



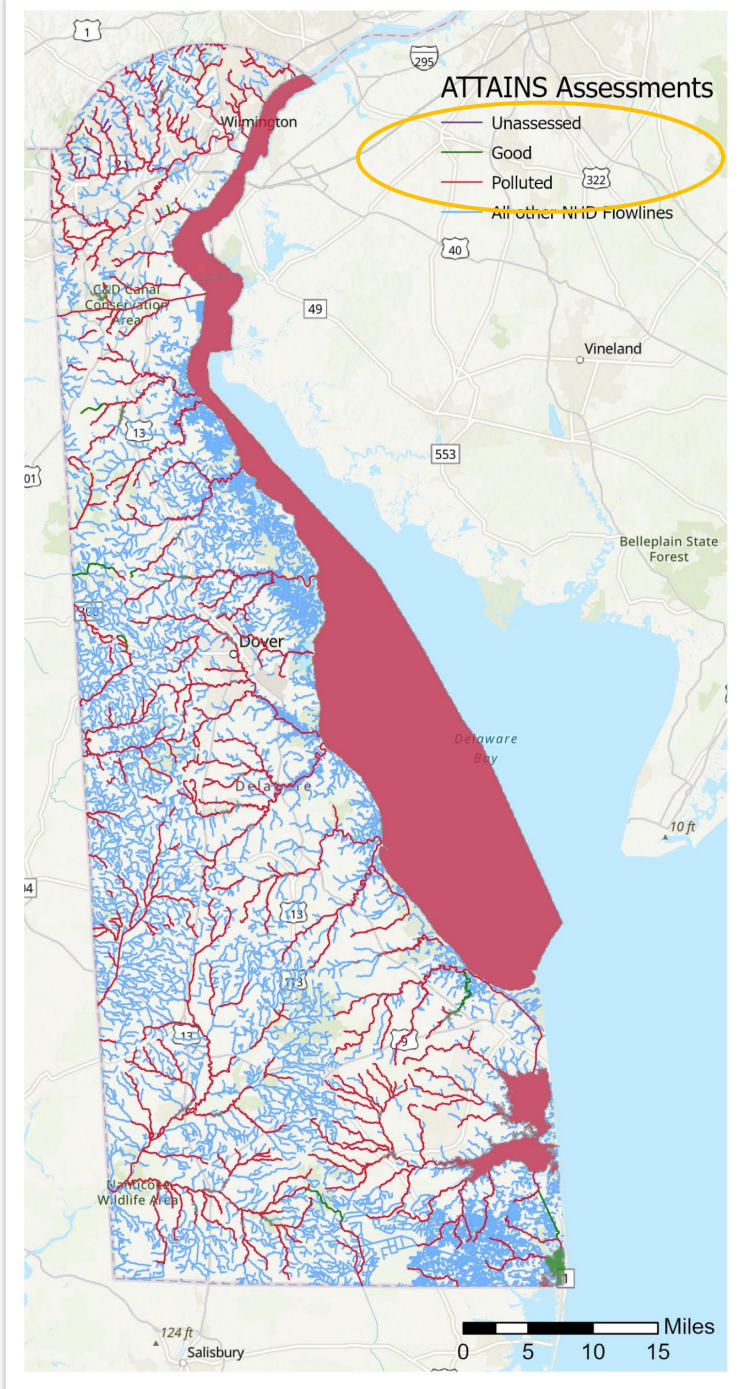
DTAP

Delaware Targeting And Planning Tool

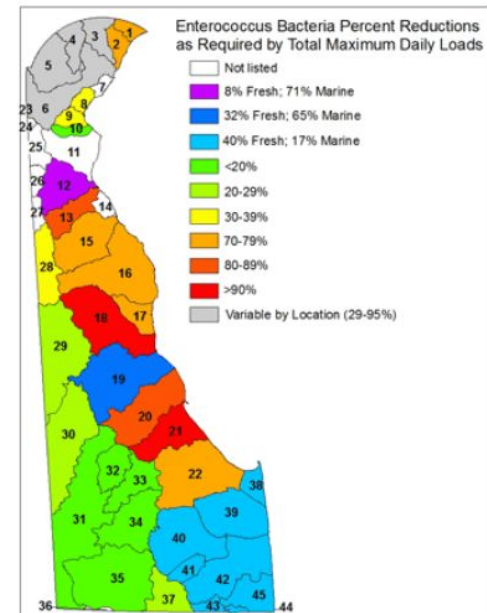
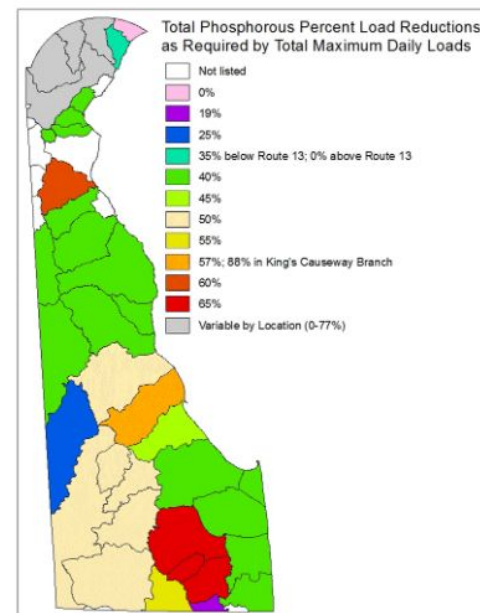
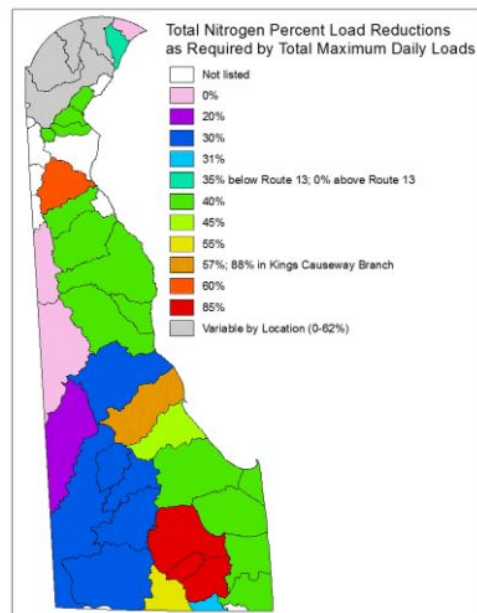
Brittany Sturgis

