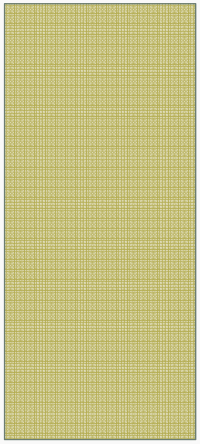
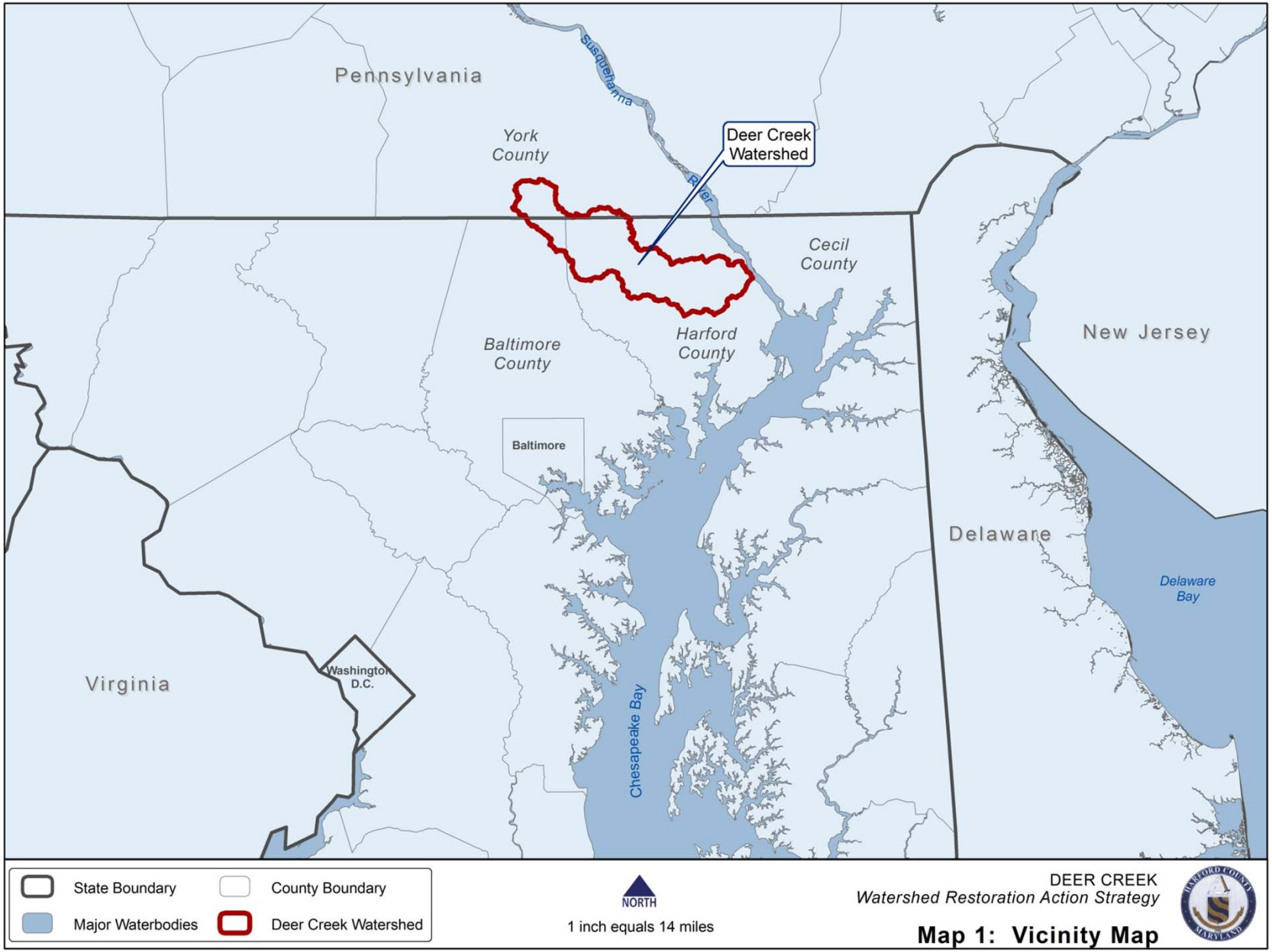
DEER CREEK WATERSHED

MAINTAIN HEALTHY WATERSHEDS
GOAL IMPLEMENTATION TEAM MEETING
JANUARY 11, 2012



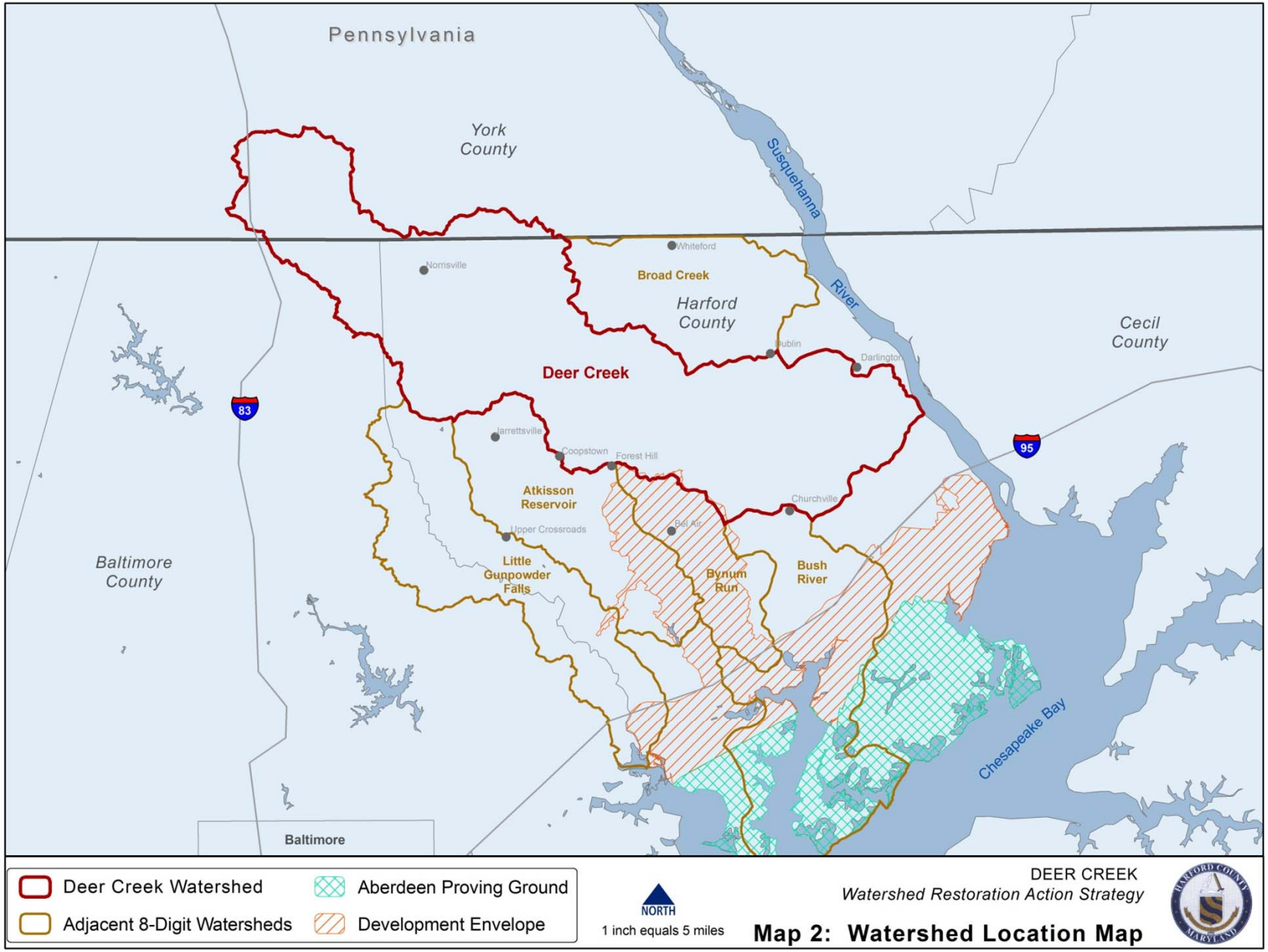
PRESENTATION OVERVIEW

- Deer Creek Conditions
  - Water Quality, Aquatic Resources, Sensitive Species and Habitats, Land Use and Imperviousness
- Watershed Planning
  - Watershed Restoration Action Strategy (WRAS)
  - Prioritization Method
- Implementation and Recent Accomplishments
  - Preservation Strategies
  - Restoration Strategies



