





# Welcome

## to a Watershed Study





# Benthic TMDL Study on Deep Run, Dover Creek, & Upham Brook Watersheds in Henrico & Goochland Counties & the City of Richmond

## DEQ TMDL Community Engagement Meeting #2

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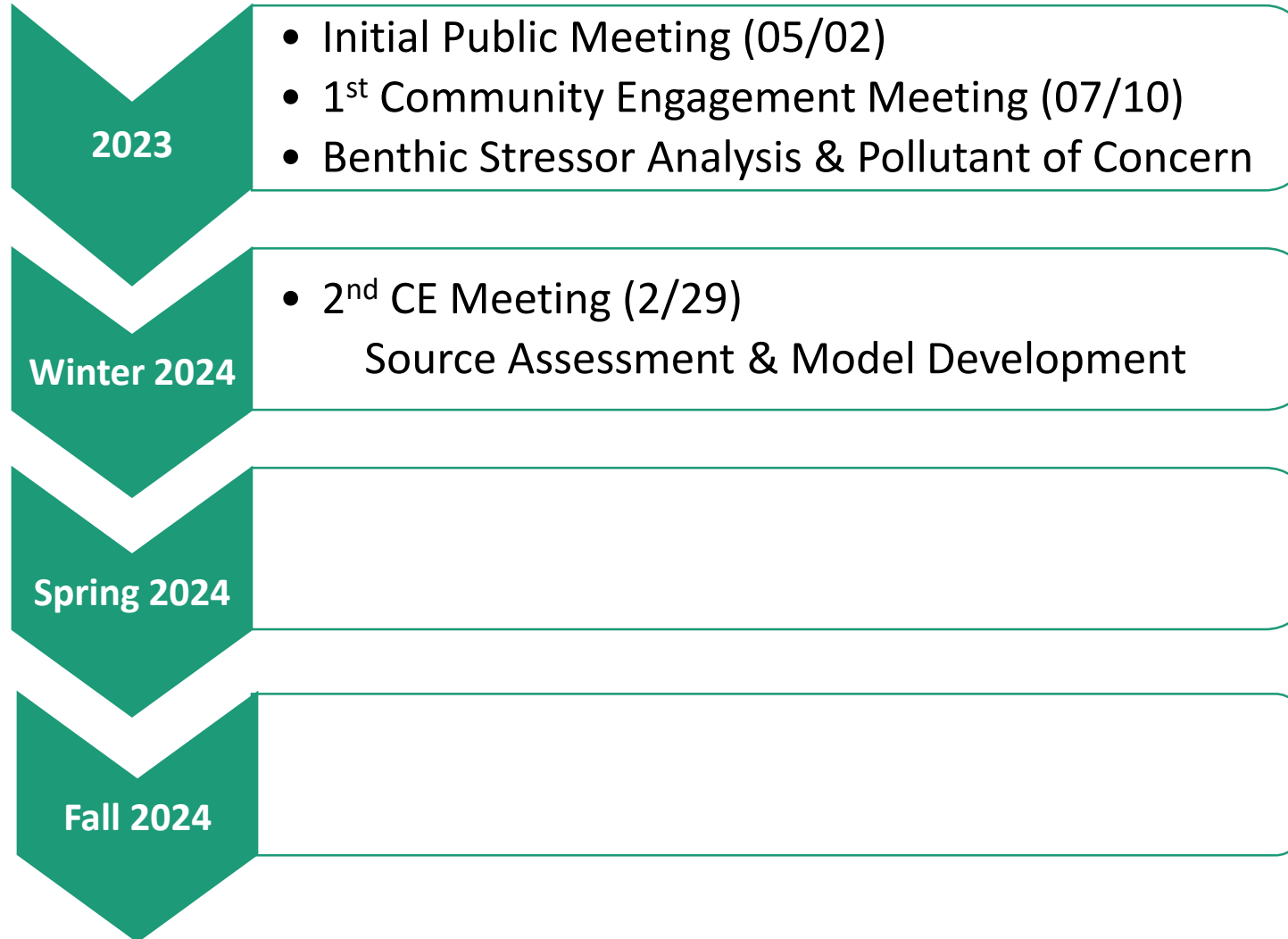
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Katie Shoemaker, Wetland Studies and Solutions, Inc.

Dr. Robert Brent, James Madison University

February 29, 2024

# Project Timeline





# Role of Community Members



## Participate in the process

### Keep the study

- Realistic
- Reasonable
- Reflective of local conditions

### Provide Information & Feedback on

- Stressors to aquatic life
- Land use
- Pollutant sources
- Community meetings & Public meetings

### Example

- ID missing pieces to the puzzle?...
- Determine outcome?...
- How to deal with the outcome?...



# Agenda

## ❖ Welcome & Introduction

- Overview: DEQ continuous planning process, watersheds of interest & stressor pollutants

## ❖ Pollutant Source Assessment

- Land cover distributions
- Tabulating permitted sources – methods used to develop allocated loads
- Tabulating count of existing BMPs by type
- Question & Answer

## ❖ Model Development

- Watershed modeling approach (overview of GWLF)
- AllForX method to set pollutant targets
- Pollutant target loads
- Question & Answer

