
DEQ
VIRGINIA DEPARTMENT OF
ENVIRONMENTAL QUALITY

James River Tributaries Watershed Study

Final Public Meeting

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February 15, 2023

Agenda

- Introductions
- Project Review
- TMDL Equation
  - Point Sources
  - Nonpoint Sources
  - Margin of Safety and Future Growth
- Draft Allocation Scenarios
- Next Steps

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Project Review

Continuous WQ Planning Process: Monitoring

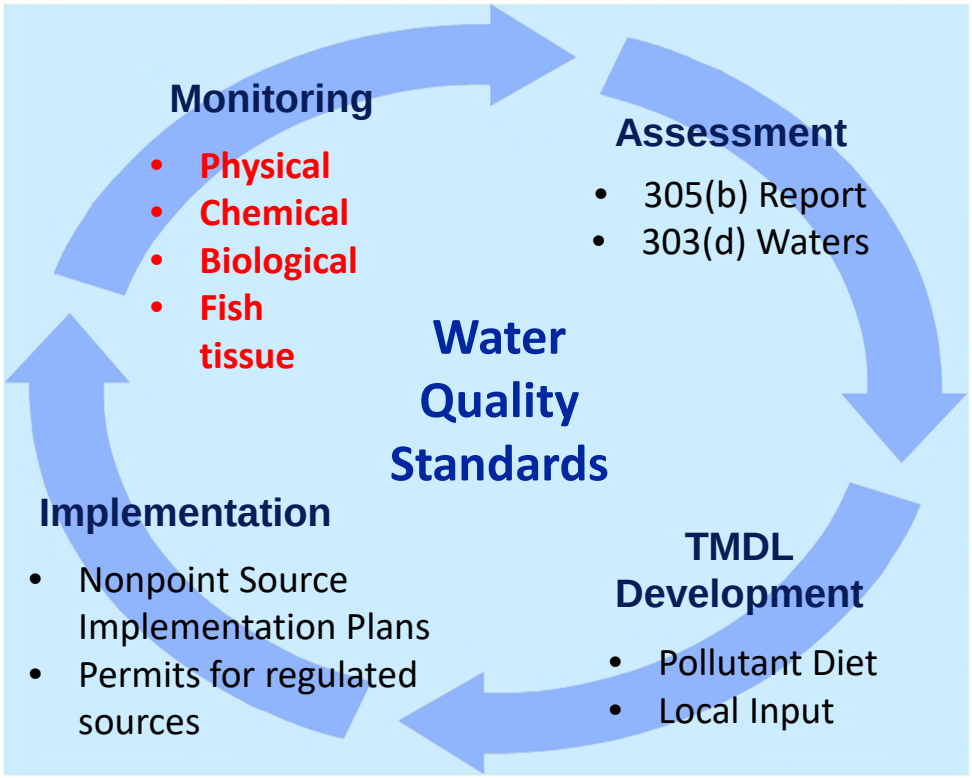


Photo: Mike Shaver, DEQ

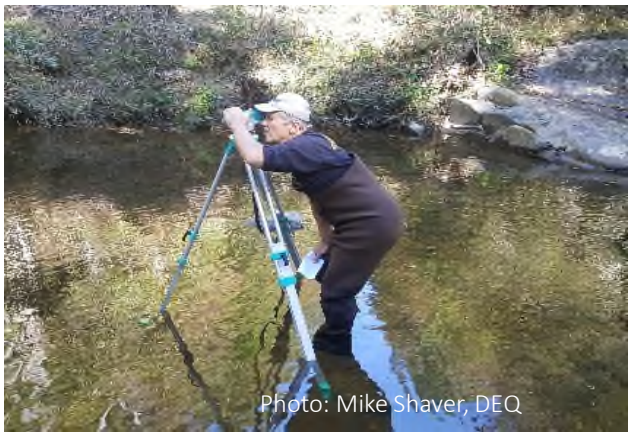
Photo: Mike Shaver, DEQ

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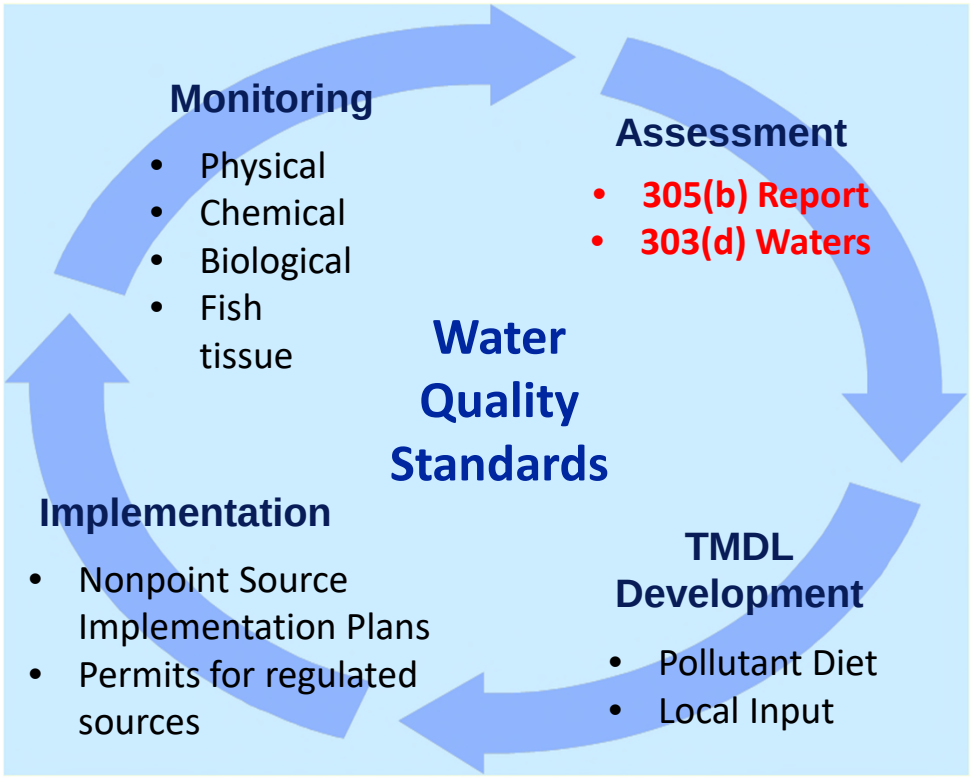
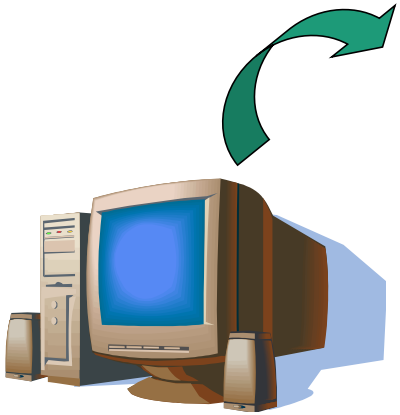
Continuous WQ Planning Process: Assessment





2020 Impaired Waters - 303(d) List

Category 5 - Waters needing Total Maximum Daily Load Study

James River Basin Cause Group Code Impaired Use	Water Name Cause	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						

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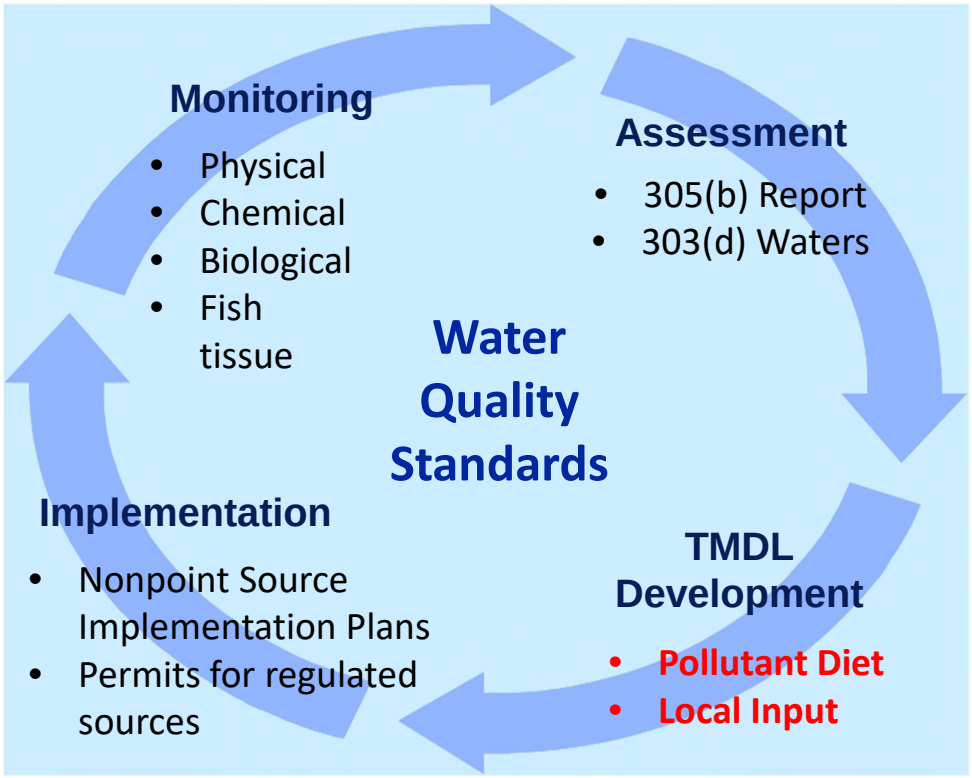
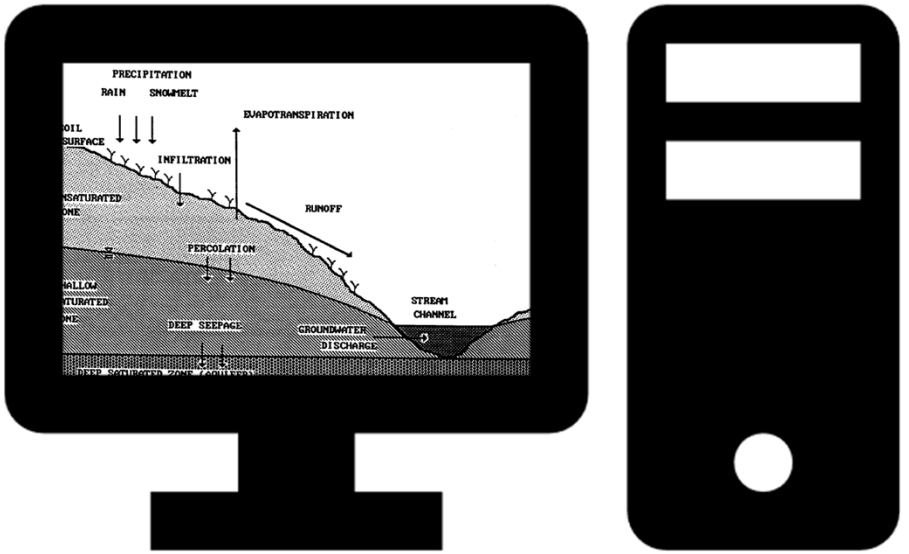
Continuous WQ Planning Process: TMDL Development





