Meeting Summary for South Fork Rivanna TMDL Development

Technical Advisory Committee Meeting #1

December 9, 2020, 2:00 p.m. – 4:00 p.m.

Participants

Andrea Bowles (RWSA)
Ann Mallek (Albemarle Co. BOS)
Ashley Hall (Stantec)
Charif Soubra
Craig Lott (DEQ)
David Vance
Dawson Garrod
Frances Lee-Vandell
James Mandell
James Nix
Jason Devillier (CHO)
Jon Lipinski (USDA-NRCS)
Kathryn Nepote
Katie Shoemaker (3E)
Kevin Vaughan (DEQ)
Kim Biasiolli (Albemarle Co.)
Laurel Williamson (Albemarle Co.)
Leah Potts
Lisa Wittenborn (RCA)
Lizbeth Palmer (Albemarle Co. BOS)
Mariah Burgess
Marilyn Smith (RCA)
Martha Donnelly
Rachel Pence (RCA)
Richard Parrish
Robert Brent (JMU)
Robert Jennings
Sara Jordan (DEQ)
Tara Wyrick (DEQ)
Nesha McRae (DEQ)
Thomas Adajian
Vicki Metcalf

Meeting Summary

Nesha McRae began the meeting with a poll to determine the proportion of meeting participants who were present for the first public meeting, or had watched a recording of the webinar. The majority of participants were present for this introductory meeting. Nesha provided and overview of the role of the technical advisory committee, explaining that this group shares and reviews technical information that will be used to develop the TMDL study. Nesha explained that the primary goal of the meeting is to share the draft benthic stressor analysis with the committee and collect feedback from participants on the pollutants identified as stressors in the South Fork Rivanna River watershed.

The group was presented with an overview of the weight of evidence approach used to complete a benthic stressor analysis along with the list of candidate stressors considered in the analysis. The Environmental Protection Agency's (EPA) Causal Analysis Diagnosis Decision Information System (CADDIS) model was used as a framework to weigh 14 lines of evidence for each stressor for each of the 13 impaired streams. Nesha shared examples of these different lines of evidence and explained how they are summed for each pollutant to create and overall score. These scores are then grouped into three categories: non-stressors, possible stressors, and probable stressors. The probable stressors then serve as the targets for TMDL development. The grouped reviewed the data sources used in this causal analysis including chemical, biological, land use and habitat data, in addition to a series of local and regional studies that were used to corroborate conclusions regarding likely stressors in the watershed.

The group responded to a poll regarding additional data sources that should be incorporated into the analysis. All participants agreed that the data used to complete the draft analysis appeared to be sufficient.

The committee moved on to the first of five Q&A sessions. One participant expressed concerns about lawns that are mowed down very low and the runoff of various chemicals from those lawns. Another participant asked whether rainfall levels and climate data were considered in the stressor analysis. Nesha responded that rainfall rates were considered, but that temporal analyses of rainfall and VA Stream Condition Index (VSCI) scores (a measure of diversity and abundance of aquatic macroinvertebrates) did not show a strong relationship between the two parameters. However, Nesha added that VSCI scores at nearly all of the sites in the project area were typically lower in the spring when rainfall rates were highest when compared to samples collected during drier fall months. This suggests that pollutant runoff is having a negative impact on aquatic life, particularly when rainfall rates are greatest.

Another participant asked for clarification on the CADDIS approach and process of grouping the stressors. A participant asked for additional information on the role of the contractor, 3E Consulting, in development of the TMDL. Nesha explained that 3E will be responsible for development of the watershed model and that JMU will provide technical assistance as needed and has reviewed the benthic stressor analysis. A participant asked whether committee members' names and contact information could be shared with the group. Nesha noted that names would be included in the meeting summary shared with the group, and the committee agreed that she would ask participants if their information could be included in the summary when it is distributed for review.

