

Planning for the Impacts of Climate Change on Washington Metropolitan Area Water Supply

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Chesapeake Bay and Water Resources Policy Committee, Metropolitan Washington Council of Governments

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Section for Cooperative Water Supply Operations on the Potomac (CO-OP)

Interstate Commission on the Potomac River Basin

Overview

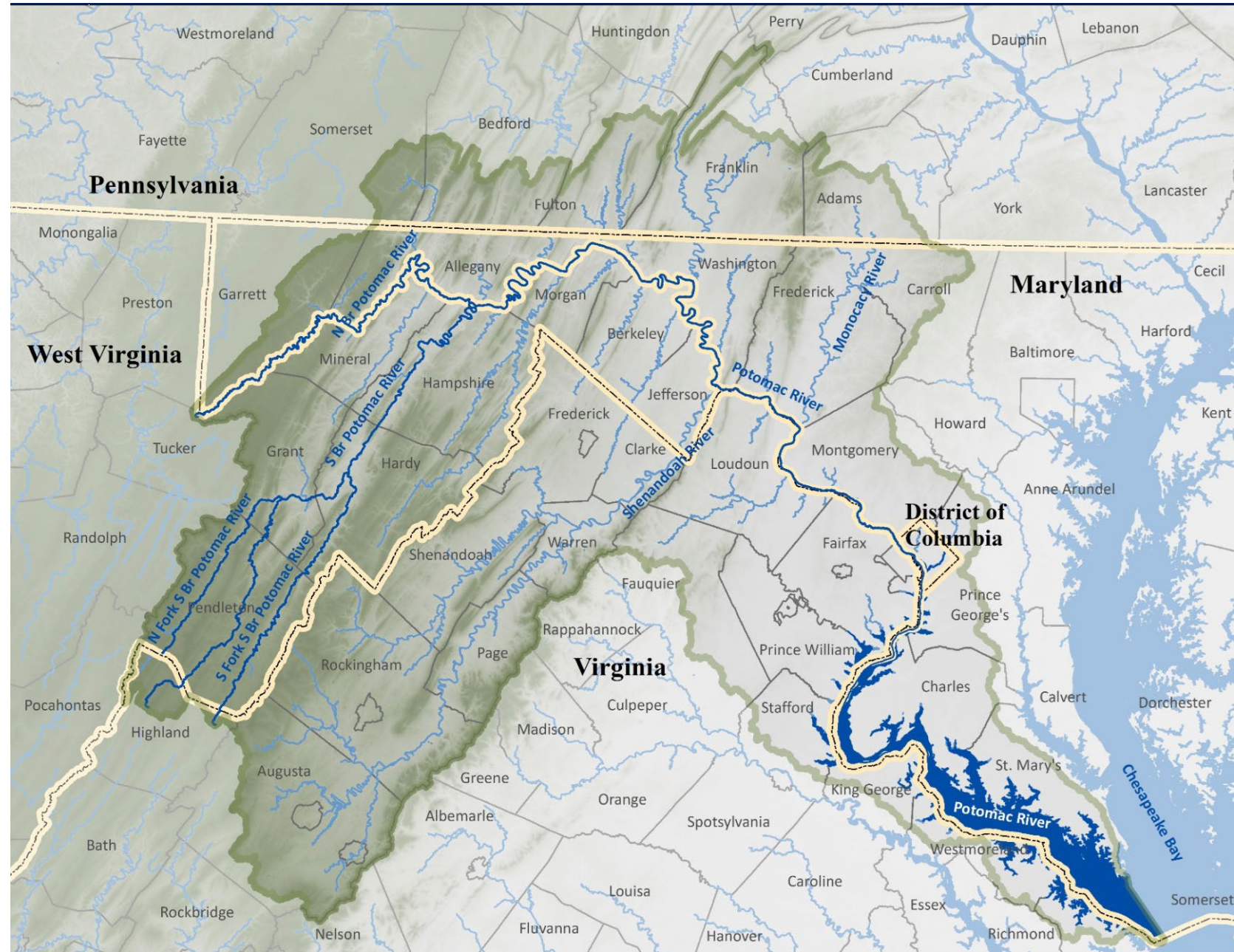
- What is ICPRB's CO-OP Section?
- How will climate change affect our water supplies?
- What is ICPRB CO-OP doing to track resilience to climate change?