## ❖ Conclude Meeting

- Likely timeline moving forward





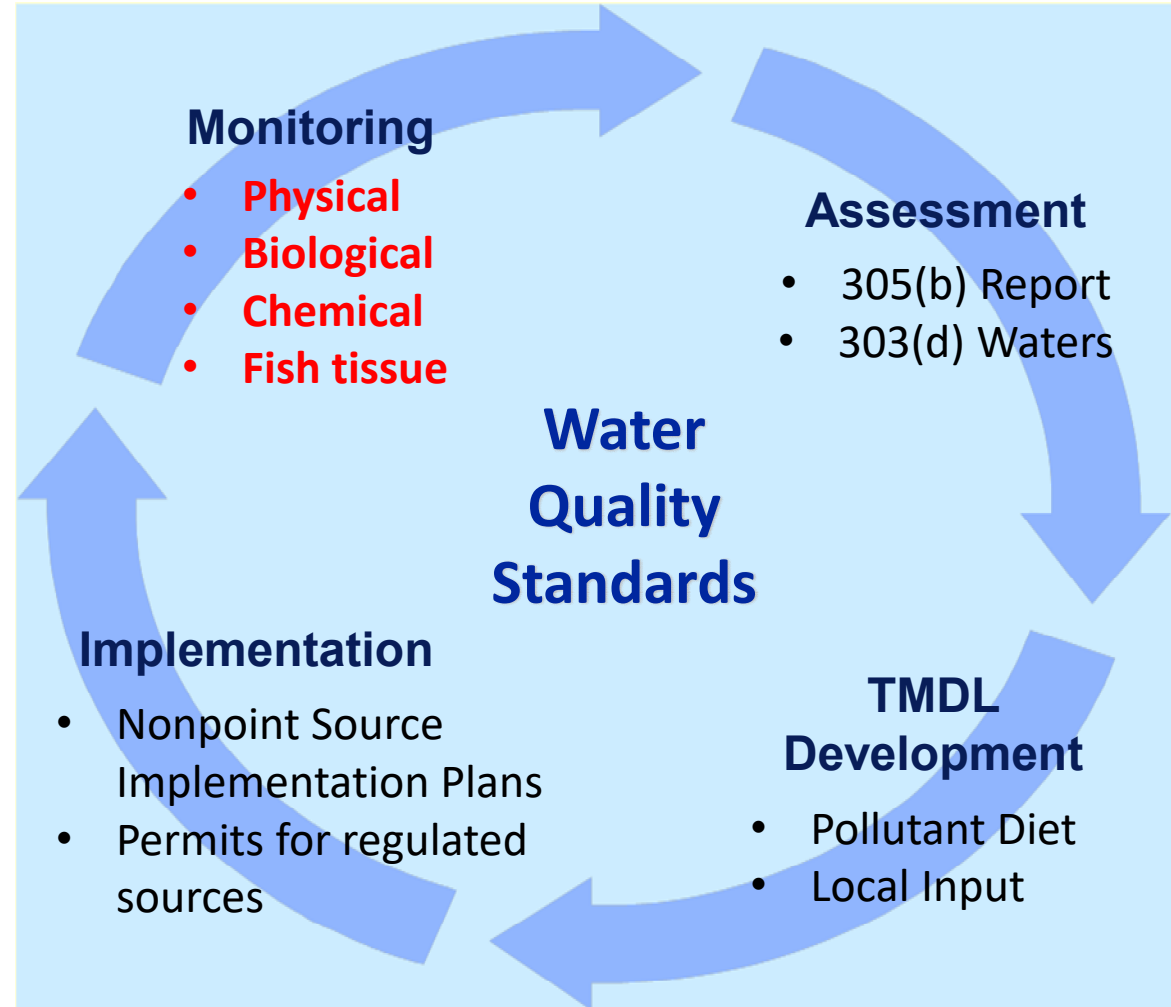
# Virginia's Water Quality Standards

Protect 6 designated uses...

