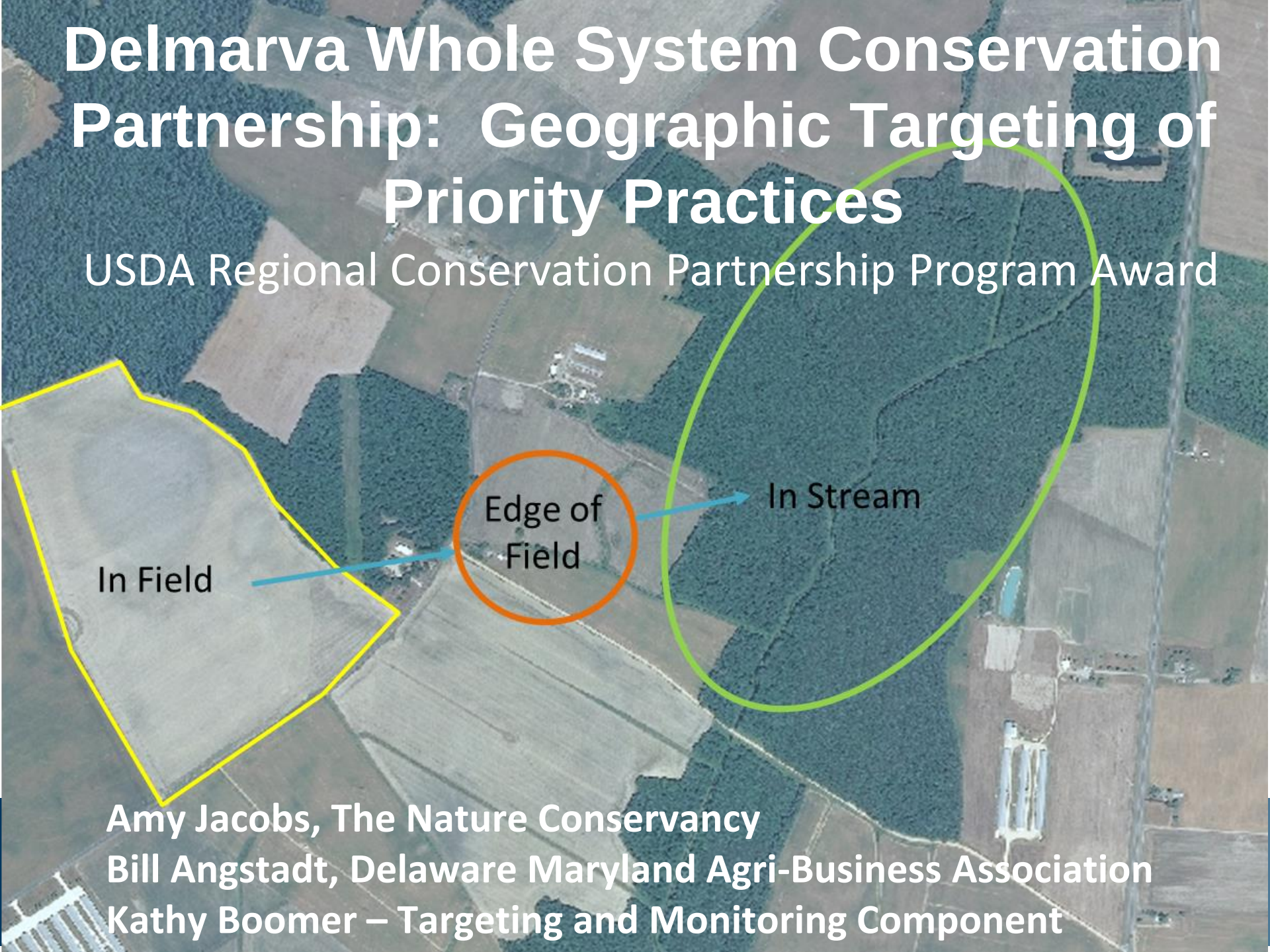
Delmarva Whole System Conservation Partnership: Geographic Targeting of Priority Practices

USDA Regional Conservation Partnership Program Award



Amy Jacobs, The Nature Conservancy
Bill Angstadt, Delaware Maryland Agri-Business Association
Kathy Boomer – Targeting and Monitoring Component

Delmarva Whole System Conservation Partnership
From Field to Stream

AGRIBUSINESS/ TRADE GROUPS:

- Delaware Soybean Board
- Delmarva Poultry Industry, Inc.
- Growmark FS
- Agrium U.S., Inc.
- Willard Agri-Service
- The Fertilizer Institute (TFI)
- Maryland Grain Producers

CONSERVATION GROUPS:

- Chesapeake Conservancy (CC)
- Ducks Unlimited (DU)
- Eastern Shore Land Conservancy (ESLC)
- Lower Shore Land Trust (LSLT)
- Midshore Riverkeeper Conservancy
- National Fish and Wildlife Foundation (NFWF)
- The Conservation Fund (TCF)

HIGHER EDUCATION:

- University of Maryland (UMCES)
- University of Maryland Eastern Shore
- University of Delaware Extension (UDE)

FEDERAL AGENCIES:

- U.S. Fish and Wildlife Service (USFWS)
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Department of Agriculture (ARS)
- Environmental Protection Agency (EPA)
- U.S. Geological Survey (USGS)

STATE AGENCIES:

- Maryland Department of Natural Resources (DNR)
- Maryland Department of Agriculture (MDA)
- Delaware Department of Agriculture/ Nutrient Management Commission (DDA)

COUNTY/ LOCAL GOVERNMENT:

- Worcester County (MD) Department of Planning
- Maryland Association of Conservation Districts
- Delaware Conservation Districts

AVOID: In-field Component

Programs and Practices:

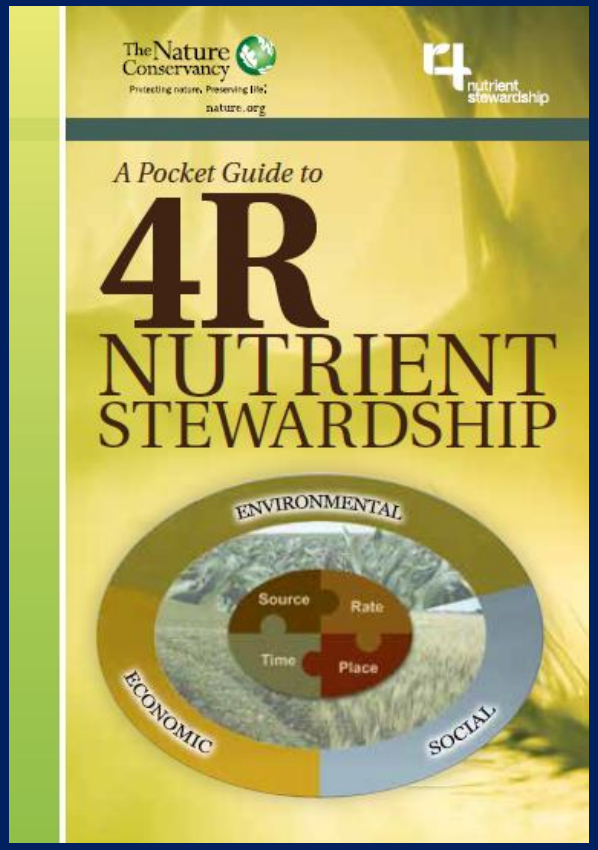
- Conservation Stewardship Program (CSP)
  - Five year agreement encompassing multiple practices such as split application, precision application, incorporation, enhanced efficiency fertilizer etc.
- Environmental Quality Incentive Program (EQIP)
  - Advanced nutrient management
  - Precision Agriculture
  - Grassed waterways

Outreach:

- Chesapeake 4R Alliance
- Public/ private partnership with agribusiness

Program Implementation:

- CCAs and Partners will facilitate applications to NRCS/ SCDs
- SCDs will provide technical assistance to write contracts/ deliver practices



TRAP: Edge of Field/ In-stream Component

Programs and Practices:

- Wetlands through Wetland Reserve Easement Program (WRE)
  - Permanent easements
  - Include restoration and rehabilitation (cropland and forested areas)
- Buffers through CREP (provided significant contribution)
  - Leveraging efforts with new FSA/NRCS focus and funding on forested buffers and potential changes to existing programs to provide flexibility

Outreach:

- Conservation partners perform targeted outreach to priority landowners
- Coordination through 4R Alliance

Program Implementation:

- Partners will facilitate applications to county NRCS (wetlands) or SCDs (buffers)
- NRCS, SCD or other TSPs as needed will provide technical assistance to implement easements and projects
- In Maryland – DNR has committed funds to cover restoration/ construction costs for WRE

USDA

U.S. Department of Agriculture
Natural Resources Conservation Service
Commodity Credit Corporation
Financial Assistance Programs Division
Programs Deputy Area

Regional Conservation Partnership Progra

The Regional Conservation Partnership Program (RCPP) is au
of Title XII of the Food Security Act of 1985 (the 1985 Act), a
2401 of the Agriculture Act of 2014 (2014 Act). The Secreta
delegated the authority to administer RCPP to the Chief of t
Conservation Service (NRCS), who is Vice President of the Co
Corporation (CCC). NRCS is an agency of the Department of

DEPARTMENT OF AGRICULTURE

ANNOUNCEMENT TYPE: Announcement for Program Funding

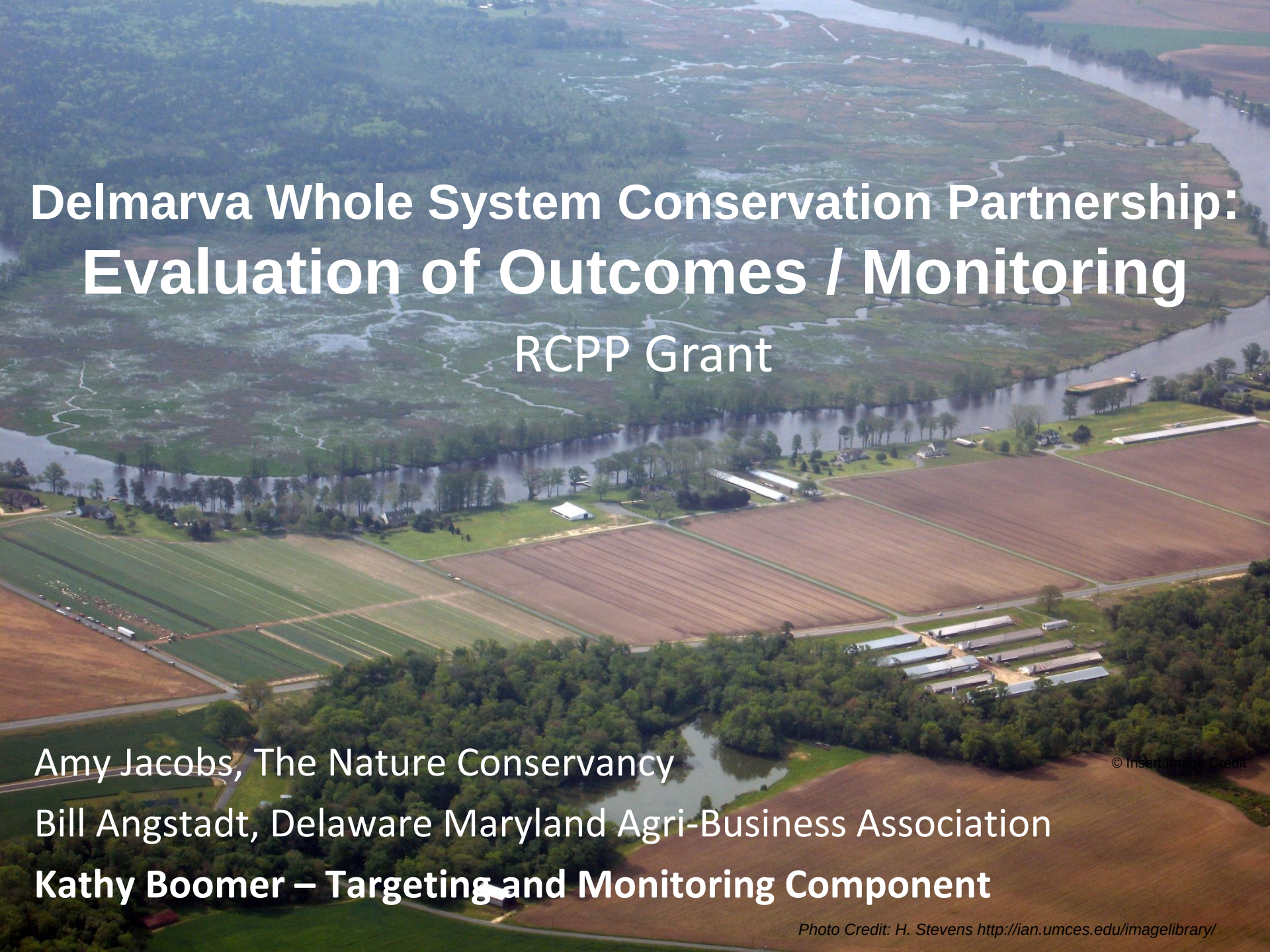
2. Project Summary

a. Identify the project objectives and the natural resource concerns that will be addressed and how those concerns were identified. A complete list of NRCS approved natural resource concerns may be found on the RCPP Web site at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/farmbill/rcpp/.

b. A general description of the plans for evaluating outcomes, including plans for monitoring and modeling, and for reporting on progress to achieve the objectives of the application.

c. A brief description of the types of activities including: conservation practices, conservation activity plans, enhancements, wetland restoration activities, easement acquisition activities, other partner activities to be implemented during the project timeframe, and the general sequence of implementation of the project.

d. If applicable, indicate how the project will help producers in the area in "assisting producers in meeting or avoiding the need for natural resource regulatory requirements." Section 1271B(d)(4)(A) of the 1985 Act.



Delmarva Whole System Conservation Partnership:
Evaluation of Outcomes / Monitoring

RCPP Grant

Amy Jacobs, The Nature Conservancy

Bill Angstadt, Delaware Maryland Agri-Business Association

Kathy Boomer – Targeting and Monitoring Component

Photo Credit: H. Stevens http://ian.umces.edu/imagelibrary/

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Delmarva Science Consortium

GOAL: Advance a more synthetic understanding of how agricultural bmp performance varies over space and time.

