

SNODAS Data Product Tool Update

Water Availability Task Force, April 18, 2017



openwater
FOUNDATION

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Open Water Foundation

Social enterprise 501(c)3 nonprofit focusing on developing open source software and open data tools to help make better decisions about water resources. Water is a public resource, and water data and software tools should also be public.



open data | open software | open decisions

openwaterfoundation.org

Project Overview

- CWCB Severance Tax Project - \$50k budget
- Team led by the Open Water Foundation, Brendle Group as subcontractor
- Main goals of project, from scope of work:
 - Improve water resources data access and transparency
 - Help water managers visualize their supply basins
 - Improve information for water providers and customers

Project Need

- Some basins do not have monitoring stations (SNOTEL)
- Existing monitoring stations are not representative of snow conditions across the entire watershed
- Water managers lack late-season information because snow has melted out at observing stations

What is SNODAS?

Secure | https://www.nohrsc.noaa.gov/interactive/html/map.html?ql=station&zoom=&loc=37.57+N%2C+102.42+W&var=ssm_swe&d

National Operational Hydrologic Remote Sensing Center

Interactive Snow Information

Navigation Tools: Home, Help, Comments

37.012 N, 107.013 W

Redraw Map

Select Physical Element: Snow Water Equivalent

Select Date: 2017 April 18 07:00 UTC

☒ Snap to nearest time

Select Overlays:

Hydrologic Features

- ☐ RFC Basins ☐ Label
- ☐ Other Basins ☐ Label
- ☐ HUCs (6-digit)
- ☐ RFC Boundaries
- ☐ Rivers and Streams
- ☐ Lakes and Reservoirs

Political Features

- ☐ County Boundaries
- ☐ CWA Boundaries
- ☒ State Boundaries
- ☐ National Boundaries

Point Features

- ☒ Stations ☐ Label
- ☒ Cities ☐ Label
- ☐ Flight Lines ☐ Label
- ☐ Climate Stns. ☐ Label
- ☐ Skiing ☐ Label

Transportation Features

- ☐ Roads and Highways

Other features

- ☐ NSA Disc. Regions
- ☐ NSA Disc. Subregions
- ☐ NSA Modelling Tiles

Map Preferences

English units

- ☐ Legend below map
- ☒ Background image
- ☒ Hill shading
- ☐ High-contrast palette
- ☐ Title on image

800 pixels map width
450 pixels map height

Modeled Snow Water Equivalent forecasted for 2017 April 18, 7:00 UTC

Created 2017 Apr 17, 13:45 Z

Gridded observed snowfall images, seasonal totals, and data downloads in several formats can now be found on the [National Snowfall Analysis](#) page.

Directions:

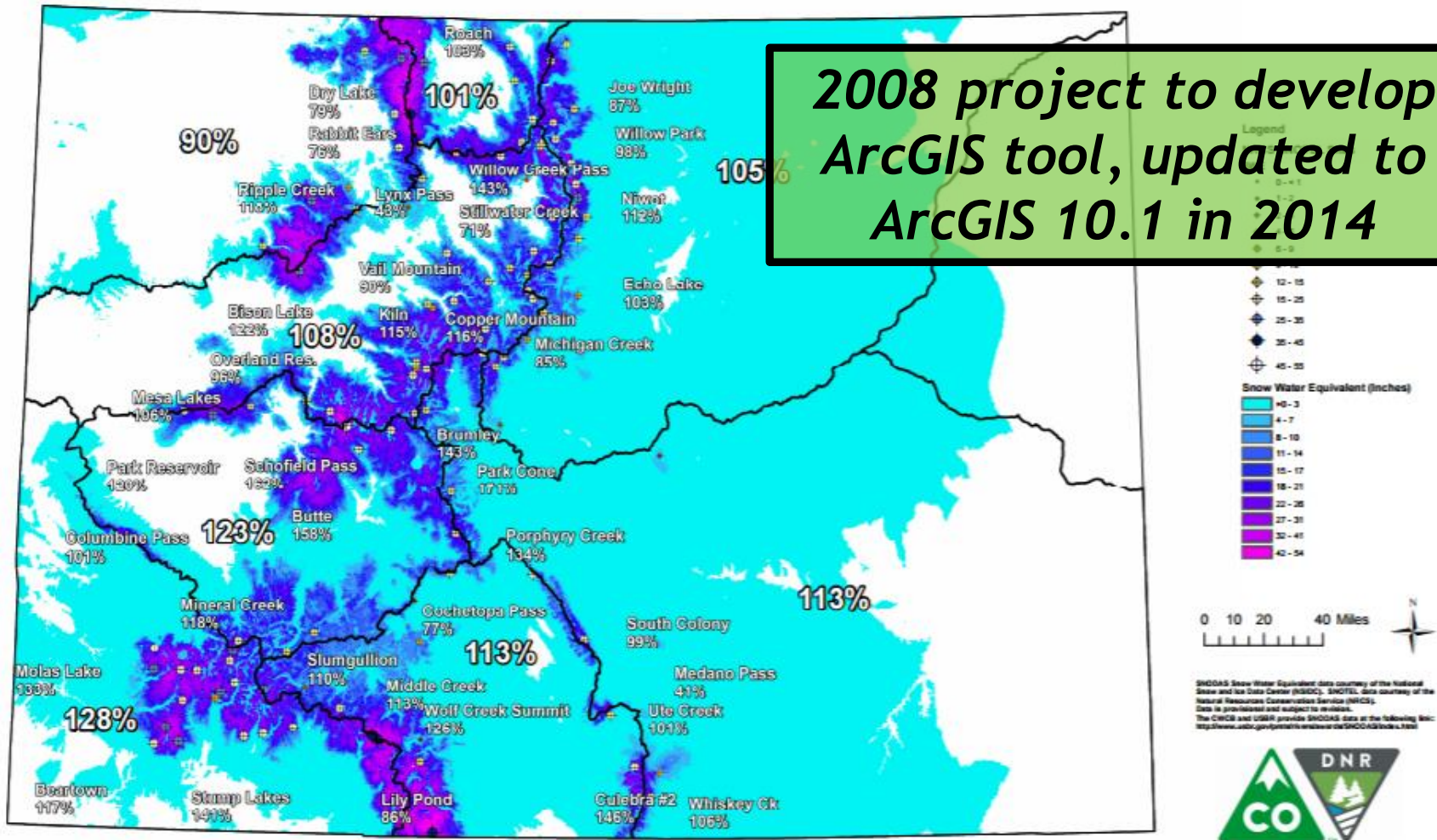
<https://www.nohrsc.noaa.gov/interactive/html/map.html>