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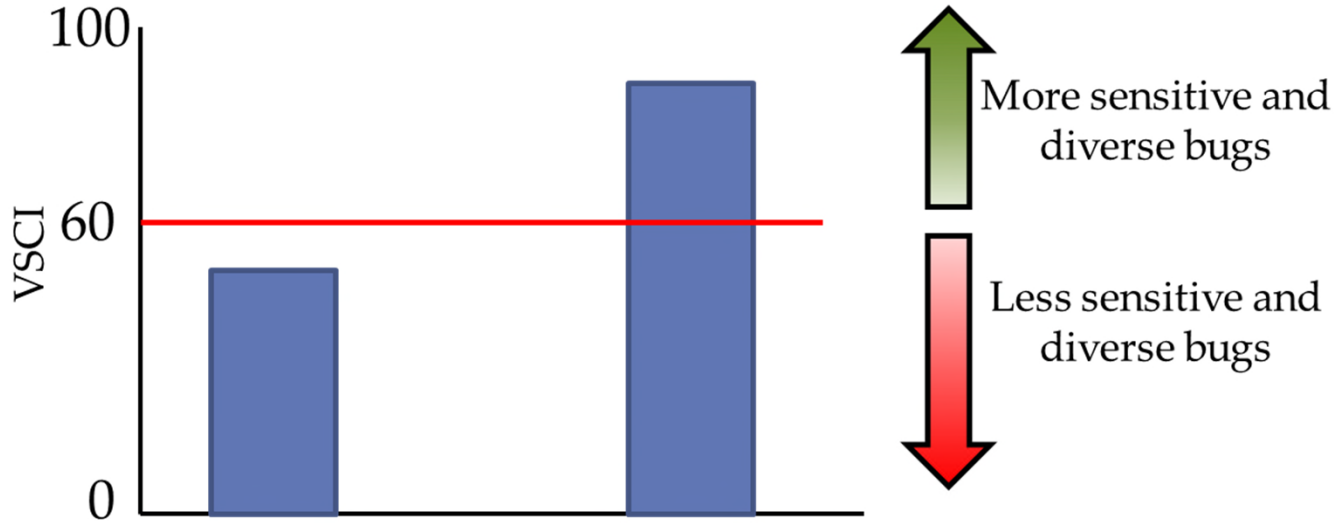
Virginia Stream Condition Index

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



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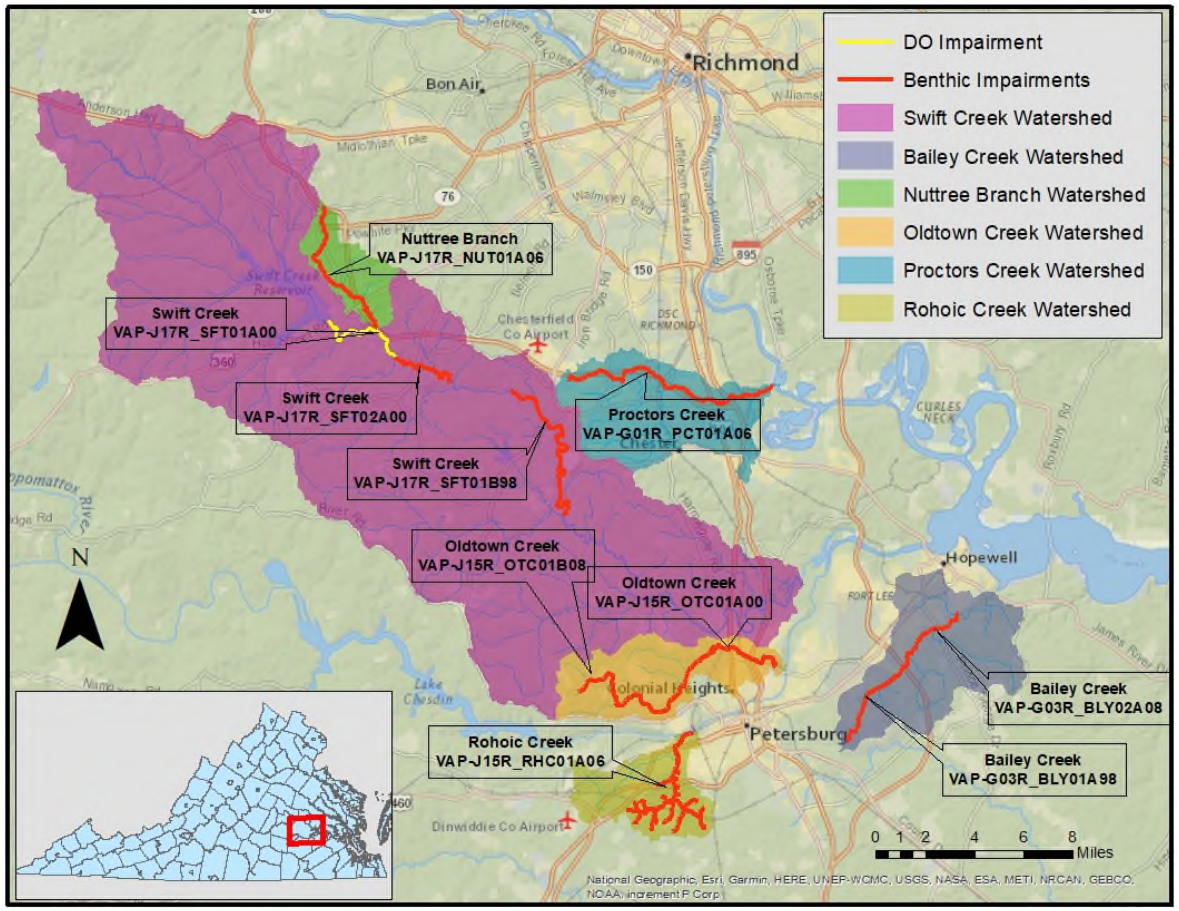
James River Tributaries Project Area

- Chesterfield, Dinwiddie, and Prince George Counties
- Cities of Colonial Heights, Hopewell, and Petersburg
- 6 impaired streams
- 54 miles of impaired streams
- Benthic impairment caused by Sediment and Phosphorus (only Bailey, Oldtown and Swift)
- DO Impairment on Swift Creek



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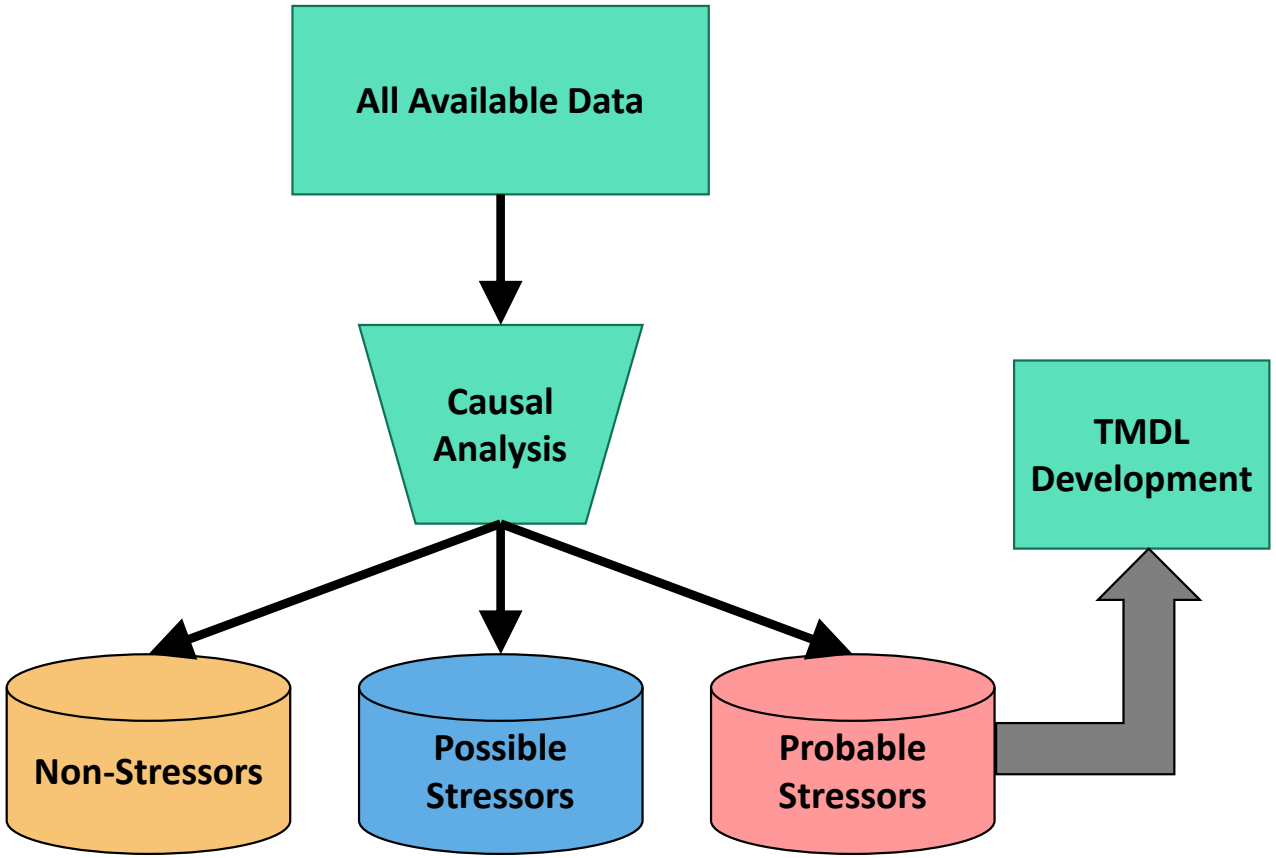
Stressor Analysis