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and Environmental Control (DNREC)

Watershed Assessment and Management
Section



DTAP History



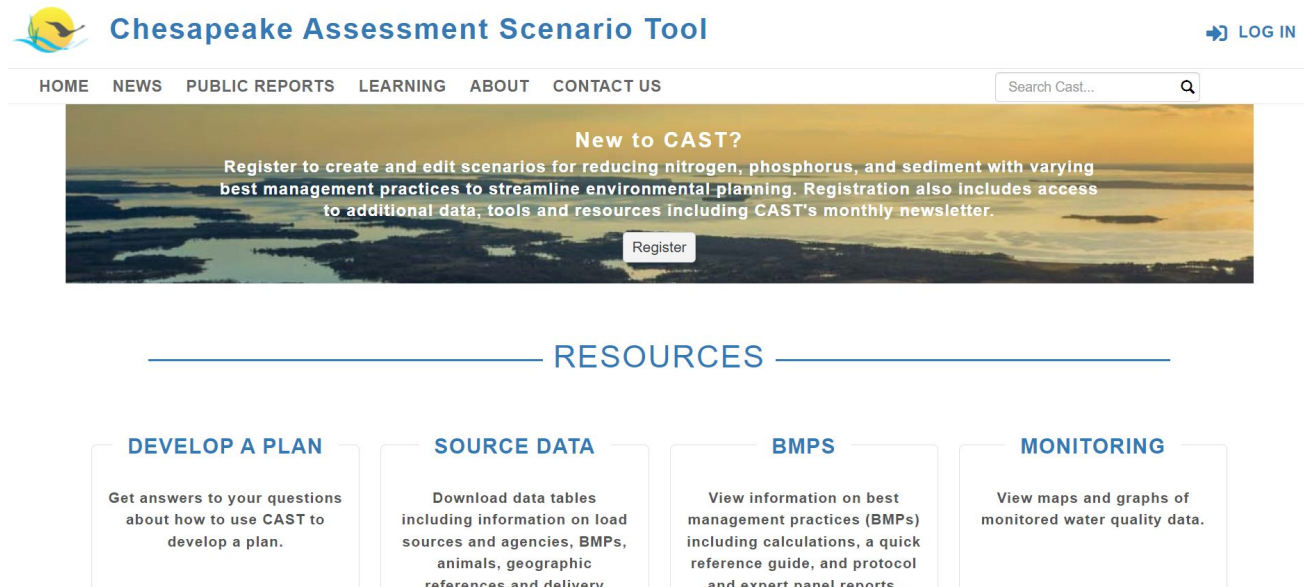
▶ TMDLs!

How can we accelerate water quality improvement?

- ▶ Understand background/baseline loads
- ▶ Model impacts of current BMPs
- ▶ Evaluate impacts of potential/future BMPs to get closer to TMDLs



Started with CAST...



A web-based nitrogen, phosphorus and sediment load estimator tool where users specify a geographical area, and then select BMPs to develop plans to meet goals.

How do we want to customize to meet DE's needs?

What worked and what didn't?

Delaware Targeting and Planning Tool

Goals of DTAP



A Delaware-specific tool that can help model background loads and identify BMPs to achieve water quality standards

DTAP is intended to be a
modeling tool—
not a regulatory tool.



Identify opportunities to reach load reduction goals for TMDLs, WIPs, PCSs, etc.

Major differences between DTAP & CAST

- ▶ Evaluating impacts to local streams (TMDLs) vs. bay-wide
 - Edge of Stream = the load that reaches the edge of a small stream
 - Edge of Tide = the load that reaches the edge of the tidal portion of the Bay
 - DTAP is currently a water quality model and **not** a hydrodynamic model
- ▶ Modeling statewide and at various scales
- ▶ Modeling nitrogen, phosphorus, sediment AND bacteria
- ▶ Simplified/condensed list of BMPs

1. Edge of Tide vs. Edge of Stream

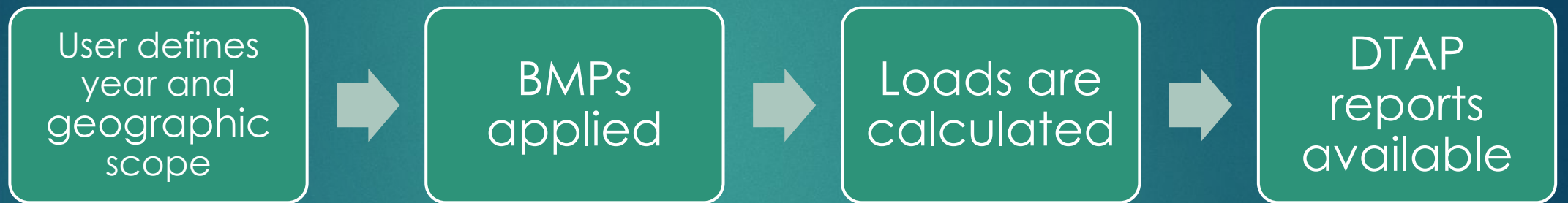
CAST

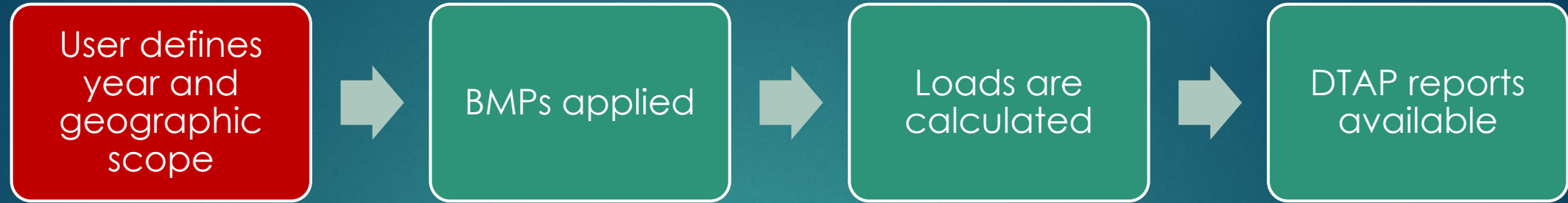


DTAP



How does DTAP work?





