

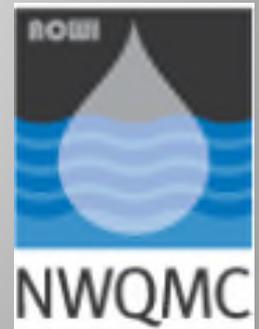
# Watershed-Scale Biological Monitoring and Assessment for Ecological Protection and Restoration Planning

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**TETRA TECH**

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# Acknowledgement

- **Department of Environmental Resources, Prince George's County, Maryland**
  - Dr. Mow-Soung Cheng
- **Maryland-National Capital Park and Planning Commission (M-NCPPC)** ([www.mncppc.org/pgco](http://www.mncppc.org/pgco))
  - C.J. Lammers, Kate Fritz
- **Tetra Tech, Inc.**
  - Chris Millard, Erik Leppo, Chris Wharton, Carolina Gallardo, Chad Barbour, John Roberts, and subcontractors Mike Winnell (Freshwater Benthic Services), and Todd Askegaard (Aquatic Resources Center)

# Purpose of presentation

- Describe ecological restoration in terms of stressors and stressor sources
- Routine biological monitoring
- Need for long-term status assessments
- Targeting reporting for different audiences
- Green infrastructure planning and goal-setting

# Ecological restoration

- Define in context of stressors and stressor sources
  - Stressors - any human-induced agent that limits the biological capacity for survival and reproduction
  - Stressor source - any human activity that contributes to production of stressors
  - Restoration - removal or elimination of stressors and their sources
  - Protection - prevention of stressors and their sources

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**Stressors sources**



**Stressors**



**Response indicators**



# Removal of watershed vegetation Urban/suburban development



# Watershed scale hydrologic alteration



# Channel alteration



# Combined sewer overflows (CSO)



# *The river catches on fire!!!*



**Cuyahoga River, Cleveland, OH  
June 22, 1969**

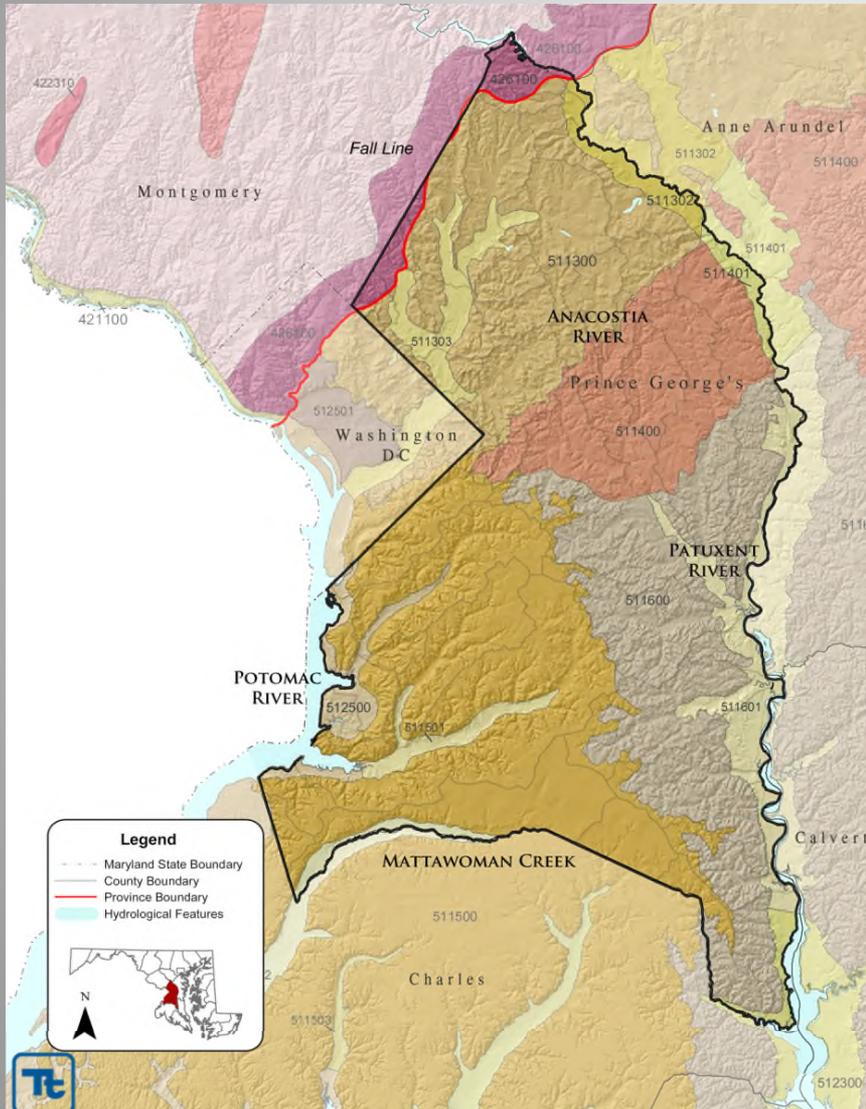
# There are many stressor sources

- Municipal waste
- Fertilizer application
- Sewage collection system overflows
- Industrial effluent
- Hazardous waste site/landfill leachate
- Channel alteration
- Impoundment
- Riparian de-vegetation
- Watershed de-vegetation
- Grazing
- Row crop agriculture
- Transportation corridors
- Surface-mining sites
- Combined animal feeding operations (CAFO)
- Impervious surface/stormwater

