Nontidal Network Workgroup Bi-Monthly meeting

Thursday, June 20th, 2024
2:30PM – 4:00PM

Meeting Materials: **Link**
This meeting was recorded for internal use to assure the accuracy of meeting notes.

Participants:

August Goldfischer (CRC), Lucretia Brown (DC DOEE), Doug Moyer (USGS), James Webber (USGS), Peter Tango (USGS), Nick Murray (WV DEP), Doug Chambers (USGS), Tyler Shenk (SRBC), Durga Ghosh (USGS), John Jastram (USGS), Molly Pulket (PA DEP), Tammy Zimmerman (USGS), Bhanu Paudel (DNREC), Christopher Mason (USGS), Lori Brown (DNREC), Mark Brickner (PA DEP), Kaylyn Gootman (EPA), Meighan Wisswell (VA DEQ), Alex Soroka (USGS), Isabella Bertani (UMCES), Tyler Trostle (PA DEP)

Action items:

- ✓ SRBC will share their latest loads and trends results at a future NTN meeting.
- ✓ Tyler Shenk (SRBC) will set up a meeting between Tyler, Doug Moyer (USGS), Kaylyn Gootman (EPA), and any others particularly from USGS and SRBC who work on loads and trends to discuss SRBC loads and trends to ensure consistency of methods and approach with NTN loads and trends.
- ✓ Doug Chambers will share his presentation on potential bias in the Suspended Sediment Concentration (SSC) analysis for NTN stations in karst watersheds at a future Data Integrity Workgroup meeting for their awareness and input on next steps.
- ✓ The page for the Nontidal Water Quality Monitoring Program was updated to reflect that the number of stations is 123, *not* 126.
- ✓ Contact Jimmy Webber (jwebber@usgs.gov), Chris Mason (camason@usgs.gov), and Alex Soroka (asoroka@usgs.gov) with any feedback on the River Input Monitoring (RIM) loads and trends results.

Minutes:

2:30 PM Welcome, updates and announcements

August shared that when the new STAR staffer starts, the new STAR staffer will be taking over staffing of the Nontidal Network Workgroup to re-balance the two STAR staffer positions' workloads.

Lee McDonnell and Ken Hyer updated the Principals' Staff Committee (PSC) on the efforts to sustain and enhance the monitoring networks at the PSC meeting on June 25th, 2024. The PSC agreed to assign a team to develop a Phase II funding strategy that addresses vulnerabilities and protects investments in Chesapeake Bay Program (CBP) monitoring networks, through assessment and partner coordination.

There is now continuous monitoring in place at all River Input Monitoring sites.

Kaylyn Gootman (EPA) encouraged participants to please consider attending the 2024 Watershed Forum this October 18-20 in Shepherdstown, WV. Alex Gunnerson, Breck Sullivan and Kaylyn put together a proposal for an education and engagement session where they will be talking about tidal and nontidal data connections, Bay trends mapper, tributary summaries, and story maps. They'll focus on data and tools that are available to understand why different trends are happening across the watershed. They're hoping to get selected for a 90-minute presentation with an interactive lesson plan.

Peter shared updates on GIT funding, reminding the group of how GIT funding functioned for 8 years until 2022 with about a million dollars distributed across Goal Teams annually. Usually each of the Outcomes had a proposal funded. This most recent round was different, however; in 2023 the process was halted, there was no decision made, and at the end of the year management started calling for proposals. 9 out of 21 proposals submitted for funding consideration were accepted, 2 of those proposals being from STAR. One is a monitoring design related effort in the tidal waters, another is cluster analysis of the nontidal network trends (which some participants of this group have connected with statistician Elgin Perry on).

Durga Ghosh (USGS) said regarding field audits, there's no nontidal funding updates she knows of. For citizen science there is one Tier 3 audit scheduled next week for the Severn River group. Durga is hoping to have funding for the fall to loop in 2-3 nontidal groups into field audits. Durga said she'll check in with Breck regarding the status of funding.

Jimmy Webber (USGS) shared an update on the historical database reconstruction. He said the team working on this met that morning and are reviewing and finalizing all the data they've compiled from published datasets. The overall objective was to build the next round of NTN load and trend data based on water quality samples that are retrievable, reproducible and publicly available data sets. Now they're working though all the datasets that have been assembled and saying they're ready to move into Weighted Regressions on Time, Discharge and Season (WRTDS). They're hopeful this will be a great product that will support the NTN loads and trends update and will be available to the public later this fall. There may be an opportunity to connect back with data providers to verify that the data reflect what they should be reflecting.

