From Drought to Flood
What’s next?

Dr. Michael Anderson, State Climatologist
Climate Division 2 (Sacramento Basin) – Calendar Year Data

Annual Precipitation (inches)

Annual Average Temperature (deg F)

1895-2000
21st Century
POR Average
Snowpack and Winter Temperatures of the Sierra Nevada

Sierra Winter (DJF) Average Minimum Temperature (degrees Fahrenheit)
Distribution of Landfalling Atmospheric Rivers on the U.S. West Coast
(From 1 Oct 2016 to 12 April 2017)

<table>
<thead>
<tr>
<th>AR Strength</th>
<th>AR Count*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weak</td>
<td>12</td>
</tr>
<tr>
<td>Moderate</td>
<td>21</td>
</tr>
<tr>
<td>Strong</td>
<td>13</td>
</tr>
<tr>
<td>Extreme</td>
<td>3</td>
</tr>
</tbody>
</table>

- 49** Atmospheric Rivers have made landfall on the West Coast thus far during the 2017 water year (1 Oct. – 12 April 2017)
- This is much greater than normal
- 1/3 of the landfalling ARs have been “strong” or “extreme”

**Water year total was 53 ARs per CW3E

*Radiosondes at Bodega Bay, CA indicated the 10–11 Jan AR was strong (noted as moderate based on GFS analysis data) and 7–8 Feb AR was extreme (noted as strong)

By F.M. Ralph, B. Kawzenuk, C. Hecht, J. Kalansky
Center for Western Weather and Water Extremes
Scripps Institution of Oceanography
For July, Death Valley average temperature was 107.4°F, a new record.
Initial Conditions

• Major reservoirs holding more water than last year with exception of Oroville

• Runoff response from upper watersheds likely to begin sooner due to wetter conditions (no direct observations for this)

• Some high elevation carryover of snow (above 10,000’)
October 2015
(driest year in drought)

Soil moisture deficit
(Oct 1 mm)

- 0 - 100
- 100 - 200
- 200 - 300
- 300 - 400
- 400 - 600
- 600 - 800
- 800 - 1,000
- 1,000 - 1,400

Water supply basins

October 2017

Basin Characterization Model Results, USGS
Soil moisture deficit
October 2017
(acre-feet deficit)
Seasonal Outlook for Water Year 2018
The size, number, and strength of atmospheric river events (ARs) result from the alignment of key physical processes operating on different space and time scales that will change with climate change.
Circulation Patterns of Note
Most models and the multi-model averages predict ENSO-Neutral through the remainder of the year and into early 2018.

From Climate Prediction Center’s ENSO Diagnostic Discussion
Most models and the multi-model averages predict ENSO-Neutral through the remainder of the year and into early 2018.
The seasonal outlooks combine the effects of long-term trends, soil moisture, and, when appropriate, ENSO.

From Climate Prediction Center’s ENSO Diagnostic Discussion
NMME Dynamic Model Outlooks with October Initial Conditions

December

January

February
Atmospheric anomalies over the North Pacific and North America During the Last 60 Days

During mid August to mid September 2017, an anomalous trough (and below-average temperatures) was present over eastern North America, and an anomalous ridge (and above-average temperatures) was present over the western contiguous U.S.

After mid September, the pattern of anomalies flipped. An anomalous trough (and below-average temperatures) was observed over the western U.S. and an amplified ridge (and above-average temperatures) occurred over eastern North America.

From Climate Prediction Center’s ENSO Diagnostic Discussion
Outlook Summary

• Atmosphere showing more La Niña type circulation for this winter

• Location of Pacific High Pressure key to winter outcome – can vary over course of winter

• Expectations are for dry southern CA and limited opportunities for storms to reach northern CA – does not exclude flood possibility

• Early shutoff to wet season possible