- Choose landuse/base conditions for years 1990-2025
- An average hydrological condition used for all years
- Geographic scales – next slide

Developing the Land Use

Use the ArcGIS function union with the NHD and CAST modeling segments with the 1-m data for the 2013 year at NHD scale

Align land uses to match between the 2013 1-m 13 categories and the NLCD categories by aggregating

- Natural
- Urban
- Agriculture
- Other

Calculate change between NLCD years 2001, 2006, 2011, and 2016 for each of the four classes and each NHD catchment

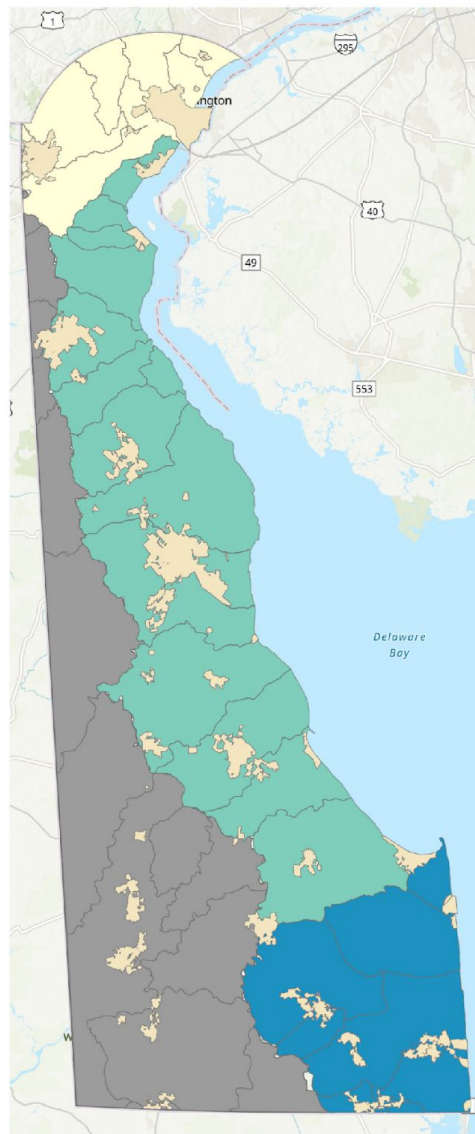
Calculate the proportion of each 2013 1-m class within each of the four NLCD simplified classes for all years and NHD

- Each of the four categories can change over time
- The proportion of the land uses within those four land use categories does not change over time and stays true to the 2013 1-m data

Calculate the proportion of each 2013 1-m land use class within each of the four NLCD simplified classes.

Apportion changes to the areas from the four classes to the 2013 1-m land classes using the proportion calculated

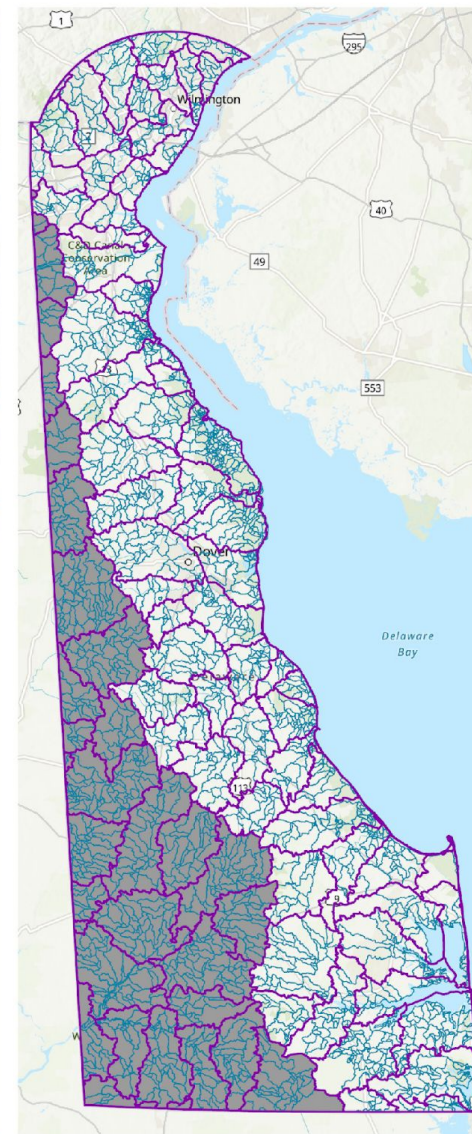
Linearly interpolate between the 2013 and 2025 land use for all land classes



Major basin, historic
watersheds &
municipalities



HUC8 (orange)
HUC 10 (blue)



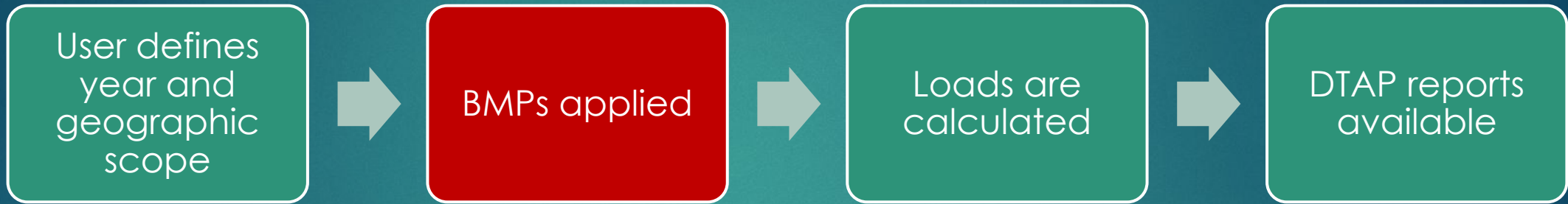
HUC12 (purple)
NHD

DTAP: Scenario Scales

Major Basins

- Piedmont
- Delaware Bay
- Inland Bays/Atlantic Ocean
- Historic Watersheds
- Municipalities
- HUC8 (Delaware Only)
- HUC10 (Delaware Only)
- HUC 12 (Delaware Only)
- NHD Plus V2 Catchments
- Chesapeake Watershed

