

Planning For Seasonal Supply & Climate Change At The Portland Water Bureau

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PNWS- AWWA 2016 Boise Pre-Conference Session

May 4, 2016



Portland's Water Supply



	Water Storage Facility		Portland Water System Distribution Area
	Water Supply Pipes		Water Source
	Water Treatment Facility		Protected Area
	Dam		

Bull Run Watershed

1929



1962



- Portland's primary water supply since 1895
- 102 square miles
- Unfiltered
- Protected watershed
- ~1 million people served
- 175 billion gallons annual production
- 9.9 billion gallons storage capacity

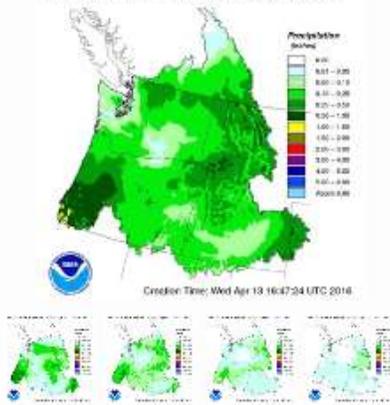
Columbia South Shore Well Field



Weather

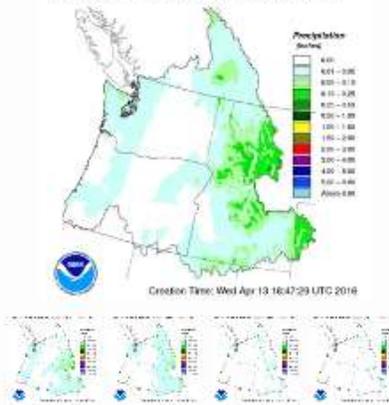
Day 2 (Thursday): Precipitation Forecast

DAY 2 QPF, 24hr Period Ending 12Z, 04/15/2016



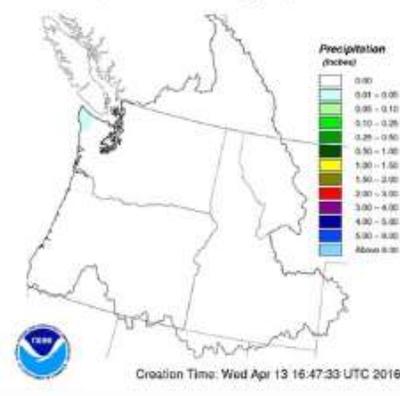
Day 3 (Friday): Precipitation Forecast

DAY 3 QPF, 24hr Period Ending 12Z, 04/16/2016

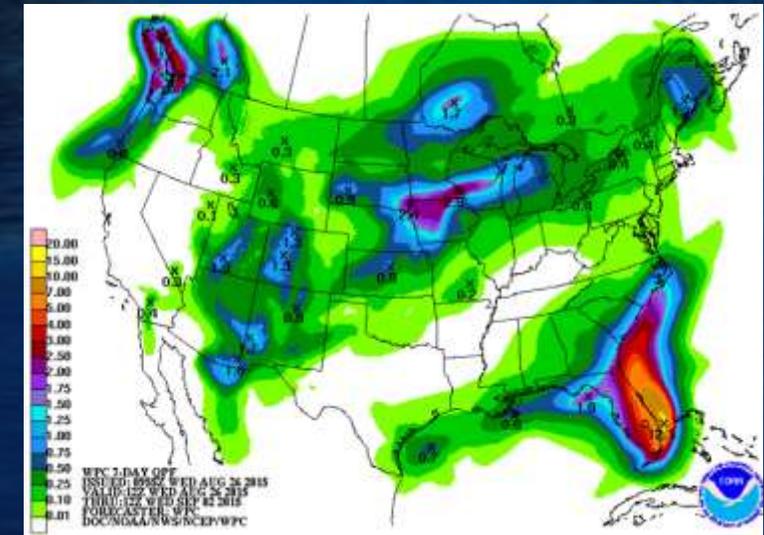
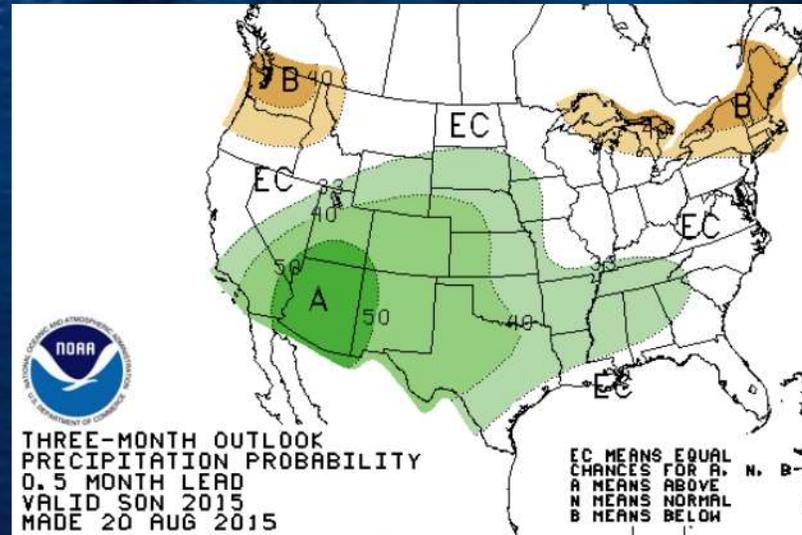
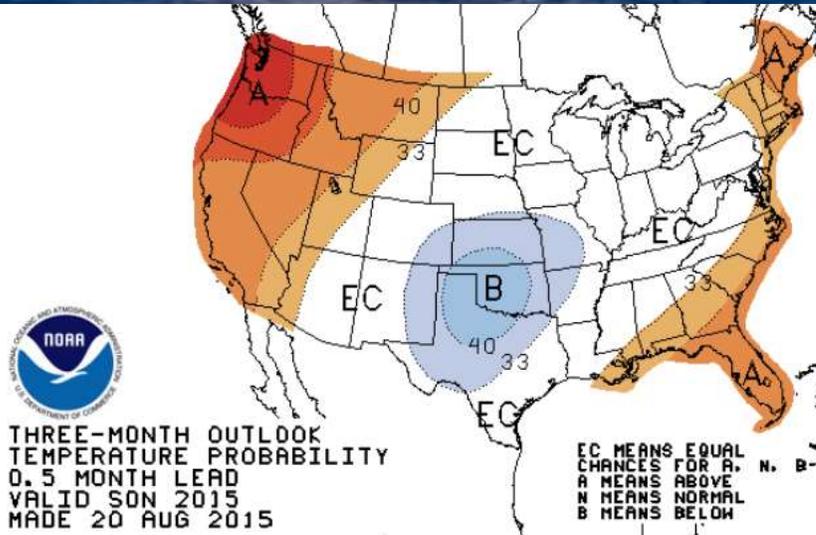
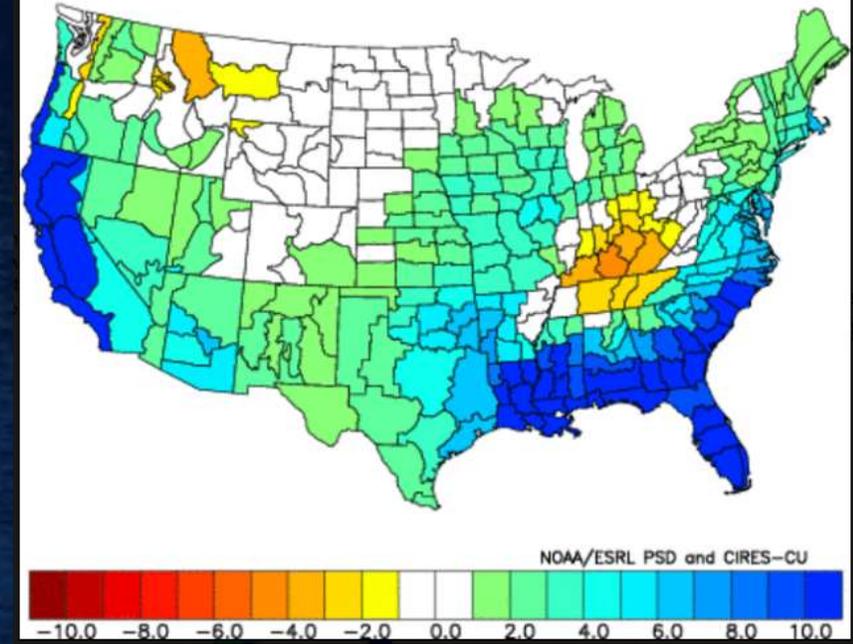


Day 4 (Saturday): Precipitation Forecast

DAY 4 QPF, 24hr Period Ending 12Z, 04/17/2016



NOAA/NCDC Climate Division Composite Precipitation Anomalies (in)
Nov to Mar 1982-83, 1997-98
Versus 1950-2007 Longterm Average



1992

Very warm winter,
dry spring and
summer

Well field
inaccessible

**OFFICIALS CHART PLANS FOR POSSIBILITY OF EARLY
WATER CONSERVATION**

April 3, 1992

**DROUGHT MAY LEAD TO MANDATORY WATER
RESTRICTION**

June 25, 1992

CITY'S BACKUP WATER WELLS FAIL TO FULFILL PROMISE

August 2, 1992

RAIN, RAIN, DON'T GO AWAY

August 7, 1992

**PORTLAND TURNS TO BLUE LAKE WELLS TO RELIEVE
BULL RUN WATER SUPPLIES**

August 17, 1992

CITY SET TO START PUMPING FROM LAKE

September 11, 1992

BE PATIENT ABOUT YOUR DIRTY CAR

September 26, 1992

Recent rainfall means that some restrictions could end before Dec. 3, the original target date OK, so it rained this week. Can I wash my car now? No, but you probably won't have to wait until Dec. 3 to do it. So when? Stay tuned and stay patient. The immediate effect of the rain is that the easing of restrictions will occur before the original Dec. 3 target date. That date was a worst-case scenario, predicated on the dire possibility of a complete lack of rain....

