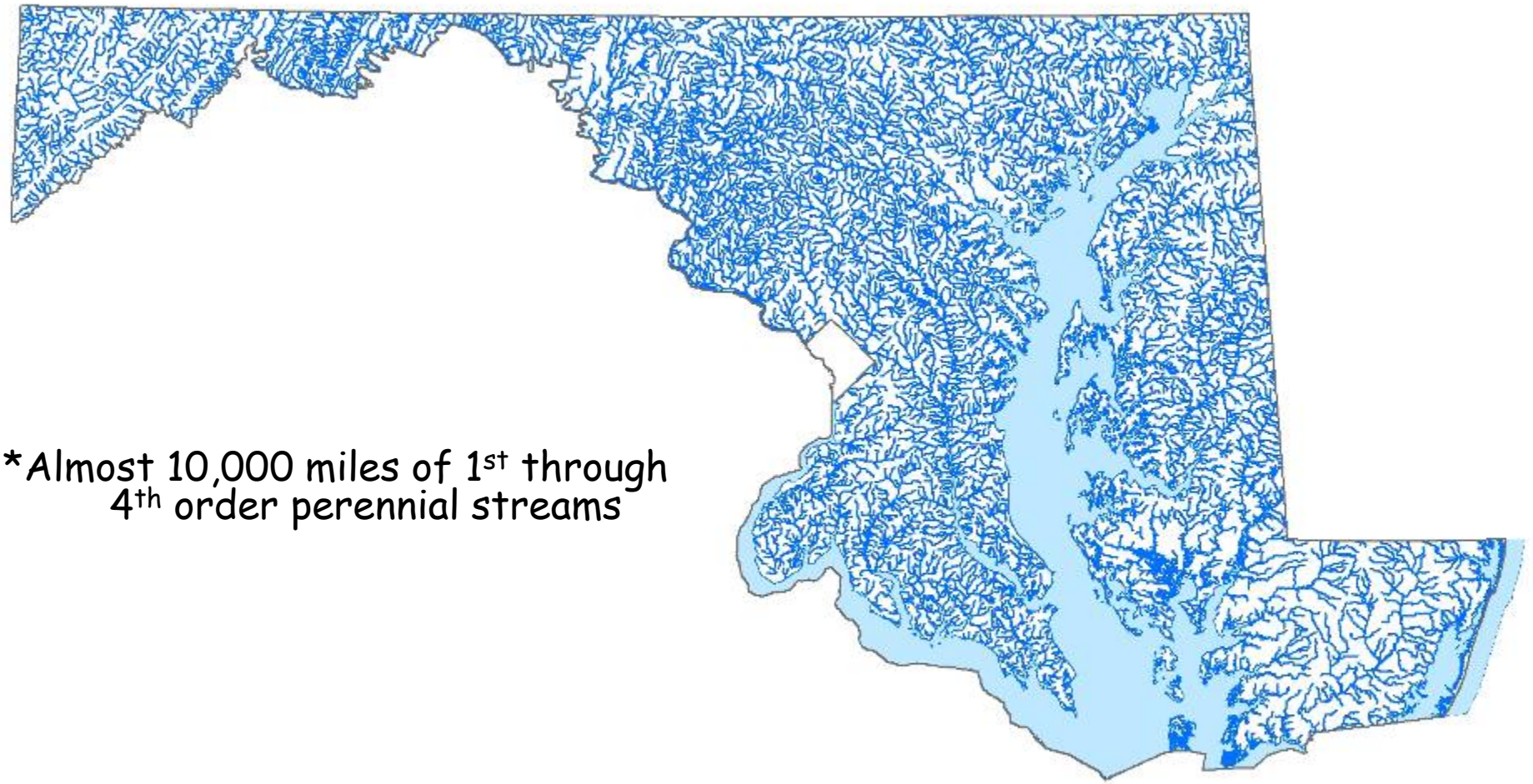
Topics

- Maryland Biological Stream Survey (MBSS)
  - Design
  - Methods
  - Results
  - Data Use
- Trend Monitoring Programs
- Maryland Stream Waders (Volunteers)
- Maryland Water Monitoring Council (MWMC)

Maryland's Non-Tidal Streams*



*Almost 10,000 miles of 1st through 4th order perennial streams

MARYLAND
DEPARTMENT OF NATURAL RESOURCES
Monitoring and Non-Tidal Assessment Division
April 13, 2010

0 10 20 40 60 80
Kilometers

N

Maryland Biological Stream Survey

MBSS Data and Method Uses

- CWA Requirements (303(d) list, 305(b) report)
- Antidegradation (Tier II)
- Designated Uses & Criteria Development
- NPDES/MS4
- Restoration Monitoring
- Land Preservation Programs
- Endangered Species
- > 40 peer-review publications

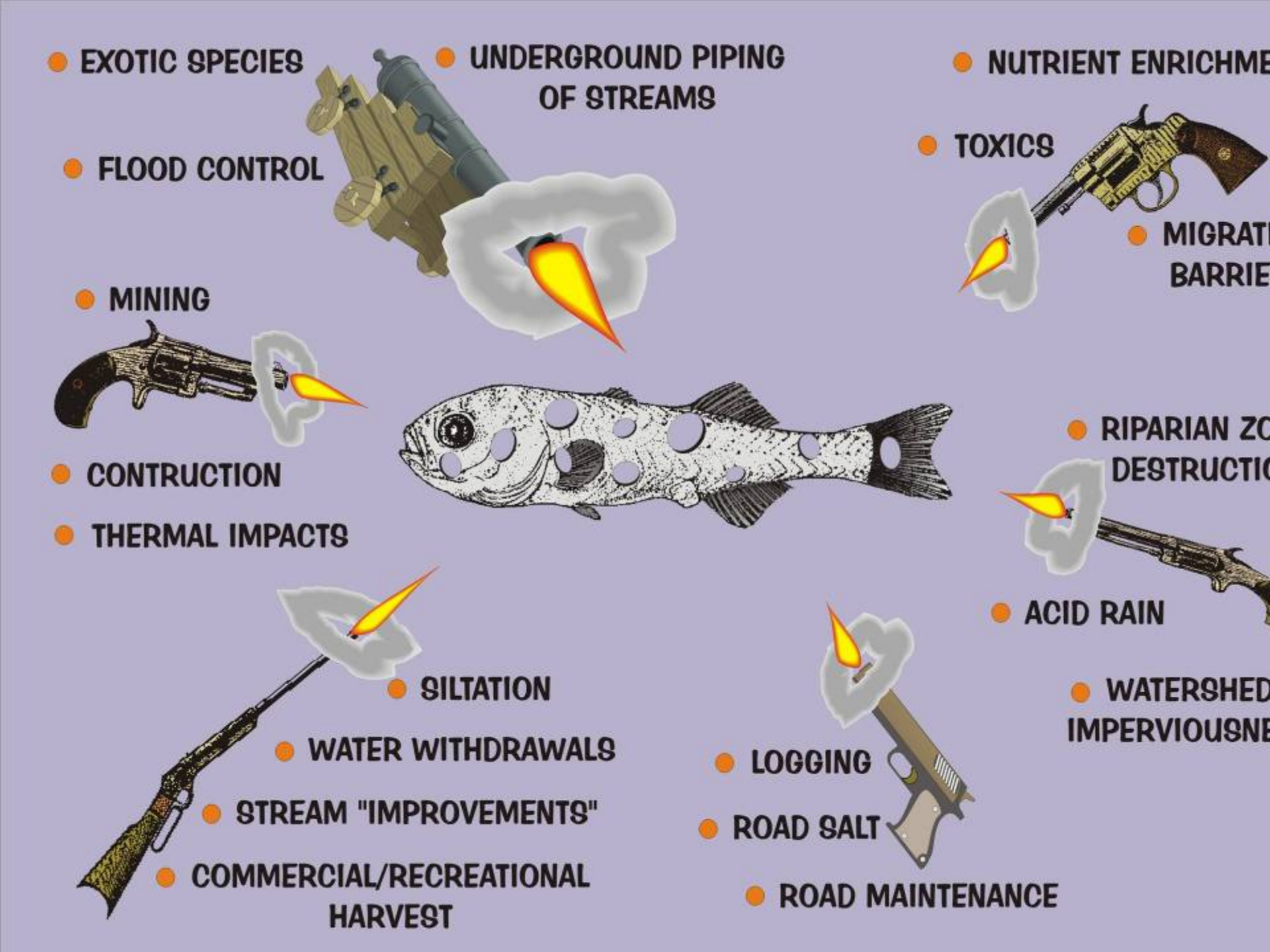
MBSS Goals/Management Objectives

- Status and trends
- Support for regulatory programs
- Help guide protection and restoration
- Document rare species
- Educate and engage the public
- Provide lots of data for graduate students and EPA contractors

