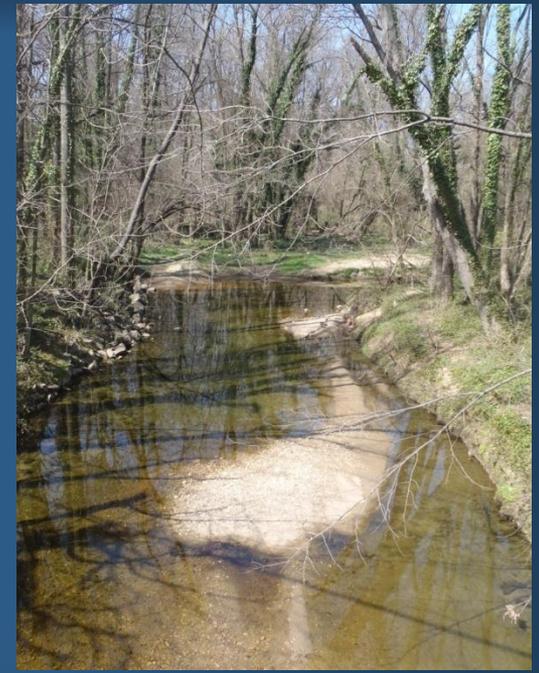


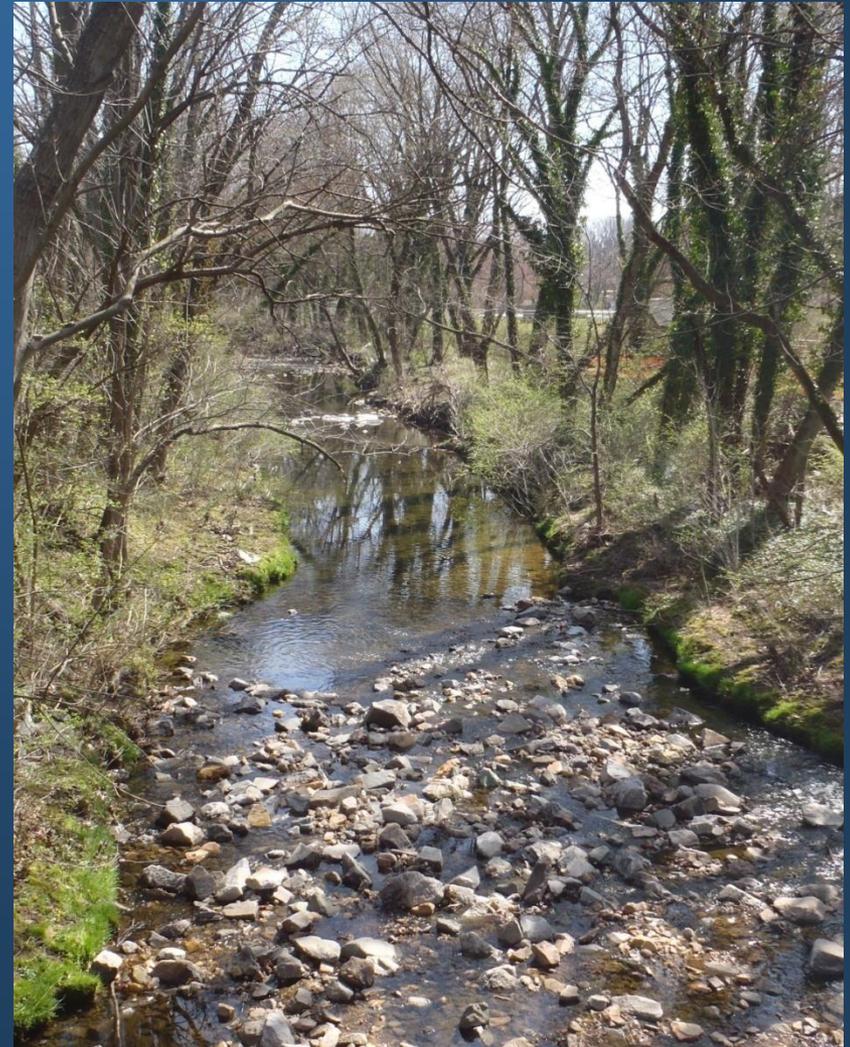
Water Quality Studies for Holmes Run and Tripps Run

1st Public Meeting
Falls Church, VA
May 31, 2012



Why are we here?

- To learn about water quality in portions of Holmes Run and Tripps Run.
- To explain efforts that Virginia is undertaking to improve and protect water quality.
- To learn what you can do to help.