Pollutants		
pH	Dissolved Sulfate	Ammonia
Dissolved Oxygen	Total Dissolved Ions	Dissolved Metals
Temperature	Suspended Solids	Sediment Toxics
Conductivity	Deposited Sediment	Sediment Metals
Dissolved Chloride	Organic Matter	Pesticides
Dissolved Sodium	Nitrogen	Polycyclic Aromatic Hydrocarbons (PAHs)
Dissolved Potassium	Phosphorus	Polychlorinated Biphenyls (PCBs)
Additional Contributing Factors		
Habitat	Hydrologic Alteration	Existing Dams and Impoundments
Natural low gradient	Current Land Use Practices	Anaerobic decomposition in connected wetlands

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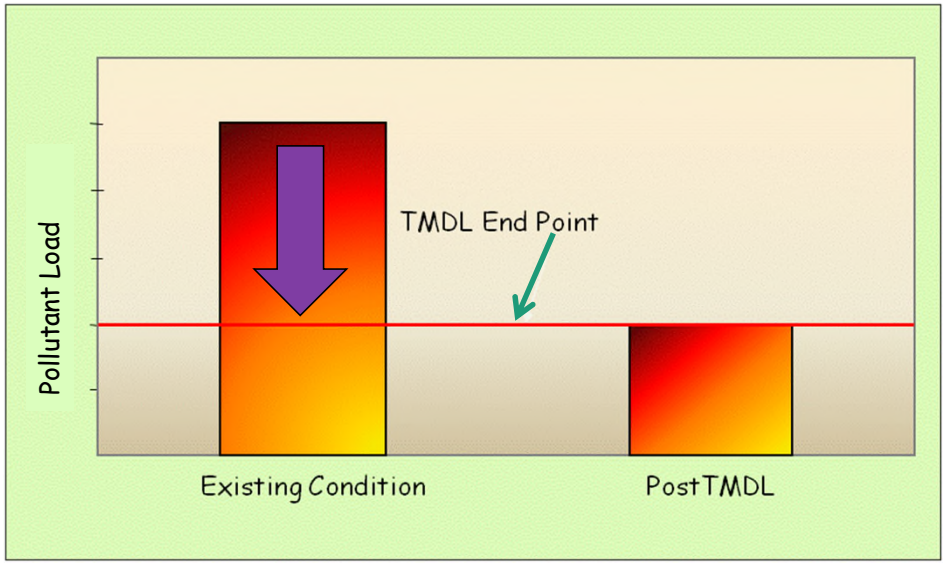
Stressors

Stream	Non-Stressors	Possible Stressors	Probable Stressors	TMDL Target
Bailey Creek	Ammonia, Conductivity, Dissolved Chloride, Dissolved Metals, Dissolved Oxygen, Dissolved Potassium, Dissolved Sodium, Dissolved Sulfate, Nitrogen, Organic Matter, PAHs, Pesticides, pH, Phosphorus, and Temperature	PCBs	Sediment	**Sediment**
Nuttree Branch	Ammonia, Conductivity, Dissolved Chloride, Dissolved Metals, Dissolved Potassium, Dissolved Sulfate, Nitrogen, Organic Matter, PAHs, PCBs, Pesticides, pH, Phosphorus, Sediment Metals, and Temperature	Dissolved Oxygen Dissolved Sodium	Sediment	**Sediment**
Oldtown Creek	Ammonia, Conductivity, Dissolved Chloride, Dissolved Metals, Dissolved Potassium, Dissolved Sodium, Dissolved Sulfate, Nitrogen, PAHs, PCBs, Pesticides, Sediment Metals, and Temperature	Organic Matter	Dissolved Oxygen pH Phosphorus Sediment	**Phosphorus** **Sediment**
Proctors Creek	Ammonia, Conductivity, Dissolved Chloride, Dissolved Metals, Dissolved Potassium, Dissolved Sodium, Dissolved Sulfate, Nitrogen, PAHs, PCBs, Pesticides, Phosphorus, Sediment Metals, and Temperature	Dissolved Oxygen Organic Matter	pH Sediment	**Sediment**
Rohoic Creek	Ammonia, Conductivity, Dissolved Metals, Dissolved Oxygen, Dissolved Potassium, Dissolved Sodium, Dissolved Sulfate, Nitrogen, Organic Matter, PAHs, PCBs, Pesticides, pH, Sediment Metals, and Temperature	Dissolved Chloride Dissolved Oxygen	Phosphorus Sediment	**Phosphorus** **Sediment**
Swift Creek	Ammonia, Conductivity, Dissolved Chloride, Dissolved Metals, Dissolved Potassium, Dissolved Sodium, Dissolved Sulfate, Nitrogen, Organic Matter, PAHs, PCBs, Pesticides, pH, and Temperature	Sediment Metals	Dissolved Oxygen Phosphorus Sediment	**Phosphorus** **Sediment**

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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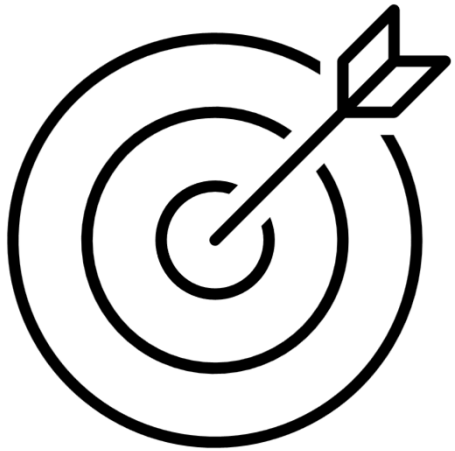
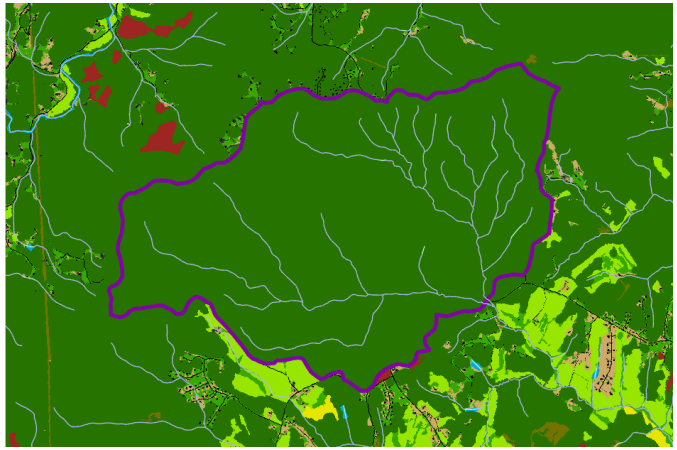
TMDL Reductions Need a Target to Shoot For

- 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)



Sediment and Phosphorus TMDL Endpoint Approach

- 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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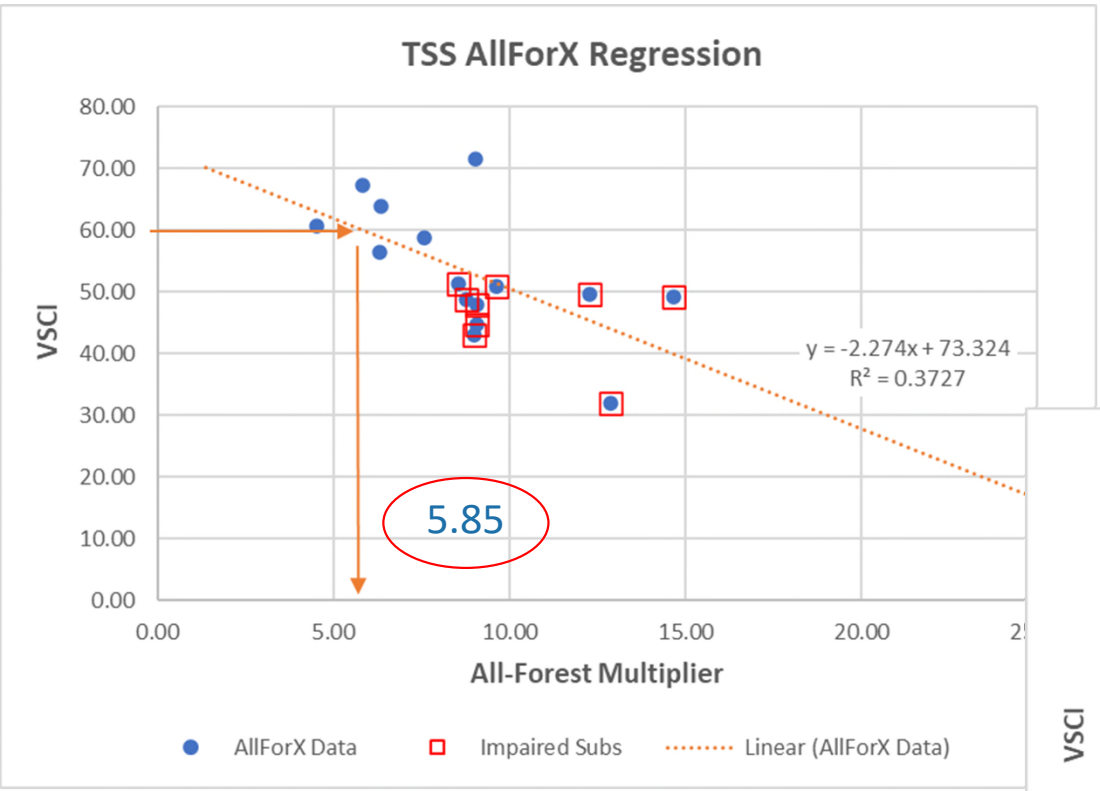
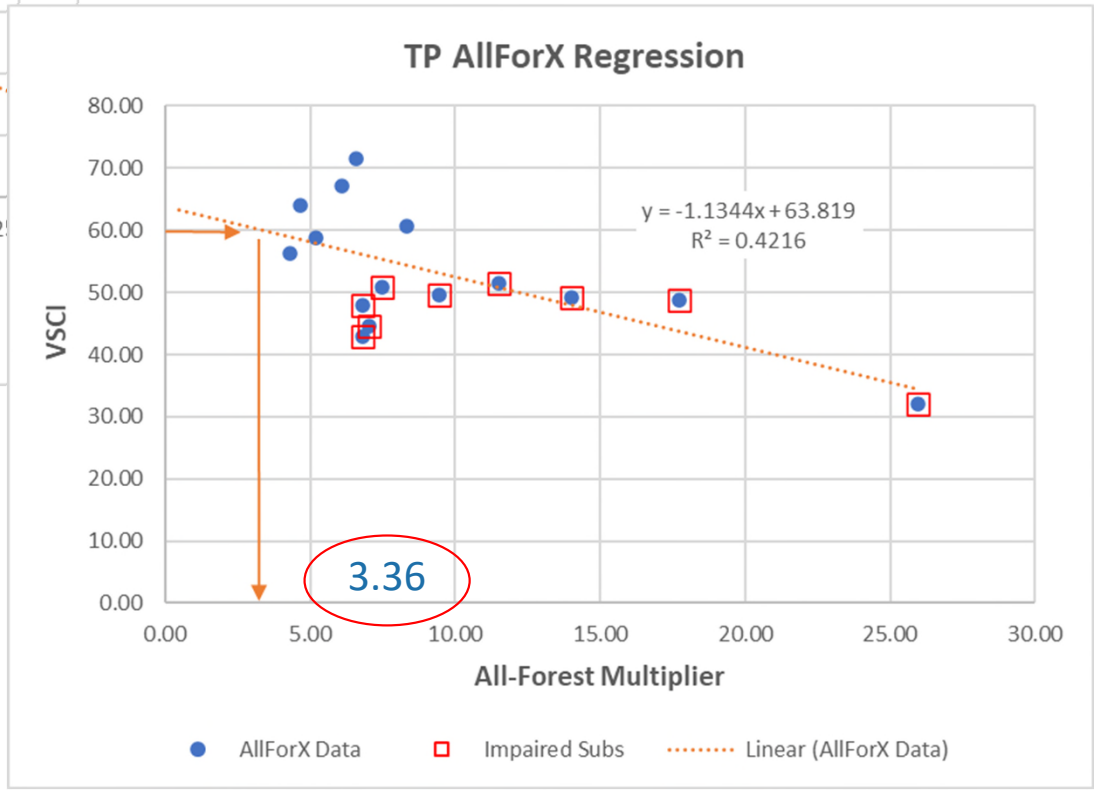

