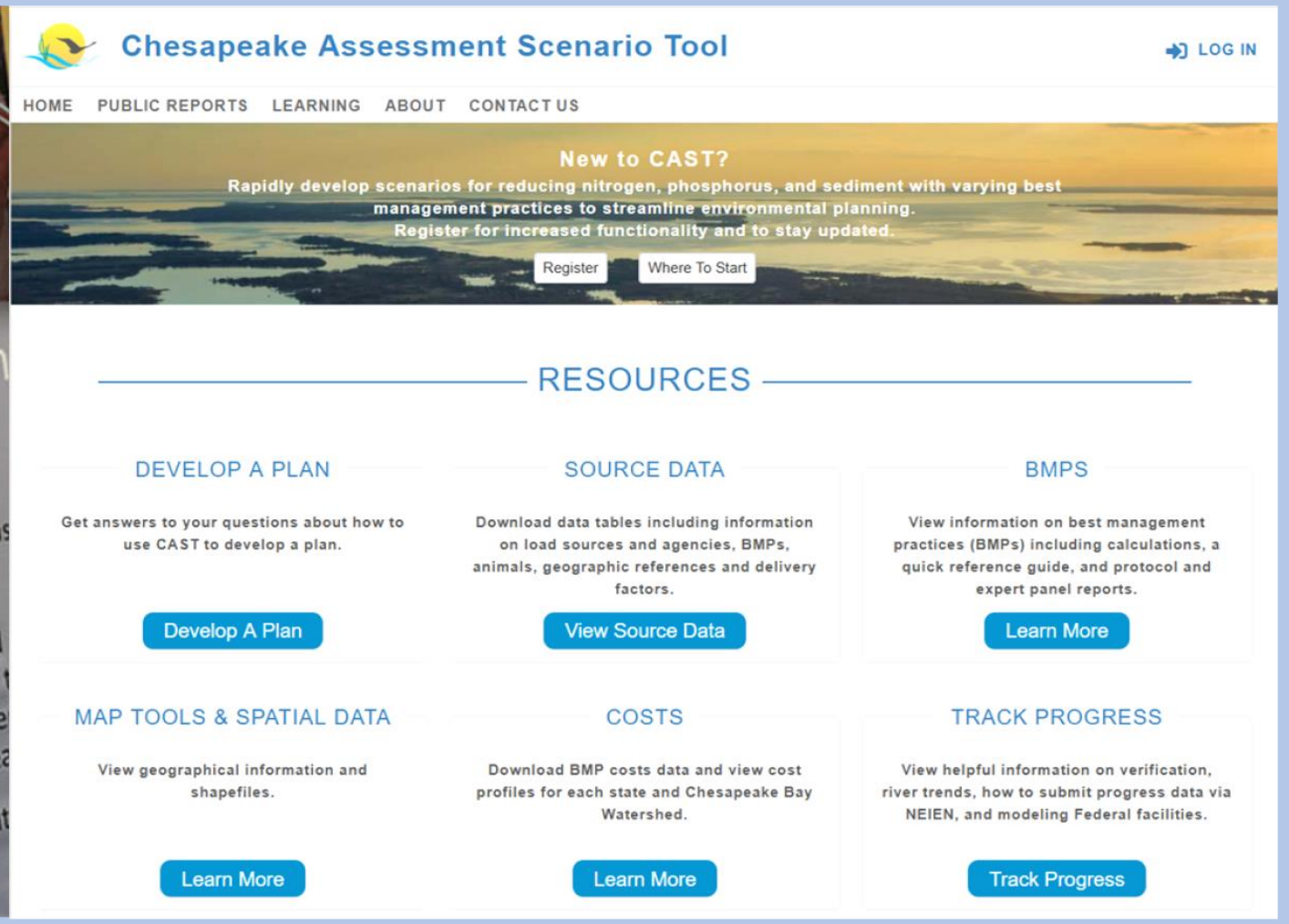


WHAT CAST DOES NOW AND WHAT IT COULD DO

Includes animated slides – Please use Slide Show view option

Goal Implementation Chairs

September 1, 2021

Olivia Devereux

Outline

- What CAST is and can do
- Connecting BMPs to multiple ecological conditions and communities
- Examples for using CAST
  - Stream Health
  - Toxics
- Goals, Strategy, and Near-term objectives

This presentation relates to:

- Work Ryann Rossi is doing in developing quantitative measures for co-benefits.
- Modeling Team's work to move to a finer scale hydrological model.