Tyler Shenk (SRBC) shared an update on the status of of SRBC loads and trends. Dawn Hinz submitted a lot of SRBC's older datasets to CBP through DUET. For SRBC's loads and trends analysis they submitted a bunch of data to DUET, pulled it back out, and are doing QA on that and doing their loads and trends. Maybe by next meeting they'll have initial results to share with the group.

Doug Moyer (USGS) said it would be good for USGS and SRBC to talk to ensure consistency of data sets and approach between SRBC and NTN loads and trends. He asked what year's data SRBC will be going through. Tyler said he is willing to discuss this, and they'll be going through

2023 data. Tyler said he'll set up a meeting between SRBC and USGS. Doug said that would be good because the USGS team running the NTN loads and trends is about to run the 2023 loads and trends so it's a good time to coordinate. Kaylyn said she'd also like to be included in that meeting.

Tammy Zimmerman (USGS) thanked Dawn Hinz (SRBC) for how quickly she turned around the historical data and got it in.

Kaylyn gave a brief presentation on how the Nontidal Monitoring Network is funded. It costs $7.5 million per year to run the 123 stations. The median station cost is $52,000/year. 56% of the funding goes to discrete sampling, 12% of the funding goes for operations and maintenance of continuous water quality monitoring (at 28 stations), and 21% of the funding goes to streamflow monitoring. There are 30 funding partners for the NTN, including federal, jurisdictions, local government, and other partners that don't fit those categories. How many partners fund an individual station varies, from 1 partner to 5 partners, with the largest number of stations having 3 funding partners.

Peter asked what goes into the cost? Kaylyn said they included any activity associated with the NTN. That included nitrogen, phosphorous, suspended sediment, flow and continuous water quality with those parameters. Each parameter each had a line in the spreadsheet, and they binned them into these 3 groups. Discrete sampling includes field time, travel time, and lab analysis. Continuous monitoring and stream flow were similarly broken out.

Bhanu Paudel (DNREC) asked in the chat: Question not related to funding - As we are updating our 2025 Monitoring plan I see the total number of stations = 126 (we had 123 in our last plan so just checking) here, https://www.chesapeakebay.net/what/programs/quality-assurance/nontidal-water-quality-monitoring-program.

Peter asked if that is the number of stations that made it to the 10-year timeline? Doug Moyer said that the number of stations that are analyzed for the nontidal network is 123 stations.

Kaylyn and Jimmy shared an update on small agricultural watershed monitoring. Jimmy said that four out of five of the sites are in, and a plan for installing the fifth one (Beaverdam Creek in MD). All sites have been selected with feedback from partners and have high priority for conservation efforts. They want to use the data to continuously evaluate effects of conservation practices and use the stations to motivate additional conservation on the landscape. They hope to get folks out from the community to talk about conservation and monitoring.

Kaylyn said the ability to start to answer questions about BMP implementation are all possible from what can be learned from these places. Peter asked if the education events planned for these sites will be open to the public and Kaylyn responded they will be.

Tammy Zimmerman announced that York County is planning their watershed week for September 21-27 and she will share details on this event when they become available. There will be another streamside demonstration at Fishing Creek near Goldsboro site in York County.

Tammy said they just got the York County agreement signed for another 5 years (through Calendar Year 2028). In addition, there will be an additional 5 sites at small watersheds in agricultural areas in PA that will be going in (as part of a new signed agreement with NRCS (through federal fiscal year 2028). Part of them will get installed later this summer, and the rest of them will go in the beginning at FY25. Three of those sites will be in the Chesapeake Bay watershed. Tammy will let everyone know if there are any streamside demonstrations at any of those sites.

Peter said there was a presentation about work in Central PA to coordinate remediation of sites. Kaylyn said John Clune put together a map of all the funding partners for those sites.

3:10 PM **Update/presentation on potential bias in the SSC analysis for NTN stations in karst watersheds** – Doug Chambers (USGS)

Summary:

The nontidal network sites in West Virginia are in the Eastern panhandle, with all 10 sites in the Potomac River basin. It is a diverse set of sites from less than 10 square miles to over 3,000 square miles. The sites vary in physiography and are mostly in the valley and ridge physiographic province but with portions in the Blue Ridge and Appalachian Plateau provinces as well. Sampling started in 2005 and grew to the current 10 sites by mid-2012. Sites vary in water quality characteristics as well as in size and physiography. There's some variability in suspended sediment concentration, and a significant difference in nutrient state is indicated in nitrate concentration and dissolved material as indicated by specific conductance.