- aquatic life
- wildlife
- fishing
- shellfish
- swimming
- drinking water

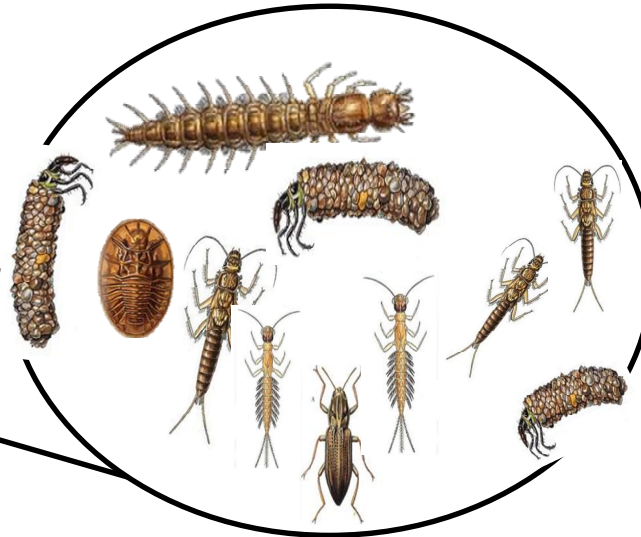


# DEQ Continuing Planning Process: Monitoring

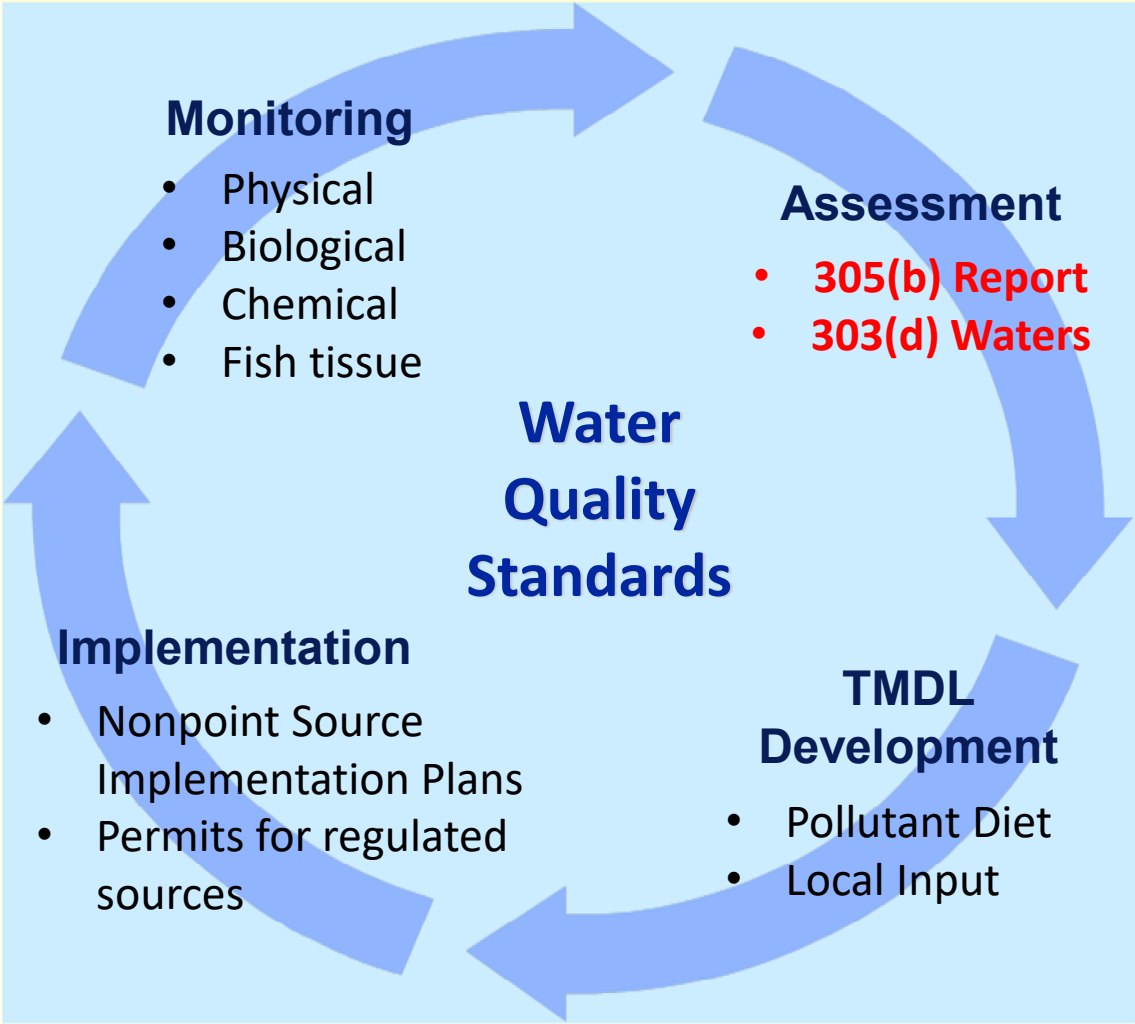




# Monitoring aquatic life... BUGS



# DEQ Continuing Planning Process: Assessment



**2020 Impaired Waters - 303(d) List**  
Category 5 - Waters needing Total Maximum Daily Load Study

**James River Basin**

Cause Group Code	Water Name	Cause Category	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)	Initial List Date	TMDL Dev. Priority
G01E-02-EBEN	James River						
Aquatic Life	Estuarine Bioassessments	5A	6.547			2012	L
G01E-03-PCB	James River and Various Tributaries						
Fish Consumption	PCBs in Fish Tissue	5A	62.904			2002	H
	PCBs in Fish Tissue	5A	1.914			2004	H
	PCBs in Fish Tissue	5A	183.258		7.51	2006	H
	PCBs in Fish Tissue	5A	0.002			2008	H
G01L-01-CHLA	Falling Creek Reservoir						
Aquatic Life	Chlorophyll-a	5A		88.37		2018	L
G01R-01-PCB	Goode Creek						
Fish Consumption	Polychlorinated Biphenyls (PCBs)	5A			1.21	2012	H
G01R-02-PCB	Almond Creek						
Fish Consumption	Polychlorinated Biphenyls (PCBs)	5A			2.10	2012	H
G01R-02-PH	XVO and XVP - Almond Creek, UT						
Aquatic Life	pH	5A			0.82	2004	L
G01R-04-DO	Falling Creek						
Aquatic Life	Dissolved Oxygen	5A			0.98	2008	L
G01R-05-PH	Kingsland Creek						
Aquatic Life	pH	5C			8.54	2006	L
G01R-06-PCB	Gillies Creek						
Fish Consumption	Polychlorinated Biphenyls (PCBs)	5A			2.08	2008	H