Questions

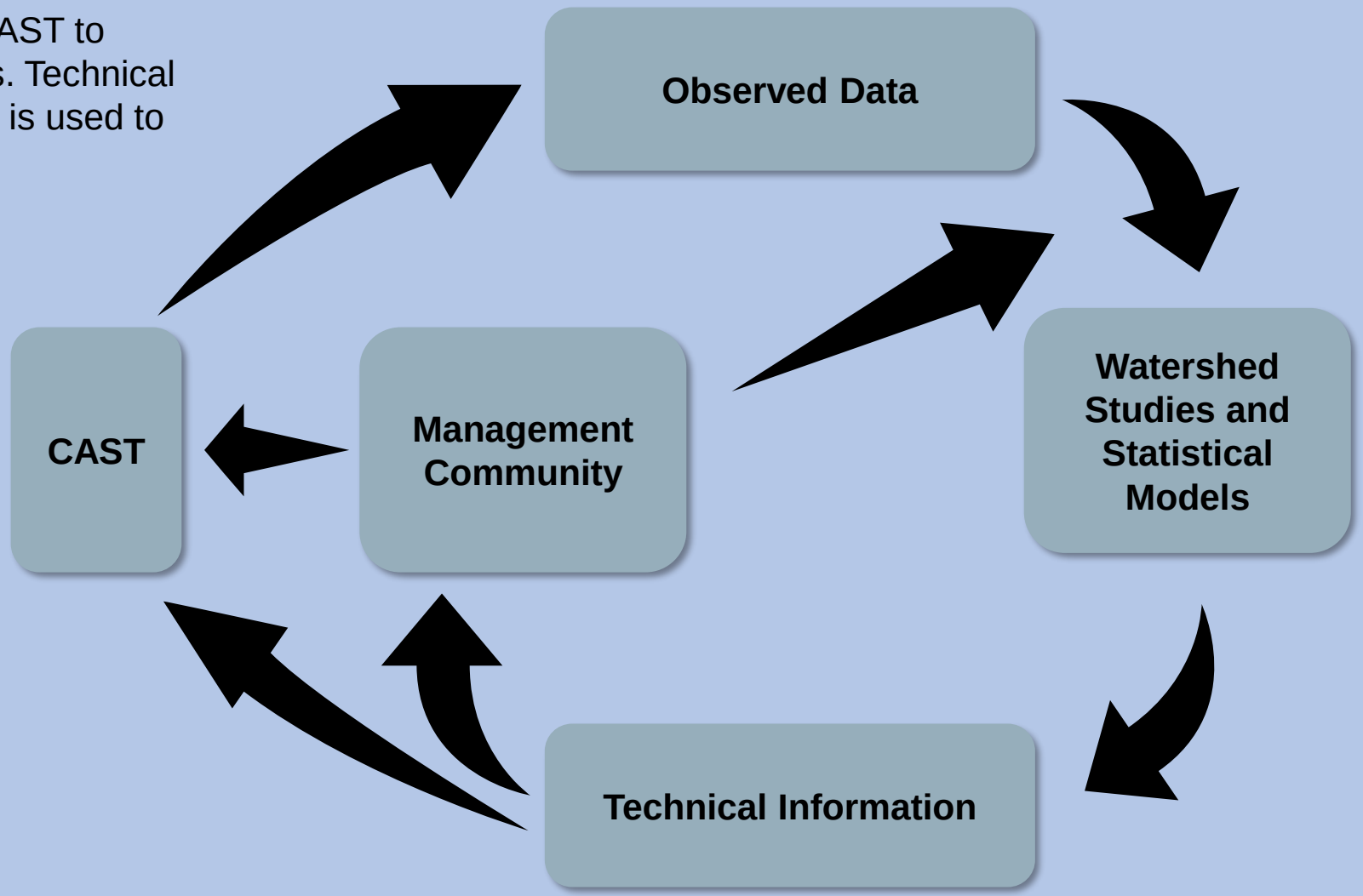
- **Current**
  - **What are the most commonly used BMPs?**
  - **What has BMP implementation changed over time?**
  - **What are the lowest cost, most effective BMPs?**

- Future
  - Stream Health outcome
    - What are the dominant BMPs where Stream Health improved?
    - How has land use changed in areas where Stream Health in/decreased?
    - What has the financial investment been in watersheds with increased Stream Health?
    - These can inform plans for future improvements.
  - Toxics outcome
    - What are the main sources and factors controlling transport of Toxics in stormwater draining from a watershed?
    - To what extent can proposed BMPs, including green infrastructure solutions, reduce toxic loadings?
    - What are the implications of modeled reductions for fish?

The Chesapeake Bay watershed model (CAST) is a comprehensive synthesis of knowledge that can help direct management

The management community largely relies on CAST to understand and improve water-quality conditions. Technical information about water-quality loads and trends is used to improve and assess modeled predictions.

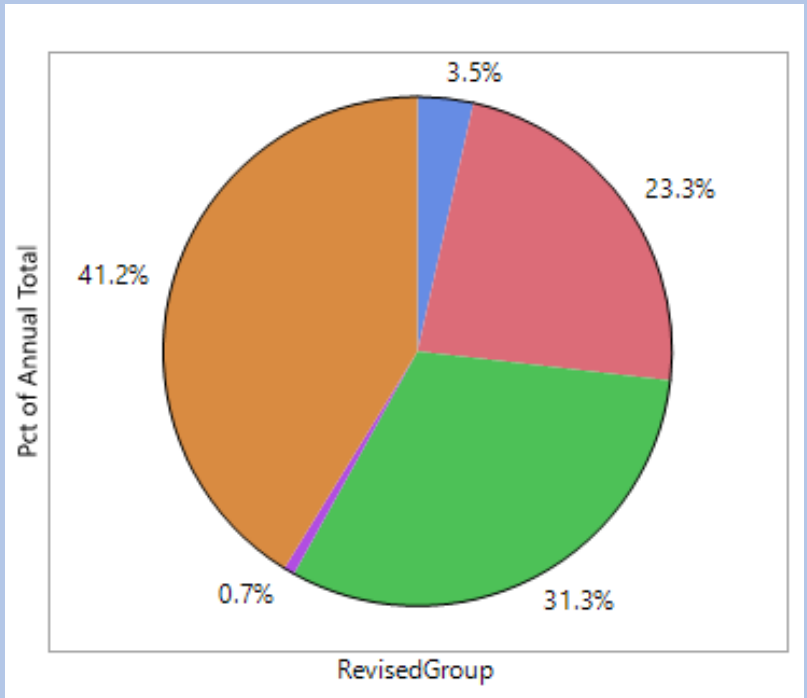
- **Observed data** are used to develop **watershed studies and statistical models**, based on priorities identified by the **management community**.
- **Watershed studies and statistical models** provide **technical information** that are communicated to the **management community** and used to improve **CAST**.
- The **management community** uses **CAST** to develop management strategies.
- **CAST** assesses predictions and performance against **observed data**.