APPROACH: Develop an adaptive watershed management framework to align science partners to address uncertainties:

- Explicitly articulate habitat/water storage objectives
- Evaluate decision tool uncertainties
  - (Water Quality) Model comparison
  - (Water Quality) Monitoring coordination

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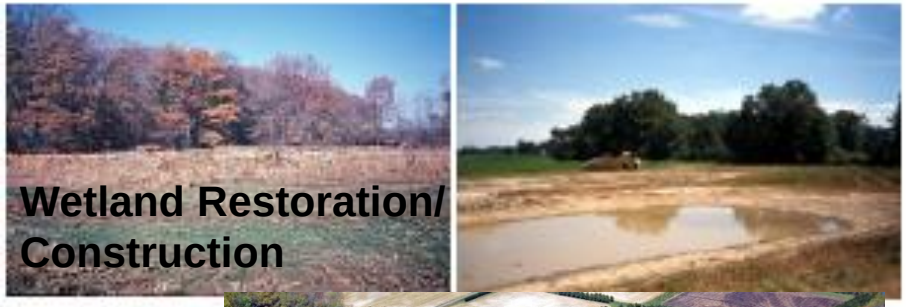
Management Alternatives:



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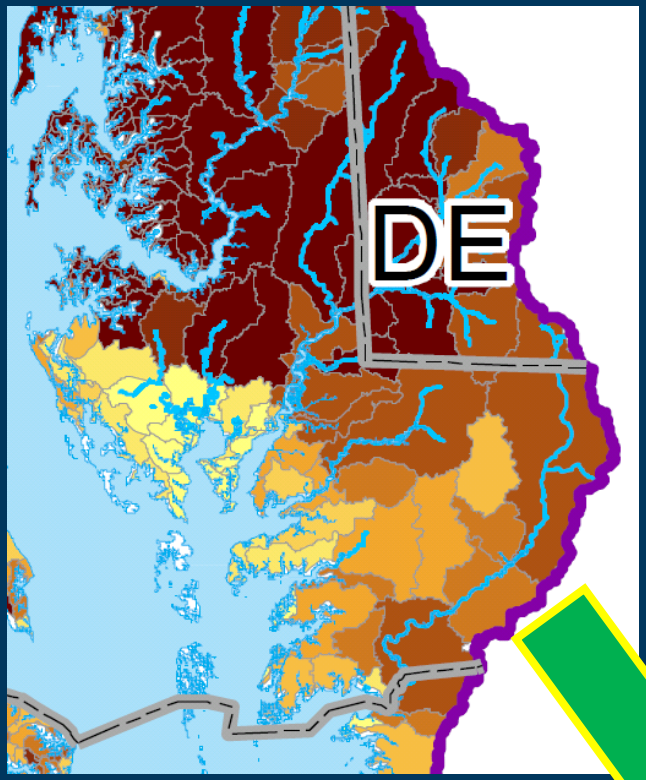
Decision Tool Requirements -



MODEL GOALS:

- Provides information at a meaningful spatial scale
- Generates credibility with partners
- Compliments or links to regulatory watershed model
- Predicts measurable outcomes

Reach	Subbasin	Reach Length (ft)	Watershed Area (acres)	Retention Area (acres)	Restoration Type	Number of Owners	EOS TN (lbs/yr)	TN captured (lbs/yr)	EOS TP (lbs/yr)	TP captured (lbs/yr)	EOS TSS (lbs/yr)	TSS captured (lbs/yr)	Cost	C
6297	Nass	266	749.64	19.36	buffer	1	212,264	39,177	32,779	11,318	144,877	3,449	$104,544	
6588	Nass	1043	28.88	5.58	plug	1	78,430	61,379	12,501	11,975	6,187	717	$3,232	
6592	Nass	1260	292.3	6.31	buffer	1	193,895	30,415	30,546	9,111	47,800	662	$34,074	
7232	Nass	492	85.19	2.82	buffer	1	140,458	32,306	22,332	9,352	15,881	285	$15,228	
10123	Nass	1053	79.63	7.53	buffer	1	53,676	28,240	8,463	6,667	7,860	952	$40,662	
6621	Nass	541	16.91	2.69	plug	1	45,920	32,842	7,319	6,779	3,622	346	$2,076	
6685	Nass	669	213.19	3.91	buffer	1	187,775	25,308	29,688	7,706	27,376	398	$21,114	
6796	Nass	164	10.99	10.91	plug	2	29,836	29,825	4,756	4,756	2,354	1,402	$5,364	
6853	Nass	371	64.17	10.99	plug	1	35,353	26,218	5,550	5,216	10,176	1,180	$5,396	

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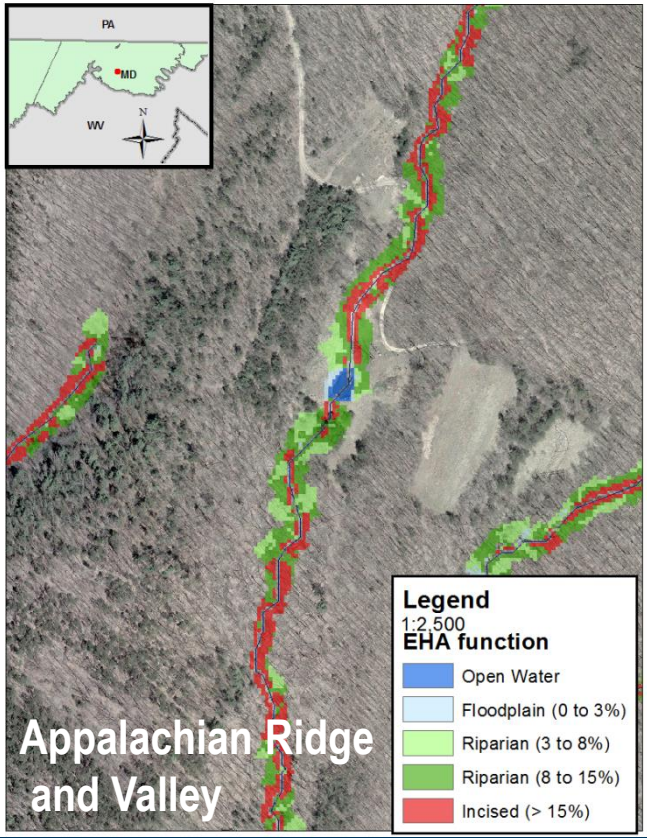
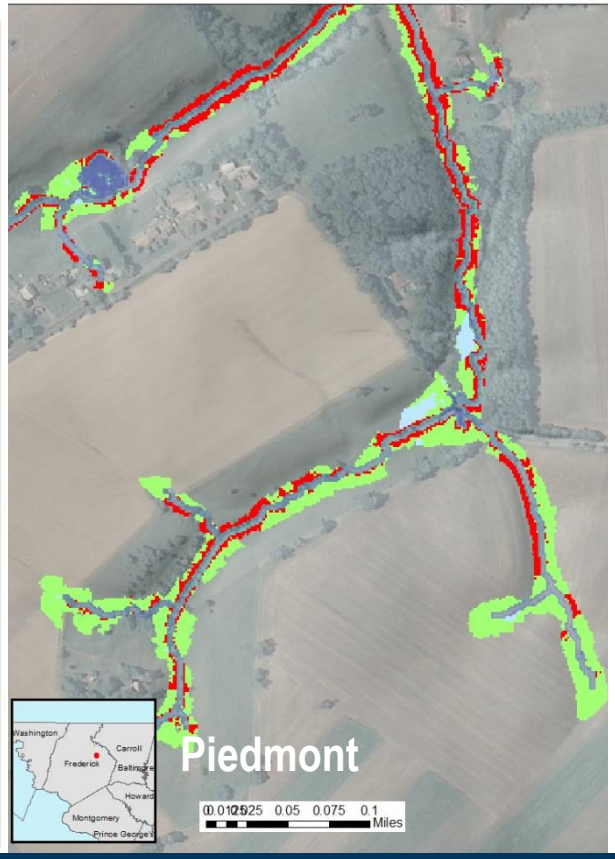
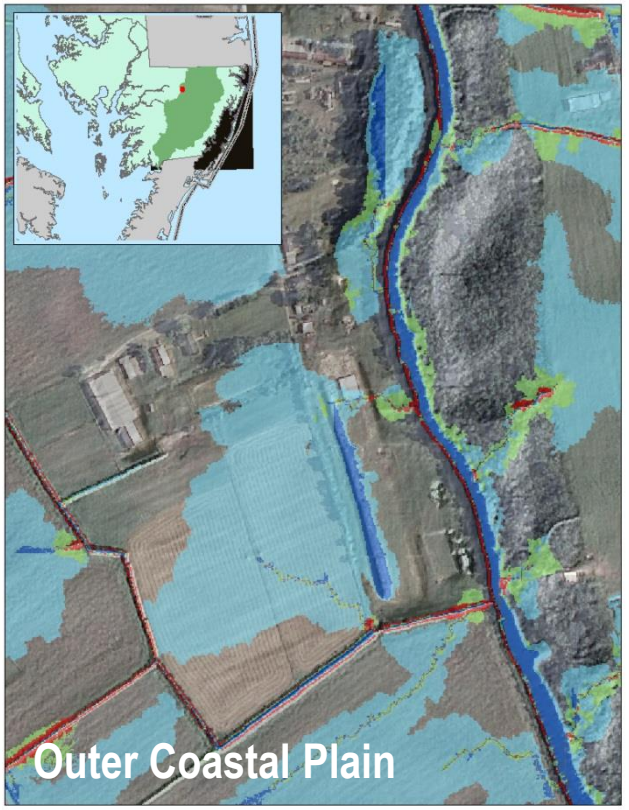
1. Identify BMP Opportunities







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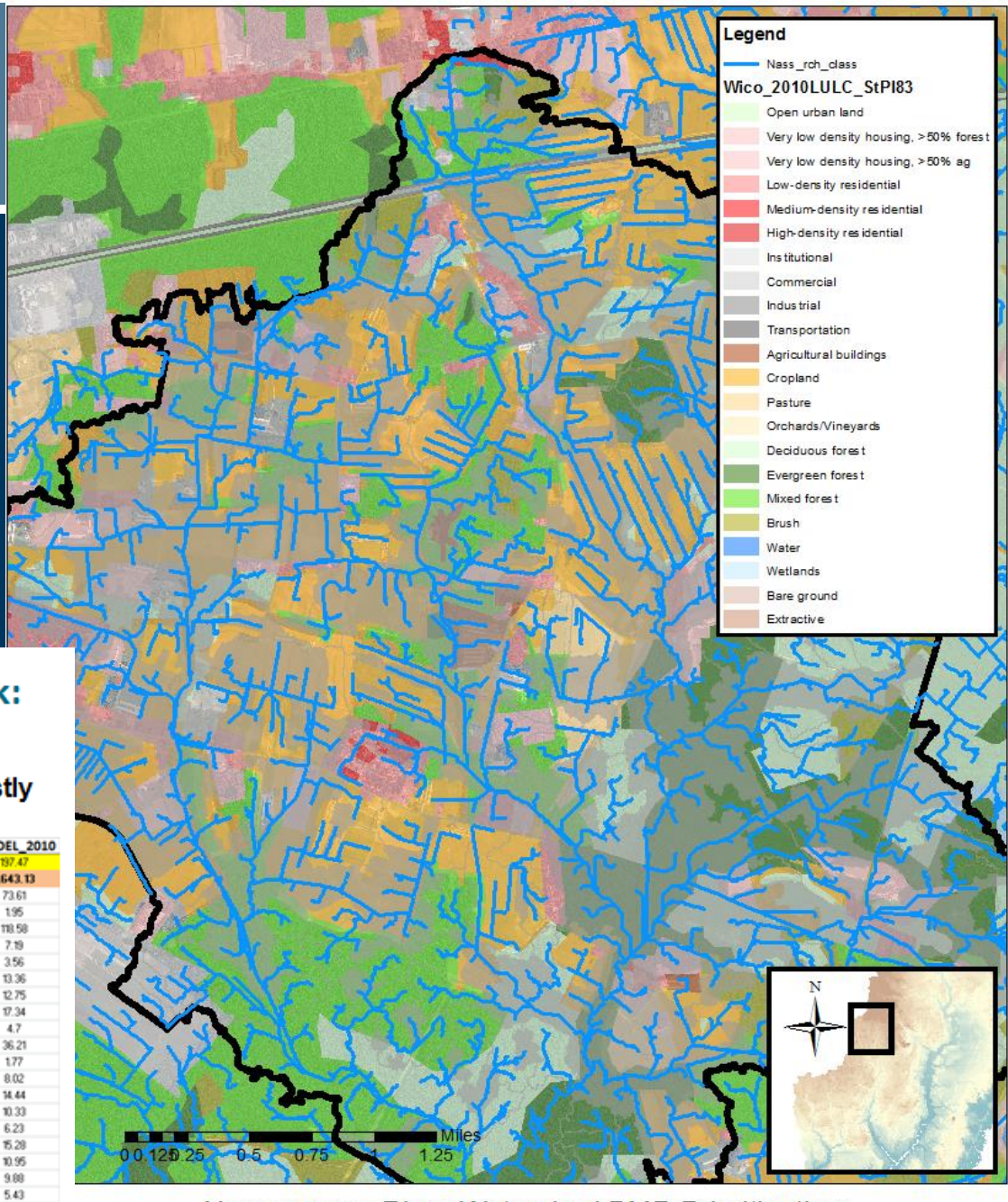
2. Assess Water Quality Impacts



Nassawango River Watershed BMP Prioritization:
Potential Nutrient and Sediment Sources

Chesapeake Bay Program
A Watershed Partnership

AWM Modeling Framework:

CBP5 SOURCE ALLOCATIONS… mostly CAFOs

CBP LU	TN_EOS_2010	TN_DEL_2010
Agriculture - animal feeding operation	227.2	197.47
Agriculture - concentrated animal feeding operation	**1,890.47**	**1,643.13**
Agriculture - degraded riparian pasture	84.7	73.61
Agriculture - hay without nutrients	2.25	1.95
Agriculture - nursery	136.43	118.58
Agriculture - nutrient management alfalfa	8.29	7.19
Agriculture - nutrient management hay with nutrients	4.1	3.56
Agriculture - nutrient management hightill with manure	15.79	13.36
Agriculture - nutrient management hightill without manure	14.85	12.75
Agriculture - nutrient management lowtill with manure	20.09	17.34
Agriculture - nutrient management pasture	5.41	4.7
Agriculture - pasture	41.66	36.21
Forest	1.99	1.77
Forest - harvested forest	9.04	8.02
Non-tidal atmospheric	14.82	14.44
Urban NonReg - extractive	10.95	10.33
Urban NonReg - impervious developed	6.88	6.23
Urban Reg - construction	17	15.28
Urban Reg - extractive	10.95	10.95
Urban Reg - impervious developed	10.76	9.88
Urban Reg - pervious developed	5.87	5.43

Predicted Edge-of-Stream (EOS) and Delivered (Del) Average Annual Loading Rates (lbs/acre-year) for Total Nitrogen (TN)

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Estimating Nutrient/Sediment Retention Capacity

3. Estimate Wetland Retention Capacity (CBP5)

- For TN: Every acre wetland 'treats' 25% of load delivered by four upland source acres (based on weighted average loading rate).
- For TP: Every acre wetland 'treats' 50% of load delivered by two upland source acres.
- For TSS: Every acre wetland 'treats' 15% of load delivered by two upland source acres.

