

Western Water and Power Solution Bulletin

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Sustaining Habitat Health and Salt Balances in Wetlands

Developing optimal wetland management strategies in response to salinity discharge limits

What Is The Problem?

The Grasslands Ecological Area (GEA) in western Merced County, California contains the Grassland Water District, San Luis National Wildlife Refuge Complex, and the Los Banos Wildlife Management Area Complex, with nearly 140,000 acres of wetlands, grasslands, riparian habitats, and conservation easements on private lands. These managed wetlands constitute most of the remaining wetlands in California's Central Valley and are extremely important to Pacific Flyway waterfowl.

In 2003, the California Regional Water Quality Control Board released a Total Maximum Daily Load (TMDL) standard for salinity in the San Joaquin Basin. Managed wetlands which release water to the San Joaquin River are subjected to the same salt load discharge limits as agricultural operations under this TMDL. However, the Board allows a waiver of strict Waste Discharge requirements for basin dischargers if they demonstrate coordinated salt management under a real-time water quality management program. We are meeting this challenge by researching and developing innovative wetland salinity control practices and decision support tools.

What Is The Solution?

The Science and Technology Program sponsored some of the first field-based research in the GEA to develop telemetered sensor networks for wetland hydrology. These monitoring systems included technologies to estimate wetland evapotranspiration, seepage, and salt loading into and out of the ponds. This initial research was supplemented by more than two million dollars in non-federal competitive research grants which helped build the current web-based real-time flow and water quality monitoring network of almost sixty stations. These stations are used to characterize the current system and for future operations. Data are used to meter and schedule salt loads from the combined wetlands to fall within the salt load assimilative capacity in the San Joaquin River assigned to these wetlands.



Real-time telemetered flow and salinity monitoring stations.

Water and salinity balances are an important first step in developing a wetland simulation and forecasting model. Quantifying wetland hydrology is technically difficult because water and salinity balance data are lacking, because water uptake by the diversity of wetlands plants is hard to predict, and because soil seepage is highly variable due to differences in soil texture. Further, evaporation rates can deviate by more than 20 percent from theoretical estimates. Accurately quantifying seasonal wetland hydrology is essential to assess the effectiveness of seasonal wetland management practices needed to comply with the salinity objectives.

Who Can Benefit?

Managers have been improving their understanding of wetland hydrology—developing better understanding between water deliveries, moist-soil plant water requirements, and habitat response to manage these wetlands effectively. Many of these technologies and implementation techniques can be adopted in wetlands across the Reclamation service area.

Where Have We Applied This Solution?

The current monitoring network includes sites in private, federal and state wetlands – all three entities will need information on salt loads contained in their ponds to permit collaborative scheduling for wetland drainage as mandated under the TMDL and real-time water quality management program. In three years, the telemetered, real-time flow and salinity monitoring network has had a profound effect in encouraging more quantitative wetland water management, encouraging innovation and promoting an understanding of the relationship between wetland water and salt management.

Future Development Plans

Full implementation of real-time wetland salinity management in the San Joaquin Basin will likely take more than a decade. The wetland pilot project shows the development work needed basin-wide.

More Information

Quinn et al., 2010. Use of environmental sensors and sensor networks. *Env. Mod. and Software.*, 25, 1045-1058.

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Collaborators

Wetland staff within Grassland Water District and the California Department of Fish and Game and scientists at Berkeley National Laboratory and UC Merced have been active supporters.