Sand Branch Benthic Total Maximum Daily Load (TMDL) Study

Sixth Technical Advisory Committee Meeting

January 31, 2023

Meeting Summary

Location: Brambleton Public Library, Meeting Room A
22850 Brambleton Plaza
Brambleton, Virginia 20148

Start: 10:00 A.M.
End: 12:00 P.M.

Meeting Attendance:

See attached sign-in sheet for list of meeting attendees (provided as an attachment to the PDF).

Meeting Materials:

The meeting agenda is provided as an attachment to the PDF.

The meeting was conducted with the assistance of a MS PowerPoint presentation. Detailed information in the presentation (provided as an attachment to the PDF) is not repeated in these summary notes; instead, highlights from each general topic section of the meeting are summarized along with the questions and discussion held during the meeting.

Meeting Summary:

Margaret Dannemann, DEQ opened the meeting by welcoming the participants and going over the meeting materials and noted that those will also be posted to DEQ's webpage. She then reviewed the agenda for the meeting and discussed the project's progress so far:

<u>Source Assessment: Permitted Source Updates and Existing Loads</u>

Katie Shoemaker, WSSI presented on source assessment.

- Permit Updates:
    - Ms. Shoemaker discussed permit changes that have occurred to permits within the watershed since the last Technical Advisory Committee (TAC) meeting.
        i. Modification to VAR10Q588 H&M properties (Data Center)
        ii. Two (2) new construction stormwater general permits (VAR10R191 and VAR10R648)
        iii. Closure of Loudoun Composting Facility (VA0091430)
    - These changes will be reflected in the wasteload allocations.
- Ms. Shoemaker presented on baseline pollutant loads:
    - Point Source Loading: Minimum, maximum and average values of total dissolved solids (TDS), total suspended solids (TSS), and total phosphorus (TP) data for each VPDES permit as relevant.

- Nonpoint Source Loading: Land cover loading estimates for TSS, TP and TDS were shared for Sand Branch as well as Flatlick Branch, which is being used for hydrologic calibration. Ms. Shoemaker briefly discussed Flatlick Branch hydrologic calibration and reasons for variation in pollutant loading rates for the same land cover type categories in different watersheds (mostly slope/ soils). Ms. Shoemaker asked the TAC for feedback as to whether the model is adequately characterizing the movement of sediment through the channel.

- Discussions
  - Several TAC members discussed land use cover types shown and questioned the presence and amount of pasture in the Sand Branch watershed. This land cover type is likely due to presence of unkept grassy areas and not presence of agricultural activities. TAC members suggested looking at differences of pasture vs turfgrass in terms of loading rates to identify if there are any differences that warrant possible revision to reflect the non-agricultural nature of the land within the watershed.
  - Members of the TAC discussed the stream bank stability and commented that the model was not fully reflecting movement of sediment thorough the system. The TAC discussed whether there are additional resources that improve the model in terms of sediment movement and deposition. Chris Van Vlack, Loudoun Soil and Water Conservation District (SWCD) stated he would expect it to be down-cut based on imperviousness. Norm Goulet, Northern Virginia Regional Commission (NVRC) suggested asking Loudoun County for stream erosion data and any back pin or restoration data that may be available from development plans submitted to the locality. Dr. Robert Brent, James Madison University (JMU) added that net deposition doesn't necessarily mean a stable channel but rather the channel is in a state of flux with transient deposition. Dr. Brent and Ms. Shoemaker elaborated that the data represents the conditions at the outlet of the watershed, at which point the stream channel is developing inset floodplains due to deposition, which is what the model is reflecting.
  - Norm Goulet, NVRC suggested to add Nash–Sutcliffe efficiency (NSE) or R^2 to the TDS analysis/other statistical quantity. WSSI explained that the model for TDS is not yet complete but statistical analysis will be incorporated into the final calibration evaluation.
  - Various members of the TAC questioned how future growth will be handled in the watershed. Feedback indicated that there is expected that 99% of the watershed would likely be developed due to airport expanding, solar fields, data center, conversion of gravel roads to paved, etc... Mr. Goulet suggested asking Loudoun County for the 9.2 TAZ that should have projected growth out to 2040. DEQ is considering how to reflect future growth changes in the watershed and in the TMDL and welcomes input from the TAC. Immediately following the meeting, a representative from the County indicated that full build-out of the watershed may not be possible due to zoning restrictions and a lack of sewer and water connection in some areas.
  - Michael Smith, Virginia Department of Energy (DOE) raised a question about the margin of safety (MOS) percentage to be used. Ms. Shoemaker indicated that the MOS has not been decided but that an implicit MOS can be built into the HSPF model and/or an explicit can be applied on the back end. Mr. Smith indicated that future growth is sometimes taken from MOS. Ms. Shoemaker indicated that the MOS and future growth should be separate, and it was noted that growth in coal fields is likely different than growth in Sand Branch watershed.

- A question was raised about the baseline TDS in groundwater or baseflow that was used to model allocations. Ms. Shoemaker stated that the base calibration for TDS in the HSPF model was developed in calibration to match USGS conductivity data on Flatlick.
- John Brooks, Groundwater and Environmental Services, Inc. (GES) questioned how the groundwater load was calculated for TDS and if the sedimentary rock in Flatlick vs trap rock in Sand Branch would make the base level conductivity higher in Flatlick. Ms. Shoemaker stated that conductivity data was correlated to wet and dry periods to account for stormwater entering the system versus periods when groundwater would be the main source. Stanley Grant, Virginia Tech – Occoquan Watershed Monitoring Lab (VT-OWML), suggested looking at the available USGS well data that may be available with conductivity and ion data.

<u>Setting TMDL Endpoint for Total Phosphorus and Total Suspended Sediment</u>

- Katie Shoemaker, WSSI provided an overview of the All Forested Load Multiplier (AllForX) approach, endpoint development, and methodology used for both TP and TSS. A preliminary calculation of the percent reductions was provided for both TP and TSS to give the TAC a sense of the level of reductions that will be needed to achieve the targets.

