

Potential impacts of climate change on Washington metropolitan area water supply

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Background

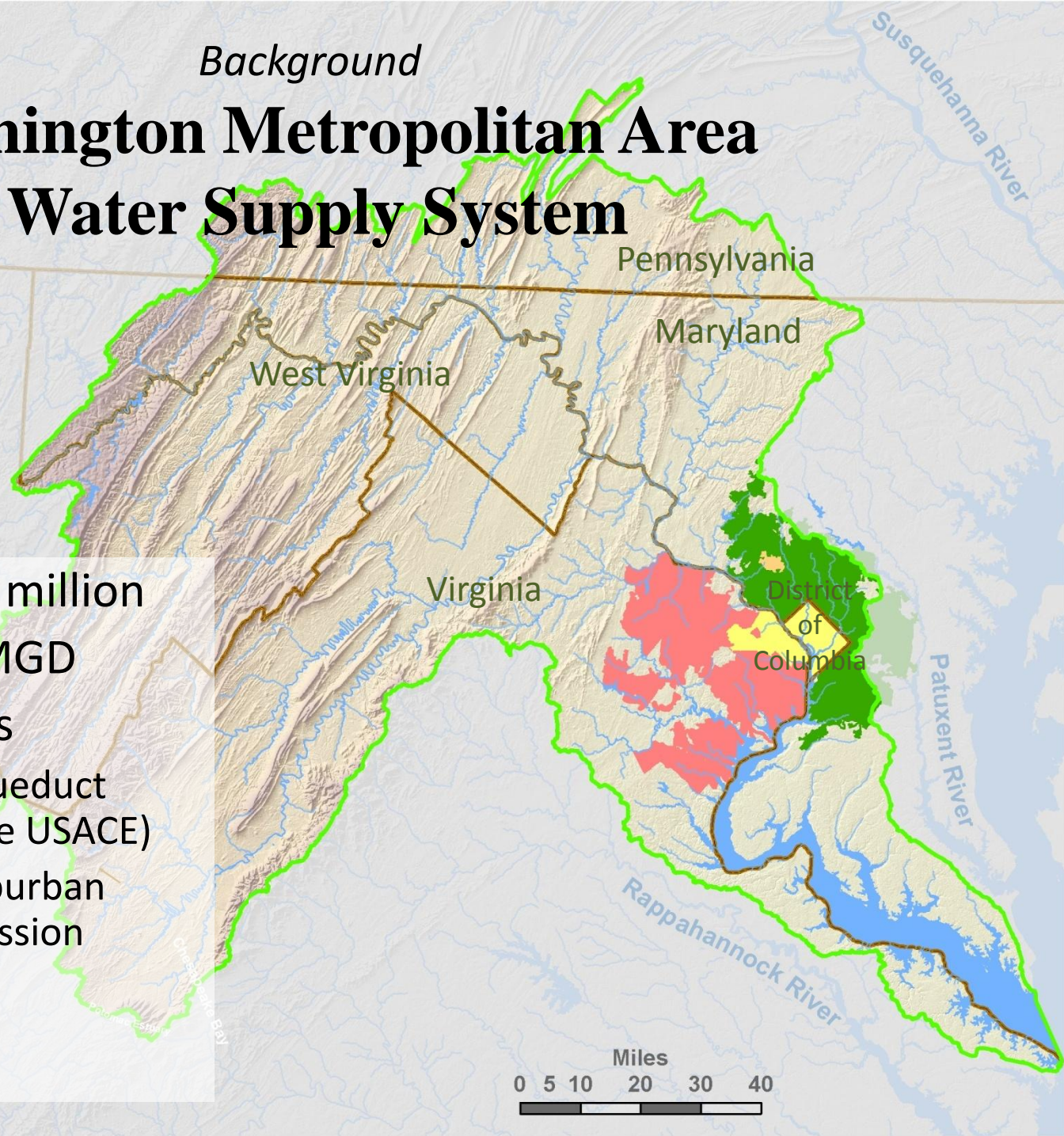
Washington Metropolitan Area Water Supply System

- Population > 4.3 million
- Demand ~ 500 MGD
- 3 major suppliers

 Washington Aqueduct
(a Division of the USACE)

