Chesapeake Bay Program

Science. Restoration. Partnership.

Stream Health Workgroup August 2025 Meeting

Friday, August 15, 2025 from 10:00am - 12:00pm

Link to Meeting Materials

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Meeting Purpose:

To receive a presentation about EPA's Causal Analysis/Diagnosis Decision Information System (CADDIS), hear a proposal for the creation of a Chesapeake-wide Biological Stressor Identification (BSID) framework, and learn about the current BSID procedures within each of the Chesapeake Bay States.

Decisions/Actions:

- Action: Learn about and revisit EPA ORD – ROAR.

Participants:

- **Denise Clearwater**, MD Dept. of the Environment
- **Claire Buchanan**, ICPRB
- **Matt Shank**, Pennsylvania Department of Environmental Protection
- **Rosemary Fanelli**, USGS
- **Kristin Saunders**, Maryland DNR
- **Lindsey Boyle**, USGS
- **Becky Monahan**, Maryland Department of the Environment
- **Gabriella Vailati**, DE DNREC
- **Cassie Davis**, NYS DEC
- **Marina Metes**, USGS
- **John Lancaster**, PA DEP
- **Rikke Jepsen**, ICPRB
- **Emily Young**, ICPRB
- **Aerin Portner**, VA DEQ
- **Kelly Maloney**, USGS
- **Sandy Davis**, U.S. Fish and Wildlife Service, Chesapeake Bay Field Office
- **Bel Martinez da Matta**, Maryland Department of the Environment
- **Brittany Sturgis**, DE DNREC
- **Coral Howe**, USGS
- **Scott Heidel**, PA DEP
- **Marisa Baldine**, Alliance for the Chesapeake Bay
- **Brock Reggi**, Virginia DEQ
- **Greg Noe**, USGS
- **Katheryn Barnhart**, EPA
- **Nancy Roth**, Tetra Tech
- **Ryan Pack**, WVDEP
- **Nick Staten**, Chesapeake Research Consortium
- **Alison Santoro**, Maryland DNR
- **Sara Weglein**, Maryland DNR
- **Carol Cain**, Unknown Affiliation
- **Maggie Woodward**, Unknown Affiliation
- **Kyle Hodgson**, Maryland DNR
- **Ashley Hullinger**, Unknown Affiliation
- **Becky Monahan**, MDE
- **Lindsay Boyle**, USGS
- **Katie Brownson**, USDA
- **Chris Spaur**, USACE
- **Michael Bott**, Unknown Affiliation
- **Everald McDonald**, Unknown Affiliation
- **Keith Bollt**, EPA
- **Breck Sullican**, Chesapeake Bay Program
- **Sadie Drescher**, CBT

10:00 – Welcome, Introductions & Housekeeping (5 minutes)
Presenter: Nick Staten, CRC (Stream Health Workgroup Staffer)

- **Please put in the chat:** First and Last Name, Affiliation
- **New meeting practices**
- **New section of agendas**
    - Request presentation topics
    - Helpful resources for partners: funding opportunities, job openings and more.
- **Upcoming meetings:**
    - The next Stream Health Workgroup Meeting will be on **Friday, October 17, 2025 from 10:00am - 12:00pm**

10:05 –

(Presentation) Potential Development of a Chesapeake-wide Biological Stressor Identification Protocol

(20 minutes)
Presenter: Claire Buchanan, ICPRB

Claire's slides can be found here.

- Proposal: This workgroup establishes a Biological Stressor Identification process for the entire Chesapeake watershed.
    - It would build off our recent GIT-funded projects and USGS research studies.
    - It would also build off the assessment procedures that Chesapeake states are currently using for their 303(d) integrated reporting and TMDL development.
    - And it would more closely integrate this workgroup's efforts with other Chesapeake Bay Program workgroups and the states.

- State Water Quality Assessments
    - Every 2 years the states draw up Integrated Reports and submit them to the EPA.
        - The reports describe the overall condition of a state's surface waters as required by the 305(b) section of the Clean Water Act. They also identify those waters deemed impaired by the state. This is the 303(d) list.
    - Impaired waters are those that fail to meet the water quality standards of a state's Designated Uses.
        - Designated uses are described in each state's laws along with narrative and numeric criteria that make the waters fishable and swimmable.
        - Most designated uses focus on human health and recreational activities; however, every state also must have a Designated Use specifically for

Aquatic Life. This is to meet the Clean Water Act's goal of biological integrity.

- TMDL
  - When any designated use fails, the state must plan and implement management actions to control the pollution sources causing the degradation. This usually involves a TMDL.
  - When the Aquatic Life Use fails, states typically undertake a BSID process to accurately identify which pollution sources are causing the biological degradation.