TSS AllForX Regression
VSCI
All-Forest Multiplier
y = -2.274x + 73.324
R² = 0.3727
5.85
AllForX Data
Impaired Subs
Linear (AllForX Data)


TP AllForX Regression
VSCI
All-Forest Multiplier
y = -1.1344x + 63.819
R² = 0.4216
3.36
AllForX Data
Impaired Subs
Linear (AllForX Data)

Developing a Pollutant Target

Impaired Stream	TSS AllForest (lb/yr)	TSS Target (lb/yr)	TP AllForest (lb/yr)	TP Target (lb/yr)
Bailey Creek	204,200	1,200,000	n/a	n/a
Nuttree Branch	90,930	533,000	n/a	n/a
Oldtown Creek	106,700	625,162	269	904
Proctors Creek	174,200	1,020,000	n/a	n/a
Rohoic Creek	110,700	649,000	194	654
Swift Creek	1,875,000	11,000,000	2,594	8,730

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Q&A Session #1

- Questions about DEQ's method for listing impaired streams?
- Questions on project background or stressor analysis?
- Questions on TMDL target development?

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TMDL Equations

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TMDL Equation

- WLA= Wasteload Allocation
  - Permitted/Point Source

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Summary of Permitted Sources

Permit Type	Number of Permits	Watershed
VPDES IP	3	Bailey Creek, Swift Creek
Nonmetallic Mineral Mining	3	Nuttree Branch, Rohoic Creek, Swift Creek
VPDES ISW	19	Bailey Creek, Nuttree Branch, Proctors Creek, Rohoic Creek, Swift Creek
VPDES Concrete	5	Bailey Creek, Nuttree Branch, Proctors Creek, Rohoic Creek
Domestic Sewer	4	Swift Creek
MS4	8	Bailey Creek, Nuttree Branch, Oldtown Creek, Proctors Creek, Rohoic Creek, Swift Creek
CGP	175	Bailey Creek, Nuttree Branch, Oldtown Creek, Proctors Creek, Rohoic Creek, Swift Creek
Vehicle Wash	1	Proctors Creek

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TMDL Equation

- WLA= Wasteload Allocation
  - Permitted/Point Source
- LA= Load Allocation
  - Nonpoint Source

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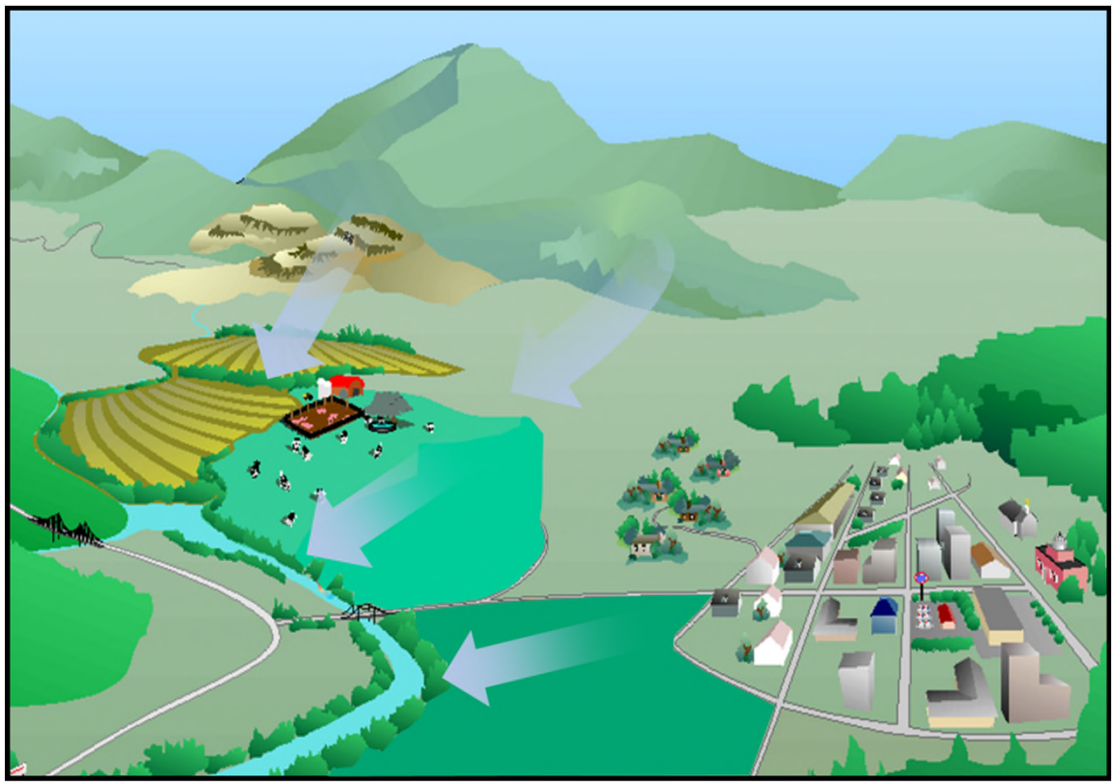
Identify nonpoint sources



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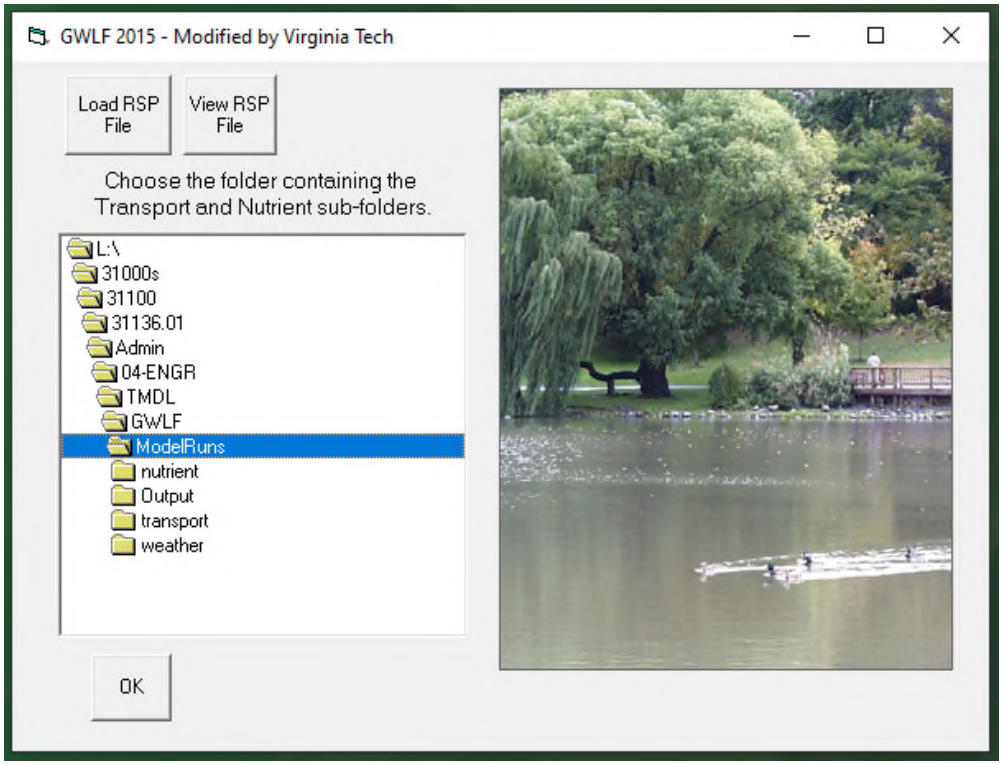
Modeling Approach

- Selected Model: GWLF
  - Widely used in VA for sediment TMDLs
  - Lumped parameter
  - Point and non-point sources
  - Landscape and streambank/channel erosion
  - Sediment delivery ratio



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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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Margin of Safety (MOS)

