



Water Supply and Source Water Protection

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Potomac Watershed Roundtable
October 6, 2023

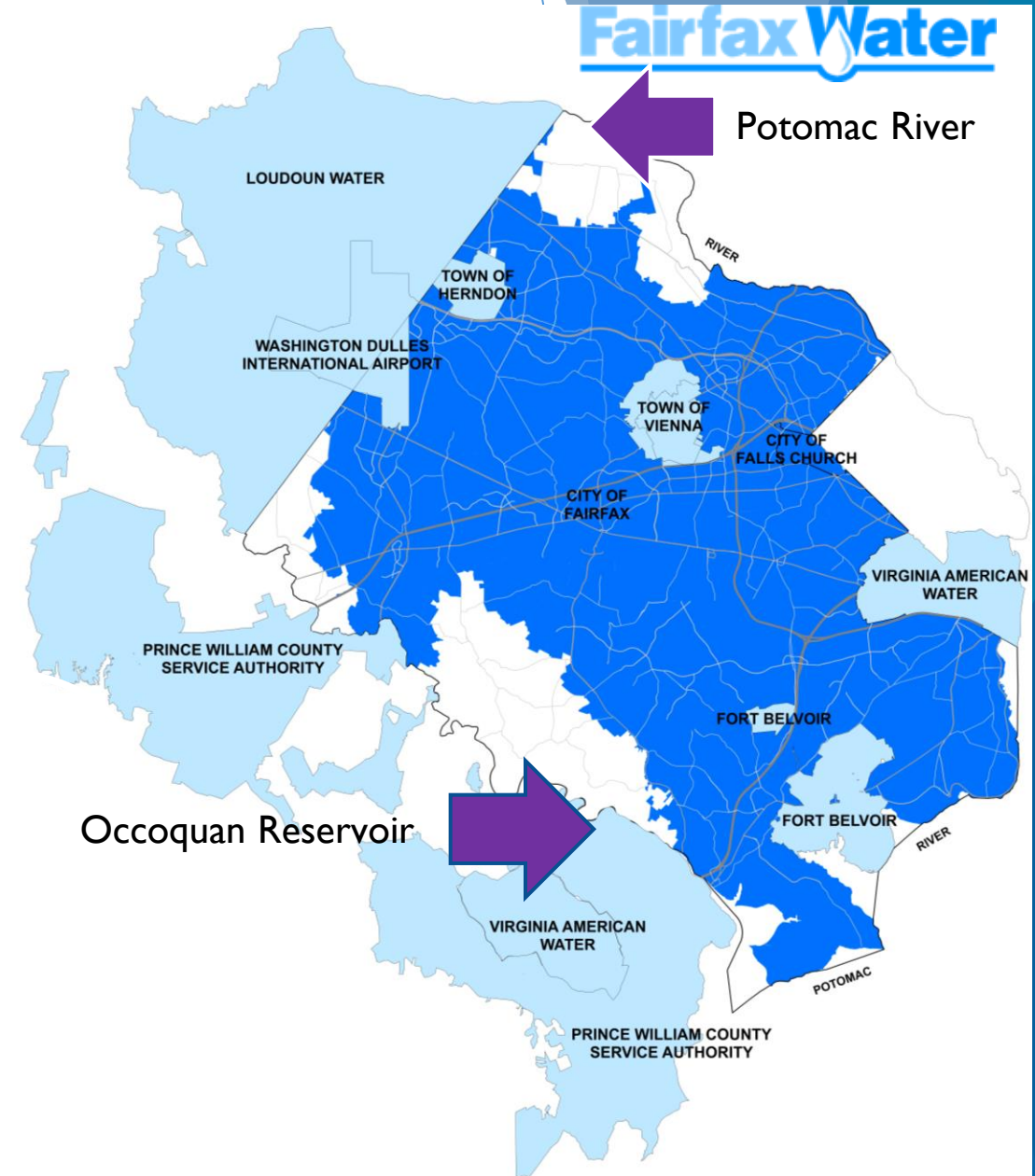
Presentation Topics

- ▶ About Fairfax Water
- ▶ Our Sources
- ▶ Water Supply Planning Efforts
- ▶ Source Water Protection



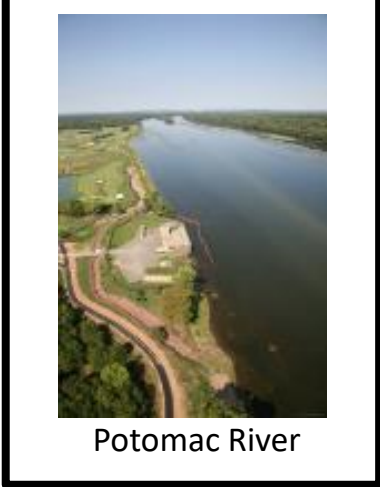
FAIRFAX WATER – WHO ARE WE?

- Drinking Water Only
- Non-Profit Authority
- 2 Million Customers in Fairfax County and Neighboring Counties via Wholesale
- Corbalis Water Treatment Plant – Potomac River
- Griffith Water Treatment Plant – Occoquan Reservoir
- Washington Aqueduct, Army Corps of Engineers





Occoquan Reservoir



Potomac River

SUPPLY



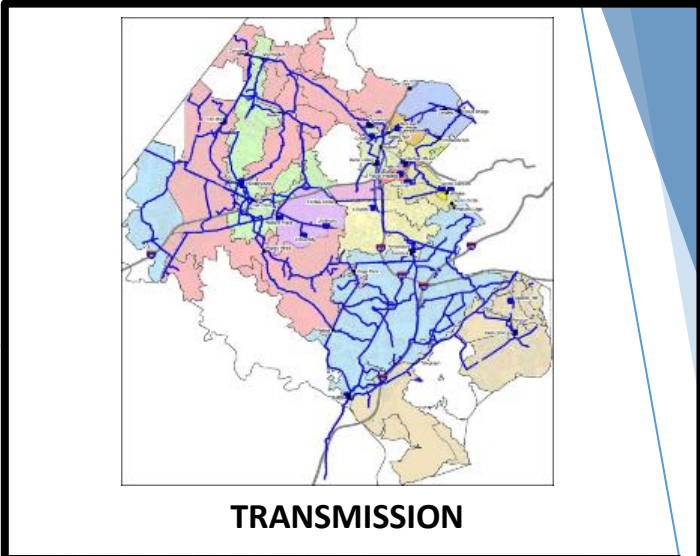
Griffith WTP



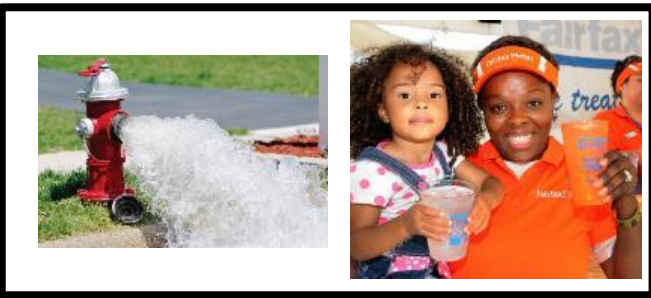
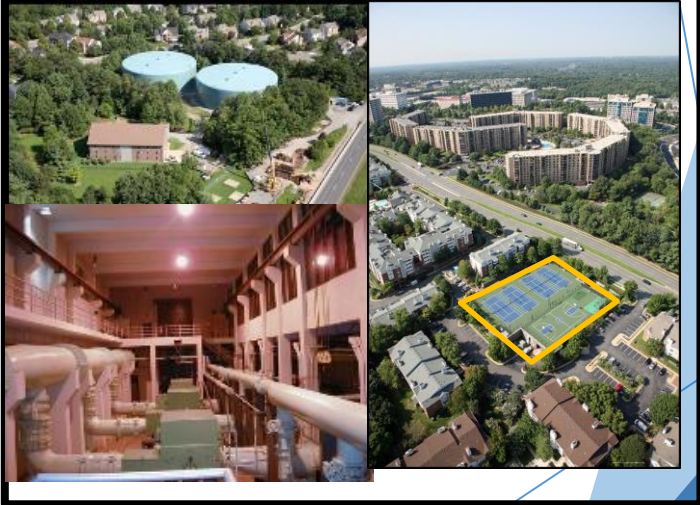
Corbalis WTP



TREATMENT

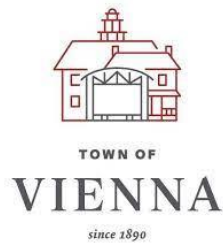


TRANSMISSION



DISTRIBUTION SYSTEM

Fairfax Water Wholesale Partners and Communities Served



BACKGROUND

WATER SUPPLY & TREATMENT

- ▶ Treated water quality surpasses all Environmental Protection Agency (EPA) and Virginia Department of Health (VDH) regulations
- ▶ Conventional treatment plus ozone & granular activated carbon
 - ▶ **Plant tour this afternoon!**
- ▶ Griffith Water Treatment Plant (WTP) - 120 MGD
- ▶ Corbalis Water Treatment Plant (WTP) - 225 MGD

