Thank you for joining our fifth Crisfield/EPA ORD Technical Working Group (TWG) providing technical feedback on proposed nature-based solutions (NBS) and co-benefits for Crisfield’s coastal resilience!

AGENDA for May 20:

* Updates
  + Next planned TWG meeting and community workshop: June 12
  + [Crisfield Resilience Academy binder](https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=365853)
  + NBS layer on [Crisfield Flood Mitigation map](https://salisburyu.maps.arcgis.com/apps/webappviewer/index.html?id=8a6695a14f76408e8e56608b005713a6)
  + Potential NBS project Storymap
    - Describe project context, research process, and results
      * Environmental conditions criteria for NBS (What works well where?)
      * Modeling process and results
      * Co-benefits analysis
    - Links to maps, reports, and other project documentation
    - Would this be a useful resource for other communities interested in exploring NBS?
* Preliminary results for co-benefits analysis based on Batch 1 NBS modeling
  + Sharing draft metrics and calculations, and looking for feedback on methodology, metrics and data sources to refine analysis for Batch 2 modeling results

Attendees:

|  |  |
| --- | --- |
| **Organization** | **Expertise** |
| City of Crisfield, climate resilience projects | Local knowledge, funding |
| National Oceanic and Air Administration (NOAA) Fisheries, Habitat and Ecosystem Services Division | Local fisheries regulatory considerations, fish habitat consultations, and co-benefits |
| National Oceanic and Air Administration (NOAA) Fisheries, Restoration Center | Local fisheries habitat and restoration |
| US Army Corps of Engineers, Engineering with Nature program | Coastal hydraulics, modeling of nature-based solutions |
| Virginia Institute of Marine Science, Center for Coastal Resources Management | Urban and environmental coastal planning, sustainability |
| Maryland Department of Natural Resources, Janes Island State Park, Assistant Manager | Local state park use, recreation, tourism, park management |
| Eastern Shore Regional GIS Cooperative | Local mapping, spatial data |
| University of Maryland, Environmental Finance Center | Finance and green infrastructure, coastal resilience |
| EPA Chesapeake Bay Program Office | Regional communications and stakeholder coordination |
| EPA Office of Research and Development | Project Navigator |
| EPA Office of Research and Development | Ecosystem co-benefits |
| EPA Office of Research and Development | Community engagement |

Introduction of Chesapeake Bay Program Office involvement, and support for Resilience Academy and communications as Crisfield is an important part of Chesapeake watershed and ecosystems.

Updates on Crisfield community engagement:

* Planned TWG and community meetings for June 12: Discuss Batch 2 storm modeling results, and get feedback to incorporate into third and final batch of modeling
* Successful first Crisfield Community Resilience Day on April 26, 2025 with a lot of participation; just released [electronic binder](https://cfpub.epa.gov/si/si_public_record_report.cfm?LAB=CPHEA&dirEntryID=365853) compiling resources and materials from Resilience Academy
* Eastern Shore Regional GIS Cooperative (ESRGC) added NBS projects to their master [Crisfield Flood Mitigation map](https://salisburyu.maps.arcgis.com/apps/webappviewer/index.html?id=8a6695a14f76408e8e56608b005713a6), with information about each option and how they protect and benefit
* Final [Crisfield NBS scoping report](https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=366018) based on literature success criteria now publicly available – comprehensive guide for how to match likely successful coastal NBS to environmental conditions
* Working on visual, interactive StoryMap about how Crisfield explored NBS options; TWG feedback that what works well for community is video format for information, and videos can be embedded in StoryMaps

EPA ORD shared draft metrics selected to calculate Crisfield NBS co-benefits, based on TWG and community feedback and available data. Calculation method involves identifying relationships from the peer-reviewed literature that associate changes in landcover (e.g., marsh area/elevation/density, seagrass area, sand dune area) with changes in selected co-benefits of interest to the Crisfield community (e.g., striped bass density, blue crab density, black duck density, water quality, marsh condition). Changes to co-benefits are estimated based on how NBS and sea level rise are expected to modify landcover.

| **Co-benefit** | **Metric** | **Source (relating metric to habitat)** |
| --- | --- | --- |
| Commercial and recreational fishing | Striped bass forage food (forage fish and invertebrates) density | Fabrizio et al. 2021 (relating forage food to striped bass); Minello et al. 2003 (30 studies in Atlantic and Gulf, corrected for Chesapeake Bay) |
| Blue crab nekton (adult) density |
| Striped bass (mixed juvenile/adult) catch per unit effort, and | Beck et al. 2001; Nagelkerken 2014; Louisiana Coastal Management Plan 2023 |
| Blue crab (large juvenile, sub-adults) density |
| Striped bass relative value within a habitat type | Ludwig et al. 2026 (importance weighting using expert judgement, specifically for the Chesapeake) |
| Blue crab relative value within a habitat type |
| Hunting and birdwatching for tourism and recreation | Shorebird and waterfowl (spotted sandpiper, killdeer, great blue heron, great egret, snowy egret, black-crowned night heron) relative value within a habitat type |
| Black duck food calories available to meet energy requirements | Livolsi 2021; Jones et al 2016; Morton 1989; Rochlin 2012; Erwin 1991 |
| Water quality, fishing/seafood species, marsh condition for tourism and recreation | Seagrass cover as habitat availability | Not identified yet (looking for appropriate habitat suitability model to show how NBS and sea level rise impacts seagrass) |
| Water quality for fishing and recreation | Nitrogen concentration, sediment concentration, bacterial counts | Not identified yet (looking for literature values to link to habitat) |
| Water access for ferry, commercial fishing, recreation | Wave energy, currents, navigational hazards, wave height, water depth | Storm surge attenuation modeling (not yet calculated) |
| Habitat for fishing/seafood, plant and animal communities for recreation and tourism, youth programs | Marsh condition/quality, marsh longevity, unvegetated to vegetated ratio, vegetation density, elevation | Vegetation as NBS design input to storm surge attenuation modeling (not yet calculated), Rapid Benefits Indicator (RBI) Approach |
| Natural beauty and cultural resources | Views of natural open spaces, assess if The Stack is protected or vulnerable to erosion | Not yet calculated, erosion estimates potentially from storm surge attenuation modeling |
| Seafood industry | Nuisance and invasive species like blue catfish or phragmites | Lower priority, to be determined |
| Recreation and tourism | Mosquito populations, native and rare plants | Lower priority, to be determined |
| Youth development, Community gathering spaces | Access and participation in nature-based youth programs, participation in restoration, increased community spaces | Lower priority, to be determined |