DEER CREEK
Watershed Restoration Action Strategy

Map 1: Vicinity Map

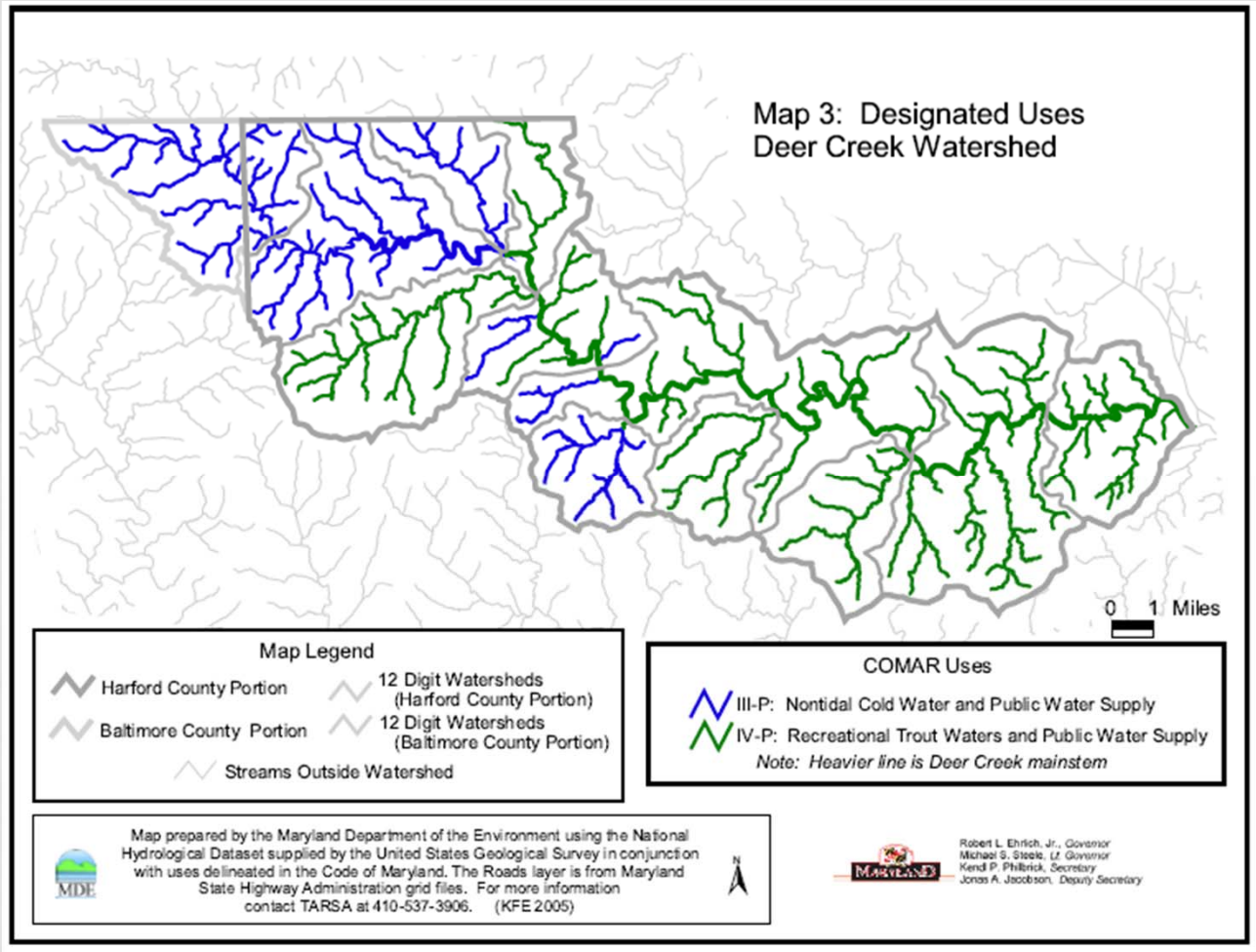

Pennsylvania
York County
Susquehanna River
Whiteford
Norrisville
Broad Creek
Harford County
Cecil County
Dublin
Darlington
Deer Creek
83
95
Jarrettsville
Coopstown
Forest Hill
Atkisson Reservoir
Churchville
Bel Air
Upper Crossroads
Baltimore County
Little Gunpowder Falls
Bynum Run
Bush River
Chesapeake Bay
Baltimore
Deer Creek Watershed
Adjacent 8-Digit Watersheds
Aberdeen Proving Ground
Development Envelope
NORTH
1 inch equals 5 miles
DEER CREEK
Watershed Restoration Action Strategy
Map 2: Watershed Location Map

WATERSHED CONDITIONS

WATER QUALITY, AQUATIC RESOURCES,
SENSITIVE SPECIES AND HABITATS, LAND USE AND IMPERVIOUSNESS

WATER QUALITY

- Designated Uses
  - All Use III-P and IV-P



WATER QUALITY

- Impaired Waters
  - 2006 Listing
    - Several segments listed based on biological impairments

2006 Listings

Table 5: Deer Creek 303(d) list segments

Listing Category	Code	WRAS Subwatershed Name
2	02120202	Deer Creek
	021202020321	Lower Deer Creek
	021202020322	Lower Deer Creek Tobacco Run Coolbranch and Lower Deer Creek Mill Hopkins Hollands Graveyard
	021202020327	Middle Deer Creek Rock Hollow Wet Stone
	021202020329	Falling Branch
	021202020331	Big Branch
3a	021202020323	Thomas Run
	021202020324	Middle Deer Creek St. Omar, Middle Deer Creek, Middle Deer Creek Kellogg
	021202020326	Stirrup Run
5	021202020325	Stout Bottle Cabbage Run
	021202020330	Upper Deer Creek Jackson Branch and Island Branch
	021202020328	Little Deer Creek Lower and Upper
	021202020332	Upper Deer Creek Plumtree

Listing Categories

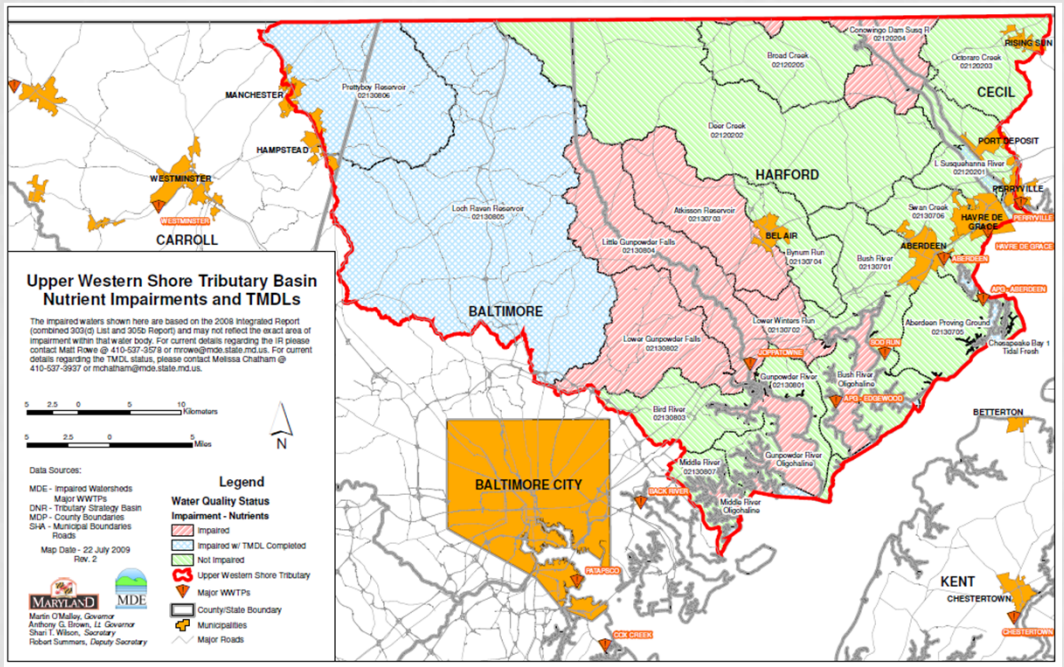
2: meeting some standards but insufficient information to determine attainment of other standards

3a: insufficient quantity of data and information to determine waterbody attainment status

5: waterbodies that may require a TMDL

WATER QUALITY

- Impaired Waters
  - 2006 Listing
    - Several segments listed based on biological impairments
  - 2010 Listing
    - No impairments listed
    - Deer Creek listed as Category 2 – Clean Waters



AQUATIC RESOURCES

- MBSS data (1995-2005) indicate a majority of 'Good' and 'Fair' biological conditions

Table 6: Summary MBSS and Stream Waders Data

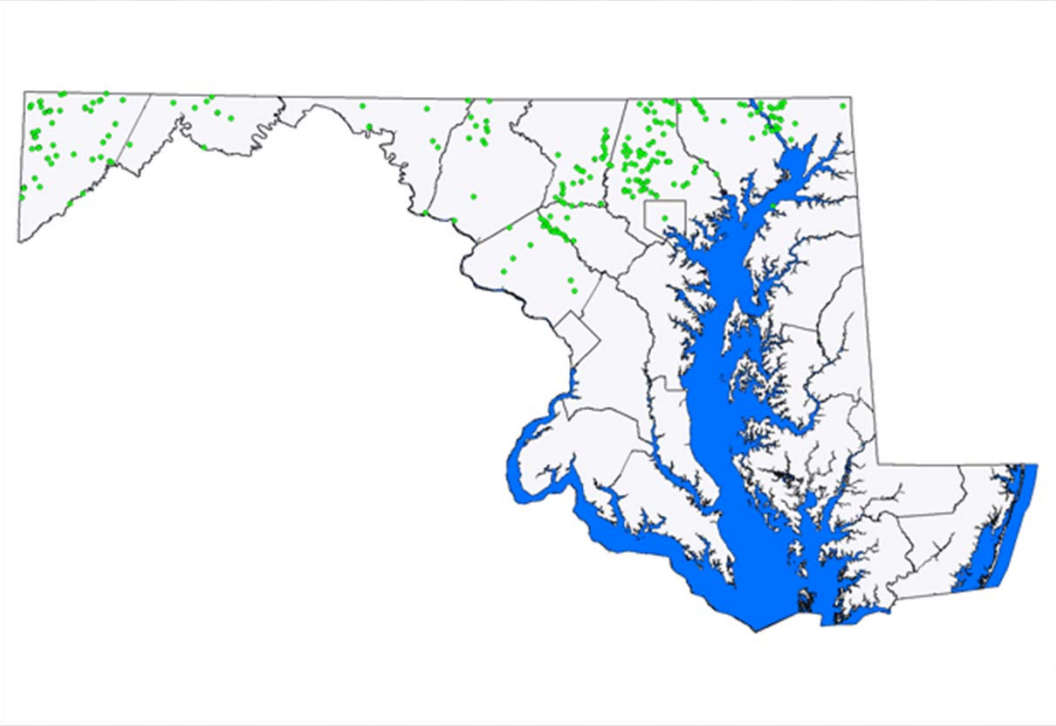
Type	Source	Sample Number	Good	Fair	Poor	Very Poor
BIBI	MBSS	63	39 (61.9)	20 (31.7)	2 (3.2)	2 (3.2)
BIBI	Stream Waders*	171	45 (26.3)	91 (53.2)	26 (15.2)	9 (5.3)
FIBI	MBSS	52	26 (50.0)	15 (28.8)	4 (7.7)	7 (13.5)

* Stream Waders assessment uses a family level BIBI rather than the genus level BIBI used by MBSS.

- Fish Passage
  - MDNR Fish Passage Program Blockages - 7
  - SCA (2005) - 37 total blockages
  - SCA (2011) – 10 total blockages (3 road crossings)

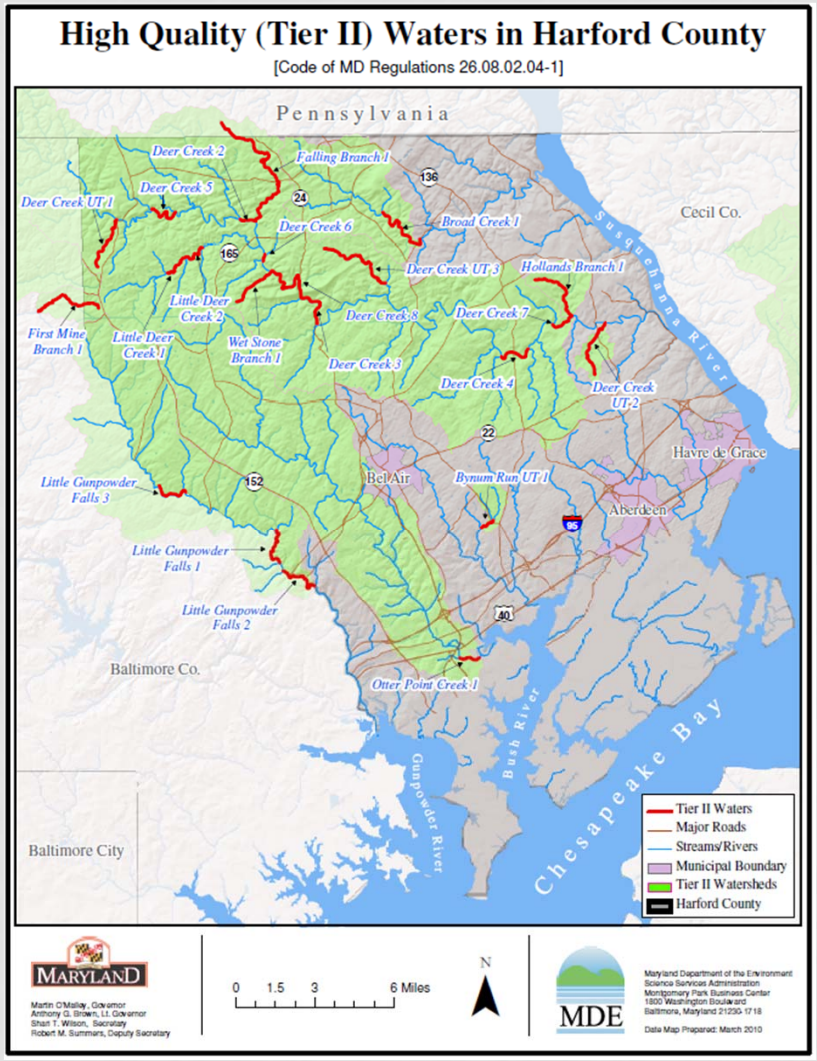
AQUATIC RESOURCES

- Brown trout distribution (MBSS data, 1995-2002)
- Trout spawning areas 9 out of 10 (MDNR Indicator)
- Trout located in 10 of 20 WRAS subwatersheds