# There are many potential stressors

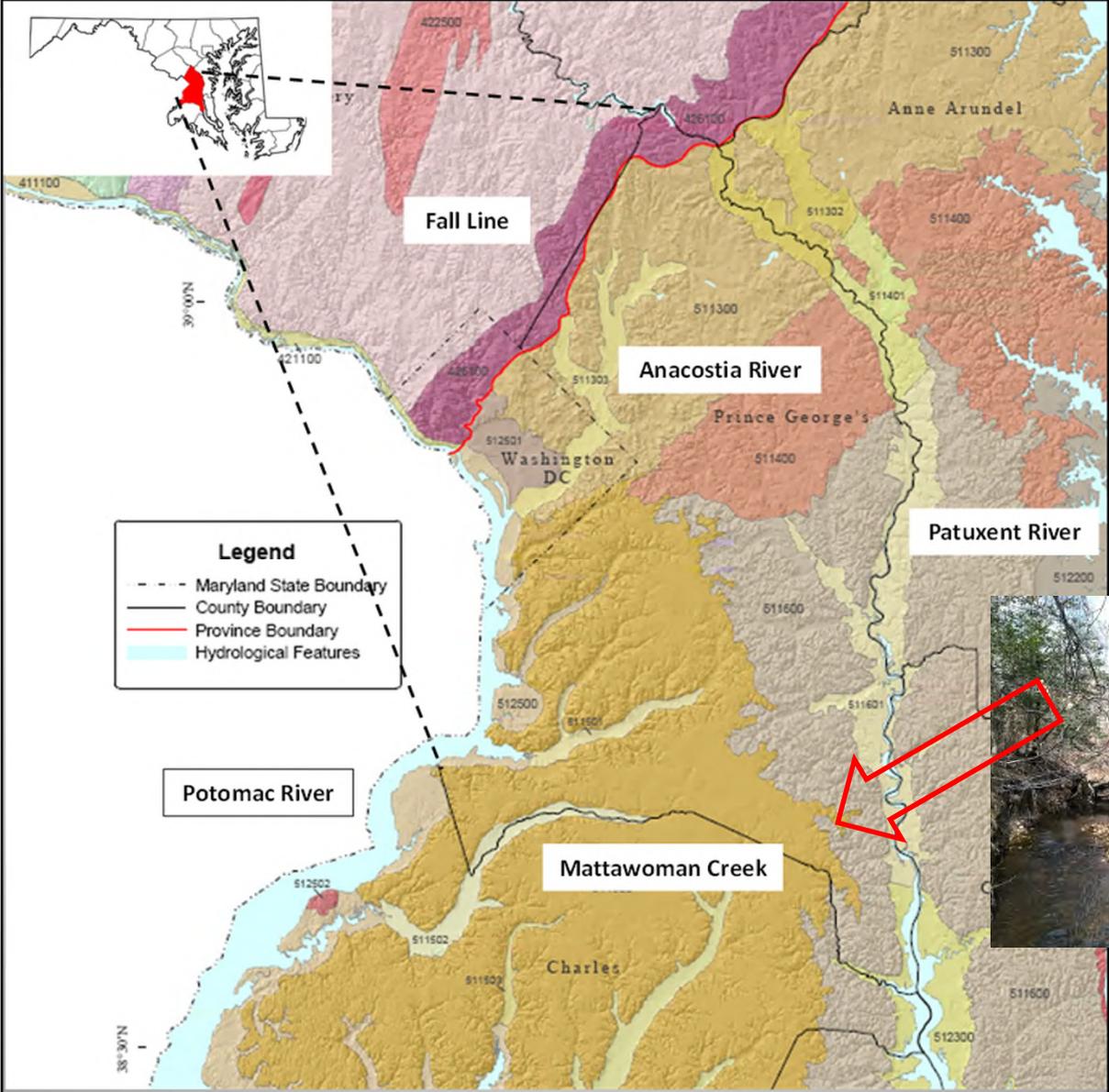
- Degraded physical habitat
- Flow alteration (increased flashiness)
- Flow alteration (dam)
- Unspecified toxic chemicals
- Metals
- Sediments
- Nutrients
- Ionic strength
- Low dissolved oxygen
- Temperature
- Non-native species