Interstate Commission on the Potomac River Basin (ICPRB)

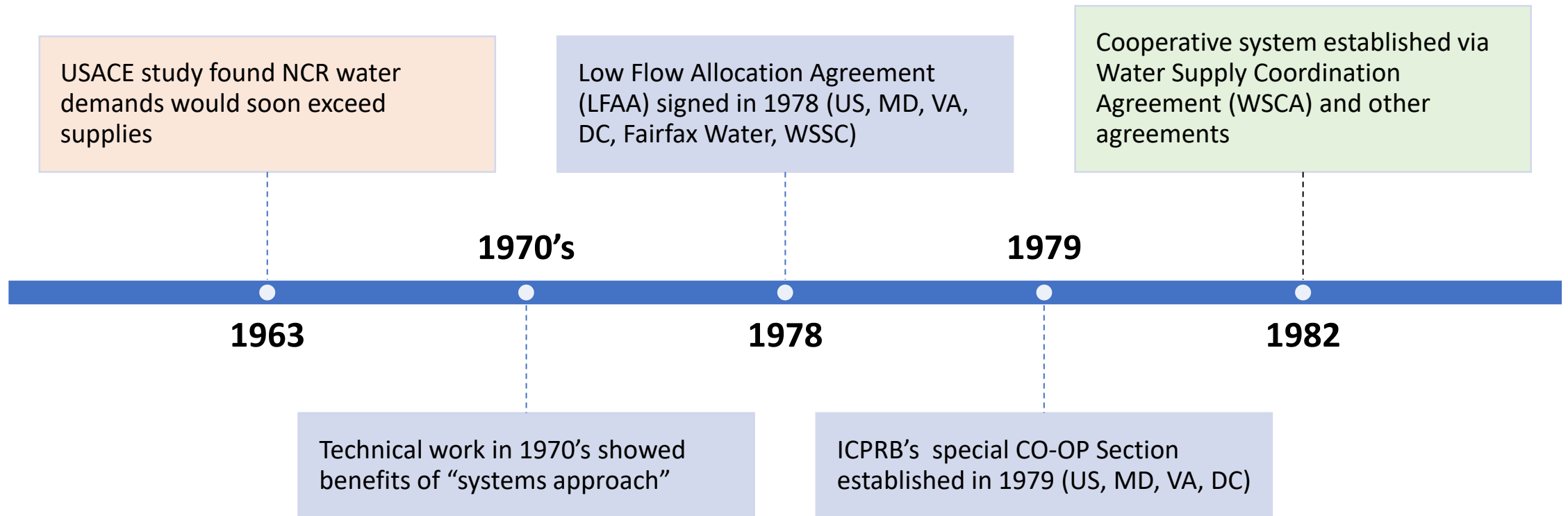
Interstate compact commission authorized by Congress in 1940

- Original focus was pollution
- No regulatory powers

ICPRB enhances, protects, and conserves the water and associated land resources of the Potomac River basin through regional and interstate cooperation.



Formation of our cooperative water supply system



The cooperative system (CO-OP)

An interstate regional system

- Fairfax Water - NoVa
- Washington Aqueduct* - DC, Arlington, Falls Church via Fairfax Water
- WSSC Water – MD suburbs

Reservoir cost-sharing by suppliers & DC

- Jennings Randolph Reservoir - water supply portion of storage
- Little Seneca Reservoir
- Savage Reservoir (portion of O&M costs)

Water Supply Coordination Agreement (US, FCWA, WSSC, DC, ICPRB)

- Coordination of drought operations
- Regular planning studies
- Cost-share formula for future storage
- Support by ICPRB CO-OP Section

