

# NOAA Spring Flood and Drought Outlook



briefing for the Subcommittee on Disaster Reduction  
April 6, 2017

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# National Hydrologic Assessment



## Factors considered

- Precipitation
- Soil Moisture and Drought
- Snow Water Content
- Current Streamflow Conditions
- Extended range forecasts of precipitation, temperature, and streamflow

## Routine coordination with partners and stakeholders

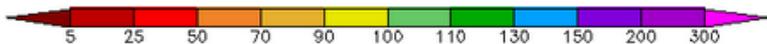
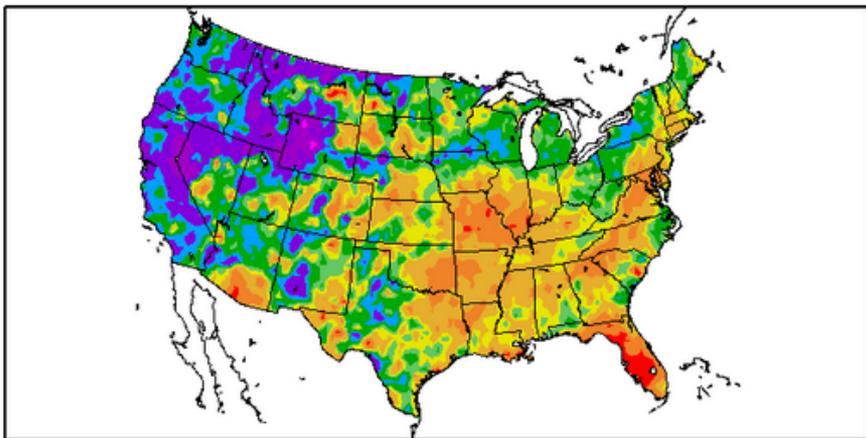
- Began bi-weekly coordination in February 2016 with Federal, Tribal, State, and Local Partners (including Canadians) to establish a common operating picture
- Decision support services are foundational for building a Weather-Ready Nation

# Prior 6-Mon Precip + Monthly Soil Moisture

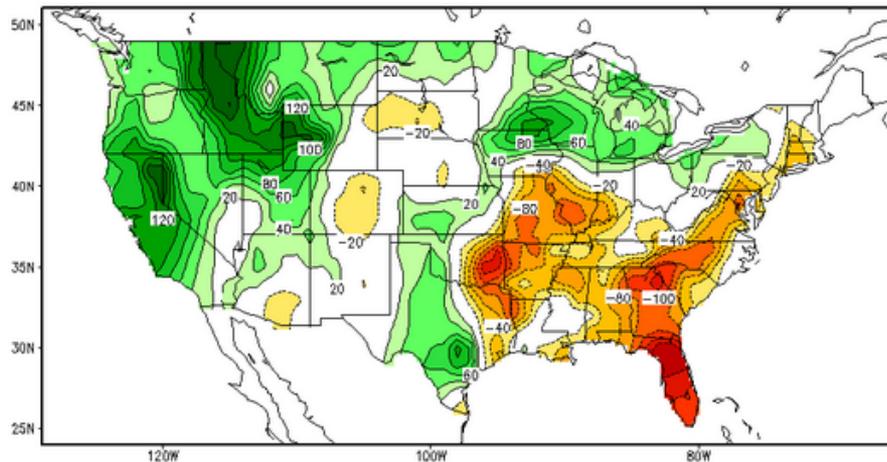


Wet fall and winter have caused above normal soil moisture in parts of Upper Midwest and West

Percent of Normal Precipitation (%)  
10/4/2016 - 4/3/2017



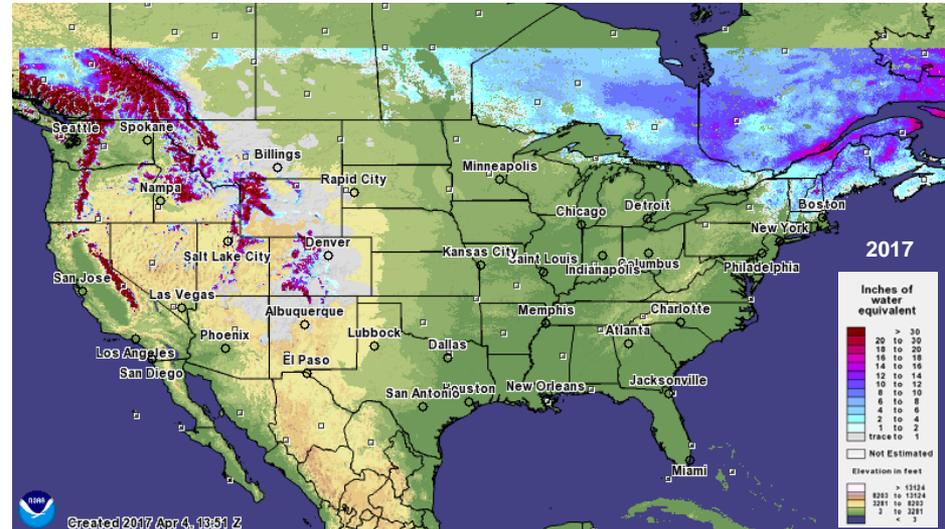
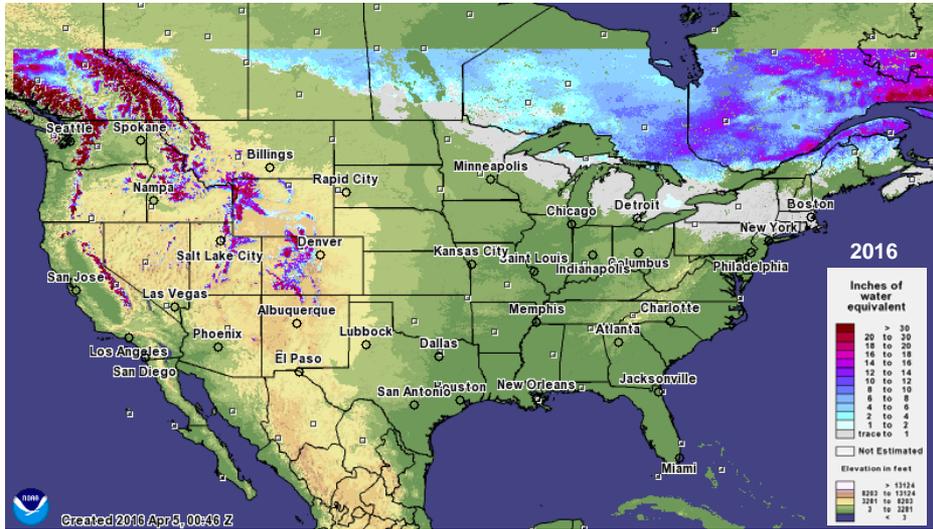
Calculated Soil Moisture Anomaly (mm)  
APR 03, 2017