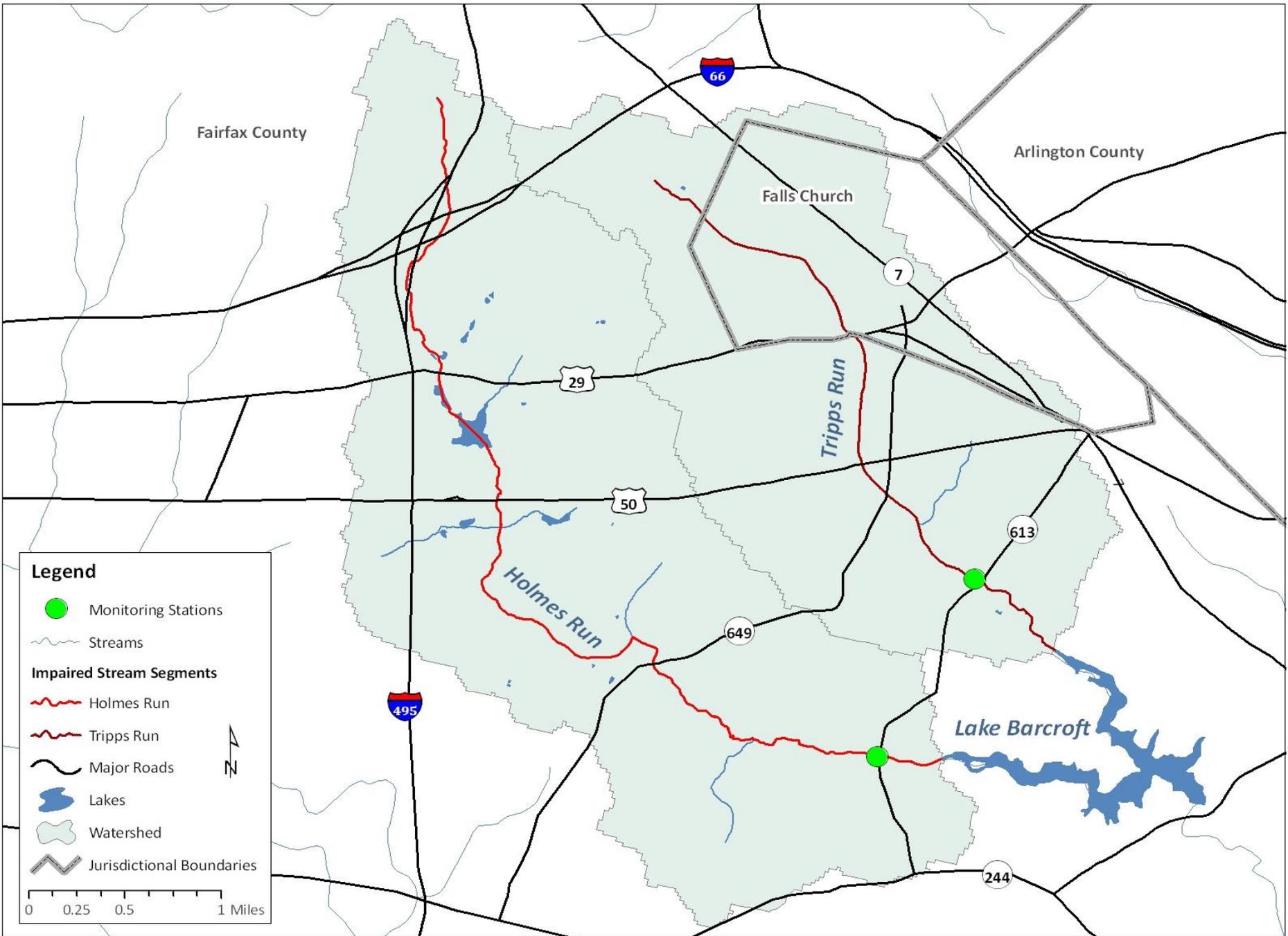
Holmes Run and Tripps Run

- Who is involved in this process?
- Why are we studying Holmes Run and Tripps Run?
- Where are Holmes Run and Tripps Run located?
- How do we know the standards aren't being met?
- Why aren't the standards being met?
- What is being done to correct the problem?



Who is involved in this process?

- DEQ :** Virginia Department of Environmental Quality. Lead Agency for TMDL Development
- DCR :** Virginia Department of Conservation and Recreation. Partners with DEQ in TMDL Development, Lead Agency for TMDL IP Development
- Contractor:** Performs Modeling for TMDL Development (for this project, contractor is the Interstate Commission on the Potomac River Basin).
- TAC:** Technical Advisory Committee. Representatives from state and local governments, watershed groups, planning district commission, soil and water conservation districts, etc. Provides technical input and information for TMDL development.
- Citizens:** Any citizen who wishes to participate in the project; provide local knowledge and information.



Holmes Run and Tripps Run Impairment Descriptions

Stream Name	Location	Impairment	Area (miles)	Upstream Limit	Downstream Limit
Holmes Run	Fairfax County	Aquatic Life Use Benthic Macroinvertebrates	5.78	Headwaters of Holmes Run	Start of Lake Barcroft
Tripps Run	Falls Church Fairfax County	Aquatic Life Use Benthic Macroinvertebrates	2.24	Headwaters of Tripps Run	Start of Lake Barcroft

How do we know if water bodies in Virginia are healthy?

