The CBP Partnership & the Agriculture Workgroup

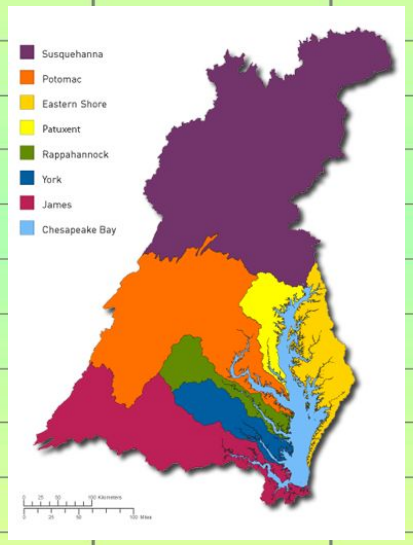
March 18, 2021

Relative Watershed Sizes
(metric units)

5X

14:1

hesapeake Bay
Gulf of Finland
n (Persian) Gulf
Baltic Sea
Great Lakes
Sea of Cortez
North Sea
Black Sea
Red Sea
diterranean Sea
Gulf of Mexico
outh China Sea
Sea of Japan



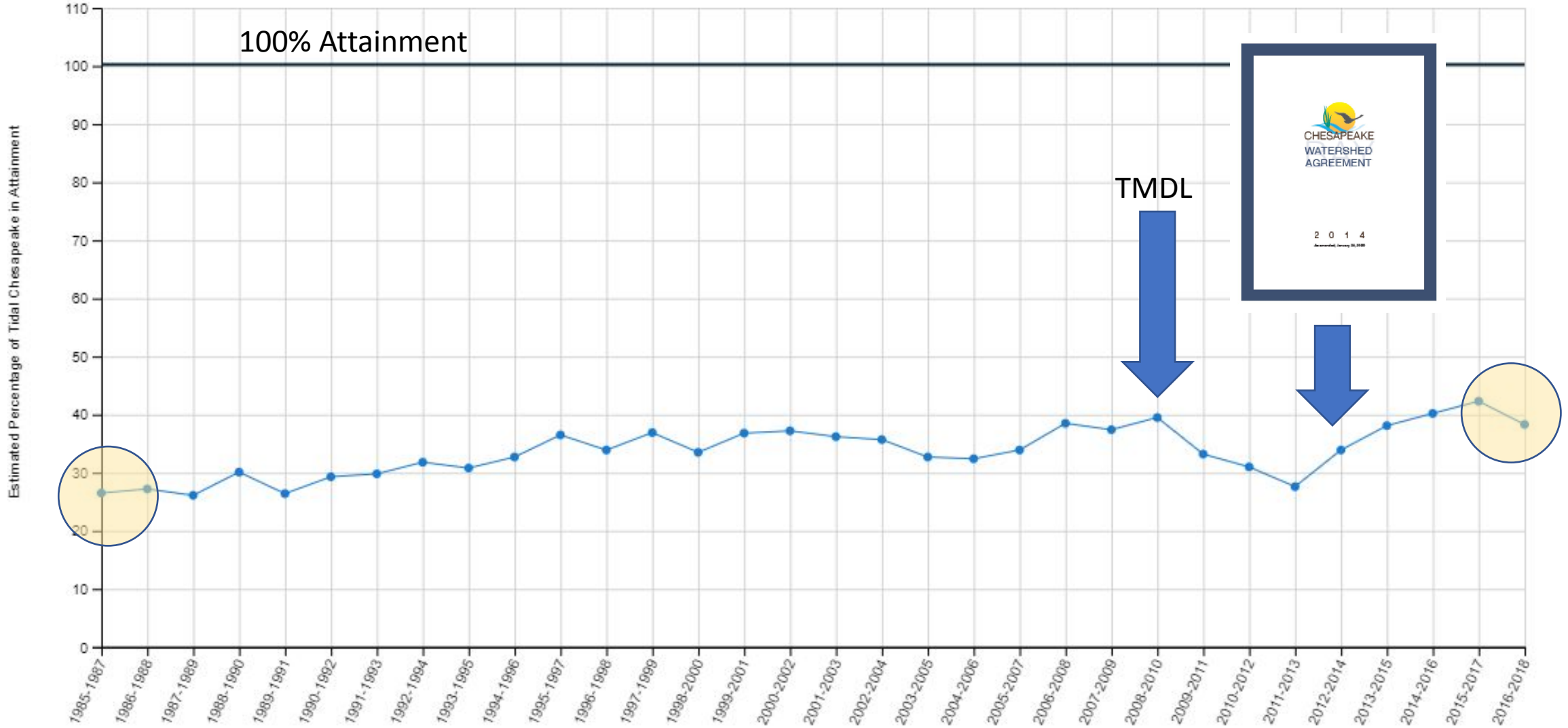
0 1000 2000 3000

Watershed/Volume Ratio

Water Quality Standards Attainment (1985-2018)

Water quality is evaluated using three parameters: dissolved oxygen, water clarity or underwater grass abundance, and chlorophyll a (a measure of algae growth).

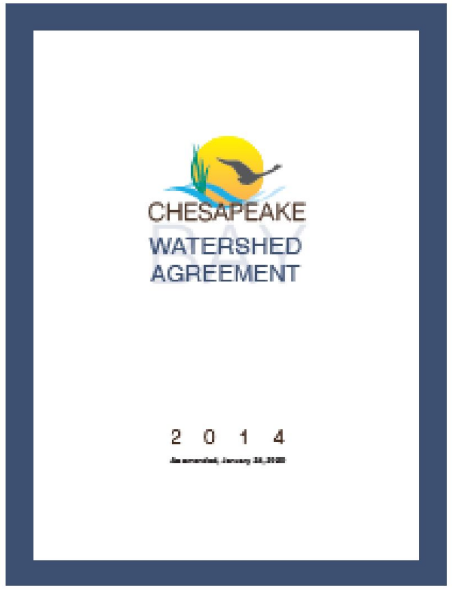
https://www.chesapeakeprogress.com/



Total Maximum Daily Load (TMDL) "Pollution Diet"

Maximum amount of a pollutant that a body of water can receive while still meeting water quality standards

Goal: ***Restore clean water*** in the Chesapeake Bay & streams, creeks, and rivers by ***load reductions***



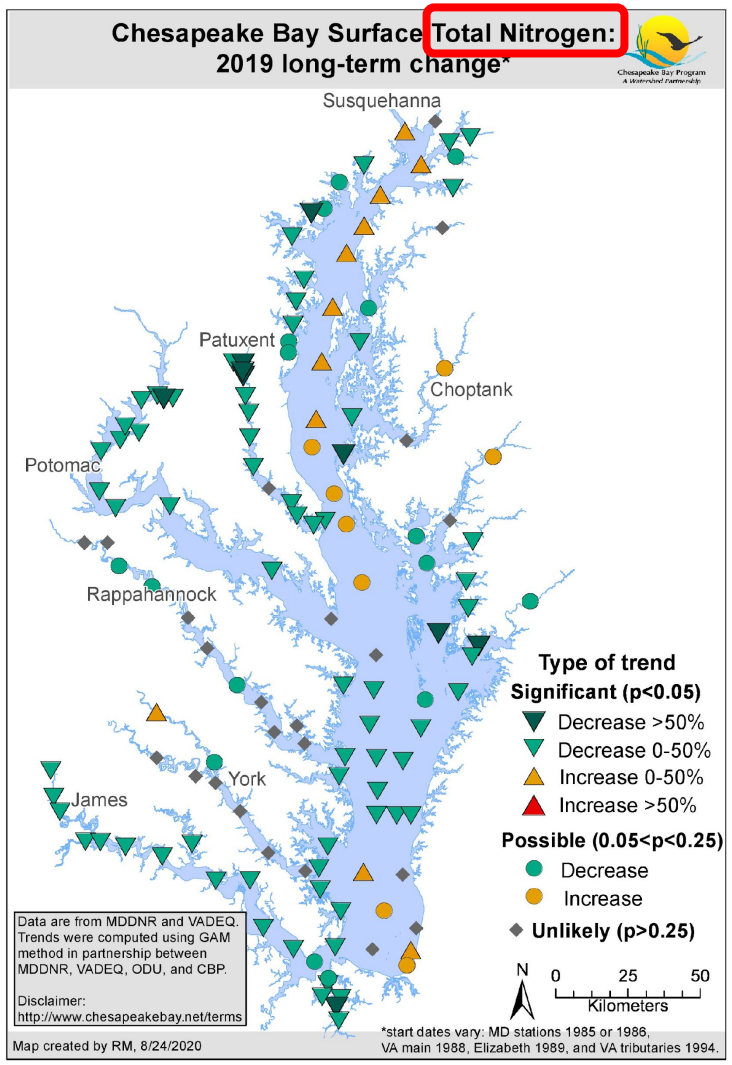
2017 60% of control measures in place (midpoint)

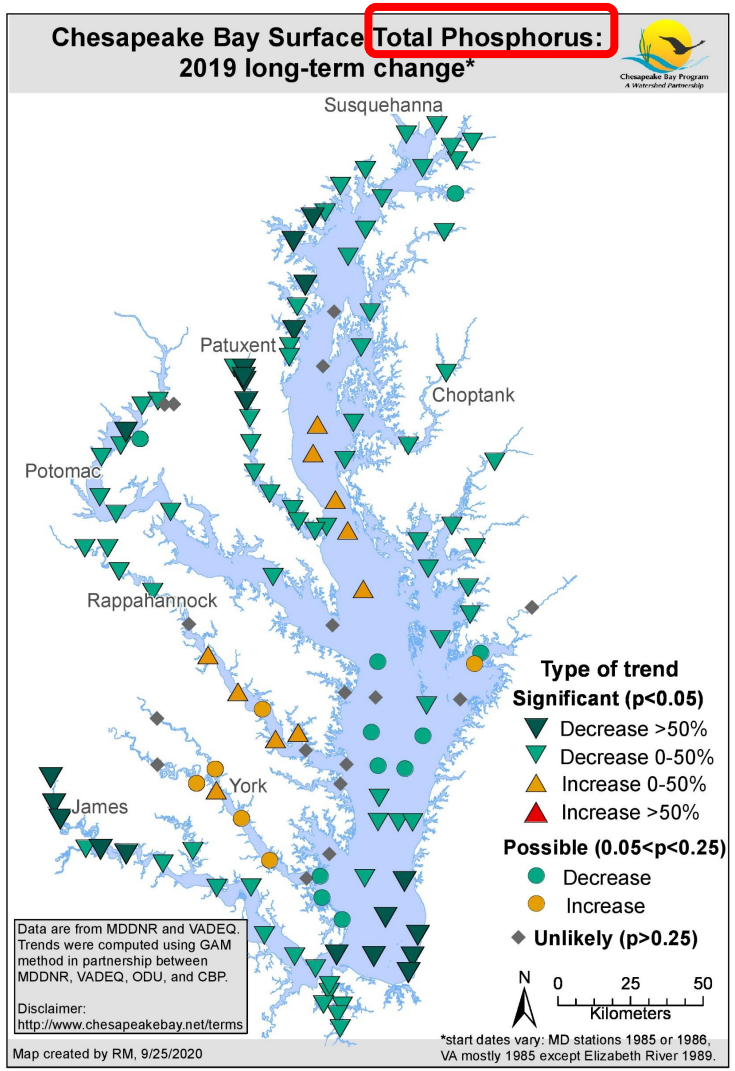
2025 100% of control measures in place to fully restore the Bay and its tidal rivers