Griffith WTP



Corbalis WTP



Occoquan Reservoir Watershed

8.5 BG concrete impoundment
constructed in the late 1950s

590 sq. miles

43% Forest

15% Agricultural

36% Urban/Developed

6% Water/Wetlands

Urbanization impacts, about 574,000
watershed population

Serves the Griffith Water Treatment Plant

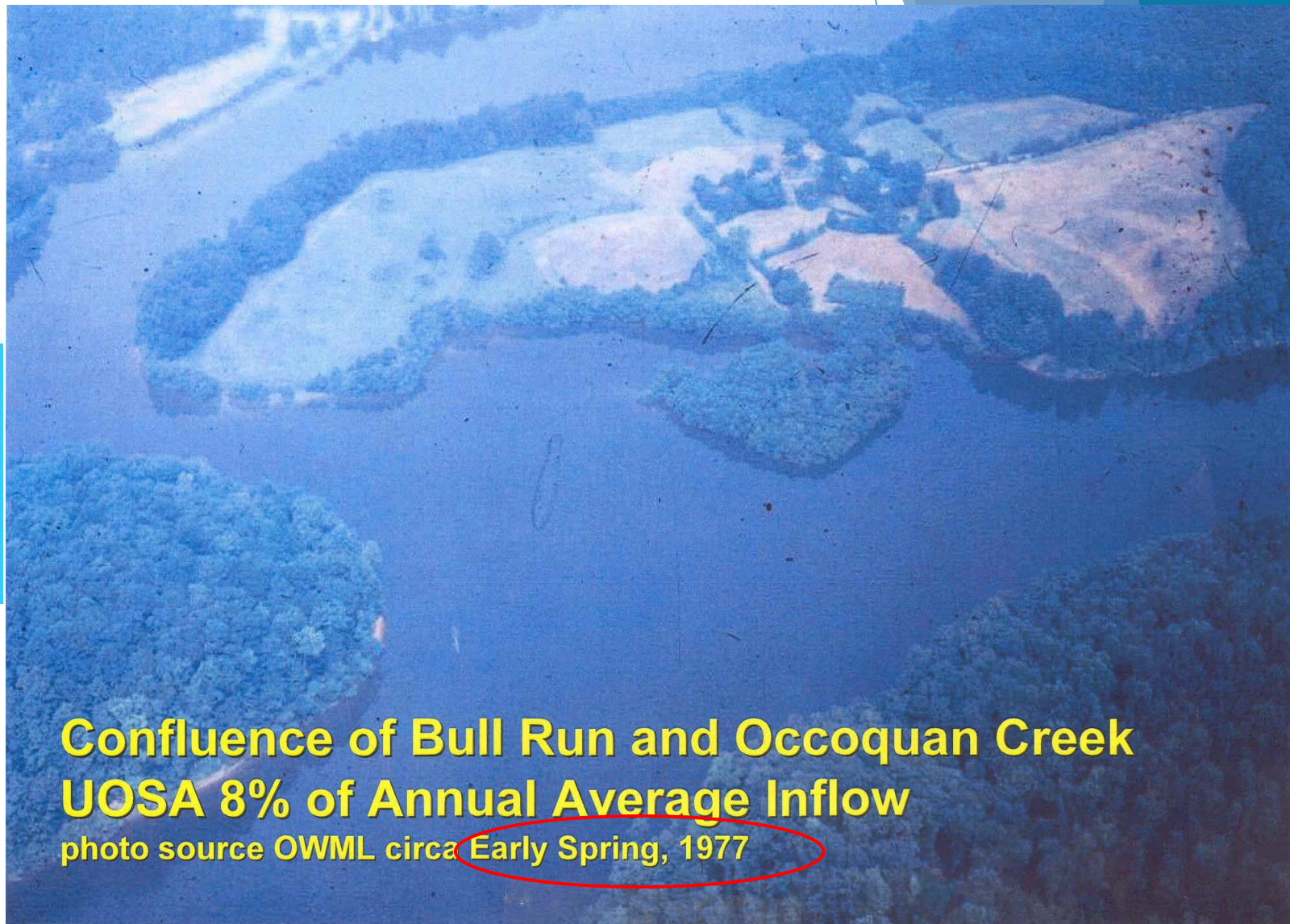
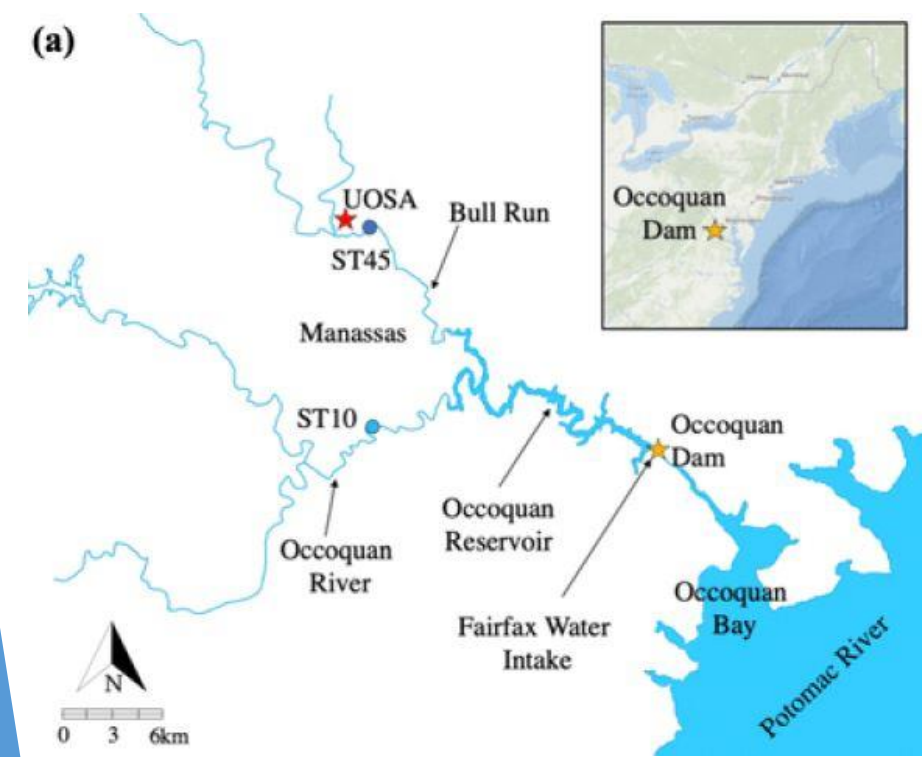
Indirect Potable Reuse

The Occoquan Reservoir is bordered
by Fairfax County on the north, and
Prince William County on the south.