- No model is perfect
- Set aside to account for this
- Implicit and Explicit MOS
- Selected 10% for this study

Future Growth

- Part of WLA
- Set aside for future permits in the watershed
- Selected 2% for this study

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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TMDL Equation – Bailey Creek TSS

Impairment	Allocated Point Sources (**WLA**) (lb/yr TSS)	Allocated Nonpoint Sources (**LA**) (lb/yr TSS)	Margin of Safety (**MOS**) (lb/yr TSS)	Total Maximum Daily Load (**TMDL**) (lb/yr TSS)	Existing Load (lb/yr TSS)	Overall Reduction (%)
Bailey Creek (VAP-G03R_BLY02A08, VAP-G03R_BLY01A98)	**424,000**	**656,400**	**119,600**	**1,200,000**	2,130,000	43.7%
VA0059161	*5,245*					
Concrete Facility Permits	*1,945*					
ISW Permits	*43,060*					
MS4 Permits	*316,500*					
Construction Permits	*33,500*					
Future Growth (2% of TMDL)	*23,930*					

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TMDL Equation – Nuttree Branch TSS

Impairment	Allocated Point Sources (**WLA**) (lb/yr TSS)	Allocated Nonpoint Sources (**LA**) (lb/yr TSS)	Margin of Safety (**MOS**) (lb/yr TSS)	Total Maximum Daily Load (**TMDL**) (lb/yr TSS)	Existing Load (lb/yr TSS)	Overall Reduction (%)
Nuttree Branch (VAP-J17R_NUT01A06)	**303,000**	**177,000**	**53,300**	**533,000**	861,000	38.1%
NMMM Permits	*45,700*					
Concrete Facility Permits	*326*					
ISW Permits	*8,888*					
MS4 Permits	*107,300*					
Construction Permits	*129,600*					
Future Growth (2% of TMDL)	*10,700*					

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TMDL Equation – Oldtown Creek TSS

Impairment	Allocated Point Sources (**WLA**) (lb/yr TSS)	Allocated Nonpoint Sources (**LA**) (lb/yr TSS)	Margin of Safety (**MOS**) (lb/yr TSS)	Total Maximum Daily Load (**TMDL**) (lb/yr TSS)	Existing Load (lb/yr TSS)	Overall Reduction (%)
Oldtown Creek (VAP-J15R_OTC01A00 VAP-J15R_OTC01B08)	**253,000**	**308,500**	**62,520**	**624,000**	1,590,000	60.8%
MS4 Permits	*159,700*					
Construction Permits	*80,810*					
Future Growth (2% of TMDL)	*12,500*					

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TMDL Equation – Proctors Creek TSS

Impairment	Allocated Point Sources (**WLA**) (lb/yr TSS)	Allocated Nonpoint Sources (**LA**) (lb/yr TSS)	Margin of Safety (**MOS**) (lb/yr TSS)	Total Maximum Daily Load (**TMDL**) (lb/yr TSS)	Existing Load (lb/yr TSS)	Overall Reduction (%)
Proctors Creek (VAP-G01R_PCT01A06)	**573,000**	**345,000**	**102,100**	**1,020,000**	3,290,000	69.0%
Concrete Facility Permits	*1,188*					
ISW Permits	*64,760*					
Vehicle Wash Permits	*55*					
MS4 Permits	*112,900*					
Construction Permits	*373,600*					
Future Growth (2% of TMDL)	*20,420*					

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TMDL Equation – Rohoic Creek TSS

Impairment	Allocated Point Sources (**WLA**) (lb/yr TSS)	Allocated Nonpoint Sources (**LA**) (lb/yr TSS)	Margin of Safety (**MOS**) (lb/yr TSS)	Total Maximum Daily Load (**TMDL**) (lb/yr TSS)	Existing Load (lb/yr TSS)	Overall Reduction (%)
Rohoic Creek (VAP-J15R_RHC01A06)	**377,000**	**206,000**	**64,870**	**648,000**	1,360,000	52.4%
NMMM Permits	*127,900*					
Concrete Facility Permits	*4,586*					
ISW Permits	*57,800*					
MS4 Permits	*43,510*					
Construction Permits	*130,500*					
Future Growth (2% of TMDL)	*12,970*					

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TMDL Equation – Swift Creek TSS

Impairment	Allocated Point Sources (**WLA**) (lb/yr TSS)	Allocated Nonpoint Sources (**LA**) (lb/yr TSS)	Margin of Safety (**MOS**) (lb/yr TSS)	Total Maximum Daily Load (**TMDL**) (lb/yr TSS)	Existing Load (lb/yr TSS)	Overall Reduction (%)
Swift Creek (VAP-J17R_SFT01B98, VAP-J17R_SFT02A00)	**2,870,000**	**7,030,000**	**1,099,000**	**11,000,000**	20,100,000	45.3%
VA0006254	*91,380*					
VA0023426	*8,910*					
NMMM Permits	*137,100*					
ISW Permits	*101,700*					
Domestic Sewage Permits	*366*					
MS4 Permits	*993,200*					
Construction Permits	*1,314,000*					
Future Growth (2% of TMDL)	*219,800*					

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TMDL Equation – Oldtown Creek TP

Impairment	Allocated Point Sources (**WLA**) (lb/yr TSS)	Allocated Nonpoint Sources (**LA**) (lb/yr TSS)	Margin of Safety (**MOS**) (lb/yr TSS)	Total Maximum Daily Load (**TMDL**) (lb/yr TSS)	Existing Load (lb/yr TSS)	Overall Reduction (%)
Oldtown Creek (VAP-J15R_OTC01A00, VAP-J15R_OTC01B08)	**404**	**407**	**91**	**902**	2,720	66.8%
MS4 Permits	*327.7*					
Construction Permits	*58.2*					
Future Growth (2% of TMDL)	*18.1*					

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TMDL Equation – Rohoic Creek TP

Impairment	Allocated Point Sources (**WLA**) (lb/yr TSS)	Allocated Nonpoint Sources (**LA**) (lb/yr TSS)	Margin of Safety (**MOS**) (lb/yr TSS)	Total Maximum Daily Load (**TMDL**) (lb/yr TSS)	Existing Load (lb/yr TSS)	Overall Reduction (%)
Rohoic Creek (VAP-J15R_RHC01A06)	**426**	**163**	**65**	**654**	2,330	71.0%
NMMM Permits	*85.3*					
Concrete Facility Permits	*31.0*					
ISW Permits	*197.0*					
MS4 Permits	*6.3*					
Construction Permits	*94.0*					
Future Growth (2% of TMDL)	*13.1*					

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TMDL Equation – Swift Creek TP

Impairment	Allocated Point Sources (**WLA**) (lb/yr TSS)	Allocated Nonpoint Sources (**LA**) (lb/yr TSS)	Margin of Safety (**MOS**) (lb/yr TSS)	Total Maximum Daily Load (**TMDL**) (lb/yr TSS)	Existing Load (lb/yr TSS)	Overall Reduction (%)
Swift Creek (VAP-J17R_SFT01B98, VAP-J17R_SFT02A00)	**3,150**	**4,700**	**873**	**8,720**	20,200	56.8%
VA0006254	*9.6*					
VA0023426	*46.0*					
NMMM Permits	*121.8*					
ISW Permits	*377.1*					
Domestic Sewage Permits	*17.2*					
MS4 Permits	*1,354*					
Construction Permits	*1,040*					
Future Growth (2% of TMDL)	*174.6*					

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Q&A Session #2

- Questions about permitted loads?
- Do the MOS and Future Growth allocations seem reasonable?
- Thoughts or questions about TMDL equation?

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Allocation Scenarios - TSS

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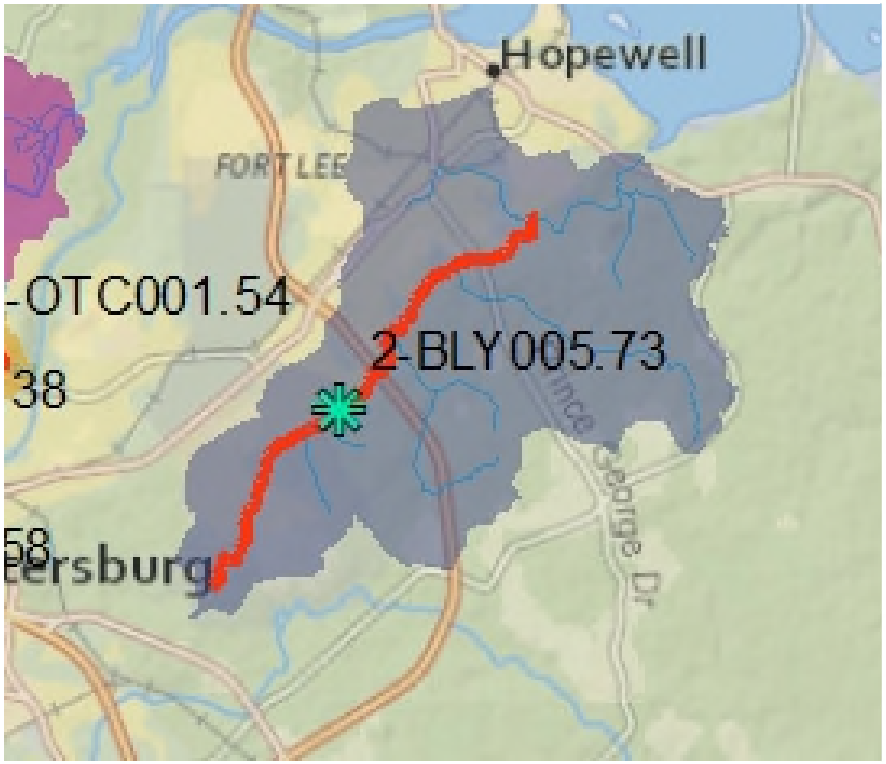
Bailey Creek - TSS