Seasonal Water Supply Augmentation and Contingency Plan

2015 SEASONAL WATER SUPPLY AUGMENTATION AND CONTINGENCY PLAN

CITY OF PORTLAND

PORTLAND WATER BUREAU

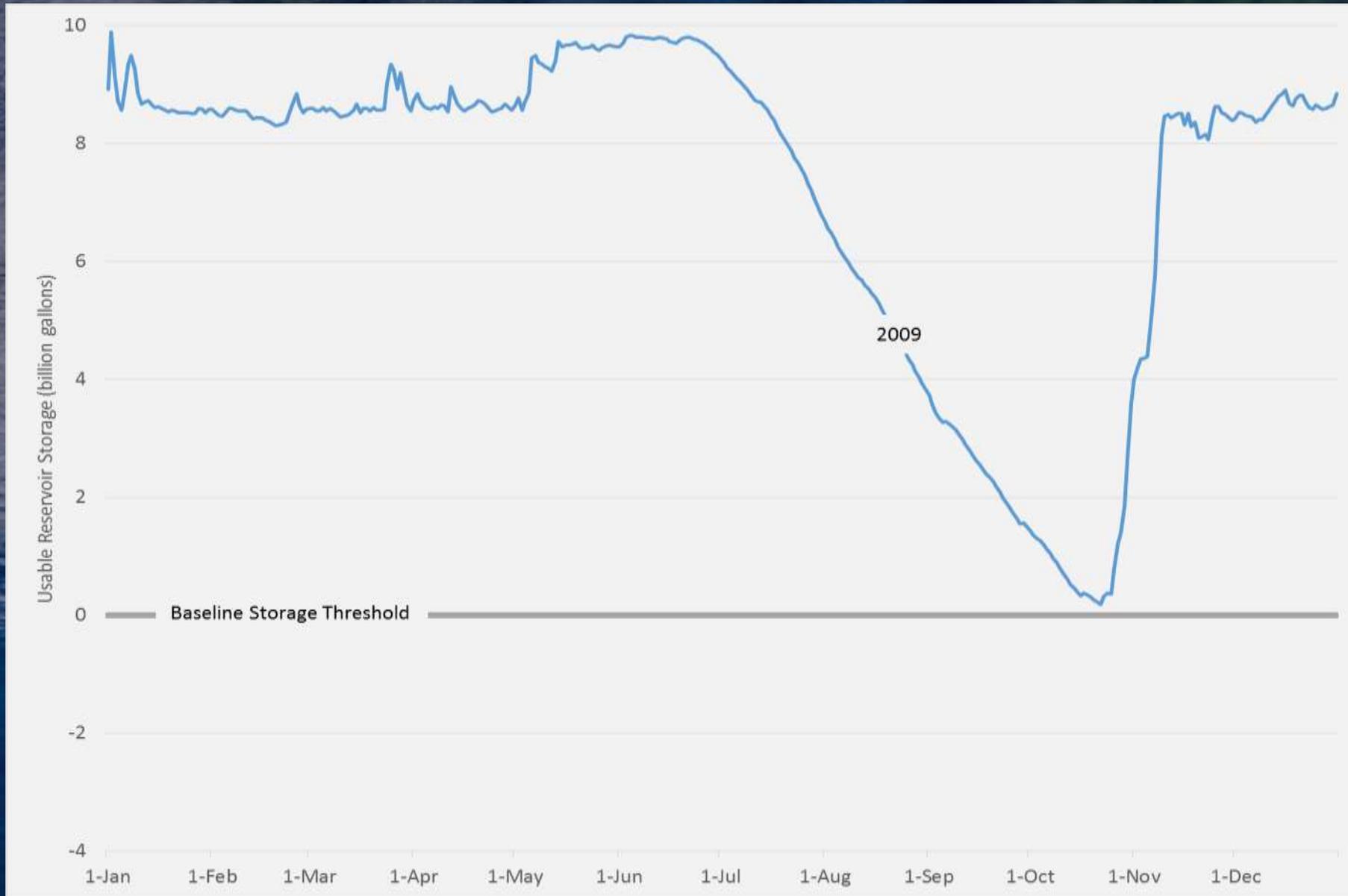
MAY 26, 2015

1. OVERVIEW

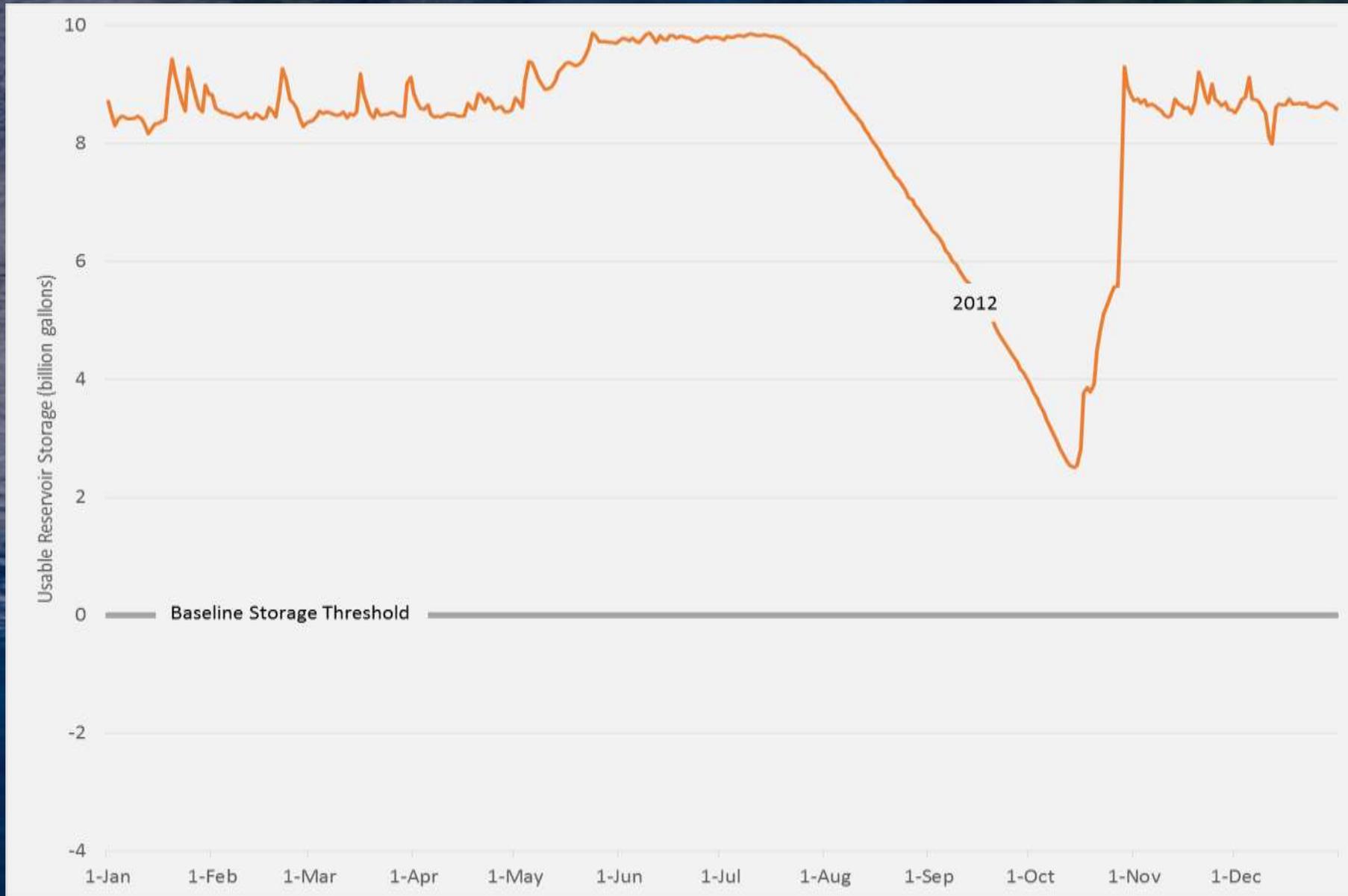
Each year, the Portland Water Bureau (bureau) prepares a seasonal water supply augmentation and contingency plan, commonly referred to as the Summer Supply Plan. The Summer Supply Plan provides a comprehensive strategy for augmenting the bureau's baseline water resources, if needed during the peak demand season. An interdisciplinary team of bureau staff, with input from wholesale customer representatives, prepares the plan based on current supply and demand information and analysis of resource options.

- Baseline supplies
 - Bull Run water
 - Columbia South Shore wells
- Contingency supplies
 - Two tiers
 - Includes interties with other systems, offloads from wholesalers, tapping a large natural lake in the Bull Run, bringing out of service wells into service, customer curtailment measures

