SCIENTIFIC & TECHNICAL ADVISORY COMMITTEE

Meeting Minutes

DATE & TIME: *July 31, 2026 -- 9:00 a.m. to 12:00 p.m.*

LOCATION: Virtual ONLY

RSVP to mnoefellows@inlandbays.org with any questions.

https://us02web.zoom.us/j/3528420482?pwd=ICYnb9eBbOVKW8XwyLIQpU3SSyELqM.1&omn=84546883875

Meeting summary

- The STAC meeting focused on GIS resources, new digital tools, and their applications for environmental monitoring and management in the Delaware Inland Bays region.
- The State of the Bays report is in active development, with metric reports due and a draft targeted for end of August.
- Delaware passed its first wetlands protection bill this legislative session; the Wetlands Regulatory Work Group held its first meeting on the same day as this STAC meeting.
- Brooke Walls was welcomed as a new STAC member, representing the Delaware Department of Agriculture's Nutrient Management Program.
- Nivette Perez Perez presented the center's use of ArcGIS Survey123 for participatory science projects, including Diamondback Terrapin and Osprey surveys.
- Peter Claggett (USGS) presented high-resolution land use/land cover datasets for the Chesapeake Bay watershed, including all of Delaware, available free to the public.
- Jay Hodny presented Newark's tree canopy study and GIS-based tree inventory system aimed at reaching a 36% canopy goal by 2030.
- Daniel Warner presented research on mapping blue carbon stocks in Delaware salt marshes using Landsat imagery and machine learning.
- John Callahan presented NOAA's Sea Level Calculator and related coastal inundation tools relevant to the Delaware Inland Bays.
- The next STAC meeting is scheduled for October 23rd, likely at the UD Lewes facility.

Administrative Opening and Attendance

The meeting was called to order at 9:00am EDT by Andrew Wozniak, STAC Chair. Participants introduced themselves.

Center Announcements

Meghan Noe Fellows provided updates on center staffing, upcoming events, and legislative developments.

- Meghan Noe Fellows: Noted an active summer with three seasonal specialists/interns supporting SAV work, oyster reef restoration, and continuous water quality monitoring. Staff consistency has improved following recent turnover.
- Meghan Noe Fellows: Announced "Decked Out," the Center's annual gala/festival, scheduled for September 24th at the Big Chill Beach Club. An online auction format will be tried this year.
- Meghan Noe Fellows: Announced a NOAA traveling exhibit on weather and coastal resilience, to be hosted at the Center's education building (the "Susie") at James Farm starting approximately August 29th through October, open Saturdays, Sundays, and by appointment during the week. The exhibit will subsequently travel to Maryland.
- Nivette Perez-Perez: Confirmed the exhibit will run through October and will be open Saturdays, Sundays, and by appointment.
- Claire Simmers: Noted the first day is August 29th and that CAC will help kick off the event.
- Kelly Somers: Asked for clarification on the exhibit location; confirmed it is the education building at James Farm, also known as the Susie.
- Meghan Noe Fellows: Noted that Christophe Tulou (Center for Inland Bays Executive Director) and Ashley Norton (Vice Chair-STAC) DNREC - Division of Watershed Stewardship were absent because Delaware passed its first wetlands protection bill (freshwater wetlands) this legislative session, and the first Wetlands Regulatory Work Group meeting was being held in Dover on the same day.

CAC Meeting Announcement

- Claire Simmers announced the upcoming Citizens Advisory Committee (CAC) meeting scheduled for August 27th, 6–8 PM, virtual and in-person (limited to 30 in-person seats; registration required). Featured speakers include State Senator Stephanie Hansen, 10th District and Susan Love, Administrator of Climate & Sustainability Programs with DNREC.
    - Meghan Noe Fellows: Clarified that CAC is the Citizens Advisory Committee, the sister committee to STAC, meeting four times per year in the evenings and the 2026 theme is coastal resiliency.

Old Business

State of the Bays Subcommittee Report

- Meghan Noe Fellows: Metric reports are due and trickling in; Rachel McQuiggan was noted as the first to finalize her report. Contributors with outstanding metrics were asked to contact Meghan as soon as possible.
- Meghan Noe Fellows: Thanked Bhanu Paudel and DNREC for taking on the water quality metric.