WATER SUPPLY PLANNING

BACKGROUND – OCCOQUAN RESERVOIR WATER SUPPLY



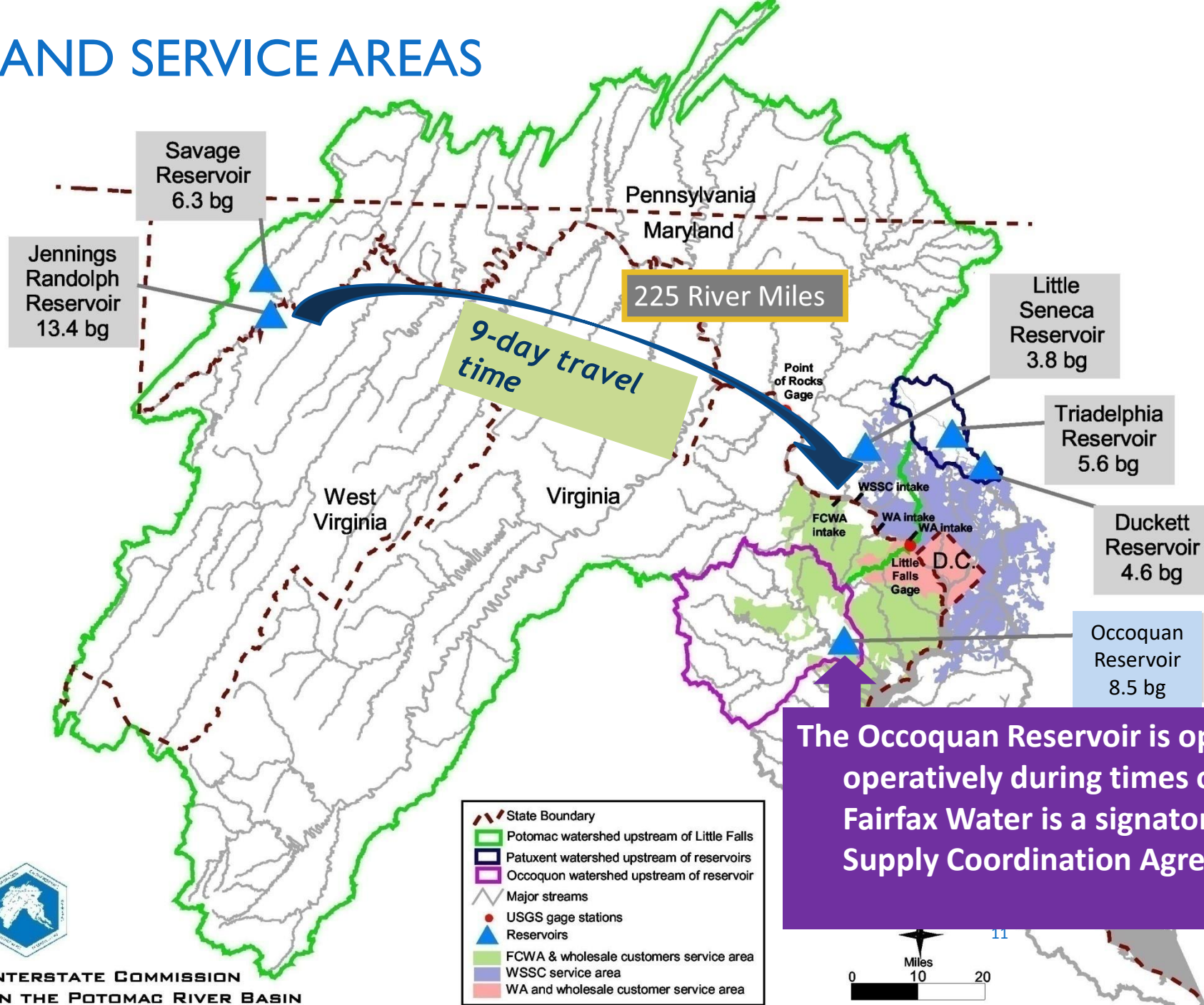
Confluence of Bull Run and Occoquan Creek
UOSA 8% of Annual Average Inflow
photo source OWML circa **Early Spring, 1977**

BACKGROUND – OCCOQUAN RESERVOIR WATER SUPPLY



Confluence of Bull Run and Occoquan Creek
UOSA > 90% of Drought Inflow
photo source OWML circa Fall 1977

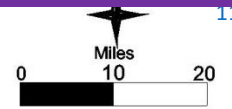
RESERVOIRS AND SERVICE AREAS



The Occoquan Reservoir is operated co-operatively during times of drought. Fairfax Water is a signatory to the Water Supply Coordination Agreement (WSCA)



INTERSTATE COMMISSION
ON THE POTOMAC RIVER BASIN



2020 ICPRB CO-OP Study Purpose and Objectives

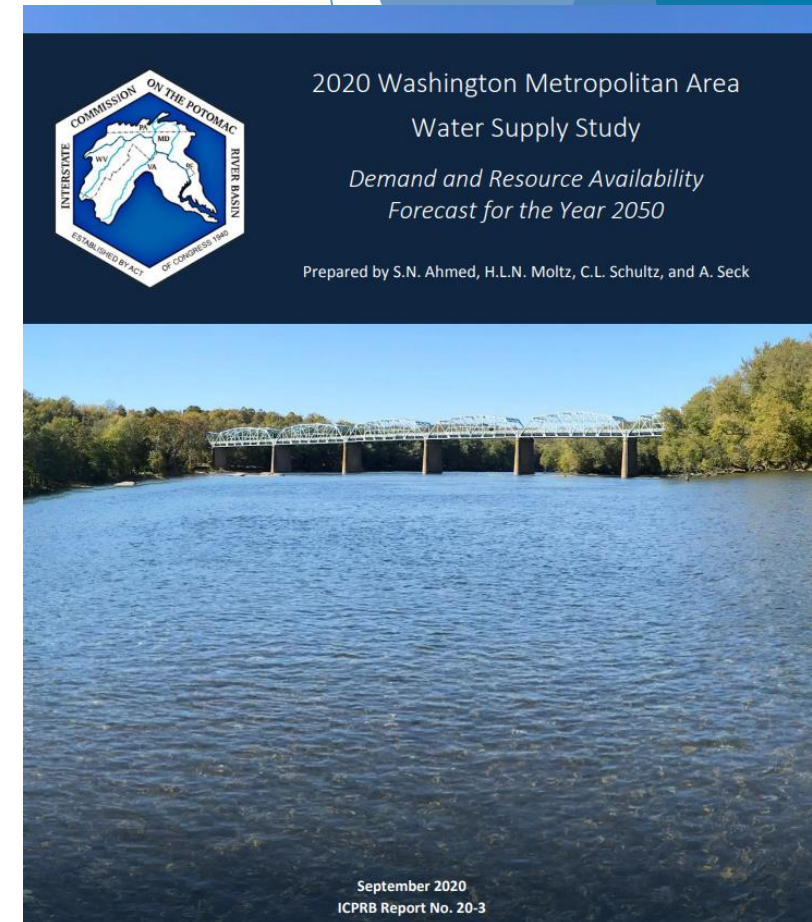
On behalf of FW, WA and WSSC, the ICPRB assesses supply and demand every 5 years

Forecasts of water demands for the WMA through the year 2050, taking into account projected demographic and societal changes that may affect future water use.

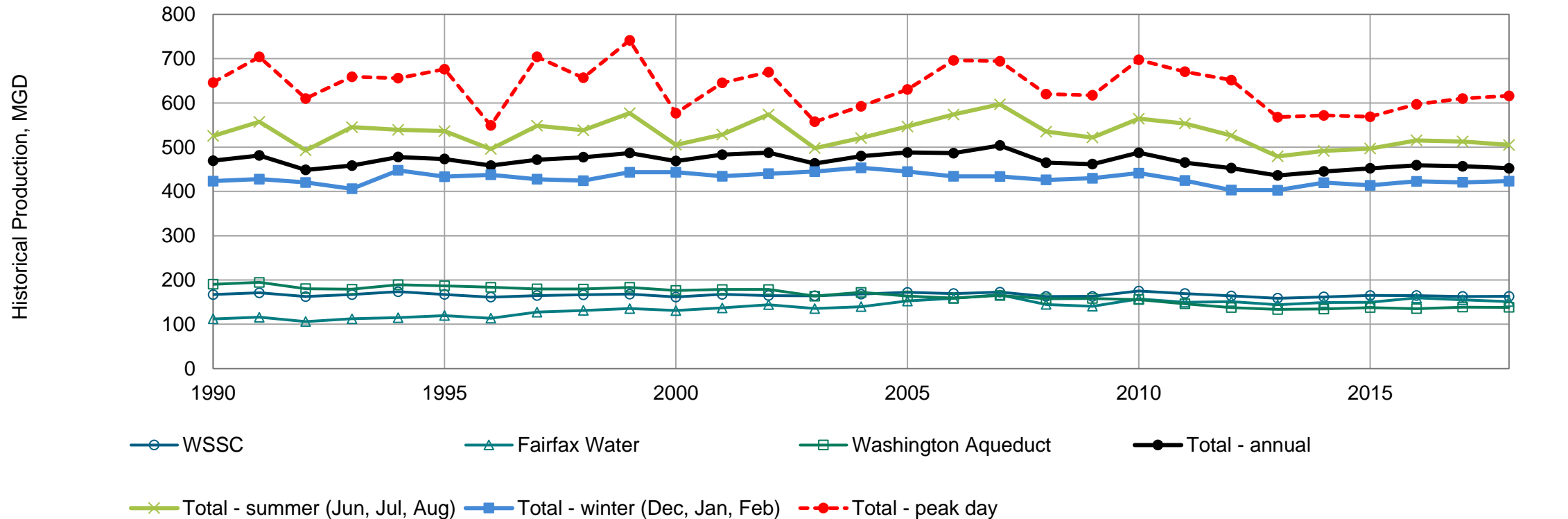


Forecasts of water availability, considering the potential impact on system resources of changes in climate and upstream water use, and evaluations of the ability of current, planned, and proposed system resources to meet the forecasted demands.

The planning study is also used to support locality requirements under Virginia's Water Supply Planning regulations



OBSERVED WATER DEMANDS (1990-2019)



- WMA population rose 23 percent over this period, from 3.9 to 4.8 million people
- Water demands have essentially remained constant due to falling per household and per employee use.
- This pattern of declining unit use is consistent with trends observed throughout the United States.

