California Examples of USGS Water Data Science and Visualization Tools

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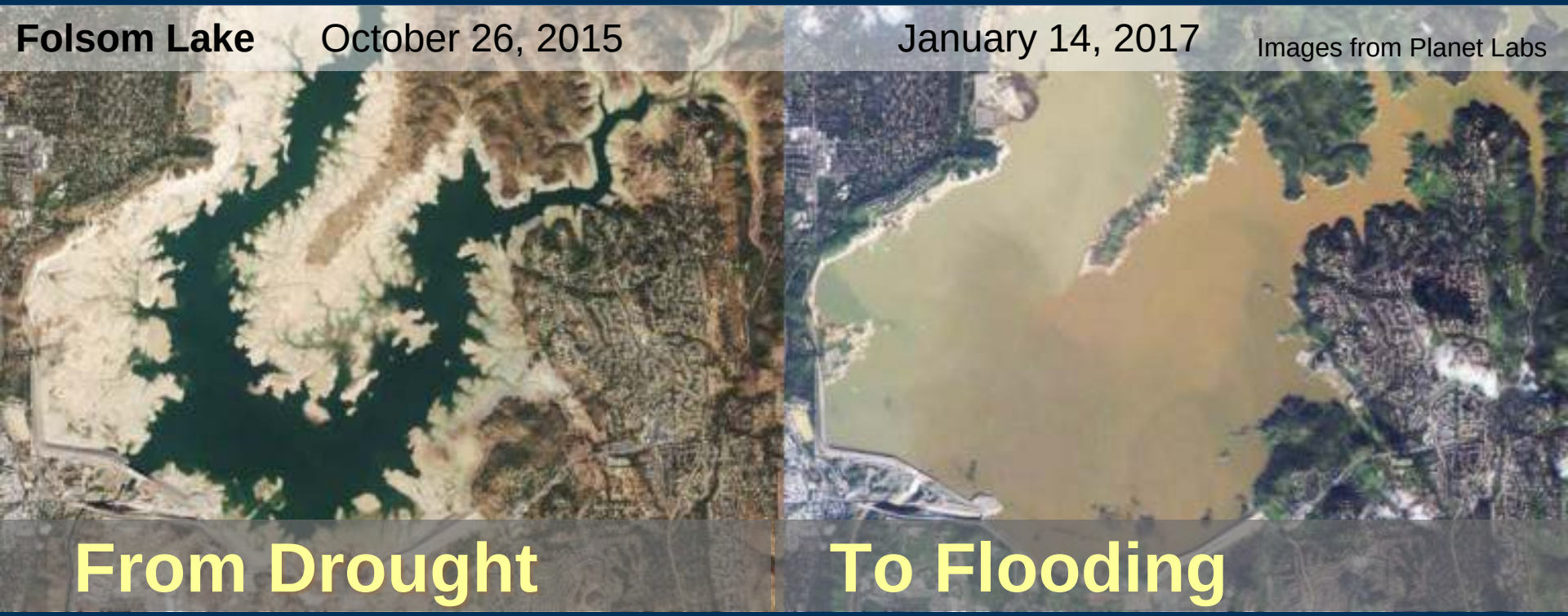
USGS California Water Science Center

26th Groundwater Resources Association Annual Meeting, Sacramento, CA, Oct 3–4, 2017

USGS visualization tools for California

Folsom Lake October 26, 2015 | January 14, 2017 Images from Planet Labs



From Drought

- 5 years of drought

To Flooding

…followed by extreme flood events in 2017

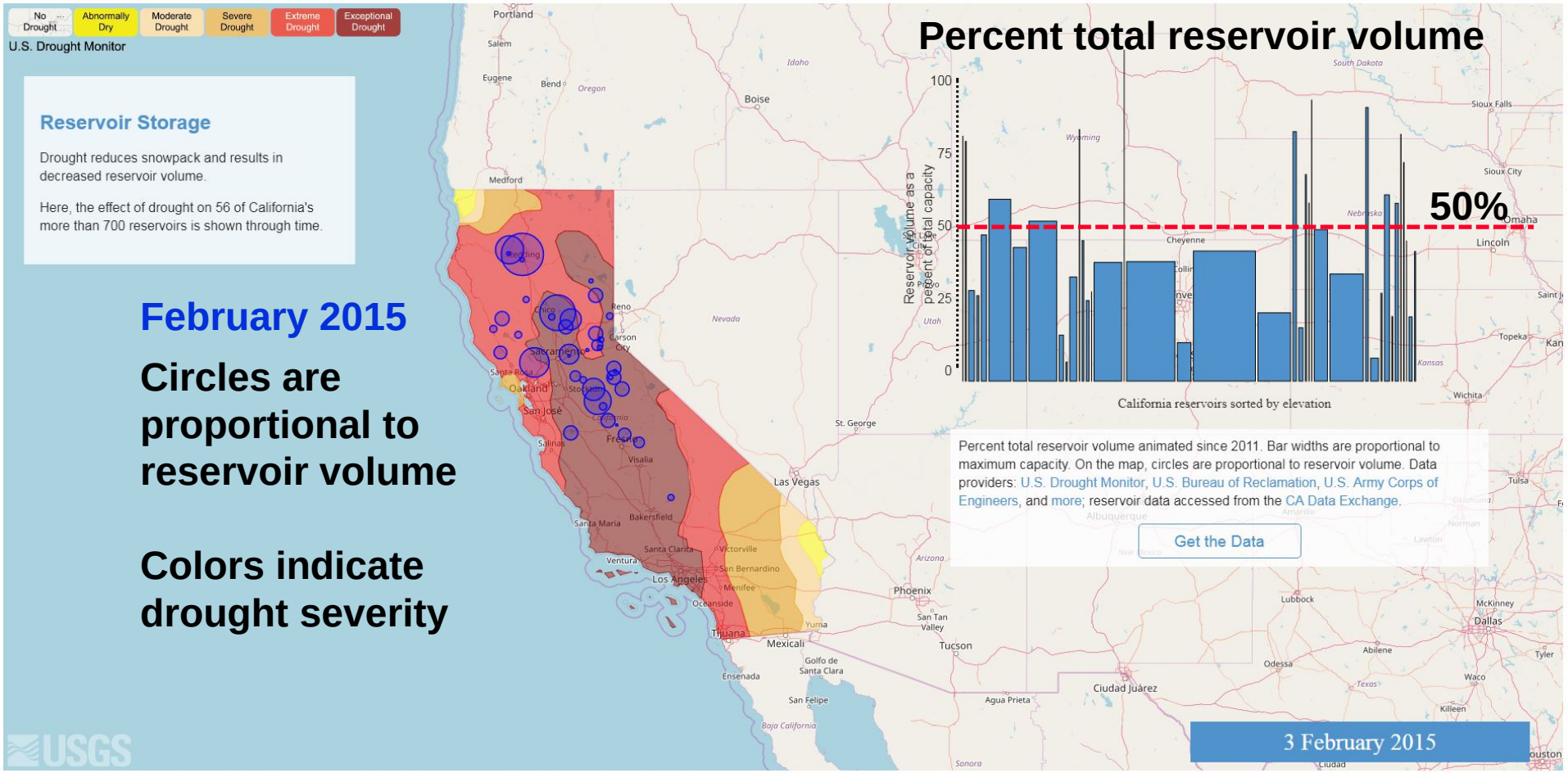
USGS

USGS science for a changing world

Center for Integrated Data Analytics

https://cida.usgs.gov/ca_drought/

California drought visualized with open data



USGS science for a changing world

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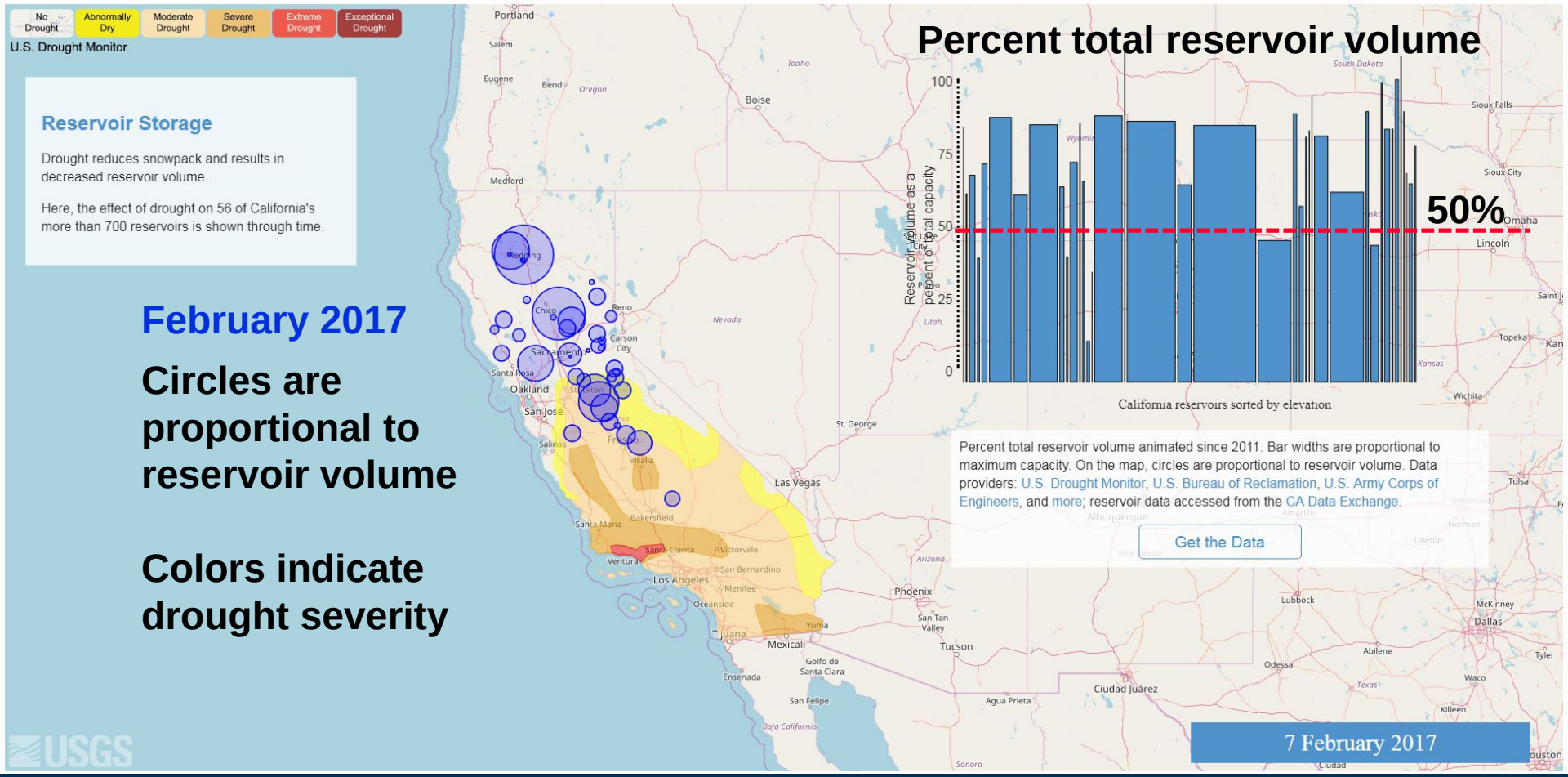