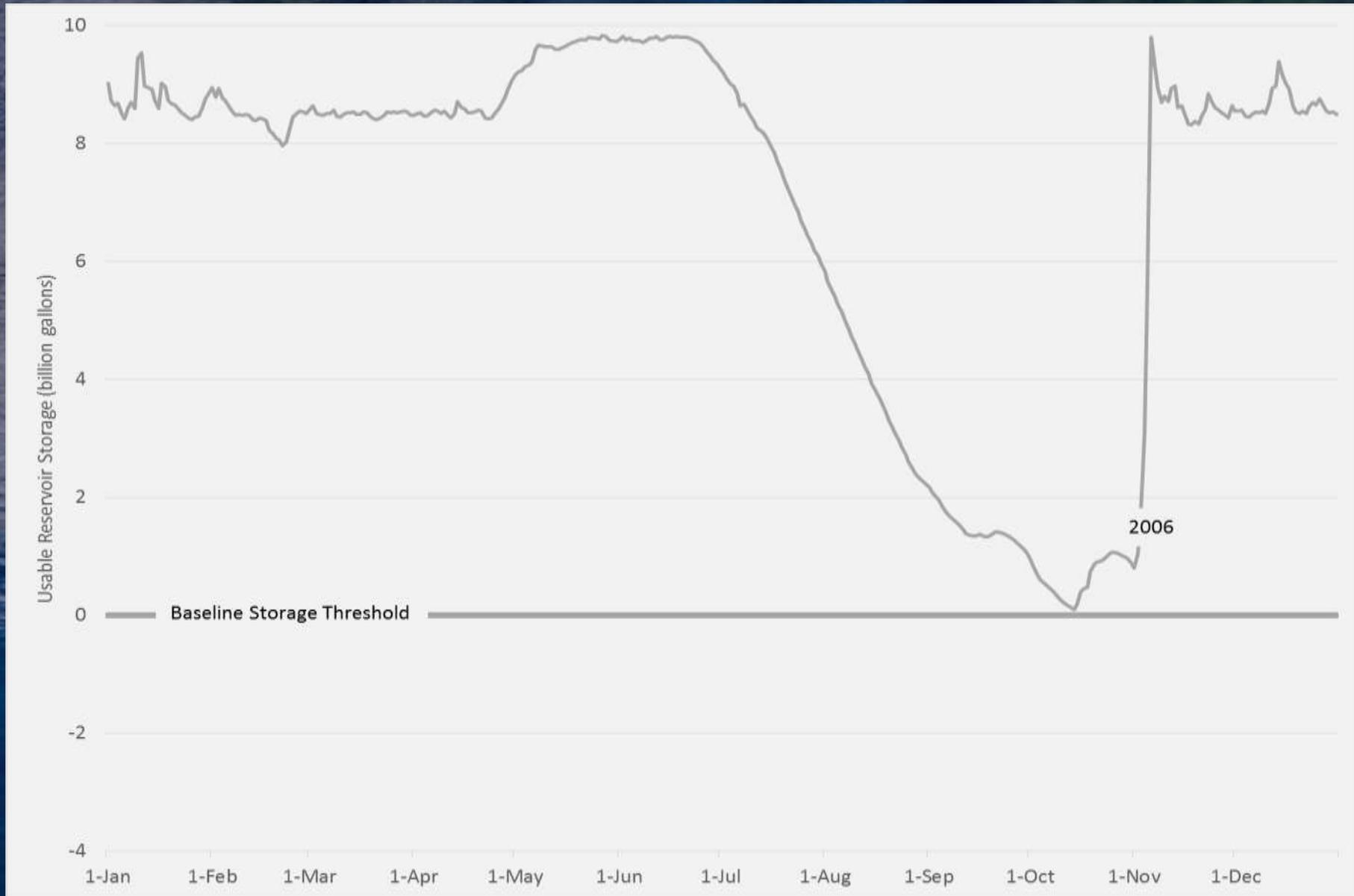
Bull Run Reservoir Drawdown



Bull Run Reservoir Drawdown



Bull Run Reservoir Drawdown



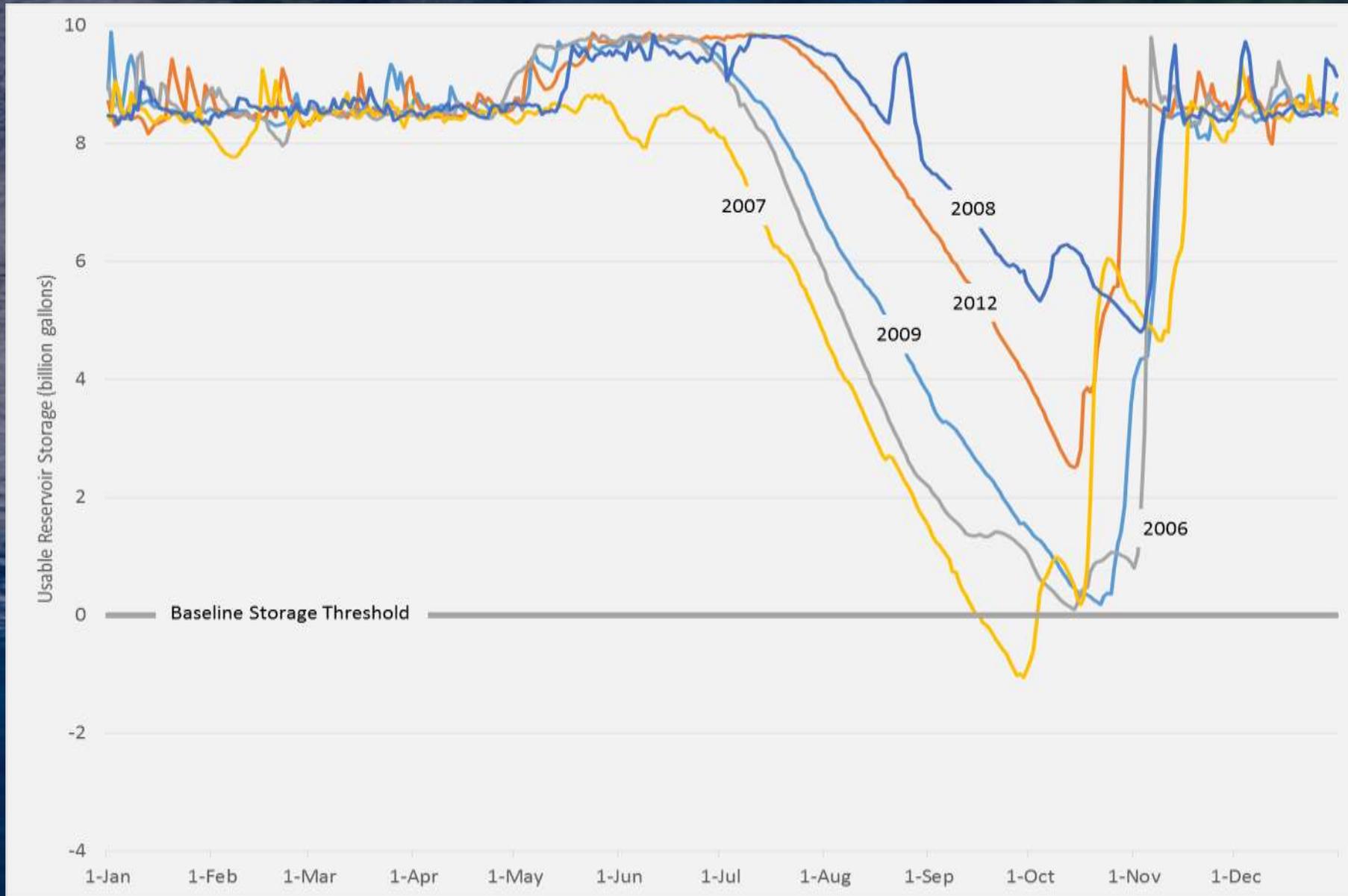
Bull Run Reservoir Drawdown



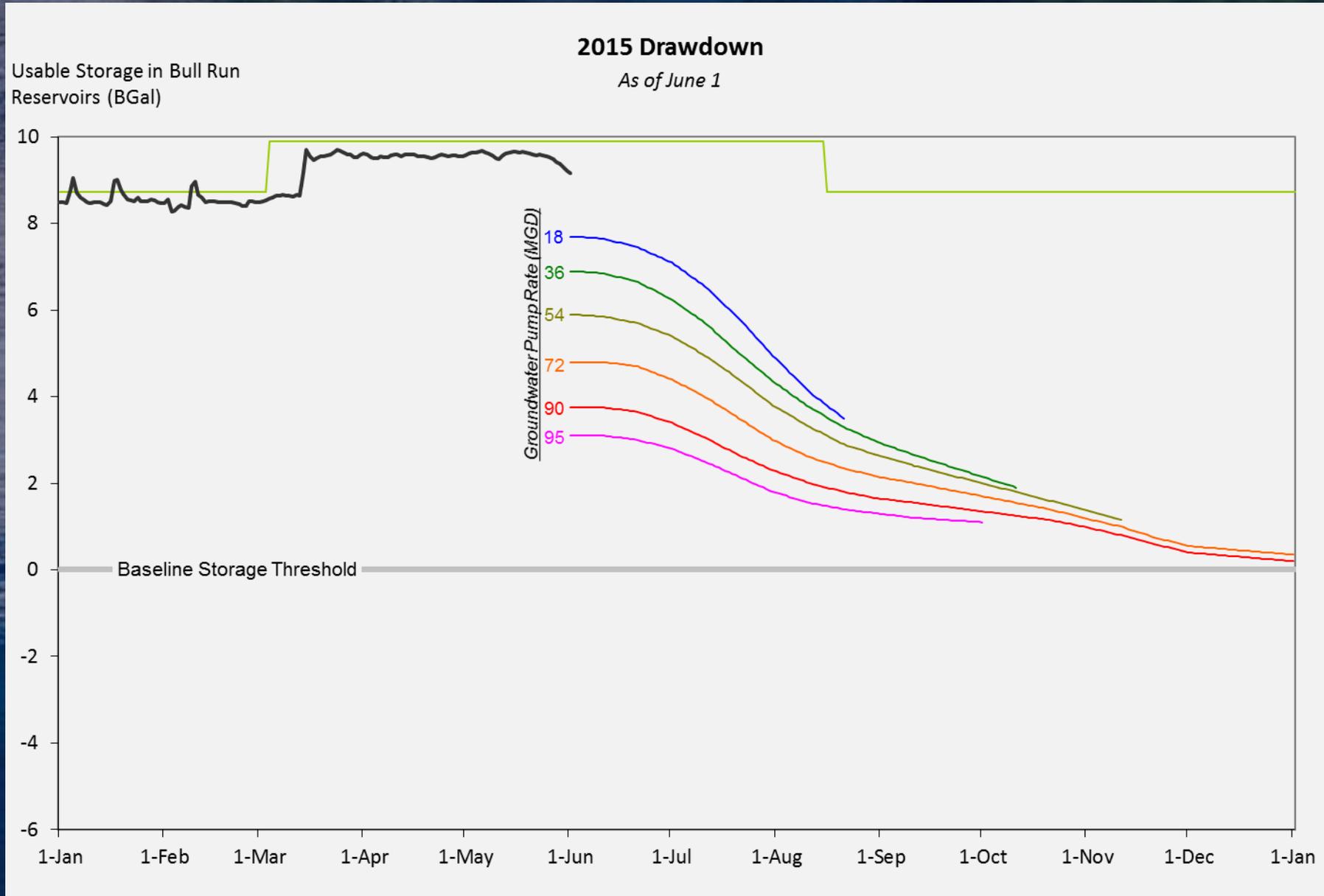
Bull Run Reservoir Drawdown



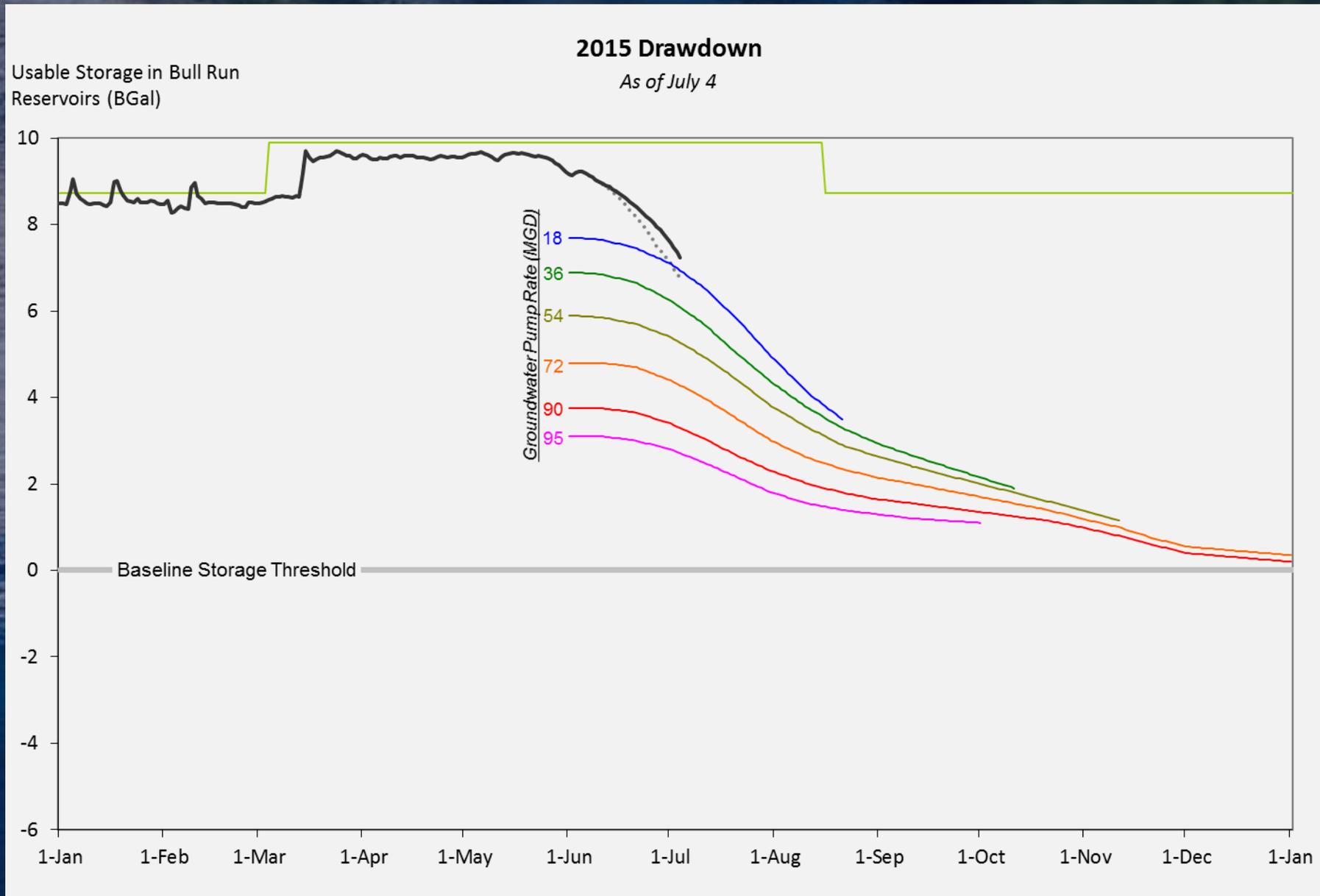
Bull Run Reservoir Drawdown



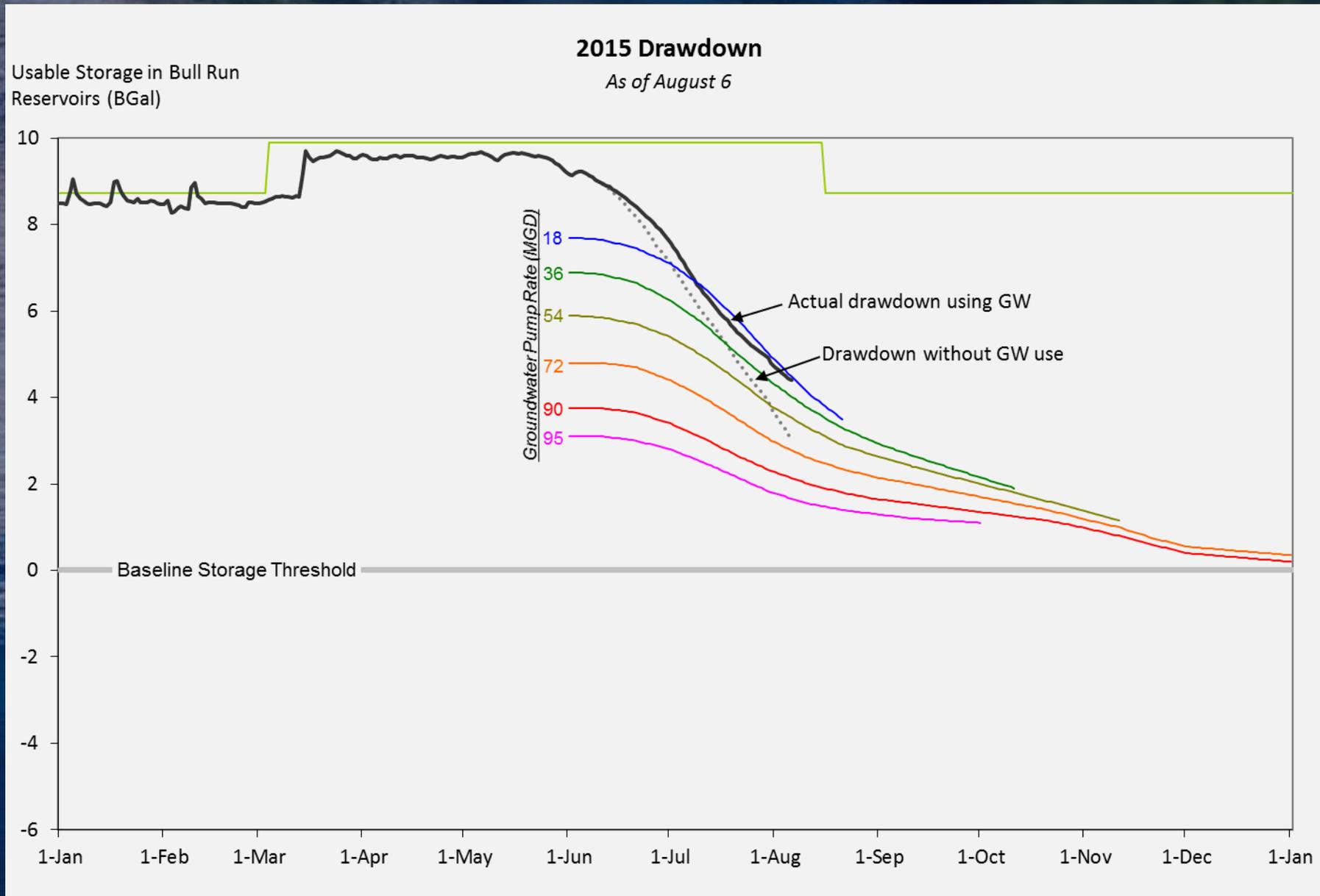
Planning Process during Reservoir Drawdown