# Aquatic Life Impairments

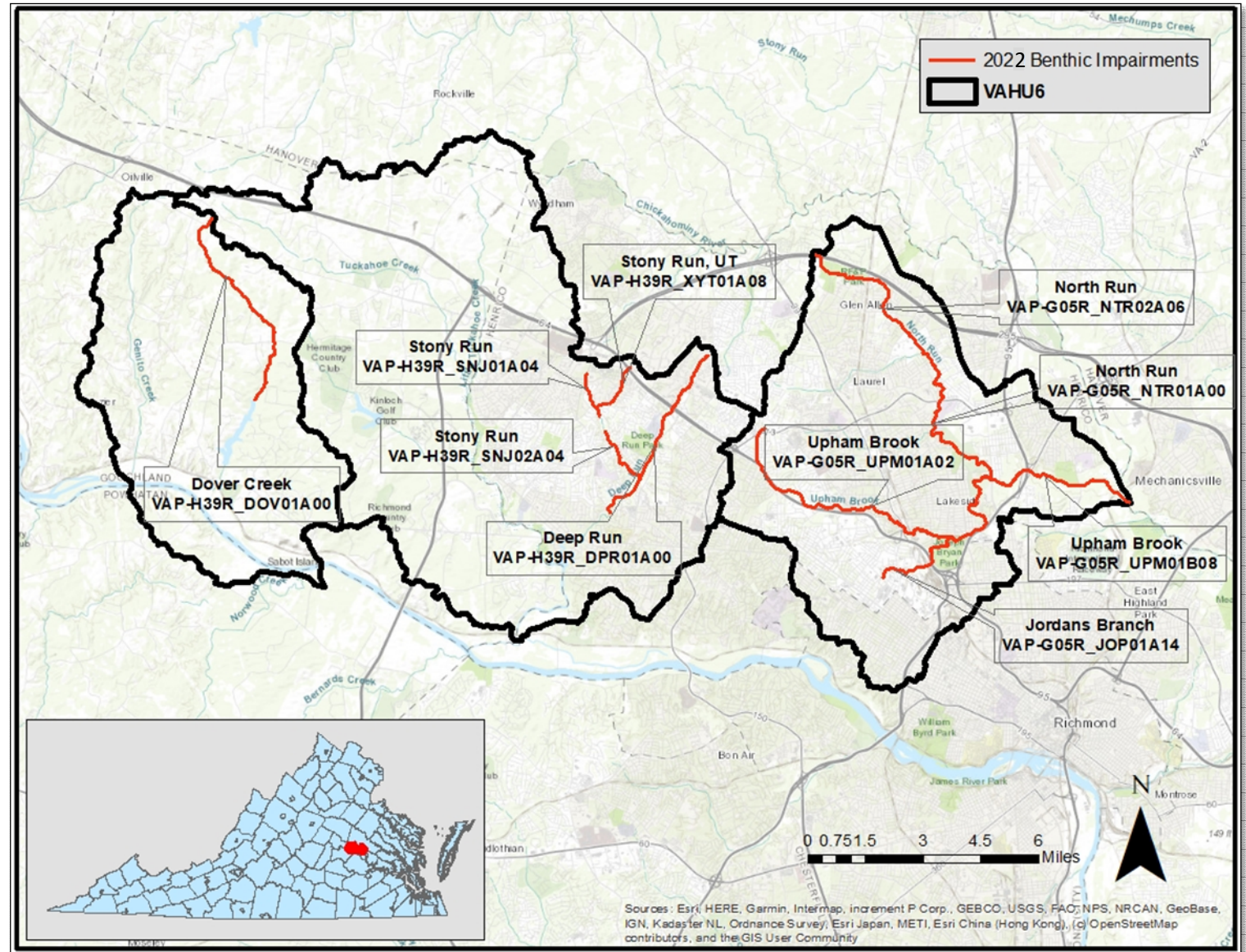
## Upham Brook

- North Run
- Jordans Branch

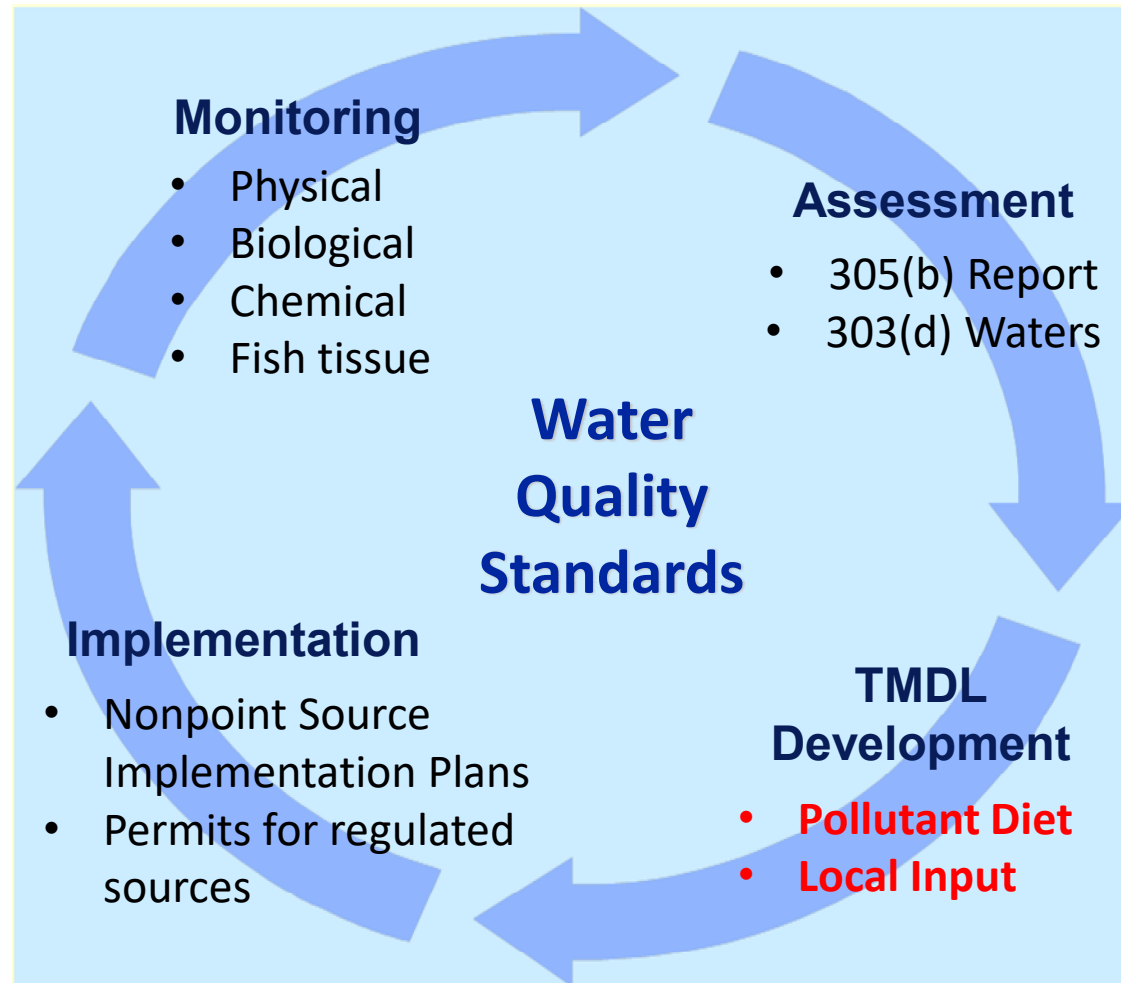
## Deep Run

- Stony Run
- Stony Run UT

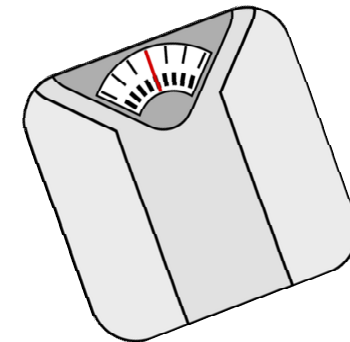
