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VIRGINIA DEPARTMENT OF
ENVIRONMENTAL QUALITY

Fryingpan Creek, Pigg River, Poplar Branch and Beaverdam Creek TMDL Project

A water quality study for watersheds in Pittsylvania, Franklin and Bedford Counties

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Virginia Department of Environmental Quality
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Our goals for today…

- Share with you DEQ's water quality improvement process.
  - The results of a water quality study
  - Discuss the stressor identified, land use contributions, and reductions necessary.
  - Introduce and solicit interest in the Implementation Planning Process
- You share your thoughts on these conclusions and next steps

While we will be presenting during this meeting, it is not intended to be a monologue (i.e. WE NEED TO HEAR FROM YOU)

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Final TMDL Meeting & Kickoff Implementation Planning

- What is DEQ's process for improving water quality?
- Why focus on Fryingpan Creek, Pigg River, Poplar Branch and Beaverdam Creek?
- What needs to be done to improve the water quality?

- How we can meet the goals of the TMDL?
- What you can do to help!

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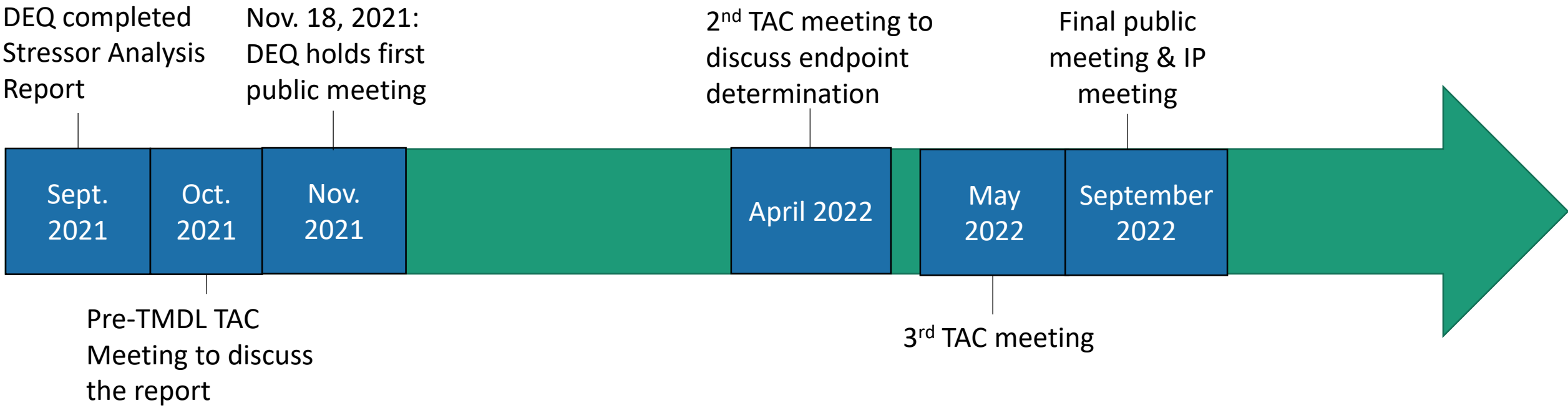
Where we are now…



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THANK YOU!

- Roanoke Valley Alleghany Regional Commission
- Virginia Department of Forestry
- Franklin County
- Blue Ridge SWCD
- Peaks of Otter SWCD
- Pittsylvania SWCD
- Leesville Lake Association
- AEP
- Friends of Rivers of Virginia

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DEQ's Water Quality Improvement Process

Background: Clean Water Act

- The 1972 Clean Water Act (CWA) requires that all waters meet water quality standards that promote healthy water use.

- In order to meet the goals of the CWA, Virginia established water quality standards (WQS)

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Virginia's Water Quality Standards

- WQS protects the 6 designated uses:
  - **aquatic life**
  - wildlife
  - fishing
  - shellfish
  - swimming
  - drinking water

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DEQ's Water Wheel

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DEQ's Water Wheel

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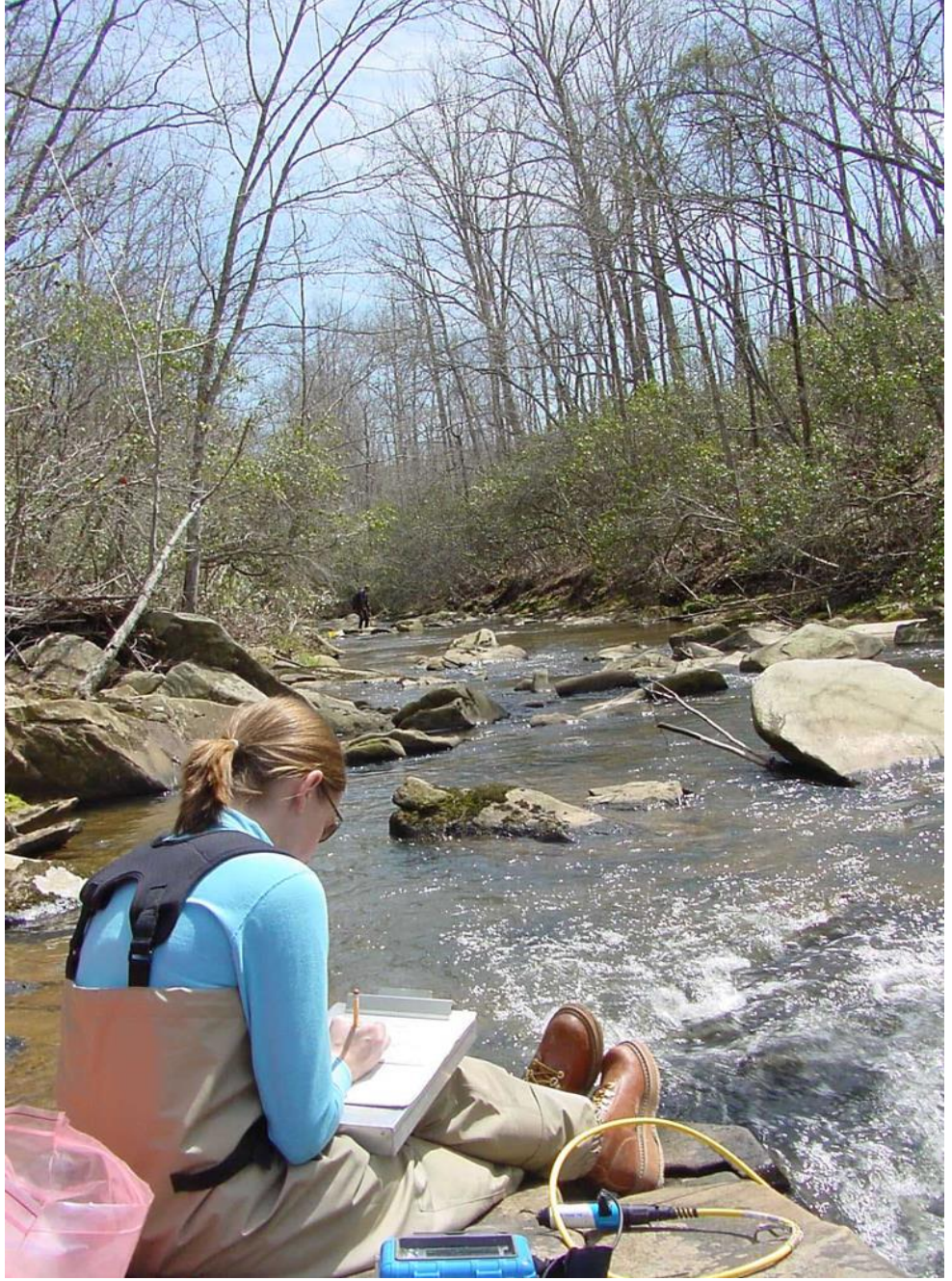
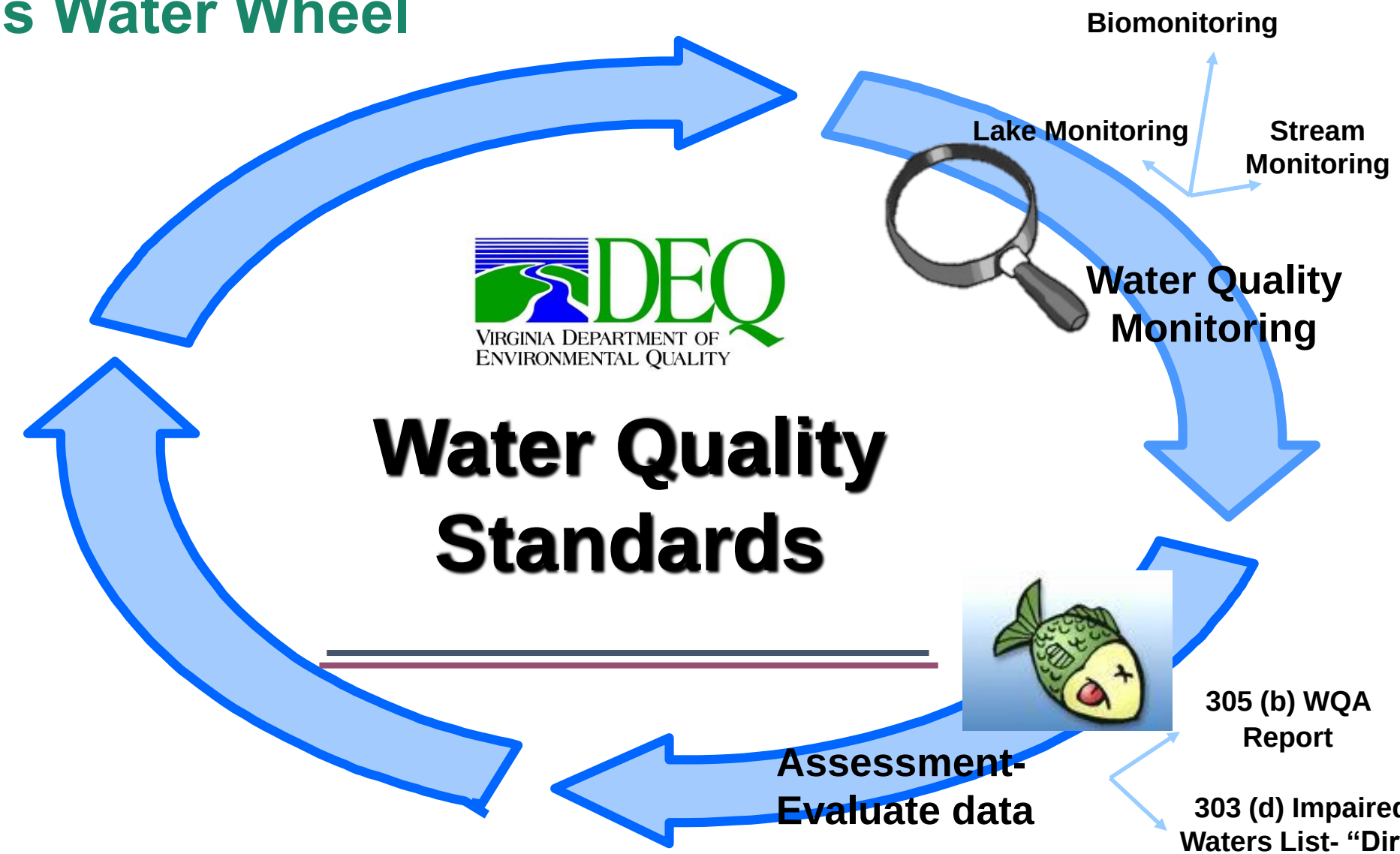
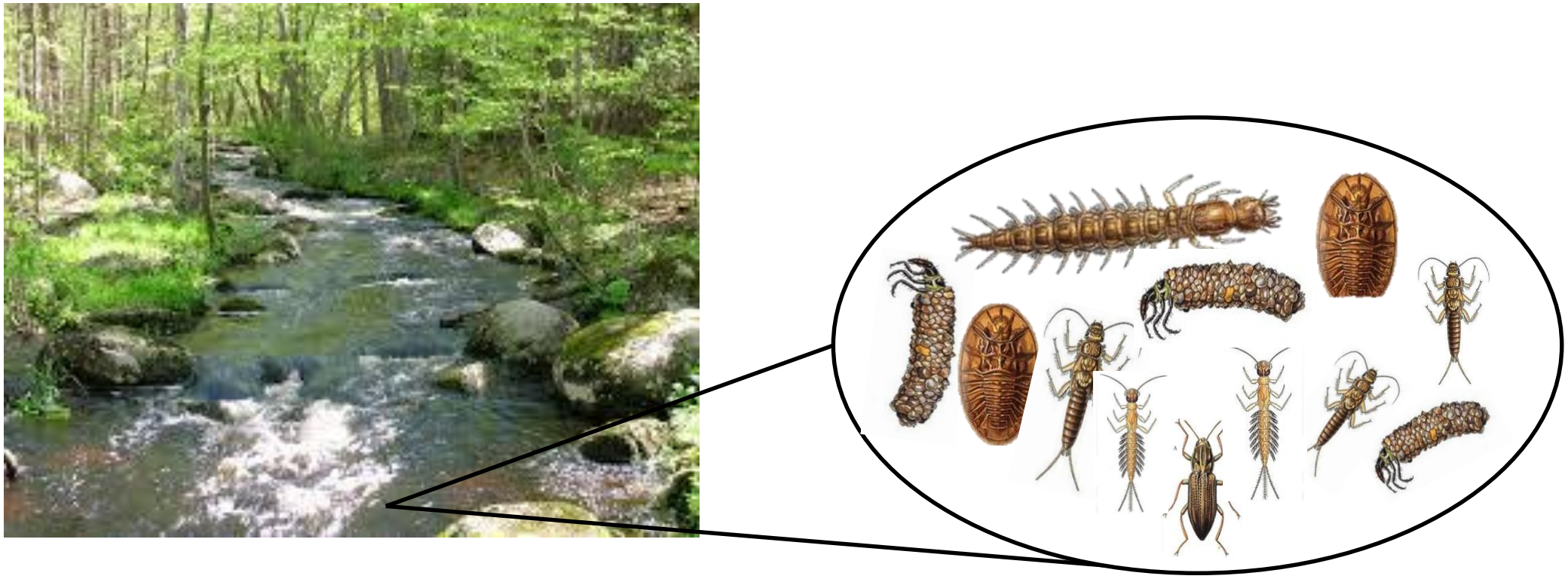


DEQ's Water Wheel



Aquatic Life Use Impairments

- Water bugs represent a longer term picture of water quality than water samples.