IT ALL STARTED

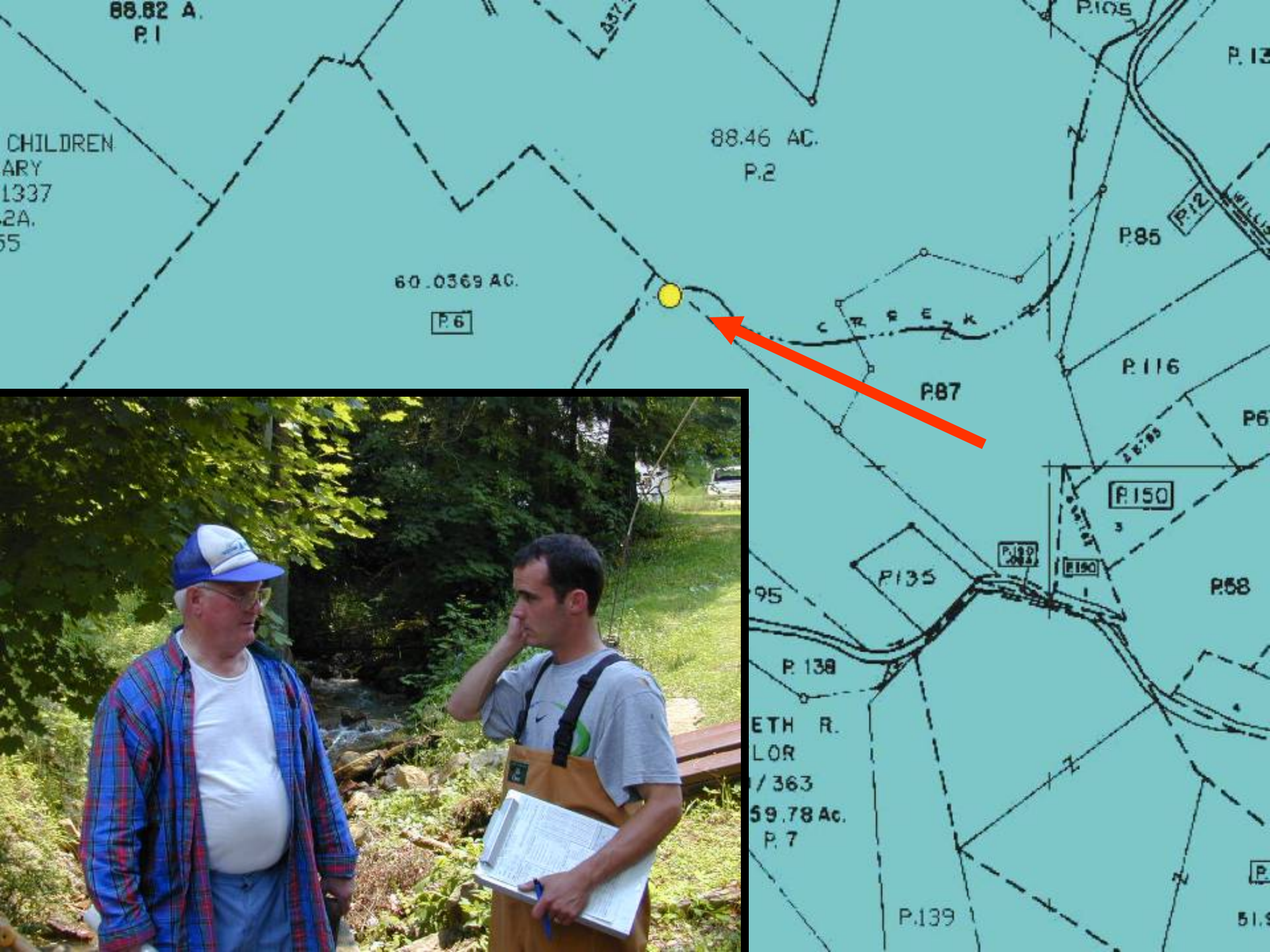
WITH ACID RAIN

STATE OF MARYLAND
DEPARTMENT OF NATURAL RESOURCES

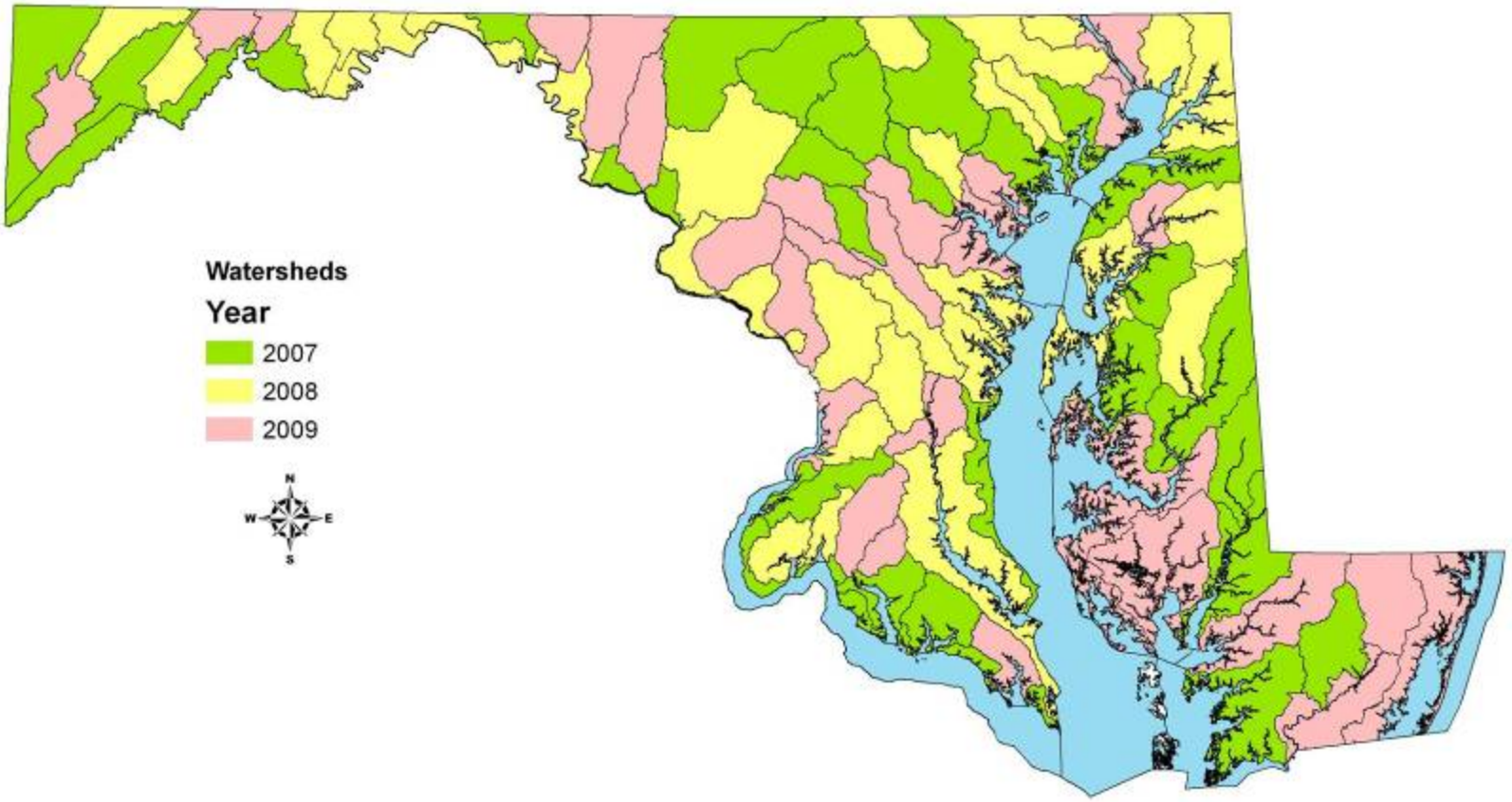

EXOTIC SPECIES
UNDERGROUND PIPING OF STREAMS
NUTRIENT ENRICHME
FLOOD CONTROL
TOXICS
MIGRATI BARRIE
MINING
CONTRUCTION
THERMAL IMPACTS
RIPARIAN ZO DESTRUCTIO
ACID RAIN
SILTATION
WATER WITHDRAWALS
STREAM "IMPROVEMENTS"
COMMERCIAL/RECREATIONAL HARVEST
LOGGING
ROAD SALT
ROAD MAINTENANCE
WATERSHED IMPERVIOUSNE


ON/OFF
POS
LIGHT
PLOT
NAV
GOTO
WPT
MOB
ROUTE
AUX
MAGELLAN

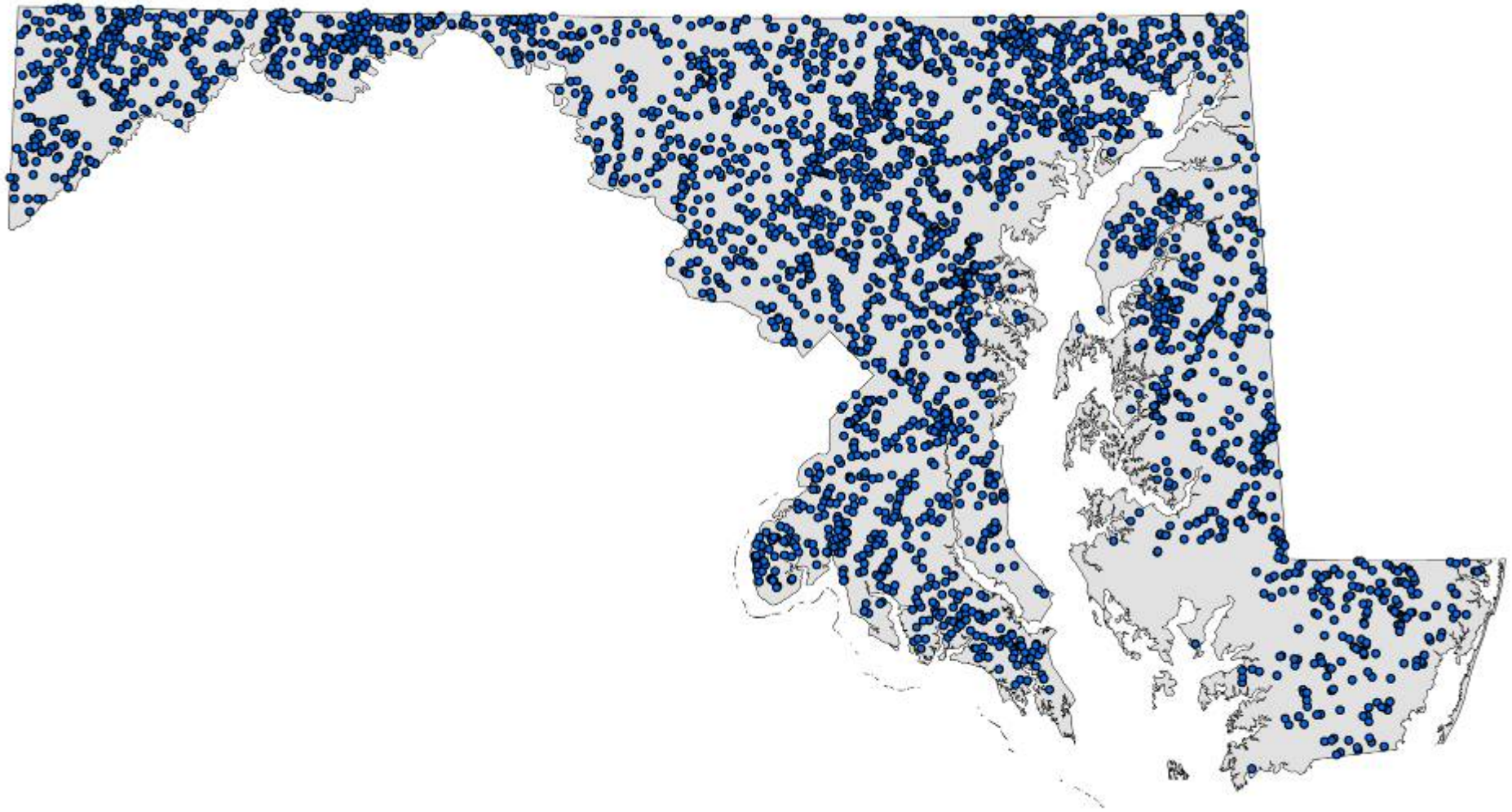

NOTICE
IF YOU ENTER
LEAVE NAME & ADDRESS
SO WE MAY NOTIFY
NEXT OF KIN
NAME
ADDRESS
ZIP


88.62 A.
P.1
CHILDREN
ARY
1337
2A.
55
88.46 AC.
P.2
60.0369 AC.
P.6
P.105
P.13
P.12
P.85
C R E E K
P.87
P.116
P6
P.150
P.135
P.68
95
P. 138
ETH R.
LOR
/ 363
59.78 Ac.
P. 7
P.139

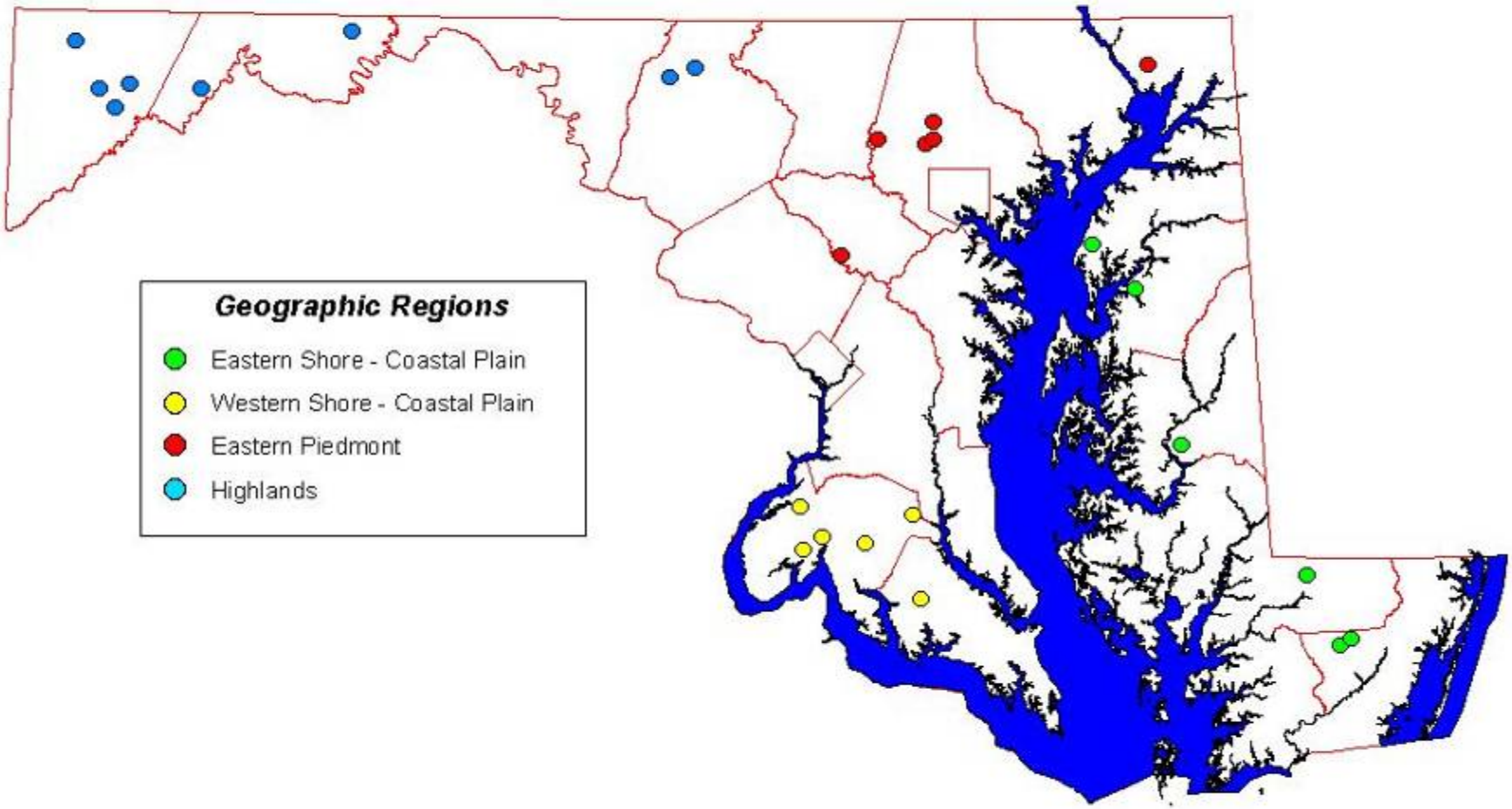
MBSS Round 3 Watershed Sampling Schedule



Maryland Biological Stream Survey Sites (1995 – 2010)