0 5 10 15 Miles



DTAP BMPs

Sector	BMP Type	BMP
Agriculture	Efficiency	Ag Erosion & Sediment Control
Agriculture	Efficiency	Ammonia Emissions Reduction
Agriculture	Efficiency	Conservation Plans
Agriculture	Efficiency	Cover Crop
Agriculture	Efficiency	Ditch Controls
Agriculture	Efficiency	Nutrient Management
Agriculture	Efficiency	Pasture Management
Agriculture	Efficiency	Streambank Fencing
Agriculture	Efficiency	Tillage Management
Agriculture	Landuse Change	Forest Buffer
Agriculture	Landuse Change	Grass Buffer
Agriculture	Landuse Change	Land Retirement
Agriculture	Landuse Change	Tree Planting
Agriculture	Landuse Change	Wetland Creation/Restoration
Agriculture	Pound Reduction	Manure Transport
Agriculture	Pound Reduction	Waste Management System
Developed	Efficiency	Erosion and Sediment Control- Level 2
Developed	Efficiency	Pet Waste Education
Developed	Efficiency	Runoff Reduction
Developed	Efficiency	Stormwater Treatment
Developed	Landuse Change	Impervious surface elimination to pervious surface
Natural	Pound Reduction	Shoreline Erosion Control
Natural	Pound Reduction	Stream Restoration
Septic	Efficiency	Septic Denitrification and Pumping
Septic	Pound Reduction	Septic Connection
Septic	Pound Reduction	Sliplines

Forest Buffer: Forest buffers are linear wooded areas that help filter nutrients, sediments and other pollutants from runoff as well as remove nutrients from groundwater. The recommended buffer width is 100 feet, with a 35 feet minimum width required.

Synonymous BMPs: Tree/Shrub Establishment, Windbreak/Shelterbelt Establishment, Urban Forest Buffer, Urban Forest Planting, Riparian Forest Buffer, CREP Hardwood Tree Planting (CP3A), Riparian Forest Buffer (NRCS 391), Riparian Buffer (FSA CP22), CREP Riparian Forest Buffer, Riparian Forest Buffer, Woodland Buffer Filter Area

BMP Efficiency Rates:	BMP Name	Nitrogen	Phosphorus	Sediment	Impacts bacteria?
Forest Buffer efficiencies differ depending upon land use where it's implemented:					
	Ag open land	0.65	0.42	0.56	No
	Commercial	0.25	0.5	0.5	No
	Construction	0.25	0.5	0.5	No
	Cultivated Crops, pasture/hay & production area	0.65	0.42	0.56	No
	Highway	0.25	0.5	0.5	No
	Multi & Single Family Residential	0.25	0.5	0.5	No
	Open Space	0	0	0	No

Grass Buffer: Grass buffers are linear strips of grass or other non-woody vegetation maintained to help filter nutrients, sediment and other pollutants from runoff. The recommended buffer width for buffers is 100 feet, with a 35 feet minimum width required. Vegetated open channels are modeled identically to grass buffers.

Synonymous BMPs: Grassed waterway, filter strip, field buffer, Riparian Herbaceous Cover (NRCS 390), Filter Strip (NRCS 393), Filter Strip (FSA CP21), Field Border (NRCS 386), Grass Waterway (NRCS 412), ~~Noneasement~~ (FSA CP8A), Vegetated Filter, Vegetative Buffer Strip, Vegetated Open Channel

BMP Efficiency Rates:	BMP Name	Nitrogen	Phosphorus	Sediment	Impacts bacteria?
	Grass Buffer	0.46	0.42	0.56	No

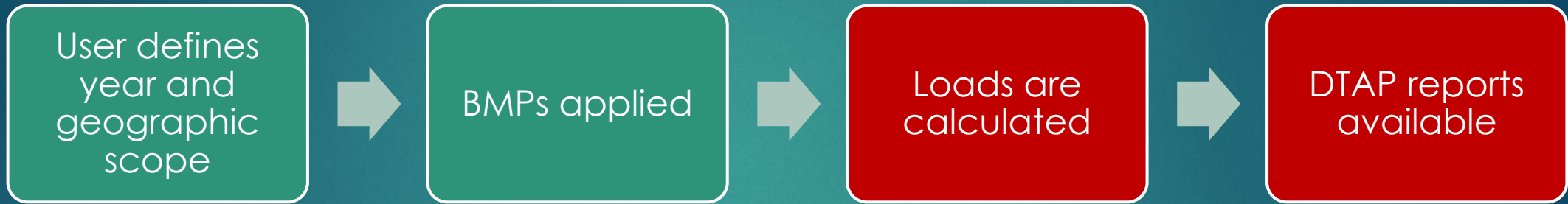
DTAP BMP guide currently being developed to help users select correct BMP

BMPs can be entered into DTAP manually or by using statewide BMP data.

Statewide BMP data are available for use in DTAP. Data are from DNREC's BMP Tracking & Reporting Tool, but there are still major gaps in statewide data in the tool.



**Models are only as good
as the data put into them!**



Report Type

Scenario Loads Report

Scenario Loads Comparison

Scenario Land Use

Land Use Comparison

BMP Summary Report

BMP Input File

BMP – Submitted vs. Credited

An aerial photograph showing a large construction site. A central area is covered with a dense forest of tall, thin trees with green and yellow foliage. This forest is surrounded by a cleared, muddy area with visible tire tracks. In the background, there are residential houses and a road. A yellow excavator and a green tractor are visible on the right side of the cleared area.

Project Example

What would be the impact of converting 500 acres of crops to forest buffers in the Inland Bays Basin in 2022?

All users will need a valid login
(managed by DTAP team in DNREC)



Welcome to the Delaware Targeting And Planning Tool

The *Delaware Targeting and Planning Tool (DTAP)* is designed to facilitate identification of opportunities for achieving load reductions required by TMDLs, develop implementation plans, and support long-term evaluation of nonpoint source nitrogen, phosphorus, sediment, and bacteria reductions.

It is anticipated that users will engage DTAP to answer questions such as:

- What is the effect of urban stormwater treatment's anticipated impact on pollutant loads?
- What are the anticipated effects of tillage on nutrients and sediment?
- What is the anticipated effect of various combinations of BMPs on limiting nutrient and sediment runoff?
- At what location should BMPs be implemented to reduce the most pollutants?
- Which BMPs are most cost-effective?

To answer these questions, users will need to be able to identify contaminant loads in a defined geographic location and determine which are the most cost-effective BMPs that can be targeted to control the pollutants. The geographic area includes the portions of Delaware that are within the Piedmont, Delaware and Inland Bays, and Atlantic Ocean Basins. Beneficiaries of DTAP are expected to include MS4s, U.S. EPA, DNREC, and all those who care about clean water in Delaware.