## Dover Creek



# DEQ Continuing Planning Process: TMDL



**Total Maximum Daily Load**  
**“Pollutant Diet”**





# Study Watersheds

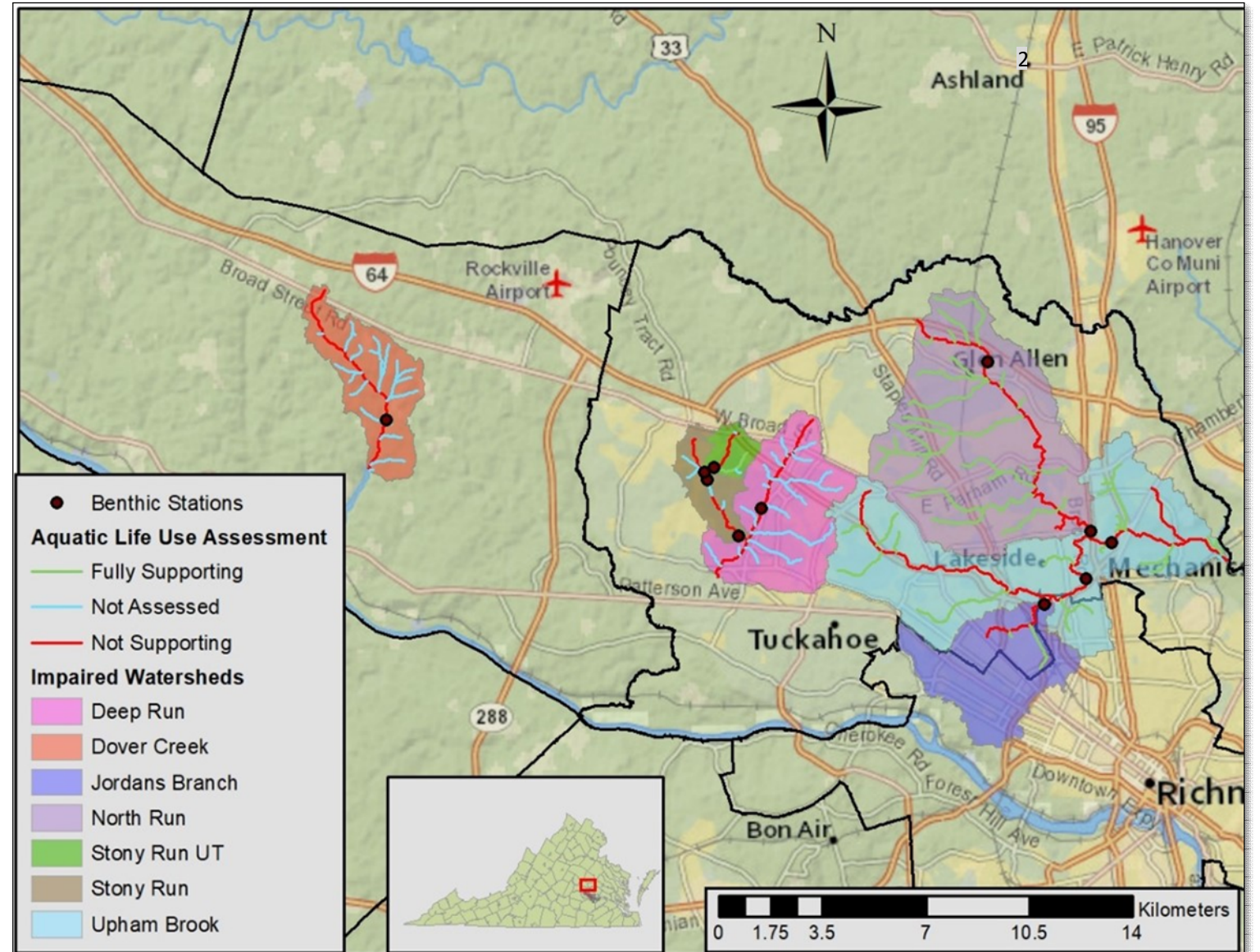
## Upham Brook

- North Run
- Jordans Branch

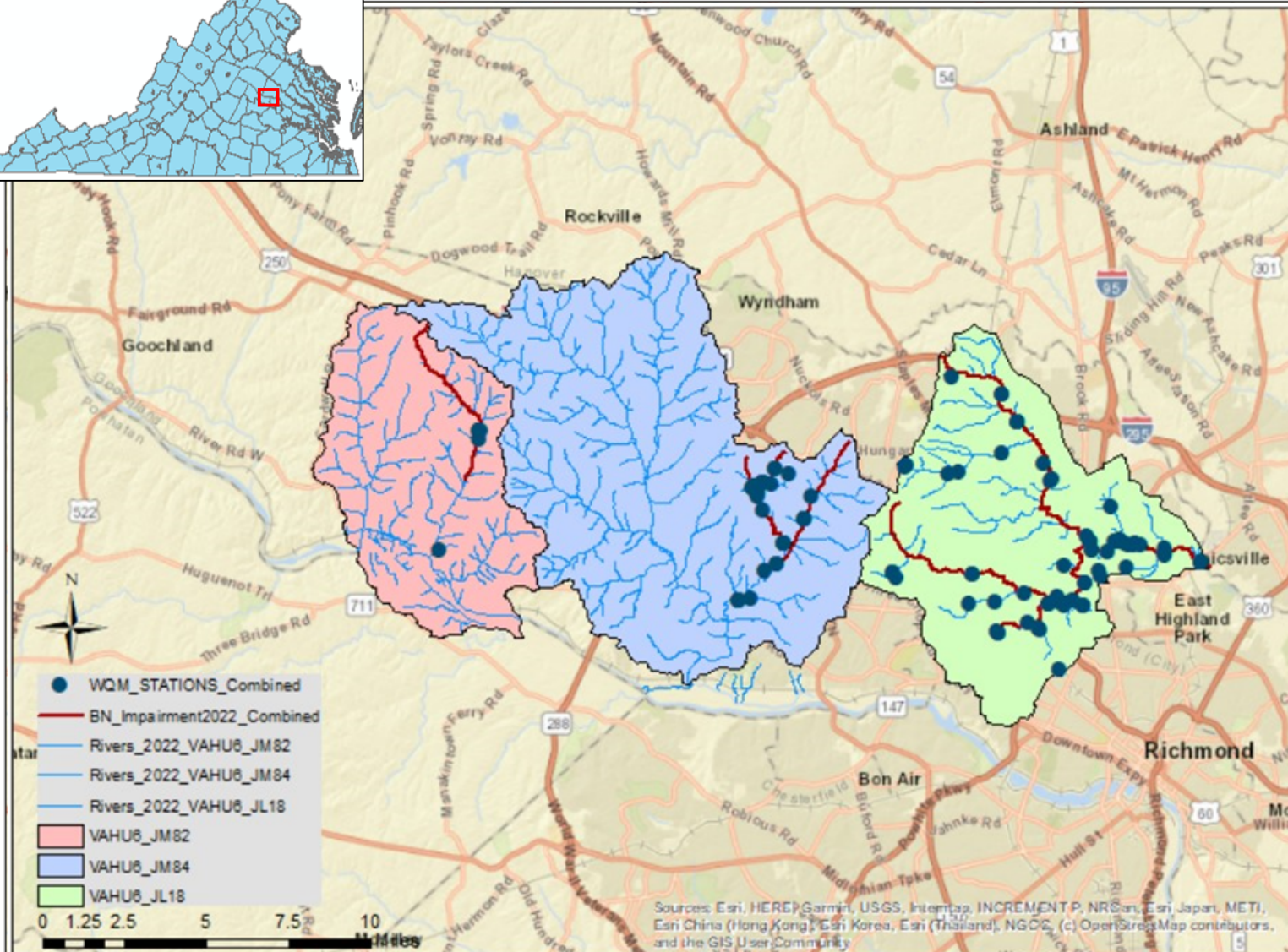
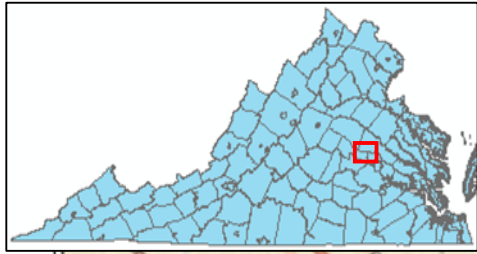
## Deep Run