- Meghan Noe Fellows: Described the multimedia format of the report: an online report with embedded short video "lightning talks" (approximately 5 minutes each) on specific topics. Andrew Wozniak is covering eutrophication; Chris Hauser (UD/Sea Grant) will summarize the economic report. Additional lightning talk contributors will be contacted.
- Meghan Noe Fellows: Target is a draft for review by end of August.

New Business

Welcome of New STAC Member – Brooke Walls (Delaware Nutrient Management Program, DE Department of Agriculture)

Brooke Walls introduced herself and provided an overview of the Delaware Nutrient Management Program.

- Brooke Walls: Has been with the Nutrient Management Program since 2016, becoming Program Administrator in January 2025. Holds degrees from Delaware Valley University (equine/animal science) and Auburn University (crop, soil, and environmental science, 2020). Also a LEADelaware Fellow.
- The program's mission is to manage nutrient generation and application to protect Delaware's ground and surface waters, sustain agriculture, and meet federal water quality standards. The program is overseen by a 15-member voting commission representing Delaware agriculture and the turf industry, meeting the first Tuesday of each month. Non-voting members include the Secretary of Agriculture, Secretary of DNREC, and others.
- The nutrient management law applies to anyone applying nutrients to 10 or more acres and/or having 8 or more animal units (1,000 lbs of animal generating manure). Certification is required and managed by the University of Delaware, with four levels: nutrient generator, private nutrient handler, commercial nutrient handler, and nutrient management consultant.
- Nutrient management plans are comprehensive documents covering manure generation, storage, management, and fertilizer prescriptions. Conservation Districts provide free plan writing; cost share is available for private consultant-written plans. Over the past 6 years, an average of 171,399 acres per year have been covered under the planning cost share program.
- The manure relocation cost share program moves manure from operations with high-phosphorus soils to lower-P land or alternative uses (e.g., the mushroom industry near the PA line). Annual average of 57,734 tons relocated since FY2020. The program also works with CAFOs (Concentrated Animal Feeding Operations), with EPA delegating authority jointly to DDA and DNREC.
- In 2025, the Commission updated the turf law, reducing the threshold for commercial turf applicators from 10 acres to a quarter acre, effectively capturing all commercial lawn applicators. Enforcement begins January 1, 2027. Regulation 1204 sets annual nitrogen limits at 3 lbs per 1,000 sq ft (up to 3.5–4 lbs with enhanced efficiency fertilizers or a certified nutrient management plan), no phosphorus unless soil test confirms deficiency or for establishment/repair, and setback requirements of 15 feet from waterways/wetlands (reducible to 10 feet with certain equipment).
- The program currently has 5 full-time employees and plans to add 2 more for turf enforcement.
- Douglas Janiec: Asked for clarification on whether the quarter-acre threshold is cumulative or per property; Brooke Walls clarified the intent is to eliminate the ambiguity of the previous 10-acre threshold and effectively capture all commercial applicators.

- **Conclusion**

- The Delaware Nutrient Management Program plays a critical role in protecting water quality through regulation of nutrient application in agriculture and turf.
- The 2025 turf law update significantly expands regulatory reach to commercial lawn applicators, with enforcement starting in 2027.

Presentations

Participatory Science Digital Tools – ArcGIS Survey123
Nivette Perez-Perez - Manager of Community Science, Center for Inland Bays.

