Bay Area Ecosystems Climate Change Consortium

Thursday, January 26, 2012, 10:00 am - 2:00 pm
Conference room, 11th Floor, California State Coastal Conservancy
1330 Broadway, Oakland, California 94612

Meeting Summary

Attendees:
Patrick Barnard, *US Geological Survey*
Louis Blumberg, *The Nature Conservancy*
Ellie Cohen, *PRBO Conservation Science*
Deanne DiPietro, *Sonoma Ecology Center*
Benét Duncan, *Gulf of the Farallones National Marine Sanctuary*
Tom Gandesbery, *CA State Coastal Conservancy*
Wendy Goodfriend, *Bay Conservation and Development Commission*
Andrew Gunther, *BAECCC Executive Coordinator*
Taylor Nairn (representing Kelley Higgason), *Gulf of the Farallones National Marine Sanctuary*
Marc Holmes, *The Bay Institute*
Jaime Kooser, *SF Bay National Estuarine Research Reserve* (via teleconference)
Marilyn Latta, *CA State Coastal Conservancy*
David Loeb, *Bay Nature Institute*
Jeremy Lowe, *ESA/PWA*
Lisa Micheli, *Pepperwood Foundation*
Dana Morawitz, *California Invasive Plant Council*
Hilary Papendick, *California Coastal Commission*
Nadine Peterson, *CA State Coastal Conservancy*
Marina Psaros, *SF Bay National Estuarine Research Reserve*
Bruce Riordan, *Joint Policy Committee*
Bob Rosenbauer, *US Geological Survey*
Christina Sloop, *SF Bay Joint Venture*
Katherine Smetak, *Center for Ecosystem Management and Restoration*
Mark Stacey, *UC Berkeley*
Tom Suchanek, *US Geological Survey*
Caitlin Sweeney, *San Francisco Estuary Project*
John Takekawa, *US Geological Survey*
Luisa Valiela, *US Environmental Protection Agency, Region 9*
Sam Veloz, *PRBO Conservation Science*

1. **Introduction of participants and their BAECCC-related projects**

The meeting was convened at 10:10 AM. Participants introduced themselves and the interests of their organization in BAECCC. Andy Gunther provided the information for the "Go-to-meeting" for those on the teleconference.

2. **Review Agenda**

A short item regarding the San Francisco Conservation Commons was added to the agenda at the request of Deanne DiPietro.

3. **Jeremy Lowe, PWA/ESA, *Hayward Shoreline Vulnerability Assessment***

Jeremy used his experience on the Hayward Shoreline vulnerability assessment for the Hayward Area Shoreline Planning Agency (HASPA) to identify issues that must be considered regionwide relative to sea level rise. He first noted that even if CO_2 emissions are greatly reduced, we have set into motion a series of processes that will cause sea level rise to continue well beyond the next century. Although projections vary depending on future emission scenarios, we can expect relatively high and accelerating rates of sea level rise over the next century (as compared to historic rates) resulting in change to coastal ecosystems and damage to infrastructure along the shoreline. Uncertainty about rates and magnitude of sea level rise presents a challenge to planners because there is no clear agreement on what exactly may happen and when, there are multiple approaches for addressing the problem, and addressing the problem could absorb a lot of time and resources if not managed correctly.

Jeremy suggests we should think about sea level rise not by evaluating the impacts of a range of values for a given date, but rather by considering that within a range of time we are likely to reach a certain sea level elevation. For example, the statement "Between 2060 and 2070 sea level rise is likely to pass 25 inches" is more useful for the purposes of planning than is "by 2070 sea level may have risen between 22 and 32 inches," because it can be used to compare with threshold elevations at which damage to a particular structure or change to a natural feature might occur.