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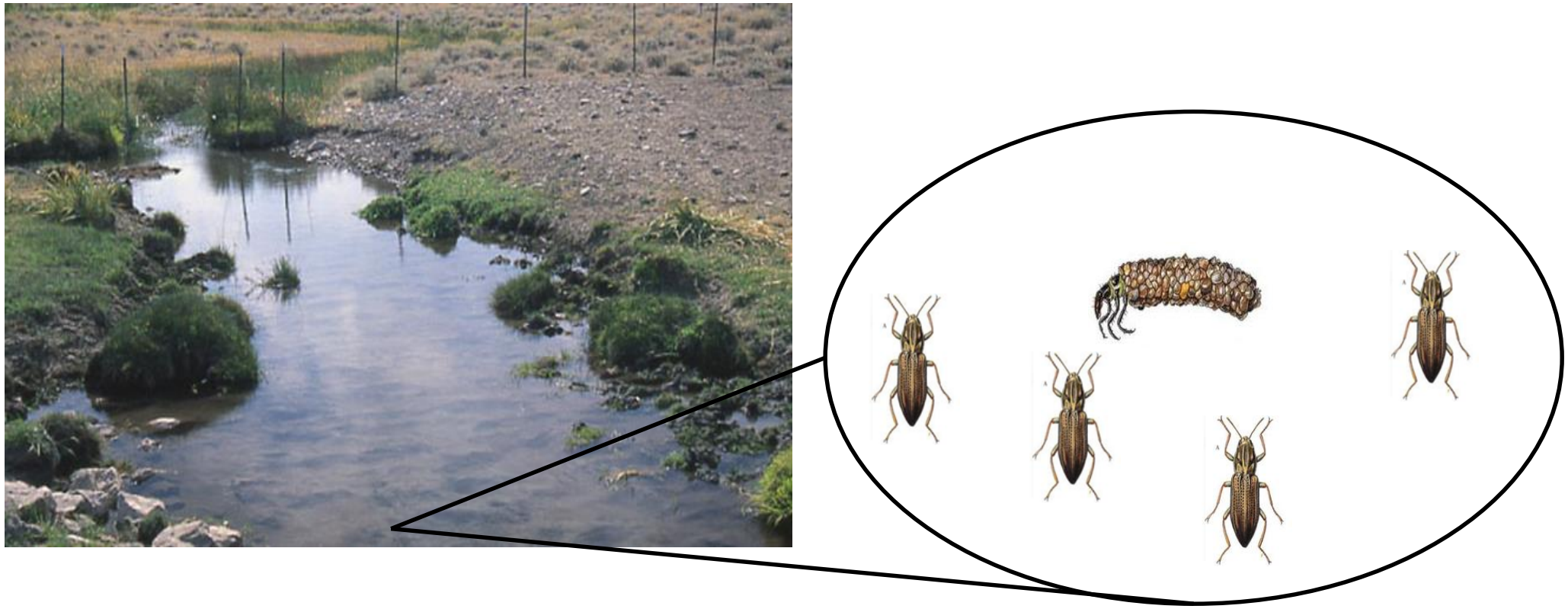
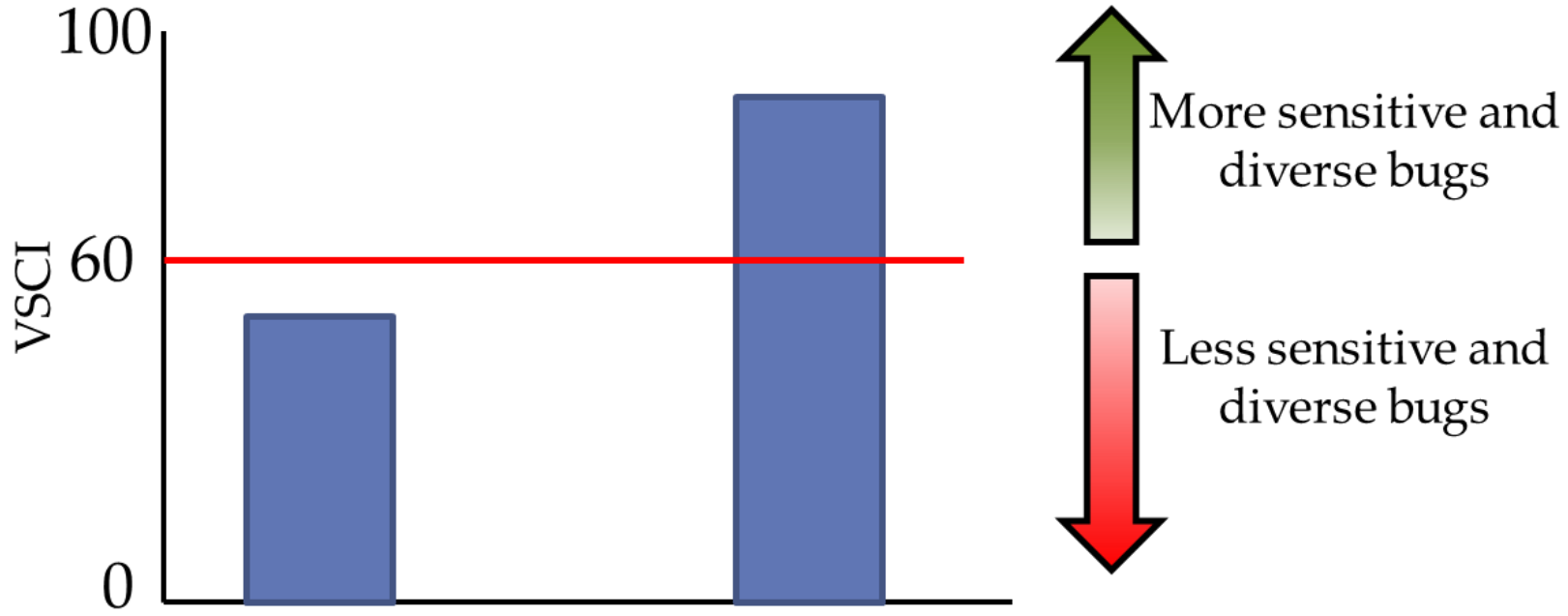


Virginia Stream Condition Index

- Multi-metric index
- VSCI scores tell us that there is an impairment but not what the pollutant is…



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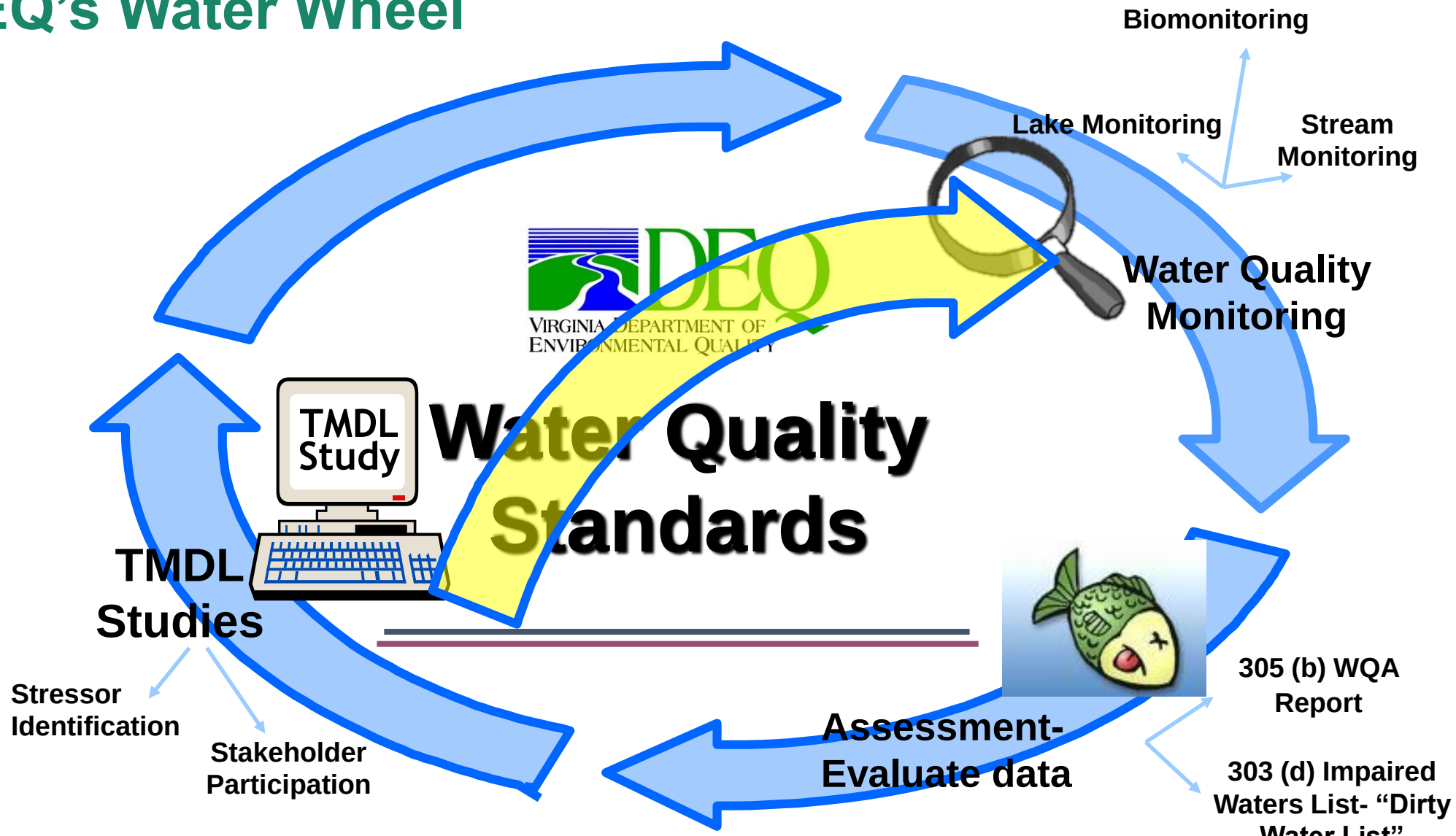
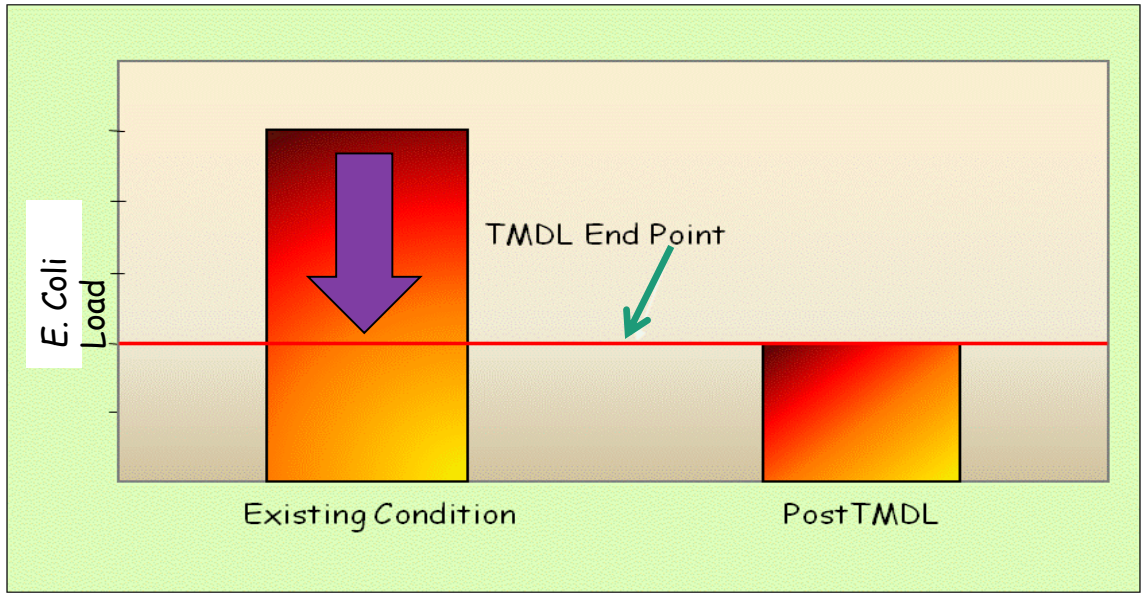
DEQ's Water Wheel



TMDL Study

- The Clean Water Act tasks DEQ to address impaired waters by conducting a Total Maximum Daily Load (TMDL) study.
  - The TMDL is the amount of pollutant that can enter a waterbody and still meet the water quality standard.
    - "Pollution diet"



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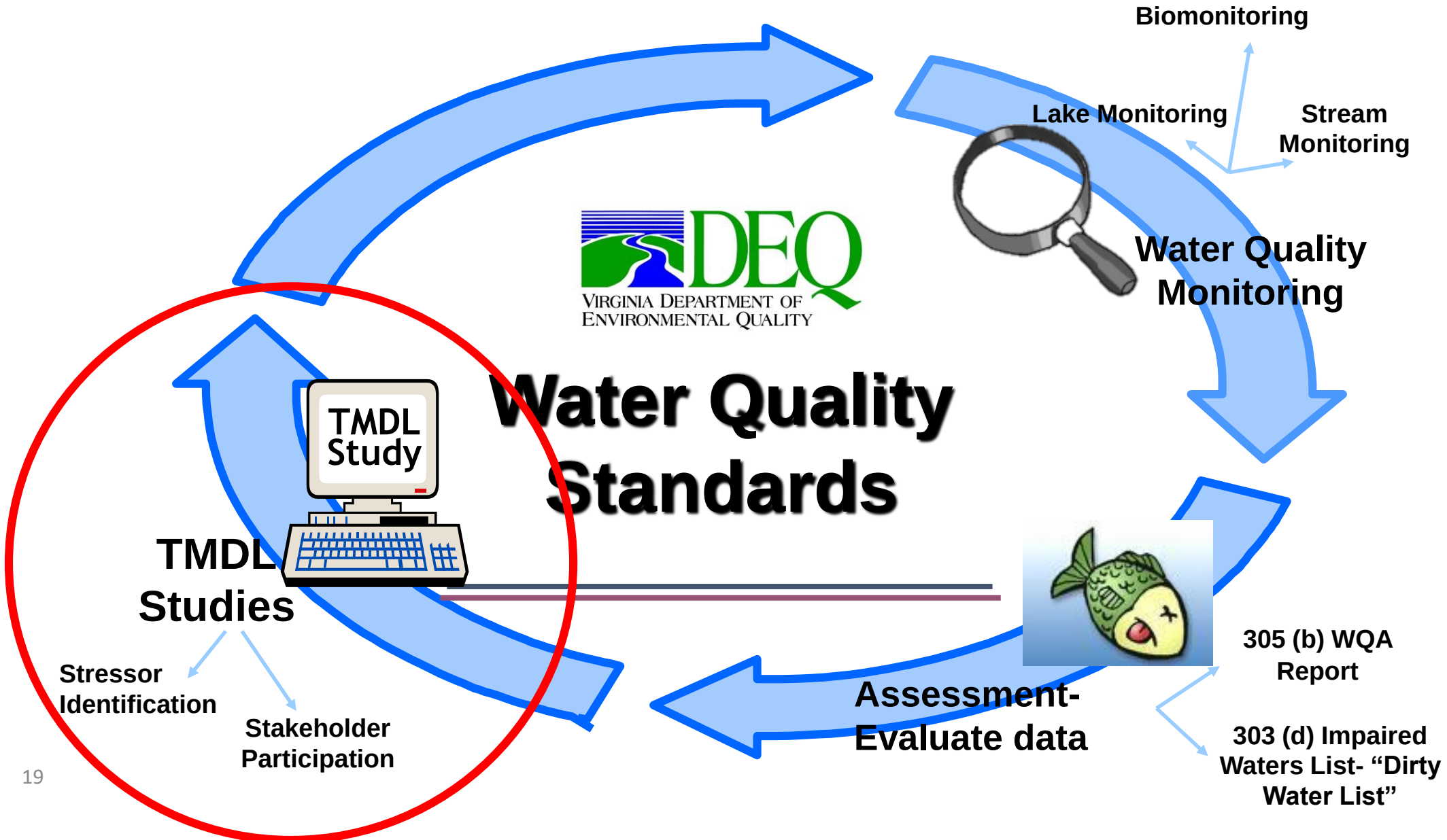
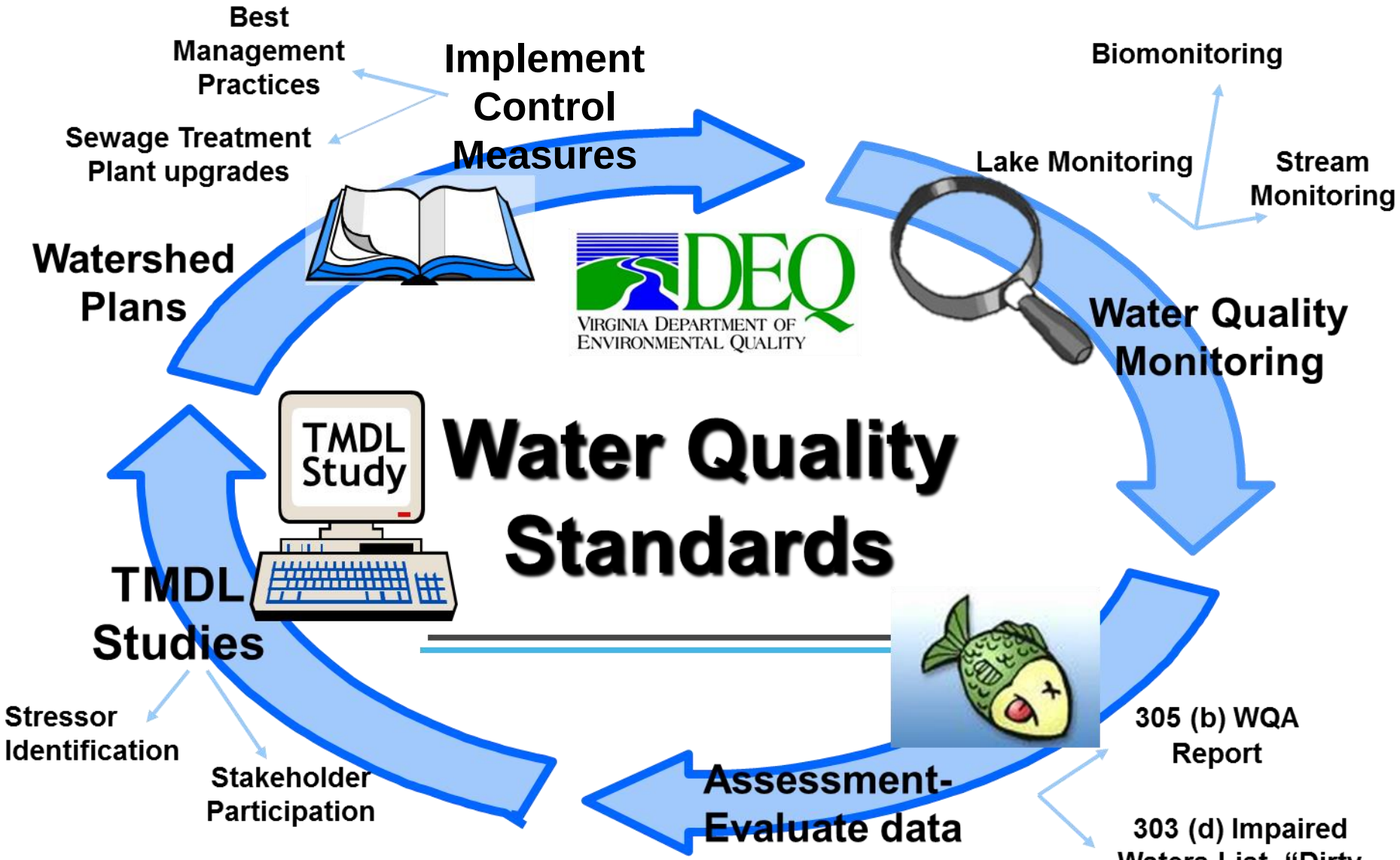
DEQ's Water Wheel



DEQ's Water Wheel



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Why focus on Fryingpan Creek, Pigg River, Poplar Branch, and Beaverdam Creek?