In late 2016 the USGS Kentucky sediment lab notified us there would be an additional charge for using 500ml disposable bottles that had been in use since the beginning of sampling. This charge was to cover the additional effort in retrieving suspended sediment due to the bottle's narrow mouth. They recommend a 1 Liter reusable bottle instead. The WV nontidal sites adopted the reusable bottle to avoid the extra charge. After the switch they started to receive suspended sediment results and for most sites there was no significant difference. However, Mill Creek had a significant difference in suspended sediment concentrations associated with bottle type. After the bottle switch there was a positive shift in the suspended sediment and turbidity relationship almost exclusively in the samples decanted from the reusable bottles.

This pattern of a positive bias in the suspended sediment turbidity relationship associated with bottle type was also reflected in 2 other sites for a total of 3 of the WV nontidal sites: Mill Creek at Bunker Hill, Opequon Creek near Martinsburg, and Rocky Marsh Run. No other site reflected this pattern even though the bottle change had been implemented at all sites at the same time.

The most obvious difference among sites was geology. Significant portions of valley and ridge physiographic provinces are underlain by carbonate rock aquifers and Karst terrain. The three sites with the bottle type associated sediment bias they drain basins dominated by karst

landscapes. These three sites differ significantly; the streams carry more dissolved materials derived from the soluble carbonate landscapes that dominate their watersheds.

To address this issue, Doug implemented a program collecting replicate samples for each sediment bottle. The main sample in a reusable bottle, and the replicate in a disposable bottle. They collected bottle type replicates for all types of samples; environmental samples, blanks, and even replicates of replicates. Doug talked to the lab about possible sources of variability that may have been overlooked but did not receive valuable feedback. Doug kept up with the replicate samples and a year or two down the line Sam Miller, USGS hydrologist, asked why might these sites have high sediment at low turbidity? The suspended sediment – turbidity relationships were biased high for sediment at the low end of turbidity. Sam looked at his sites in comparison and found common patterns. All of these sites were in the Great Valley, an area of extensive Karst terrain. Sam noted samples with suspended sediment concentrations exceeding 100 mg/L while having turbidity values of less than 10 fmu. In Sam's models he found higher specific conductance associated with greater uncertainty in suspended sediment – turbidity models. There was increased uncertainty in the WV dataset in data co-occurring with the bottle change. Sam examined the suspended sediment – turbidity relationships in the Midwest and found high biased patterns in many areas underlain by carbonate geology. This strengthened the hypothesis that elevated solids could contribute to high bias in suspended sediment concentration analysis. With these multiple lines of evidence Doug re-engaged the lab in this issue.

The lab paid closer attention to samples from Karst sites and saw the re-usable bottle types almost always had higher suspended sediment concentrations. One explanation suggested it was the small mouth of the single use bottle that precluded the efficient use of the spatula to harvest sediment from the bottles. But if this were the case an increase in sediment would be seen in all 10 WV sites, not just those in Karst terrain. At this point, while Doug realized may be an issue with the re-usable bottles, the lab had only used their standard 1 pint glass bottles for their lab blanks. With the possibility of bottle type being the source of bottles, the lab processed a series of blanks using glass bottles, the recyclable plastic bottle Doug used previously, and the 4 common types of reusable bottles: 500 mL, 1 L Isco bottle, 1 L sampler bottle and a 3 L bottle. Reused plastics, particularly the 1 L sampler bottle performed somewhat poorly in blanks.

How could high dissolved solids be contributing to high bias in sediment? Precipitation dissolved materials. Why this occurs in re-usable plastic bottles and not single use plastic in glass? Possible factors include condition and residue. Plastic is more susceptible to abrasions, gauges and other damage from harvesting sediment with spatulas or cleaning with brushes. These scrapes may serve as nucleation sites for precipitation of dissolved material. Residue left in the bottle from either cleaning or environmental residue not removed from cleaning can contribute to high bias. Residual material may also serve as nucleation sites for previously dissolved constituents. Glass is less susceptible to wear and scratches. Glass surfaces are more readily

cleaned. Single use plastics are not cleaned, therefore not damaged or having a possibility of residue build-up. The final factor could be holding time. The lab is conducting an experiment to analyze the influence of organics such as algae or biofilms, and initial analysis demonstrate that organic constituents are not a contributor to bias. However a study of holding time and precipitation of dissolved inorganics has not been conducted to date.

Doug concluded by sharing key takeaways: High bias in SSC has been observed for sites with high dissolved solids (as measured by specific conductance), and is not isolated to one lab. Findings have been shared with the USGS Sediment Labs Workgroup. Kentucky Sediment Lab incorporated new procedures: Specific Conductance (SpCond) measurements for all samples; additional rinses for samples with SpCond > 500 µS/cm; acid rinsing of all sample bottles during cleaning. Plastic sample bottles should be routinely replaced, or glass bottles used. Karst Terranes are present throughout the Chesapeake Bay Watershed and many NTN sampled watersheds contain karst terrains, therefore careful examinations of SSC:Turbidity are needed and field staff should pay close attention to conditions of reusable sample vessels.