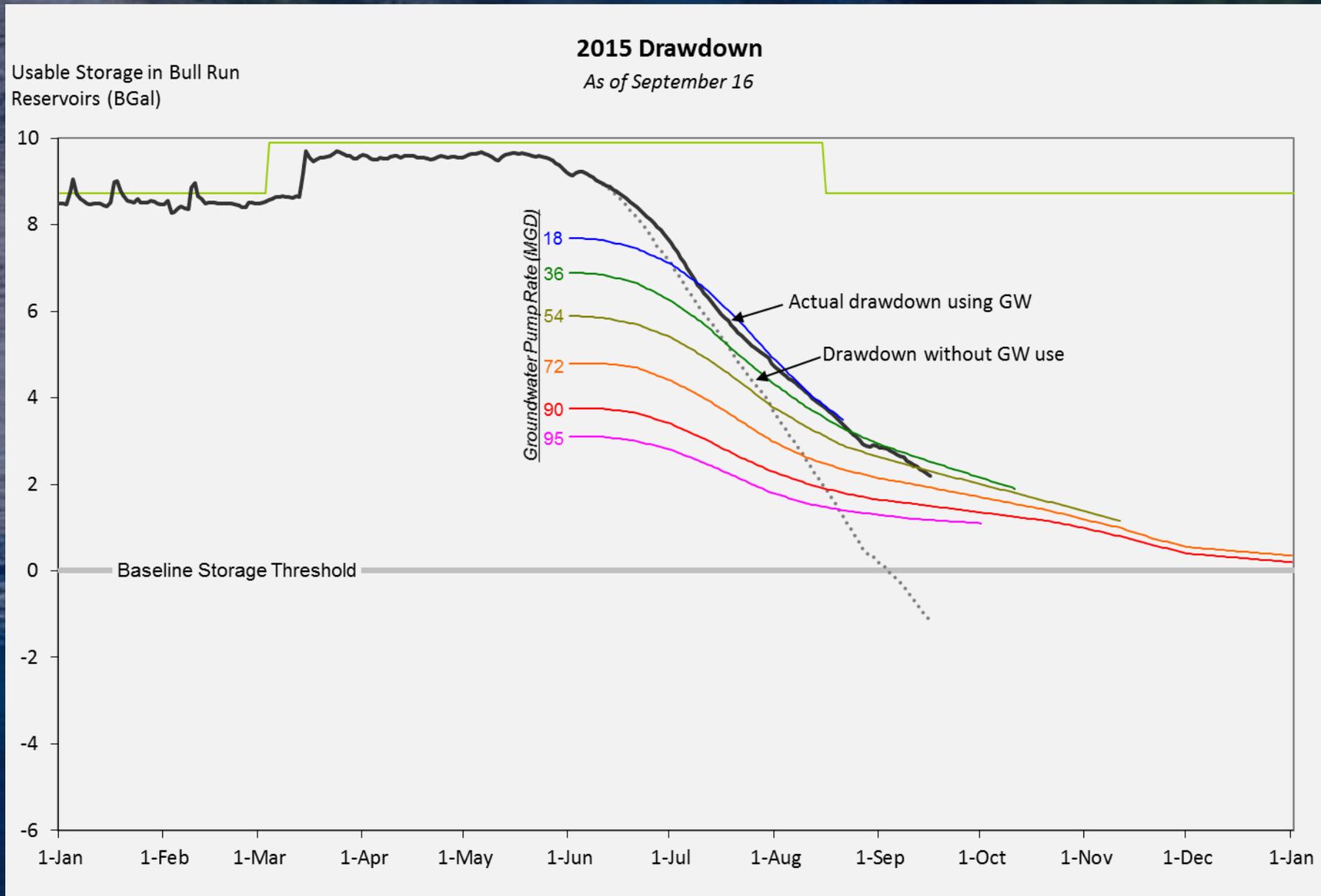
Planning Process during Reservoir Drawdown



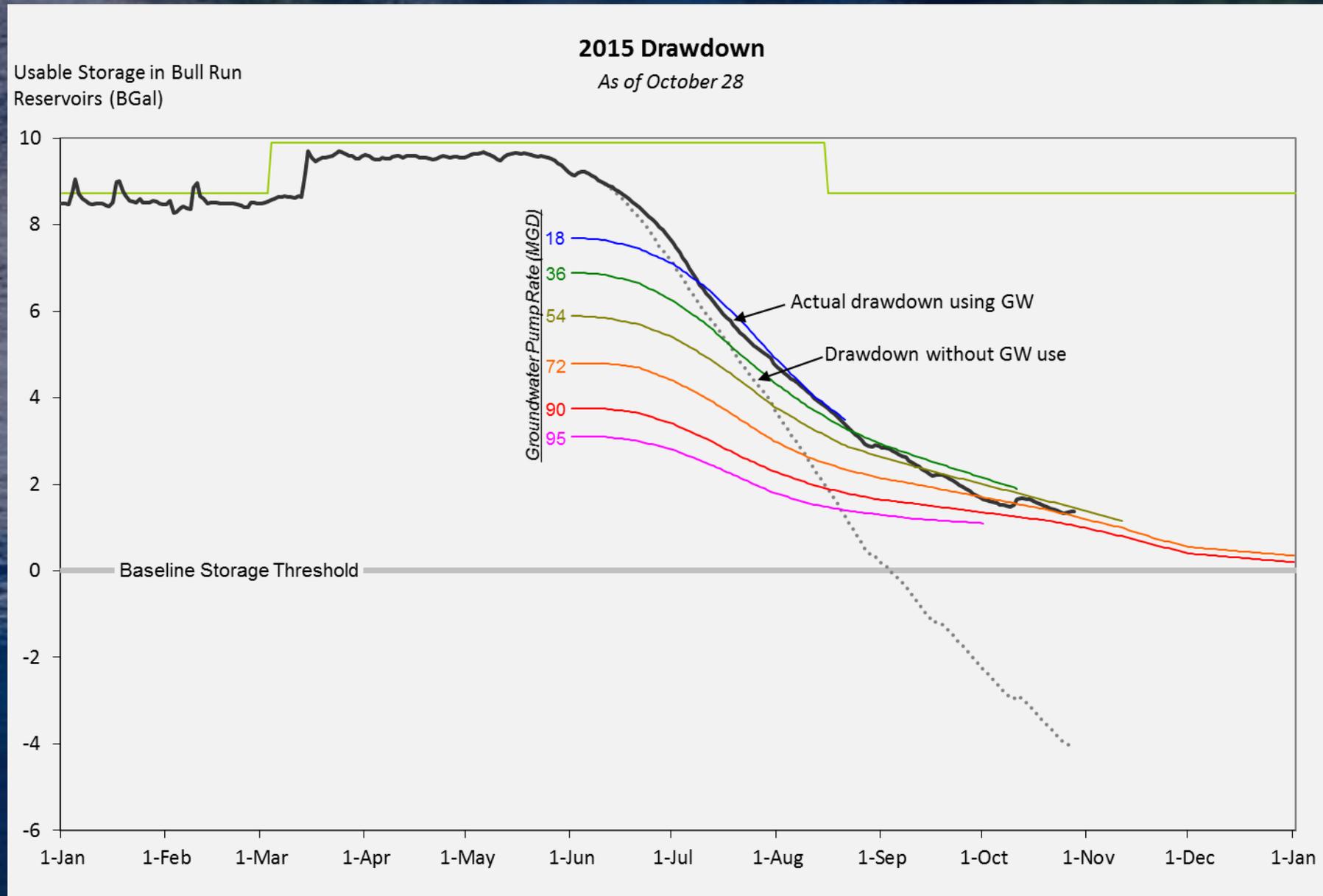
Planning Process during Reservoir Drawdown



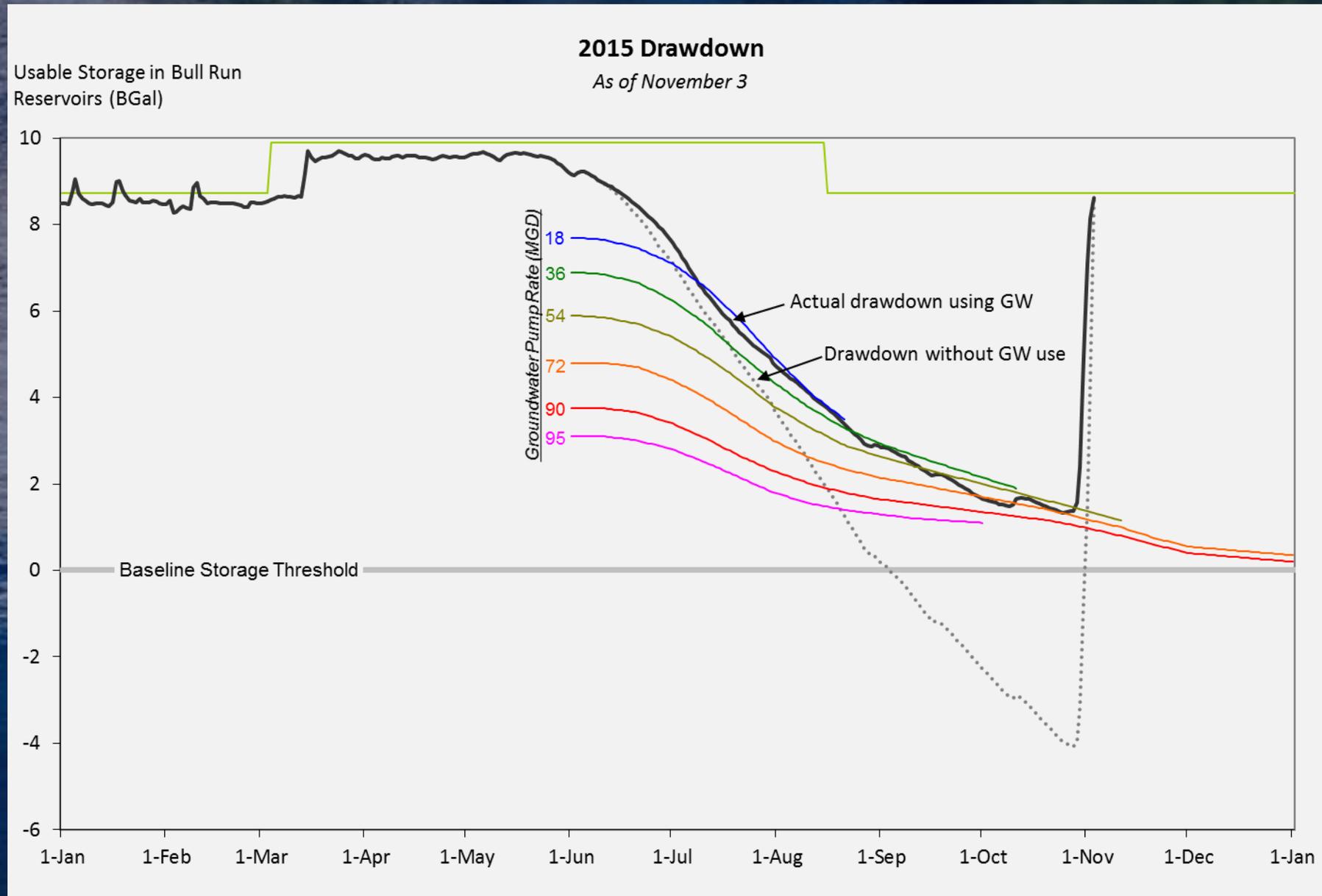
Planning Process during Reservoir Drawdown



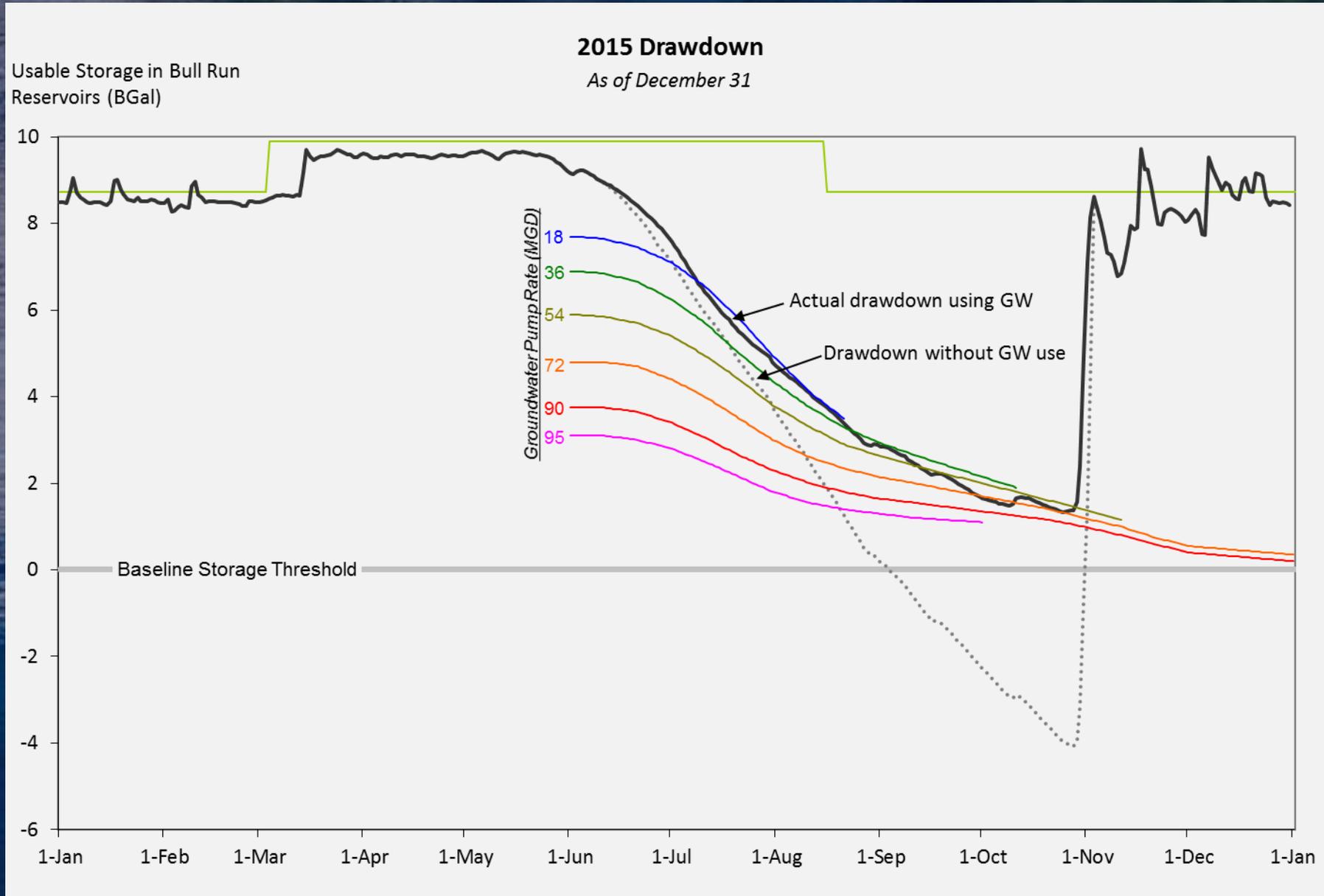
Planning Process during Reservoir Drawdown