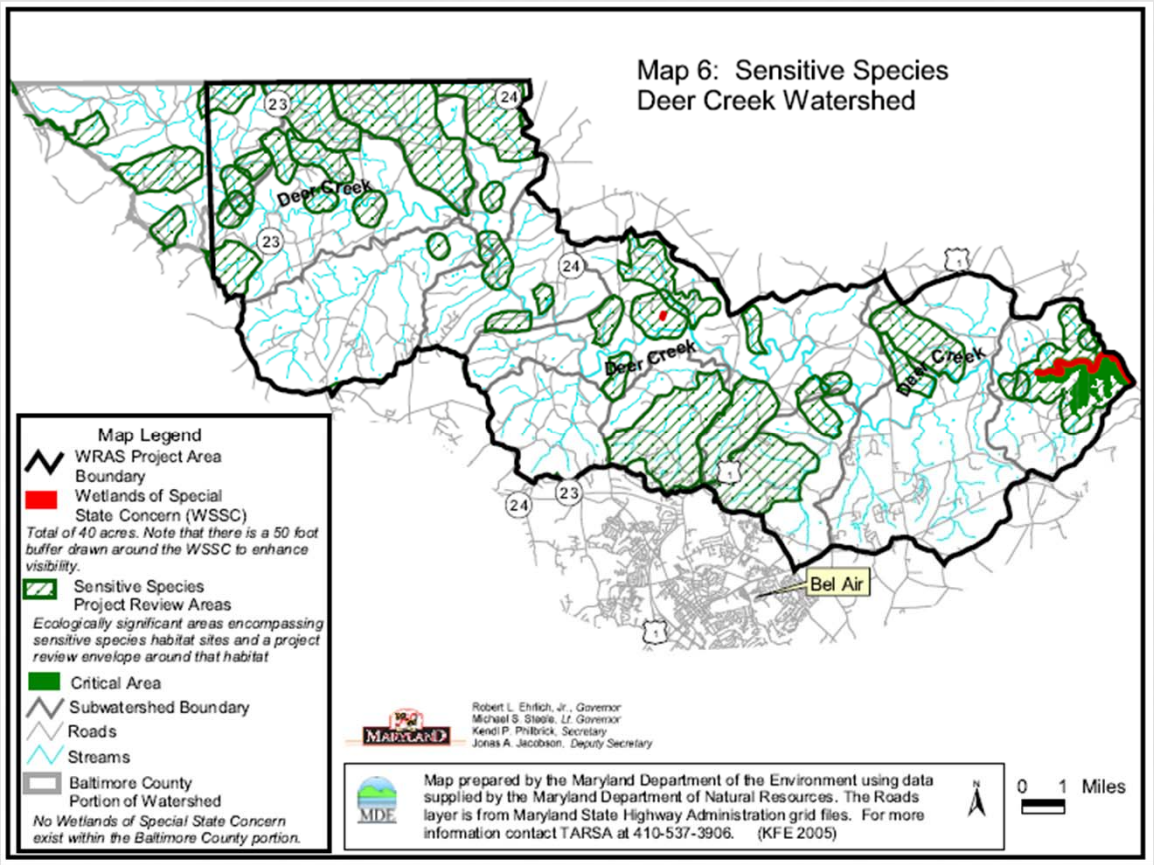
AQUATIC RESOURCES

- Tier II Waters
  - Antidegradation Policy for high quality waters
  - Several segments in Deer Creek
  - Requires a higher level of review for changes to County plans or discharge permits
- Biodiversity
  - Deer Creek ranked #3 in the state



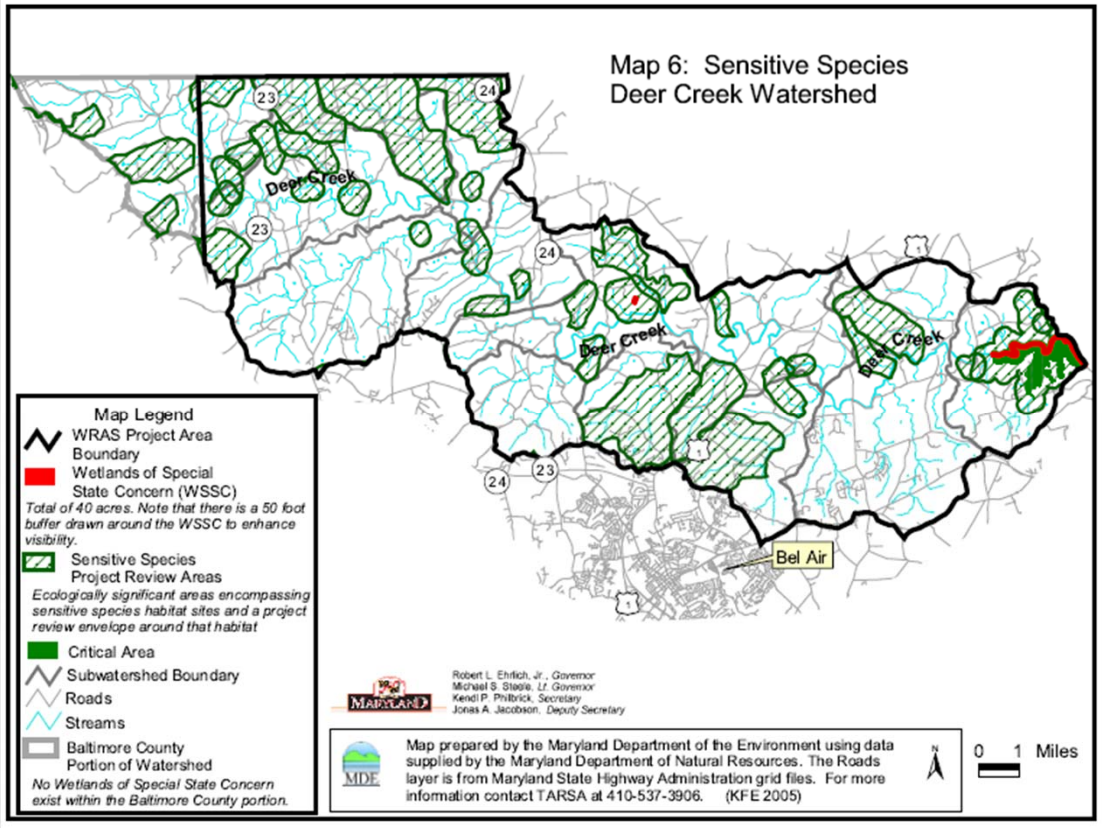
SENSITIVE SPECIES AND HABITATS

- Sensitive Species Project Review Areas (SSPRA)
  - Bald eagle
  - Bog turtle
  - Maryland darter



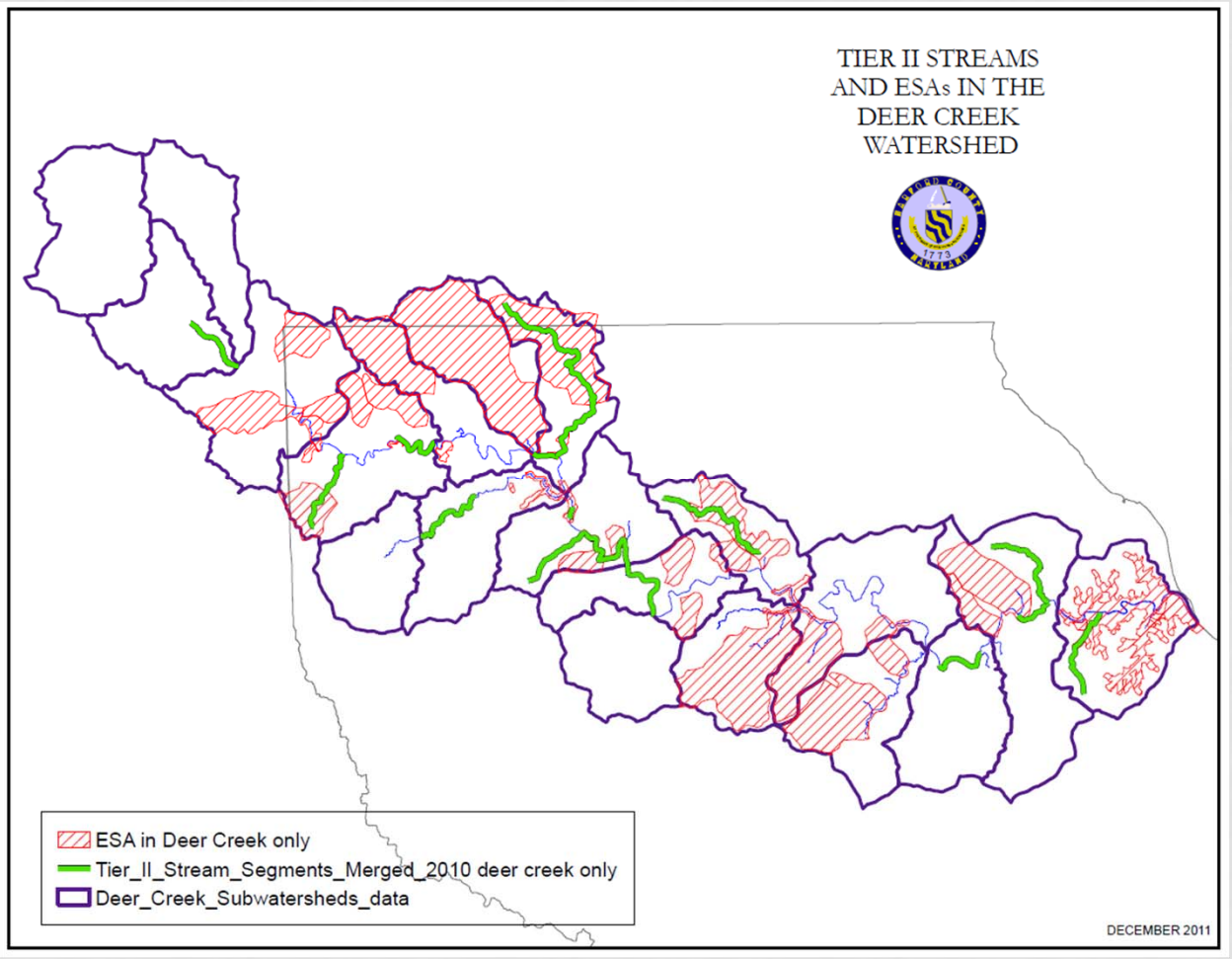
SENSITIVE SPECIES AND HABITATS

- Chesapeake Bay Critical Area (CBCA)
  - Habitats of Local Significance (HLS)
    - Deer Creek Hillside
    - Stafford Road Slopes
    - Northern Susquehanna Canal
    - Elbow Branch
    - Deer Creek Pumping Station
- Wetlands of Special State Concern (WSSC)
  - Deer Creek Serpentine Barren
  - Deer Creek – in the CBCA