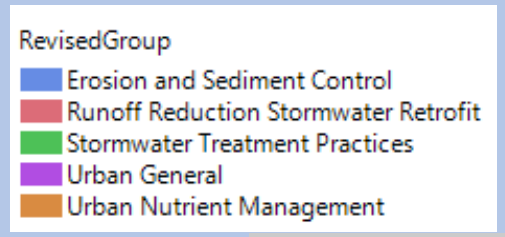
What are the most commonly used types of BMPs?

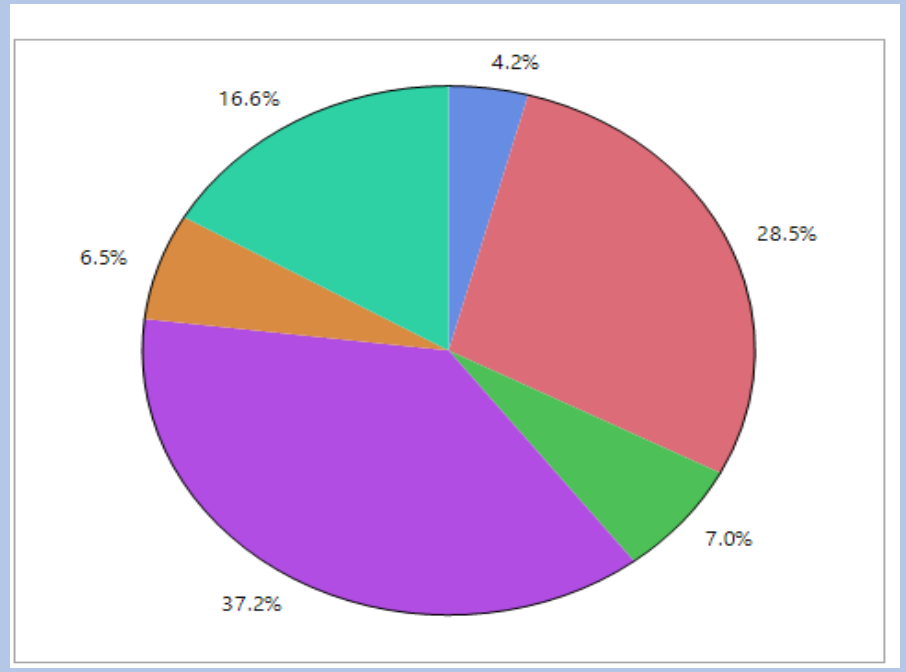
This question can be answered with CAST

CAST is a free, online nitrogen, phosphorus and sediment load estimator tool that streamlines environmental planning: cast.chesapeakebay.net

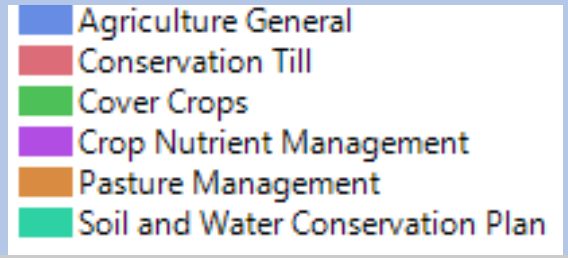


Above: *The percent of total urban BMP acres represented by practice groups.*





Above: *The percent of total agricultural BMP acres represented by practice groups.*

