Implementation of Wetland Adaptive Water Quality Management Strategies under Real-Time Salinity TMDLs

Thomas C. Harmon
Environmental Systems Program
University of California, Merced

Nigel Quinn
Hydroecological Engineering Advanced Decision Support
Lawrence Berkeley National Laboratory
& University of California, Merced

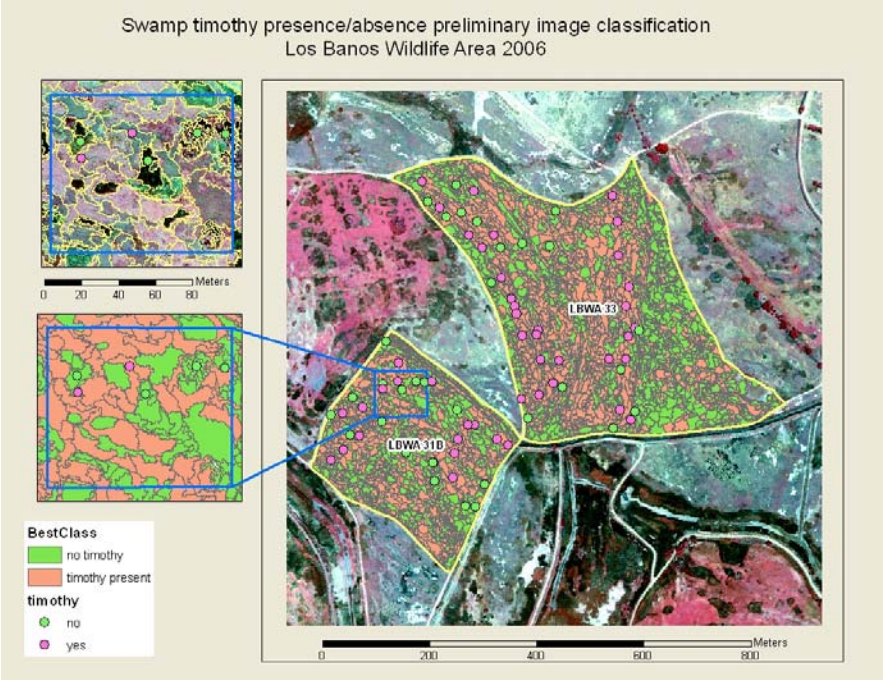
A comprehensive ecological monitoring program is described in this proposal to measure and quantify potential long-term impacts of real-time wetland salinity management on wetland habitat and the health of the biological resource.

This project is aimed at developing and testing a pilot-scale real-time water quality management relevant to managed wetlands in the San Joaquin River Basin. Restoration and improvement of seasonal wetlands is an important part of the overall plan to improve water and salinity management in the Central Valley and the San Francisco Bay-Sacramento Delta region. The use of seasonal wetland habitat by over-wintering waterfowl and shorebirds degrades the water supply delivered to private duck clubs and to State and Federal Refuges from the Delta. Returning drainage from the wetlands contains further elevated salts, carbon and nutrients as a result of bird use, the life cycle of other biota and invertebrates, decaying aquatic vegetation, wind-blown sediment and natural evapotranspiration processes.

This research centers around six pairs of experimental seasonal wetland units in the Grassland Water District. For each pair we are comparing traditional management practices with a delayed seasonal drawdown timed such that it provides benefits to San Joaquin River water quality. Progress over the first year of the project has been made in five main areas:

- Radio-telemetry stations equipped with autosamplers, electrical conductivity, temperature and stage sensors have been constructed and are undergoing testing at the inlet and outlet of each wetland unit to measure salt fluxes under both management regimes.
- High resolution multispectral imagery was acquired for the project study area. Features of this imagery are now being classified and checked for accuracy using ground truth data. A map showing estimated presence or absence of *Crysis schoenoides* (swamp timothy) at Los Banos wildlife area is shown below.
- Fabrication of an ATV-mounted electromagnetic soil salinity sensing system used to map seasonal wetland soil salinity in traditional and adaptively managed units.
- Design and fabrication of stationary sensor arrays observation of wetland pond salinity. The stationary arrays, or javelins, will enable continuous monitoring of moist soil conditions in the wetlands.
- Design and fabrication of a robotic device called “Sensoduck” will enable pond salinity and temperature mapping through remote controlled and eventually autonomous adaptive sampling routines.

Supplemental funding, through a California Department of Water Resources Proposition



204 grant, will support instrumenting the wetland units for observing spatiotemporal salinity and temperature distributions in pond water and underlying sediments. This will enable us to gain a process level understanding of the distributed moist soil plant conditions which prevail under the two management practices.

Professional Presentations

Quinn, Nigel W.T. and Josephine R. Burns, New Tools for Ecological Impact Assessment in Managed Seasonal Wetlands, LBL ES Departmental Review, April 11-12, 2006. (poster)

Harmon, Thomas C., Roger Bales, Samuel Traina, Deborah Estrin, and William Kaiser, Observing, Forecasting, and Managing a CLEANER California Water Cycle, American Geophysical Union Annual Spring Meeting, Baltimore, MD, May 24, 2006.

Harmon, Thomas C., John Ewart, Christopher Butler, and others, CENS Contaminant Transport Observation and Management Research Overview, Center for Embedded Networked Sensing (CENS) Annual Site Visit, Los Angeles, CA, June 14, 2006. (poster)

Burns, Josephine R. and Nigel W.T. Quinn, LBNL-60747: Use of Geospatial Technologies to Compare Environmental Impacts of Wetland Delayed Drawdown in California's San Joaquin Basin, Society for Conservation GIS, June 24-28, 2006. (poster)

Burns, Josephine R., Fuzzy Classification of Wetlands Vegetation Using Object Based Image Segmentation, USBR project review at LBNL, January 17, 2006.

Burns, Josephine R., Classification of Wetlands Vegetation Using Object Based Image Segmentation, CAMFER seminar, UC Berkeley, February 15, 2006.

Collaborative Efforts

Josephine Burns and Katherine Burns, *Lawrence Berkeley National Laboratory;* John Beam, William Cook, and Ricardo Ortega, *California Department of Fish and Game;* Don Marciochi*, Grassland Water District;* Joe Tapia**,** Ernie Taylor**,** and Stuart Itoga*, California Department of Water Resources;* Deborah Estrin, *UCLA* and Guarav Sukhatme, *USC.*

California DWR participation is through a Proposition 204 grant to support supplemental work on this project.

UCLA and USC participation is through the National Science Foundation Center for Embedded Networked Sensing (CENS).

For further information please contact:

Tom Harmon
tharmon@ucmerced.edu
(209) 724-4337
www.ucmens.net

Nigel Quinn
nwquinn@lbl.gov
(510) 486-7056
www-esd.lbl.gov/ESD_staff/quinn/