Planning Process during Reservoir Drawdown



Planning Process during Reservoir Drawdown



2015

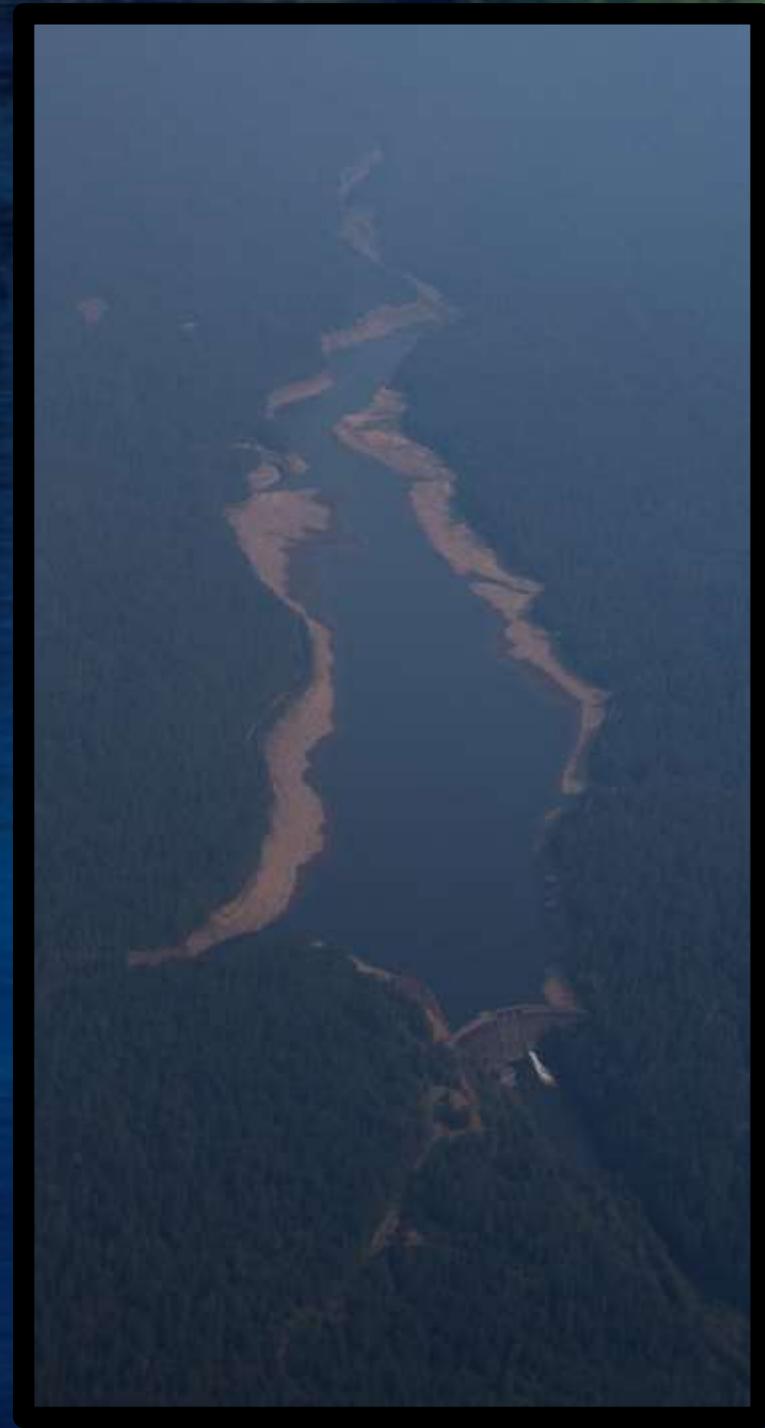
Very warm winter

Record early snowmelt

Very dry spring and summer

Record heat

Record duration of drawdown





Climate Change & Portland's Water Supply



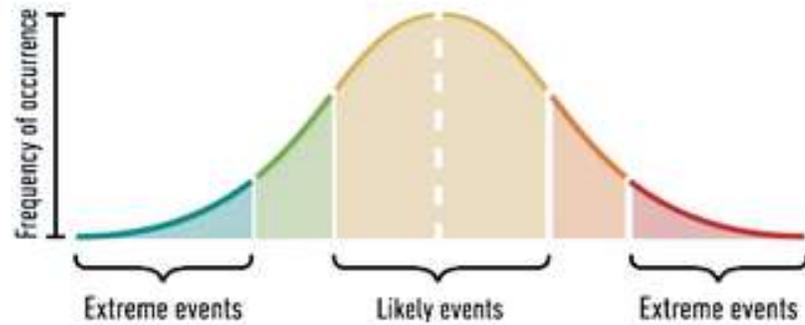
Climate Change & Portland's Water Supply



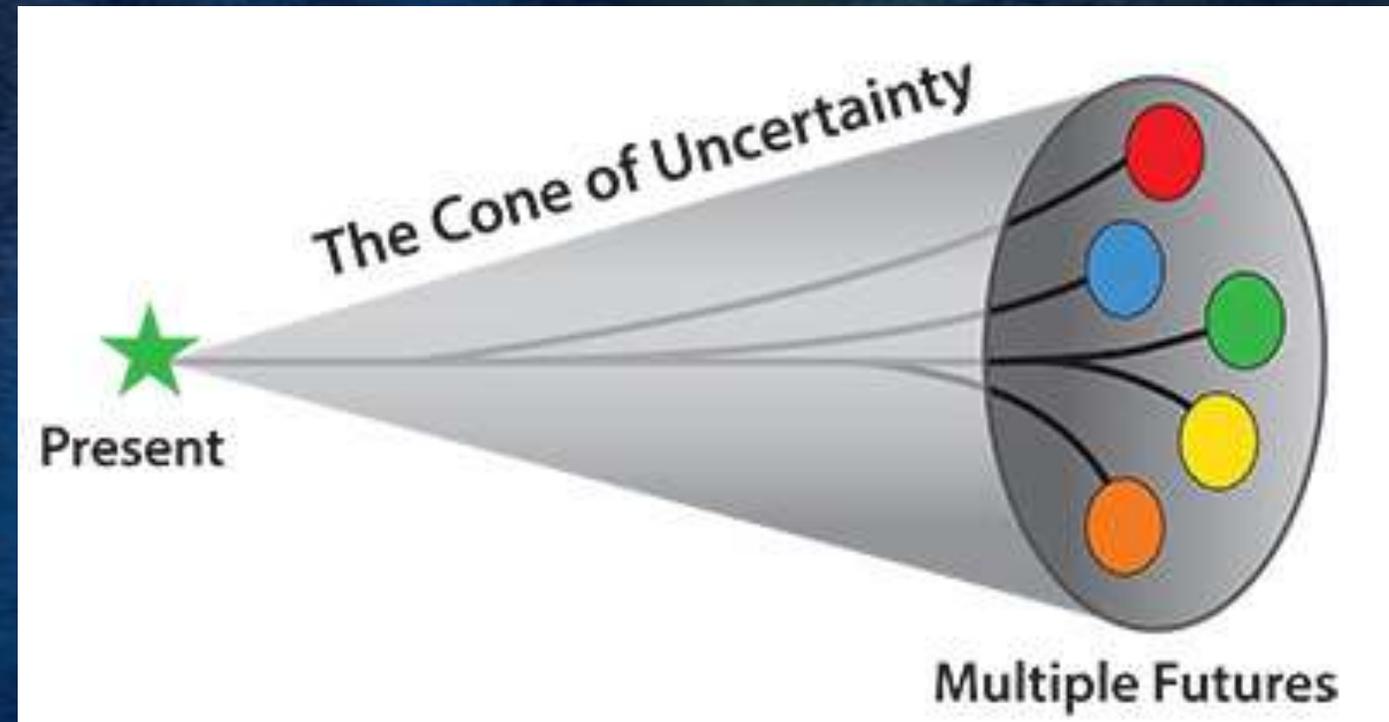
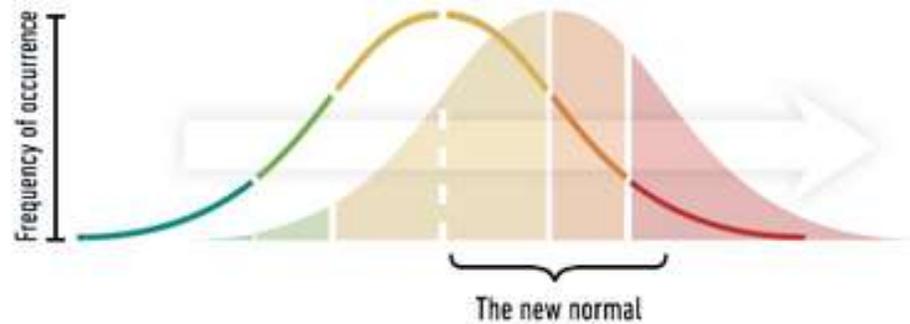
Increasing Variability & Range: New "Normal"

FIGURE 2: HOW EXTREME WEATHER EVENTS BECOME THE NORM

"Normal" weather distribution over time



Distribution range shifted by climate change



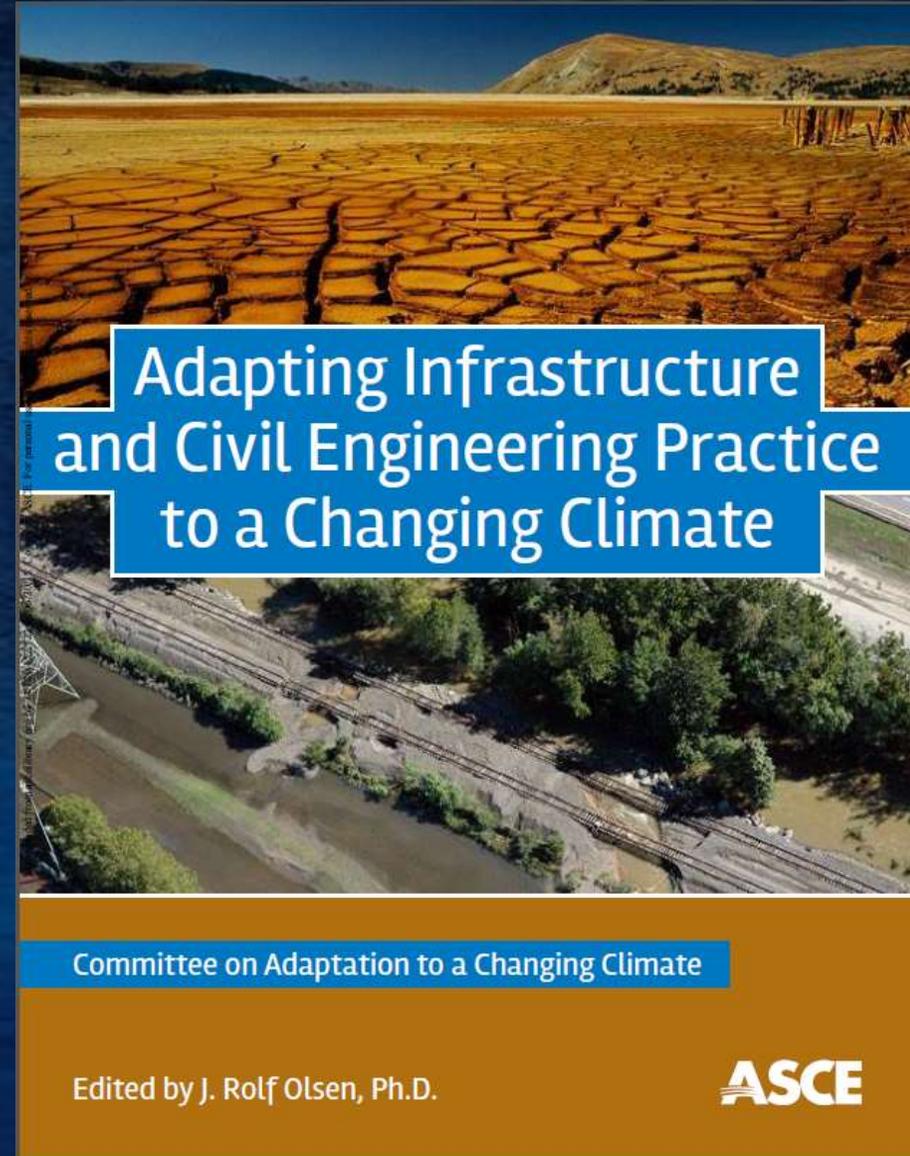
Water Utility Climate Alliance: Embracing Uncertainty, 2015

Past Is No Longer Prologue...