# Prince George's County, Maryland

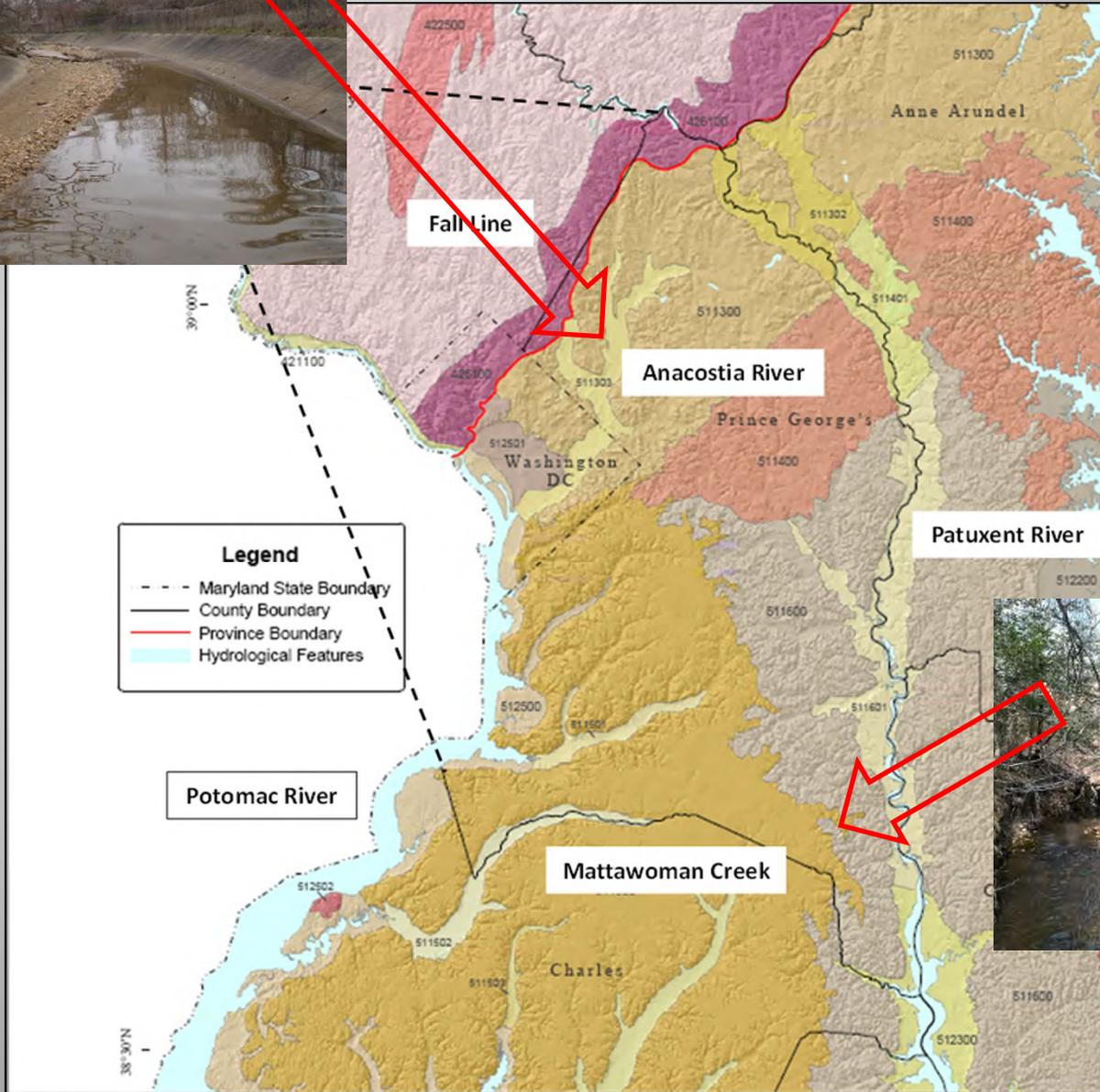


- Mid-Atlantic Coastal plain
- Major river basins
  - Anacostia River
  - Patuxent River
  - Potomac River (non-Anacostia)
- Spatial footprint:  $\sim 500\text{mi}^2$
- Population:  $\sim 881,000$