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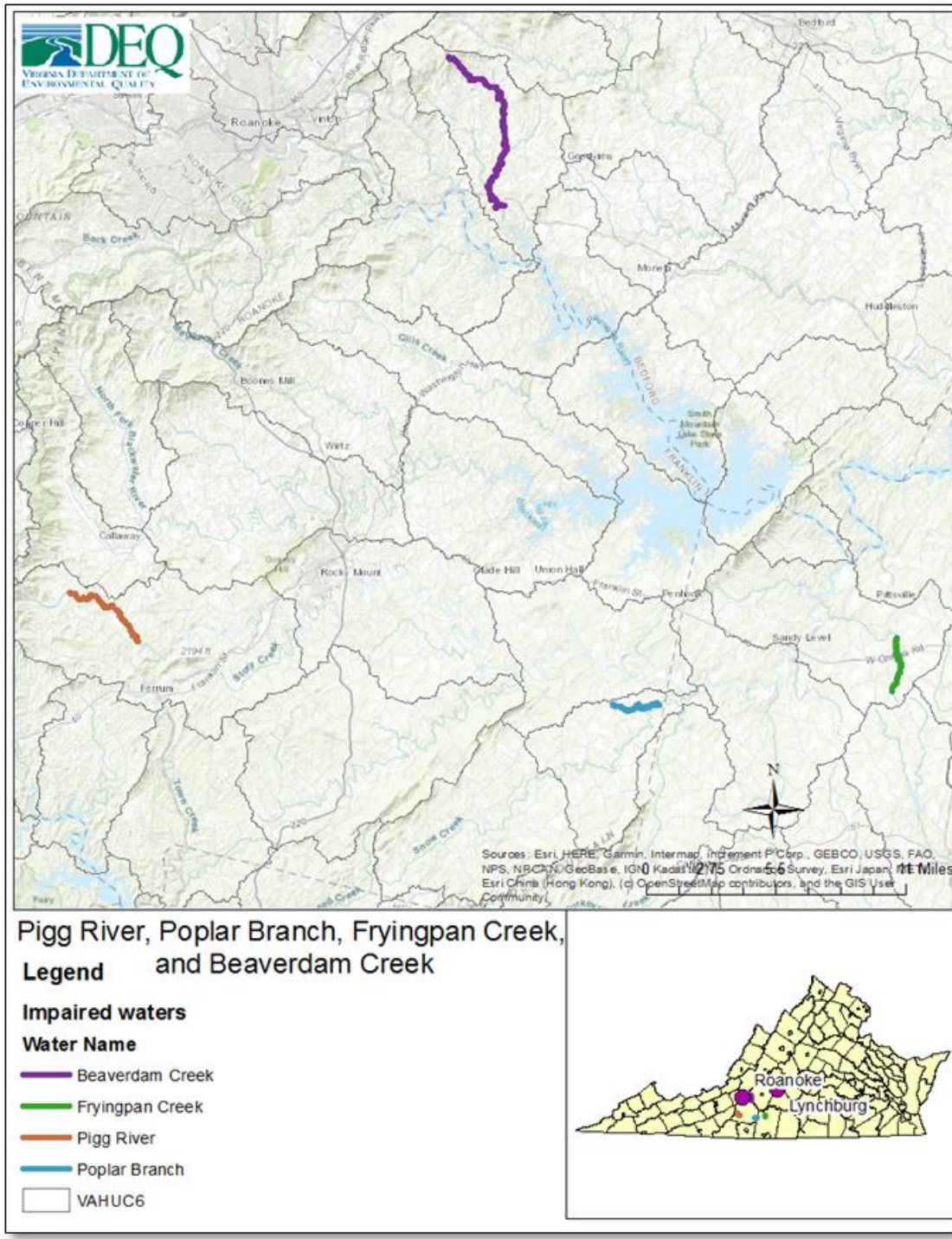
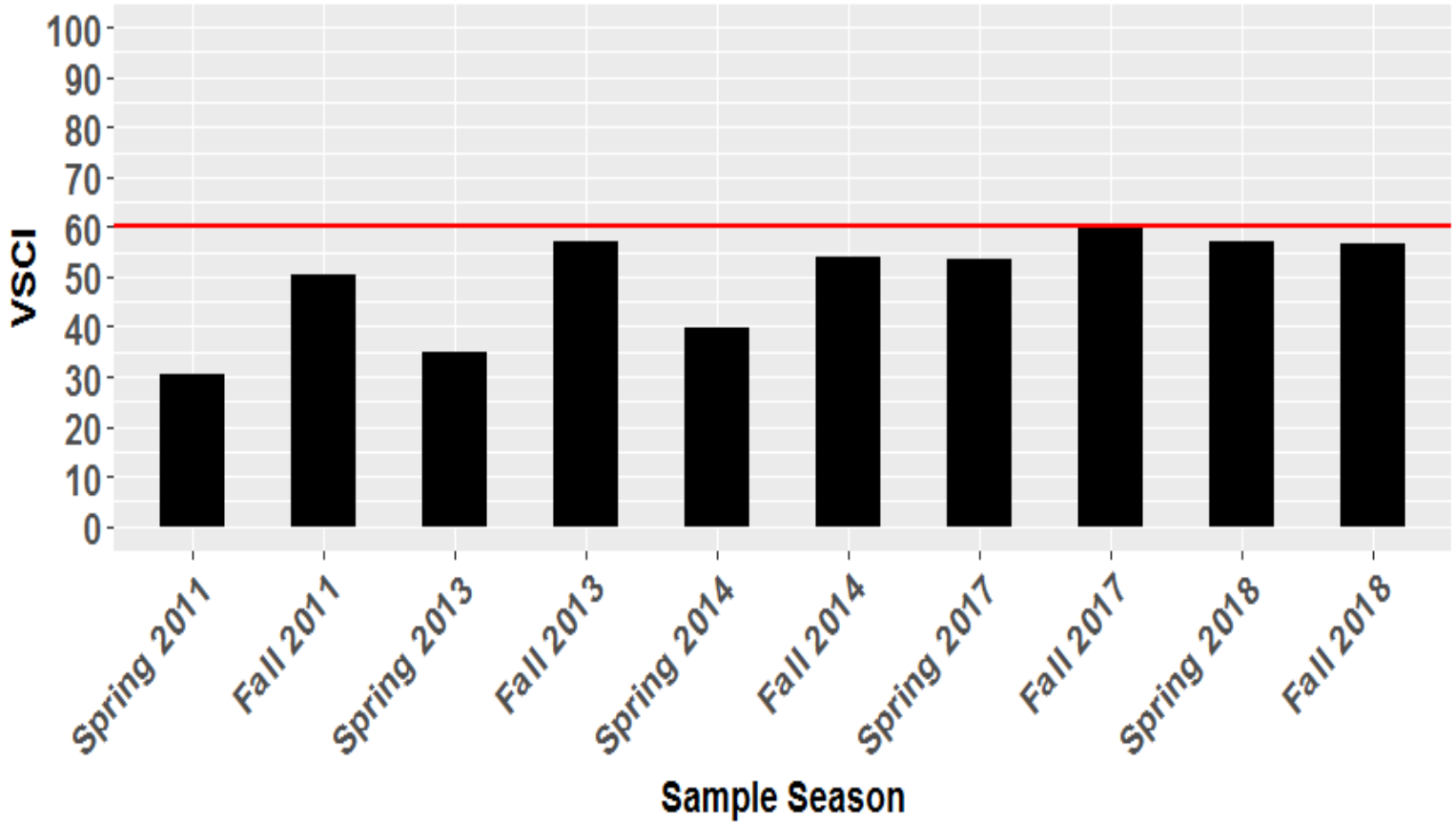
Fryingpan Creek, Pigg River, Poplar Branch and Beaverdam Creek

- Fryingpan Creek: Pittsylvania County
  - 2.56 miles from its headwaters downstream of the Rt. 40 crossing
- Pigg River: Franklin County
  - 4.43 miles from near Five Mile Mountain Road (Rt. 748) on downstream to the confluence of Turners Creek
- Poplar Branch: Franklin County
  - 2.56 miles from headwaters to confluence with Snow Creek
- Beaverdam Creek: Bedford County
  - 10.33 miles from mainstem waters from the 795 ft. pool elevation of Smith Mountain Lake upstream to its headwaters



Fryingpan Creek Biomonitoring Data



Low VSCI scores are driven by % Mayflies, % Stoneflies and Caddisflies, and % Scrapers

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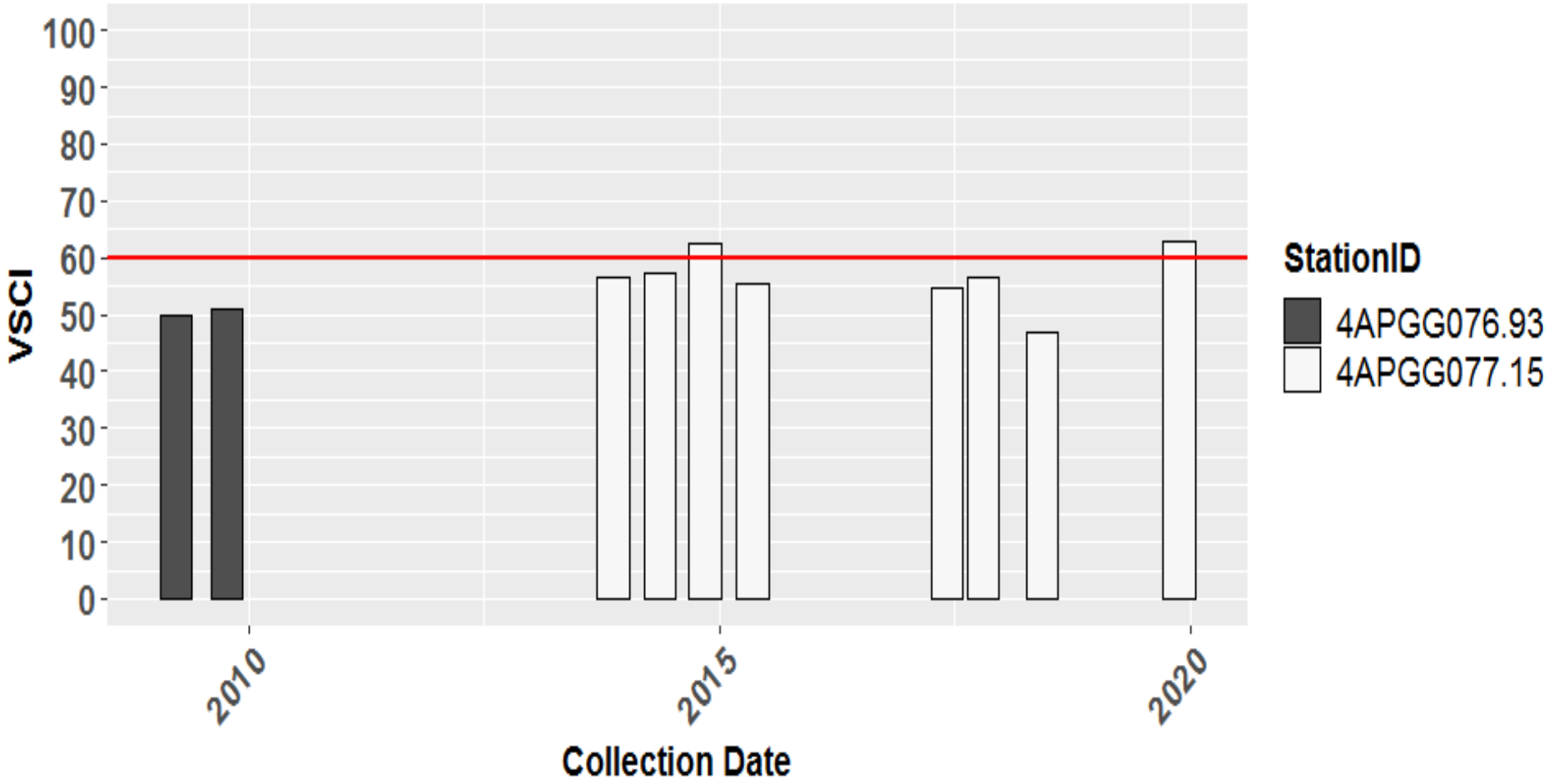
Pigg River Biomonitoring Data



Low VSCI scores are driven by % Mayflies, % Stoneflies and Caddisflies, and % Scrapers

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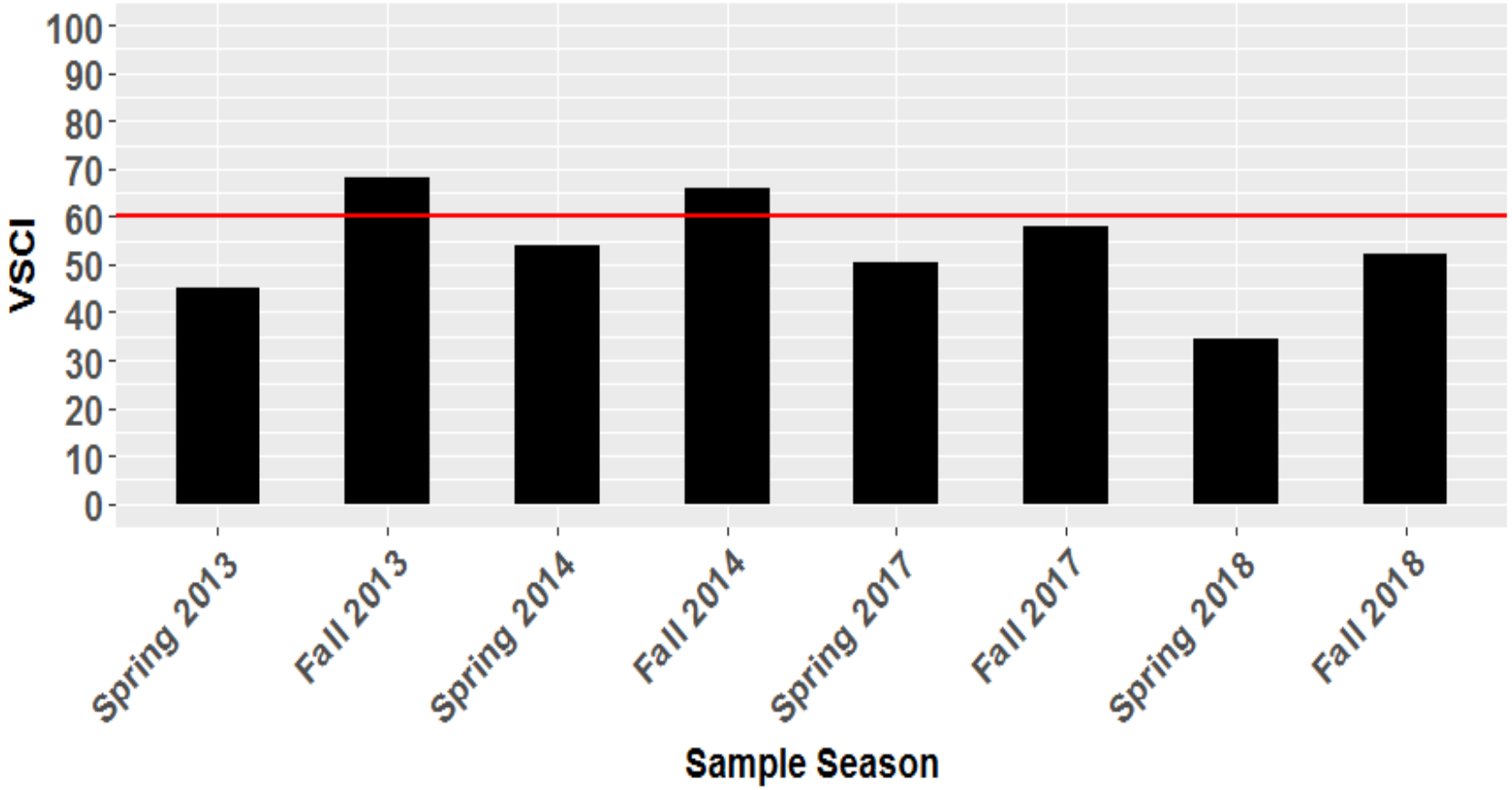
Poplar Branch Biomonitoring Data



