

# Real Time Snow Water Equivalent (SWE) Simulation April 17, 2012 Sierra Nevada Mountains, California

## Introduction

This report is a beta product and subject to revision. We have developed a real-time SWE estimation scheme based on historical SWE reconstructions between 2000-2009, a near real time MODIS image, and daily in situ SWE measurements for the Sierra Nevada in California. Real-time SWE will be released on a weekly basis during the maximum snow accumulation/ablation period.

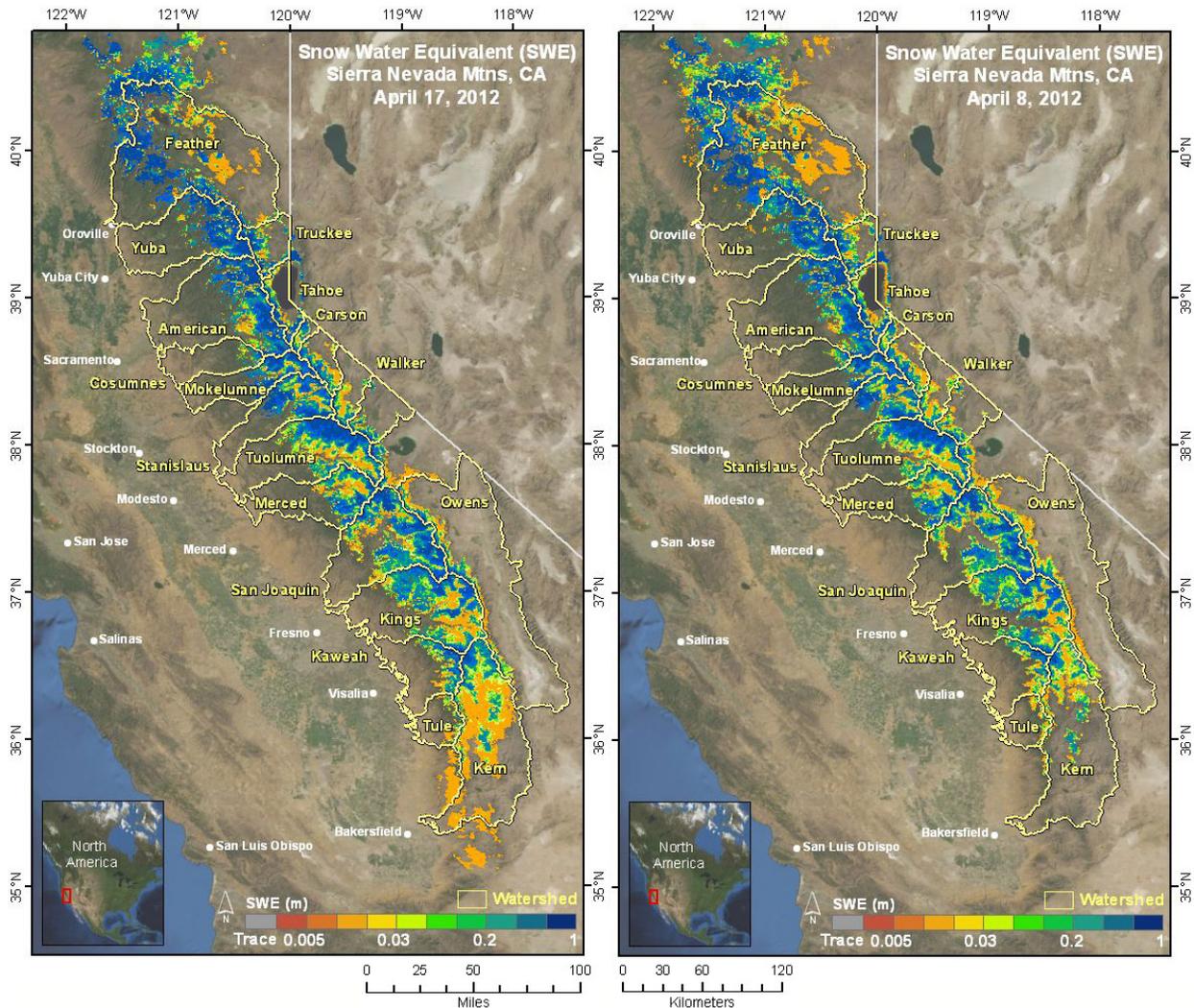


Figure 1. SWE amounts for April 17, 2012 are shown on the left and SWE amounts for April 8, 2012 are shown on the right.