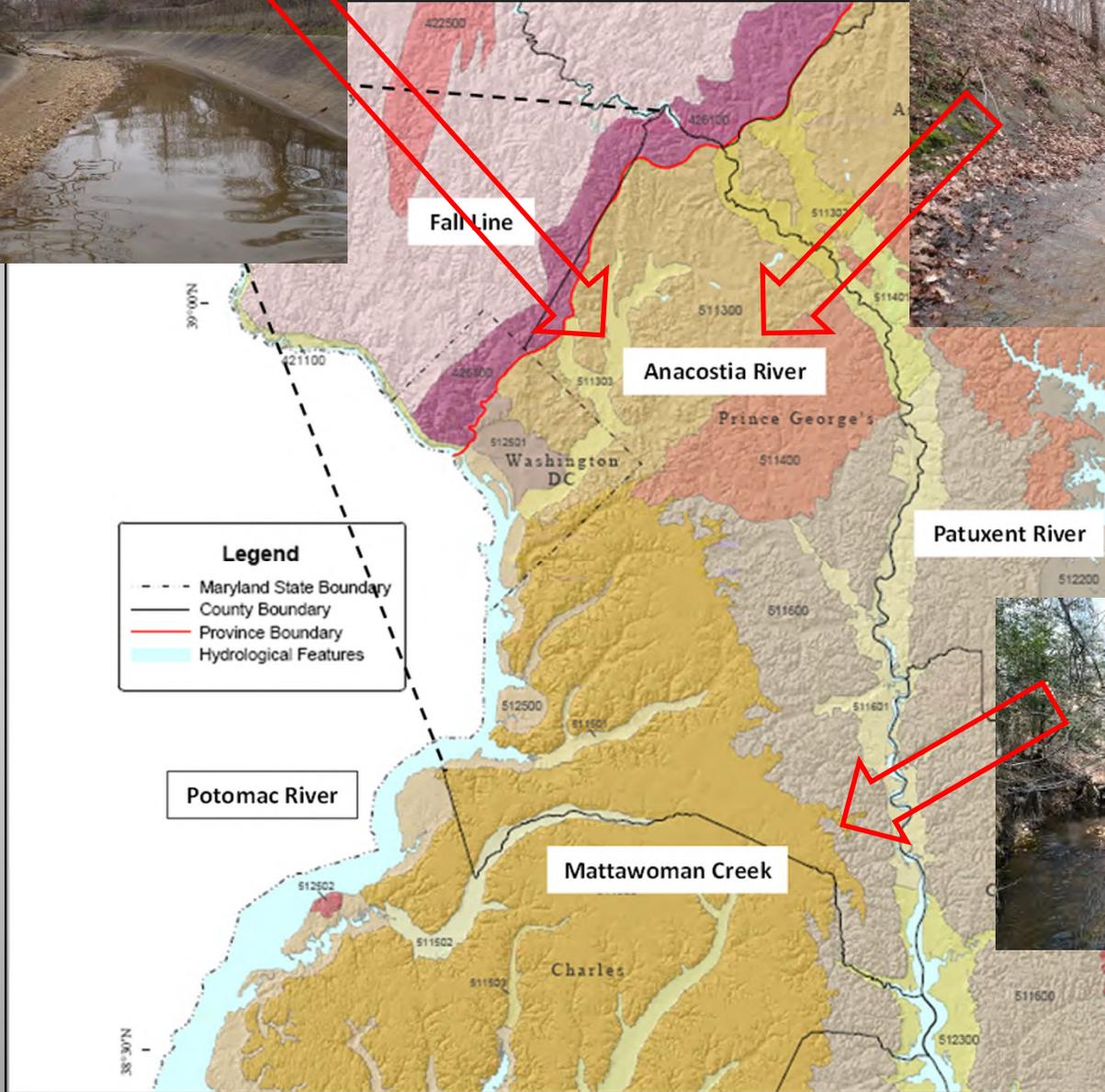
# Prince George's County, Maryland



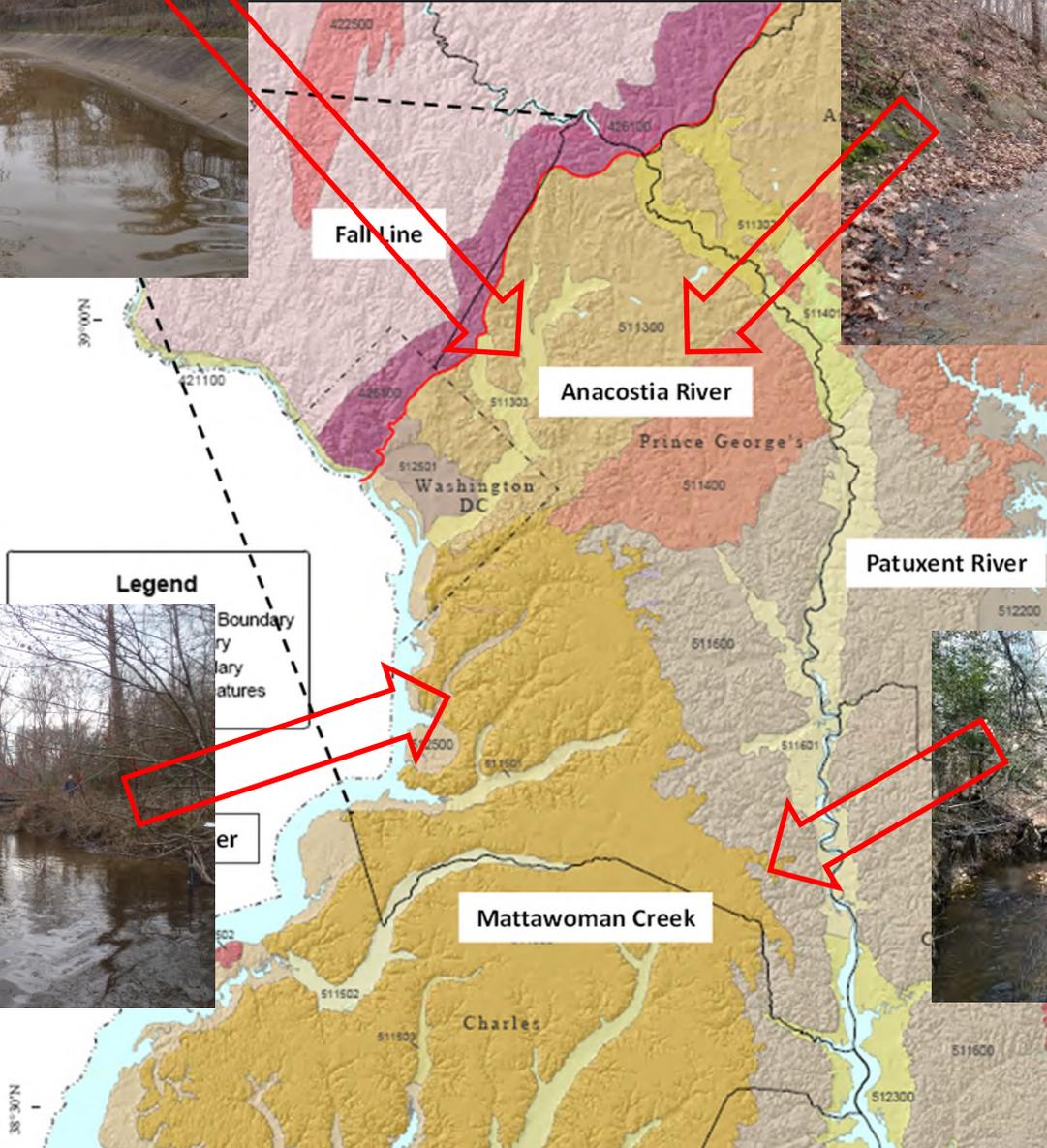