Low % Mayflies, and low % stoneflies and caddisflies

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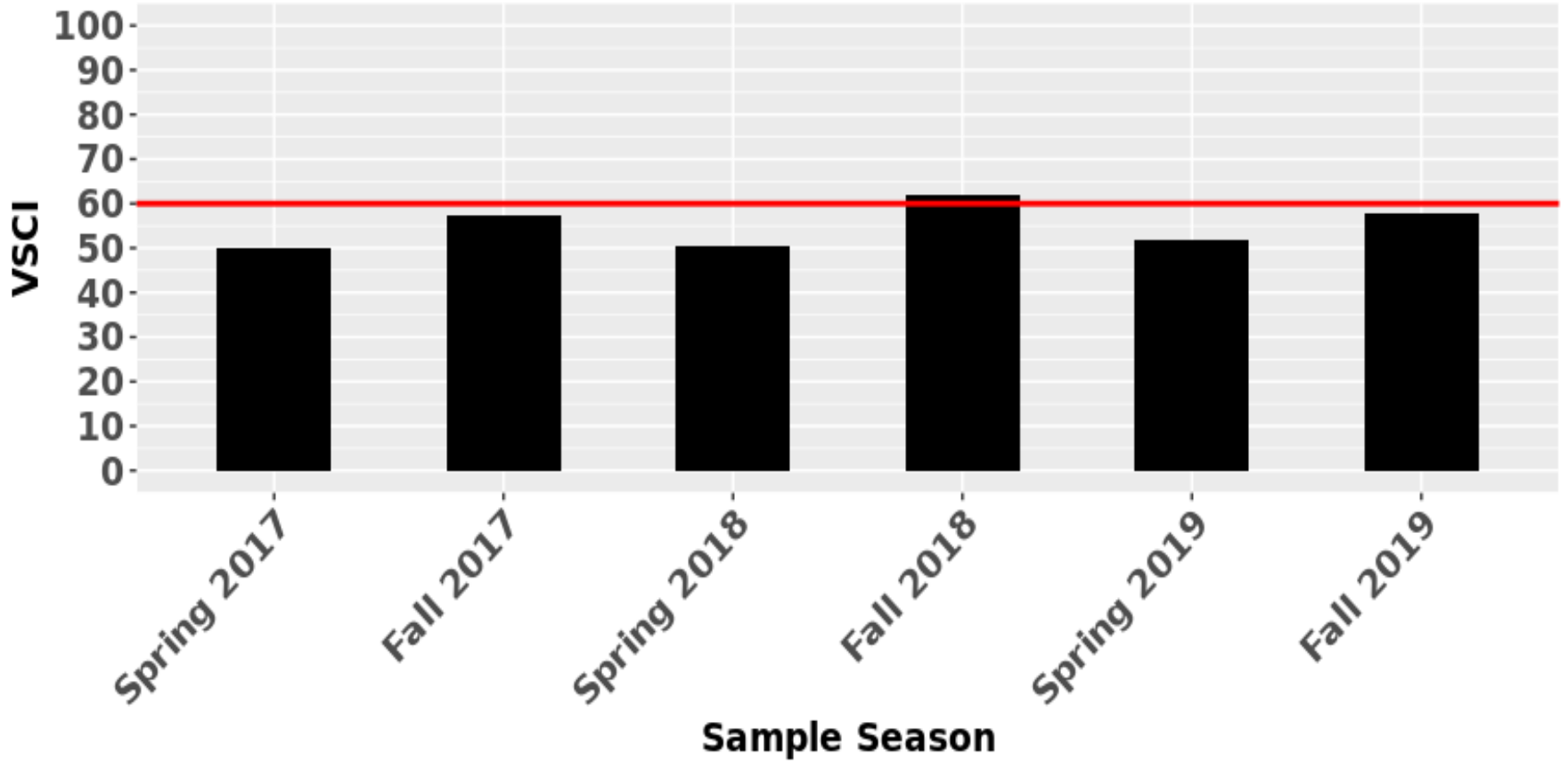
Beaverdam Creek Biomonitoring Data



Low % Mayflies, low % stoneflies and caddisflies, and low % scrapers

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Candidate Stressors

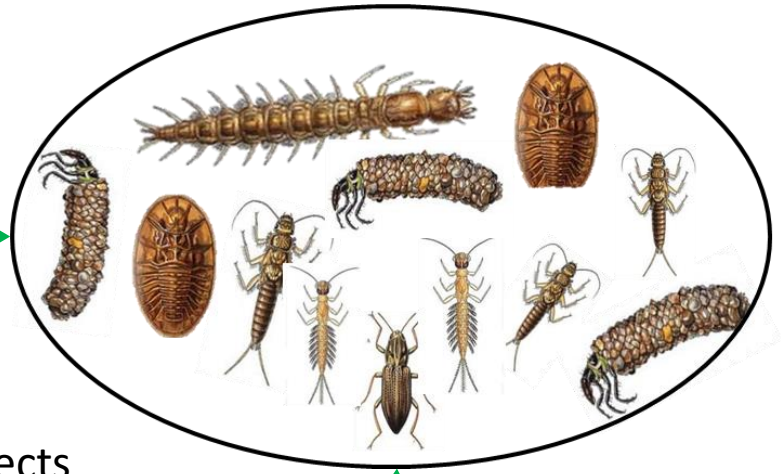
Sediment measured by:
TSS
Total Habitat scores
LRBS

Indirect Effects

Habitat

pH
DO
Dissolved Metals
Temperature
Toxins
Conductivity

Direct Effects



Total Phosphorus
Total Nitrogen
Organic Matter

Indirect Effects

Food Resources

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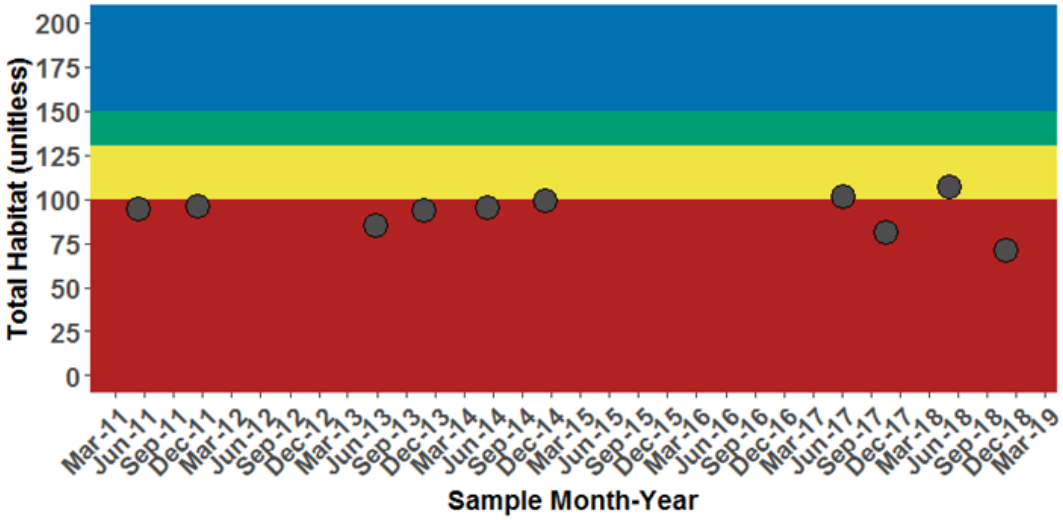
Fryingpan Creek Stressor Analysis

- Total Habitat Scores were consistently low and driven by excess sediment and unstable banks.

Station ID	Date	Channel Alteration	Banks	Bank Vegetation	Embeddedness	Flow	Riffles	Riparian Vegetation	Sediment	Substrate	Velocity	Total Habitat
4AFRY006.08	2013-05-28	12	2	6	11	14	12	11	2	4	11	85
4AFRY006.08	2013-10-28	12	2	10	9	18	10	7	5	11	9	93
4AFRY006.08	2014-11-12	11	4	13	11	19	6	10	3	6	16	99

Station ID	Date	Channel Alteration	Bank Stability	Bank Vegetation	Flow	Pool Substrate	Pool Variability	Riparian Vegetation	Sediment	Sinuosity	Substrate	Total Habitat
4AFRY006.08	2011-05-16	18	6	10	16	6	5	10	7	9	7	94
4AFRY006.08	2011-11-16	18	4	6	19	5	6	14	8	11	5	96
4AFRY006.08	2014-05-14	12	4	10	15	11	5	16	5	8	9	95
4AFRY006.08	2017-06-07	15	4	18	15	7	4	16	6	9	7	101
4AFRY006.08	2017-10-18	12	4	10	10	11	5	12	5	7	5	81
4AFRY006.08	2018-05-07	15	2	15	19	10	9	13	8	8	8	107
4AFRY006.08	2018-11-01	15	3	3	15	7	3	13	4	5	3	71



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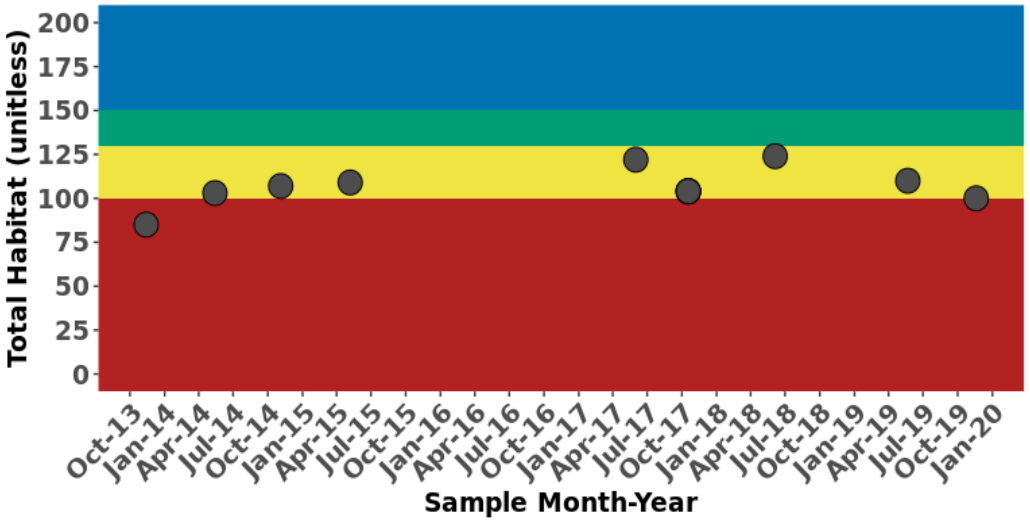
Pigg River Stressor Analysis

- The median total habitat score was in the medium probability category for aquatic stress and banks were observed to be unstable with little riparian vegetation.

Station ID	Date	Channel Alteration	Banks	Bank Vegetation	Embeddedness	Flow	Riffles	Riparian Vegetation	Sediment	Substrate	Velocity	Total Habitat
4APGG077.15	2013-11-13	3	0	6	11	11	18	2	6	12	16	85
4APGG077.15	2014-05-14	7	4	8	12	15	18	4	7	11	17	103
4APGG077.15	2014-11-04	11	4	10	12	12	18	2	7	13	18	107
4APGG077.15	2015-05-07	11	6	10	11	15	19	4	8	10	15	109
4APGG077.15	2017-06-01	14	8	10	11	16	16	6	8	15	18	122
4APGG077.15	2017-10-18	14	4	8	14	11	17	4	7	12	13	104
4APGG077.15	2018-06-05	15	4	10	18	19	18	4	11	10	15	124
4APGG077.15	2019-05-22	13	7	12	8	17	18	4	8	8	15	110
4APGG077.15	2019-11-19	15	11	8	3	18	16	2	5	8	14	100



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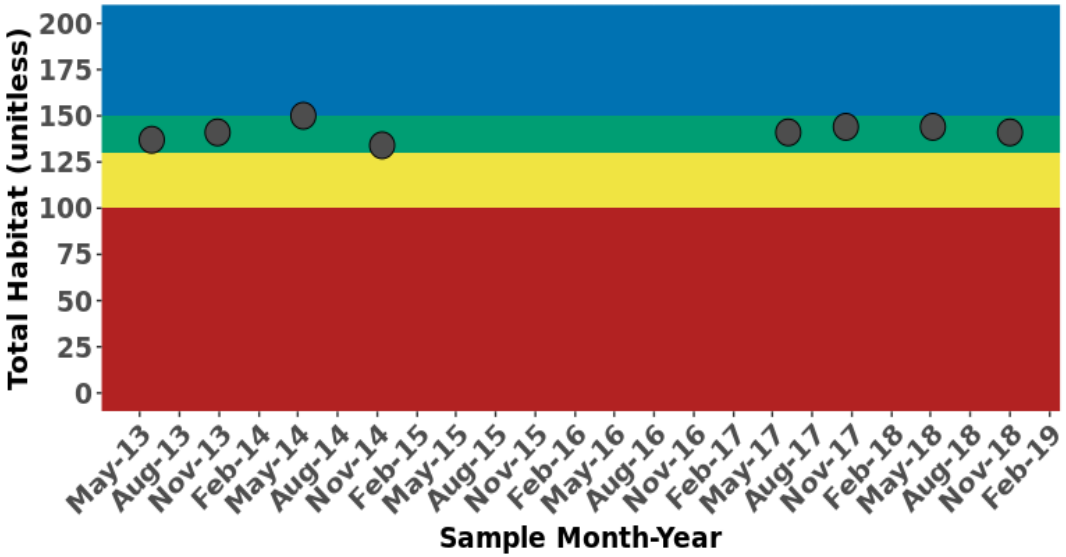
Poplar Branch Stressor Analysis

- The median total habitat score was in the medium probability category for aquatic stress and banks were observed to be unstable with little riparian vegetation.