MBSS Sentinel Site Locations



Benthos

Fish

FISHABILITY

Benthic Macroinvertebrates







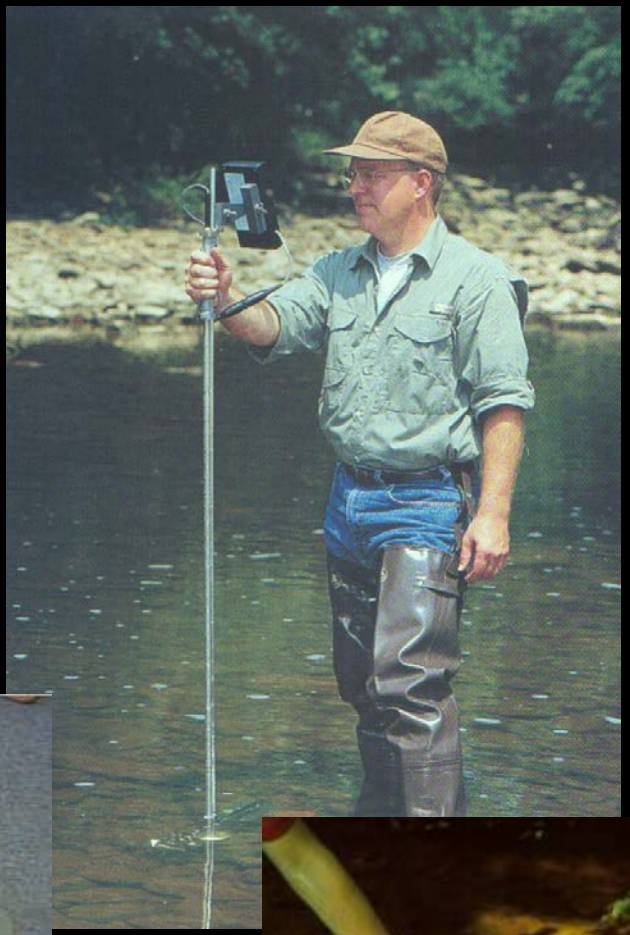


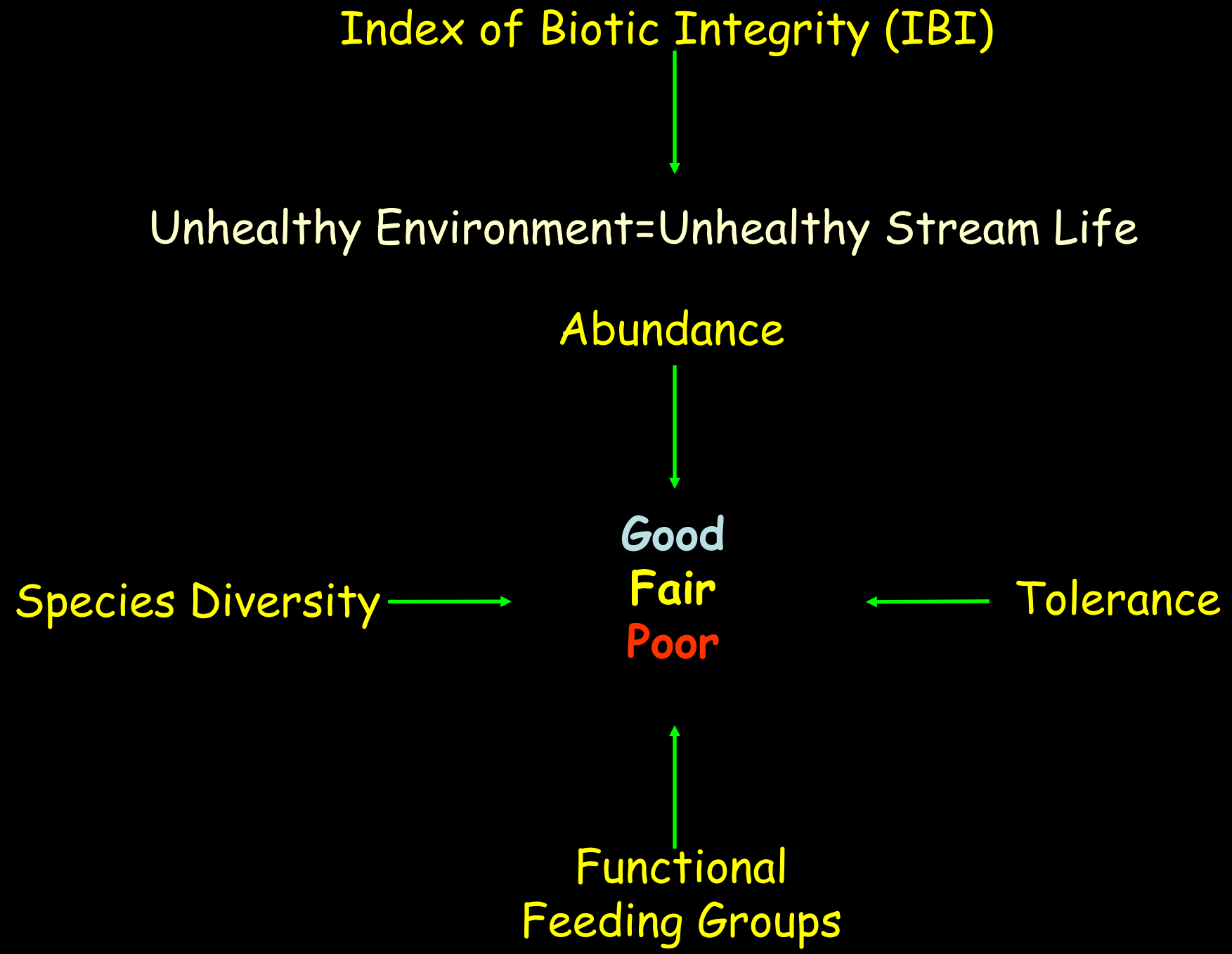



© John White

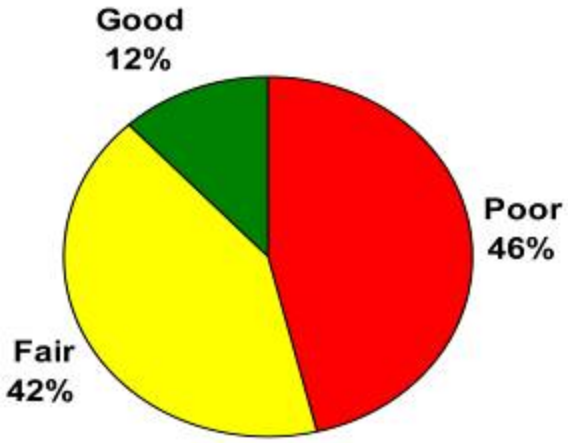
Physical Habitat

Water Quality

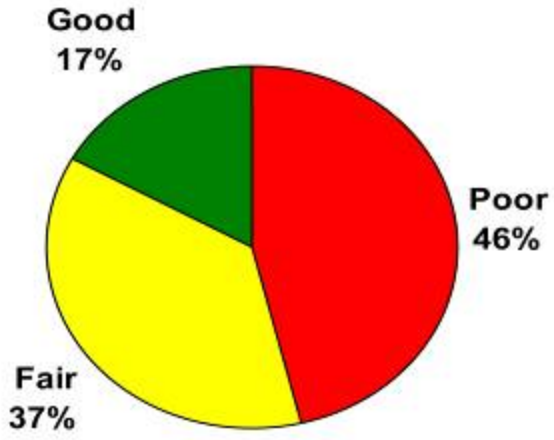



Index of Biotic Integrity (IBI)
Unhealthy Environment=Unhealthy Stream Life
Abundance
Good
Fair
Poor
Species Diversity
Tolerance
Functional
Feeding Groups

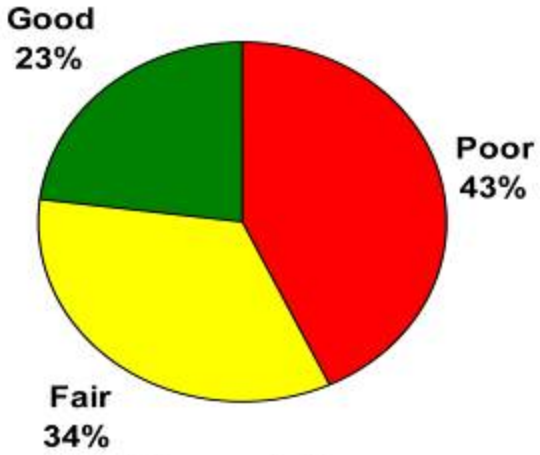
Maryland Stream Conditions*



Round 1
(1995 - 1997)

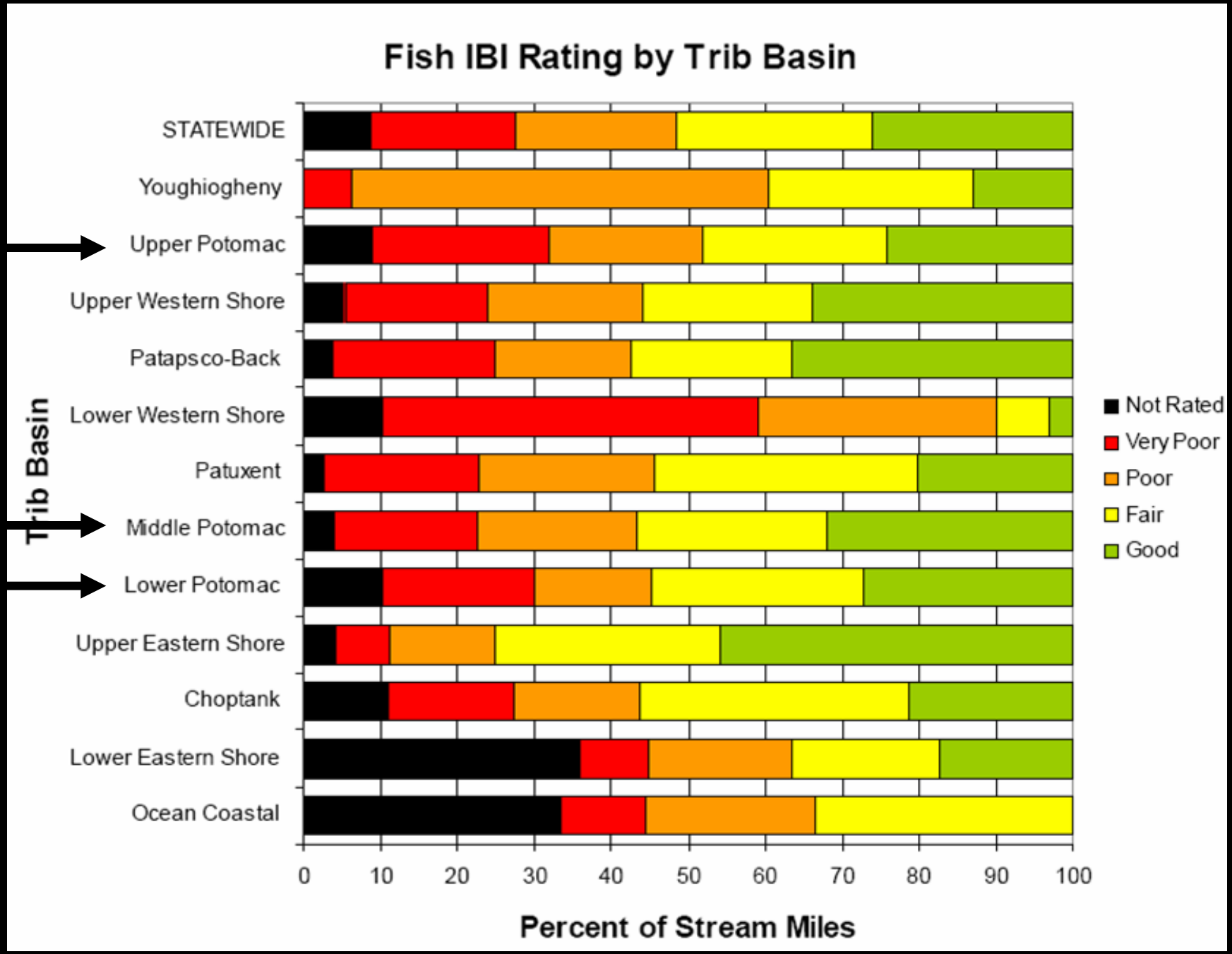


Round 2
(2000 - 2004)

