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# Co-creating Understanding in Water Use & Agricultural Resilience in a Multi-scale Natural-human System: Sacramento River Valley--California’s Water Heartland in Transition

## Details

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## Abstract

The Sacramento River Valley (SRV), valued for its \$2.5 billion agricultural production and its biodiversity, is the main supplier of California’s water, servicing 25 million people. . Despite rapid changes to the region, little is known about the collective motivations and consequences of land and water use decisions, or the social and environmental vulnerability and resilience of the SRV. The overarching research goal is to examine whether the SRV can continue to supply clean water for California and accommodate agricultural production and biodiversity while coping with climate change and population growth. Without understanding these issues, the resources of the SRV face an uncertain future. The defining goal is to construct a framework that integrates cross-disciplinary and diverse stakeholder perspectives in order to develop a comprehensive understanding of how SRV stakeholders make land and water use decisions. Traditional approaches for modeling have failed to take into consideration multi-scale stakeholder input. Currently there is no effective method to facilitate producers and government agencies in developing a shared representation to address the issues that face the region. To address this gap, researchers and stakeholders are working together to collect and consolidate disconnected knowledge held by stakeholder groups (agencies, irrigation districts, and producers) into a holistic conceptual model of how stakeholders view and make decisions with land and water use under various management systems. Our approach integrates a top-down approach (agency stakeholders) for larger scale management decisions with a conceptual co-creation and data gathering bottom-up approach with local agricultural producer stakeholders for input water and landuse decisions. Land use change models that combine a top-down approach with a bottom-up stakeholder approach are rare and yet essential to understanding how the social process of land use change and ecosystem function are linked. Data gathered in a survey of agency stakeholder perspectives on how producers operate with respect to crop types, fallowing and water transfers, production components and land changes were compared with monitoring data (1990-2011) covering two drought emergency time periods in the state. Results show that a synthesis is required between top-down and bottom-up approaches to understand land-use dynamics, as decision makers had a limited understanding on water and land-use decisions by land owners at the farm level. A major goal is to create a high level of transparency and stakeholder buy-in by co-developing a model of the system. The approach captures context-based parcel level changes that include the range of variability in natural-human systems such as decisions stakeholders make during drought vs. non-drought years. These decisions are crucial to understanding the tensions that current and future land-use change dynamics will place on the vulnerable hydrological system of the SRV. Knowledge gained through this effort will provide a rigorous conceptual understanding of how the primary land and water stakeholders in the SRV obtain and use water to accommodate competing interests of local agricultural production and resilience, environmental management, and regional and state water needs.

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