- Discussions
    - Stanley Grant, VT-OWMLT, stated that the ratio is a proxy for imperviousness vs development (AllForX ratio). He suggested to plot different things other than pollutant load and maintain the same relationship due to VSCI's connection with imperviousness. Ms. Shoemaker noted that the ratios are different between TSS, and TP. Dr. Brent stated that there are other factors that drive VSCI scores than the pollutant of concern, noting the process includes reviewing the regression and filtering out any outliers, so it's not a straight correlation to imperviousness.
    - Michael Smith, DOE asked how variability of the VSCI scores at each station was addressed and if it can show any error bars or standard deviation of VSCI scores to account for uncertainty of measurements across seasons etc. are shown. Ms. Shoemaker explained that points are averages of all VSCI scores for a particular station during a specific time period and model run over time (generally 10–20-year time span for both). Ms. Shoemaker explained that if there are any outliers that are identified, those are removed.
    - Stanley Grant, VT-OMWL, commented that weighting the regression with standard deviation would be more rigorous (give more weight to sites with smaller standard deviation), and would allow points to influence regression with tighter standard deviation.
    - Ms. Shoemaker mentioned the closure of Loudon Composting will remove a large portion of TP loading in watershed, lessening load of TP reduction on other sources of TP.
    - Members of the TAC suggested and discussed if the benthic macroinvertebrate, and thus the VSCI score, differ geographically from north to south in Virginia given the use of benthic data from stations located in basins to the south of the Potomac Basin. Dr. Brent suggested that it would be unlikely because VSCI is a multi-metric and is used statewide. Stanley Grant, VT-OMWL, recommended that the values on regression be color-coded or assigned the station name to identify the point's location to identify whether VSCI scores in stations

located in watersheds outside of the Potomac Basin (specifically to the south) have any effect on the regression.

TMDL Endpoint for TDS (Refresher)

Dr. Robert Brent, JMU provided an overview of the TDS endpoint and how it was developed. Dr. Brent also discussed why the process for development was different from the approach for TDS vs TP and TSS. More detailed information on the development of the TDS endpoint can be found in the meeting materials for the 5th TAC meeting for this TMDL project.

Project Timeline and Next Steps

Ms. Dannemann began the meeting wrap-up with an overview of next steps. She noted that the next TAC meeting is anticipated to be held late Spring or early Summer 2023 to share information on the TMDL allocations along with margins of safety and future growth.

- Mr. Goulet requested email of presentation/ meeting notes.
- Ms. Dannemann indicated that she would reach out to TAC members to request additional information and solicit input on margin of safety and future growth.

Ms. Dannemann closed the meeting by thanking those present for attending.

SAND BRANCH TMDL PROJECT

Sign-in Sheet

Date/Time: January 31, 2023, 10:00 AM – 12:00 PM

Location: Brambleton Public Library, Meeting Room A

First Name	Last Name	Organization	Email	TAC Member (Y/N)	Present
Ben	Bradley	Stantec	benjamin.bradley@stantec.com	Y	
John	Brooks	GES	jbrooks@GESonline.com	Y	✓
Melanie	Mason	Loudoun County	Melanie.Mason@loudoun.gov	Y	✓
Dennis	Cumbie	Loudoun County	dennis.cumbie@loudoun.gov	Y	✓
Shannon	Curtis	Fairfax County	shannon.curtis@fairfaxcounty.gov	Y	
Joseph	Fitter	Chantilly Crushed Stone Inc.	jfitterer@gudelskygroup.com	Y	✓
Thomas	Foley	Virginia Concrete	foleyt@vmcmail.com	Y	
Norm	Goulet	NVRC	ngoulet@novaregion.org	Y	✓
Stanley	Grant	VT-OMWL	stanleyg@vt.edu	Y	✓
Ashley	Hall	Stantec VDOT	ashley.hall@stantec.com	Y	✓
Edward	Hoy	Chantilly Crushed Stone Inc.	edhoy4@gudelskygroup.com	Y	✓
Martin	Hurd	Fairfax County	martin.hurd@fairfaxcounty.gov	Y	
Sean	Minavio	ESS	seanm@ess-services.com	Y	
Greg	Prelewicz	Fairfax Water	gprelewicz@fairfaxwater.org	Y	
~~Nikki~~ Nicki	Bellezza	Fairfax Water	nbellezza@fairfaxwater.com	Y	✓
Chris	Ruck	Fairfax County	Christopher.ruck@fairfaxcounty.gov	Y	
Michael	Smith	DOE	Michael.smith@energy.virginia.gov	Y	✓
Chris	Van Vlack	Loudoun SWCD	Chris.vanvlack@lswcd.org	Y	✓
Project Team					
Robert	Brent	JMU	brentrn@jmu.edu		✓
Margaret	Dannemann	DEQ	Margaret.Dannemann@deq.virginia.gov		✓

Robert	Breeding	DEQ	Robert.Breeding@deq.virginia.gov		
Justin	Loyd	DEQ	Justin.Loyd@deq.virginia.gov		
Rebecca	Shoemaker	DEQ	Rebecca.Shoemaker@deq.virginia.gov		
Bryant	Thomas	DEQ	Bryant.Thomas@deq.virginia.gov		✓
Thomas	Schubert	WSSI	Tschubert@wetlands.com		✓
Katie	Shoemaker	WSSI	KShoemaker@wetlands.com		✓
Sarah	Sivers	DEQ	Sarah.sivers@deq.virginia.gov	N	✓
Public (non-TAC Members)					
Niffy	Saji	Fairfax Water	nsaji@fairfaxwater.org		
Nathan	Staley	WSSI	nstaley@wetlands.com		
Gwendolin	McCrea	DEQ	Gwendolin.Mccrea@deq.virginia.gov		✓
REBECCA	SHOEMAKER	DEQ			✓

DEQ

Virginia Department of Environmental Quality

Sand Branch Benthic TMDL Study

Sixth Technical Advisory Committee Meeting

January 31, 2023

Agenda

- Welcome, Introductions, and Meeting Objectives
- Source Assessment: Permitted Source Updates, Existing Loads
- Setting TMDL Endpoints for TPh and TSS: AllForX Method
- TMDL Endpoint for TDS (Refresher)
- Project Timeline and Next Steps

DEQ

TMDL Development Process

Characterize the Watershed

- Evaluate data on land use, soils, hydrology, ecoregion, etc. ✓

Conduct a Pollutant Source Assessment

- Identify point (permitted) and nonpoint (unpermitted) sources
- Identify existing pollutant loads ✓

Establish the TMDL endpoint

- Identify a numeric value/threshold that meets applicable water quality criteria ✓

Identify the TMDL Condition and Needed Pollutant Reductions

- Model baseline and projected conditions to identify a scenario (loads) that attains the TMDL endpoint
- Calculate the pollutant reduction needed (the difference between the baseline and TMDL condition)

Allocate the TMDL to Pollutant Sources

- Assign pollutant load allocations to point and nonpoint sources to achieve reductions needed to meet the TMDL
- Include an allocation for future growth (FG) in WLA and a margin of safety (MOS)

Source Assessment

Permitted Sources

Katie Shoemaker and Thomas Schubert
Wetland Studies and Solutions, Inc.