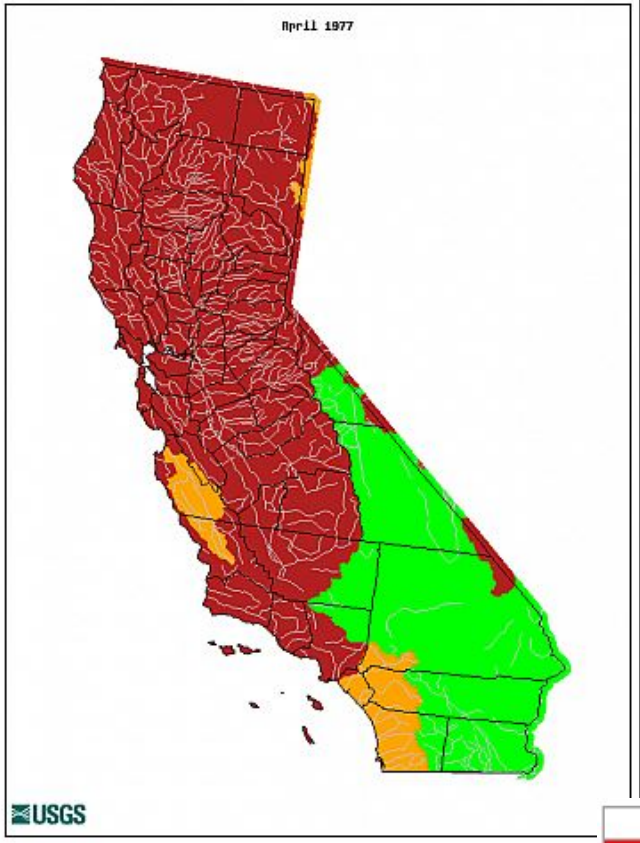
USGS science for a changing world

WaterWatch

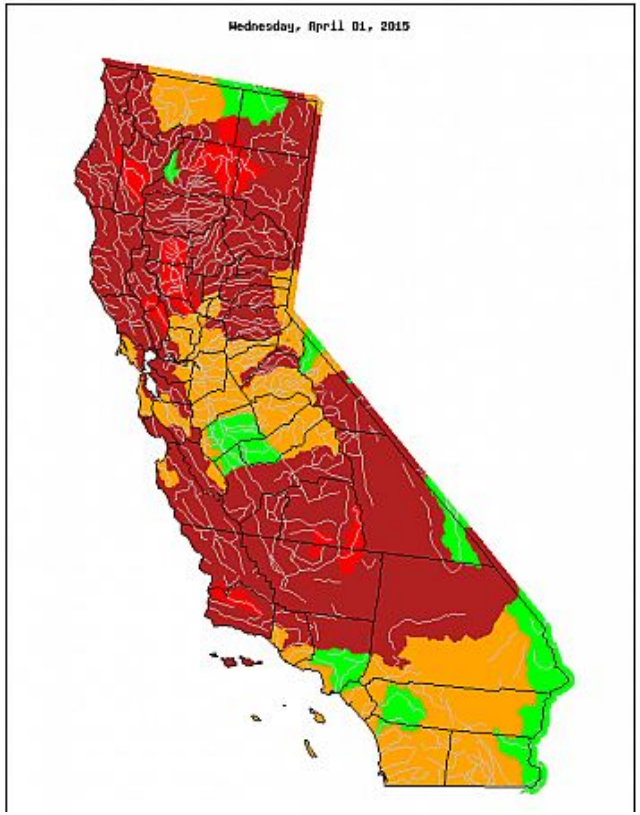
https://waterwatch.usgs.gov

Monthly streamflow visualized with USGS data

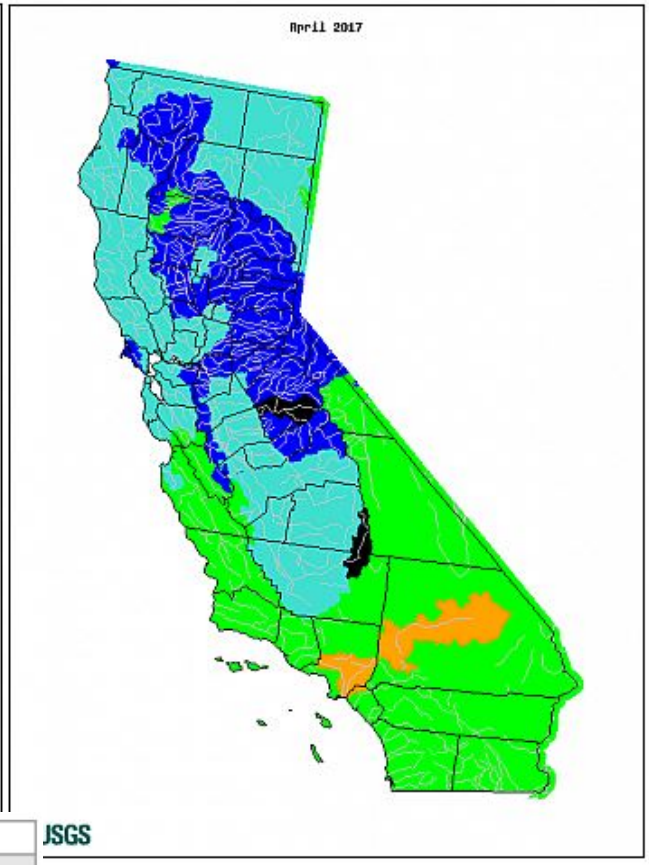
April 1977

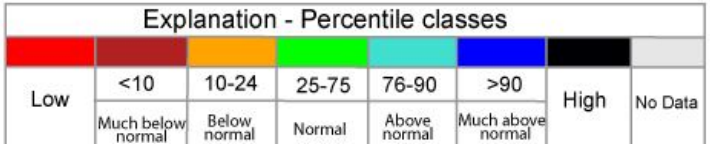


April 2015



April 2017





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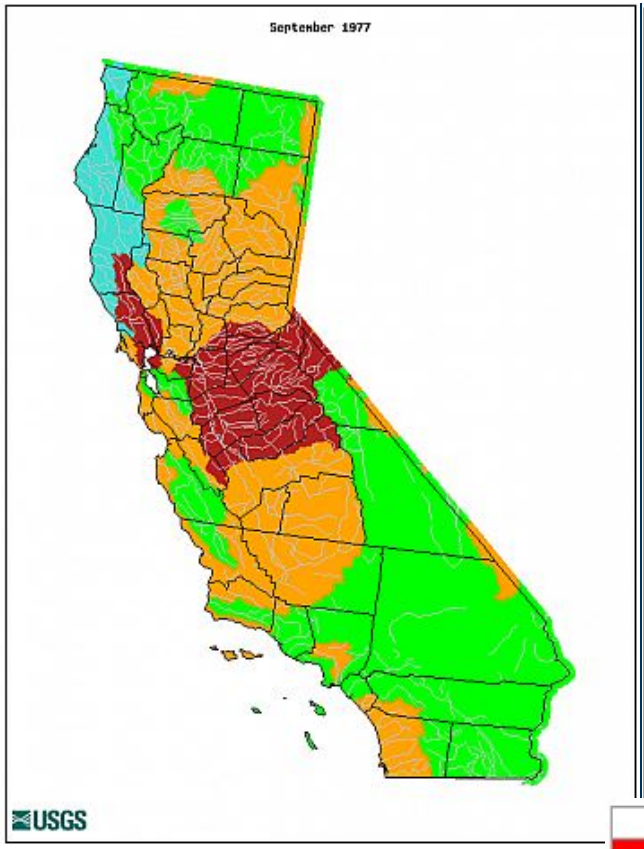
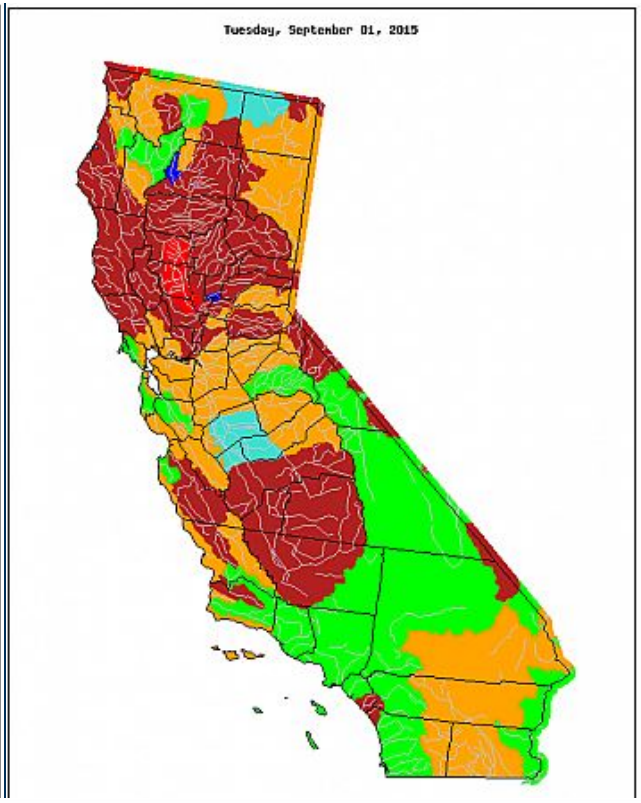
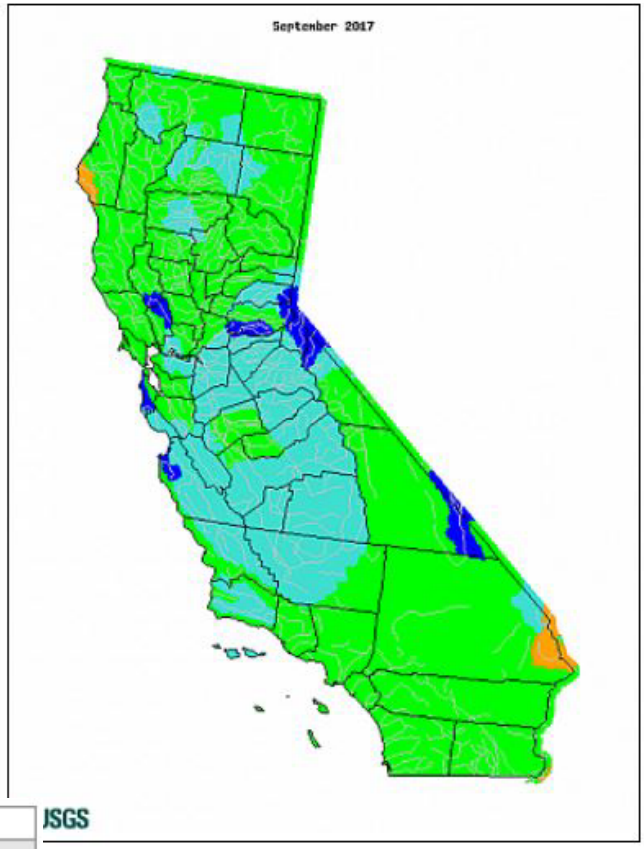
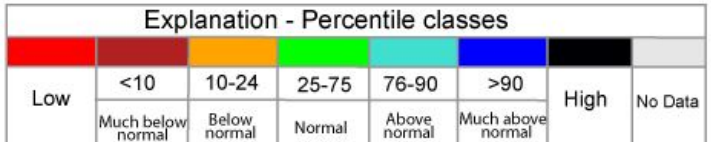


