Welcome to the Webinar

Updating Local Codes to Cultivate Green Infrastructure and Foster Sustainable Stormwater Management

December 13, 2011

The webinar will begin at 1:00 EST

Updating Local Codes to Cultivate Green Infrastructure and Foster Sustainable Stormwater Management

Tanner Springs Park, Portland, OR

A Few Things Worth Mentioning

- Your phone or microphone is on mute. This will minimize background noise during the webinar.
- We are interested in your questions and comments. Please Send your questions to the moderator via the ‘Question’ box in the GoToWebinar dock on the right side of your screen.
  - The moderator will pose the questions submitted to the speakers.
- This webinar is being recorded. We are looking into how we can post the webinar with audio, and just the slides, for later viewing.
- We expect the webinar to last 2 hours.

The Fine Print

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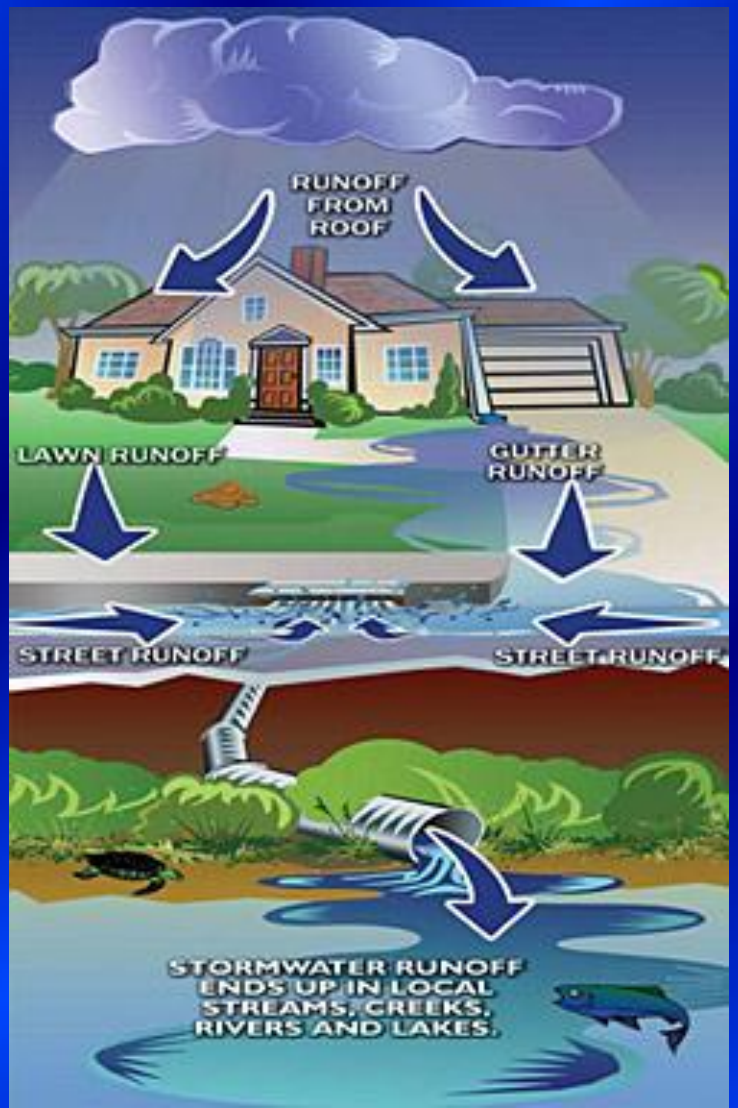
Agenda

- Why Green Infrastructure? Regulatory Drivers and Watershed Approaches
- The Role of Codes and Ordinances
- Code and Ordinance Reviews: Case Studies and Findings
- Cleveland Heights, Ohio's Sustainability Audit of Codes and Ordinances
- Top Ten Things to Search and Replace in Your Plans and Codes: Common Problems and Tested Solutions
- Wrap-up and Questions