Metropolitan Washington Water Supply and Drought Awareness Response Plan

MWCOG (2000)

- ▶ Developed a common set of triggers and actions to be used by local governments and water utilities for the Potomac River Water Supply System.

	Normal	Watch	Warning	Emergency
Audience	Metropolitan Washington region local governments, Co-op/Non Co-op Customers, media, and general public	Metropolitan Washington region local governments, Co-op/Non Co-op Customers, media, and general public	Customers of Co-op System	Customers of Co-op System
Trigger	<ul style="list-style-type: none"> Meeting all demands 	<ul style="list-style-type: none"> NOAA D1 (adopted on a <i>provisional 2-year basis and will be re-assessed during this time period</i>) 	<ul style="list-style-type: none"> Water supply storage at Jennings Randolph and Little Seneca reservoirs drops to 60% of capacity for 5 consecutive days; lifted when combined water storage at reservoirs increases and remains above 60% for a period of 15 days; OR 5% Probability of not meeting unrestricted water supply demands 	<ul style="list-style-type: none"> 50% probability of not being able to meet water supply demands
Action	<ul style="list-style-type: none"> Routine reporting Year round water conservation program (Attachment A) 	<ul style="list-style-type: none"> Meeting of the Drought Coordination Committee Regional media briefing/media communications; detailed water supply and drought status reporting, noting the adequacy of water supply, but warning that if conditions deteriorate voluntary water use restrictions will be initiated Press release upon first water supply release from reservoirs and water supply reporting on a weekly basis thereafter Press release when water supply storage at Jennings Randolph and Little Seneca 	<ul style="list-style-type: none"> Meeting of the Drought Coordination Committee Regional media briefing on a weekly basis/ ongoing media communications Announcement of <u>voluntary water use reductions</u> initiated (see attached illustrative list of possible voluntary reductions) Detailed water supply system outlook Water supply reporting on a daily basis 	<ul style="list-style-type: none"> Meeting of the Drought Coordination Committee WAD assigns allocations to Potomac River utilities (per Low Flow Allocation Agreement) Regional press conference on daily basis; ongoing media communications Water supply reporting on a daily basis Comprehensive mandatory water use <u>reductions</u> implemented (see attached illustrative list of possible mandatory reductions)

Key Elements:

- Triggers specific to Potomac System
- Drought Coordination Committee
- Actions based on defined stages

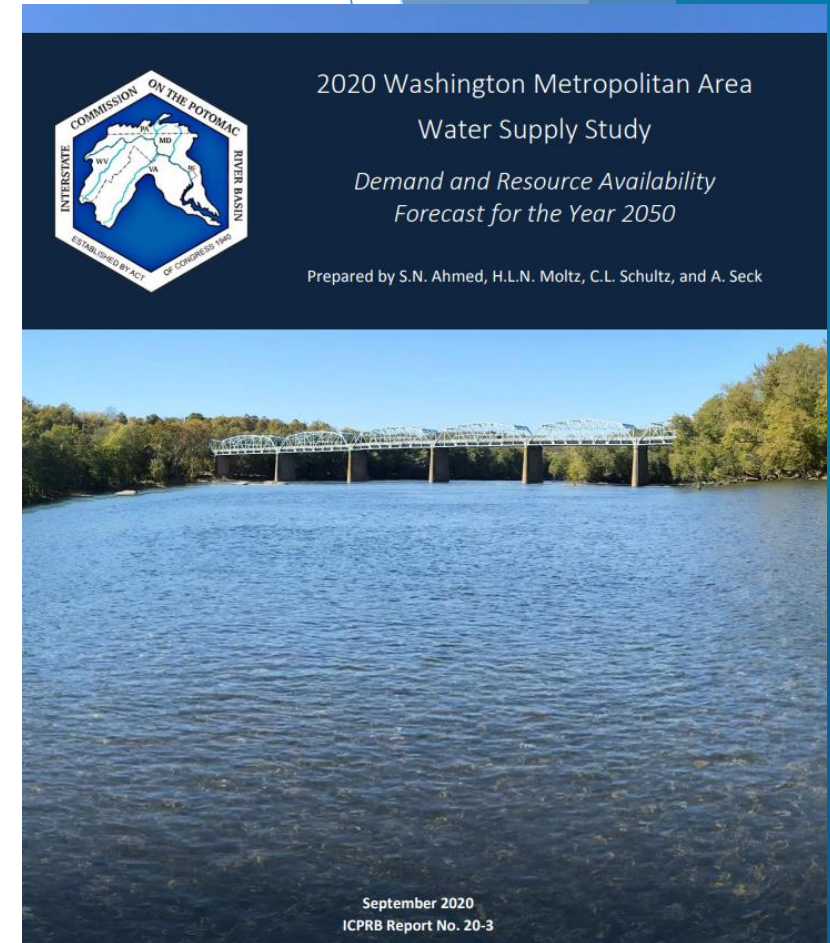
Climate change in the Potomac Basin

- ▶ Uses an ensemble of 224 climate projections derived from the statistically downscaled model
- ▶ Precipitation in the Potomac basin in 2040 is projected to increase by 8%
- ▶ Temperature in the Potomac Basin in 2040 is projected to increase by 2.2 °C
- ▶ Uncertainty in future streamflows as the range of projected changes among the ensemble members is large.



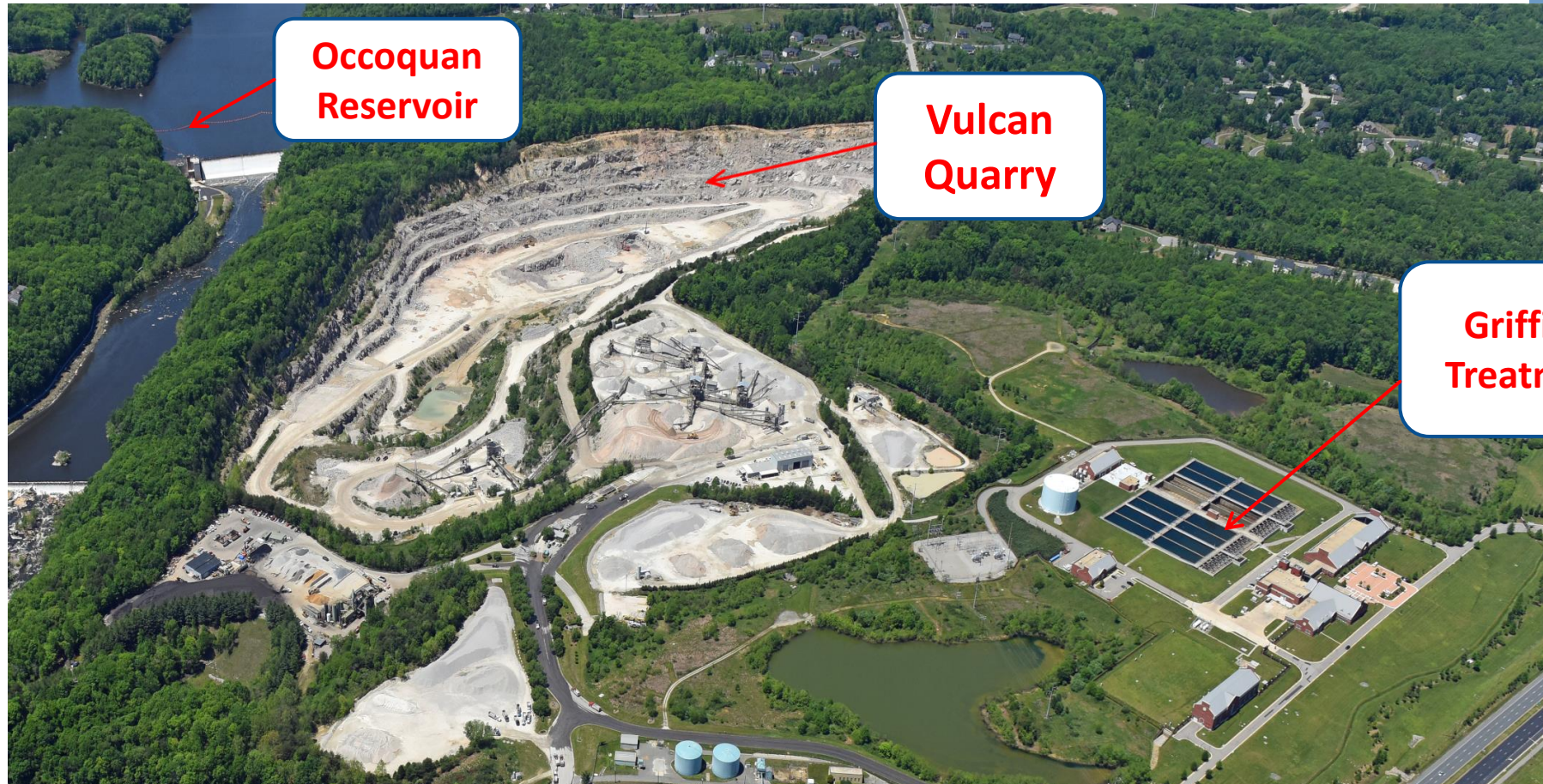
ICPRB STUDY CONCLUSIONS

- ▶ Future demand is uncertain – with long history of over-prediction
 - Most likely 2040 scenario is the low demand scenario
- ▶ Impact of climate change on future flows is very uncertain
 - Regional precipitation and streamflow projections vary widely, **droughts may be more severe**
- ▶ 2040 Demands Scenarios
 - Moderate stress on the WMA Baseline system, during severe drought under the Medium Flows/Medium Demands scenario
 - Operational alternatives alone are not sufficient
 - Quarries help mitigate the impacts of a severe drought