- Select a physical element to view, select a date, select overlays, and click "Redraw Map."
- Clicking on the map while the Recenter button is selected (red) will recenter the map on that point.
- Clicking on the Zoom Control slider will zoom into or out of the map.
- Clicking on the map and dragging with the button held down while the Recenter button is selected (red) will zoom to a rectangle when the button is released.
- Stations and regions can be queried using the Query button and menu.

Vector GIS Datasets used by this page
Raster GIS Datasets used by this page

Previous CWCB Projects

Colorado - 2017 SNOTEL and SNODAS Snow Water Equivalent (SWE) 4/1/2017

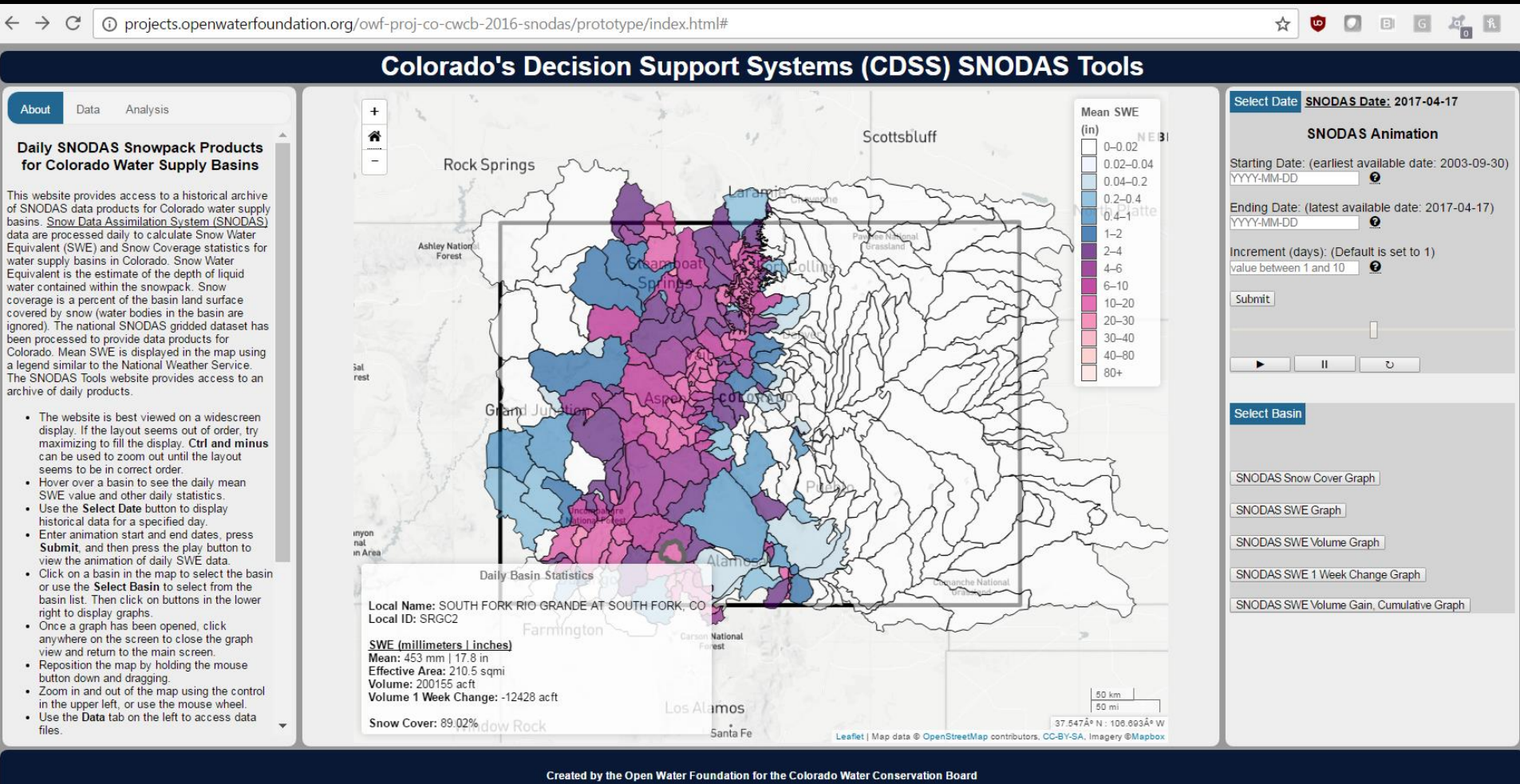


<http://cwcb.state.co.us/water-management/flood/pages/snodassnowpackmaps.aspx>

Previous CWCB Projects

- 2008-2009 - SNODAS map products for Rio Grande Water Conservation District
- 2012-2013 - SNODAS map products for Dolores Water Conservancy District
- 2015 - Open Water Foundation updated Colorado Surface Water Supply Index (SWSI) process.

Enhanced Snowpack Products



Select Date SNODAS Date: 2017-04-17

SNODAS Animation

Starting Date: (earliest available date: 2003-09-30)
YYYY-MM-DD

Ending Date: (latest available date: 2017-04-17)
YYYY-MM-DD

Increment (days): (Default is set to 1)
value between 1 and 10

Submit

▶ || ↺

Select Basin

SNODAS Snow Cover Graph

SNODAS SWE Graph

SNODAS SWE Volume Graph

SNODAS SWE 1 Week Change Graph

SNODAS SWE Volume Gain, Cumulative Graph

<http://projects.openwaterfoundation.org/owf-proj-co-cwcb-2016-snodas/prototype>

Approach

1. Download daily SNODAS SWE grid
2. Clip to Colorado basins
3. Calculate statistics for basins
4. Output to CSV, GeoJSON, Shapefile.
5. Process CSV files into time series graph products.
6. Publish to the web (80 GB total for 2003-2017)

Software:

- *QGIS, PyQGIS, GDAL for spatial processing*
- *Leaflet for web mapping*
- *TSTool for time series products*

Downloadable Data Files

About

Data

Analysis