“Climate change will increase the rate of assumption failure”

David Zetland

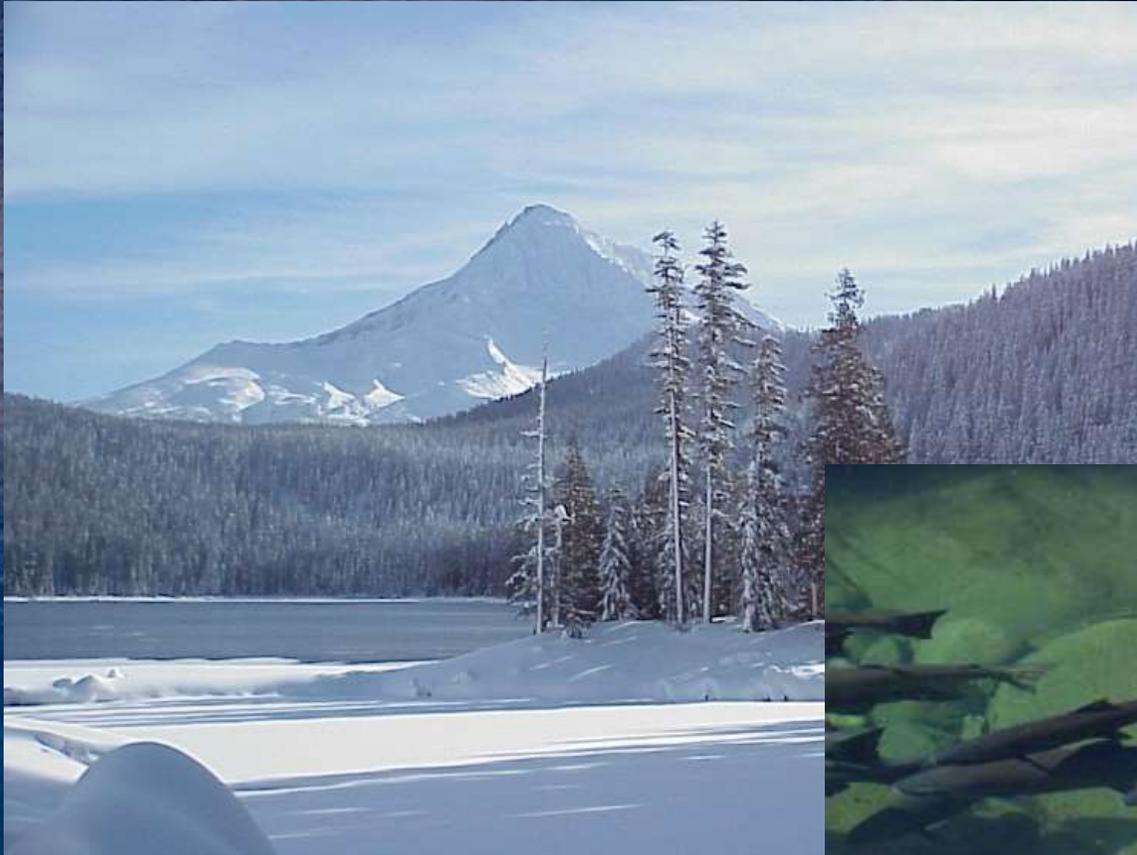
(Living with Water Scarcity, 2014)



Climate Impacts: Drawdown, Turbidity, Fire



Climate Impacts: Water Quality



Climate Impacts: Assets, Infrastructure



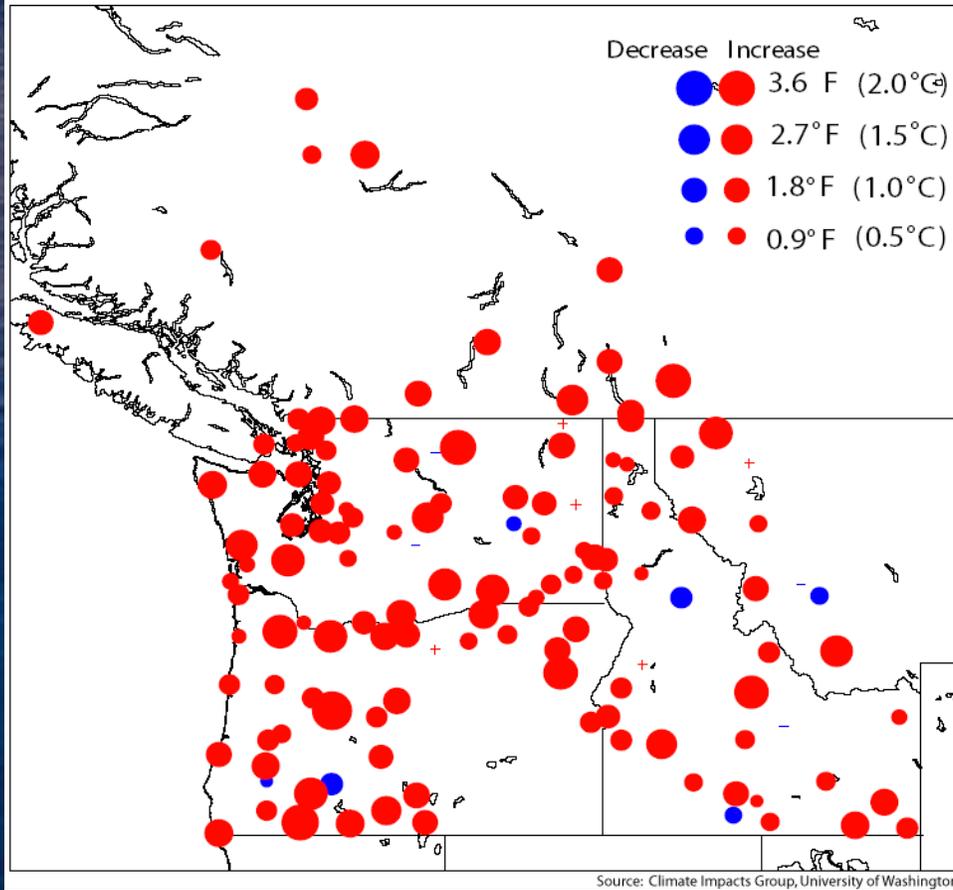
Planning for climate change at PWB

Internal Expertise & Capacity



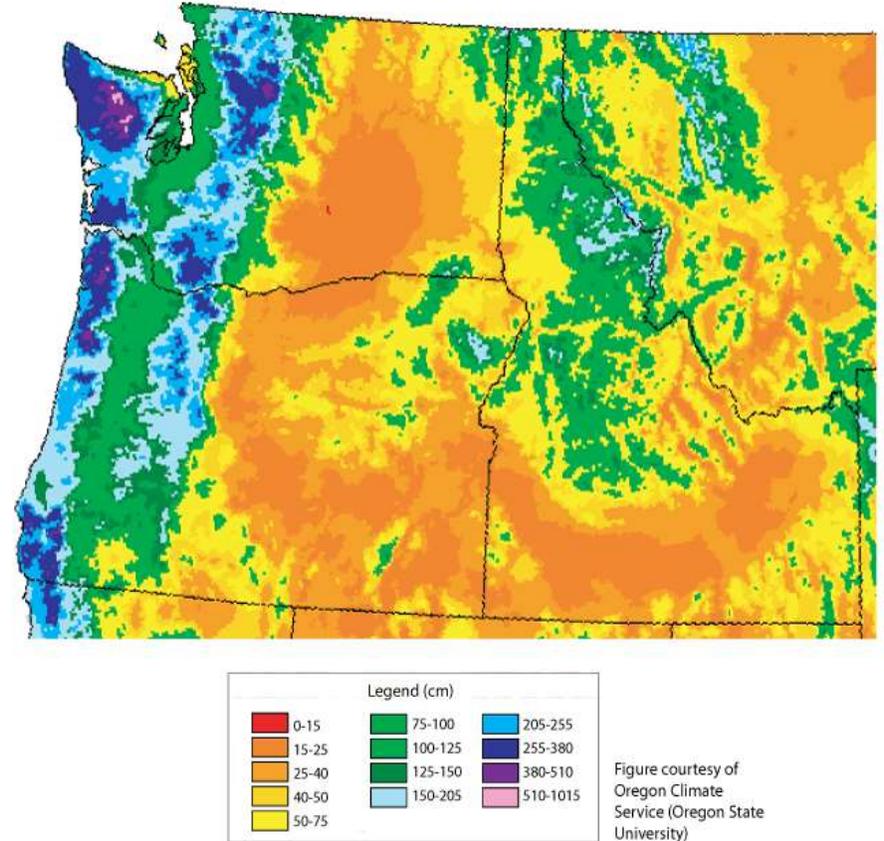
State of the Science

(a) Temperature trends (1920-2000)



Climate Impacts Group, UW

Pacific Northwest average annual precipitation
1961-1990



Oregon Climate Service, OSU

National Collaboration: Water Utility Climate Alliance

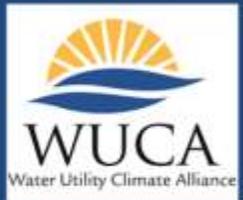
43 million drinking water customers



The map displays the following member utilities and their locations:

- Seattle Public Utilities
- Portland Water Bureau
- San Francisco Public Utilities Commission
- Metropolitan Water District of So. California
- San Diego County Water Authority
- Southern Nevada Water Authority
- Central Arizona Project
- Denver Water
- Tampa Bay Water
- New York City Department of Environmental Protection

Mission Statement
The Water Utility Climate Alliance provides leadership in assessing and adapting to the potential effects of climate change through collaborative action. We seek to enhance the usefulness of climate science for the adaptation community and improve water management decision-making in the face of climate uncertainty.



National Collaboration: Water Utility Climate Alliance

EMBRACING UNCERTAINTY

A Case Study Examination of How Climate Change
is Shifting Water Utility Planning



Available at:
www.wucaonline.org



ACTIONABLE SCIENCE IN PRACTICE

Co-producing Climate Change
Information for Water Utility
Vulnerability Assessments

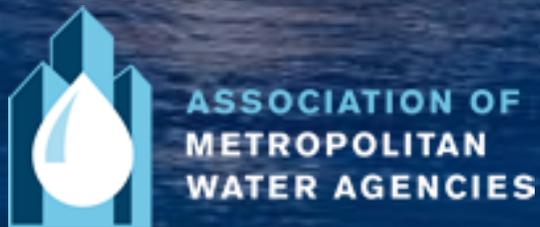


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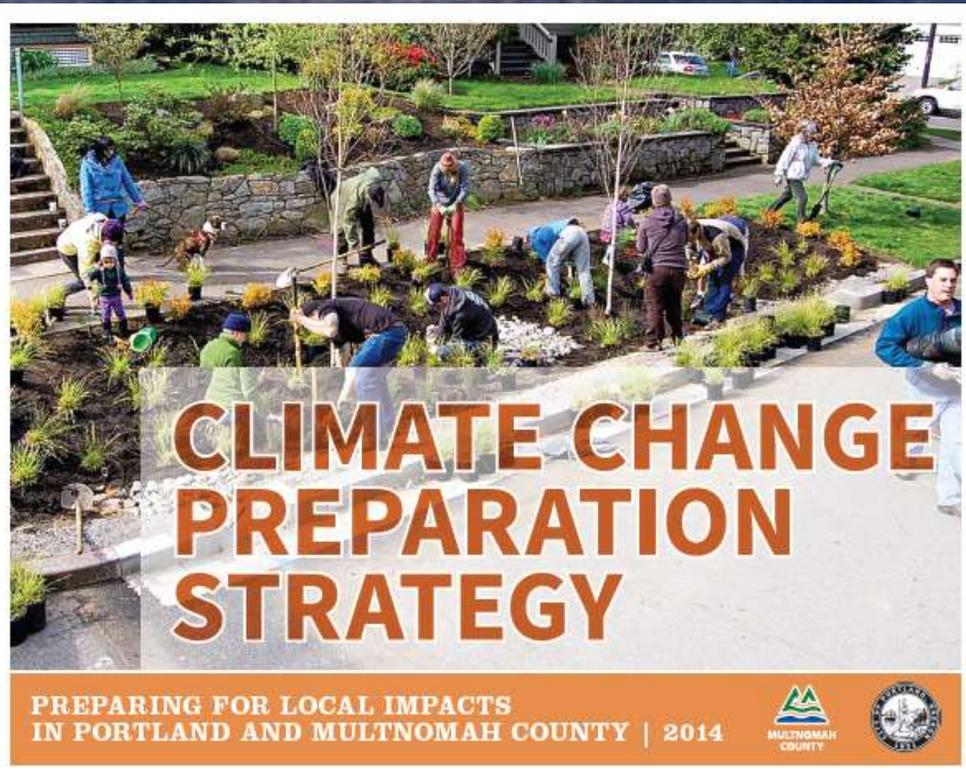