Scenario comparisons will then show estimates of co-benefit changes for each NBS option.

Questions for TWG include:

* Are these the best metrics to use or are there better alternatives?
* Are the estimation assumptions from the literature reasonable or are there assumptions made that would be inaccurate for Crisfield natural spaces?
* What is the best spatial resolution for reporting results (e.g., 10-meter grid cells, polygons for different Crisfield areas, e.g., Janes Island, or a single total averaged value for all of Crisfield)?
* What output would you want to see (or would resonate with the public) at the June Meeting?

Feedback from TWG:

* Clarification of spatial resolution used (answer: mostly 10m x 10m grids but zoomed into 3m X 3m for the marsh layer)
* Discussion of SAV spatial coverage (typically five-year average is used for permitting since there is a lot of year-to-year SAV variability; EPA ORD currently using average across years 2020-2023)
* Low density SAV is not comparable to macroalgae - VIMS does not delineate macroalgae, and there is not an extensive amount of macroalgae in this area.
* For oysters, you could consider the NOB layer that is maintained by Maryland DNR (see: <https://maryland.maps.arcgis.com/apps/webappviewer/index.html?id=f8f3e637af1c4e5ab20c2ccab014ce29>). You can ask Chris Judy at DNR about what layer would be most appropriate to assign as a functional oyster reef.
* UV/VR data is available from USGS and calculated a bit different than the equation presented. See: <https://usgs.maps.arcgis.com/apps/instant/sidebar/index.html?appid=67d557aab0274465bf0bb1ce89cac06f>
* A lot of assumptions required for these estimates, a lot of variability in relating biological metrics to habitat types – might be useful to conduct sensitivity analysis to determine how much changes to different assumptions would change the co-benefit estimate maps [EPA ORD is addressing this by using only cited methods of relating habitat to co-benefits, and by looking at same co-benefit using multiple, independent datasets to see if different approaches give similar answer to the same question, e.g., blue crab density changes for specific NBS habitat change)
* This information is very complex and detailed and will need to be simplified for a community meeting, not that people would not understand it, it would just take a lot of time to explain at this level of detail (EPA ORD agrees and suggests not even going into GIS methods for community meeting and just showing summary tables comparing co-benefit metrics by NBS)
* Current summary table shows decrease in blue crab, striped bass, and waterfowl habitat between 2020 and 2050 given no NBS implemented. If NBS is implemented, could some of those values increase from where they are now? (EPA ORD – yes, that is possible, and we would include additional columns that show co-benefits for 2020 and 2050 with NBS implemented)
* Would need to lay a lot of groundwork to present these kinds of results to the public – e.g., where certain habitats (low marsh, high marsh, seagrass) are currently situated, how we anticipate those habitats to change with no intervention, why those habitats are so important for which endpoints. Crisfield is the center of the soft crabbing industry in Maryland – what about just focusing on soft crab and telling the story through that lens, instead of including so many other types of endpoints (co-benefits). How forage fish, water quality, marsh quality all affect blue crabs. You could even focus on one polygon, say the marsh next to Janes Island, and say: that marsh has a life capacity of this many years, and once that marsh is drowned, imagine all the wave energy that is going to come in through that area from the Bay towards Crisfield. Besides that, we are going to lose the seagrass beds associated with those marshes, which is the soft crab molting habitat --- There is a lot of information you could probably gloss over and just focus on the really interesting story to tell people and talk about the importance of some kind of intervention to maintain a way of life that has been central to Crisfield’s identity for so many years. It would make sense to cleave off one piece of this story and make a compelling, compelling narrative around it. Maybe blue crab would be a good one, but it depends on which kinds of community members show up to the public meeting.
* The people from Crisfield whose families have been there for generations are very familiar with what makes good blue crab habitat, but more and more people have moved to the area who are not familiar with that. And watermen are usually not at public meetings. So the people who usually attend public meetings may not be as familiar and it may help to break down the narrative from the beginning.
* Even touching on a complex topic, even for the watermen, about how the marsh is not going to keep pace with sea level rise and what the means for how the marsh platform will change, that is whole presentation in and of itself. You are building on a lot of concepts here to make a case for what the future might look like for these natural resources, which is very complex and TWG members certainly applaud the effort. Just thinking about how to boil that down to meet the audience needs. It’s a big lift. The technical work is a whole separate component from the science translation, and to figure out what the story is and how to communicate it.

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**[END MEETING]**