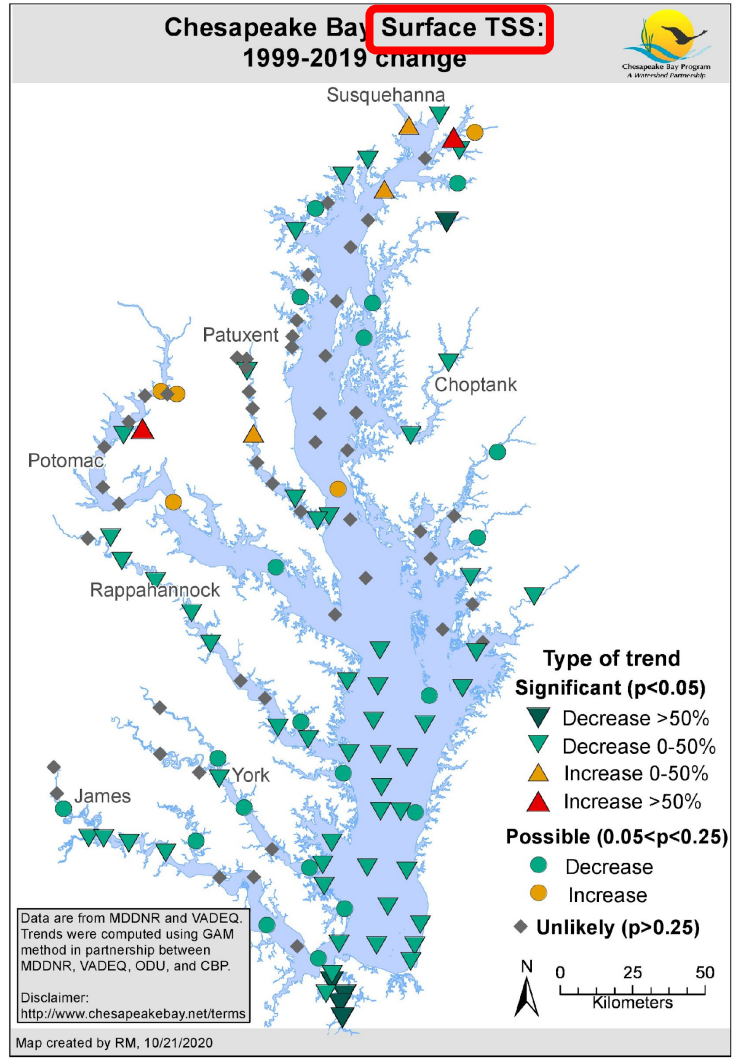
How do we evaluate Bay Health progress?

- Fish, crab, oyster, duck populations…
- Underwater vegetation (SAV)
- Restored fish passages…
- Restored Wetlands
- Water monitoring stations (hard data)
- **Models… (predicted outcome based on inputs)**
  - ***Trends:*** Seeing the forest for the trees
    - Making sense of a VERY complex systems
      - topography, soils, climate, precipitation, local land management, hydrology, etc.
    - Trends= forest
    - Trees= BMPs, population indicators, monitoring station data, land uses and land changes etc.

Big Picture: Bay and Tidal Waters
Integrated Trends Analysis Team (ITAT)