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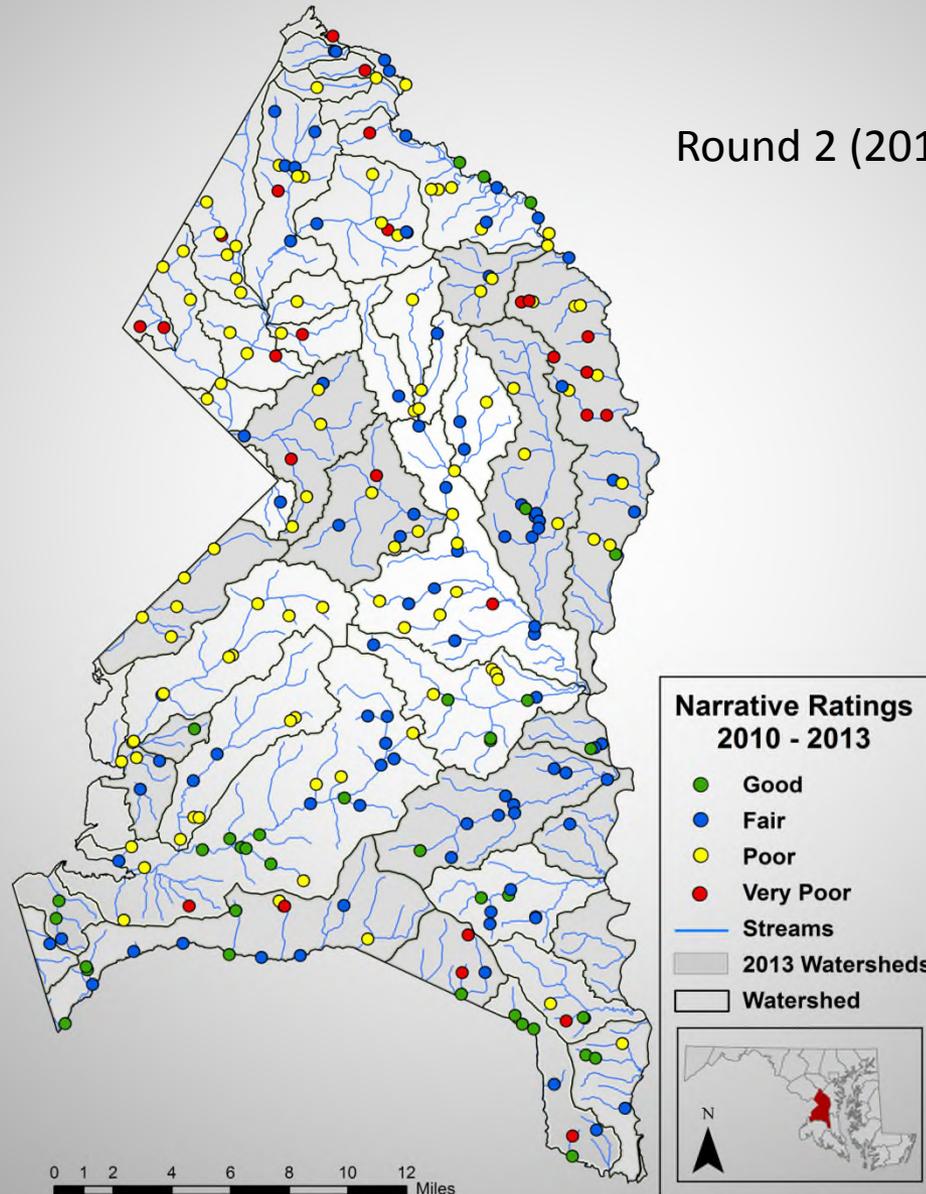