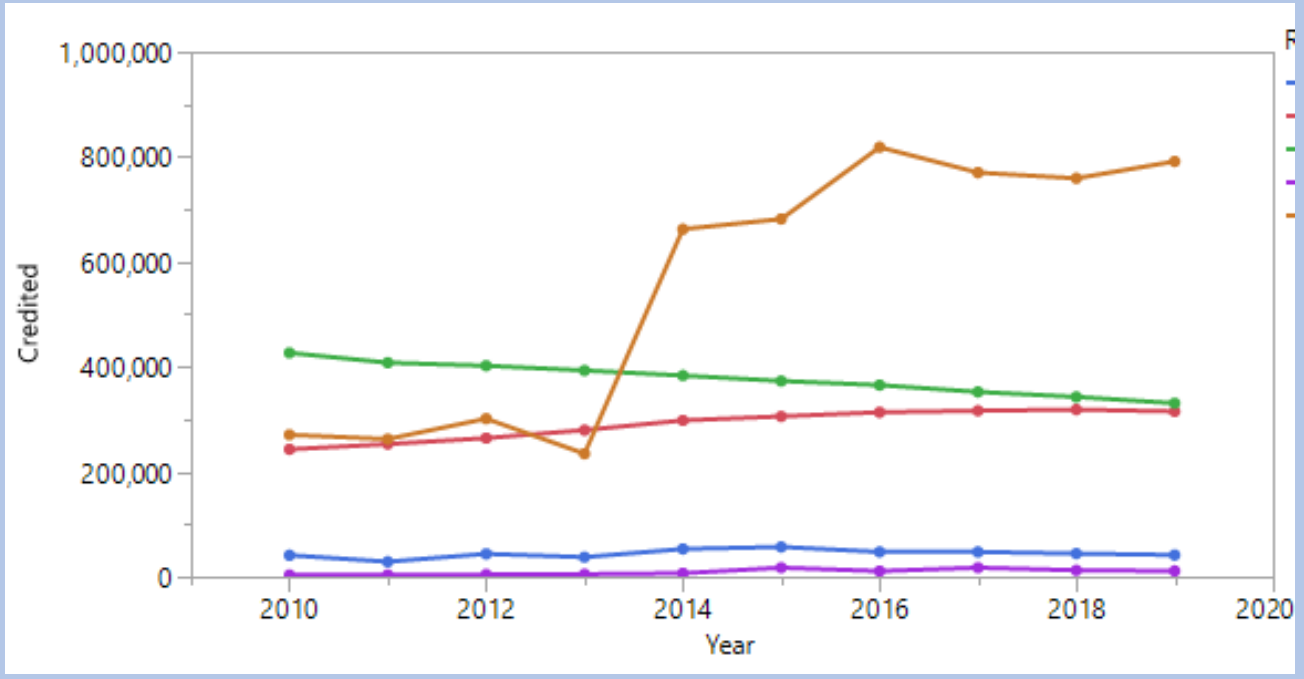


Explore BMP patterns by source sector or geography: cast.chesapeakebay.net/TrendsOverTime/BMPs

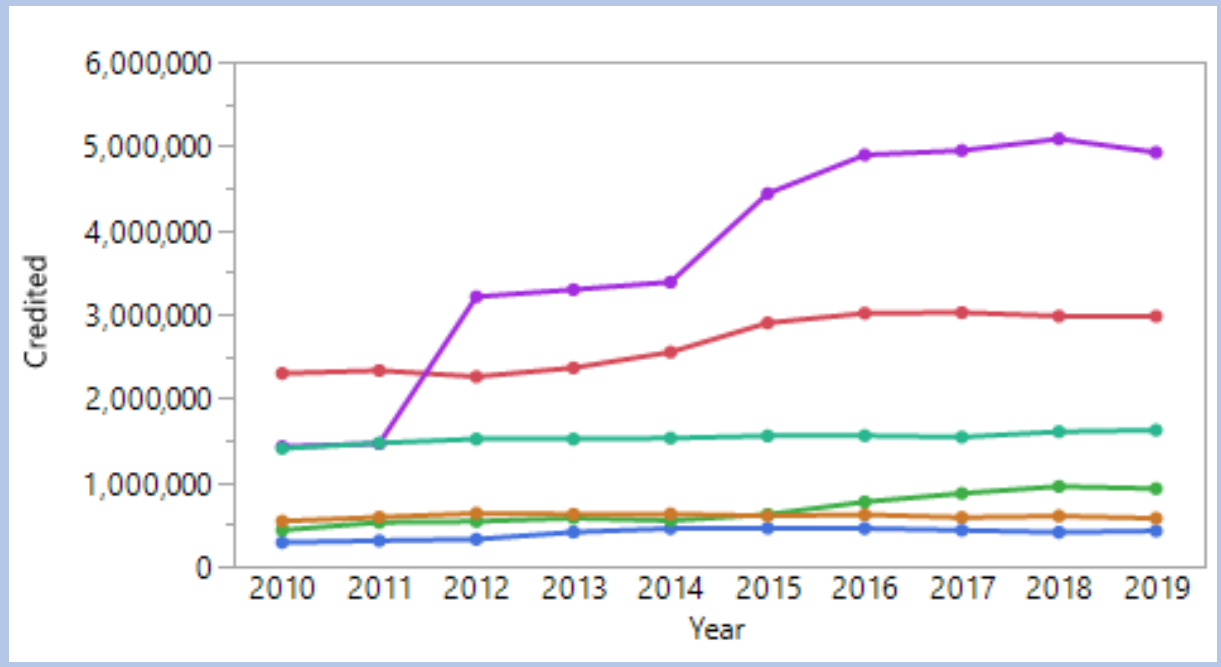
How has BMP implementation changed over time?

This question can be answered with CAST

CAST is a free, online nitrogen, phosphorus and sediment load estimator tool that streamlines environmental planning: cast.chesapeakebay.net



***Above:**: Urban BMP acres by practice group.*



***Above**: Agricultural BMP acres by practice group*

Explore BMP patterns by source sector or geography: cast.chesapeakebay.net/TrendsOverTime/BMPs

Are most BMP investments being made in the highest loading areas of the watershed?