*A Division of the USACE



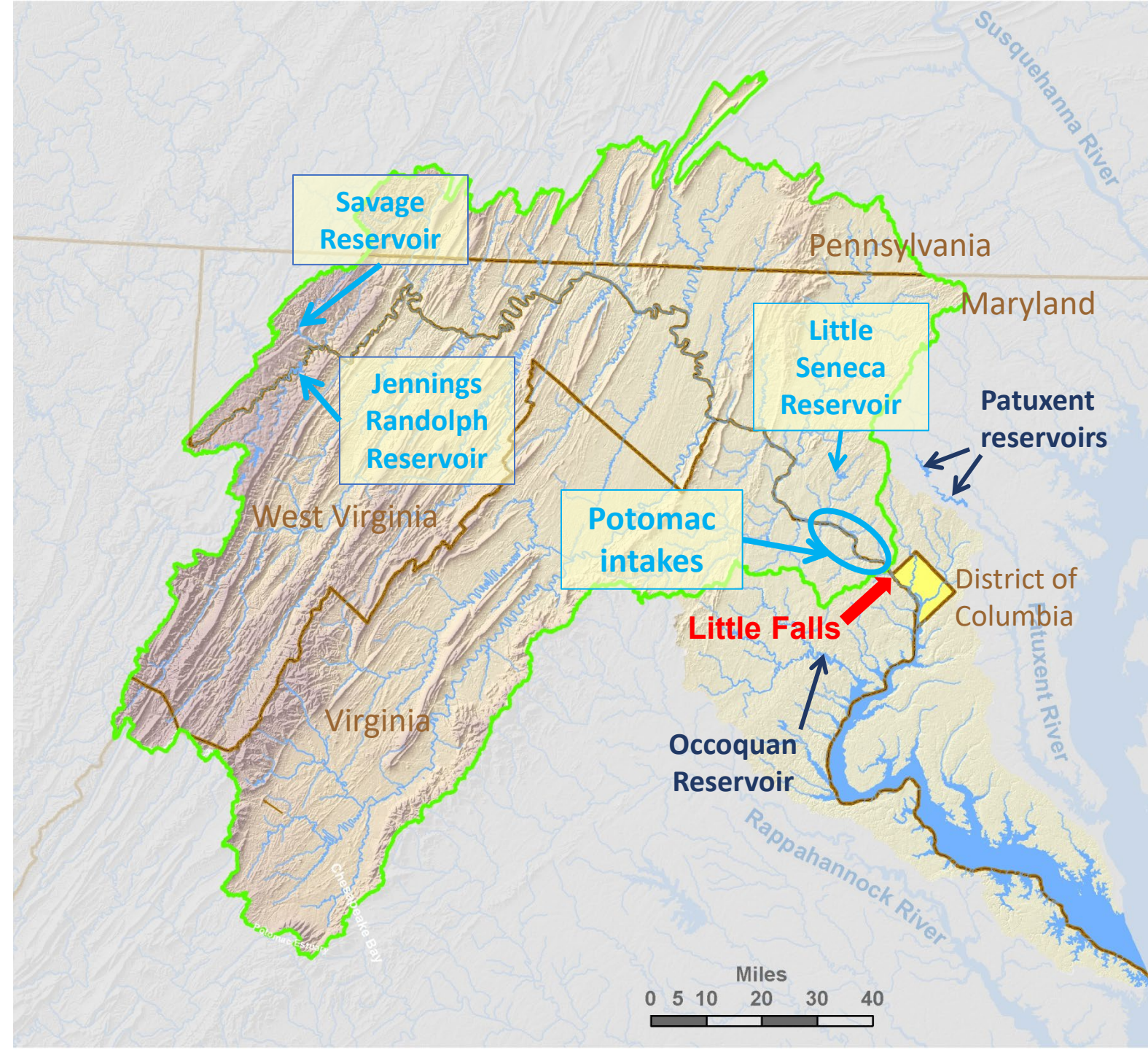
CO-OP system resources

Supplies

- 78% from Potomac River
- 22% from off-Potomac
 - Occoquan Reservoir (Fairfax Water)
 - Patuxent reservoirs (WSSC Water)

Operational targets

- ~300 MGD flow between Great Falls & Little Falls
- 100 MGD flow-by at Little Falls dam



ICPRB CO-OP Section's role

- Coordinate water supply operations during droughts
- Conduct drought planning studies
- Facilitate regional cooperation

How will climate change impact water supplies?