Jeremy described three potential adaptation strategies developed for the Hayward Shoreline study: 1) Hold the Line – raise levees and seawalls to protect land and infrastructure; (2) Realignment – move the levee further inland to allow marshes and mudflats to naturally transgress landward over the existing ground; and (3) Use natural features to create a long, gently sloping, terraced levee, behind the tidal marsh— creating an ecotone from shallow bay to tidal mud flat to tidal marsh to transitional and upland habitat and space for tidal marsh transgression bayward of the existing flood levees.

He noted that risk assessments are a combination of the *likelihood* of occurrence of a particular event and the *severity* of that event's consequence, and in their study they assessed the

combination of likelihood and severity for these three adaptation strategies. Jeremy noted that although the "hold the line" option would temporarily decrease the risk of damage, erosion at the base of the levees would require building up the toe of the levees, and the baylands behind the levees would continue to subside over time. He noted that the "realignment" option would be more likely to reduce risk over a longer period because the marshes in front of the levees would attenuate waves and reduce erosion. He noted that with sea level rise we may lose the value of marshes more rapidly than we need to because of the flat aspect of the existing land.

Using natural features (or fill) to create a long, gently sloping, terraced levee would slow the rate of marsh transgression and buy more time for society to make better choices on how to adapt to sea level rise. It would drop the risk of damage to lower likelihood and lower consequences and keep it there for longer. He described long slopes as "win-win" because they also create upland transitional habitat that has been lost around the Bay, providing upland refuge for species and act as buffers from other shoreline activities.

Jeremy noted that in addition to structural shoreline adaptation in response to sea level rise, there also exists a need to adapt our governance and permitting processes, as our regulatory systems are designed for the static bay we know rather than the dynamic bay that will be. He suggested taking a step-by-step approach to management that would involve thinking several decades and several feet of sea level rise in advance to provide lead time for planning and project construction so that adaptation decisions will provide the benefits when they are needed. This will allow adaptation strategies to be thoughtfully included into capital improvement plans rather than become knee-jerk responses to emergency situations.

Jeremy concluded his talk by describing a unique Resolution developed by HASPA. Major points of the resolution include: (1) understand vulnerabilities and thresholds—focus on priority climate risks and balance both climate and non-climate risks; (2) look for "no regrets" and "win-win" early actions that have unambiguous benefits under multiple sea level rise scenarios, and avoid actions that limit future options; 3) using adaptive management strategies to learn about strategy effectiveness through experimentation and monitoring; and (4) find ways for multiple agencies to work together.

When asked what percentage of the bay shoreline would allow for the gradual upland transgression, Jeremy noted many opportunities exist in areas along the North, South and Central Bays where our shoreline still retain features such as mudflats, marshes, and salt ponds that have space to accommodate transgression. Areas of the Bay that have a hard, urbanized shoreline adjacent to deep water, such as much of the San Francisco and Oakland frontage, and where there is no fronting existing marsh or mudflat, would require different adaptation strategies. He suggested focusing on storm water channels and wastewater facilities to begin to evaluate where potential adaptation strategies could incorporate the reuse of dredge sediment and treated wastewater.

4. **Mark Stacey, UC Berkeley, *Hydrodynamic Modeling in San Francisco Bay***

Mark Stacey of UC Berkeley presented a summary of recent developments in the modeling of hydrodynamics and sediment transport in San Francisco Bay, with a focus on the usefulness of these developments for understanding the effects of climate change on the estuarine ecosystem. This is a joint project being conducted by UC Berkeley and Stanford with support from the California State Coastal Conservancy.

There are many factors that must be considered for modeling how climate change will affect the Bay ecosystem. For example, variability in storminess will influence the frequency and magnitude of storm surges, and a shift toward more rain and less snow in the winter will alter freshwater flow patterns that influence circulation in the estuary. Changes in wind fields (due to subtle shifts in upwelling) will also change hydrodynamics, as will alterations of the geometry of the Bay shoreline by marsh restoration.