- Perform physical and chemical monitoring on water bodies throughout the state
- Monitor parameters such as:
 - pH
 - Temperature
 - Dissolved Oxygen
 - Biological Community
 - Bacteria
 - Nutrients
 - Fish Tissues
 - Metals/Toxic Pollutants

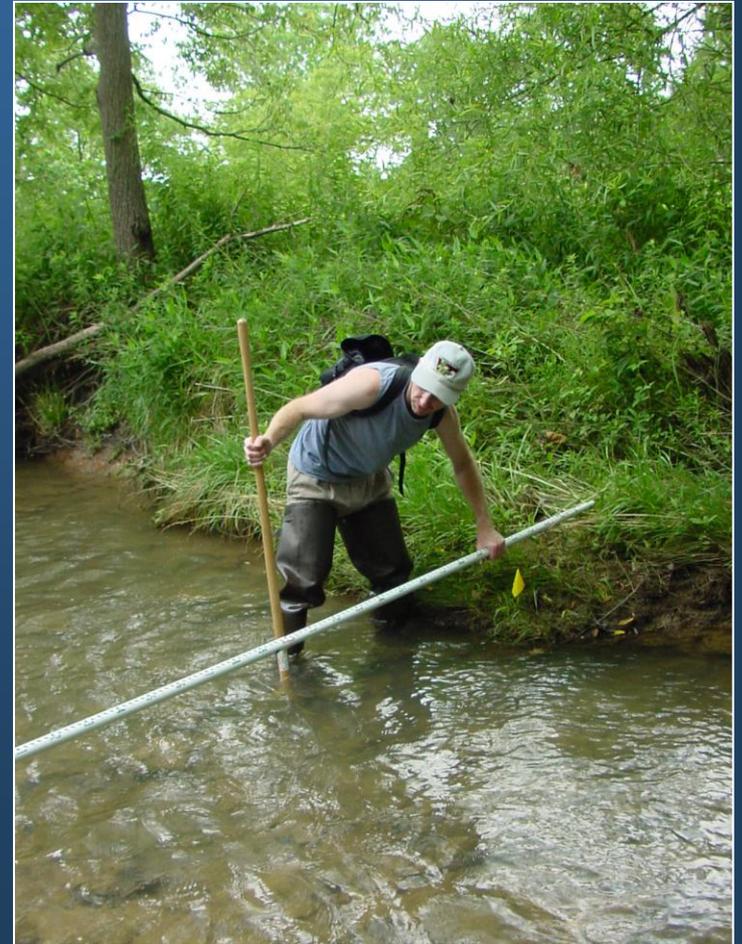


What do we do with the monitoring data that is collected?

Compare the data collected to the water quality standards

Water Quality Standards:

- Regulations based on federal and state law
- Set numeric and narrative limits on pollutants
- Consist of designated use(s) and water quality criteria to protect the designated uses



Designated Uses

- Recreation
- Public Water Supply
- Wildlife
- Fish Consumption
- Shellfish
- Aquatic Life



Holmes Run and Tripps Run do not meet the state's water quality standards for the aquatic life use because of poor health in the benthic macroinvertebrate community.

Aquatic Life Use: What are benthic macroinvertebrates?

Aquatic invertebrates
(Bugs) that live on the
bottom of streams, rivers,
and other bodies of water.



Why do we care about these bugs?

- Important food source for fish (important link in the food chain).
- Important cycling of nutrients.
- Good indicators of overall stream health.



Aquatic Life Use Impairment: Benthic Macroinvertebrates

**Pollution
Intolerant
Invertebrates**



Mayfly



Stonefly



Caddisfly

**Moderately
Pollution
Tolerant
Invertebrates**



Crayfish



Water Penny



**Net spinning
Caddisfly**

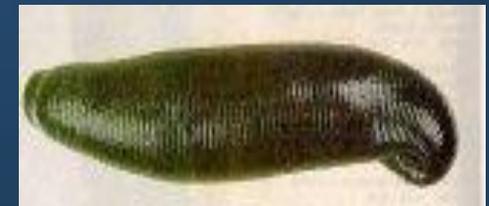
**Highly Pollution
Tolerant
Invertebrates**



Midge Larvae



Segmented Worm



Leech

What are the bugs like in Holmes Run and Tripps Run?

Bugs are collected and identified, and the stream is given a score based off the number and type of bugs present in the stream. If the stream gets a score of 60 or above, it is considered healthy. All the scores for Holmes Run and Tripps Run were below 60.



Questions?

What happens when a water body doesn't meet water quality standards?

- Waterbody is listed as “impaired” and placed on the 303(d) list
- Once a water body is listed as impaired, a Total Maximum Daily Load value must be developed for that impaired stream segment to address the designated use impairment.
- TMDL Studies are required by law:
 - 1972 Clean Water Act (CWA)
 - 1997 Water Quality Monitoring Information and Restoration Act (WQMIRA)

What is a TMDL ?

