

# California's almond boom has ramped up water use, consumed wetlands and stressed pollinators

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A new study using aerial imagery across the state of California has found that converting land to grow almonds between 2007 and 2014 has led to a 27% annual increase in irrigation demands—despite the state's historic drought. The expansion of almonds has also consumed 16,000 acres of wetlands and will likely put additional pressure on already stressed honeybee populations.

The conversion of lands to almond orchards was sparked by a rapid growth in demand and rising almond prices. Consumption of [almonds](#) has jumped 200% since 2005 and almond prices rose from about a dollar per pound in 2000 to a peak of around \$5 per pound in 2014 according to the study's author.

"We were initially investigating pollinators," explains Kelly Watson, an Assistant Professor of Geosciences at Eastern Kentucky University. Almonds are entirely dependent on domestic honeybees for pollination, and each almond tree has tens of thousands of flowers, she explained. But when she and her student Larissa Watkins started looking at the land conversions to almonds, and mapping it out using geographic information systems (GIS) tools, they soon started to wonder about the effects on water use.

"We looked at data between 2007 and 2014," Watson says, referring to the aerial images from the National Agriculture Imagery Program

(NAIP). "We did this pixel by pixel for the entire state of California."

What they found was a 14% increase in almond acreage over those years. But instead of it all being former cotton or tomato fields, a lot of the new almond orchards were formerly natural landscapes, including wetlands.

"If you look at the land-use, 23,000 acres were converted from natural landscapes," says Watson. "More than 16,000 acres were converted from land classified as wetlands to almonds."

Of the agricultural land converted to almonds, a lot of it was formerly corn, cotton, winter wheat and tomatoes, which use less water than almonds. In other places the reverse was true—more water-intensive crops like sugar beets, alfalfa and clover were replaced by almonds trees, and the irrigation demands were reduced. The net overall irrigation change, however, was a 27% annual increase in the amount of irrigation from 2007 to 2014.

The work is being presented on Wednesday at a poster session at the annual meeting of the Geological Society of America meeting in Denver and the research submitted to Nature Publishing's open access journal, *Scientific Reports*.

"The next thing we want to tackle is what the increase in almonds will mean for the demand on pollinators," says Watson. "Seventy percent of our managed honeybees in the U.S. go to pollinate almonds in California."

That means a lot of bees from different locations coming to one location and mixing—increasing the chances of diseases spreading. It also subjects bees to a very limited diet of only almond nectar—and potentially exposes them to pesticides. The stress of transporting bees

across the country also takes a toll.

"If you look at what's driving honeybee declines, industrial agriculture certainly plays a major role," Watson says.

**More information:** *Scientific Reports*,  
[gsa.confex.com/gsa/2016AM/webp...ram/Paper285205.html](https://www.gsa.confex.com/gsa/2016AM/webp...ram/Paper285205.html)

Provided by Geological Society of America

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