The national SNODAS data are available from the [Snow Data Assimilation System \(SNODAS\)](#). The SNODAS data are processed into statistical data products by the CDSS SNODAS Tools. The output consists of comma-separated-value (CSV) files **ByDate** (basin data for each day) and **ByBasin** (historical period for each basin). Data files can be downloaded by accessing the following URL resources. The zip file contains a shapefile with daily statistics in the attribute table (attribute names have been truncated to adhere to shapefile limit).

<http://projects.openwaterfoundation.org/owf-proj-co-cwcb-2016-snodas/prototype/SnowpackStatisticsByBasin/SnowpackStatisticsByBasin.zip>

<http://projects.openwaterfoundation.org/owf-proj-co-cwcb-2016-snodas/prototype/SnowpackStatisticsByDate/SnowpackStatisticsByDate.zip>

<http://projects.openwaterfoundation.org/owf-proj-co-cwcb-2016-snodas/prototype/SnowpackStatisticsByDate/SnowpackStatisticsByDate.zip>

<http://projects.openwaterfoundation.org/owf-proj-co-cwcb-2016-snodas/prototype/SnowpackStatisticsByDate/SnowpackStatisticsByDate.zip>

The following static resources are also available:

http://projects.openwaterfoundation.org/owf-proj-co-cwcb-2016-snodas/prototype/json/CO_boundary.geojson (State of Colorado rectangular boundary)

[json/SNODAS_CO_BasinBoundaries.geojson](#) (basin boundaries, same as daily boundaries)

[StaticData/SNODAS_CO_BasinBoundaries.zip](#) (input basin boundary layer shapefile)

[StaticData/Watershed_Connectivity_v3.xlsx](#) (input basin

- *Comma-separated-value (CSV)*
- *Shapefile*
- *GeoJSON*

- *Static data for basins*

Developer and User Documentation

← → ↺

software.openwaterfoundation.org/cdss-app-snodas-tools-doc-user/process/processing-steps/

🏠 SNODAS Tools (User Manual)

Search docs

Home

SNODAS Tools Data

Overview

Input Data

SNODAS Tools Process

Overview

Processing Steps

Table of Contents

1. Download SNODAS Data

Download SNODAS Data (Historical)

Download SNODAS Data (Each New Day)