Available at:
www.wucaonline.org

National Collaboration: AWWA, AMWA, Water RF



Local Collaboration: City of Portland Climate Change Preparation



HOTTER, DRIER SUMMERS WITH INCREASED INCIDENCE OF EXTREME HEAT DAYS

3

2030 Objective 3: Increase the resilience of Portland's water supply to drier summers.

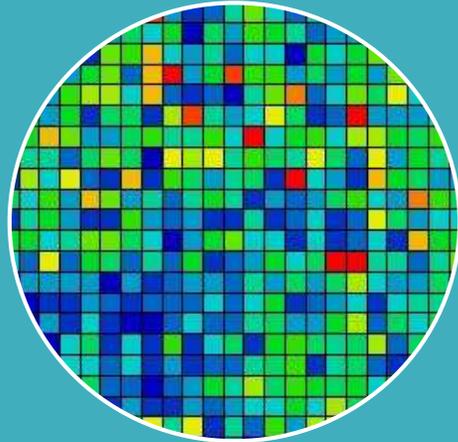
Lead partners

3a	Incrementally expand the groundwater capacity of the Columbia South Shore Well Field as back up to Bull Run, as detailed in the City's Water Management and Conservation Plan.	City (Water)
3b	Continue to implement water conservation education and outreach programs in retail service areas (business, industry and government) and continue participation in the Regional Water Providers Consortium conservation education and outreach activities.	City (Water)
3c	Support regulatory efficiency programs (e.g., low-flow plumbing fixtures, Water Sense Program for appliances).	City (Water)
3d	Update the assessment of climate impacts on Bull Run watershed hydrology by completing the Pilot Utility Modeling Application as a member of the Water Utility Climate Alliance (i.e., develop a hydrologic model, run recent global climate model outputs through this model, and assess impacts on hydrology of the watershed).	City (Water)
3e	Change design and management methods to minimize water use and waste in fountains, parks and other landscaped publicly owned or managed properties while still maintaining thriving vegetation.	City (PPR, BES, Water); County (DCA)

Modeling & Planning



Develop a hydrologic model for BR



Downscale climate data to BR

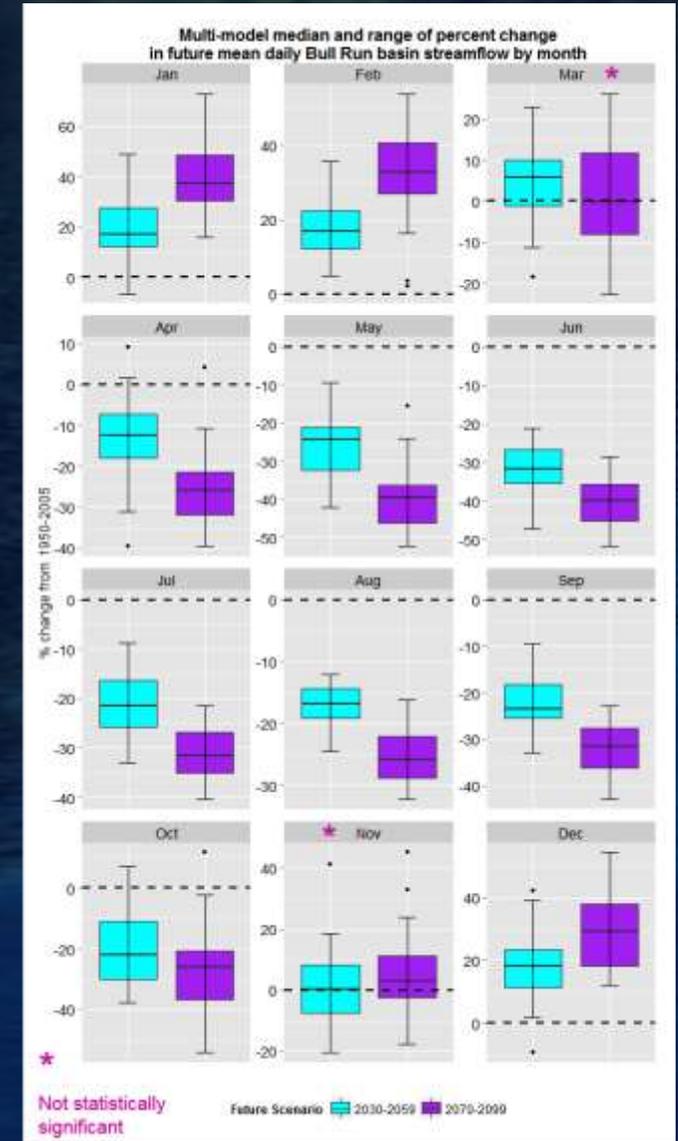
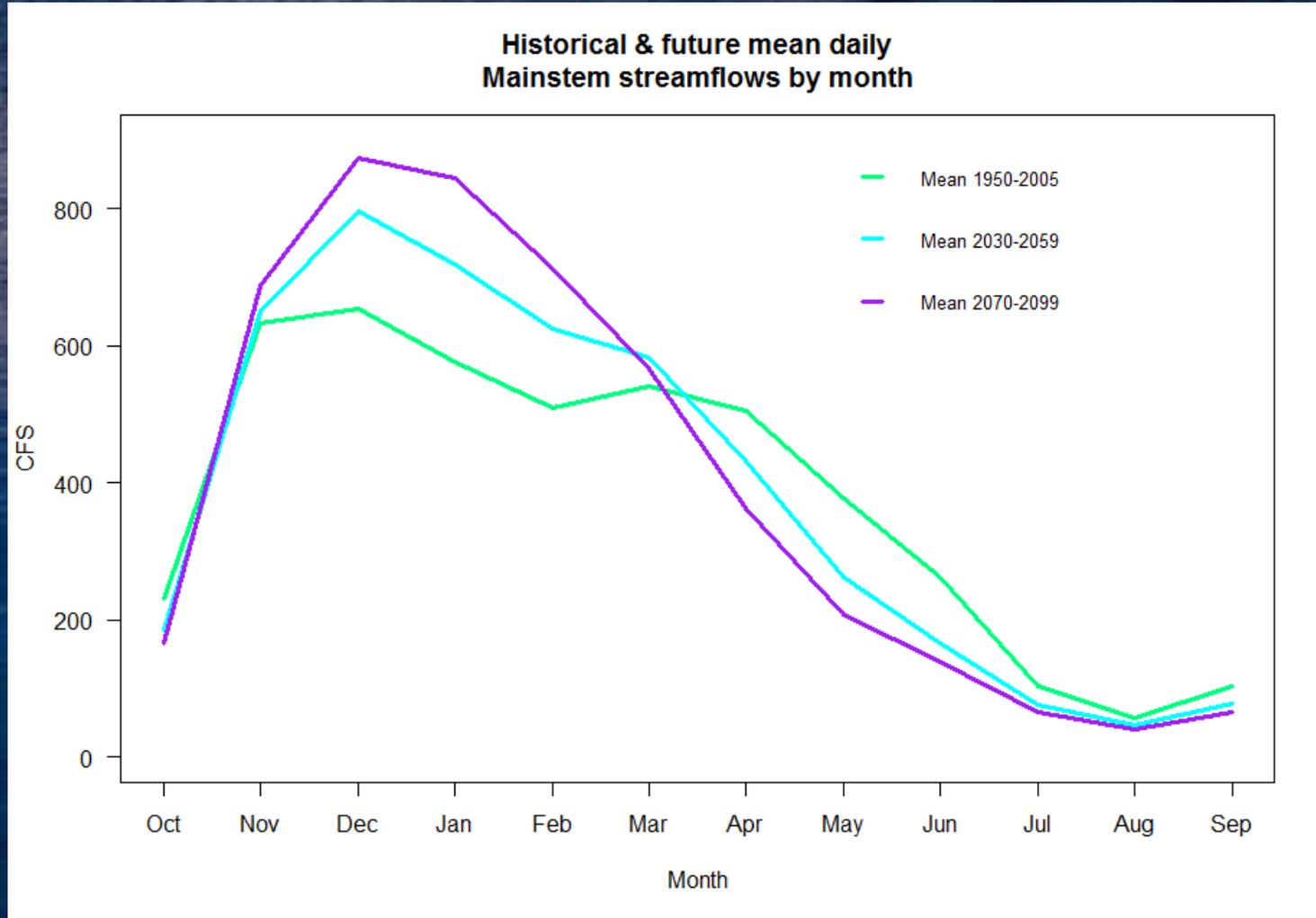


Build institutional capacity

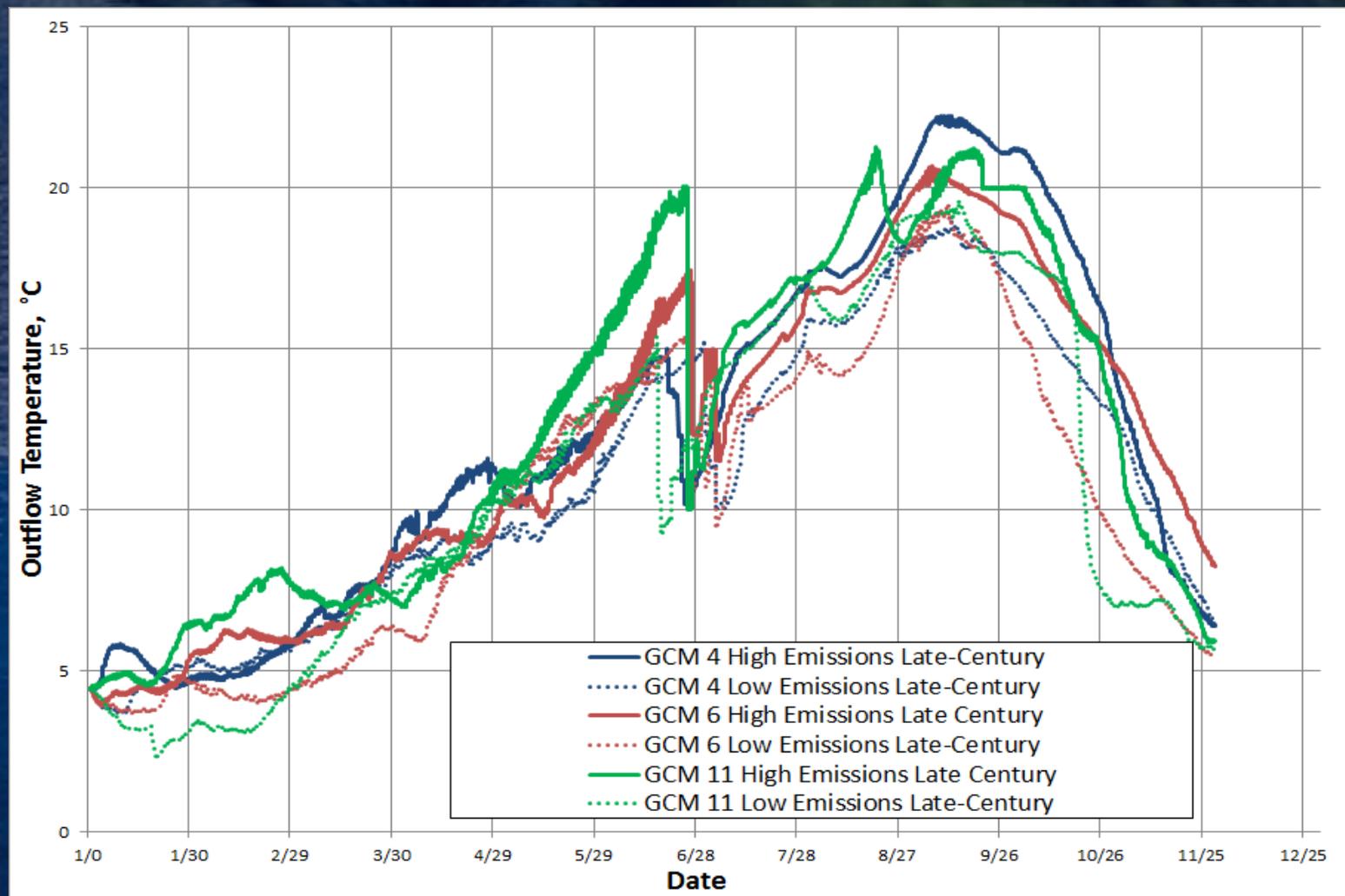
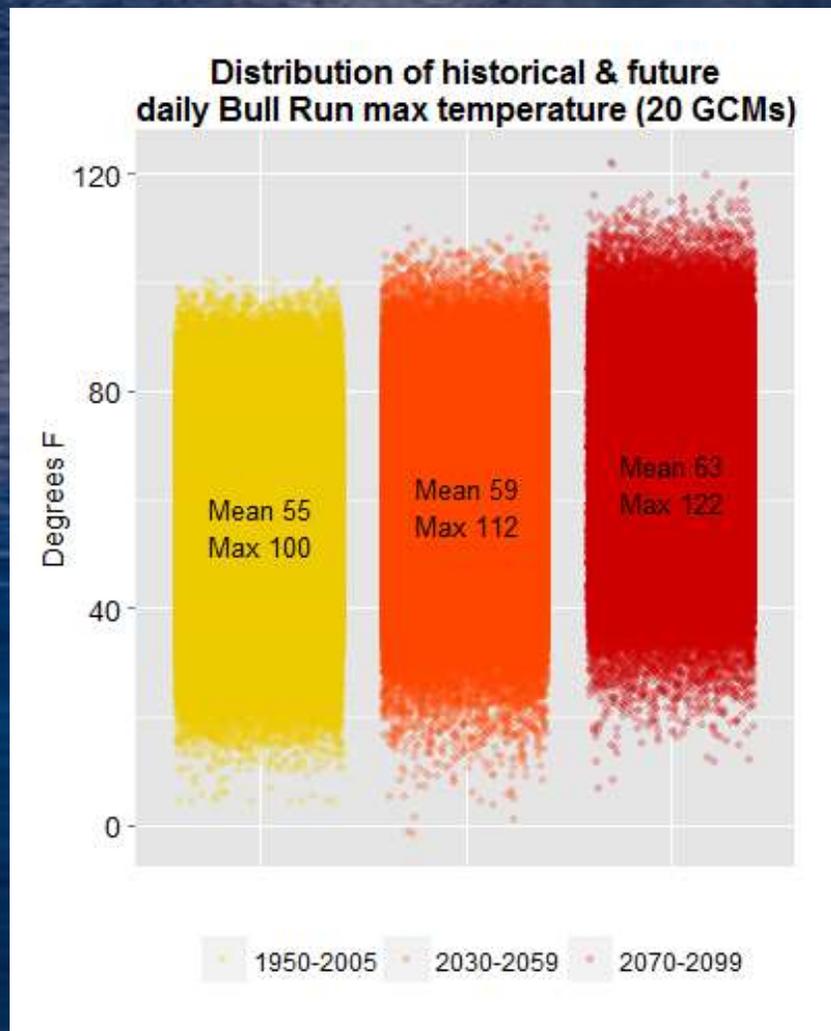
Customized modeling tools & expertise