Permit Changes Within the Watershed

Non-Point Source: Changes in Construction General Permits

- Modification to VAR10Q588 H&M Properties (Data Center)
  - Project area and disturbed increased by apx. 36 acres
- New construction permits in the watershed
  - VAR10R191 The Fichel Co. – Utility Installation
  - VAR10R648 Pictor Dulles Logistic Center - Industrial

Point Source Changes: Permitting Changes and QA/QC

- Closure of Loudoun Composting Facility (VA0091430)
- QA/QC of discharge data resulted in minor revisions

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Point Sources with TDS Data

Permit Number	Facility	Avg Reported Flow (MGD)	No. of Samples	Min. Conc. (mg/L)	Max. Conc. (mg/L)	Avg Conc. (mg/L)	Permit Type
VA0091430	Loudoun Composting	0.02	31	1.31	1590	792	VPDES IP
VAG110089	Virginia Concrete Company Inc. - Chantilly Plant	0.01	0				Concrete Products GP
VAG110094	Superior Concrete - Dulles	001: 0.0057 002: 0.0023	001: 3 002: 0	274	543	444	
VAG110318	Aggregate Industries MAR – Chantilly	ND	0				
VAG840106	Chantilly Crushed Stone Incorporated	0.71	17	441	825	641	Nonmetallic Mineral Mining GP

*ND = No discharge

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Point Sources with Sediment (TSS) Data

Permit Number	Facility	Avg Reported Flow (MGD)	No. of Samples	Min. Conc. (mg/L)	Max. Conc. (mg/L)	Avg Conc. (mg/L)	Permit Type
VA0091430	Loudoun Composting	0.02	31	0.05	134.9	47.5	VPDES IP
VAG110089	Virginia Concrete Company Inc. - Chantilly Plant	0.01	18	0	20	5	Concrete Products GP
VAG110094	Superior Concrete - Dulles	001: 0.0057 002: 0.0023	001: 29 002: 9	001: 0 002: 20	001: 326 002: 160	001: 23.7 002: 59.7	
VAG110318	Aggregate Industries MAR – Chantilly	ND					
VAG840106	Chantilly Crushed Stone Incorporated	0.71	44	0	54	11	Nonmetallic Mineral Mining GP
VAG406265	Chantilly Liberty	0.001	1	9.4	9.4	9.4	Domestic Sewage GP
VAR050863	Virginia Paving Company - Chantilly Plant	No data	12	18.5	270	81	Industrial Stormwater GP

*ND = No discharge

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Point Sources with Phosphorus Data

Permit Number	Facility	Avg Reported Flow (MGD)	No. of Samples	Min. Conc. (mg/L)	Max. Conc. (mg/L)	Avg Conc. (mg/L)	Permit Type
VA0091430	Loudoun Composting	0.02	21	0	7.2	3.1	VPDES IP
VAG110089	Virginia Concrete Company Inc. - Chantilly Plant	0.01	1	0	0	0.01	Concrete Products GP
VAG110094	Superior Concrete - Dulles	001: 0.0057 002: 0.0023	001: 1 002: 0	0.03	0.03	0.03	
VAG110318	Aggregate Industries MAR – Chantilly	ND	0				
VAG840106	Chantilly Crushed Stone Incorporated	0.71	10	0	0	0	Nonmetallic Mineral Mining GP
VAR050863	Virginia Paving Company - Chantilly Plant	No data	4	0	0.33	0.16	Industrial Stormwater GP

*ND = No discharge

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Sediment Land and Stream Loading

Land Cover	Sand Branch (689 ac)			Flatlick Branch (2690 ac)		
	Area *ac*	Sediment Loading Rate *t/ac/yr*	Sediment Load *t/yr*	Area *ac*	Sediment Loading Rate *t/ac/yr*	Sediment Load *t/yr*
Open Water	6.84	0.00462	0.0316	13.1	0.00464	0.0607
Developed	45.6	0.617	28.1	31.9	0.576	18.4
Barren	36.0	2.62	94.5	1.00	1.79	1.79
Forest	334	0.150	50.2	712	0.109	77.3
Turfgrass	76.1	0.775	59.0	1110	0.618	685
Pasture	14.6	0.956	14.0	1.47	0.726	1.06
Impervious	176	0.895	157	825	0.895	738
Total Land Load (t/yr)			**403**			**1,520**
Streambed Deposition (t/yr)			**-84.5**			**-215**
Total Sediment Outflow (t/yr)			***319***			***1,310***

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Phosphorus Land and Groundwater Loading

Land Cover	Sand Branch (689 ac)			Flatlick Branch (2,690 ac)		
	Area	Phosphorus Loading Rate	Phosphorus Load	Area	Phosphorus Loading Rate	Phosphorus Load
	ac	*lb/ac/yr*	*lb/yr*	*ac*	*lb/ac/yr*	*lb/yr*
Open Water	6.84	1.92	13.2	13.1	1.93	25.2
Developed	45.6	2.39	109	31.9	2.36	75.2
Barren	36.0	10.6	383	1.00	7.79	7.81
Forest	334	1.890	632	712	1.83	1,310
Turfgrass	76.1	2.48	188.0	1110	2.33	2,580
Pasture	14.6	2.81	41.0	1.47	2.55	3.75
Impervious	176	4.07	714	825	4.07	3,360
Total Land Load (lb/yr)			**2,080**			**7,350**
Groundwater Load (lb/yr)			**113**			**773**
Total Phosphorus Outflow (lb/yr)			***2,190***			***8,120***

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Total Dissolved Solids Land and Groundwater Loading

Land Cover	Sand Branch (689 ac)			Flatlick Branch (2,690 ac)		
	Area	TDS Loading Rate	TDS Load	Area	TDS Loading Rate	TDS Load
	ac	*lb/ac/yr*	*lb/yr*	*ac*	*lb/ac/yr*	*lb/yr*
Open Water	6.84	73.2	501	13.1	71.7	937
Developed	45.6	48.7	2,220	31.9	50.1	1,600
Barren	36.0	45.1	1,620	1.00	32.6	32.7
Forest	334	41.5	13,800	712	29.0	20,700
Turfgrass	76.1	36.6	2,790	1110	31.5	35,000
Pasture	14.6	37.2	543	1.47	31.5	46.1
Impervious	176	918	161,000	825	918	757,000
Total Land Load (lb/yr)			**183,000**			**815,000**
Groundwater Load (lb/yr)			**146,000**			**591,000**
Total TDS Outflow (lb/yr)			***329,000***			***1,410,000***

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Discussion

- Stream bank mass wasting
- Future growth potential in the watershed

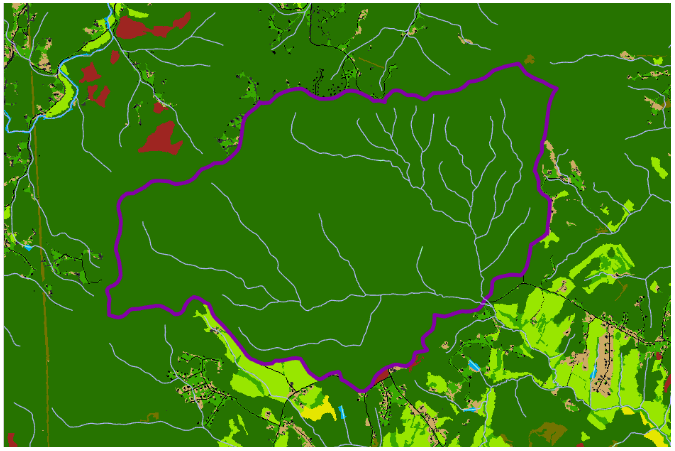
Setting the TMDL Endpoint

Total Phosphorus and Sediment (TSS)

Katie Shoemaker and Thomas Schubert
Wetland Studies and Solutions, Inc.