- State BSIDs
  - Identify Impairment Cause
    - Whether or not they have formal BSID procedures written down, each state has criteria or screening thresholds that they use to identify when an environmental parameter may be degrading aquatic life in streams.
      - For example, water quality standards in most states spell out pH and dissolved oxygen criteria that are protective of aquatic life in their surface waters.
      - When specific criteria are not spelled out, states typically use screening thresholds developed from monitoring data and data analyses. Some examples are screening thresholds for specific conductivity, nutrient concentrations, and stream physical habitat parameters like embeddedness.
      - Methods for testing or evaluating the toxicity of different metals also have been used to identify impairment causes.
      - And close examination of species compositions using tools such as the Biological Condition Gradient can help identify potential causes of degradation.
  - After Identifying Impairment Cause, Identify Pollution Source
    - After candidate causes of degradation are identified, the likely sources of the pollution causing the degradation at a stream site need to be identified before an effective TMDL can be developed.
    - Our Chesapeake states have developed some clever and effective methods for doing this. They include methods for differentiating between atmospheric deposition (acid rain) and acid mine drainage as the cause of pH impairment in streams, methods for identifying nutrient enrichment as the likely cause of stream impairment, and screening thresholds for

land use and land cover percentages that are statistically related to stream impairment.
    - There exists a wealth of experience throughout our region, but every state develops its own BSID components using their own monitoring data, assumptions, and methods.
    - Consequently, each BSID is tuned to that state's primary concerns.
    - Despite this individualism, I believe many of the state approaches could be expanded and applied to the Chesapeake watershed as a whole. And, fortunately, there exists a standard framework for how this can be done. It is called the Causal Analysis/Diagnosis Decision Information System or CADDIS.

- EPA's Causal Analysis/Diagnosis Decision Information System (CADDIS)
    - It was developed by EPA in 2000 to help investigators and water resource managers identify the major environmental stressors causing biological degradation.
    - It is a formal and rigorous process that provides a structure for organizing the scientific evidence and supporting the conclusions.
    - The process first lists possible candidate causes of biological impairment, then analyzes the available evidence, and finally characterizes and identifies the strongest candidate causes.
    - It is part of the larger process that connects the detection or suspicion of biological impairment to TMDLs and management actions to correct the causes of impairment.
    - The EPA CADDIS website is a hugely helpful resource for developing an effective, defensible BSID process.
    - The website has a step-by-step stressor identification framework, a library of supporting documentation, many case studies, and several analytical methods and statistical tools.

- Example: EPA Conceptual Diagram for Ionic Strength
    - One example of the resources available on the website is the Conceptual Diagrams such as this one for conductivity, or ionic strength.
    - Using these diagrams, candidate stressors at an impaired site can be tentatively identified by comparing a biologically degraded site's available data and information to the causal pathways that connect pollution sources to stressors and ultimately biological impairments.

- "...Improve Stream Health and Function…" (Stream Health Outcome)
    - In many ways, the adoption of stream health goals in the various Chesapeake Bay Agreements and 2009 Executive Order makes it necessary to develop a process resembling CADDIS for the entire watershed.
    - For starters, an estimate of the percentage of healthy stream miles in the watershed requires an indicator that consistently distinguishes between healthy and degraded biological communities across the entire watershed.
        - In 2008 the Non-Tidal Stream Workgroup, a predecessor of the Stream Health Workgroup, investigated whether the state Aquatic Life Use assessments could be patched together to report progress in meeting the CBP stream health goal.
        - The answer was no. The states' IBI scoring thresholds and assessment methods were too different. This prompted development of the Chessie BIBI index which can consistently distinguish between healthy and degraded streams.
        - Remember that the CADDIS system starts with the identification of degraded streams.
    - CBP goals made it necessary to better understand the full breadth of ecosystem benefits and impacts from stream restoration projects, and especially the trade-offs between the existing and proposed stream corridor conditions.
        - This prompted surveys in 2015 and 2023 to identify and resolve issues involving stream restoration permitting and workshops in 2004, 2014 and 2023 that focused on the effectiveness of different stream restoration approaches.
        - Remember that the CADDIS system ends with planning management actions that eliminate or control the causes of stream degradation.
    - Therefore, the Bay Program efforts to-date have accomplished the first and last components of the CADDIS flow chart and with input from our state assessment and TMDL folks, we have the potential to develop the steps connecting these two components with a BSID for the Chesapeake watershed.

- Ongoing Efforts to ID Stressors Watershed-Wide
    - This slide highlights the pieces we already have of a potentially CADDIS-like framework.
        - Stream Health Workgroup has funded work in three phases:

        - Phase I: Most significant stressors impacting stream health in Chesapeake watershed
        - Phase II: Management actions to reduce impacts of stressors
        - Phase III: select suite of non-biological metrics that complement the Chessie BIBI
    - And there have been many additional USGS-led, Chesapeake-focused studies…

- SHWG Efforts Could Line Up with a CADDIS Approach
    - We have a common index of stream biological conditions - the Chessie BIBI index.
    - We have a workable understanding of the watershed's major environmental stressors from the various GIT-funded projects and the USGS and other research studies.
    - As a community, we have built consensus through workgroup discussions and workshops about effective ways to restore streams.
    - The missing steps are those where the stressors are scored and evaluated consistently across the Chesapeake watershed.

- Proposal – use a CADDIS or CADDIS-like approach to complete a Chesapeake watershed-wide BSID....
    - To do this we would need:
        - To identify state BSID methods that could be expanded to a chesapeake watershed scale and could inform restoration efforts.
            - We could start this today with the presentations that follow.
        - We need to agree on consistent ecoregion-specific screening thresholds for stream water quality and habitat parameters
            - Could be in the form of a dedicated workgroup meeting or workshop
        - Lastly we would need to develop a stressor identification and evaluation process to rank stressors and degraded stream sites across the watershed.
            - Would probably need dedicated funding and could take several years of data gathering and indicator development to finalize it.