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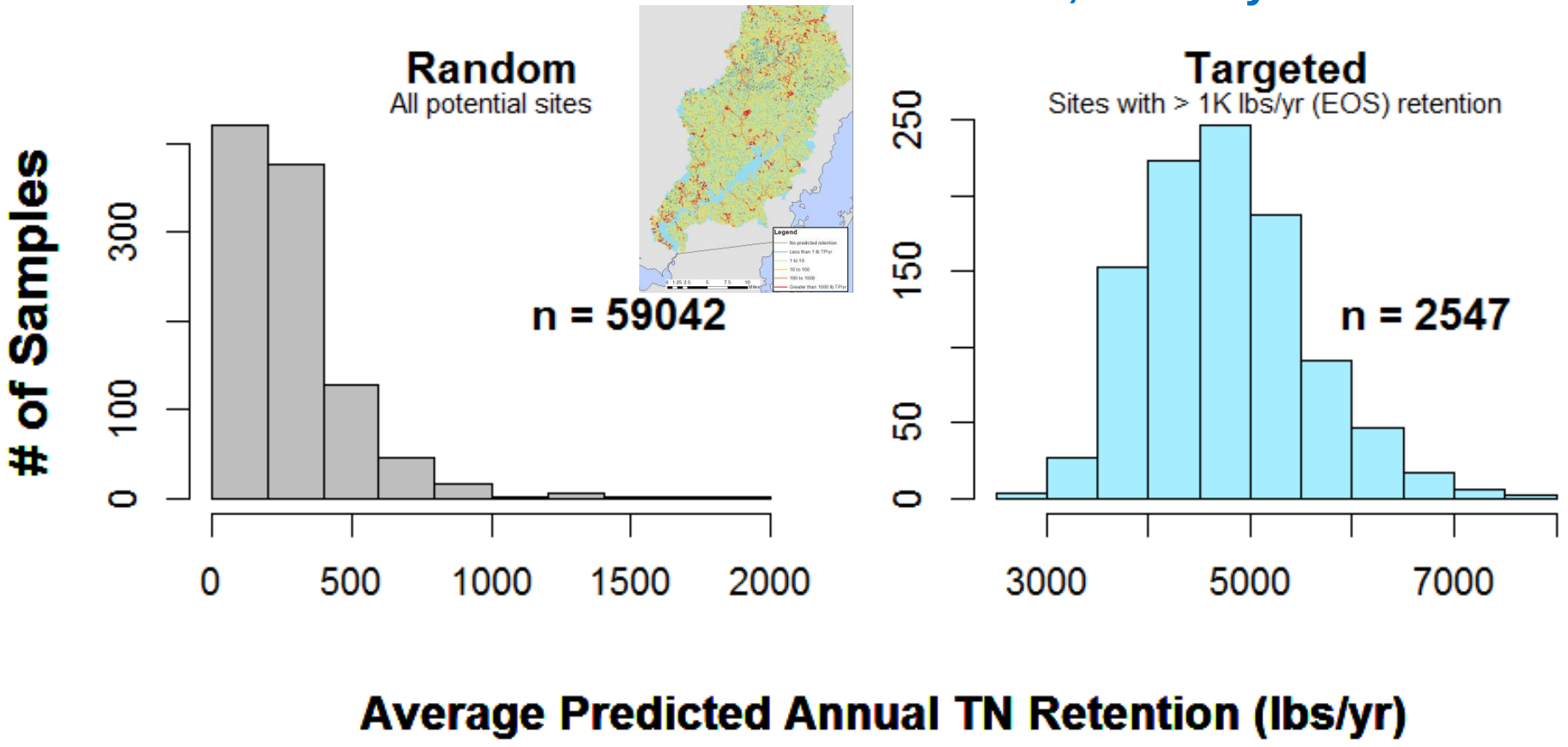
Pocomoke River Watershed:

Opportunistic vs Targeted Outcomes

(sample of 50 sites, drawn 1000 times)

TP TMDL Reduction Goal: ~15,000 lbs/yr



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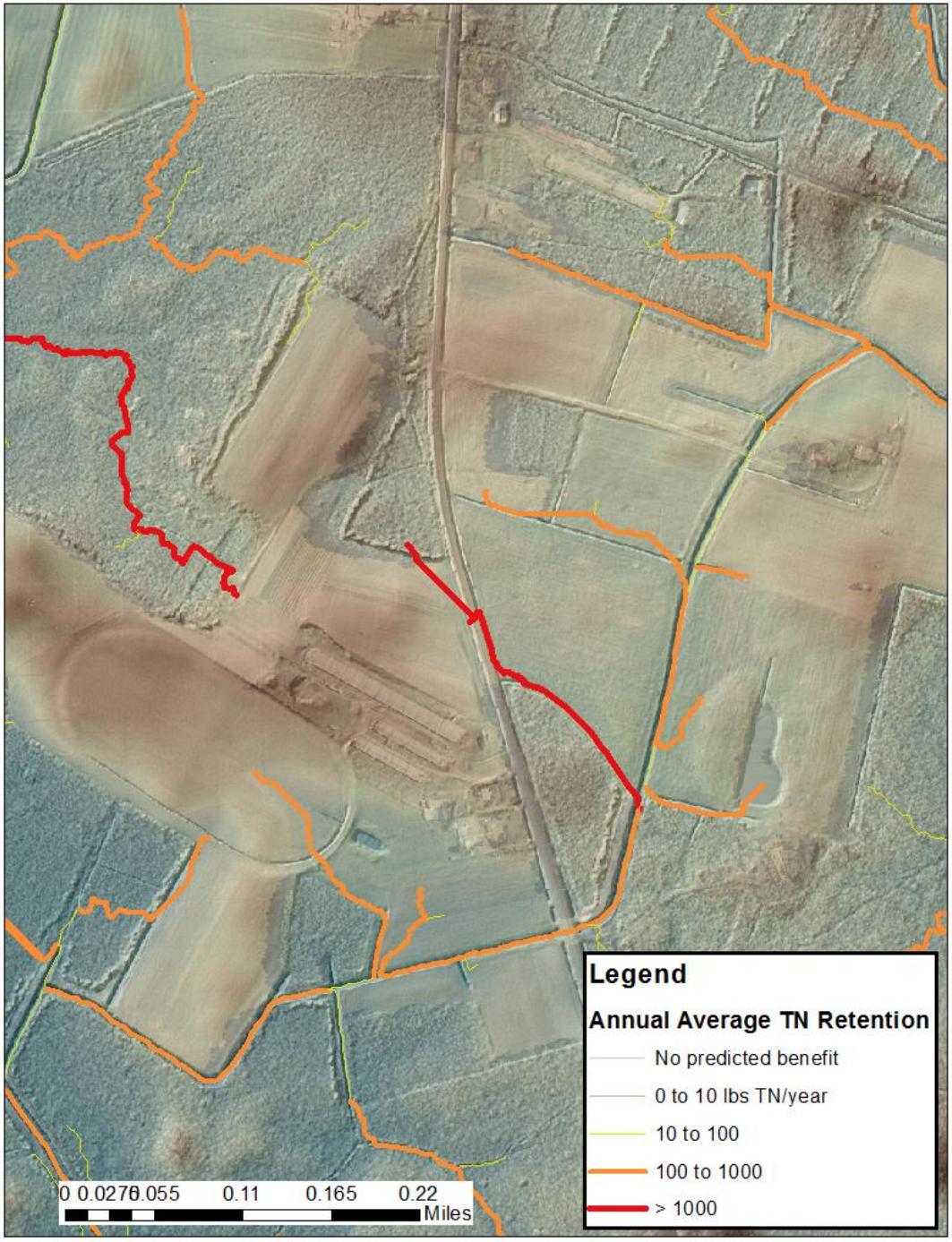
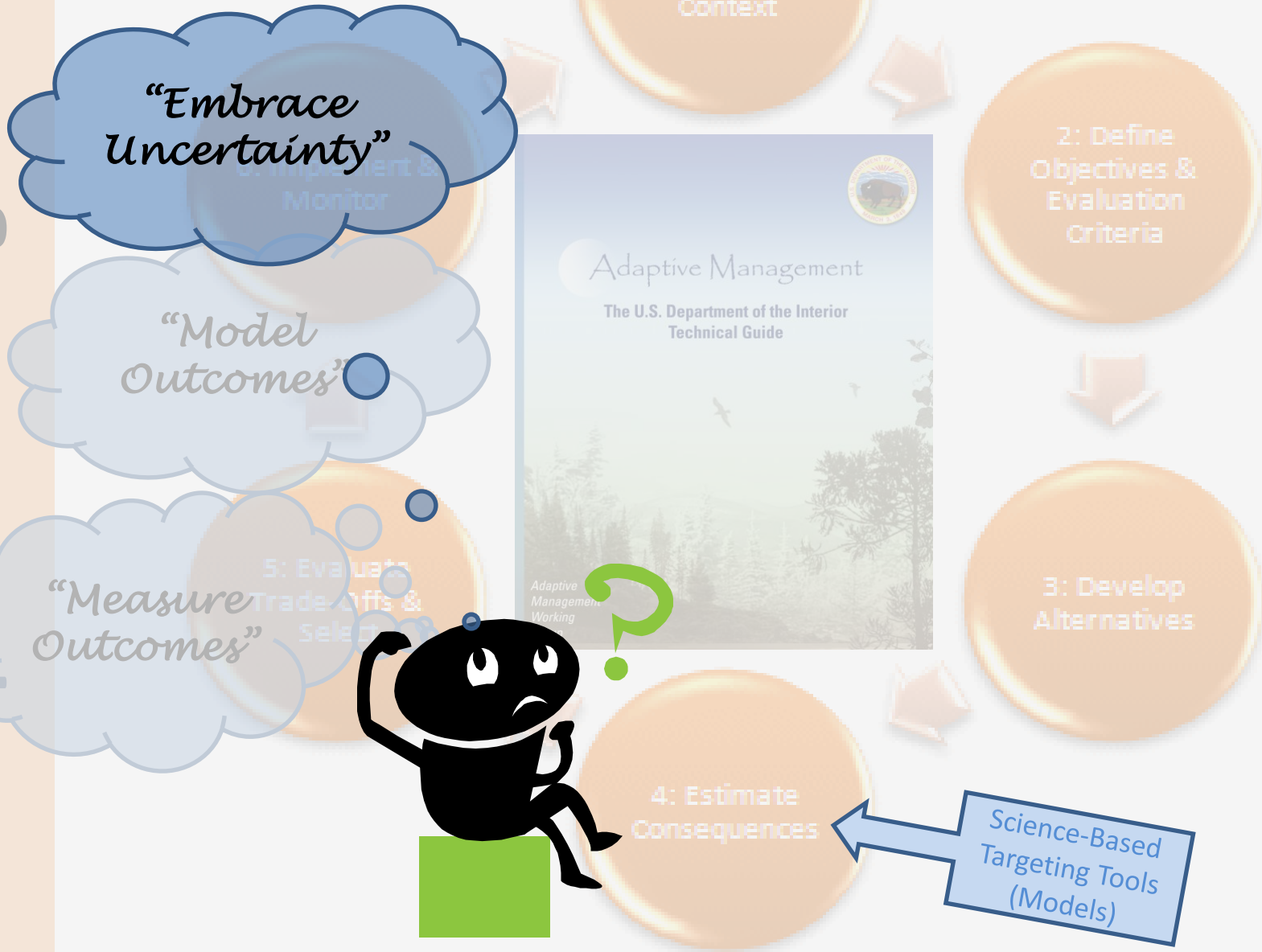
Prioritizing Wetland Restoration Projects in the Pocomoke River Watershed



Adaptive Management

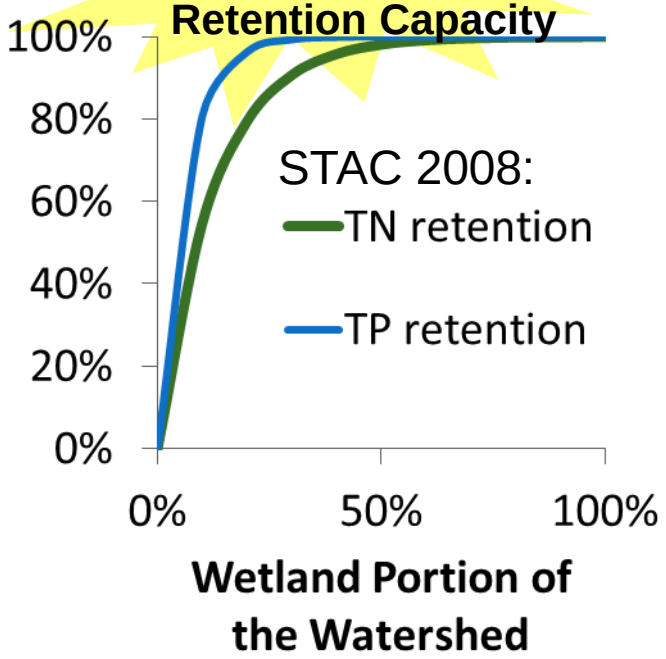


Chesapeake Bay Program
A Watershed Partnership

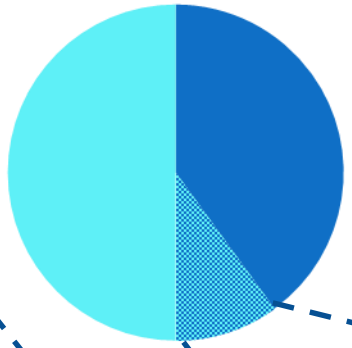
Watershed Modeling Framework: Key Information Gaps