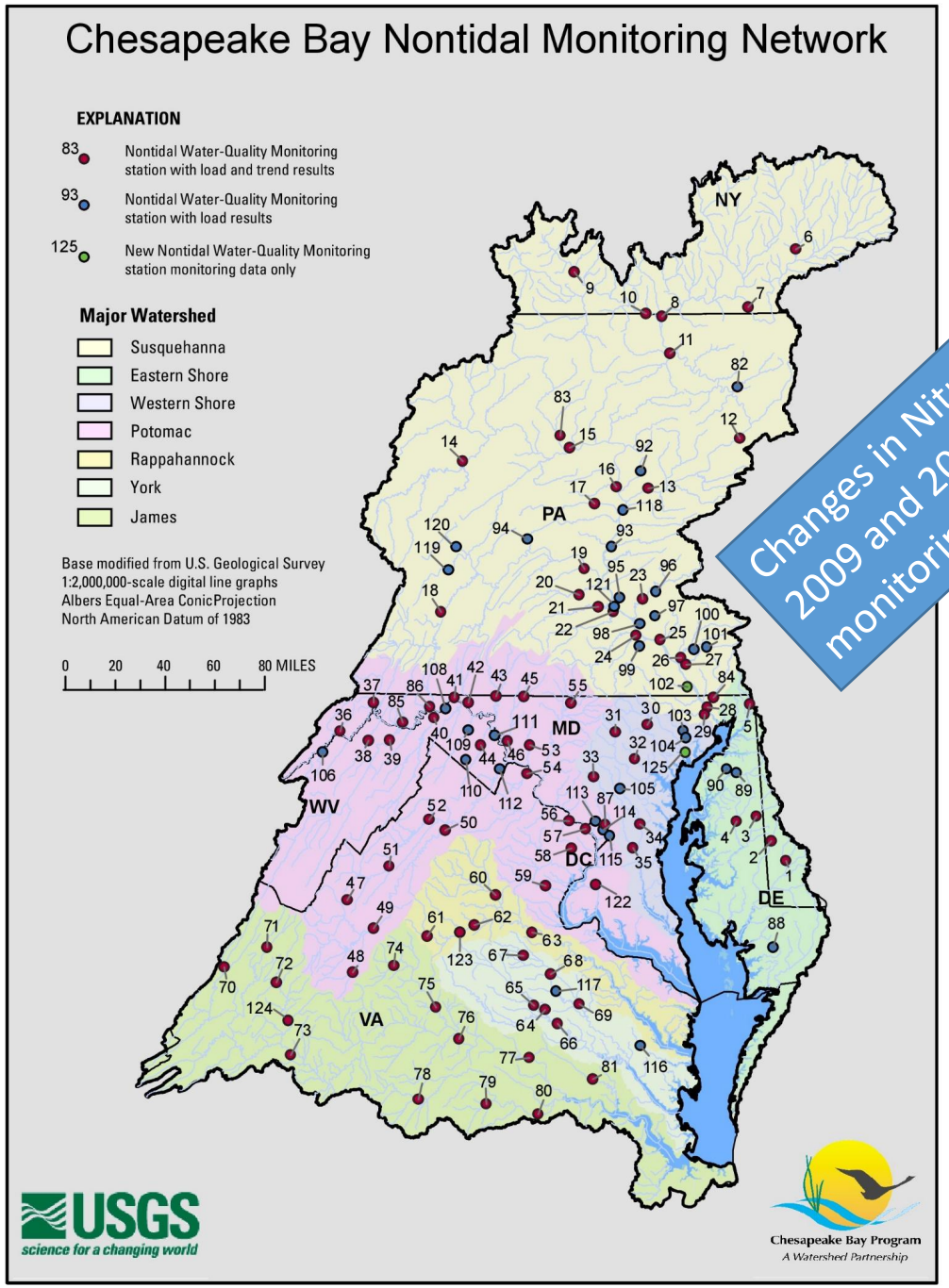




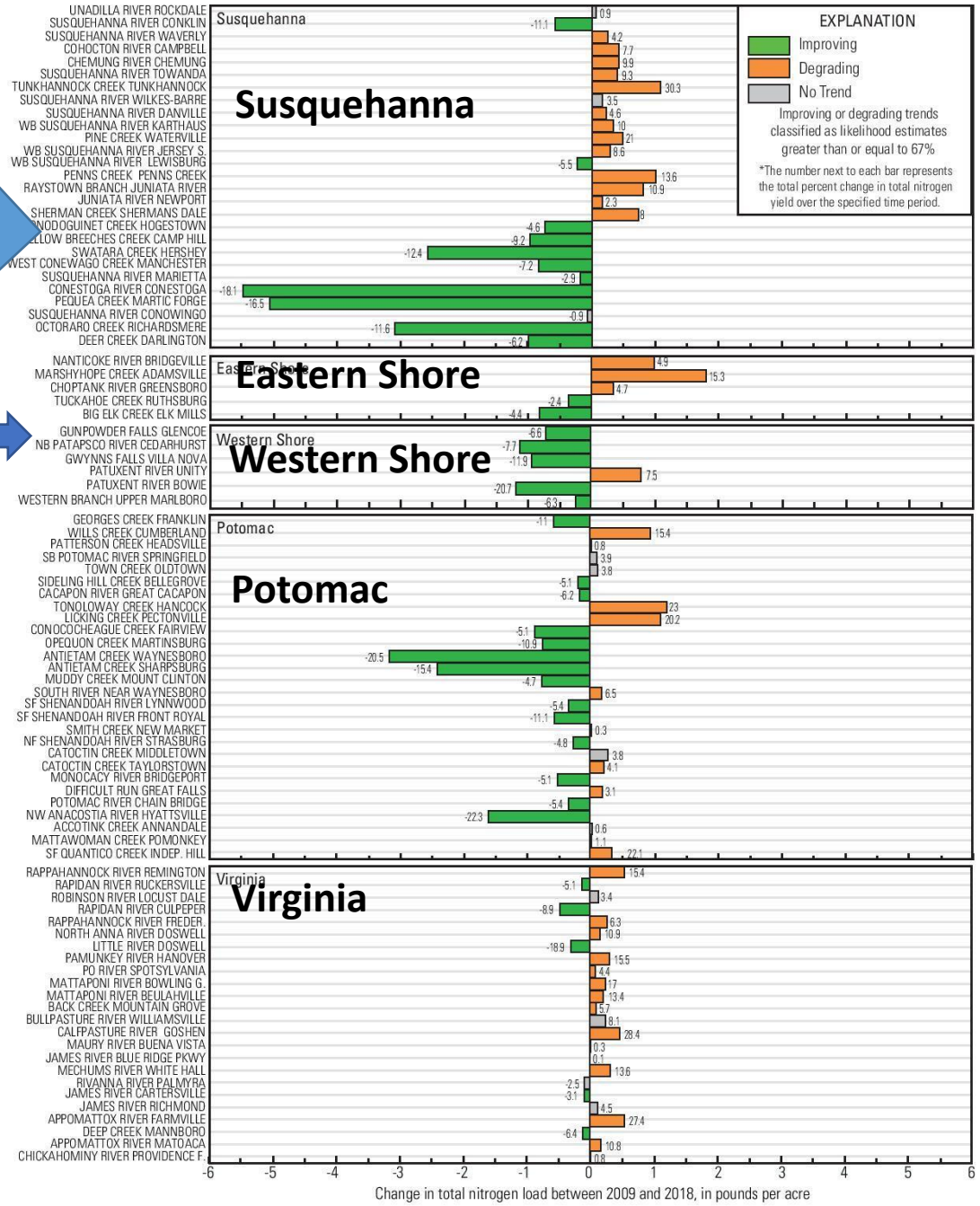


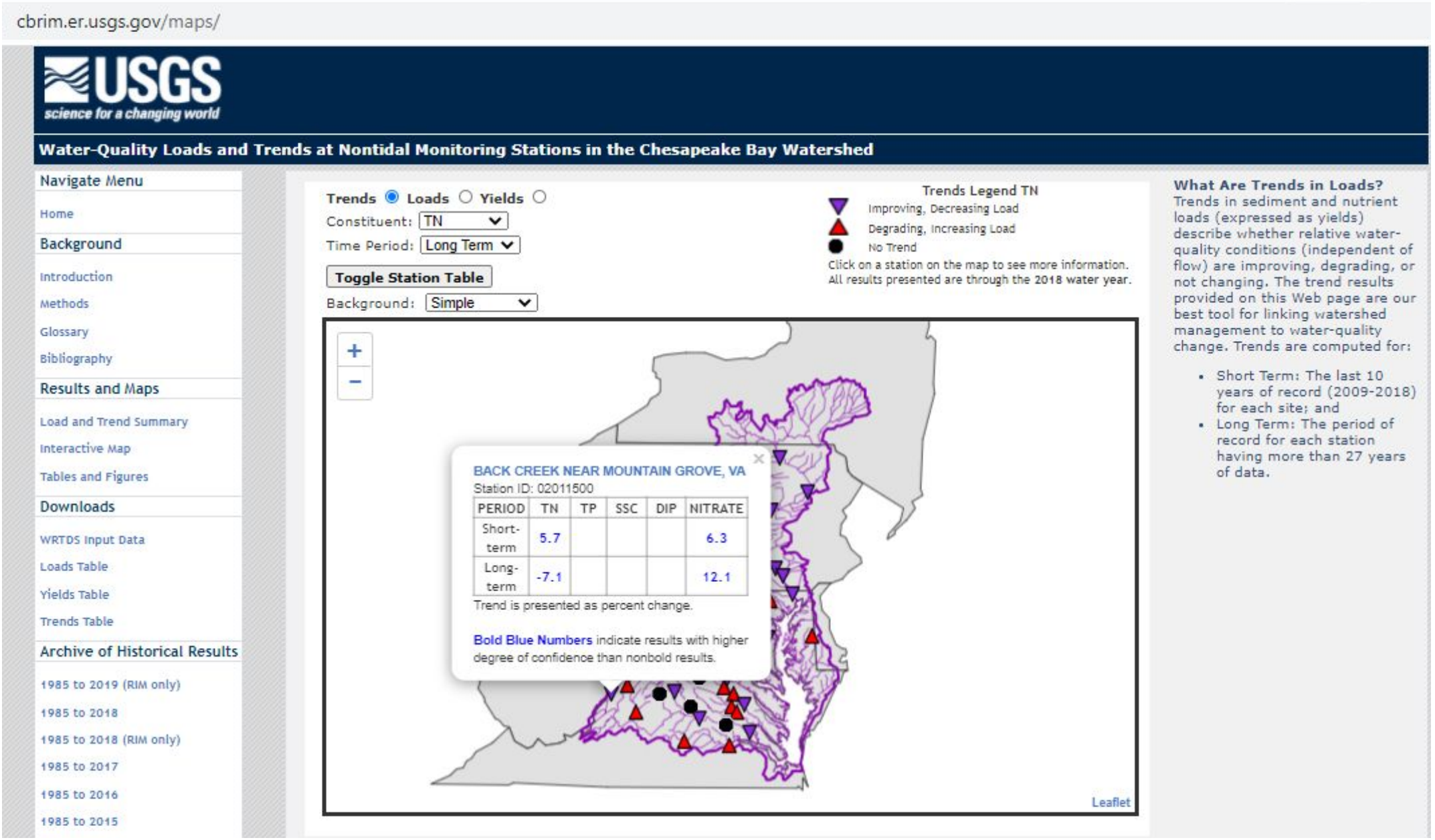
https://www.chesapeakebay.net/who/projects-archive/integrated_trends_analysis_team

https://cbrim.er.usgs.gov/maps.html



Changes in Nitrogen between 2009 and 2018 at each monitoring station



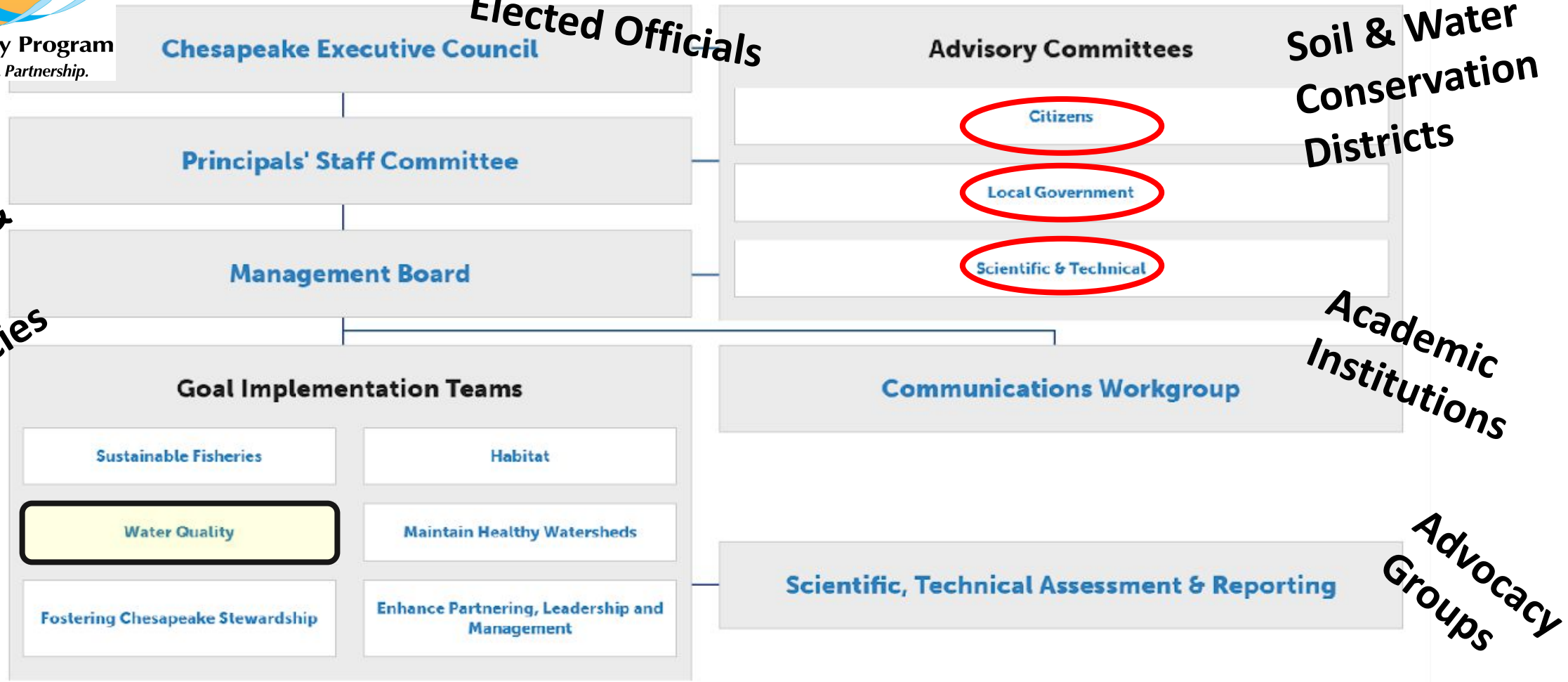


https://cbrim.er.usgs.gov/maps/

https://www.chesapeakemonitoringcoop.org/

Chesapeake Bay Program
Science. Restoration. Partnership.

Vision Statement:
To lead and empower others to protect & restore the Chesapeake Bay ecosystem for future generations.



Elected Officials

Soil & Water Conservation Districts

Federal & State Agencies

Academic Institutions

Advocacy Groups

Private Consultants

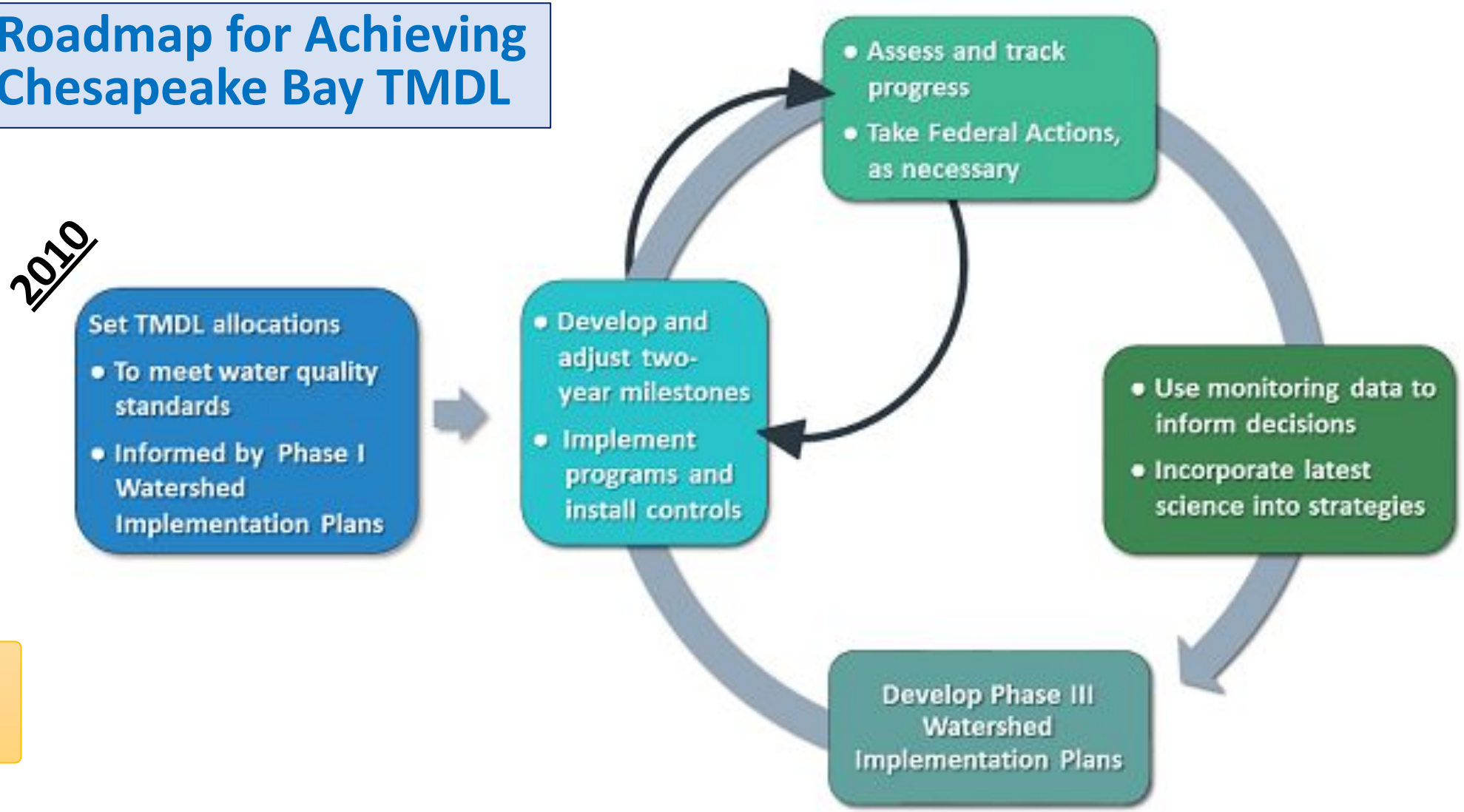
Industry Reps

Small Business

*A unique regional partnership that has led and directed the restoration of the Chesapeake Bay since **1983**.*

Watershed Implementation Plan (WIP)

Roadmap for Achieving Chesapeake Bay TMDL



2017

Mid-point Assessment
What has been achieved?
What needs to be done?