- The center transitioned to digital monitoring tools for four main reasons: accessibility (reaching all watershed residents and visitors via smartphones), protocol reinforcement (embedded links, graphics, and hints), live data observations (immediate data access with controlled public sharing), and quality assurance (reduced human error, automated GPS/date/time, real-time protocol tracking).
- Not all projects are suited for digital tools; the horseshoe crab survey (fast-paced, 100-quadrant counts) remains paper-based. ArcGIS Survey123 was chosen over platforms like eBird, iNaturalist, or MyCoast due to data ownership, customization, geospatial features, free use for participants, and the ability to control location sharing for protected species. It is covered under the center's existing ArcGIS licensing.
- The center has five participatory science projects using Survey123, plus non-participatory science uses and a collaborative project with MYCoast Delaware (approved by NOAA for three more years), which collects recreational data in the inland bays. A short under-one-minute instructional video is available on the center's website to guide volunteers through downloading the app and accessing projects.
    - **Diamondback Terrapin Survey:**
        - The only true estuarine turtle in North America; protected in Delaware as a species of conservation concern (Tier 1). Survey started in 2020 with 12 land survey locations and 10 water transects. In 2023, the center received a grant from the Northeast Association of Fish and Wildlife and the Wildlife Management Institute to standardize headcount survey protocols across the Northeast (Massachusetts to Virginia). The survey season was expanded from 3 weeks to 6 months (May 1–October 31), divided into three periods, with a minimum of 3 surveys per site during the peak period (May 1–June 30). In 2026, 3 sites in Kent County were added in collaboration with state partner Nate Dandrusky. The Survey123 form collects volunteer information, liability waiver, weather conditions (with a link to the DOS weather tool), observation data, and includes a signature feature and travel time tracking for grant requirements. Preliminary data shows terrapin counts ranging from 0 to 35 per site; Bethany Bay was among the most visited sites.
    - **Osprey Survey:**
        - Launched in the app in 2025, based on the 2021 survey developed for the State of the Bays report. Volunteers are assigned to one of 13 zones across the watershed and report active osprey nests (occupied by two adults with nesting or copulating behavior). In 2025, 928 reports were received; 538 were active nests. Cross-referencing with Osprey Watch data confirmed 235 active nests. The most reports and active nests were concentrated in the same zones.
        - Andrew Wozniak: Relayed a comment from Ed Whereat that the number of osprey chicks fledging successfully appears dramatically lower this year, possibly due to food availability or unusual weather, and suggested a fledgling survey in the future.

    - Nivette Perez Perez: Acknowledged the current survey focuses on bonded pairs and does not track individual nest outcomes or chick counts; some nests moved from "potential" to "active" and back, suggesting mid-season failures.
- **Northeast Terrapin Watch:**
    - Launched in April 2025; open to the public from Virginia to Massachusetts with no training required. Allows anyone who encounters a terrapin to submit a report. Collects location, behavior, habitat description, and photos. A network code tracks how participants heard about the survey. As of the meeting, 73 observations had been submitted from Delaware, Maryland, New York, and Virginia. For comparison, a similar North Carolina program launched 10 years ago has just under 1,000 observations.
- **Conclusion**
    - ArcGIS Survey123 has significantly improved the center's participatory science data collection, quality, and reach. The Northeast Terrapin Watch is off to a strong start and will help identify new survey locations and recruit volunteers. Future consideration: developing a fledgling osprey survey to track reproductive success.

Geospatial Data and Analyses
Peter Claggett United States Geological Survey (USGS) Chesapeake Bay Program

- Peter Claggett has worked at the Chesapeake Bay Program Office for approximately 24 years. Leads a team of 4 (12 total on the geospatial team, 11 from USGS), co-funded by EPA, serving the state-federal Chesapeake Bay Program partnership.
- Described a "geospatial pyramid" from raw raster data (derived from satellite/aerial imagery and LiDAR) through models to communication/decision-making products (story maps, web maps, infographics). The team's process begins with stakeholder questions, which are refined collaboratively before data investigation and product development. Criteria for accepting requests include support for the Bay TMDL, the Bay Watershed Agreement (approximately 20–21 outcomes), or advancement of the USGS science plan. All data produced with federal dollars is free and open source, available on the Chesapeake Data website. QGIS (free, open-source GIS software) and R (free statistical software) are highlighted as cost-free alternatives to commercial GIS tools.
    - **Land Use/Land Cover Dataset:**
        - The team has mapped all of Delaware (and all counties intersecting/adjacent to the Bay) at three time points: 2013, 2018, and 2021. Data is 1-meter resolution raster, derived from USDA aerial photography collected every 2 years in summer. The dataset has 56 land use/land cover classes (aggregated to 18 for most analyses), with approximately 95% overall accuracy and approximately 86% change accuracy. Peer-reviewed and publicly available.
        - A viewer allows users to compare base imagery (2013 vs. 2021/2022) and overlay mapped changes without needing GIS software. Examples shown for Rehoboth Bay area, demonstrating significant development and land cover change. Tree canopy fact sheets were created for every municipality in the Bay Watershed and for full counties (including Sussex County), in partnership with the US Forest Service and Chesapeake Conservancy. Available via "urban tree canopy network" Google search.
    - **Future Scenario Development:**
        - Worked with the Delaware Office of State Planning on 2050 sprawl vs. compact growth scenarios. Noted that the compact scenario, while environmentally preferred, pushes significant growth along the edges of the inland bays.
    - **Machine Learning and Data Evolution:**