SENSITIVE SPECIES AND HABITATS

- Ecologically Significant Areas (ESA)



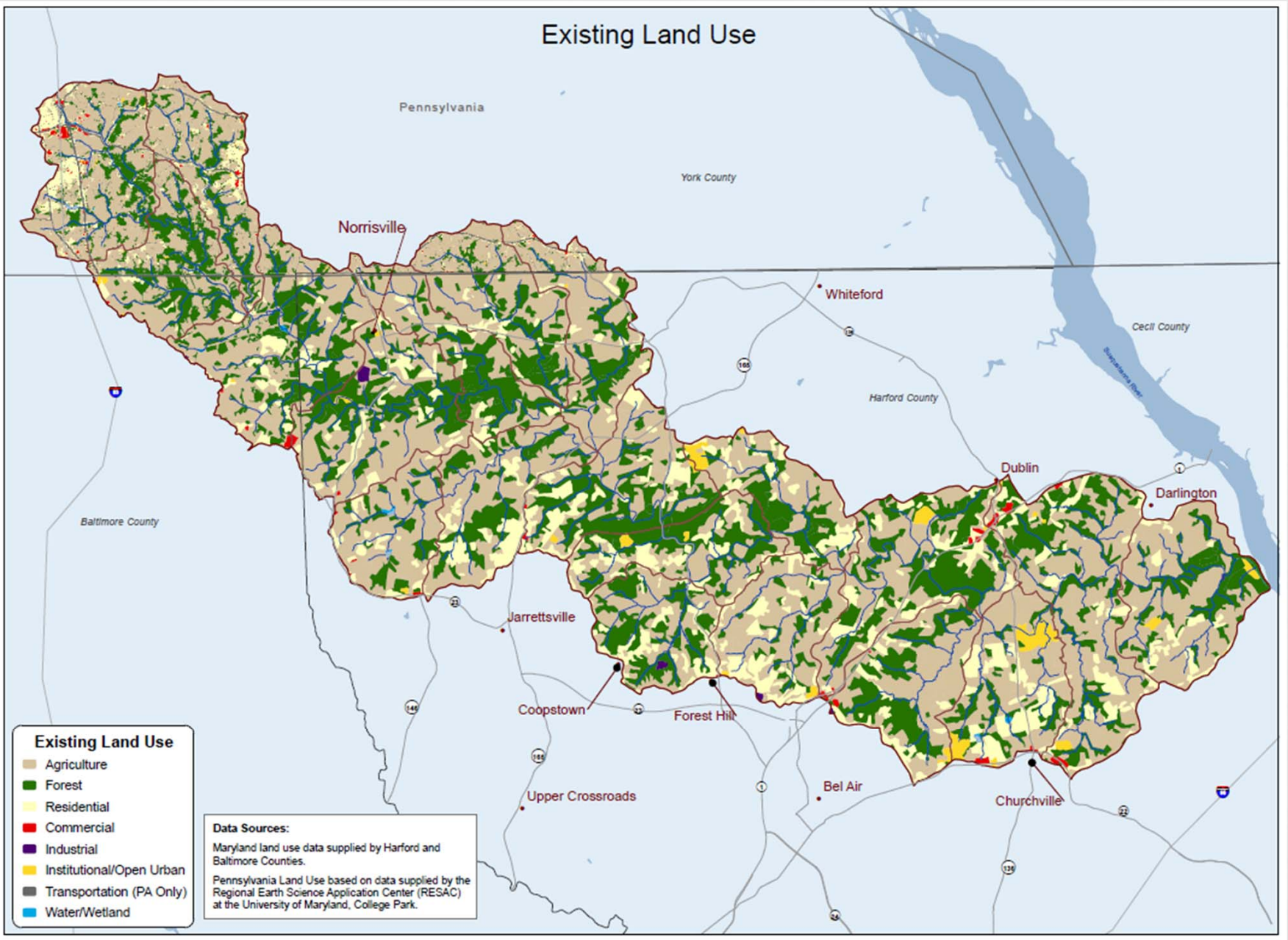
LAND USE AND IMPERVIOUSNESS

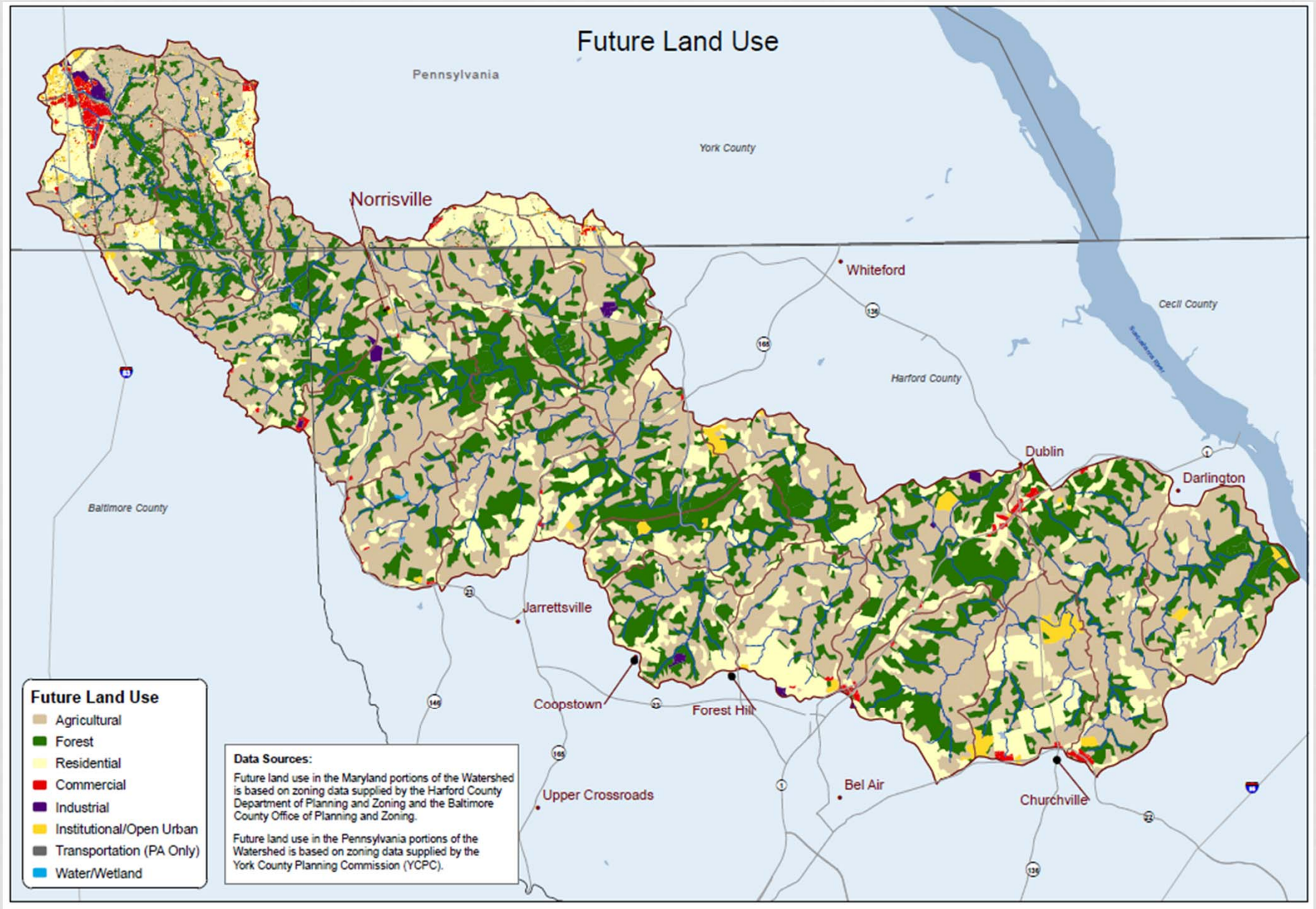
- Existing and Future Land Use Analysis (2007)
  - Only minor land use changes projected