        - The final BSID would then become a routine part of our data management analysis and reporting process just as the chessie BIBI is at this point.
    - Potential Chesapeake Bay Program Uses:
        - The Bay Program could then report specific reduction of stressors of stream biology, specific parameters.
        - It could also better target and inform diverse restoration efforts
        - Lastly it would integrate other CBP GIT restoration efforts from other groups to inform where to plant riparian buffers, establish fish passage, restore wetlands, protect lands, and streamline effective use of land use and land cover data for the purpose of improving stream biological health.
    - Potential State Uses:
        - Participating states would have additional BSID information and resources.
        - Could coordinate TMDL development and implementation in interstate waters.
            - Currently it is rare to see states collaborating on improving interstate watersheds.
    - From Phase I: Fanelli et al.'s 2022 paper: "EPA's CADDIS could be a good starting point for unifying key terms and conceptual frameworks for stressor identification and could reduce the likelihood of attributing biological impairment to a proxy or co-occurring stressor."

- We are fortunate today to have several state staff who will talk to us about their state BSID methods. We have asked them to address three questions ..
    - Please provide an overview of your jurisdiction's BSID procedures.
    - How does your state BSID compare to the CADDIS approach?
    - Are there components of your BSID that could potentially be used for a Chesapeake-wide BSID?

10:25 –

(Multiple Presentations) Overview of Existing Jurisdictional BSID Methods

(~50 minutes)

Each presenter will have 7 minutes to present the BSID methods within their jurisdiction. Please answer the 3 discussion guiding questions:

1. Please provide an overview of your jurisdiction's BSID procedure.
2. How does your jurisdiction's BSID compare to CADDIS?
3. Are there parts of your BSID that could potentially be used for a Chesapeake-wide BSID?

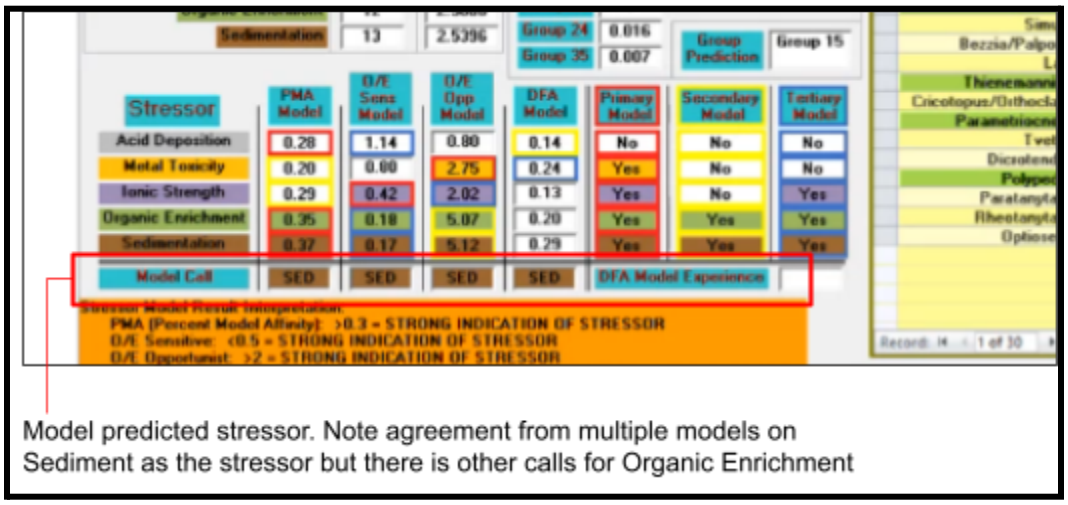
West Virginia (7 minutes)

Presenter: Ryan Pack, West Virginia Department of Environmental Protection

Ryan's slides can be found here.

- Why do a stressor ID?
  - TMDL required if a waterway is impaired to determine best management actions.
- What samples need a stressor ID?
  - WV uses Benthic IBIs to decide which samples to use
    - Previously used WVSCI, our family level index.
    - More recently switched over to a genus level identification system.
      - It uses a "seagionality" component where there are separate metric sets for different regions and seasons.
      - We use a percent of threshold approach which is a normalization across those different regions and seasons. If a sample scores less than 100% it is considered not attaining.
  - Impairments are then applied to Assessment Unit ID (AUID) stream segments
- Data used
  - Huge database with all over 130,000 water quality records, 12,000 benthic samples, 700 fish community surveys. Most benthic and fish surveys include habitat surveys.
  - RBP data, field observations and notes, qualitative and quantitative measurements, photos, GIS with multiple layers including permit layers, internal abandoned mine layers, geologic formations, and more.
- O/E Model and Stressor Modules
  - Ratio of observed taxonomic richness to the expected taxonomic richness in the absence of disturbance
  - Tetratech developed the model using WV sampling data including 7500 benthic samples, 700 of which were reference samples.
  - Includes multiple modules
    - O/E Sensitive
    - O/E Opportunistic
    - Discriminant Analysis
    - Percent Model Affinity
  - Modules help fine tune the types of stressors that could be impacting the benthic community
  - Performance is not perfect but provides acceptable resolution for most stressors and when you couple that with the other data that is collected and look at you have a good idea of the stressor that may be impacting that benthic community.
- Determining Comparability

    - Important because you need to determine if the sample is valid for stressor ID as there are aspects of the sampling that deviate from the methods that have nothing to do with the community.
        - Examples include weather events that cause extended dryness or scour, the stream could be too shallow, stream velocity could potentially not carry organisms into the sample net, etc.
- Stressors Categories
    - Typically look at 8 categories including Metals Toxicity/AMD, Acid Deposition, High pH, Ionic Strength, Sediment, Metals Flocculation, Organic Enrichment, and Temperature.
    - Often identify multiple stressors at a single site.
    - Much of our BSID process can be found here: https://assessments.epa.gov/risk/document/&deid%3D201963.
- Sediment
    - Sediment is probably the number 1 stressor in the state and the criteria used is shown in the slides.
    - Use multiple modules to determine impairment. Some modules are better for certain stressors, for example PMA typically described sediment better than some of the others.



