

Water Quality Monitoring: Changes with Increasing Development

Prince William County, Virginia



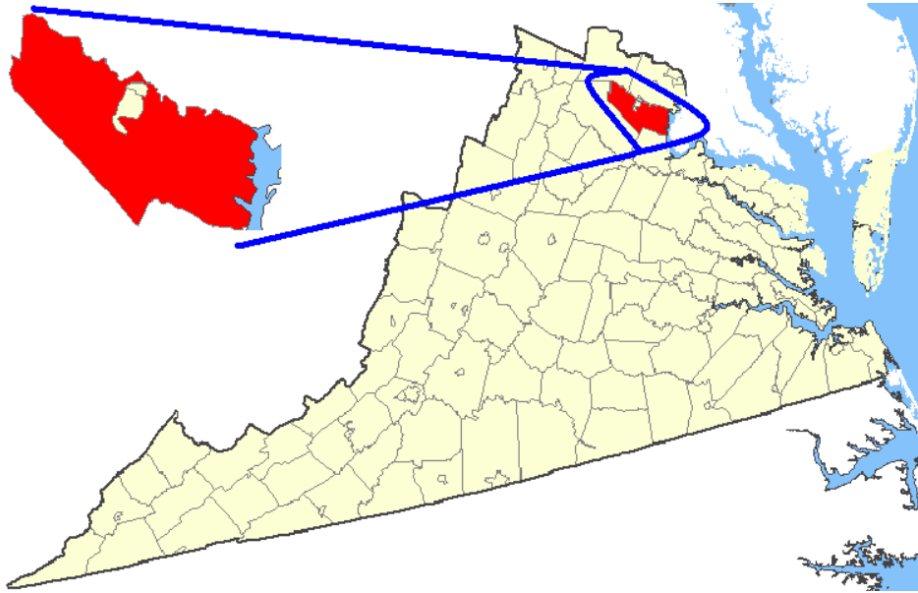
2025 Virginia Water Monitoring Conference



Veronica Tangiri
waterquality@pwsacd.org

*Water Quality Program Manager
Prince William Soil and Water Conservation District*





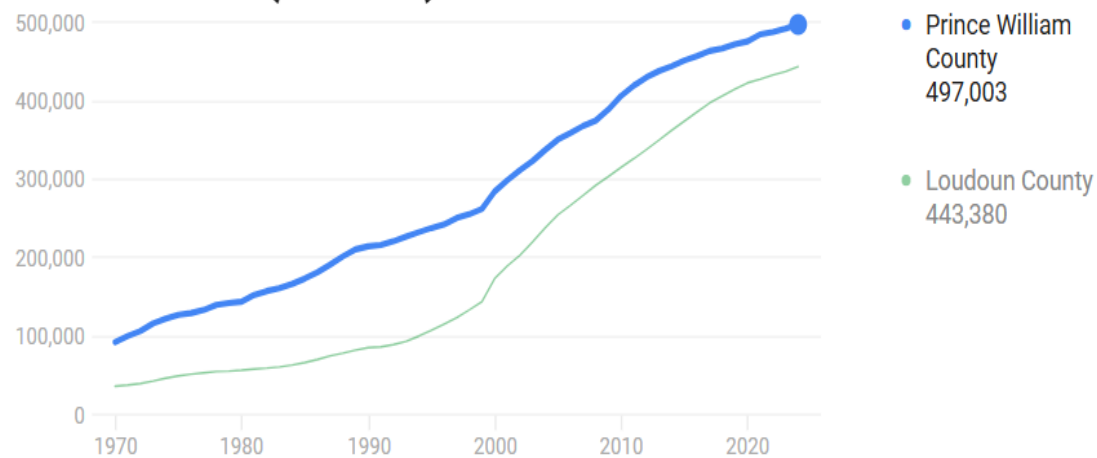
Wiki

Prince William County (PWC) is a fast-growing suburban County in the Chesapeake Bay Watershed.

It is Virginia's second-most populous County.

Prince William County / Population

497,003 (2024)



Virginia's population increase rate

Year	VA Population Increase Rate
2020 -2021	27%
2022 -2023	46%

Prince William County is anticipated to be the world's largest Data Center hub.

PrinceWilliamTimes 2024)

Water Quality Challenges

"Increased Impervious Surfaces"

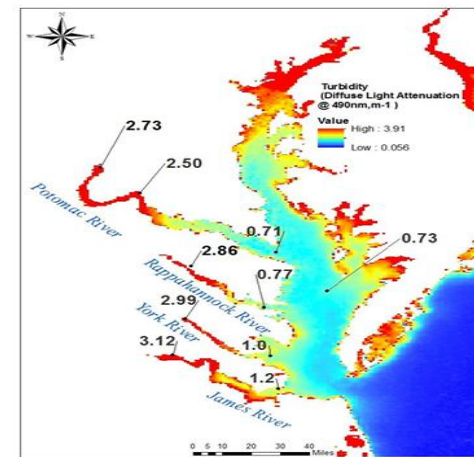


Increased stormwater flow, flooding, erosion (siltation)

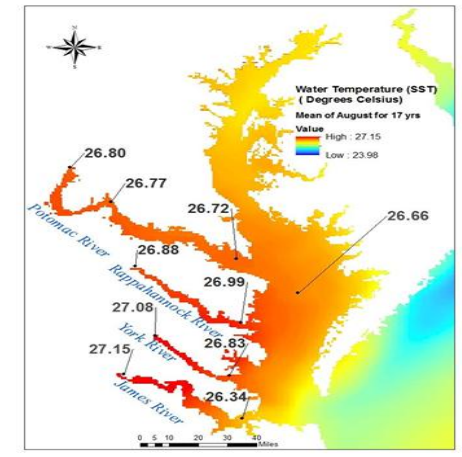
Increased water pollution (Deicing salts, HABs, debris, etc.)

Loss of trees/forestland (clean water sponges)

Landscaping (green lawns, fertilizers, etc.)



Turbidity: August Mean (K490) for 7 yrs. (2011-2018)



Water Temperature (Celsius) Mean of August (2001-2018)

Veronica Tangiri (2019) NOAA Project

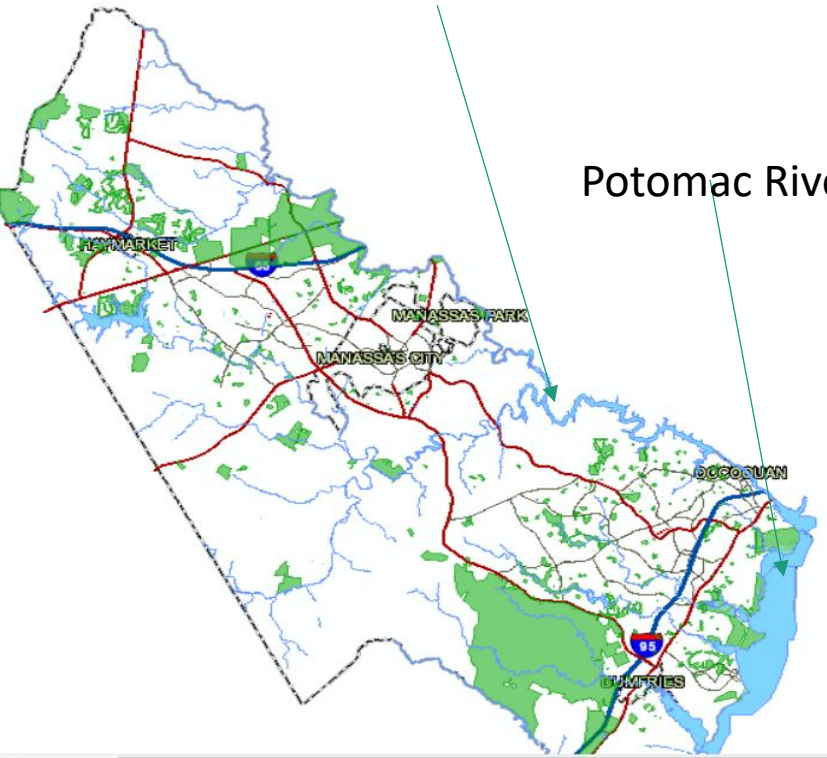
Our Major Drinking Water Sources

Primary drinking water sources for most parts of Prince William & Fairfax Counties

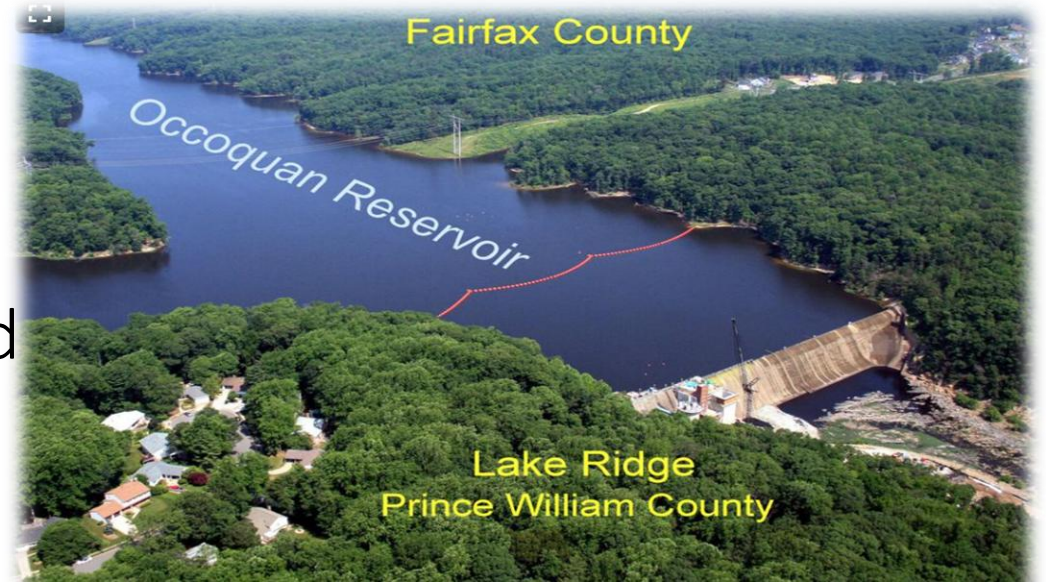
PWC has over 1,100 miles of streams.

