Maryland

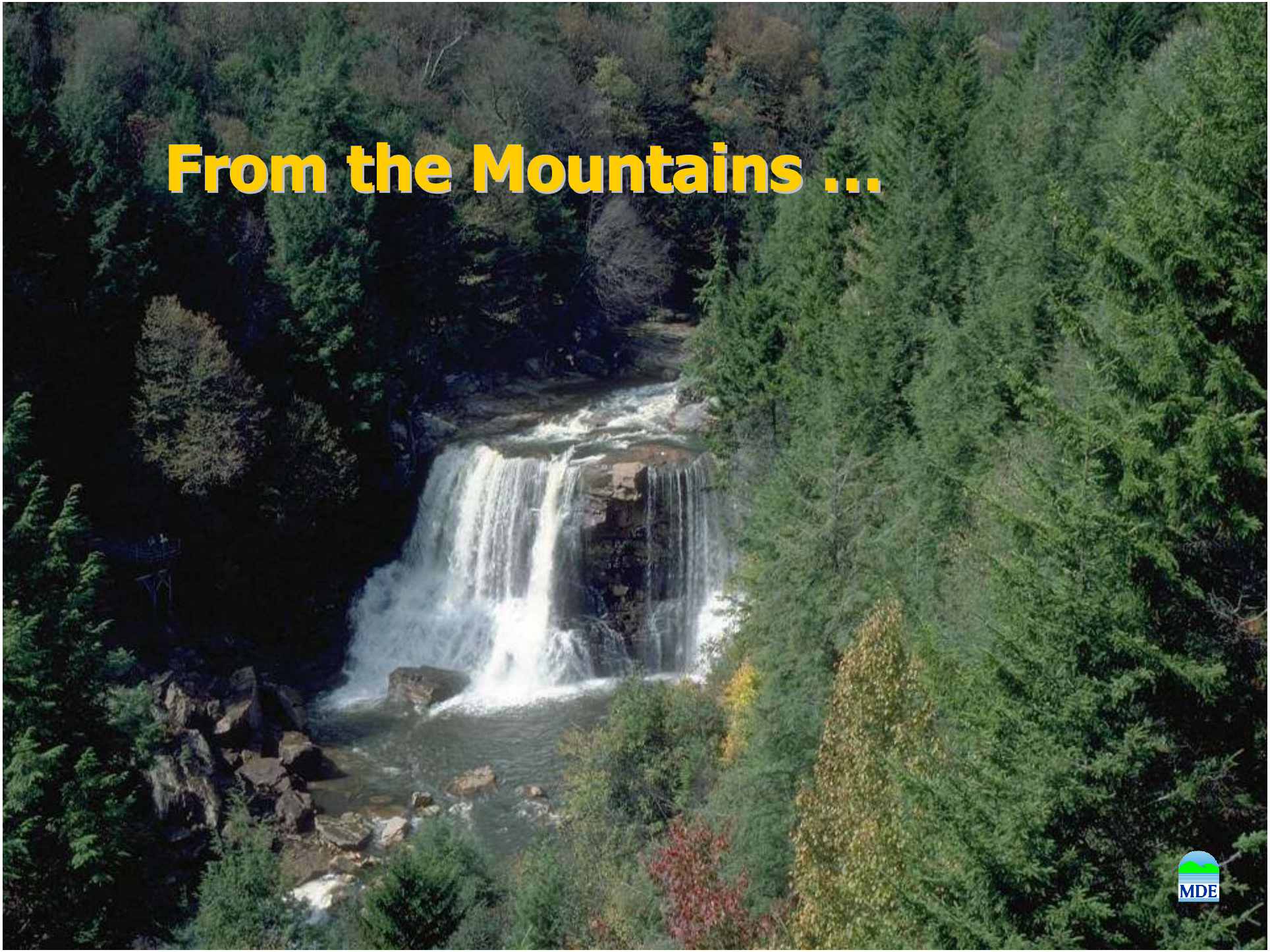
Department of the Environment

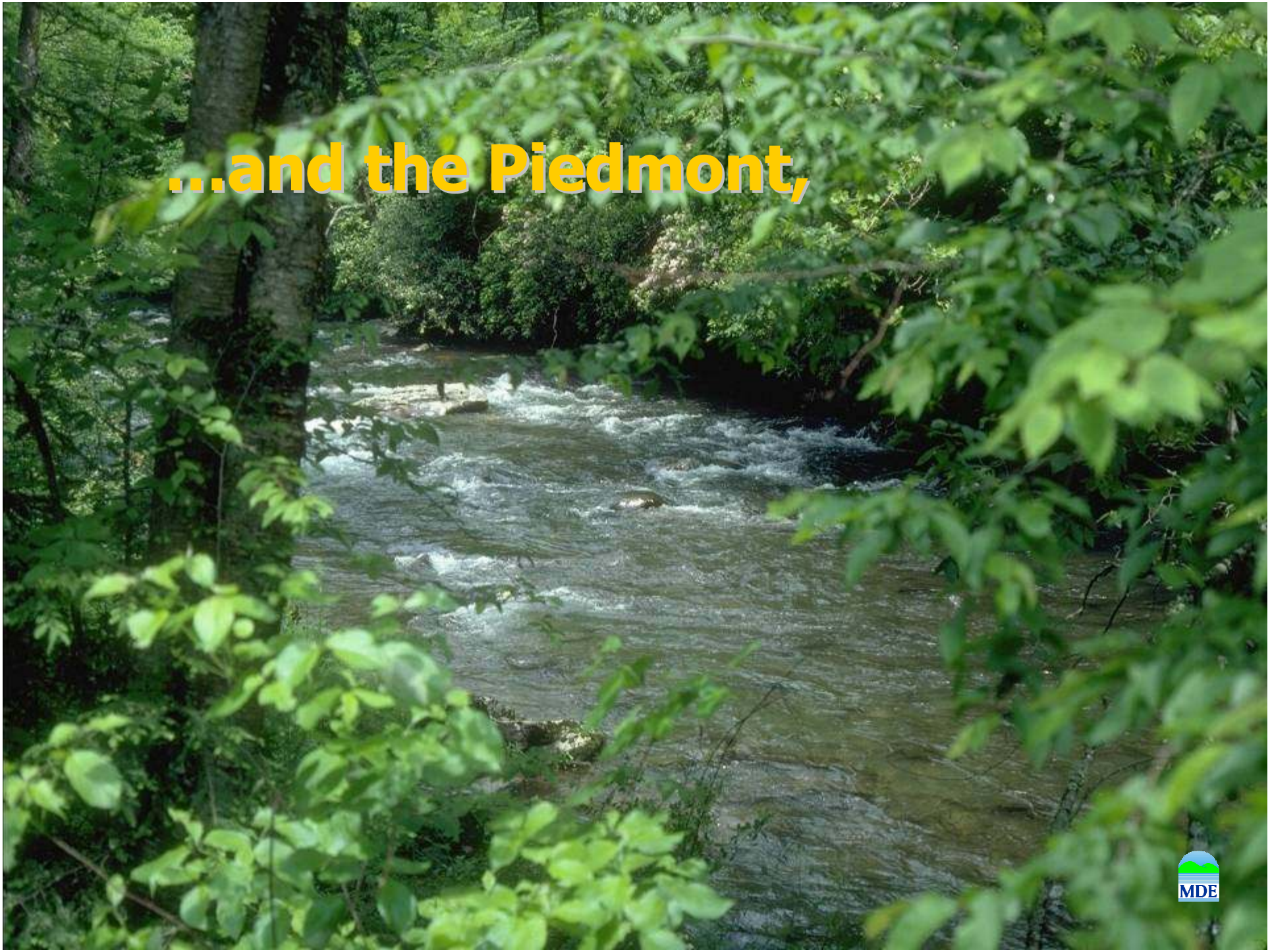
MARYLAND
Department of the Environment

MARYLAND'S STORMWATER MANAGEMENT PROGRAM

MDE

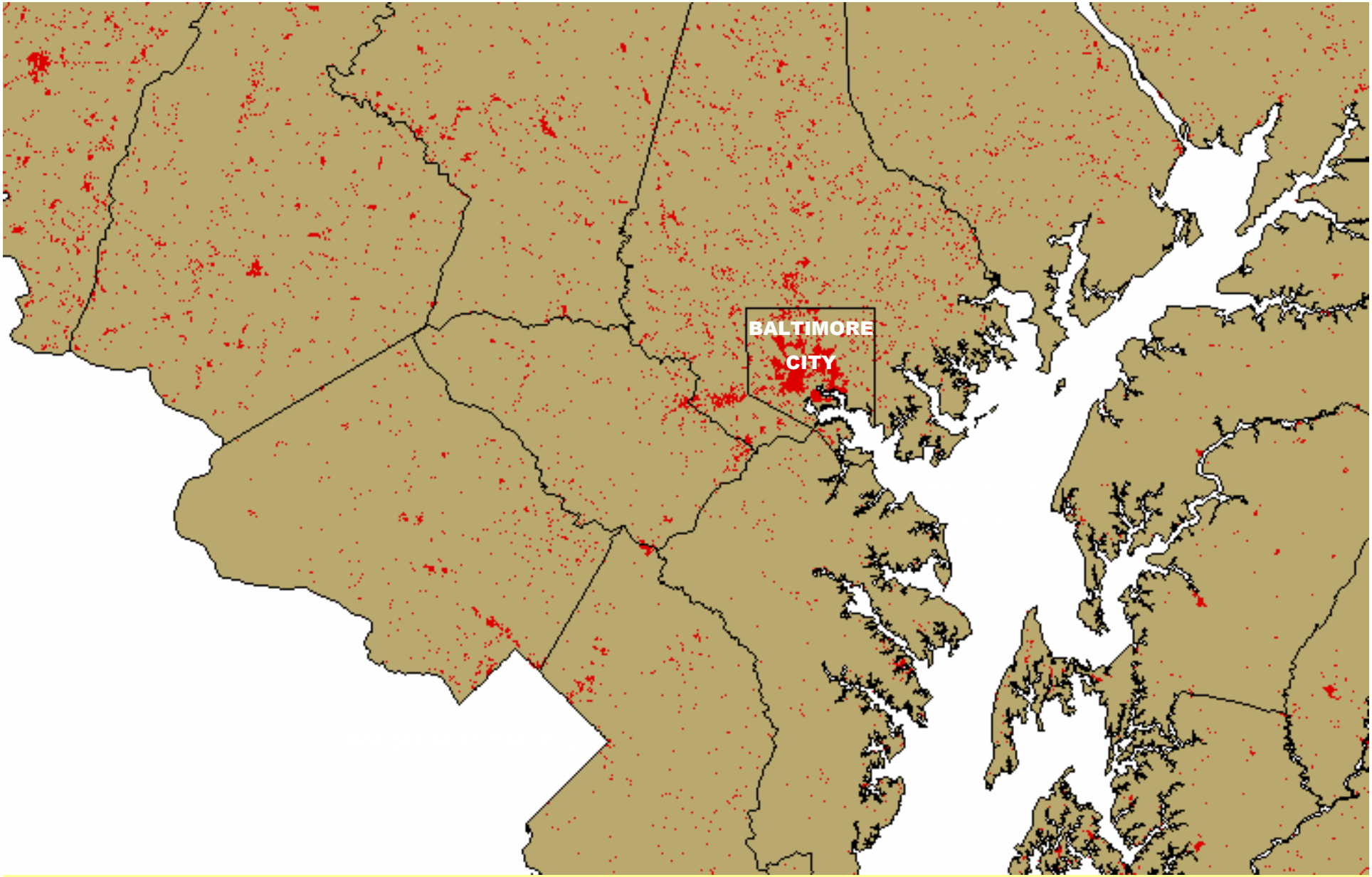

MARYLAND
Department of the Environment
MDE


From the Mountains …
MDE


...and the Piedmont,
MDE

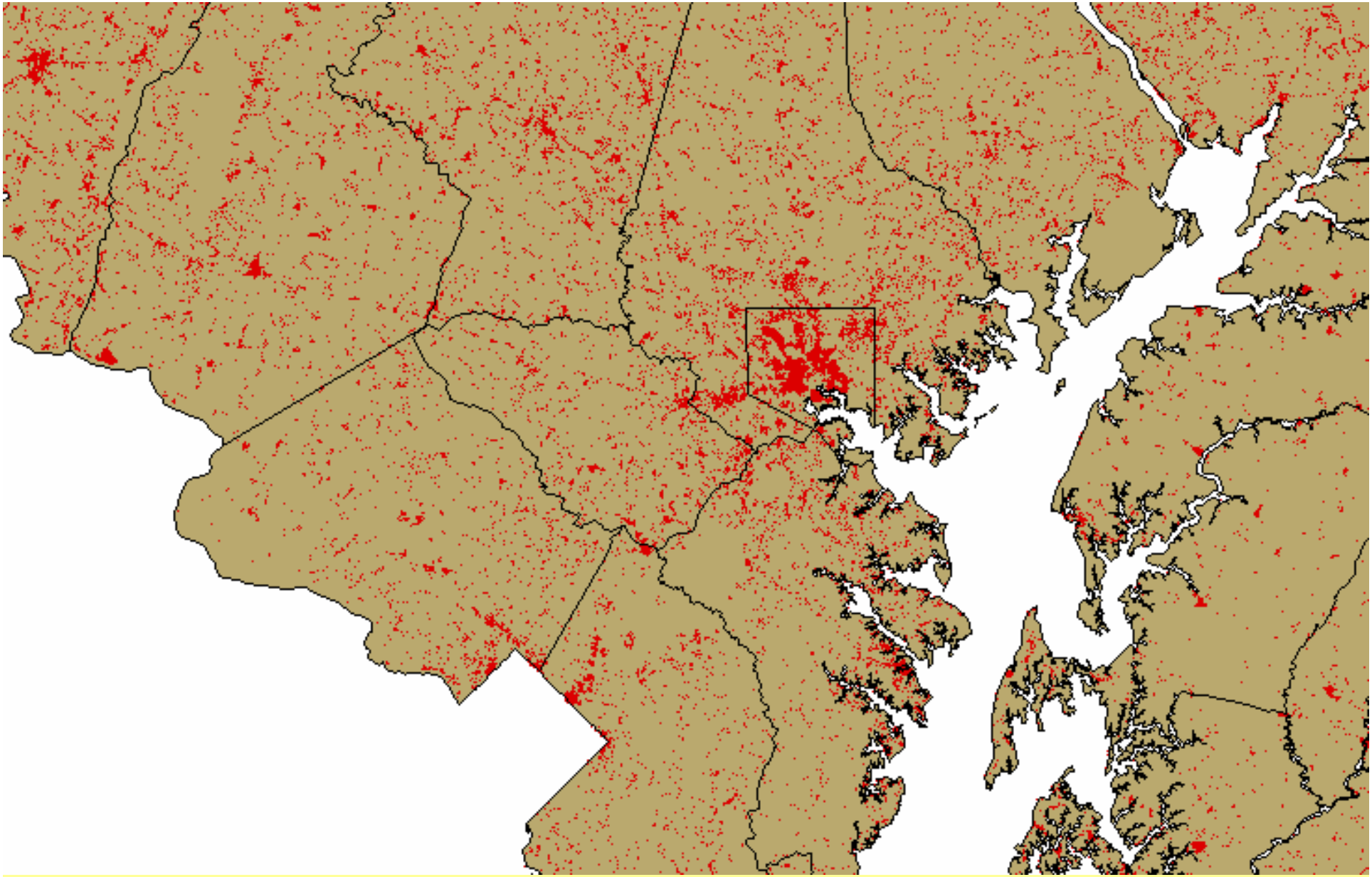

to the Coastal Plain…
Pocomoke Scenic River
©1998 Hardie Truesdale
MDE


...to protect the Chesapeake and Coastal Bays
MDE



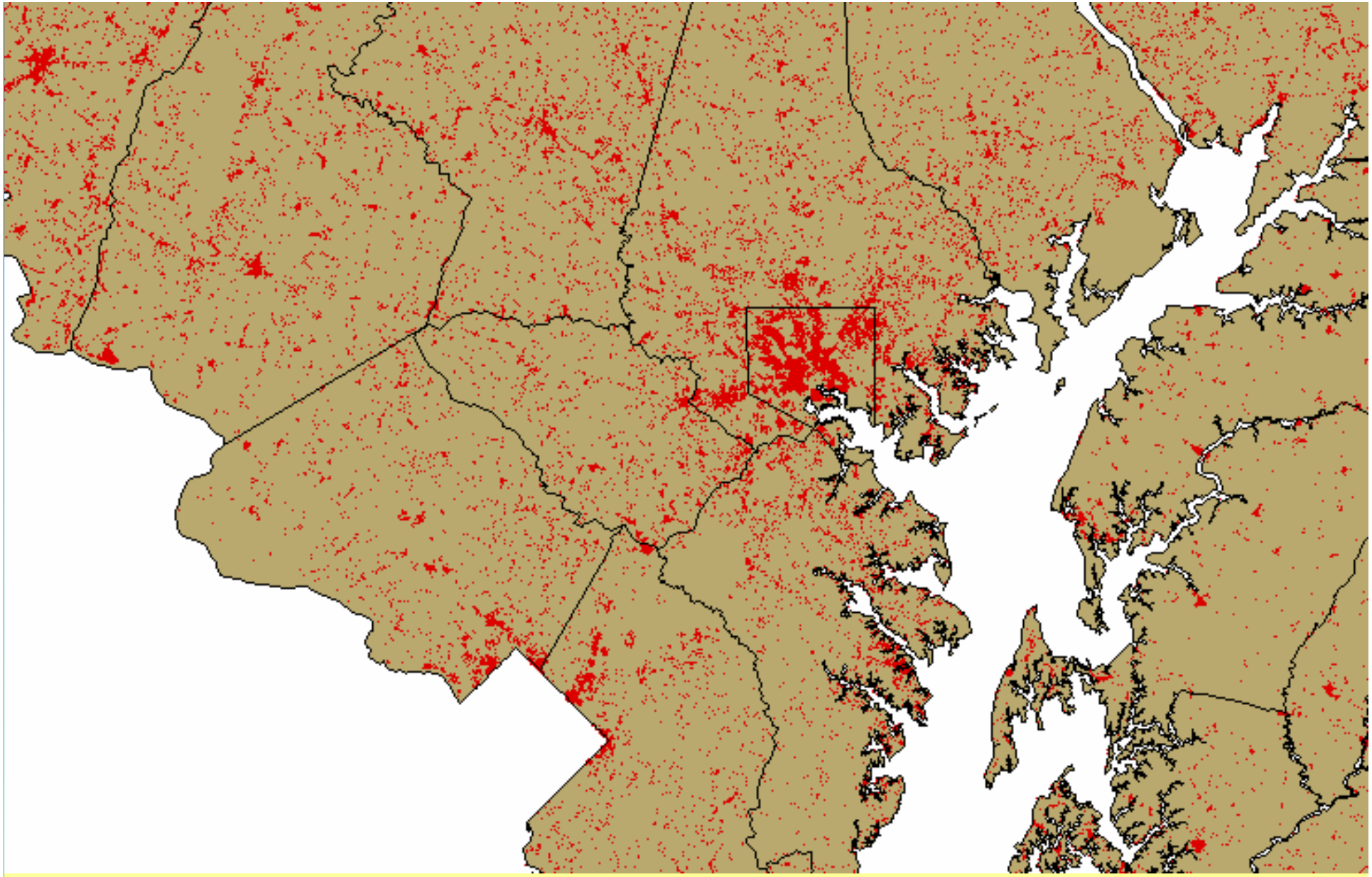