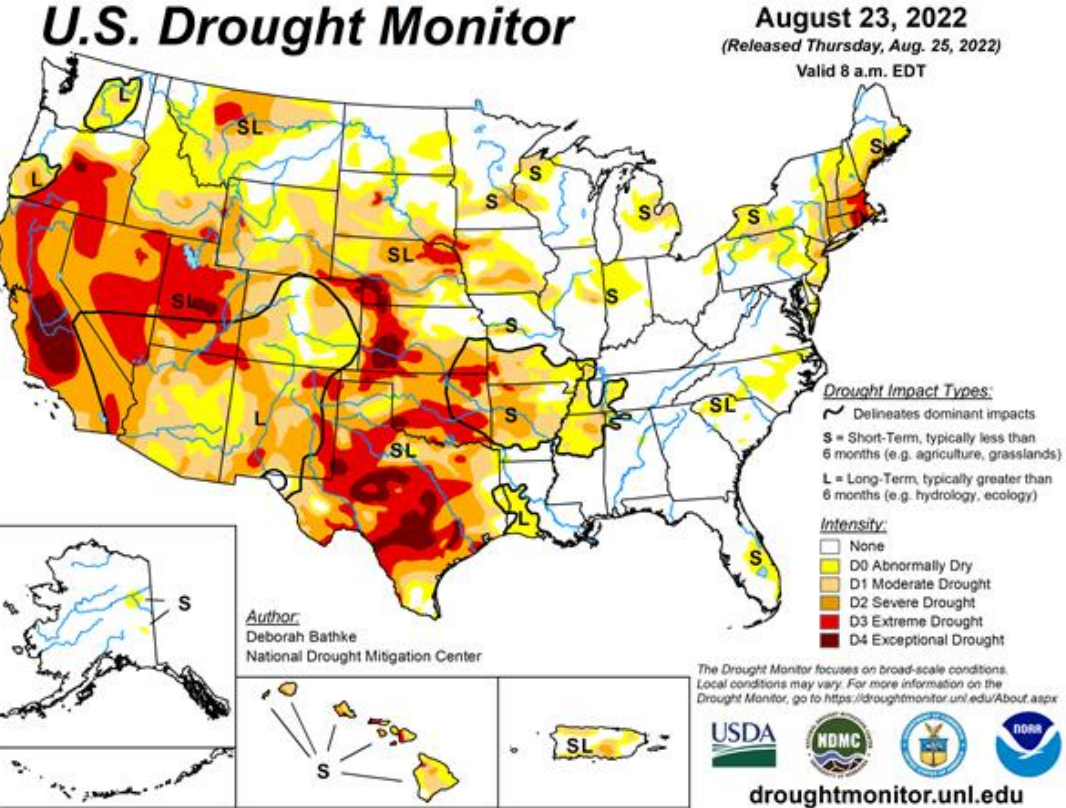


FUTURE WATER SUPPLY RESERVOIR (STEVEN T. EDGEMON)

- Innovative solution to meet critical future water supply needs
- Proximity to existing water treatment infrastructure reduces environmental and community impact
- Phase 1 provides initial storage of about 1.8 billion gallons by 2040
- Phase 2 provides additional storage capacity of up to 15 billion gallons by 2085



Regional Water Supply Resiliency



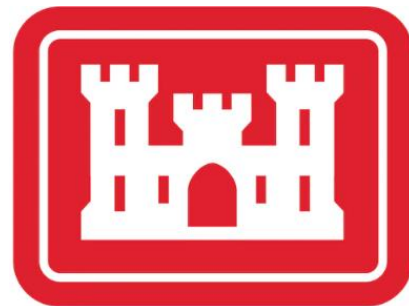
Risks to regional water supply:

- Spill events
- Severe drought caused by climate change



Potomac River Supplemental Supply

- ▶ The 2022 Water Resources Development Act (WRDA) authorized a study to evaluate alternatives to improve resiliency for the Potomac supply.
- ▶ The study authorized under WRDA:
 - Requires an appropriation (**in-consideration by Congress**)
 - Will be conducted by U.S. Army Corps of Engineers
 - Requires collaboration with utilities
- ▶ Solution will be capital intensive and take years to develop
- ▶ Regional support and collaboration is essential to success



WATER RESOURCES DEVELOPMENT ACT



SOURCE WATER PROTECTION INITIATIVES

Source Protection Initiatives - “Occoquan Policy”

- Result of the late 1960s Water Quality Problems
- Established Occoquan Watershed Monitoring Subcommittee of State Water Control Board
- Formed UOSA (Upper Occoquan Service Authority) to Consolidate Older WWTPs
- Established Indirect Potable Reuse as Sustainable Water Supply for Northern Virginia
- *“A Policy for Waste Treatment and Water Quality Management in the Occoquan Watershed”* (adopted 1971) 9 VAC 25-410, administered by Virginia DEQ

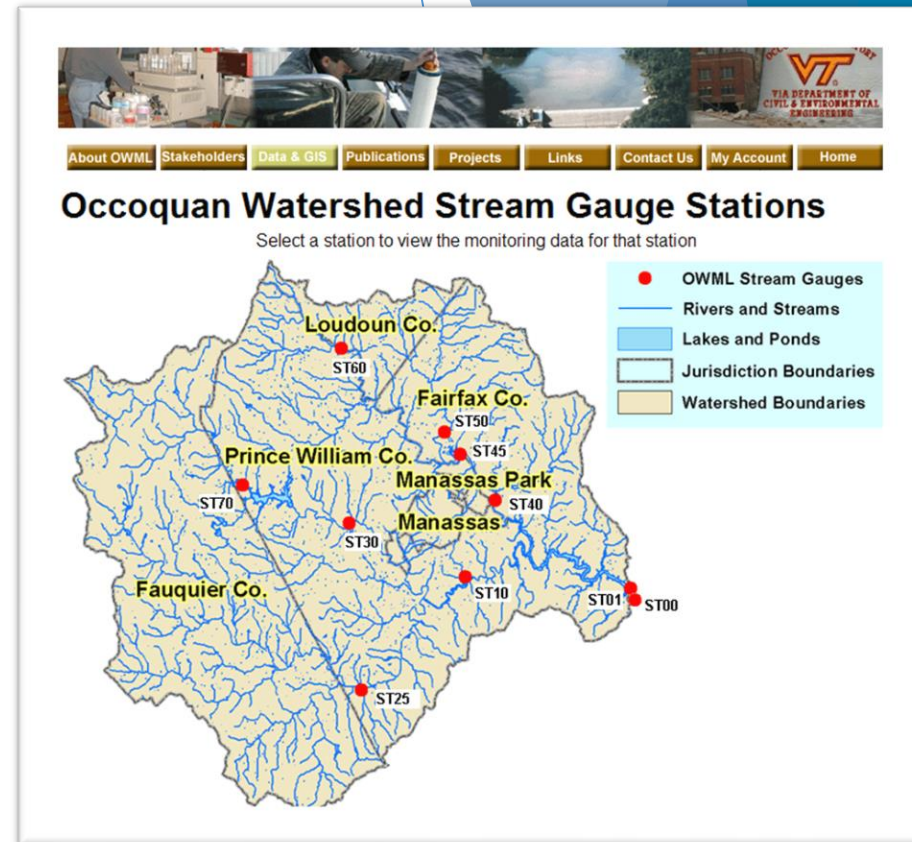


Millard H. Robbins Jr. Water Reclamation Plant
Centreville, VA (UOSA)