Occoquan River Reservoir

Potomac River



Riparian areas need to be protected



The Water Quality Program

Promotes:

- Water quality awareness and citizen science data
- Natural Resource Conservation
- The County's Green Community Goals





Water Quality Program: Promotes Water Quality Awareness and Fosters Green Community Goals in Prince William County

Prince William Soil and Water Conservation District (PWSWCD)

4 Water Quality Programs

Promote

- Environmental education/STEM
- Community Science
- Community Engagement/Stewardship
- Collects data to promote research



1. Floatable Monitoring (FM) program

Data strictly for
County's assessment
& reports
(MS4 permit etc)

Water Quality Monitoring

2. Biological Monitoring

Benthic Macroinvertebrate
monitoring
(Across PWC)

4. Adopt-A-Stream/ Pond/ Lake/River (Program

3. Chemical Monitoring

Temperature, pH, Conductivity, Turbidity



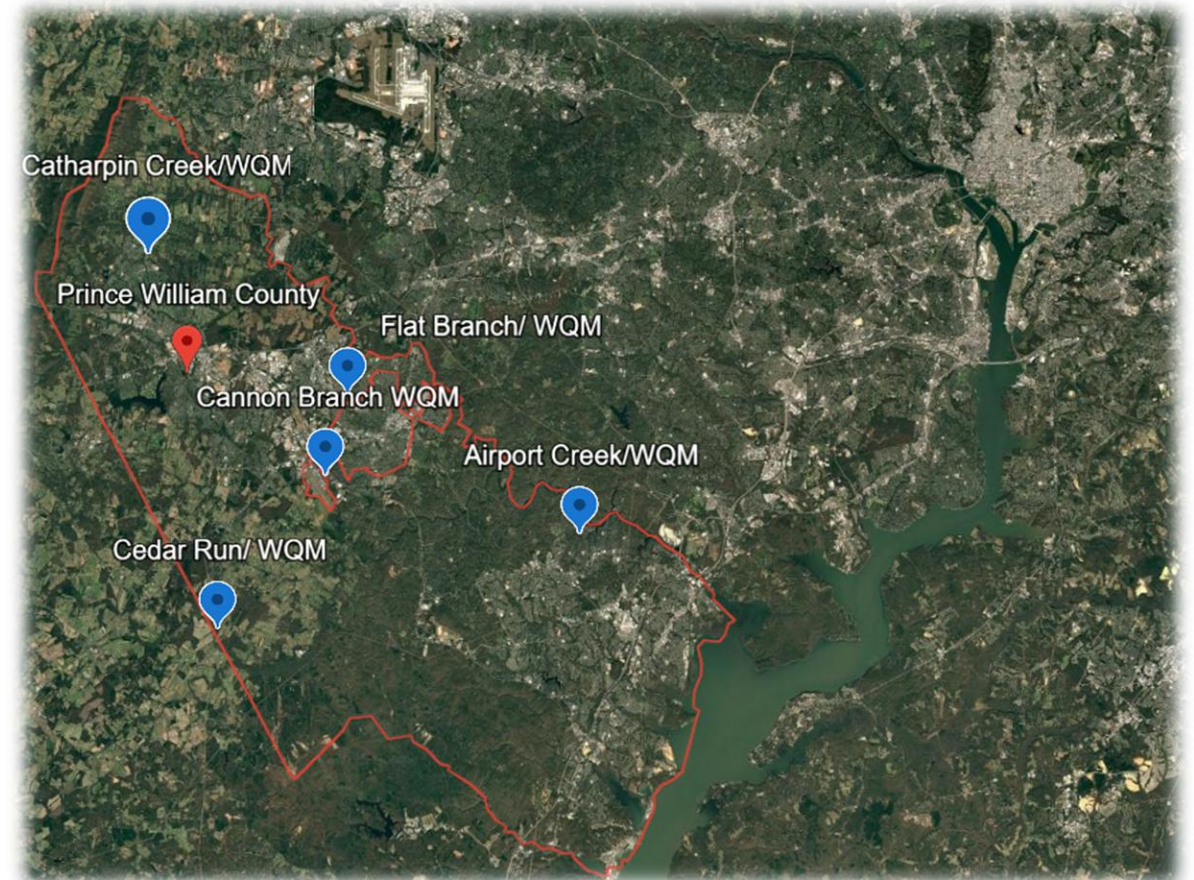
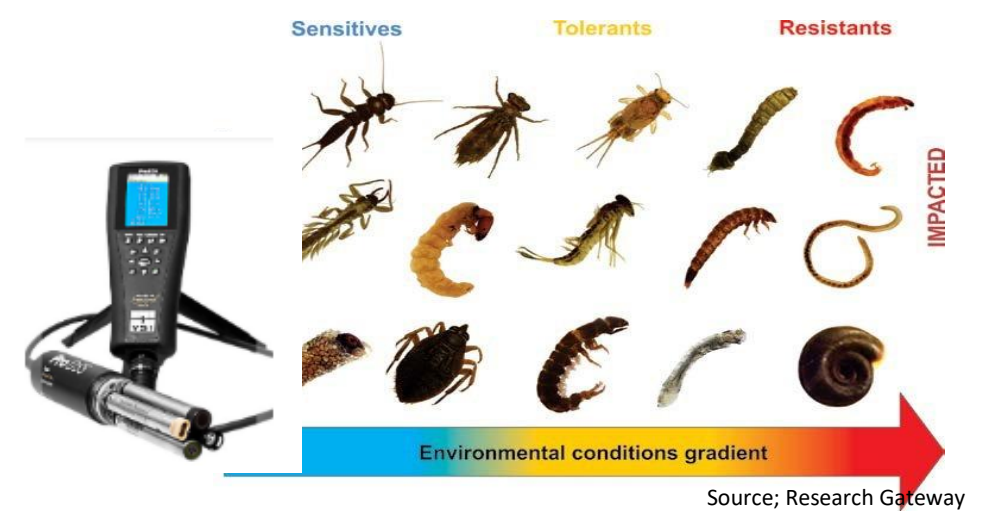
This Program was the
2022 National Earth
Team Award Winner.
An award from the
Natural Resource and
Conservation Service
(NRCS) with the USDA

In 2024, over 1,400
volunteers saved over
\$145,000 in taxpayers'
money as volunteer
time under the
Program.

(2023 Independent Sector
Volunteer Rate)

Analyzed Biological and Chemical Data from 5 Sites

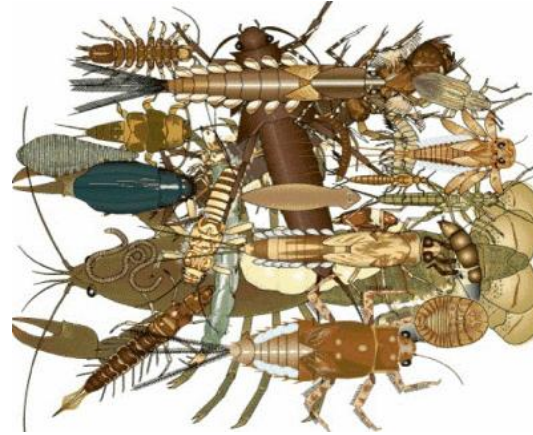
- **Airport Creek** (Developed area)
- **Cannon Branch**(Fast Developing)
- **Catharpin Creek**(Semi Developed)
- **Cedar Run** (Agricultural)
- **Flat Branch** (Highly Developed)