Development Patterns Before

1900



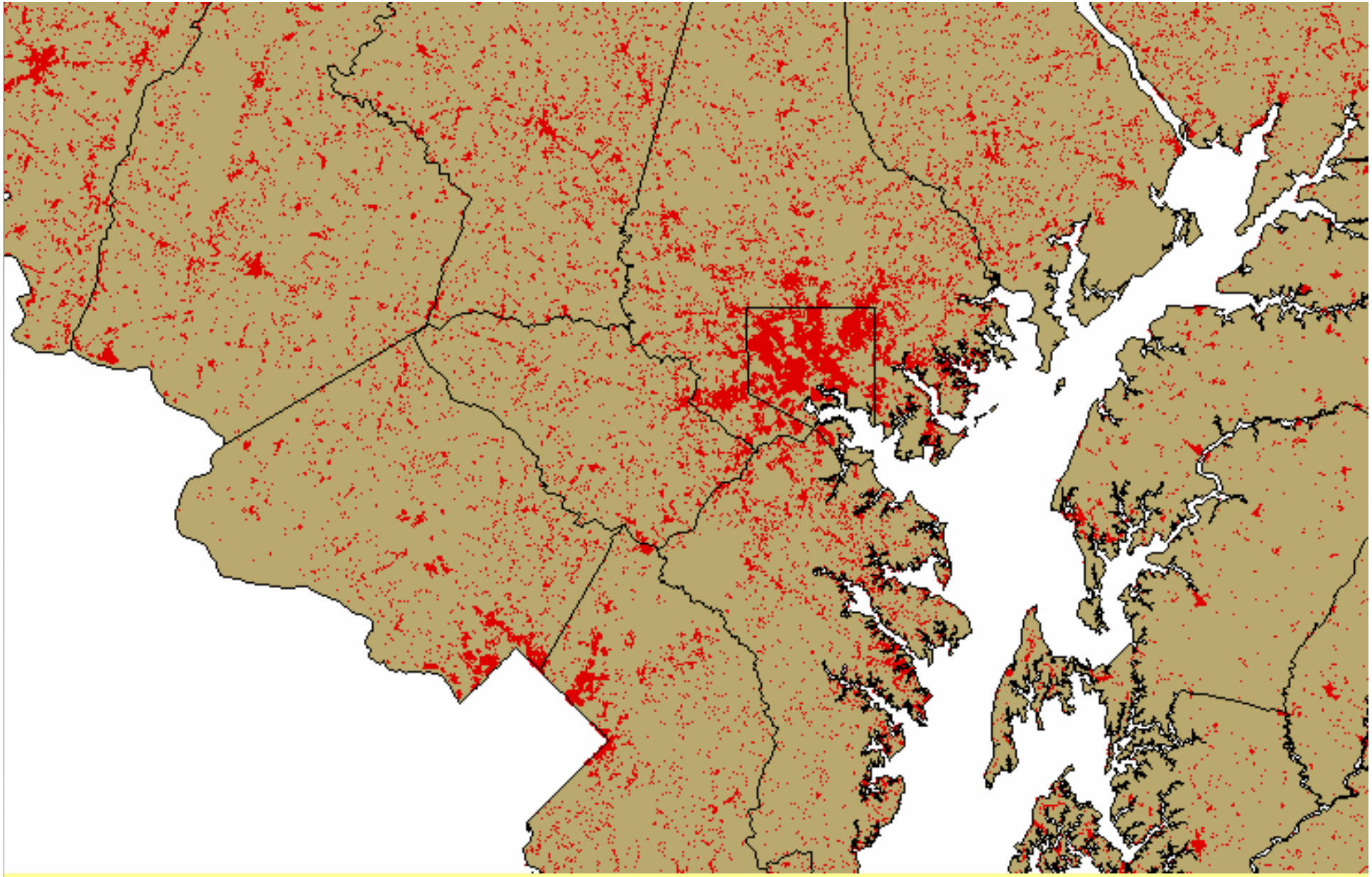
Development Patterns Up to

1910



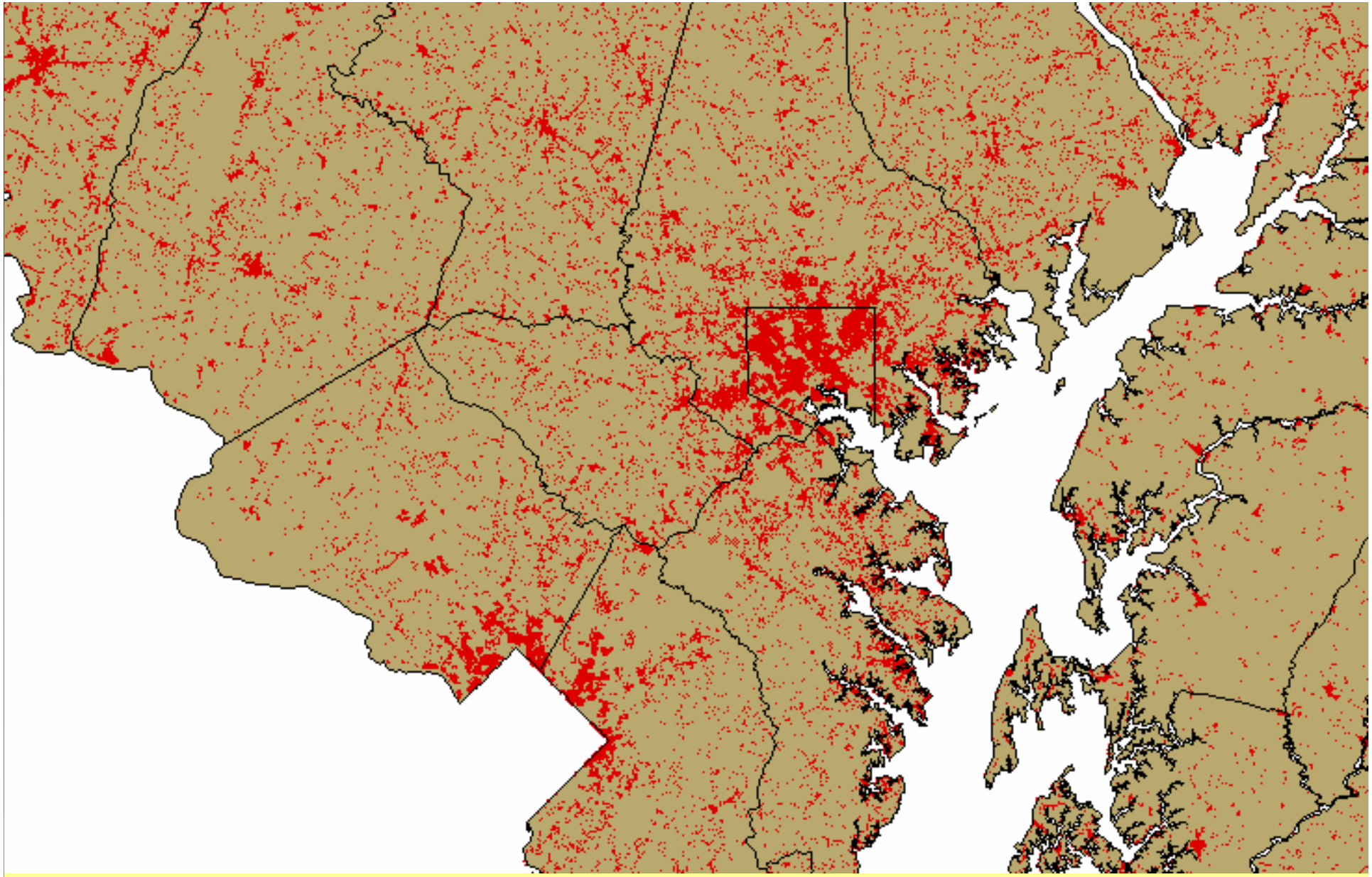
Development Patterns Up to

1920



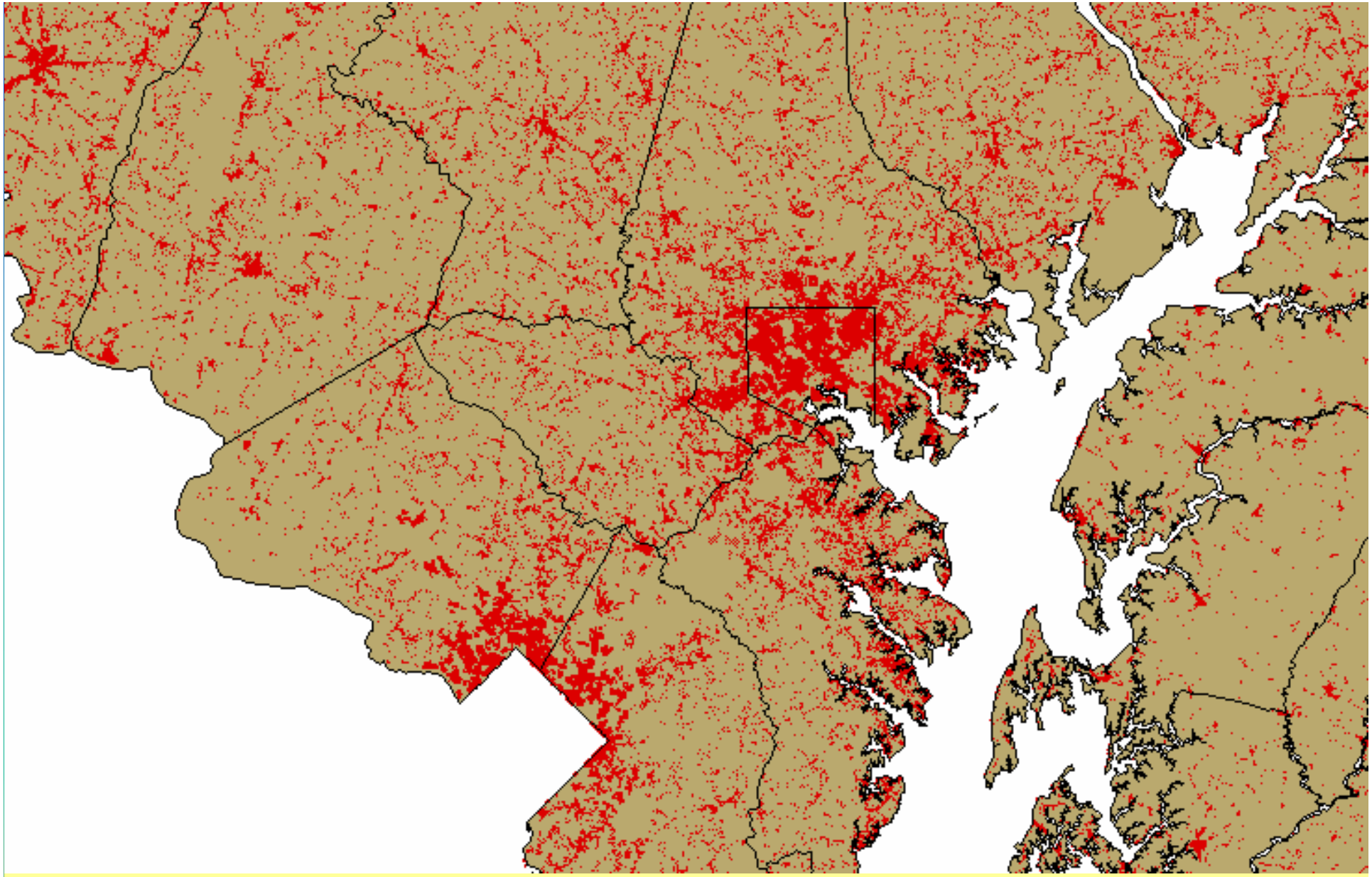
Development Patterns Up to

1930



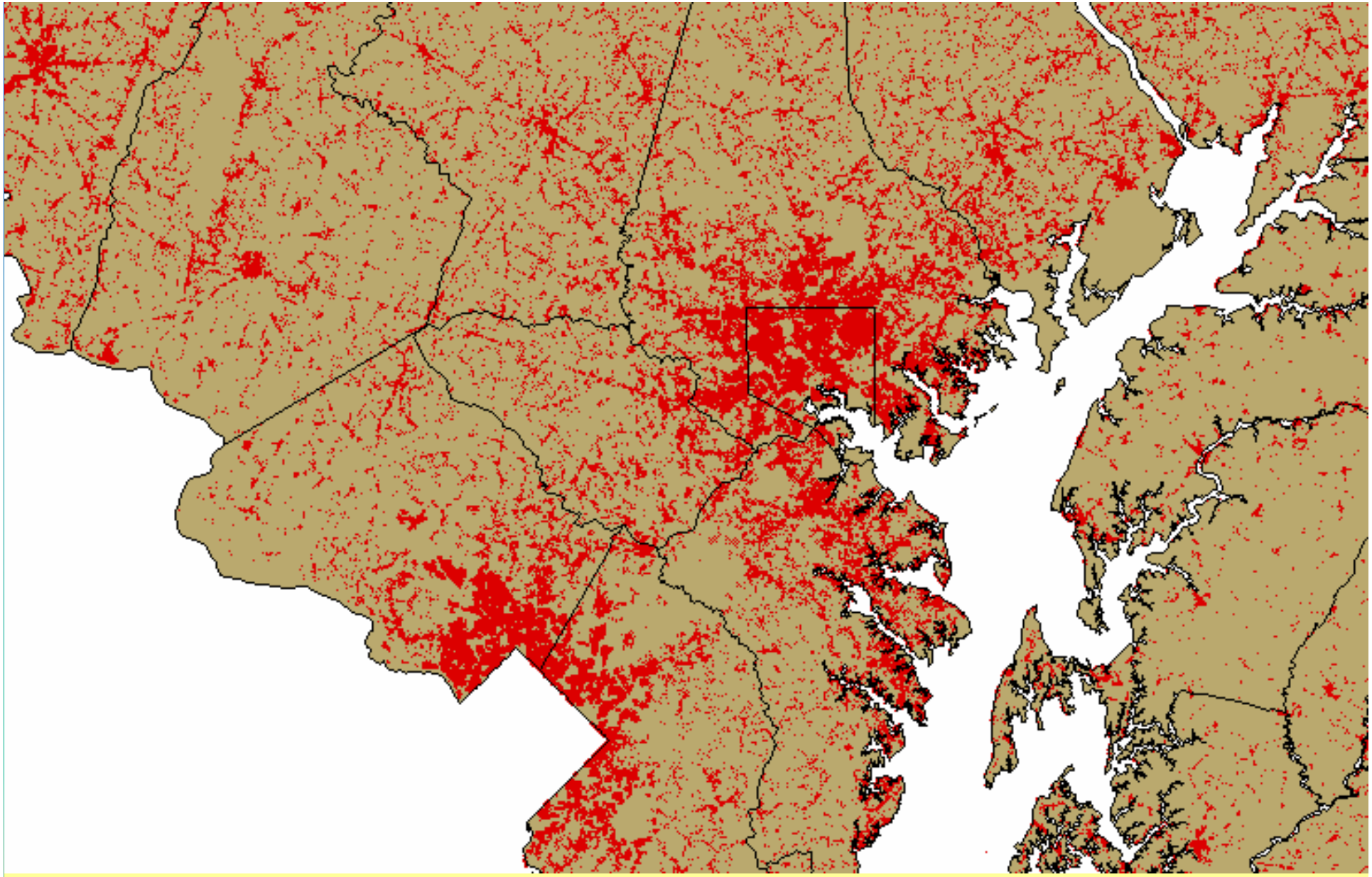
Development Patterns Up to

1940



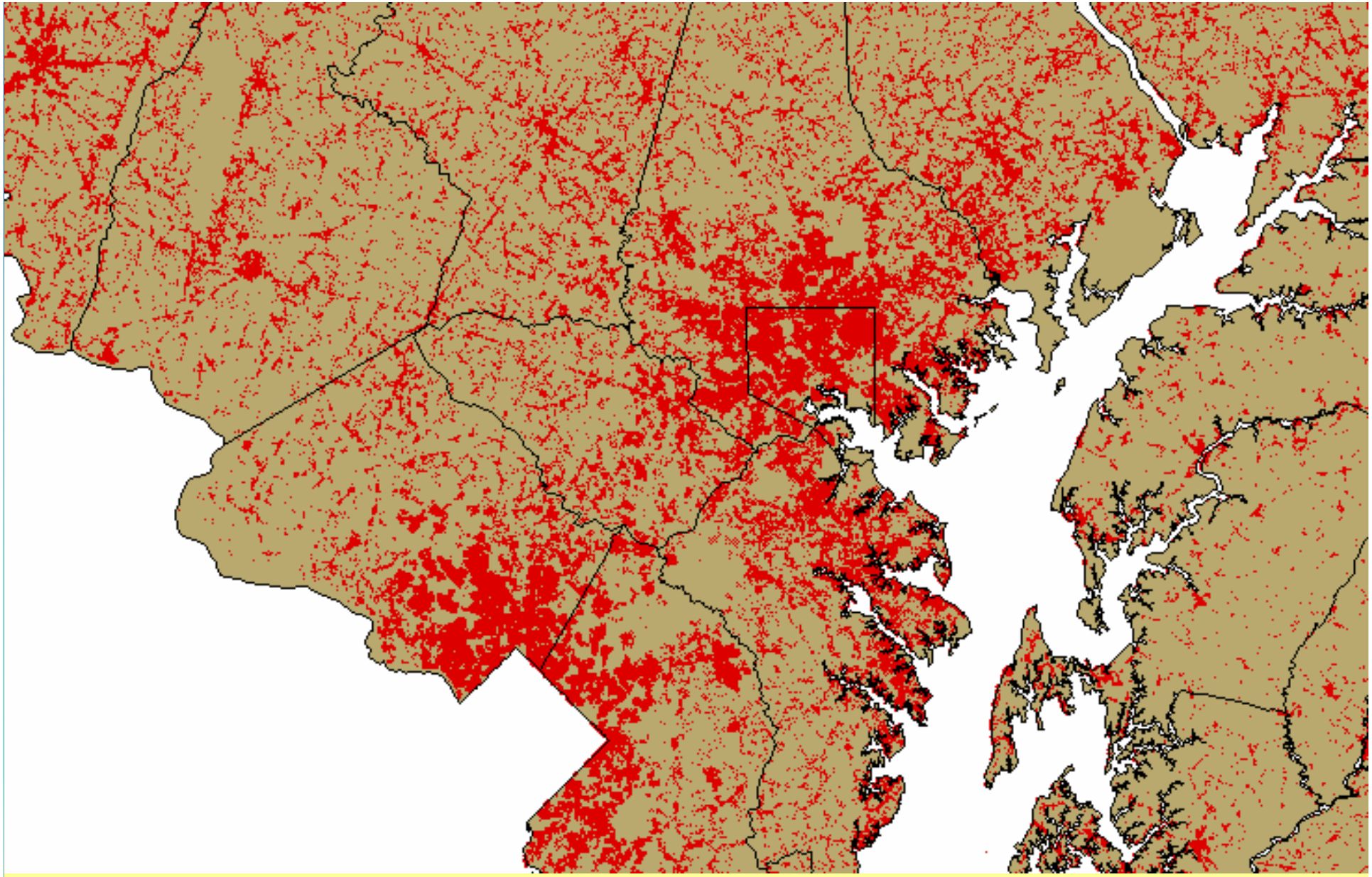
Development Patterns Up to

1950



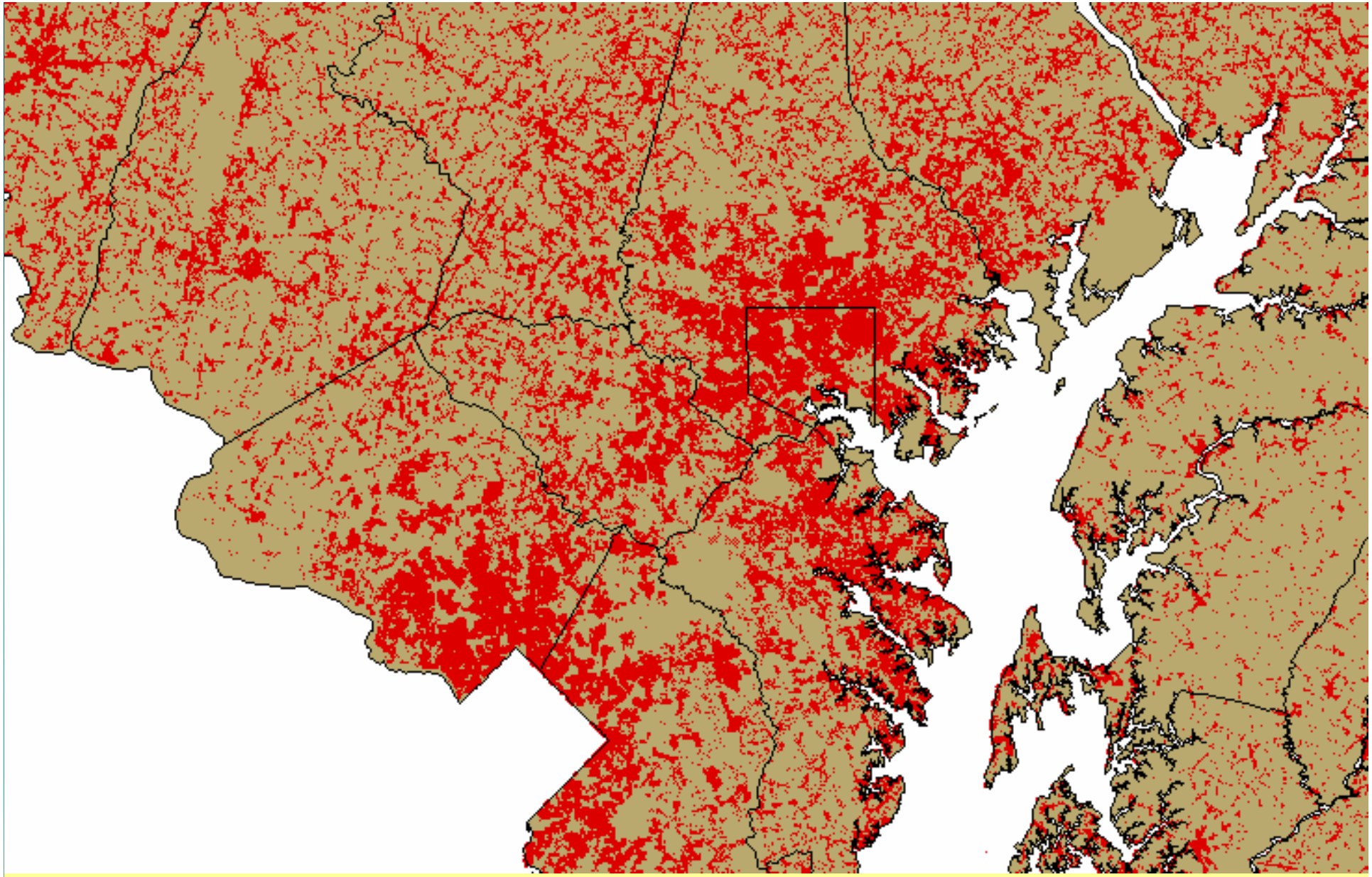
Development Patterns Up to

1960



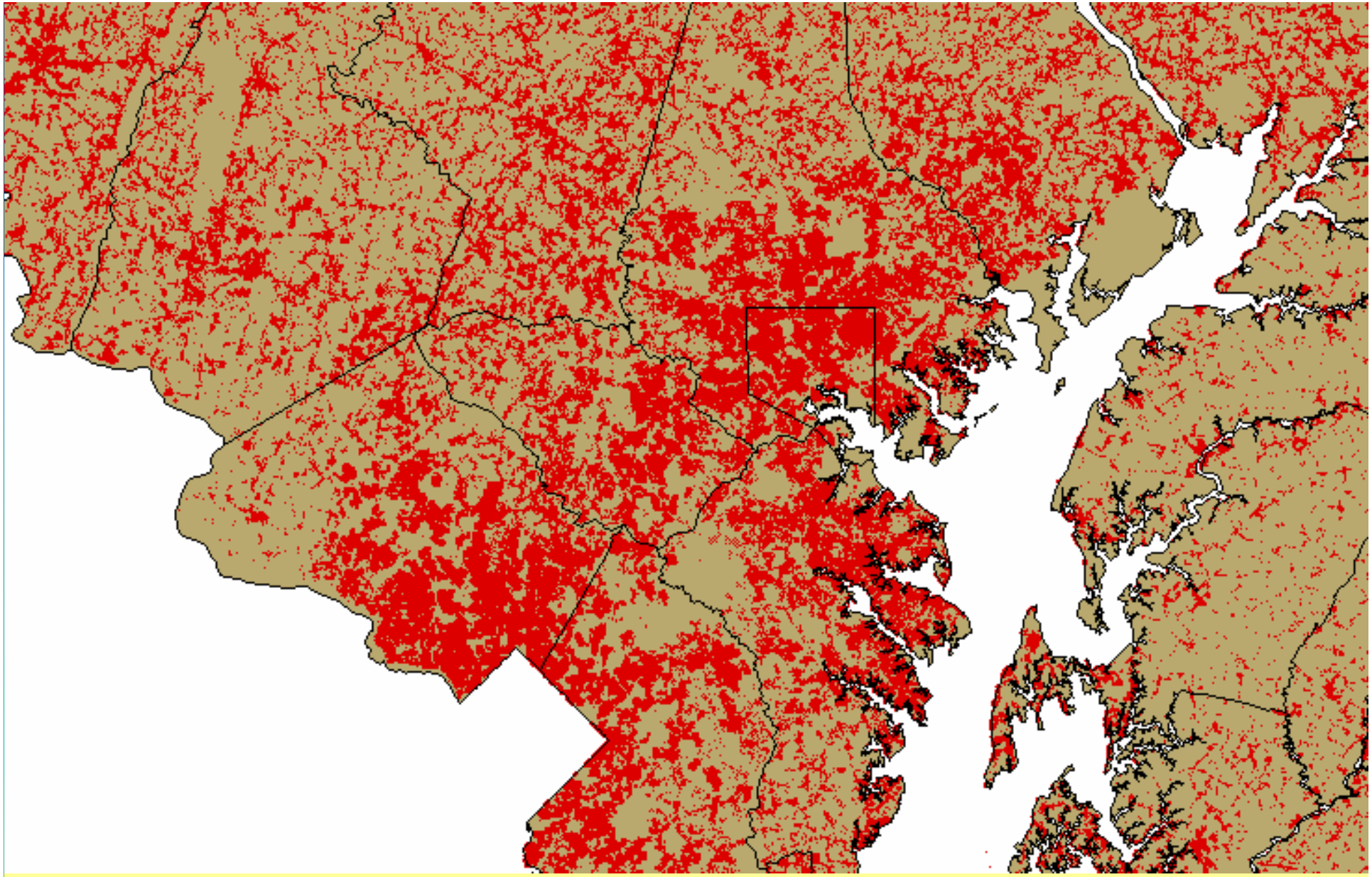