# Snow Water Content



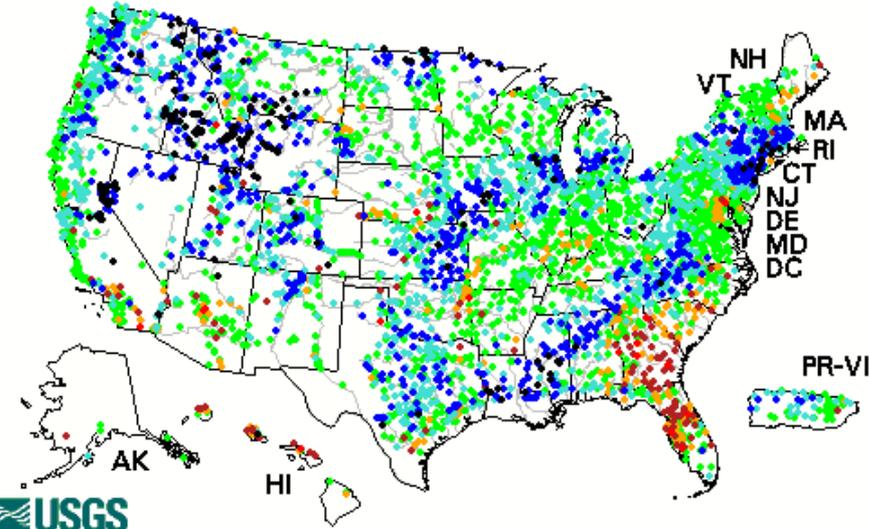
Limited snowpack again this year in Midwest and Northeast, higher in Cascades and Sierras



# Current Streamflow and Drought

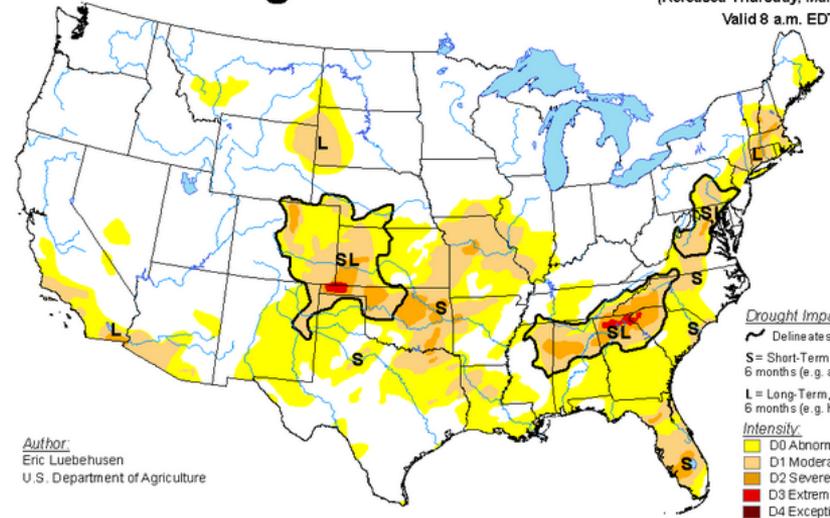


Tuesday, April 04, 2017 11:30ET



## U.S. Drought Monitor

March 28, 2017  
(Released Thursday, Mar. 30, 2017)  
Valid 8 a.m. EDT



Author:  
Eric Luebbehusen  
U.S. Department of Agriculture

**Drought Impact Types**  
Delineates dominant impacts  
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)  
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

**Intensity**  
 D0 Abnormally Dry  
 D1 Moderate Drought  
 D2 Severe Drought  
 D3 Extreme Drought  
 D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