[Download Source Data](#)

[Log In](#)



Add Scenario

Scenario

Save

Save & Close

Copy Scenario Without BMPs

Back To List

Scenario Name *

NPSmtg-InlandBays

Only letters, numbers, dash, colon, space and underscore.

Cost Profile

Select Cost Profile

Base Condition *

2022

Add to My Scenario List: ☒ ?

Scenario Description *

Creating a test scenario for the NPS meeting. Scenario includes 500 acres of forest buffer, geographic scale of major basin: Inland Bays, and base condition year of 2022.

Is BaseLine Scenario: ☒ ?

Geographic Scale *

MajorBasin

Search geographies

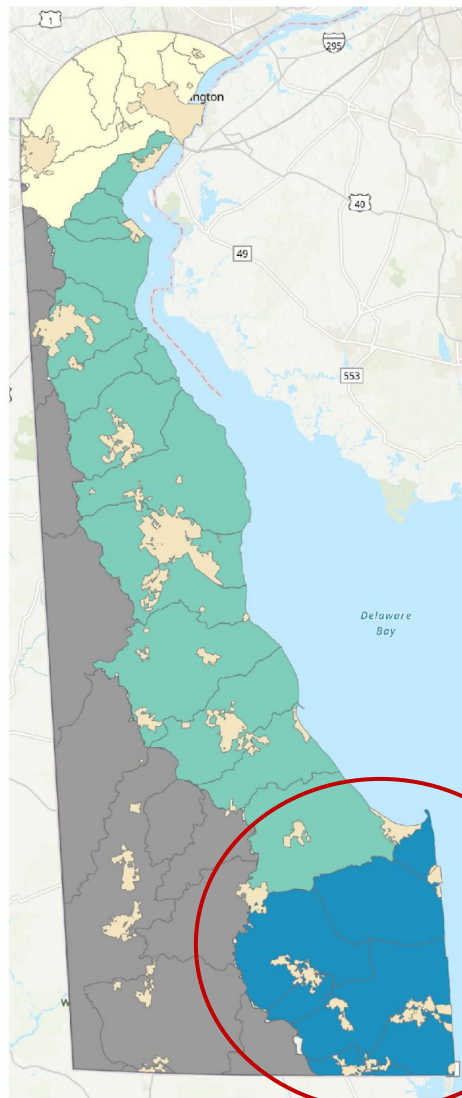
Chesapeake Bay

Delaware Bay

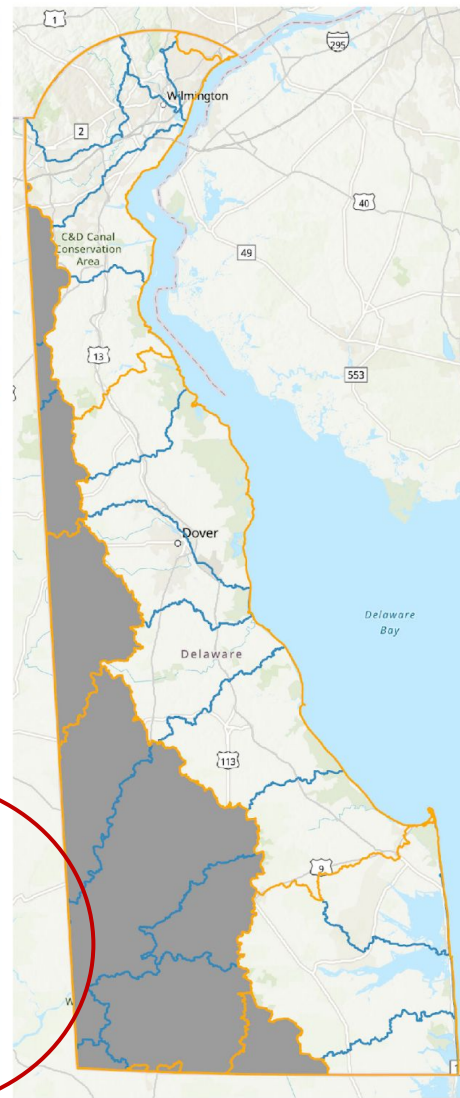
Piedmont

Inland Bays/Atlantic Ocean

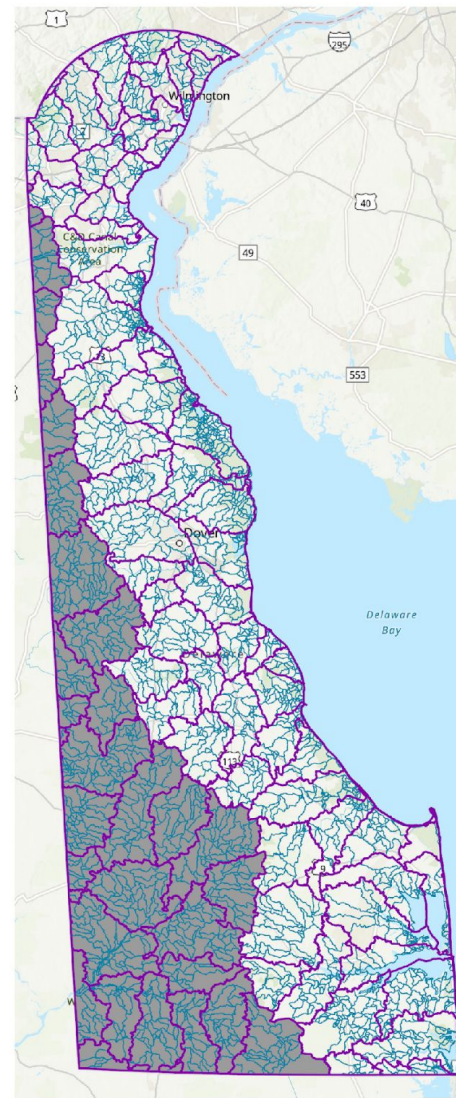
Step 1 – Create scenarios & base conditions. Define base condition year and geographic scale.