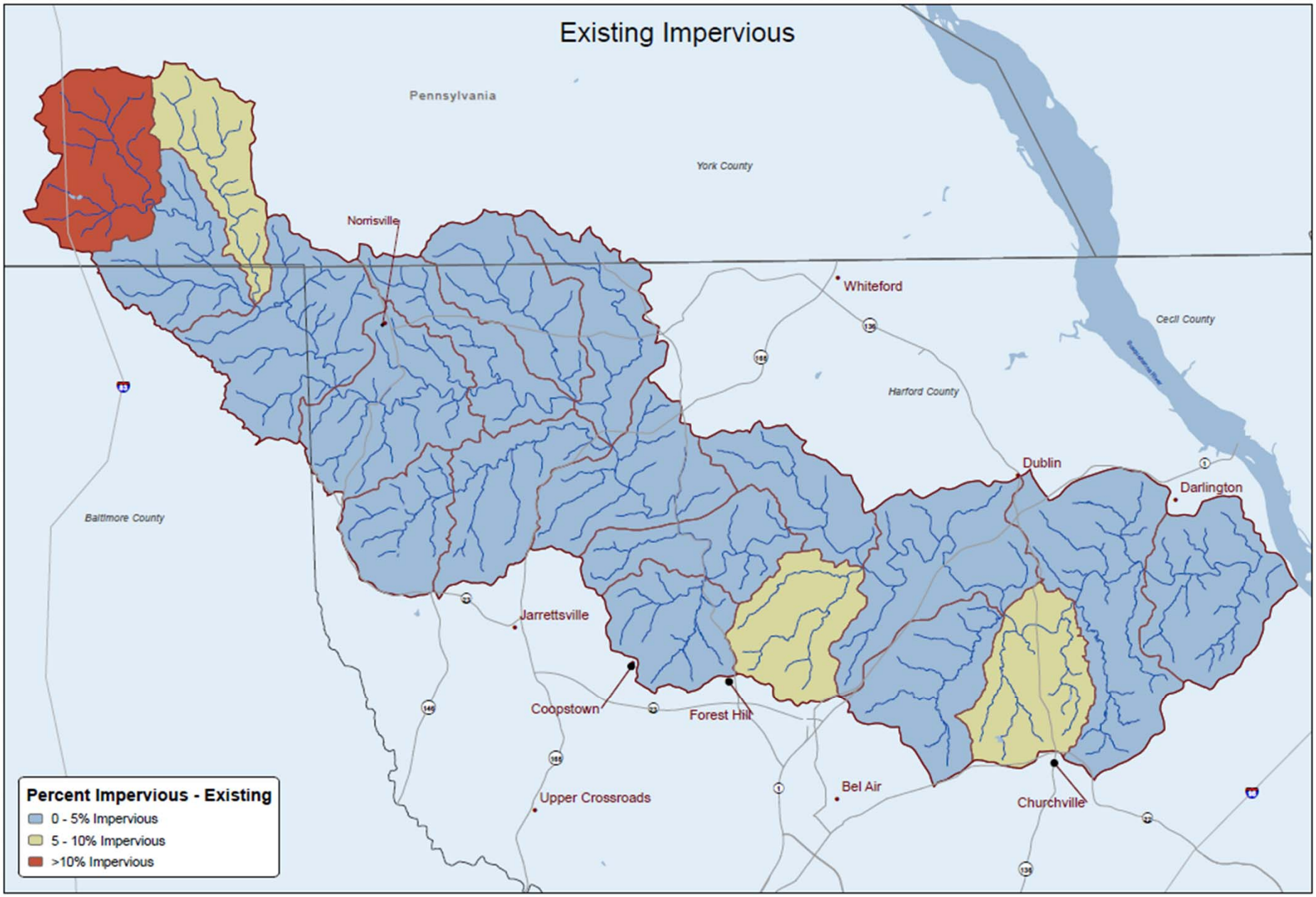
Table 11: Summarized Landuse

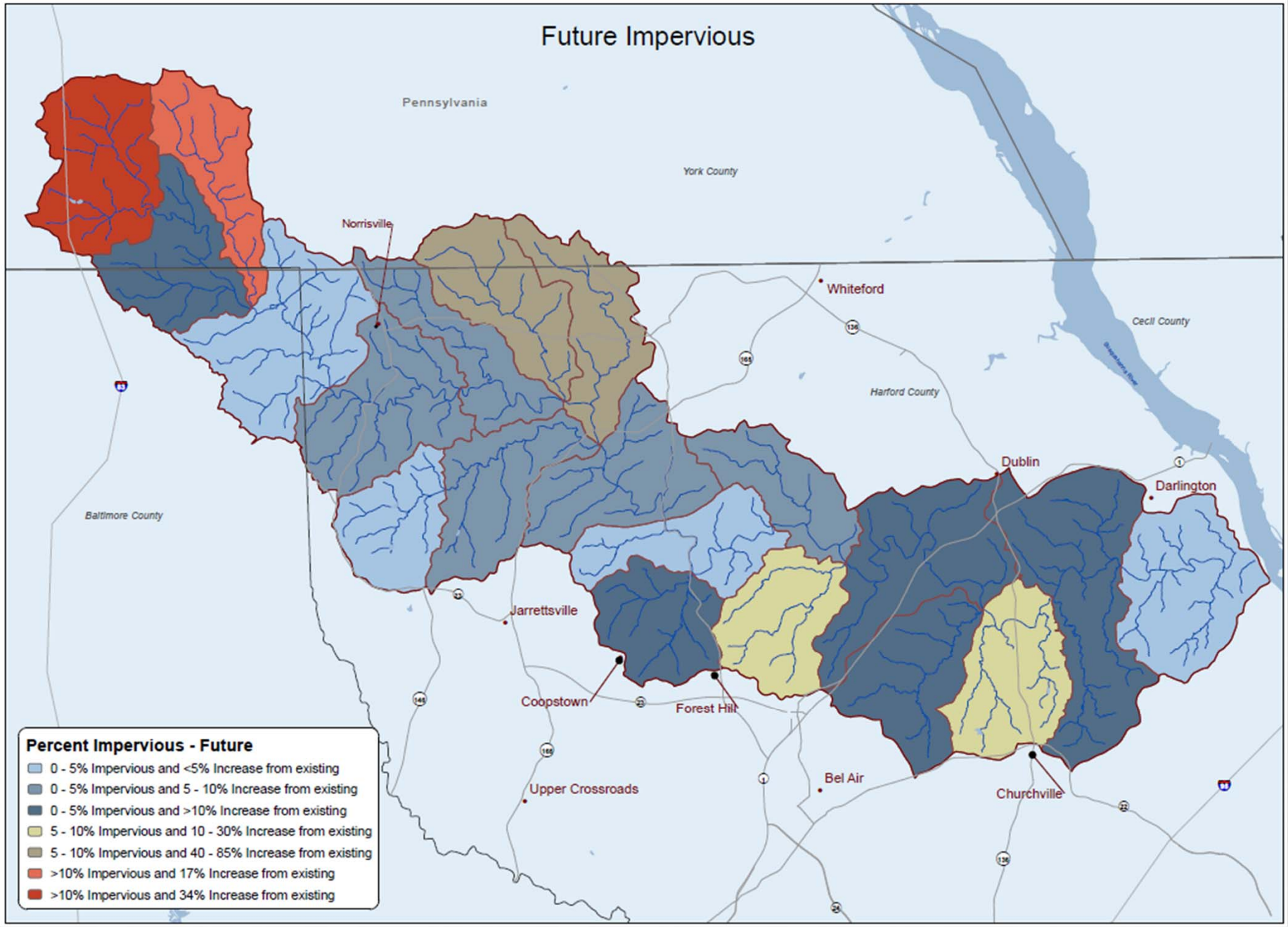
Land Use (Combined*)	Existing Percent of Watershed	Future Percent of Watershed	Change Percent
Residential	12.3	16.0	+3.7
Commercial/Institutional	1.2	2.2	+1.0
Road	0.7	0.7	0.0
Industrial	0.1	0.4	+0.3
Forest	30.5	29.3	-1.2
Rural/Agricultural	54.7	51.1	-3.6
Open Urban/Bare Ground	0.4	0.3	-0.1
Water/Wetland	0.1	0.1	0.0

*land use categories have been combined for descriptive purposes


Existing Land Use
Pennsylvania
York County
Norrisville
Whiteford
Cecil County
Harford County
Susquehanna River
Dublin
Darlington
Baltimore County
Jarrettsville
Coopstown
Forest Hill
Upper Crossroads
Bel Air
Churchville
Existing Land Use
Agriculture
Forest
Residential
Commercial
Industrial
Institutional/Open Urban
Transportation (PA Only)
Water/Wetland
Data Sources:
Maryland land use data supplied by Harford and Baltimore Counties.
Pennsylvania Land Use based on data supplied by the Regional Earth Science Application Center (RESAC) at the University of Maryland, College Park.


Future Land Use
Pennsylvania
York County
Norrisville
Whiteford
Cecil County
Harford County
Baltimore County
Dublin
Darlington
Jarrettsville
Coopstown
Forest Hill
Upper Crossroads
Bel Air
Churchville
Future Land Use
Agricultural
Forest
Residential
Commercial
Industrial
Institutional/Open Urban
Transportation (PA Only)
Water/Wetland
Data Sources:
Future land use in the Maryland portions of the Watershed is based on zoning data supplied by the Harford County Department of Planning and Zoning and the Baltimore County Office of Planning and Zoning.
Future land use in the Pennsylvania portions of the Watershed is based on zoning data supplied by the York County Planning Commission (YCPC).


Existing Impervious
Pennsylvania
York County
Norrisville
Whiteford
Cecil County
Harford County
Dublin
Darlington
Baltimore County
Jarrettsville
Coopstown
Forest Hill
Upper Crossroads
Bel Air
Churchville
Percent Impervious - Existing
0 - 5% Impervious
5 - 10% Impervious
>10% Impervious


Future Impervious
Pennsylvania
York County
Norrisville
Whiteford
Cecil County
Harford County
Baltimore County
Dublin
Darlington
Jarrettsville
Coopstown
Forest Hill
Upper Crossroads
Bel Air
Churchville
Percent Impervious - Future
0 - 5% Impervious and <5% Increase from existing
0 - 5% Impervious and 5 - 10% Increase from existing
0 - 5% Impervious and >10% Increase from existing
5 - 10% Impervious and 10 - 30% Increase from existing
5 - 10% Impervious and 40 - 85% Increase from existing
>10% Impervious and 17% Increase from existing
>10% Impervious and 34% Increase from existing

WATERSHED PLANNING

DEER CREEK WRAS

DEER CREEK WRAS

- WRAS Completed in 2007
- Watershed Characterization, Synoptic Survey, Stream Corridor Assessment
- Stakeholder Committee
- Characterize and Prioritize Subwatersheds
  - Protection and Restoration
- Identify Management Strategies
- Implementation Plan

PRIORITIZATION

- Procedure
  - Identify Goals
  - Identify Scale
  - Potential Indicators
  - Data Conversion
  - Scaled Indicator Score
  - Indicator Weights
  - Total Scaled Score and Priority Rank

PRIORITIZATION

- Procedure
  - **Identify Goals**
    - **Protection and Restoration**
  - Identify Scale
  - Potential Indicators
  - Data Conversion
  - Scaled Indicator Score
  - Indicator Weights
  - Total Scaled Score and Priority Rank

PRIORITIZATION

- Procedure
  - Identify Goals
    - Protection and Restoration
  - **Identify Scale – planning unit**
    - Watershed, **Subwatershed**, Catchment, Reach, Site
  - Potential Indicators
  - Data Conversion
  - Scaled Indicator Score
  - Indicator Weights
  - Total Scaled Score and Priority Rank

PRIORITIZATION

- Procedure
  - Identify Goals
    - Protection and Restoration
  - Identify Scale
    - Watershed, Subwatershed, Reach, Site
  - **Potential Indicators**
    - **Type and Sources**
    - **Test data for Coverage, Quality, Effectiveness and Duplication**
  - Data Conversion
  - Scaled Indicator Score
  - Indicator Weights
  - Total Scaled Score and Priority Rank

PRIORITIZATION

- Procedure
  - Identify Goals
    - Protection and Restoration
  - Identify Scale
    - Watershed, Subwatershed, Reach, Site
  - Potential Indicators
    - Type and Sources
    - Test data for Coverage, Quality, Effectiveness and Duplication
  - **Data Conversion**
    - **Aggregate data to match scale**
    - **Normalize to correct for differences in area or length**
  - Scaled Indicator Score
  - Indicator Weights
  - Total Scaled Score and Priority Rank