Potomac basin projections

- Wetter on average

Water supply perspective

- Understanding impacts on extremes is crucial



Making sense of climate change

Certainties

- Temperatures are rising
- Precipitation is becoming more variable
- Sea levels are rising

Uncertainties

- How fast and far will temperatures increase?
- How will precipitation change in our region?
- How will river flows respond to the competing effects of rising temperatures and changing precipitation patterns?
- *How will societies respond to the challenge of climate change?*

CO-OP's
methodology for
estimating
climate impact
on stream flows

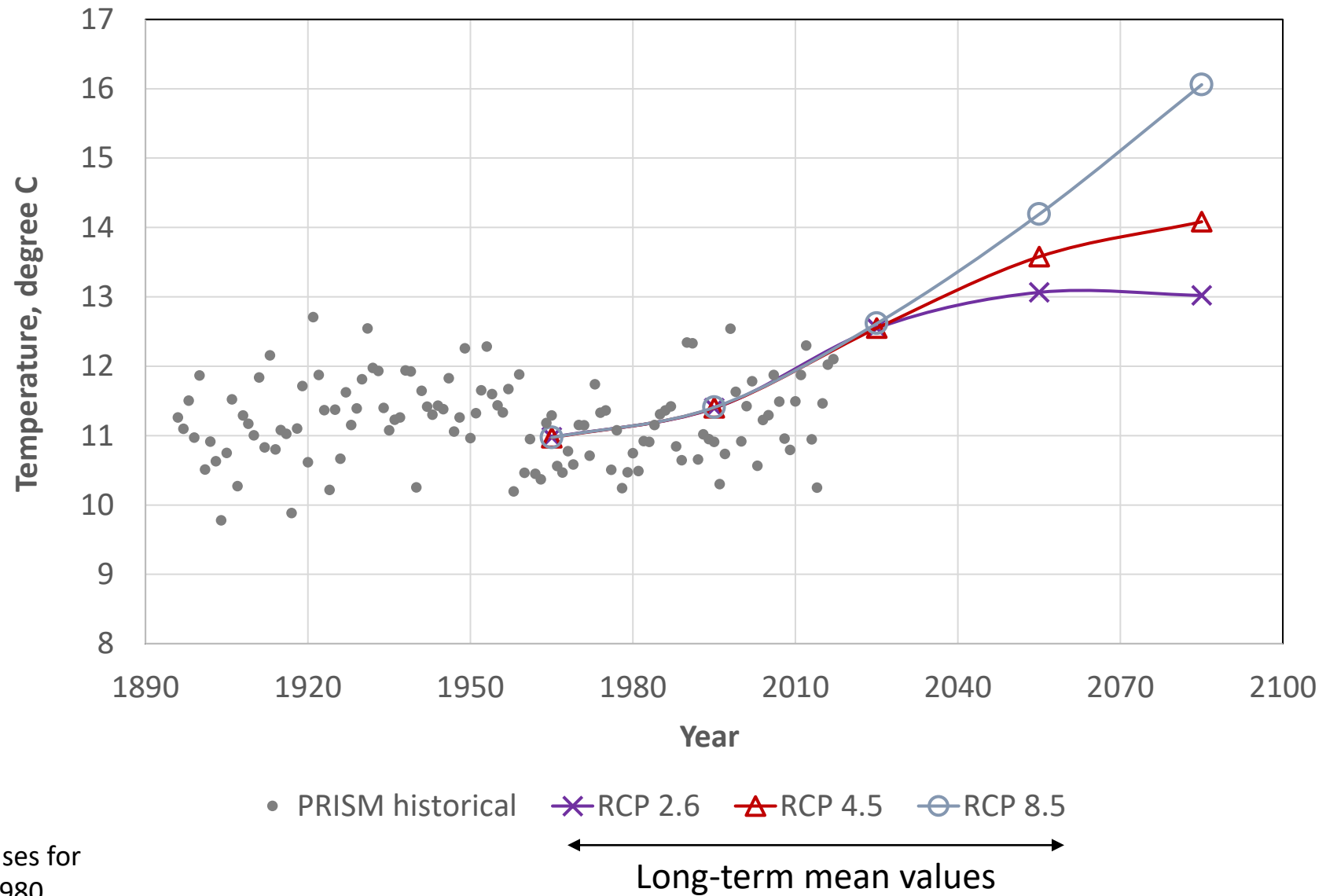
Currently using CMIP5 generation of global climate model (GCM) results, downscaled to the Potomac basin