Station ID	Date	Channel Alteration	Banks	Bank Vegetation	Embeddedness	Flow	Riffles	Riparian Vegetation	Sediment	Substrate	Velocity	Total Habitat
4APAA000.71	2013-05-29	17	14	18	14	12	16	13	8	13	14	137
4APAA000.71	2013-10-28	15	18	14	17	7	18	7	12	17	16	141
4APAA000.71	2014-05-14	18	16	18	16	8	20	14	9	18	13	150
4APAA000.71	2014-11-12	19	13	14	13	11	19	8	8	16	13	134
4APAA000.71	2017-06-07	15	10	16	16	10	19	16	9	15	15	141
4APAA000.71	2017-10-18	19	9	15	17	8	19	17	11	19	10	144
4APAA000.71	2018-05-07	19	10	13	17	11	19	15	10	15	15	144
4APAA000.71	2018-11-01	19	10	15	15	13	19	14	10	15	11	141



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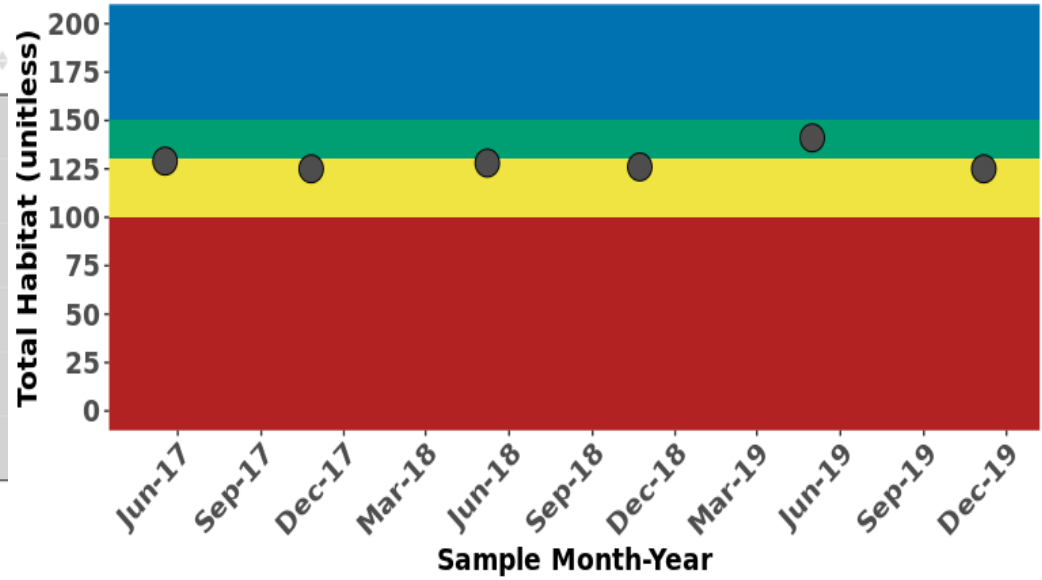
Beaverdam Creek Stressor Analysis

- The median total habitat score was in the medium probability category for aquatic stress and banks were observed to be unstable with excess sediment observed.

Station ID	Date	Channel Alteration	Banks	Bank Vegetation	Embeddedness	Flow	Riffles	Riparian Vegetation	Sediment	Substrate	Velocity	Total Habitat
4ABDA004.14	2017-05-18	15	8	14	11	18	16	12	7	11	17	129
4ABDA004.14	2017-10-26	14	8	12	16	15	16	12	6	11	15	125
4ABDA004.14	2018-05-08	15	9	13	18	16	14	8	8	12	15	128
4ABDA004.14	2018-10-23	15	5	12	14	17	17	10	8	11	17	126
4ABDA004.14	2019-05-01	15	7	12	18	19	17	13	6	16	18	141
4ABDA004.14	2019-11-06	15	10	10	10	16	14	8	11	15	16	125



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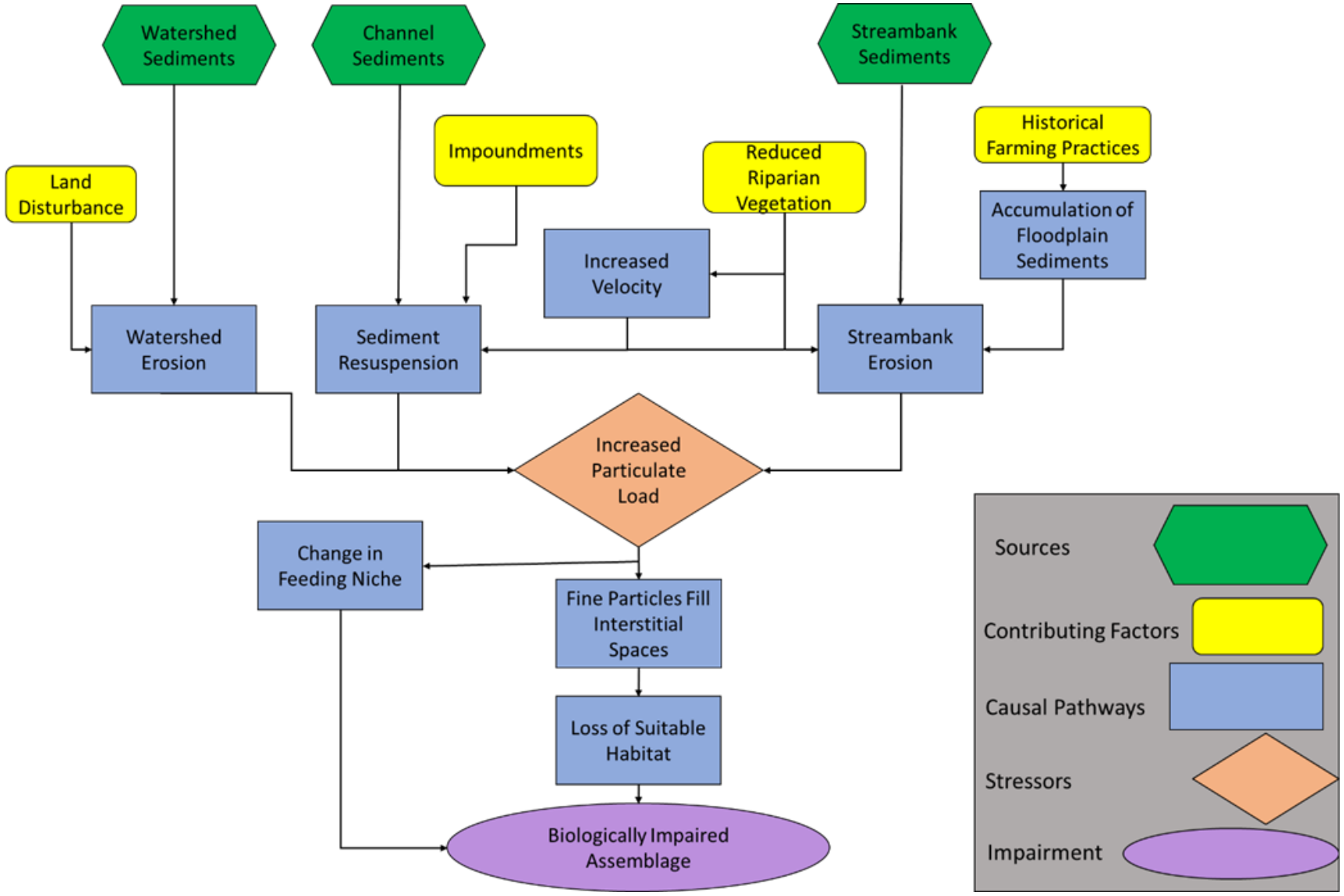
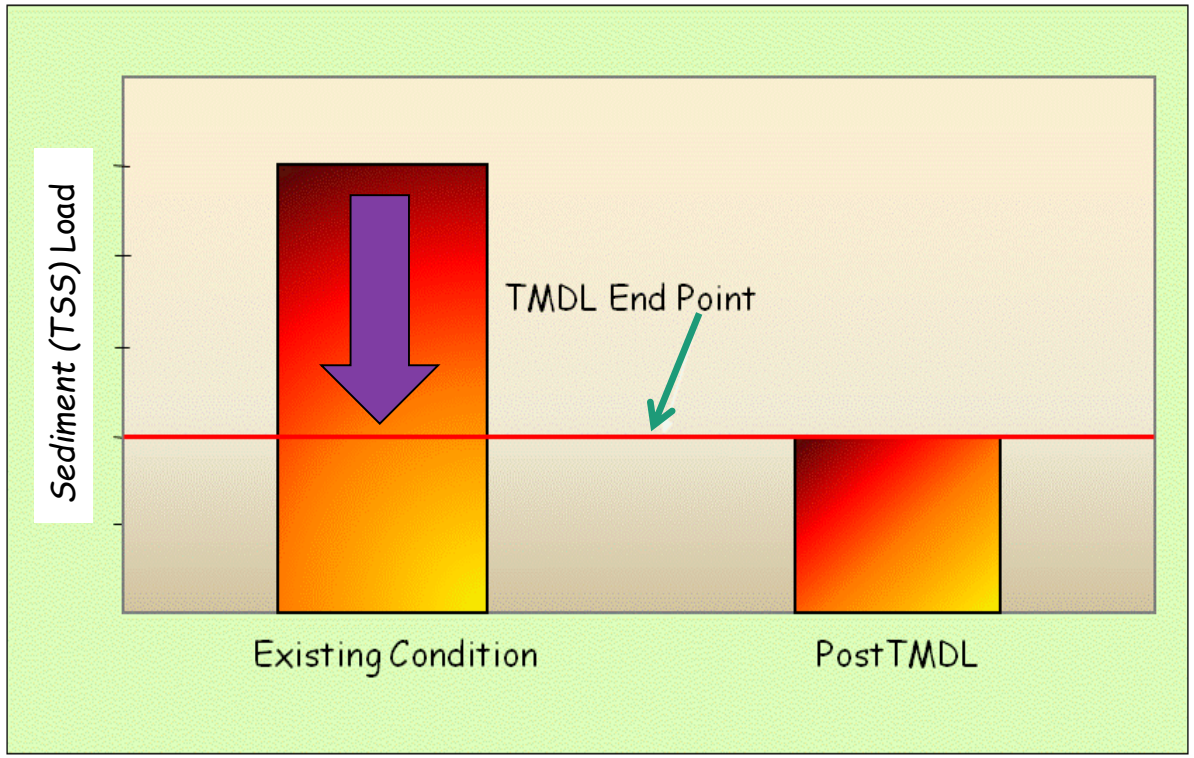
Causal Analysis- Sediment



What needs to be done to improve the water quality?

Develop a TMDL equation for sediment

- Develop a TMDL equation that will help us meet the post TMDL scenario
  - First we need to identify the endpoint



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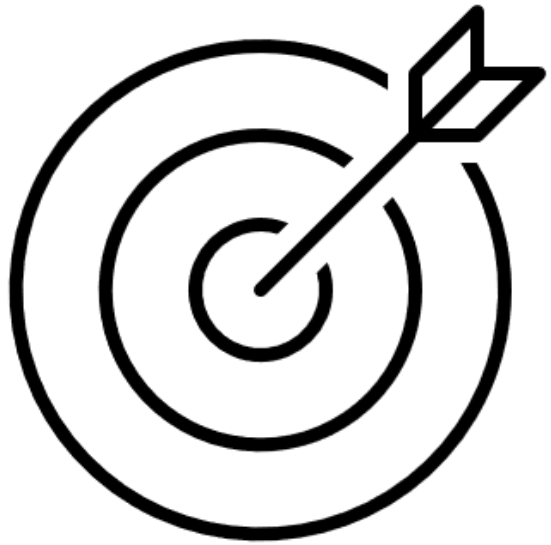
TMDL Reductions Need a Target to Shoot For

- Some pollutants have numerical criteria in regulations to set acceptable levels (e.g. bacteria counts)
- Other pollutants are expected to vary among ‘healthy’ watersheds, so there is no set regulatory threshold (e.g. sediment)



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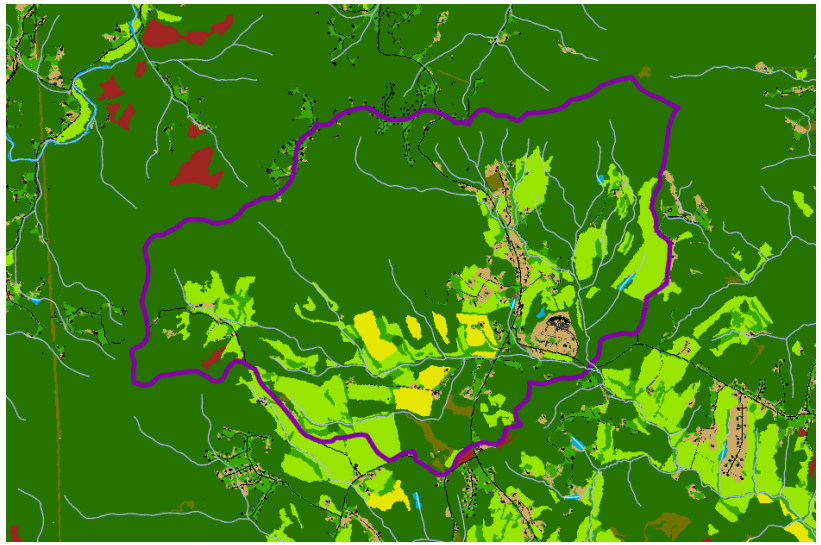
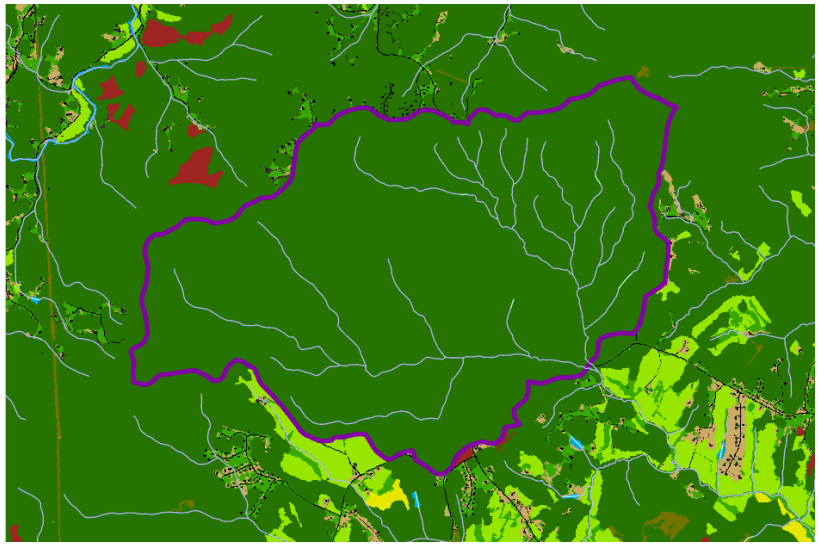
Sediment TMDL Endpoint- AllForX Computer Modeling

- All-Forested Load Multiplier (AllForX) Approach selected
  - Used widely in Virginia since 2014
  - Doesn't rely on a single reference condition or watershed
  - Robust approach that compares the site to a range of similar watersheds
  - Directly links the TMDL endpoint to the health of aquatic life (VSCI scores)





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Developing a Pollutant Target

Impaired Stream	TSS Existing (lb/yr)	TSS AllForest (lb/yr)	TSS Target (lb/yr)	Estimated % Reduction
Beaverdam Creek	3,069,353	532,823	2,520,252	17.9%
Fryingpan Creek	999,244	69,690	329,636	67.0%
Pigg River	2,373,946	414,345	1,959,852	17.4%
Poplar Branch	290,676	35,481	167,826	42.3%

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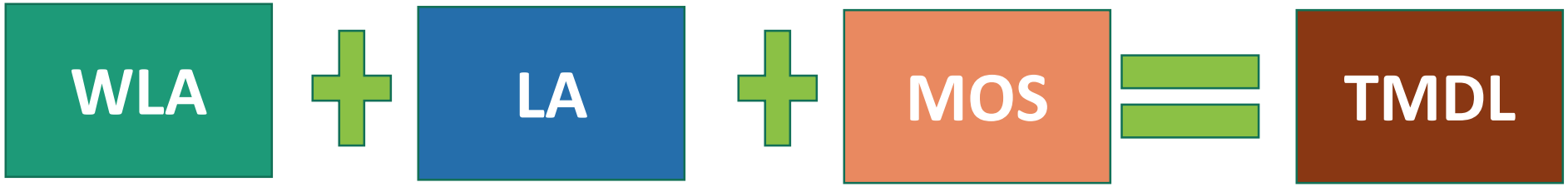
TMDL Equation



- WLA= Wasteload Allocation
  - Permitted/Point Source
- LA= Load Allocation
  - Nonpoint Source
- MOS= Margin of Safety
  - Extra load to account for uncertainty

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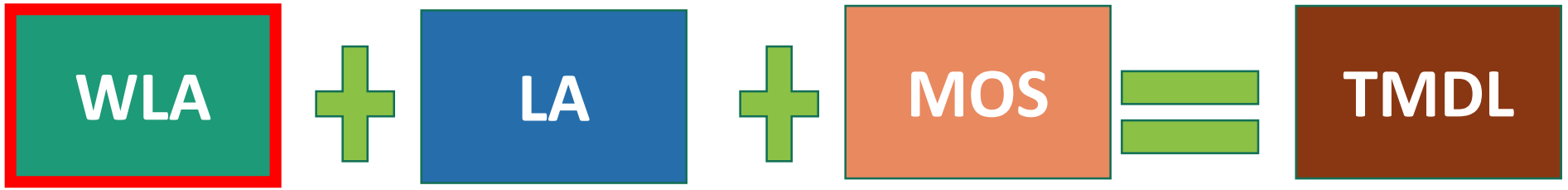
Identify point sources