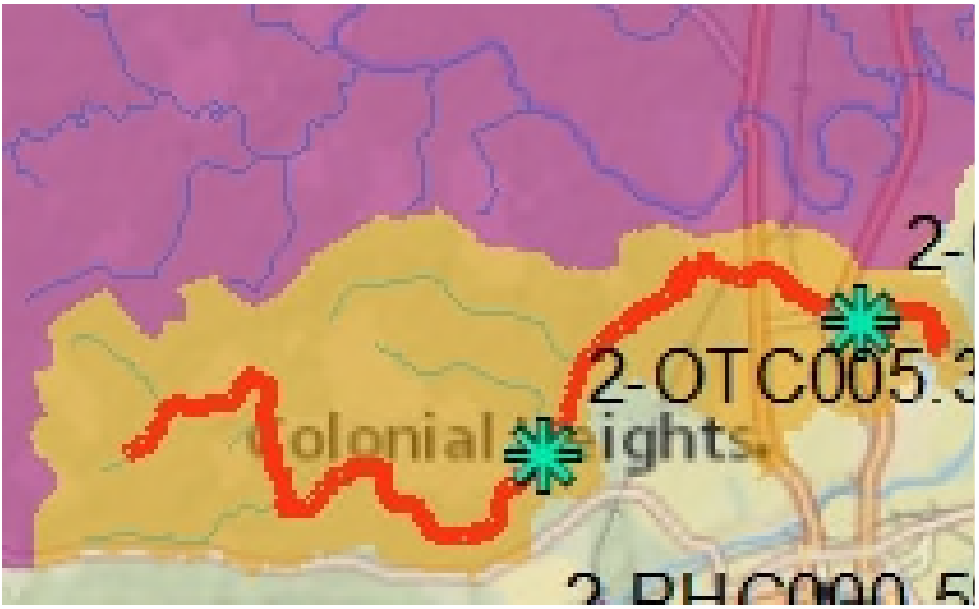


Bailey Creek Watershed		Scenario 1 (preferred)	
Source	**Existing TSS (lb/yr)**	**Reduction (%)**	**Allocation TSS (lb/yr)**
Cropland	26,620	54.5	12,110
Hay	6,796	54.5	3,092
Pasture	6,592	54.5	2,999
Forest	52,790	-	52,790
Trees	65,790	-	65,790
Shrub	15,240	-	15,240
Harvested	38,880	54.5	17,690
Wetland	56,730	-	56,730
Barren	216,700	54.5	98,610
Turfgrass	78,630	54.5	35,780
Developed Pervious	10,940	54.5	4,975
Developed Impervious	219,200	54.5	99,720
Streambank Erosion	410,600	54.5	186,800
VA0059161	5,245	-	5,245
Concrete Facility Permits	1,945	-	1,945
ISW Permits	43,060	-	43,060
MS4	695,700	54.5	316,500
Construction Permits	33,500	-	33,500
Future Growth (2%)	23,930	-	23,930
MOS (10%)	119,600	-	119,600
TOTAL	**2,130,000**	**43.7**	**1,200,000**

Nuttree Branch- TSS

Nuttree Branch Watershed		Scenario 1 (preferred)	
Source	**Existing TSS (lb/yr)**	**Reduction (%)**	**Allocation TSS (lb/yr)**
Cropland	-	-	-
Hay	-	-	-
Pasture	-	-	-
Forest	16,410	-	16,410
Trees	32,270	-	32,270
Shrub	10,830	-	10,830
Harvested	-	-	-
Wetland	4,520	-	4,520
Barren	-	-	-
Turfgrass	44,640	59.9	17,900
Developed Pervious	3,547	59.9	1,422
Developed Impervious	164,700	59.9	66,040
Streambank Erosion	68,130	59.9	27,320
NMMM Permits	45,690	-	45,690
Concrete Facility Permits	326	-	326
ISW Permits	8,888	-	8,888
MS4	267,500	59.9	107,300
Construction Permits	129,600	-	129,600
Future Growth (2%)	10,660	-	10,660
MOS (10%)	53,280	-	53,280
TOTAL	**861,000**	**38.2**	**532,000**

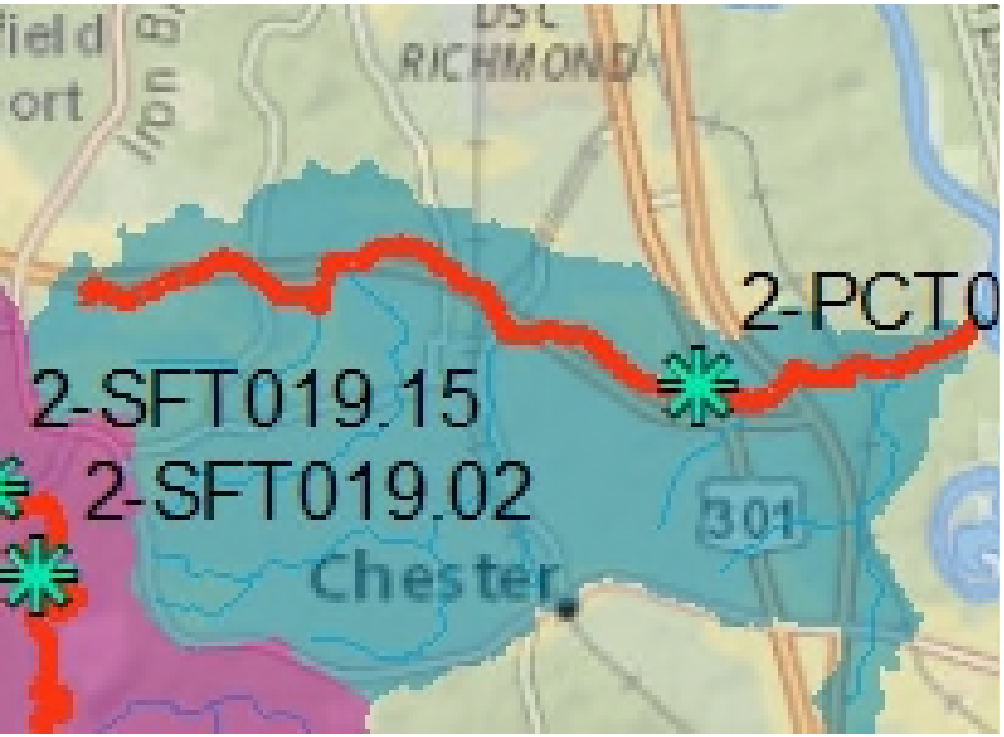
Oldtown Creek - TSS



Oldtown Creek Watershed		Scenario 1 (preferred)	
Source	**Existing TSS (lb/yr)**	**Reduction (%)**	**Allocation TSS (lb/yr)**
Cropland	159,200	72.3	44,090
Hay	6,105	72.3	1,691
Pasture	1,690	72.3	468
Forest	37,250	-	37,250
Trees	19,720	-	19,720
Shrub	5,024	-	5,024
Harvested	24,670	72.3	6,834
Wetland	37,550	-	37,550
Barren	11,290	72.3	3,127
Turfgrass	31,170	72.3	8,635
Developed Pervious	3,218	72.3	891
Developed Impervious	179,100	72.3	49,620
Streambank Erosion	337,800	72.3	93,580
MS4	576,600	72.3	159,700
Construction Permits	80,810	-	80,810
Future Growth (2%)	12,500	-	12,500
MOS (10%)	62,520	-	62,520
TOTAL	**1,590,000**	**60.8**	**624,000**