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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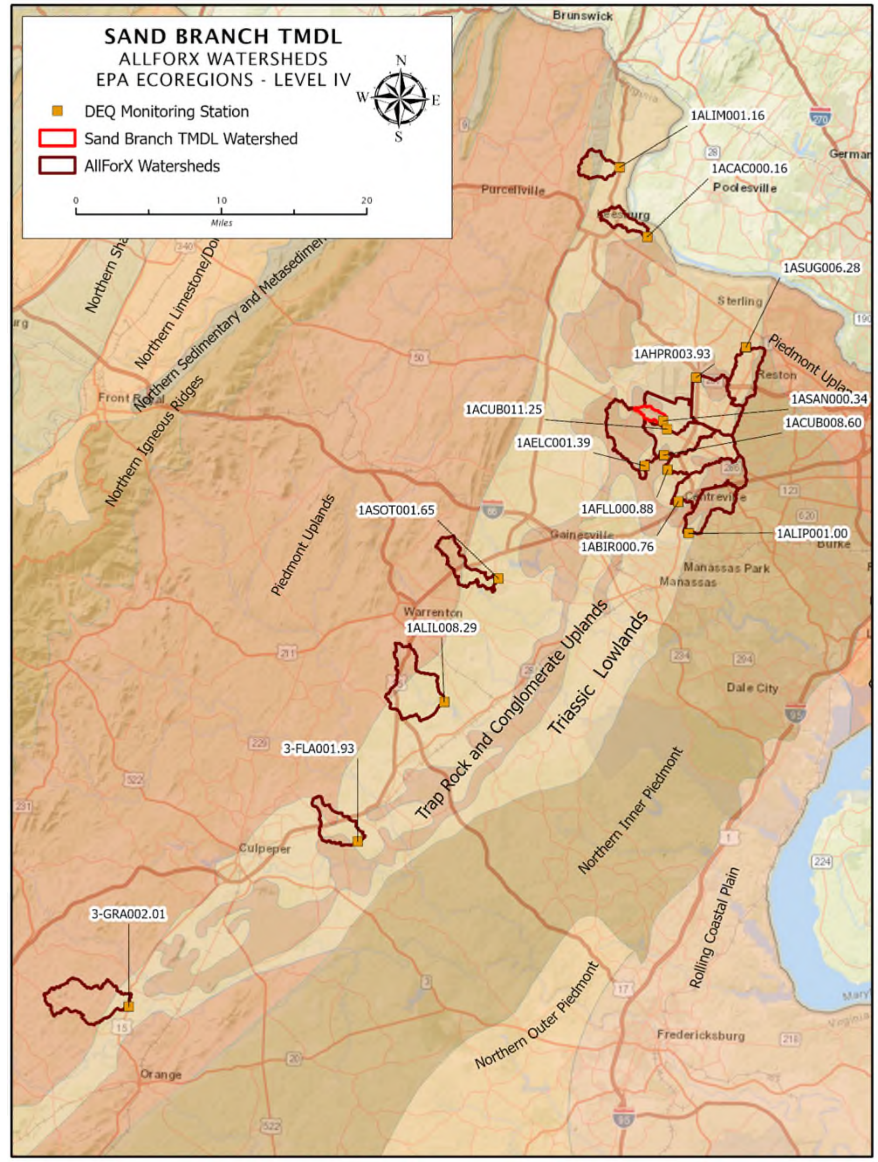
AllForX Approach

- Step 1: select 15-25 comparison watersheds
  - Within the same ecoregion
  - Of comparable size
  - Within close proximity
  - With available benthic data (impaired or unimpaired)

- The list of comparison watershed used for Sand Branch was narrowed down to 14 watersheds of similar size, ecoregion (Triassic) and availability of recent monitoring data.



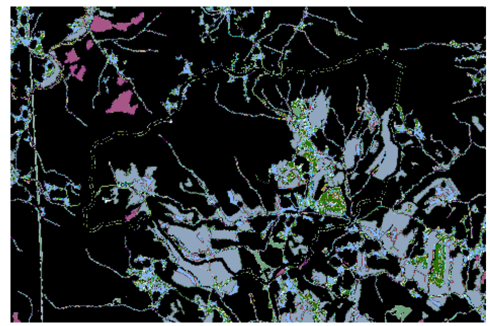
AllForX Approach

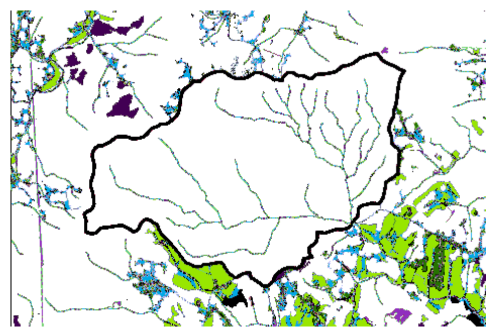
- Step 2: model pollutant load in each comparison watershed under two conditions
  - Existing condition
  - All-forested condition
- Step 3: calculate the AllForX multiplier for each comparison watershed

$$\text{AllForX Multiplier} = \frac{\text{Existing Condition Pollutant Load}}{\text{All Forested Pollutant Load}}$$

What Does It Mean?