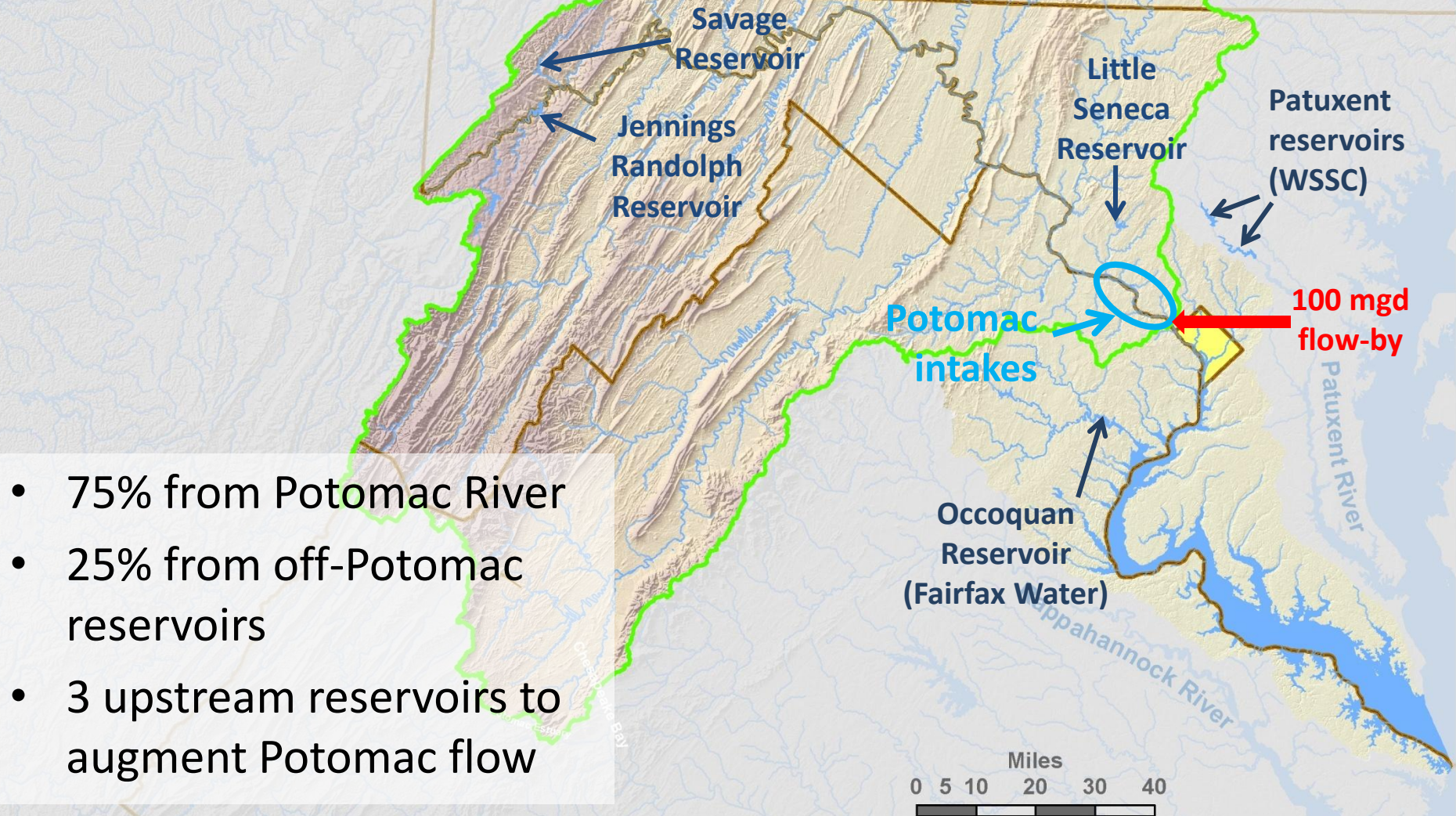
 Washington Suburban
Sanitary Commission
(WSSC)