PRIORITIZATION

- Procedure
  - Identify Goals
    - Protection and Restoration
  - Identify Scale
    - Watershed, Subwatershed, Reach, Site
  - Potential Indicators
    - Type and Sources
    - Test data for Coverage, Quality, Effectiveness and Duplication
  - Data Conversion
    - Aggregate data to match scale
    - Normalize to correct for differences in area or length
  - **Scale Indicator Score**
    - **Absolute, relative, categories**
    - **0-10 and combination Absolute and Relative**
  - Indicator Weights
  - Total Scaled Score and Priority Rank

PRIORITIZATION

Indicator	Type	Data Source	Spatial Coverage, Counties and Subwatersheds	Potential Scoring (Scaling)	Data conversion/ Normalized Unit
Restoration					
Instream Habitat Quality	Stream Condition	MBSS	H, B 19/20	Range of values (Poor 0-5; Fair 6-15, Good 16-20) or **Relative** range	Weighted Average or **Average** for subwatershed
		SRBC	H, B, Y 4/20	Range of percent comparability values (Excellent >90; Supporting 89-75; Partially Supporting 74-60; Nonsupporting <60) or **Relative** range	Supplement to MBSS, 4 sites along MD-PA border
Fish	Stream Condition	MBSS	H, B 19/20	Range of IBI scores (Very Poor 1.0-1.9 Poor 2.0-2.9; Fair 3.0-3.9; Good 4.0-5.0) or **Relative** range	Weighted Average or **Average** for subwatershed
Benthic Macroinvertebrate	Stream Condition	MBSS	H, B 19/20	Range of IBI scores (Very Poor 1.0-1.9 Poor 2.0-2.9; Fair 3.0-3.9; Good 4.0-5.0) or **Relative** range	Weighted Average **Average** for subwatershed
		SRBC	H, B, Y 4/20	Range of percent comparability values (Nonimpaired >83; Slightly Impaired 79-54; Moderately Impaired 50-21; Severely Impaired <17) or **Relative** range	Supplement to MBSS, 4 sites along MD-PA border

PRIORITIZATION

Indicator	Type	Data Source	Spatial Coverage, Counties and Subwatersheds	Potential Scoring (Scaling)	Data conversion/ Normalized Unit
Restoration					
Nitrogen (NO_2+NO_3) loads	Water Quality	Synoptic	H, B 19/20	Range of values (Baseline <0.01; Moderate 0.01-0.02; High 0.02-0.03; Excessive >0.03) or **Relative** range	Kg/ha/day (converted to lb/ac/yr)
pH	Water Quality	Synoptic	H, B 19/20	Range of values (Low <5.5; Marginal 5.5-6.5; Neutral 6.5-7.5; Basic >7.5) or **Relative** range	Average for subwatershed
Conductivity	Water Quality	Synoptic	H, B 19/20	Range of mmohs/cm values (<100, 100-200, 200-300, >300) or **Relative** range	Average for subwatershed
Temperature	Water Quality	Synoptic	H, B 19/20	Range of degrees Celsius values (<10, 10-14, 14-18,>18) or **Relative** range	Average for subwatershed
Nitrogen loads	Water Quality	WTM	H, B, Y 20/20	Relative range of values	Annual load per acre (lb/ac/yr)
Phosphorus loads	Water Quality	WTM	H, B, Y 20/20	Relative range of values	Annual load per acre (lb/ac/yr)
Sediment loads	Water Quality	WTM	H, B, Y 20/20	Relative range of values	Annual load per acre (lb/ac/yr)

PRIORITIZATION

Indicator	Type	Data Source	Spatial Coverage, Counties and Subwatersheds	Potential Scoring (Scaling)	Data conversion/ Normalized Unit
Restoration					
Riparian Stream Buffers	Landscape	MDP	H, B 19/20	Relative range of values	Percent or **total length** (miles) of stream with no riparian buffer or Percent of riparian area with no buffer
Imperviousness	Landscape	MDP and RESAC	H, B, Y 20/20	**Relative** range of values, literature value breakpoints	Percent of subwatershed area with impervious surface

PRIORITIZATION

- Procedure
  - Identify Goals
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  - Identify Scale
    - Watershed, Subwatershed, Reach, Site
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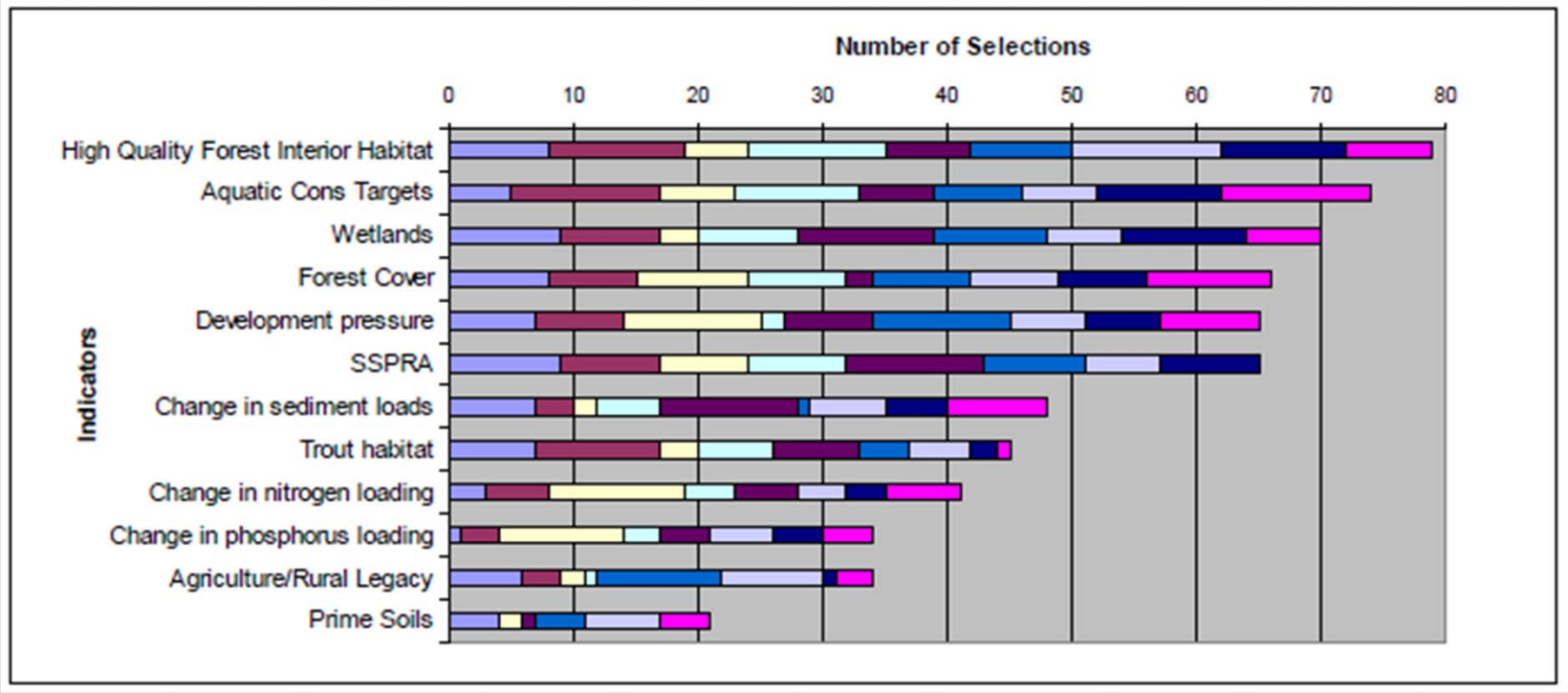
    - Type and Sources
    - Test data for Coverage, Quality, Effectiveness and Duplication
  - Data Conversion
    - Aggregate data to match scale
    - Normalize to correct for differences in area or length
  - Scale Indicator Score
    - Absolute, relative, categories
    - 0-10 and combination Absolute and Relative
  - **Indicator Weights**
    - **Paired Comparison**
  - Total Scaled Score and Priority Rank

PRIORITIZATION

- Paired Comparison Example
  - Protection Indicators



PRIORITIZATION

Restoration Indicator	Weight	Protection Indicator	Weight
Benthic Macroinvertebrates	11.6	High quality Forest Interior Habitat	12.0
Riparian Stream Buffers	11.6	Aquatic Conservation Targets	11.3
Nitrogen loads (sampled)	11.4	Wetland	10.7
Imperviousness	**11.3**	Forest cover	10.1
Fish	8.9	Development Pressure	10.0
Temperature	8.9	SSPRA	10.0
Sediment loads (modeled)	8.1	Change in Sediment loads	7.5
Instream Habitat Quality	7.8	Trout Habitat	7.1
Phosphorus loads (modeled)	7.0	Change in Nitrogen loads	6.5
Nitrogen loads (modeled)	6.3	Change in Phosphorus loads	5.5
pH	4.6	Agriculture/Rural Legacy	5.5
Conductivity	2.5	Prime Soils	3.7

PRIORITIZATION

	Raw Value	Normalized	Scaled Score	Weighted Score		Raw Value	Normalized	Scaled Score	Weighted Score
ID	Existing Imp. Area (acres)	Ex. Imp. Percent	(0-10)	11.3	ID	Existing Imp. Area (acres)	Ex. Imp. Percent	(0-10)	11.3
1	160.34	3.12	2.1	**24**	11	205.09	3.52	3.6	**41**
2	181.35	3.82	7.3	**82**	12	249.04	3.50	3.1	**35**
3	97.02	2.32	0.0	**0**	13	157.33	3.75	6.8	**77**
4	185.92	3.61	4.7	**53**	14	237.34	5.10	8.4	**95**
5	118.71	3.06	1.5	**17**	15	190.57	3.60	4.2	**47**
6	173.07	2.68	0.5	**6**	16	176.58	3.61	4.7	**53**
7	361.64	4.00	7.8	**88**	17	683.38	11.00	10.0	**113**
8	399.62	7.43	8.9	**100**	18	350.85	7.97	9.4	**106**
9	144.99	3.61	4.7	**53**	19	226.04	3.39	2.6	**29**
10	162.65	3.71	6.3	**71**	20	222.92	2.89	1.0	**11**

