# Winter Water Management in Almond Orchards

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## PROJECT SUMMARY

### Objectives for current year:

- Conduct field studies to test the effectiveness of winter/late spring irrigation as a sustainable groundwater recharge strategy
- Document any negative or positive effects of winter irrigation on almond yield, water status or root development
- Determine the threshold level of dormant tree water stress (SWP) indicating the need for pre-bloom irrigation in dry winters

### Background and Discussion:

A number of factors have led to a reduction in groundwater recharge in California, and in some parts of the state groundwater levels have exceeded historic lows. In order to sustain water security and agricultural production in California a new technology is explored where farmland (e.g. almond orchards) is flooded during the winter using surface water to recharge the underlying groundwater. Applying excess surface water, when and where available, to almond orchards during dormancy, could potentially save surface water for use to respond to critical environmental needs such as enhanced environmental streamflow. A key assumption of this approach, however, is that almond trees will need to tolerate saturated or near saturated soil conditions during dormancy and/or late spring. An equally important question is whether winter irrigation is necessary during dry years and whether dormant almond trees are negatively impacted by drought during dormancy.

Three field sites (Delhi, Modesto, Selma) were instrumented to document the movement of applied water beyond the root system, and to document root health and tree productivity during and after the recharge period. Due to lack of water at Selma, comprehensive data was only collected at Delhi and Modesto. Water for recharge was applied at these sites in late December and early January 2016. At the Modesto site soils remained saturated for up to 48 hours after each water application, while the soil water content at the much sandier Delhi site returned to pre-flooding conditions within 12 hours after each water application. Immediately following these events at both sites, midday stem water potential (SWP) was slightly higher (wetter) in the recharge treatment compared to the control, but was not different from the control at the Modesto site for the rest of the season. At the Delhi site, SWP remained somewhat wetter in the recharge treatment compared to the control through July. 2015 and 2016 yield data also showed no negative impact of winter recharge on yield at either site. Root data is currently being analyzed, but trees at Modesto generally produced many more roots than trees at Delhi.

A preliminary pot study to determine the impact of drought during dormancy indicated that severe stress (SWP lower than -10 bar, more stressed than any field observation thus far) followed by irrigation prior to bloom, delayed bloom by about 1 week. However, even for these stress values, the average final percentage of bloom remained above 80%. Also there appeared to be no damage to flowers, as normal fruit set and embryo growth were observed in the flowers of dormant stressed trees. These preliminary results suggest that dormant trees and flowers may be relatively tolerant of water stress in almond, and that during dry winters, waiting to irrigate until close to the end of the dormant period may be a reasonable strategy.

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**Project Cooperators and Personnel:** Roger Duncan, David Doll, and Elizabeth Fichtner UCCE- Stanislaus, Merced, Tulare Counties respectively

**For More Details, Visit**

- Poster location 75 Exhibit Hall A + B during the Almond Conference; or on the web (after January 2017) at Almonds.com/ResearchDatabase
- 2015 - 2016 Annual Reports CD (15-PREC9/9A-Shackel-Dalhke-Volder) or on the web (after January 2017) at Almonds.com/ResearchDatabase
- Related Projects: 16-WATER7-Horwarth/Dahlke, 16-PREC5-Volder; 16-STEWCROP4A-Kimmelshue