- Permitted dischargers
- Construction permits

WATERSHED	STREAM	PERMIT NUMBER	PERMIT TYPE	PARAMETERS SAMPLED
BEAVERDAM CREEK	Nat Branch, UT	VA0020842	VPDES IP- municipal	pH, BOD, TSS, Cl_2, Ammonia, E. Coli
	Beaverdam Creek	VAG402030	Domestic Sewage	pH, BOD, TSS, DO, Cl_2
	Nat Branch, UT	VAG402101	Domestic Sewage	pH, BOD, TSS, DO, Cl_2



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Identify nonpoint sources

WLA + LA + MOS = TMDL

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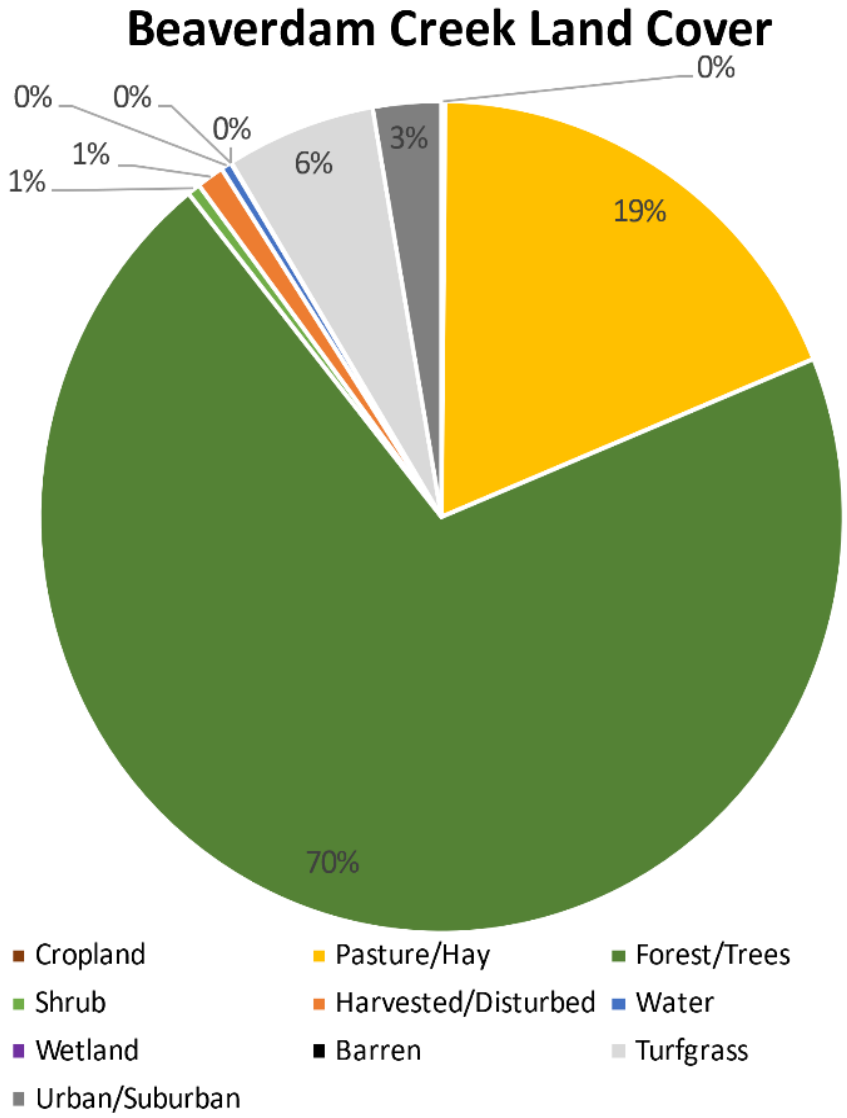
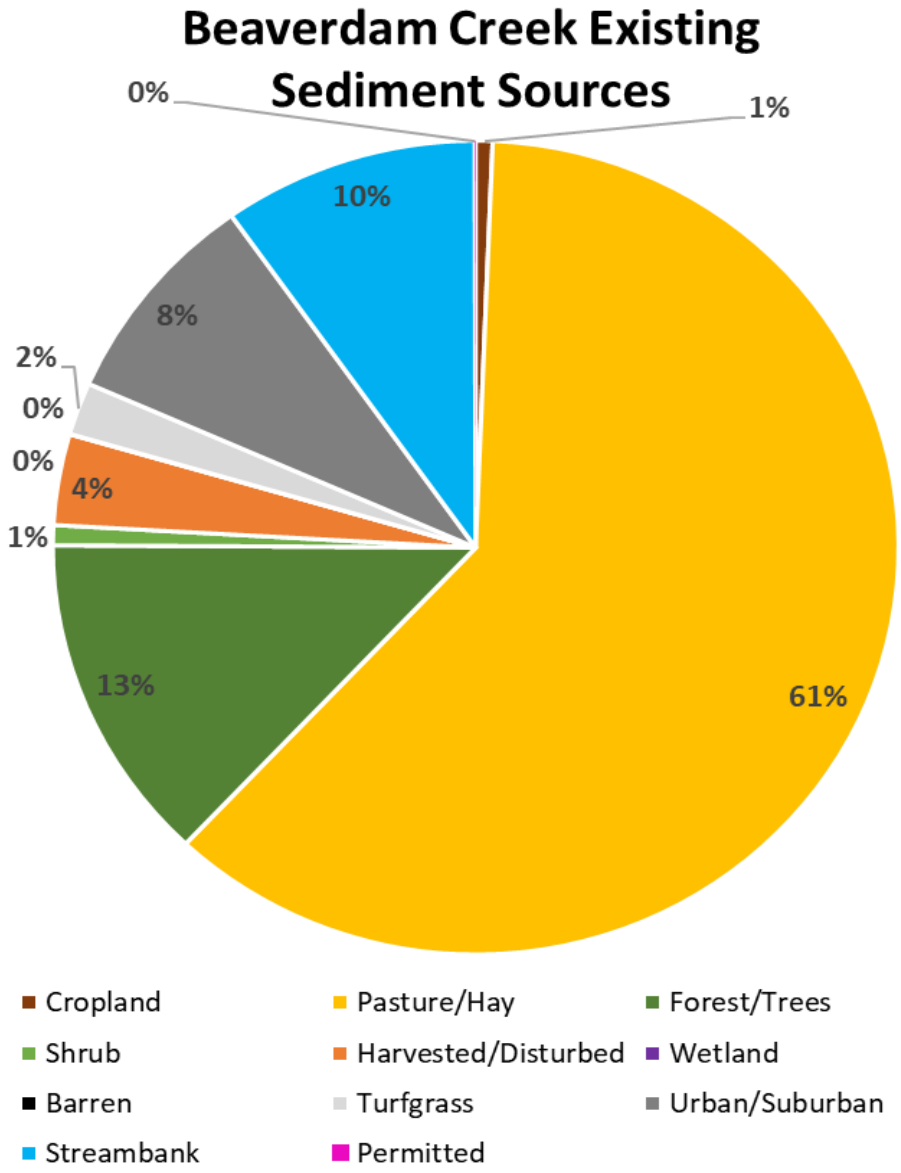
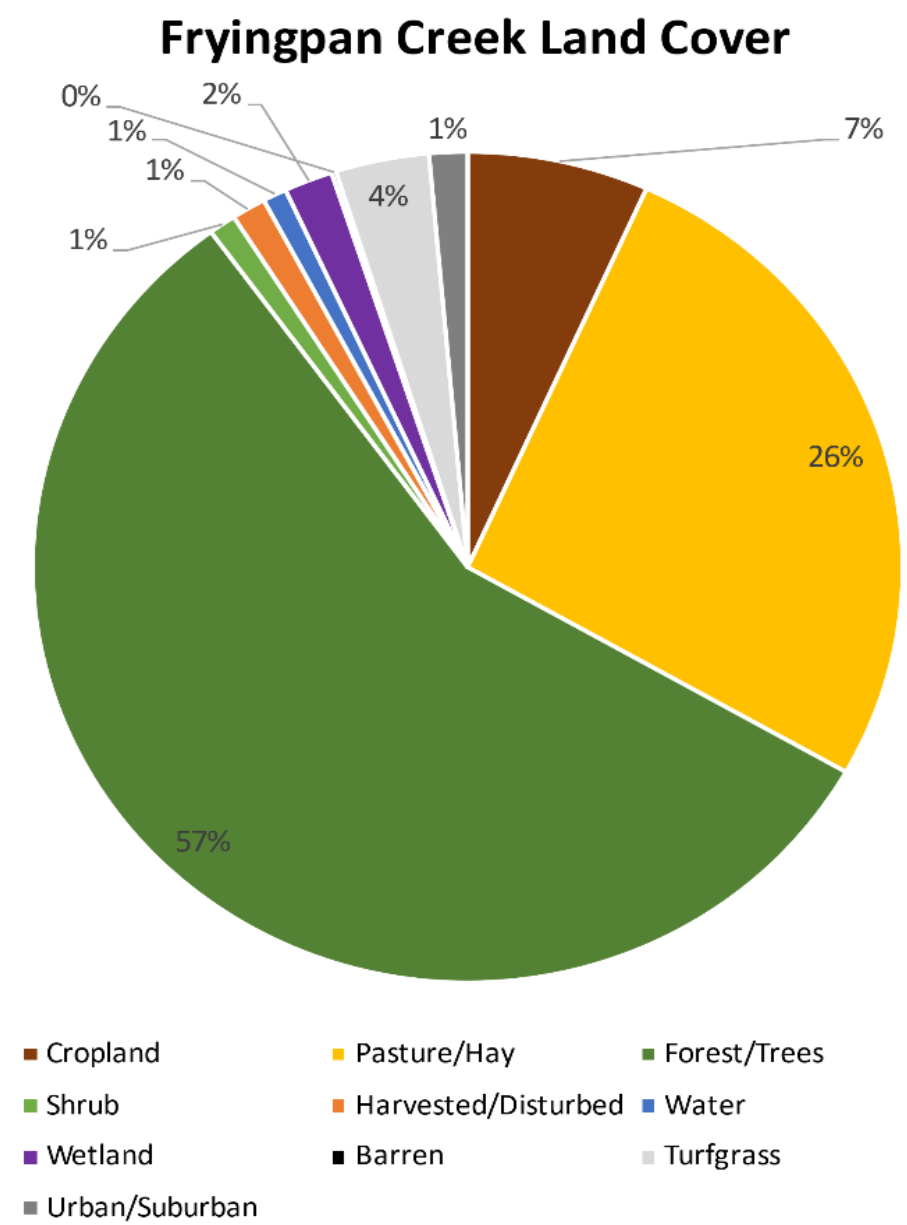
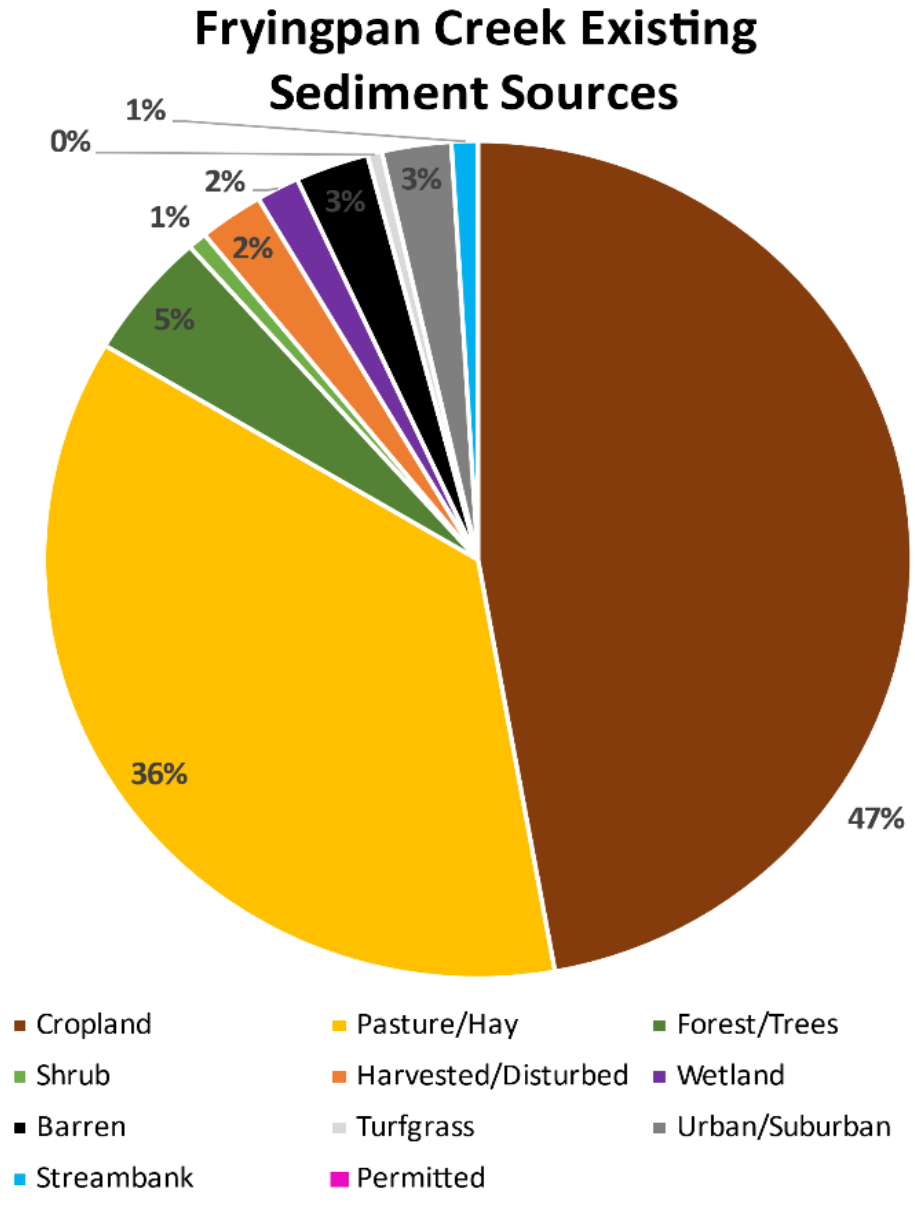
Beaverdam Land Cover