- Peter Claggett: Explained that switching from rule-based to machine learning (AI) classification of tree canopy, combined with improving aerial imagery resolution (1m in 2013 → 60cm in 2017 → 30cm in 2021), now captures growth of existing canopy much more accurately. The entire dataset history back to 2013 will be reprocessed with machine learning by 2028. The plan is to disaggregate reporting into growth of existing canopy vs. loss from removal/death, rather than just net change, to avoid confusion.
    - Meghan Noe Fellows: Raised the issue of how to handle changing narratives as measurement tools improve (e.g., new machine learning methods showing net canopy gains vs. previous methods showing losses).
    - Andrew Wozniak: Noted that calculating change using two different methods is scientifically problematic (comparing apples and oranges) and suggested either communicating the improvement clearly or ”dumb down” the new data so they are comparable to the historical data.
    - Peter Claggett: Confirmed the new method is demonstrably more accurate and that the entire history cannot be reprocessed because the data are lesser resolution.
    - Claire Simmers: Asked about working directly with county governments (e.g., Sussex County) for tree canopy data. Peter Claggett noted the team traditionally works through states or regional planning organizations but is not opposed to county-level collaboration, particularly for land use/land cover.
- **Conclusion**
    - Free, high-resolution land use/land cover data for all of Delaware is publicly available and can be accessed without GIS software via the Chesapeake Data viewer.
    - Tree canopy fact sheets for Sussex County are available online.
    - Transitioning to machine learning will improve accuracy but requires careful communication of methodology changes to stakeholders.

Newark Tree Canopy Study and GIS Tree Inventory
Jay Hodny, GIS Technician, Public Works and Water Resources Department, City of Newark, DE

- Jay is the GIS Technician for the City of Newark, DE and has been with the City for nine years. His duties include ArcGIS for Enterprise administration, development of internal and public facing GIS maps and apps, and GIS support for other City departments. He presented the City of Newark's tree canopy study and new GIS-based tree inventory system.

- The City of Newark has been a Tree City USA member for over 20 years. A previous tree inventory was conducted in 2015 (approximately 4,100 trees). Newark's 2019 Sustainability Plan set a goal of 36% tree canopy by 2030.
- The University of Vermont Spatial Analysis Laboratory conducted a tree canopy study using aerial imagery and LiDAR (8-foot height threshold for trees), following USDA Forest Service urban tree canopy protocols. The study identified approximately 80,160 individual trees using LiDAR-derived crown delineation. Change mapping between 2013 and 2023 showed a net gain of approximately 5 acres of canopy (stable, trending in the right direction). High-resolution LiDAR enabled detection of small-scale gains and losses not previously quantifiable.
- Land cover was classified into four categories: existing tree canopy (approximately 35% of the city), possible vegetated tree canopy (approximately 1,800 acres), possible impervious tree canopy (approximately 1,000+ acres with surface work), and not suitable for canopy. The study used 25-acre hexagons for spatial analysis.

Analysis by zoning district revealed significant tree loss in the 18RS (single-family residential) zone due to redevelopment into garden apartments. Demographic analyses explored correlations between population/income and tree canopy.
    - Runoff Retention Index and Heat Mitigation Index maps were produced to prioritize planting locations; downtown Newark and UD buildings/parking lots showed the least heat mitigation capacity. A new GIS-based tree inventory (boots-on-the-ground) is underway using ArcGIS Field Maps. The system uses a feature class with full taxonomy (common name auto-populating genus, species, family, cultivar via contingent values), attribute rules for automated calculations (average spread, pit area), and an "escape hatch" for trees not in the taxonomy list. Data is collected in the field on tablets or smartphones and syncs to the office database in real time.
    - The goal is to seed the inventory with the 80,160 LiDAR-derived tree points, allowing field staff to walk up to a tree, confirm its location, and update its attributes.
    - Claire Simmers: Asked about the level of buy-in required from city leadership. Jay Hodny noted he was brought in after the contract was already signed and that buy-in was relatively straightforward given the 10-year gap since the last inventory and the city's sustainability goals.
- **Conclusion**
    - Newark's tree canopy is stable and trending toward the 36% goal, with a robust methodology now in place for future monitoring.
    - The GIS-based inventory system significantly streamlines field data collection and reduces manual error.