Ag Sector Share of Nitrogen Load Reduction: Past & Future

State	Since 2009 (%)	WIP Goal 2018-2025 (%)
Delaware	97	97
Maryland	16	52
New York*	99	28*
Pennsylvania	7	92
Virginia	6	76
West Virginia	42	90

*NY depending equally on wastewater, agricultural & urban sector.

Median Annualized Costs of Practices in Use

	Median $/lb of N reduction	Median $/lb of P reduction
Stormwater BMPs (excluding storm drain cleaning and practices n<3)	$1,082	$8,384
Agricultural BMPs	$16	$489

Data from Price et al. 2019. Cost Analysis of Stormwater and Agricultural Practices for Reducing Nitrogen and Phosphorus Runoff in Maryland.

Graphic courtesy of Lisa Wainger, University of Maryland Center for Environmental Science


Chesapeake Executive Council
Principals' Staff Committee
Management Board
Goal Implementation Teams
Sustainable Fisheries
Habitat
Water Quality
Maintain Healthy Watersheds
Fostering Chesapeake Stewardship
Enhance Partnering, Leadership and Management
Workgroups and Action Teams
Agriculture Workgroup
BMP Expert Panels
BMP Verification Ad-hoc Action Team
Best Management Practices (BMP) Verification Committee
Federal Facilities Workgroup
Forestry Workgroup
Land Use Workgroup
Local Planning Goals Task Force
Milestones Workgroup
Reevaluation Technical Workgroup*
Sediment Workgroup*
Toxic Contaminants Workgroup
Trading and Offsets Workgroup
Urban Stormwater Workgroup
Wastewater Treatment Workgroup
Watershed Technical Workgroup

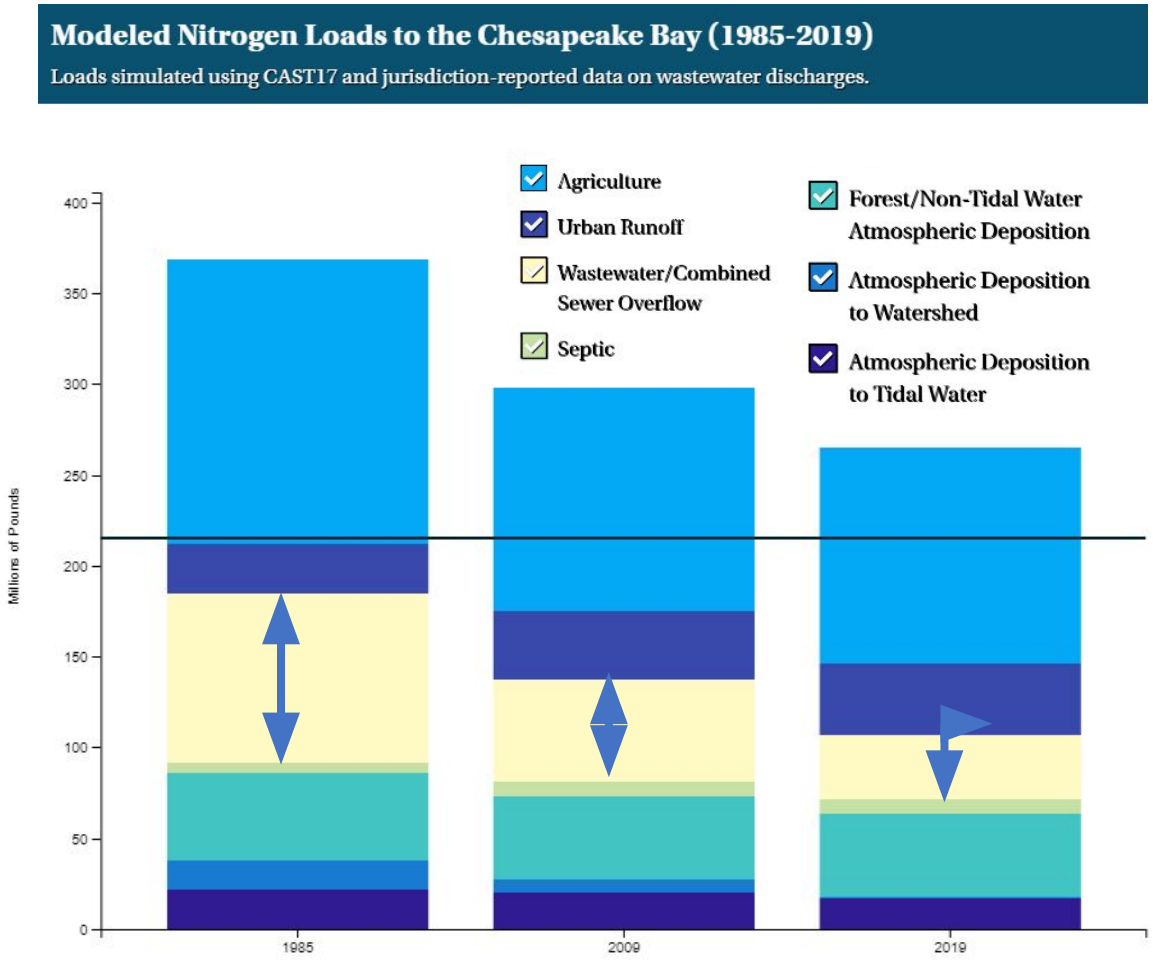
Water Quality Goal Implementation Team (GIT 3)

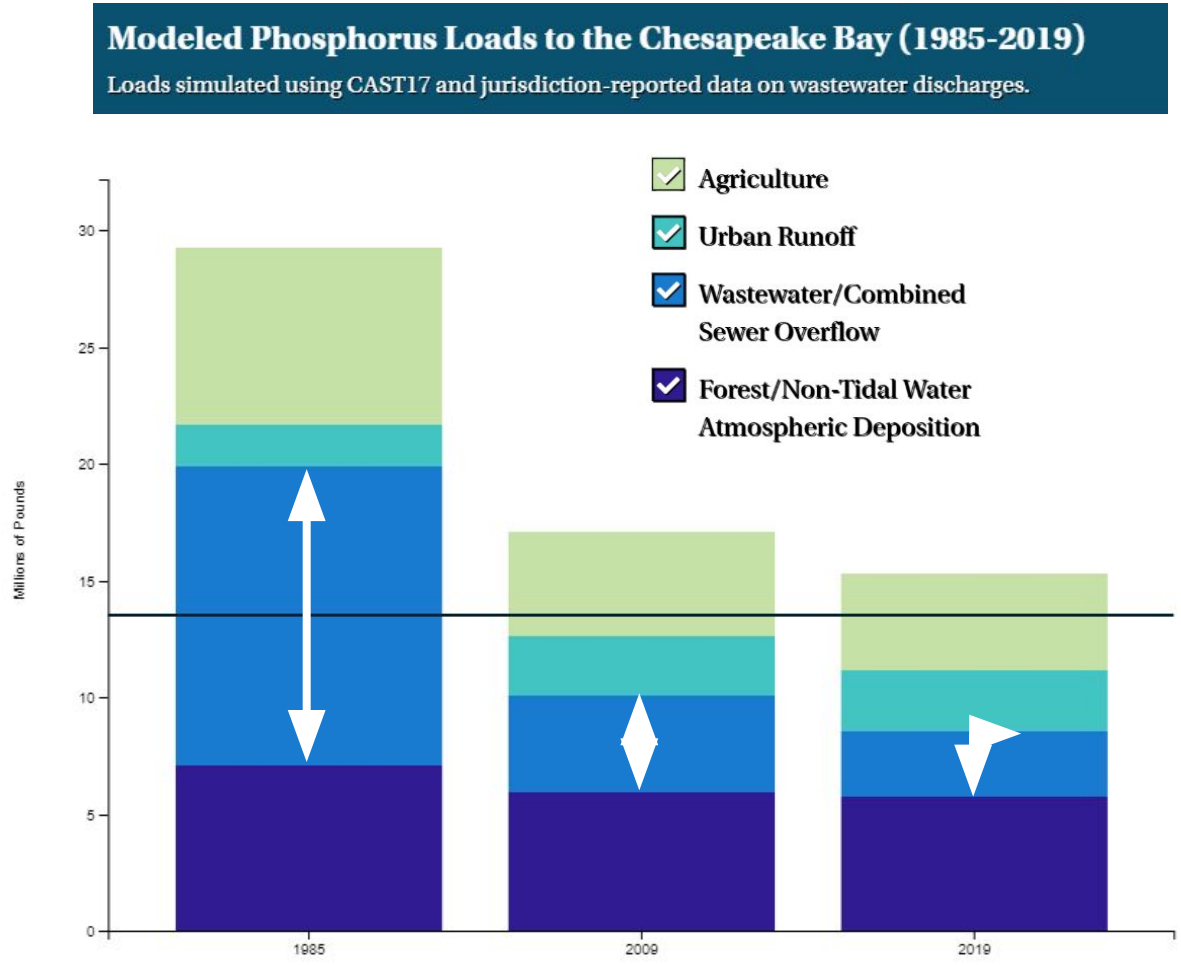
Scope and Purpose

The charge of the Water Quality Goal Implementation Team (WQGIT) is to evaluate, focus, and accelerate the implementation of practices, policies, programs that will restore water quality in the Chesapeake Bay and its tributaries to conditions that support living resources and protect human health. The Team reports to the Management Board and Principals' Staff Committee. Functions include:

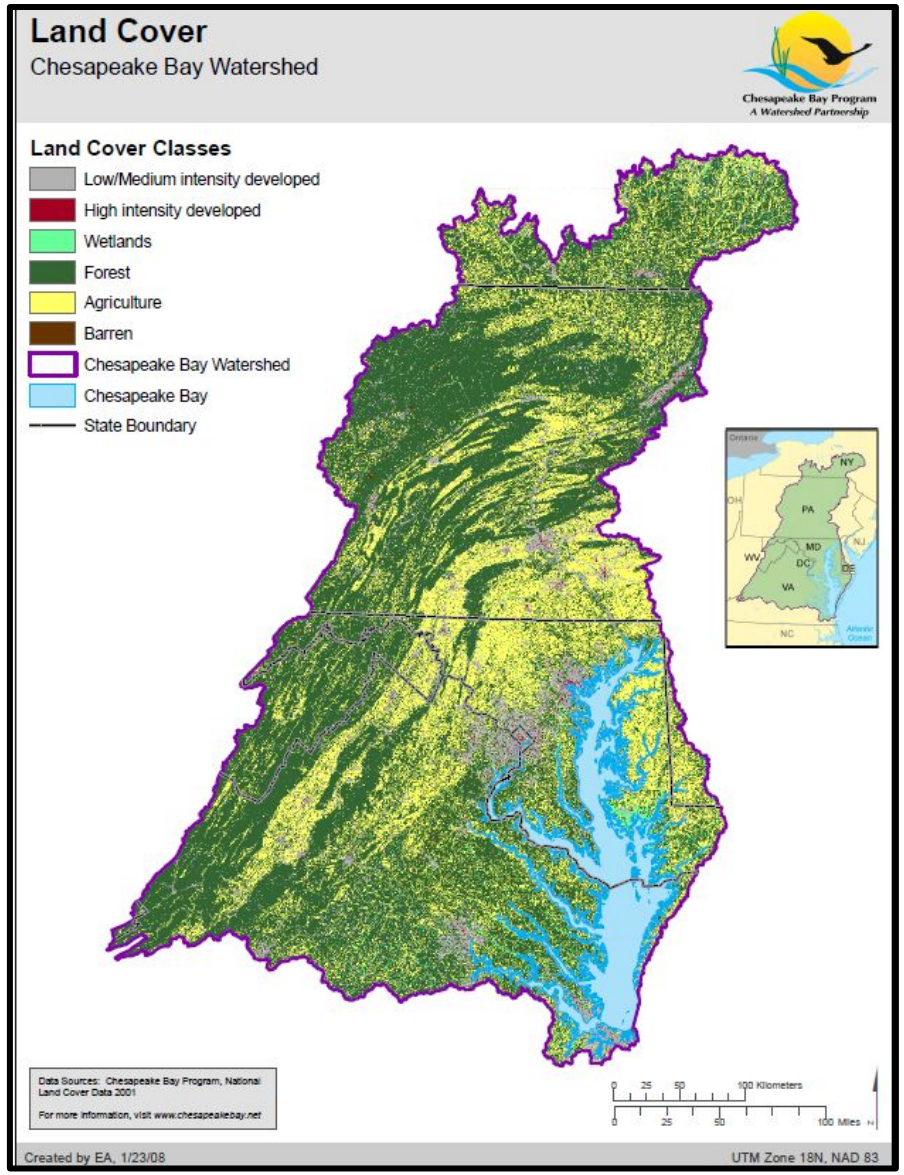
- Provide a forum for discussion, exchange of information, and evaluation among federal, state, and local agencies, river basin commissions, industry groups, universities, and other interested parties on water quality goals, data, modeling, authorities, and restoration efforts.
- Evaluate and promote strategies to reduce nutrient, sediment, and chemical contaminant loads from municipal, industrial and onsite wastewater; agricultural lands and animal operations; urban and suburban stormwater; forested lands; tidal and in-stream sediment; and air emissions.
- Promote consistent, uniform and transparent processes to model, track, report, and verify water quality restoration efforts.
- Identify, define, quantify, and incorporate pollutant reduction and conservation practices into the Chesapeake Bay Program decision support system.
- Provide technical expertise and leadership to support the development, implementation, and tracking of the Chesapeake Bay TMDL, Watershed Implementation Plans, and two-year milestones that support long-term Bay restoration goals.

Loads by Sector





Agriculture in the Chesapeake Bay



- 87,000 farms
- 8.5 million acres cropland (~ 22%))

Slide courtesy Kelly Shenk, EPA

Agriculture Workgroup

Scope and Purpose

The charge of the Agriculture Workgroup is to provide expertise and leadership on development and implementation of policies, programs, and research to reduce pollutant loads delivered from agricultural lands and animal operations to upstream waters and the Chesapeake Bay. The Workgroup reports to the Water Quality Goal Implementation Team. Functions include:

- Provide a forum for discussion, exchange of information, and evaluation between federal, state, and local agencies, conservation districts, universities, agri-business, and the corporate sector on sustainable and/or cost-effective agricultural production systems that benefit water and air quality.
- Provide recommendations on the prioritization of federal and state technical and financial resources on specific practices in priority watersheds.
- Provide technical expertise and leadership to support the development and implementation of agricultural elements within the Chesapeake Bay TMDL, Watershed Implementation Plans, two-year milestones, and tracking and reporting mechanisms that support an adaptive management approach towards Bay restoration.
- Coordinate with WQGIT Watershed Technical Workgroup to identify, define, quantify, and incorporate pollutant reduction and conservation practices on agricultural lands and animal operations into the Chesapeake Bay Program decision support system. Provide data and support for the Water Quality Goal Implementation Team and Technical and Support Services.

The Charge of the Agriculture Workgroup (September 2018)

Provide expertise and leadership on development and implementation of policies, programs, and research

Reduce pollutant loads delivered from agricultural lands and animal operations to upstream waters and the Chesapeake Bay

Value: Improving Water Quality Across Our Shared Region While Maintaining Agriculture's Viability & Sustainability

Goal: Balance Science & Data Collection / Improved & Increased Implementation

- https://www.chesapeakebay.net/channel_files/26848/prioritization_update_final.pdf

Workgroup Areas of Focus

Accounting and Reporting

Ensuring that Best Management Practices are accurately reported to the Chesapeake Bay Program for credit towards water quality goals.

Implementation

Making WIPs reality

Innovation

Staying abreast of and evaluating new/innovative agricultural conservation practices that mitigate nutrient loss

Data & Modeling

Ensuring that the agricultural sector is represented accurately

CBP Assignments

Addressing tasks and projects assigned by the Partnership

Members

Gary Felton (Chair), University of Maryland +

Jeremy Daubert (Vice Chair), Virginia Tech +

Loretta Collins (Coordinator), University of Maryland +

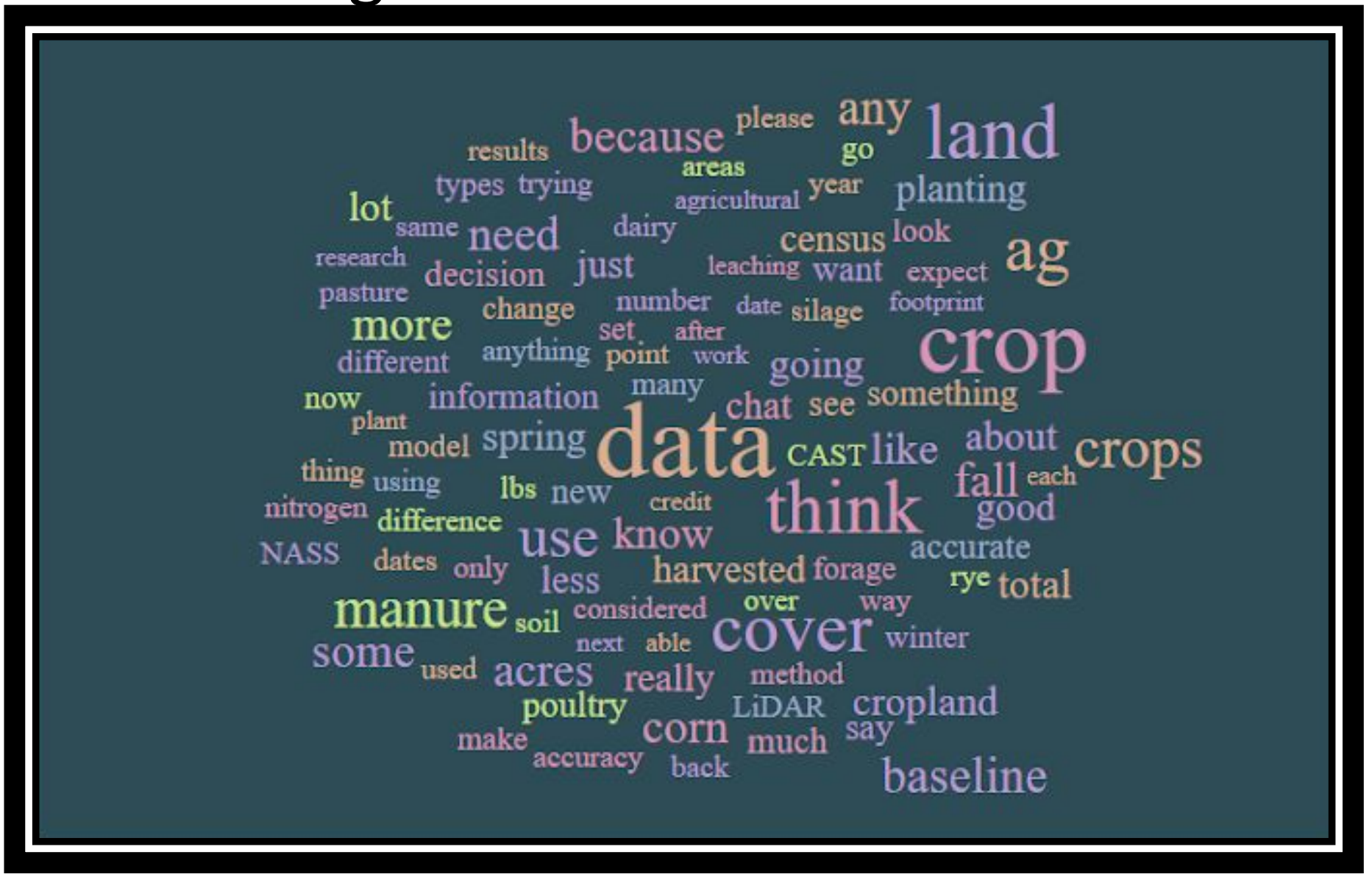
Jackie Pickford (Staffer), Chesapeake Research Consortium +

Jurisdiction	Name	Affiliation
Delaware	Chris Brosch (alt.)	DDA
Delaware	Clint Gill	DDA
Maryland	Elizabeth Hoffman	MDA
Maryland	Bill Tharpe (alt.)	MDA
New York	Greg Albrecht	NY State Dept. of Agriculture and Markets
New York	Amanda Barber (alt.)	Cortland Co. SWCD District Manager
Pennsylvania	Frank Schneider	PA State Conservation Commission
Pennsylvania	Jill Whitcomb (alt.)	PA DEP
West Virginia	Cindy Shreve	WV Conservation Agency
West Virginia	Matt Monroe	WV Dept. of Ag.
Virginia	Tim Sexton	VA DCR
Virginia	Seth Mullins (alt.)	VA DCR
Chesapeake Bay Commission	Marel King	CBC
Chesapeake Bay Commission	Ann Swanson (alt.)	CBC
U.S. EPA	Kelly Shenk	EPA

Name	*Affiliation*	*Membership category*	*Alternate*	*Term Started (lasts 2 years)*
Paul Bredwell	U.S. Poultry & Egg Association	Agribusiness & Industry	Christian Richter, U.S. Poultry & Egg Association	March 2021
R.O. Britt	Smithfield Foods	Agribusiness & Industry		March 2021
Emily Dekar	Upper Susquehanna Coalition	Soil/Water Conservation		March 2021
Tim Rosen	ShoreRivers	Conservation/Environmental NGO		March 2021
Matt Royer	Penn State	Academic/Extension	Tyler Groh, Penn State	March 2021
Gurpal Toor	University of MD	Academic/Extension		March 2021
Jeff Hill	Lancaster County Conservation District	Soil/Water Conservation		March 2020
Evin Fitzpatrick	Country View Family Farms	Agribusiness & Industry		March 2020
Ken Staver	University of MD	Academic/Extension		March 2020
Matt Kowalski	Chesapeake Bay Foundation	Conservation/ Environmental NGO	Jenna Schueler, Chesapeake Bay Foundation	March 2020
David Graybill	Farm Bureau, Dairy Operator	Agribusiness & Industry		March 2020
Denise Coleman	Natural Resources Conservation Service (NRCS)	United States Department of Agriculture (USDA)		March 2020

https://www.chesapeakebay.net/who/group/agriculture_workgroup

3 Months in the AgWG…



Models can fill in gaps in water quality monitoring

Water quality monitoring

Nitrogen yields (lbs/acre)