Stormwater Runoff from Urban and Suburban Areas

- In urban areas runoff is typically collected in sewers and then discharged via pipes or ditches (so it is a "point source")
- Testing has shown there can be significant amounts of pollutants in stormwater
- Therefore, U.S. EPA and State agencies regulate stormwater discharges under the Clean Water Act



Stormwater Discharges Under the Clean Water Act

- **EPA and the State focus on 3 types of storm water sources:**
  - ✓ **Municipal storm sewer systems**
  - ✓ **Factories, Power Plants**
  - ✓ **Construction Sites**

Municipal Separate Storm Sewer Systems (MS4s)

MS4 Six Minimum Measures

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Control Runoff
5. Post-Construction Stormwater Management for New and Re-development
6. Pollution Prevention/Good Housekeeping for Municipal Operations

MS4 Stormwater Requirements

Illicit Discharge Detection and Elimination

- **An Illicit Discharge is a release of non-stormwater flows to a storm sewer system**
  - **Such as a car wash or laundromat**
- **MS4 communities must develop, implement and enforce a program to detect and eliminate illicit discharges**
- **The community must adopt and implement "An ordinance or other regulatory mechanism to prevent and eliminate illicit discharges and connections to the MS4. "**

Illicit Discharge Detection and Elimination

At a minimum, the ordinance or other regulatory mechanism shall:

- **Prohibit the discharge, spilling or dumping of non-storm water substances or materials into waters of the state or the MS4**
- **Establish inspection and enforcement authority**

MS4 Stormwater Requirements

Construction Site Storm Water Runoff Control

- **Each permittee shall develop, implement and enforce a program to reduce the discharge of sediment and construction materials from construction sites**
- **The program must include: "An ordinance or other regulatory mechanism to require erosion and sediment control at construction sites and establish sanctions to ensure compliance"**
- **The ordinance must include erosion and sediment control criteria, standards and specifications equivalent to those approved by the DNR and performance standards at least as stringent as NR 151.11 and 151.23**

MS4 Stormwater Requirements

Post-Construction Stormwater Management

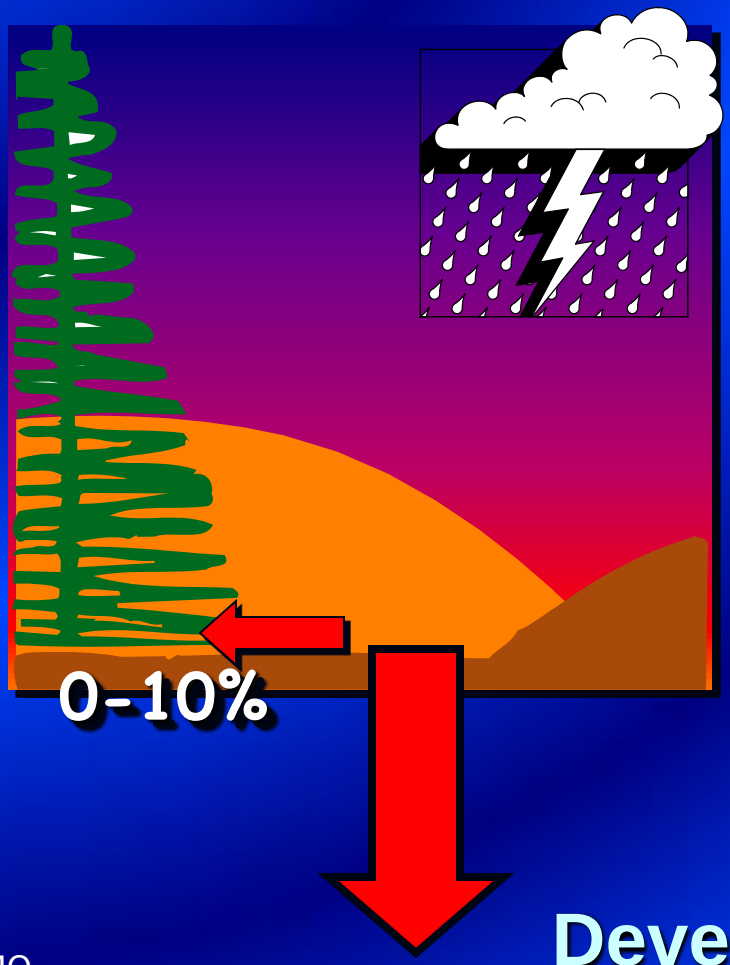
- Communities must develop, implement and enforce a program to require control of the quality of discharges from areas of new development and redevelopment, after construction is completed
- The program must include an ordinance (or other regulatory mechanism)
- The ordinance must establish/include design criteria, standards, and specifications equivalent to State standards
- Must also include post-construction performance standards at least as stringent as NR 151.12 and 151.24