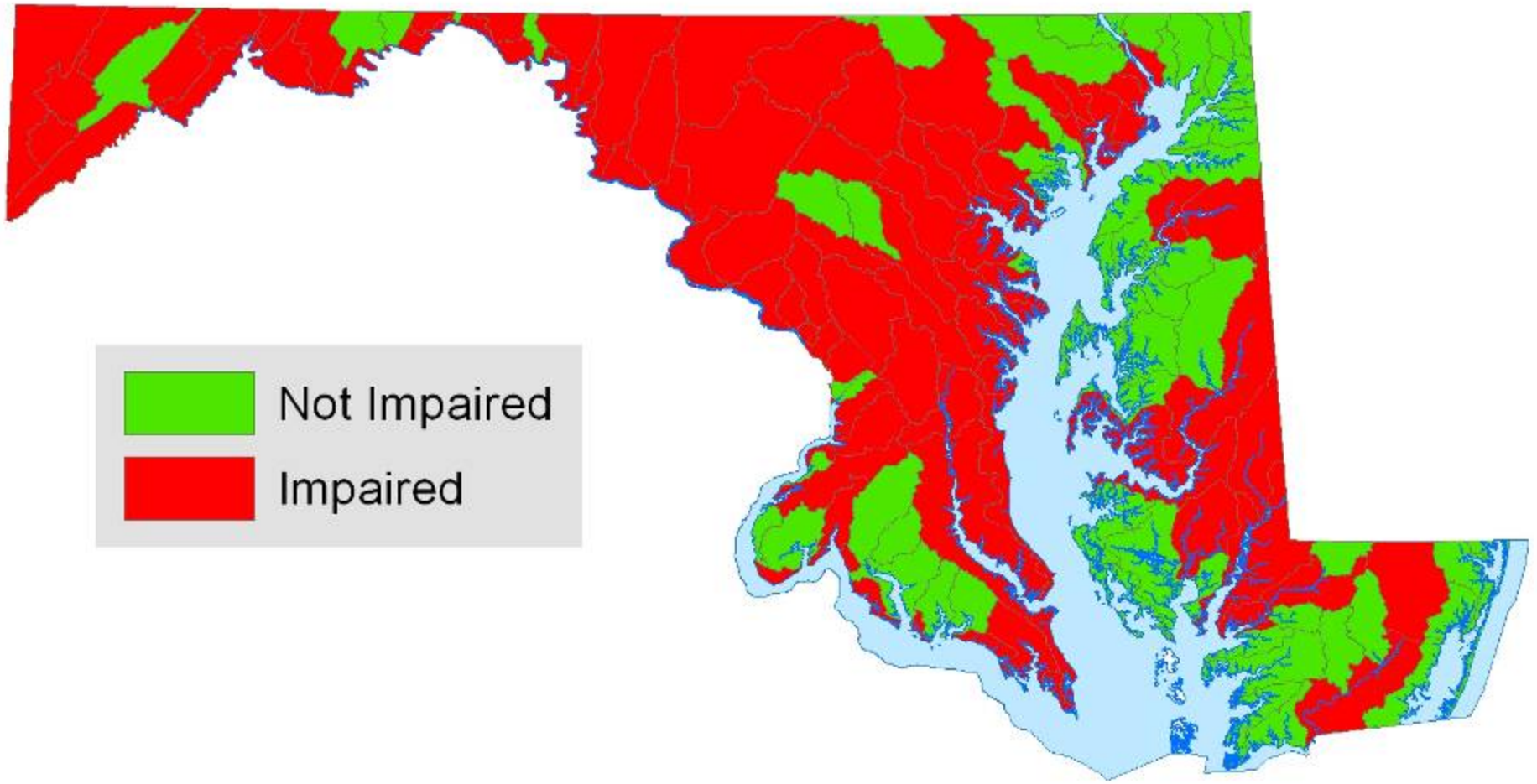


Round 3
(2007 - 2009)

*Based on MBSS Biological Indicators


Fish IBI Rating by Trib Basin
STATEWIDE
Youghiogheny
Upper Potomac
Upper Western Shore
Patapsco-Back
Lower Western Shore
Patuxent
Middle Potomac
Lower Potomac
Upper Eastern Shore
Choptank
Lower Eastern Shore
Ocean Coastal
Trib Basin
0
10
20
30
40
50
60
70
80
90
100
Percent of Stream Miles
Not Rated
Very Poor
Poor
Fair
Good

Maryland's Impaired Watersheds*



MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

Monitoring and Non-Tidal
Assessment Division
April 13, 2010

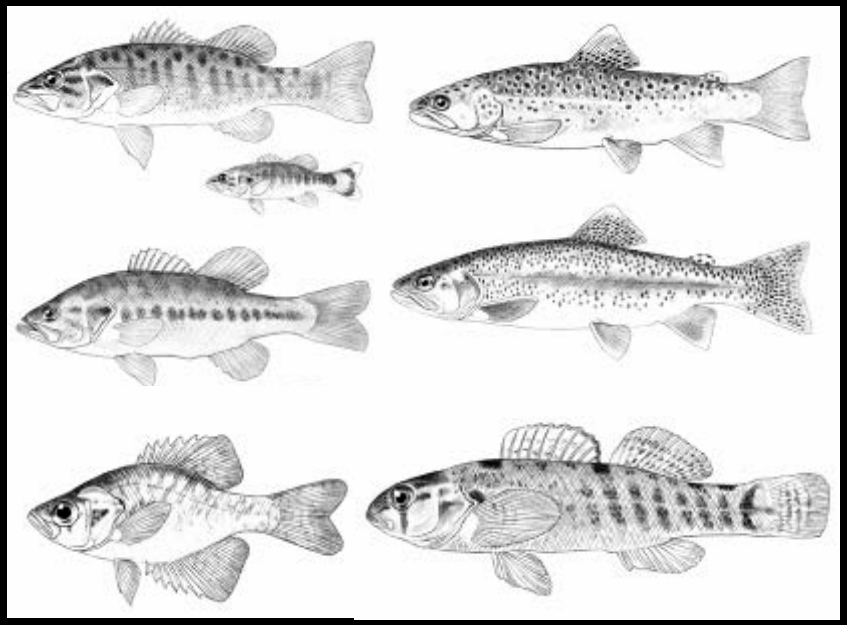
0 10 20 40 60 80
Kilometers

N

MBSS Statewide Abundance (in millions)

Blacknose Dace	11.6 ± 1.6
Mottled Sculpin	8.1 ± 2.4
Eastern Mudminnow	6.7 ± 1.0
Creek Chub	3.8 ± 0.6
Rosyside Dace	2.9 ± 0.6
Brook Trout	0.3 ± 0.1
Total Fish	61

Non-native species…

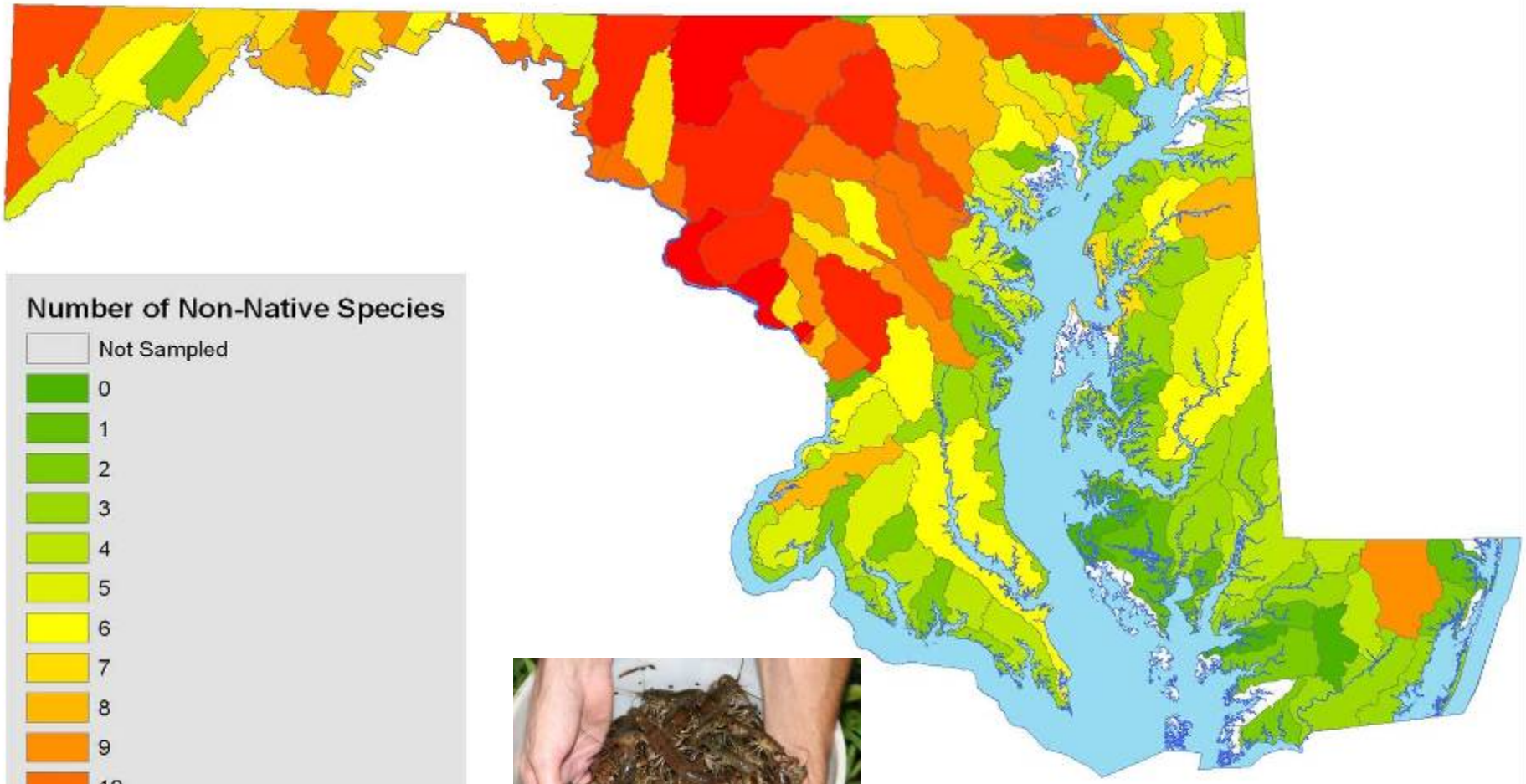


Non-Native Fishes:

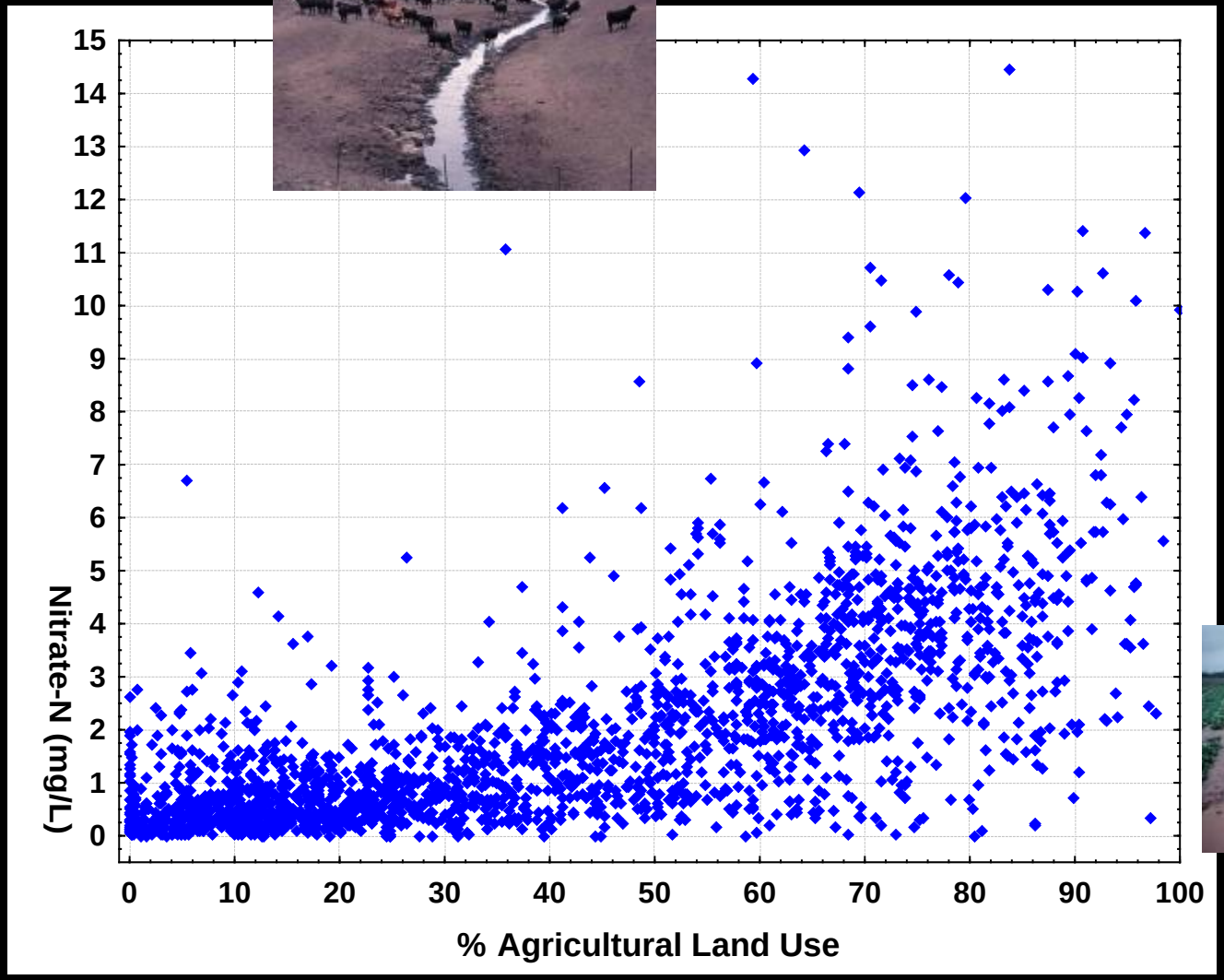
Brown trout
Rainbow trout
Lake trout
Cutthroat trout
Channel catfish
Blue catfish
Flathead catfish
Northern pike
Tiger Muskie
Fathead minnow
Goldfish
Common carp
Grass carp
Northern snakehead
Banded darter
Rainbow darter
Walleye
Largemouth bass
Smallmouth bass
Bluegill
Rock bass
Green sunfish
Longear sunfish
Black crappie
White crappie
Redear sunfish