Discussion:

Doug Moyer: Are you hearing any resolutions regarding the data in our database, there is no correction for those, right? What is the right path forward, are these data useless?

Doug Chambers: To a large degree I think it will take a station-by-station examination of suspended sediment and look at where those effects might be. Even within my small sample size of 3 sites we see Rocky Marsh Run is a small site with 98% baseflow, we saw the largest effect there. We saw a lesser change at Opequon Creek. Because I started this soon after I noticed the difference, I have a pretty extensive nearly 1:1 replicate database and for my submission to DUET, I revised that data and resubmitted the lower biased dataset from the replicate models and made that change. I haven't looked at other locations beyond my network. This group should take a close look at their environmental setting and specific conductance, and the relationship between suspended sediment and turbidity.

Doug Moyer: We'll put it on the to-do list. Maybe a joint handling out of the NTN and Data Integrity Workgroup (DIWG)? We could identify all of our Karst sites to begin with, or all NTN sites, and take the same approach Doug has taken to identify any issues? I'm sure these data exist within other Karst situated sites. I don't think it's unique to KY but the bottle type may be more consistent across the watershed but we'll have to see. Some guidance and how to move forward with load and trend analysis would be helpful. We could take a look at that with existing NTN loads and trends sites we're about to run loads and trends on to see if any are suspect, but I think a more in-depth analysis focused out of NTN and DIWG would be warranted.

Durga Ghosh: I agree. It would be useful to find out which sites within NTN would be impacted. For sediment samples aren't all of them sent to KY lab so wouldn't all of them be impacted?

Doug Chambers: It's not a KY lab issue, it's a methodological issue. I've seen this at other USGS labs but not sure about outside USGS labs. It's not specific to the KY lab, they just happen to be the one analyzing my samples.

Doug Moyer: In VA we use Kentucky Sediment Lab (KSL) and Division of Consolidated Laboratory Services (DCLS). DCLS runs the vast majority of the VA sediment analysis. DCLS uses a reusable plastic bottle and KSL historically uses glass bottles. RIM stations are primarily USGS KY in VA and everything else primarily is DCLS.

Durga Ghosh: Can we loop back with Doug Chambers and Doug Moyer for our next DIWG meeting? Doug Chambers, can you give us the same talk? There are several members who would be interested in learning this.

3:30PM **2023 River Input Monitoring Loads and Trends** – Jimmy Webber (USGS)

Summary:

The USGS collects monthly and storm-targeted water quality samples from the 9 station RIM network. RIM stations represent about 78% of the Chesapeake Bay watershed area. The goal of the RIM network is to compute the load and trend of nitrogen, phosphorous, and suspended sediment. USGS reports on the loads, total amount of nutrients or sediment delivered, and flow normalized loads, removal of most hydrologic variability associated with loads. Trends are changes in the flow normalized load over time. The estimated annual-mean streamflow entering the Bay in water year 2023 was about 17% less than the 1937 – 2023 average. This lower amount of streamflow resulted in below-average nutrient and sediment loads delivered to the Bay. The flow normalized and sediment loads decreased from the RIM watershed area over time. Jimmy showed the results in per-acre loads at the RIM stations. For trends, he showed both the short- and long-term results by RIM station. Trend information in context to the water quality goals was also computed (1995 – 2023) to align with the time frame used in TMDL modeling. Modeling loads can be compared to WIP loads to assess progress towards meeting water-quality goals. Jimmy showed this information for nitrogen, phosphorous, and suspended sediments across the watershed. This information provides context on where the partners need to go to reach their goals.

Discussion:

Peter Tango: Do we know the difference in total load above and below the fall line?

Jimmy Webber: Everything I'm looking at here is relative to the RIM watershed area and the reference WIP load is specific to the RIM watershed so it doesn't speak to the below fall line area. We can estimate it and folks have done that.

Doug Moyer: Additional information that would be helpful; as Jimmy said we'll be taking this presentation to the Water Quality Goal Implementation Team (WQGIT) and other CBP

workgroups and your feedback and input is highly valuable. If there's something that doesn't makes sense or causes concern we'd love to hear from you.

Jimmy: The data release is public with these results. The results will be uploaded to our website and Chesapeake data dashboard. In the next month or two we'll be continuing these communication efforts. My presentation is also available on the meeting webpage.

4:00 PM Adjourn

Next Meeting: August 21st, 2024, 1-2:30pm

In person meeting: October, date TBD