- Stony Run
- Stony Run UT

## Dover Creek





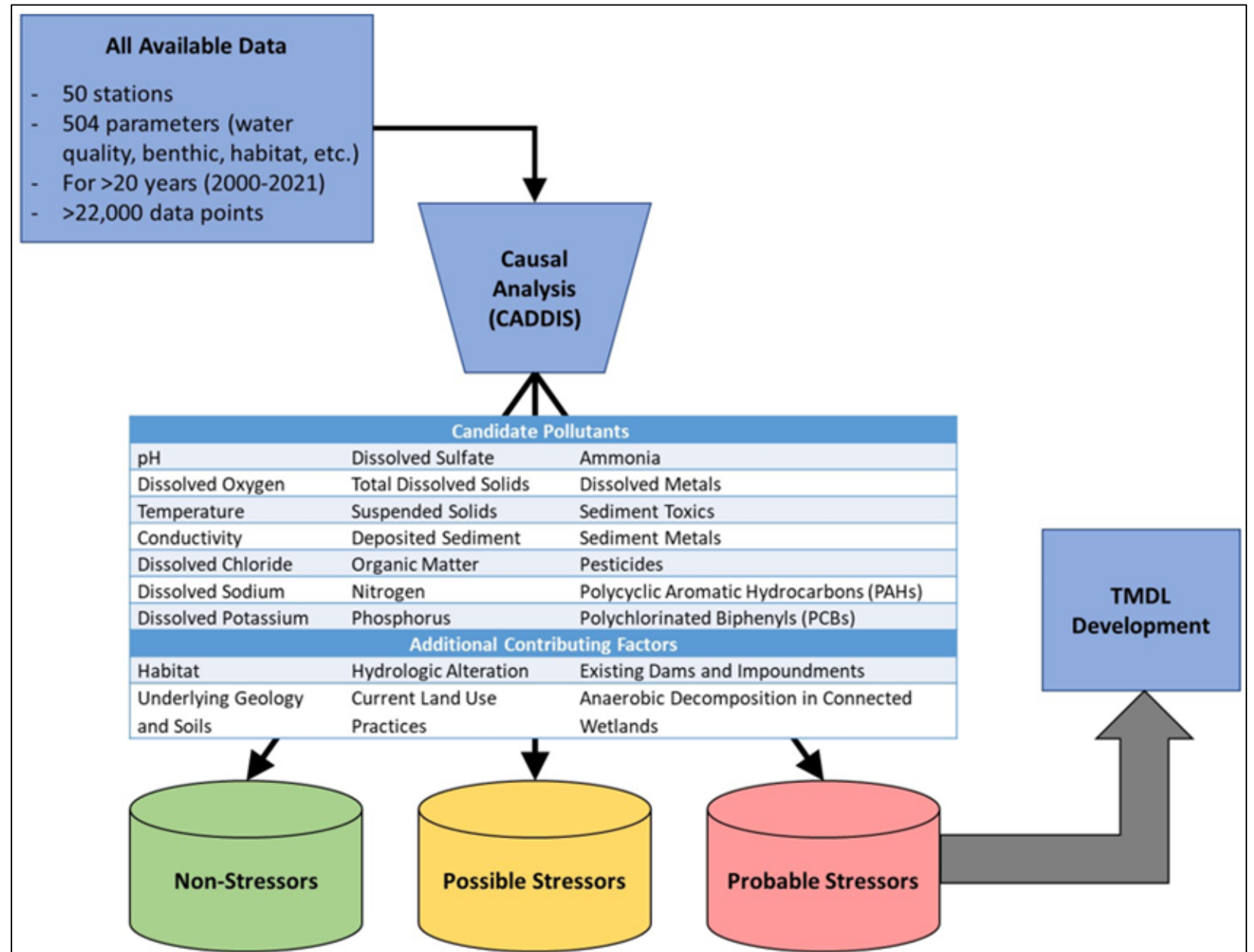


# Water Quality Monitoring

- Temperature
- pH
- Dissolved Oxygen
- Conductivity
- Nutrients
- Total Suspended Solids (TSS)
- Ions
- Metals
- And More!