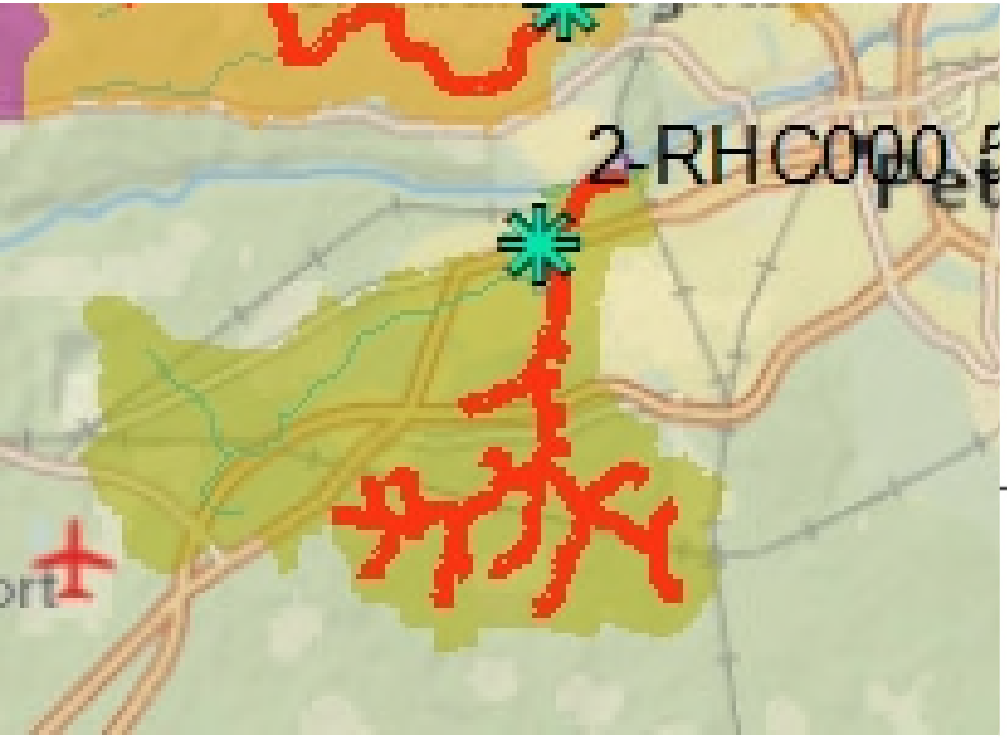
DEQ

Proctors Creek - TSS



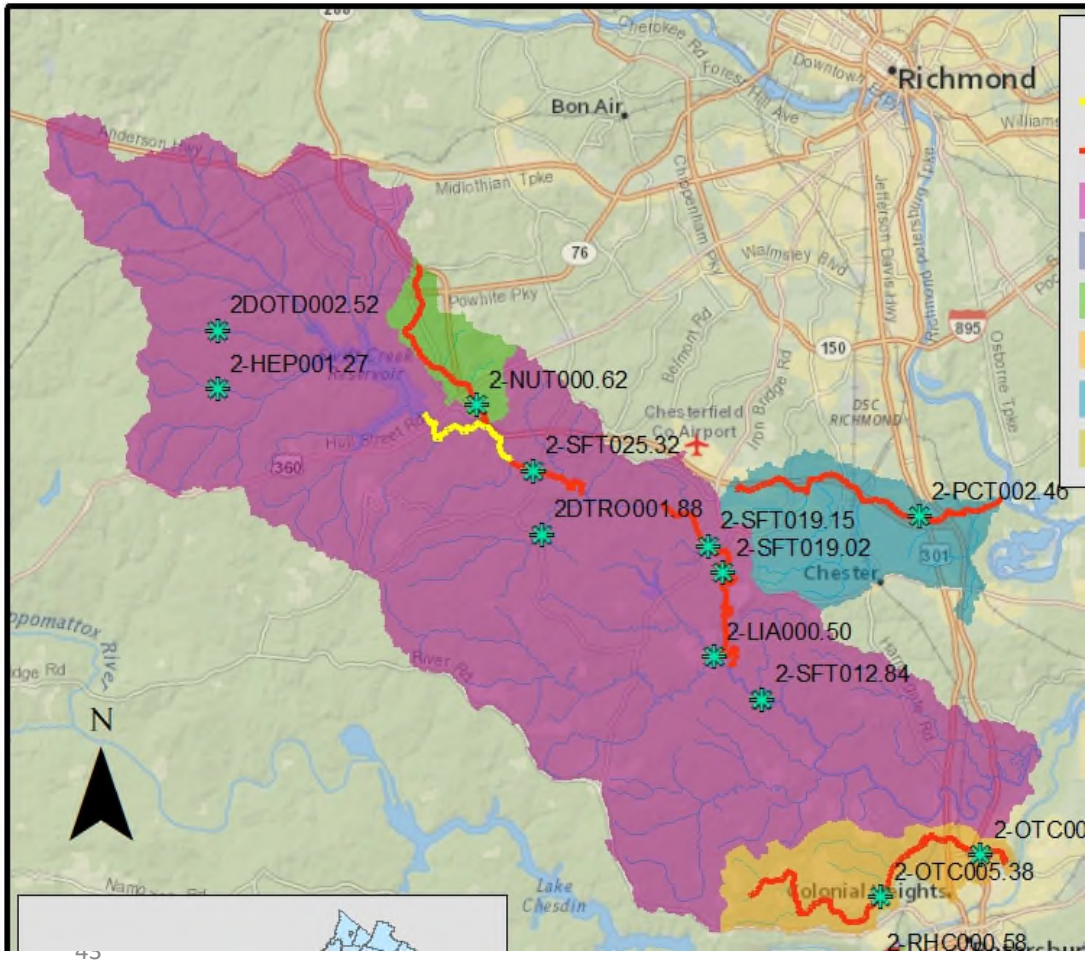
Proctors Creek Watershed		Scenario 1 (preferred)	
Source	**Existing TSS (lb/yr)**	**Reduction (%)**	**Allocation TSS (lb/yr)**
Cropland	8,824	88.4	1,024
Hay	2,111	88.4	245
Pasture	3,043	88.4	353
Forest	36,460	-	36,460
Trees	45,160	-	45,160
Shrub	8,735	-	8,735
Harvested	-	88.4	-
Wetland	68,880	-	68,880
Barren	199,600	88.4	23,160
Turfgrass	58,680	88.4	6,807
Developed Pervious	4,151	88.4	482
Developed Impervious	361,100	88.4	41,880
Streambank Erosion	955,900	88.4	110,900
Concrete Facility Permits	1,188	-	1,188
Vehicle Wash Permits	55	-	55
ISW Permits	64,760	-	64,760
MS4	973,100	88.4	112,900
Construction Permits	373,600	-	373,600
Future Growth (2%)	20,420	-	20,420
MOS (10%)	102,100	-	102,100
TOTAL	**3,290,000**	**69.0**	**1,020,000**

Rohoic Creek - TSS



Rohoic Creek Watershed		Scenario 1 (preferred)	
Source	**Existing TSS (lb/yr)**	**Reduction (%)**	**Allocation TSS (lb/yr)**
Cropland	52,140	79.8	10,530
Hay	16,410	79.8	3,314
Pasture	4,153	79.8	839
Forest	22,270	-	22,270
Trees	31,910	-	31,910
Shrub	9,145	-	9,145
Harvested	4,129	79.8	834
Wetland	21,340	-	21,340
Barren	-	79.8	-
Turfgrass	68,250	79.8	13,790
Developed Pervious	9,356	79.8	1,890
Developed Impervious	198,800	79.8	40,160
Streambank Erosion	247,200	79.8	49,930
NMMM Permits	127,900	-	127,900
Concrete Facility Permits	4,586	-	4,586
ISW Permits	115,600	50.0	57,800
MS4	215,400	79.8	43,510
Construction Permits	130,500	-	130,500
Future Growth (2%)	12,970	-	12,970
MOS (10%)	64,870	-	64,870
TOTAL	**1,360,000**	**52.4**	**648,000**

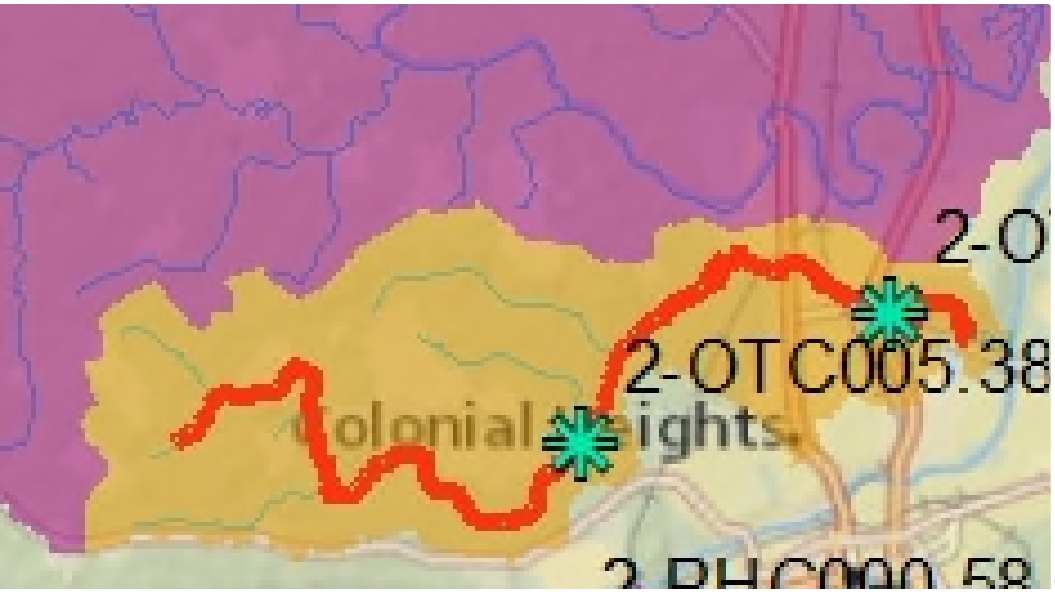
Swift Creek - TSS



Swift Creek Watershed		Scenario 1 (preferred)	
Source	**Existing TSS (lb/yr)**	**Reduction (%)**	**Allocation TSS (lb/yr)**
Cropland	119,500	57.0	51,390
Hay	26,210	57.0	11,270
Pasture	144,700	57.0	62,210
Forest	305,700	-	305,700
Trees	142,300	-	142,300
Shrub	19,860	-	19,860
Harvested	70,200	57.0	30,190
Wetland	134,300	-	134,300
Barren	668,000	57.0	287,200
Turfgrass	155,500	57.0	66,860
Developed Pervious	20,960	57.0	9,015
Developed Impervious	1,517,000	57.0	652,100
Streambank Erosion	10,970,000	57.0	4,717,000
VA0006254	91,380	-	91,380
VA0023426	8,910	-	8,910
NMMM Permits	137,072	-	137,072
Domestic Sewage Permits	366	-	366
ISW Permits	101,700	-	101,700
MS4	2,310,000	57.0	993,200
Construction Permits	1,314,000	-	1,314,000
Future Growth (2%)	219,800	-	219,800
Nuttree Branch TMDL Target	533,000	-	533,000
MOS (10%)	1,099,000	-	1,099,000
TOTAL	**20,100,000**	**45.3**	**11,000,000**

Allocation Scenarios - TP

Oldtown Creek - TP

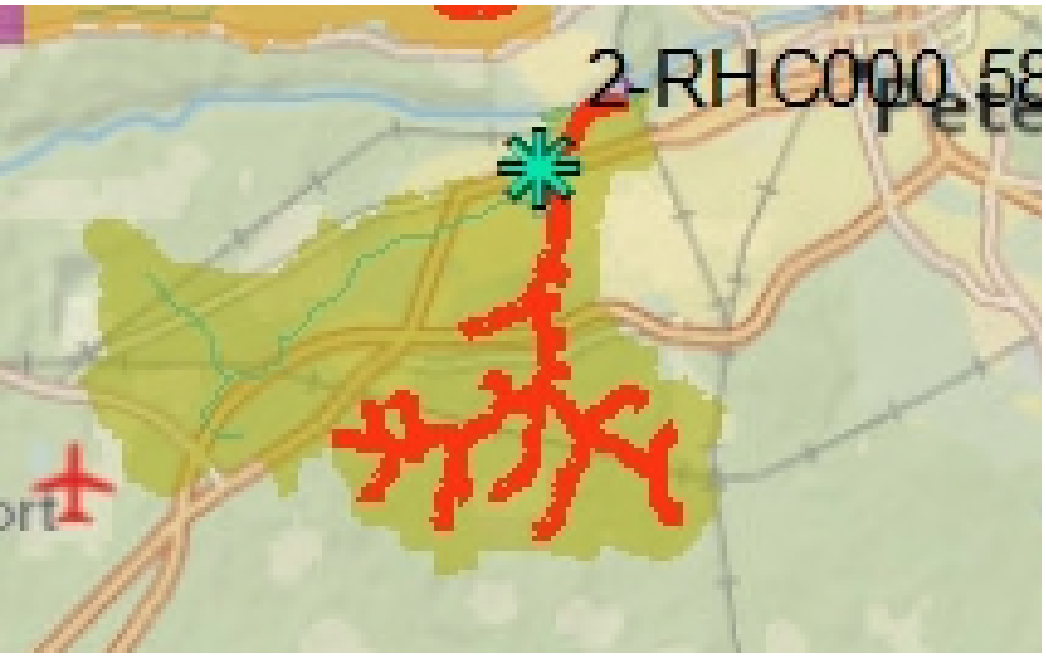


Oldtown Creek Watershed		Scenario 1 (preferred)	
Source	**Existing TP (lb/yr)**	**Reduction (%)**	**Allocation TP (lb/yr)**
Cropland	102.4	76.7	23.9
Hay	84.8	76.7	19.8
Pasture	3.1	76.7	0.7
Forest	18.0	-	18.0
Trees	13.4	-	13.4
Shrub	0.9	-	0.9
Harvested	7.1	76.7	1.7
Wetland	4.1	-	4.1
Barren	1.3	76.7	0.3
Turfgrass	238.6	76.7	55.6
Developed Pervious	4.7	76.7	1.1
Developed Impervious	394.1	76.7	91.8
Streambank Erosion	118.2	76.7	27.6
Septic	0.9	76.7	0.2
Groundwater	150.9	-	150.9
MS4	1,406.0	76.7	327.7
Construction Permits	58.2	-	58.2
Future Growth (2%)	18.1	-	18.1
MOS (10%)	90.5	-	90.5
TOTAL	**2,720.0**	**66.8**	**904.0**