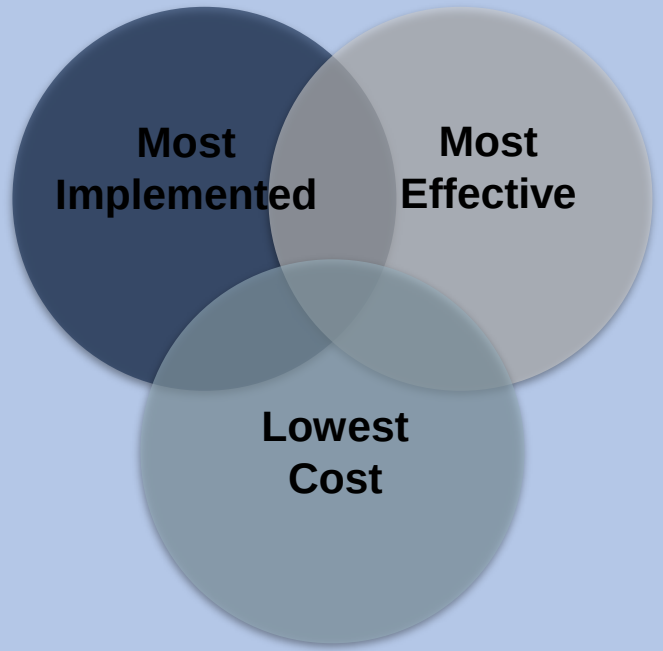
This question can be answered with CAST

CAST is a free, online nitrogen, phosphorus and sediment load estimator tool that streamlines environmental planning: cast.chesapeakebay.net

CAST provides estimates of BMP costs and expected nutrient/sediment reductions, customized by geography, that can be used to target cost effective BMPs.

In addition to targeting BMPs in high loading areas, BMPs can be targeted that offer the largest nutrient and sediment reductions at the lowest cost.

The most commonly used BMPs are not always the most cost effective. Understanding local conditions, BMP co-benefits, and cost effectiveness are some of the considerations that make up an effective management strategy.



Below: *Average cost effectiveness of nitrogen and phosphorus BMPs by source sector, as estimated by CAST.*[1]

Source Sector	Average Cost Effectiveness ($/lb reduced)	
	Nitrogen	Phosphorus
Agriculture	$108	$10,100
Developed	$7,724	$80,349
Septic	$1,006	$0
Natural*	$548	$2,461

*BMPs in the natural sector include practices such as wetland enhancements, forest harvesting practices, oyster practices, and non-urban shoreline management and stream restoration.

Learn more about these data and developing management plans by viewing CAST training videos: cast.chesapeakebay.net/Learning/FreeTrainingVideos

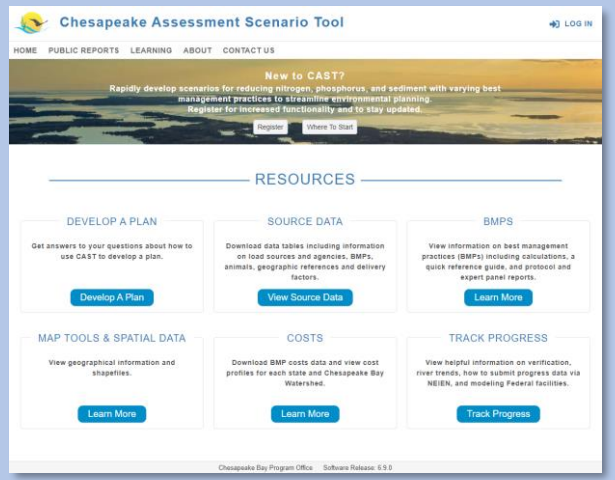
Which BMPs are most likely to result in a water-quality benefit?

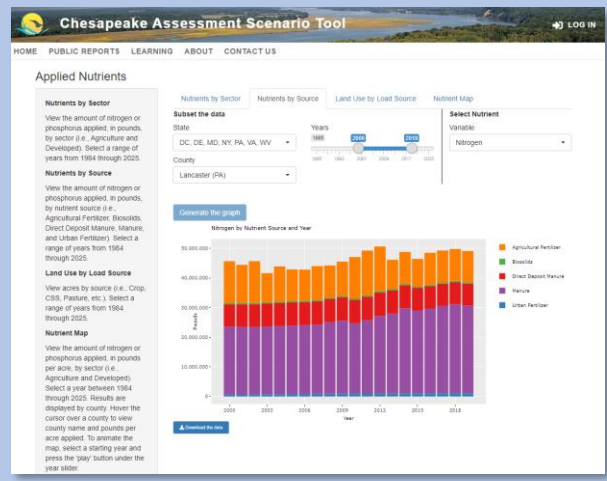
This question can be answered with CAST
CAST is a free, online nitrogen, phosphorus and sediment load estimator tool that streamlines environmental planning.

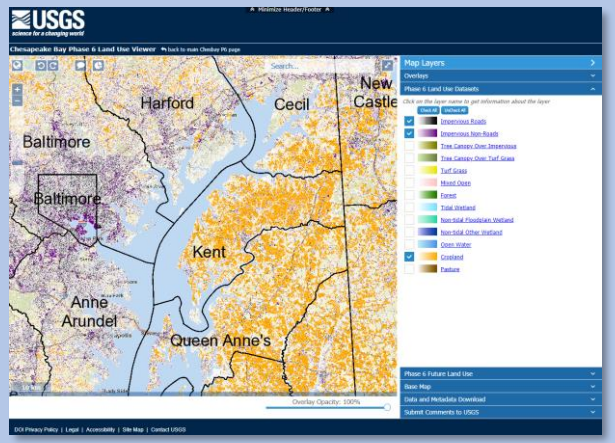
- Explore nutrient sources, application rates, and land use patterns: cast.chesapeakebay.net/TrendsOverTime/NutrientsApplied
- Explore BMP implementation patterns by source sector and geography: cast.chesapeakebay.net/TrendsOverTime/BMPs
- Explore BMP cost profiles: cast.chesapeakebay.net/Documentation/CostProfiles