Nesha moved on to share a summary of probable stressors identified in the stressor analysis including: sediment for all 13 impaired streams, nitrogen in X-Trib to Parrott Branch, and dissolved oxygen and phosphorus in the South Fork Rivanna River downstream of the reservoir. Nesha reviewed the evidence supporting each pollutant as a probable stressor:

Sediment

- Taxonomic community structure indicated shifts to Dipteran-dominated communities that prefer sediment and away from Ephemeroptera, Plecoptera, and Trichoptera, which generally prefer clean substrate. Trichoptera present in impaired streams were predominantly Hydropsychidae, which is also indicative of excess sediment in the stream. Hydropsychidae is a family of net-spinning caddisflies, which spin nets of silk to trap particles as a food source. The Hydropsychidae are more pollution tolerant than most other Trichopteran families and can thrive in enriched and sediment laden environments.
- Functional feeding group analysis indicated shifts to filterers and collectors that prefer sediment conditions and away from shredders and scrapers that prefer clean substrate.
- Habitat metrics that indicate excess sediment and substrate embeddedness (SEDIMENT and EMBED) were low compared to reference conditions. Additionally, streambank stability and vegetation metrics (BANKS and BANKVEG) were typically lower than reference conditions, suggesting bank erosion is an issue of concern in the impaired streams
- Relative bed stability measurements indicated that bottom substrates in the impaired streams were dominated by sand and fine material when compared to a similar reference stream where bottom substrates were predominantly gravel, cobble and bedrock.

Following this summary of evidence used to identify sediment as a probable stressor, Nesha polled participants as to their level of comfort with this conclusion. 95% of participants either strongly agreed with this conclusion or felt comfortable with it (5% had some reservations). The group moved into the second Q&A session to discuss sediment as a stressor in the watershed. Marilyn Smith, a volunteer with Rivanna Conservation Alliance (RCA), noted that overall, her observations in the South Fork Rivanna River watershed support the conclusion that there is a problem with sediment in the watershed. She added that they have had to relocate some of their monitoring stations in the watershed as a result of excess sediment deposition. She also noted that last time she sampled Naked Creek, she heard a lot of land clearing activities underway.

Laurel Williamson, a staff member with Albemarle County and an RCA volunteer monitor, asked whether the study would determine how much sediment is coming from the streambanks and how much from the watershed itself (or if this is something DEQ has already determined). Nesha responded that this would be part of the study process. She also noted that historic land use in the watershed has resulted in legacy deposits of sediment in valley bottoms, which has resulted in a lot of unstable streambanks, bank erosion and sandy bottom streams. Katie Shoemaker added that in developing the watershed model, we will be paying attention to bank erosion and scouring. We will be able to look at sediment sources by land use in addition to streambank erosion.

Another participant asked whether development is a source of sediment in these streams. Nesha replied that development can certainly be a source of sediment. If appropriate best management practices are put into place, this can reduce sediment inputs. However, increasing impervious surface also increases peak streamflows, which increases erosion. A participant asked whether this was the case in Lickinghole Creek. Nesha responded that the watershed is a targeted growth area for the county, and that the impoundment about the watershed outlet is slowly filling in. This makes development a likely source of sediment in the watershed.

Nitrogen (X-Trib Parrott Branch)

- Total nitrogen concentrations fell within the medium probability of stressor effects range, with multiple excursions into the high probability range.
- Considerable shifts in the benthic community to pollution tolerant organisms including Lumbriculida (aquatic worms), which comprised nearly 40% of the population and are highly tolerant of low dissolved oxygen concentrations. Additionally, sensitive EPT taxa were entirely absent from the stream.

Nesha noted that she had followed up on several potential causes for high nitrogen concentrations in this small tributary including leaking sewer lines and failing septic systems. Albemarle County Water and Sewer Authority staff visited the site and checked their sewer main to determine if there were any leaks in the line (none were found). VA Department of Health staff were also contacted regarding any reports of failing septic systems in the watershed as there are a few homes that are not connected to public sewer and are relatively old. There have been no reports of failing systems or requests for repair permits from VDH. Nesha added that RCA has also collected *E.coli* data at the monitoring station in the watershed, which showed elevated concentrations above water quality standards on both occasions when samples were collected. These elevated concentrations could indicate the presence of septage in the creek, though they are not conclusive. Additional research into potential causes of the elevated nitrogen concentrations will be necessary.