Model predicted stressor. Note agreement from multiple models on Sediment as the stressor but there is other calls for Organic Enrichment

- Ryan (Chat): WV [Water Quality] Results can be downloaded here: https://tagis.dep.wv.gov/wabbase/map/
- Additional questions can be directed to: Ryan Pack Philip.R.Pack@wv.gov

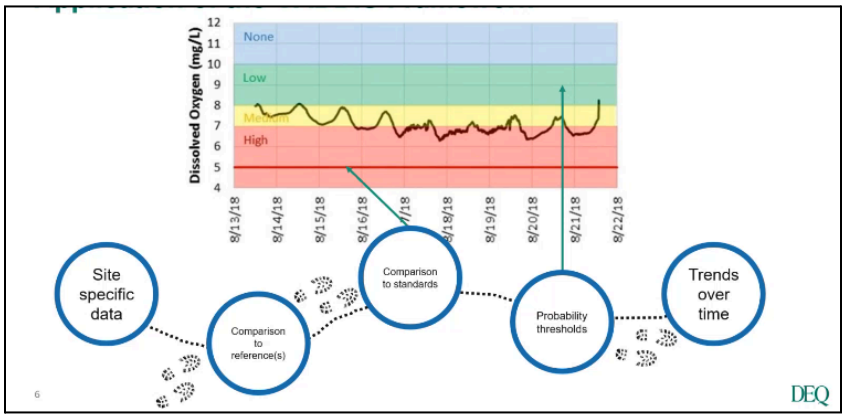
Virginia (7 minutes)

Presenter: Aerin Portner, Virginia Department of Environmental Quality

Aerin's slides can be found here.

- Virginia's development of a benthic stressor analysis

    - Not usually doing this until we need to do a cleanup study because our aquatic life standard has not been met
- We first identify what additional data needs we have to develop the stressor analysis
- Then take all that data and put it through family-level multimetric indices of biotic integrity (IBI), VA Stream Condition Index (VSCI) for non-coastal, and Coastal Plain Macroinvertebrate Index (CPMI)
    - Currently developing a genus level IBI
- VA has published statistical stressor thresholds for Benthic macroinvertebrates using probabilistic monitoring sites around the state.
    - Determine probable stressor thresholds for water quality parameters as well as habitat parameters.
- Site Specific Data >
  Comparison to references >
  Comparison to standards >
  Probability thresholds >
  trends over time >
  identify threats using CADDIS-like framework
- Application of the CADDIS Framework
    - CADDIS is a “weight of evidence” framework to identify stressors
        - VA commonly uses 10 out of the 18 lines of evidence EPA provides as potential evaluation metrics of benthic stressor analysis.
        - Example of probability thresholds and DO standard:



  The standard: average DO should not get below 5mg/L

  Probabilistic stress/monitoring data: if your average is consistently below 7 or 8, there is a medium to high probability DO impairment is causing stress to the benthic community.
- Procedures applicable chesapeake-wide:
    - VA has different indices for different regions (ex. coast vs non-tidal). This could be applied to account for mid-atlantic regional complexity
    - Use of probabilistic monitoring data to determine stressor thresholds. Sediment and nutrients don't always have a standard and it is often hard to measure sediment in a consistent way which is where probabilistic data can provide clarity.

    - Using parts of CADDIS that are applicable or that you have evidence for rather than reinventing a weight of evidence approach
    - Prior to analysis it is important to identify and fill the data gaps.
- Challenges and Future Steps to Consider
    - State specific indices
        - Genus vs species
    - Standard collection procedures
    - Data collection, submission and storage
        - Stressor analysis can have many data points and the storage of these data should be considered.
    - Defining scales and success
        - When targeting small streams to improve the overall watershed how does the overall success manifest.
- Additional questions can be directed to: Aerin Portner aerin.l.portner@deq.virginia.gov

Pennsylvania (7 minutes)

Presenter: Matthew Shank, Pennsylvania Department of Environmental Protection

- Assessment Methodology page for the bureau of clean water: Link
- First link on the page downloads a pdf of all the assessment methods
- Chapter 9.1 General Source and Cause Methods
    - Stressor Identification is one piece of our source and cause determination process
    - Source: area where pollutant/nonpollutants are originating
    - Cause: Pollutant/nonpollutant causing impairement
    - Source decisions is done by desktop recon of GIS layers including NLCD, point source layers, mining layers, and field recon observation and sampling data.
    - Cause decisions are made by evaluating sample data gathered during surveys
    - Distinction between “Stressor Identification” and “Source and Cause Determinations”
        - DEP does comparisons to PA Chapter 93 water quality criteria.
        - When there is impairment but none of the Chapter 93 criteria are exceeded, then DEP shifts to their Stressor Identification Process.
    - In the event of using the Stressor Identification Process, DEP follows a similar “weight of evidence” approach to CADDIS.
- Beyond general Source and Cause Process, DEP is trying to develop methods that include the source and cause determination components.
    - Example include “Chapter 2.12: Aquatic Life Assessment Methods, Wadeable Freestone Acidification Methods”
        - Able to use data with a low pH signal and an impairment to delineate whether the low pH is stemming from acid mine drainage or atmospheric deposition.
- Methods are independently applicable
    - Typically using genus level macroinvertibrate data, but also have a viable fish community method at the species level to make aquatic life use decisions and all can be used in the source and cause determination.

