SUMMARY PROPOSAL FORM

Project No. (For office use)_____

PROJECT TITLE: Low Inflow Estuarine Response to Extreme Events: Storms and El Niño as Indicators of Future Conditions in Urban Southern California Estuaries

OBJECTIVE:
Our project objectives are to:

- Assess hydrodynamic and morphodynamic impacts of storm events on low inflow estuaries in Southern California using in-situ and remote observations. The forecast 2014-2015 El Niño can offer an enhanced opportunity to examine extreme event response.
- Use these observations to make predictions about the response of these estuaries to future conditions including sea level rise and enhanced storminess.

We plan to approach these broad objectives by asking the following research questions:

- What is the relative importance of offshore waves versus stream flow in altering estuary mouth morphology (potentially closing the mouth) and circulation?
- Can single storms (lasting 1-3 days) alter the long-term (monthly and longer) morphology and estuarine exchange dynamics?
- Will a more natural system adapt and be more resilient to extreme events than an engineered system?

METHODOLOGY:
We plan to address our hypotheses by carrying out detailed in-situ observations in three Southern California estuaries measuring currents, salinity, temperature, water depth and suspended sediment. Moorings will be placed in all three study sites. Long-term moorings will be supplemented with transect surveys to gain enhanced temporal and spatial resolution. These will include monthly hydrographic surveys (in all systems), and surveys before and after individual storm events (in our main study site). Remote measurements will complement the in-situ observations and quantify morphodynamic change. A cliff-mounted digital camera at the main study site will take time-lapse imagery throughout the deployment. Unmanned aerial surveys will be carried out before and after the storm season and before and after one major storm event.

RATIONALE:
Low inflow estuaries are prevalent throughout Southern California providing extensive ecological and human benefits. These systems have been drastically reduced and those that remain are heavily modified by human development. Thus it is unclear if these estuaries can maintain their roles contributing to habitat, biodiversity, carbon storage, and coastal protection. Most poorly understood is these systems response and resiliency to extreme events. Some work has shown that extreme events have the ability to drastically modify morphology and transition vegetation structure, yet the physics underlying these processes has not been studied, nor has the physical response of the hydrodynamics to these morphological changes. Thus we aim to explore in detail the coupled hydrodynamic/morphodynamic response of urbanized Southern California estuaries to extreme events. This work will lead to an improved understanding of estaurine adaptation to future change and help inform management and sustainable development decisions.