All this means that there are multiple uncertainties in the factors that force our models of hydrodynamics and sediment transport. Research and monitoring will be required to help refine over time features of models such as parameters used to represent basic processes and boundary conditions. We also need to decide precisely what we want to project for the future, such as sea level, temperature, or phytoplankton biomass. Mark and his colleagues are focusing on projections of salinity and sediment transport. If they can project salinity accurately, it means that they are successfully representing the larger scale dynamics of the estuary correctly. At a smaller scale, they are projecting sediment transport in order to help inform decisions about how various restoration actions (such as levee breaches) will influence sediment erosion and accumulation in different areas.

Mark and his colleagues are using a public domain, unstructured 3-D model known as SUNTANS. Their goal is to develop and apply this model in a manner that can provide higher resolution results for the different sub-embayments in the estuary. The "unstructured" nature of the model allows the grid resolution to change, so that higher resolution output is obtained where needed (such as a particular proposed levee breach) but not everywhere, greatly reducing computational requirements. For example, a larger scale portion of the grid extends into 100km out into the Gulf of the Farallones to capture conditions at that boundary that influence processes in the Bay (e.g., tides).

Mark presented some of their recent output, showing the model's capability of reproducing the salt fields measured by USGS cruises on the Bay. He demonstrated how initially poor results helped them recognize that they had not included the East Bay Dischargers Authority discharge correctly in the model, and once this large freshwater input was treated correctly salinity predictions improved substantially. The greatest challenge for the salinity predictions now is in the vicinity of the Golden Gate, indicating the complexity of Bay-Gulf interactions is not yet completely captured by the model.

He also showed how the higher resolution portion of the model was able to capture sediment dynamics around a specific breach in a levee at the South Bay salt ponds. In this instance the

model is working at a grid scale of one meter. Critical to working at such high resolution effectively is determining where this resolution is required, and where lower resolution can be used to represent larger scale forcing phenomena. This allows the model to provide useful output at a small spatial scale (particular breach) without requiring such significant computational resources that model application is impractical.

Mark also described how the model could be used in a "rapid response" mode. When USGS scientists detected low dissolved oxygen (DO) in deeper waters of the Bay, field data was obtained and loaded into the model so that within 7 days a simulation of the Bay during the low DO episode was available. The model helped scientists conclude that the low DO was likely due to incursion of low DO water into the Bay from the Gulf, as opposed to having a source within the estuary.

Mark and his colleagues will be handing off to the Coastal Conservancy the core of the model to be used for future assessments. Much of work to set up model runs has been automated, allowing key datasets to be automatically downloaded, formatted, and loaded into the model. As future scenarios for shoreline change, freshwater flow, and winds are identified, the SUNTANS model can be used to project how these changes will influence circulation and sediment transport in the Bay. By linking the output of SUNTANS to other ecosystem models and analyses, it will be possible to consider biological/ecological changes in the estuary that will driven by the physical changes projected by SUNTANS.

5. **Project Updates**
    a. Our Coast Our Future and King Tides (M. Psaros)

Marina gave a brief update of the Our Coast Our Future (OCOF) project, as new funding awarded through the National Estuarine Research Reserve System Science Collaborative (NERR) for the period November 2011 – August 2014 will allow the project to expand its scope from the outer coast to inside San Francisco Bay. The new funding will be used to increase the stakeholder participatory process and will also be used to provide increased technical assistance to decision support tool users, both for the outer coast and the San Francisco Bay. Marina noted that NERR is particularly interested in identifying end users.

For the outer coast, flooding and coastal impacts scenarios will start running in February. Web tool prototypes for the outer coast are in development and will be presented to focus groups in April, with a final version expected this fall. A needs assessment for the San Francisco Bay web tool is being put together, and Marina requested that people contact her with ideas. An "open house" to discuss development of the San Francisco Bay decision support tool will be held in April or May of this year, and advisory groups are being convened.

Marina commented on the form the final web tool would take, noting that it would be a website that would be accessible to users of all different levels that would, for example, allow a user to draw a polygon within a Google map interface or to download data for GIS analysis. When asked about overlap between OCOF and SUNTANS, Marina noted that information collected for the OCOF project will help inform the SUNTANS project and vice versa, with SUNTANS

focused on processes in the Bay and OCOF focused on impacts to the shoreline and infrastructure.