Total Maximum Daily Load

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

Where:

TMDL = Total Maximum Daily Load

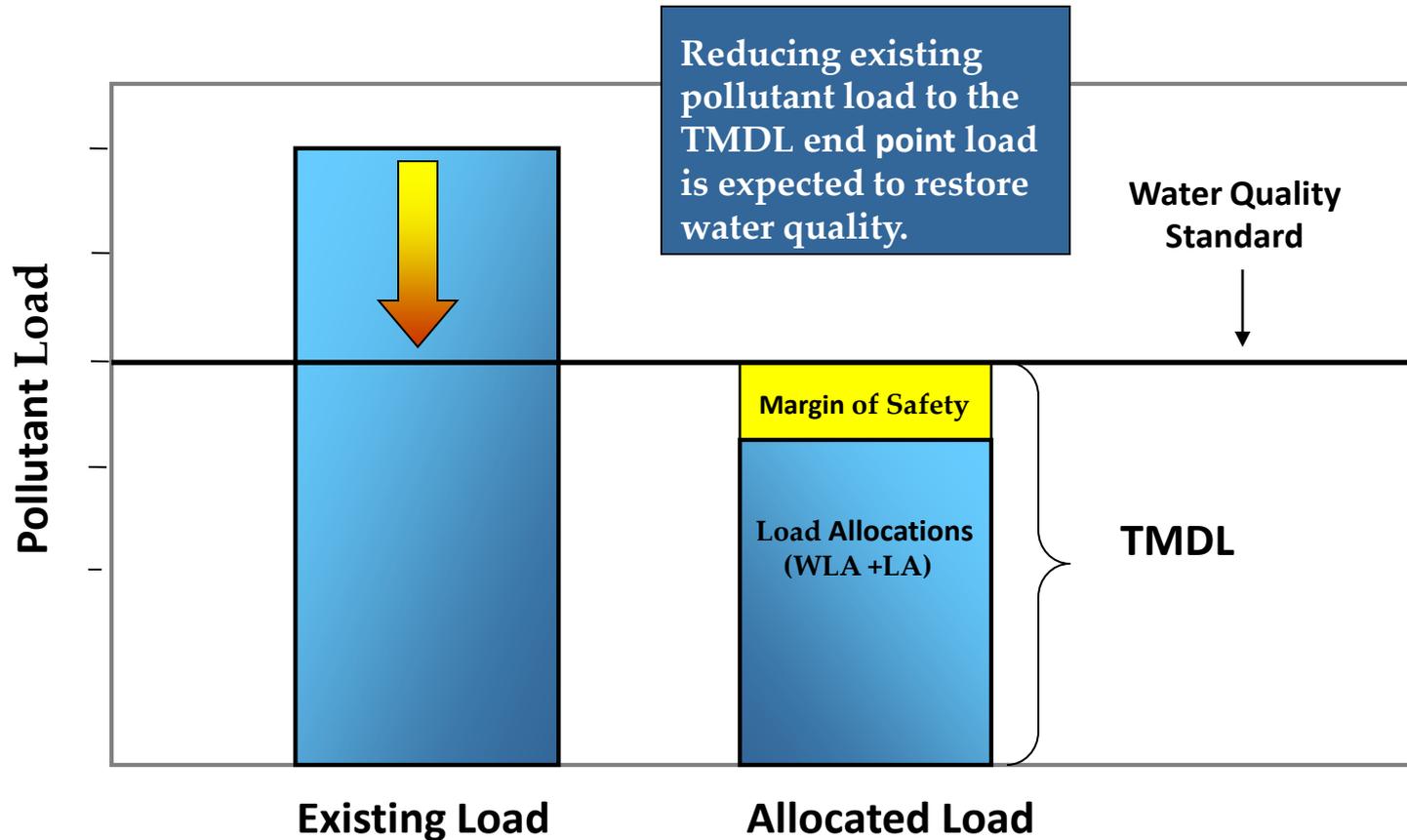
WLA = Waste Load Allocation (Point Sources)

LA = Load Allocation (Non-point Sources)

MOS = Margin of Safety (Implicit or Explicit)

A TMDL is the total amount of a certain pollutant that a water body can receive and still not exceed water quality standards.

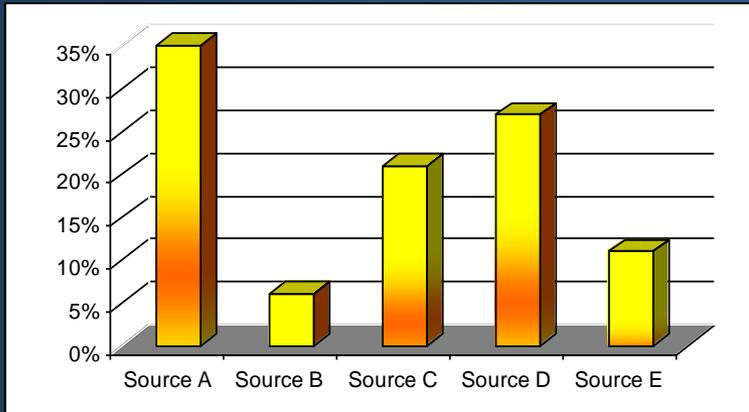
An Example TMDL



TMDL Development Methodology



1. Analyze data for the watershed to determine what is causing the benthic macroinvertebrate impairment (Stressor Analysis).