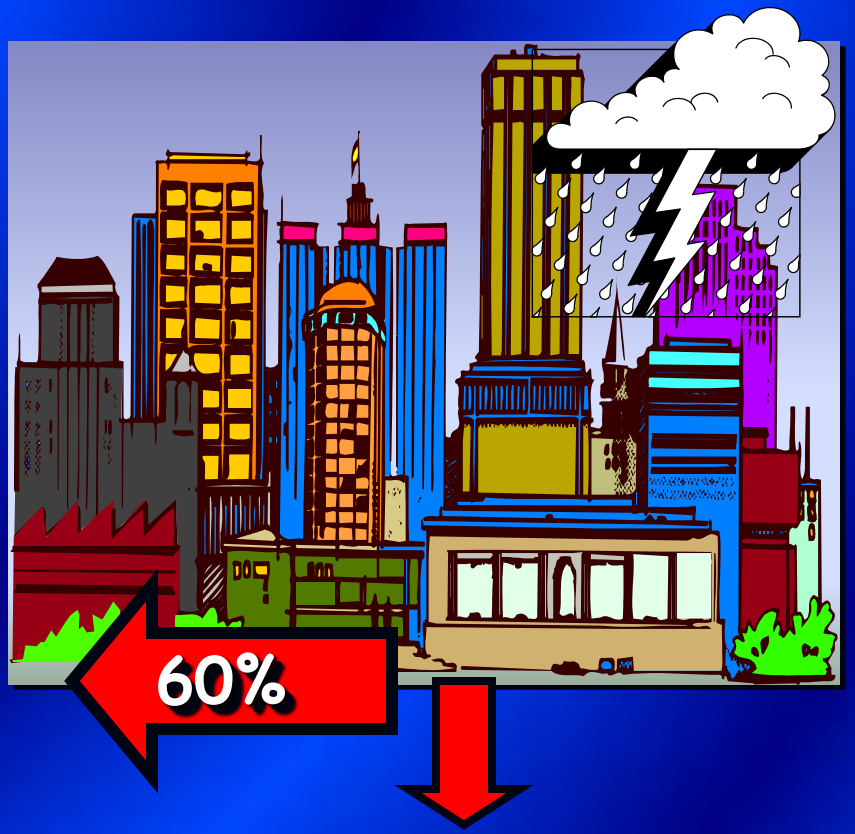
Many MS4s Implement Post-Construction Ordinance Provisions to Regulate Discharge Volumes

- Localized Flooding
- Protect Water Quality

Setting standards for the volume of runoff from new development sites and redevelopment sites is one of the focus areas for EPA's NPDES Stormwater Rulemaking