Sept. 2015



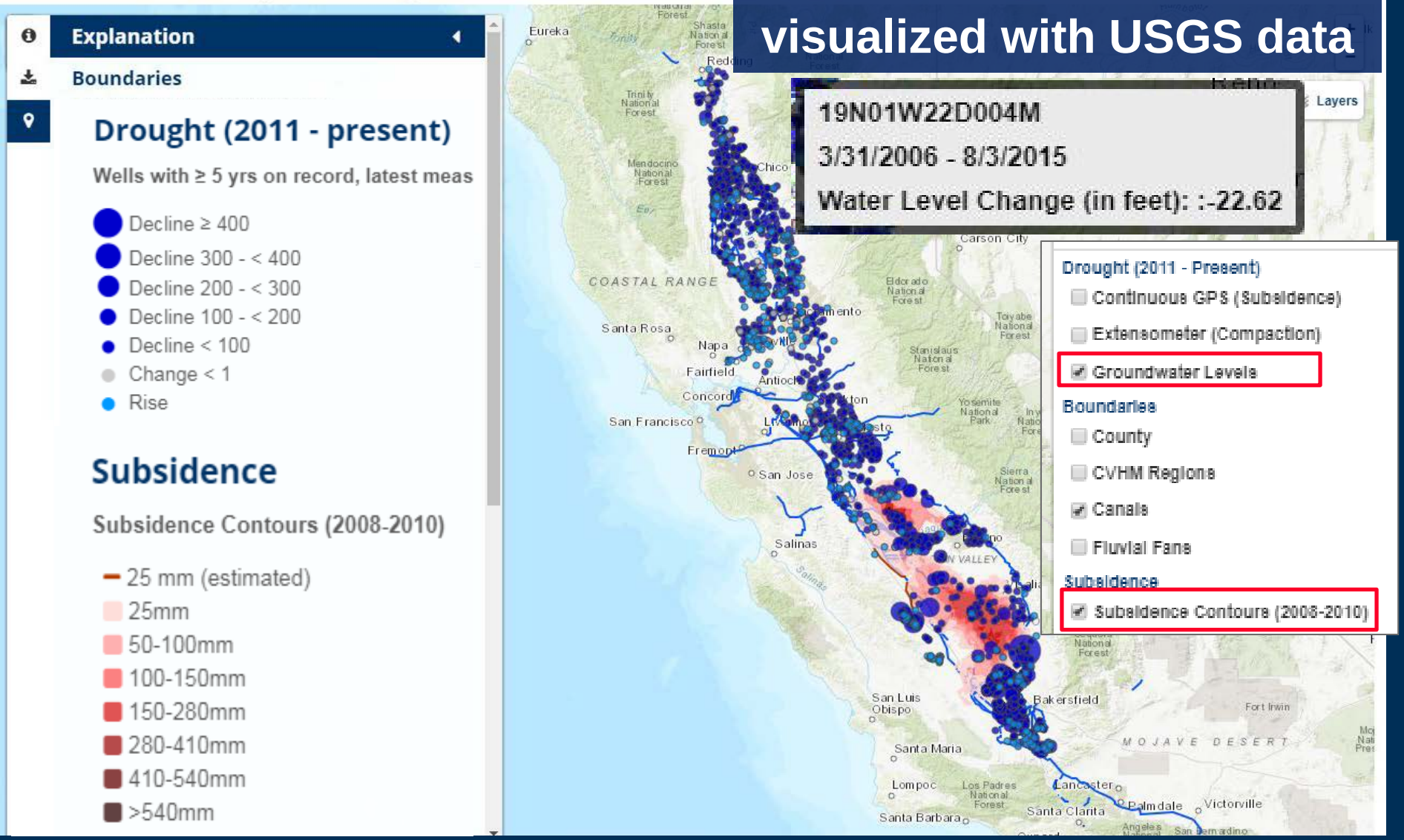
Sept. 2017





Central Valley: Drought Indicators

Groundwater level decline visualized with USGS data



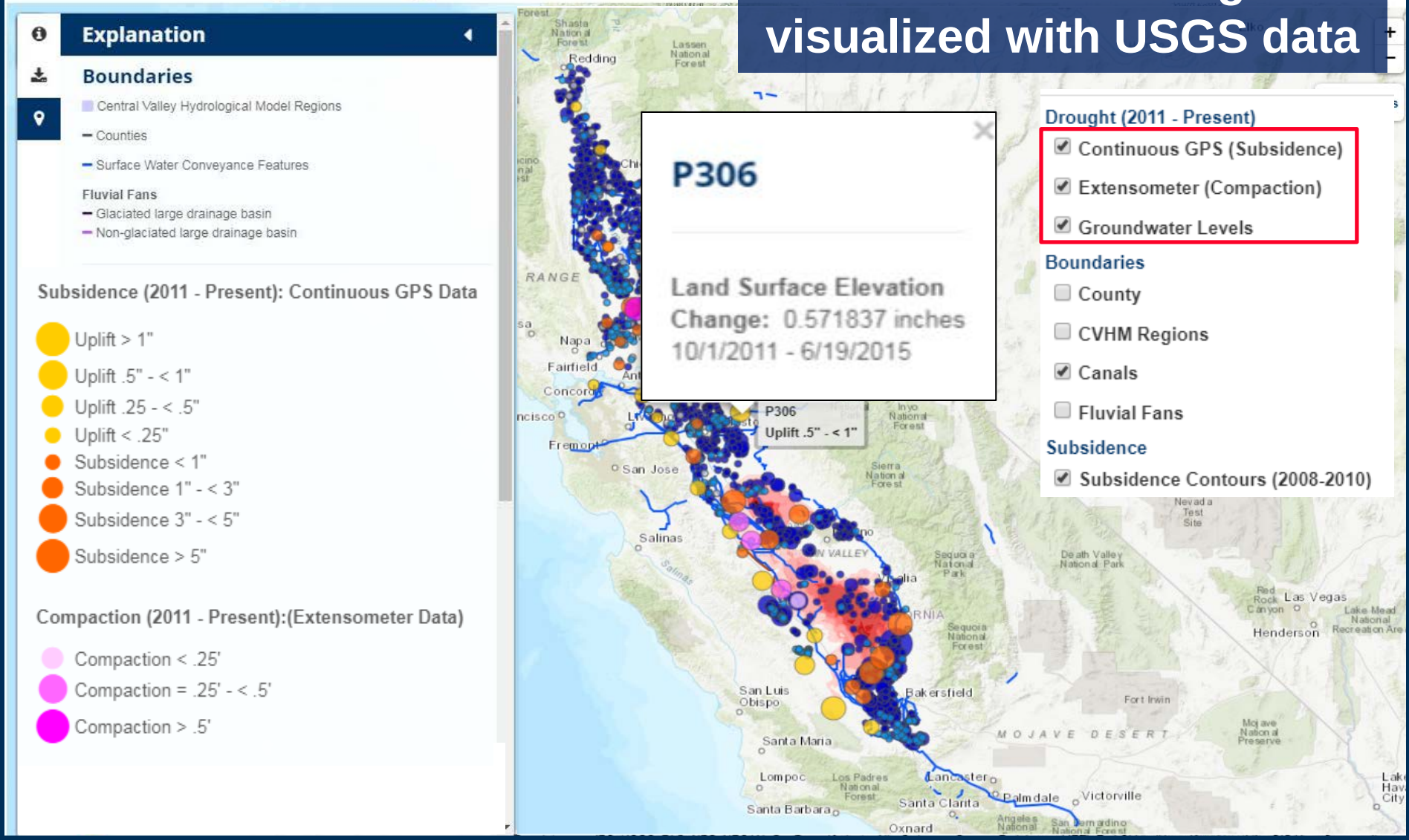
USGS science for a changing world

https://ca.water.usgs.gov/land_subsidence/central-valley-subsidence-data.html

California Water Science Center

Central Valley: Drought Indicators

Subsidence changes visualized with USGS data



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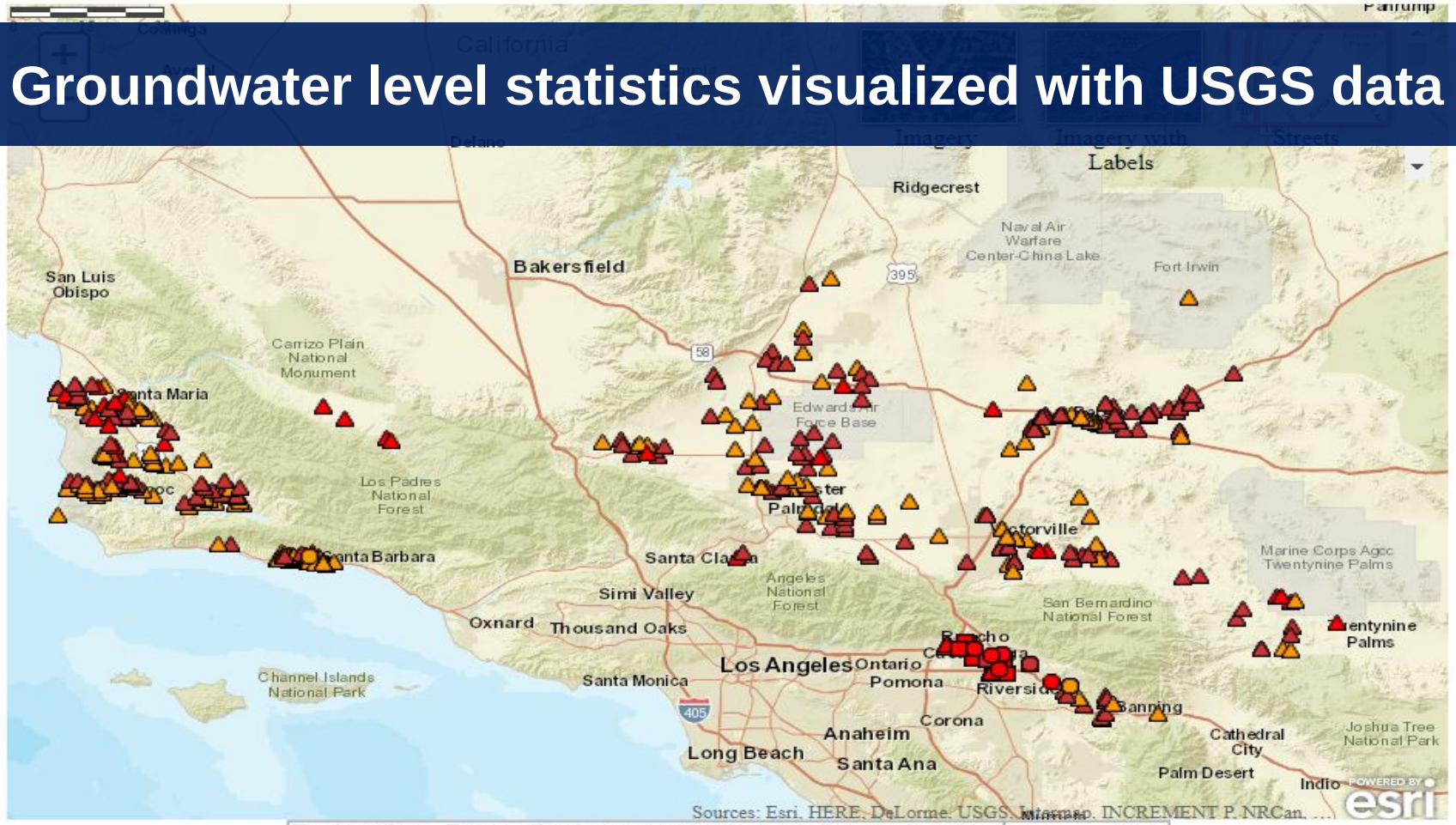
Groundwater Watch

Latest News...