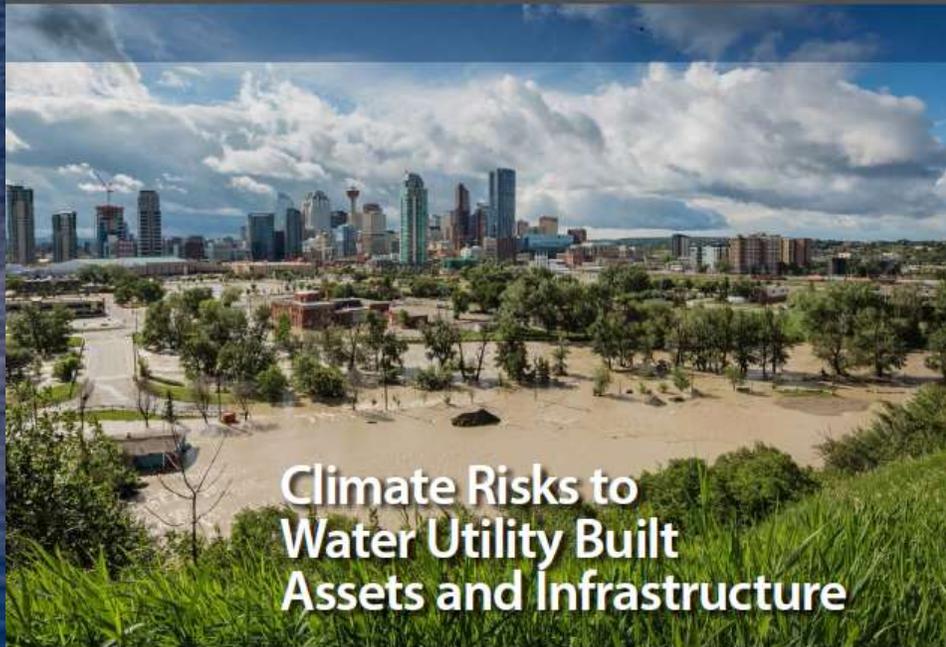
Modeling & Planning



Modeling & Planning



Asset & Infrastructure Risks



Climate Risks to Water Utility Built Assets and Infrastructure

A synthesis of interviews with national and international water utilities

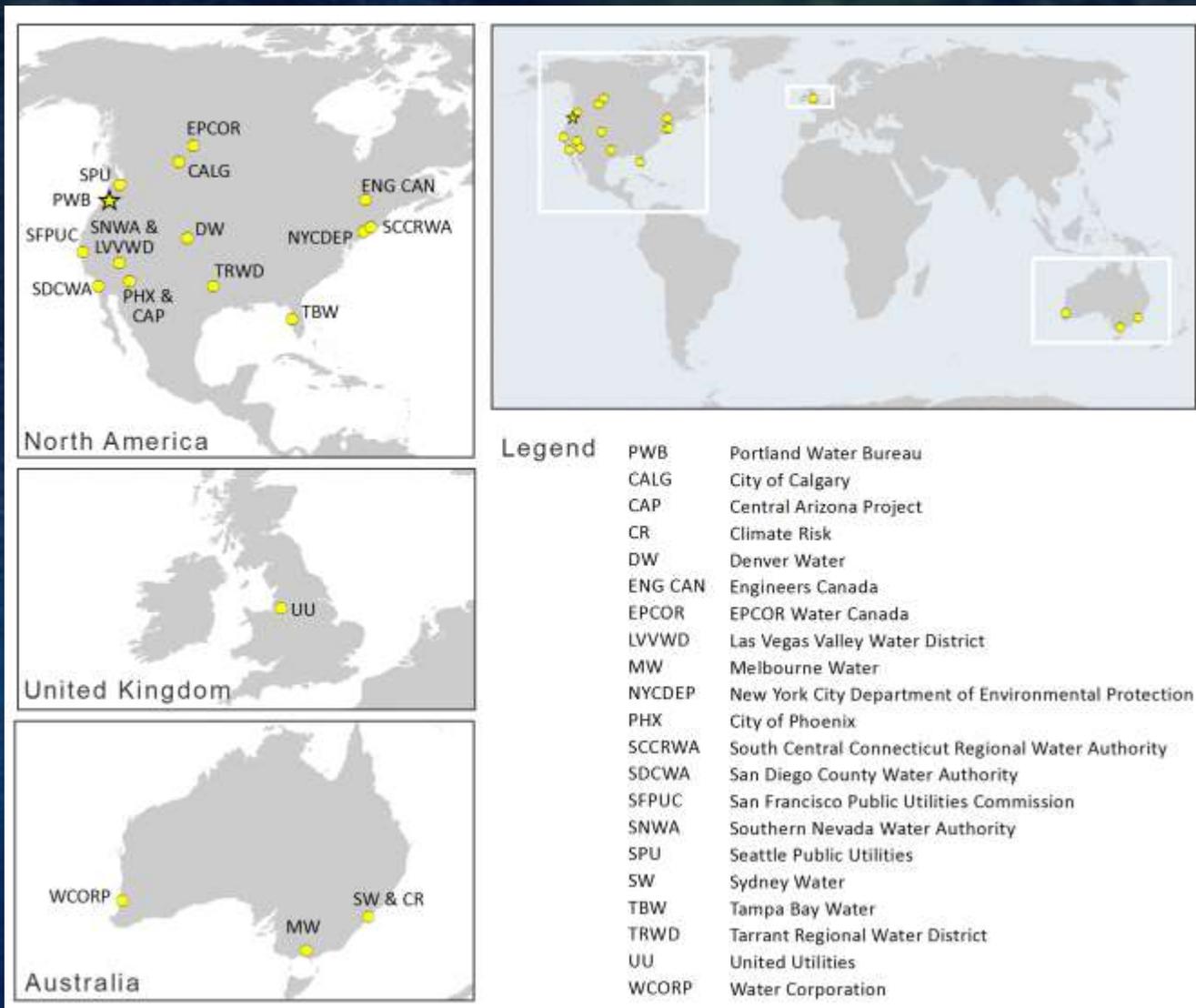
WRITTEN BY:

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Communicating

Climate Change



Portland's rain-fed water supply

Portland's primary drinking water supply in the Bull Run Watershed depends mostly on rain rather than snow, making it more resilient to warming temperatures.



Planning for the future:

The Portland Water Bureau is actively committed to understanding and planning for climate change impacts to the City's drinking water system by:

- ▶ **Applying** the best available climate science and working with research institutions and climate scientists to assess how climate change could affect the Bull Run Watershed (the City's primary surface water supply) and future water supply planning;
- ▶ **Partnering** with large drinking water utilities (through the [Water Utility Climate Alliance](#)) and other water utility groups to develop and share climate information, science, and decision support tools;
- ▶ **Developing** strategies to prepare for climate change as part of city-wide efforts, including the City of Portland and Multnomah County's [Climate Change Preparation Strategy and Risk and Vulnerabilities Assessment](#);
- ▶ **Calculating** annual carbon emissions in a [Carbon Footprint Report](#) and implementing actions to meet the City's [Climate Action Plan](#) goals and reduce the bureau's contribution to climate change.

Snow, Portland's Drinking Water, and Climate Variability

May 19, 2015 at 11:08 AM

If you're a skier or snowboarder you probably noticed how warmer-than-average temperatures caused a [record low snowpack](#) across Oregon this past winter. These conditions led to drought declarations for several Oregon counties whose water supplies depend on snow-fed river basins. Fortunately the City of Portland is not dependent on snowpack, but instead gets its water supply from mostly rain-fed reservoirs in the [Bull Run Watershed](#) and a backup [groundwater system](#). While it is extremely unlikely that Portlanders will have to worry about water use restrictions this summer, the Water Bureau is planning for [summer supply](#) needs, as it does every year.



But what do the lack of snow and unusually warm winter temperatures indicate about the region's [climate future](#)? Climate models project hotter, drier summers and warmer, wetter winters, with more rain and less snow falling at higher elevations. Climate change is basically "shifting the odds" in favor of these types of conditions so that warm winters with low snow accumulation in the mountains will become increasingly likely in any given year over the next few decades. Winters like 2014/2015 may therefore occur more frequently in our region's future.

And while climate change refers to the [long-term](#) change in average and extreme weather conditions, the Northwest also experiences climatic variability. For example, [short-term](#) yearly or seasonal fluctuations in temperature, rain, and snow are significantly affected by the [El Niño Southern Oscillation](#) and the [Pacific Decadal Oscillation](#). These types of events will continue to influence regional climate, especially in the near term. Because of this, Portlanders can expect to see both high and low snowfall winters in the coming years, even as long-term climate shifts make what the region experienced this past winter a more regular occurrence.

To learn how the Portland Water Bureau is actively working to understand climate change impacts to Portland's drinking water system, visit these [resources](#).

Kavita Heyn
Climate Science & Sustainability

Climate Change Resources

Institutions

- Water Utility Climate Alliance (www.wucaonline.org)
- Climate Impacts Research Consortium (CIRC) projects and resources (<http://pnwcirc.org/>)
- Northwest Climate Science Center
(<https://www.nwclimatescience.org/>)
- AWWA Climate Change Committee

Reports

- *Climate Change in the Northwest* (Dalton et al., 2013) available from Oregon Climate Change Research Institute (OCCRI) webpage
- *National Climate Assessment 2014* available online
- EPA Climate Ready Water Utilities *Adaptation Strategies Guide*
- AWWA climate change manual (forthcoming 2017)

Tools

- EPA CREAT (Climate Resilience Evaluation & Awareness Tool) from Climate Ready Water Utilities

Questions?

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Kavita Heyn (Climate Science Coordinator): Kavita.Heyn@portlandoregon.gov

<https://www.portlandoregon.gov/water/climatechange>