1. Location

3. Wetland Retention Capacity

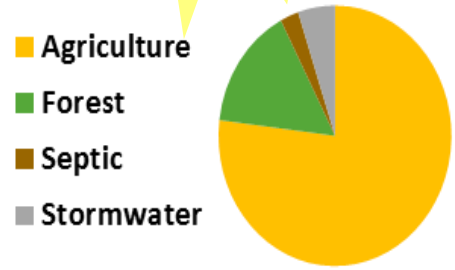


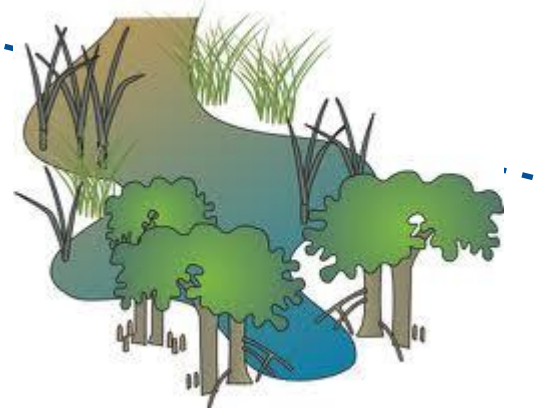
Predicted Stream Water Budget



2. Nutrient & Sediment Sources

Non-Point Source





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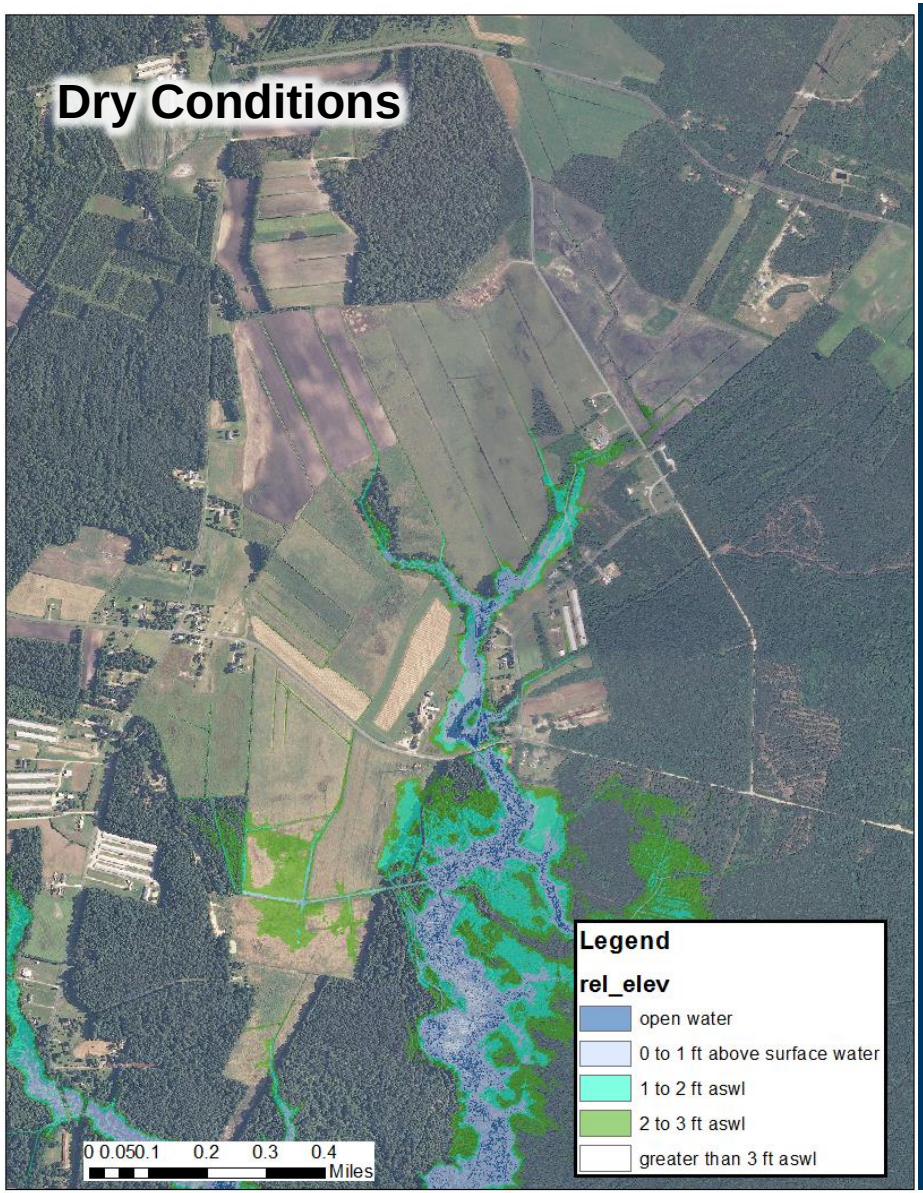
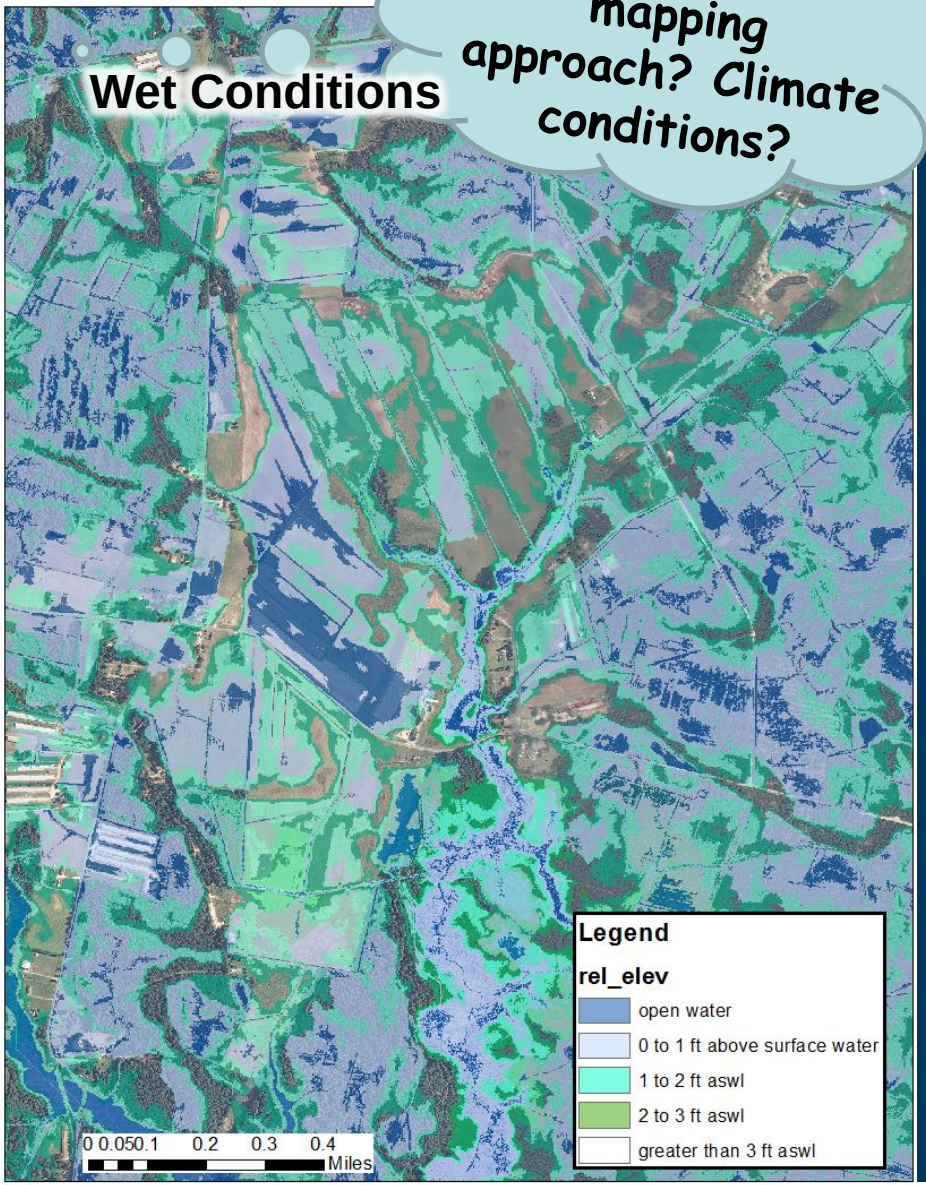
Restorable Opportunities





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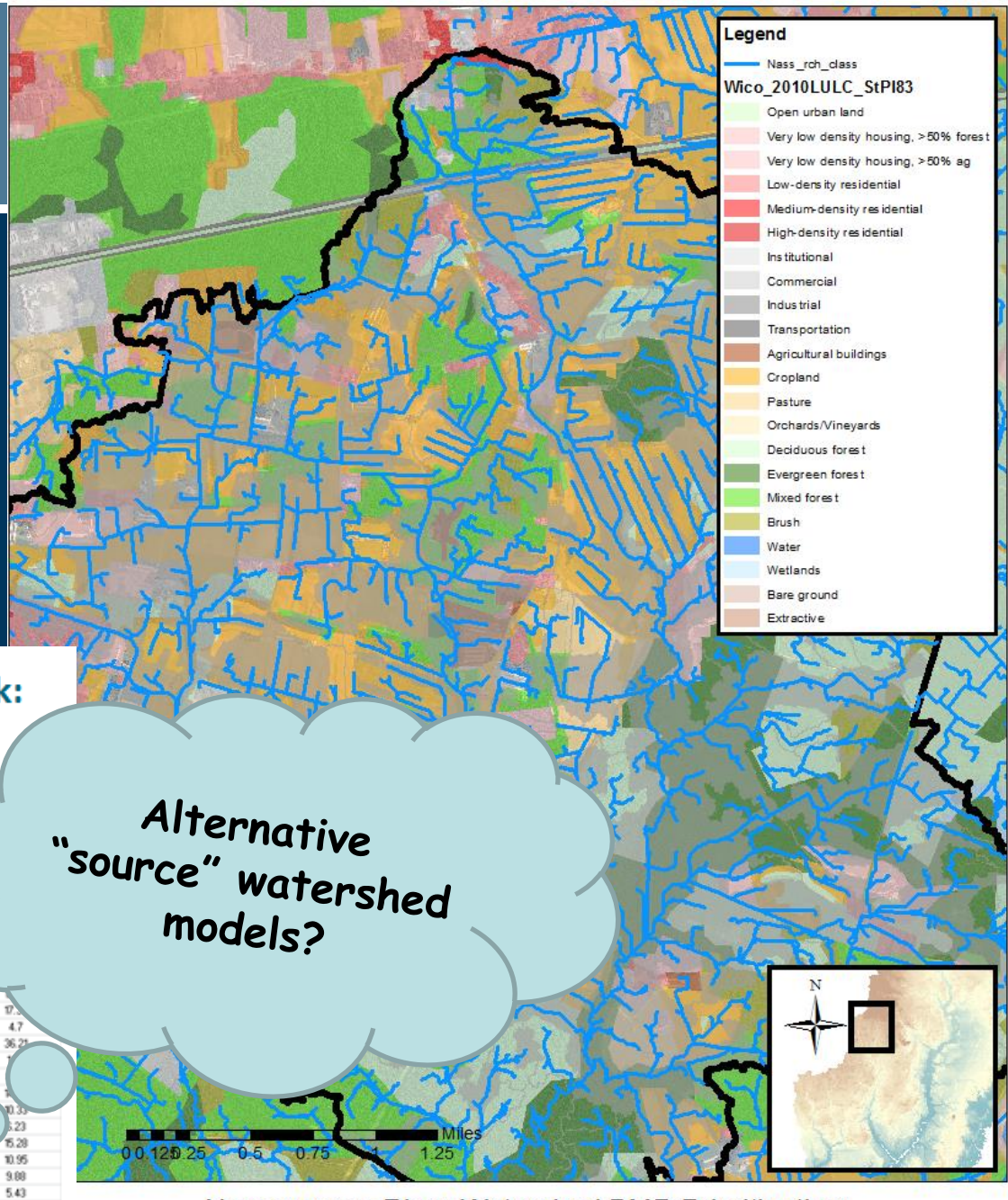
1. Prioritization:

- **Edge-of-Stream Delivered Loads from Local and Watershed Contributing Areas**



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Chesapeake Bay Program
A Watershed Partnership

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- For TSS: Every acre wetland 'trea… delivered by two upland source a…

Alternative BMP performance models?

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Delmarva Science Consortium

Collaboration Options:

1. Invest in experimental field and small-watershed monitoring to measure and compare bmp outcomes (e.g., Upper Choptank)
2. Coordinate watershed model comparison to evaluate uncertainty in our decision tools
3. Develop centralized BMP/natural filter database for water quality and habitat model validation (recognizing responsibilities to support landowners and managers).