Use a statistically-derived “climate sensitivity” relationship between annual precipitation, temperature, flow

Construct multi-GCM “pooled” time series of annual climate to obtain results for extreme years

Potomac basin annual temperature

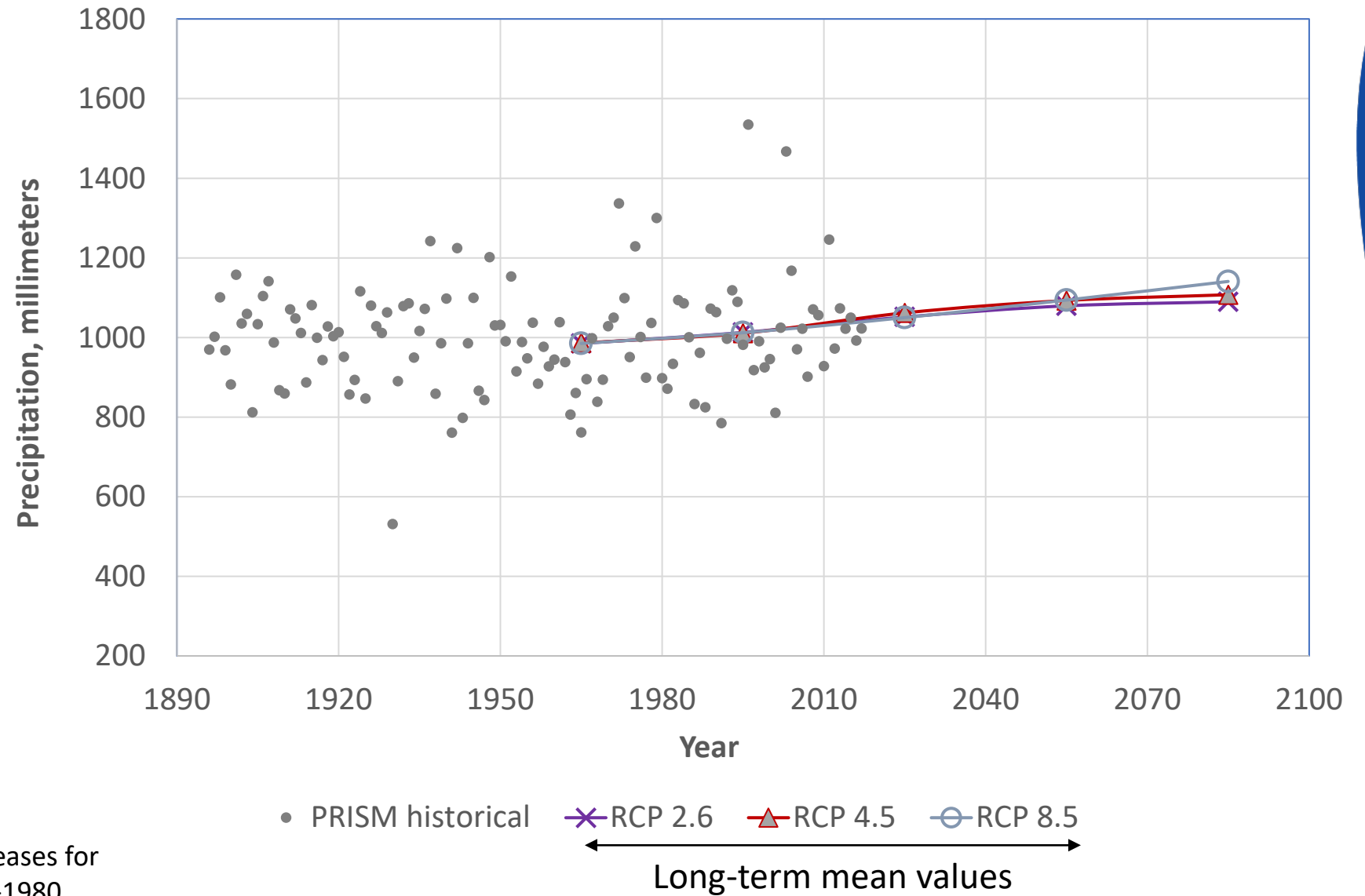
- Historical
 - High in 1930's
 - Slight upward trend
- 2085 projected increases* (°C)
 - RCP 2.6: +2.0
 - RCP 4.5: +3.1
 - RCP 8.5: +5.1



