California NWR Water VA

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Location/Scale: National Wildlife Refuges in California, Nevada, and Klamath Basin. Adequate water supply (quantity and timing) is critical for the function of most National Wildlife Refuges. Incorporation of predicted climate-change impacts to species and land-management plans, programs, and activities is required to better understand potential underlying constraints, such as water supply, to meeting current and planned habitat management objectives. Climate change may result in substantial changes or increases in constraints (temporal or quantitative) to established water rights and water supply scenarios. However, much readily available information pertaining to the predicted effects of climate change on water resources is too broad in spatial scope or lacks enough specific information to understand impacts at the refuge scale. Use of downscaled climate variability and climate change water balance models can inform refuges about the implications of climate change on water supply and wetland management which is a critical component for development of monitoring strategies and conservation planning.

Scale/focus: Use of a downscaled water balance model to address the impacts to water availability and water supply at one highly managed National Wildlife Refuge in northeastern California will help determine the best ways to use this model to inform management at that scale. Partners at the U.S. Geological Survey California Water Science Center (USGS) and University of California, Davis Information Center for the Environment (UCD ICE) have developed and are continually improving a regional water balance model (Basin Characterization Model, BCM) which is driven by high resolution (270 meter) downscaled precipitation and temperature data that is used to characterize water budget at the land surface.

Objectives: Using BCM, 1.) predict the effect of climate change on water supply and availability and 2.) analyze potential and actual evapotranspiration (climate water deficit) on the refuge footprint (within and/or near refuge boundaries).

Address the following questions: 1.) What is the current natural variability of basin discharge (amount, timing of delivery of water, and frequency of extreme events) in refuge water supply basins, and how have these streams been altered by human diversion? 2.) How will climate change affect the amount, frequency of extreme events, and timing of delivery of water in streams that supply water for one highly managed National Wildlife Refuge? 3.) What currently are the general water balance properties within the refuge (annual and seasonal recharge, runoff and climatic water deficit? 4.) How will climate change affect these water balance properties in the future and what are the implications for wetland and habitat management?

Results from this phase can be used to determine the resources needed to extend this analysis to additional refuges in the Pacific Southwest Region, and demonstrate the utility of using data from BCM to address issues of refuge water budget for use in habitat management planning.

Status: U.S. Fish and Wildlife Service, U.S. Geological Survey, and University of California, Davis, are currently working on phase 1 (pilot refuge). At the end of this project, a proposal to extend this analysis to additional refuges will be developed by the end of FY 2013.