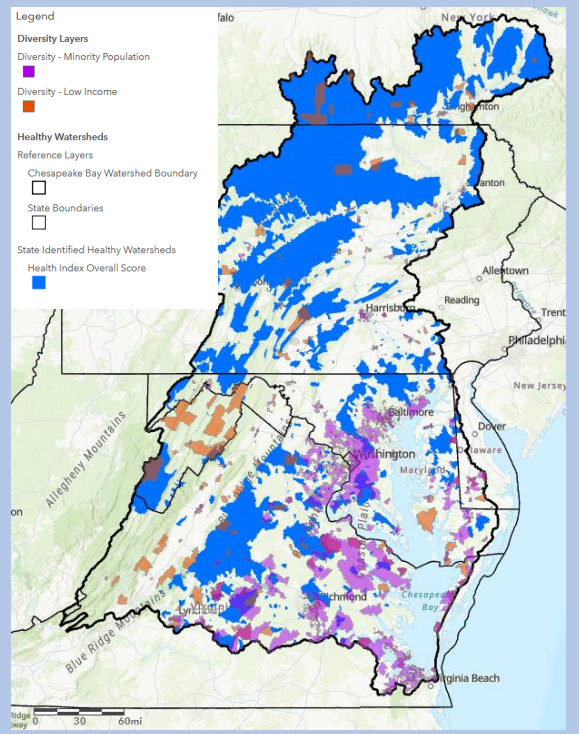
The **Chesapeake Bay Phase 6 Land Use Viewer** can be used to explore land use patterns throughout the watershed is accessible from:
https://cast.chesapeakebay.net/Documentation/MapToolSpatialData

The **Chesapeake Bay Watershed Model Phase 6 Map Viewer** includes a variety of data to guide management, including information on nutrient inputs, healthy watersheds, and aquatic resources is accessible from:
https://cast.chesapeakebay.net/Documentation/MapToolSpatialData









***Above**: Screenshots of online tools and resources that can help guide effective watershed management.*

Questions

- Current
  - What are the most commonly used BMPs?
  - What has BMP implementation changed over time?
  - What are the lowest cost, most effective BMPs?

- **Future**
  - **Habitat-Stream health outcome**
    - **What are the dominant BMPs where Stream Health improved?**
    - **How has land use changed in areas where Stream Health in/decreased?**
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Habitat Outcomes

- Black Duck
- Brook Trout
- Fish Passage
- Forest Buffers
- SAV
- Stream Health
- Tree Canopy
- Wetlands

The responses to these questions can inform future actions and programs

- Questions
  - What are the dominant BMPs where Chessie BIBI scores have improved over time?
  - How has land use changed over time where scores have in/decreased?
  - What has the level of financial investment been in watersheds with increasing Chessie BIBI scores?

What is needed to add Stream Health to CAST

- Research needed—Chessie BIBI for a 10+ year timespan
- Cross-GIT map use
  - Include Diversity Layers
- BMPs