Analyzed Parameters

Biological

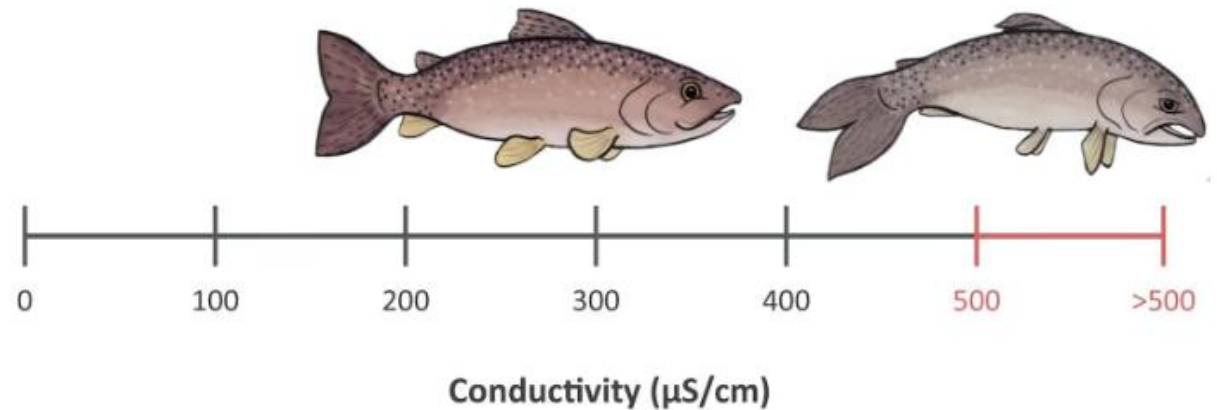
- Benthic Macroinvertebrate diversity
- Multi-Metric Index or score



9-12: Acceptable
8 : Greyscale
1-7: Unacceptable

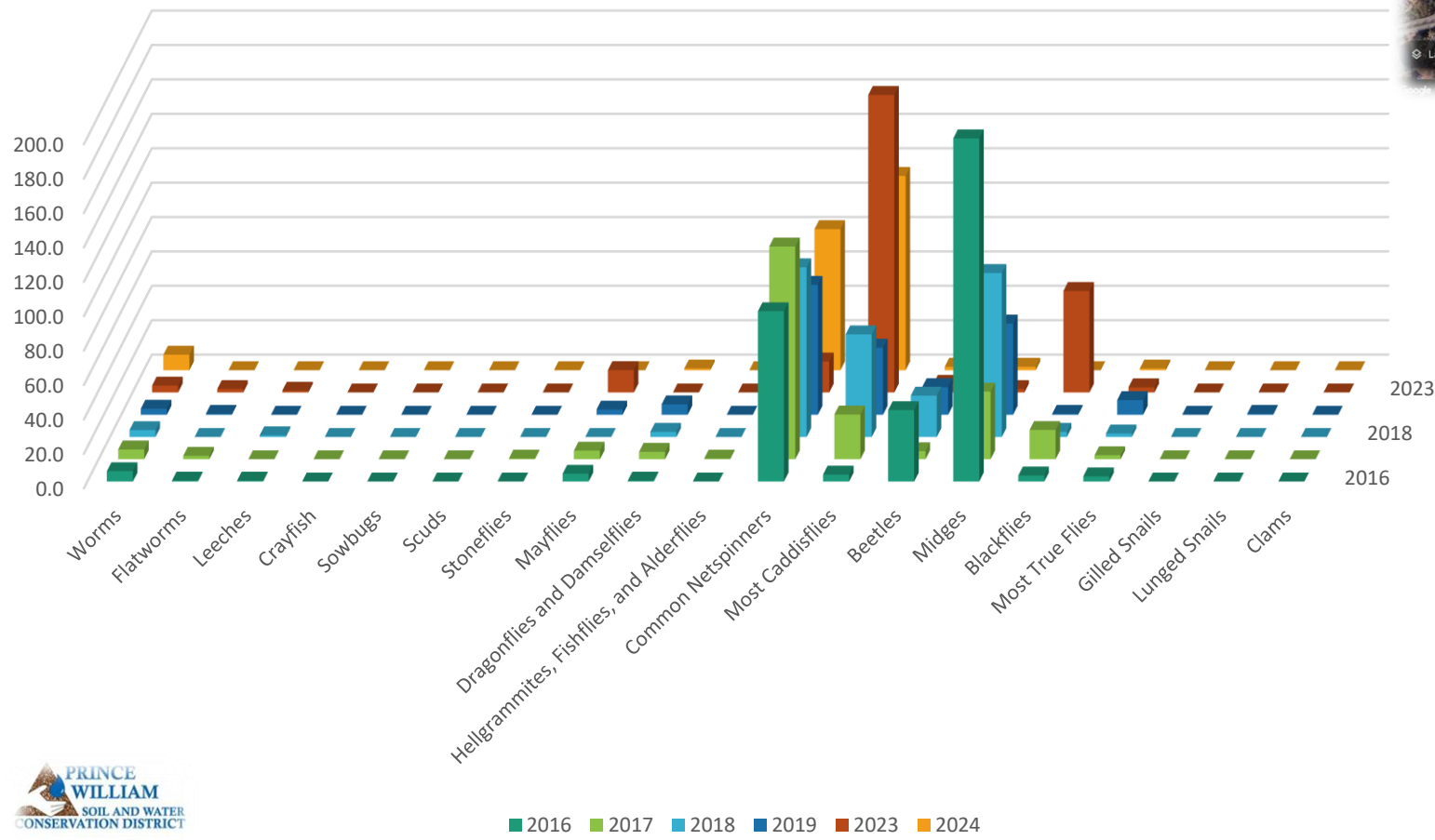
Chemical

- Conductivity ($\mu\text{S}/\text{cm}$)

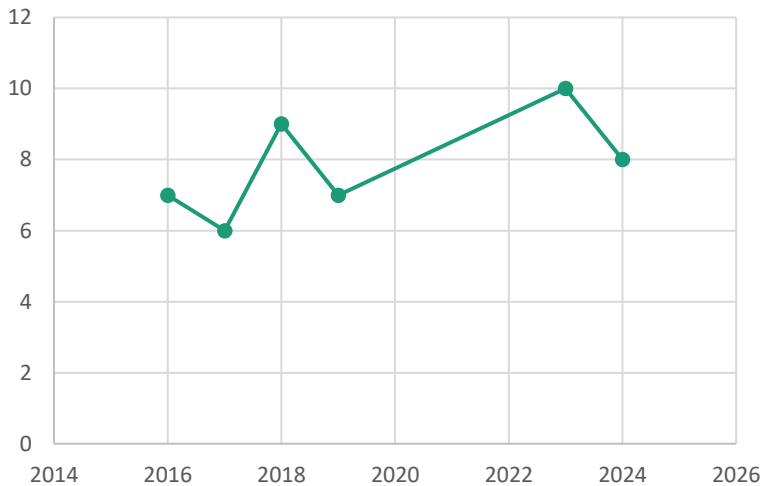


Airport Creek (Developed area)

Airport Creeks Benthic Macroinvertebrate Diversity (2016-2024)