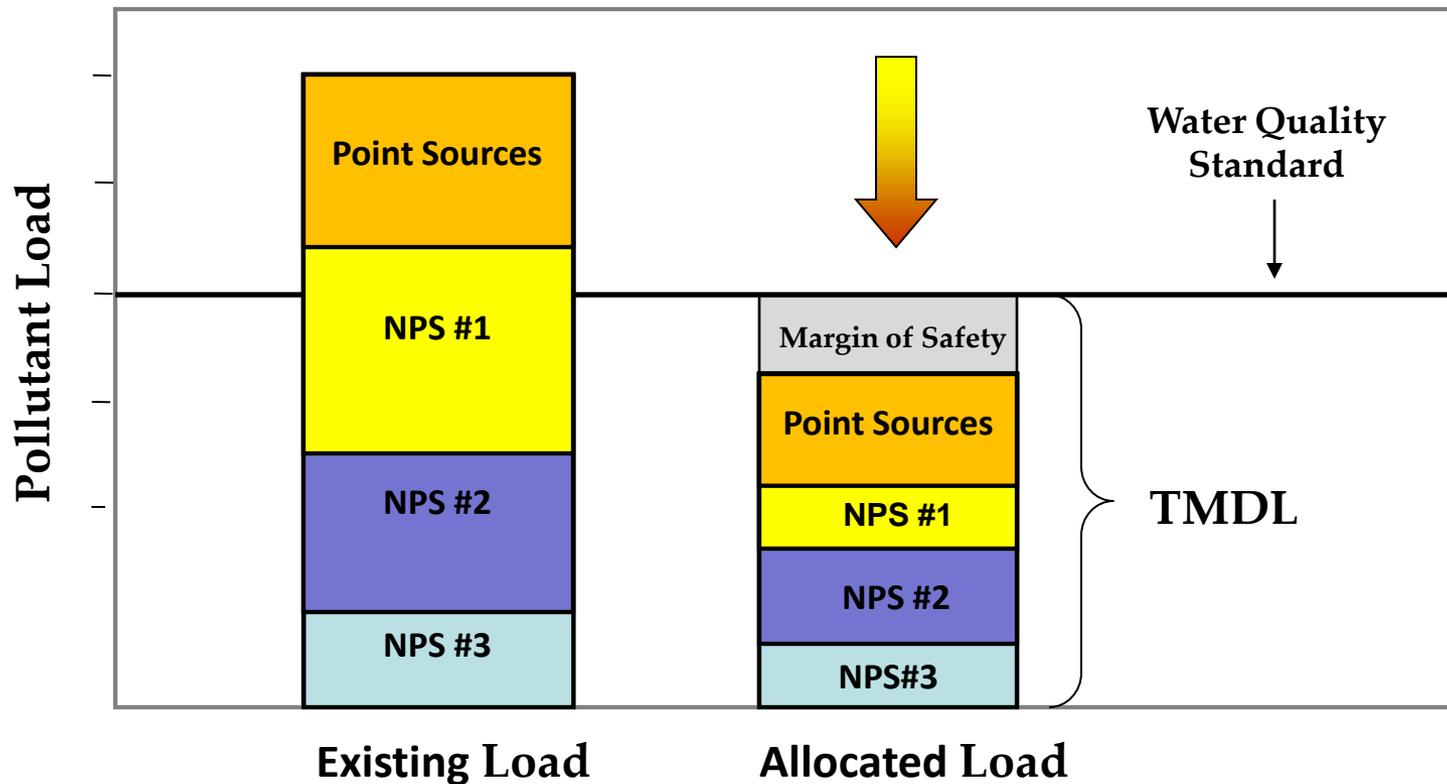
2. Calculate the amount of pollutant entering the stream from each source type.
3. Enter available data into a computer model. Model simulates pollutant loadings into the watershed.
4. Use the model to calculate the pollutant reductions needed, by source, to attain Water Quality Standards.

5. Allocate the allowable loading to each source and include a margin of safety.



TMDL Development Methodology

Use the model to calculate the pollutant reductions needed, by source, to attain Water Quality Standards. Allocate the allowable loading to each source and include a margin of safety.

