American Water Resources Association
2017 International Conference: Cutting-Edge Solutions to Wicked Water Problems
September 10-11, 2017
Tel Aviv University, Tel Aviv, Israel

Sunday, Sept. 10
10:30 AM – 12:00 Noon
SESSION 1: Water Quality and Quantity Monitoring and Assessment

Geospatial Assessment of Source Water Quality Vulnerabilities - Noah Garfinkle, US Army Engineer Research and Development Center, Champaign, IL, USA (co-authors: E. Jenicek, N. Bartholomew)

Military installations, like all communities, rely upon water resources in order to sustain their local population as well as to serve important mission functions. Water sources and supplies face a number of quality threats, including micro-organisms stemming from human and animal sources, disinfectants and disinfection byproducts, exposure to organic and inorganic chemicals, and radionuclides. Exposure to inorganic and organic chemicals can stem from seemingly obvious sources of hazards such as from petroleum, manufacturing, agricultural chemicals, and exposure to solid and hazardous waste. However, less obvious threats exist including residues from construction, byproducts of power generation, exposure to threats due to traffic or rail accidents which may occur over bridges and near waterways, and mining incidents such as occurred in West Virginia in 2014, affecting over 300,000 water users. Even more ominous, changes in source water quality can cause cascading effects in chemical reactions within water infrastructure, much as happened in Flint Michigan.Maintenance of water quality standards cannot depend solely on treatment technologies. The expense and technical complexity required to treat heavily contaminated water to suitable levels can often be sustained only for short periods of time at contingency-levels of service. Because of this, it is vital for communities to have access to best-available information about the types of water contamination events they may encounter, such that mitigation and response plans can be developed and put into place. A number of data sources- geospatial and otherwise- are available in the United States, but few comprehensive and authoritative sources exist to help installations plan for and simulate potential source water emergencies.This presentation outlines the US Army Research and Development Center's research into the creation and validation of fused catalogues of potential environmental threats. Such catalogues build upon geospatial data about potential threat vectors within a watershed, hydrologic, fate and transport modeling, and ongoing research into categorizing mission-essential water needs for the formulation of emergency response plans. Remote geospatial and field assessment methods are used in order to compile and federate information about agricultural, energy, solid and hazardous waste, health care, manufacturing, mining, and transportation assets which could pose a threat to downstream water supplies. This information is coupled with both planning-scale modeling and datasets on natural threat vectors in order to help installations develop prioritized estimates of risks to their source waters.This work is expected to contribute to the creation of planning-scale tools designed to help installations and communities compile and analyze data on potential risk- and risk thresholds- to their source waters. Presentation of this work is expected to contribute to ongoing dialogue about the cross-community and cross-border nature of many watershed risks, requiring collaborative approaches to both data collection and mitigation planning.

The Development and Demise of the USDA National Water Quality Program in the United States - Carl Evensen, University of Hawaii, Honolulu, HI, USA

The US Department of Agriculture implemented an innovative National Water Quality Program during the first decade of the 2000's which fully integrated research, extension and education to solve water quality problems at the national, regional, and local levels throughout the US. Although focusing particularly on agriculturally managed watersheds, the program broadly dealt with protection and improvement of water resources throughout the country, including urban areas, coastal zones, public lands and natural areas. The program emphasized the USDA's traditional ties to land-grant universities with their mix of education, research and extension (public outreach) responsibilities and was comprised of 10 regional projects as well as representatives of Historically Black and Native American Universities. The broad representation of the whole country and integration of research, extension and education made this program unique in USDA's history of water quality initiatives. In this presentation, I provide my perspective as the state water quality coordinator from the State of Hawaii who participated in the national program from its inception in 2000 to the end in 2011.The National Water Quality Program was a partnership between the USDA Cooperative States, Research, Education and Extension Service (CSREES) and the land-grant institutions across the US. With funding from CSREES, 10 Regional Coordination Projects were created to promote multistate and multiregional collaboration and enhance delivery of successful water programs. The 10 regions were identical with US Environmental Protection Agency (EPA) regions and collaboration with EPA and other federal agencies, like the US Geological Survey and the Natural Resources Conservation Service was encouraged and enhanced through interagency meetings and projects. The national program, while emphasizing local needs and solutions, did identify 8 key themes for nationwide attention; 1) Animal manure management, 2) Drinking water/human health, 3) Environmental restoration, 4) Nutrient and pesticide management, 5) Pollution assessment and prevention, 6) Water management and conservation, 7) Water policy and economics, and 8) Watershed management. These themes encouraged sharing of successful programs and solutions to problems across all regions.I will present examples of the successful collaboration of the Southwestern States and Pacific Island (Region 9) both internally and externally with other regions. One of the best aspect of this national program was to acquaint water scientists and educators was colleagues across the country, in many cases for the first time, which led to very productive sharing of research findings, educational curricula, policy initiatives and innovative ideas. While very successful, this national program ended with a change of Administration and legislative mandate in USDA which replaced CSREES with the National Institute of Food and Agriculture, which has a more research-driven and global focus on food security, climate change, sustainability and food safety. While many of us involved in the national water quality program lamented its end, we agree that it was a great experience that created national connections between colleagues and regions which persist to today. I will end the presentation with lessons learned from participation in the National Water Quality Program.