- Chapter 9.2 Eutrophication Cause Method
    - Looking for DO signals, then apply eutrophication cause method to determine if eutrophication is cause of impairment
- How does PA's stressor identification process compare to CADDIS?
    - Similar to WV and VA, it is consistent in its core of providing a weight of evidence approach to identify causes of biological impairment, although there are fine scale differences.
- Are there parts of PA's methods that can be used in a Chesapeake-wide BSID?
    - Yes, where some of the challenges would be having consistent terminology, and consistent data collection at the same resolutions whether that be species, genus, family level.
- (From Chat) Matt Shank: PADEP macroinvertebrate viewer: https://gis.dep.pa.gov/macroviewer/index.html
- Additional questions can be directed to: Matt Shank mattheshan@pa.gov

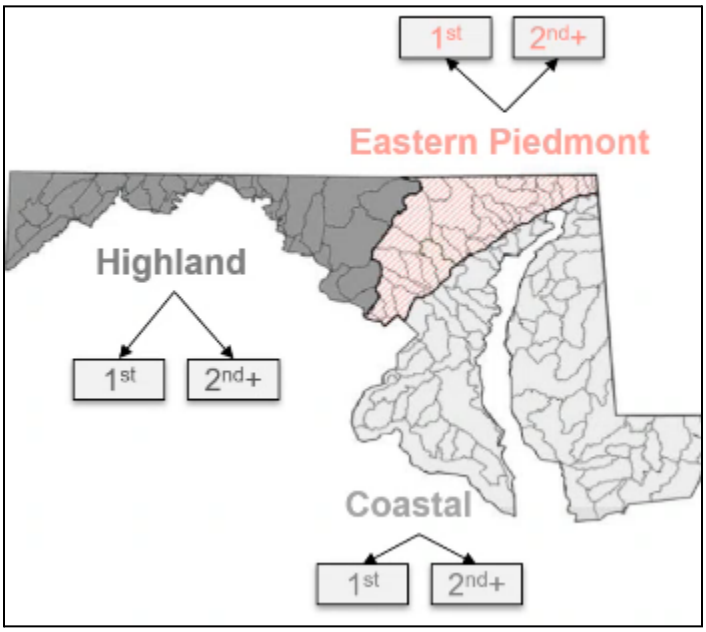
Maryland (7 minutes)

Presenter: Bel Martinez da Matta, Maryland Department of the Environment

Bel's slides can be found here.

- MD's BSID was developed in 2014, with studies on specific impaired 8-digit watersheds published in 2016.
    - Some of these studies led to watershed and pollutant specific TMDLs.
    - MD has not re-run this assessment since 2014 but are currently in the process of refining their methodology with the help of Claire Buchanan and ICPRB.
        - Data from original BSID were primarily from the Maryland Biological Stream Survey in 1st through 4th order non-tidal streams using randomly selected sites.
            - Data categories collected:
                - Benthic macroinvertebrate
                - Fish
                - Water Chemistry
                - Instream Habitat Conditions
                - Riparian Habitat Conditions
        - Also used GIS data layers collecting:
            - Altitude
            - Land use parameters
            - Impervious surface
            - State Road data
    - MD BSID
        - Compare biology to stressor levels
            - Using case-control statistics: Mantel-Haenszel Odd Ratios
            - Samples are categorized into groups, then numbers in each group are compared.

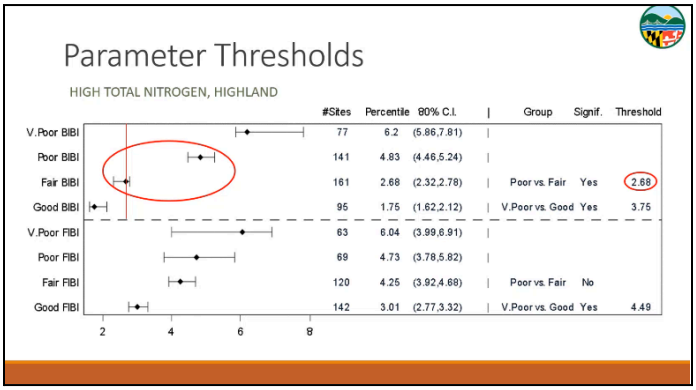
- Categorized by:
  - Biology pass/fail
  - Stressor level above/below thresholds
  - Physiographic region and some cases stream order
- Biology pass/fail: Cases vs Controls
  - Because MD aims to be protective of both fish and benthic aquatic life, we default to worst case scenarios where if there is data for both fish and macroinvertebrates and only one of those groups are below 3 (poor or very poor), then that site is included in the "case" category
  - Sites are considered Controls when both their FIBI and BIBI scores are fair or good.



  - When grouping sites for the analysis, we run the assessment at the 8-digit watershed scale for cases and compare those with controls from across the entire physiographic region.
  - We look at cases within a watershed located at a specific psychographic region and compare those cases to all controls within the same region.
    - Summarizing controls over larger areas meant more robust results due to considerably larger sample sizes while maintaining comparability within the control groups.
    - For habitat and sediment parameters, the comparison was further stratified on the basis of stream order where sites were grouped as 1st order or 2nd order and above.
      - Could not divide higher than 2nd order because the sample size was not large enough
- Stressor Categories
  - Categorize as stressor above or below threshold, but a better terminology would be within or beyond thresholds.