Major basin, county
& municipality



HUC8 (orange)
HUC 10 (blue)



HUC12 (purple)
NHD

DTAP: Scenario Scales

Major Basins

- Piedmont
- Delaware Bay
- Inland Bays/Atlantic Ocean
- Historic Watersheds
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- HUC 12 (Delaware Only)
- NHD Plus V2 Catchments
- Chesapeake Watershed

0 5 10 15 Miles

DTAP - Delaware Targeting And Planning

Edit Scenario - *NPSmtg-InlandBays* -

Scenario | **BMPs** | Manure

+ Add BMP | Clear Filters

Unique ID ↓	BMP Type
NPSmtgforestbuffers	

Add Bmp

Unique Identifier *

NPSmtgforestbuffers

Geographic Scale *

MajorBasin

Geography *

Inland Bays/Atlantic Ocean

BMP Type *

Forest Buffer

Landuse *

Cultivated Crops

Amount *

500.000

Unit *

acres

Save

Cancel

Related Me	Amount	Unit
<input type="checkbox"/>	500.000	

Step 2 – Add BMPs

- Manually enter BMPs through user interface
- Use Excel template to upload
- Import all BMPs from DE BMP Tracker for a particular year



Reports

Report Type *

Select Report Type ▼

Select Report Type

- Scenario Land Use
- Scenario Loads Report
- BMP - Submitted vs Credited
- BMP Input File
- BMP Summary Report
- Scenario Loads Comparison
- Land Use Comparison
- Source Data Report

Step 3 – Run model with “reports”

	A	B	C	D	E	F	G	H
	BaseYear	GeographyFullName	SectorName	LanduseName	NPSmtg-InlandBays Acres	NPSmtg-InlandBays - BMPsadded Acres	NPSmtg-InlandBays - BMPsadded Acres Diff	
1								
2	2022	Inland Bays/Atlantic Ocean	Agriculture	Agricultural Open Land	0.00	0.00	0.00	
3	2022	Inland Bays/Atlantic Ocean	Agriculture	Cultivated Crops	50,049.40	49,549.40	-500.00	
4	2022	Inland Bays/Atlantic Ocean	Agriculture	Pasture/Hay	2,830.76	2,830.76	0.00	
5	2022	Inland Bays/Atlantic Ocean	Agriculture	Production Area	179.03	179.03	0.00	
6	2022	Inland Bays/Atlantic Ocean	Developed	Commercial	13,940.00	13,940.00	0.00	
7	2022	Inland Bays/Atlantic Ocean	Developed	Construction	2,173.18	2,173.18	0.00	
8	2022	Inland Bays/Atlantic Ocean	Developed	Highway	5,606.56	5,606.56	0.00	
9	2022	Inland Bays/Atlantic Ocean	Developed	Multi-Family Residential	7,870.25	7,870.25	0.00	
10	2022	Inland Bays/Atlantic Ocean	Developed	Single Family Residential	30,226.30	30,226.30	0.00	
11	2022	Inland Bays/Atlantic Ocean	Natural	Forest	48,617.40	49,117.40	500.00	
12	2022	Inland Bays/Atlantic Ocean	Natural	Harvested Forest	740.37	740.37	0.00	
13	2022	Inland Bays/Atlantic Ocean	Natural	Open Space	11,490.80	11,490.70	-0.10	
14	2022	Inland Bays/Atlantic Ocean	Natural	Water	9,134.14	9,134.14	0.00	
15	2022	Inland Bays/Atlantic Ocean	Natural	Wetland	22,539.20	22,539.20	0.00	
16	2022	Inland Bays/Atlantic Ocean	Septic	Septic	0.00	0.00	0.00	
17								
18								
19								
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30								
31								
32								
33								

First double check the acres – looks good!

A	B	C	D	E	F	G
BaseYear	GeographyFullName	SectorName	LanduseName	NPSmtg-InlandBays TnLbs	NPSmtg-InlandBays - BMPsadded TnLbs	NPSmtg-InlandBays - BMPsadded TnLbs Diff
2022	All	All	All	5,731,633.8	5,672,001.8	-59,632.0

A	B	C	D	E	F	G
BaseYear	GeographyFullName	SectorName	LanduseName	NPSmtg-InlandBays TnLbs	NPSmtg-InlandBays - BMPsadded TnLbs	NPSmtg-InlandBays - BMPsadded TnLbs Diff
2022	Inland Bays/Atlantic Ocean	Agriculture	Agricultural Open Land	0.0	0.0	0.0
2022	Inland Bays/Atlantic Ocean	Agriculture	Cultivated Crops	3,289,580.0	3,228,660.0	-60,920.0
2022	Inland Bays/Atlantic Ocean	Agriculture	Pasture/Hay	68,862.9	68,862.9	0.0
2022	Inland Bays/Atlantic Ocean	Agriculture	Production Area	526,383.0	526,383.0	0.0
2022	Inland Bays/Atlantic Ocean	Developed	Commercial	354,426.0	354,426.0	0.0
2022	Inland Bays/Atlantic Ocean	Developed	Construction	88,226.0	88,226.0	0.0
2022	Inland Bays/Atlantic Ocean	Developed	Highway	175,774.0	175,774.0	0.0
2022	Inland Bays/Atlantic Ocean	Developed	Multi-Family Residential	102,995.0	102,995.0	0.0
2022	Inland Bays/Atlantic Ocean	Developed	Single Family Residential	508,416.0	508,416.0	0.0
2022	Inland Bays/Atlantic Ocean	Natural	Forest	114,306.0	115,594.0	1,288.0
2022	Inland Bays/Atlantic Ocean	Natural	Harvested Forest	18,799.6	18,799.6	0.0
2022	Inland Bays/Atlantic Ocean	Natural	Open Space	37,951.4	37,951.4	0.0
2022	Inland Bays/Atlantic Ocean	Natural	Water	94,799.1	94,799.1	0.0
2022	Inland Bays/Atlantic Ocean	Natural	Wetland	41,309.8	41,309.8	0.0
2022	Inland Bays/Atlantic Ocean	Septic	Septic	309,805.0	309,805.0	0.0



Let's look at nitrogen loads

Results

- ▶ What would be the impact of converting 500 acres of crops to forest buffers in the Inland Bays Basin in 2022?

Pollutant	Scenario Δ
Nitrogen (lbs/yr)	-59,632
Phosphorus (lbs/yr)	-474
Sediment (lbs/yr)	-444,796
Bacteria (MPN)	* Still in development

Other ways to utilize DTAP

- ▶ Quantify cumulative impacts of BMP implementation
- ▶ Look at trends towards meeting TMDLs (WIPs, PCSs, etc.)
- ▶ Pollutant hot spot analyses
- ▶ Analyze land use change

Opportunities are endless!