California Below Normal Groundwater Levels

Click site symbol to open information pop-up. Click Station ID in pop-up for information and data.

Groundwater level statistics visualized with USGS data



Explanation - Percentile classes (symbol color based on most recent measurement)

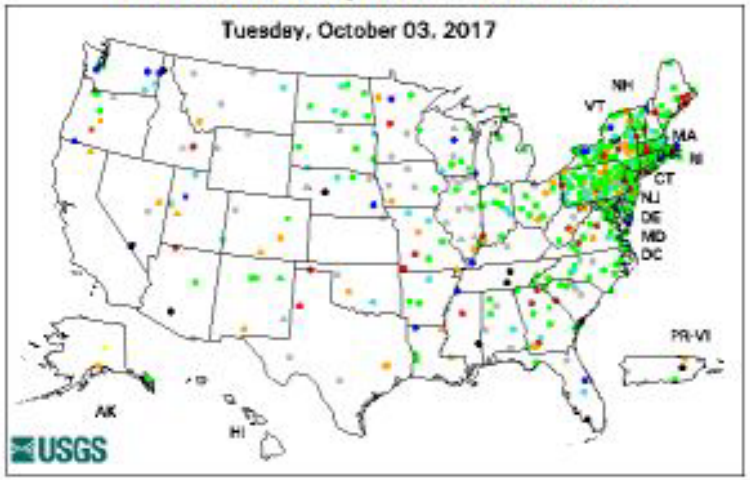
Low	<10 Much Below Normal	10-24 Below Normal	25-75 Normal	76-90 Above Normal	>90 Much Above Normal	High	Not Ranked

Wells	Springs
Real-Time	
Continuous	
Periodic Measurements	

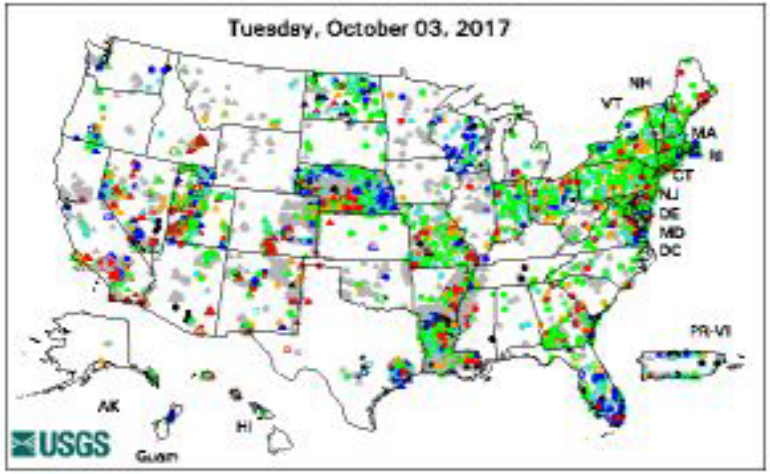
USGS science for a changing world

Groundwater Watch https://groundwaterwatch.usgs.gov

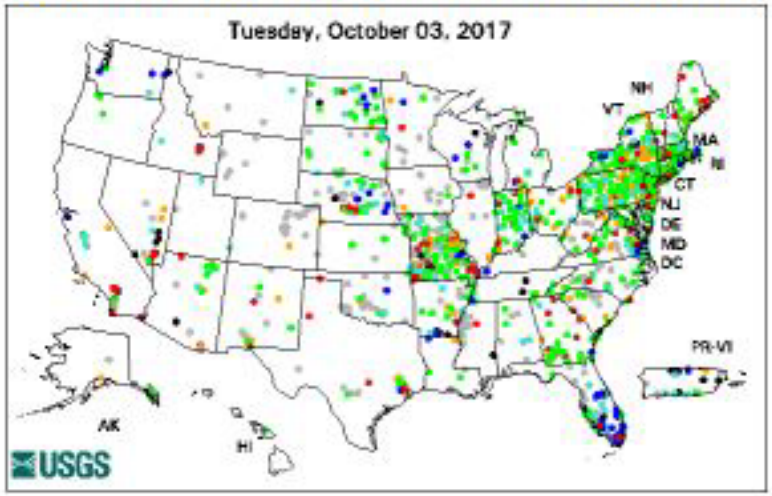
Climate Response Network



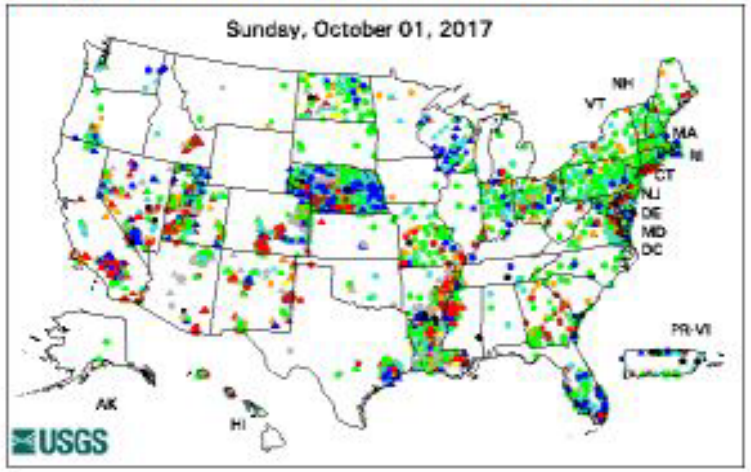
Active Groundwater Level Network



Real-Time Groundwater Level Network



Long-Term Groundwater Data Network



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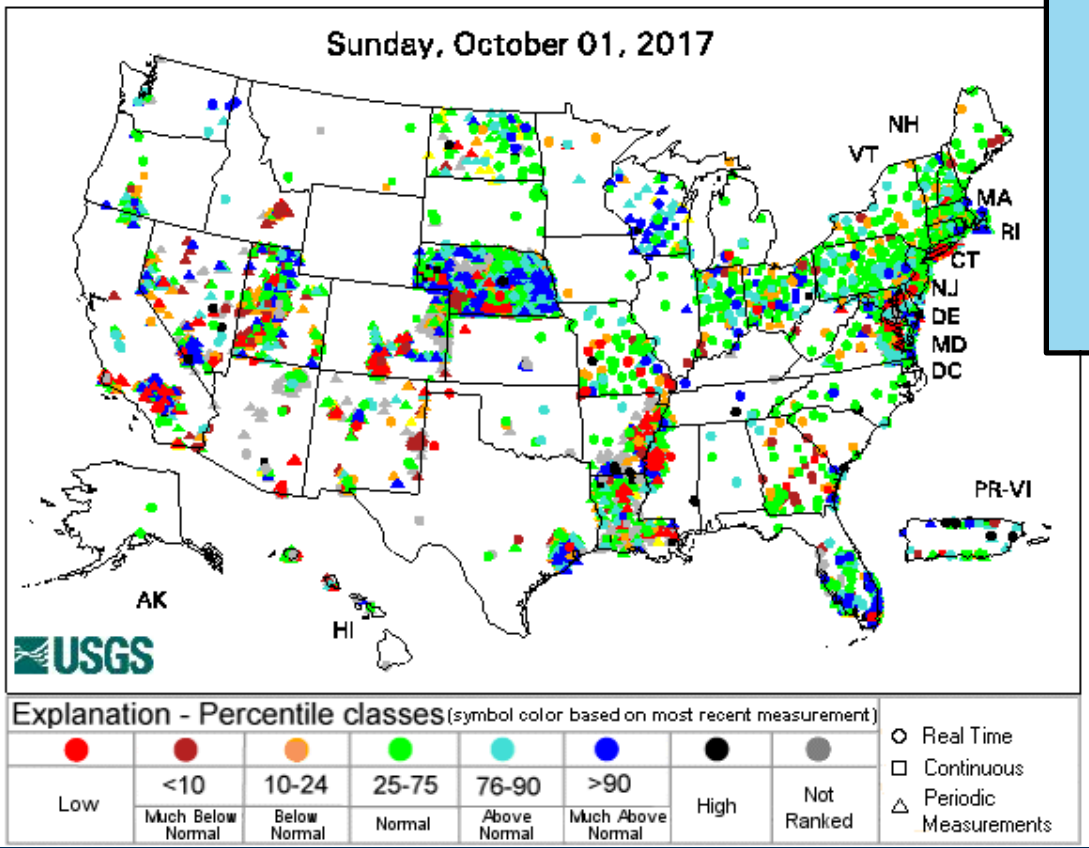
Groundwater Watch

Long-Term Groundwater Data Network

Use the buttons above the map to select the data frequency and length of record.
NOTE: Javascript must be enabled for the map to work correctly.

(•) Annual Data	( ) Monthly Data	( ) Daily Data
(•) 20 Years or More	( ) 30 Years or More	( ) 50 Years or More