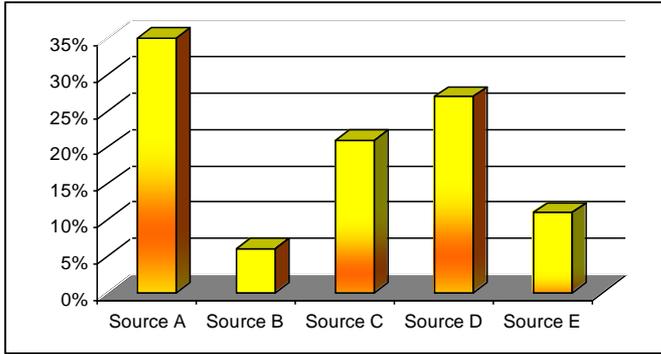


NPS = Non-Point Source

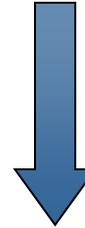
An Example TMDL

We are here

TMDL Study

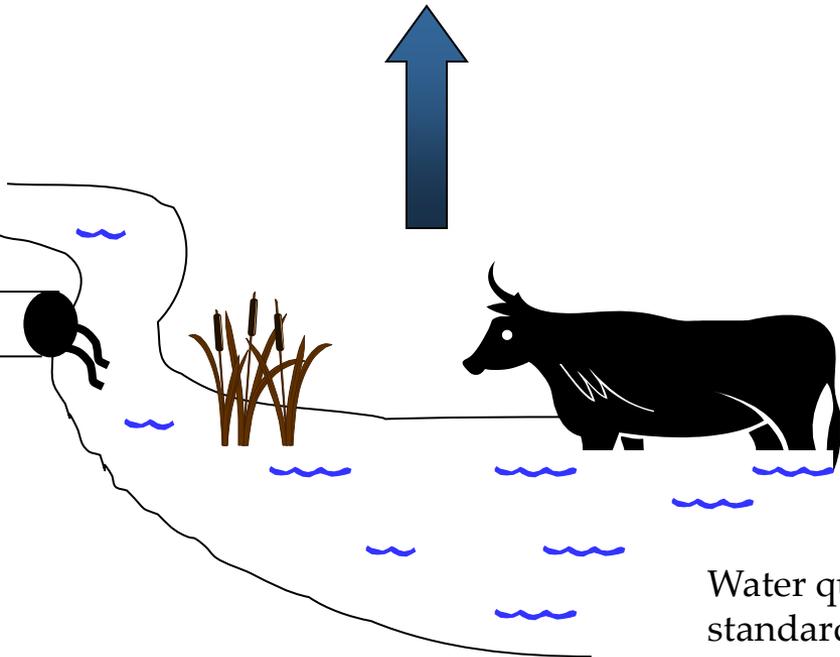


Implementation Plan

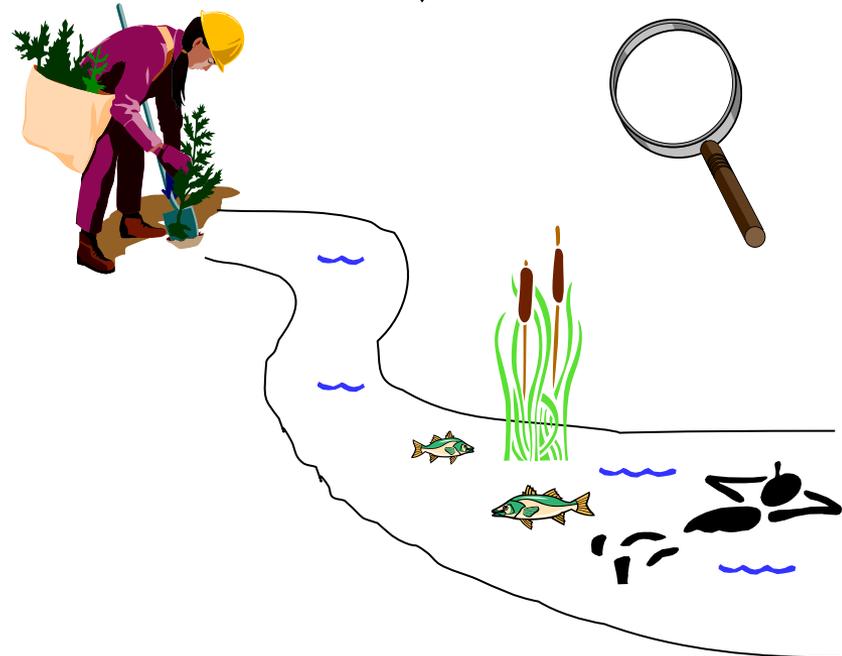


Implementation

Monitoring



Water quality standards not met



Stressor Analysis for Holmes Run and Tripps Run

What is a Stressor Analysis?

Answers the question: *What pollutant is causing the aquatic life impairment?*

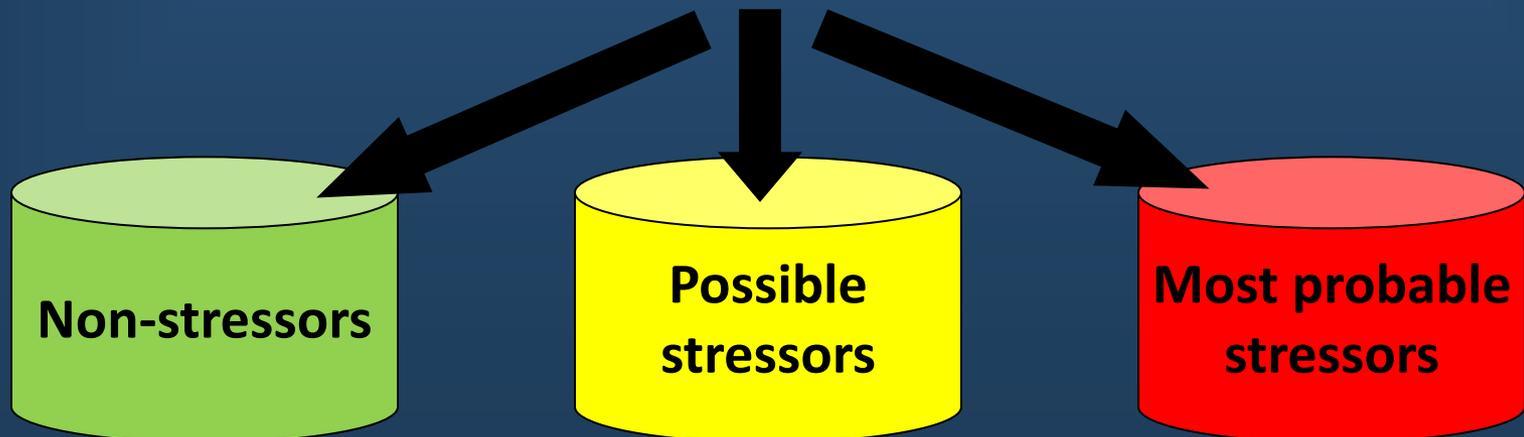
1. List all potential causes, for example:

Dissolved oxygen, nutrients, pH, sediment, temperature, toxics, etc.

2. Analyze the evidence for and against each pollutant:

Biological, habitat, water quality, historic data, etc.

3. Categorize each of the causes as being one of the following:



Potential Stressors

- Temperature
- pH
- Dissolved Oxygen
- Total Dissolved Solids
- Chloride
- Conductivity
- Nutrients
- Metals
- Toxics
- Sediment
- Hydro-modification

DEQ Monitoring Studies

- **Ambient monitoring 2004-2012**
- **Biological monitoring and habitat assessment**
- **Storm monitoring (Four Samples in 2012)**
- **Two continuous monitoring samples in Holmes Run and one sample in Tripps Run**
- **Special study in Tripps Run (Two samples at four locations)**

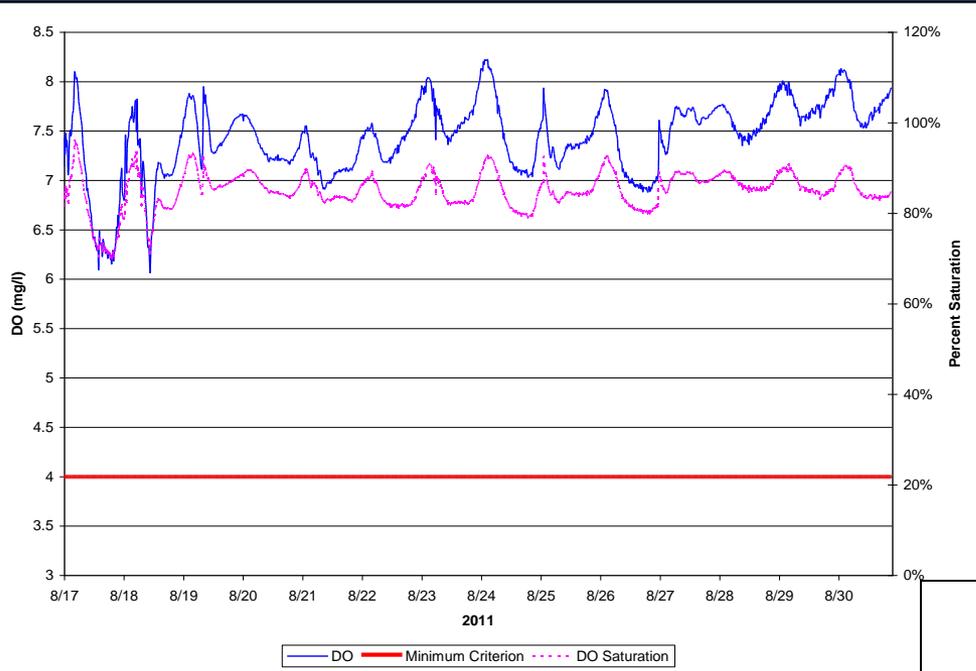
Fairfax County has also provided the results of their biological and water quality monitoring in Holmes Run and Tripps Run

Temperature, pH, and DO

- Field measurements and continuous monitoring data
- No exceedances of VA standards observed
- Some evidence of diurnal DO swings in continuous monitoring data