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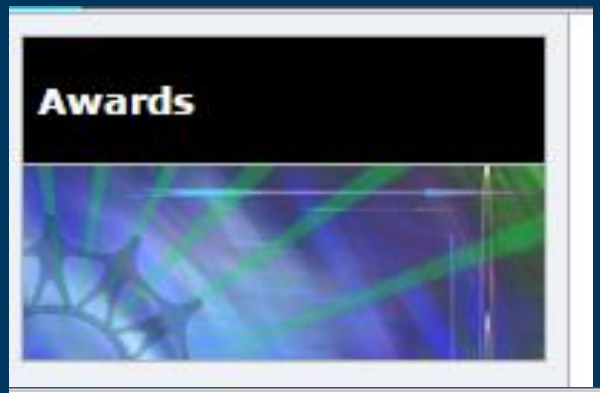
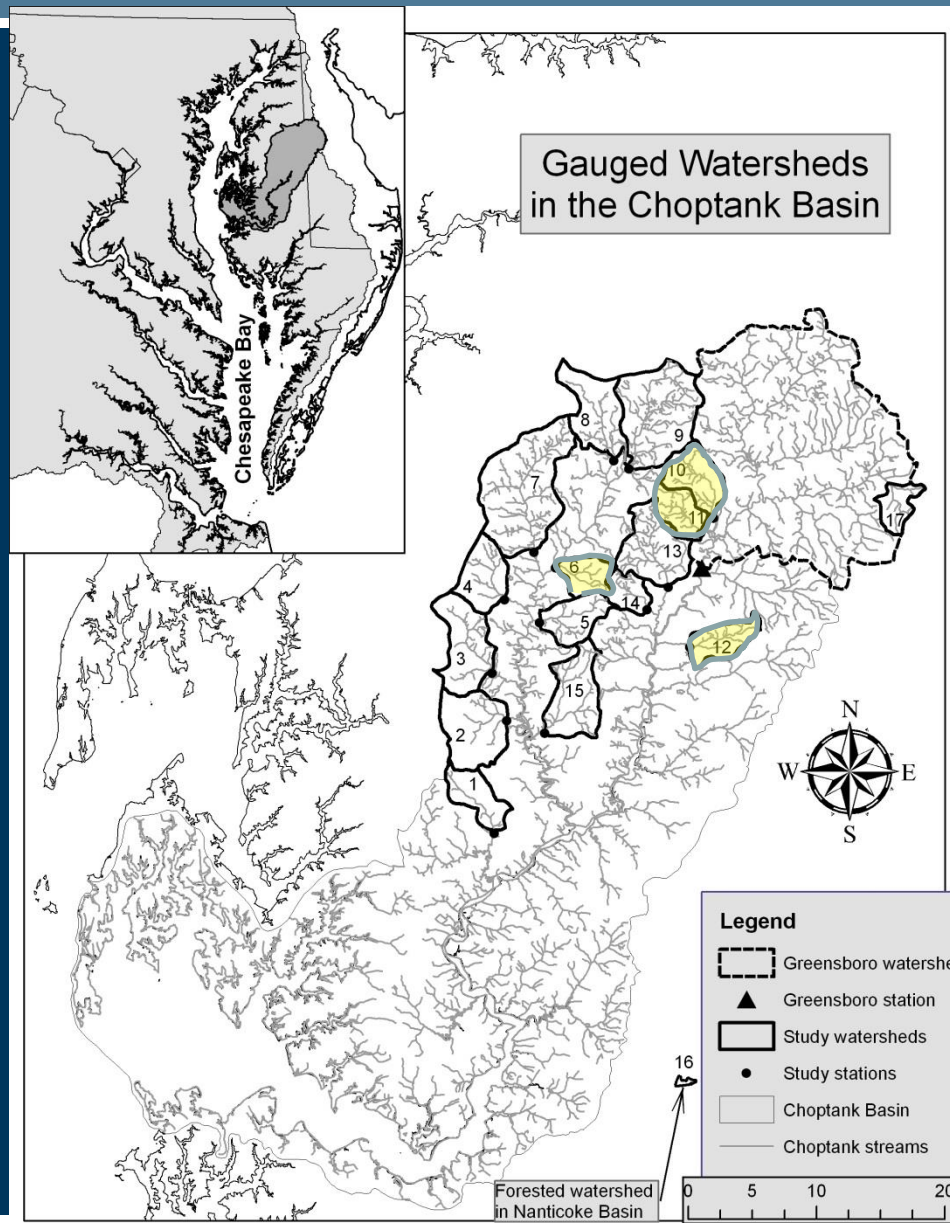
Delmarva Science Consortium – 1. Experimental Field Studies



Award Abstract #1325553

Coastal SEES (Track 2), Collaborative: Improving Chesapeake Bay water quality by creating sustainable coastal watersheds

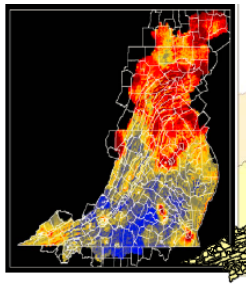
NSF Org:	DEB Division of Environmental Biology
Start Date:	October 1, 2013
End Date:	September 30, 2018 (Estimated)
Awarded Amount to Date:	$1,618,200.00
Investigator(s):	Thomas Fisher fisher@hpl.umces.edu (Principal Investigator) Rebecca Fox (Co-Principal Investigator) Kalla Kvalnes (Co-Principal Investigator)
Sponsor:	University of Maryland Center for Environmental Sciences BOX 775 Cambridge, MD 21613-0775 (410)221-2014
NSF Program(s):	ECOSYSTEM STUDIES, CROSS-EF ACTIVITIES, SEES Coastal

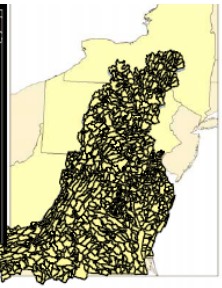


Delmarva Science Consortium – 2. Model Comparison

Chesapeake Bay Phase 5 Community Watershed Model

SECTION 1. PHASE 5.3 WATERSHED MODEL OVERVIEW

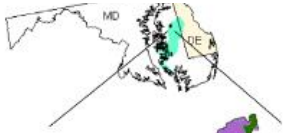


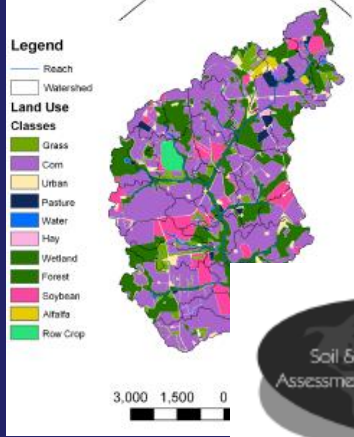


Nitrate and ammonia deposition from improved Daily Nitrate and Ammonium Concentration Models using 35 monitoring stations over 18 simulation years.
Adjustments to deposition from Models-3/Community Multi-scale Air Quality (CMAQ) Modeling System

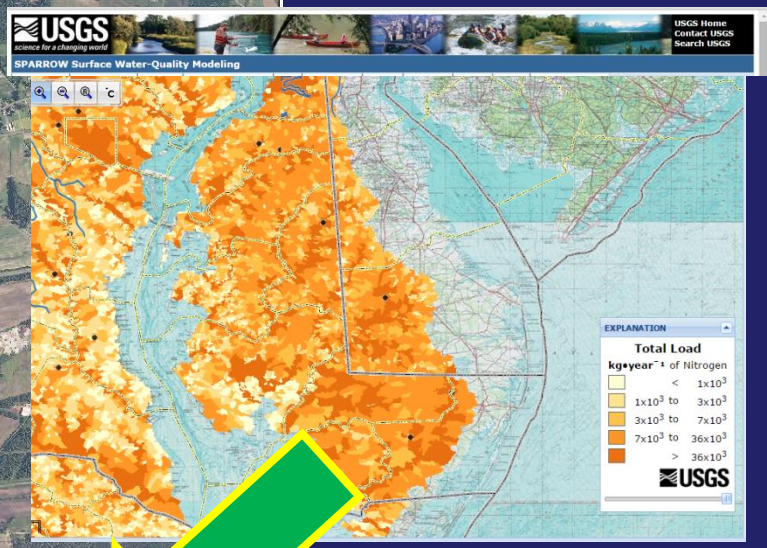
Phase 5 Watershed Model
Year-to-year changes in land use and BMPs; 899 segments; 24 land uses; 296 calibration stations; 18 simulation years; sophisticated calibration procedures; calibration demonstrably better in quality and scale

Figure 1.8b. Overview of CBMP application during Phase 5.3 application.



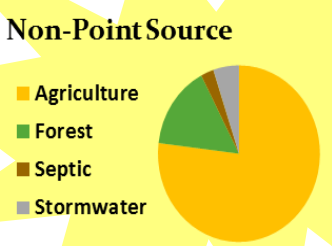


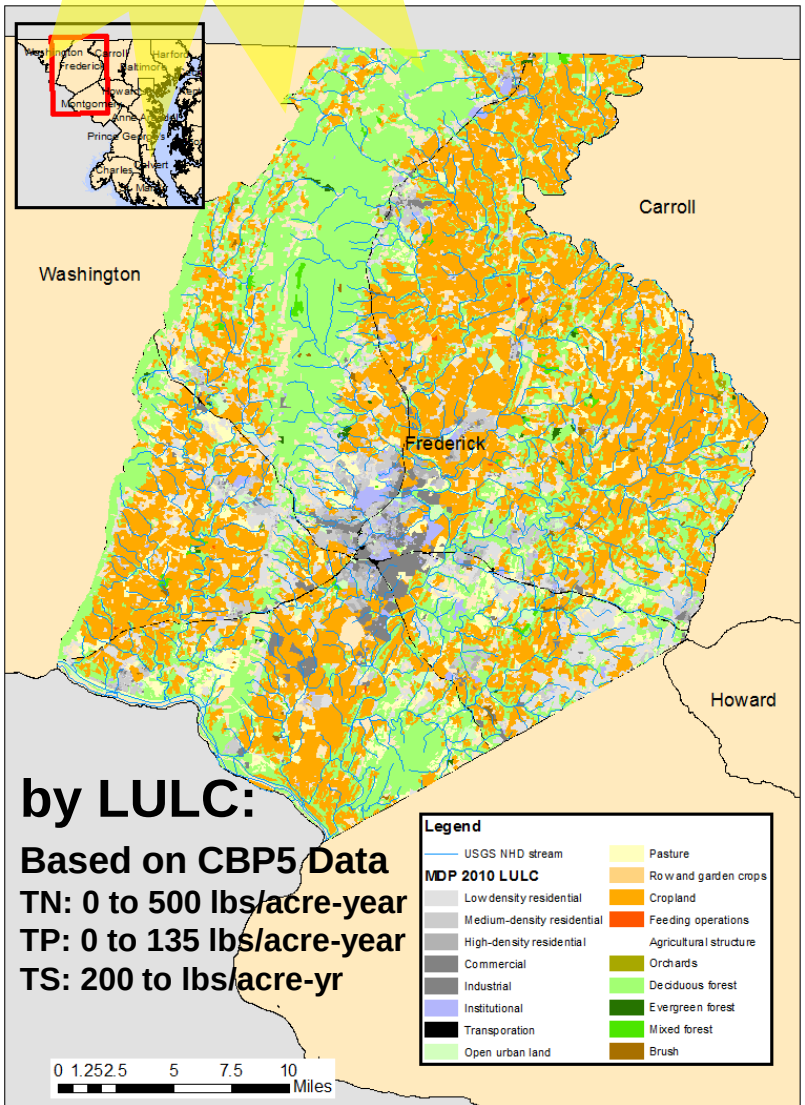
Soil & Water Assessment Tool SWAT



Confronting Uncertainty with Multiple Models:

NUTRIENT & SEDIMENT SOURCES





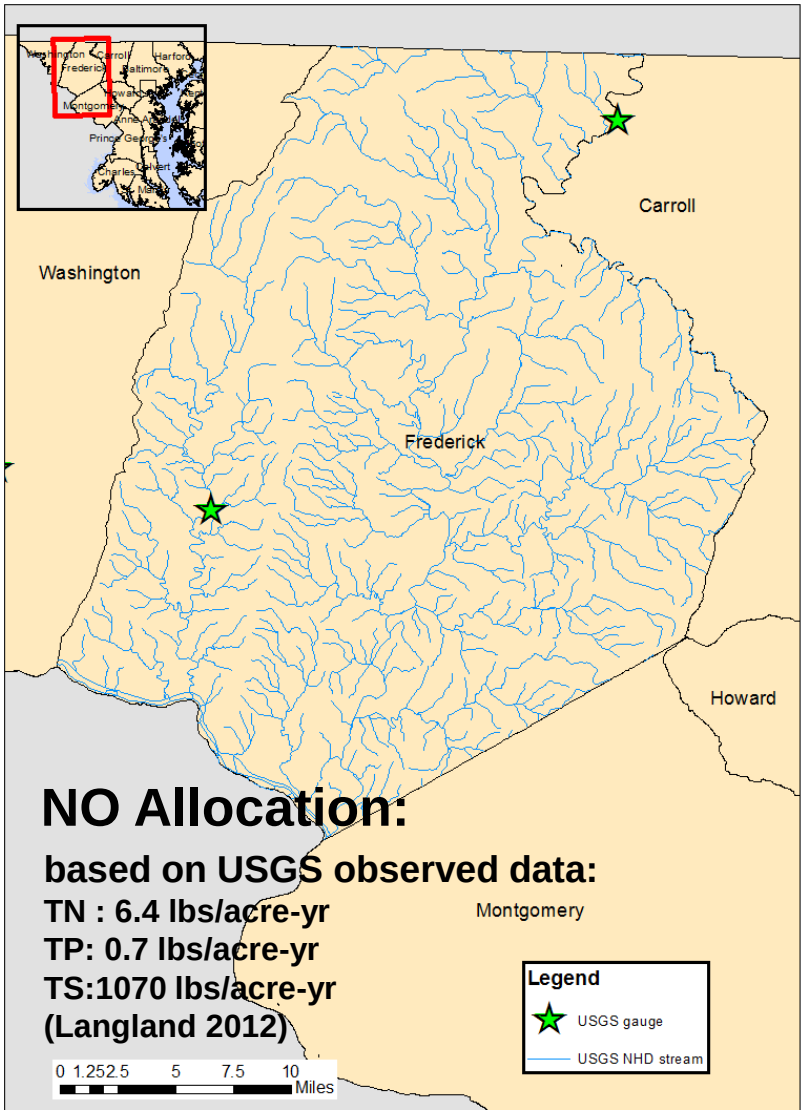
by LULC:

Based on CBP5 Data

TN: 0 to 500 lbs/acre-year

TP: 0 to 135 lbs/acre-year

TS: 200 to lbs/acre-yr



NO Allocation:

based on USGS observed data:

TN : 6.4 lbs/acre-yr

TP: 0.7 lbs/acre-yr

TS:1070 lbs/acre-yr

(Langland 2012)

Confronting Uncertainty with Multiple Models:

WETLAND TN RETENTION EFFICIENCY

Function of Wetland Type?

- Based on lit review

Function of Wetland Area?

- CBT: 28.7 lbs TN/acre-year

Function of Incoming Load/Province?

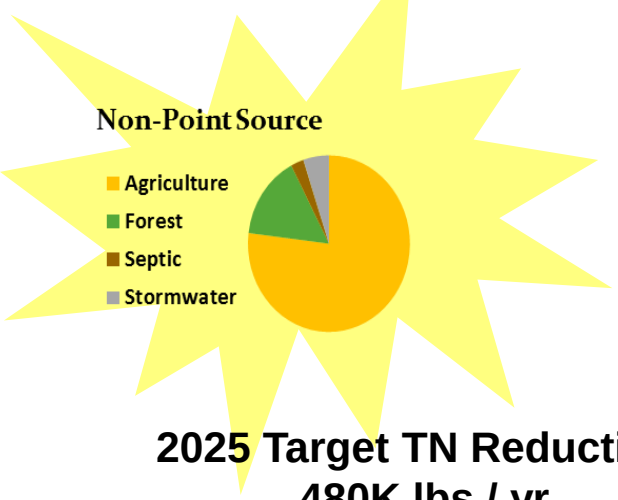
- MD DNR: 25% of local delivered load
- CBP4: 25% of load delivered by four acres

Function of Watershed Position?

- STAC: 1 - $\exp^{(-7.9\ \text{wetland:area})}$
- TNC: Similar to STAC, inverse for TP, TS

Function of Wetland Width?