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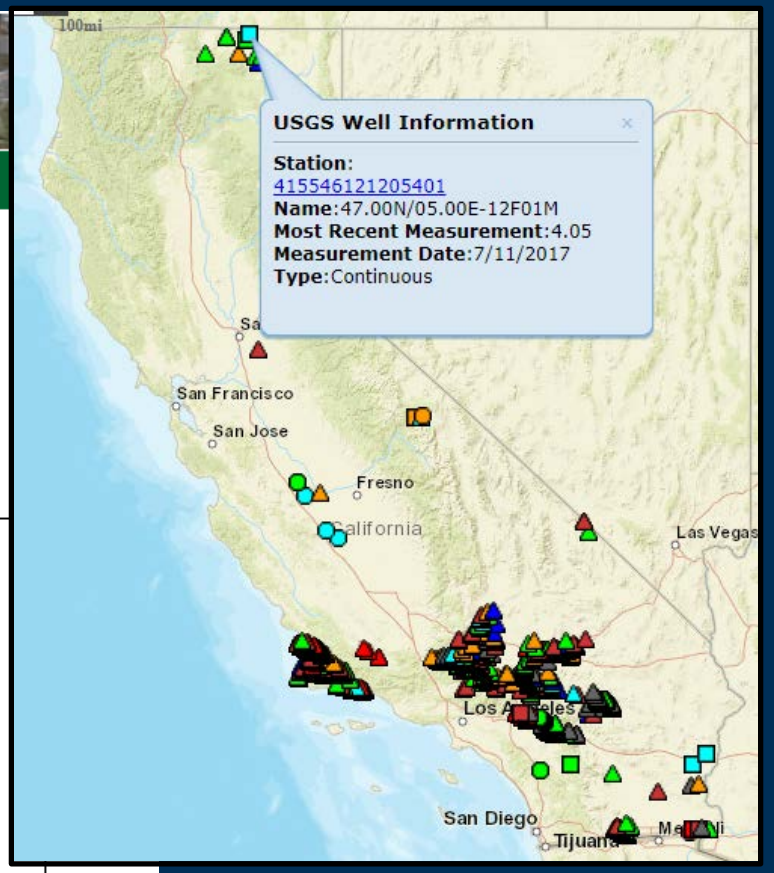
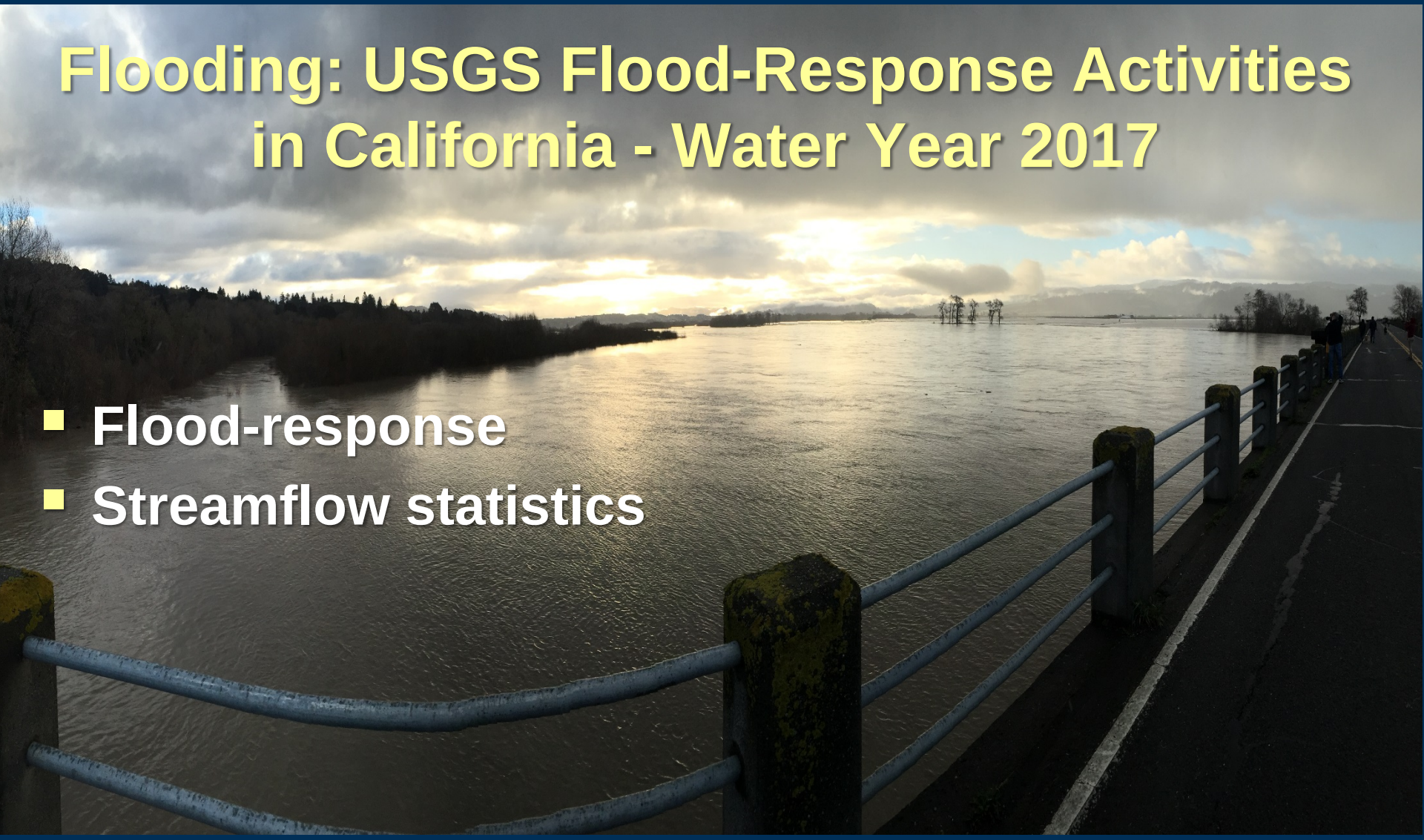
○ Real Time
□ Continuous
△ Periodic Measurements



California

Annual Data
1000 sites 20+ yrs
700 sites 30+ yrs
230 sites 50+ yrs

Flooding: USGS Flood-Response Activities in California - Water Year 2017



- Flood-response
- Streamflow statistics

USGS site 11479560, Eel River at Fernbridge, CA, January 11, 2017. Photo courtesy of Travis Apo, Hydrographer, USGS

USGS

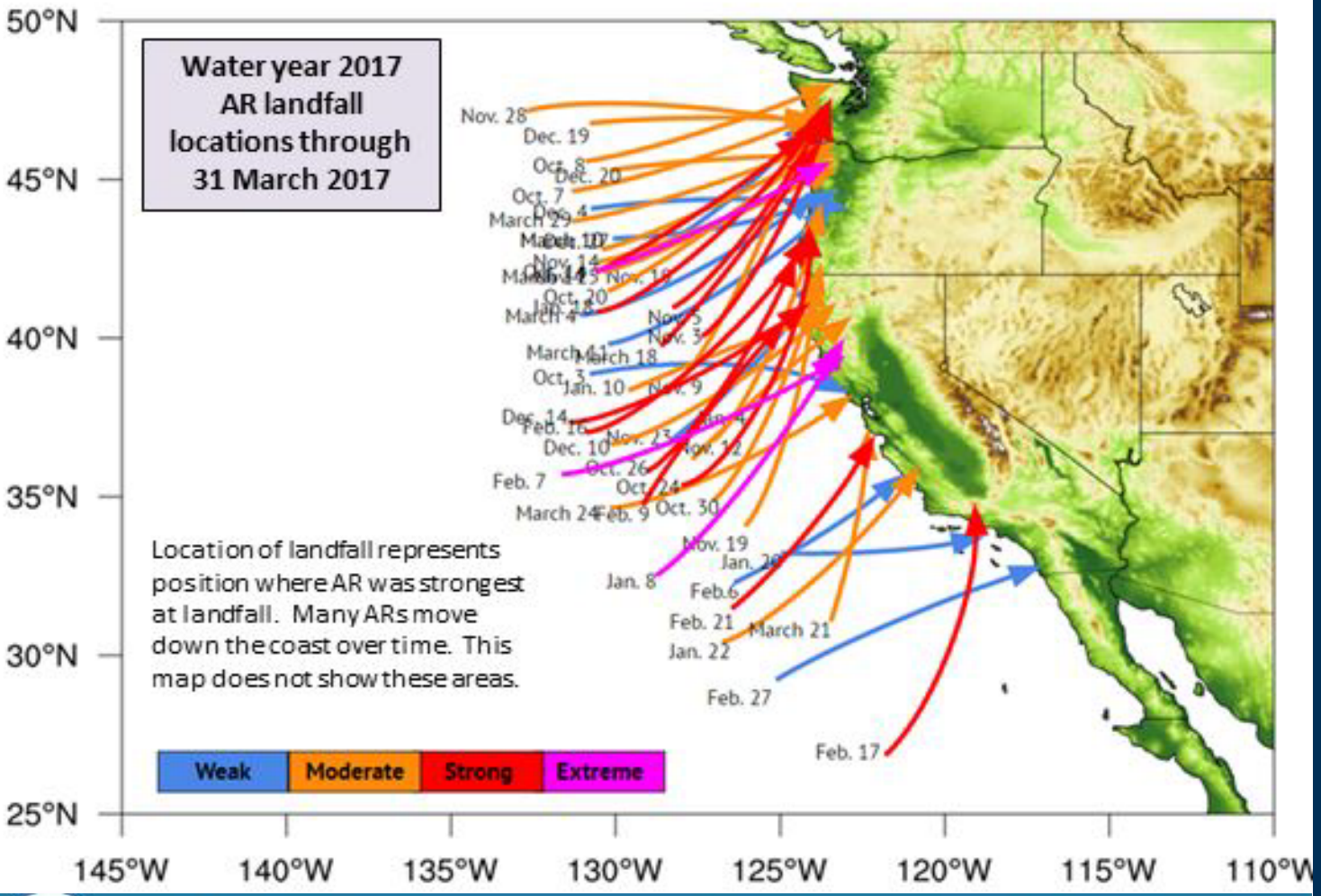
USGS flood-response activities 2017

- 1000+ storm-related streamflow measurements at over 360 streamgage locations
- 445 crews deployed for storm-related activities on 40 occasions

USGS

Photo: USGS making a streamflow measurement from the cableway using an Acoustic Doppler Current Profiler at the American River at Fair Oaks, Jan 12, 2016

- 45 Atmospheric Rivers have made landfall on the West Coast thus far during the 2017 water year (1 Oct. – 31 March 2017)
- This is much greater than normal
- 1/3 of the landfalling ARs have been "strong" or "extreme"