DEQ

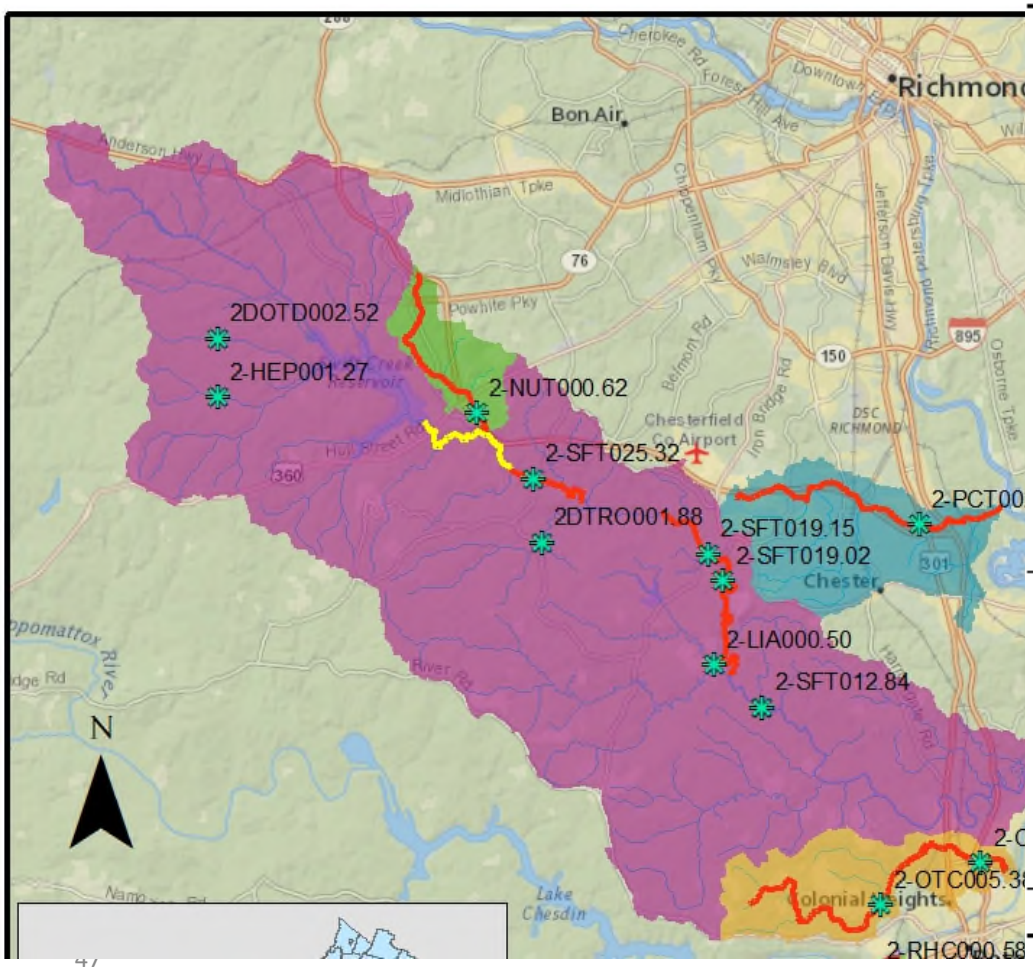
Rohoic Creek - TP

- Unable to meet the modeled TMDL endpoint for phosphorus at the watershed's current permitted load
- Proposed reduction in ISW phosphorus loads of 50%



Rohoic Creek Watershed		Scenario 1 (preferred)	
Source	**Existing TP (lb/yr)**	**Reduction (%)**	**Allocation TP (lb/yr)**
Cropland	31.3	98.8	0.4
Hay	113.1	98.8	1.4
Pasture	4.1	98.8	0.0
Forest	9.7	-	9.7
Trees	14.3	-	14.3
Shrub	1.5	-	1.5
Harvested	1.2	98.8	0.0
Wetland	2.6	-	2.6
Barren	-	-	-
Turfgrass	290.9	98.8	3.5
Developed Pervious	9.7	98.8	0.1
Developed Impervious	437.4	98.8	5.2
Streambank Erosion	86.5	98.8	1.0
Septic	0.9	98.8	0.0
Groundwater	122.3	-	122.3
NMMM Permits	85.3	-	85.3
Concrete Facility Permits	31.0	-	31.0
ISW Permits	394.1	50.0	197.0
MS4	523.4	98.8	6.3
Construction Permits	94.0	-	94.0
Future Growth (2%)	13.1	-	13.1
MOS (10%)	65.4	-	65.4
TOTAL	**2,330.0**	**71.9**	**654.0**

Swift Creek - TP



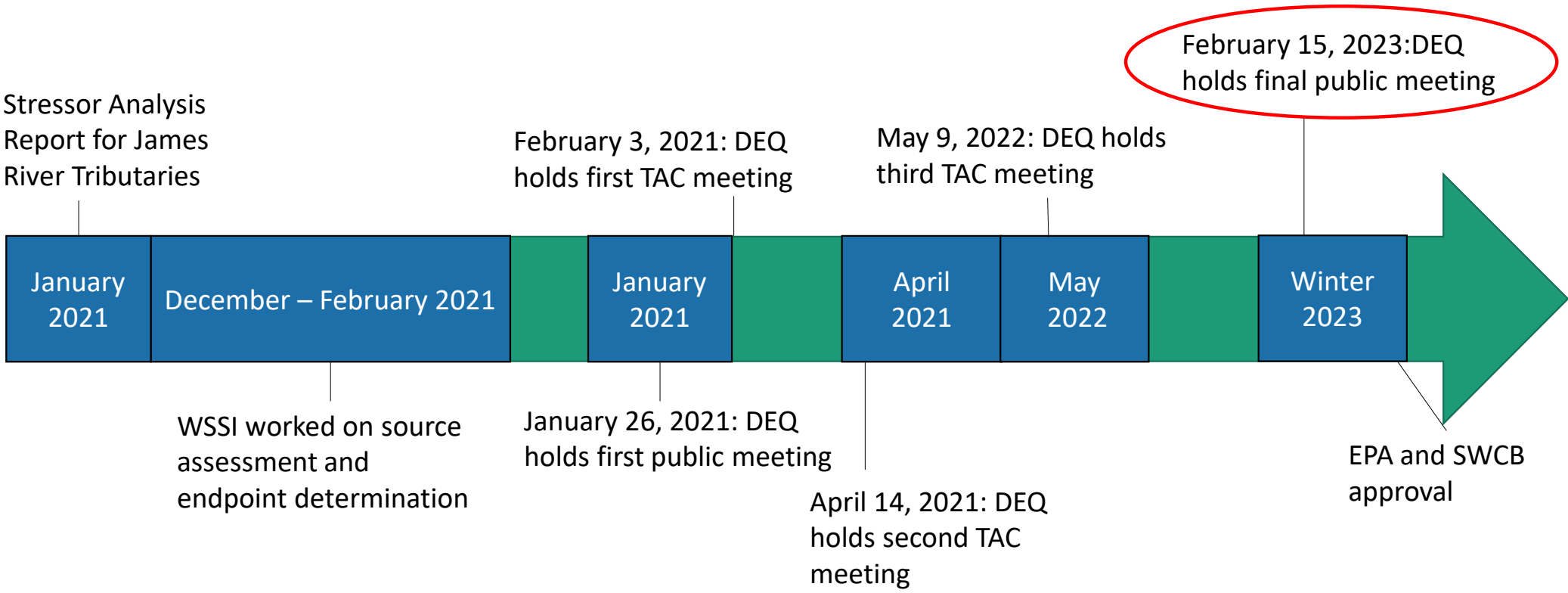
Swift Creek Watershed		Scenario 1 (preferred)	
Source	**Existing TP (lb/yr)**	**Reduction (%)**	**Allocation TP (lb/yr)**
Cropland	70.9	73.2	19.0
Hay	362.6	73.2	97.2
Pasture	190.9	73.2	51.2
Forest	143.3	-	143.3
Trees	115.1	-	115.1
Shrub	2.5	-	2.5
Harvested	22.6	73.2	6.1
Wetland	7.9	-	7.9
Barren	43.7	73.2	11.7
Turfgrass	1,267.0	73.2	339.5
Developed Pervious	35.3	73.2	9.5
Developed Impervious	4,237.0	73.2	1,135.0
Streambank Erosion	4,383.0	73.2	1,175.0
Septic	17.4	73.2	4.7
Groundwater	1,588.0	-	1,588.0
VA0006254	9.6	-	9.6
VA0023426	46.0	-	46.0
NMMM Permits	121.8	-	121.8
Domestic Sewage Permits	17.2	-	17.2
ISW Permits	377.1	-	377.1
MS4	5,071.0	73.2	1,359.0
Construction Permits	1,040.0	-	1,040.0
Future Growth (2%)	174.6	-	174.6
MOS (10%)	873.0	-	873.0
TOTAL	**20,200.0**	**56.8**	**8,730.0**

Q&A Session #3

- Thoughts on the presented allocation scenarios?

DEQ

Next Steps…



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