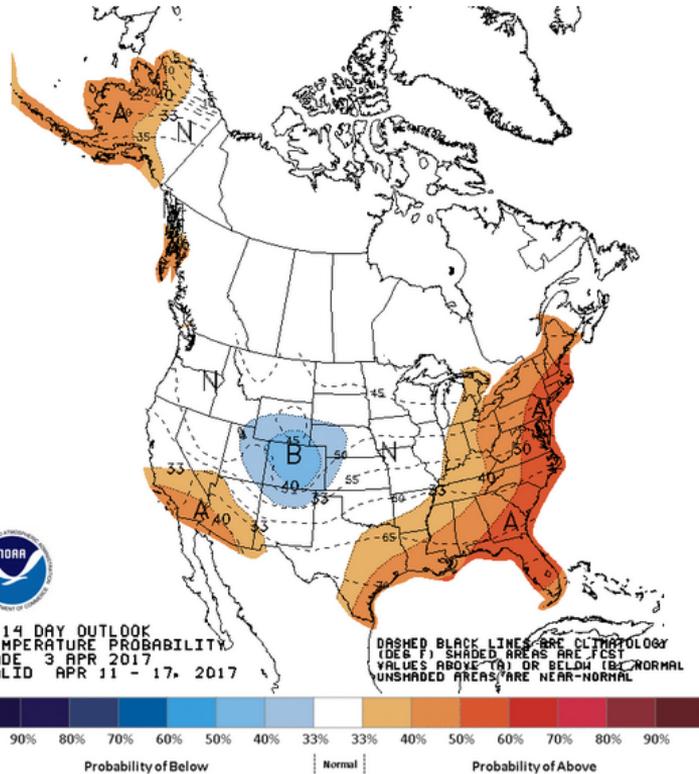
Explanation - Percentile classes						
<span style="color: red;">●</span>	<span style="color: red;">●</span>	<span style="color: orange;">●</span>	<span style="color: green;">●</span>	<span style="color: cyan;">●</span>	<span style="color: blue;">●</span>	<span style="color: black;">●</span>
Low	<10	10-24	25-75	76-90	>90	High
	Much below normal	Below normal	Normal	Above normal	Much above normal	

# 8-14 Day Temp/Precip Outlooks

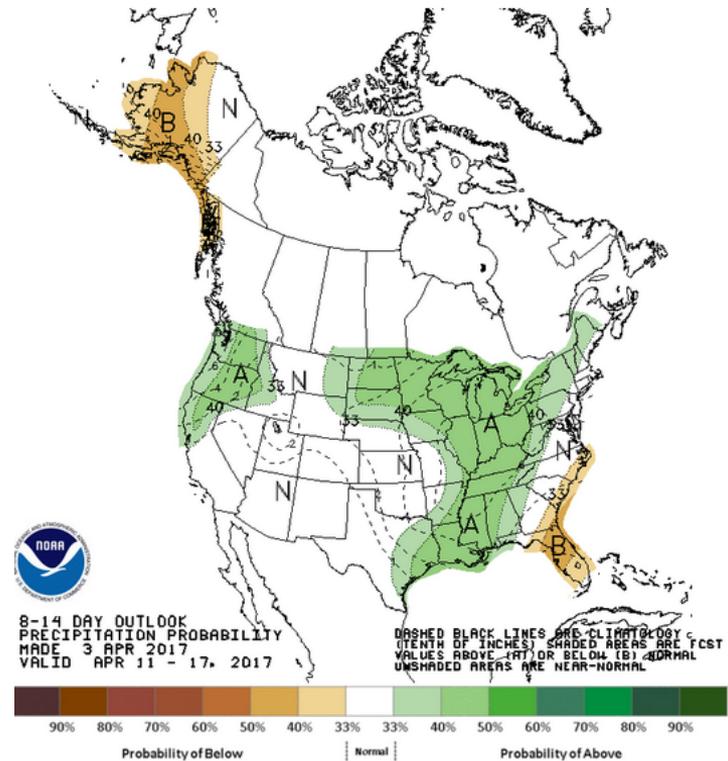


Wetter across upper mid-west, Ohio Valley and Mississippi Valley

Temperature



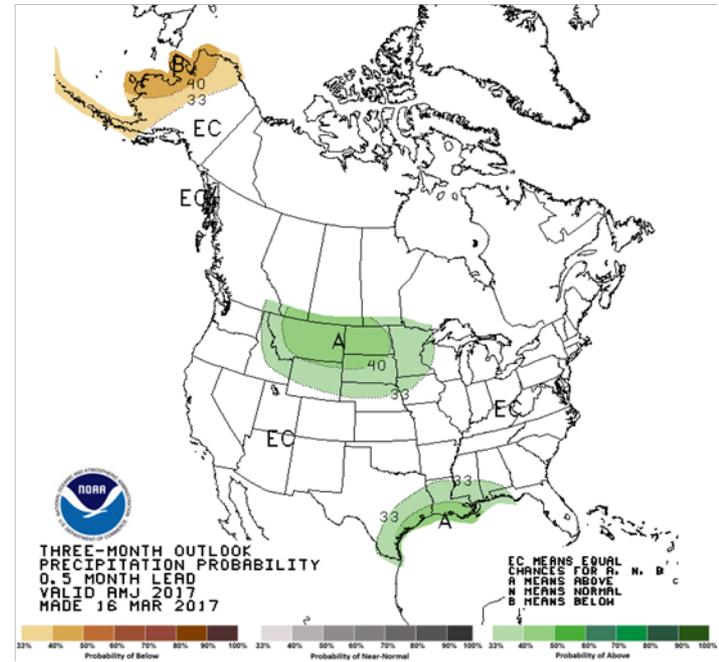
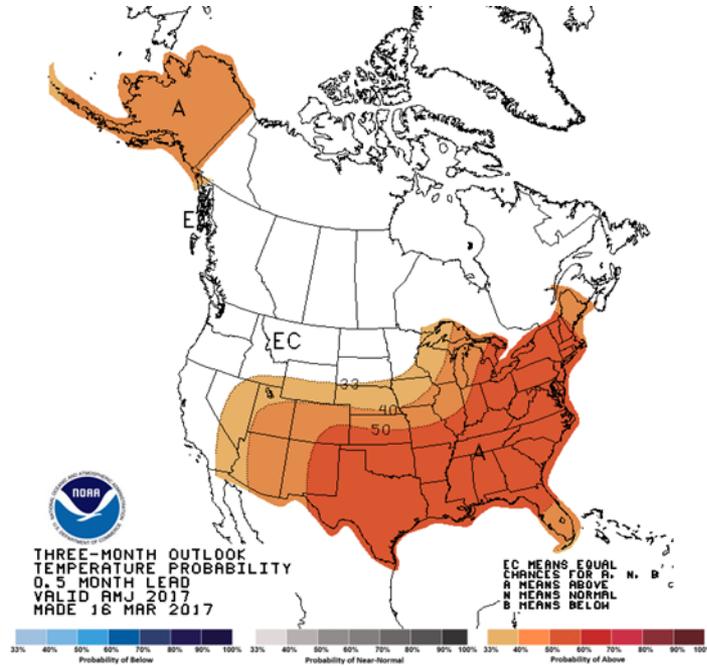
Precipitation