*Ensemble 30-year mean projected increases for 2070-2099 over baseline period of 1897-1980

Potomac basin annual precipitation

- Historical
 - Highly variable
 - Slight upward trend
- 2085 projected increases*
 - RCP 2.6: +10%
 - RCP 4.5: +12%
 - RCP 8.5: +15%



*Ensemble 30-year mean projected increases for 2070-2099 over baseline period of 1897-1980

Potomac River annual flow

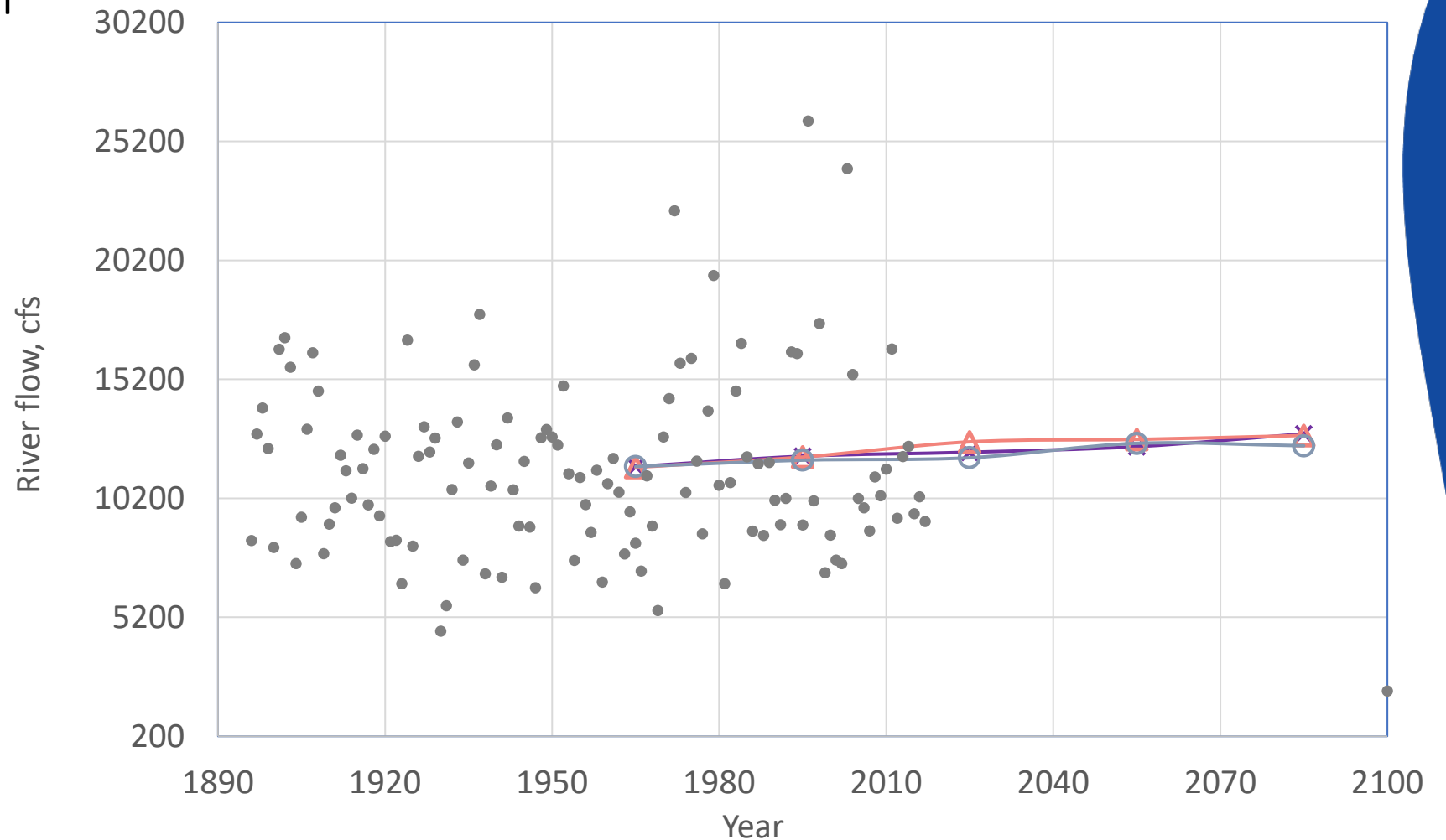
(natural, above Little Falls dam)