- Parameters from the dataset were selected because they represented the stressor itself or the potential source of the stressors
- Parameter thresholds
    - Challenge: it is difficult to identify stressors because we do not necessarily have criteria defining the threshold.
    - Each parameter was assigned a stressor threshold per eco-region, based on:
        - Existing guidelines in literature or other sources
        - For stressors without guidelines we used statistical analysis on grouped responses to indicate levels above which degradation to biological communities is likely to occur.
            - Poolling into their narrative IBI and stratified by ecoregion, stressor measures were then bootstrapped and the 90th (where high values were detrimental) and 10th (where low values were detrimental) percentiles were calculated.
            - Lastly graphed 80% confidence intervals of grouped percentile distributions and tested for statistical significance.

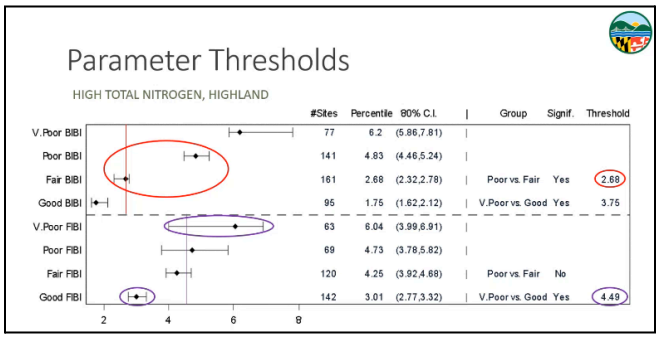
            Stressor threshold example for highland eco-region's high total nitrogen impacting the BIBI:



- First looked at poor and fair confidence intervals to see if they overlapped.
- If they don't overlap it would show statistically significant results.
- In this case we used the mean of Fair BIBI's confidence interval: 2.68.

Stressor threshold example for highland eco-region's high total nitrogen impacting the

FIBI:



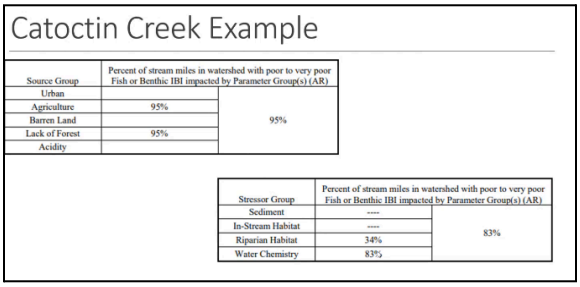
- First looking at poor and fair, they overlap so it is statistically insignificant.
- Move on to look at V. Poor and Good which do not overlap, so it is statistically significant.
- Therefore the threshold is set at the mean of poor and fair 4.49

■ Since the FIBI yielded 4.49 and BIBI yielded 2.68, the overall threshold for high total nitrogen is set at 2.68 to preserve both benthic and fish communities.

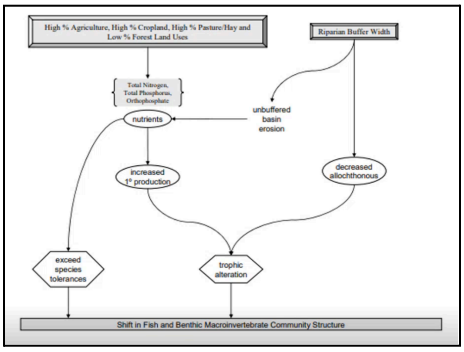
■ After defining the thresholds for parameters, we then generated two-way contingency tables for each 8-digit watershed and stressor
- Group sites by case/control and above/below stressor limit

■ From the two-way contingency tables, we calculated Odds ratios to test strength of association between stressor and biological components.
- If the results of the odds ratio is greater than 1 with a 90% confidence interval, we conclude that the stressor is likely impacting biology.

■ After calculating Odds ratios for every stressor and source, we find which stressors/sources are impacting biology the most by calculating the Attributable Risk to find the proportion of sites within each 8-digit watershed with poor or very poor biological condition as a result of the stressor sources identified
- Attributable Risk: Subtract the proportion of controls outside of stressor thresholds from the proportion of cases outside of stressor thresholds.



Summarized by a causal model based on the assessment results where MD tried to determine what is causing observed biological degradation:



- Additional questions can be directed to: Bel Martinez Da Matta Bel.Martinezdamatta@maryland.gov
- (From Chat) Kyle Hodgson: If anyone wants MD DNR data, feel free to fill out a data request form here: https://dnr.maryland.gov/streams/pages/datarequest.aspx

Delaware (7 minutes)

Presenter: Brittany Sturgis, Delaware Department of Natural Resources and Environmental Control

Brittany's slides can be found here.