Development Patterns Up to

1970



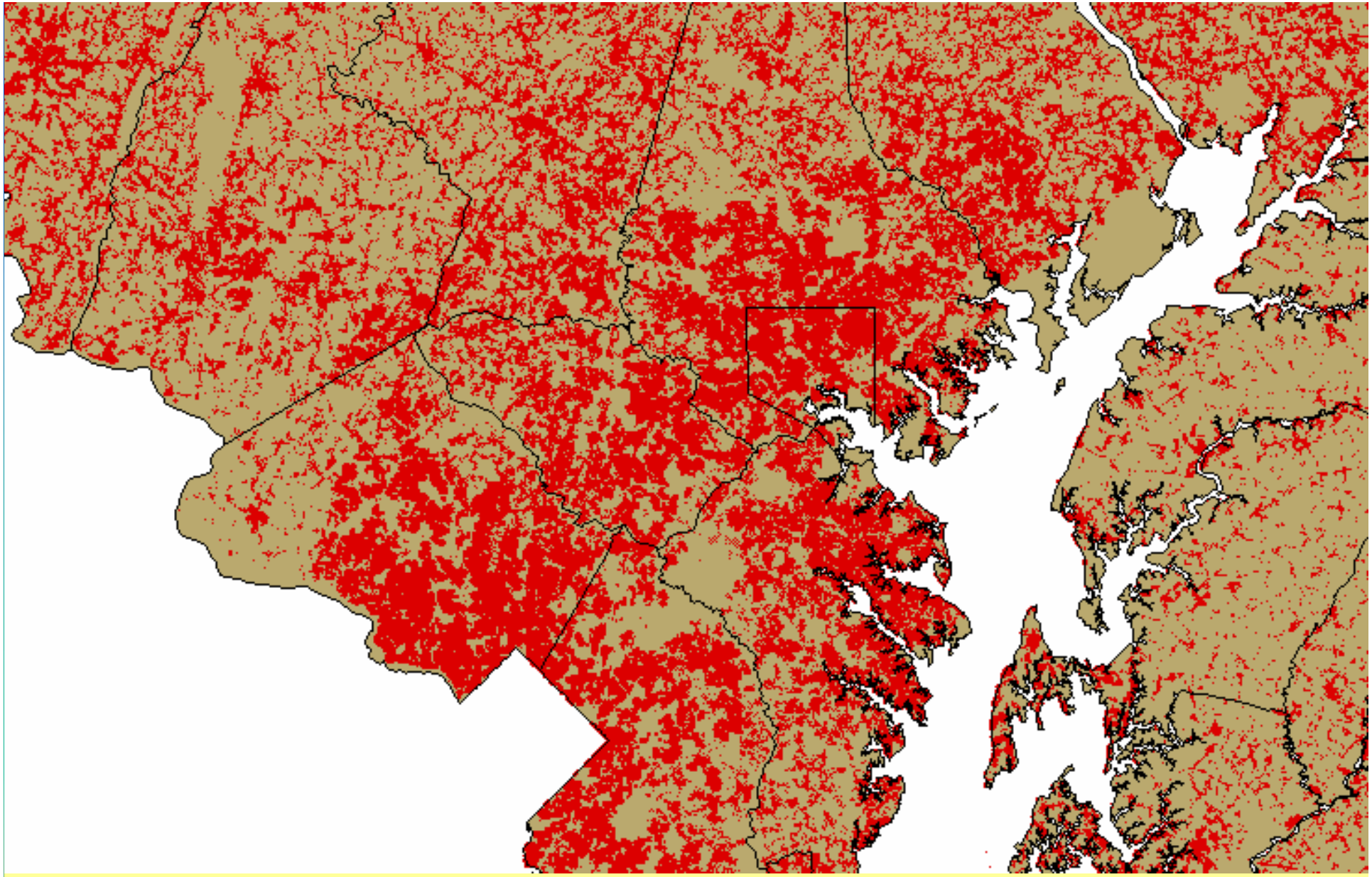
Development Patterns Up to

1980



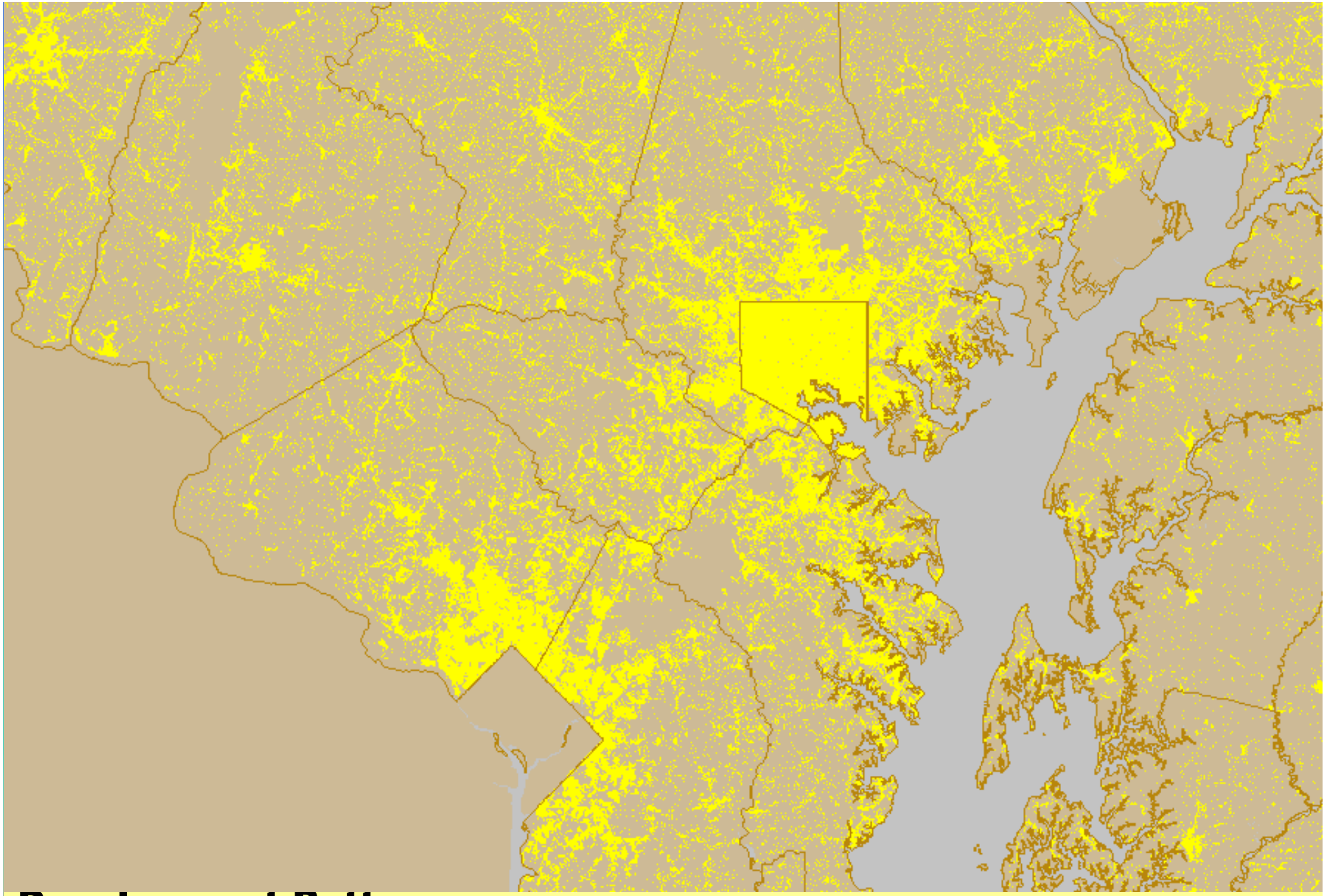
Development Patterns Up to

1990



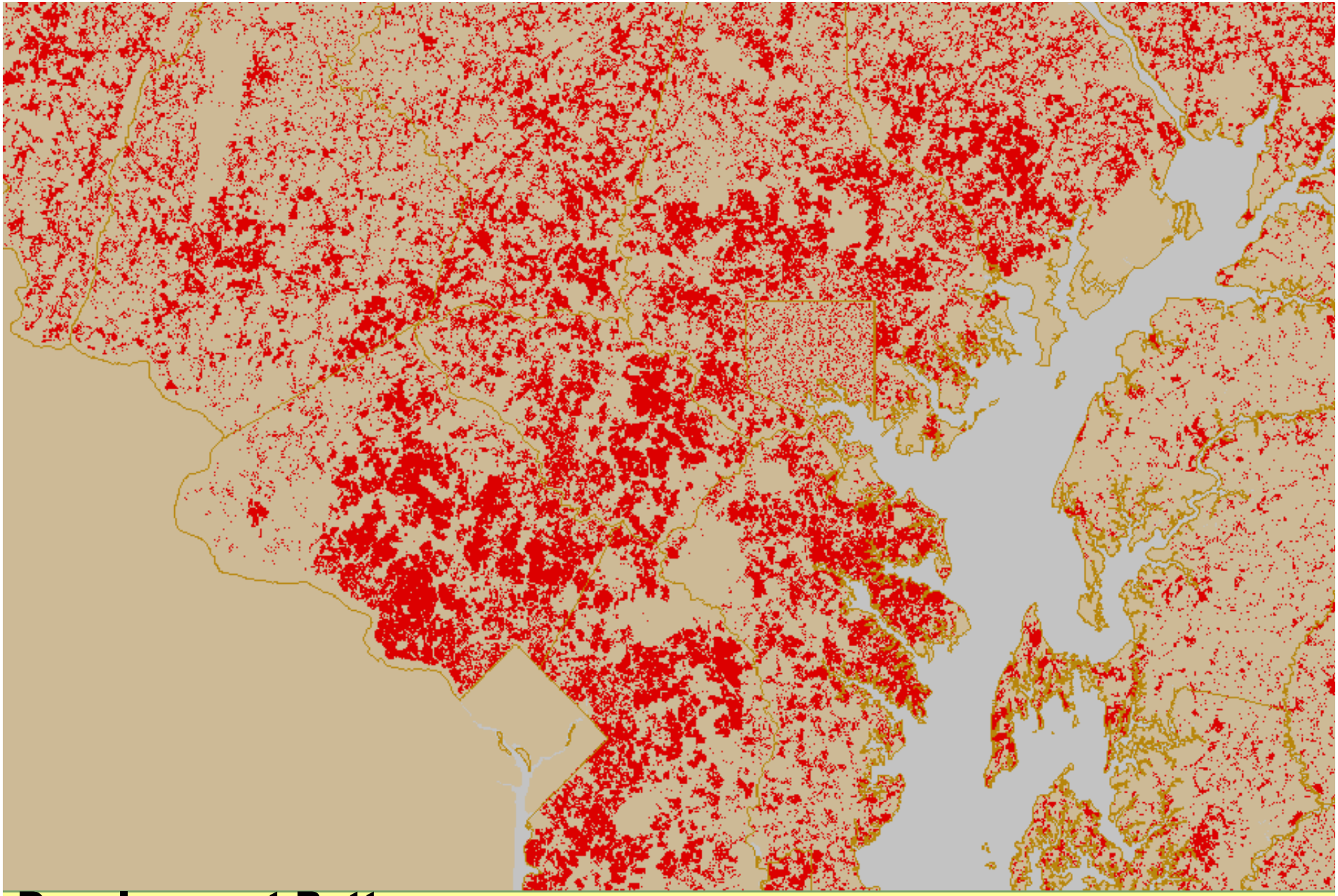
Development Pattern through

2000



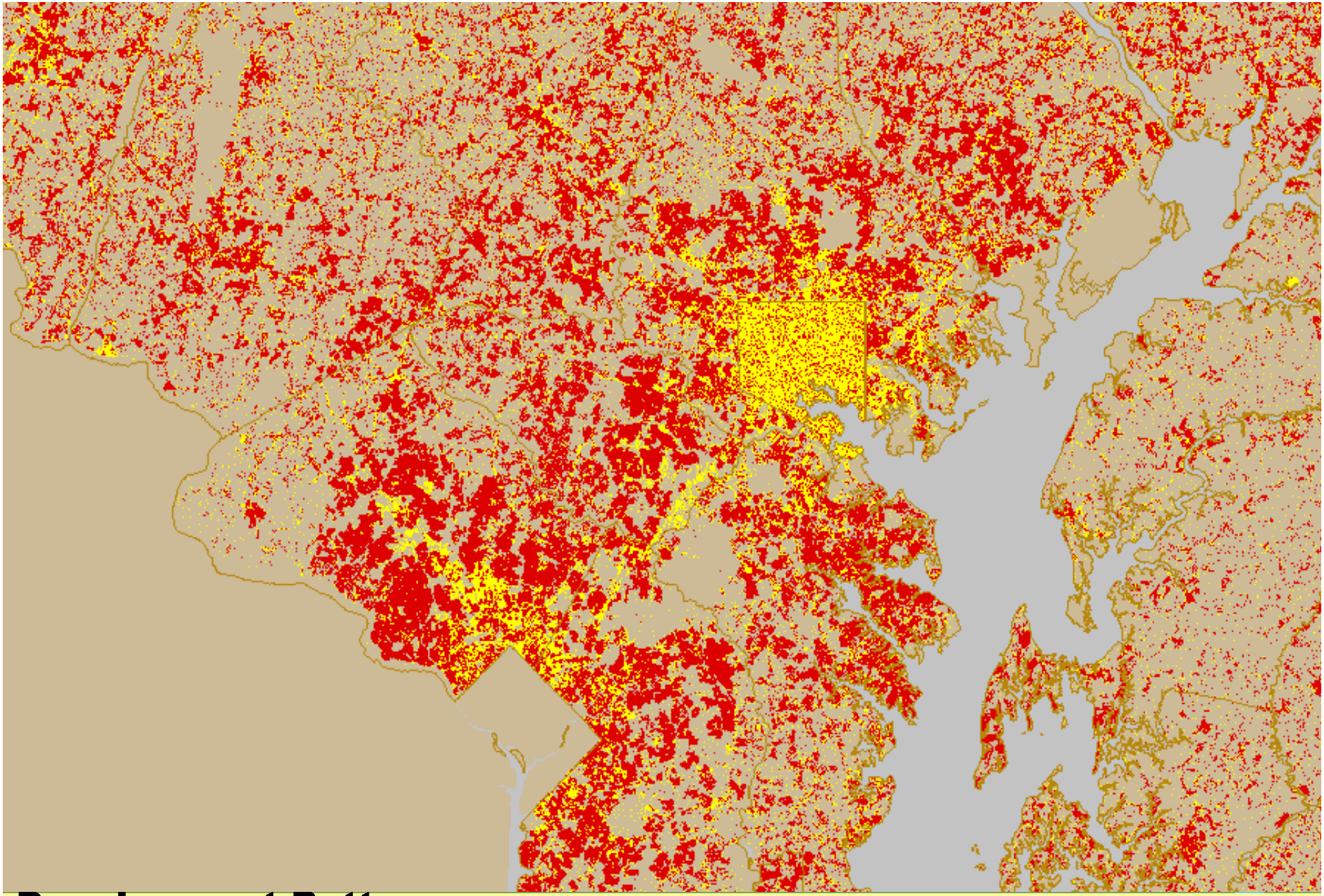
Development Patterns:

1900 - 1960



Development Patterns:

1961 - 1997



Development Patterns:

1900 - 1997

Declining Water Quality: Pollutants

Declining Water Quality: Nutrients

Changes in the Natural Water Balance

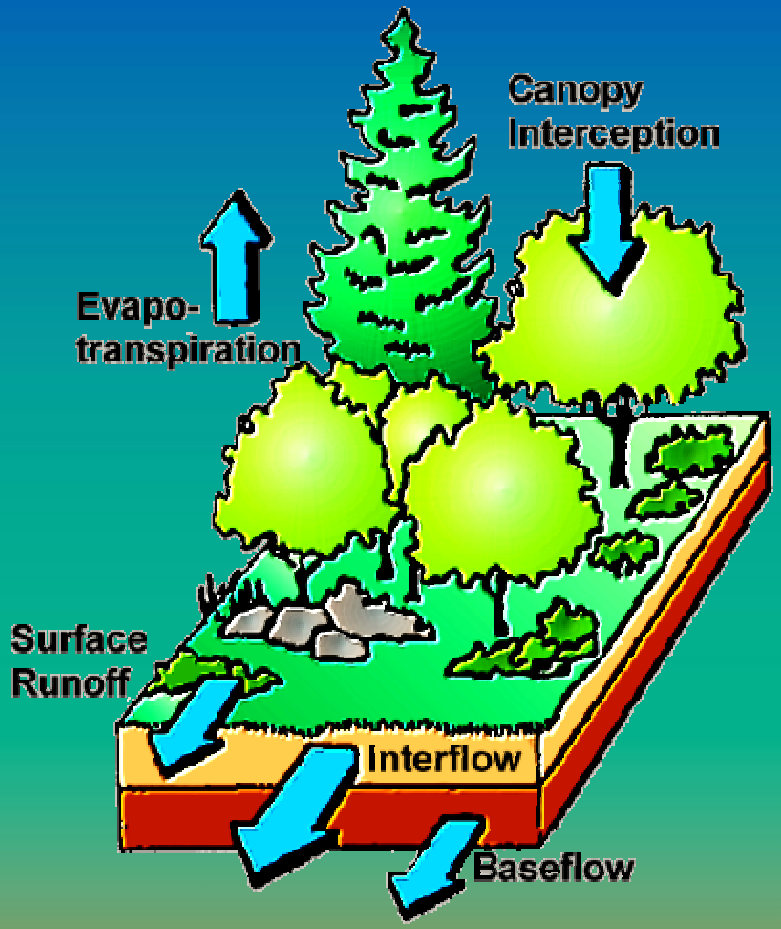