 Fairfax Water



Background

Washington Metropolitan Area Water Supply System



Background

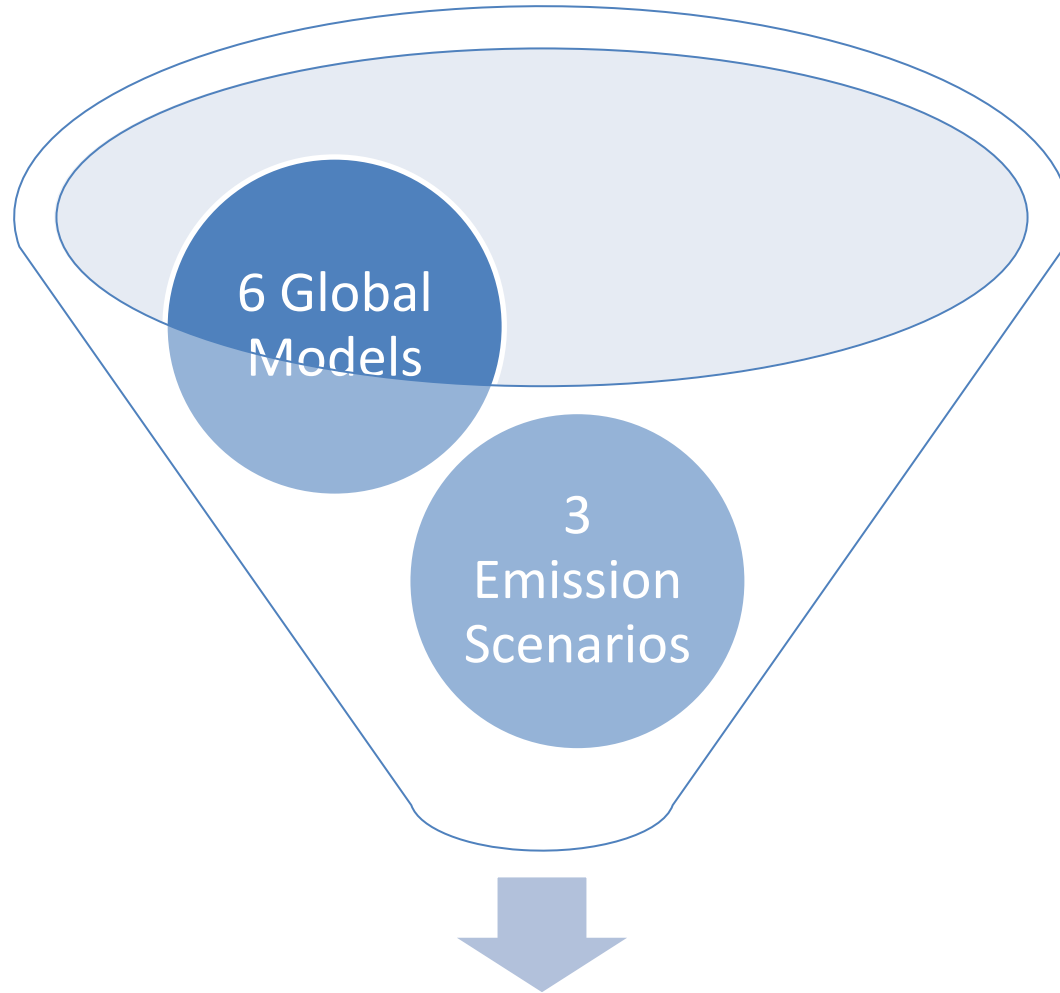
2010 Reliability Study

Findings of Part 1 – Demand and Resource Availability for the year 2040 **(based on historical climate)**

- The current system will likely meet demands through 2030
- By 2040 the current system may have difficulty meeting demands in event of severe drought
- Summertime outdoor water use may be increasing

Objective of Part 2: Determine potential impacts of climate change, assuming no management changes.