Legend

Diversity Layers

Diversity - Minority Population

Diversity - Low Income

Healthy Watersheds

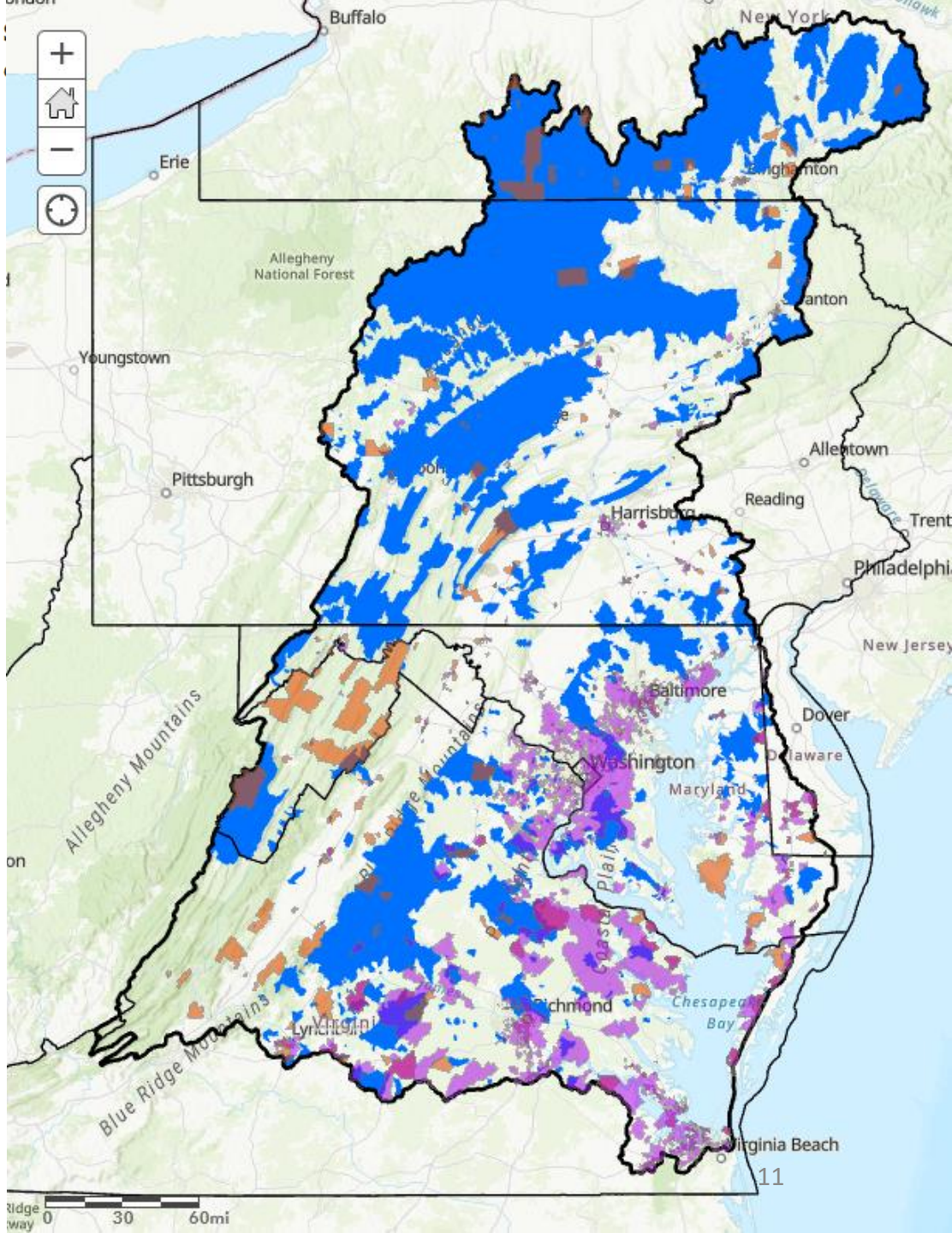
Reference Layers

Chesapeake Bay Watershed Boundary

State Boundaries

State Identified Healthy Watersheds

Health Index Overall Score

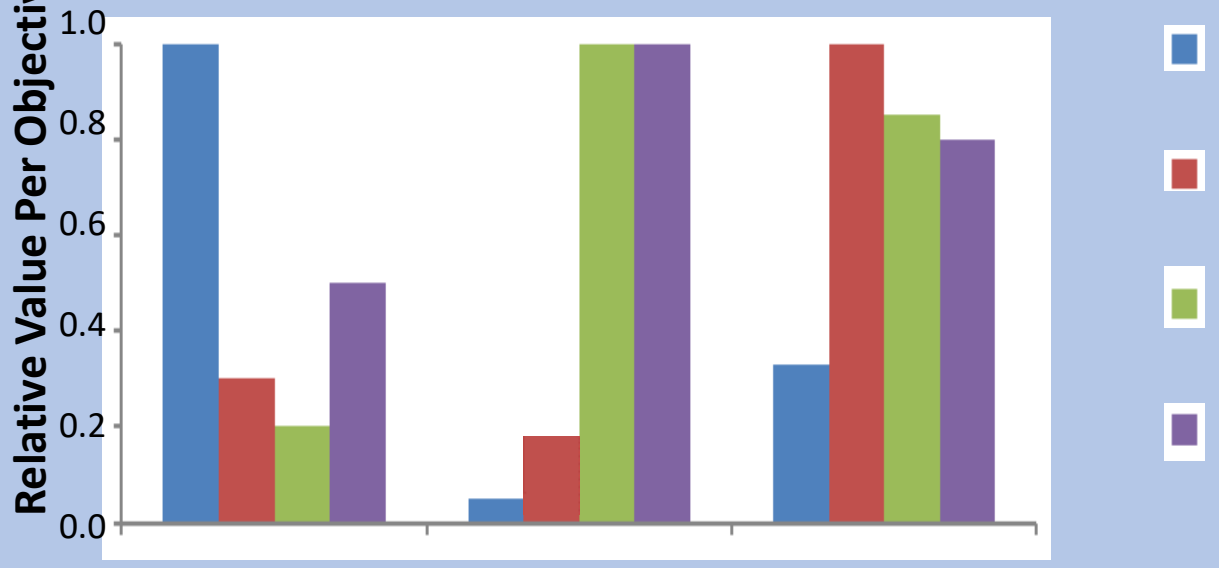


Trade-offs for some outcomes

- Identify habitat restoration priorities
  - Stream health, woody debris, forest buffers
- Determine how much restoration and where
- Scenarios for balancing diverse objectives
  - Stream health, black ducks, timber, local jobs, recreation, sport fishing

Trade-offs for Alternative Scenarios

Hypothesized Results



Scenario 1: Current Industrial Forest Practices *(maximize timber yield & profit)*

Scenario 2: No Forest Harvest *(maximize stream health)*

Scenario 3: Multi-Stakeholder Community Plan *(optimize ecological, economic & cultural benefits for community stakeholders)*