Disruptions to Channel Morphology

Floodplain & Conveyance Disturbances

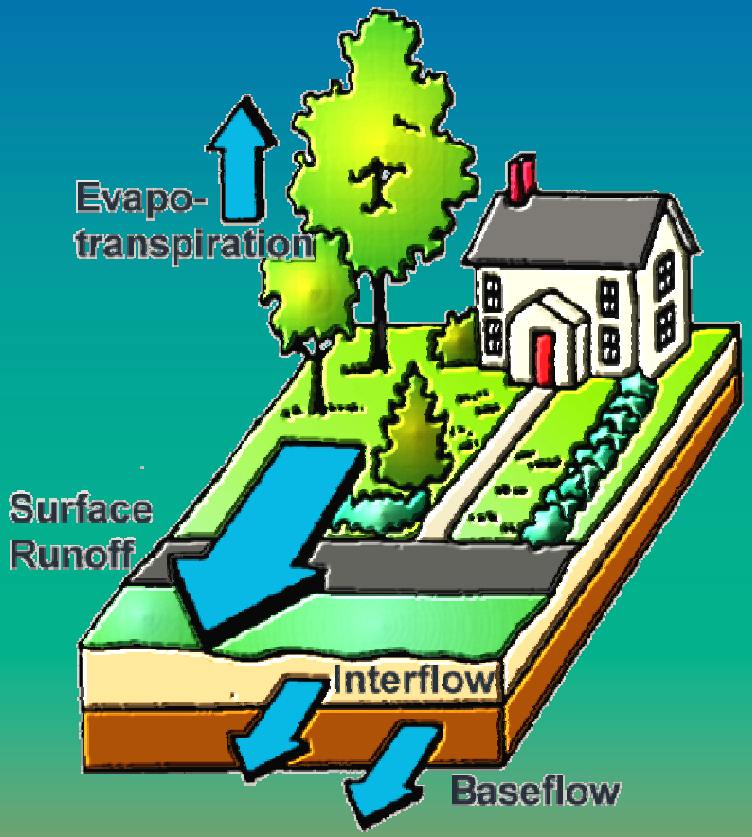
Building Better Tiger Traps...

WATER BALANCE

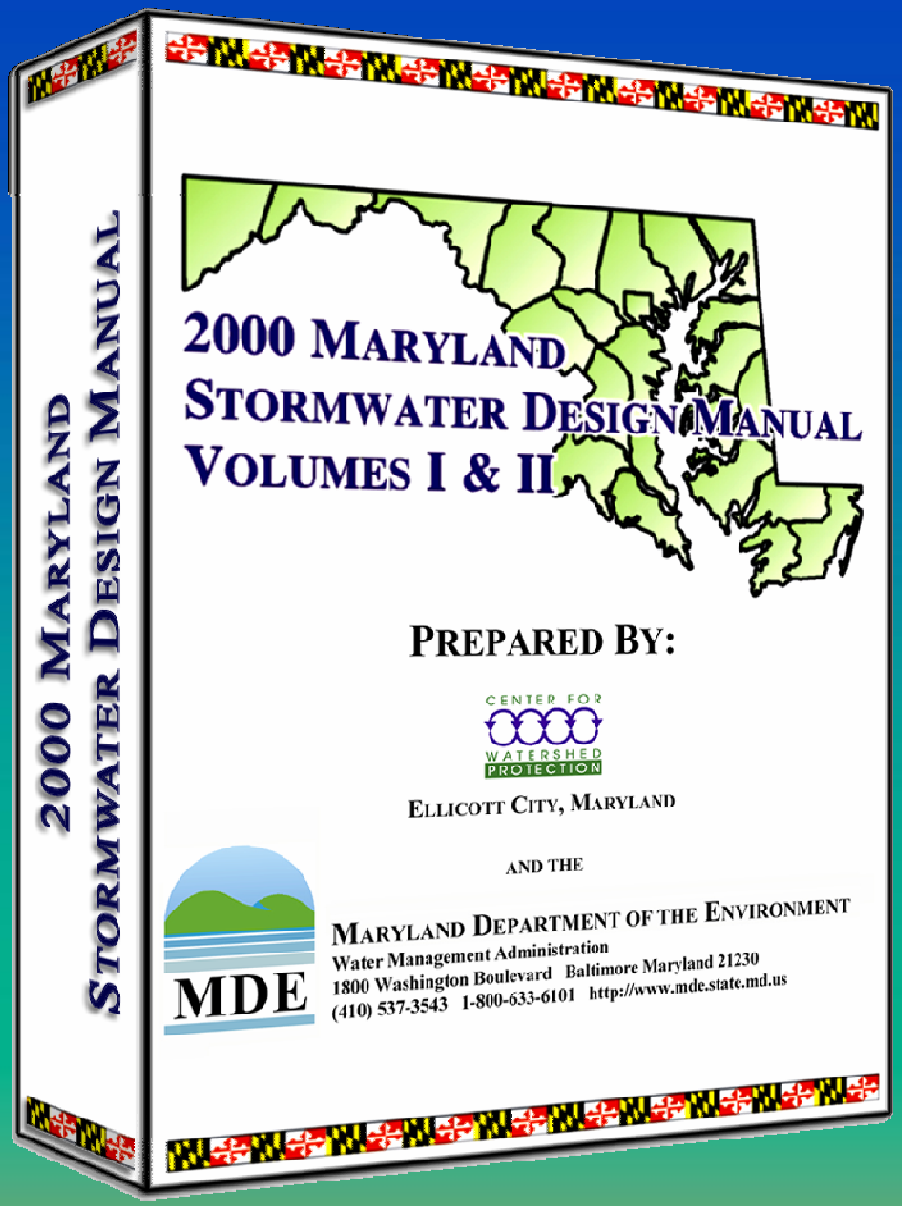
PRE-DEVELOPMENT



POST-DEVELOPMENT



MDE



The Maryland Stormwater Design Manual is a publication of the Maryland Department of the Environment in cooperation with the Maryland Department of Natural Resources pursuant to National Oceanic and Atmospheric Administration Award No. NA67OZ0302

In the Beginning…

Design Manual to address three goals:

1. **Protect Waters of the State from Adverse Impacts;**

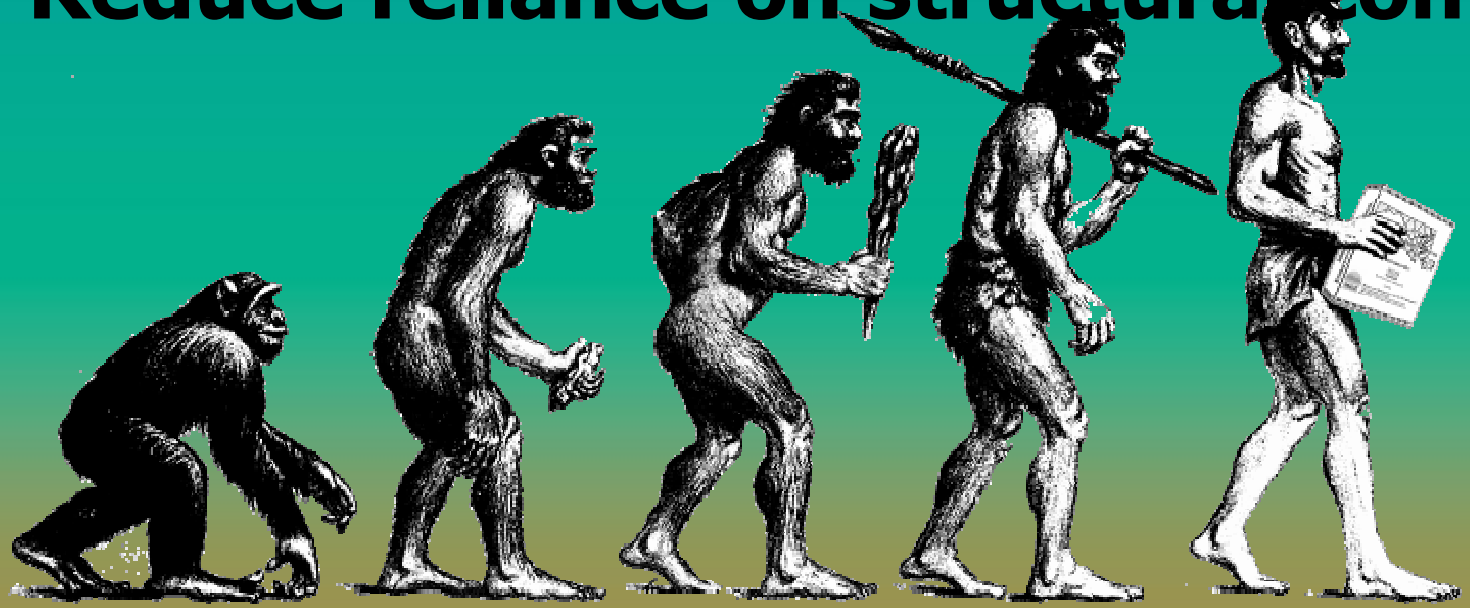
2. **Provide Better Design Guidance for BMP's; and**

3. **Improve Quality of Constructed BMP's**

Maryland's Program…

Evolved into a more comprehensive approach to stormwater design…

- **Guidance for total site design**
- **Incentives for "green" techniques**
- **Reduce reliance on structural controls**



Who are the Bad Guys?

Common Pollutants

- Flow
- Nutrients
- Suspended Material
- Bacteria
- Hydrocarbons
- Trace Metals

Are they really the bad guys?…


WELCOME TO
LANSDOWNE
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Imperviousness as Pollutant

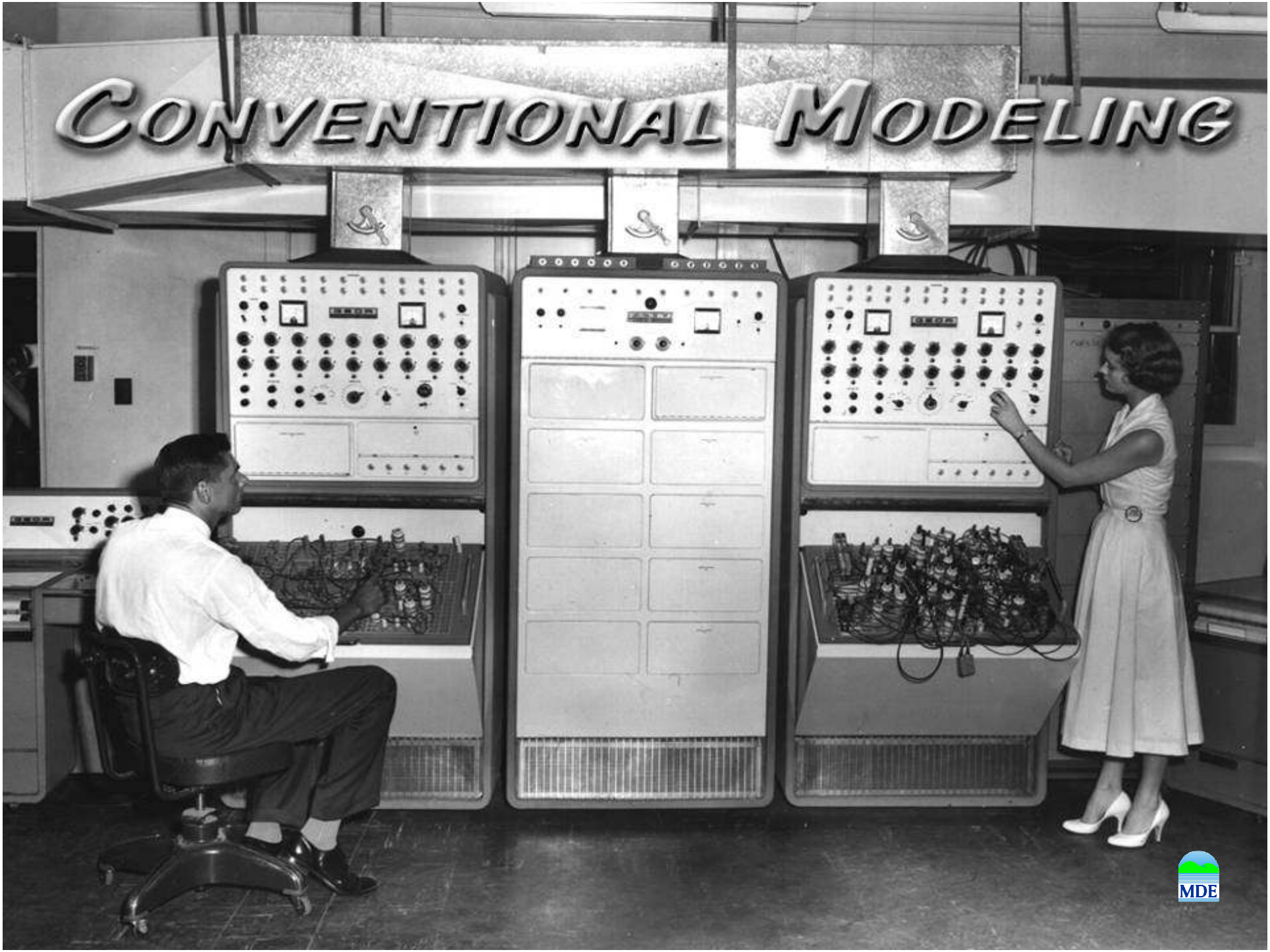
- **Impervious Cover directly linked to:**
  - **diminished groundwater**
  - **increased flow; and**
  - **elevated temperature**
- **Impervious Cover indirectly linked to:**
  - **nutrient levels**
  - **hydrocarbons**
  - **trace metals**
  - **suspended materials**
- **Connected is a greater impact than disconnected**
- **Impervious Cover Model (CWP 1998)**

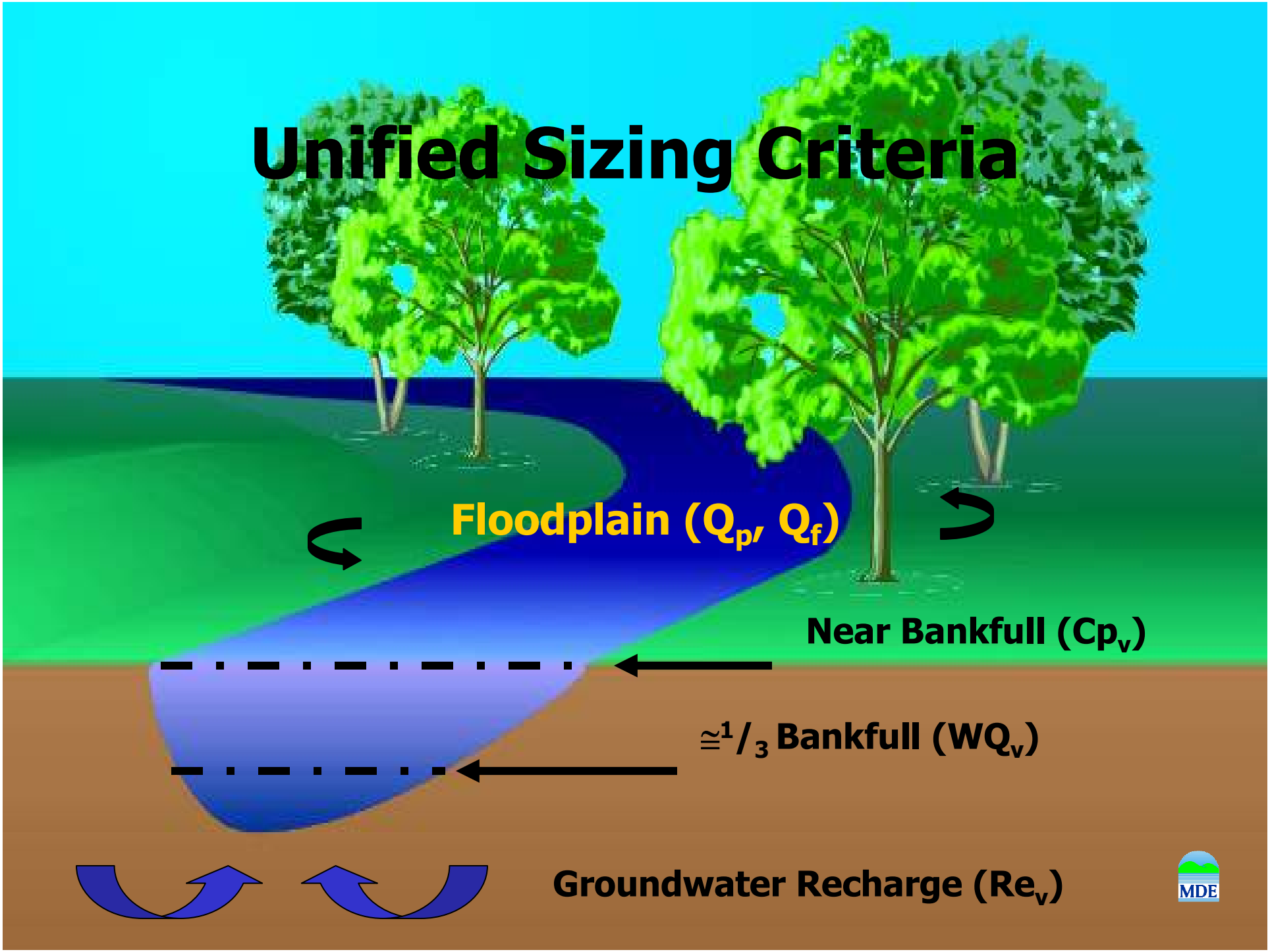
Imperviousness vs. Biotic Integrity

ABOVE 2% BROOK TROUT DISAPPEAR	ABOVE 15% BIOTIC INTEGRITY FAIR OR POOR	ABOVE 25% ONLY HARDY REPTILES & AMPHIBIANS

LOW	% Impervious Cover	HIGH


Sustainability –
"to meet the needs of the present without compromising the ability of future generations to meet their own needs."
-World Commission on Environment and Development
MDE


CONVENTIONAL MODELING
MDE


Unified Sizing Criteria
Floodplain (Q_p, Q_f)
Near Bankfull (Cp_v)
≅1/3 Bankfull (WQ_v)
Groundwater Recharge (Re_v)
MDE


CONVENTIAL DEVELOPMENT
Cover IT with ASPHALT
0000
'94
MDE


Conventional Residential Design
MDE


Conventional Stormwater
Conveyance
MDE

Three Step Approach

- **Avoidance**
  - Ex. Resource Conservation Programs
- **Minimization**
  - Chapter 5 – "Stormwater Credits"
- **Mitigation**
  - Chapter 3 – "Urban BMP Design"