Relationships Between Land Use and Water Resources

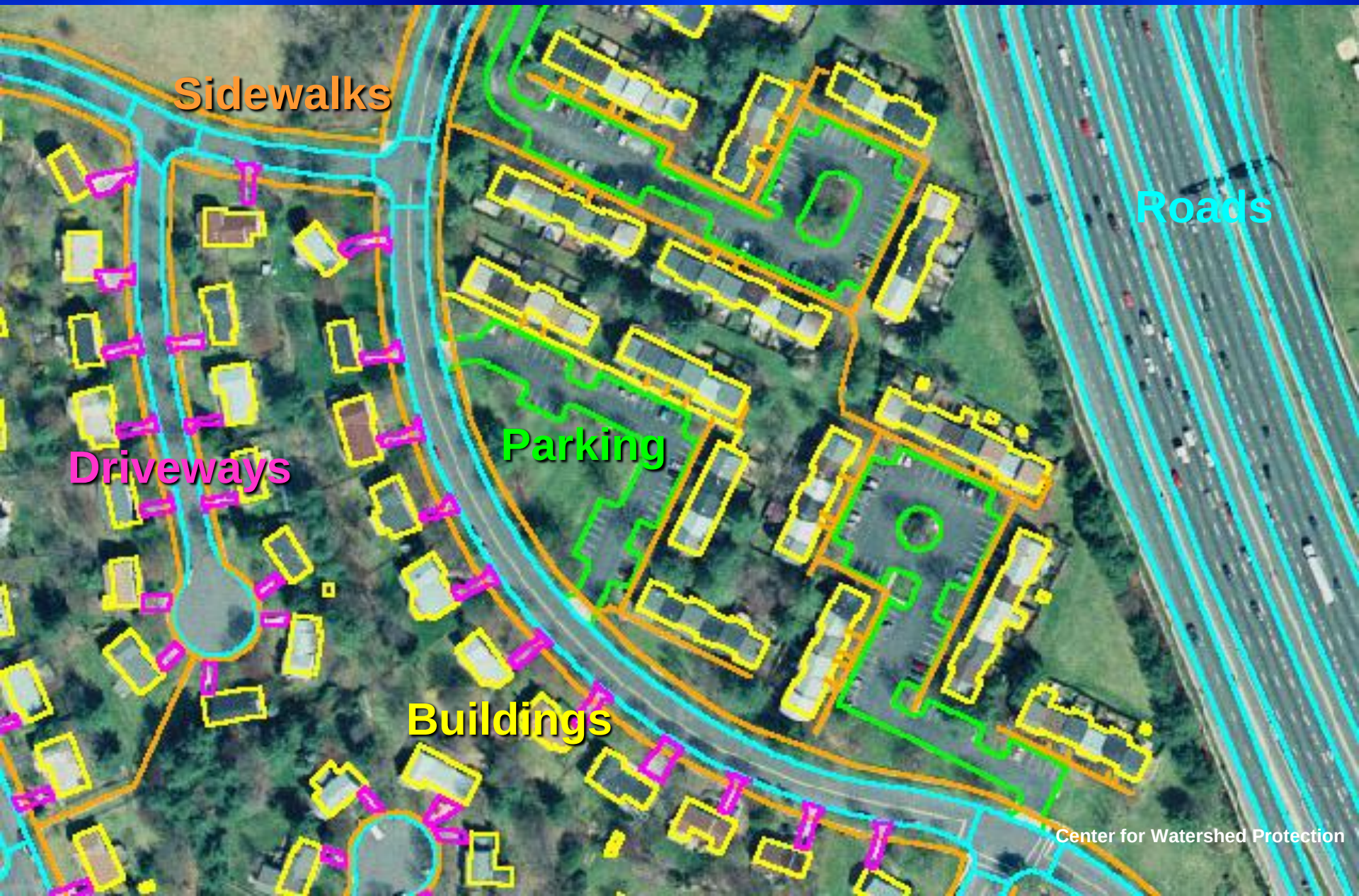