# Aquatic Life Stressor Analysis



# Analysis Scores by Stream & Candidate Stressor

Candidate Stressor	Deep Run	Dover Creek	Jordans Branch	North Run	Stony Run	Stony Run UT	Upham Brook
Temperature	-8	-10	-5	-6	-5	-8	-6
pH	-24	-23	-23	6	-24	-24	-9
Dissolved Oxygen	-5	-14	-2	13	1	-9	3
Conductivity/Total Dissolved Solids	3	-11	1	-1	2	3	3
Dissolved Sodium	3	-13	3	0	1	2	1
Dissolved Potassium	-3	-1	-1	-1	-3	-4	-2
Dissolved Chloride	-1	-13	-3	-10	-10	-3	-4
Dissolved Sulfate	-9	-11	-10	-12	-10	-12	-9
Sediment	10	5	9	12	12	12	12
Organic Matter	-1	0	-2	12	-1	-1	0
Phosphorus	-2	11	2	3	5	-2	9
Nitrogen	-11	2	1	-9	-9	-8	3
Ammonia	-15	-12	-13	-13	-15	-14	-12
Dissolved Metals	-13	-13	-13	-13	-13	-12	-13
Sediment Toxics	-2	-2	-5	-8	-6	-5	-2

- Green indicates non-stressors
- Orange indicates possible stressors
- Red indicates probable stressors.

# Probable stressors and TMDL targets selected

Stream	Probable Stressors	TMDL Target
Deep Run	-Sediment	-Sediment
Dover Creek	-Sediment -Phosphorus	-Sediment -Phosphorus
Jordans Branch	-Sediment	-Sediment
North Run	-Sediment (-pH, Dissolved Oxygen, Organic Matter – Natural Conditions)	-Sediment
Stony Run	-Sediment -Phosphorus	-Sediment -Phosphorus
Stony Run UT	-Sediment	-Sediment
Upham Brook	-Sediment -Phosphorus	-Sediment -Phosphorus



# TMDL Equation

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

**TMDL** = Total Maximum Daily Load

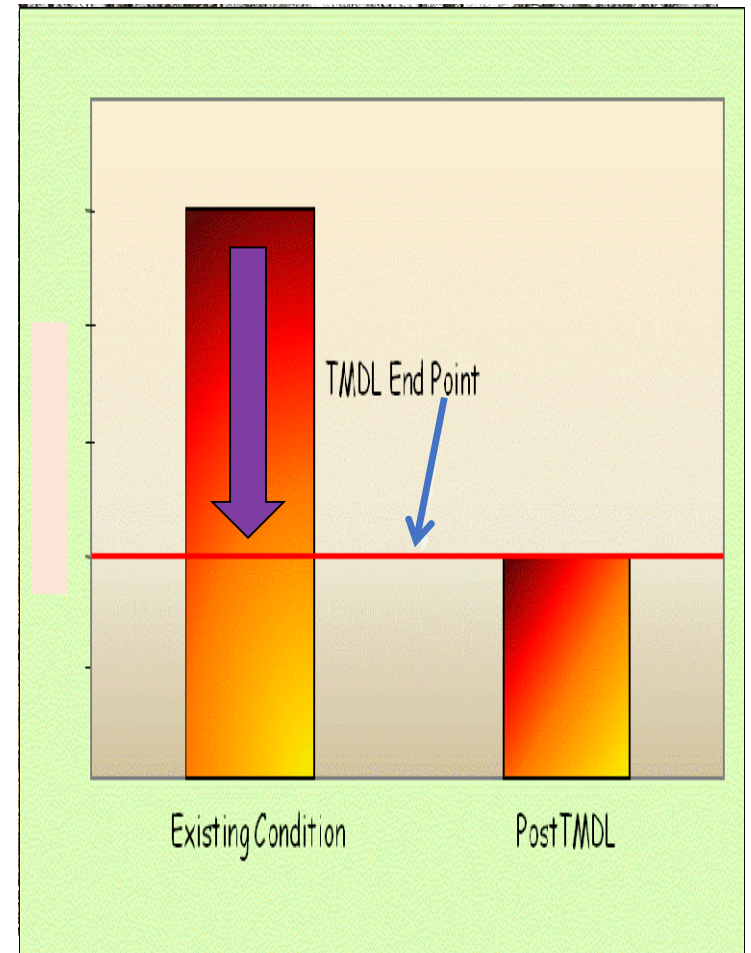
**WLA** = Waste Load Allocation of permitted point sources