# Apr-May-Jun Outlooks



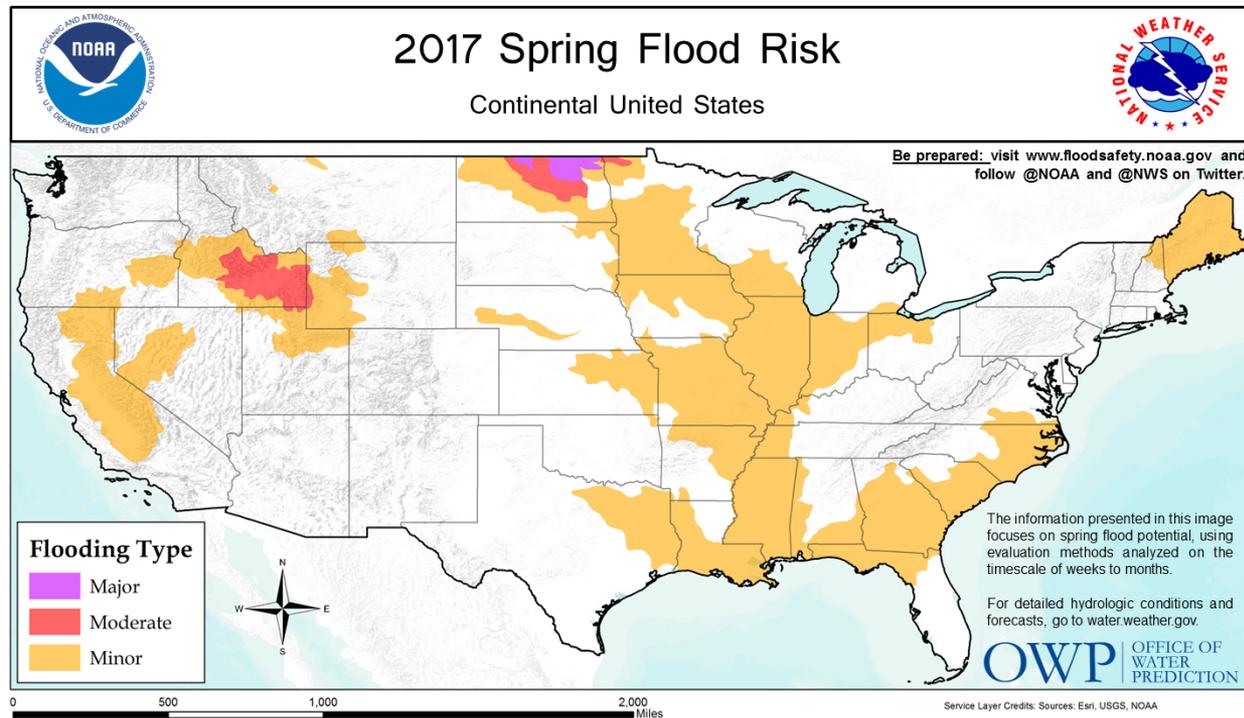
Warmer pattern in Alaska; Continued warmth for CONUS; Wet across Gulf Coast, Northern Plains



# U.S. Spring Flood Outlook



## Risk of major flooding in North Dakota, moderate flooding in Idaho



- Heavy snowpack and wet soils contribute to flooding risk in Northern North Dakota, Northern New England, and in the West
  - Moderate to major flooding possible for Souris River Basin, the Devils Lake Basin, and the northernmost tributaries of the Red River of the North Basin.
  - Moderate flooding possible for Snake River Basin in Idaho.
- Spring thunderstorm activity and associated rainfall will drive flood risk in Central US, along the Gulf Coast, and across the Southeast.