- A lot of the work discussed in this presentation is in the piedmont region of delaware but will be soon applied to the coastal plain.
- DE splits out habitat 303d listings and biology 303d listings
- DE uses different methods for the piedmont and coastal plain regions.
- Habitat and macroinveritibrate data is classified as: Excellent, good, moderately degraded, or severely degraded
    - Moderately and severely degraded are listed in 303d for habitat and/or biology impairment
- In the past 3 years we have been recollecting data in the Piedmont region to recalibrate reference conditions.
    - Dataset is now large enough to define reference vs stressed sites, but currently there is not a clear definition.
- Next steps
    - Stressor Analysis
        - EPA ROAR Project has been put on hold but could be a potential grant we could apply for to continue the work
            - Since EPA has been a huge help with DE's BSID methodology formation, they are very familiar with our data and the EPA ORD program has approached us to develop a stressor identification tool:

Project Description:
The existing stressor identification (SI) process detailed in EPA's SI Guidance Document and on the CADDIS (Causal Analysis/Diagnosis Decision Information System) website is resource intensive. This has been a barrier preventing many states from routinely implementing the process, and states have repeatedly stated the need for more streamlined methods and tools for implementing EPA's recommended SI process. This project will: (1) adapt an existing, automated SI tool, originally developed for use in a Region 9 state, for use in two Region 10 states (Oregon and Washington); (2) develop a standardized protocol for this type of tool adaptation, which will facilitate the implementation of SI in other states; and (3) test this protocol by adapting the tool for use in Region 3. This tool will leverage existing datasets (e.g., landuse and StreamCat databases) with existing state-collected data and streamline the SI process to maximize the use and utility of available data and resources.

        - This tool is meant to take the CADDIS tool, acknowledging it is a very resource intensive tool, and come up with a more streamlined process to identify stressors.
        - Believe this has been in development with TetraTech in Region 10 in Oregon and Washington but could be on hold.
    - Analyzing Piedmont data to define reference sites and stressed sites
    - Beginning to evaluate the Coastal Plain region, asking:
        - Are survey methods still valid?
        - Is existing data still usable?
        - Etc.
- Additional questions can be directed to: Brittany Sturgis Brittany.Sturgis@delaware.gov

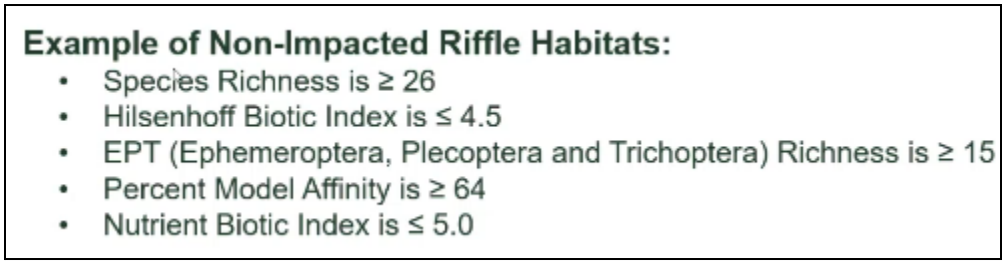
New York (7 minutes)

Presenter: Cassandra Davis, New York State Department of Environmental Conservation

Cassandra's slides can be found here.

- Biomonitoring
    - NY has major watershed basins that are visited on a 5 year rotation as a part of NY's Rotating Integrated Basin Studies (RIBS)
    - During the June-September sampling season, water quality and habitat data is recorded at each site to determine potential impacts to the macroinvertebrate community.
- Biological Assessment Profile (BAP) score
    - Individual community metrics are assigned a score 0-10 which are then put into a weighted equation to yield a BAP score.
    - Various combinations of individual metrics are used to calculate the BAP score and are dependent upon the type of surface water and the method of sample collection.

      Example parameters used in a BAP score:



    - There is a different BAP score for each type of macroinvertebrate habitat which can be used as a comparison to identify if an area is under biological impairment.
- Previous Approach
    - Series of impact source determination models that were based on macroinvertebrate community structure from known stressors
    - The approach would identify impacts from impoundments, siltation, sewage effluent and animal waste, toxic, municipal/industrial, and nonpoint nutrients combined with a physical habitat evaluation to provide a basis.
    - NY collects physical habitat data and water quality data, but because aquatic life use is a supplemental indicator in NY's consolidated assessment listing methodology (CALM), which determines which streams go on the 303d list, we have not completed an updated Impact Source Determination (ISD) process.
    - Challenge: while benthic macroinvertebrate communities have shown to be effective means of determining severity of water quality impacts, it has been **less effective in determining what kind of pollution is causing the impact.**
- Example: 2025 Draft Phosphorus Guidance Values
    - Depending on the water classes, watertype/region, and use protected there are different total phosphorus requirements:

Examples:

Water Classes	Water Type/Eco Region	Total Phosphorus (ug/l)	Response Variable	Best Use Protected
A, A-S, AA, AA-S, B, C	Flowing waters / Aggregated Nutrient Ecoregions 8 & 11	30	Biological Assessment Profile (BAP) shall not be less than or equal to 5	Fishing (Aquatic Life)
A, A-S	Flowing waters (Statewide)	25	Chlorophyll-a 6 µg/L	Drinking Water (Human Health)

- Additional questions can be directed to: Cassie Davis Cassandra.Davis@dec.ny.gov
- (From Chat) Cassie Davis: NY's Monitoring Portal can be accessed here https://dec.ny.gov/environmental-protection/water/water-quality/monitoring/water-quality-data

11:15 – Questions / Discussion (30 minutes)

Denise Clearwater (Chat):

RAISES HAND: for Ryan-how much of sediment problem is related to increased flow/ For Aerin - you mentioned water quality improvement from TMDL implementation, but did biology improve?