Source Protection Initiatives

Occoquan Watershed Monitoring Program

- Established by requirement of the "Occoquan Policy" for an independent monitoring and surveillance program
 - 50% Funding by Fairfax Water
 - 50% Funding by Local Jurisdictions
- ▶ Occoquan Watershed Monitoring Lab (OWML)
 - Sampling and Analysis
 - Stream Gages and Reservoir Stations
- ▶ Objective: to Evaluate and Monitor Long-Term Water Quality Trends in the Watershed



Source Protection Initiatives

The Occoquan Non-Point Source Program

- ▶ Technical Investigations and Support
 - Land Use Inventory and Updates
 - Northern Virginia BMP Handbook
 - Nonstructural Urban BMP Handbook
- ▶ Occoquan Nonpoint Source Model
 - Watershed (HSPF) / Reservoir (CE-QUAL-W2) Model
 - Model maintained by Virginia Tech / OWML

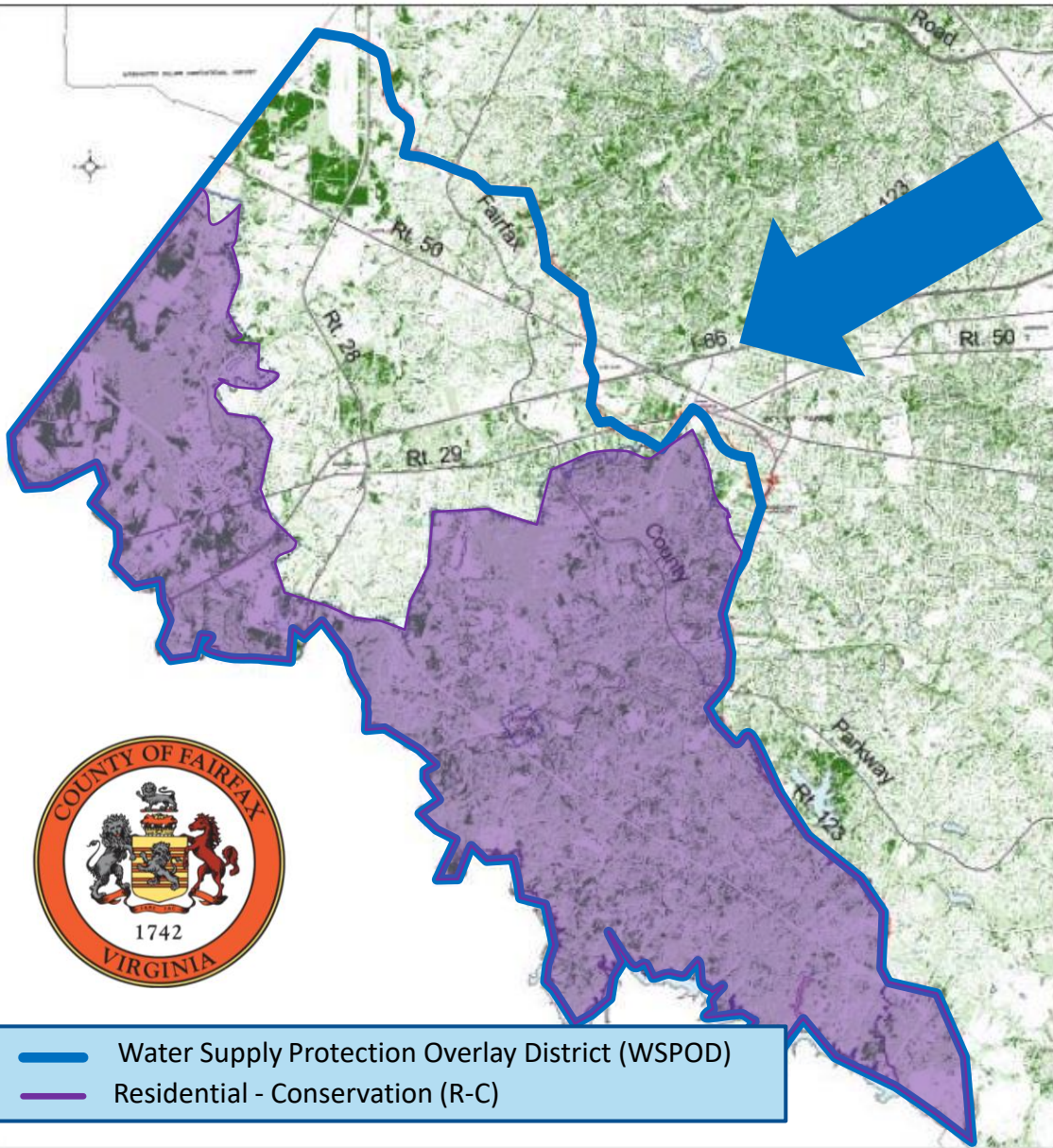
Program funding provided by water suppliers and local jurisdictions based on water use and population % within the watershed

The Occoquan Non-Point Source Program is administered by the NVRC



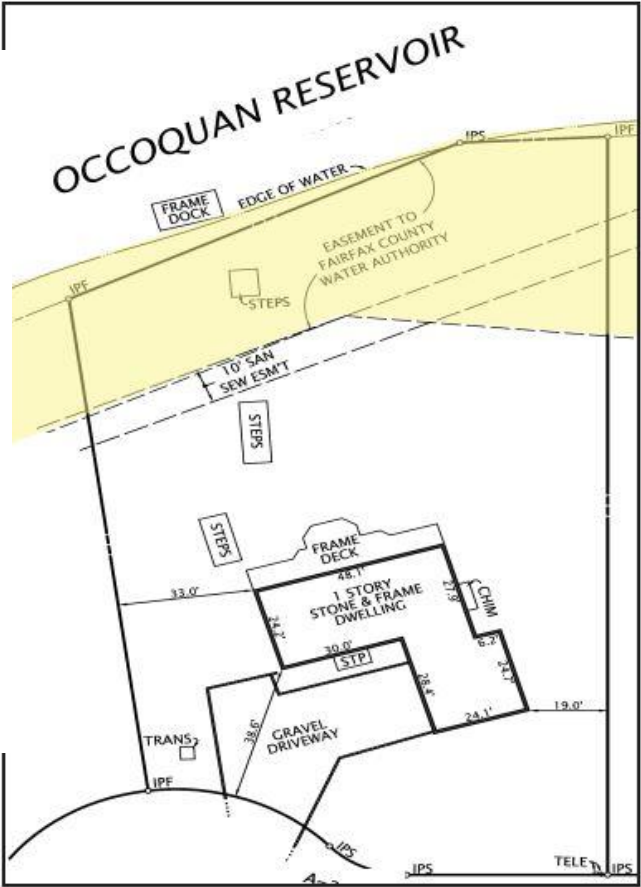
Source Protection Initiatives FAIRFAX COUNTY ZONING ACTIONS (1982)

- After many studies and at the recommendation of the Occoquan Basin Task Force (1980) established by the Board of Supervisors, the BOS protected the Occoquan Reservoir watershed through actions:
 - Residential-Conservation (R-C)
 - 41,000 acres downzoned to allow one dwelling per 5 acres
 - Water Supply Protection Overlay District (WSPOD)
 - Includes areas in the Occoquan watershed outside the R-C zoning district
 - Higher density development allowed with stormwater controls (50% reduction in phosphorus loads)
 - Supports various residential, industrial, and commercial uses while balancing runoff impacts



SOURCE PROTECTION STRATEGIES IN THE OCCOQUAN FAIRFAX WATER'S OCCOQUAN SHORELINE EASEMENT POLICY

- Land adjacent to the water's edge
- Varies in height above normal water surface elevation for each property
- Serves as a buffer around the perimeter of the Occoquan Reservoir
- Buffers are considered a best management practice because they:
 - Protect stream and shoreline water quality
 - Reduce streambank and shoreline erosion



SOURCE PROTECTION STRATEGIES IN THE OCCOQUAN FAIRFAX WATER'S OCCOQUAN SHORELINE EASEMENT POLICY

- ▶ Restricts activities within easement to small piers or floating docks
- ▶ Prohibits:
 - ▶ (New) Structures other than Piers or Floats
 - ▶ Clearing of Trees and Vegetation
 - ▶ Closed Storage Sheds
 - ▶ Fuel and Chemical Storage
 - ▶ Application of Pesticides, Herbicides, and Fertilizers
 - ▶ Trash, Debris, and Vegetative Waste
 - ▶ Pipes Withdrawing or Discharging Water
 - ▶ Septic Tank Installation
- ▶ Shoreline stabilization and erosion control projects are permitted with prior permission



SHORELINE POLICY REMINDER

To protect the water supply, Fairfax Water has an easement on a portion of your property. The Occoquan Shoreline Easement Policy protects this land.

If you are thinking of making changes to your shoreline property, permission from Fairfax Water is required before starting any work within Fairfax Water's easement.