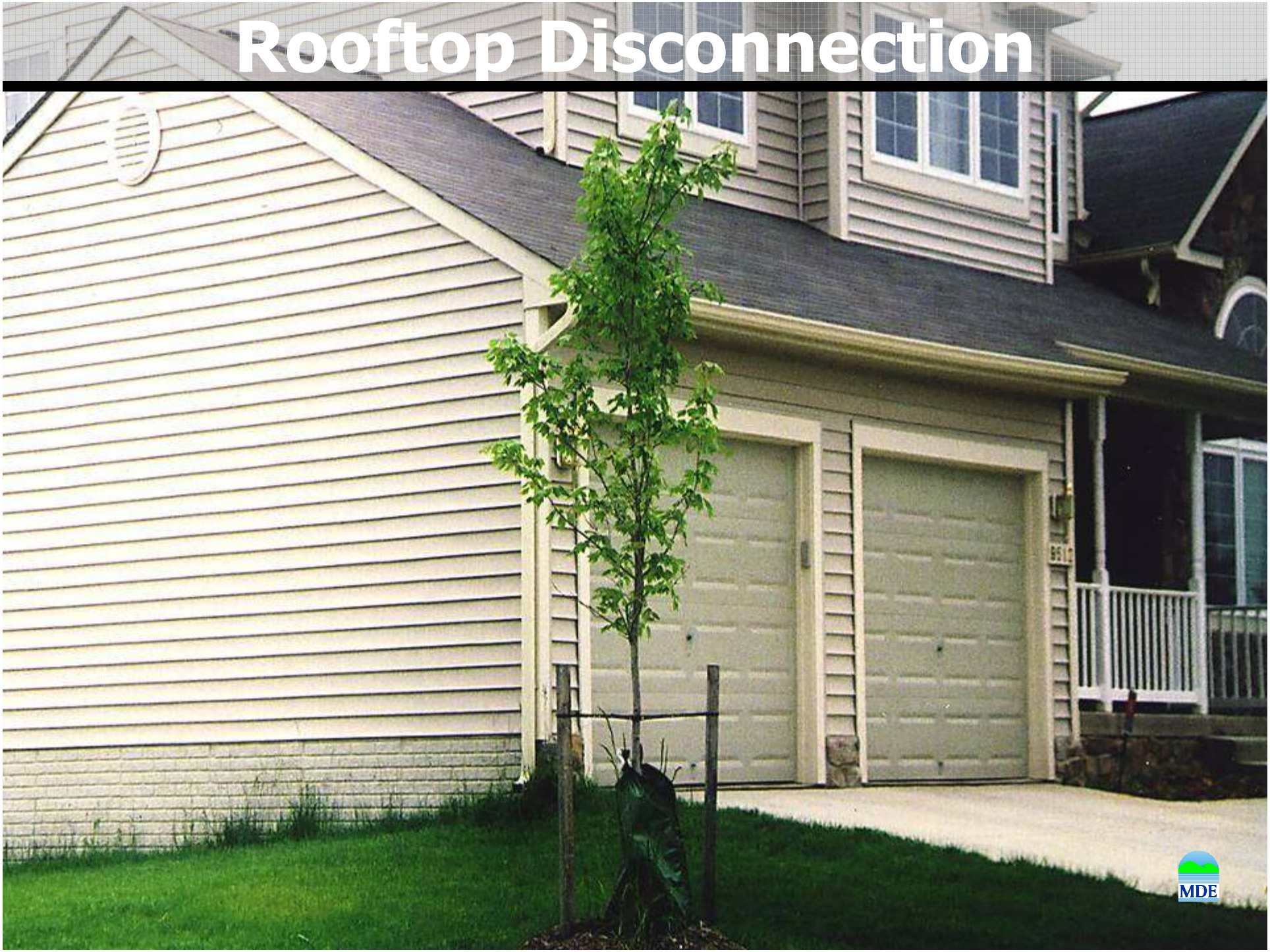
Resource Protection

Site Fingerprinting

Alternative Designs

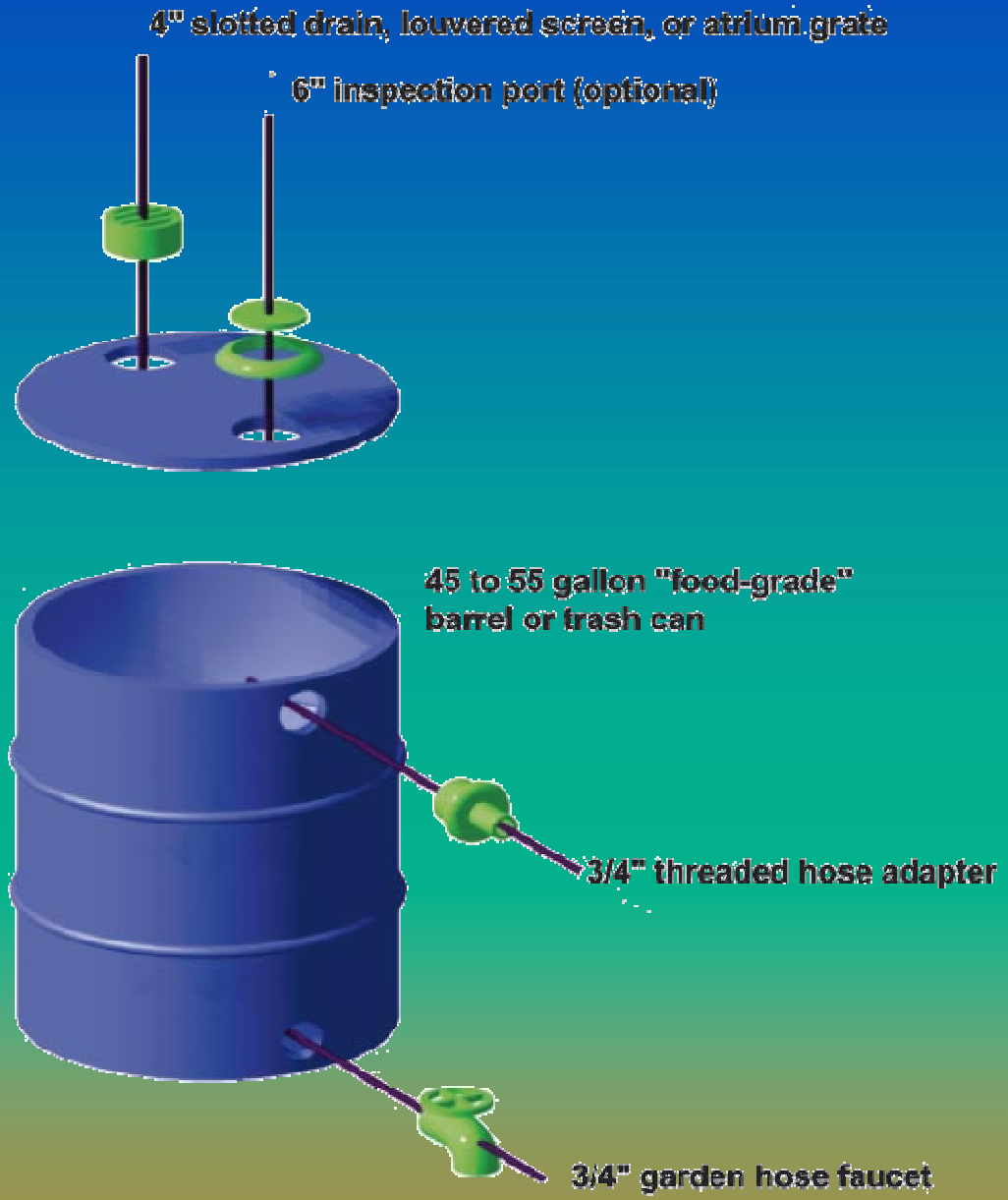
Natural Resource Conservation

Rooftop Disconnection



Rooftop Disconnection

Rooftop Disconnection



Non-Rooftop Disconnection

Non-Rooftop Disconnection

Non-Rooftop Disconnection

Sheet Flow to Buffers

Grass Channels


Impervious Cover Reduction
MDE

Redevelopment

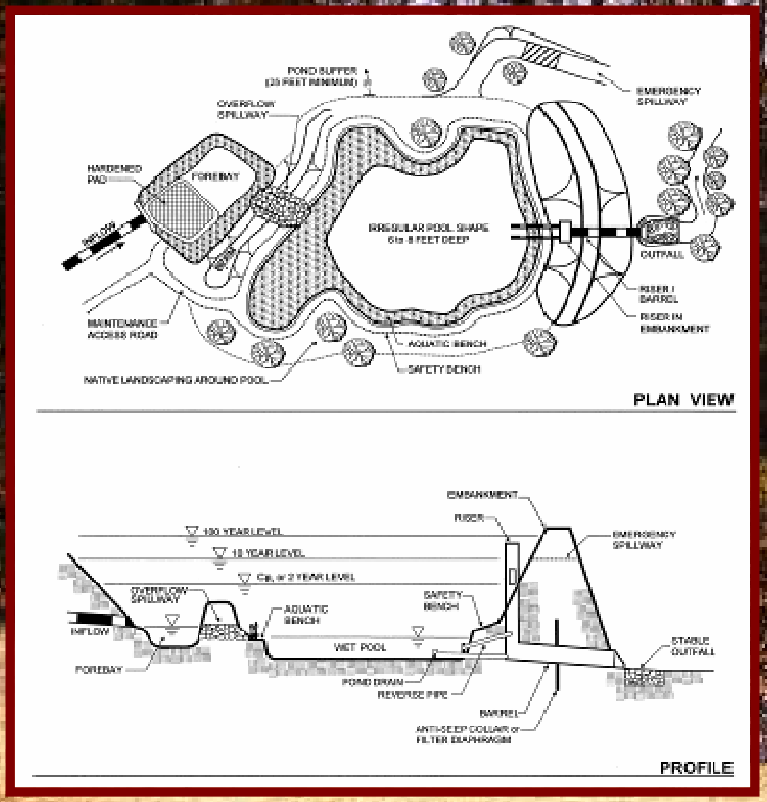

Green Roof Technologies
MDE

Environmentally Sensitive Development

Best Management Practice Selection

Wet Ponds

Micropool ED Pond



Infiltration

Filters

Bioretention Areas

Although classified as a filter practice, Bioretention may be designed as an infiltration practice.

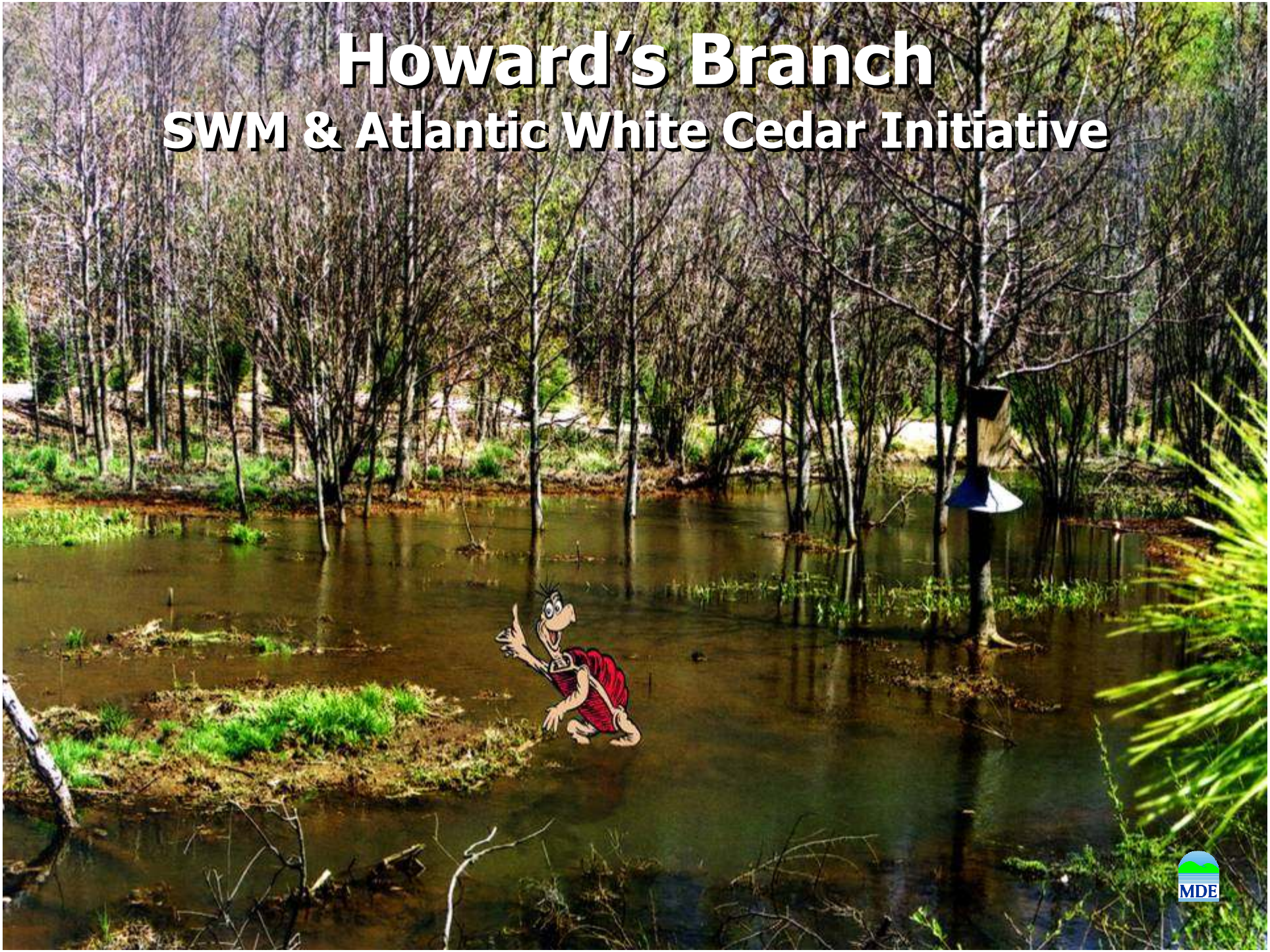
Rain Gardens (Bioretention) are used for landscaping in residential or commercial areas.

Open Channel

Moving Beyond Regulatory Compliance

Howard's Branch

SWM & Atlantic White Cedar Initiative



Environmentally Sensitive Design


Flexibility for Locals and the Ease of Maintenance...
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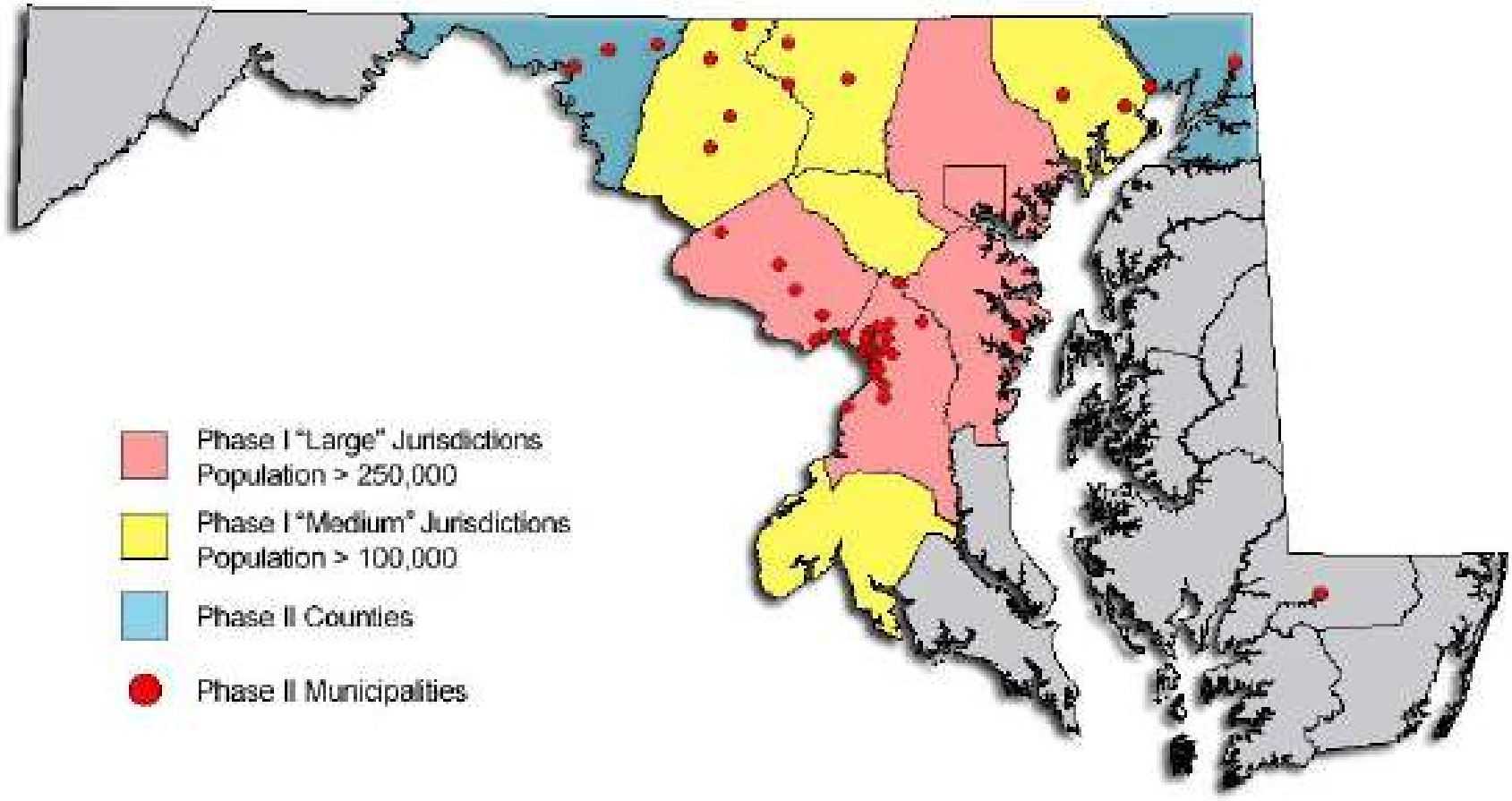
Federal Stormwater Management Regulations

National Pollutant Discharge Elimination System (NPDES)

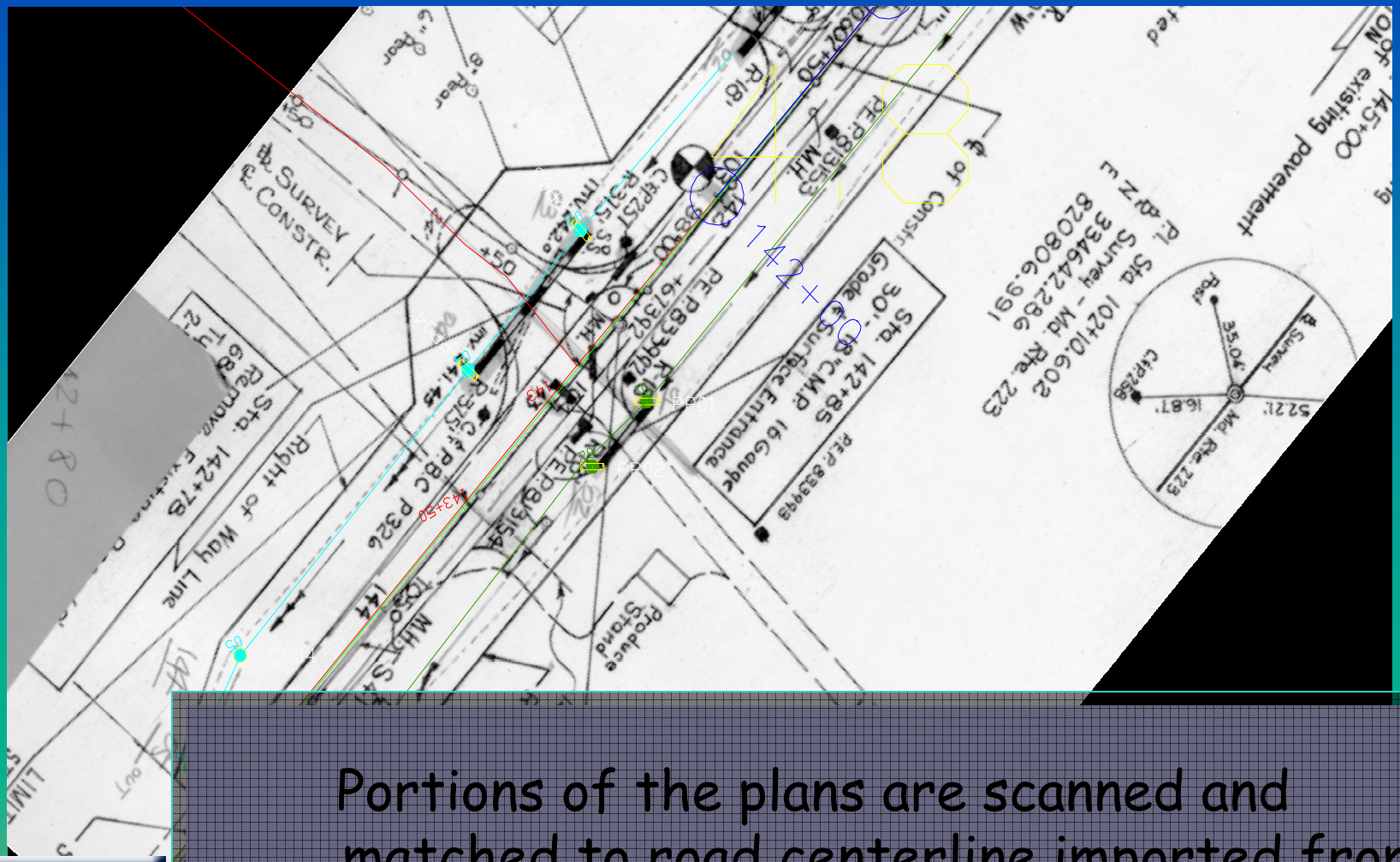
Municipal Separate Storm Sewer Systems (MS4)

