American Water Resources Association
2015 SUMMER SPECIALTY CONFERENCE
Climate Change Adaptation

June 15 - 17, 2015
New Orleans, LA

Wednesday, June 17
8:30 AM – 10:00 AM
SESSION 13: Planning for Action 1

Climate Change Management in Marine Ecosystems: Ocean Acidification and Hypoxia - Ken Schiff, So Cal Coastal Water Research, Costa Mesa, CA

Ocean acidification (OA) and hypoxia (depressed oxygen) are perhaps the biggest threat to our ocean environment of this generation. Ocean acidification, where increases in global CO2 dissolve into the seawater, results in chemical reactions that decrease the pH of this typically well-buffered system. Even small changes in pH can be detrimental to marine life by dissolving shells made of calcium. Similarly, hypoxia can be amplified when temperature stratification in the ocean (called thermoclines) increases with increasing global temperatures. Depressed oxygen naturally occurs below thermoclines, but increased stratification exacerbates the problem due to lack of mixing, and shallower thermoclines have already begun delivering this low dissolved oxygen water closer to the Pacific coast of the US. A challenge for managers dealing with climate change is that local human inputs can also affect OA and hypoxia. Inputs of nutrients, such as those from wastewater treatment plants or river runoff, can lead to algal blooms that also depress oxygen and decrease pH. This scenario gets amplified as climate change drives wastewater treatment plants towards recycling and reuse, resulting in even greater concentrations from brines discharged to the ocean fueling even more algal blooms. Currently, managers cannot discern the relative magnitude of local vs global contributions to local OA and hypoxia; should billions of dollars be spent on increased wastewater treatment to slow down the onset of OA and hypoxia? Or will the progress of global induced OA and hypoxia overwhelm any local actions to reduce eutrophication and the funds be better spent on remediating the impending fisheries impacts? This talk will describe the steps being taken in southern California to provide managers the tools they need for addressing this climate change challenge. This talk will cover the first three years of our five-year study that has quantified nutrient inputs, assessed the increasing frequency and magnitude of OA and hypoxic events, is quantifying eutrophication rates and processes, and has begun building a west coast-wide ocean model to predict the relative impacts of local vs global sources of CO2 and climate warming.

Planning for Uncertainty - Ron Harris, Newport News Waterworks, Newport News, VA

In conjunction with the Goddard Institute for Space Studies (GISS), NASA Langley Applied Research Center used 16 global climate models with multiple emission scenarios to estimate future climate conditions in Hampton Roads, Virginia. 1 to 5 degrees of annual warming longer periods of seasonal high temperatures, minor increases in average annual precipitation, and increases in threshold level climate events 2 to 50 inches of sea-level rise, depending on future rate of rise Two other important studies were conducted by the USGS; one to assess the potential for saltwater encroachment into the freshwater estuaries, and another to assess any changes in regional stream flow characteristics. The table below provides a very brief summary of the predicted long-term regional effects combined with the adaptation measures that either have begun or are anticipated to be needed by Waterworks. Future planning efforts will focus on secondary impacts to Waterworks, including how sea-level rise will impact population trends and density within the service area, and how these trends could change future water demand Newport News Waterworks Observed EffectObserved/Possible Impacts & Adaptation measures Increase in atmospheric temperature Reduction in long-term runoff from basins fed by snowpack or glacier melting. Changes to demand patterns and peaking characteristics. No significant impact to Waterworks. Potential peaking changes have been incorporated as option into yield models. Increase in surface water temperature Reduction in dissolved oxygen levels and changes in stratification patterns. Increased algal blooms and changes in algal species and distributions. Minor impact to Waterworks. Changes in treatment processes have been implemented and reservoir mixing options using solar-powered aeration are being evaluated. Evaporation losses have been quantified. Sea-level rise Changes in salt water - fresh water gradients in both surface water estuaries and in coastal aquifers. Potential to significantly impact to primary water supply intake on Chickahominy River estuary. Modeling study and assessment performed by VIMS and USGS to define future gradients in normal and low flow conditions. Shifts in precipitation patterns. More frequent and intense extreme events Increased difficulty in managing flood events and increased erosion and sedimentation rates. Longer or more intense droughts can impact water availability and water quality. Dams and spillways are being upgraded to pass maximum flood predictions. Desalting facilities including drought-tolerant deep wells were completed in 1998. Yield models have been expanded to include 19th Century drought inventories. Increase in inter-annual precipitation variability Changes in seasonal water transfers and pumping rates, including reservoir drawdown and refill cycles. Impacts to infrastructure and energy costs. Minor impact to Waterworks due to integrated resources planning and flexibility in pumping rates and source water supply interconnections. Variable speed motors have been integrated in supply system. Increased evaporation and evapotranspiration Lowering of water table and decreasing discharges to streams and reservoirs. Increased losses from reservoirs during warm seasons. No significant decreasing trend in stream flows identified in Chesapeake Bay basin watersheds over past 80 years (USGS 2012-5151). Variable evaporation rates have been modeled in Waterworks safe-yield model with no significant reduction in safe-yield.

A New Climate Adjustment Tool: An update to EPA's Storm Water Management Model - Michael Tryby, US EPA Office of Research and Development, Cincinnati, OH

The US EPA's newest tool, the Stormwater Management Model (SWMM) - Climate Adjustment Tool (CAT) is meant to help municipal stormwater utilities better address potential climate change impacts affecting their operations. SWMM, first released in 1971, models hydrology and hydraulics to simulate the movement of water through the landscape and into and through sewer systems. It has had numerous updates over the years, including the addition of a green infrastructure module in 2010 to simulate the integration of green infrastructure practices, ranging from green roofs to permeable parking lots, into a community's stormwater management plan. SWMM is widely used throughout the world and considered the "gold standard" in the design of urban wet weather flow pollution abatement approaches, and allows users to include any combination of low impact development/green infrastructure controls to determine their effectiveness in managing stormwater and sewer overflows. The new CAT update for SWMM is a simple to use software utility that applies monthly climate adjustment factors to historical precipitation and temperature data to consider potential impacts of future climate on stormwater. The climate adjustment factors are derived from US EPA's Climate Resilience Evaluation and Awareness Tool (CREAT 2.0) and utilize the best available climate science to facilitate water utility sector climate adaptation and resiliency analysis.

Climate Change Adaptation Planning at the USACE Albuquerque District: The New Normal - Ariane Pinson, U.S. Army Corps of Engineers-Albuquerque District, Albuquerque, NM

Kate White/Rachel Grandpre USACE IWR session. The USACE Albuquerque District (SPA) is tasked with assisting communities in reducing flood risk and in restoring vital riparian habitat for threatened and endangered species, tasks likely to become more difficult under a rapidly warming, increasingly xeric Southwestern climate. Following national USACE policy, SPA is mainstreaming climate change adaptation in all of SPA's Civil Works planning activities, using the best-available, actionable climate science and climate change information. Actionable science, however, is qualitative or, at best, quantitative with large errors. To overcome these challenges, SPA has pursued a tiered decision-making strategy to identify projects where climate change impacts are likely to be significant, and to make these risks transparent throughout the planning process. SPA is working with State and Tribal partners to qualitatively identify climate change risks to watersheds, and to propose strategies for reducing these risks over the next half century. To close the information gap, SPA is collaborating with the Bureau of Reclamation on the development of river- basin-scale analyses of projected hydrologic impacts of climate change, and assisting in regional planning efforts. Finally, because hydrologic changes will impact all future SPA projects, SPA has been actively engaging current and potential future project sponsors on climate change issues through workshops and other outreach activities.