Marina gave a brief overview of the California King Tides Initiative. The project's focus is to encourage members of the public to visualize sea level rise through the observation of current conditions. Members of the public take photos of local features during high tides and upload them to web-based image sharing sites such as Flickr. There are now King Tide Initiatives in Australia, Canada, and on the East and West coasts of the US. Due in part to public outreach by Surfrider and Thank You Ocean in the Bay Area, a few hundred pictures of the highest tides this past December and January were submitted to the project.

King Tides recently held an exhibition at the nightlife event at the California Academy of Sciences, where before and after pictures of local high tide events (*e.g.* water overtopping over-topping the Embarcadero in San Francisco) were presented on 3 x 4 foot posters. Another exhibition will be held at the SPUR lunchtime forum. This fall, King Tides is expected to present at the Commonwealth Club, linking policy to the discussion. Marina noted that those interested in borrowing the poster installation for local events can do so by contacting one of the organizers via the project website. All photos are also available to the public with use of the photo credit on the Flickr website.

b. Marsh Prioritization (S. Veloz)

Sam presented a summary of PRBO Conservation Science's application of a sea level rise model to project changes in tidal marsh habitat and to prioritize landscapes for conservation. The model is informed by data on tidal marsh bird populations in the San Francisco Bay collected between 2000 and 2010. The main objectives of the project are to determine if: (1) climate change will impact the distribution and abundance of 5 tidal marsh species in the SF Estuary from 2010-2110; (2) the landscape can be prioritized for the importance to tidal marsh birds through this period incorporating the uncertainty in sea-level rise; and (3) proposed or ongoing restoration projects can be ranked for their benefits to tidal marsh species and resilience to sea-level rise. Sam noted that model projections can be used to determine where money should be invested for restoration and new acquisitions.

The model was used to test high and low sediment and sea level rise scenarios for five tidal marsh species for the period 2010 to 2110. These populations were found in general to fare better under low sea level rise and high sediment scenarios, indicating that climate change will have a noticeable impact. Sam provided examples of model projections for two species: the Black Rail, which was found to be most sensitive to reductions in the sediment supply until about the year 2070, at which point accelerating sea level rise would have greater impacts on this population; and the Common Yellowthroat, which was found to be more sensitive to changes in salinity (sea level rise) than to changes in the sediment supply. Sam noted that the SUNTANS model could be used to improve PRBO's sediment models.

Sam provided an example of how tidal marsh restoration priorities change once climate change projections are taken into account. He presented two maps of the San Francisco Bay—one based on models that only accounted for the year 2010 and the other based on models for the period

2010-2110—that indicated where high quality marshes could be located following the removal of levees. The map for the period 2010 – 2110 illustrated that many areas considered priority restoration sites under the 2010 scenario are likely to be inundated by sea level rise, narrowing down opportunities for facilitating marsh migration. Sam noted that this same type of analysis has been used to rank ongoing restoration projects. He also noted that the current analysis considers only tidal marsh bird populations, but as the project moves forward, the model could be extended to incorporate data on shorebird and other species, providing the opportunity for a more holistic evaluation.

c. Head of Tides (W. Goodfriend)

Wendy provided a brief update on BCDC's Head of Tide (HOT) project. The project has two goals: the first is to develop a protocol to identify the HOT zone for tidal rivers and tributaries around the Bay. To accomplish this goal BCDC is working with SFEI to develop GIS mapping and field verification methods. The second goal is to evaluate the vulnerability of HOT to sea level rise. This part of the project will likely focus on evaluating the types of methods and approaches that could be used to determine the impact of sea level rise on the HOT zone, for example through modeling of joint river-bay flooding to determine where flooding will occur during high river flows and high Bay water levels. Wendy noted that BCDC is interested in finding out if there are ongoing projects evaluating the HOT zone, modeling joint river-Bay flooding, or considering HOT vulnerability either in the Bay Area or elsewhere. To provide input or find out more about this project call Wendy at 415-352-3646 or email wendyg@bcdc.ca.gov.