Watershed produces 3 times the pollutant load that it would otherwise produce if it were all forested





$$\frac{15\ \text{T/yr}}{5\ \text{T/yr}} = 3$$

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AllForX Approach

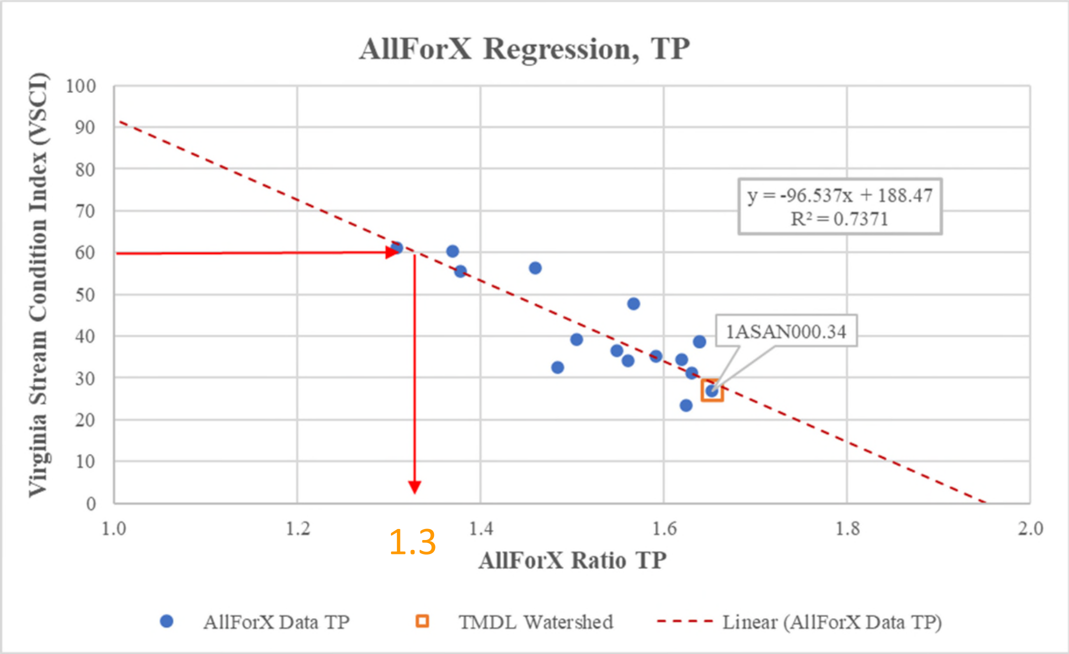
Station ID	Stream Name	VSCI	TSS (t/yr)	TSS All-Forested (t/yr)	TSS Multiplier	TP (lb/yr)	TP All-Forested (lb/yr)	TP Multiplier
1ASAN000.34	Sand Branch	26.9	301	72	4.2	2,080	1,260	1.7
1ALIM001.16	Limestone Branch	61.2	674	235	2.9	4,340	3,320	1.3
1ACAC000.16	Cattail Branch	38.6	939	181	5.2	5,610	3,420	1.6
1ASUG006.28	Sugarland Run	31.3	2,160	451	4.8	12,900	7,910	1.6
1AHPR003.93	Horsepen Run	34.3	3,060	632	4.9	18,400	11,400	1.6
1ACUB011.25	Cub Run	32.5	1,950	512	3.8	13,200	8,910	1.5
1AELC001.39	Elklick Run	47.8	3,550	888	4.0	20,500	13,100	1.6
1ACUB008.60	Cub Run	36.5	4,140	978	4.2	26,400	17,000	1.6
1AFLL000.88	Flatlick Run	23.5	2,450	511	4.8	14,800	9,090	1.6
1ABIR000.76	Big Rocky Run	35.2	2,650	560	4.7	16,100	10,100	1.6
1ALIP001.00	Little Rocky Run	34.1	1,980	439	4.5	12,000	7,670	1.6
1ASOT001.65	South Run	55.5	837	338	2.5	6,700	4,860	1.4
1ALIL008.29	Licking Run	60.3	2,520	951	2.7	18,600	13,600	1.4
3-FLA001.93	Flat Run	39.2	1,480	435	3.4	10,800	7,140	1.5
3-GRA002.01	Great Run	56.2	2,520	962	2.6	13,600	9,290	1.5

DEQ

AllForX Approach

- Step 4: make a regression of AllForX multipliers versus VSCI scores for each of the comparison watersheds

- Step 5: TMDL target is the AllForX multiplier that corresponds to a VSCI of 60



DEQ

AllForX Approach

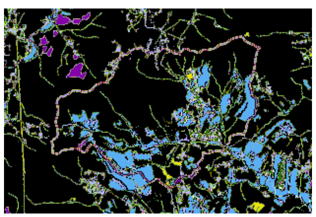
- Step 6: TMDL reductions are set to meet the all-forested load x AllForX multiplier

What Does It Mean?

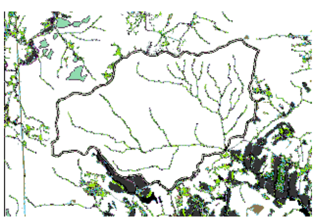
The impaired watershed can produce up to 1.3 times the all-forested load and still support a healthy benthic community.