Applications are available at FairfaxWater.org/Shoreline-Easement-Policy

SHORELINE GRANTS

Grants are available to support shoreline stabilization and plantings. The deadline is May 5, 2023. For an application visit FairfaxWater.org/Grants

Activities permitted and not permitted in Fairfax Water's Easement include, but are not limited to, the following:



PERMITTED*
*Only if approved by Fairfax Water


- Installing a dock/float (total facility 250 square feet or less)
- Maintaining existing permitted structures
- Establishing stairs and a pathway
- Removing dead or dying vegetation

*Specific requirements relating to permitted activities are set forth in the Shoreline Easement Policy. Consult Fairfax Water before conducting any of the above activities.

NOT PERMITTED



- New development
- Additions to existing structures
- Parking lots
- Concrete pads
- Secondary structures such as sheds, gazebos, and any kind of closed storage
- Sea walls/retaining walls
- Permanent fire pits
- Clear-cutting trees
- Filling and grading
- Establishing grass lawns

Swimming is prohibited in the drinking water reservoir 

For more information contact Fairfax Water at 703-289-6060 or email ShorelinePolicy@FairfaxWater.org

Occoquan Reservoir Shoreline Stabilization



SOURCE PROTECTION STRATEGIES IN THE OCCOQUAN WATER SUPPLY STAKEHOLDER OUTREACH GRANT PROGRAM

For the past 20+ years, Fairfax Water has offered watershed and water-supply education grants to support community efforts to protect our source water and supply.

Eligible projects include:

- Education Efforts
- Source-Water Protection Projects
- Water Quality Monitoring Projects
- Occoquan Reservoir Shoreline Stabilization
- www.fairfaxwater.org/grants



WATER SUPPLY STAKEHOLDER OUTREACH PROGRAM GRANTS

Source Protection Projects

Raingarden Installation at Rachel Carson Middle School



Friends of the Occoquan Reservoir Litter Cleanups



WATER SUPPLY STAKEHOLDER OUTREACH PROGRAM GRANTS EDUCATION PROJECTS - Watershed Models and Workshops



Belvedere Elementary School
Enviroscape Watershed Model



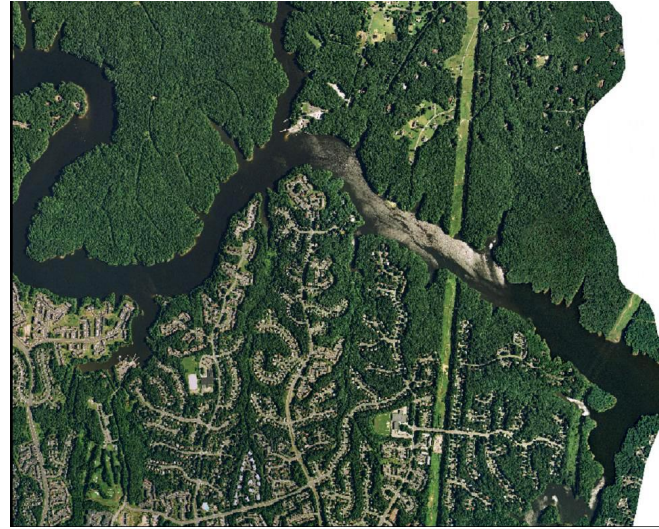
Reston Association
Stormwater and Erosion Control Workshop



WATER QUALITY & HYPOLIMNETIC OXYGENATION SYSTEM

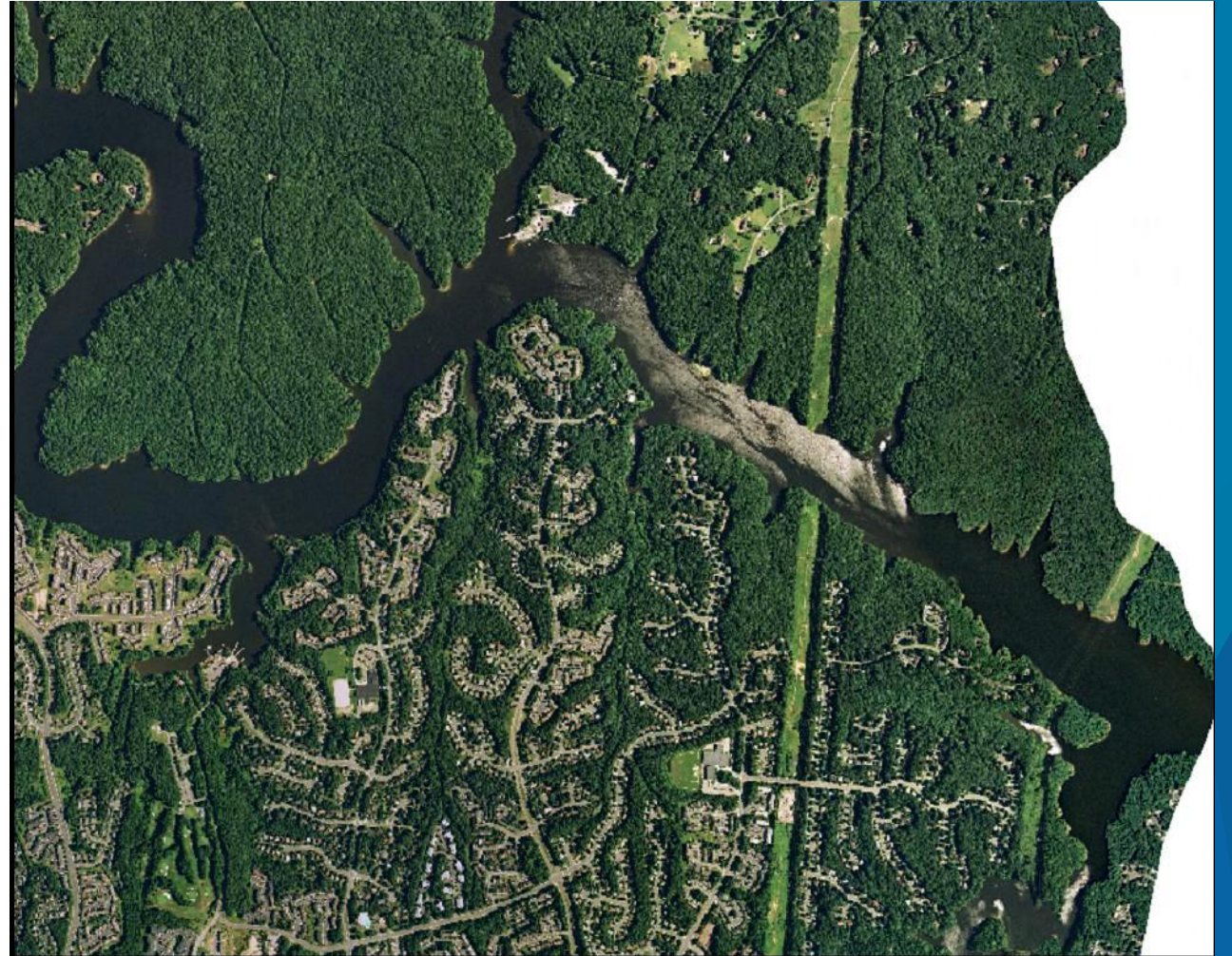
WATER QUALITY & RESERVOIR MANAGEMENT

- ▶ 3 Tier Approach
 - ▶ Source Control
 - ▶ Delivery Control
 - ▶ In-Lake Restoration



WATER QUALITY & RESERVOIR MANAGEMENT

- ▶ Source Control
 - ▶ Minimize impervious cover and pollutants entering reservoir



WATER QUALITY & RESERVOIR MANAGEMENT

- ▶ Source Control
 - ▶ Minimize impervious cover and pollutants entering reservoir
- ▶ Delivery Control
 - ▶ Capture and treat stormwater runoff to decrease the amount of pollutants entering reservoir