- EPA: $39.5 * \text{rip.width.m}^{0.1644}$ (for TN)



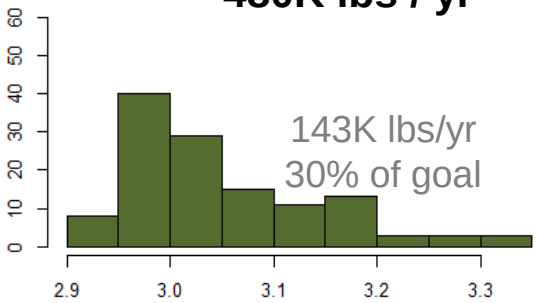
Assessing Model Uncertainty:

Potential Benefits of TOP 100 Riparian Buffer Restoration Opportunities in Frederick County, MD (greater than 0.25 acres)

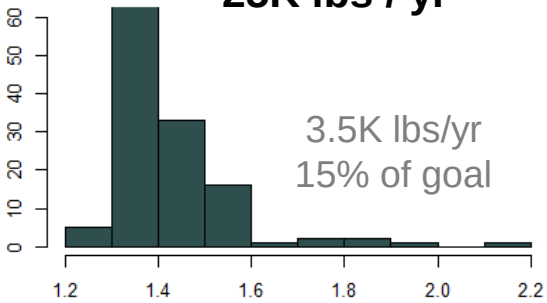
2025 Target TN Reduction: 480K lbs / yr

2025 Target TP Reduction: 25K lbs / yr

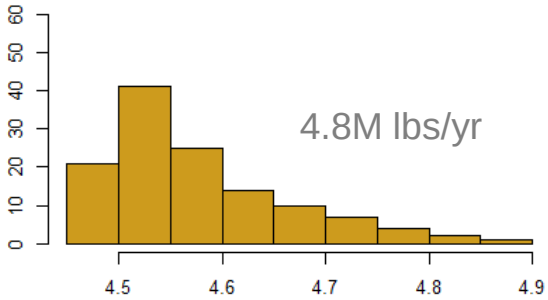
Number of Sites



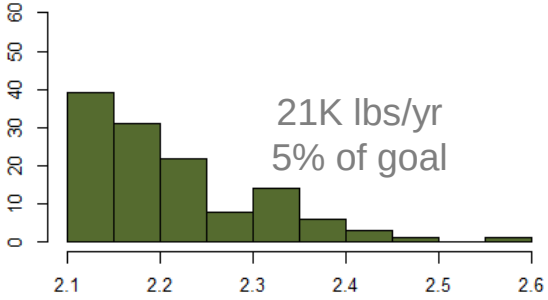
CBP5 TN



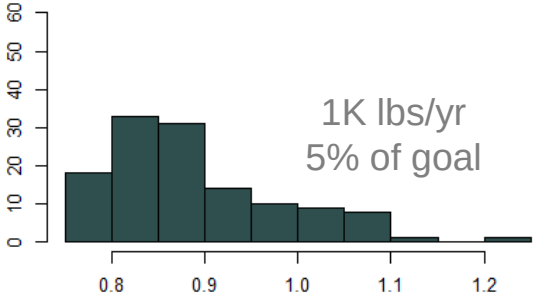
CBP5 TP



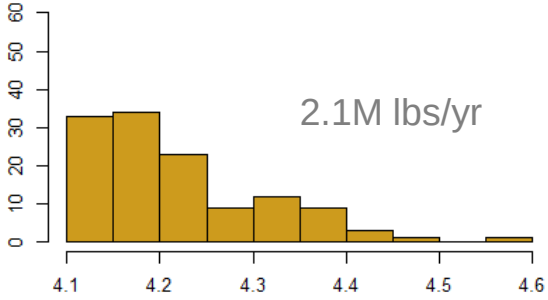
CBP5 TSS



USGS TN



USGS TP



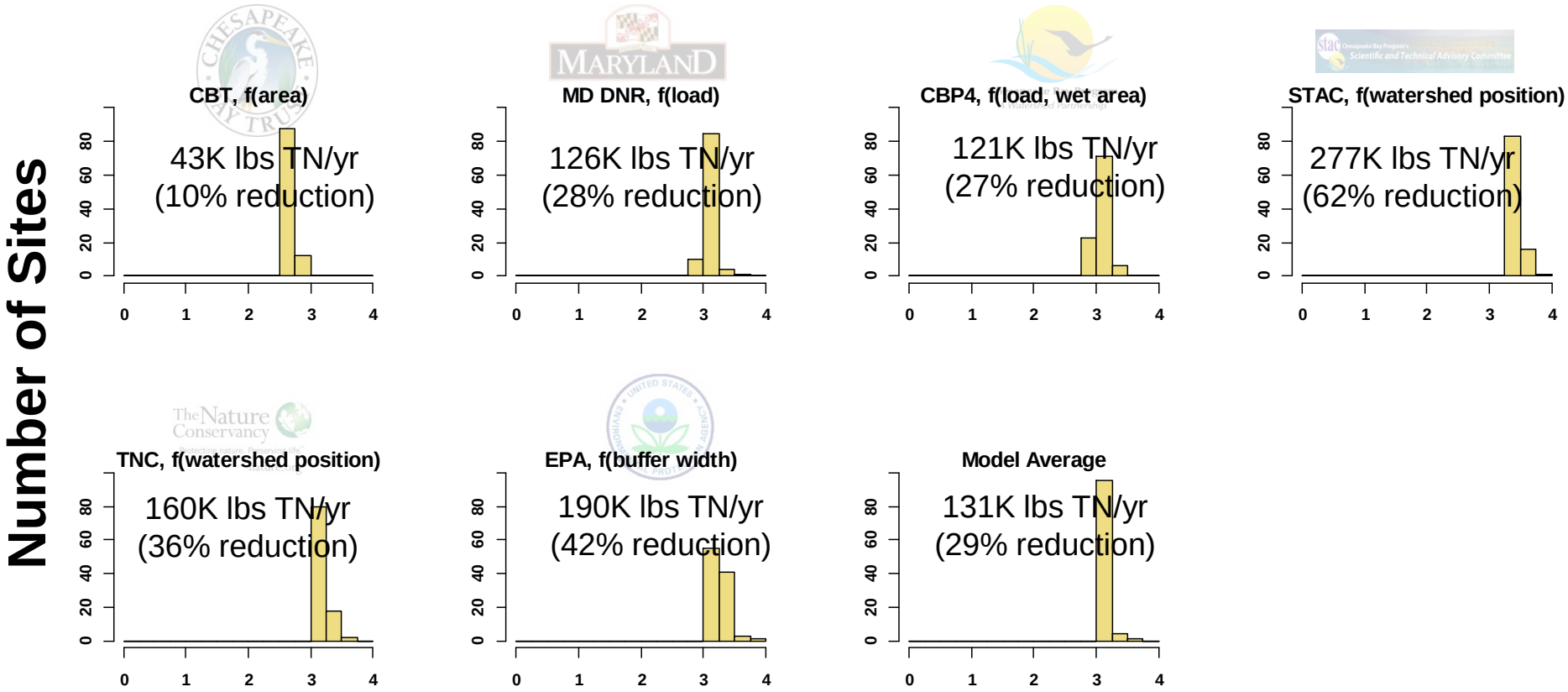
USGS TSS

Retention (10^x lbs / site / year)

AWM Modeling Framework: Targeting Sensitivity

WETLAND RETENTION EFFICIENCY:

Frederick County TN Reduction Goal: 480K lbs per year

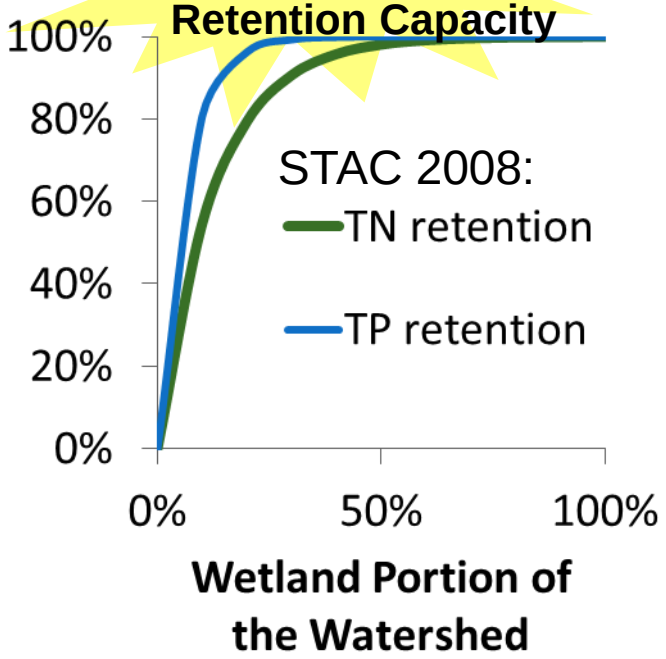


Chesapeake Bay Program
A Watershed Partnership

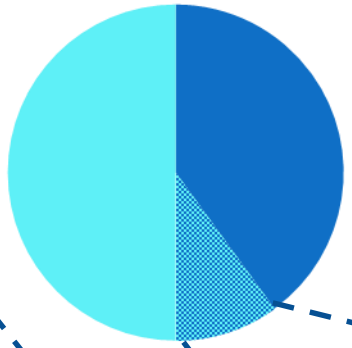
Watershed Modeling Framework: Key Information Gaps

1. Location

3. Wetland Retention Capacity

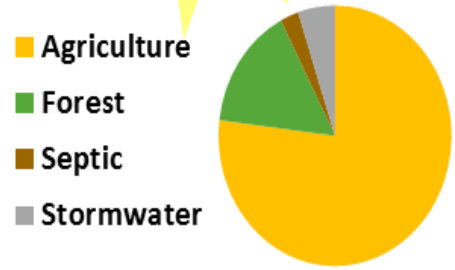


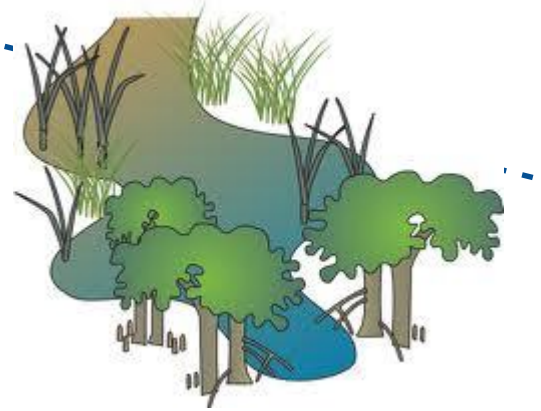
Predicted Stream Water Budget



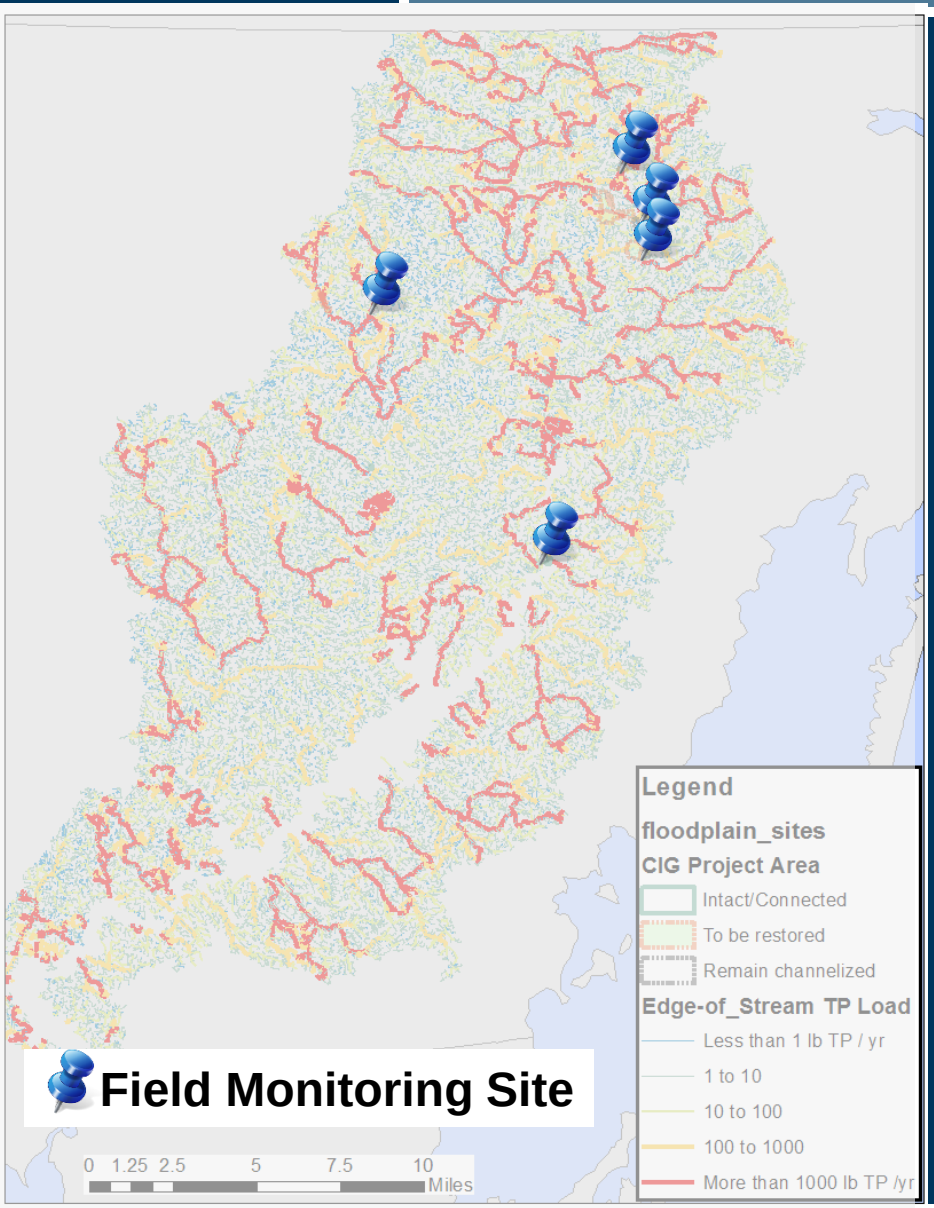
2. Nutrient & Sediment Sources

Non-Point Source





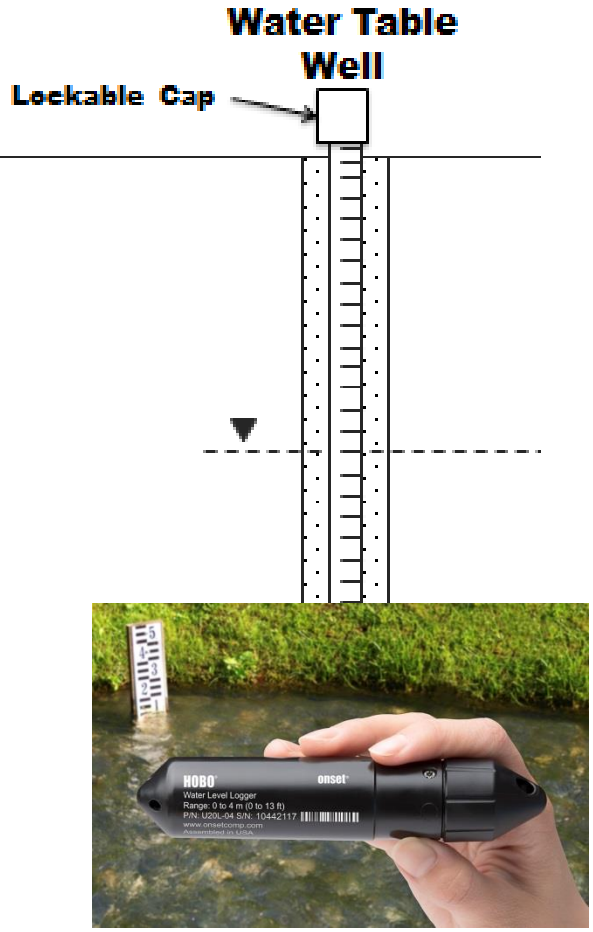
Delmarva Science Consortium – 3. Performance Assessment