PRIORITIZATION

- Procedure
  - Identify Goals
    - Protection and Restoration
  - Identify Scale
    - Watershed, Subwatershed, Reach, Site
  - Potential Indicators
    - Type and Sources
    - Test data for Coverage, Quality, Effectiveness and Duplication
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  - Scale Indicator Score
    - Absolute, relative, categories
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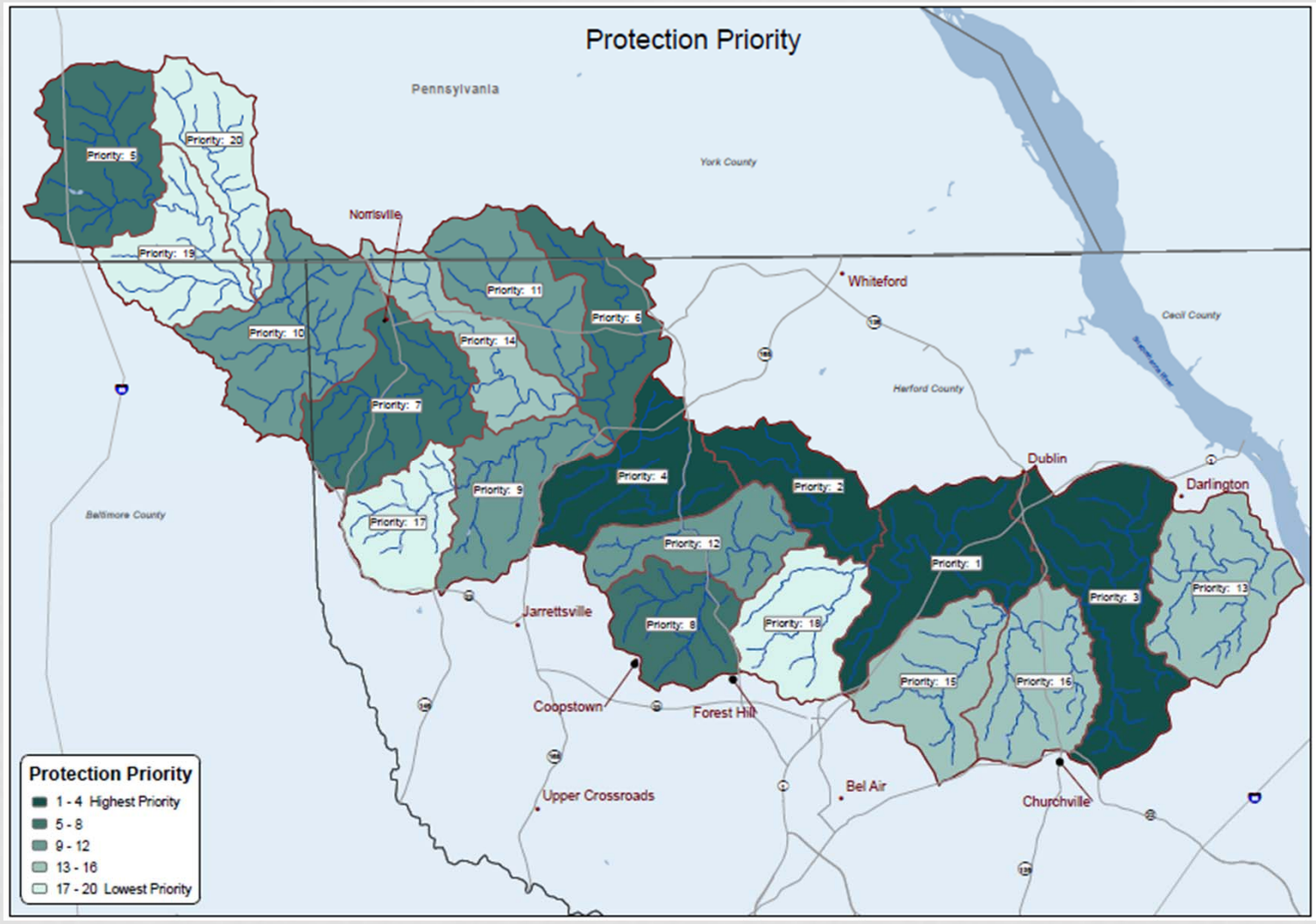
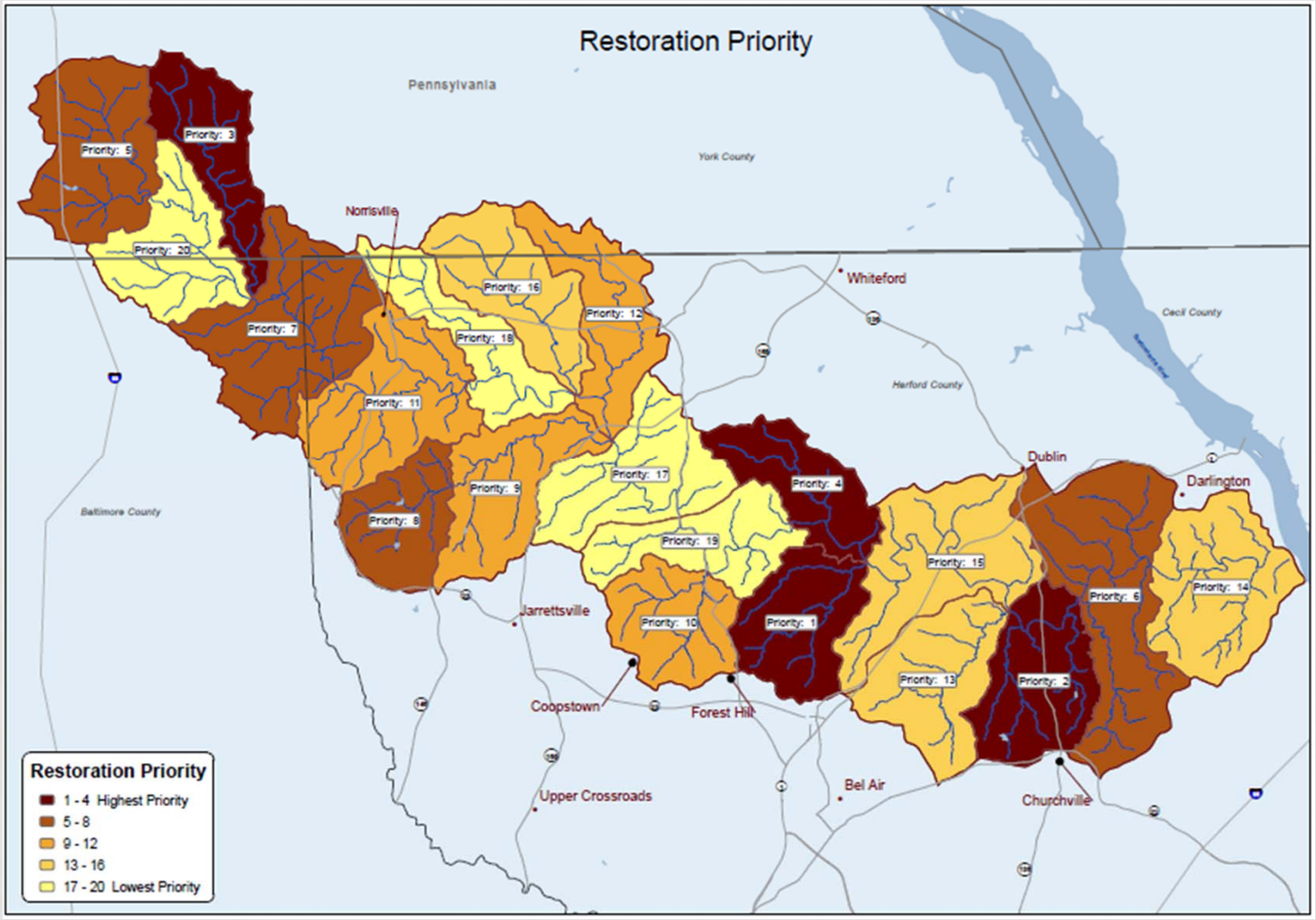
    - Paired Comparison
  - **Total Scaled Score and Priority Rank**

PRIORITIZATION



PRIORITIZATION



DEER CREEK WRAS

- Identify Management Strategies
  - Agricultural
  - Natural Resources
  - Development
  - Education and Outreach
  - Interjurisdictional Coordination
- Implementation Plan / Strategies
  - Benefit
  - Responsible Party
  - Timeline
  - Success / Performance Measure
  - Outreach and Education Component
  - Cost and Funding

IMPLEMENTATION

PRESERVATION, RESTORATION

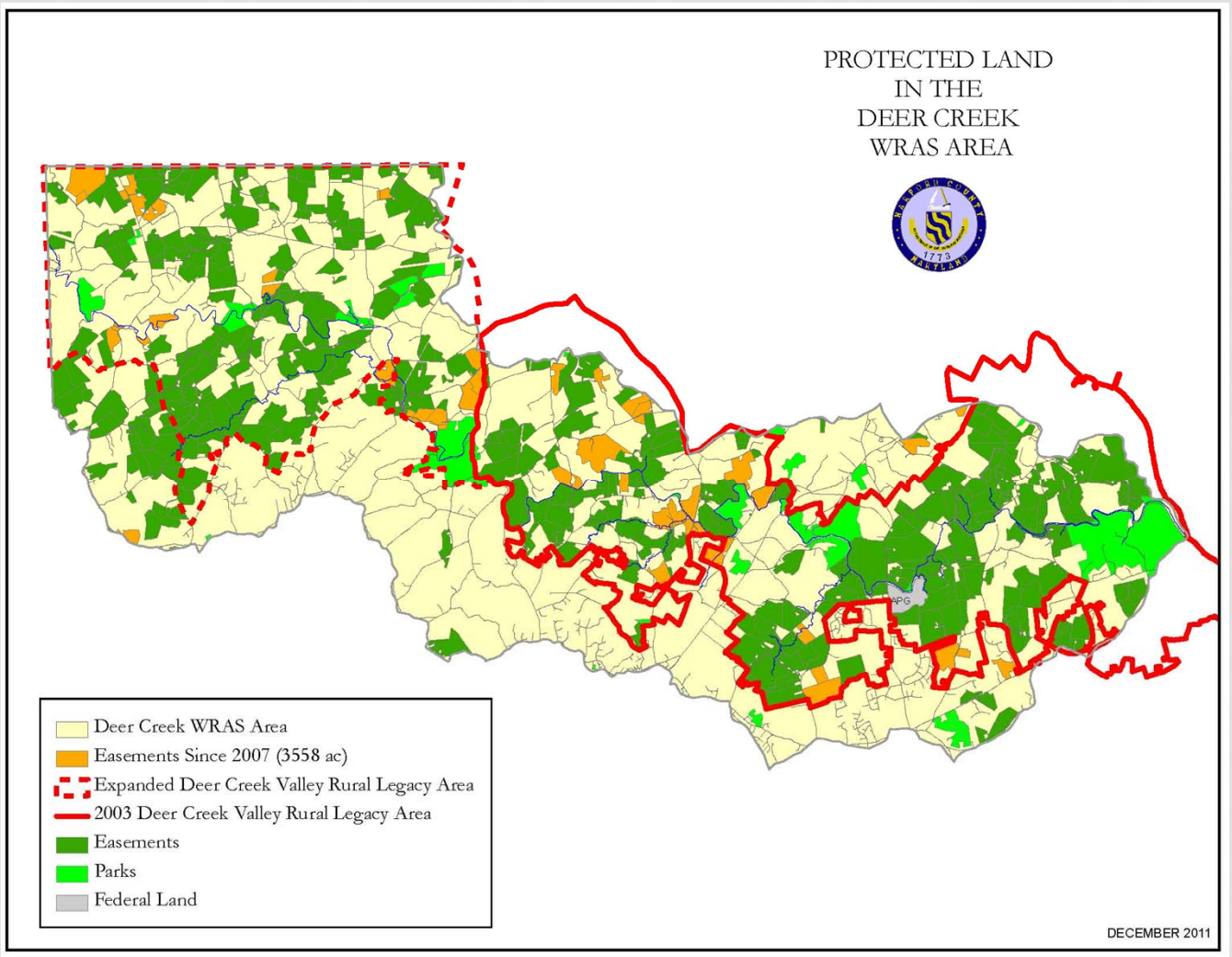
IMPLEMENTATION

- Implementation Strategies
  - Agricultural BMPs
  - Riparian Buffers
  - Land Preservation
  - Outreach

PRESERVATION

- Recent Accomplishments
  - Expansion of the Deer Creek Rural Legacy Area
  - Designation of the watershed as the County's Priority Preservation Area
  - Since June 2007 Harford County has added 3,558 acres of easements (both Rural Legacy and Agricultural) in the Deer Creek watershed.
  - One of the latest Rural Legacy easements in a 265 acre camp with a designated WSSC and serpentine barrens.