5 T/yr x 1.3 = 6.5 T/yr

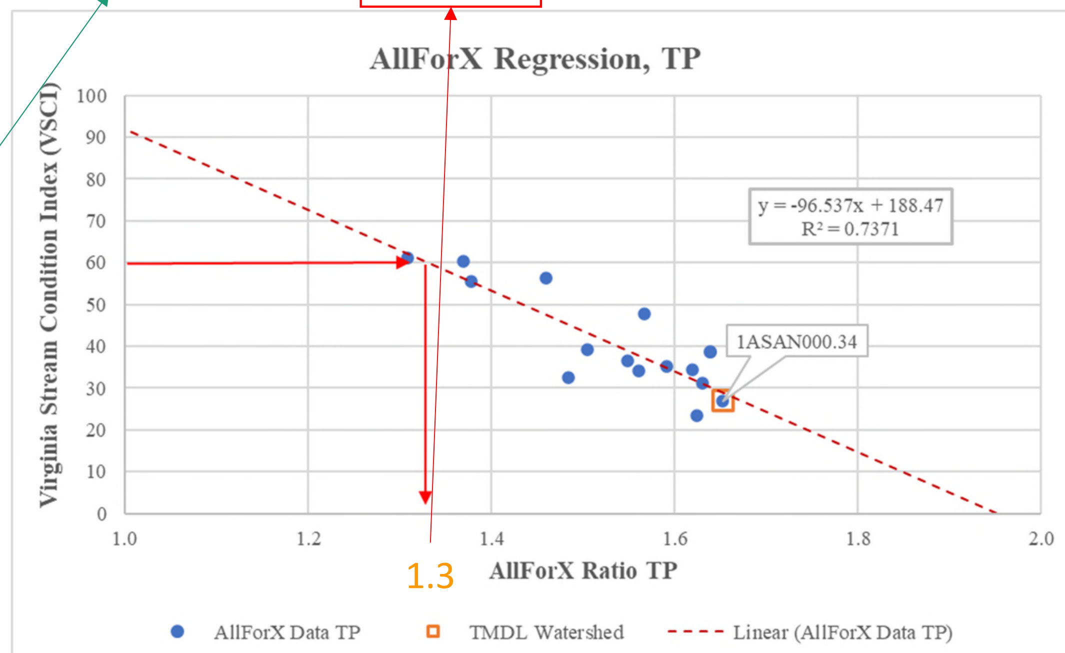
TMDL Endpoint



15 T/yr



5 T/yr



TSS AllForX Regression and Target

Station ID	Stream Name	VSCI	TSS (t/yr)	TSS All-Forested (t/yr)	TSS Multiplier
1ASAN000.34	Sand Branch	26.9	301	72	4.2
1ALIM001.16	Limestone Branch	61.2	674	235	2.9
1ACAC000.16	Cattail Branch	38.6	939	181	5.2
1ASUG006.28	Sugarland Run	31.3	2,160	451	4.8
1AHPR003.93	Horsepen Run	34.3	3,060	632	4.9
1ACUB011.25	Cub Run	32.5	1,950	512	3.8
1AELC001.39	Elklick Run	47.8	3,550	888	4.0
1ACUB008.60	Cub Run	36.5	4,140	978	4.2
1AFLL000.88	Flatlick Run	23.5	2,450	511	4.8
1ABIR000.76	Big Rocky Run	35.2	2,650	560	4.7
1ALIP001.00	Little Rocky Run	34.1	1,980	439	4.5
1ASOT001.65	South Run	55.5	837	338	2.5
1ALIL008.29	Licking Run	60.3	2,520	951	2.7
3-FLA001.93	Flat Run	39.2	1,480	435	3.4
3-GRA002.01	Great Run	56.2	2,520	962	2.6

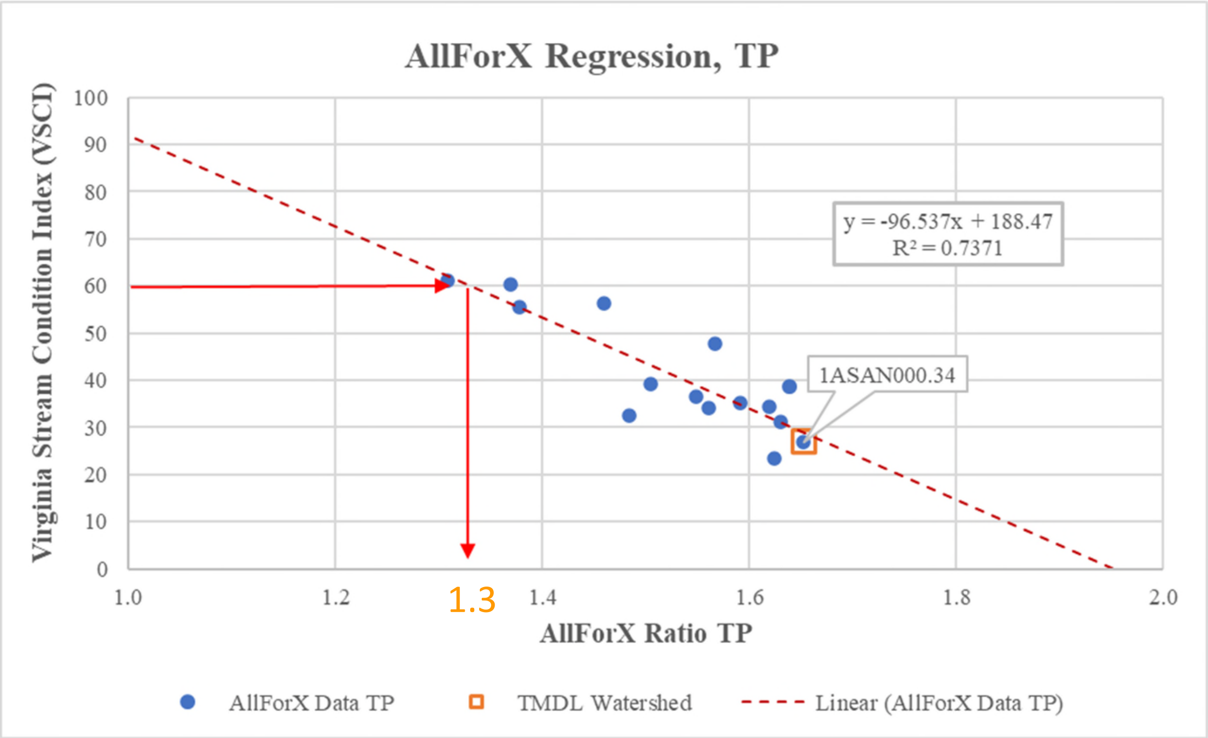
Target = 76 T/yr x 2.2 = **167 T/yr**

Estimated % Reduction = 100*(319 – 167)/319 = **47.6%**

DEQ

TP AllForX Regression and Target

Station ID	Stream Name	VSCI	TP (lb/yr)	TP All-Forested (lb/yr)	TP Multiplier
1ASAN000.34	Sand Branch	26.9	2,130	1,260	1.7
1ALIM001.16	Limestone Branch	61.2	4,340	3,320	1.3
1ACAC000.16	Cattail Branch	38.6	5,610	3,420	1.6
1ASUG006.28	Sugarland Run	31.3	12,900	7,910	1.6
1AHPR003.93	Horsepen Run	34.3	18,400	11,400	1.6
1ACUB011.25	Cub Run	32.5	13,300	8,910	1.5
1AELC001.39	Elklick Run	47.8	20,500	13,100	1.6
1ACUB008.60	Cub Run	36.5	26,400	17,000	1.6
1AFLL000.88	Flatlick Run	23.5	14,800	9,090	1.6
1ABIR000.76	Big Rocky Run	35.2	16,100	10,100	1.6
1ALIP001.00	Little Rocky Run	34.1	12,000	7,670	1.6
1ASOT001.65	South Run	55.5	6,700	4,860	1.4
1ALIL008.29	Licking Run	60.3	18,600	13,600	1.4
3-FLA001.93	Flat Run	39.2	10,800	7,140	1.5
3-GRA002.01	Great Run	56.2	13,600	9,290	1.5



Target = 1,330 lb/yr x 1.3 = **1,770 lb/yr**

Estimated % Reduction = 100*(2,190 – 1,770)/2,190 = **19.5%**

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Discussion

- TP TMDL in light of closure of Loudoun Composting

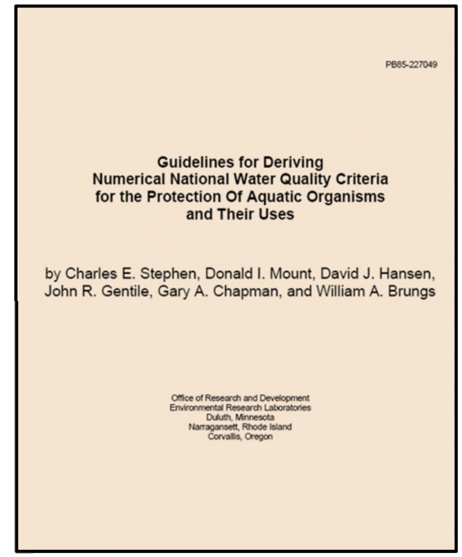
TMDL Endpoint for TDS

Refresher

Dr. Robert Brent
Professor of Aquatic Ecotoxicology
James Madison University

Total Dissolved Solids (TDS) Endpoint Development

- No numeric water quality criteria for TDS
- We used a site-specific toxicity approach
  - Similar to the approach used nationally to set numeric Water Quality Criteria, but specific to the conditions in Sand Branch