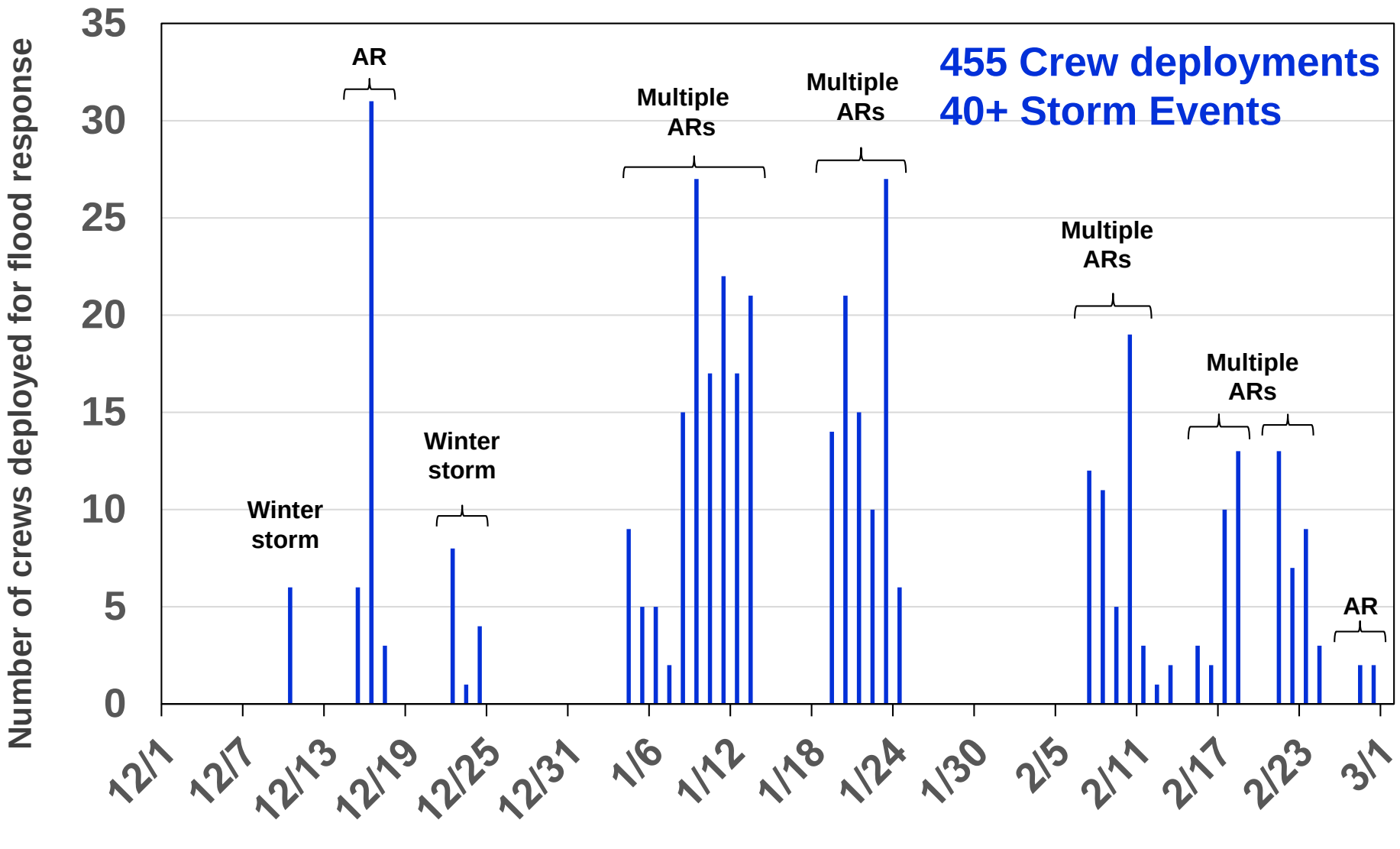
USGS

Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

By F.M. Ralph, B. Kawzenuk, C. Hecht, J. Kalansky

Experimental

CREWS CAWSC Crews deployed for flood work, WY17



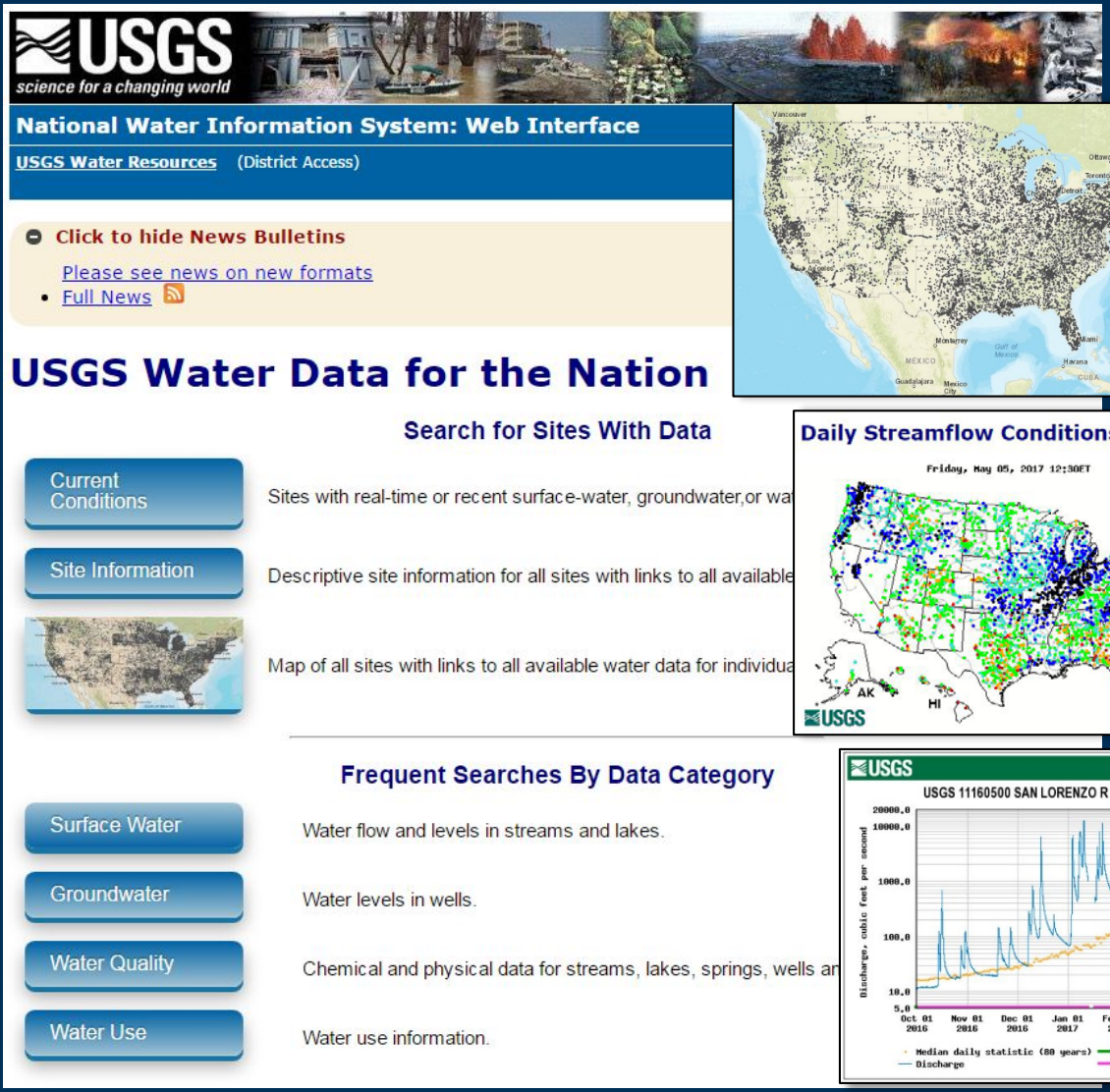
USGS flood-response crews

- Safety first
- Swift water trained
- On-call

USGS Hydrographer Rich Castro measuring discharge at USGS site 11063510, Cajon Creek below Lone Pine Creek near Keenbrook CA, January 12, 2017.

USGS National Water Information System (NWIS)

https://waterdata.usgs.gov/nwis

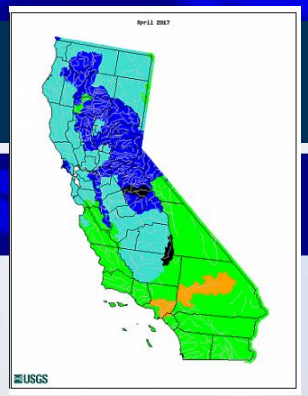


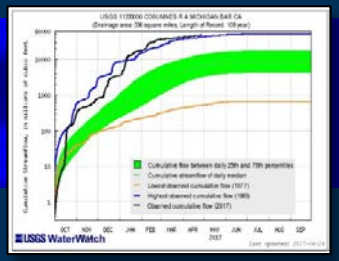
data

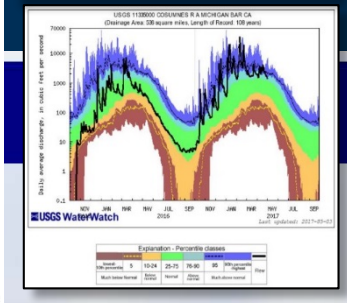
- **Publically available**
- **~1.5 million monitoring sites across the nation**

USGS WaterWatch

https://waterwatch.usgs.gov/ data







USGS
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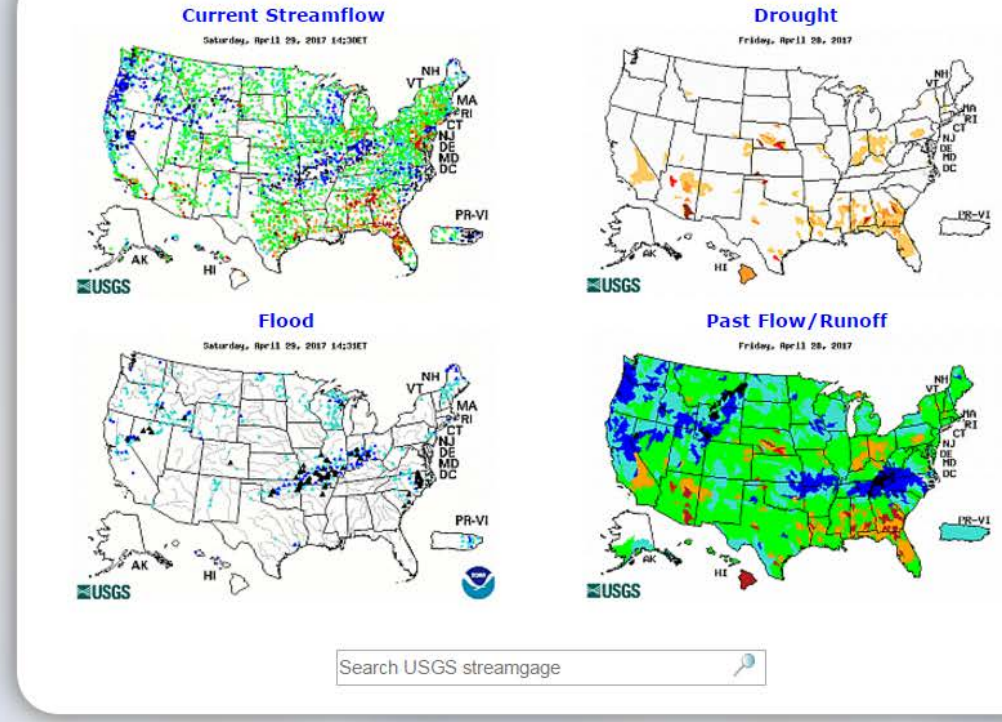
tools

WaterWatch

- Home
- Current Streamflow
- Flood
- Drought
- Past Flow/Runoff
- Animation
- Toolkit
- Annual Summaries
- Additional Information
- About WaterWatch

- Site Duration Hydrograph (streamflow)
- State Duration Hydrograph (runoff)
- Cumulative Streamflow Hydrograph
- Cumulative Runoff Hydrograph
- Streamgage Statistics
- Rating Curve
- Streamflow Map Builder
- Streamflow Map Viewer
- Flood Table
- Drought Table
- Map Comparison
- Flood-Tracking Chart
- Streamgage Finder
- Field Measurements
- AHPS River Forecast
- Raster Hydrograph



USGS Streamflow Statistics WY-2017

Rivers above flood stage
Oct 1, 2016 – May 1, 2017

Of the 100 streamgages with NWS defined flood stage

- 50% exceeded flood stage
- 25% were above flood stage for 5 or more days
- 14% had flows classified by NWS as major flooding