## Discussion

The most recent cloud-free MODIS/MODSCAG image available is for April 17, 2012. Figure 1 shows SWE amounts for April 17, 2012 on the left and SWE amounts for April 8, 2012 on the right. Depth of SWE has increased between April 8, 2012 and April 17, 2012, with an increase in snow extent in the south and decrease in the Feather Watershed. Most watersheds are affected by the increased snowpack. Figure 2 shows the percent of average SWE for April 17, 2012 for the snow-covered area on the left. Note that all areas have a higher % of average from last week. On the right is percent of average for April 17, 2012 shown by watershed. Table 1 shows the average SWE by watershed for 4/17/2012, 4/8/2012, the percent of average for 4/17/2012 and the change between 4/8/2012 and 4/17/2012 for all areas above 3000 feet.

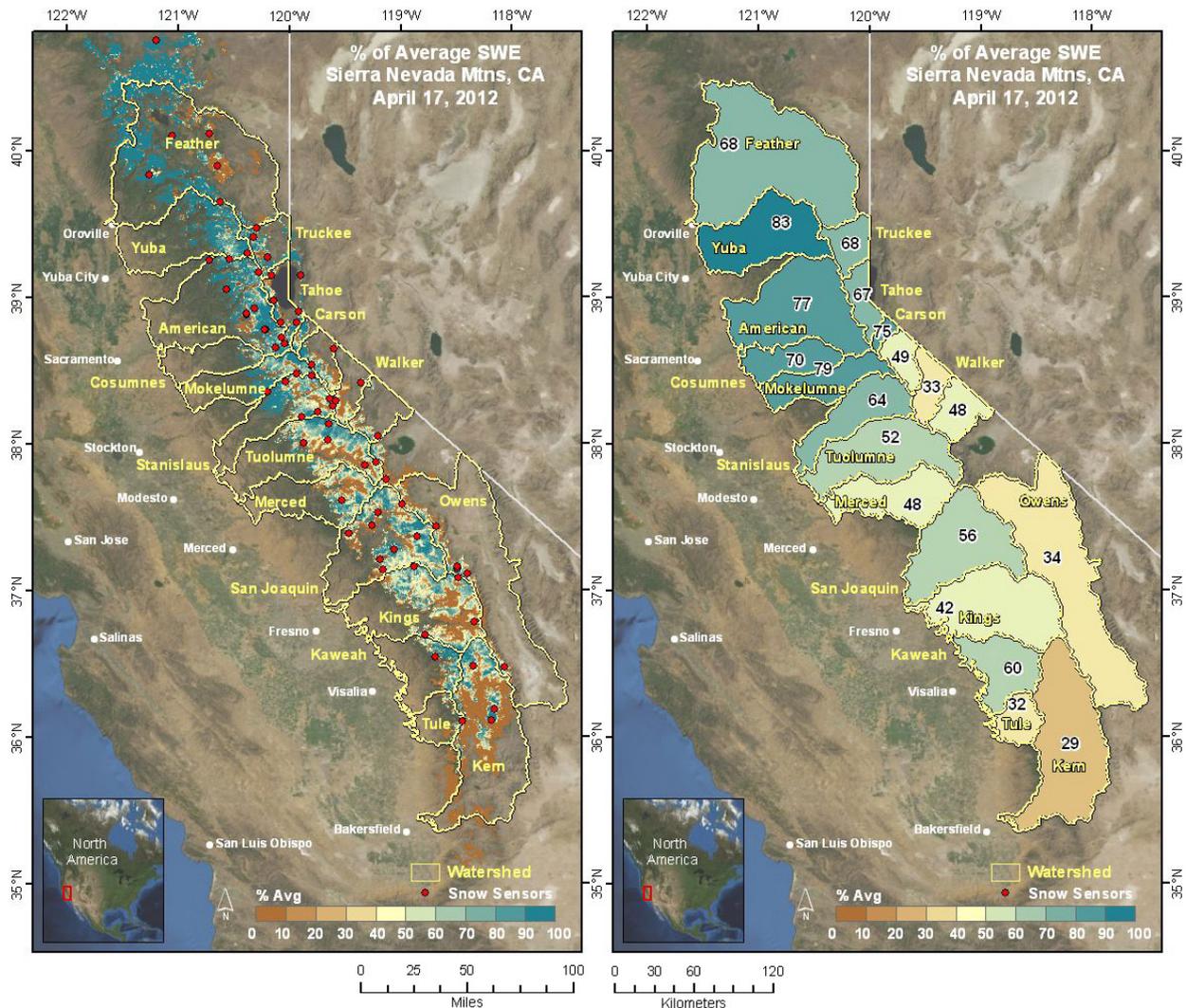


Figure 2. Percent of average SWE for April 17, 2012 for the entire Sierra (on left) and by watershed (on right).

## Methods

Results for the date of April 17, 2012 are based on April 17, 2012 real-time data from 70 in situ SWE measurements distributed across the Sierra Nevada, one Moderate Resolution Imaging Spectroradiometer (MODIS)/Terra Snow cover daily cloud-free image (Hall, et. al.) which has been processed using the MODSCAG fractional snow cover program (Painter, et. al.), a normalized reconstructed SWE image for March 1, 2006, and an anomaly map based on 10 years of modeled SWE (2000-2009). This year the near real time SWE product is an iterative process, we are refining the processing as we get better data and develop better methodology. Relative to snow stations and the NWS SNODAS product, the reconstructed SWE product correlates strongly with full natural flow, especially late in the snowmelt season (Guan, et. al.).