NPDES Phase I & II Jurisdictions

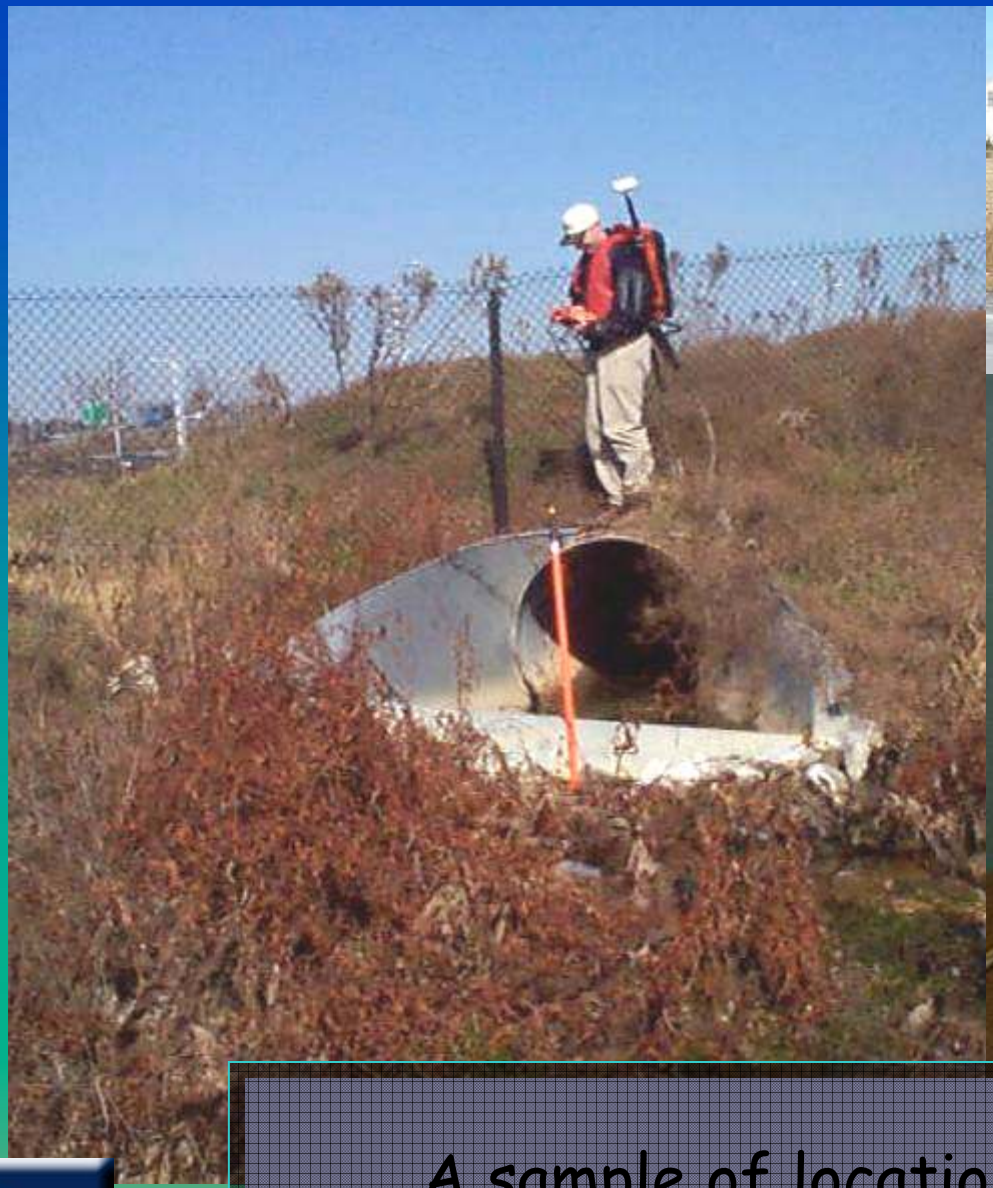



Monitoring
MDE

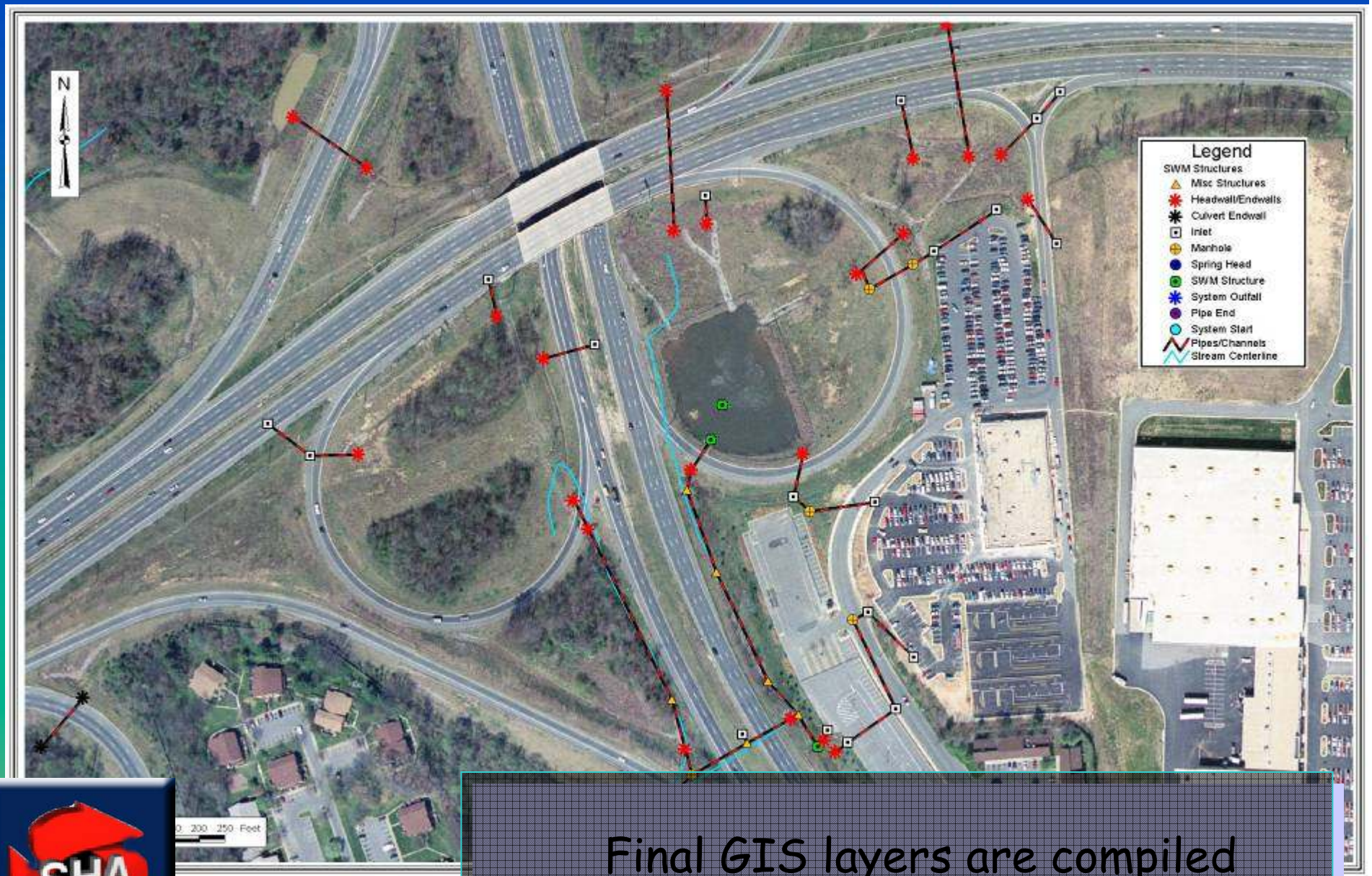
Data Compilation



Portions of the plans are scanned and matched to road centerline imported from ArcView. Stormdrain and Stormwater Management facilities elements are digitized.



A sample of locations is verified in the field using GPS. Data gaps are filled



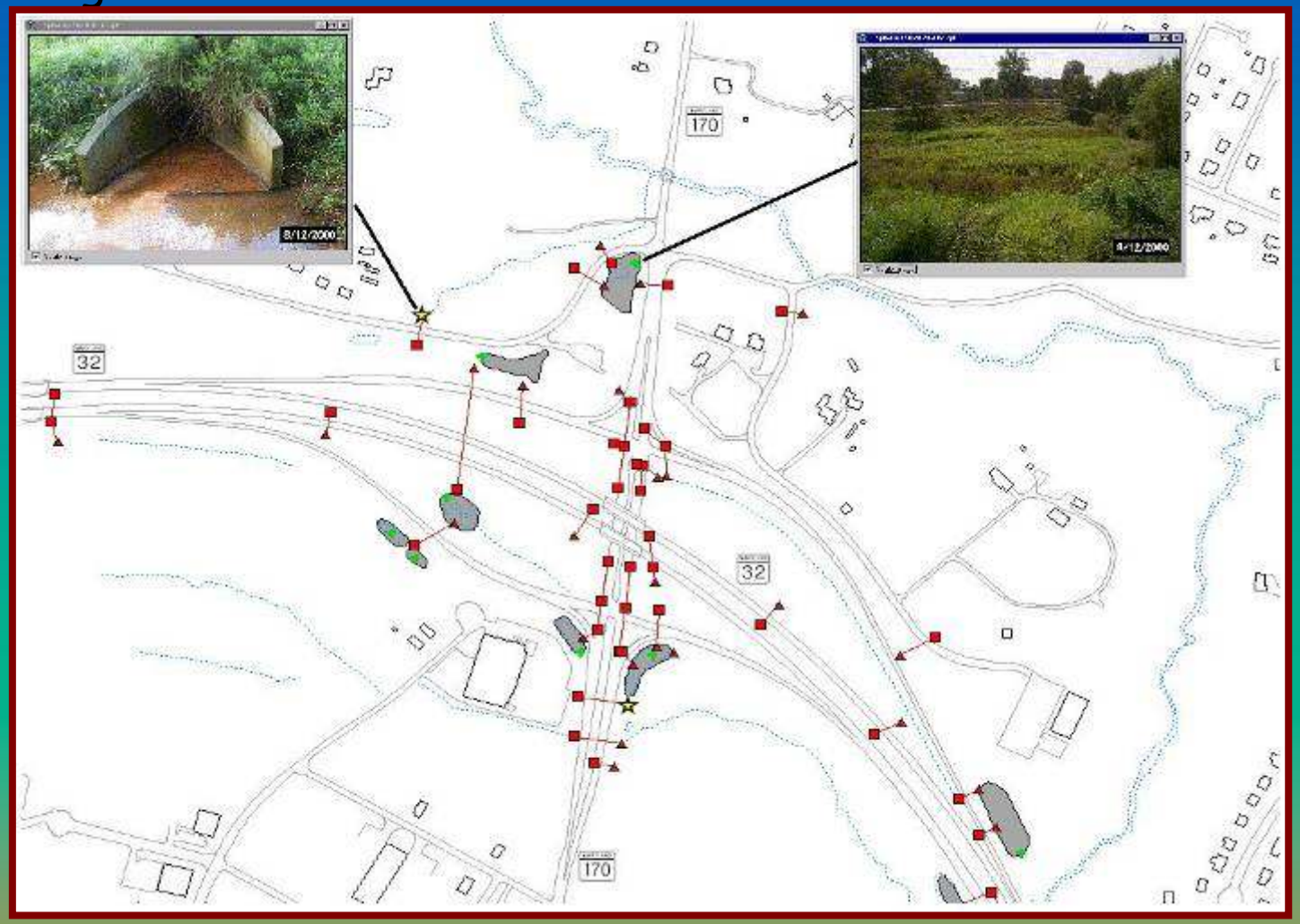
Final GIS layers are compiled

The power of GIS…

Connectivity with County System

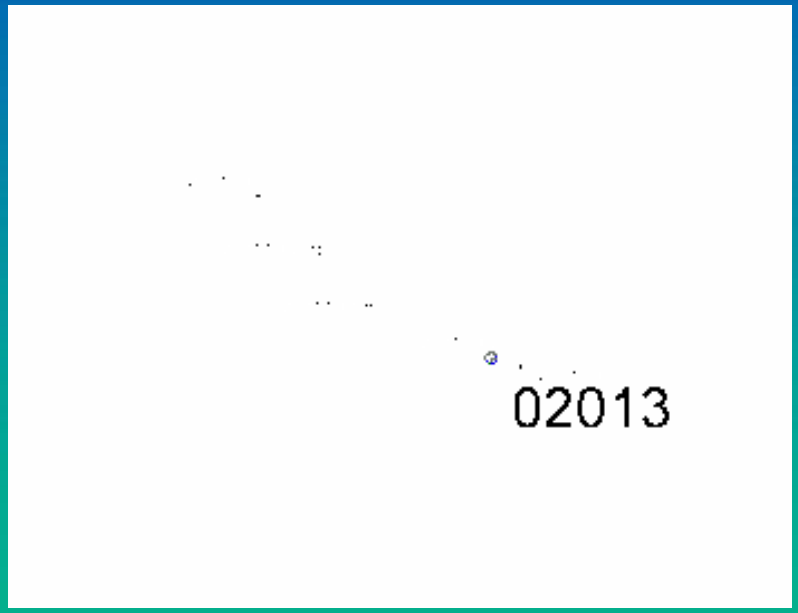
The power of GIS…

Digital data for historic documentation



SWM Facility Inspection Form

02013 - RETENTION POND



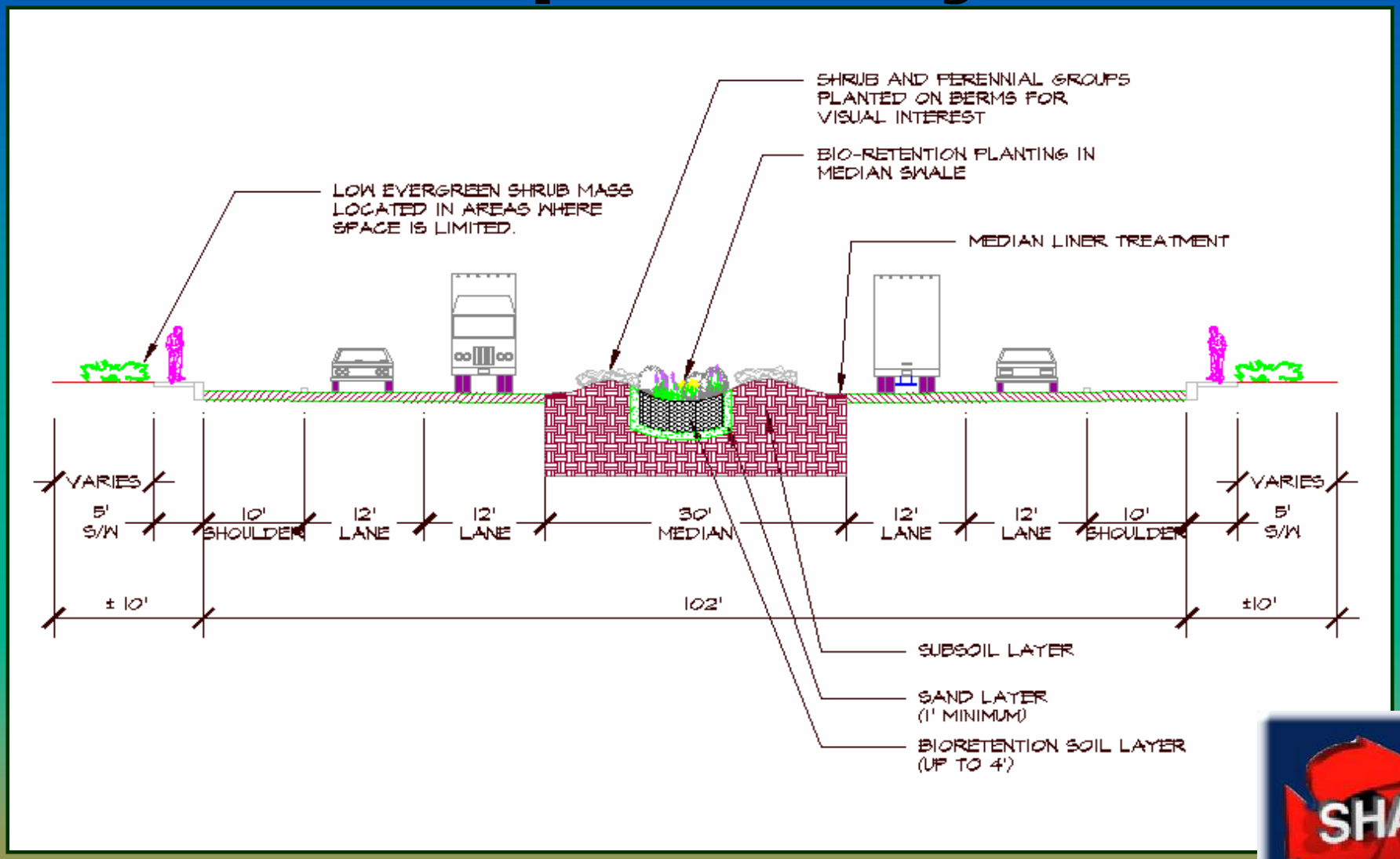
Date	Inspectr	BMP type	structure_no	swm_facility_no	easting	northing	xy_sourc	appurt	retrofit	Qin_stab	Qin_cond	aesth	pub_haz	fences
7/7/2000	WRP/DGS/SET	RETENTION POND	0200118.002	02013	-76.710435933	39.097853231	DGPS	0	0	5	5	1	1	0

access	bmp_veg	bmp_cont	debris	ponding	forebay	embU-cvr	embU-ero	embU-toe	embD-cvr	embD-ero	embD-toe	embD-seep	espw-stab	espw-open	orf_open	orf_trsh	rsr_open
1	4	1	5	5	0	4	1	4	4	1	4	1	0	0	5	5	5

rsr_trsh	rsr_sedi	rsr_strc	rsr_valv	prin-spwy	spwy-out	depth	Rating	SHA Priority
5	5	5	0	2	3		E	