Fryingpan Creek Land Cover





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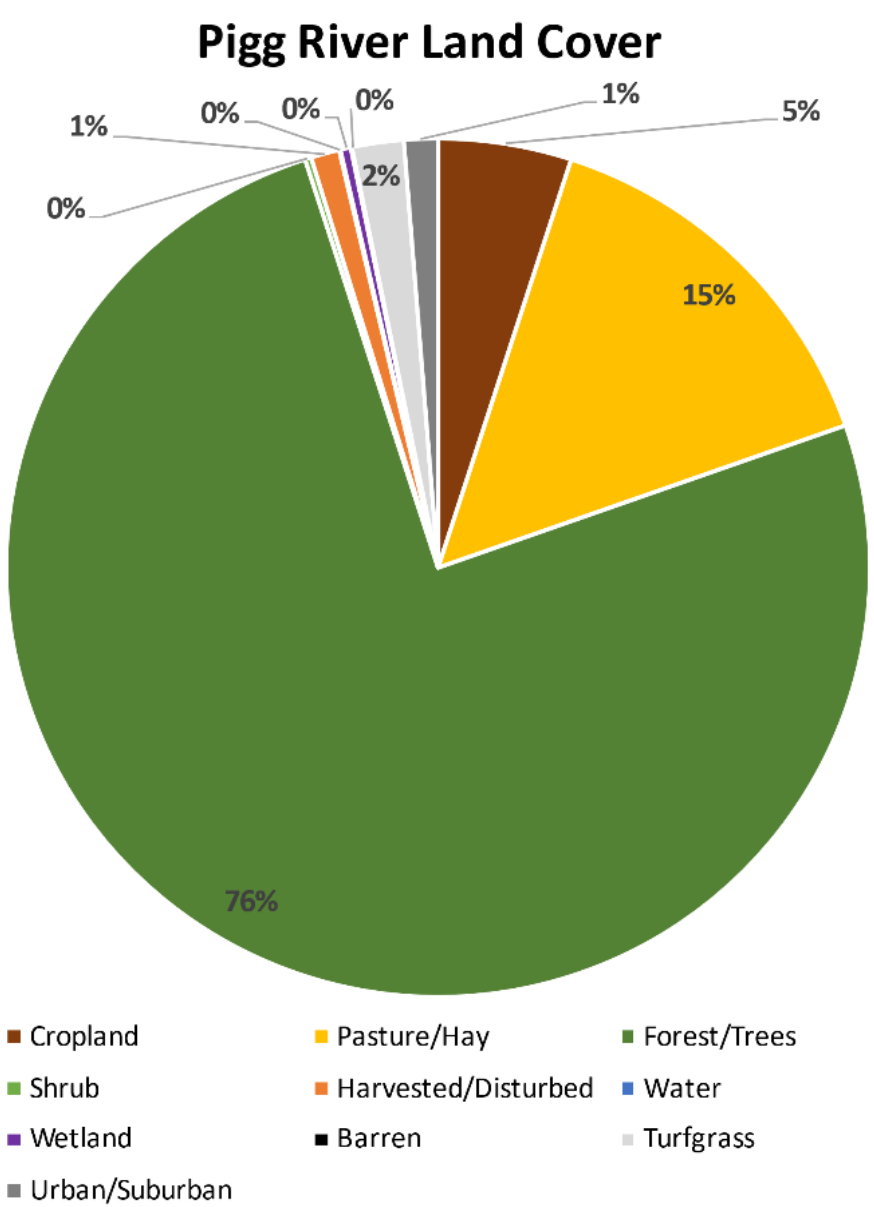
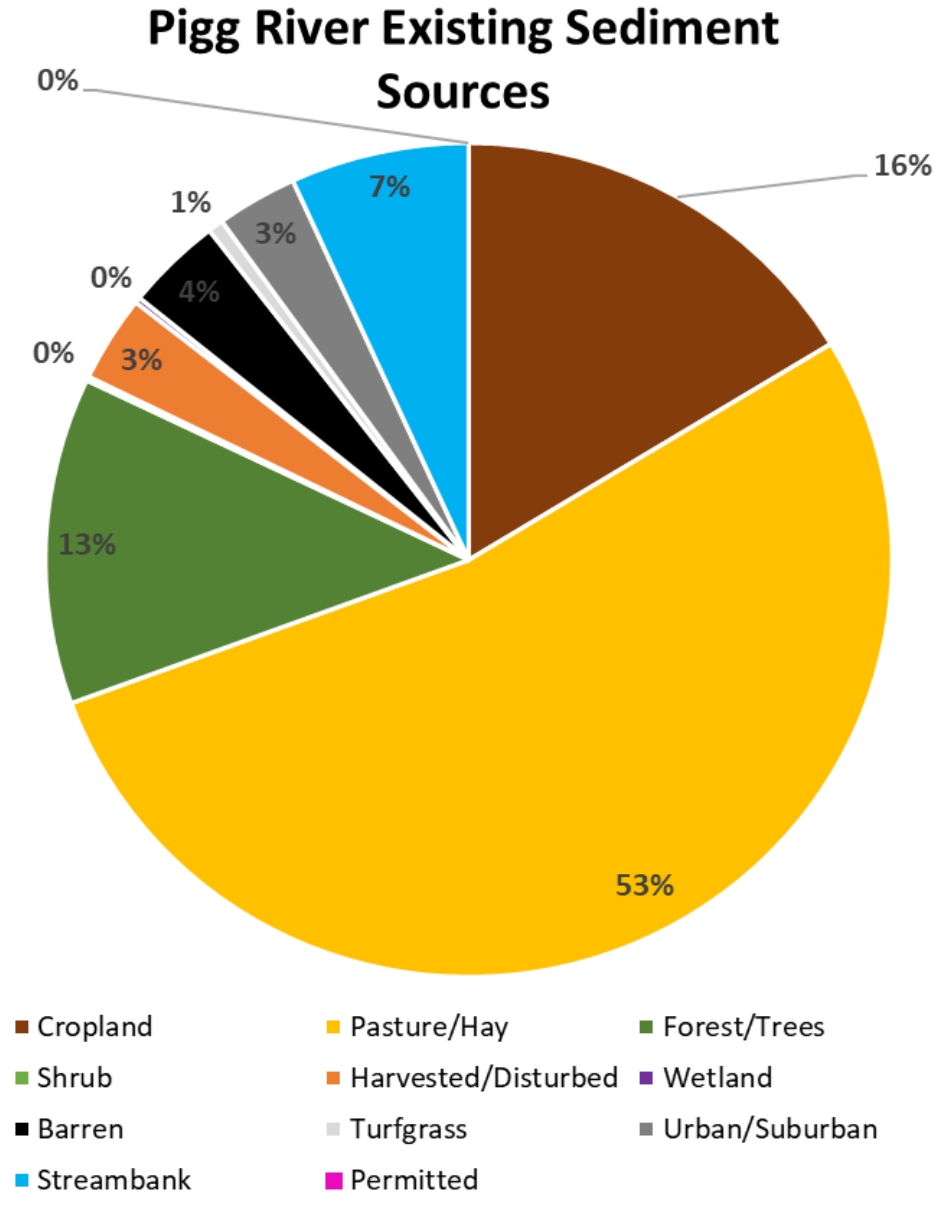
Pigg River Land Cover





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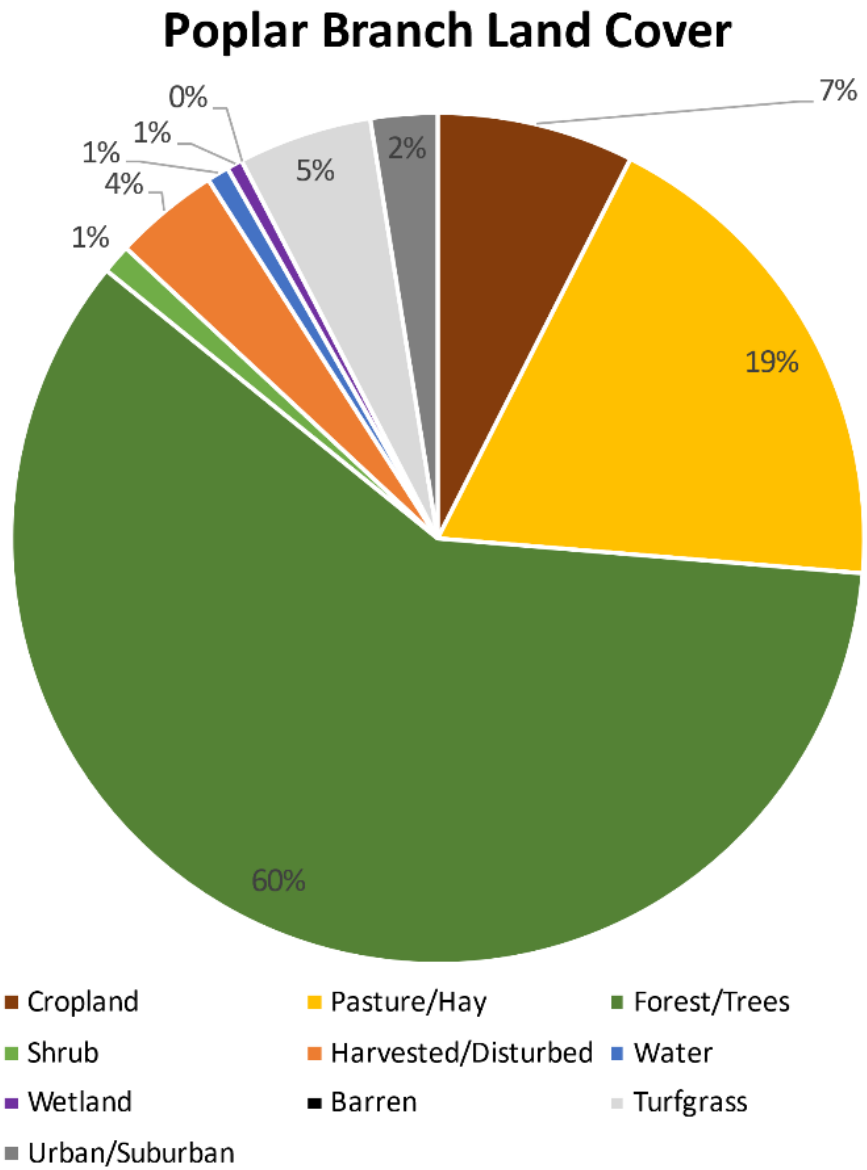
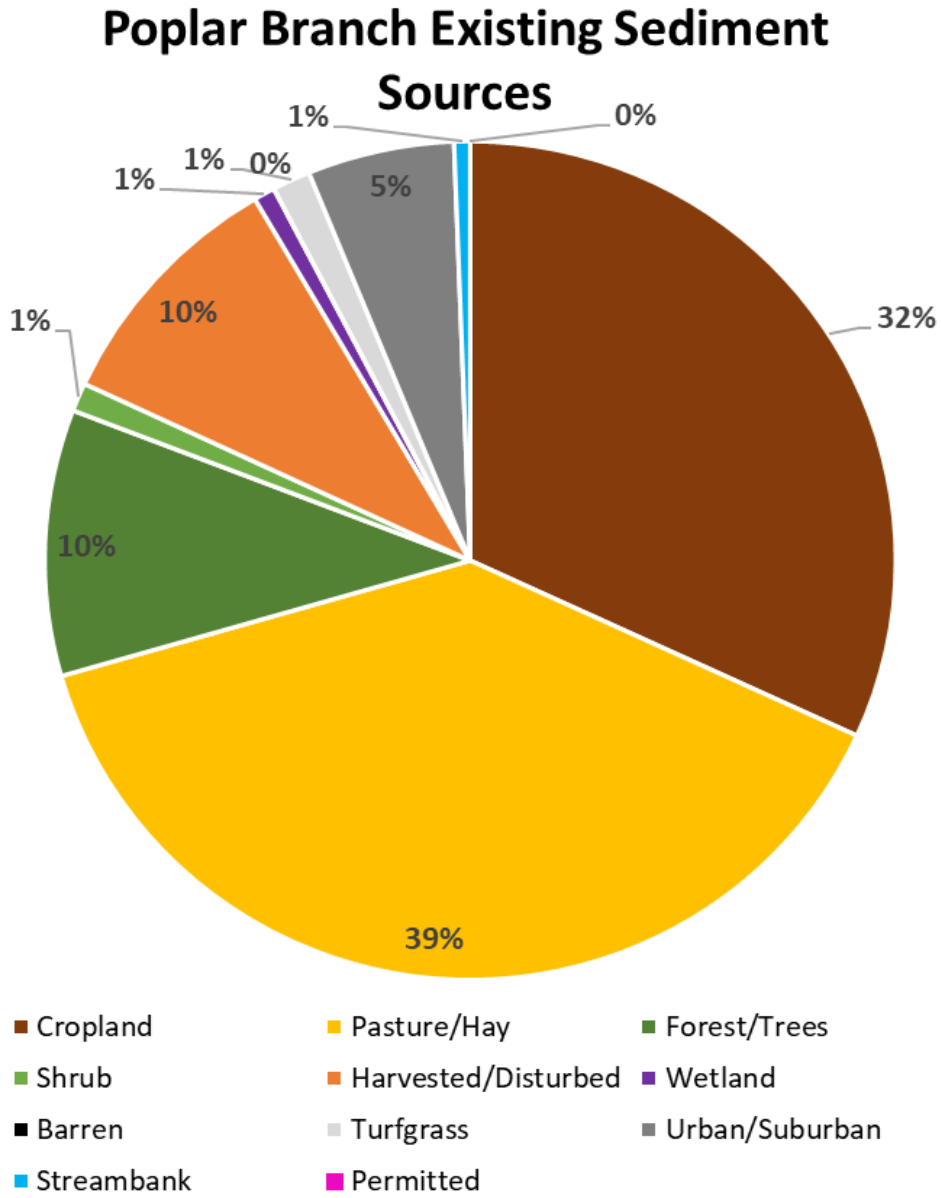
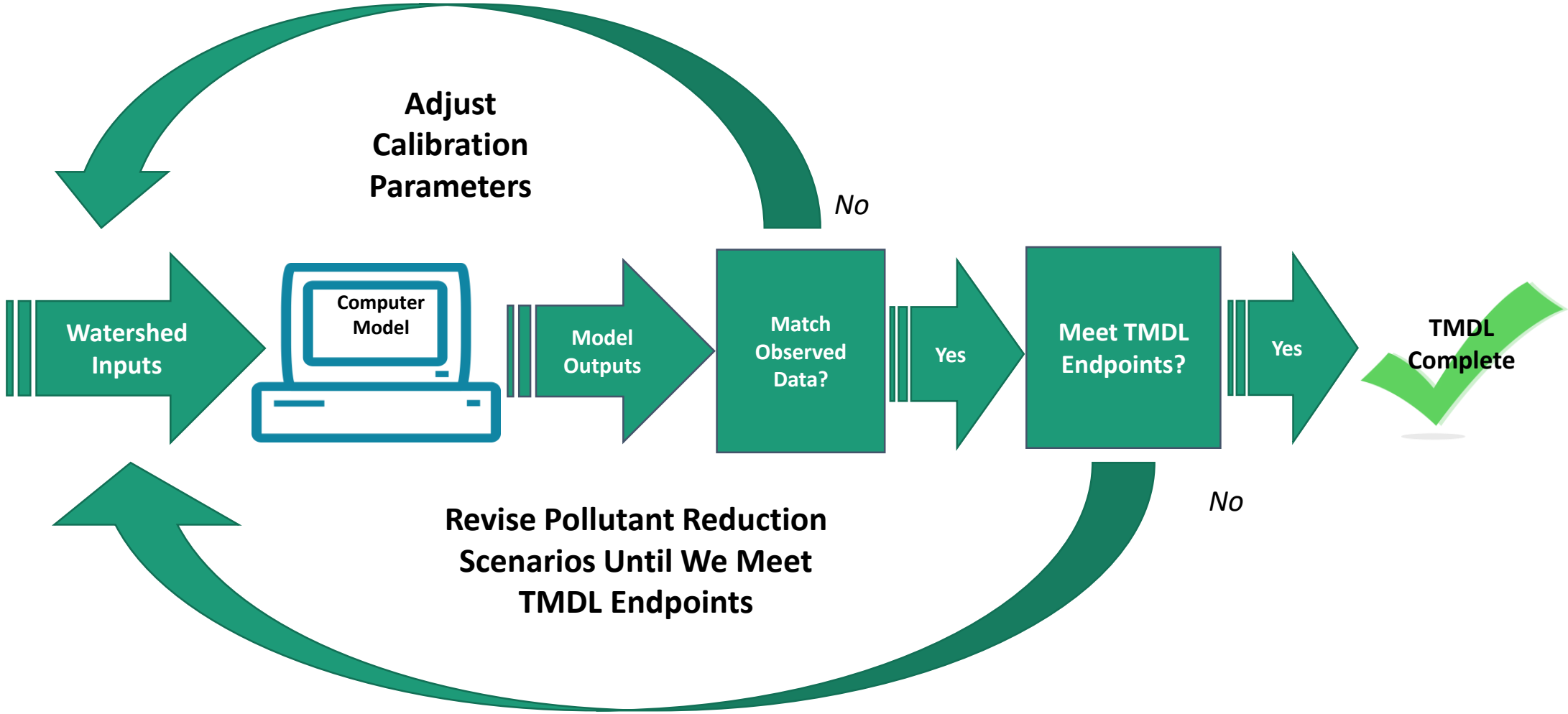
Poplar Branch Land Cover





Model Watershed and assign reductions



Biological Systems Engineering

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TMDL Equations

	WLA	+	LA	+	MOS	=	TMDL
Beaverdam Creek	54,140 lbs/yr	+	2,216,000 lbs/yr	+	252,000 lbs/yr	=	2,520,000 lbs/yr
Fryingpan Creek	6,593 lbs/yr	+	289,300 lbs/yr	+	32,960 lbs/yr	=	329,000 lbs/yr
Pigg River	39,200 lbs/yr	+	1,720,000 lbs/yr	+	196,000 lbs/yr	=	1,960,000 lbs/yr
Poplar Branch	3,357 lbs/yr	+	147,500 lbs/yr	+	16,780 lbs/yr	=	168,000 lbs/yr