Following this summary of evidence used to identify nitrogen as a probable stressor in X-trib Parrott Branch, Nesha polled participants as to their level of comfort with this conclusion. 85% of participants either strongly agreed with this conclusion or felt comfortable with it (15% had some reservations). The group moved into the third Q&A session to discuss sediment as a stressor in the watershed. Andrea Bowles noted that she is very interested in what is causing these elevated nitrogen concentrations because Parrott Branch is a tributary of Beaver Creek, which provides drinking water to residents in Crozet. RWSA has not conducted monitoring on this tributary to date and will be very interested in the results of the study. Andrea added that RWSA has had to complete two large streambank restoration projects on Ivy Creek and Lickinghole Creek to address streambank erosion along their sewer lines. RWSA tries to avoid using more traditional bank restoration practices like rip rap, but sometimes the extent of erosion present necessitates it. Andrea also noted that the impoundment on Lickinghole Creek is a sedimentation basin built in 1994. The basin is owned by RWSA, and is doing its job as is slowly fills up with sediment. RWSA is currently working to develop estimates of how much sediment has accumulated in the basin since its construction. Nesha asked if RWSA could share these data as it would be really helpful in developing sediment loading rate estimates for the watershed.

Phosphorus (SF Rivanna River, downstream of reservoir)

- Over 40% of total phosphorus data points fell within the medium probability of stressor effects category and 10% of points fell within the high probability category at the South Fork Rivanna River monitoring station below the reservoir.
- Dissolved oxygen periodically dipped into the range of high probability for stressor effects and frequently approached the water quality standard (WQS) of 5 mg/L during diurnal monitoring in July 2020.
- Diurnal temperature monitoring in July 2020 showed several excursions above the water quality standard. Warmer water temperatures could also result in lower dissolved oxygen concentrations, making elevated phosphorus concentrations potentially more problematic with respect to aquatic macroinvertebrates
- RWSA study of the reservoir showed average TP concentration between 2015 and 2017 was 0.054 mg/L, with a maximum value of 0.191 mg/L. Monitoring of chlorophyll a (a measure of phytoplankton) in the reservoir provides further evidence of nutrient enrichment. Secchi depths recorded between 2015 and 2017 indicated that the reservoir is eutrophic, with a mean depth of 1.64 m between 2015-2017 at the deeper of the two monitoring stations, and a mean depth of 1.3 m at the shallower station. Typically, secchi depths of less than 2 m are indicative of a eutrophic state.
- Nitrogen to phosphorus ratios in SF Rivanna streams indicate that phosphorus is the limiting nutrient that would control algal growth and subsequent dissolved oxygen levels.

Following this summary of evidence used to identify sediment as a probable stressor, Nesha polled participants as to their level of comfort with this conclusion. 73% of participants felt comfortable with this conclusion while 27% had some reservations. The group moved into the fourth Q&A session to discuss sediment as a stressor in the watershed. Andrea Bowles noted that Rivanna Water and Sewer Authority (RWSA) has additional data from their SF Rivanna Reservoir monitoring stations since the reservoir study was completed (post 2017 data). She stated that this past year, the reservoir did not experience any algal blooms. Andrea thinks this is likely due to the amount of rain that we saw during this period. Due to the size of the drainage area of the reservoir, the

retention time of water during periods of higher flow is very short. Andrea explained that anecdotally, we can connect algal blooms to periods of low flow over the dam, but this varies year to year. Andrea added that there is phosphorus coming into the reservoir from upstream tributaries, which is then retained there and creates algal blooms. She also explained that RWSA has a minimum in stream flow requirement to comply with, and that RWSA treats the reservoir with SeaClear when algal blooms occur. It knocks phosphorus out, so there may be some beneficial uses to the aquatic community from its application. Nesha added that a watershed approach will be taken to address the impairment, meaning that upstream inputs of phosphorus into the reservoir would be accounted for. She also explained that several of the upstream tributaries (e.g. Naked Creek and Fishing Creek) have impaired benthic communities, suggesting that we are dealing with a watershed-scale water quality problem. A participant asked what the primary sources of phosphorus are in the watersheds. Nesha explained that we will work to answer this question as part of the study process.

Ashley Hall asked whether there is a possibility of holding off on development of a phosphorus TMDL in order to determine if addressing sediment issues would also address excess phosphorus loads. Nesha agreed that some of the solutions to address excess sediment and phosphorus may go hand in hand; however, the presence of the reservoir may require that additional measures be considered to specifically address excess phosphorus loads. Nesha asked Craig Lott (DEQ TMDL Program in Central Office) whether the approach Ashley suggested has been taken in other watersheds across the state. Craig explained that DEQ used to develop benthic TMDLs using this more generalized approach focusing on one probable stressor with the assumption that others would be addressed concurrently. However, today we favor a multi stressor approach to ensure that all stressors are addressed. This approach provides a great degree of certainty and reasonable assurance that the TMDL(s) are protective of water quality. Another participant asked whether quarry runoff can be high in phosphorus. Robert Brent responded that he would not expect this unless the quarry was mining phosphorus.