2. Clip National SNODAS Grid to Colorado

3. Intersect SNODAS Colorado Grid with Colorado Basins and Calculate Statistics

Snowpack Statistics Exported as Tabular Data

Snowpack Statistics Exported as Spatial Data

4. Generate Time Series Snowpack Products

Additional Details

SNODAS Tools Products

Overview

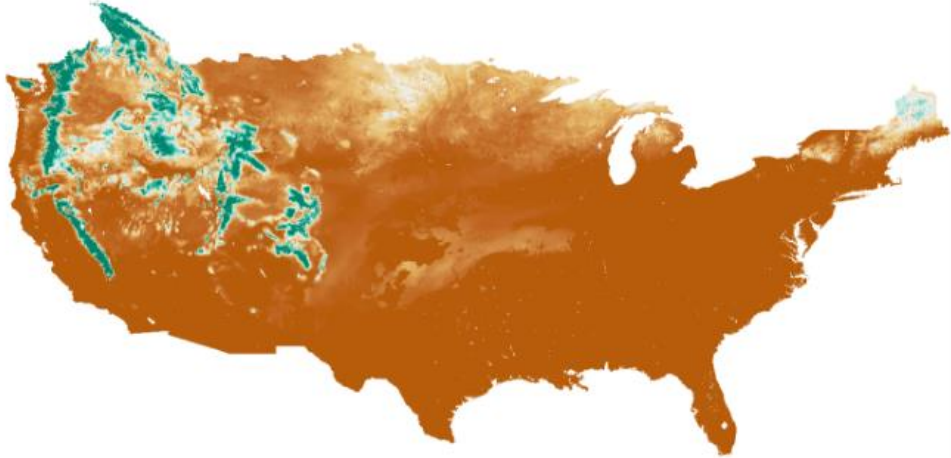
CDSS SNODAS Tools Web Application

Products and Downloads

1. Download SNODAS Data

National SNODAS grids are downloaded to the SNODAS Tools computer for processing into products that are relevant to Colorado.

Daily SNODAS data grids are national grids representing a variety of snowpack parameters. They are developed by NOAA National Weather Service's National Operational Hydrologic Remote Sensing Center (NOHRSC) and hosted by the National Snow and Ice Data Center (NSIDC). NSIDC stores the daily grids, dating back to September 30th, 2003, in a public [FTP site](#) that is updated every day. Although, as mentioned before, the SNODAS products contain many grids of snowpack parameters, the SNODAS Tools are designed to specifically calculate snowpack statistics in regards to the Snow Water Equivalent (SWE) grid. Below is an image of a daily SNODAS grid representing SWE values across the nation. The areas of higher SWE are represented by blue while the areas with lower, or no SWE values, are represented by brown.



SNODAS Snow Water Equivalent Masked Grid for January 16th, 2017

The SNODAS Tools are designed to process all available daily SNODAS SWE grids from September 30th, 2003 to the current date. A full historical repository of daily snowpack statistics gives insight

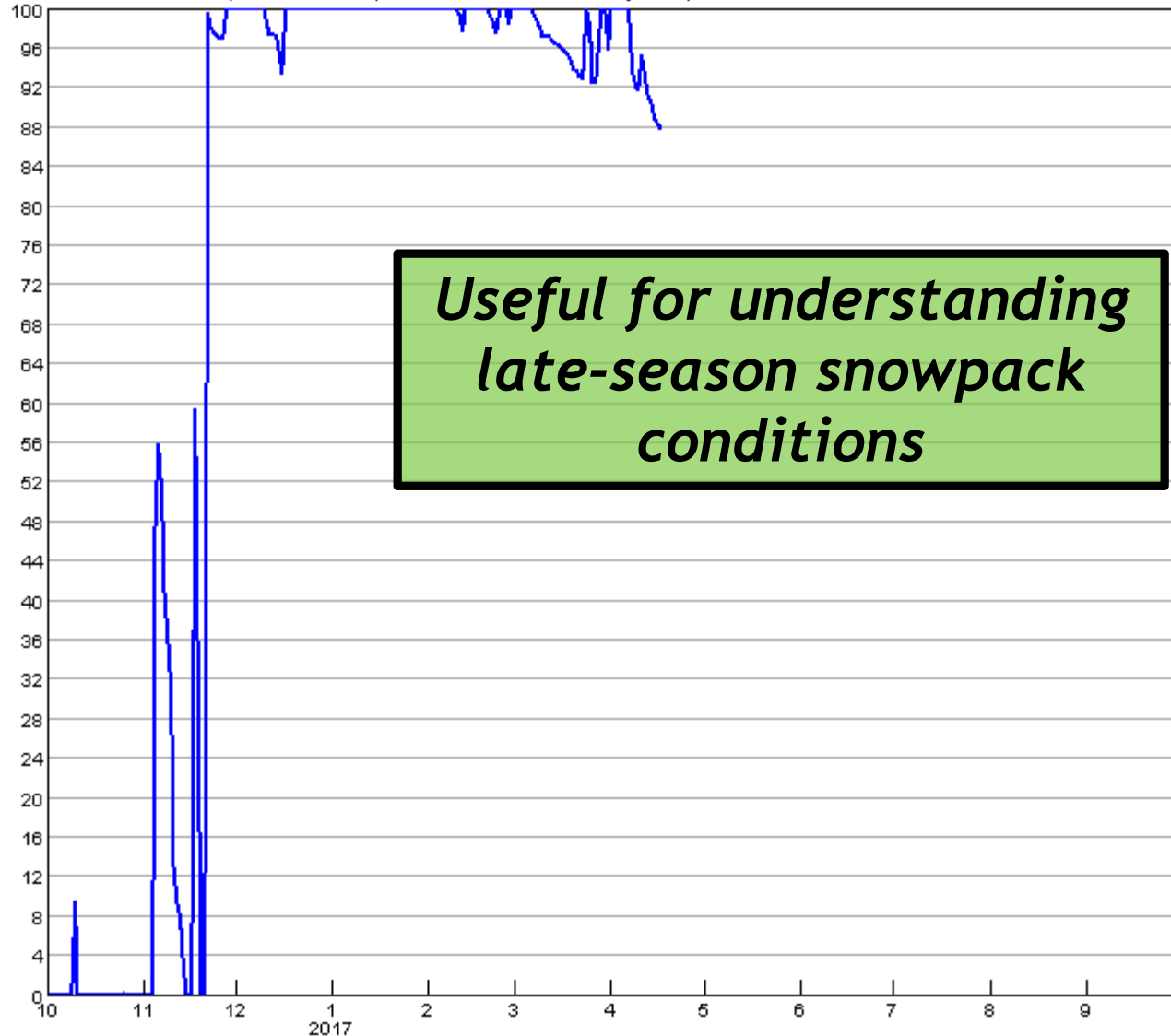
Snow Cover (Percent)