**New Story Map Display**

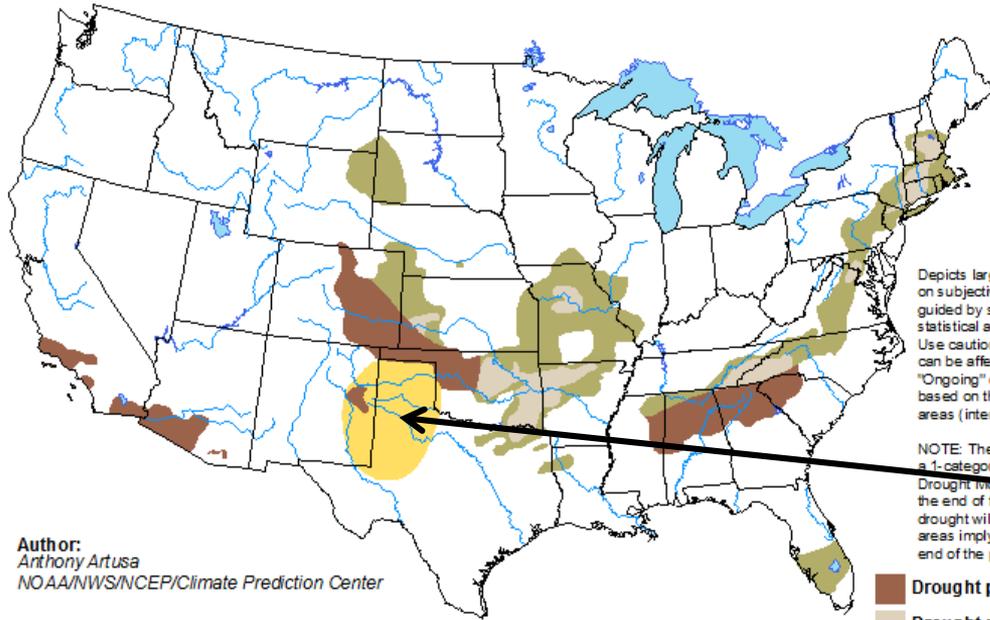
<http://noaa.maps.arcgis.com/apps/MapJournal/index.html?appid=68e302ea2b1c4f53aa711374c44bf109>



# Apr-May-Jun Drought Outlook

## **U.S. Seasonal Drought Outlook** Drought Tendency During the Valid Period

Valid for March 16 - June 30, 2017  
Released March 16, 2017



Author:  
Anthony Artusa  
NOAA/NWS/NCEP/Climate Prediction Center

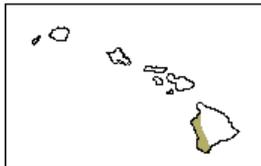
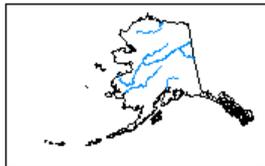
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

-  Drought persists
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely

The Spring drought outlook released in mid-March favored improving drought conditions for many existing areas in the contiguous U.S. (green/gray areas)

Drought development over the period is favored for portions of eastern New Mexico and northwest Texas based on several factors.



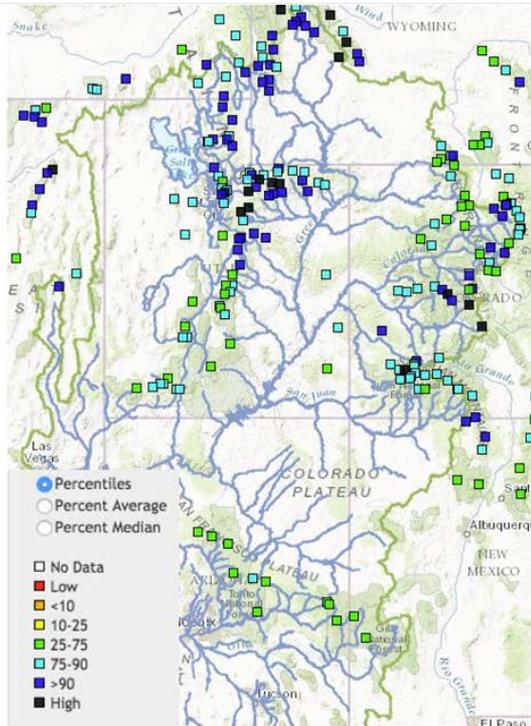
<http://go.usa.gov/3eZ73>

# A Word about the West



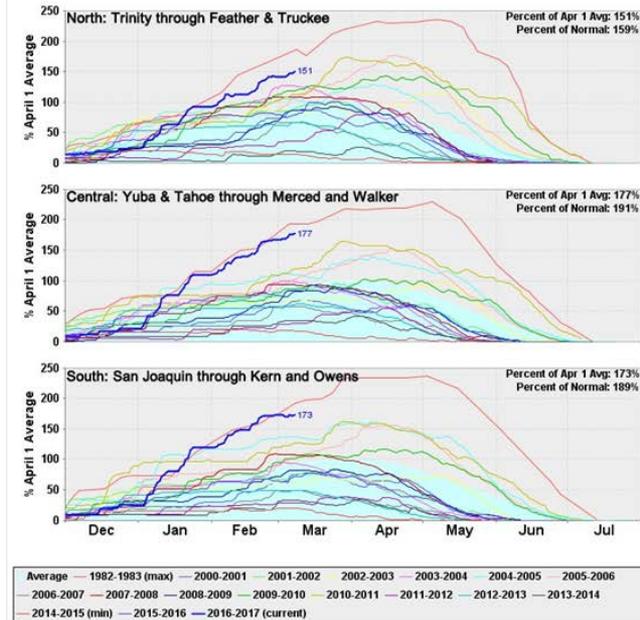
## This winter has been significant for water resources across the West

- Snowpack is significant in the Great Basin of Utah, Idaho, and Wyoming in Upper Colorado River Basin and throughout the Sierra
- Wet winter leaves many areas susceptible to additional flooding through the remainder of the wet season
- Mid-March is still too early to determine final spring flooding potential. The duration and intensity of flooding will depend on future precipitation and temperatures



