Improving Water Management During the California Drought: Snow Model and Airborne LiDAR

ARS and NASA JPL Partnership

Transitioning Research Tools for Operational Applications
The Western US Drought

- Widespread, multi-year drought
- Intensified by warming temperatures, increasing demand
- Economic Impacts:
  - Estimated loss of $2.2 billion to agriculture (2015)
  - Energy production
  - Natural habitat
  - Land subsidence
  - Increased wildfire activity
  - Thousands of jobs lost

February 3, 2014
October 5, 2014
The California Drought

- Very low reservoir inflows from the snow-dominated high Sierra
- Earlier peak discharge impacts late summer water supply for agriculture
- Operational forecasting models are unreliable during droughts

Hetch Hetchy reservoir – San Francisco water supply
How does 2015 Compare?

- 45 years of inflow to Hetch Hetchy reservoir
- Longest drought on record, 2015 historical low
The Airborne Snow Observatory

- Basin-scale airborne monitoring in the high Sierra
- LiDAR and Spectrometer
- Produces high resolution snow depth and albedo maps (3m)
- Product shared with Hetch Hetchy water managers and other stakeholders for operations
**iSnobal**: the ARS snow model
Providing densities to determine SWE
Reynolds Creek Experimental Watershed & CZO
A Mountain Hydro-Climate Laboratory for the 21st Century

RCEW (239 km²)

- 32 climate stations
- 36 precipitation stations
- 7 EC systems
- 14 weirs (nested)
- 10 soil microclimate stations
- 4 hill-slope hydrology sites
- 5 instrumented catchments
- 3 instrumented headwater basins