CONEJOS RIVER NEAR MOGOTE, CO. (MOGC2) SNODAS Snow Cover

(Each line corresponds to a Water Year starting Oct 1)

— SNODAS WY 2017

Snow Cover (percent of non-waterbody basin area)

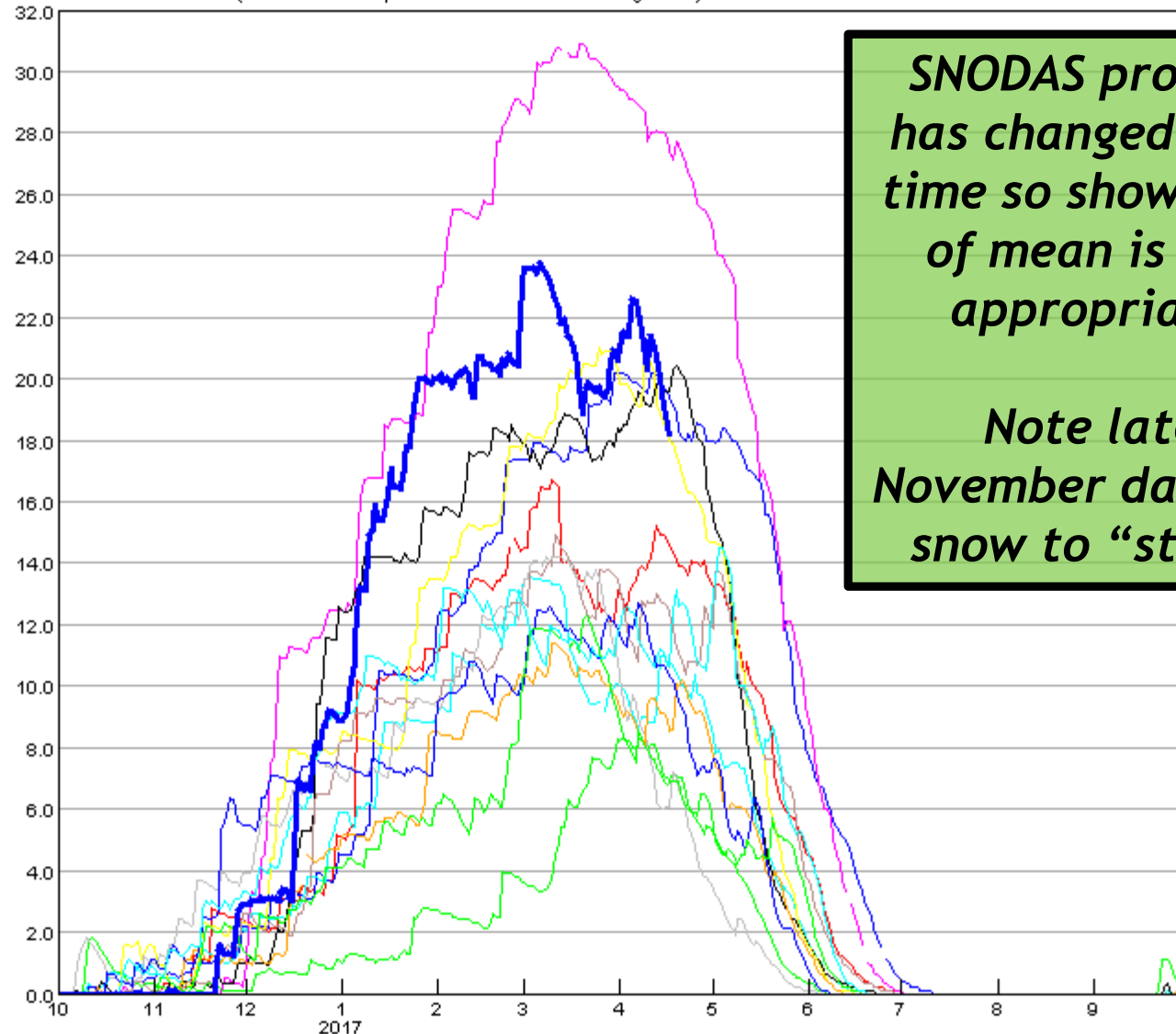


*Useful for understanding
late-season snowpack
conditions*

SNODAS Snow Water Equivalent

CONEJOS RIVER NEAR MOGOTE, CO. (MOGC2) SNODAS SWE