Develop centralized database to combine field monitoring efforts and confront models

(i.e., decision tools, scientific hypotheses)

Field Monitoring Priorities:



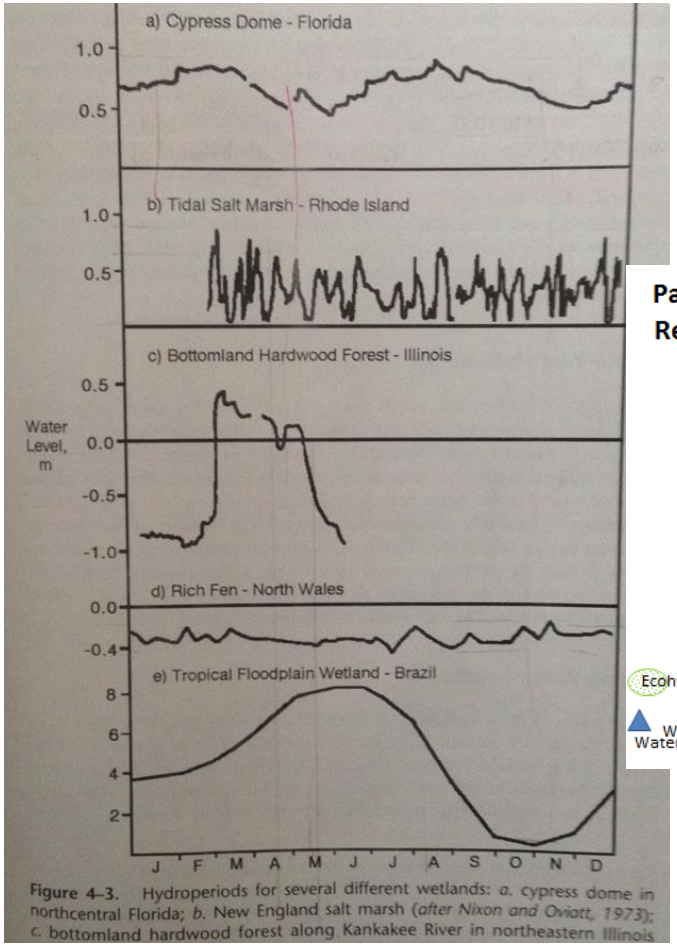
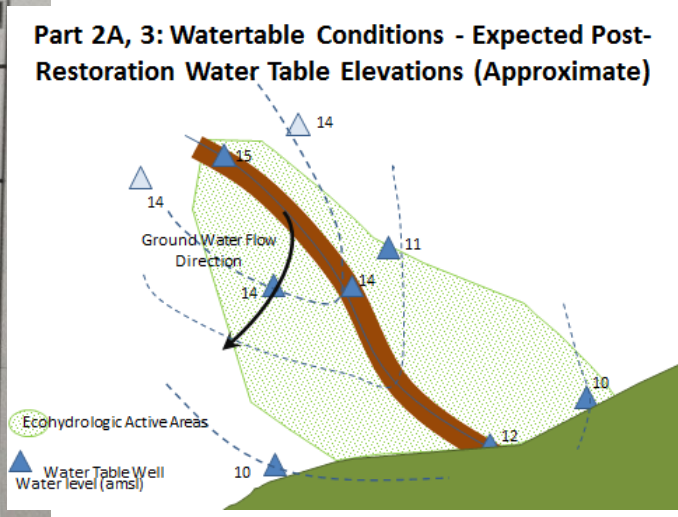


Figure 4–3. Hydroperiods for several different wetlands: *a.* cypress dome in northcentral Florida; *b.* New England salt marsh (*after Nixon and Oviatt, 1973*); *c.* bottomland hardwood forest along Kankakee River in northeastern Illinois



Results: Characterize timing, magnitude, duration, frequency, and rate of change in water level (aka hydrologic signature); map water table depth; and flow directions and flow rates. Relate water quality trends.

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Delmarva Science Consortium

GOAL: Advance a more synthetic understanding of how agricultural bmp performance varies over space and time

CHALLENGES:

1) Funding was provided for 40% of the request;
2) RFP stipulated no funding for modeling and evaluating outcomes;

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Delmarva Science Consortium

Current Status:

- Sponsor annual or semi-annual (6 to 12 month) research symposium

- Facilitate Research Collaborations:
  1. Invest in experimental field and small-watershed monitoring to measure and compare bmp outcomes (e.g., Upper Choptank)
  2. Coordinate watershed model comparison to evaluate uncertainty in our decision tools
  3. Develop centralized BMP/natural filter database for water quality and habitat model validation (recognizing responsibilities to support landowners and managers).

Delmarva Whole System Conservation Partnership: Geographic Targeting of Priority Practices

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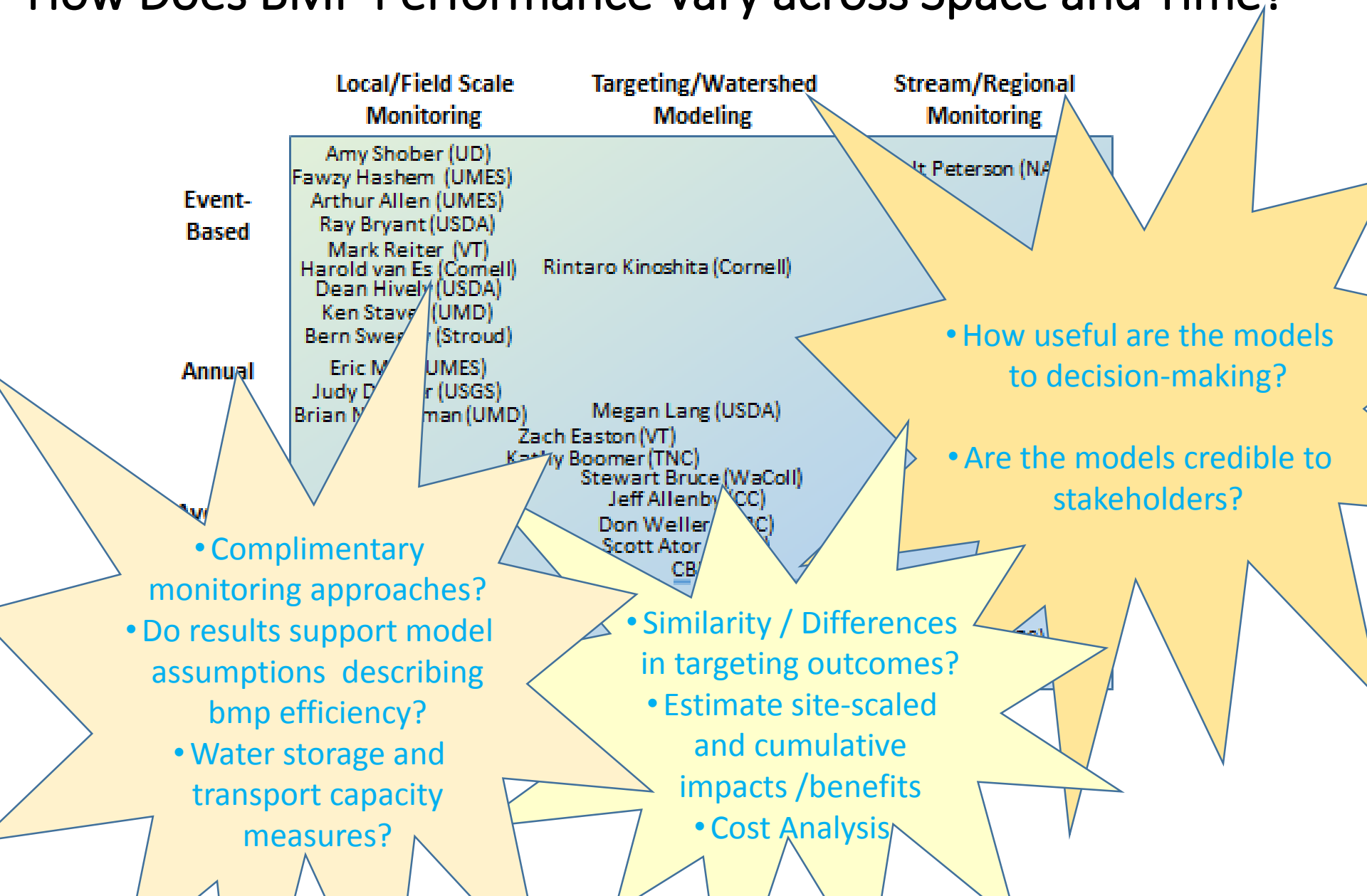
Consortium Meeting: July 7 – 9, 2015
Location: tba

Kathy Boomer
kboomer@tnc.org
607-280-3720

Delmarva RCPP Proposal – Perspective Science Partners:

	Local/Field Scale Monitoring	Targeting/Watershed Modeling	Stream/Regional Monitoring
Event-Based	Amy Shober (UD) Fawzy Hashem (UMES) Arthur Allen (UMES) Ray Bryant (USDA) Mark Reiter (VT) Harold van Es (Cornell) Dean Hively (USDA) Ken Staver (UMD) Bern Sweeny (Stroud)	Rintaro Kinoshita (Cornell)	Walt Peterson (NASA)
Annual	Eric May (UMES) Judy Denver (USGS) Brian Needleman (UMD)	Megan Lang (USDA) Zach Easton (VT) Kathy Boomer (TNC)	Doug Levin (WaCol) Tom Fisher (UMCES) Tom Jordan (SERC)
Average Annual	Greg Noe (USGS)	Stewart Bruce (WaColl) Jeff Allenby (CC) Don Weller (SERC) Scott Ator (USGS) CBP	USGS
Management	Peter Kleinman (USDA)	Rich Batiuk (EPA) Kelly Shenk (EPA)	Scott Phillips (USGS)

Delmarva RCPP Proposal - Promoting Soil and Water Health: How Does BMP Performance Vary across Space and Time?



NRCS Programs and Practices

- Conservation Stewardship Program (CSP)
  - Five year agreement encompassing multiple practices such as split application, precision application, incorporation, enhanced efficiency fertilizer etc.

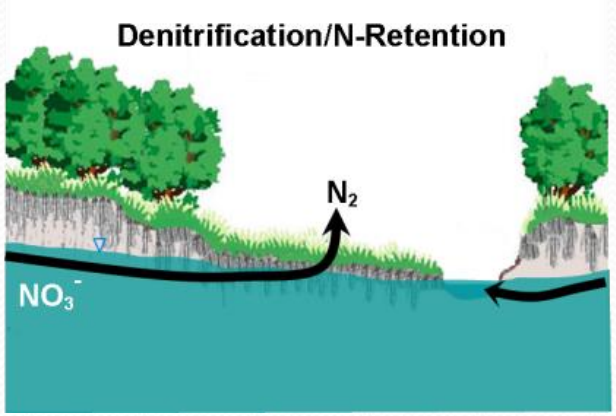
- Environmental Quality Incentive Program (EQIP)
  - Advanced nutrient management
  - Precision Agriculture
  - Grassed waterways

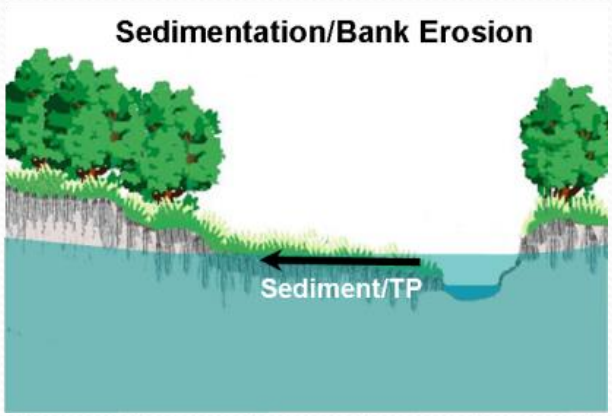
- Wetland Reserve Easement Program (WRE)
  - Permanent easements
  - Include restoration and rehabilitation (cropland and forested areas)