# Prince George's County, Maryland



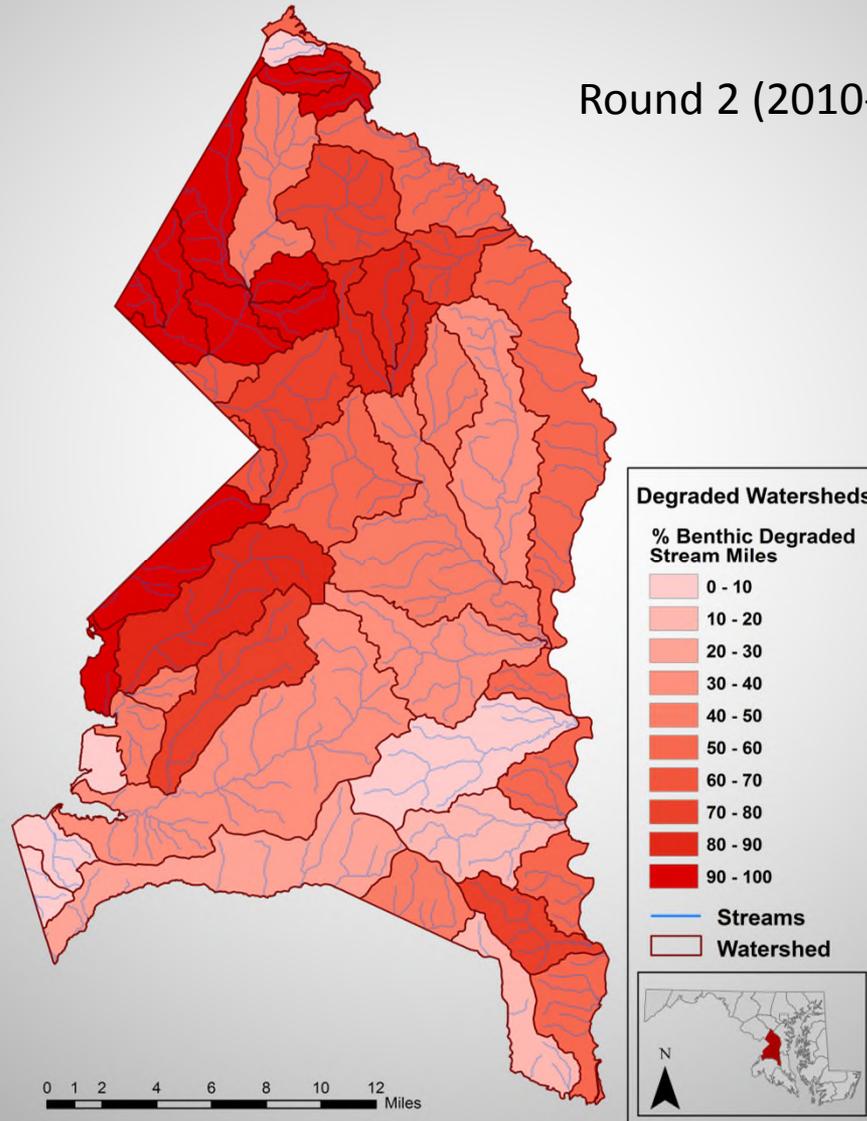
# Point assessments (site-specific)

Round 2 (2010-2013)