(Each line corresponds to a Water Year starting Oct 1)



***SNODAS process
has changed over
time so showing %
of mean is not
appropriate***

**Note late
November date for
snow to “stick”**

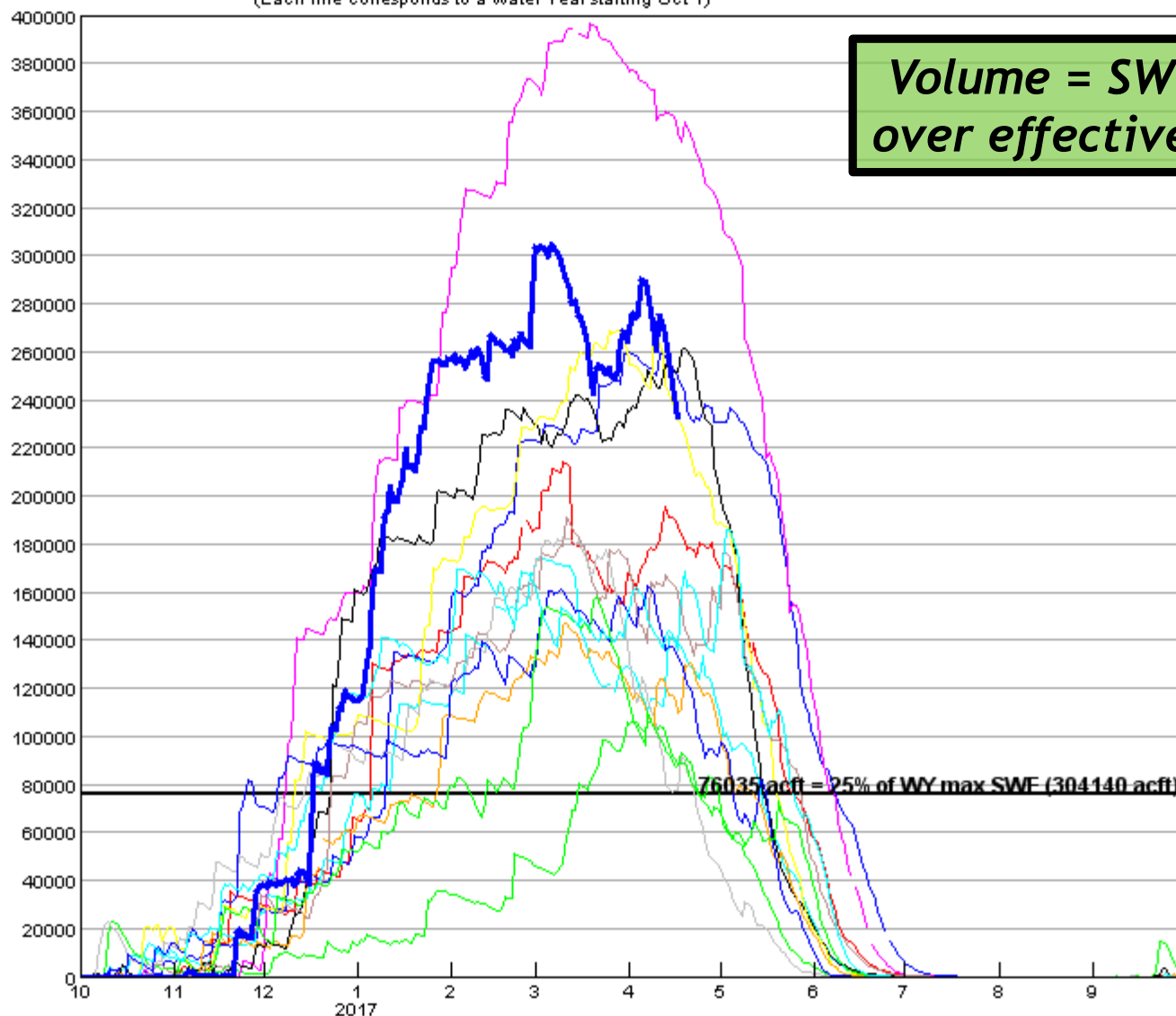
SNODAS SWE Volume

CONEJOS RIVER NEAR MOGOTE, CO. (MOGC2) SNODAS SWE Volume

(Each line corresponds to a Water Year starting Oct 1)