Risk Assessment of Drought Hazards Based on Water Resources Vulnerability in Guangdong Province, China - Yongqin David Chen, Department of Geography and Resource Management, Shatin, Hong Kong, People's Repubic of China (co-author: D. Hua)

Droughts have repeatedly occurred over the past decades and have inflicted significant damage to human society and ecological environment. In reality drought is a complicated phenomenon caused by combined actions of the admixtures of meteorological, hydrological, ecological, and socioeconomic factors. Therefore, it is of great significance to have a better understanding of droughts from the physical dimension as a natural hazard and from the socioeconomic dimension as a response. This study aims to develop a joint assessment system to assess the risk of droughts from physical dimension (i.e.

duration, severity, occurrence frequency and spatial patterns) and from the socioeconomic dimension (i.e. water resources vulnerability, exposure, sensitivity, and adaptability). For the physical dimension, the study has focused on characterizing the changing properties of droughts in both time and space in Guangdong province. Univariate and bivariate frequency analysis of drought duration and severity using Copulas were conducted to investigate the spatial distribution of droughts based on the joint probability distribution in Guangdong province. The quartiles descriptive statistical approach and spatial interpolation were used to map the spatial frequency distribution for the marginal distribution and joint occurrence probability of drought duration and severity. Cluster analysis was employed to characterize the spatial pattern. Results show that the Exponential distribution and Gamma distribution are applicable to fit drought duration and drought severity in water rich regions; the drought properties in water rich regions have their own unique features so there might not be a best copula for a region but a best copula for a site; further analysis demonstrated that the Gumbel Copula outperformed marginally than Frank Copula in the relatively dry regions of Guangdong Province and may serve as a reference for Copulas selection for droughts in other humid regions; the quartiles descriptive statistical approach enables comparison of the risk of drought properties among the meteorological stations and allows recognition of the spatial distributions of droughts in a multi-scale way. Spatial patterns based on cluster analysis indicate that total precipitation is not the only factor that influences the drought occurrence for a certain region, the temporal uneven distribution of precipitation also plays an important role, which may provide valuable information for site selection for water conservancy projects.For the socioeconomic dimension, water resources vulnerability are measured, and a drought vulnerability assessment index system has been developed and a drought vulnerability map of Guangdong has also been produced based on the typical regional drought vulnerability indicators, mainly based on the water resources demand and supply indicators, land indicators, population and GDP indicators and so on. The combination of the drought hazards physical characteristics with the water resources vulnerability index system will lead the drought risk assessment system to be of great importance for sustainable management and adaptation of water resource resilient to the changing climate and socioeconomic development in Guangdong province, China.

San Francisco Bay - Climate Adaptation Challenges and Solutions – Warner Chabot, San Francisco Estuary Institute, San Francisco, CA

The Regional Monitoring Program (RMP) is SFEI's largest program and monitors contamination in the Estuary. It provides water quality regulators with information they need to manage the Estuary effectively. The RMP is an innovative collaborative effort between SFEI, the Regional Water Quality Control Board, and the regulated discharger community. The RMP has combined shared financial support, direction, and participation by regulatory agencies and the regulated community in a model of collective responsibility. The RMP has established a climate of cooperation and a commitment to participation among a wide range of regulators, dischargers, industry representatives, non-governmental agencies, and scientists. The RMP provides an open forum for interested parties to discuss contaminant issues facing the Bay. Stable funding has enabled the RMP to develop long-term plans. In addition, Special Studies provide an opportunity to adapt to changing management priorities and advances in scientific understanding. RMP committees and workgroups meet regularly to keep the Program efficient, focused on the highest priority issues, and to ensure that RMP science is sound. The RMP has continually improved since its inception in 1993. The RMP has produced a world-class dataset on estuarine contaminants. Monitoring performed in the RMP determines spatial patterns and long-term trends in contamination through sampling of water, sediment, bivalves, bird eggs, and fish, and evaluates toxic effects on sensitive organisms and chemical loading to the Bay. The Program combines RMP data with data from other sources to provide for comprehensive assessment of chemical

contamination in the Bay. The RMP provides information targeted at the highest priority questions faced by managers of the Bay. The RMP produces the Annual Monitoring Results which document the activities of the program each year, a summary report (Pulse of The Bay), technical reports that document specific studies and synthesize information from diverse sources, and journal publications that disseminate RMP results to the world's scientific community. The RMP website provides access to RMP data, information products, and links to other sources of information about water quality in San Francisco Bay.