Toxic Contaminants

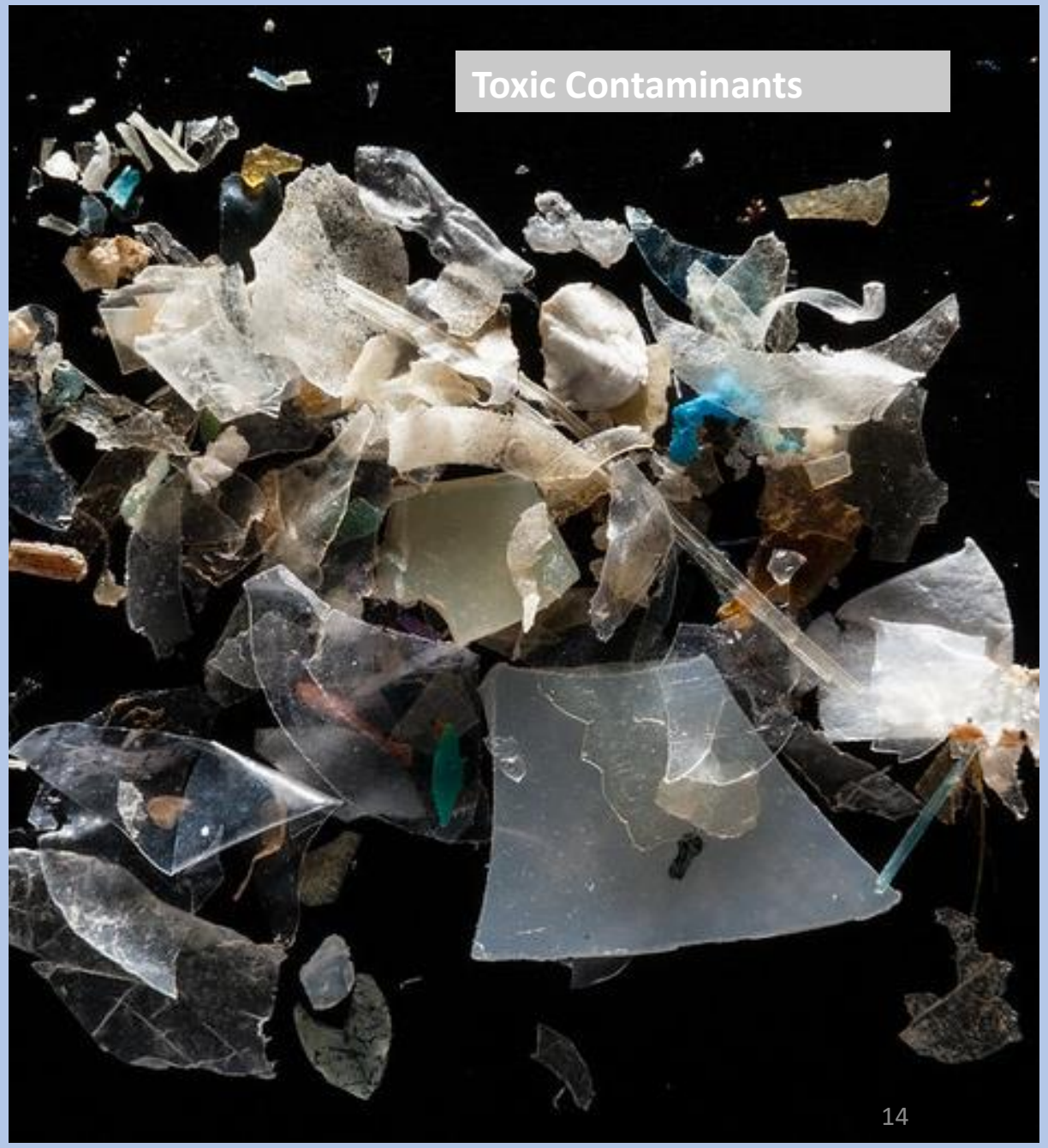
- Toxic Contaminants Research
- Toxic Contaminants Policy and Prevention

PCBs

- Determine the time period **when new development occurred** in each area, each year
- Estimate likely **background levels** of PCBs from building materials like caulks and paint.
- Further refine the baseload per year by the **land use** such as impervious or turfgrass. (*This is consistent with the methodology Brown et al. (2019) used when modeling trace organic contaminants with WinSLAMM. In this study, the mean annual load variation was determined for commercial and residential areas in Madison, WI.)*
- **Data needed**:
  - PCB base load per year of development
  - PCB loading rate differential per land use
- The delivery factors exist for nitrogen, phosphorus, and suspended sediment. While not optimal, the **suspended sediment delivery factor could be used** and is supported by findings from Verazzo et al. (2011).
- This would accommodate the effects of **suspension/resuspension**, but not sorption/desorption.

Toxic Contaminant BMPs

- Green infrastructure reducing stormwater runoff
- Increase stormwater treatment
- Target redevelopment to areas with oldest infrastructure
- Assess relationship between PCB presence and fish using cross-GIT map layers
  - Include diversity layers



Summary

- Goals
  - Provide federal, state, and local partners and stakeholders **tools and information** for ecological improvement in the Bay
  - **Quantify** the link between BMPs and ecological conditions
- Strategy for making changes
  - Adapt CAST to **include additional benefits**
  - Add **spatially-explicit land use** for planning
  - Redesign the **interface**
- Near-term goals
  - Continue working with Goal Teams to make CAST an effective tool to **show comprehensive recovery solutions** across habitats and scales
  - Identify **data gaps**

Contaminated sites → Revitalized communities

Citizen stewardship, Diversity, Local Leadership

Why Use CAST

- On-going decision support
  - Includes online software, user manual, monthly training webinars, one-on-one user support and knowledge transfer
- More than 2,000 current users
- Was used to inform the 2010 TMDL for Nitrogen, Phosphorus, and Sediment
- Already used to assess numerical annual progress goals and for WIPs
- Already used for local TMDL implementation plans and many watershed groups
- Varying scales of analysis—HUC-12, county, state, entire watershed
- *Community engagement using structured decision making*

Questions?

Olivia Devereux

Olivia@DevereuxConsulting.com