- Ryan: Flow is definitely an issue but most of our sediment issues come from poor stream bank management. Additionally because of development pressures reducing the trees on the banks, we are seeing some increased effect from large flow events on sedimentation. We have also done a bank erosion study several years ago that showed in the wintertime the freeze/thaw is creating the bank sloughing and input of sediment in some of these places with raw stream banks.
- Aerin: Yes the biology has improved significantly there, especially in the headwaters of the James River and Jackson River. These observed improvements have led to the delisting of more than 30 stream miles in the headwaters since 2019.People are fishing bass and other species.

Rosemary Fanelli (Chat):

Question for everyone: Is it possible for states to share information/data on reference sites with each other since multiple states may cover the same physiographic setting/ecoregion? It may increase statistical power in the BSID analyses by increasing the number of reference sites used to characterize reference conditions.

- Matt Shank: In PA we share macroinvertebrate data with epa and delaware to develop a piedmont IBI so this isn't unprecedented. I like the idea but it would take some coordination and would require a standardized methodology to compare across boundaries because state collection methods do vary and we'd have to be kind of thoughtful about that.
- Aerin Portner: I agree with Matt, and we have been trying to make some GIS layers in Virginia of where all of our reference sites are at. However it is ever changing, especially because one of the challenges with reference sites is you get a good site and you get enough data to be able to support and use it for TMDLs, but because the water quality is so good there, we're not necessarily returning for a few years because we have so many other impaired streams to work on. So we have been compiling these and it would be possible to send out a list of them. Most of the time we're putting these together in GIS, but it would be easy to put it into something else that we could send out.
- Brittany Sturgis (Chat): Great question. DNREC/EPA are using a few hand selected sites from MD & PA to help compare to potential DE reference sites in the Piedmont region. The same methods were used between all sites and we are in the midst of analyzing these data now and the EPA selected reference sites are aligning nicely with our DE reference sites. I'm wondering if the similar methods are used amongst the states to be able to compare them? Ditto to everything Matt just said!
- Bel Martinez da Matta: I am speaking on behalf of DNR because they are the ones who collect and maintain the database. But I know they visit sentinel sites (high quality sites) annually. Their data I believe is publicly available. You just have to fill out a data request form.
- Ryan Pack: West Virginia can also provide stream data especially for ecoregion 67 we have a number of reference sites in that region. If you would like some of our data feel free to reach out to me.
- Matt Shank: I will also add that in Pennsylvania we try to make all of our data available publicly, not just with other agencies, so we do make an effort to upload all of our chemistry data to the water quality portal that is available to anyone. We also have a website that makes all of our

macro-vertebrate data available. I think the crux of the question gets to that next step where you take that concerted effort to coordinate across jurisdictional boundaries which is a clear need, so I really appreciate the question.

Carol Cain (Chat):

Will a concerted effort for a watershed wide BSID include guidance on how stream segments could be delisted? Or would that be separate?

- Alison Santoro: From the stream health workgroup perspective, we are looking at a lot of work in the next year to revisit our management strategy. I am not sure what the structure of the bay program will be in 2026, but I wanted to start this BSID conversation before drafting the management strategies because I think it is an important point to include. When we start consolidating all of the work done over the past few years with multiple indicators we want to be able to create not just datasets, but also a food tool for managers to use because one of the questions we had over this past year was what is the stream health workgroup doing that is useful to the jurisdictions or as a management tool. So this is the first step of potentially a multi year process.
- Claire Buchanan: I will add that the Bay Program does not and should not have the ability to list or delist streams. That is up to the states who use their indicators, their own criteria and benchmarks, and their own methods to do that. The Bay Program is more of a “what is the watershed wide situation?”; “where should we focus effort?”; “where are things improving - and why?”. It should be used for those purposes, not for listing..

Kristin Saunders:

States have their own way of doing things that they are comfortable with and have really stretched themselves to try to understand the value of utilizing something that is a watershed-wide indicator or watershed-wide methodology. I'm curious after listening to the presentations today and seeing what you all are already doing and highlighting how your work could plug into this effort, what is the sentiment about moving this effort forward to serve that purpose that Claire talked about, of being able to talk about the condition in the watershed as a whole.

- Alison Santoro: One of the question that we are interested in asking is “what does the local jurisdictions need?”. Are those needs being met by the states and if not are there areas that the Bay Program can fill in?
- Chris Spaur: So much of the stream restoration nowadays is being by needs to meet TMDL/MS4 requirements and often there is a push to focus on nitrogen, phosphorus and sediment, so how can we align that with what makes sense to restore stream health. Sometimes they do alight but sometimes we should be doing something different and I do not know how we resolve that.
- Denise Clearwater: As we saw in the STAC report we are most likely to see an uplift in biology when you make it an objective, plan and construct for it. This is not built into TMDLs so perhaps if that's the mission of this work, to improve biological health, then maybe there should be additional discussions about doing that.

- Alison Santoro: That is what we are hoping to get at with the biological stressor ID. Definitely do not want to ignore the nutrients and sediments, but want to make room for some of the other issues that are affecting the biological health.
- Aerin Portner: One of the big things to consider, especially whenever you're looking at like Chesapeake Bay, watershed-wide, some of our most effective projects have been when targeting smaller watersheds. You're looking at a scale where you can look at historical imagery/data and get more exact with pinpointing stressors. So I think that's one thing to consider: while it is awesome to look at the whole watershed and be able to apply a standard procedure, it will be more effective to apply that procedure on smaller local scales because whenever you can target stressors specifically, the efforts are usually more effective.

11:45 – Meeting Wrap Up and Review Next Steps (5 minutes)

- Consider EPA ORD – ROAR?

11:50 – Meeting Adjourned

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