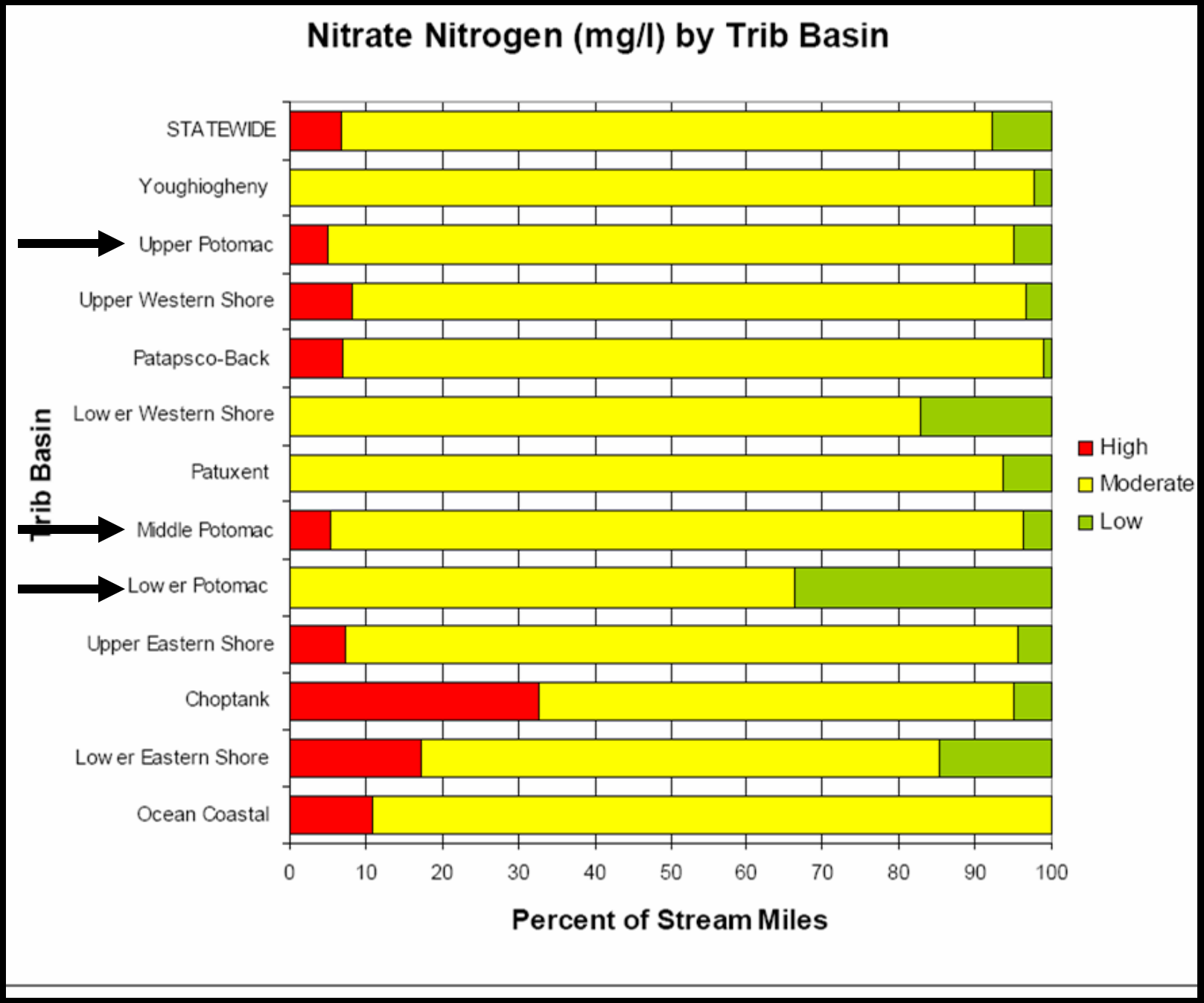
Statewide, 36% of stream miles contain non-native fish species.

Numbers of Non-Native Aquatic Species by 8-digit Watershed in Maryland's Non-Tidal Streams
(Based on Data Collected by the Maryland Biological Stream Survey in 1994 - 2006)

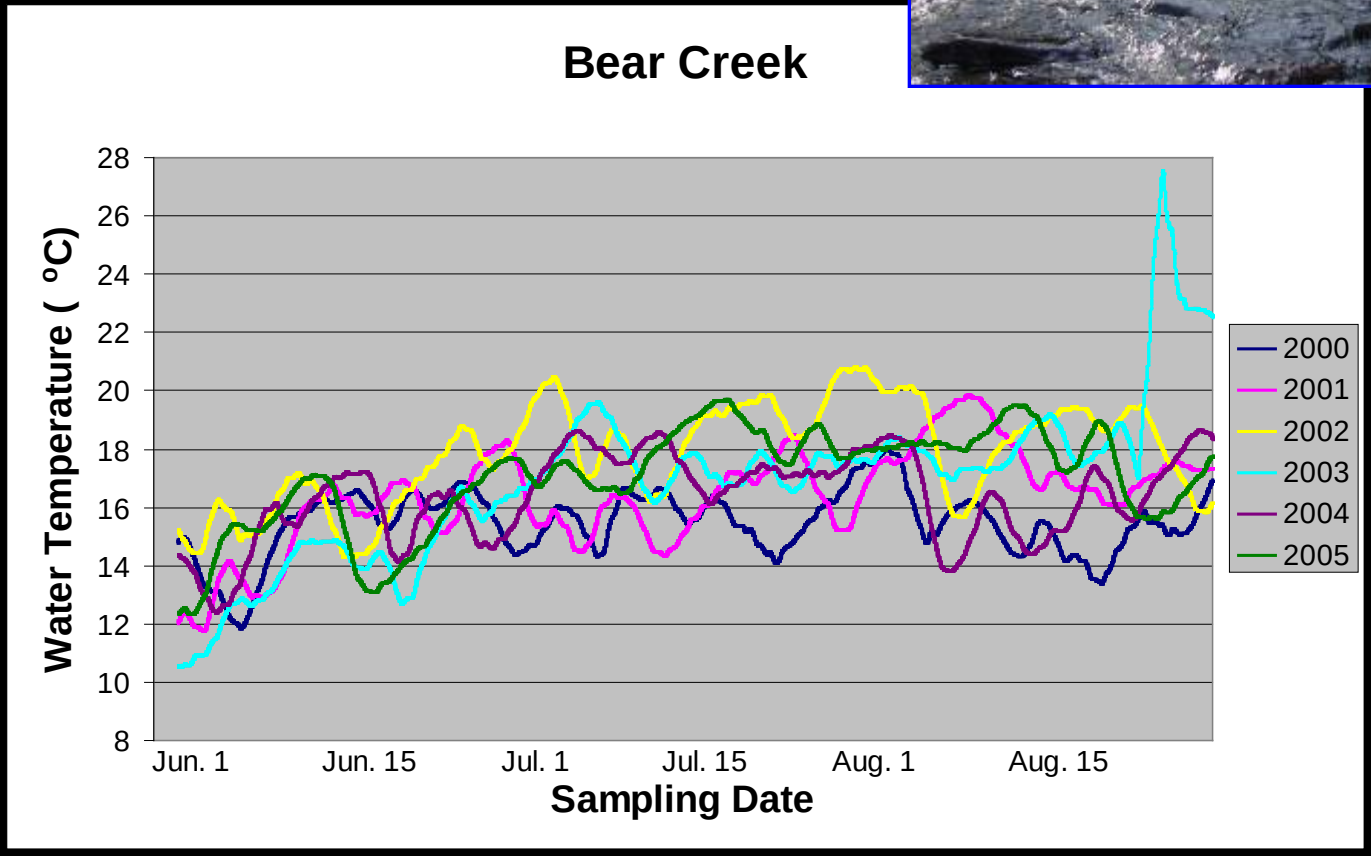


Nutrients...


Nitrate-N (mg/L)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
0
10
20
30
40
50
60
70
80
90
100
% Agricultural Land Use

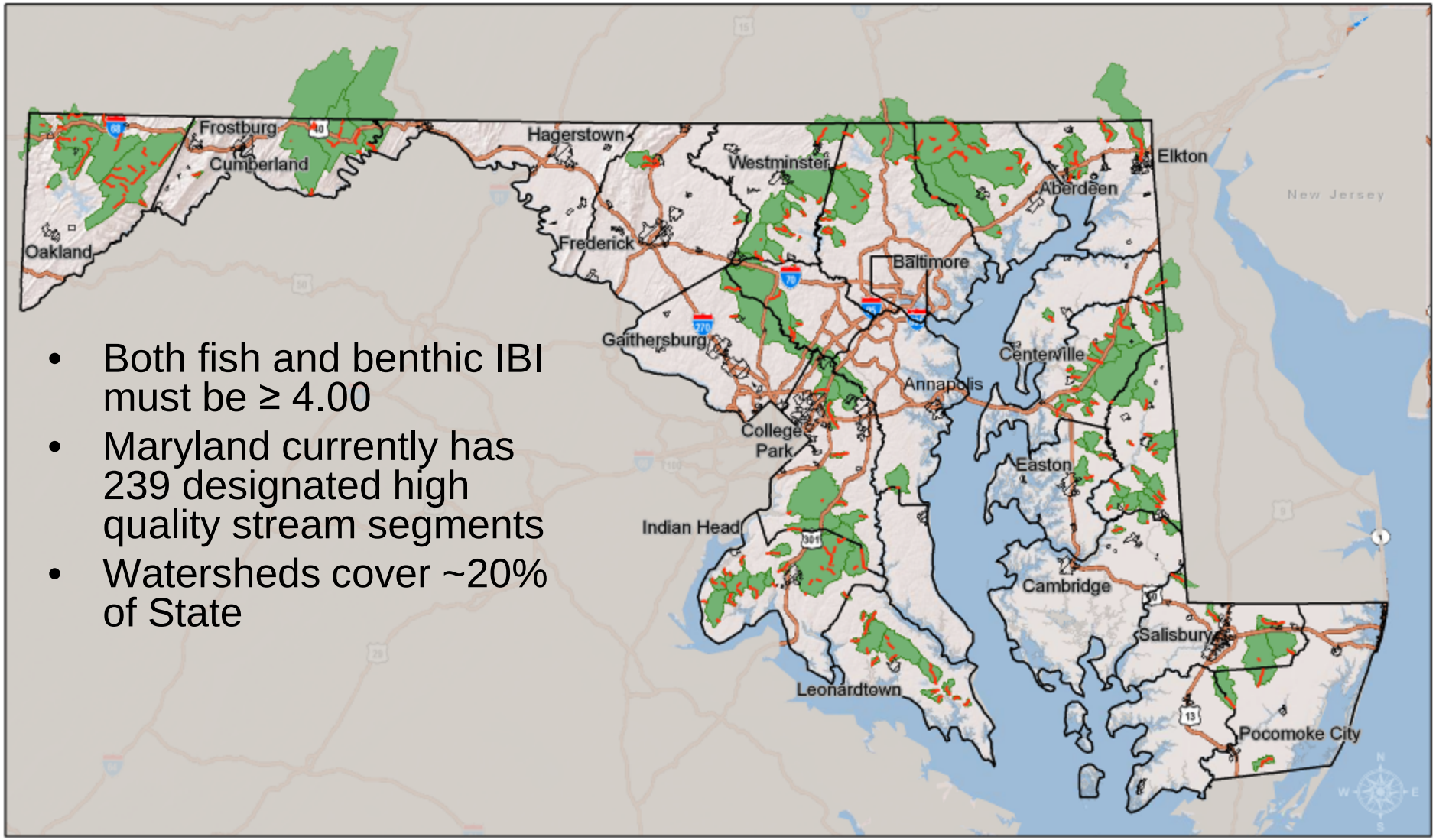

Nitrate Nitrogen (mg/l) by Trib Basin
STATEWIDE
Youghiogheny
Upper Potomac
Upper Western Shore
Patapsco-Back
Lower Western Shore
Patuxent
Middle Potomac
Lower Potomac
Upper Eastern Shore
Choptank
Lower Eastern Shore
Ocean Coastal
Trib Basin
0
10
20
30
40
50
60
70
80
90
100
Percent of Stream Miles
High
Moderate
Low

Temperature Loggers at Sentinel Sites



High Quality (Tier II) Waters in Maryland

[Code of MD Regulations 26.08.02.04-1]



- Both fish and benthic IBI must be ≥ 4.00
- Maryland currently has 239 designated high quality stream segments
- Watersheds cover ~20% of State

MARYLAND

Martin O'Malley, Governor
Anthony G. Brown, Lt. Governor
Shari T. Wilson, Secretary
Robert M. Summers, Deputy Secretary