Blue Carbon Mapping in Delaware Salt Marshes
Daniel Warner, Associate Scientist, Delaware Geological Survey, University of Delaware

- Daniel Warner: Presented research on estimating soil blue carbon stocks in Delaware salt marshes using Landsat imagery and machine learning. Blue carbon refers to carbon stored in marine and estuarine environments (tidal salt marshes, mangroves, seagrass beds). Delaware has approximately 7% of its land surface as tidal salt marsh. These ecosystems store 1–2 orders of magnitude more carbon per unit area than terrestrial soils.
- The study focused on the St. Jones and Blackbird Creek Marsh estuarine research reserves. Over 100 soil cores were collected (top 30 cm, 40–60 cm, and 70–90 cm sections), analyzed for organic matter content (loss on ignition), bulk density, and elemental composition (22–28% of organic matter is carbon). Landsat 8 imagery (10 years of data, 75 cloud-free images, evenly distributed across seasons and tidal conditions) was used. Spectral indices derived: NDVI, MNDWI (water index), and non-photosynthetic vegetation index (NPVI). Per-pixel statistics (mean, standard deviation, min, max, coefficient of variation) were extracted for each index over the 10-year period.
- A gradient-boosted trees model (XGBoost) was used, achieving $R^2 = 0.67$ for predicting organic matter density in the top 30 cm — considered very good for this type of work. No predictive relationships were found for deeper soil layers. Key predictors: average NPVI (positive effect — more dead biomass correlates with more soil carbon), standard deviation of NDVI (seasonality of vegetation greenness), and standard deviation of the water index (variability in tidal inundation frequency, indicating healthier marsh conditions). Total organic carbon in the top 30 cm of the two study marshes estimated at 130–200 gigagrams (approximately 490,000–760,000 metric tons CO2 equivalent). Much

more carbon is stored in deeper layers and across the broader state marsh landscape. Within-pixel heterogeneity was generally low (less than 20% variability), except in areas with actively eroding marsh or mixed vegetation types. Daniel Warner: A peer-reviewed paper was published in 2024; QR code provided for access.

- Future directions include improving deep-layer core collection, extending Landsat records back to the 1980s, expanding to a statewide blue carbon inventory, and fusing coarser Landsat data with higher-resolution LiDAR/NAIP imagery.
  - Claire Simmers: Commented on the importance of this research for demonstrating the value of salt marshes as carbon sinks and the relevance to Delaware's new wetlands protection legislation. Daniel Warner: Noted the "double-edged sword" — these systems are valuable carbon stores, but loss of marshes could release stored carbon back to the atmosphere.
  - Andrew Wozniak: Asked about relationships between carbon inventories and vegetation/elevation; Daniel Warner noted highest predicted organic matter density in pixels with strong seasonal vegetation signals and variable tidal inundation (high marsh areas), and lower carbon in frequently inundated low marsh areas.

- **Conclusion**
  - Remote sensing combined with machine learning can effectively map spatial variability of blue carbon in salt marshes, improving on traditional homogeneous stock estimates.
  - Delaware's salt marshes represent a significant and underquantified carbon reservoir; protecting them is critical for both biodiversity and climate goals.

NOAA Sea Level Calculator and Coastal Inundation Tools
John Callahan, Climate Scientist, National Oceanic and Atmospheric Administration (NOAA)

