Climate Change Project Work Team Charter
Interagency Ecological Program
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I. The Interagency Ecological Program (IEP)

IEP is a consortium of nine state and federal agencies that conducts research and monitoring in the San Francisco Estuary (SFE). For the past 40 years, IEP scientists and its partners (e.g. universities, NGOs) have worked to: 1) describe the status and trends of aquatic ecological factors of interest in the SFE; 2) develop an understanding of environmental factors that influence the resources of the SFE; and 3) provide information to support natural resource planning, management, and regulatory activities in the estuary. One of the most effective tools for IEP activities and collaboration has been the formation of Project Work Teams (PWTs) that focus on specific research and monitoring topics of interest. The purpose of the PWTs includes organizing new studies, reviewing study plans and proposals, writing scientific papers and reports, promoting collaboration among different groups working on the topics of interest and conducting integrated analyses and synthesizing of SFE data sets. All IEP PWTs are open to the public. More information about IEP PWTs and a calendar with PWT meeting information is available at IEP's website.

II. Relevance of the Climate Change Project Work Team to Bay-Delta Science and Management and to the IEP

The impacts of climate change have resulted in an increasing urgency to develop management strategies for addressing climate change effects in the SFE. This urgency has spurred development of some important work, such as the Baylands Goals Report, prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project (Goals Project 2015). This report synthesizes the findings and expertise of more than 100 scientists studying the Bay and brings into focus critical needs for long term sustainability of tidal marsh and mudflat habitats. Similar groups have not yet convened for the interior Delta or Suisun Marsh. The recent focus for IEP has been on drought and the ability of the SFE ecosystem to recover from drought, largely because of the severity of the 2012-2016 drought. While increasing severity and frequency of drought is one of the major predicted impacts of climate change in California (Diffenbaugh et al. 2015), there are other major impacts that deserve attention. In particular, Dettinger et al. (2016) identified several aspects of climate change effects that have a high degree of certainty:

1. Air temperatures will increase by about 2°C by mid-century and by 4°C by 2100, if greenhouse gas emissions continue their accelerating trajectory.
2. Precipitation will arrive as more intense storms, with more dry periods separating storms. Combined with warmer air temperatures leading to less snow, projections indicate increased probability of extreme flood risk and drought risk (i.e., extreme events).
3. Sea-level rise (SLR) was approximately 0.20 m during the previous century and is estimated to continue to rise from 0.2 m to 1.7 m by the end of the current century,

resulting in increased risk of inundation and saltwater intrusion.

This combination of SLR, reduced snowpack, earlier snowmelt, more intense storms, and warmer summer temperatures will challenge both water operations infrastructure and management of aquatic resources in the SFE. Climate-induced changes in sea level rise and air temperature will have profound changes on SFE aquatic habitats and fishes of concern (Cloern et al. 2011, Feyrer et al. 2010, Brown et al. 2013, 2016, Swanson et al. 2014). The extent and location of abiotic habitat (salinity, turbidity, and water temperature) suitable for Delta Smelt will likely change (Cloern et al. 2011, Brown et al. 2013, Feyrer et al. 2015, Swanson et al. 2014, Brown et al. 2016). Changes in seasonal air temperatures may affect the duration of suitable conditions for important life stages of many species. For example, Brown et al. (2016) estimated future water temperatures using climate models downscaled to the watershed scale and estimated that the Delta Smelt reproductive maturation window could be shorted by 18-85 days as water temperatures rise.

IEP scientists, with collaboration of other science-based groups (e.g., Baylands Goals projects, USGS CASCADE effort, the San Francisco Estuary Institute), are well-suited to develop realistic predictions of the upper SFE (landward of Carquinez Strait) aquatic environment as the climate changes and to identify specific management challenges that will result. This effort will require close collaboration of ecologists, water managers, and modelers in several fields (e.g., hydrodynamics, water temperature, future water demand). IEP scientists need a forum for discussing the relevant science and new scientific endeavors that will inform adaptation strategies and monitoring needs. We also need a common understanding of current knowledge of likely climate change impacts for the SFE and the capability of existing modeling tools. Substantial work on various aspects of climate change on the SFE has been done by IEP scientists and is also being done by groups that are not closely coordinated with IEP. Some examples include the San Francisco Estuary Institute, the California Landscape Conservation Partnership, the USGS CASCADE effort, and the Department of Water Resources Climate Change Program. However, the broad science enterprise of the upper SFE lacks a dedicated forum for discussing and synthesizing climate change research, and identifying the related, specific management challenges for the aquatic habitats and species of the upper SFE. IEP has a strong history of leveraging broad expertise to bear on specific management issues by developing Project Work Teams (PWTs). These groups are open to the public such that scientists from non-governmental groups, academic, and private affiliations can participate, even by leading the team itself or sub-teams. However, IEP does not currently have a PWT focused on climate change. Hence, we propose development of a Climate Change PWT, starting with a group of IEP scientists tasked with identifying key individuals and groups that have valuable expertise that will be useful in addressing high priority IEP climate change questions.

III. Proposal to form the Climate Change PWT

The need to address climate change was explicitly included as an IEP Science Priority in the IEP 2020-2024 Science Strategy (Culberson et al. 2019). Formation of the CC PWT was also included as an element of the ongoing synthesis effort “Understanding Climate Change Tools for San Francisco Estuary Analyses and Investigation of Thermal Refugia in Warming Waters” (IEP Workplan Element 2019-340, funded by DWR). The CC-PWT has been included in the draft 2020 IEP Work Plan that will be submitted for approval by the IEP Directors later this year (2019).

The primary purpose of the CC PWT is to provide a forum and framework for addressing climate change issues within the upper SFE. More specific, technical issues will be addressed by a CC MAST (Management, Analysis, and Synthesis Team) that will include selected PWT members and outside experts who can commit to substantive work for the team. The general goals of the PWT are:

1. Provide a forum for discussion of the effects of climate change on the aquatic resources of the San Francisco Estuary. PWT members will provide ideas and discussion of potential MAST issues and periodic review of ongoing MAST efforts
2. The CC MAST will develop conceptual models for understanding the effects of climate change on the aquatic resources of the upper San Francisco Estuary.
3. The CC MAST and PWT will use the conceptual models to identify any gaps in monitoring networks relative to understanding the effects of climate change. The conceptual models will also be used to identify priority topics for analysis and synthesis.
4. The CC MAST will develop subteams as needed to address priority topics identified in goal 3.

IV. Examples of PWT Activities

Planning for the CC PWT is well advanced. Activities will include:

1. Regular PWT meetings, including discussion of climate change issues and presentations from PWT members and invited experts.
2. The CC MAST will develop conceptual models. We currently anticipate publishing an initial "overall" model with development of additional submodels as needed.
3. Establish MAST subteams as needed to address specific topics of concern
    a. Substantial work has already been done to identify and QA/QC water temperature data under an ongoing IEP synthesis effort, "Understanding Climate Change Tools for San Francisco Estuary Analyses and Investigation of Thermal Refugia in Warming Waters" (Workplan Element 2019-340, a Special Study funded by DWR). The analysis portion of this effort will be moved under the umbrella of the CC PWT. This effort will result in a published data set and at least one report/journal article.
    b. Although specific topics have not been selected yet, we anticipate at least one report/journal article summarizing the findings of the CC PWT and CC MAST by the end of 2021.

V. References Cited

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