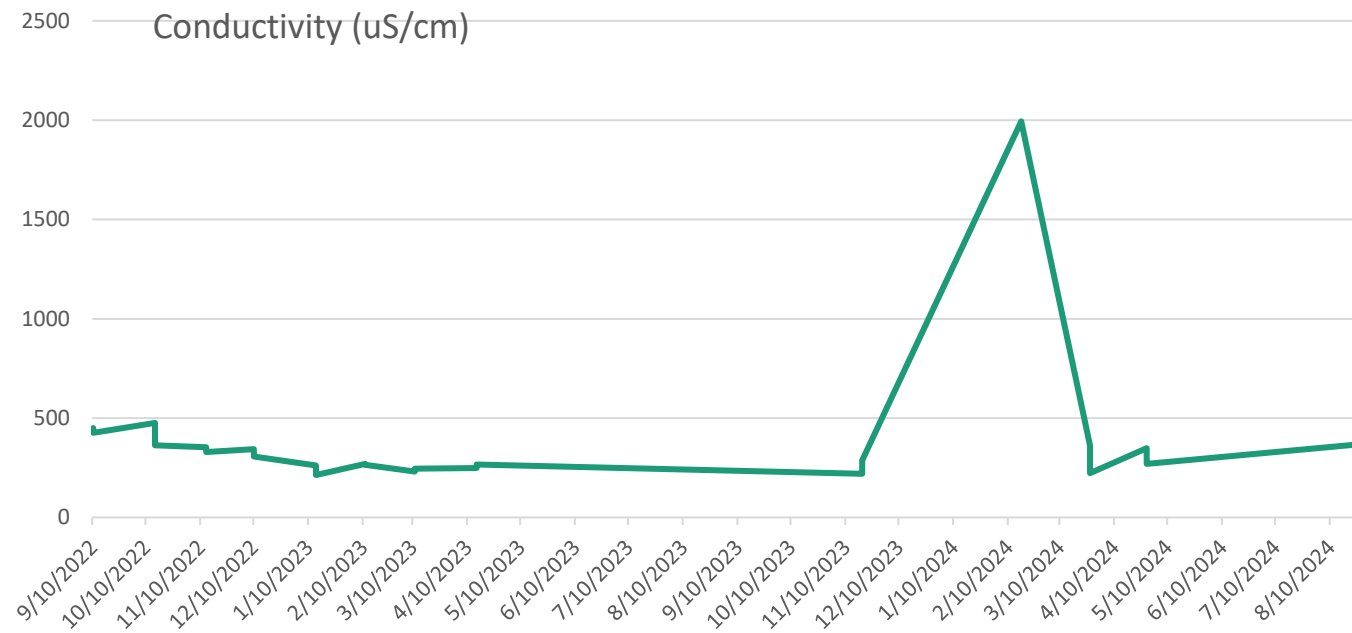
Multi Metric Score



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Chemical Data 2022-2024

Airport Creek

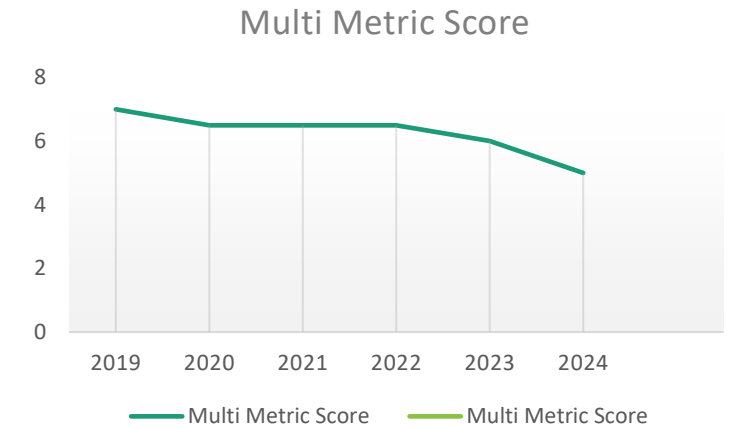
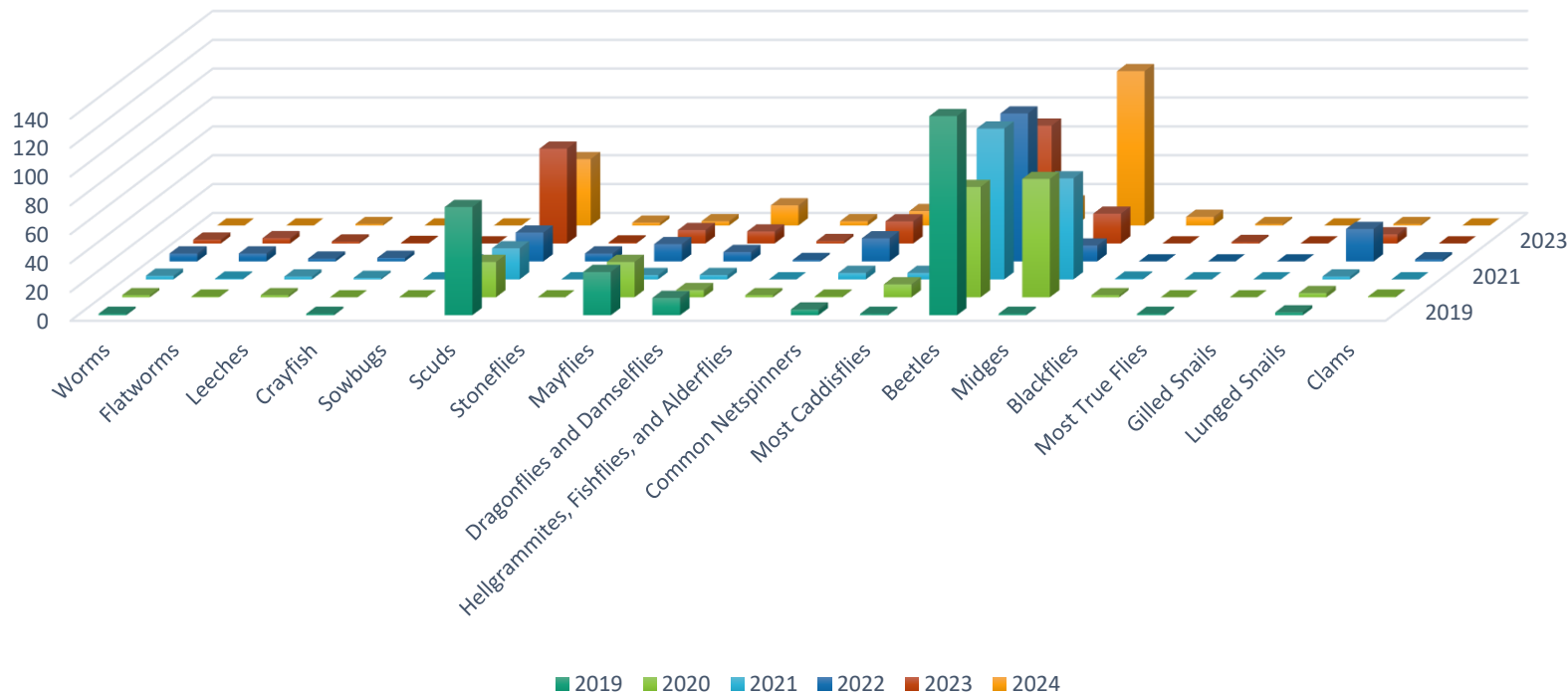


Cannon Branch 2019-2024

Near Manassas Regional Airport (Fast Developing)



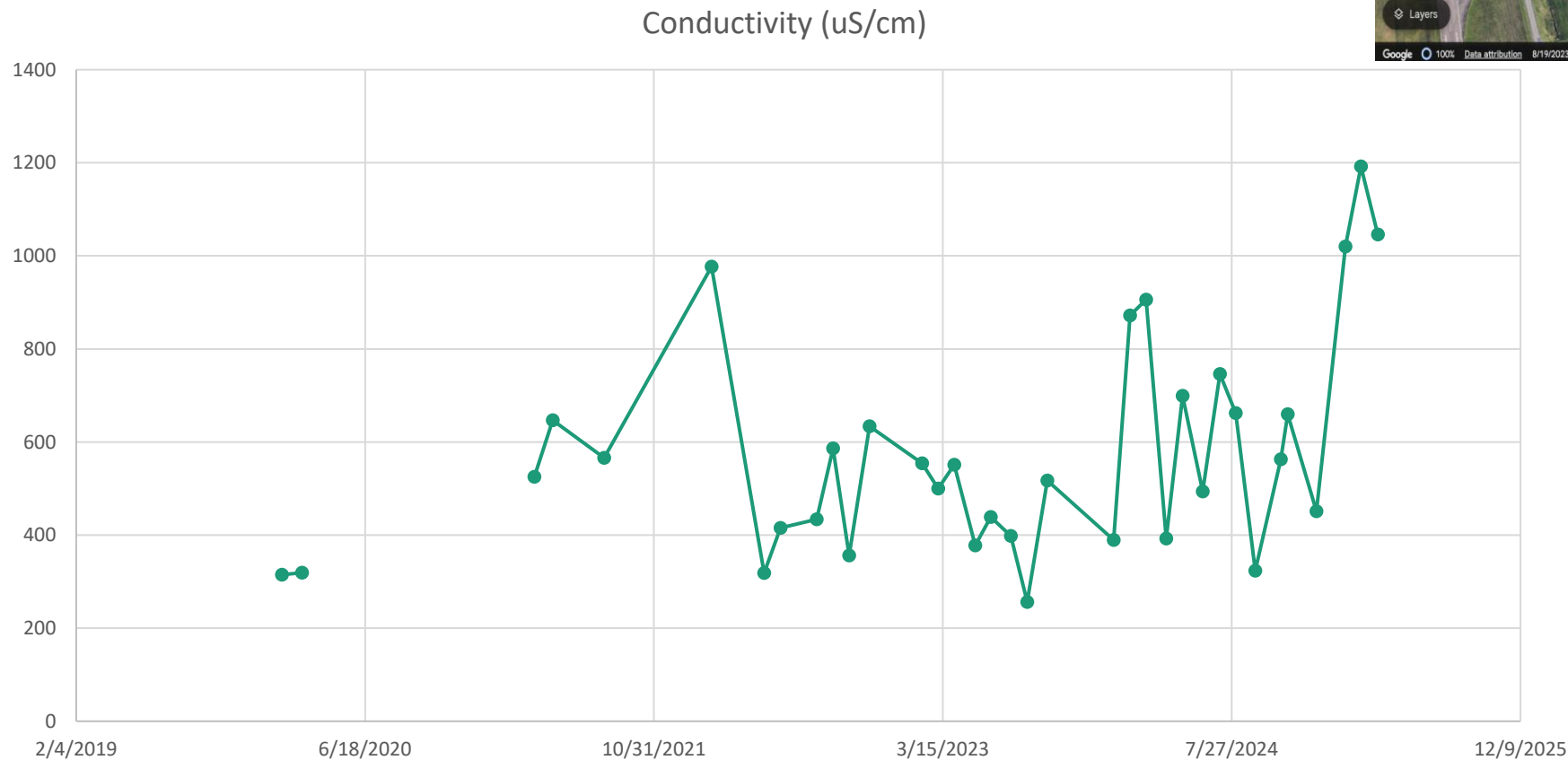
Benthic Macroinvertebrate Diversity at Cannon Branch