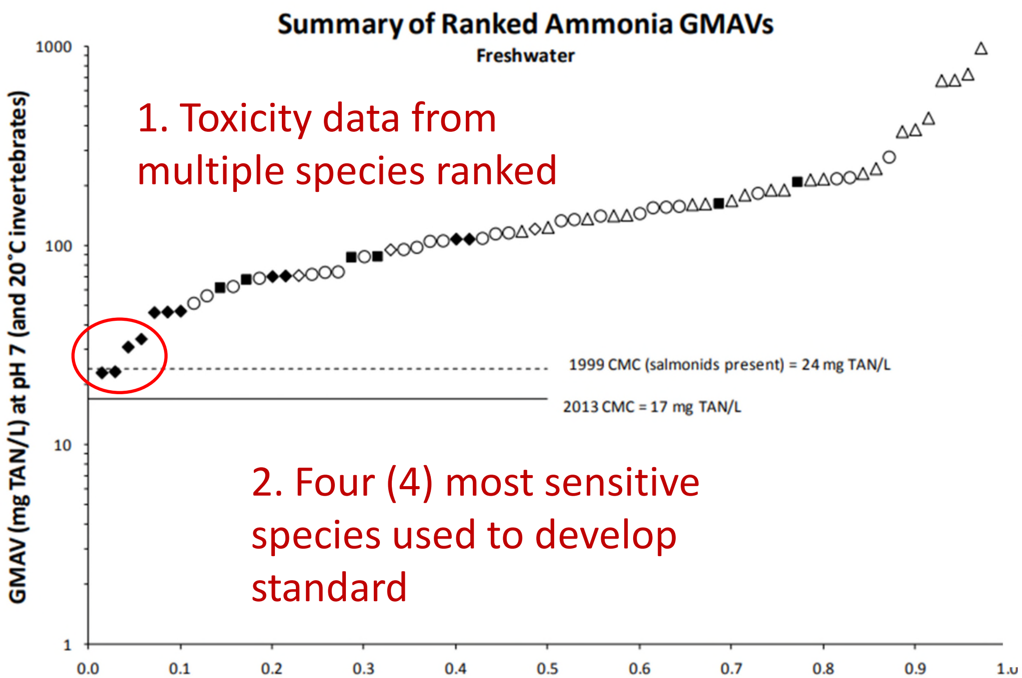


PB85-227049

Guidelines for Deriving Numerical National Water Quality Criteria for the Protection Of Aquatic Organisms and Their Uses

by Charles E. Stephen, Donald I. Mount, David J. Hansen, John R. Gentile, Gary A. Chapman, and William A. Brungs

Office of Research and Development
Environmental Research Laboratories
Duluth, Minnesota
Narragansett, Rhode Island
Corvallis, Oregon



3. Statistical calculation made to develop standard that is protective of all species

$$S^2 = \frac{\sum((\ln GMAV)^2) - ((\sum \ln GMAV))^2 /4}{\sum(F) - ((\sum(\sqrt{P}))^2/4}$$

$$L = (\sum(\ln GMAV) - S(\sum(\sqrt{P}))/4$$

$$A = S(\sqrt{0.05}) + L$$

$$FAV = e^A$$

Final value

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TDS Endpoint Calculation – Acute Effects

Species	*GMAV* (96-hr LC50)	R	$ln(GMAV)$	$ln(GMAV)^2$	P	$\sqrt{P}$
P. promelas	1511	1	7.320527	53.590115	0.166667	0.408248
I. bicolor	1839	2	7.516977	56.504947	0.333333	0.57735
C. dubia	3195	3	8.069342	65.114286	0.5	0.707107
L. carinata	3338	4	8.113127	65.822831	0.666667	0.816497
Sum			28.24581	199.94074	1.666667	2.509202

S^2	5.100087
S	2.258337
L	6.338337
A	6.843317

	TDS (mg/L)
FAV	938

Acute TDS Threshold

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TDS Endpoint Calculation – Chronic Effects

Species	$GMCV$ (IC25)	R	$ln(GMCV)$	$ln(GMCV)^2$	P	$\sqrt{P}$
I. bicolor	652	1	6.48024	41.993515	0.166667	0.408248
P. promelas	1233	2	7.117206	50.654614	0.333333	0.57735
C. dubia	1440	3	7.272398	52.887778	0.5	0.707107
L. carinata	1597	4	7.375963	54.404831	0.666667	0.816497
Sum			28.24581	199.94074	1.666667	2.509202

S^2	5.227924
S	2.286465
L	5.627151
A	6.13842

	TDS (mg/L)
FCV	463

Chronic TDS Threshold

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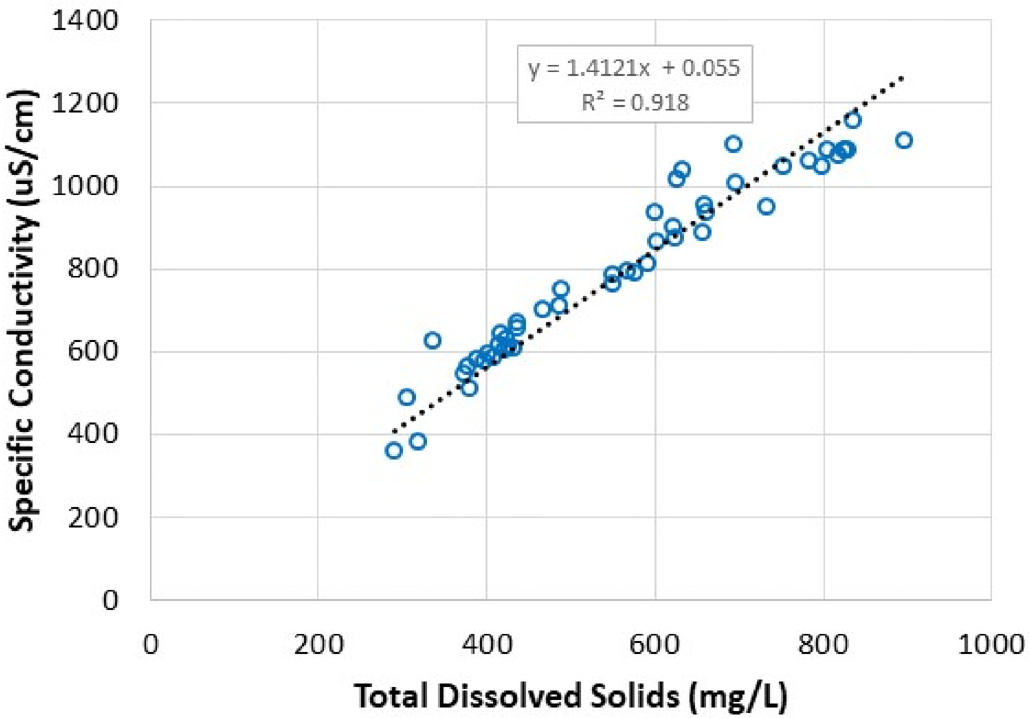
How Do TDS Endpoints Relate to Conductivity?