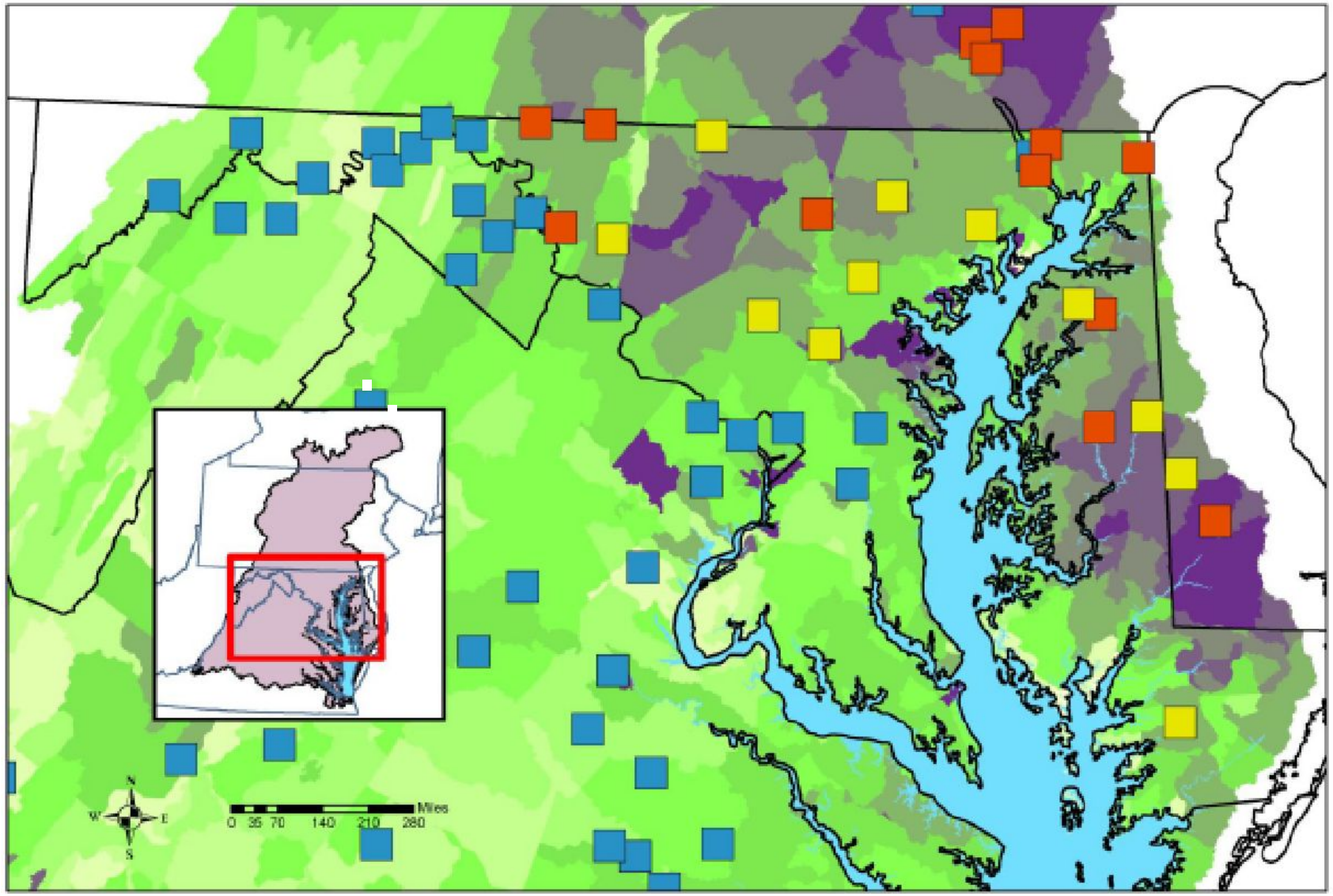
- 1 to 7
- 7 to 14
- 14 to 33

Bay Program Watershed Model

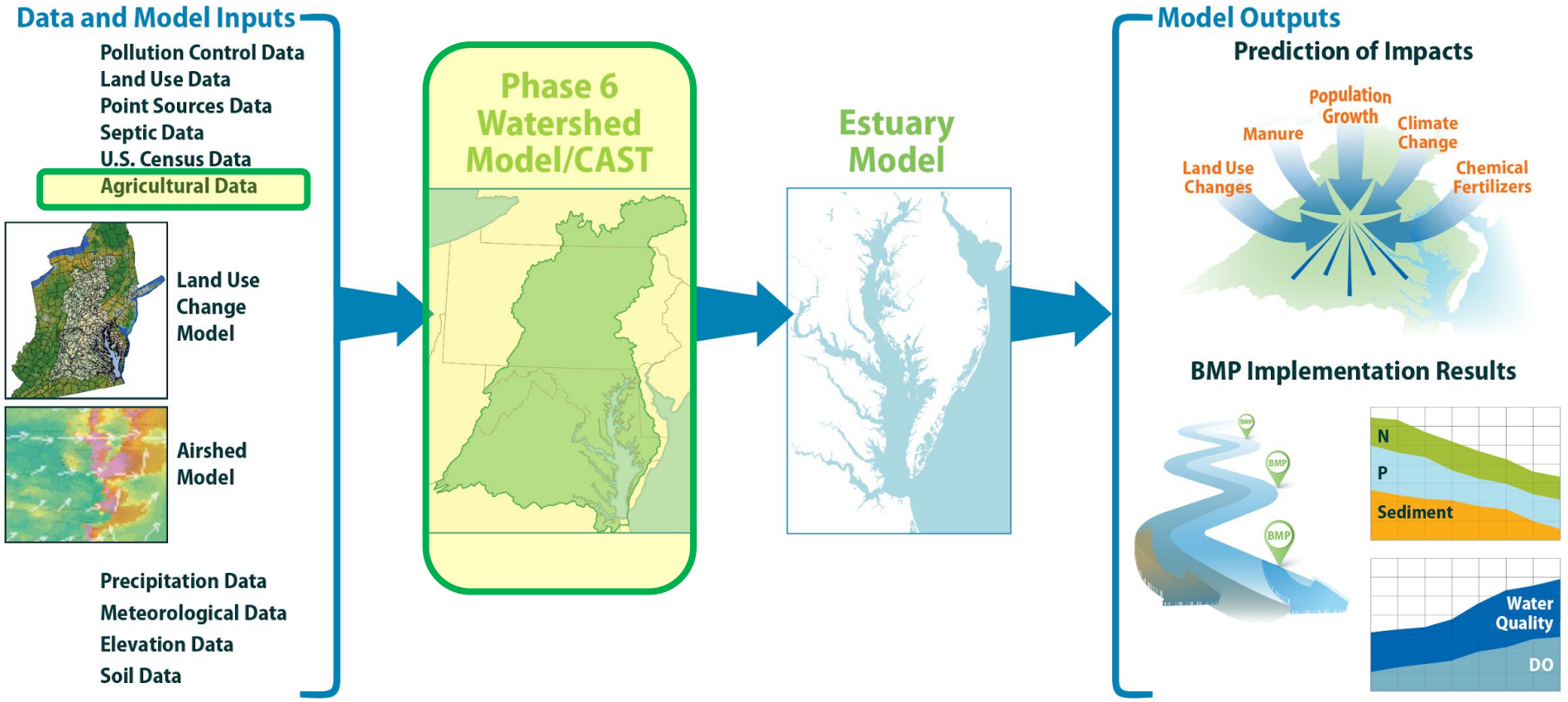
Estimated annual yield to local streams (lbs/acre)

Nitrogen

- < 2
- 2 to 3
- 3 to 4
- 4 to 5
- 5 to 7
- 7 to 10
- 10 to 14
- 14 to 17
- 17 to 22
- >22



Courtesy of Emily Trentacoste, CBP

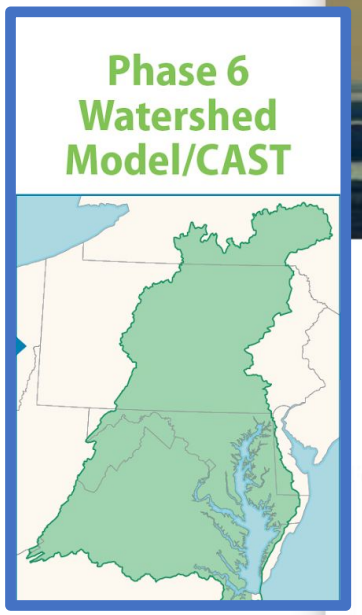


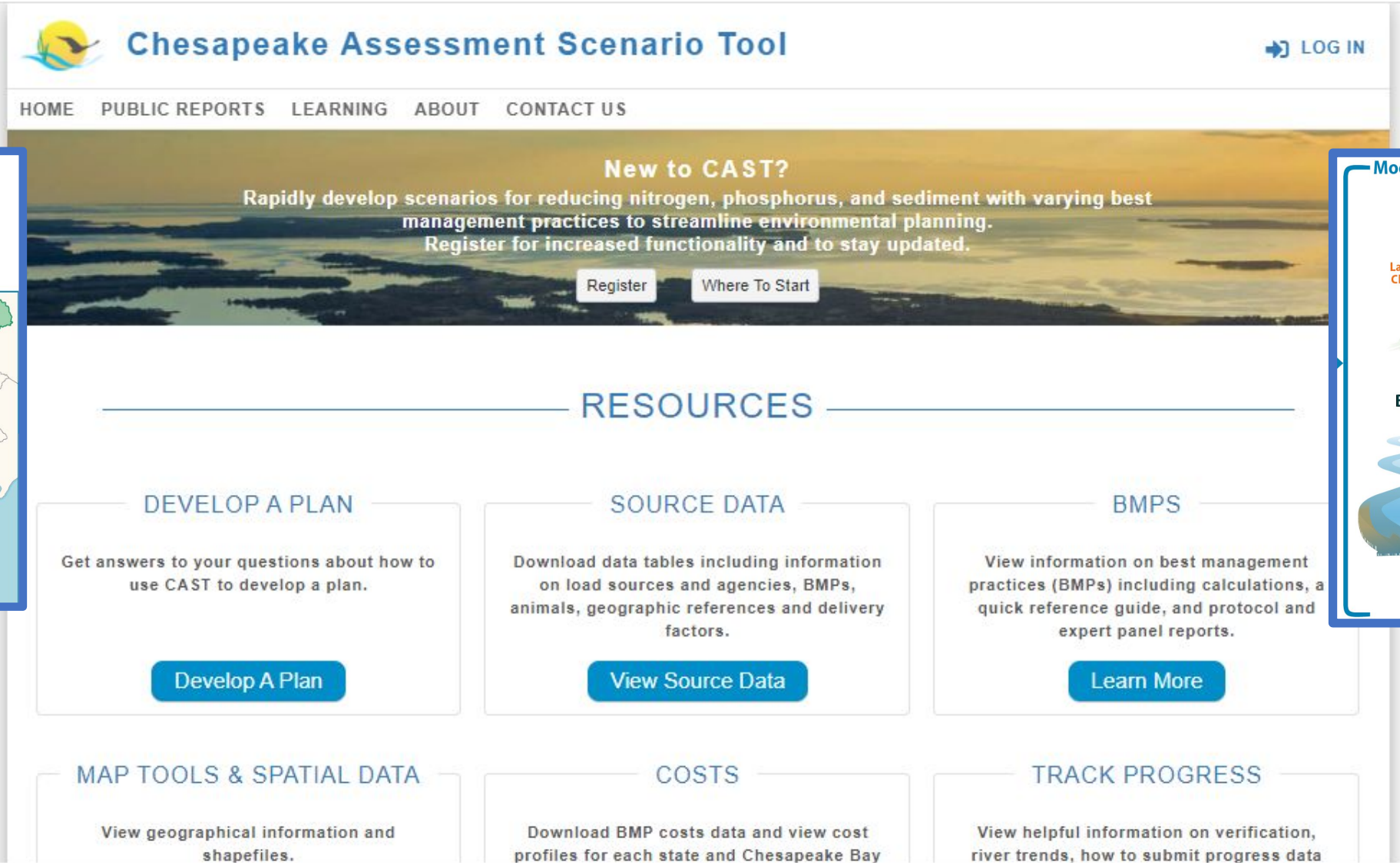
What is included in the Chesapeake Bay Program's suite of modeling tools?