9-12: Acceptable
8 : Greyscale
1-7: Unacceptable

Chemical Data 2020-2025

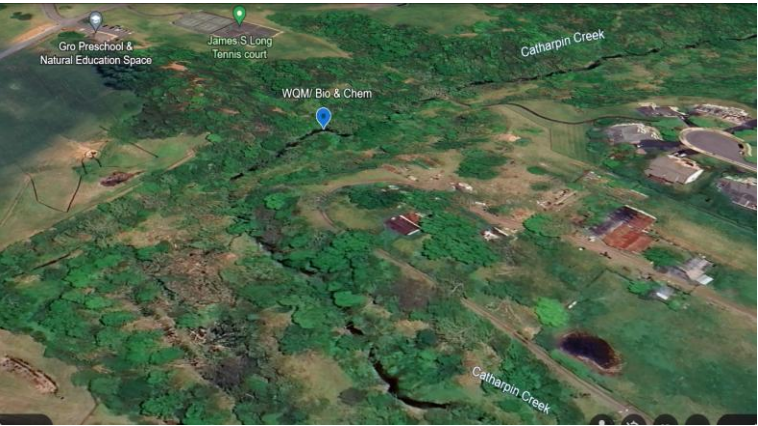
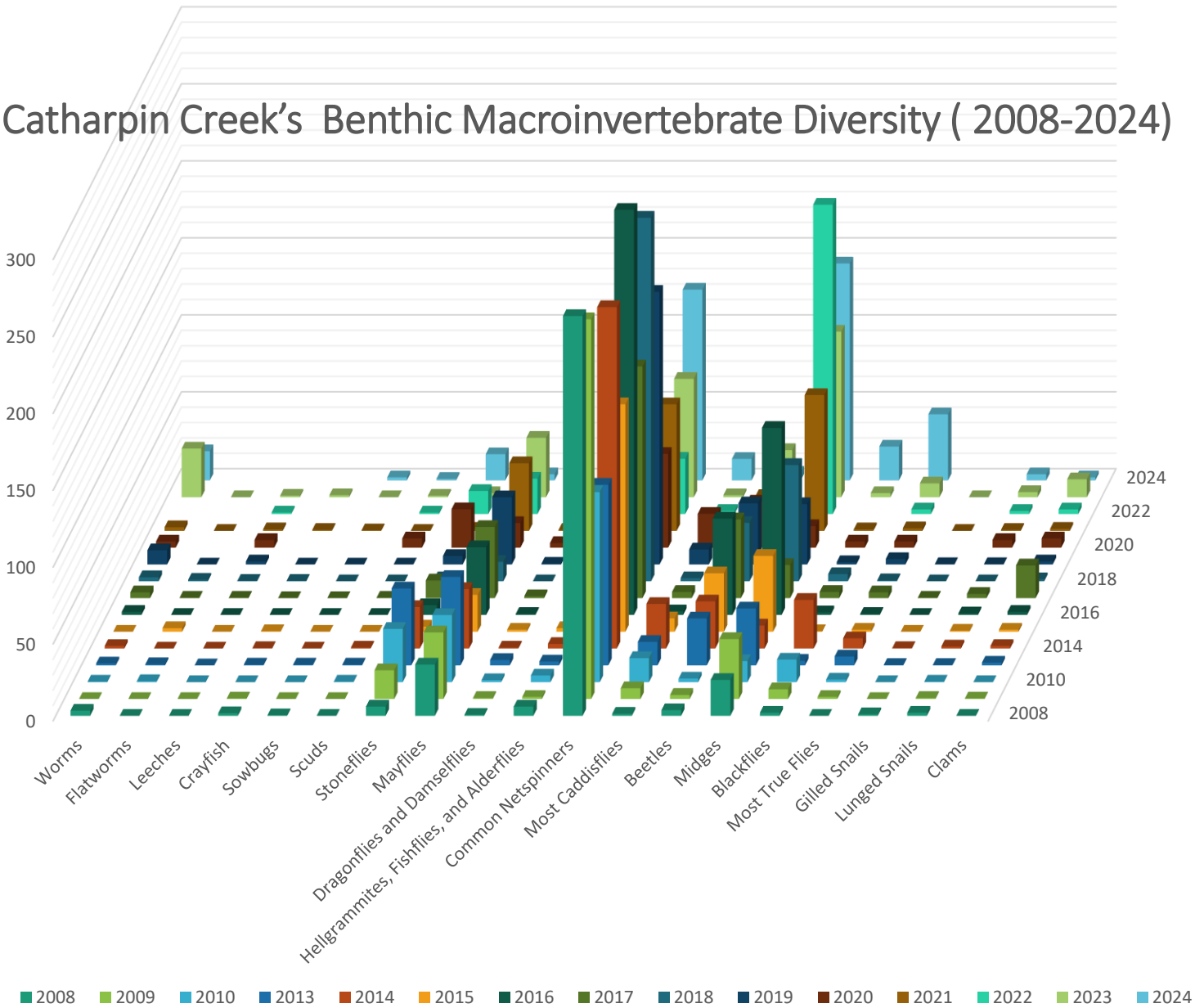
Cannon Branch



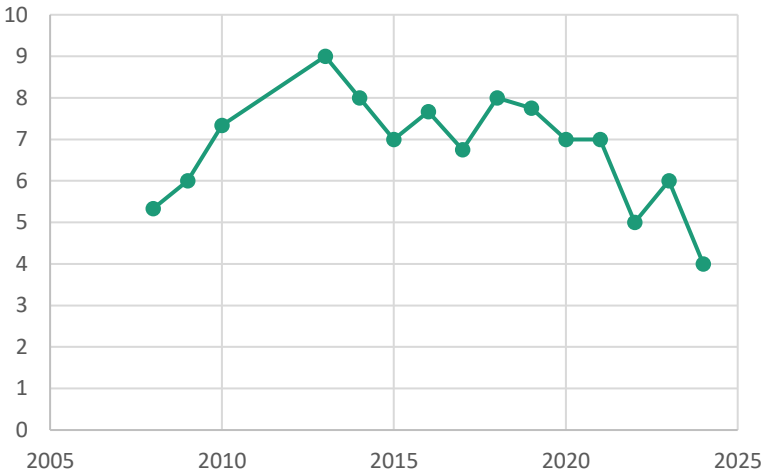
2/9/2025 = 1120 us/cm
3/8/2025 = 1192 us/cm

Catharpin Creek

Catharpin Creek’s Benthic Macroinvertebrate Diversity (2008-2024)