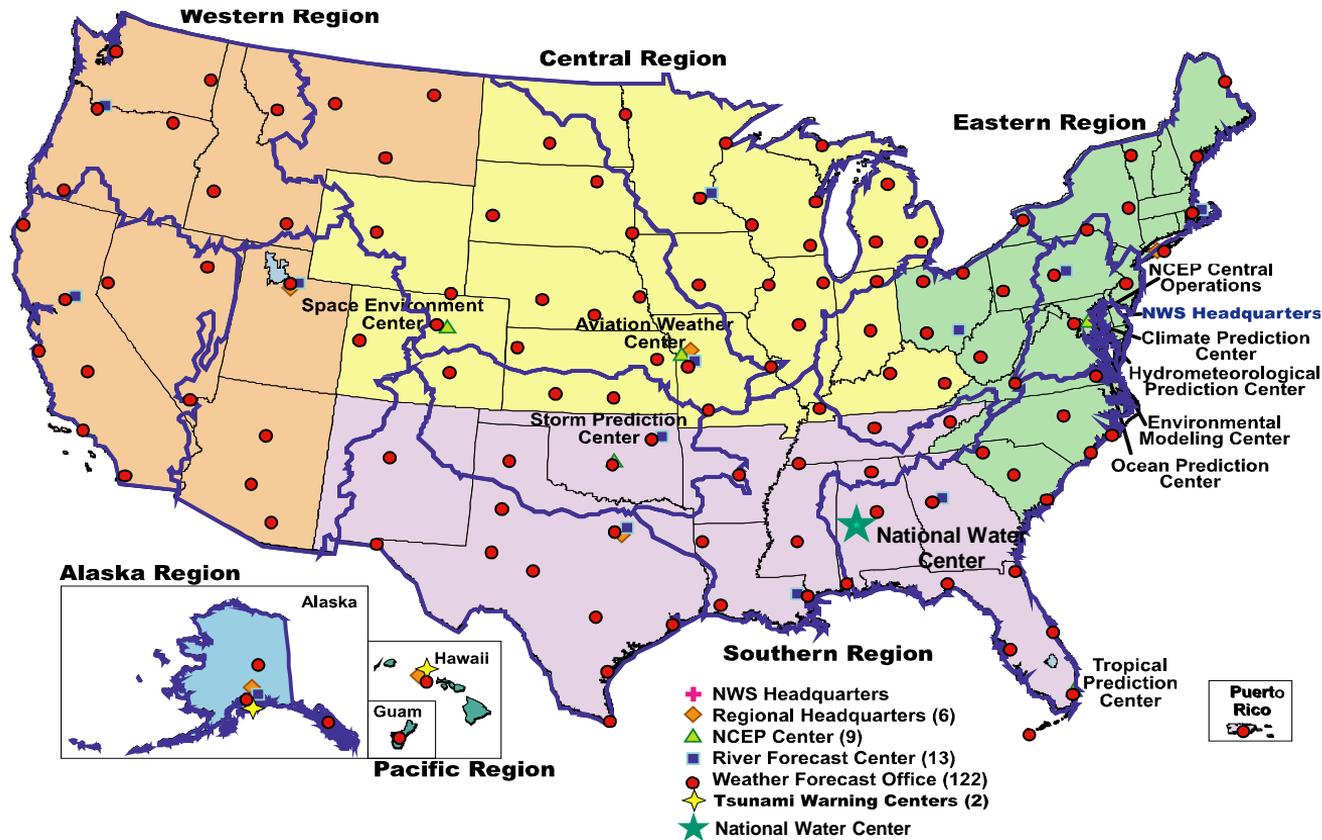
Snow Percentile Image: Historical SNOTEL ranking as of March 3rd 2017

### California Snow Water Content - Issued March 8, 2017 Snow Traces Since 2001 Water Year and Maximum Trace (1983 Water Year)



Graphic Courtesy: California Department of Water Resources  
<http://cdec.water.ca.gov> Statewide Percent of average to date 180%

# NWS Operational Infrastructure



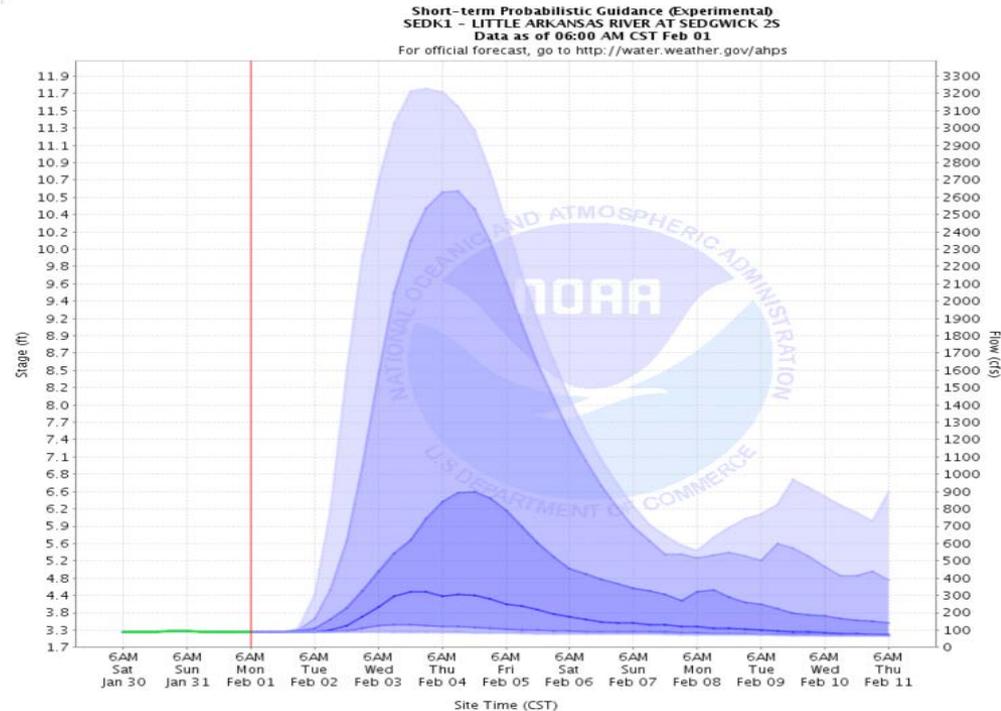
Leveraging national, regional and local assets to produce and provide life-saving forecasts and warnings

