

# 2017 Friant-NASA Snow Survey Program

## Cooperative Survey for the Upper San Joaquin River Watershed

### How Do Snow Forecasts Affect the Friant Water Supply?

The California Department of Water Resources (DWR) snow forecasts have been central to setting the Friant Division's water supply allocation. DWR orchestrates surveys throughout the state monthly, and uses their results to publish a runoff forecast for the summer. The central product in this forecast is the April-July runoff period, when peak water demands begin to occur and reservoir operators seek to maximize both deliveries and the chance of filling reservoirs for the summer ahead. Large historical errors in the forecasting methodology have led DWR to publish a range of possible runoff scenarios, which range from dry to wet.

The U.S. Bureau of Reclamation (Reclamation) relies on DWR's forecasts to determine the water supply allocation for Class 1 and Class 2 long-term contracts. These allocations have historically relied heavily upon the driest (most pessimistic) end of the range. In this manner, Reclamation has hedged against the known errors. However, opportunities have also been missed.

The NASA Airborne Snow Observatory (ASO) surveys offer a chance to capitalize on more opportunities. For example: in dry years, added precision could avoid unneeded financial hardships for Friant farmers, who might otherwise up-root acres of permanent crops in severe a drought because of overly conservative allocations. For wet years, where the anticipated runoff can be 10 times the capacity of Millerton Lake, the additional information will be invaluable in working early to manage your entire portfolio of water resources throughout the valley.

Both DWR and Reclamation have begun using these forecasts, to the extent possible, for both forecasts and operations. Adoption of these surveys by DWR and Reclamation was a central requirement for Friant participation in this program.

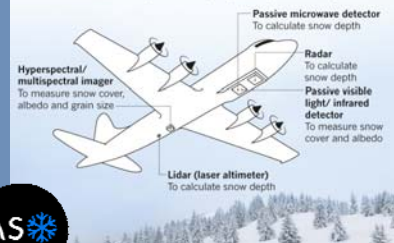
### How is Snow Being Measured?

This unpressurized aircraft, stationed at the Mammoth Lakes airport, carries a crew of three and all the remote sensing equipment needed for the California snow surveys. The size of the San Joaquin Basin necessitates three to four days of flights in order to complete a single survey.



#### EYES ON THE SNOW

Remote-sensing measurements could finally let scientists monitor Earth's snow resources—which provide drinking water for billions of people. NASA is planning to test various combinations of sensors to see which do best at quantifying how much snow lies on a landscape and how quickly it is likely to melt away.



### How is this Different than Conventional Snow Surveys?

Snow surveys were pioneered in the Sierra Nevada in 1917, consisting of a handful of permanent locations where snow was monitored on regular intervals. Beginning in 1929, the California Department of Public Works began using this data to estimate annual runoff patterns – the birth of the DWR Cooperative Snow Survey. Although the surveys have been expanded and improved over the past 100 years, a few point locations (31 exist in the San Joaquin Basin) are used to describe snow conditions for a large area (1,675 square miles above Lake Millerton).

Further, most snow falls within protected National Wilderness Areas where the surveys are prohibited or restricted heavily. The errors of the conventional approach can range from 20-40 percent, which leads to conservative decision making.

The map below shows the boundaries of Wilderness Areas, locations of conventional surveys, and the NASA ASO snow coverages for April 1, 2017. Total estimated snow water content was 2.2 million acre-feet.

The NASA ASO program overcomes the limitations of trying to extrapolate the Basin's water supply from a few point locations. For example, water users in the Tuolumne Basin have used these surveys to predict total runoff within 2 percent of actual measurements. Further, these aerial surveys overcome restrictions placed on Wilderness Areas. Having a more complete picture of basin conditions with less error will allow for earlier and more accurate water supply allocations for the Friant Division.