— SNODAS WY 2004
— SNODAS WY 2005
— SNODAS WY 2006
— SNODAS WY 2007
— SNODAS WY 2008
— SNODAS WY 2009
— SNODAS WY 2010
— SNODAS WY 2011
— SNODAS WY 2012
— SNODAS WY 2013
— SNODAS WY 2014
— SNODAS WY 2015
— SNODAS WY 2016
— SNODAS WY 2017

Snow Water Equivalent (SWE) Volume (acft)

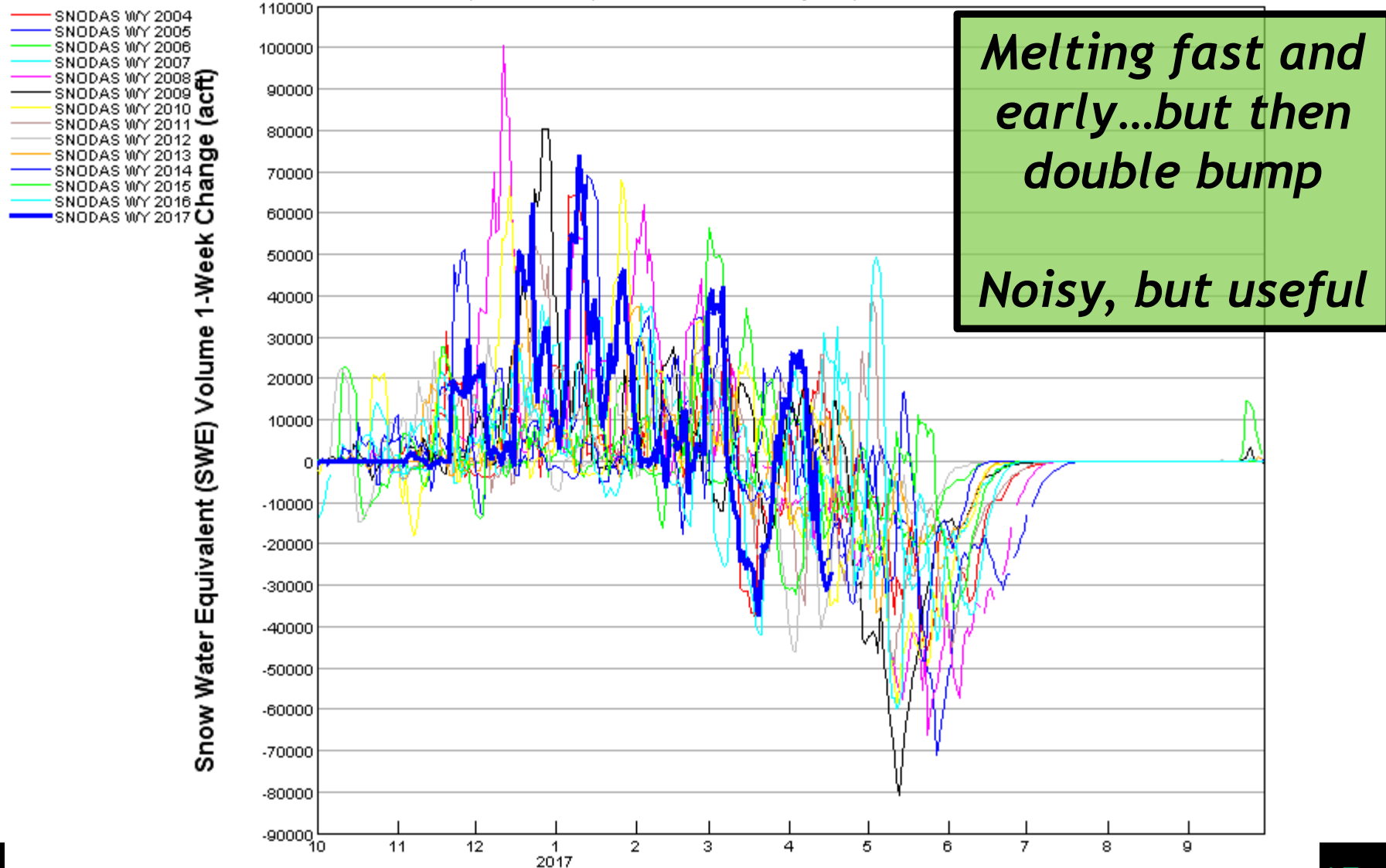


*Volume = SWE (in)
over effective area*

76035 acft = 25% of WY max SWE (304140 acft)

