address nutrient over-enrichment (eutrophication) in State waters, San Francisco Bay Water Board is working with the State Water Board, the Southern California Coastal Water Research Program (SCCWRP) and the San Francisco Estuary Institute (SFEI) to develop nutrient numeric endpoints (NNE) for the San Francisco Bay Estuary.
* [*Pacific Flyway Shorebird Survey* (PFSS)](http://data.prbo.org/apps/pfss/index.php) – PFSS data are used in models to project impacts of habitat change on shorebird populations throughout the San Francisco Bay region and entire Pacific Flyway (PRBO Conservation Science project lead: M. Reiter)
* *San Francisco State University and University of San Francisco* – T. Parker, J. Callaway and others are conducting studies on the re-vegetation dynamics of restored tidal marshes, and are developing efficient assessment and monitoring methods (see Parker et al. 2011)
* *USGS, UC Davis– Bodega Marine Lab* - Jim Cloern (USGS) has been collecting phytoplankton and chlorophyll data for San Francisco Bay to assess levels of and changes in primary productivity over time. John Largier’s (UCD BML) research group has collected phytoplankton, zooplankton data in Tomales Bay.
* *USGS Western Geographic Science Center and University of San Francisco –* With their respective research programs in tidal marshes, Drs. John Callaway (USF) & Kristin Byrd (USGS) work to assess carbon sequestration values and re-vegetation rates in marshes.
* *USGS Western Geographic Science Center and Western Ecological Research Center -* J.Y. Takekawa and B. Jaffe are collaborating on shoal ecology and sediment flux assessments at the Dumbarton Bridge.
* *USGS Western Ecological Research Center (WERC) San Francisco Bay Estuary Field Station–* J.Y. Takekawa and K. Thorne are modeling sea level rise and storms for SFB marshes for the conservation and management of endangered wildlife populations.
* *USGS WERC San Francisco Bay Estuary Field Station ––* J.Y. Takekawa and K. Thorne are monitoring high water events from tides and storms for assessment of predation risk for marsh species.
* *USGS California Water Science Center* - K. Swanson, J. Drexler, and D. Schoellhamer are modeling accretion processes for marshes in San Francisco Bay under sea level rise scenarios.

*Existing Tools*

* [*Biogeographic Information and Observation System (BIOS)*](http://bios.dfg.ca.gov/)– BIOS is a system designed to enable the management, visualization, and analysis of biogeographic data collected by the Department of Fish and Game and its [Partner Organizations](http://bios.dfg.ca.gov/partners.asp). In addition, BIOS facilitates the sharing of those data within the BIOS community. BIOS integrates GIS, relational database management, and ESRI's ArcIMS and ArcGIS Server technologies to create a statewide, integrated information management tool.
* [*Calflora*](http://www.calflora.org/)– The Calflora database aggregates and makes available data on native and non-native California wild plants, with approximately 2 million occurrence records, 20,000 checklists, and 20,000 monthly users monthly. The database includes all formats of plant occurrence data (lines, polygons, points, checklists). Calflora’s increasingly comprehensive non-native and native plant data provide raw material for identifying unique microsites and assemblages, predicting distributions of weeds and natives, and tracking and monitoring distribution changes due either to natural change or from human translocation of species.
* [*PRBO Conservation Science - SLR model*](http://data.prbo.org/apps/sfbslr/) – impact of changes in sea level and salinity, acting in concert with future sedimentation to alter suitability of habitat for tidal marsh plants and birds (five species; Project lead: S. Veloz).
* *Western Hemisphere Shorebird Reserve Network (WHSRN)* – Climate Change Vulnerability Assessment for Shorebird Habitat (CC-VASH): [climate change assessment tool](http://www.whsrn.org/tools/climate-change-tool) - CC-VASH is an innovative, Excel-based assessment and decision-making tool developed by the Manomet Center for Conservation Sciences Shorebird Recovery Project and the USFWS Northeast Region Division of Refuges. Designed to be applicable to any coastal site containing shorebird habitat.

*Programs In Development*

* *Climate change scenario planning with regard to waterfowl* in Central Valley of California (J. Fleskes, potential for extension to San Francisco Bay area?)
* *North Bay Climate Adaptation Initiative (NBCAI) -* Sonoma County-wide pilot: Pilot biodiversity monitoring plan developed for North Bay to inform climate adaptation at watershed scales; Watershed health indicators & Salmonid monitoring plan developed for North Bay.
* [*PRBO Conservation Science - California Environmental Change Network (ECN)*](http://data.prbo.org/apps/ecn/) ECN is modeled after the European ECN to monitor environmental change at preserve sites throughout the region and California (Project leader: T. Gardali).
* *University of California –Davis - Bodega Marine Laboratory -* *Bodega Ocean Acidification Research (BOAR) -* The BOAR consortium is examining spatial and temporal changes in seawater chemistry and the impacts of this variability on the ecology, physiology, and biomechanics of critical nearshore marine invertebrates.
* *USFWS National Wildlife Refuge System* - Inventory & Monitoring Program
* *San Francisco Estuary Institute (SFEI), Save the Bay & partners* - A monitoring protocol for tidal marsh transition zones/ecotones is in development.

*Tools In Development*

* *NERR - SLAMM model* - Sea Level Rise Affecting Marshes Model is applied by Eric Van Dyke at Elkhorn Slough National Estuarine Research Reserve.
* [*Our Coast–Our Future*](http://www.prbo.org/ocof) *–* High resolution seamless digital elevation model, sea level rise and extreme storm scenarios, and decision support tool to plan for and respond to sea level rise and storms along the north-central California coast.
* *PRBO Conservation Science - Sea Level Rise Model, part II:* Information on habitat suitability is coupled with demographic models of bird response to extreme storms and sea level rise impacts, assessing long-term viability (Project leader: N. Nur).
* *PRBO Conservation Science - ZONATION modeling –* Model is utilized to predict areas with highest change.
* *San Francisco Data Commons* – A Sonoma Ecology Center/University of California Davis Information Center for the Environment/PRBO Conservation Sciencepartnership for building a centralized San Francisco Bay area data clearinghouse.
* *SUNTANS SF Bay Modeling*  - Climate change scenarios are being applied to San Francisco Bay through Stanford University. University of California, Berkeley will assess changes in sea level, salinity, wind and waves, and sediment distributions.
* *USGS*- *CASCaDE model* - Plans exist for expanding CASCaDE model for a focused approach via specific SLR and geographic scenario evaluations. The USGS CASCaDE model (hydrodynamic, sediment, etc.) has been used in the north part of San Francisco Bay to evaluate SLR impacts (should be expanded to south San Francisco Bay as well)
* *USGS* – *WARMER model* - Kathleen Swanson is refining WARMER model for marsh

accretion.

* *USGS Coastal Storm Modeling System (CoSMoS) –* This modeling system is being applied to the NOAA “[Our Coast–Our Future](http://data.prbo.org/apps/ocof/)” project along the north-central coast from Half Moon Bay to Bodega Head (Project Lead: Patrick Barnard). There are plans to try to apply it in San Francisco Bay also in the near future.