**LA** = Load Allocation of nonpoint sources

**MOS** = Margin of Safety to include variances & future growth

**Existing Condition** = current load discharged to the water body

**Reduction (%)** =  $(\text{current load} - \text{TMDL}) / \text{current load} \times 100$

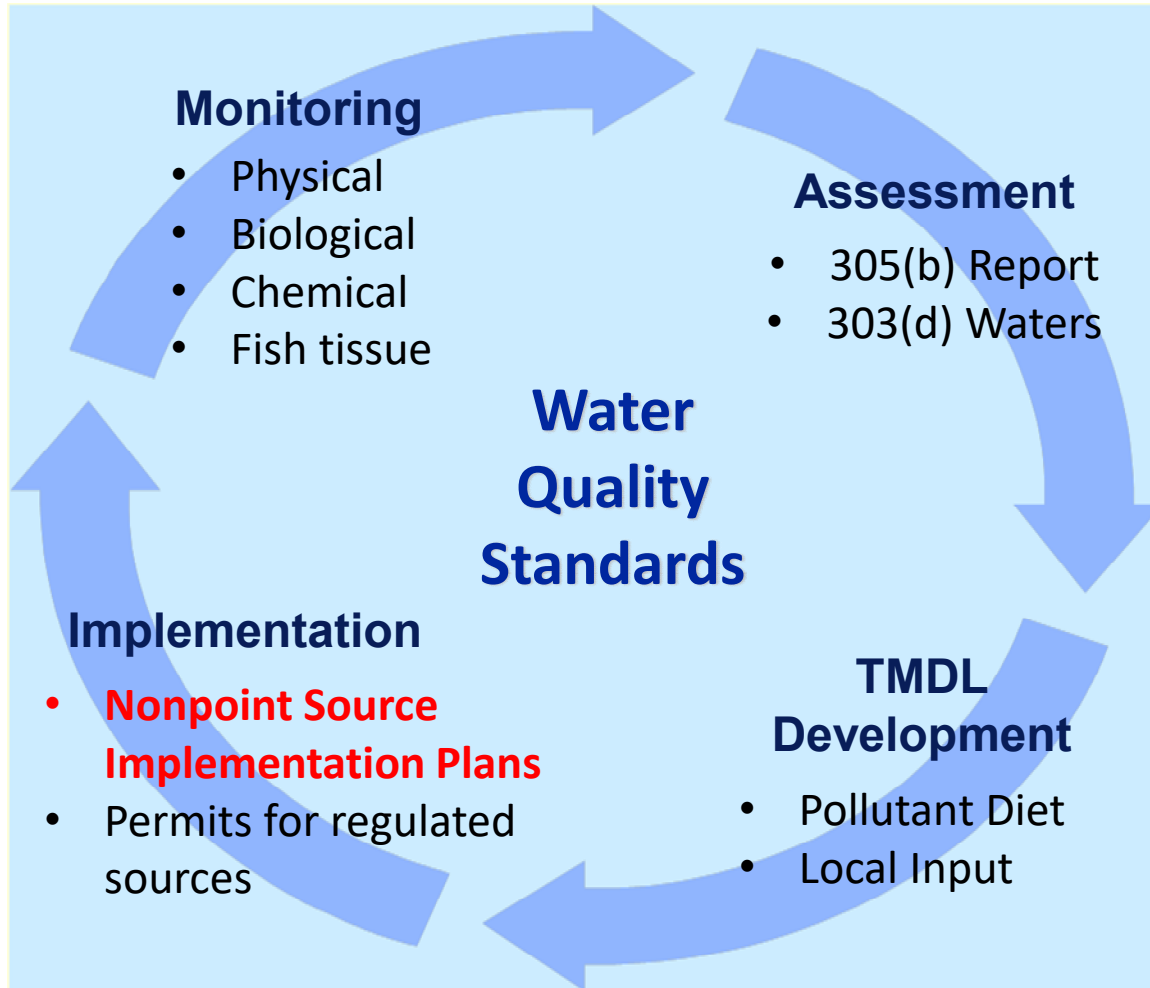


# Modeling Approach

# Handout



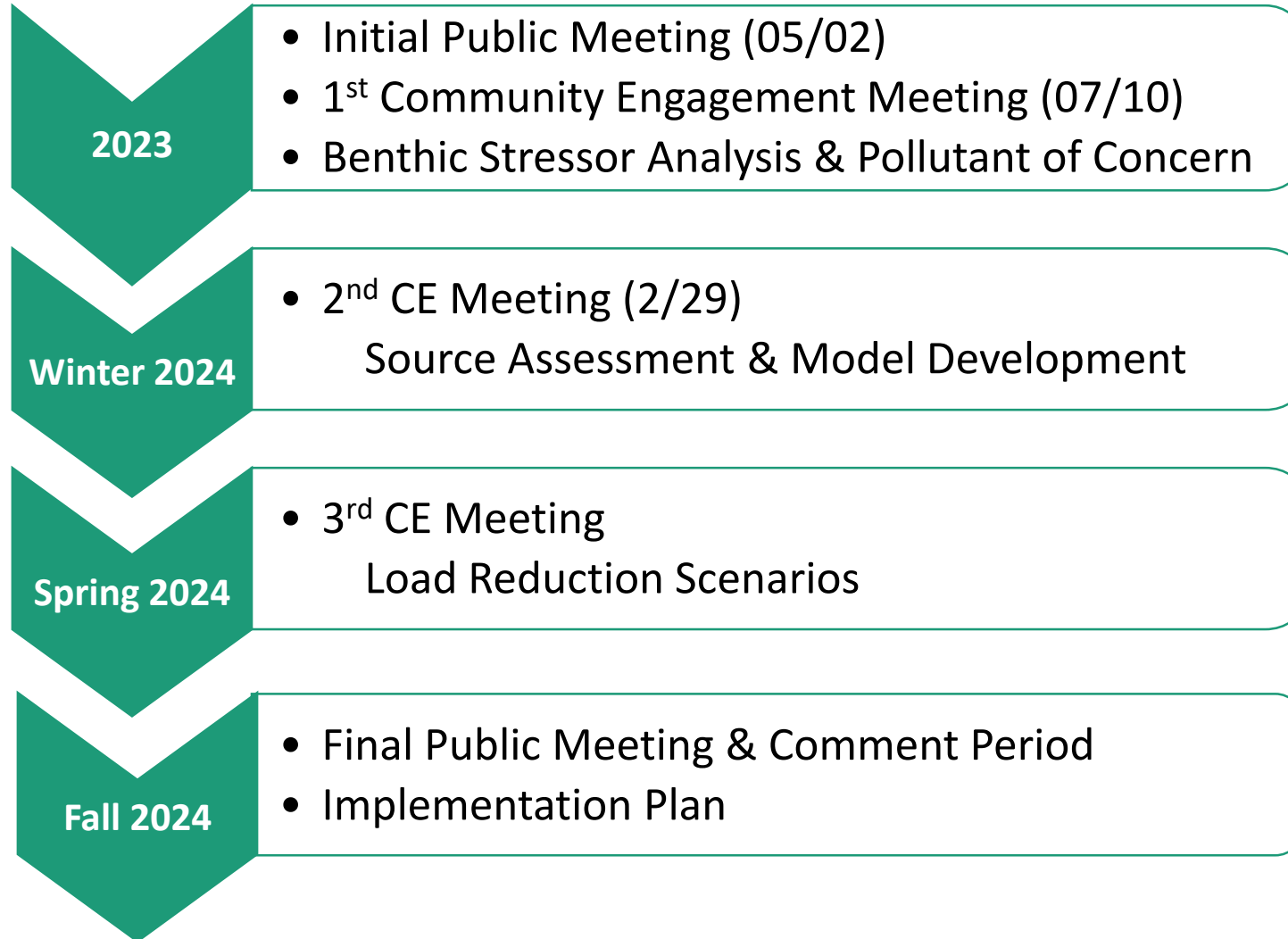
# DEQ Continuing Planning Process: Implementation Plan



## IP Report Content

- **Pollutant reduction needs**
  - Review TMDL studies & factor in changes since TMDLs
  - Land use and population changes
- **Best Management Practices**
  - Stakeholder input on practices most applicable locally
  - Quantify implementation actions
  - Assess costs and benefits of actions
- **Implementation Plan Strategies**
  - Measurable goals/milestones
  - Stakeholders' roles
  - Integrate with other plans
  - Identify potential funding sources

# Project Timeline





# Questions?