Tier II Stream Segments
Tier II Catchments
Municipal Boundary
County Boundary

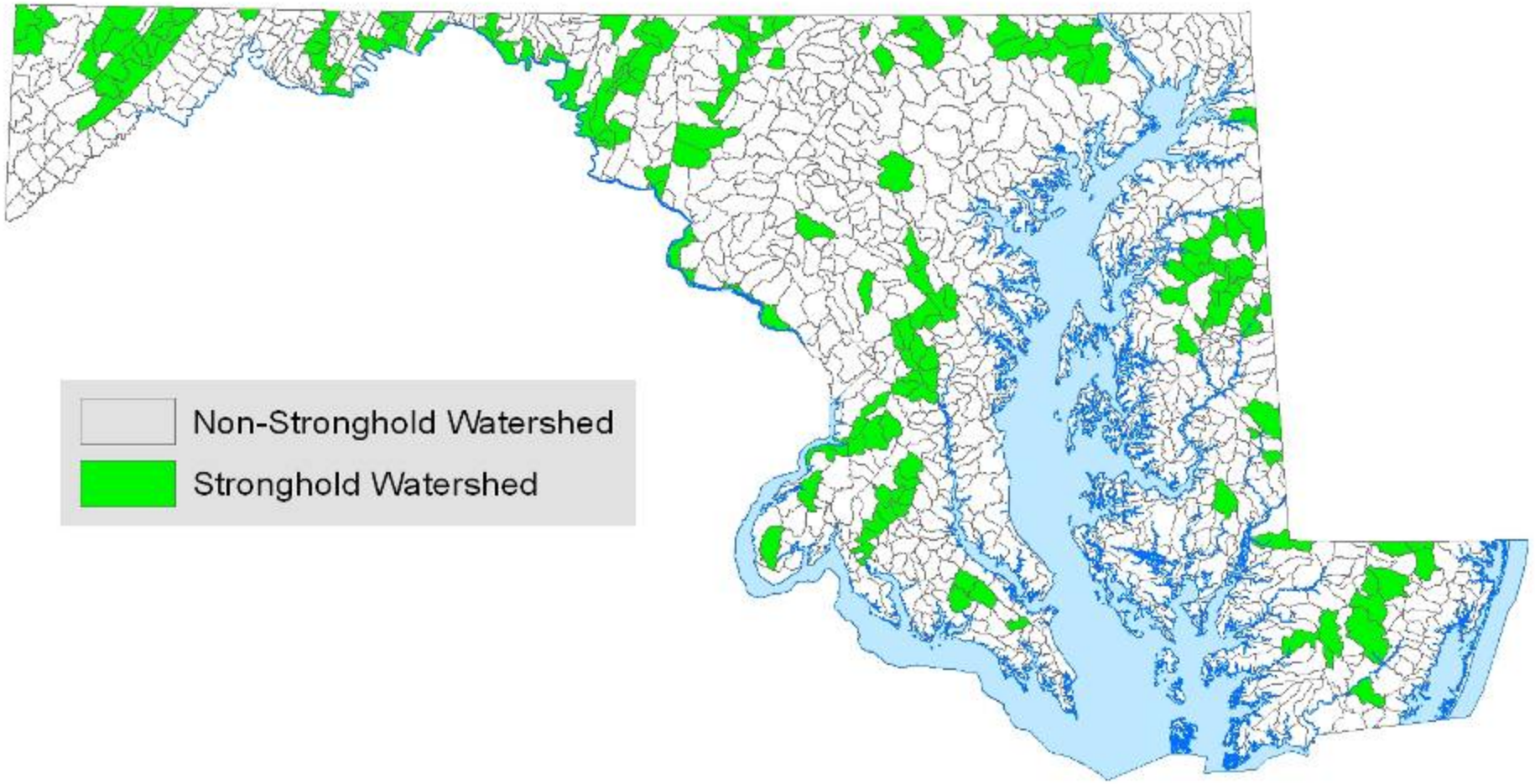
0 10 20 40 Miles

MDE

Maryland Department of the Environment
Science Services Administration
Montgomery Park Business Center
1800 Washington Boulevard
Baltimore, Maryland 21230-1718

Date Map Prepared: Mar 1, 2010

Maryland's Stronghold Watersheds

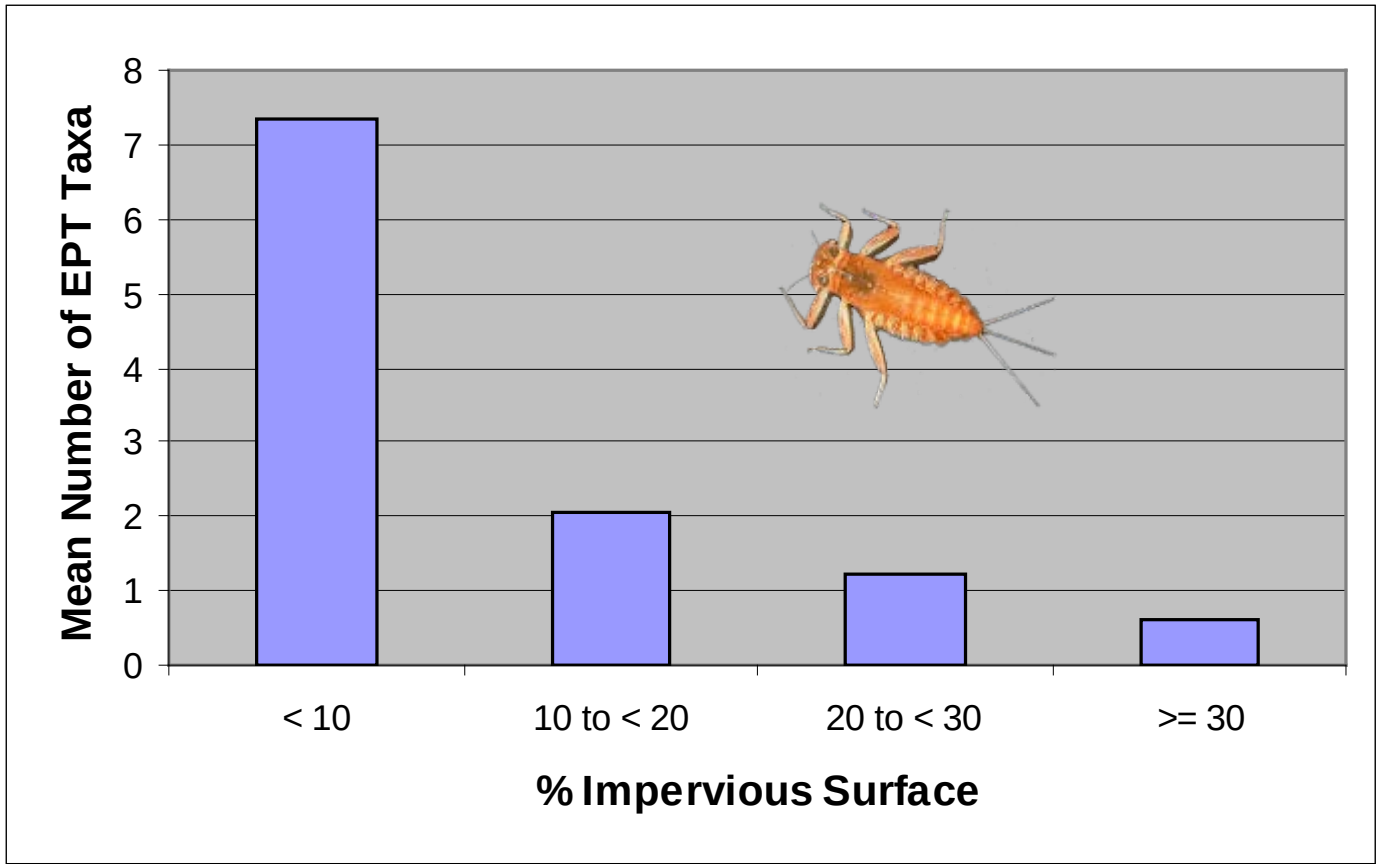


MARYLAND
DEPARTMENT OF
NATURAL RESOURCES
Monitoring and Non-Tidal
Assessment Division
April 13, 2010

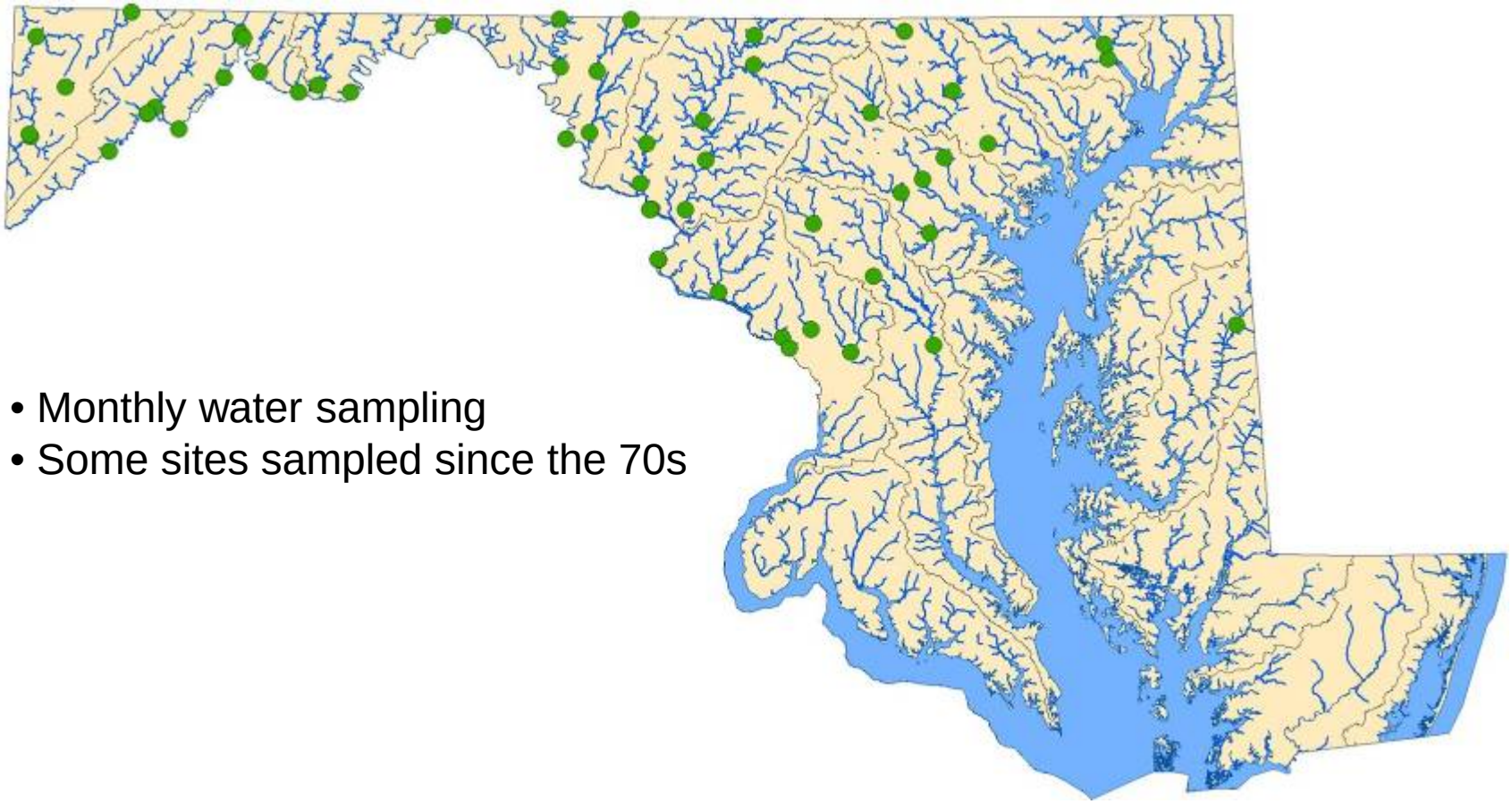
0 10 20 40 60 80
Kilometers

N

Caddisflies
Mayflies, and
Stoneflies



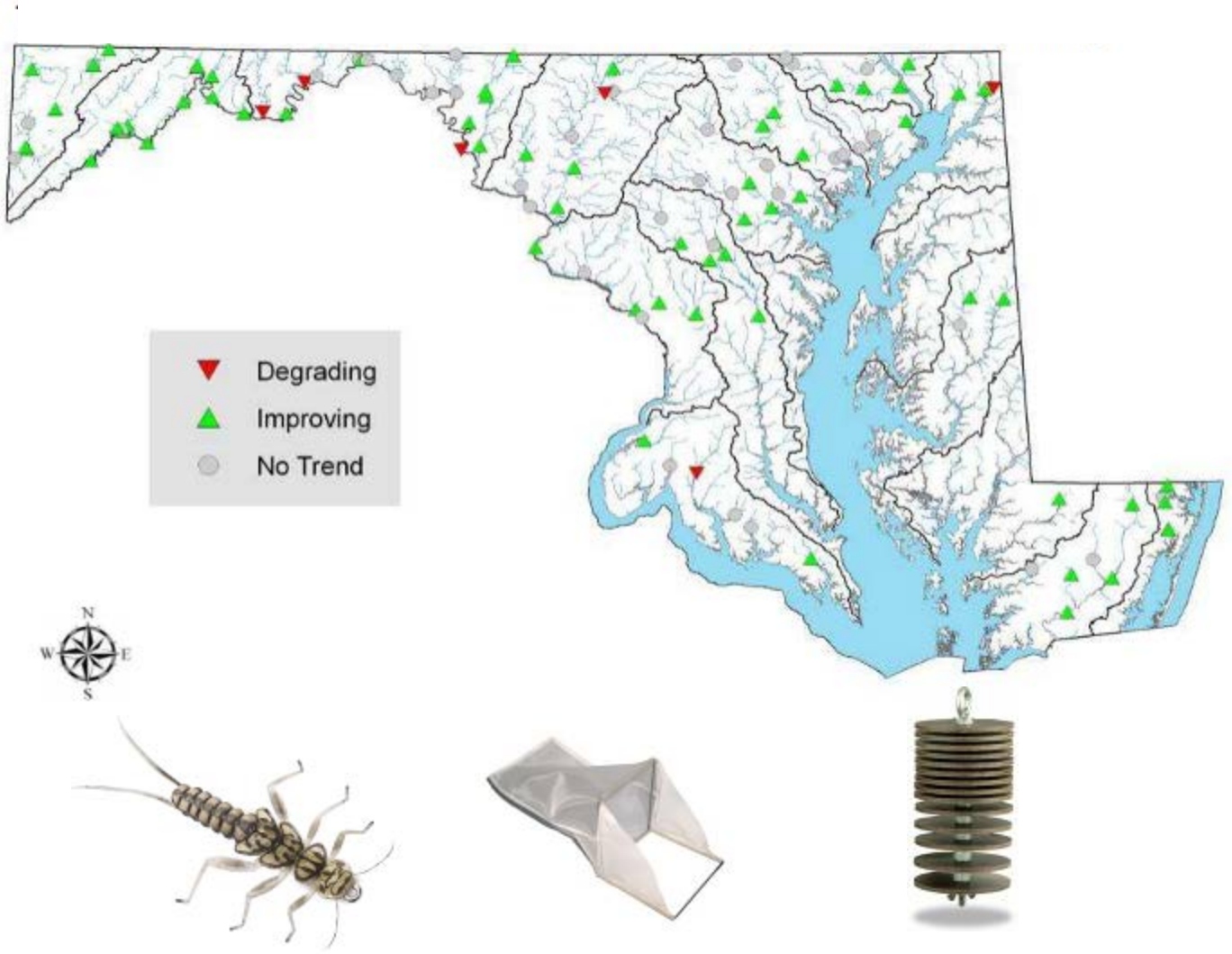
CORE/TREND Water Quality Monitoring Stations