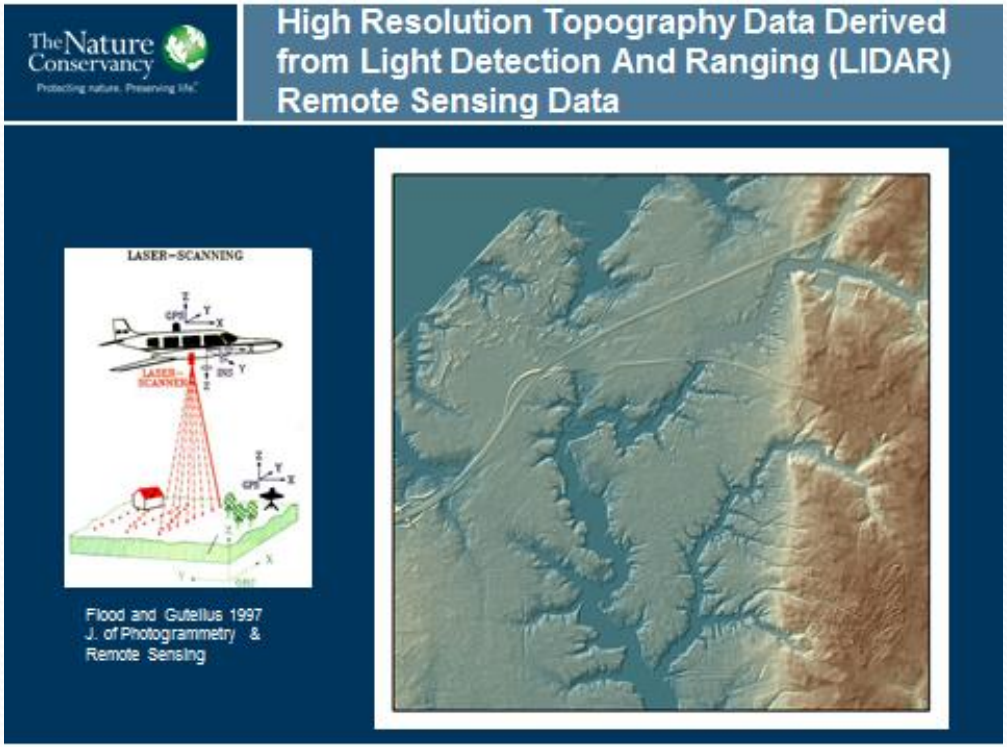
Other Programs to Fund Practices

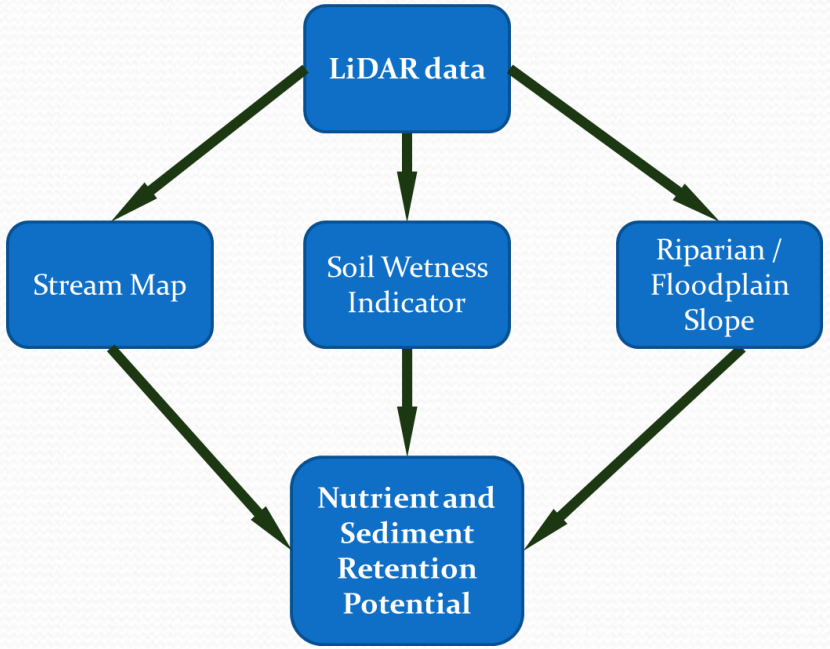
- CREP – Wetlands and Buffers/ Structural Practices
  - Incentive covers costs plus bonus payment
  - 10 year restoration agreement
  - Must have cropping history
- NGOs - Wetlands
  - Choptank – Ducks Unlimited
  - Nanticoke – TNC and DU
  - Pocomoke – TNC
- Rural Legacy, REPI, and Private Funding for Easements
- Maryland Ag Cost Share
- Landowner Adoption

Mapping Restoration Opportunities:









Boomer et al, *in prep*

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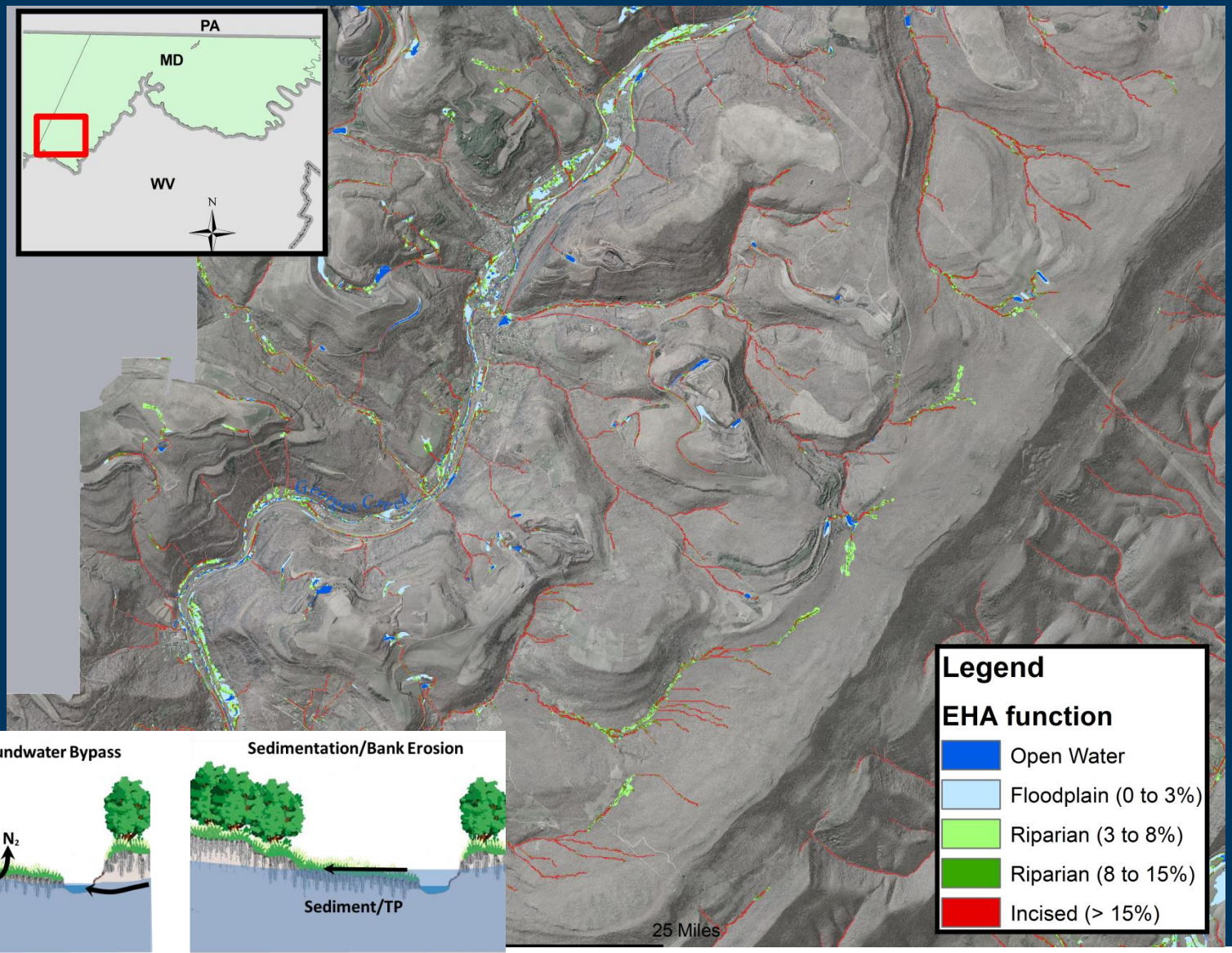
Predicted Eco-hydrologic Active Area (EHA) & Function



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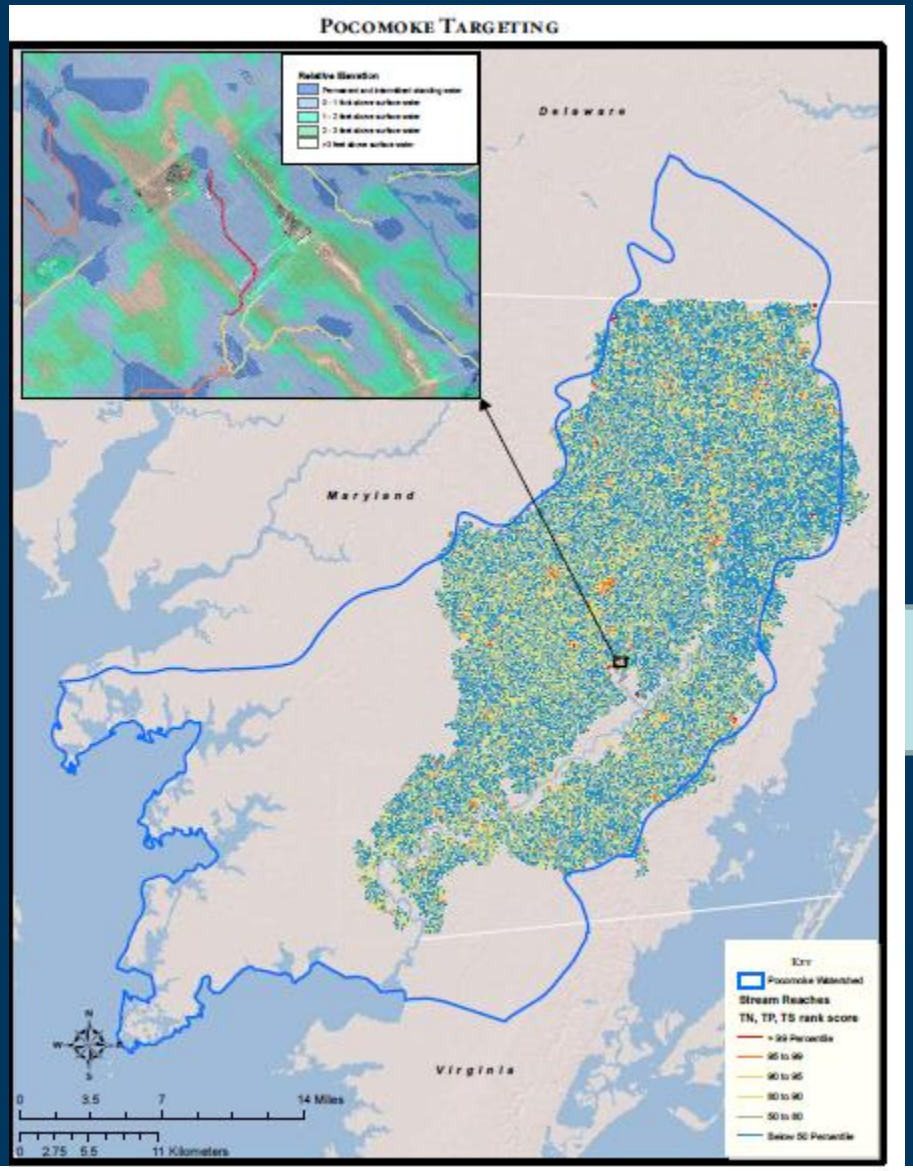
Delmarva RCPP Plans for Modeling / Decision-Making Support



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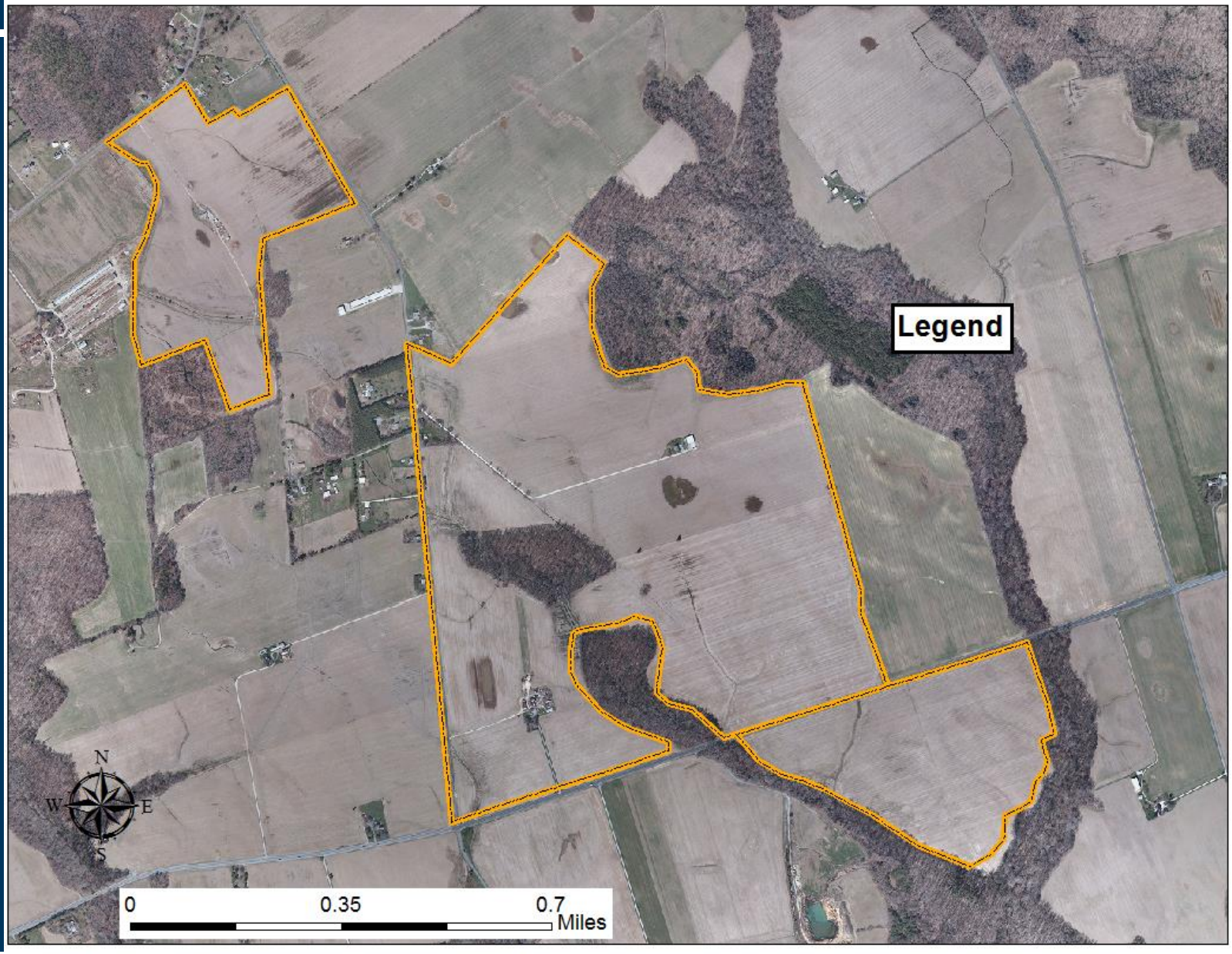
Targeting In-Field Practices



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Targeting In-Field Practices