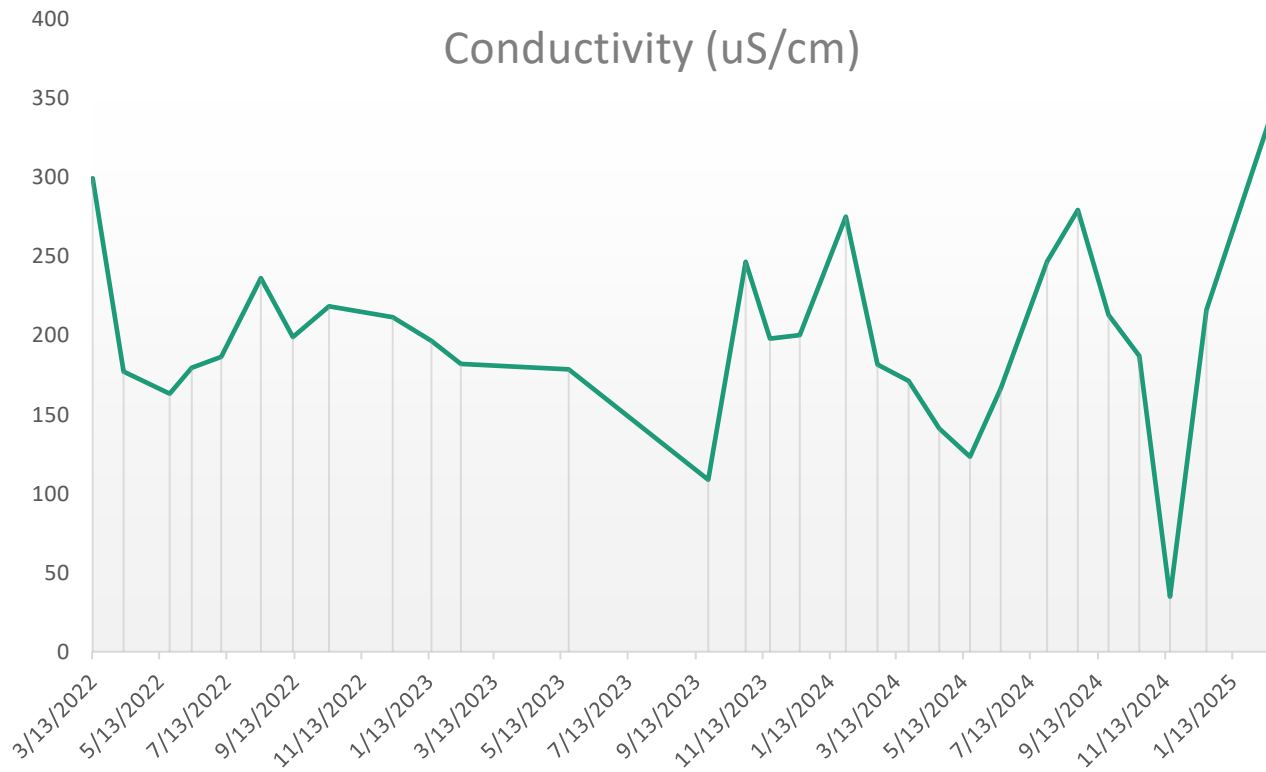
Multi Metric Score



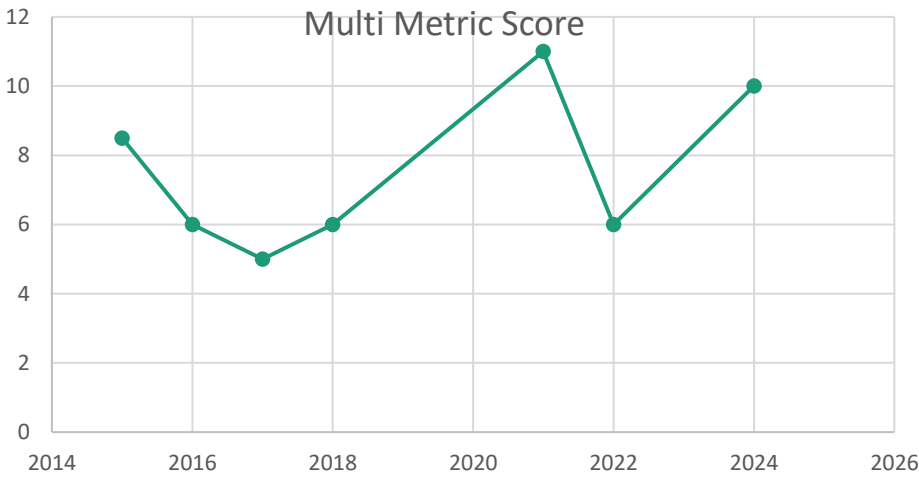
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Chemical Data 2022 – 2025

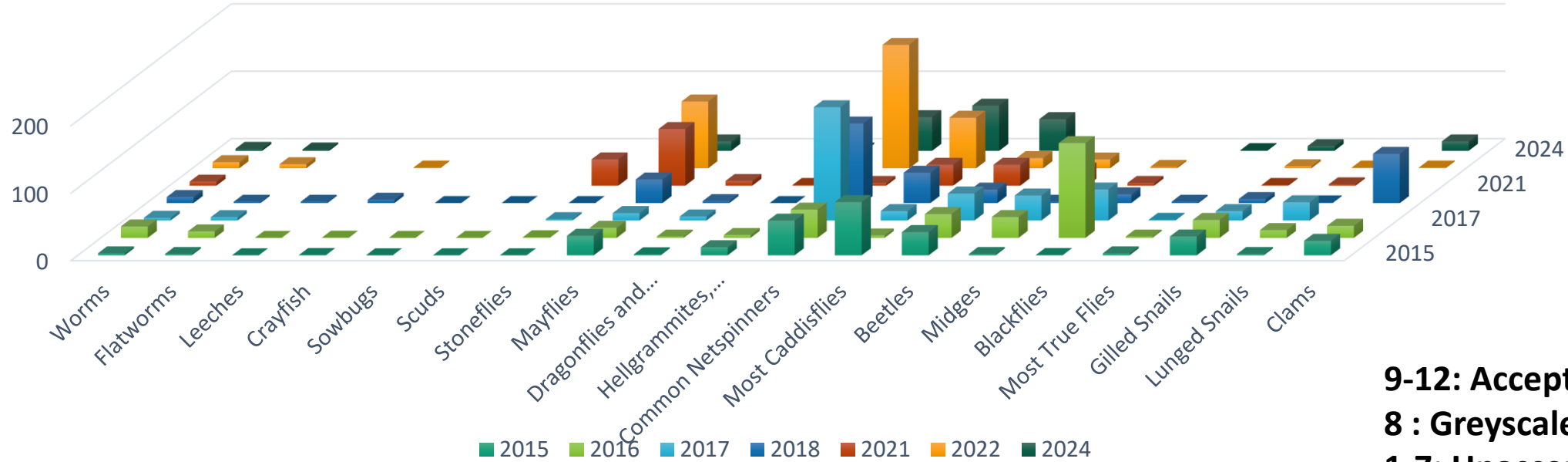
Catharpin Creek



Cedar Run 2015-2024



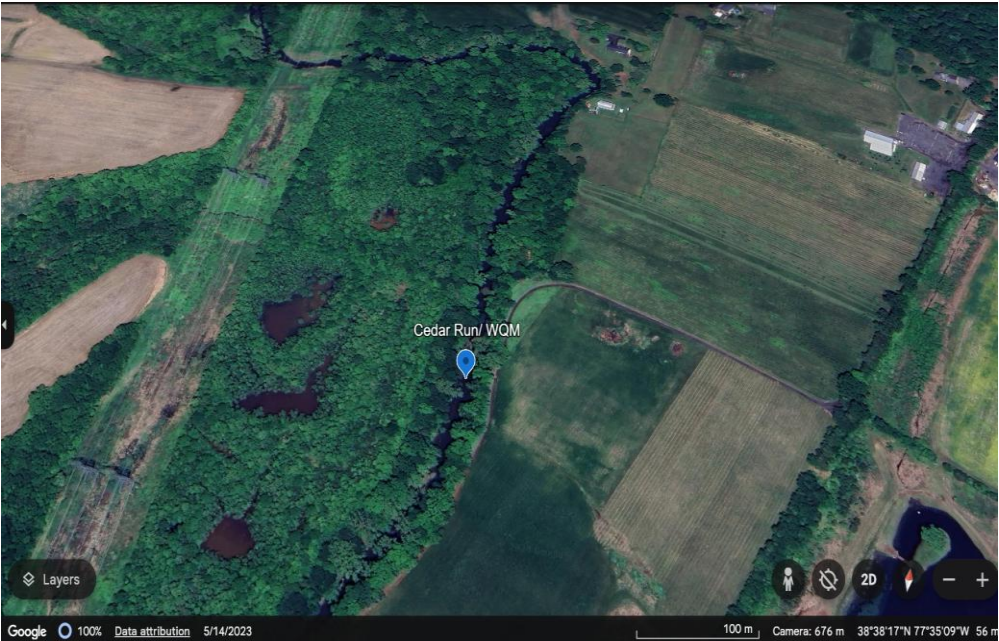
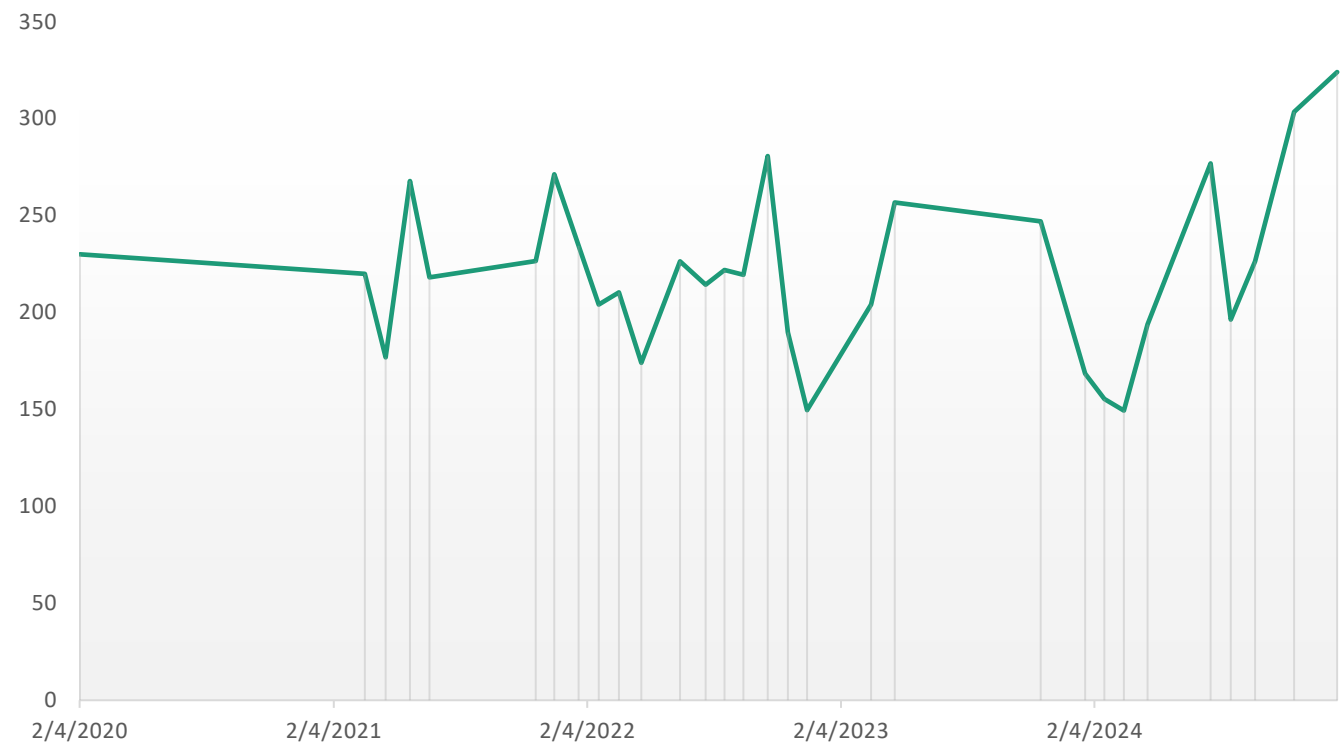
Benthic Macro invertebrate Diversity at Cedar Run (2015 -2024)