# Percent degradation

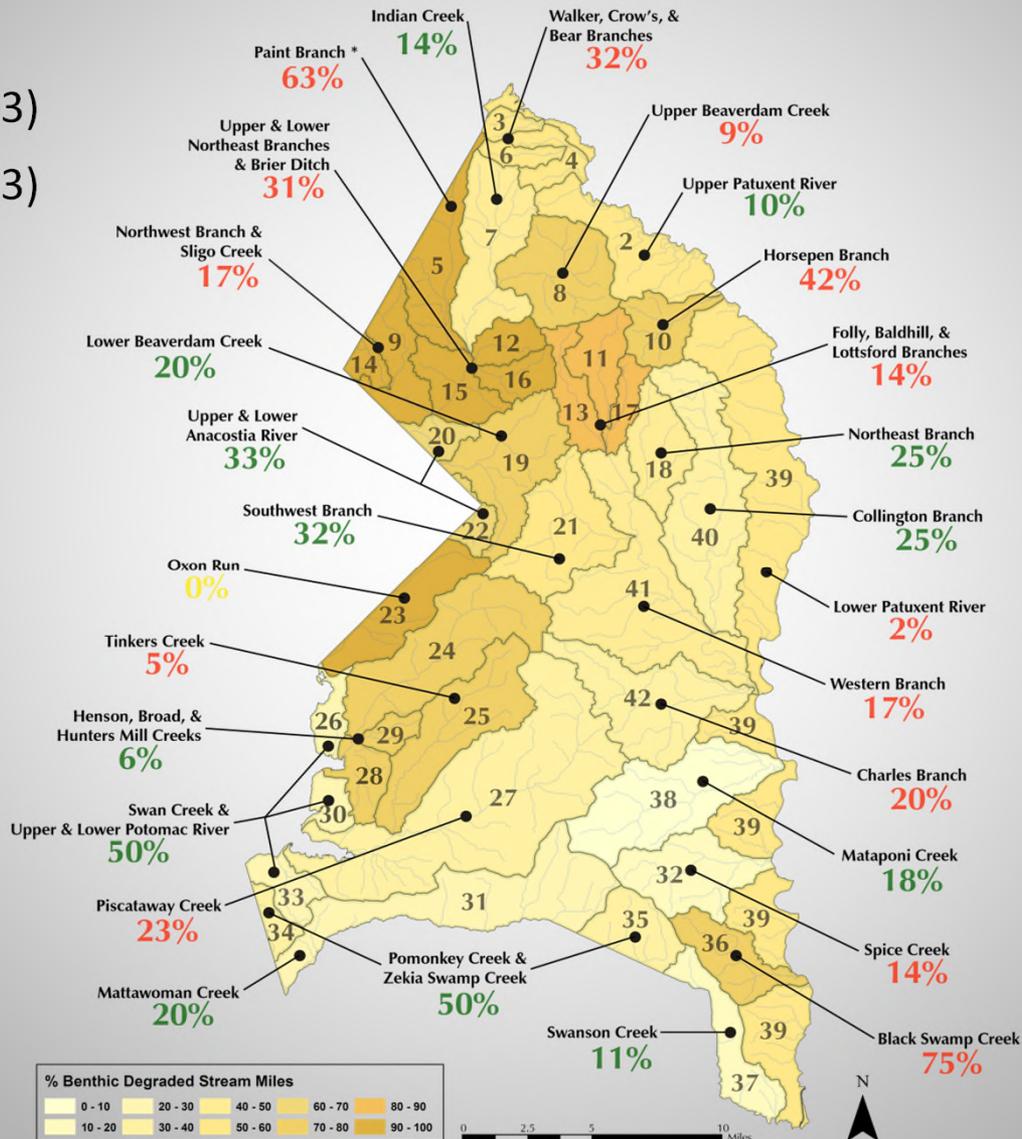
Round 2 (2010-2013)



# Change map (R1 vs. R2)

Round 1 (1999-2003)

Round 2 (2010-2013)



# Prince George's County, Maryland

- Two environmental agencies
- Department of Environmental Resources (DER)
- Maryland-National Capital Park and Planning Commission (MNCPPC)



# COUNTYWIDE GREEN INFRASTRUCTURE PLAN



Approved June 14, 2005



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The Maryland-National Capital Park and Planning Commission

[www.mnppc.org](http://www.mnppc.org)