Other contributing factors

- Historic Land Disturbance - The widespread deforestation and intensive agriculture of the 1820-1930s in the piedmont region have produced a legacy of accumulated sediment in valley bottoms that characterize present-day piedmont streams. This legacy contributes to current sediment loads, channel morphology, and stream habitat conditions.
- Historic Dams - In addition to historic forest clearing and intensive agriculture in the piedmont region, the presence of historic mill dams significantly contributed to the present morphology of streams in the region and resulting sediment loads.
- Forest Harvesting – Concerns regarding large scale forest harvesting in the Fishing Creek watershed have been expressed by local landowners for the past several years. This may be a source of sediment in the watershed
- Existing impoundments – Fishing Creek is home to six impoundments, and the South Fork Rivanna River Reservoir is clearly playing a role in the downstream impairment. These impoundments change nutrient cycling dynamics and can result in higher water temperatures and lower dissolved oxygen concentrations downstream

- Imperviousness – The most significant land use correlation with benthic health was the percentage of imperviousness within SF Rivanna watersheds ($R^2 = 0.86$). As the imperviousness of the watershed increased, benthic scores decreased.

The group moved into the fifth Q&A session to discuss sediment as a stressor in the watershed. One participant asked what can be done about impervious surfaces. Nesha identified a series of stormwater management practices to encourage infiltration and allow pollutants to settle out of stormwater.

Elizabeth Palmer asked whether DEQ measures or tracks entrenchment or bank erosion and incision in streams. She has noticed banks growing higher and higher on Mechums River in recent years. Nesha explained that we can look at places that this is occurring in the watershed during development of the study and discussed ways to address streambank erosion.

Another participant asked whether gravel roads are treated as impervious surface and how compacted soils are addressed in terms of stormwater runoff. Katie Shoemaker explained that some of this depends on how detailed the land cover dataset is and the extent of gravel roads present in a watershed. However, when it comes to calculations of runoff in the model, gravel roads are treated as impervious surfaces. Katie was unsure whether gravel roads would be differentiated from paved roads in the model, but this is something that we can explore.

Laurel Williamson asked whether TMDLs had ever explicitly addressed the role that culverts carrying streams under roads may play in sediment and streambank erosion. Katie Shoemaker responded that this is not something we have previously addressed in TMDL development. Due to the size of the South Fork Rivanna watershed and the number of culverts likely present, this would require highly detailed data analyses that we do not have the capacity to complete (Follow up note: DEQ staff are looking in to whether or not these data are already available from localities).

Another participant asked with impervious surfaces can be made more pervious without radical intervention. Nesha explained that there ways to create more effective spaces to allow for stormwater runoff to infiltrate and be treated. Craig Lott added that planting trees around parking lots can also be helpful in slowing down stormwater runoff as tree canopies intercept this runoff and delay the transport of runoff from paved surfaces.

The group moved on to next steps in development of the TMDL study. Nesha shared plans for a Technical Advisory Committee meeting in February, and explained that we will be looking at land use in the watershed and development of the watershed model next. Katie Shoemaker will be leading this effort. Katie shared a summary of the modeling process and discussed the importance of detailed information to develop the model. She described the top candidate model for the South Fork Rivanna, the HSPF model, and how it can be used to simulate pollution transport and fate in the 13 impaired streams in the project area. The HSPF model was developed by EPA and was used to develop the Chesapeake Bay TMDL. It has been used to develop numerous local TMDLs in Virginia, addressing a number of different pollutants (e.g. bacteria, PCBs, phosphorus). HSPF is a spatially lumped, continuous simulation model. HSPF establishes a subdivided watershed and channel network, then simulates this spatially distributed stream network, maintaining upstream-to-downstream connections. The model simulates multiple in stream processes including hydraulics, sediment scouring/deposition, and sediment-chemical interactions.

One participant asked how the model considers “entrenchment” or streambank erosion. Katie responded that the model looks at scour of stream channels during the modeling period. The model is also static in that you are looking at a specific point in time based on the land cover dataset that is used to develop the model. However, the model logs in stream scour over time based on underlying geology and sediment deposition over time.

Nesha reiterated that the next meeting will be held in February and that she will be sharing the meeting summary later this week or early next week. Participants are welcome to provide comments on the meeting summary.