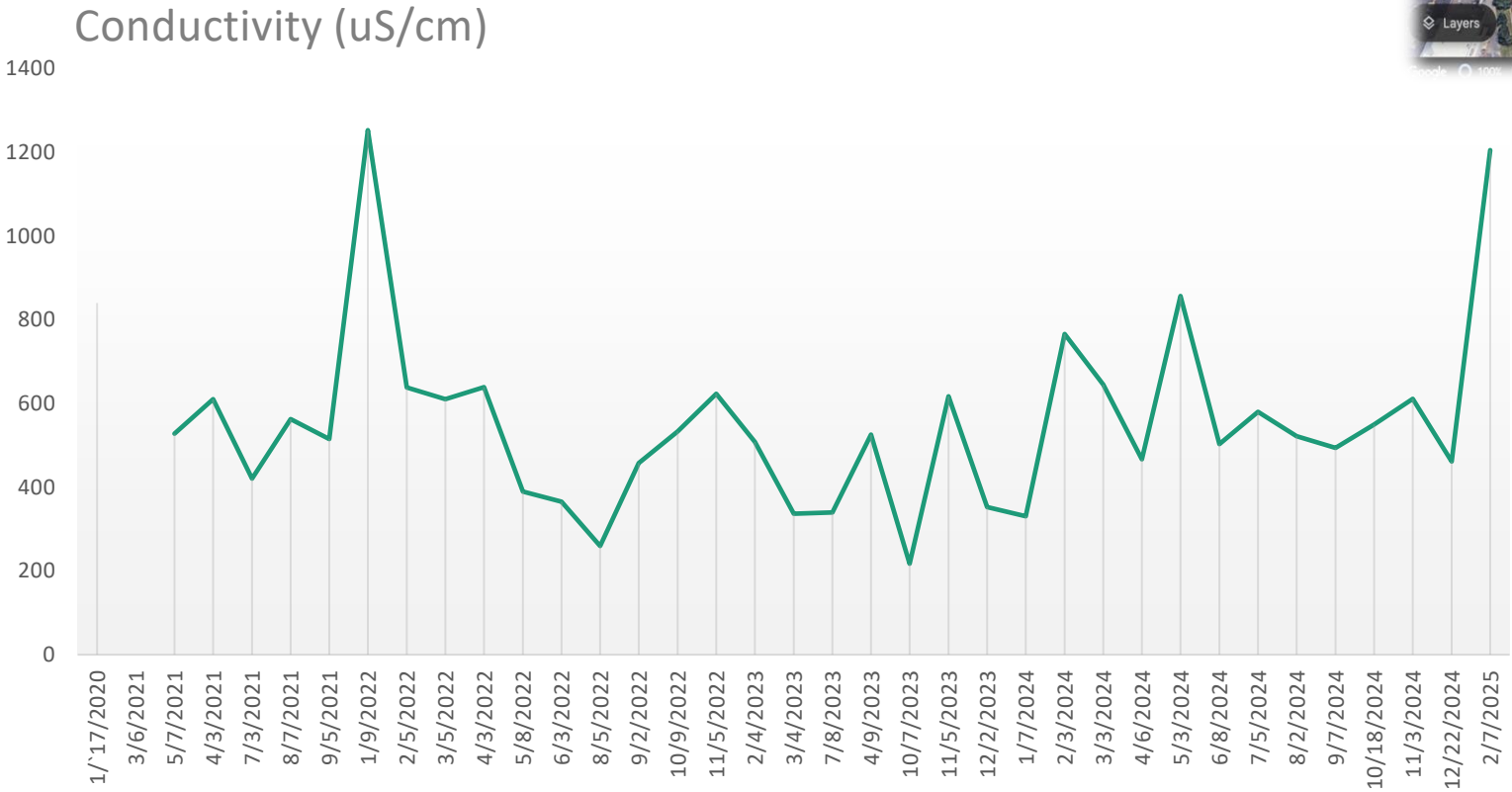
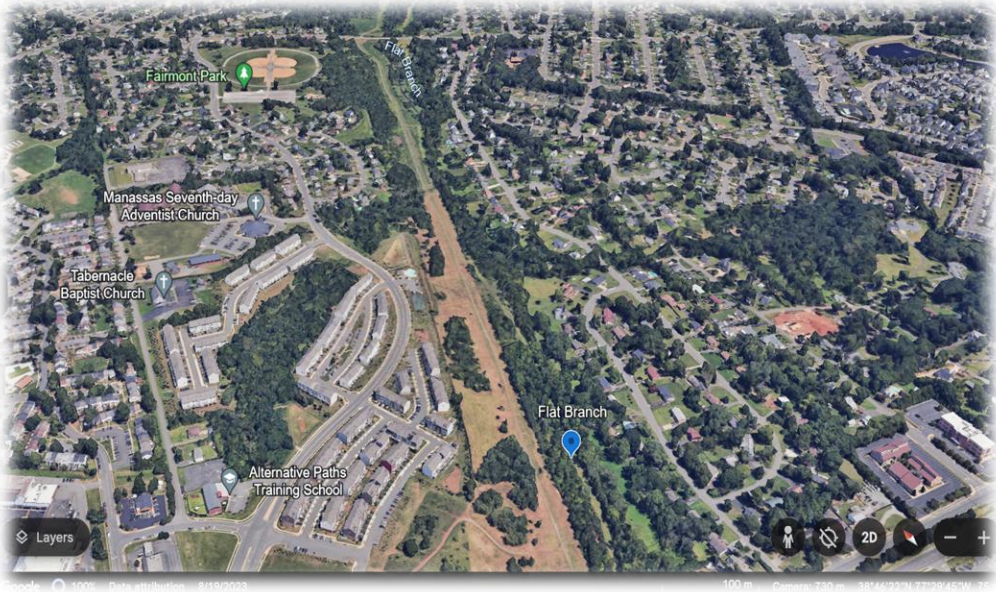
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Cedar Run 2020-2024

Conductivity (uS/cm)