# Enhancing Current Forecasting System



## Hydrologic Ensemble Forecast System (HEFS) Probabilistic information to support risk-based decisions

- Incorporates both atmospheric and hydrologic uncertainties
- 123 locations have experimental product for short-range river forecasts
- Testing and evaluation ongoing; collecting feedback via web
- New river service locations will expand throughout 2016

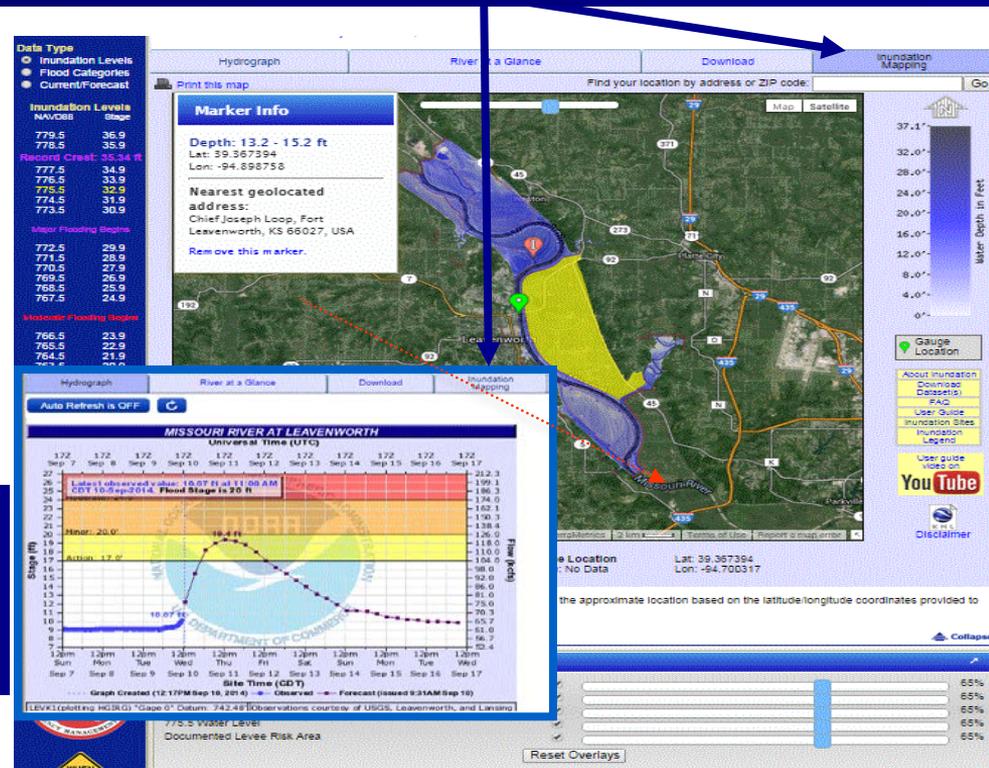


# Enhancing Current Forecasting System



When viewing forecast at a point, “click on” Inundation Mapping tab to view flood inundation maps

- Provide spatial extent and depth of flood waters
- Display inundation maps for levels from minor flooding through flood of record
- Better mitigate impacts of flooding and build more resilient communities
- Libraries include NWS flood severity categories and regulatory FEMA flood frequency maps



## Implementation Status:

- ✓ 120 Flood Inundation Map Libraries
- ✓ Continued Partnership with FEMA, USACE, USGS, States, & Others

# Enhancing Current Forecasting System



## National Water Model (NWM)

- Product of a multi-year series of stakeholder meetings
- NWM version 1.0 Implementation on August 2016
- Goals for NWM:
  - Focus on full range of water resources, from droughts to floods
  - Provide forecast streamflow guidance for underserved locations
  - Produce spatially continuous national estimates and forecasts of hydrologic states (soil moisture, snow pack, etc.)
  - Implement a modeling architecture that permits rapid infusion of new data and science, and supports cross-NOAA water initiative
- Provides foundation for sustained growth in nationally consistent operational hydrologic forecasting capability
- New versions to be released on a routine basis

# NWM v1.0 Experimental Output



## ▪ Hydrologic Output

- River channel discharge and velocity at 2.7 million river reaches
- Reservoir inflow, outflow, elevation
- Surface water depth and subsurface flow (250m CONUS+ grid)