- Monthly water sampling
- Some sites sampled since the 70s

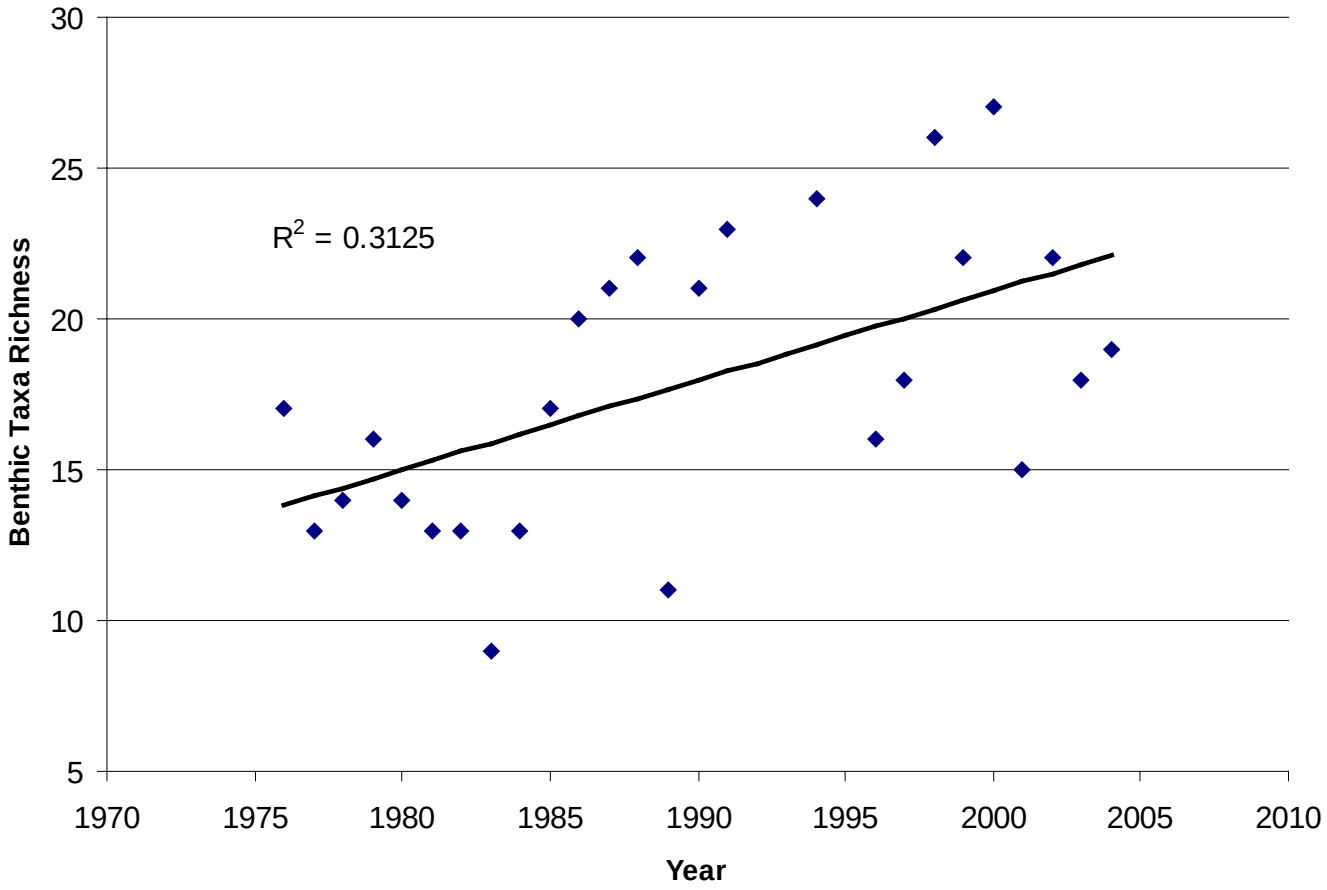
CORE/Trend Benthic Monitoring Sites

Benthic Macroinvertebrates – 1976-2015

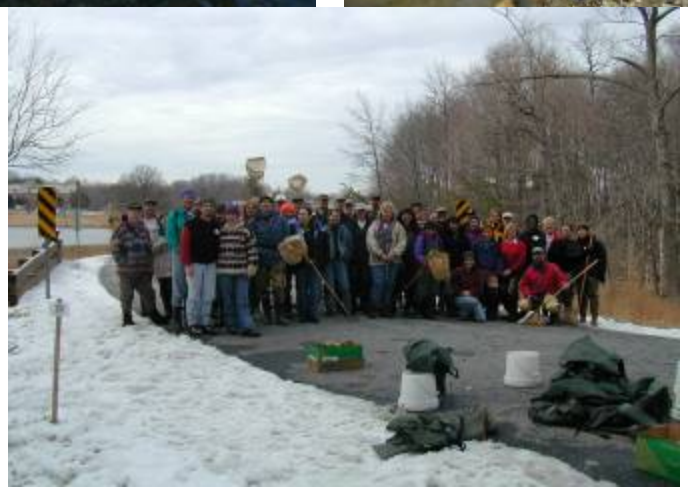


CORE/Trend Program

Patuxent River at Rt. 50 Bridge (PXT0603)
Benthic Macroinvertebrates – 1976-2015

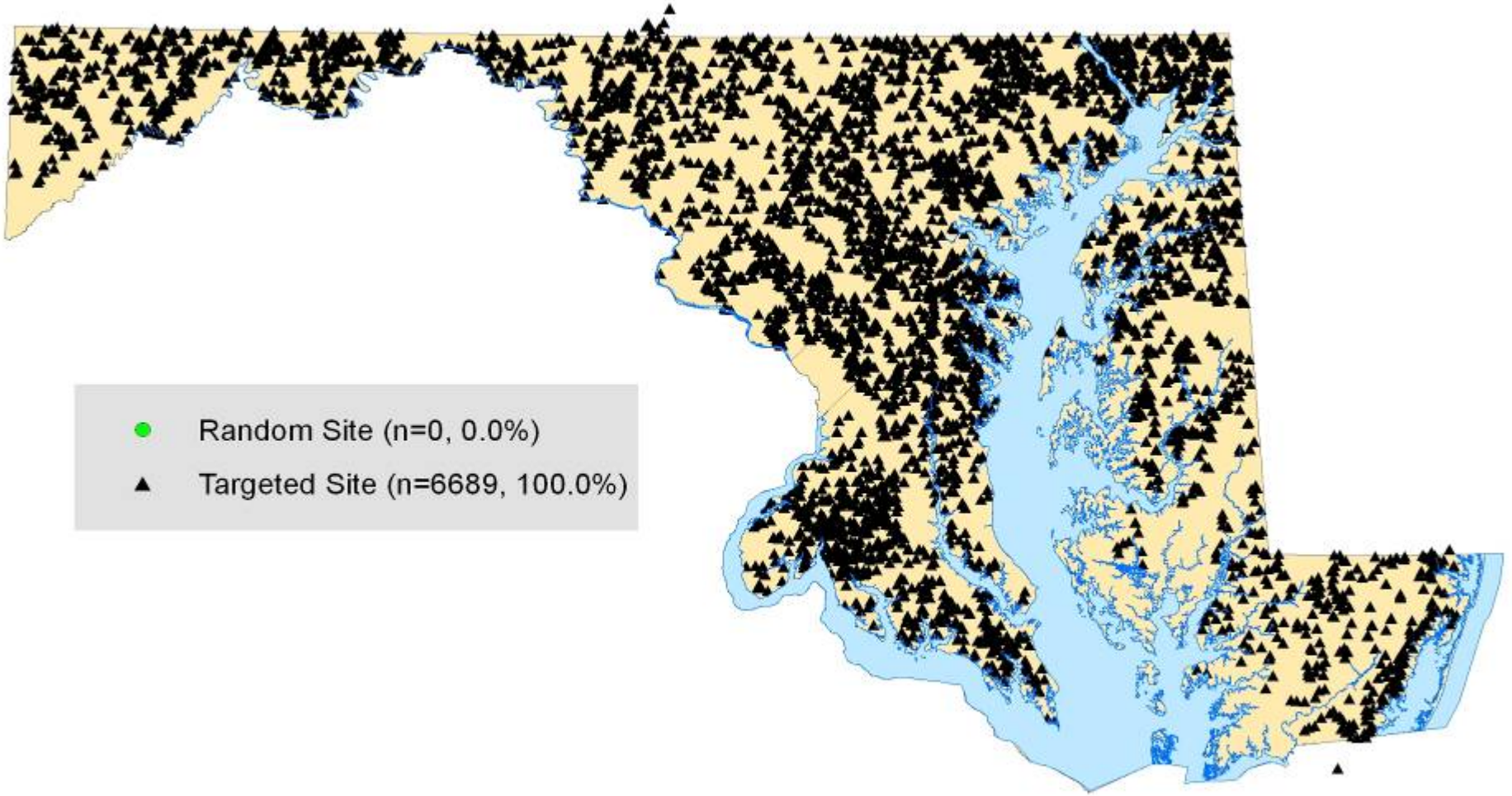


Stream Waders



- DNR's volunteer monitoring program
- 2,000+ trained volunteers sampled over 7,500 sites from 2000 through 2014
- Primary goals are education and enhanced environmental stewardship
- Secondary goal is stream health assessment

Stream Waders Sites 2000 - 2011



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Monitoring and Non-Tidal Assessment Division
www.dnr.maryland.gov

0 10 20 40 60 80
Kilometers

N

Want Data?