USGS

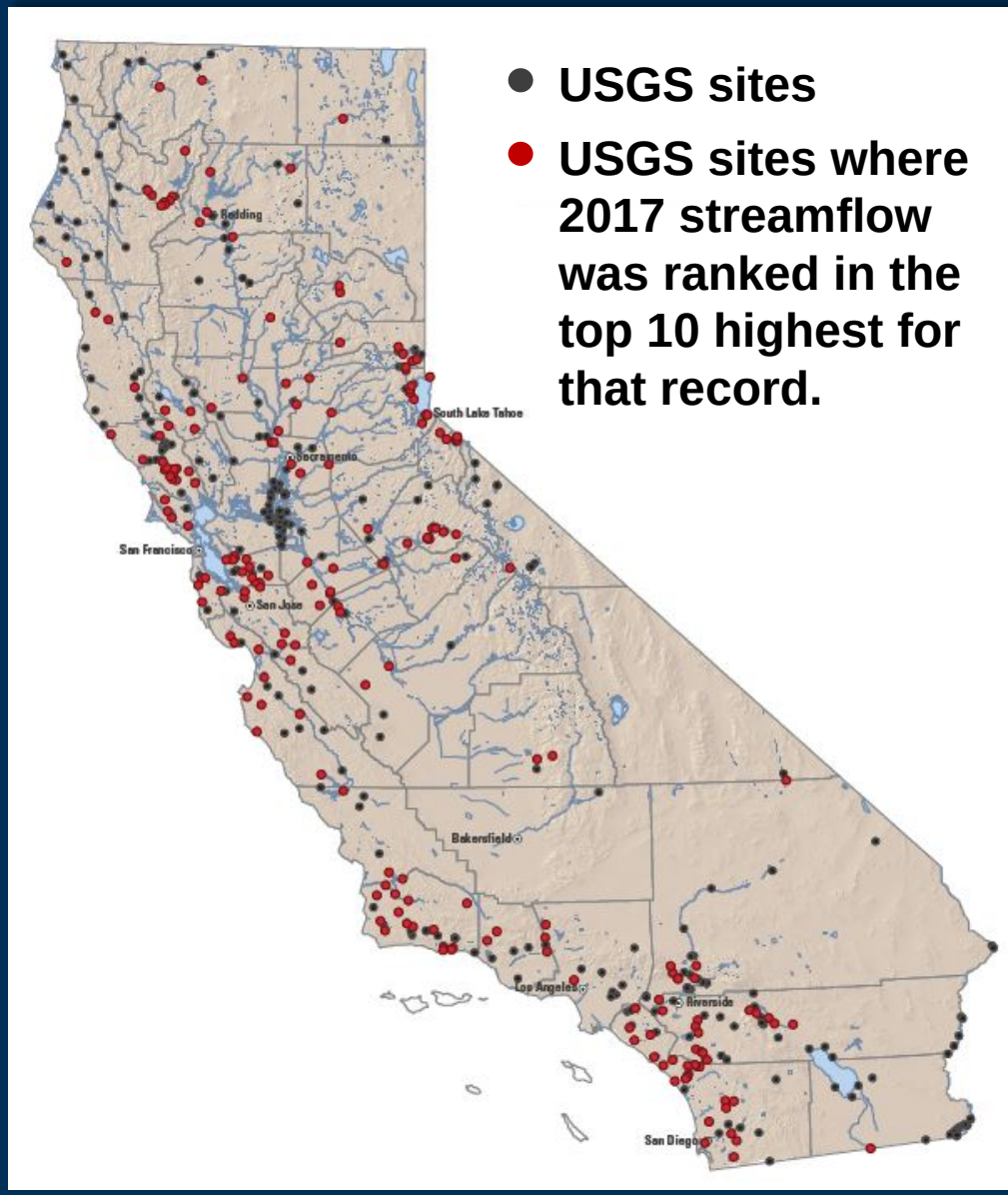
Staff gage at USGS site 11481000, Mad River near Arcata, CA, December 21, 2010. Photo courtesy of Travis Apo, Hydrographer, USGS

USGS Streamflow Statistics WY-2017

Peak streamflow ranking Oct 1, 2016 – May 1, 2017

Of the 500 USGS gages operated in California

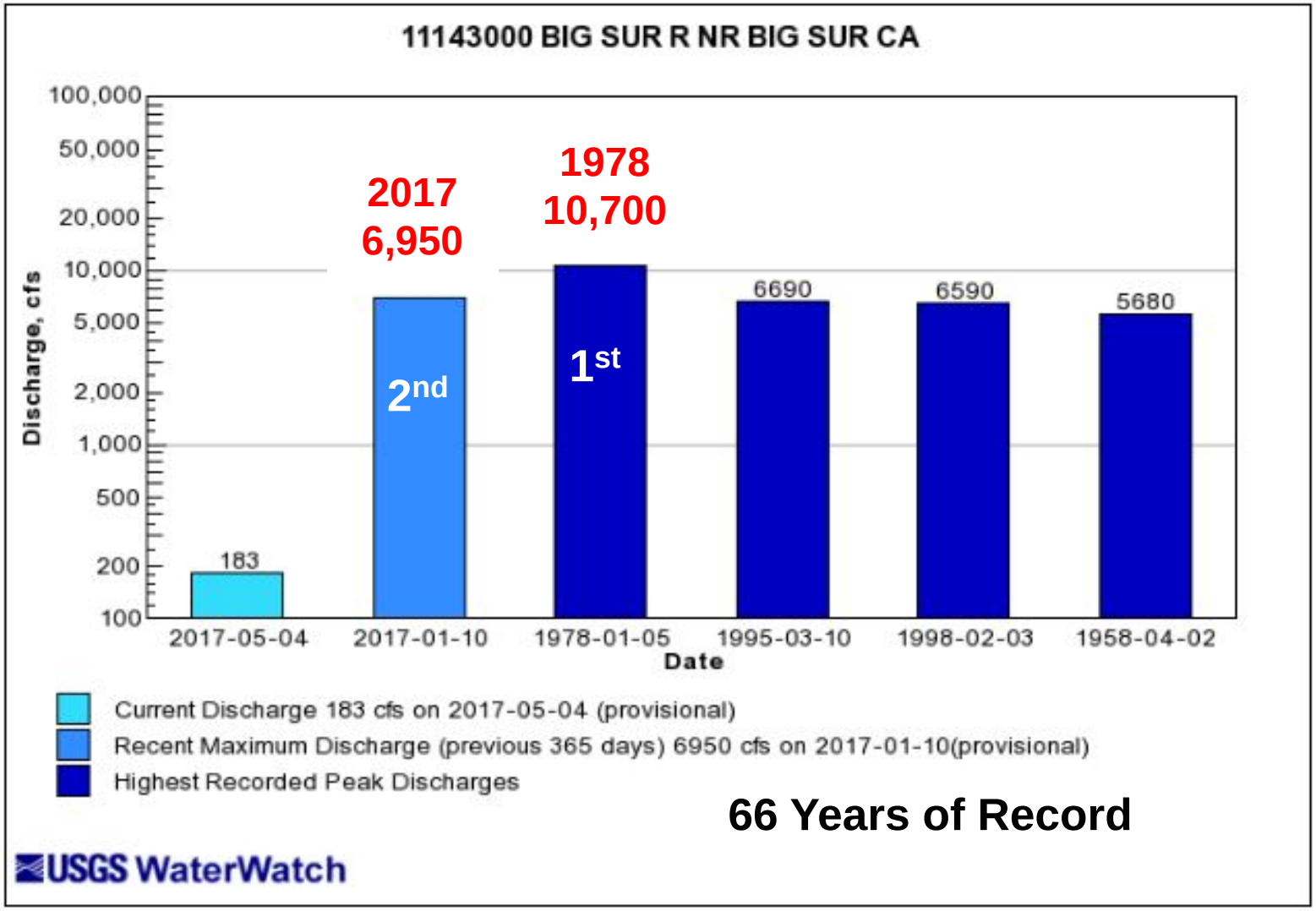
- 44% (220 gages) had top 10 ranked peak streamflows
- 23% (115 gages) had 30+ years of record



USGS

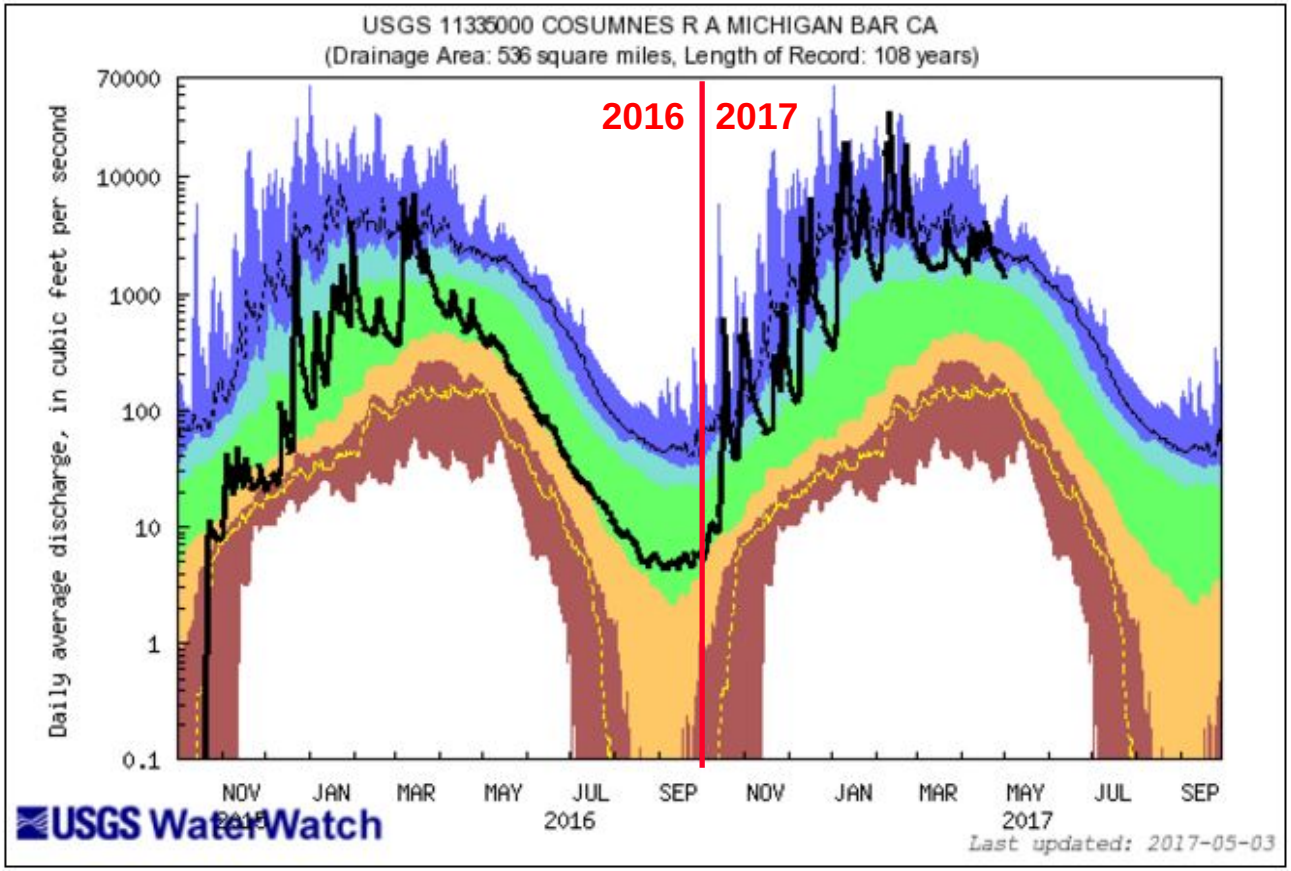
Big Sur near Big Sur, CA

Peak Streamflow Ranking



Cosumnes River at Michigan Bar CA

Streamflow Duration



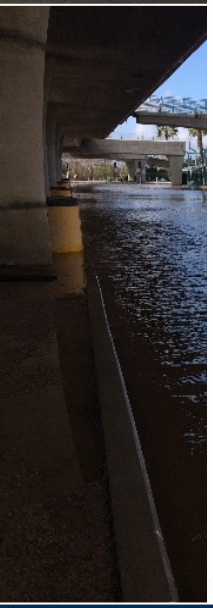
Cumulative Streamflow, in millions of cubic feet

Streamflow in 2017 was above NWS flood stage for 8 days

Explanation - Percentile classes

lowest-10th percentile	5	10-24	25-75	76-90	95	90th percentile -highest	Flow
Much below Normal		Below normal	Normal	Above normal	Much above normal		