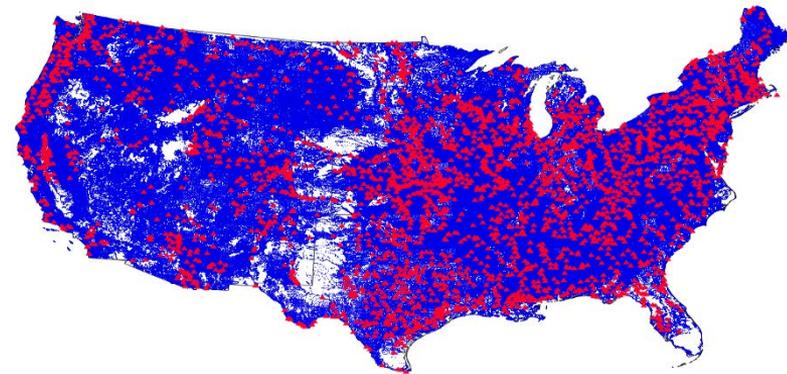
## ▪ Land Surface Output

- 1km CONUS+ grid
- Soil and snow pack states
- Energy and water fluxes

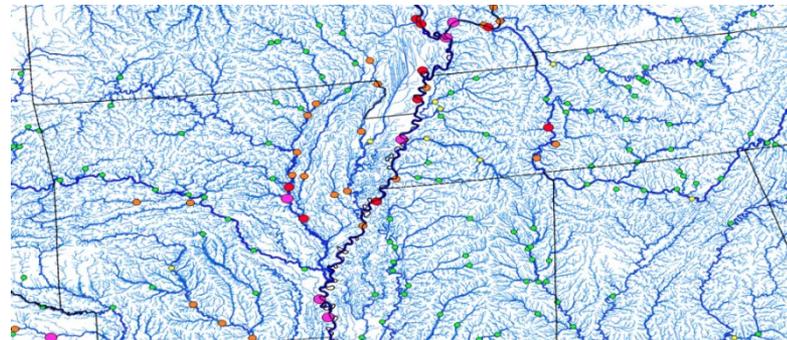
## ▪ Direct-output and derived products (e.g. streamflow anomalies)

## ▪ Three pronged dissemination strategy:

- NOMADS, Web, and Direct to field



Current NWS AHPS points (red)  
NWM output points (blue)



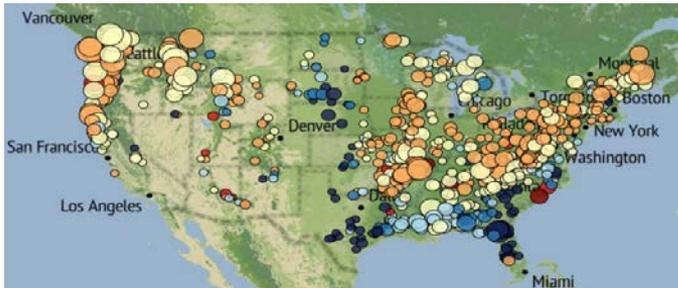
Current NWS River Forecast Points (circles)  
Overlaid with NWM Stream Reaches

# NWS Version 1.1 Enhancements



Calibration: Example of successful operations →  
research → operations feedback loop

**NWM v1.0: Oct 2011-Feb 2016**

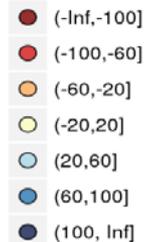


**Experimental NWM v 1.1 after regional calibration**

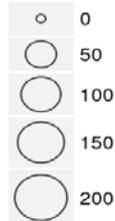


GIS: Added over 5000 OCONUS contributing basins to NWM channel routing domain, fixed over 100 stream breaks and other improvements to National Hydrography Dataset Plus (NHDPlusV2) hydrofabric

Bias (%)



Mean Flowrate (cms)



**Calibration Regions (Shaded)**



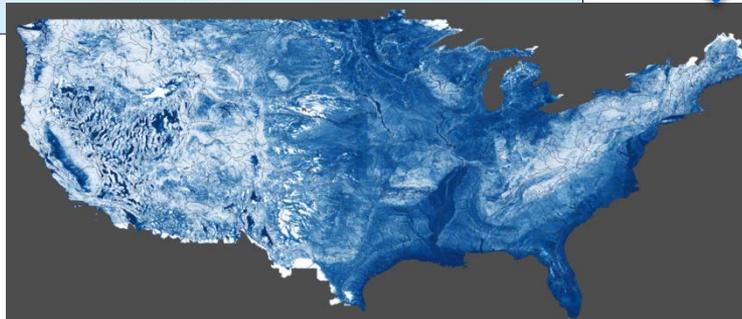
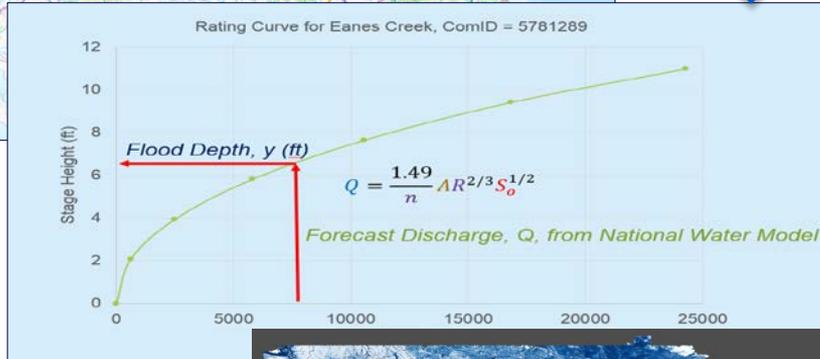
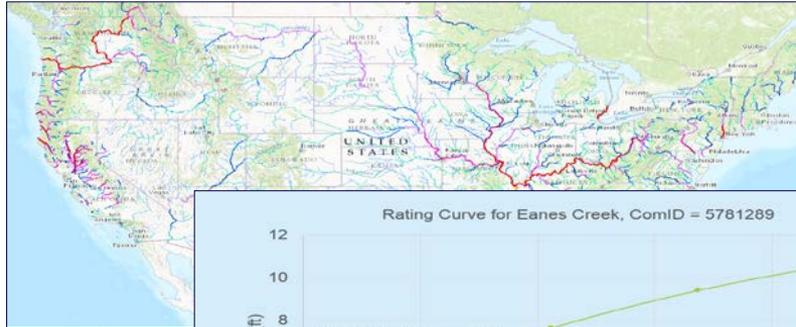
Implementation targeted for April, Version 1.2 targeted for November, with annual upgrades in October thereafter.



# Prototype Continental-Scale Inundation Mapping



1. Forecast **discharge** with National Water Model
2. Convert discharge to **depth** using rating curve
3. Convert depth to **inundation** using Height Above Nearest Drainage (HAND)





# Questions?

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