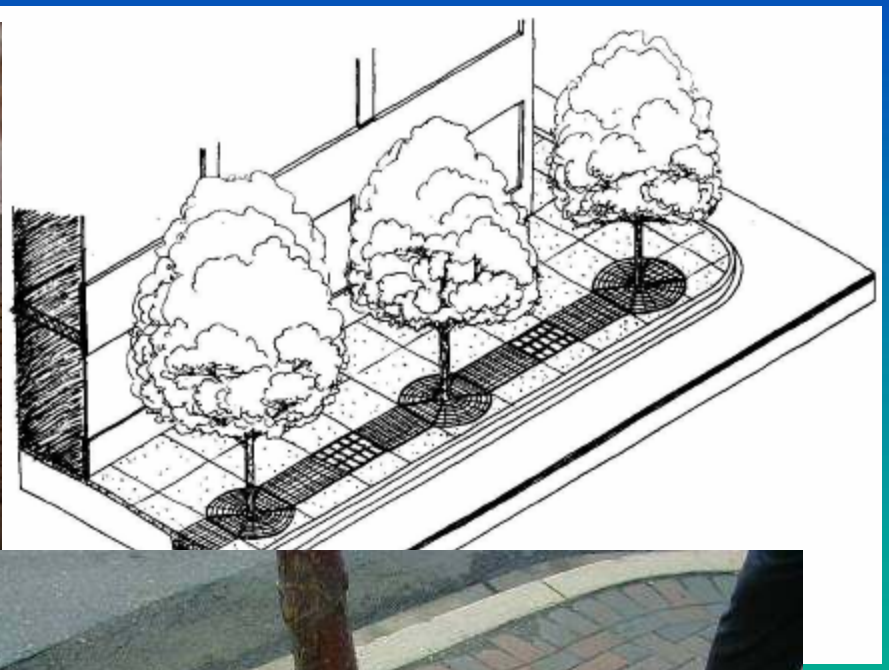
Comments
BEAVERS HAVE DAMMED UP THE RISER OPENING, CAUSING WATER LEVEL TO RISE AND STAY AT THE 100 YEAR ELEVATION. DEBRIS BUILD-UP AT OUTFALL. TREES ON B

Design Integration: A Proposed Project



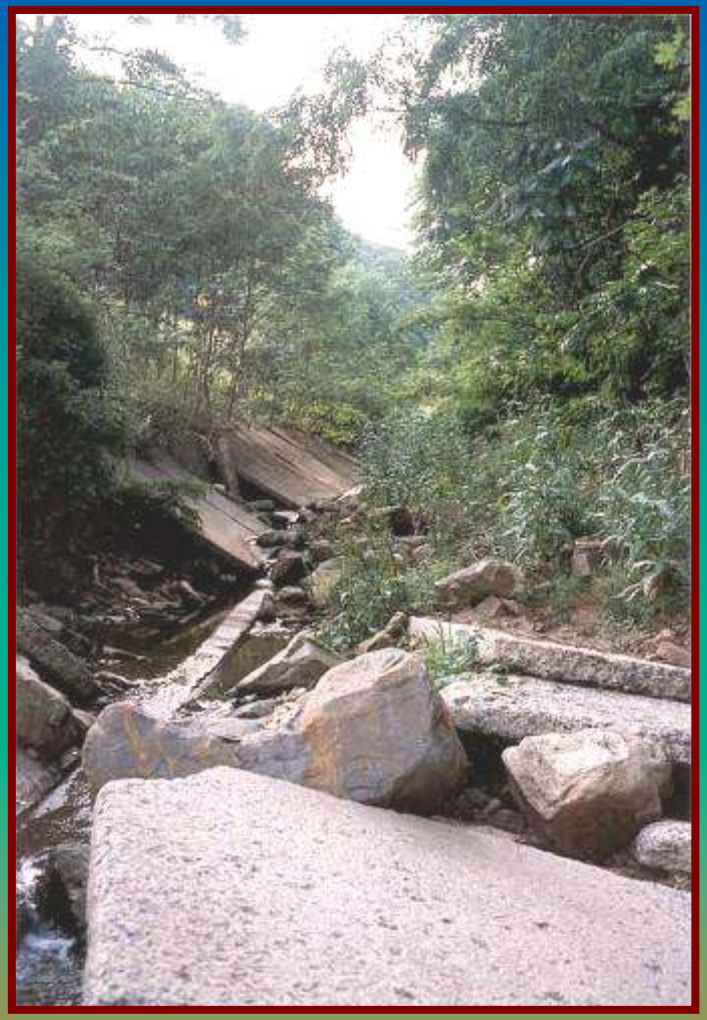
Design Integration: Median Bioretention

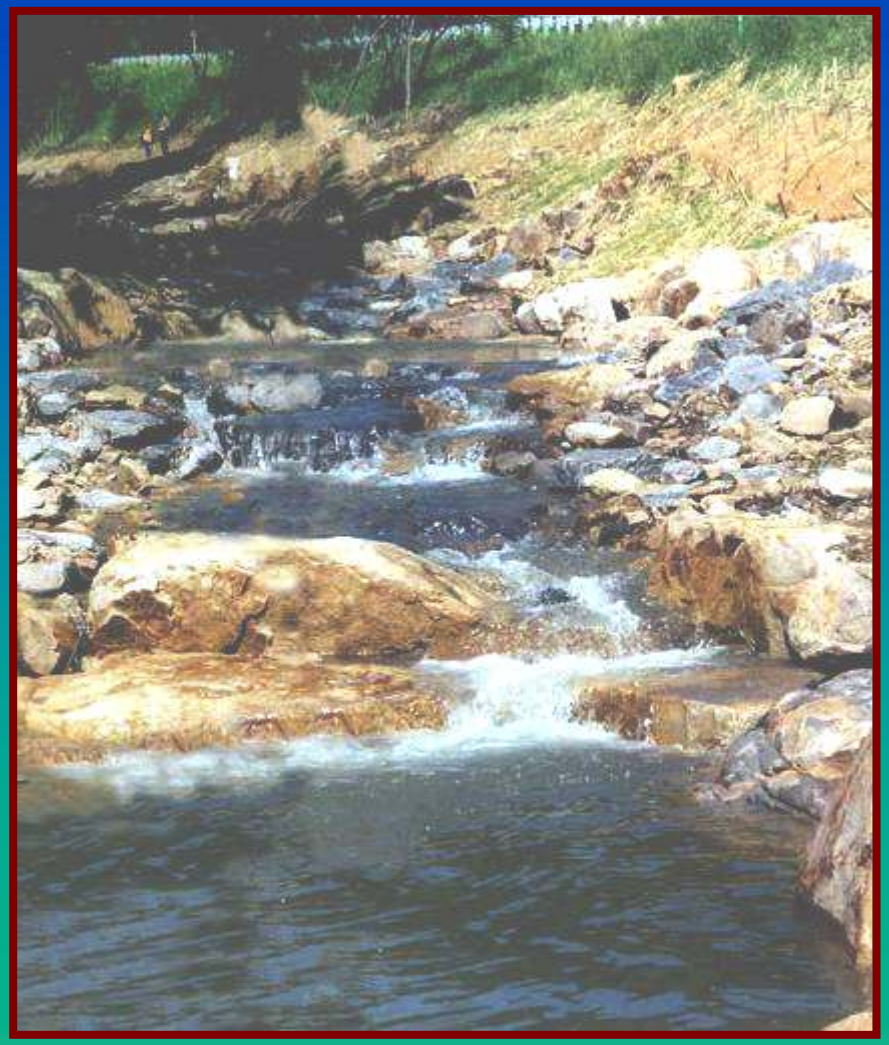
Streetscapes



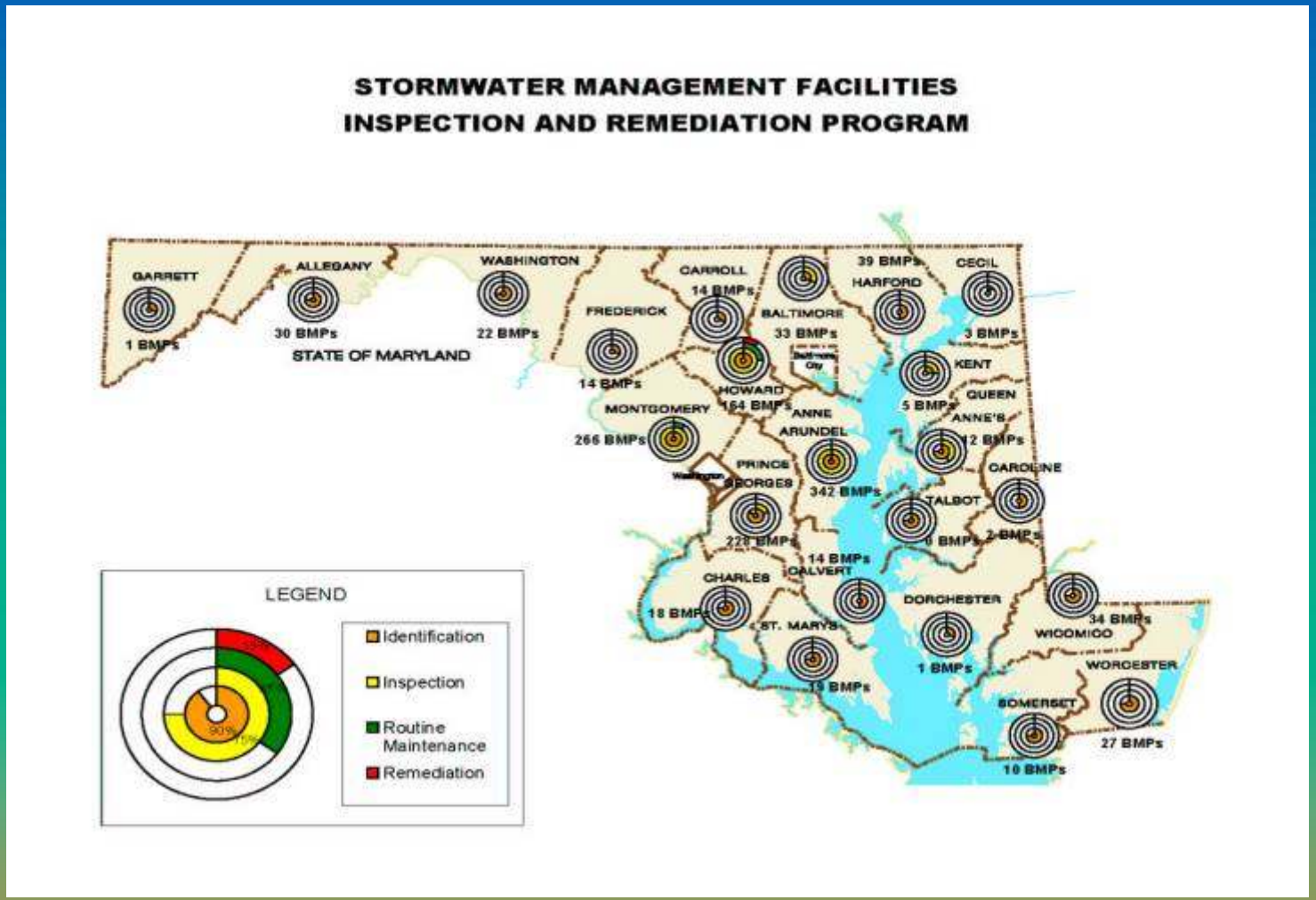
Functional and Aesthetic Retrofits

Stream Restoration





Current Status



Tributary Strategies

- **Continue to Implement SWM Program and NPDES MS4 permits**
- **Retrofit Existing BMPs and Development (e.g., 40%)**
- **Incentives to Green Up!!**

Hey Rocky, Watch Me Pull A Rabbit Out of My Hat...

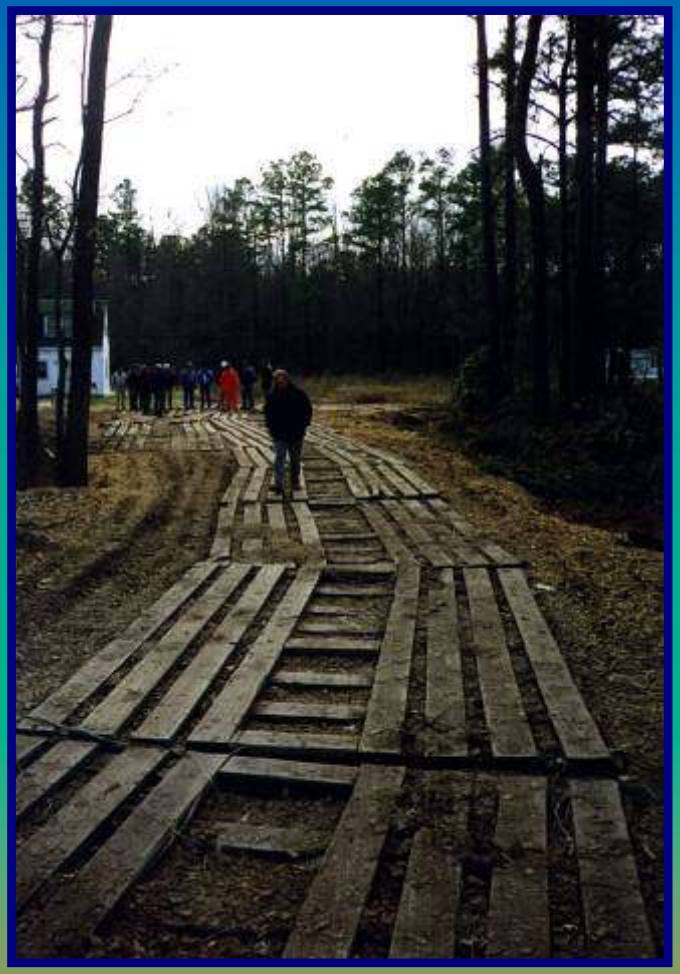
MDE

SWM, MS4 Permits, TMDLs, Trib Stategies

- State, Federal, and Local Government, Environmental Community and Businesses working together and towards…"Sustainability"
- Funding???
  - System of Charges
- Documentation!

Teamwork…

Environmentally Sensitive Design



Innovative Design, Tread Lightly….


Environmentally Sensitive
Development
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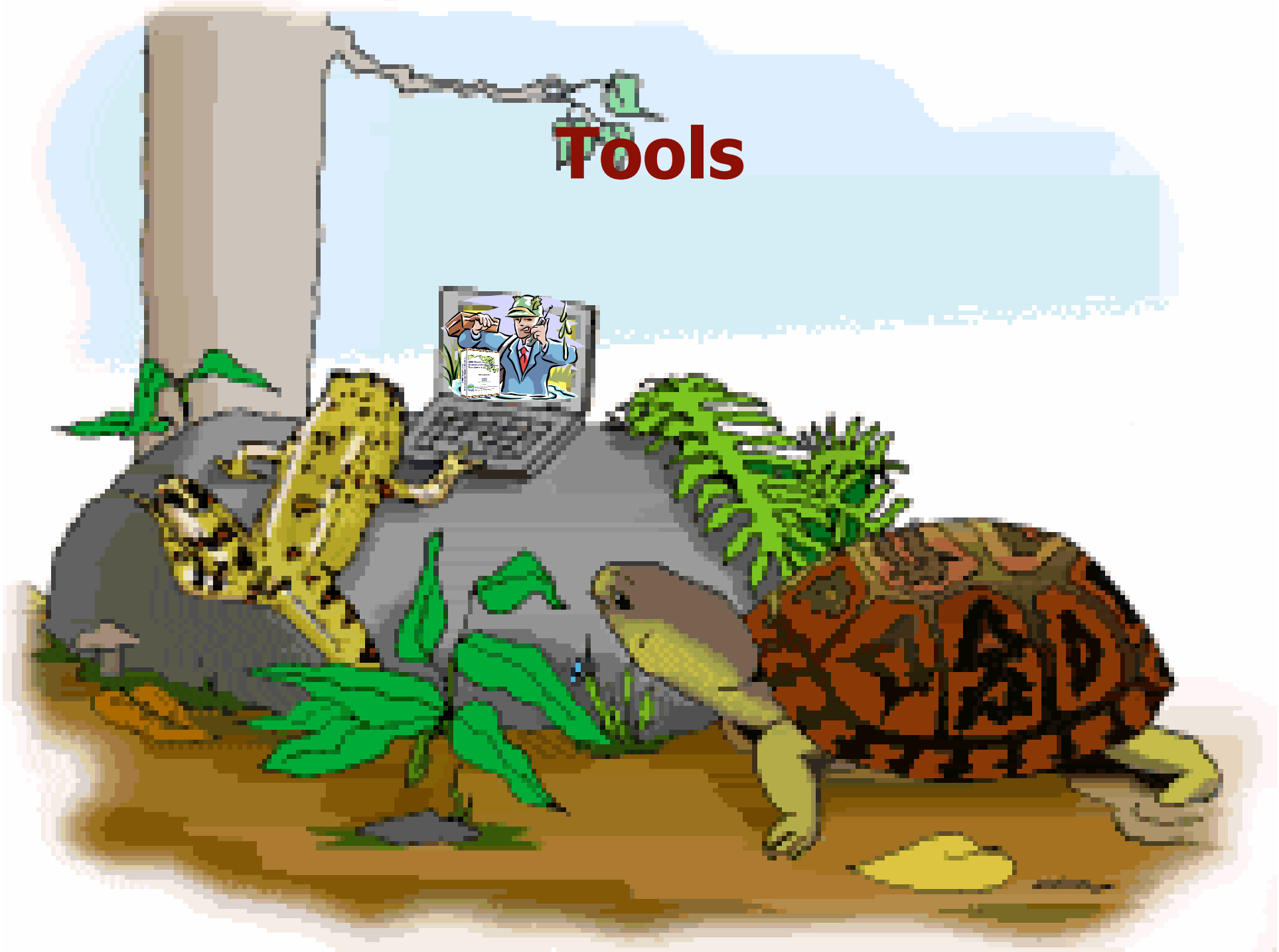
SUSTAINABLE DEVELOPMENT

Tools




Protect Our Streams...
MDE


Rivers...
MDE


And the Chesapeake and Coastal Bays!
MDE


References are available on MDE's Website:
http://www.mde.state.md.us
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Questions??


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