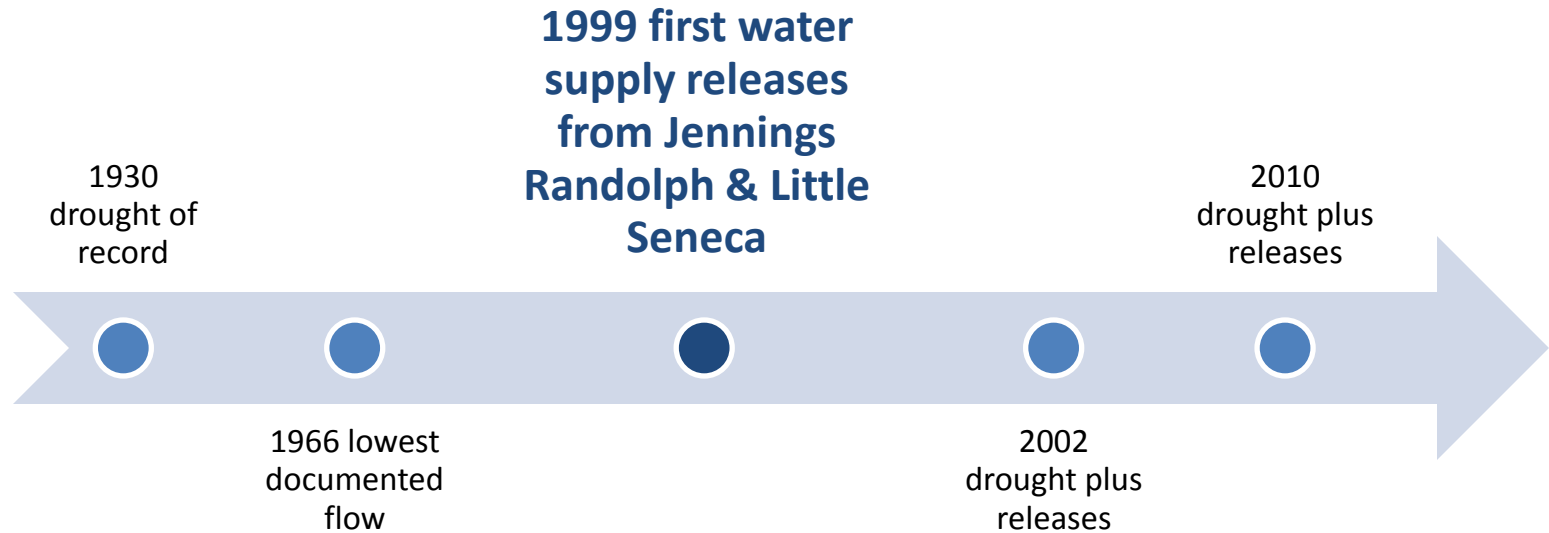




18 Climate Scenarios

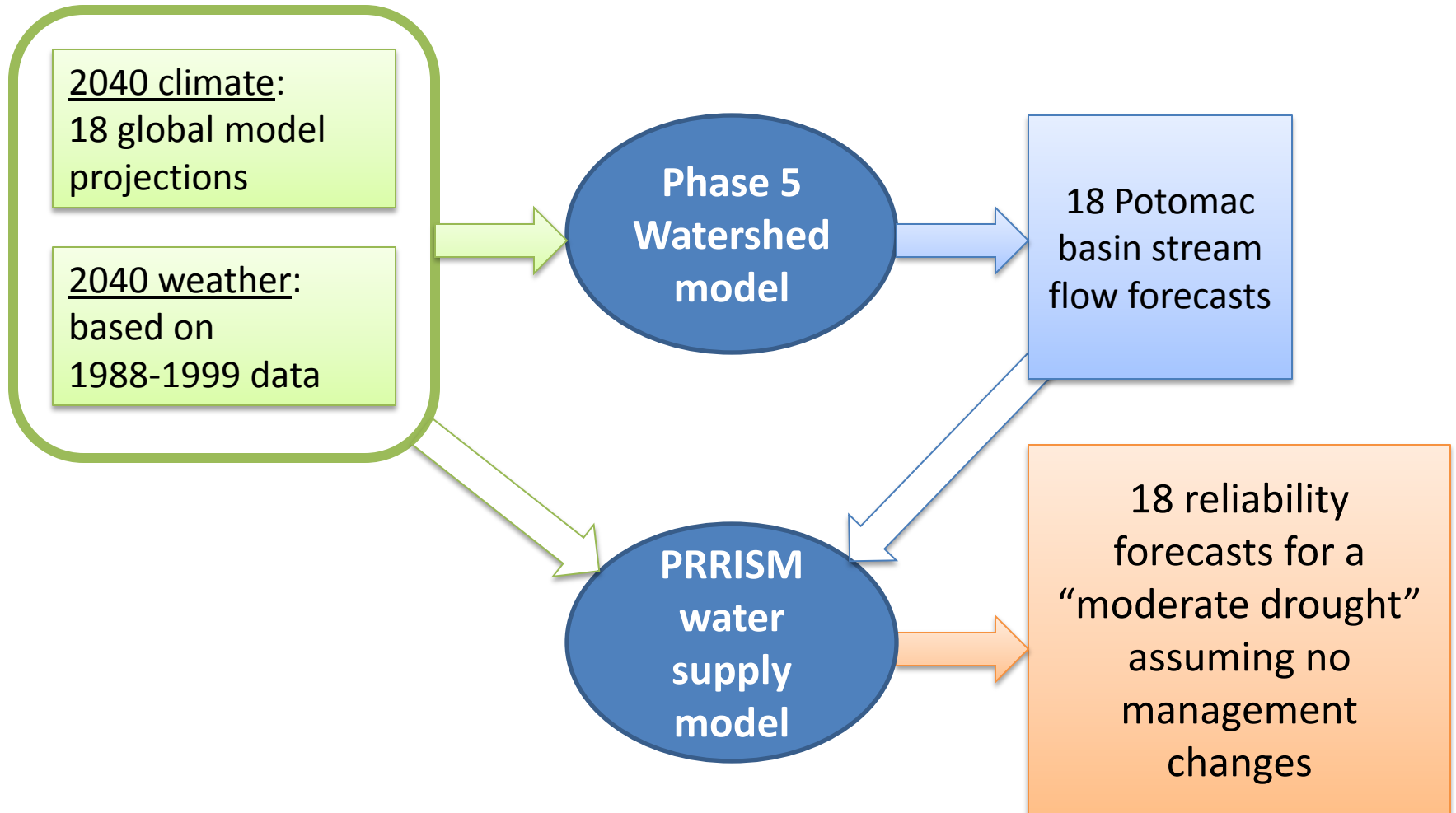
Background

Historical Potomac Low Flow Periods



- Most severe droughts were 1930, 1966, 1999, and 2002
- This study's primary focus is on a "moderate" drought, with likelihood comparable with drought of 1999