- Using the TDS to Conductivity relationship established in Sand Branch, we can relate TDS endpoints to equivalent conductivity values



	TDS (mg/L)	Conductivity (uS/cm)
Acute Endpoint	938	1324
Chronic Endpoint	463	654

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Meeting Wrap-up

Project Timeline and Next Steps

Margaret Dannemann
Water Planning and Assessment Supervisor
Virginia Department of Environmental Quality

TMDL Development Process

Characterize the Watershed

- Evaluate data on land use, soils, hydrology, ecoregion, etc.

Conduct a Pollutant Source Assessment

- Identify point (permitted) and nonpoint (unpermitted) sources
- Identify existing pollutant loads

Establish the TMDL endpoint

- Identify a numeric value/threshold that meets applicable water quality criteria

Identify the TMDL Condition and Needed Pollutant Reductions

- Model baseline and projected conditions to identify a scenario (loads) that attains the TMDL endpoint
- Calculate the pollutant reduction needed (the difference between the baseline and TMDL condition)

Allocate the TMDL to Pollutant Sources

- Assign pollutant load allocations to point and nonpoint sources to achieve reductions needed to meet the TMDL
- Include an allocation for future growth (FG) in WLA and a margin of safety (MOS)

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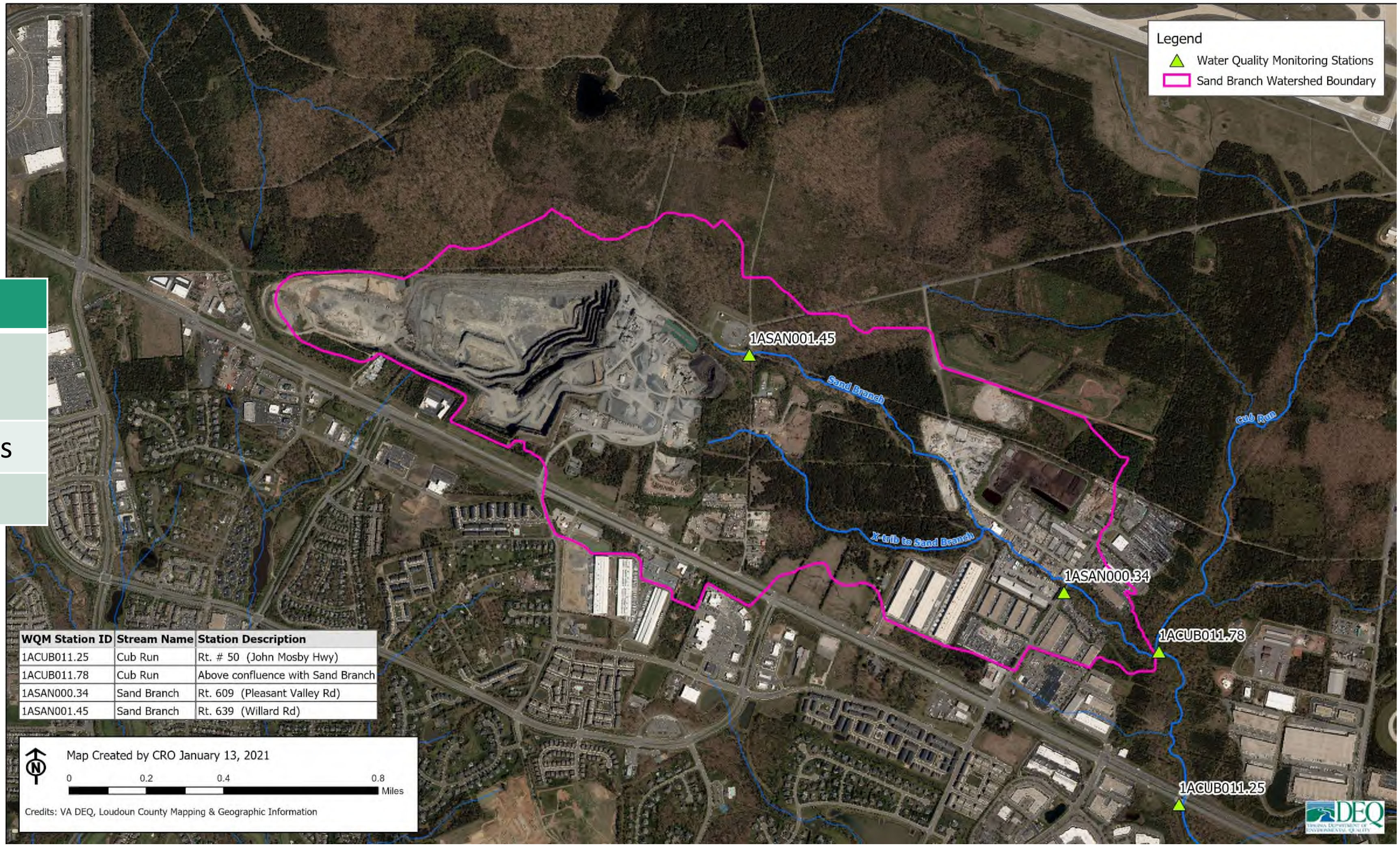
Questions?

Margaret Dannemann
Water Quality Planning Supervisor
(571) 866-6485
Margaret.dannemann@deq.virginia.gov

Sarah Sivers
Water Permitting, Planning and Monitoring Manager
(571) 408-3157
Sarah.Sivers@deq.virginia.gov

Sand Branch

TMDL Target
Total Dissolved Solids (TDS)
Total Phosphorus
Sediment



WQM Station ID	Stream Name	Station Description
1ACUB011.25	Cub Run	Rt. # 50 (John Mosby Hwy)
1ACUB011.78	Cub Run	Above confluence with Sand Branch
1ASAN000.34	Sand Branch	Rt. 609 (Pleasant Valley Rd)
1ASAN001.45	Sand Branch	Rt. 639 (Willard Rd)

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