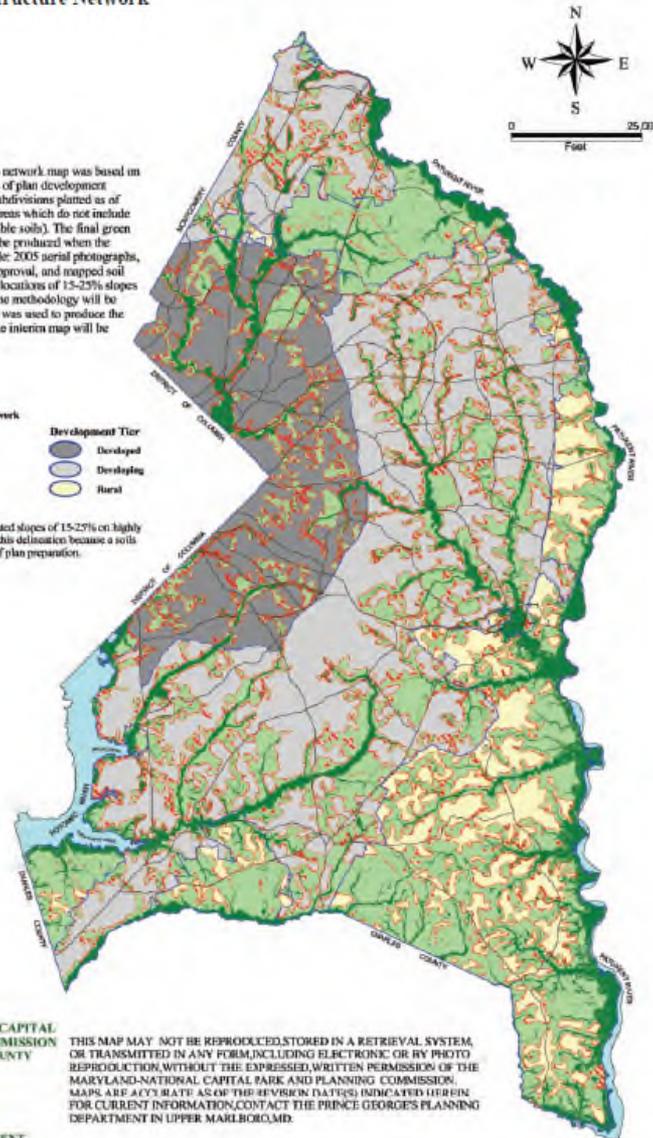
# Green infrastructure plan

**Map 1: Green Infrastructure Network  
(Interim Map)**

This interim green infrastructure network map was based on information available at the time of plan development (i.e., 2000 aerial photography, subdivisions planned as of March 31, 2004, and regulated areas which do not include 15%-25% slopes on highly erodible soils). The final green infrastructure network map will be produced when the following information is available: 2005 aerial photographs, planned subdivisions as of plan approval, and mapped soil series to determine approximate locations of 15-25% slopes on highly erodible soils. The same methodology will be used to produce the final map as was used to produce the interim map. In the meantime, the interim map will be used for implementation.

-  Green Infrastructure Network
-  Regulated Area \*
-  Evaluation Area
-  Gap
- Development Tier**
-  Developed
-  Developing
-  Rural

\* Information regarding the regulated slopes of 15-25% on highly erodible soils is not included in this delineation because a soils layer was not available at time of plan preparation.



MARYLAND-NATIONAL CAPITAL  
PARK & PLANNING COMMISSION  
PRINCE GEORGE'S COUNTY



PLANNING DEPARTMENT

THIS MAP MAY NOT BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED IN ANY FORM, INCLUDING ELECTRONIC OR BY PHOTO REPRODUCTION, WITHOUT THE EXPRESSED WRITTEN PERMISSION OF THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION. MAPS ARE ACTY RATE AS OF THE REVISION DATE(S) INDICATED HEREIN FOR CURRENT INFORMATION, CONTACT THE PRINCE GEORGE'S PLANNING DEPARTMENT IN UPPER MARLBORO, MD.



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# Countywide Green Infrastructure Plan

- Approved June 14, 2005
- Contains set of guiding principles used in developing the plan
- Sets overall goal for plan implementation
- Specifies 8 quantitative objectives
- (entire plan being updated, expected early 2014)
- Forward-looking 50 years (C.J. Lammers, *personal communication*)

# Guiding principles

- Identify contiguous network of environmentally-important areas
- Set forth strategies to preserve, protect, enhance, and restore the network
- Support the desired development pattern
- Adopt and/or support effective implementation mechanisms
- Support the county's Livable Communities Initiative
- Ensure meaningful public participation

# Goal

*To preserve, enhance, and/or restore an interconnected network of countywide environmental features that retains ecological functions; maintains or improves water quality and habitat; and support the desired development pattern of the general plan.*



# Objectives

- Total of 8 quantitative objectives, dealing with
  - Countywide significance (1)
  - Strengthening the green infrastructure network (2)
  - Avoiding all development impacts in regulated areas (3)
  - Minimizing losses of woodland cover due to development (4)
  - Biological and physical habitat condition (5 and 6)
  - Spatial distribution of forest mitigation acreage (7)
  - Targeting all environmental mitigation projects to countywide catalog of mitigation sites (8)

# Objectives

- (5)** By 2025, improve water quality in each major watershed so that the benthic index of biological integrity is elevated by at least one category from Round 1 (1999-2003)
- (6)** By 2025, improve stream habitat quality so that physical habitat rating is elevated by at least one category from Round 1

# Improving biological condition (5) and physical habitat quality (6)

- Categories
- Biological condition rating based on the Maryland Benthic Index of Biological Integrity (B-IBI) – 4 quantitative rating categories
  - Good, fair, poor, and very poor
- Physical habitat quality based on the USEPA/RBP physical habitat assessment
  - Good, fair, poor, and very poor

# Key to understanding “BIG PICTURE” of the Green Infrastructure Plan

- Most objectives are focused on restoration and/or protection
- Thus, if implemented and maintained, will lead to reduction and elimination of both stressor sources and stressors
- Objectives 5 and 6 will provide evidence of success (or failure) at several spatial scales

# Key messages

- Environmental and watershed management, done correctly, consists of
  - Restoration (eliminating stressors), and
  - Protection (preventing stressors)
- Do everything possible to ensure defensibility of decisions. That means:
  - Accountability
  - Calibrated biological indicator (index of biological integrity)
  - Data of known quality (comprehensive QA/QC)
- Restoration is not restoration unless biology responds positively

# Documents and Links

- Biological assessment reports available through contact with the authors
  - Chris Millard ([chris.millard@tetratech.com](mailto:chris.millard@tetratech.com))
  - James Stribling ([james.stribling@tetratech.com](mailto:james.stribling@tetratech.com))
- Maryland-National Capital Park and Planning Commission ([www.mncppc.org/pgco](http://www.mncppc.org/pgco))
- Plan documentation
  - [http://www.pgplanning.org/Resources/Publications/Green Infrastructure Publication.htm](http://www.pgplanning.org/Resources/Publications/Green%20Infrastructure%20Publication.htm)