d. Highway 37 planning (T. Gandesbery)

Tom gave a brief overview of the Highway 37 planning project. California State Route 37 runs from Novato to Vallejo through some of the largest remaining marshlands in the San Francisco Bay, and is one of our region's transportation arteries at greatest risk from sea level rise. Caltrans District 4, the UC Davis Road Ecology Center, the Sonoma Ecology Center, Southern Sonoma County Resources Conservation District, Sonoma Land Trust, and Napa County Resources Conservation District are studying this issue to inform transportation planning for the Highway 37 corridor. Fraser Shilling of UC Davis is leading the study.

Multiple stakeholders have interests in the project and have been attending meetings, including: local farmers; representatives from Sonoma Land Trust, which owns a large area of land near the highway; and representatives from the Fish and Wildlife Service, charged with protecting sensitive low-lying habitat near the highway from flooding. Tom noted that the Fish and Wildlife Service acquired Skaggs Island, which runs along the highway, in 2011 but that restoration of the 3,300-acre property to wetlands is on hold until more funding is available and an agreement has been reached with farmers who own land in the middle of the proposed area of restoration.

One or two more stakeholder meetings will be held, after which a report will be produced about what people in the North Bay have proposed as solutions. Many people would like to see the highway raised and put up on viaduct to allow for exchange of bay water. The idea of a toll road has been presented as an option.

e. SF Bay Joint Venture Monitoring and Evaluation Plan (C. Sloop)

Christina reported that Phase I of the Monitoring and Evaluation Plan (M&E Plan) is complete. The product of Phase I is a document that presents prioritized research and monitoring objectives for the Bay Area for seven focus themes, including: Net Landscape Change; Waterfowl; Shorebirds and Waterbirds; Riparian Landbirds; Special Status Species; Invasive Species; and Climate Change. More information about the project and links to the document are available via the Joint Venture website.

Christina noted that the Climate Change section of the M&E Plan should be considered a very general, introductory step in the assessment of climate change impacts on wetland ecosystems. The section highlights the importance of (1) continuing to track changes in wetland extent; (2) devising a coordinated way to determine those indicators best suited to inform regional climate change planning; and (3) identifying thresholds to determine the vulnerability of systems so that appropriate protective measures can be implemented on time.

In Phase II of the M&E Plan, the focus will shift from target species groups to ecosystems. In this phase, the Joint Venture will: develop goals for habitat condition and function; determine ecosystem stresses and threats (the Conservation Measures Partnership has developed a step by step approach to defining ecosystem stresses and threats that will be used to inform this process); and identify indicators that can be used to assess the effectiveness of strategies implemented on the ground. The focus of the next three months will be tidal marsh ecosystems and associated uplands, to be followed by an analysis of tidal flats, managed ponds, riparian systems, seasonal wetlands, and coastal estuaries.

f. JPC Bay Area Climate and Energy Resilience Project (B. Riordan)

Bruce reported that the Joint Policy Committee Bay Area Climate and Energy Resilience project is in the process of organizing a series of briefings for a range of Bay Area leaders—government, business, foundations, environment, CBOs, academia. The briefings are aimed to get commitments of participation, resources and leadership for a collaborative approach to resilience planning in the Bay Area. The collaboration is designed to build on the excellent work already being done on various adaptation issues in the Bay Area, adding value to local and topic specific efforts. The case for collaboration will be built on five points: (1) there are substantial climate and energy impacts; (2) there is a lot we can do that will make a difference in the region; (3) a coordinated approach, starting now, is needed; (4) there are options for how to structure this; (5) we can finance this.

Bruce noted that information flow from BAECCC (mainly through Andy) has been very helpful. They are collecting research and strategy information, and will be seeking expert groups to help review and synthesize what they compile.