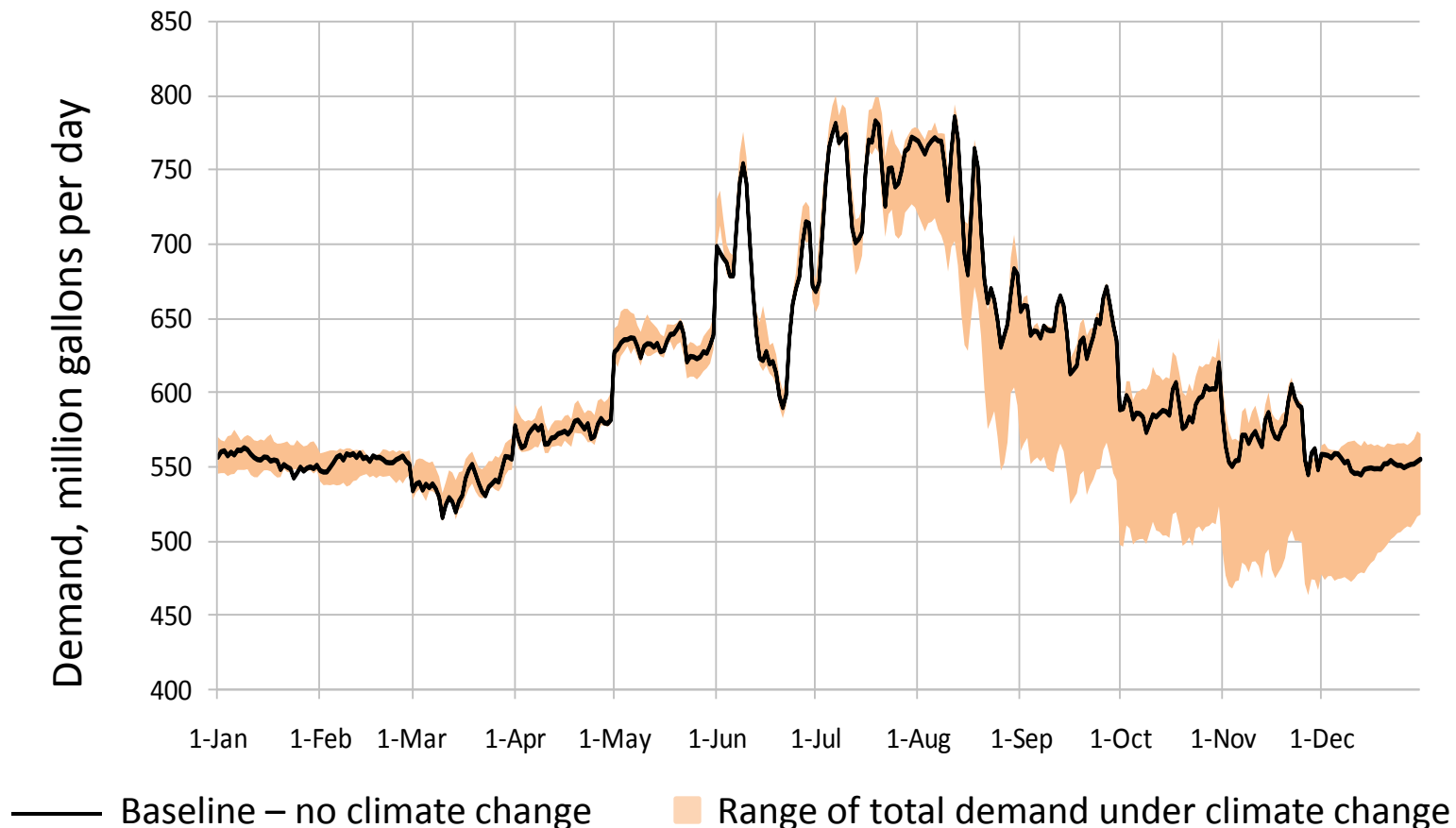
Approach **Overview**



Approach

Forecasting Daily Water Demands

- Daily demand forecasts are responsive to temperatures and precipitation changes
- Low reservoir levels trigger water use restrictions, and cause demand forecasts to drop



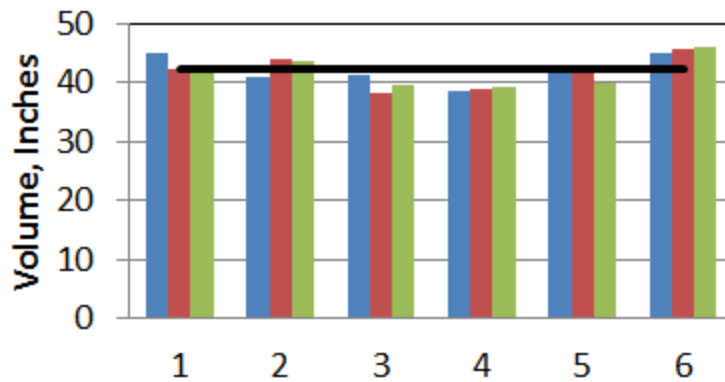
Results

Basin-wide Area Weighted Annual Water Budget

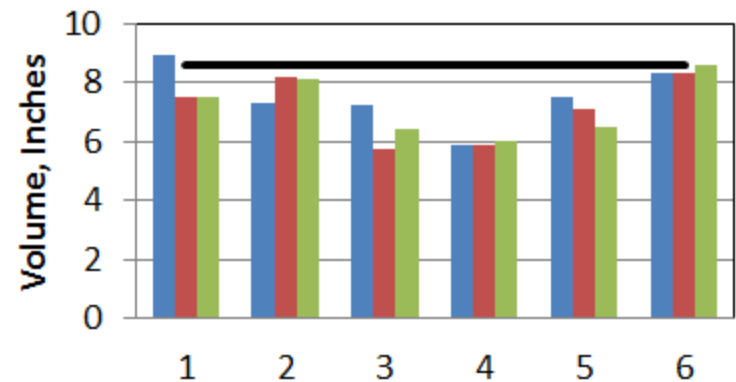
Three Emission Scenarios used with Six Global Models:

Low Medium High Base

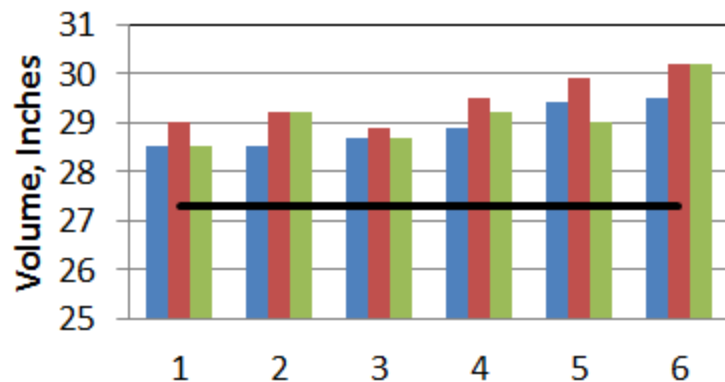
Precipitation



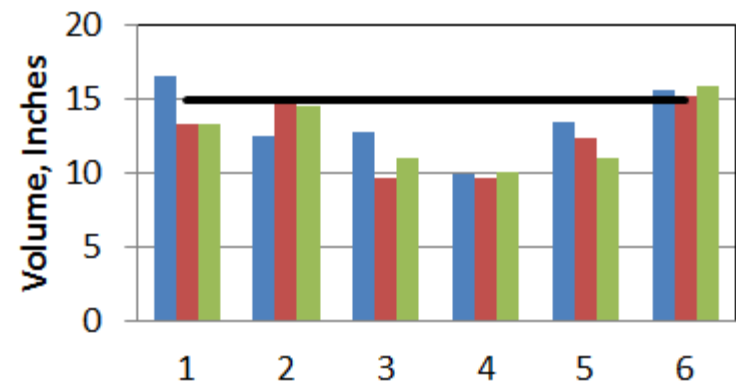
Base Flow



Evapotranspiration

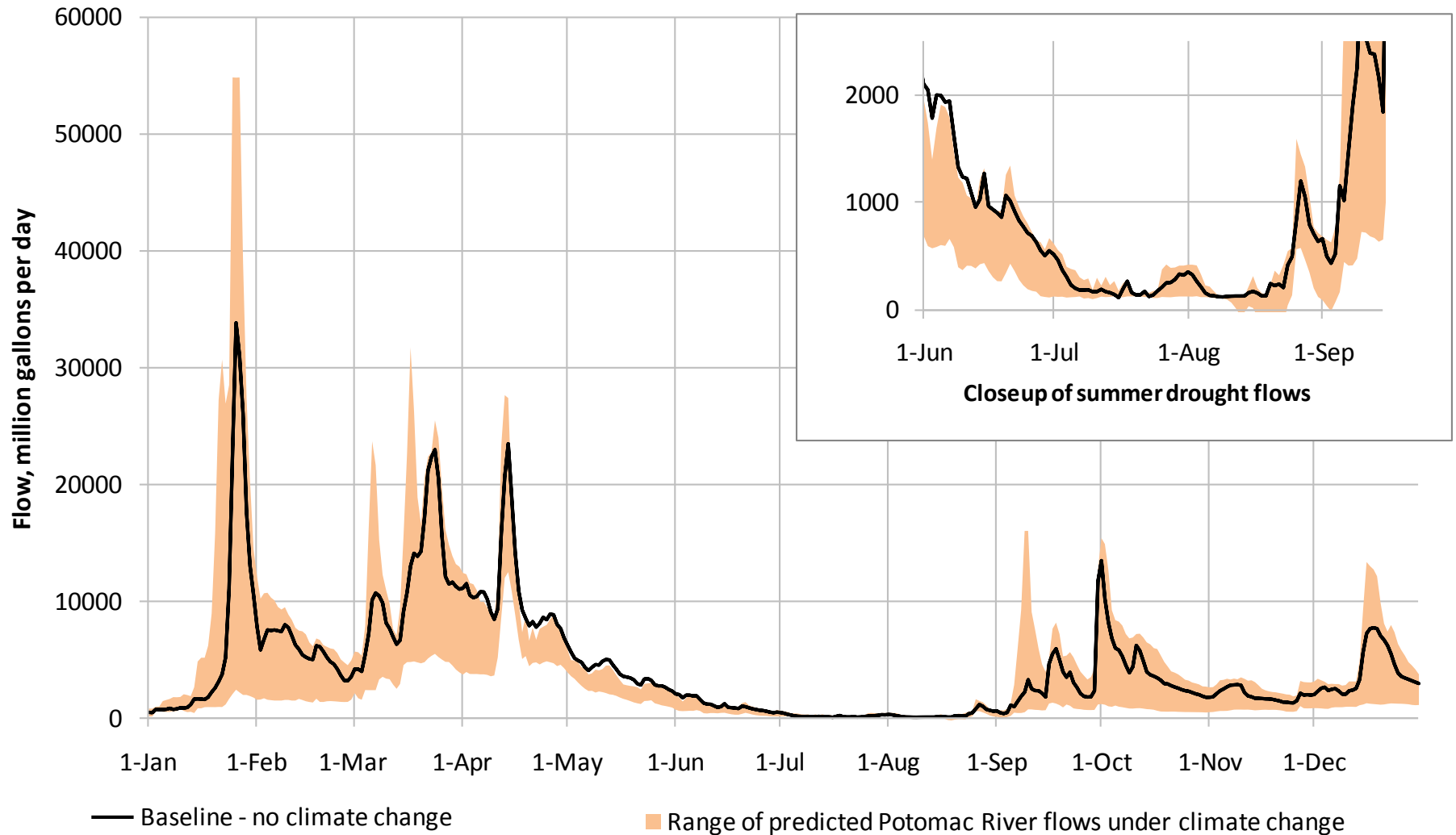


Total Stream Flow



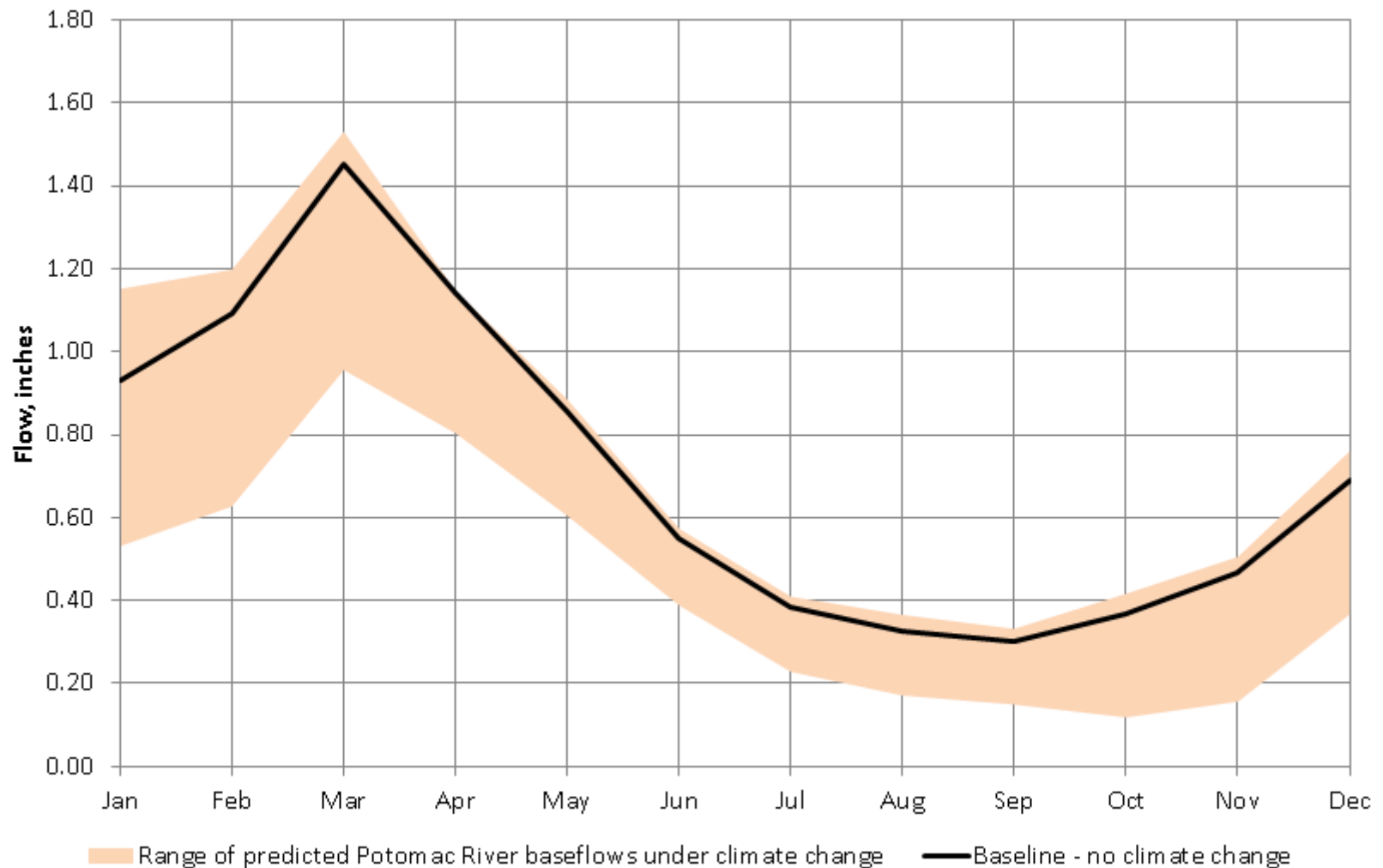
Results

Potomac Flows Decrease



Results