San Diego River at Fashion Valley



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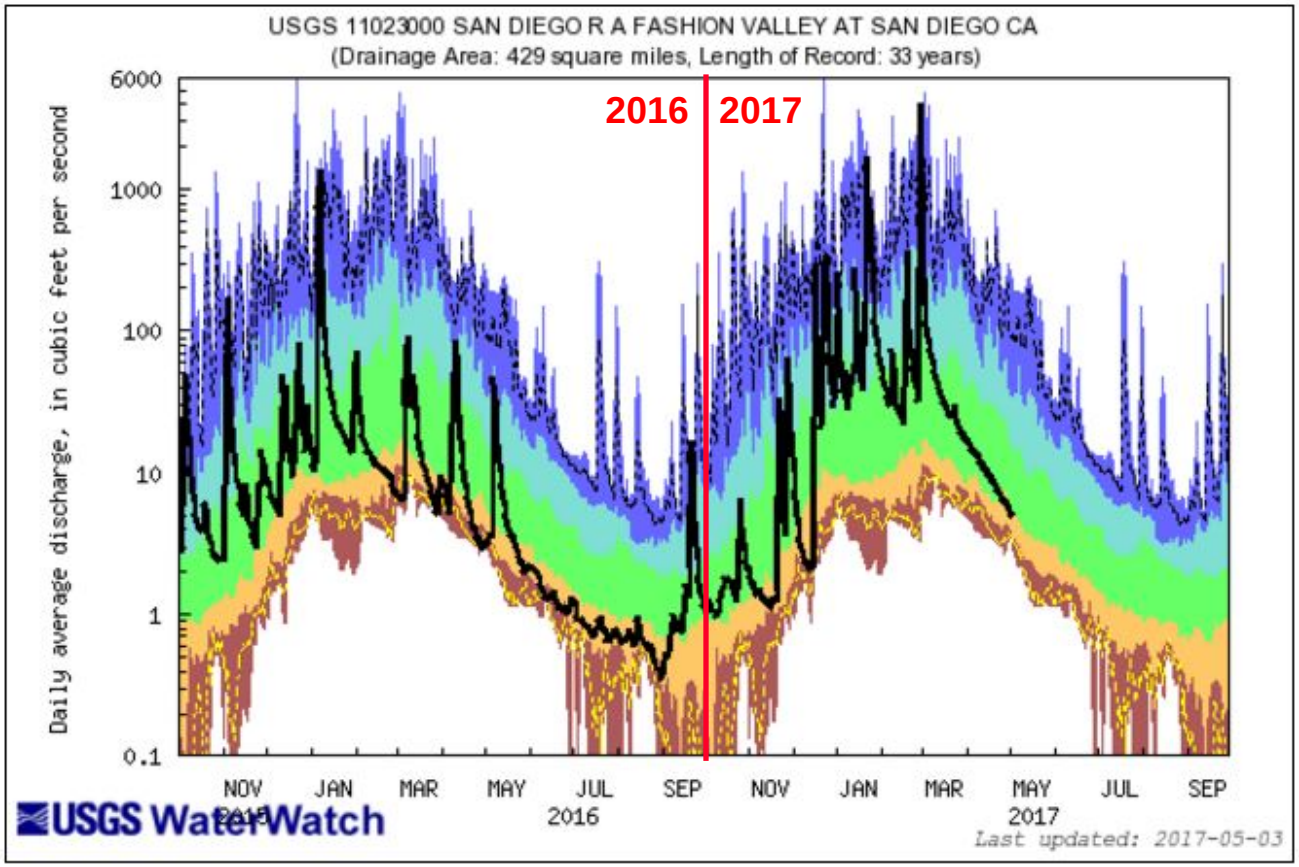
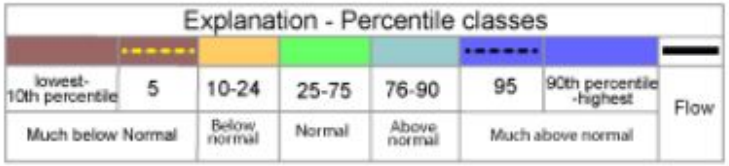
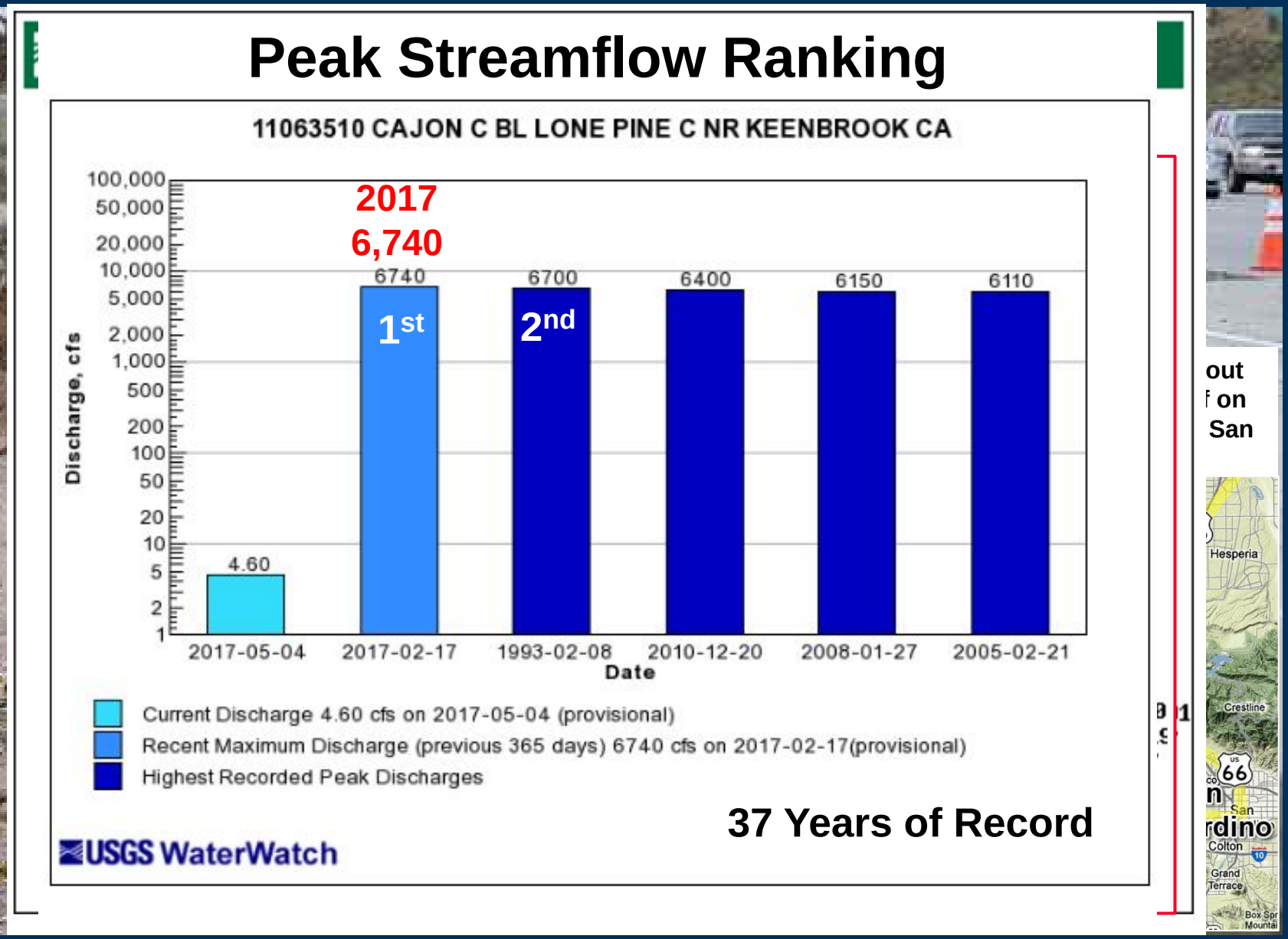




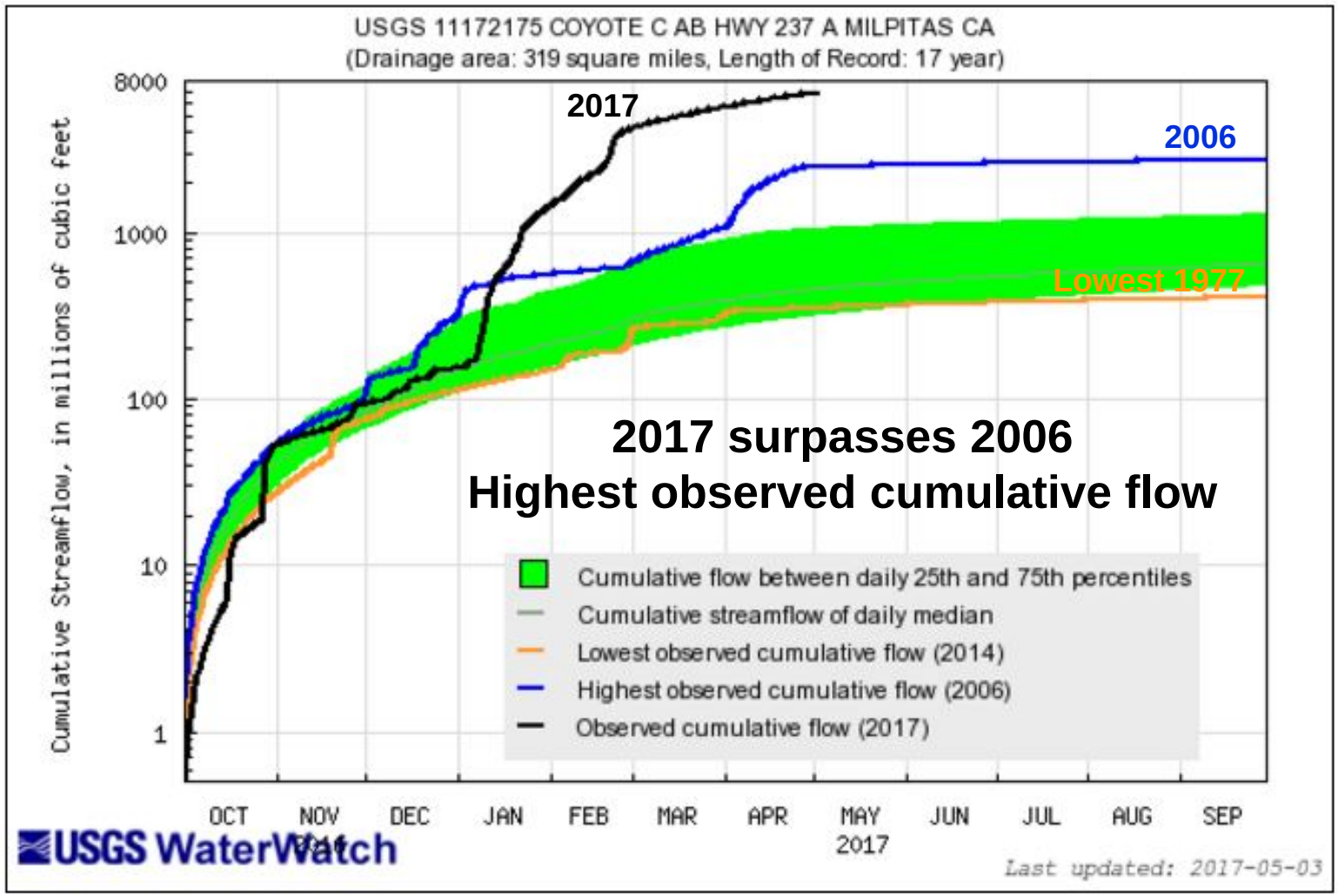
USGS

Cajon Creek near Keenbrook, CA



Coyote Creek at Milpitas, CA

Cumulative Flow



USGS site 11479560, Eel River at Fernbridge, CA, January 11, 2017. Photo courtesy of Derek Kondratowicz, Hydrographer, USGS

USGS