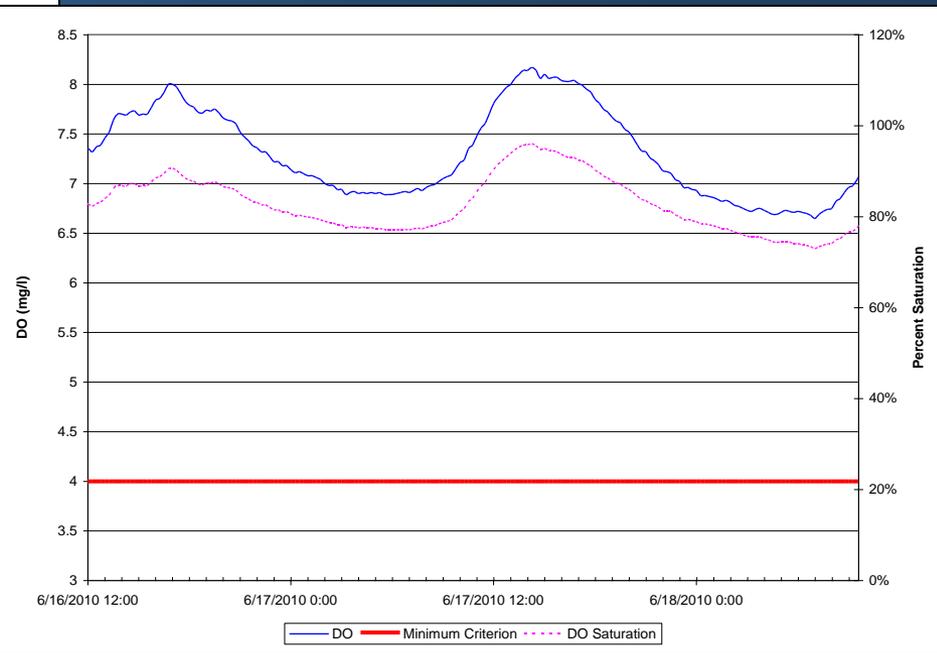
Field measurements		Water Temperature (C)	pH	Dissolved Oxygen (mg/L)
Holmes Run	Maximum	24.3	7.6	15.1
	Minimum	0.2	6.7	6.7
	<i>Median</i>	9.8	7.2	11.3
Tripps Run	Maximum	23.8	7.7	15.2
	Minimum	2.2	6.6	5.7
	<i>Median</i>	12.4	7.1	10.1
Water Quality Criterion		< 32 C	>6 and <9	>4 mg/l

Continuous Monitoring Data



Dissolved Oxygen
Tripps Run

Dissolved Oxygen
Holmes Run



Conductivity, Chloride, and Dissolved Solids

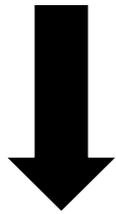
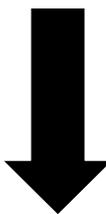
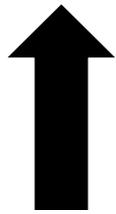
- Conductivity, chloride, and TDS highly correlated
- No exceedances of VA chloride standard
- Concentrations are high relative to VA samples

Field measurements		Specific Conductance (umho/cm)	Total Chloride (mg/L)	Total Dissolved Solids (mg/L)
Holmes Run	Maximum	1710	545	1060
	Minimum	168	31	112
	<i>Median</i>	346	70	208
Tripps Run	Maximum	1200	319	626
	Minimum	75	13	87
	<i>Median</i>	336	45	220
Water Quality Criterion		--	860 mg/l (acute)	--

Nutrients

- **No exceedances of ammonia criteria**
- **No other current VA numerical criteria for nutrients in free flowing streams**
- **Nitrogen concentrations are high in both Holmes Run and Tripps Run relative to VA samples**
- **Nitrate concentrations in Tripps Run unusually high**

Flow Regimes and Concentration

Constituent	Base Flow	Storm Flow
NO3, Cl, TDS, Conductivity		
TP, TKN, TSS		

Metals

- **No exceedances of VA criteria (based on dissolved metals)**

Toxicity Testing

- **No statistically significant evidence of chemical toxicants in either stream**

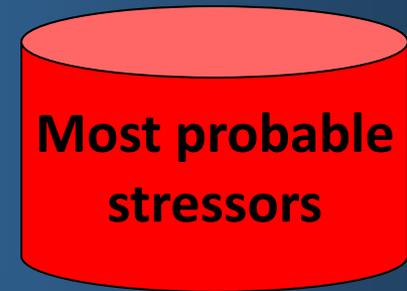
Sediment

- **Habitat Assessment**
 - Ten different habitat variables visually inspected at monitoring stations
 - Median Embeddedness and Sediment Deposition scores are marginal
 - Median Bank Stability scores are sub-optimal
- **Logged Relative Bed Stability (LRBS) Index**
 - Both Holmes and Tripps Run scored as having stable bed conditions

Hydro-Modification

- **Tripps Run is 30% impervious and Holmes Run 25% impervious**
- **Tripps Run mostly channelized or piped above Annandale Road**
- **Biological monitoring shows low sample counts and elevated proportion of clingers**
- **Urban Stream Characteristics**
 - Flashier flows
 - Channel alterations
 - Increase in concentrations of nutrients and contaminants
 - Reduced biological diversity and increase in tolerant species

Summary of Stressor Analysis



- **Complex interaction of stressors in urban streams**
- **Benthic impairments in these streams are not likely the result of a single stressor**

Questions?

What happens next?

- Comment Period for Materials presented at the Public Meeting:

May 31, 2012 to June 30, 2012

Comments should be submitted in writing to:

Jennifer Carlson

jennifer.carlson@deq.virginia.gov

13901 Crown Court, Woodbridge, VA 22193

- DEQ will finalize the stressor analysis and, if appropriate, develop a TMDL for the most likely stressor(s).
- Another public meeting will be held at the conclusion of the project to present the results of the study.
- Public will get a chance to comment on the draft report.
- Final Report will be sent to EPA for review and approval.

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Flow Conditions During Sampling