SNODAS SWE Volume 1-Week Change

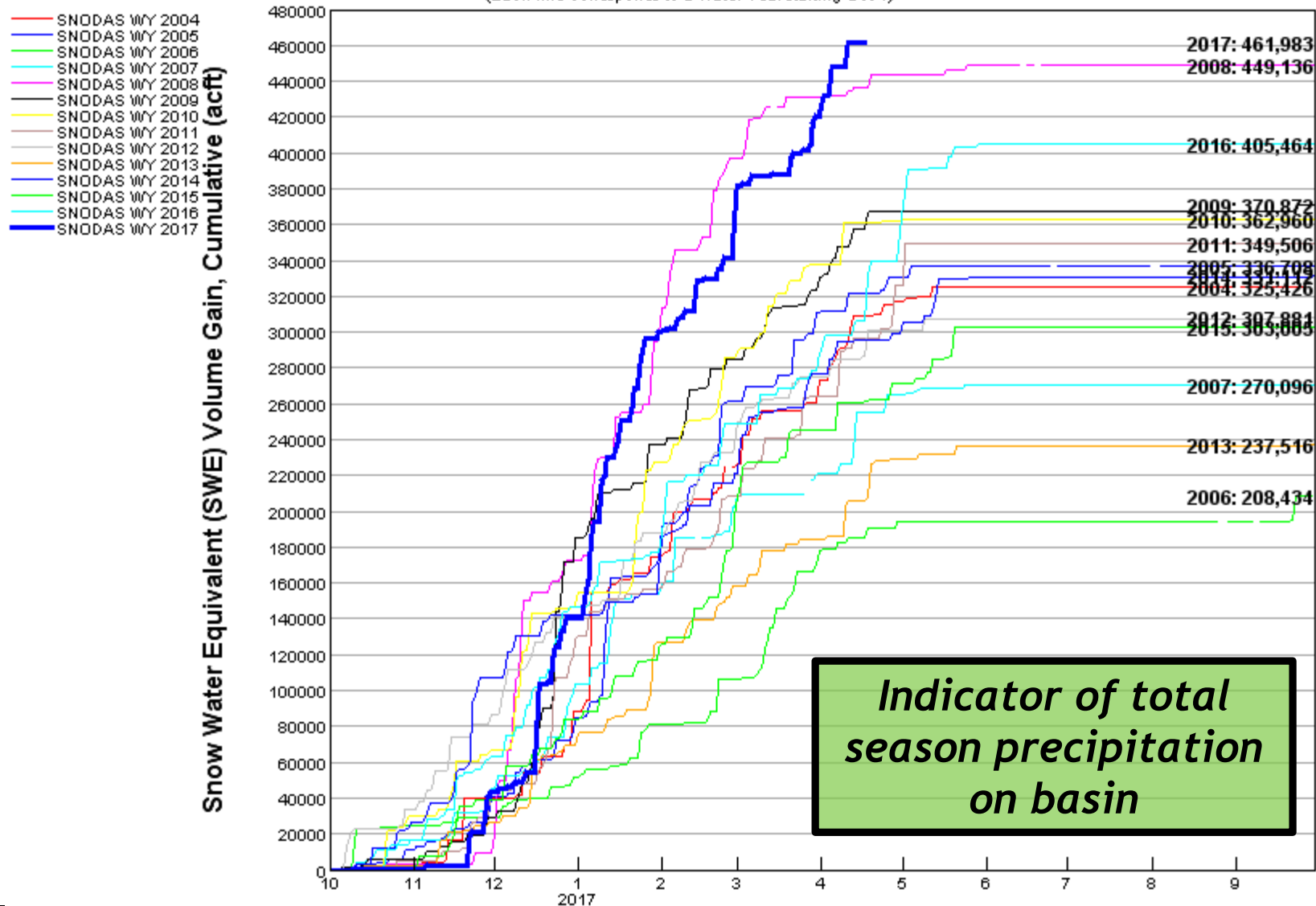
CONEJOS RIVER NEAR MOGOTE, CO. (MOGC2) SNODAS SWE Volume 1-Week Change
(Each line corresponds to a Water Year starting Oct 1)



SNODAS SWE Volume Gain, Cumulative

CONEJOS RIVER NEAR MOGOTE, CO. (MOGC2) SNODAS SWE Volume Gain, Cumulative

(Each line corresponds to a Water Year starting Oct 1)



Daily SWE Map Animation

Select Date **SNODAS Date: 2016-10-01**

SNODAS Animation

Starting Date: (earliest available date: 2003-09-30)
2016-10-01 ?

Ending Date: (latest available date: 2017-04-17)
2017-04-17 ?

Increment (days): (Default is set to 1)
value between 1 and 10 ?

Submit

2016-10-01

▶ || ↺

- *It is pretty cool!*
- *Can see storm events*
- *Can see when snow started to accumulate and melt out*

Next Steps

- Minor cosmetic changes to website
- Add graph products for total basin (upstream of current basin)
- Move system to State cloud-hosted server
- Get feedback from stakeholders
- Project ends June 30, 2017

Share It

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