Bruce also noted that working with elected officials will need to include preparing them for possible disruptions at public meetings about sustainable development by "tea party" people who are convinced that such plans are a cover for a UN plot to take over the government of the

United States. This type of disruption occurred at the recent hearings held by One Bay Area on the sustainable communities strategy, and there are other examples around the country where disruption and active opposition to climate work has been highly organized at the local level.

g. Securing Funding for a Climate Resilient Bay (M. Holmes)

Marc described his work promoting habitat restoration of diked baylands, or former tidal marshes. He briefly outlined historic and contemporary challenges to baylands restoration in California. During the 1980's, land developers presented the most significant obstacle to restoration, but this changed when Cargill sold 10,000 acres of land to the state. For most of the baylands we want to restore, the biggest challenge now is finding money to complete restoration work. Marc cited the example of Cullinan Ranch, where restoration work is just beginning although the Fish and Wildlife Service acquired the property 21 years ago. He noted that the major missing piece in funding is federal funds.

The San Francisco Bay is part of the National Estuary Program (NEP), which has an annual funding authorization of $35 million, provides restoration funds to each of its 28 participating organizations and has awarded between $250,000 and $7 million each year to the Bay Area for estuary-related improvement programs. Marc described a separate EPA-administered program established in 1983—the geographic estuary program—that can provide funding in much larger amounts than the NEP. Marc noted that the smallest authorization for the geographic estuary program was $200 million over 10 years.

The San Francisco Bay is not currently included in the geographic estuary program. Six to eight water bodies around the country, including the Chesapeake Bay, Lake Champlain, and Puget Sound have been raised to the level of the geographic program by passage of separate federal legislation. Marc noted that an organized plea for federal funds has not occurred in the Bay Area because we have been able to rely on bond monies to fund restoration projects, but this source of funding is now drying up. The Bay Institute has been working to promote passage of legislation that would include the San Francisco Bay in the geographic program.

Marc provided a summary of efforts to pass the San Francisco Bay Restoration Act (S 97 and HR 3034). He noted that passage of this legislation, with the President's signature, would get San Francisco Bay placed into the geographic estuary program. This would have to be followed by a Congressional appropriation of funds.

h. Baylands Ecosystem Habitat Goals Update (N. Peterson)

Nadine noted that Dr. Letitia Grenier would start work as the Coordinator of the Technical Update of the San Francisco Baylands Ecosystem Habitat Goals Report on February 1st. Letitia has prepared a draft work plan for the project and will be fleshing it out over the next three months. A workshop is planned for this summer that will be attended by original report preparers and those who have recently become involved in the project. An important goal of the project is to identify priority upland sites that should be protected as part of a plan for marsh migration.

Included in the work plan is a public outreach component, and two major public workshops are expected to be held in addition to the first workshop this summer. An interim report is expected by April 2013 and final report by the end of 2013.

6. **Open Discussion about Pending RFPs and Proposals**

Luisa Valiela from EPA noted that the 4th and 5th RFP for the San Francisco Bay Water Quality Fund would be issued within next two weeks. It will be available via the EPA website. The total funding available for FY11 and FY12 is $6.8 million for proposals related to water quality improvement in the nine-county Bay Area. There are slight differences between the two RFPs with regards to their requirements for match and partnerships. Initial proposals (4-5 pages) will be accepted for 45 days, and after review (about 2-3 weeks) a subset of initial proposals will be asked to submit detailed proposals.

7. **SF Bay Conservation Commons**

Deanne DiPietro noted that the project approved by the LCC to create the San Francisco Bay Conservation Commons is underway, and a prototype site is being built by Sonoma Ecology Center and others and will be available in 1.5 months. The project will be holding a workshop the last two weeks of April at PRBO to introduce the Commons and build a network with climate initiatives in the Bay Area. Information about the workshop information will be circulated to the BAECCC Google group.

8. **Adjourn**

The meeting was adjourned at 2:05.

The next general meeting of BAECCC will be on April 26, 2012.