Average Basin-wide Monthly Baseflow



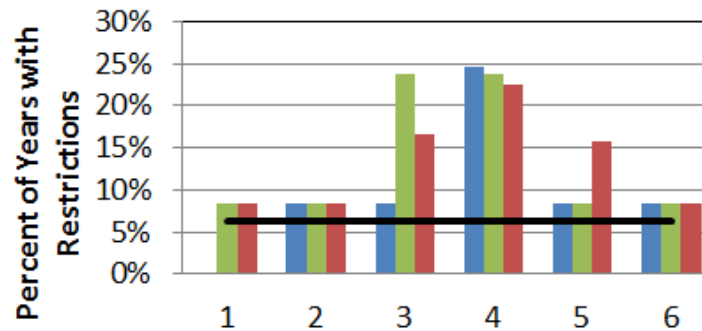
Results

Water Use Restrictions Increase

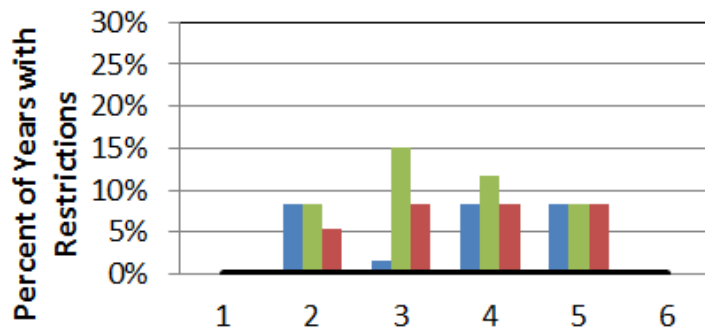
Three Emission Scenarios used with Six Global Models:

Low Medium High Base

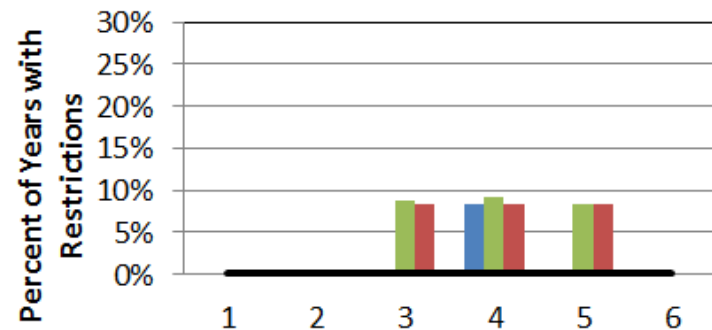
Voluntary
(5% Reduction in Demands)