PRESERVATION



RESTORATION

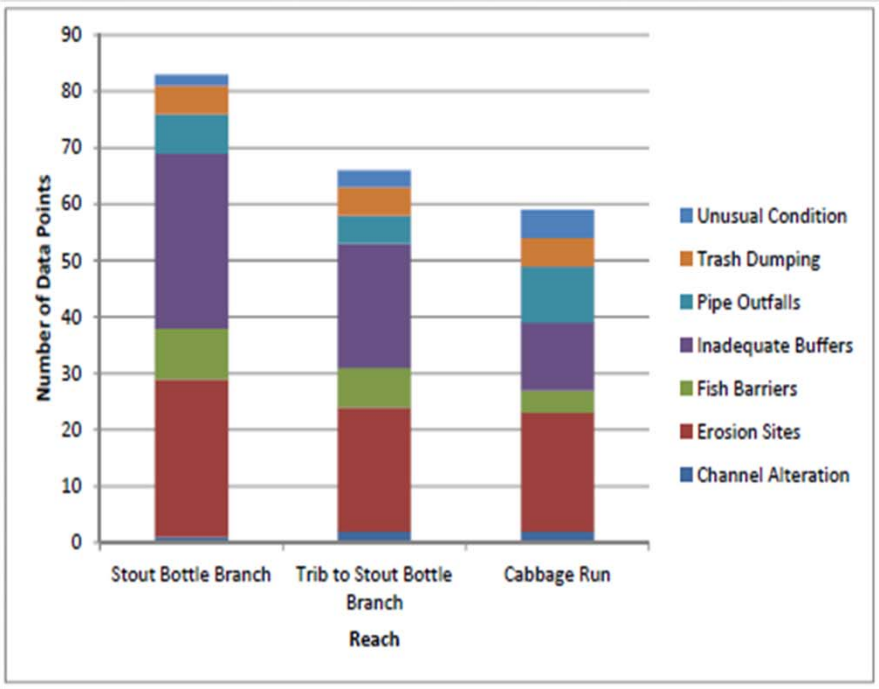
- Recent Accomplishments
  - NRCS CTA (Conservation Technical Assistance) Grant awarded to implement the Deer Creek WRAS in 2010 ($400,000)
  - Three Major Initiatives
    - Planning and Design for Agricultural BMPs
    - Subwatershed Assessment for Stout Bottle/Cabbage Run
      - ranked #1 priority for restoration in WRAS
    - Hire an Outreach Coordinator

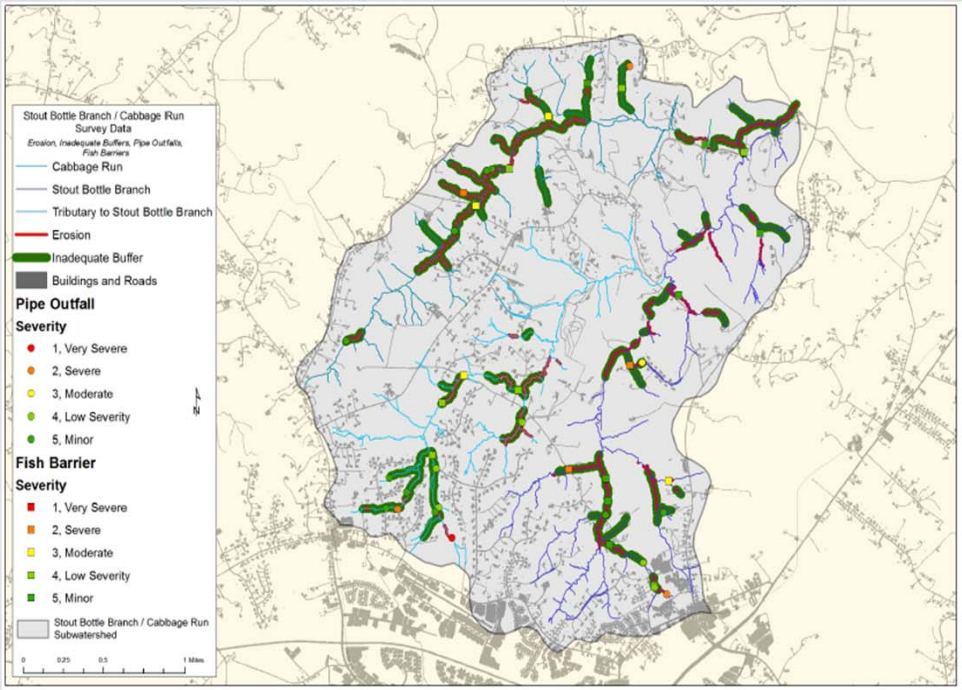
RESTORATION

- Agricultural BMPs Planned / Designed through CTA
  - 6 Riparian Buffer plans completed
  - 3 Wetlands designed (≤ 1 acre)
  - 2 Wetlands designed (≥ 1 acre)
  - 3 Streambank Stabilization projects designed
  - 6 Equine Conservation Plans completed
  - 20 BMPs designed

RESTORATION

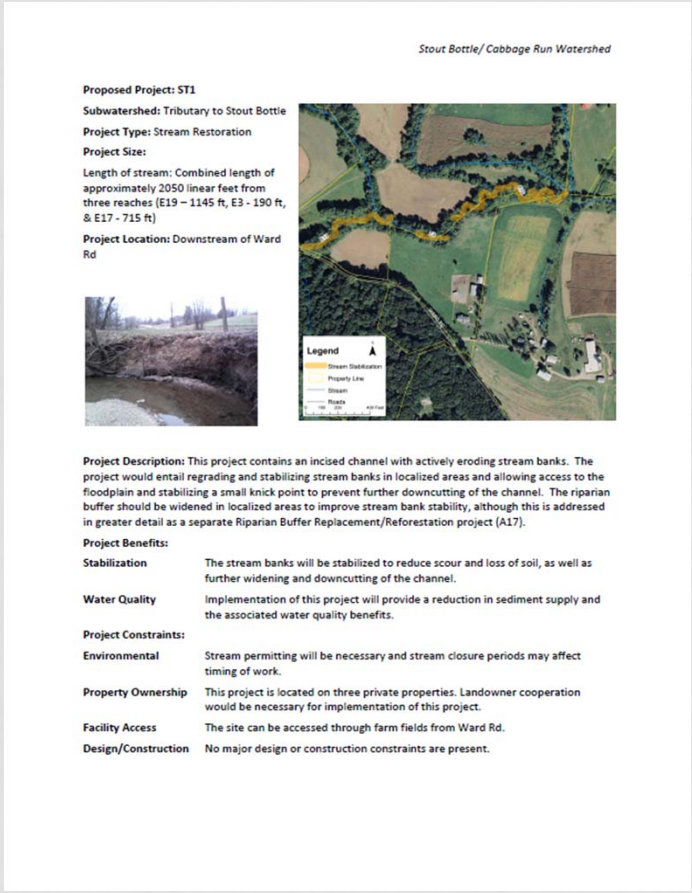
- Stout Bottle Branch / Cabbage Run
  - Stream Corridor Assessment (16 miles)
    - Impacts – Erosion (9.5 miles) and Buffers (11.6 miles) most common
    - Preliminary identification of potential restoration sites





RESTORATION

- Stout Bottle Branch / Cabbage Run
  - Subwatershed Action Plan
    - Identified and prioritized restoration projects and developed conceptual design plans and cost estimates
      - 17 Riparian buffer plantings (67 properties)
        - 12.4 miles
      - 7 Stream restoration
        - 1.9 miles
      - 5 Agricultural BMPs (fencing, water access, stabilized crossings)
      - 5 Stormwater management BMP retrofits
      - 3 Fish passage
      - 2 Wetland restoration
      - 2 Outfall stabilization



Stout Bottle/ Cabbage Run Watershed

Proposed Project: ST1

Subwatershed: Tributary to Stout Bottle

Project Type: Stream Restoration

Project Size:

Length of stream: Combined length of approximately 2050 linear feet from three reaches (E19 – 1145 ft, E3 - 190 ft, & E17 - 715 ft)

Project Location: Downstream of Ward Rd

Project Description: This project contains an incised channel with actively eroding stream banks. The project would entail regrading and stabilizing stream banks in localized areas and allowing access to the floodplain and stabilizing a small knick point to prevent further downcutting of the channel. The riparian buffer should be widened in localized areas to improve stream bank stability, although this is addressed in greater detail as a separate Riparian Buffer Replacement/Reforestation project (A17).

Project Benefits:

Stabilization	The stream banks will be stabilized to reduce scour and loss of soil, as well as further widening and downcutting of the channel.
Water Quality	Implementation of this project will provide a reduction in sediment supply and the associated water quality benefits.

Project Constraints:

Environmental	Stream permitting will be necessary and stream closure periods may affect timing of work.
Property Ownership	This project is located on three private properties. Landowner cooperation would be necessary for implementation of this project.
Facility Access	The site can be accessed through farm fields from Ward Rd.
Design/Construction	No major design or construction constraints are present.

RESTORATION

- Outreach Coordinator
  - Recent Activities
    - Mailings to Private Property Owners
    - Riparian Buffer Workshops
    - Exhibits
    - Outreach Articles
    - Site Visits with Property Owners

RESTORATION

- Other WRAS Implementation
  - Stream signage by the Izaak Walton League
  - Two bioretention projects by DPW
    - Hickory Elementary
    - Forest Hill Elementary

RESTORATION

- Other WRAS Implementation
  - Buffer Planting – Scarboro – 3 acres
  - Magness Farm Stream Restoration
    - 1,200 liner feet restored
    - 5 acre forested wetland
    - 1 acre upland planting
    - 1 acre riparian buffer planting

QUESTIONS

- Contact Information

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