The Chesapeake Bay Program has a suite of four computer models that includes:

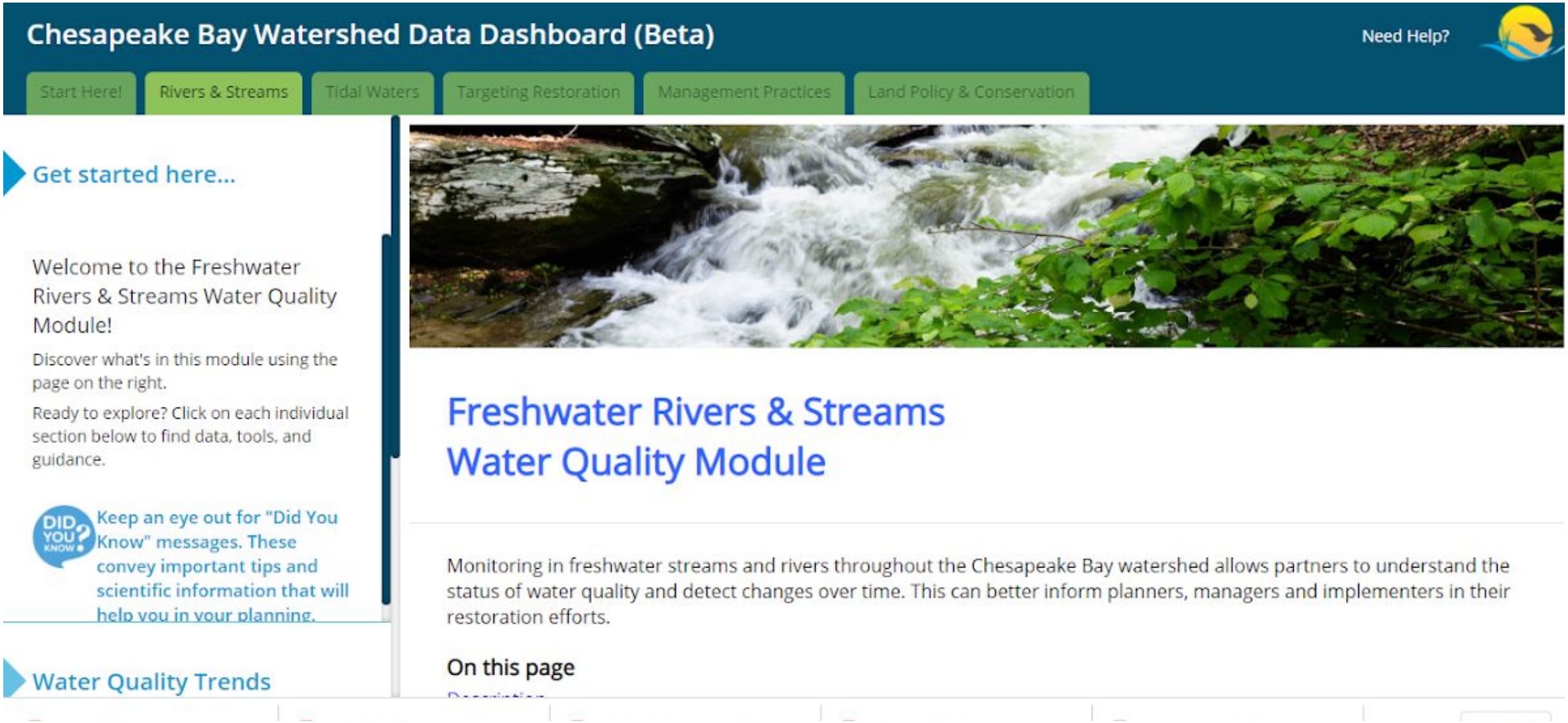
- **Airshed Model:** estimates the amount of nitrogen deposited onto the land and water by vehicles, power plants and other emission sources
- **Land Use Change Model:** predicts the impacts that urban population and development will have on sewer and septic systems
- **Phase 6 Watershed Model:** estimates the amount of nitrogen, phosphorus and sediment reaching the Chesapeake Bay
- **Estuary Model:** examines the effects that pollution loads have on water quality

https://www.chesapeakebay.net/who/group/modeling_team





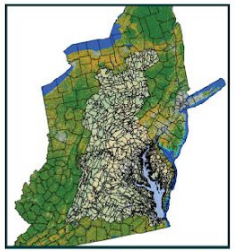
https://cast.chesapeakebay.net/



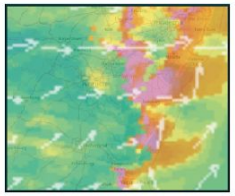
https://gis.chesapeakebay.net/wip/dashboard/

Data and Model Inputs

Pollution Control Data
Land Use Data
Point Sources Data
Septic Data
U.S. Census Data
Agricultural Data



Land Use Change Model

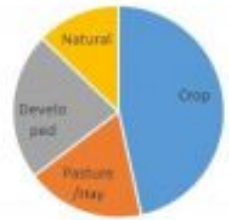


Airshed Model

Precipitation Data
Meteorological Data
Elevation Data
Soil Data

Figure 2-1: Phase 6 Model structure.

Step 1:
Estimate Total Non-point Source Load
Monitoring Data



Step 2:
Divide into Broad Classes
Multiple models

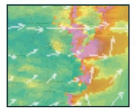
Step 3:
Split Classes into individual land uses
Multiple lines of evidence

Figure 2-2: Three steps of determining average loads

Data and Model Inputs

Pollution Control Data
Land Use Data
Point Sources Data
Septic Data
U.S. Census Data
Agricultural Data

Land Use Change Model



Airshed Model

Precipitation Data
Meteorological Data
Elevation Data
Soil Data

1.Define Crop Application Goal

A Crop Application Goal/Yield Unit

B Yields/Acre

C Acres

Crop Application Goal

2. Define Manure Available to Crops

Manure Generated

Feed Additive BMPs

Direct Deposition on Pasture

Direct Deposition to Riparian Pasture Areas

Deposited within Barnyard

Ammonia Reduction BMPs

Stored Manure

Storage and Handling Loss

Barnyard BMPs

Available for Transport

Manure Transport

Available for Application

Mineralization

Volatilization

3. Spread Manure to Crops

4. Define Inorganic Fertilizer Available to Crops

AAPFCO Fertilizer Sales Data

5. Spread Fertilizer to Crops

A AMS
B NASS Annual Survey
C Ag Census

Ag Census or NASS Annual Surveys (Animal populations dictate manure load estimates)

AMS= Agricultural Modeling Subcommittee; National Agricultural Statistics Service; AAPFCO= Association of American Plant Food Control Officials

Why Do We Use the Ag Census?

1980s: Early CBP Partnership Decision

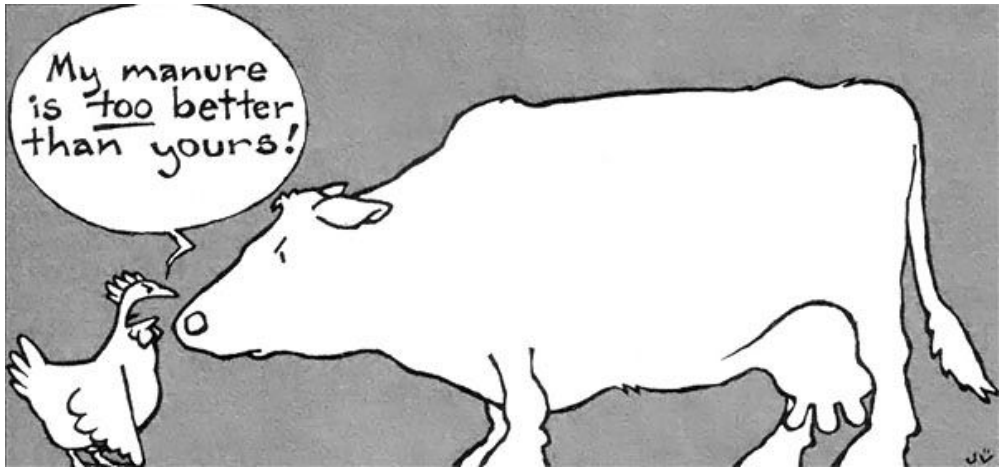
- Predictable and reliable (in terms of access)
- Public
- Breadth of coverage

2013: Building a Better Bay Model…

- Interest in alternative sources of data

How Do We Use the 5-Year Ag Census Data?

- Animal Inventory & Sales
  - Estimate populations by county
  - Define feed space acres
  - Estimate the “manure bucket” for the CBW
    - Manure nutrients applied to crops, directly deposited to pasture and riparian areas, and left in the feed space.
- Crop acres by county
  - Used in conjunction with high-resolution mapped land cover data to improve land use assumptions
  - Used in conjunction with yield data & crop application goals to allocate annual fertilizer & manure applications across the watershed



https://www.motherearthnews.com/homesteading-and-livestock/manure-fertilizer-zmaz83mazraw

What About Annual Data?