- John Callahan: Works with NOAA's Center for Operational Oceanographic Products and Services (Co-OPS) via Ocean Associates Incorporated. Co-OPS operates tide gauges throughout the US (including Great Lakes, Pacific Islands, Caribbean) and produces coastal flooding data and tools.
- The NOAA Sea Level Calculator was released in 2024. It integrates projections from the 2022 Interagency Federal Task Force Technical Report (joined by 9–11 federal agencies), the IPCC AR6, and the 5th National Climate Assessment (2023). Delaware's 2025 Sea Level Rise Projection Report (led by UD, SEMA, and DNREC) uses the same projections as the calculator. The calculator was developed through a co-development process involving approximately 25 people across federal agencies, engagement specialists, IT/web developers, scientists, and planners. Six user personas/use cases were developed to guide design. The process took approximately 6 months to 1 year before any code was written. The calculator targets Tier 2 and Tier 3 users (those needing technical detail and data download capability). It includes five "quick views": future sea levels (projections with drivers including thermal expansion, stereodynamic changes, and vertical land motion), changing flood frequency, extreme water levels, past trends, and seasonal variation. All data is free and publicly available.
- For the Lewes, Delaware tide gauge, the calculator shows an exponential increase in the number of days per year that water levels cross the National Weather Service advisory threshold — from a few times per year in the 1950s–60s to 15–20 times per year in the last decade. Extreme water level statistics have been downscaled for short-record gauges in the inland bays, including Rosedale Beach and Indian River Inlet (data from the early 1980s),

providing exceedance statistics up to the 2% chance storm. The Delaware Bay Port System includes high-priority tide gauges with meteorological data, water levels, tides, and currents, all linked via GNSS satellites. A monthly high tide flooding outlook is available for Lewes and Reed Point, showing the statistical likelihood of flooding each day out to 12 months. A future update will allow users to set custom flooding thresholds.

- CORA (Coastal Ocean Reanalysis) is a new hydrodynamic model (SCHISM + SWAN, including waves) covering the entire US East and Gulf Coasts at 300–500 meter resolution, run hourly from 1979 to 2022 (update to 2025 in progress). Data is freely available via cloud distribution; Python notebooks on GitHub enable users to extract time series or spatial extents. The Tidal Datum Analysis Calculator (TADC) is available as a web tool and Python package (GitHub), enabling users to analyze their own water level observations, determine tidal datums, and relate them to long-term NOAA gauges. VDatum tool enables conversion between oceanside tidal datums and land geodetic datums (e.g., NAVD88), useful for wetland delineations and engineering applications.
  - Claire Simmers: Commented on experiencing increased "sunny day flooding" in Bethany over 30 years and asked about causes. John Callahan explained this is high tide flooding driven primarily by sea level rise (including approximately one-third due to land subsidence in Delaware), combined with seasonal ocean temperature expansion and wind patterns. The exponential increase in flooding frequency is a direct consequence of gradually rising base water levels approaching infrastructure thresholds.
- Andrew Wozniak: Noted personal relevance for navigating flooded roads near his office in Lewes.
  - John Callahan: Encouraged local groups to test the tools against their observed flooding experiences and provide feedback to NOAA.

- **Conclusion**
  - NOAA's Sea Level Calculator and related tools provide free, actionable coastal inundation data for planning, engineering, and community use.
  - High tide flooding in Delaware is increasing exponentially and is expected to continue due to sea level rise and land subsidence.
  - All tools, data, and URLs are included in John Callahan's slide deck, which will be posted on the STAC website.

Announcements

- Mollie Yacano: Shared a link in the chat for the Delaware NERR Symposium, scheduled for September 22–23.

Public Comments

- Andrew Wozniak: Opened the floor for public comment; no public comments were made

Adjournment

- Rich Watson: Made the motion to adjourn.
- Bhanu Paudel: Seconded the motion.

- Andrew Wozniak: Adjourned the meeting at noon and noted the next STAC meeting is scheduled for October 23rd, likely at the UD Lewes facility.

Sign - in Sheet 07–31-26 Attendance from Virtual Meeting.

STAC Members
Claire Simmers
Rich Watson
Andrew Wozniak
Ed Hale
Bhanu Paudel
Brooke Walls
Doug Janiec
Ed Whereat
Mollie Yacano
Holly Michael
Kelly Somers
Nick Ray
Ram Mohan
Lesley Baggett
Tom McKenna

Guests
Rachel McQuiggan
Valerie Thompson
Mariah Livernois - MCBP
Kim Abplanalp - MCBP
Catie Soriano

Unknown
Jennifer ____?

Invited Guest Speakers
Jay Hodny
Dan Warner
Peter Claggett
John Callahan

The Center Staff
Bob Collins
Meghan Noe Fellows
Ally Szabo
Daniel Fulton
Ella McNeece
Taylor Hoffman
Megan Frady
Nivette Perez-Perez
Michael Franc
Bryan Ochs