American Water Resources Association
2015 SUMMER SPECIALTY CONFERENCE
Climate Change Adaptation
June 15 - 17, 2015
New Orleans, LA

Tuesday, June 16
3:30 PM – 5:00 PM
SESSION 11: How Do Data, Models, and Tools Aid in Adaptive Actions 4

Quantifying Risks of and Adaptively Managing Military Assets in the Face of Climate Change and Sea Level Rise on Naval Station Norfolk - Kelly A. Burks-Copes, U. S. Army Engineer Research and Development Center, Vicksburg, MS

The best available evidence indicates that sea level rise is occurring at unprecedented rates, and while military commanders may be situationally aware of their installation's vulnerabilities, demonstrable risk-based assessments are needed to proactively adapt military systems, processes, and protocols in the face of this pervasive threat multiplier. Here we describe the development and testing of a risk assessment framework - a coastal hazard risk assessment approach that incorporates sea level rise threats and communicates the risk of mission impairment to the military in a meaningful manner that supports mission adaptation and sustainability into the future. The approach is tested on a North Atlantic naval base (Naval Station Norfolk, VA) using a variety of prescribed sea level rise scenarios (0-2m) in combination with simulated coastal storms ranging in intensities of 1-yr to 100-yr return intervals. Forcings (waves, winds, sediment, flooding, etc.) are generated using a group of high fidelity numerical storm models. Installation assets and missions are decomposed (i.e., broken down into critical assets and capabilities that contribute to mission performance), and storm damage to the infrastructure network are assessed using probabilistic Bayesian analyses. The risk-based approach and step-by-step procedures presented in this study can be used to assess risks to mission on other military installations facing similar threats from coastal hazards and rising sea levels. Moreover, the approach can be used to assess vulnerability and risks at the regional scale to encourage preparedness and enhance coastal resiliency both on and off military installations. Armed with this information, planners and managers can discern thresholds where minor annoyances (on the order of ~1-2 hour delays in performance) turn into catastrophic events (i.e., resulting in weeks of mission impairment). These thresholds, or "tipping points," can then be communicated to the end-user in an actionable construct so that managers and policymakers can consider altering the status quo to incorporate proactive management strategies to prevent or anticipate impairments based on the risks. In effect, this study offers a robust, scientifically defensible approach that transparently communicates potential risks, improves military readiness through adaptation, and promotes sustainability in the face of climate change and sea level rise.

Integrated Resources Management for Cost-Effective Planning and Adaptation - Viktoria Zoltay, Abt Associates, Cambridge, MA (co-authors: I. Morin, C. Godfrey, S. Danos)

Littleton Water Department (LWD) must plan to meet the future water needs of the Town of Littleton, MA under projected future conditions. These conditions should include consideration of water demand, land use, climate and regulatory requirements. Recently revised state regulations require new actions to minimize the existing impact of withdrawals and mitigate the impact of increasing withdrawal requests on the environment. We applied EPA's Watershed Management Optimization Support Tool (WMOST) to the source subbasins of LWD to determine the least-cost combination of actions that meet the projected conditions. WMOST considers management actions related to water supply (demand management, outdoor water conservation, optimizing surface and groundwater withdrawals, additional pumping and treatment capacity), wastewater (additional capacity), stormwater, nonpotable water reuse, aquifer storage and recharge, low-impact development (LID) and land conservation. In addition, WMOST optimizes within a watershed system context accounting for the direct and indirect cost and performance of each practice. In the baseline scenario we considered meeting projected water demand and regulatory requirements under existing land use and climate because the regulations do not address the consequences of changes in land use and climate in achieving regulatory objectives and requirements (nor provide quantitative credit for doing so). We ran separate, additional scenarios to assess the effect of land use and climate change on the selection of least-cost management actions. Initial results indicate that projected new development will offset the required minimization and mitigation actions. We will run a climate scenario to assess the relative effect of projected climate. Considering uncertainty in projected conditions including future regulatory conditions (e.g., lack of accounting and credit for addressing climate and land use change), we will compare least-cost management actions across scenarios to determine an overall strategy that is most robust across a potential future conditions.

Comparative Visualization of Heat Indices - Bryan Baker, U.S. Army Corps of Engineers Cold Region Research and Engineering, Hanover, NH (co-authors: K. White, J. Arnold, A. Taylor, J. Gade)

This presentation will present different methods to visualize and compare heat indices based on over 60 years' worth of temperature and relative humidity data. These visualizations were developed in support of the U.S. Army Corps of Engineers (USACE) guidance on incorporating climate change information in hydrologic analyses. Developed by R.G. Steadman (1979), heat index represents the temperature and humidity conditions in a region as interpreted by human physiology. Steadman, R.G., 1979a: The assessment of sultriness. Part I: A temperature-humidity index based on human physiology and clothing science. J. Appl. Meteor., 18, 861-873.

Comparative Visualization of Standardized Precipitation Indices - Bryan Baker, U.S. Army Corps of Engineers Cold Region Research and Engineering, Hanover, NH (co-authors: D. Friedman, K. White, J. Arnold, A. Taylor, J. Gade)

This presentation will present different methods to visualize and compare standardized precipitation indices based on over 60 years' worth of precipitation data across 202 hydrologic regions. These visualizations were developed in support of the U.S. Army Corps of Engineers (USACE) guidance on incorporating climate change information in hydrologic analyses. Developed by McKee et al (1993), the standardized precipitation index is a measure of drought severity or moisture conditions that takes into account the historical climate trends of the region. McKee, T. B., N. J. Doesken, and J. Kleist, 1993: The relationship of drought frequency and duration of time scales. Eighth Conference on Applied Climatology, American Meteorological Society, Jan17-23, 1993, Anaheim CA, pp.179-186.