- **Historical**

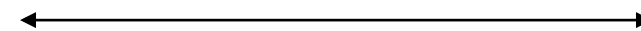
- Highly variable
- No discernable trend

- **2085 projected increases***

- RCP 2.6: +12%
- RCP 4.5: +12%
- RCP 8.5: +8%



• Flow historical RCP 2.6 RCP 4.5 RCP 8.5



Long-term mean values

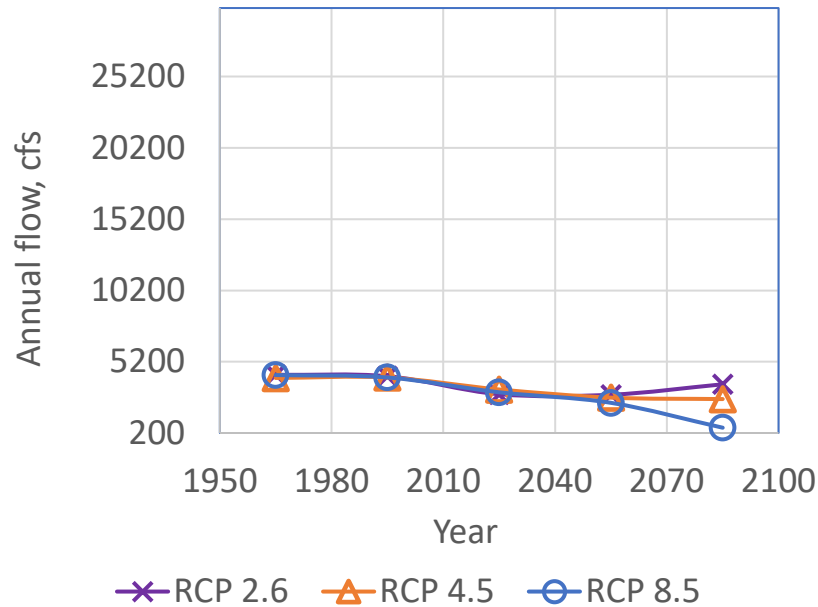
*Ensemble 30-year mean projected increases for 2070-2099 over baseline period of 1897-1980

Potomac River annual flow in extreme years

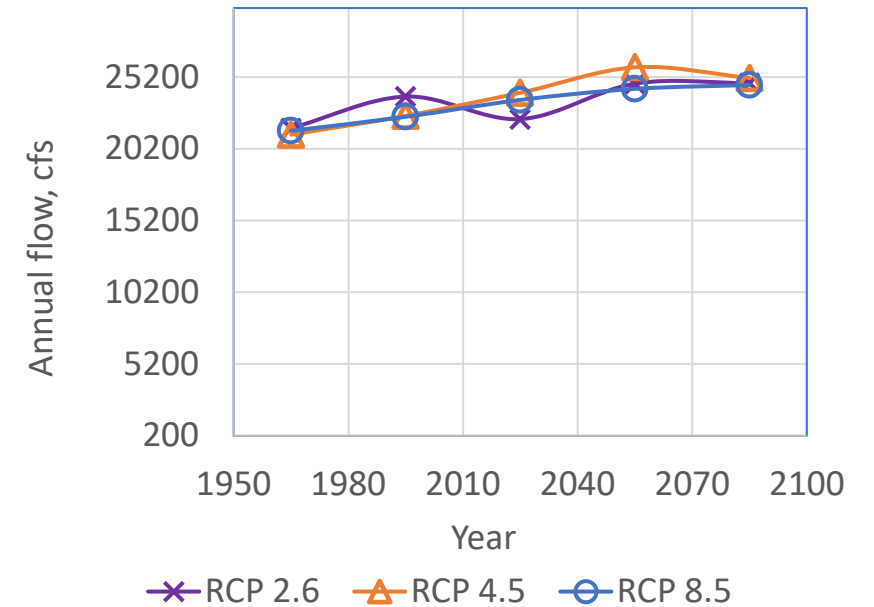
Projected changes in 2085 for 1st and 99th percentile values