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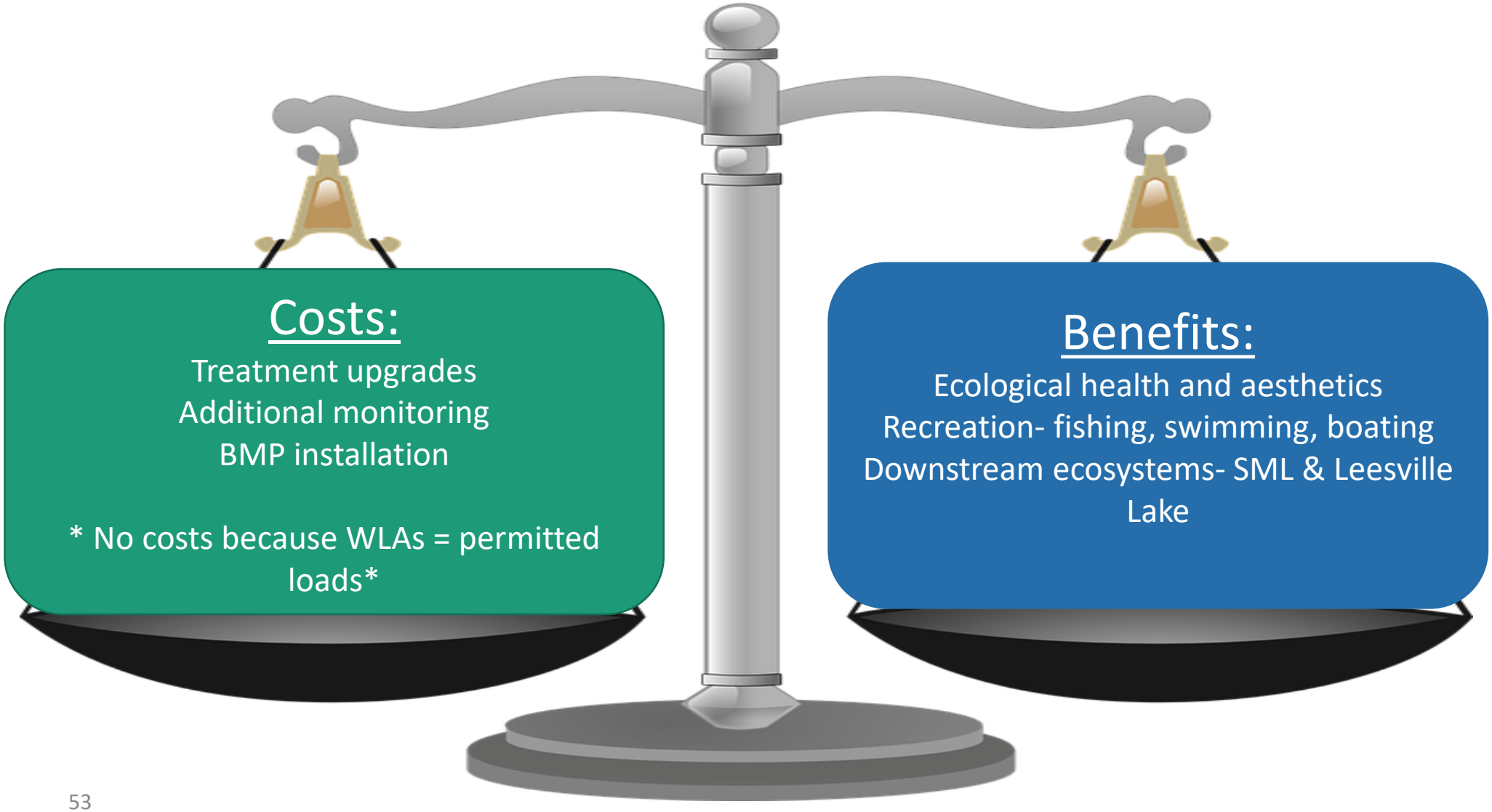
Sediment Allocation Loads

	Beaverdam Creek		Fryingpan Creek		Pigg River		Poplar Branch	
Source	Red. %	Allocation (lb/yr)	Red. %	Allocation (lb/yr)	Red. %	Allocation (lb/yr)	Red. %	Allocation (lb/yr)
Cropland	30.4	12,400	76.1	112,500	31.5	265,700	56.1	40,660
Hay	30.4	91,970	76.1	6,662	31.5	33,290	56.1	4,888
Pasture	30.4	1,173,000	76.1	76,010	31.5	829,800	56.1	44,490
Forest	-	304,700	-	42,260	-	270,100	-	25,070
Trees	-	96,380	-	6,609	-	30,640	-	4,793
Shrub	-	24,450	-	7,081	-	3,872	-	3,200
Harvested	30.4	77,130	76.1	5,756	31.5	54,500	56.1	12,280
Wetland	-	405	-	16,030	-	5,177	-	2,359
Barren	-	0	76.1	6,544	31.5	59,900	-	0
Turfgrass	30.4	44,560	76.1	1,287	31.5	9,586	56.1	1,846
Developed Pervious	30.4	3,716	76.1	71	31.5	1,322	56.1	261
Developed Impervious	30.4	180,000	76.1	6,092	31.5	48,910	56.1	6,861
Streambank Erosion	30.4	206,900	76.1	2,341	31.5	110,900	56.1	776
Permits	-	1,005	-	-	-	-	-	-
MOS (10%)	-	252,000	-	32,960	-	196,000	-	16,780
Future Growth (2%)	-	50,400		6,593		39,200		3,357
TOTAL		**2,520,000**		**329,000**		**1,960,000**		**168,000**
		23.7% red.		**67.8% red.**		**24.9% red.**		**46.1% red.**

TMDL Cost/Benefit Analysis



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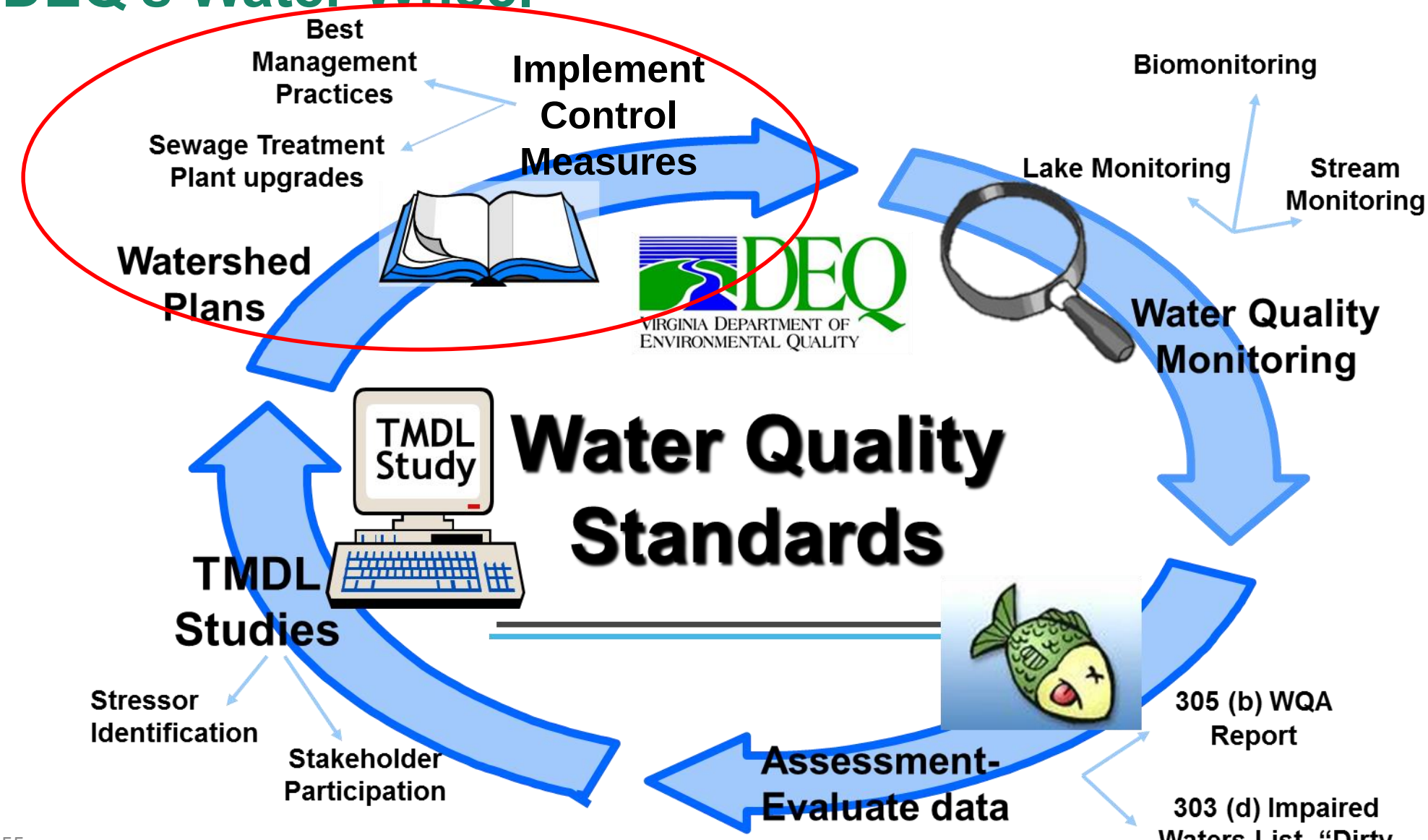
How can we meet the goals of the TMDL?

DEQ's Water Wheel



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TMDL Implementation Plan

A document that details actions or strategies that must be undertaken to achieve load reductions as defined by the TMDL.

Components of a TMDL Implementation Plan

1. **Executive Summary**
2. Introduction
3. State and Federal Requirements for Implementation Plans
4. Review of TMDL Development
5. Changes and Progress Since the TMDL Study
6. Public Participation
7. Implementation Actions
8. Measurable Goals and Milestones
9. Stakeholders' Roles and Responsibilities
10. Integration with Other Watershed Plans
11. Potential Funding Sources

"A goal without a plan is just a wish."
- Antoine de Saint-Exupery

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Implementation Plan Development

Agriculture Working Group

-Identify constraints and alternative funding sources

-Outreach methods for agricultural community

Government Working Group

- Identify funding sources, available technical resources, and measurable goals
- Identify potential parties to be responsible for implementation

Steering Committee

- Responsible for reviewing technical data, assessing working group input, guiding the process
- Meet 2-3 times
- Includes agencies, local government, SWCD, stakeholders etc.

Residential Working Group

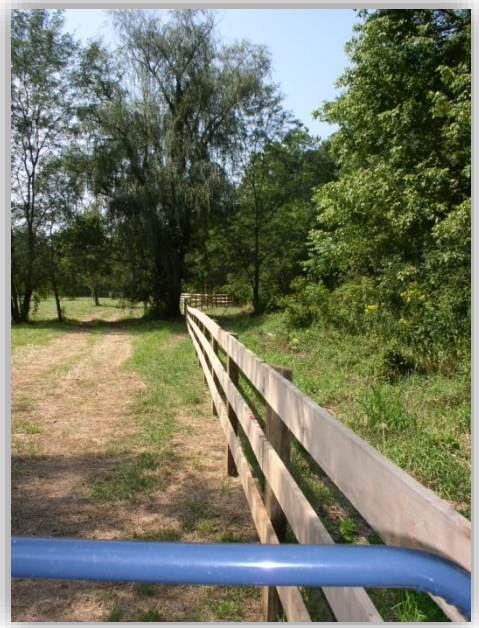
- Identify constraints and alternative funding
- Identify outreach methods to homeowners

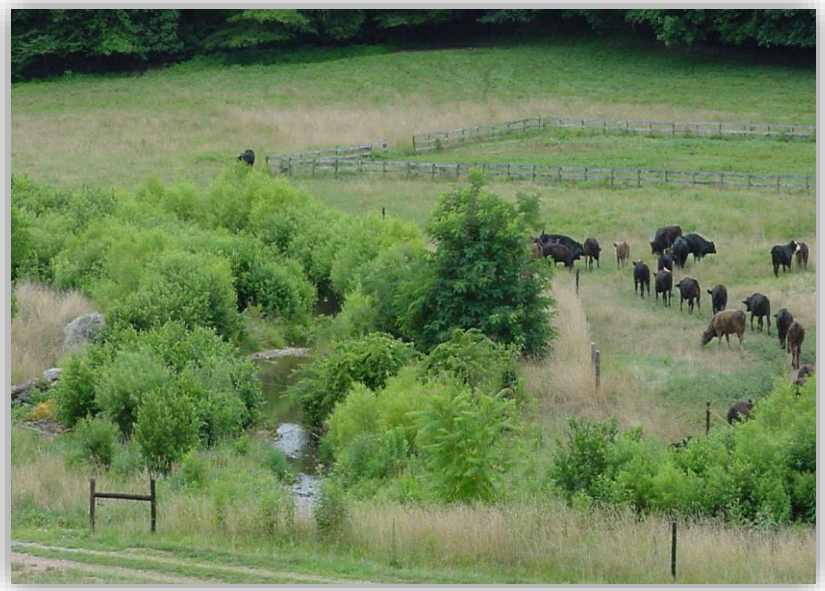
Business Working Group

-Identify funding sources, outreach methods, and constraints to implementation

Agricultural BMPS

- Livestock exclusion
- Riparian Buffer
- Pasture management





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Residential/Urban BMPs

- Rain Gardens
- Bioretention basins
- Stream Restoration


Better Homes & Garden


Manual Builders


Manual Builders

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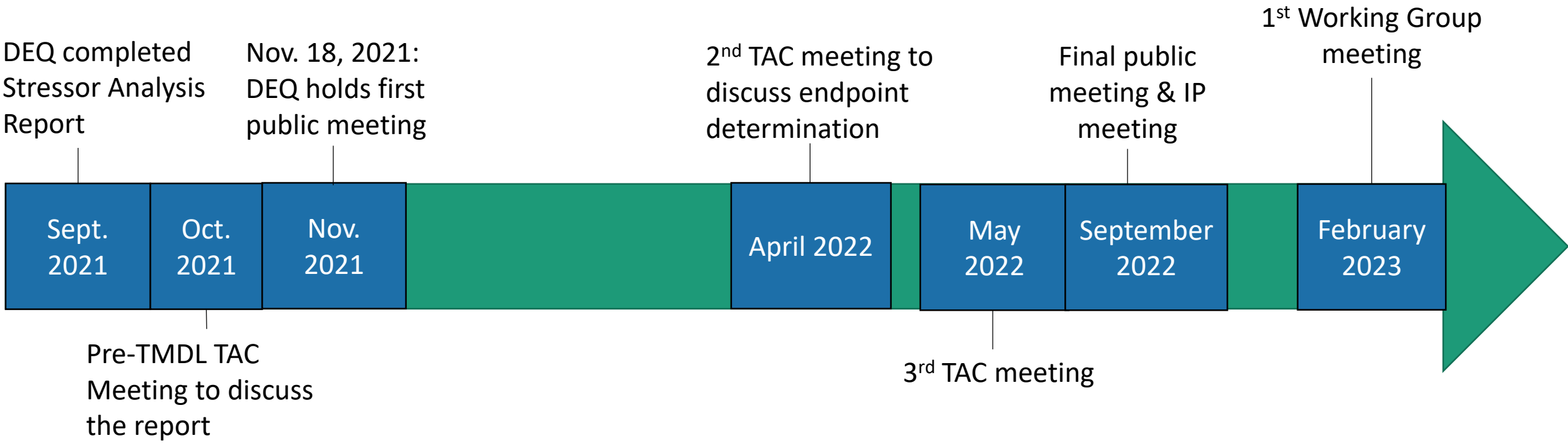
Funding

- USEPA 319 Funds (available through DEQ)
- USDA Programs – CRP/CREP/EQIP
- State Revolving Loan Funds
- State Cost-Share Program and Tax Credits
- State Water Quality Improvement Fund
- Southeast Rural Community Assistance Project
- …and others!

Where we are now…



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Please send all comments in writing to lucy.smith@deq.Virginia.gov or 901 Russell Drive Salem, VA 24153

The 30- day public comment period will end on 28 October, 2022.

To learn more about TMDLs, visit DEQ's website: https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL.aspx

Draft TMDL Report: https://www.deq.virginia.gov/water/water-quality/tmdl-development/tmdls-under-development

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