Table 1. Mean SWE above 3000 feet for 4/8/2012, shown by watershed.

Watershed	4/17/12 SWE (in)	4/17/12 % Avg to Date	4/8/12 SWE (in)	4/8 thru 4/17 Change in SWE (in)
AMERICAN	22.03	76.72	20.78	1.25
FEATHER	22.30	68.37	15.29	7.01
KAWEAH	13.36	59.68	10.98	2.38
KERN	4.80	28.87	6.87	-2.07
KINGS	11.42	42.33	11.87	-0.45
TAHOE	20.81	66.54	17.40	3.42
MERCED	13.33	47.83	12.67	0.66
OWENS	8.41	34.34	6.49	1.92
SAN JOAQUIN	16.08	55.53	15.65	0.43
STANISLAUS	19.97	63.77	17.63	2.34
TRUCKEE	17.75	67.77	14.39	3.37
TUOLUMNE	16.49	52.37	16.29	0.20
YUBA	26.26	83.36	22.05	4.21
COSUMNES	12.28	70.25	11.59	0.69
MOKELUMNE	24.09	78.74	22.23	1.86
TULE	3.80	32.00	3.00	0.79
WEST WALKER RIVER	10.59	32.88	8.50	2.09
EAST WALKER RIVER	13.74	48.32	10.13	3.60
WEST FORK CARSON RIVER	16.06	74.94	14.36	1.69
EAST FORK CARSON RIVER	11.55	49.00	9.96	1.59

## Current Meteorology

Between April 8th and April 17th, 2012, snowfall totals are as follows:

Alpine Meadows	33"
Heavenly	8"
Mammoth	25"
Snow Summit	15"

This week there is lots of sun and spring temperatures, many Tahoe area ski resorts received over 200 inches for the season.

## Location of Past Reports

<ftp://snowserver.colorado.edu/pub/fromLeanne/forCADWR/>

## **References**

Guan, B., N. P. Molotch, D. E. Waliser, S. M. Jepsen, T. H. Painter, and J. Dozier: Snow water equivalent in the Sierra Nevada: Blending snow sensor observations with snowmelt model simulations. Submitted to *Water Resour. Res.*

Hall, D. K., G. A. Riggs, and V. V. Salomonson. 2006, updated daily. *MODIS/Terra Snow Cover Daily L3 Global 500m Grid V005*, March 4, 2012. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.

Painter, T.H., K. Rittger, C. McKenzie, P. Slaughter, R. E. Davis and J. Dozier: Retrieval of subpixel snow covered area, grain size, and albedo from MODIS. *Remote Sensing of the Environment*, 113: 868-879.