- High temperature sensitivity scenario
 - RCP 2.6: -16% and +15%
 - RCP 4.5: -36% and +19%
 - RCP 8.5: -87% and +15%
- Medium temperature sensitivity scenario
 - RCP 2.6: +1% and +18%
 - RCP 4.5: -11% and +24%
 - RCP 8.5: -46% and +22%
- Low temperature sensitivity scenario
 - RCP 2.6: +16% and +21%
 - RCP 4.5: +12% and +29%
 - RCP 8.5: -7% and +30%

*100-year drought:
(1st percentile values)
high temperature sensitivity*



*Extreme wet year:
(99th percentile values)
high temperature sensitivity*



Recent CO-OP efforts to track water supply resilience

Water Supply Alternatives study (2017)

- Evaluated and compared ability of 10 alternatives to maintain reliability in the face of climate change and rising demands
- Provided recommended strategies for phased implementation of alternatives

2020 water supply study

- Assessed ability of recommended strategy from 2017 alternatives study to provide system reliability and resilience

2020 water
supply study
– *representing
uncertainty using
the scenario
approach*

- Three scenarios for future water demands
- Three scenarios for Potomac basin stream flows under a future climate
- Four scenarios for future system options
 - Baseline – no change from current plans
 - Ops – implementation of 4 “operational” alternatives, including better river flow forecasts and revised use of Loudoun Water’s Milestone & Beaverdam reservoirs
 - Ops + Travilah – add use of Travilah Quarry for shared raw water storage
 - Ops + Travilah + Luck – add use of Loudoun Water’s Luckstone Quarry B

CO-OP 2020 study results

(in the event of an extreme drought)

(GREEN – reliable, YELLOW – marginal, RED – system failure)

| | Higher Flows | | | Medium Flows | | | Lower Flows | | |
|----------------------------------|--------------|----------------|--------------|--------------|----------------|--------------|-------------|----------------|--------------|
| | Low Demands | Medium Demands | High Demands | Low Demands | Medium Demands | High Demands | Low Demands | Medium Demands | High Demands |
| Baseline | GREEN | GREEN | YELLOW | YELLOW | RED | RED | RED | RED | RED |
| Baseline + Ops | GREEN | GREEN | GREEN | GREEN | YELLOW | RED | RED | RED | RED |
| Baseline + Ops + Travilah | GREEN | GREEN | GREEN | GREEN | GREEN | GREEN | YELLOW | RED | RED |
| Baseline + Ops + Travilah + Luck | GREEN | GREEN | GREEN | GREEN | GREEN | GREEN | GREEN | RED | RED |

Upcoming assessments

USACE feasibility study on a
secondary water source for the NCR

CO-OP 2025 water supply study

Questions?

Contact: cschultz@icprb.org

CO-OP studies

- Washington Metropolitan Area Water Supply Alternatives, 2017
(https://www.potomacriver.org/wp-content/uploads/2017/08/ICP17-3_Schultz.pdf)
- 2020 Washington Metropolitan Area Water Supply Reliability Study: Demand and Resource Availability Forecast for the Year 2050, 2020
(<https://www.potomacriver.org/wp-content/uploads/2020/12/2020-WMA-Water-Supply-study-FINAL-September-2020.pdf>)