National Agricultural Statistics Service (NASS) Annual Surveys

- Incorporated every two years (milestone)
  - When the watershed model “opens” for changes
- Yield data for the following major crops:
  - Alfalfa Hay; Barley; Buckwheat; Corn for Grain; Corn for Silage; Oats for Grain; Rye for Grain; Sorghum for Grain; Sorghum for Silage; Soybeans for Beans; and Wheat for Grain
- Broiler & Turkey Sales Data (state-level)

Manure Generation – Nutrient Content

Manure Generated

Data Currently Used in the Phase 6.0 Model

Animal Type	Manure Source	Lbs Dry Manure/Animal/Yr	Lbs TN/Lb Dry Manure	LbsTP/Lb Dry Manure
Beef	Use Beef - Cow (confinement) from **ASAE 2005** for manure values	5,475.00	0.028788	0.006467
Dairy	Use Lactating Cow, Dry Cow and Heifer from **ASAE 2005** for manure values	4,404.33	0.042221	0.006764
Other Cattle	Estimated based upon weighted average combination of Beef and Dairy from Census of Agriculture	1,605.07	0.035504	0.006616
Horses	Use average of Horse- Sedentary and Horse - Intense Exercise from **ASAE 2005** for manure values	3,102.50	0.031672	0.005941
Hogs for Breeding	Swine Characterization Report;	220.62	.294653	Varies
Hogs for Slaughter	Swine Characterization Report;	97.09	0.106841	Varies
Sheep and Lambs	**Use ASAE 2003 for manure values**	240.9	0.038182	0.007909
Goats	**Use ASAE 2003 for manure values**	680.91	0.034615	0.008462
Pullets	PLS Report; See Appendix A	12.95	Varies	Varies
Layers	PLS Report; See Appendix A	17.89	Varies	Varies
Broilers	PLS Report; See Appendix A	Varies	Varies	Varies
Turkeys	Turkey Characterization Report;	7.62	Varies	Varies

3-year trends (up or down) can be applied to existing values in this table.

(requires 3 consecutive years of data)

Data must be collected in a similar fashion as was done for:

- Poultry Litter Subcommittee report
- Swine Characterization Study
- Turkey Characterization Study

Alternatives to the Ag Census?

Crop Acreage Data

Crop Application Goal

Alternative methods to account for fitting Ag Census data to CBP needs?

- Adjusting methods for estimating crop acres (e.g. double crops, vegetables, etc.)

Alternative/supplemental data sets

- Other data sets at the state or federal level?

Animal Population Data

Additional NASS Annual Survey Data may be available to inform population trends between census years (incorporated every two years)

- Dairy, Beef Cattle, Layers, Swine…

Direct from industry data can inform animal population ***trends*** between census years.

- Requires careful cooperation
- Legal, privacy assurances

Manure Generated

Other Data Issues (new data incorporation every 2 years)

Soil P data

- Gary Shenk Sept 2018 presentation to AgWG on data set incorporated into the CBWM
- **Additional soil P data is welcome and encouraged**

Manure Nutrient Concentration Data

- Changes in management may result in changes in nutrient concentrations
- **Additional manure concentration data is welcome and encouraged**

Fertilizer Data

- More accurate allocation of fertilizer within the CBW?

4. Define Inorganic Fertilizer Available to Crops

CRITICAL CONCEPT:

To maintain integrity of CBWM there are two options for new data sets:

- Provide data all the way back through 1985.
  OR
- Use the **trend** in new data sets for the years available.

CBWM= **Chesapeake Bay Watershed** Model

Best Management Practice (BMP) Expert Panels

Independent Peer Review

- Protocol in accordance with National Academy of Sciences standard practices
- Effectiveness Estimates for Proposed BMPs

The National Academies of SCIENCES ENGINEERING MEDICINE

Key Components:

- Consistent
- Transparent
- Scientifically Defensible

BMP Expert Panel

Recommendations

Sector Workgroup

(e.g., Ag, Urban Stormwater, Wastewater)

Watershed Technical Workgroup

(Compliance with watershed model)

Water Quality Goal Implementation Team

(Partnership approval)

What Are We Doing to Accelerate Implementation?

No-Till

Stream Exclusion

Prescribed Grazing

Nutrient Management

Buffers

Cover Crops

Dairy Precision Feeding

Animal Waste Systems

Chesapeake Bay Program Office (CBPO) Resource Support for the AgWG

CBPO Technical & Programmatic Assistance

Evaluation of Implementation Capacity in the Ag Sector

- Capacity under current and future conditions of staff resources, funding, financing, policies, programs and regulations to more fully understand the achievability of meeting agricultural goals and commitments

Determination of Needed Programmatic Implementation

- Technical analysis support in the assessment of what is it going to take in terms of practice implementation, technical assistance, funding and more to achieve agricultural goals and commitments

Targeting of Most Effective Practices/Geographies

- Evaluating what are the most pollutant load reduction effective and cost-efficient practices and where are the places which can yield the most reductions to local waterways and downstream Bay tidal waters

CBPO Technical & Programmatic Assistance

Data Collection & Access

- Assistance with designing, developing, reviewing and analyzing agricultural production and conservation implementation data to better inform and achieve targeted water quality reduction efforts

Source Sector Alternative Analysis

- Assistance in evaluating alternative approaches for the Phase III WIPs' agricultural strategies

Designing, Running & Interpreting Scenarios

- Design, run, and analyze various management alternative analyses as scenarios using Phase 6 CAST to understand the benefits to water quality in local waters and the Chesapeake Bay

CBPO Technical & Programmatic Assistance

Statistical Design Assistance

- BMP verification protocol development, monitoring data analysis, quality assurance

Explaining Water Quality Monitoring Trends

- Assistance with the development of more in-depth and detailed evaluations and explanations of the long- and short-term water quality trends observed at Chesapeake Bay Watershed Water Quality Monitoring Network stations

Local Planning Goal Development

- Support for thinking through the range of options leading to development, consideration, running and evaluation of alternative approaches

CAST Trainings

- Provide webinar-based or hands-on in person training tailored to the needs of the specific partners and stakeholders on use of Phase 6 CAST

EPA CBPO Funding Assistance

- Chesapeake Bay Implementation Grants (CBIG)
- Chesapeake Bay Regulatory and Accountability Grants (CBRAP)
- Chesapeake Bay Local Government Assistance Grants
- Chesapeake Bay WIP Assistance funding via CBIG/CBRAP
- Chesapeake Bay Small Watershed Grants
- Chesapeake Bay Innovative Nutrient and Sediment Reduction Grants
- Chesapeake Bay Program Goal Implementation Team Funding
- EPA Contract with Tetra Tech for WIP Development and Implementation Support

CBPO Support Staff

Mark Dubin, Senior Agricultural Advisor, University of Maryland

- Primary manager for designing & carrying out research, data collection & data analysis projects as they relate to ag production and conservation implementation
- Direct technical support to jurisdictions to improve their ability to target resources towards planning, implementing & verifying ag practices & programs to achieve agricultural goals and commitments
- Technical resource to CBPO & the Partnership to assist with achieving the ag verification objectives of the Partnership's BMP verification protocols
- Expert advice & direction in conducting evaluations of needed programmatic capacity within each jurisdiction & the supporting agricultural community to support achievement of ag goals commitments
- Assistance and support to the AgWG Workgroup Coordinator for the coordination of the AgWG and its associated panels & subcommittees
- Communication of ag research & technical findings to partners & stakeholder groups to improve the understanding of ag non-point source implementation progress

CBPO Support Staff

Loretta Collins, AgWG Coordinator, University of Maryland

- Primary coordinator for the AgWG
  - Development of meeting schedules, agendas, presentations, briefing materials, issues & options papers & meeting/conference call summaries
- Leadership in development & implementation of AgWG strategies for meeting the ag goals & commitments, coordinates partner efforts to meet those goals, & evaluates progress in meeting those strategies
- Follow through on actions/next steps agreed to by the AgWG to ensure the priority work proceeds within the partnership between scheduled meetings
- Coordination & support the development & review of priority agricultural conservation practices & implementation systems through the use of ag expert review panels
- Technical coordination & support to the AgWG's subcommittees and subgroups for developing recommendations for the improved tracking, reporting & verification of agricultural conservation practice implementation
- Coordination & assist in the management of CBP financial and technical resources provided for the technical support of the AgWG's expert panels, subcommittees & subgroups

CBPO Support Staff

Jackie Pickford, AgWG Staffer, Chesapeake Research Consortium

- Provides administrative & logistical support to the AgWG co-chairs and coordinator
- Provides meeting organization & support, member coordination and communication, task tracking, research and synthesis activities, & additional special projects as assigned

Lucinda Power, CBP WQGIT Coordinator/Implementation & Evaluation Team Leader, EPA

- Any Phase III WIP development/implementation related request for support
- Stakeholder outreach related support
- Access to EPA contractor support for Phase III WIP development/implementation

Ruth Cassilly, Nonpoint Source Policy Analyst, University of Maryland

- Programmatic capacity and policy analysis support
- Support for Phase III WIP implementation efforts

CBPO Support Staff

Jeff Sweeney, Integrated Analysis Coordinator, Watershed Technical Workgroup Coordinator, EPA

- Scheduling CAST training
- Expansion of CAST functionality
- Assistance with running Phase 6 CAST scenarios

Gary Shenk, Watershed Modeling Coordinator, USGS

- Running Phase 6 Watershed Model scenarios
- Tapping into early optimization tool development and management applications

USGS Colleagues (Scott Phillips, Jeni Keisman, Peter Tango)

- Expanding work on explaining water quality trends
- Provides science coordination across the Partnership's teams and workgroups

Durga Ghosh, Quality Assurance Coordinator, USGS

- Reviews standards, policies, and procedures to ensure program and project requirements are met

Bottom Line…

CBPO staff & resources are in place to support & advance AgWG priorities, along with other Partnership-identified goals and commitments.

Please don’t hesitate to let Loretta know of any support needs as the AgWG identifies and implements its priorities now and into the future.

WETLANDS WORK

Understanding Wetlands | Benefits of Wetlands | Building Your Wetland | Programs & Planners | Success Stories | About Us

Photo by Will Parson/Chesapeake Bay Program

Wetlands Work

Riparian Forest Buffer Progress in the Chesapeake Bay Watershed

This map shows acres of agricultural and urban riparian forest buffers as reported to the Chesapeake Bay Program in 2018. Click on the county to see new buffers installed in 2018 and total acres enrolled to date.

chesapeake network

Looking to be part of the riparian forest buffer conversation? Join our group on

Resources

- Chesapeake Progress
  - https://www.chesapeakeprogress.com/
- Maps of 2019 Tidal Water Quality Change
  - https://www.chesapeakebay.net/who/projects-archive/integrated_trends_analysis_team
- Water Quality Goal Implementation Team:
  - https://www.chesapeakebay.net/who/group/water_quality_goal_implementation_team
- Agriculture Workgroup
  - https://www.chesapeakebay.net/who/group/agriculture_workgroup
- BMP Expert Panels
  - https://www.chesapeakebay.net/who/group/bmp_expert_panels
- Modeling Workgroup
  - https://www.chesapeakebay.net/who/group/modeling_team
- Chesapeake Assessment Scenario Tool (CAST)
  - https://cast.chesapeakebay.net/
- Chesapeake Bay Watershed Data Dashboard
  - https://gis.chesapeakebay.net/wip/dashboard/
- USGS Non-tidal monitoring stations
  - https://cbrim.er.usgs.gov/maps/
- USGS Story Map
  - https://www.usgs.gov/centers/cba/science/usgs-develops-tool-further-examine-nutrient-and-sediment-trends-chesapeake-bay?qt-science_center_objects=0#qt-science_center_objects
- How's My Waterway?
  - https://www.epa.gov/waterdata/hows-my-waterway
- Chesapeake Monitoring Cooperative
  - https://www.chesapeakemonitoringcoop.org/
- Wetlands Work
  - https://www.wetlandswork.org/
- Chesapeake Riparian Forest Buffer Network
  - https://chesapeakeforestbuffers.net/