WATER QUALITY & RESERVOIR MANAGEMENT

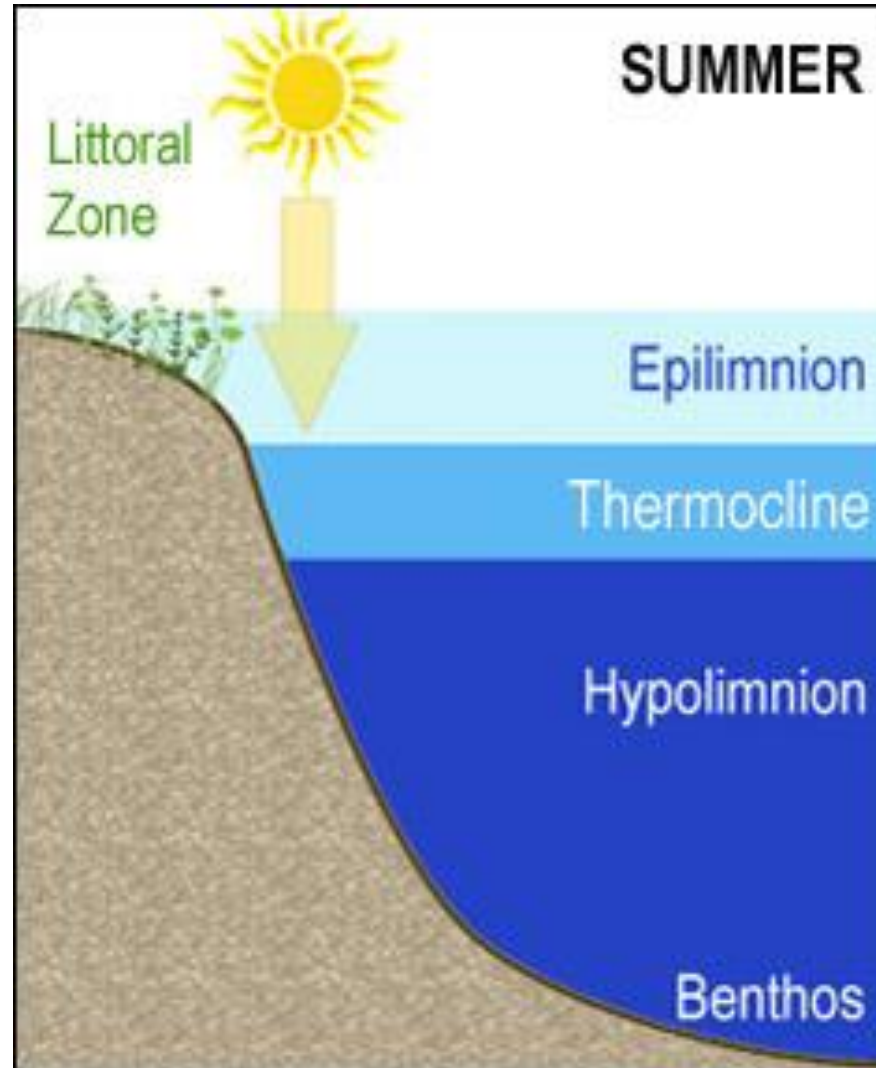
- ▶ Source Control
 - ▶ Minimize impervious cover and pollutants entering reservoir
- ▶ Delivery Control
 - ▶ Capture and treat stormwater runoff to decrease the amount of pollutants entering reservoir
- ▶ In-Lake Restoration
 - ▶ Managing pollutants once they are in the reservoir
 - ▶ Hypolimnetic Oxygenation System



Last Resort & Most Expensive \$\$\$

RESERVOIR MANAGEMENT

- ▶ During the warmer, summer months, the Occoquan Reservoir stratifies creating a density barrier, as colder, denser waters plunge to the bottom, while warmer surface waters rise to the top of the water column.

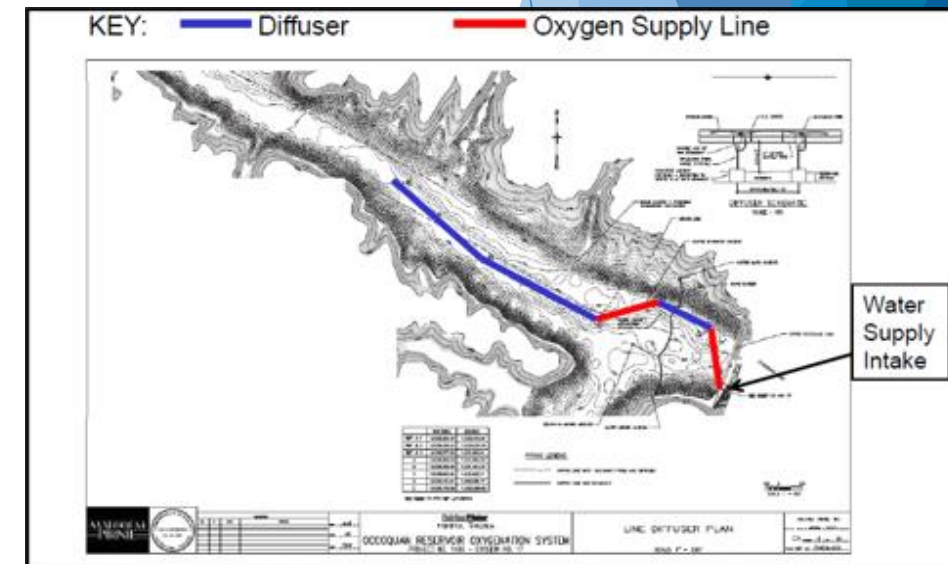


RESERVOIR MANAGEMENT

To improve Occoquan Reservoir water quality near the water supply intake, in 2012, Fairfax Water installed a Hypolimnetic Oxygenation System to replace an Destratification aeration system (first installed in 1970).

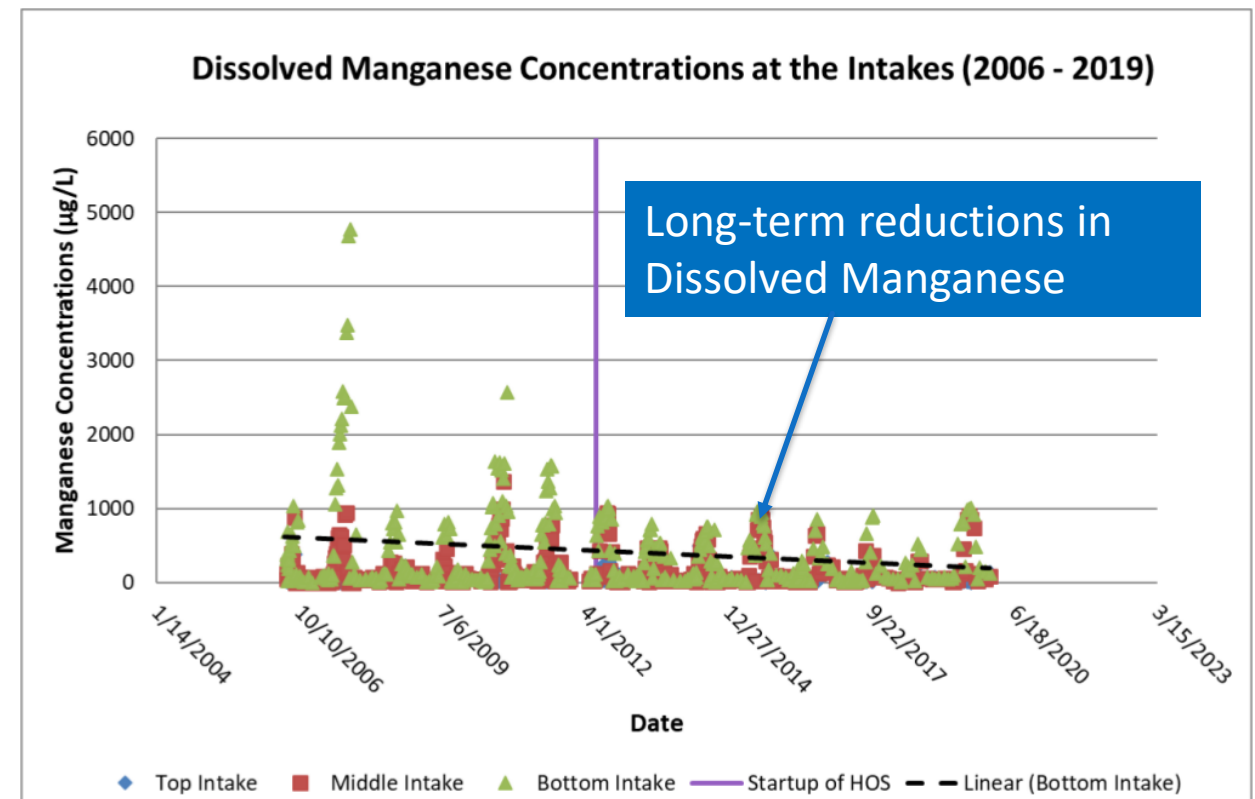
Goal: Aerate deeper waters only

- Pure oxygen
- Diffuser: Single line (2,500 ft), suspended off reservoir bottom



HYPOLIMNETIC OXYGENATION SYSTEM RESULTS

- Improved Reservoir water quality near the Dam and the water supply intake
 - Can keep bottom DO above 1-2 mg/L (controls sediment releases of **Manganese**)
 - Can reduce bottom sediment releases of Phosphorus (controls algae blooms)





More Information



FW's Source
Water Webpage