michael.kashiwagi@maryland.gov

Smart, Green & Growing Atlas

MARYLAND

Home |

Overview | How To | Contents | Add Data

Smart, Green and Growing Atlas

Ag Print

Green Print

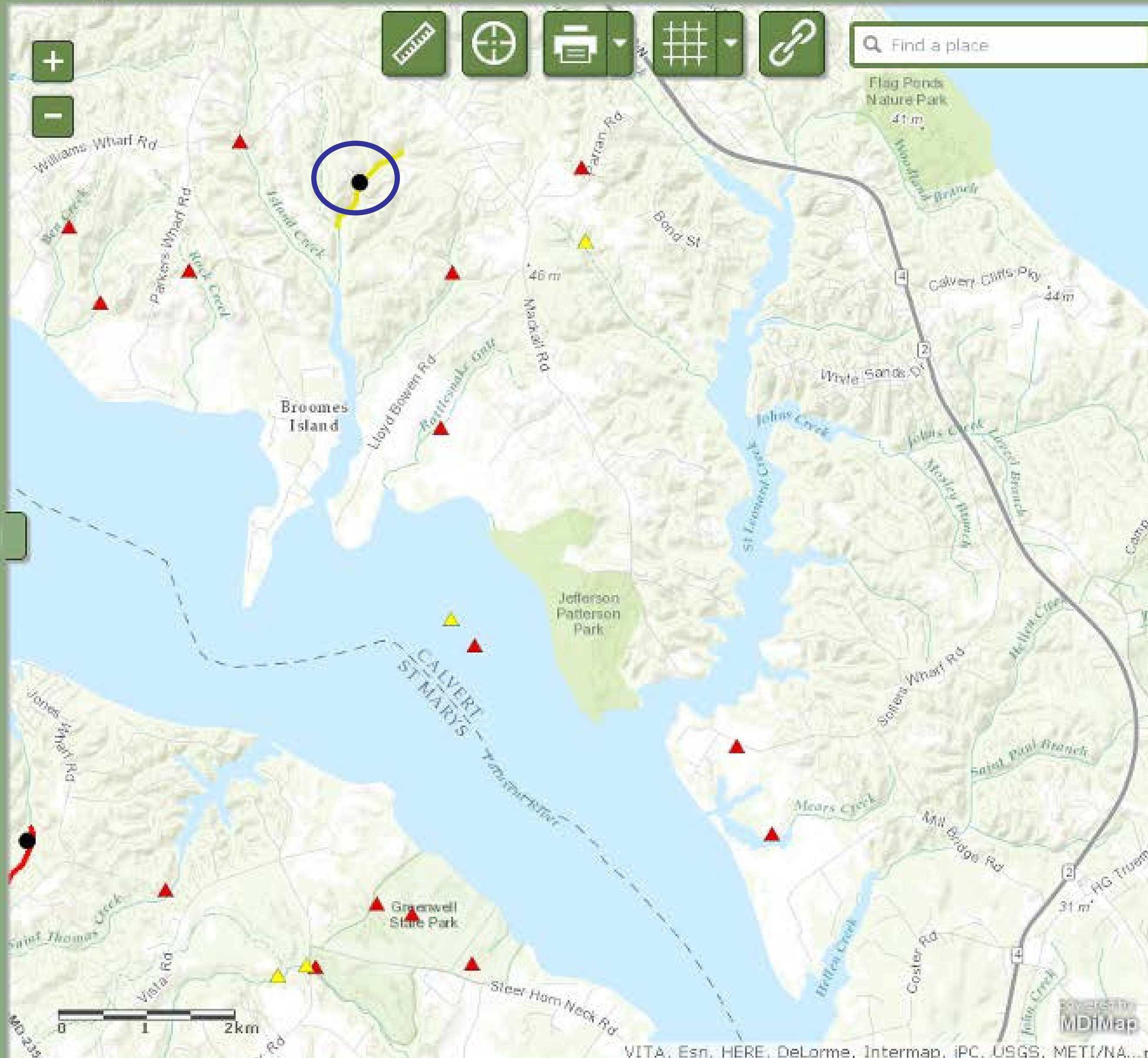
Growth Print

Stormwater Print

Stream Health

StreamHealth shows the current health of Maryland streams and factors that impact that health.

Create Your Own Map



Smart, Green & Growing Atlas

Home |

Overview | How To | Contents | Add Data

- Smart, Green and Growing Atlas
- Ag Print
- Green Print
- Growth Print
- Stormwater Print
- **Stream Health**

StreamHealth shows the current health of Maryland streams and factors that impact that health.

- Create Your Own Map

Find a place

(1 of 2)

Md Biological Stream Survey Sites:PAXL-111-R-2004

SITE ID	PAXL-111-R-2004
Year	2004
CBI	3.10
FIBI	2.33
BIBI	
Hyperlink	More info

Zoom to

Flag Ponds Nature Park
Williams Wharf Rd
Parkers Wharf Rd
Bond St
Calvert Cliffs Pky
White Sands Dr
Jefferson Patterson Park
CALVERT
ST MARY'S
Solters Wharf Rd
Mill Bridge Rd
Greenwell State Park
Steer Horn Neck Rd
Vista Rd
Coster Rd
0 1 2km
MDiMap
VITA, Esri, HERE, DeLorme, Intermap, iPC, USGS, METI/NA...

Data Summary for: PAXL-111-R-2004

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Maryland Biological Stream Survey

New Search
Search Tips
About the MBSS
Fish Distributions
1076.jpg - MIDPOINT DOWNSTREAM
1077.jpg - MIDPOINT UPSTREAM
Your Feedback

PAXL-111-R-2004 is located on **island cr ut** in the Patuxent River lower watershed, 8-digit code: (02131101). This stream was visited in the spring on 3-3-2004 and again in the summer on 7-8-2004.

Fish IBI	2.33	Poor
Benthic IBI	3.86	Fair

Catchment area	409.7 acres
Urban	5.1 %
Agricultural	23.2 %
Forest	71.7 %

Amphibians and Reptiles
AMERICAN BULLFROG
FOWLER'S TOAD
NORTHERN GREEN FROG
NONE
NORTHERN COPPERHEAD
NORTHERN TWO-LINED SALAMANDER
PICKEREL FROG
SOUTHERN LEOPARD FROG

Instream Habitat	4.0 (Poor)
Epifaunal Substrate	7.0 (Marginal)
Velocity/Depth Diversity	7.0 (Marginal)
Pool Quality Pool Extent = 10.0 of 75.0 meters	5.0 (Poor)
Riffle Quality Riffle Extent = 75.0 of 75.0 meters	12.0 (Suboptimal)
Shading	95.0 %
Embeddedness	100.0

Acid neutralizing capacity	947.4
Dissolved organic carbon	1.9
pH (lab)	7.45
pH (field)	7.16
Temperature	20.4 °C
Dissolved oxygen	8.1
Conductivity	0.17

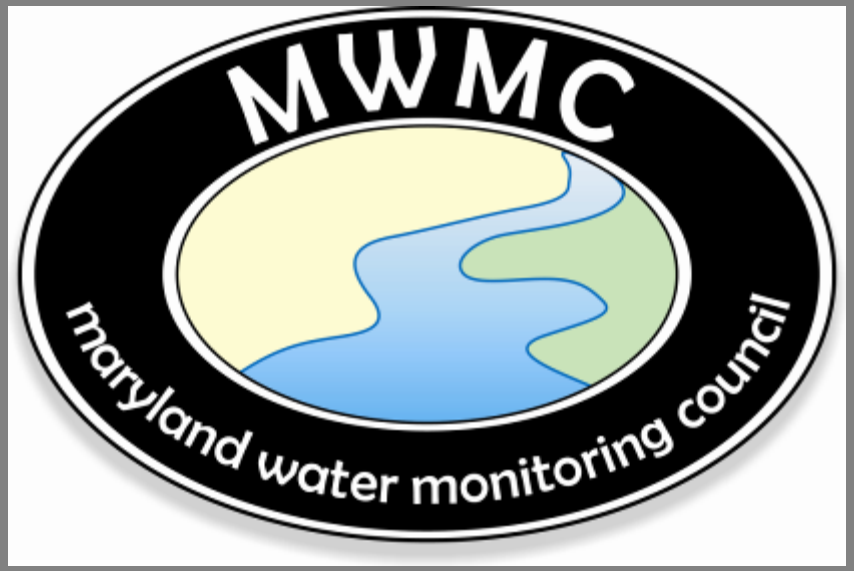
The following fishes were collected at PAXL-111-R-2004

Common name	Percent of total
AMERICAN EEL	40.0
BLACKNOSE DACE	33.3
PUMPKINSEED	26.7

Fish IBI metrics	value
Number of native sp.	
Number of benthic fish sp.	0.0
% abundance of dominant sp.	40.0%
Percentage of tolerant sp.	60.0%
biomass (g) per sq. meter	1.7

The Maryland Water Monitoring Council

Furthering the Cause of Water Monitoring in Maryland



Dan Boward; MD DNR
MWMC Executive Secretary

History

- Started by Dr. Emery Cleaves, State Geologist
- Recommendation of ITFM
- First meeting in late 1994
- 12-member steering committee:
  - State, Federal, Local, University
- Alignment under MD DNR

Vision

- The MWMC envisions a time when monitoring methods, programs, projects, and data are the product of *collaboration* and *comparability* among agencies and organizations. The resulting information will be accessible for use by all stakeholders and will facilitate sound *decision-making* in environmental management and protection.

Goals

- Forum for effective *communication*, *cooperation*, and *collaboration*
- Facilitate *collaborative*, watershed-based monitoring strategies
- *Document* monitoring activities in Maryland
- Promote *quality-assured* procedures for collection, analysis, assessment, and data management

MARYLAND WATER MONITORING COUNCIL

Board of Directors

Standing Committees

Ad Hoc Committees

General Members—Attendees at Annual Meetings and Workshops

Board of Directors

Board Membership

- State agencies (4)
- Local agencies (4)
- Federal agencies (2)
- Volunteer/Environmental groups (2)
- Universities (2)
- Intergovernmental organizations (2)
- Consultant/Industry (2)
- At-large members (2)
- Executive Secretary (1)

Committees

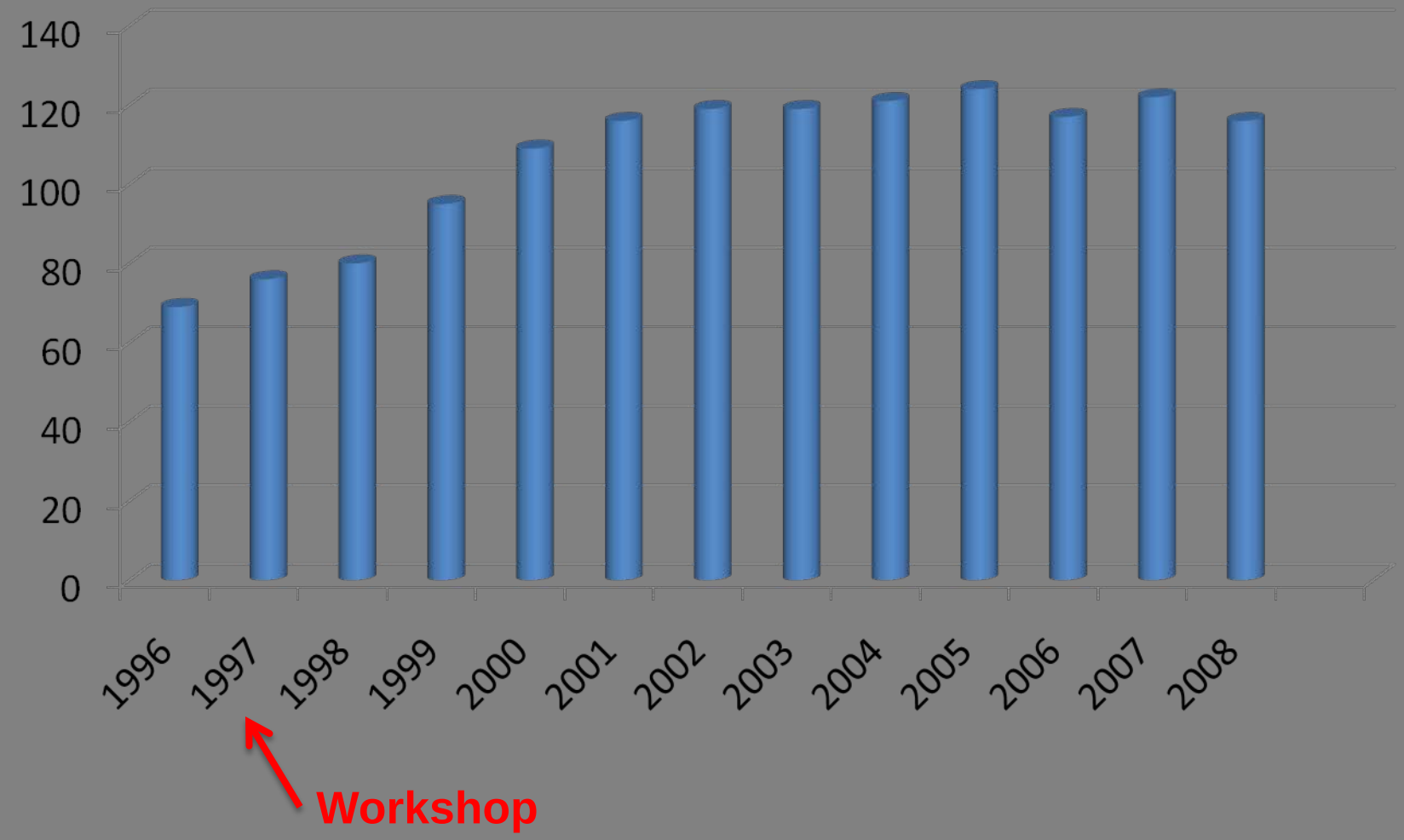
- Monitoring and Assessment
- Stream Restoration Monitoring
- Information Management and Communication
- Community Outreach and Citizen Stewardship
- Annual Conference Planning
- Nominating

Selected Workshops

- Stream Monitoring Roundtable
- Stream-Gaging Workshop
- Climate Change Workshop
- Vernal Pools Workshop
- Benthic Macroinvertebrate Taxonomy

Workshops

Growth of Maryland Stream-Gaging Network



1999, 2005, 2011 Maryland Stream Symposia

Garnered support for the Maryland Biological Stream Survey (MBSS) and solidified the need for cooperation among stream monitoring entities

Annual Conference

Annual Conference

- Held late fall
- Themed one-day conference
- Keynote and plenary sessions
- Concurrent tracks of themed talks (50) + posters (30)
- Long breaks for networking
- 140 participants in 1995; 450 in 2014
- At Maritime Institute near Baltimore

Celebrities

Panel Discussions

Food

Conclusion

- MWMC still going strong in 21st year
- Forum for communication, coordination, and collaboration
- Has raised awareness of water monitoring in Maryland
- Has led to solidarity for water monitoring
- Has led to partnerships
- Facilitates sustainability of networks in Maryland

Thank You!

Dan Boward
dan.boward@maryland.gov