Mandatory
(9% Reduction in Demands)



Emergency
(15% Reduction in Demands)



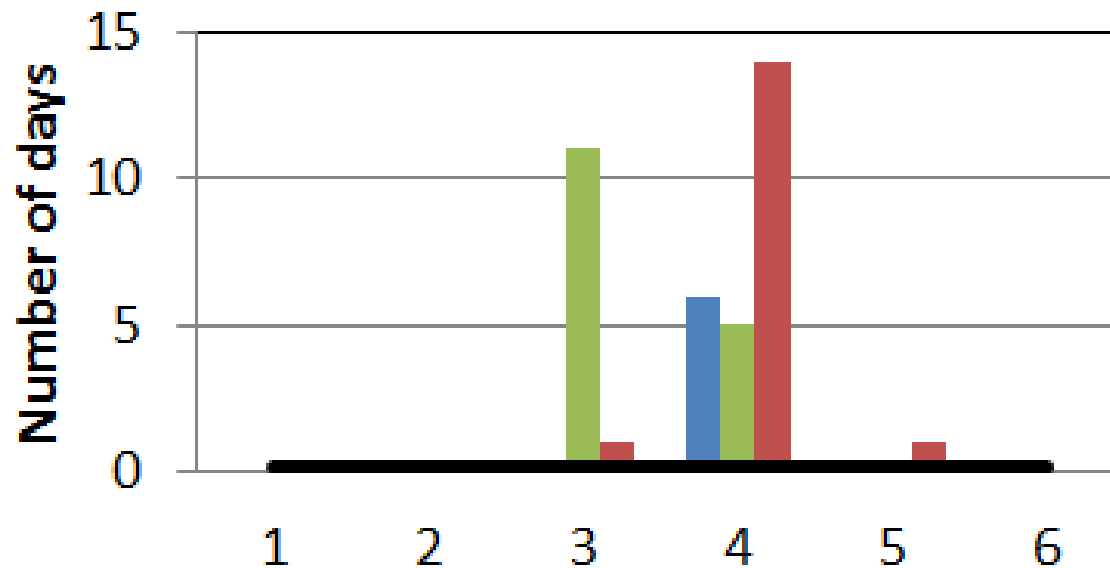
Results

System Reliability

Three Emission Scenarios used with Six Global Models:

■ Low ■ Medium ■ High — Base

Potomac shortfalls



Shortfall definition: demands that must be met or reduced by new changes to the current system management

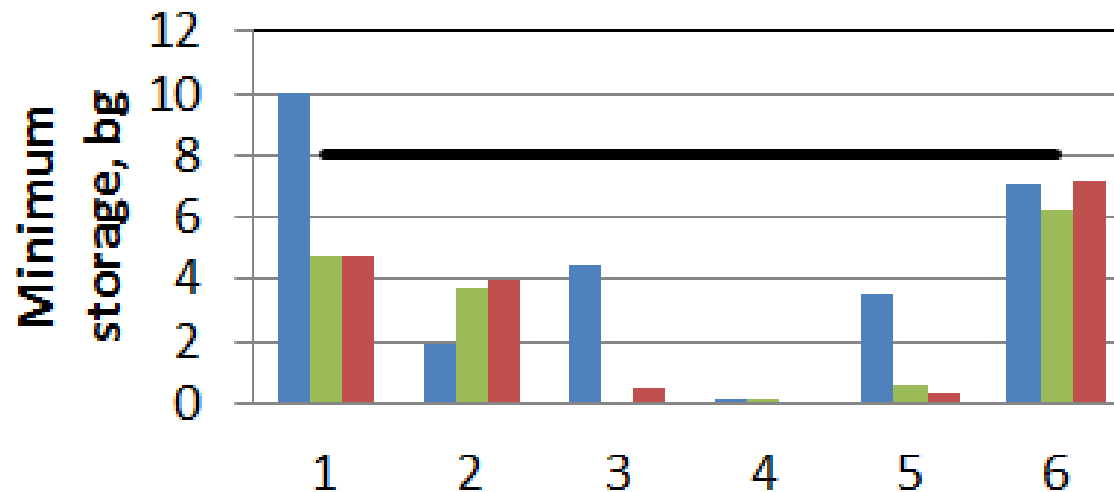
Results

Minimum Reservoir Storage

Three Emission Scenarios used with Six Global Models:

Low Medium High Base

**Little Seneca and Jennings Randolph
water supply account, combined**



Conclusion

Study Summary

Uncertainties/Limitations

- Range of projections from global models
- Less confidence in regional predictions
- Variability based on short time period (1988-1999)
- Uncertainty added by watershed modeling

2040 Water Supply Reliability *(moderate drought conditions)*

- Best scenarios: little impact
- Medium-impact scenarios: mandatory water use restrictions likely
- Worst-case scenarios: significant management/system changes required



Conclusion

Potential Management/System Changes

To be evaluated in the 2015 reliability study:

- More operational efficiency
- Increased system flexibility
- Earlier and increased water use restrictions
- Additional water supply storage



Questions?

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- Cherie Schultz, PhD, cschultz@icprb.org

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