

Where is the water? Using satellites to understand the impact of drought on surface water and waterbird habitat in the Central Valley of California

Matt Reiter, PhD
mreiter@pointblue.org

The Central Valley is largely agricultural, but also has most of California's remaining freshwater wetlands and is the State's water distribution hub. California's water is in increasingly high demand as climate changes and human populations increase. To be efficient and effective with the use of water, particularly given multiple needs (i.e. humans, wildlife, farmers), water managers need accurate estimates of water distribution.

Point Blue, with The Nature Conservancy, used Landsat satellite imagery to measure the distribution of open surface water across the Central Valley every 16 days from 2000 - 2011, assess factors influencing the amount of water, and summarize changes in water during the study period.

Between 2000 and 2011, open surface water declined during July, August, September, and October by 1 - 3% per year. Drought years reduced open surface water an additional 1 - 23% in July, September, and October, though the magnitude

and timing depended on location. During drought years, water declined immediately in the southern Central Valley, but such declines took an additional year following a drought to be evident in the northern Central Valley.

Overall, most open surface water in the Central Valley was on agricultural lands, followed by rivers, lakes, and wetlands. There was more water in rivers and lakes in late summer and early fall compared to agricultural lands, where water cover increased in the late fall and early winter. Our data were consistent with previous descriptions of waterbird habitat availability in agriculture in the Central Valley. The amount of water increased dramatically in November and December each year, coinciding with the flooding of rice fields after they were harvested for stubble decomposition.

Satellites now provide important information about where the water is and, in California, where the water is reflects changing water policy, land-use, drought, climate, and water management decisions.

Knowing where the water is can help managers make informed decisions to balance water needs for wildlife and people.

Main Points

From 2000-2011, surface water across the Central Valley declined 1 - 3% per year July - October.

Drought reduced surface water more immediately in the southern Central Valley than in the northern Central Valley.

We confirmed previous estimates of the extensive habitat availability for waterbirds in rice and other wildlife-friendly crops from late October through December as well as highlighted the lack of habitat July through September.

Landsat satellite imagery can measure the distribution of open surface water across the Central Valley every 16-days to provide near-real-time data for water management.

M.E. Reiter, N. Elliott, S. Veloz, D. Jongsomjit, C. M. Hickey, M. Merrifield, and M. D. Reynolds, 2015. Spatio-Temporal Patterns of Open Surface Water in the Central Valley of California 2000-2011: Drought, Land Cover, and Waterbirds. *Journal of the American Water Resources Association* 54:1722-1738; DOI: 10.1111/1752-1688.12353