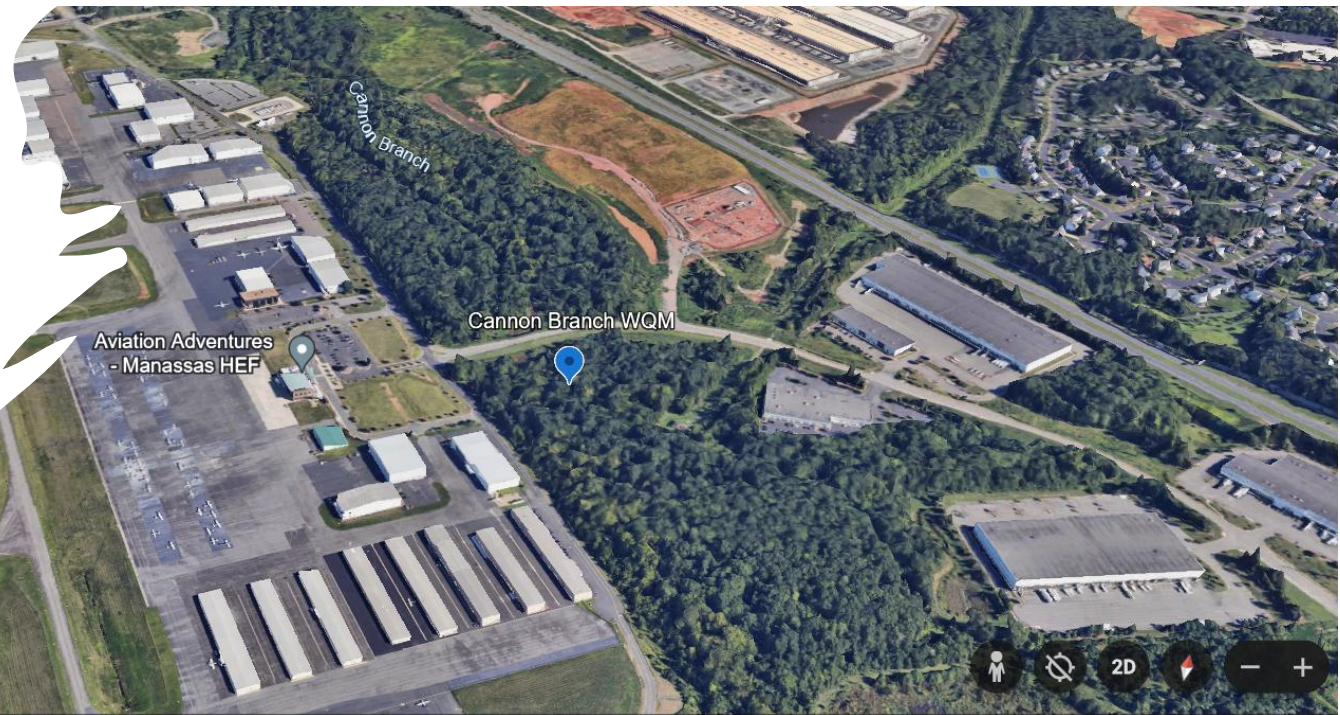
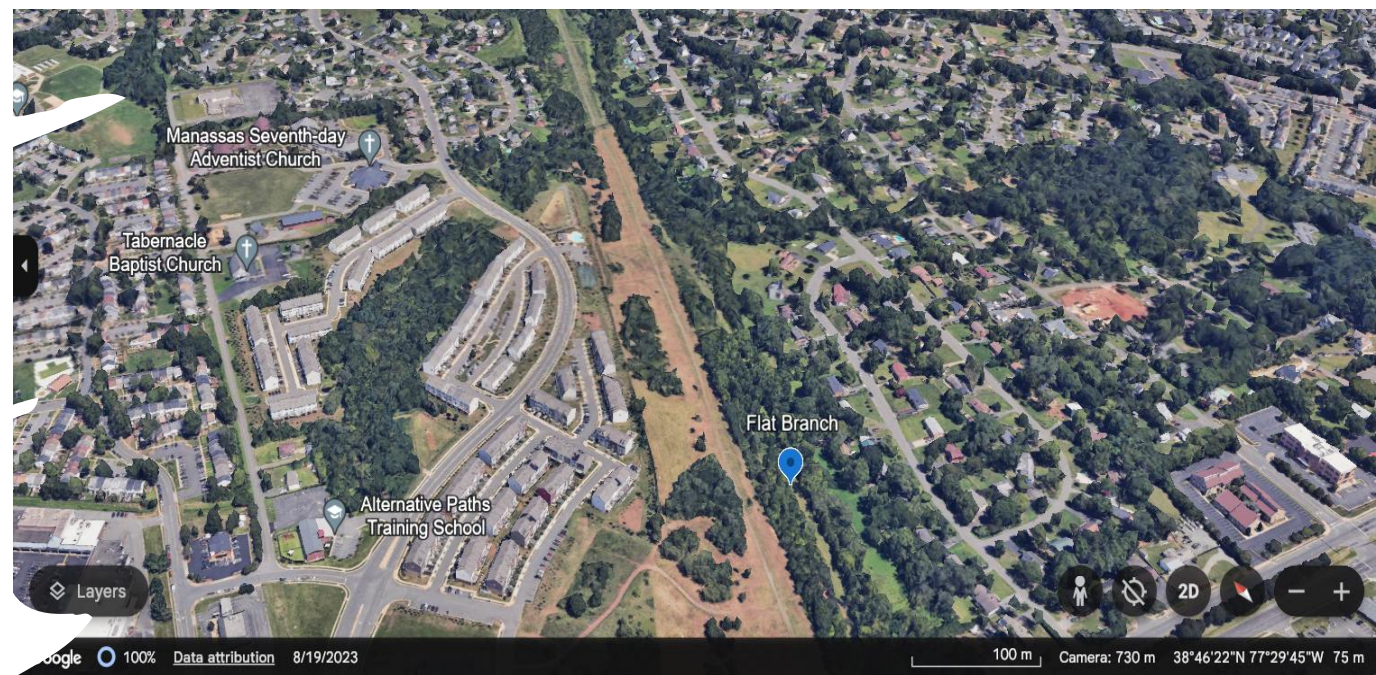
Flat Branch 2020 - 2025



Observation and Results

An increase in impervious surfaces increases water pollution and impacts the diversity of Benthic macroinvertebrates.

Road salts (Winter deicers) have a significant impact on chemical water quality data (conductivity)

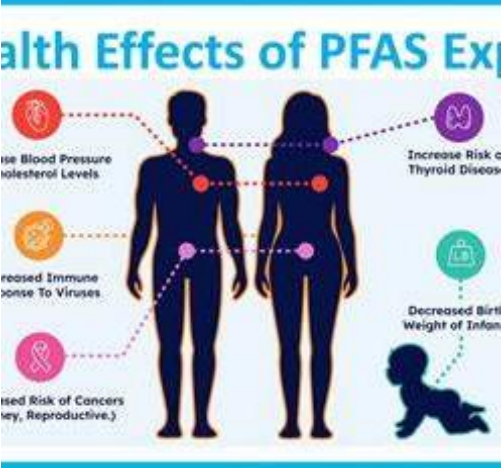




Conclusion: Benthic macroinvertebrate diversity and richness decrease with increased development

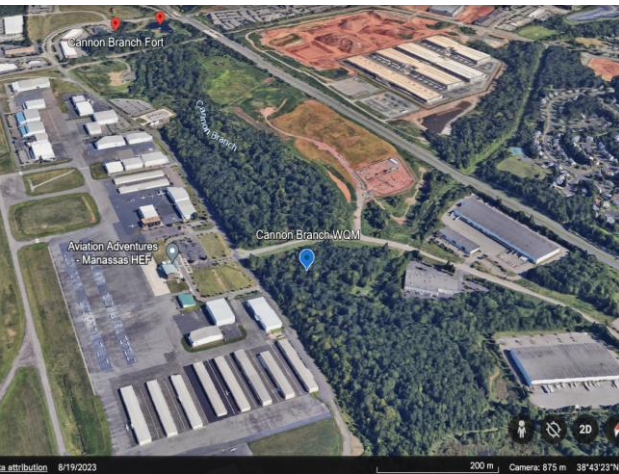


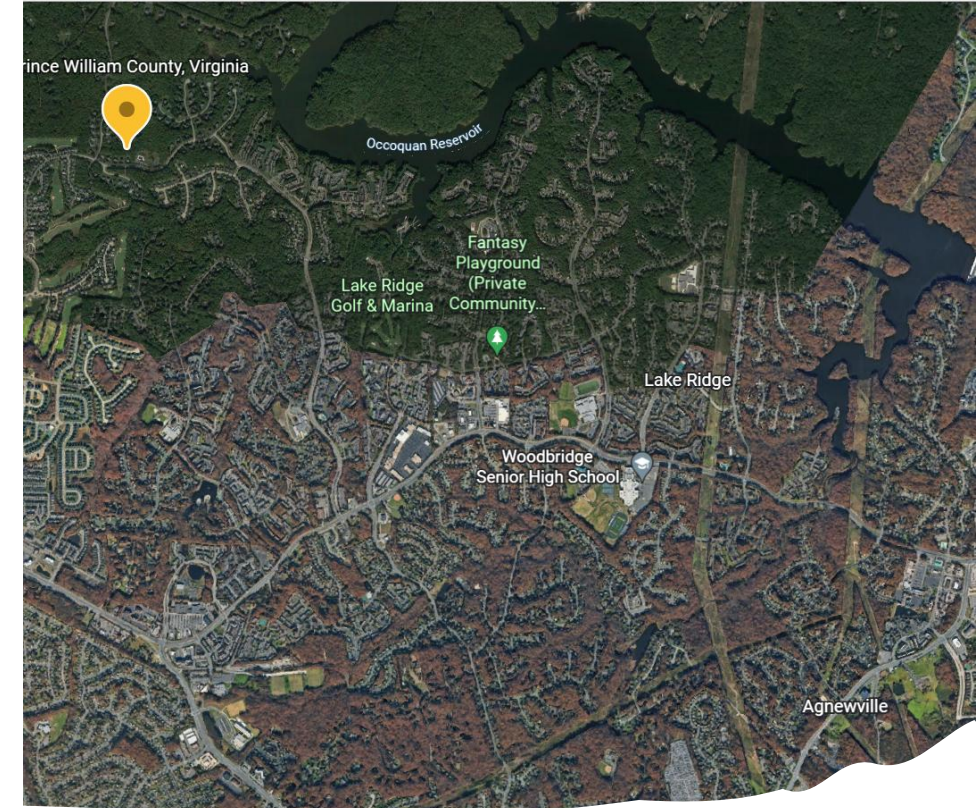
Water conductivity readings are increasing due to winter road salts).
E.g. recorded conductivity of 1120us/cm at Cannon Branch in the
Winter 2024/2025



Recommendation

- Support water quality science data
- Promote Eco-friendly urban planning/policies
- Promote advanced water quality monitoring techniques & research (modeling/forecasting)
- Support and fund community science water quality programs
- *Promote community awareness on road salting and other Man-made pollutants like PFAS (Per- and polyfluoroalkyl substances, 6PPD-Quinone)*
(Growing concerns)





Questions?

Thank you!

Thanks to Our Volunteers!



www.pwswcd.org

Veronica Tangiri
waterquality@pwswcd.org