Inland Bays Basin

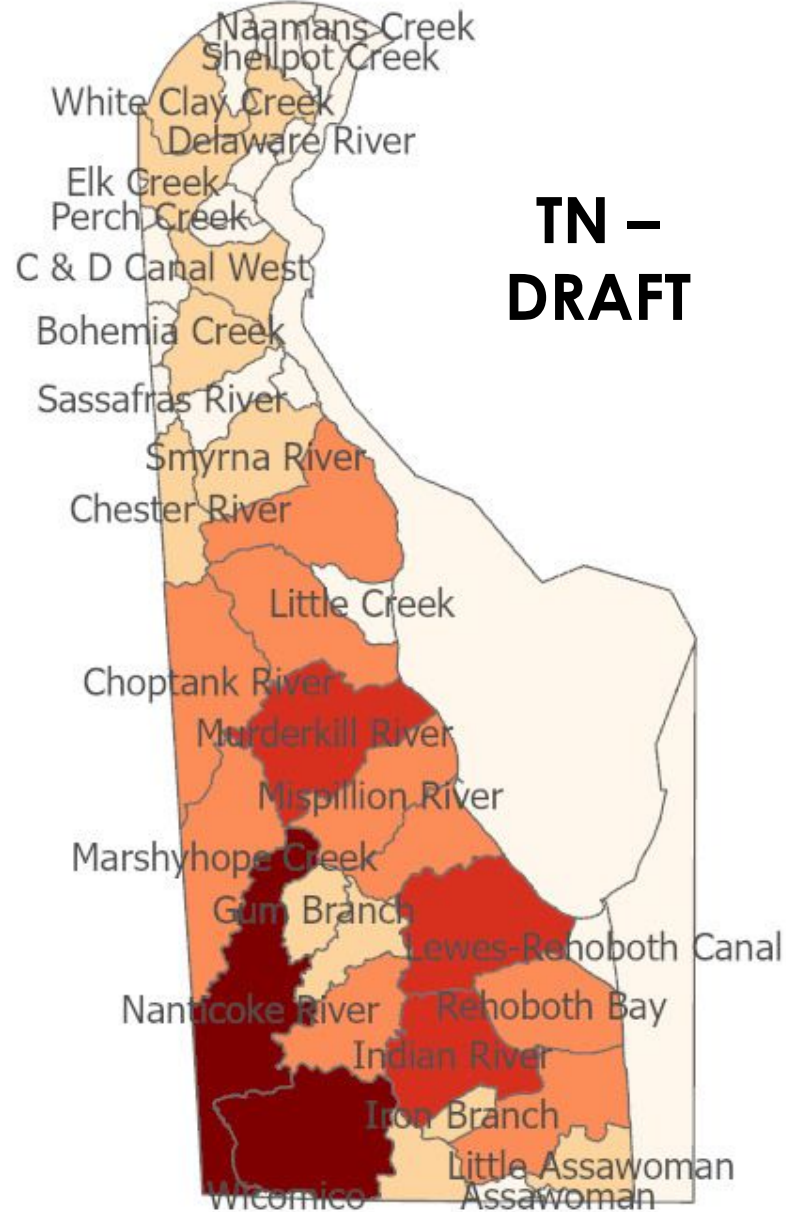
	1990 acres	2000 acres	2010 acres	2020 acres
Agriculture	63,241	62,925	58,432	54,095
Agricultural Open Land	24	0	0	0
Cultivated Crops	58,867	58,814	55,026	51,015
Pasture/Hay	4,130	3,891	3,229	2,904
Production Area	221	220	177	176
Developed	42,994	45,127	52,058	58,362
Commercial	10,658	11,243	13,016	13,769
Construction	25	36	548	1,964
Highway	4,342	4,550	5,200	5,528
Multi-Family Residential	5,994	6,407	7,424	7,788
Single Family Residential	21,975	22,890	25,870	29,313
Natural	99,163	97,346	94,907	92,940
Forest	53,376	51,879	50,490	48,965
Harvested Forest	813	790	769	746
Open Space	11,643	11,777	11,464	11,475
Water	9,973	9,802	9,264	9,146
Wetland	23,358	23,098	22,921	22,608
Grand Total	205,397	205,397	205,398	205,398

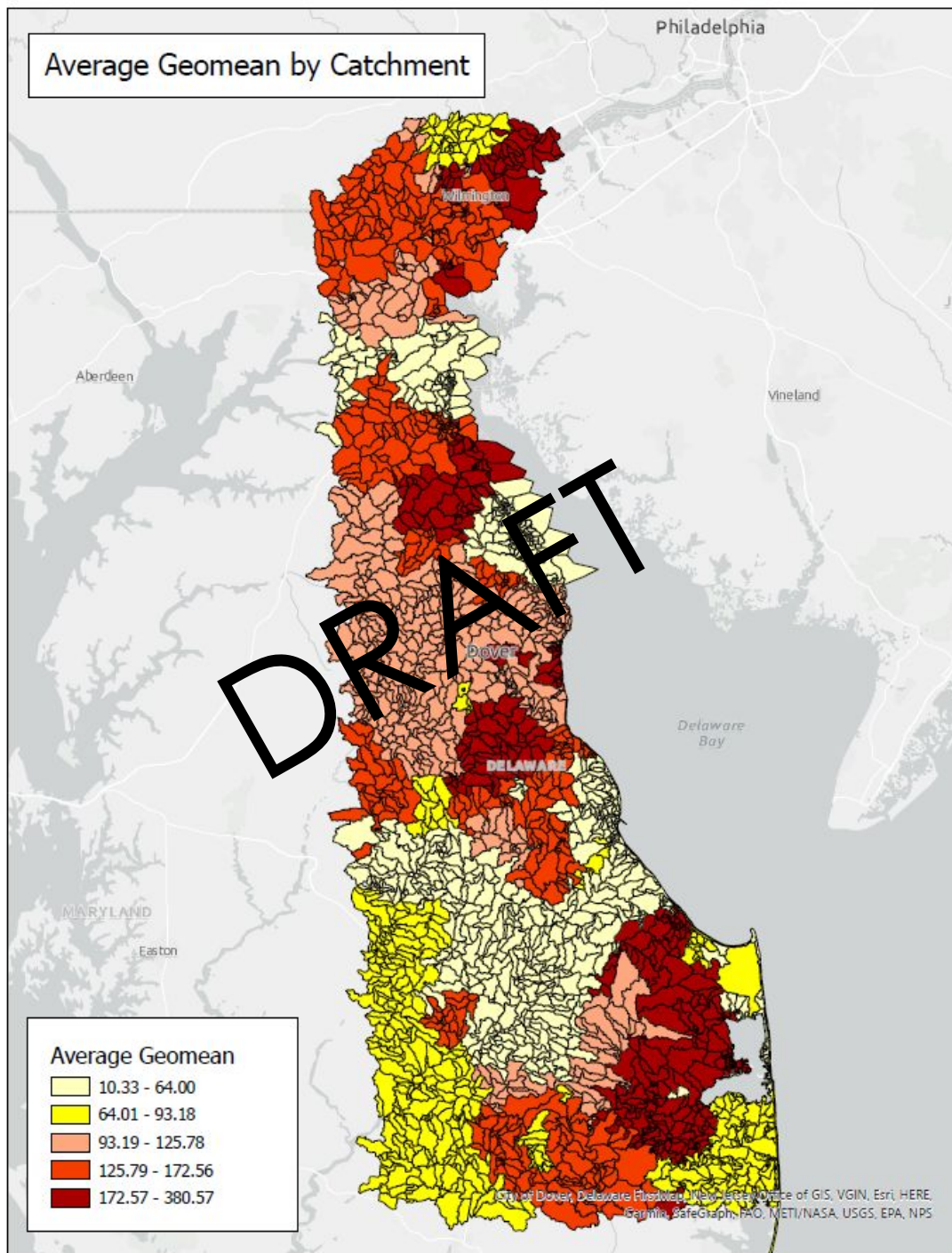
Example:

Land use change(acres)
throughout the decades

* No BMPs included in this
analysis*

DRAFT – for discussion purposes only



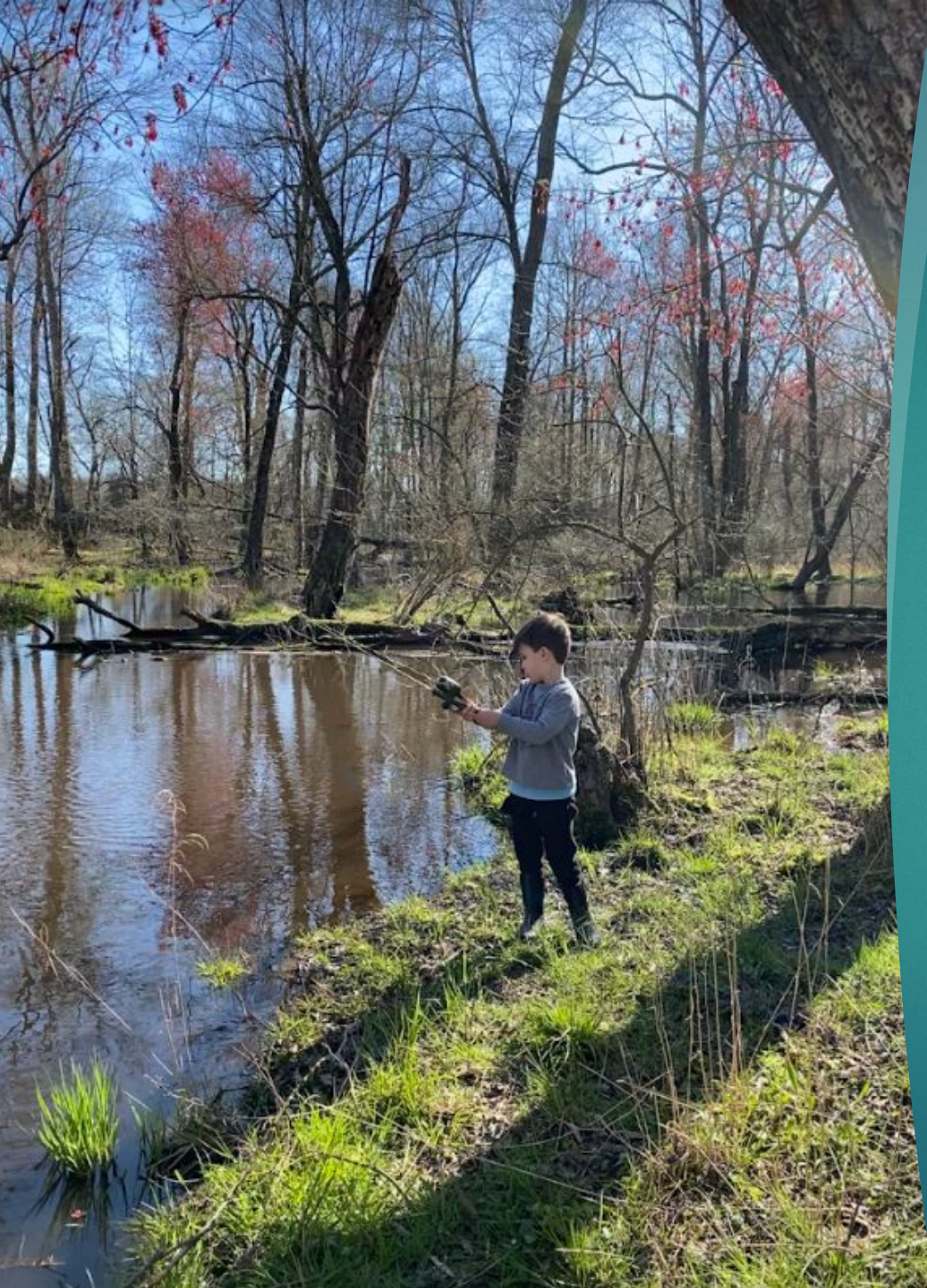


Bacteria –
much more
complicated than
we anticipated!



Next steps

- ▶ Testing of PHASE 1 has begun
 - ▶ Looking for and working out bugs
- ▶ PHASE 2
 - ▶ Create an optimization tool that identifies optimal BMPs to improve water quality in a cost-effective manner
 - ▶ Development just began and current contract extends to 2025



Questions?

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Management Section

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*Thank you to Driscoll Drones for allowing me to use their pictures