Development Increases Run-off

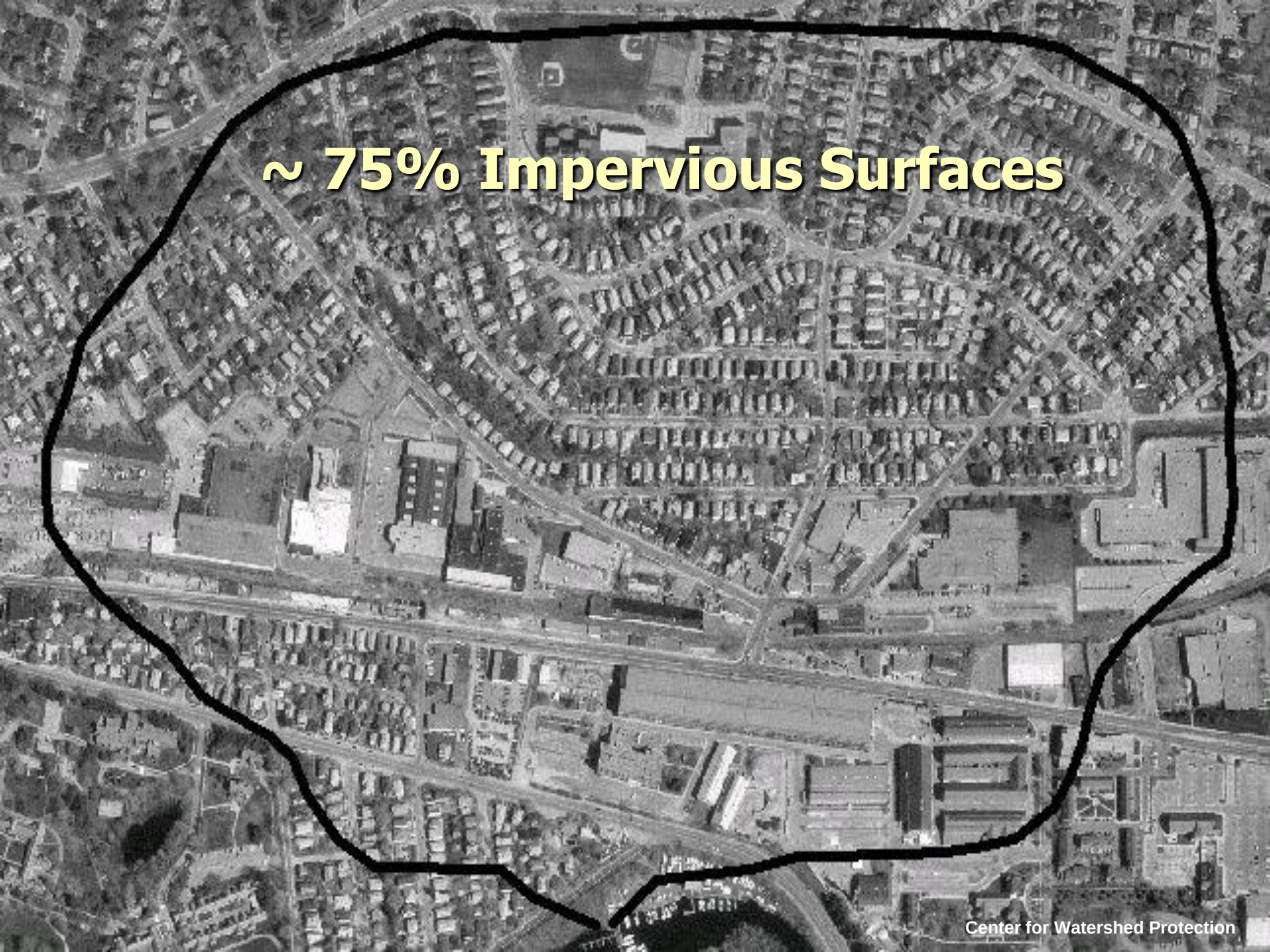
NEMO

Increased Run-off due to Impervious Surfaces

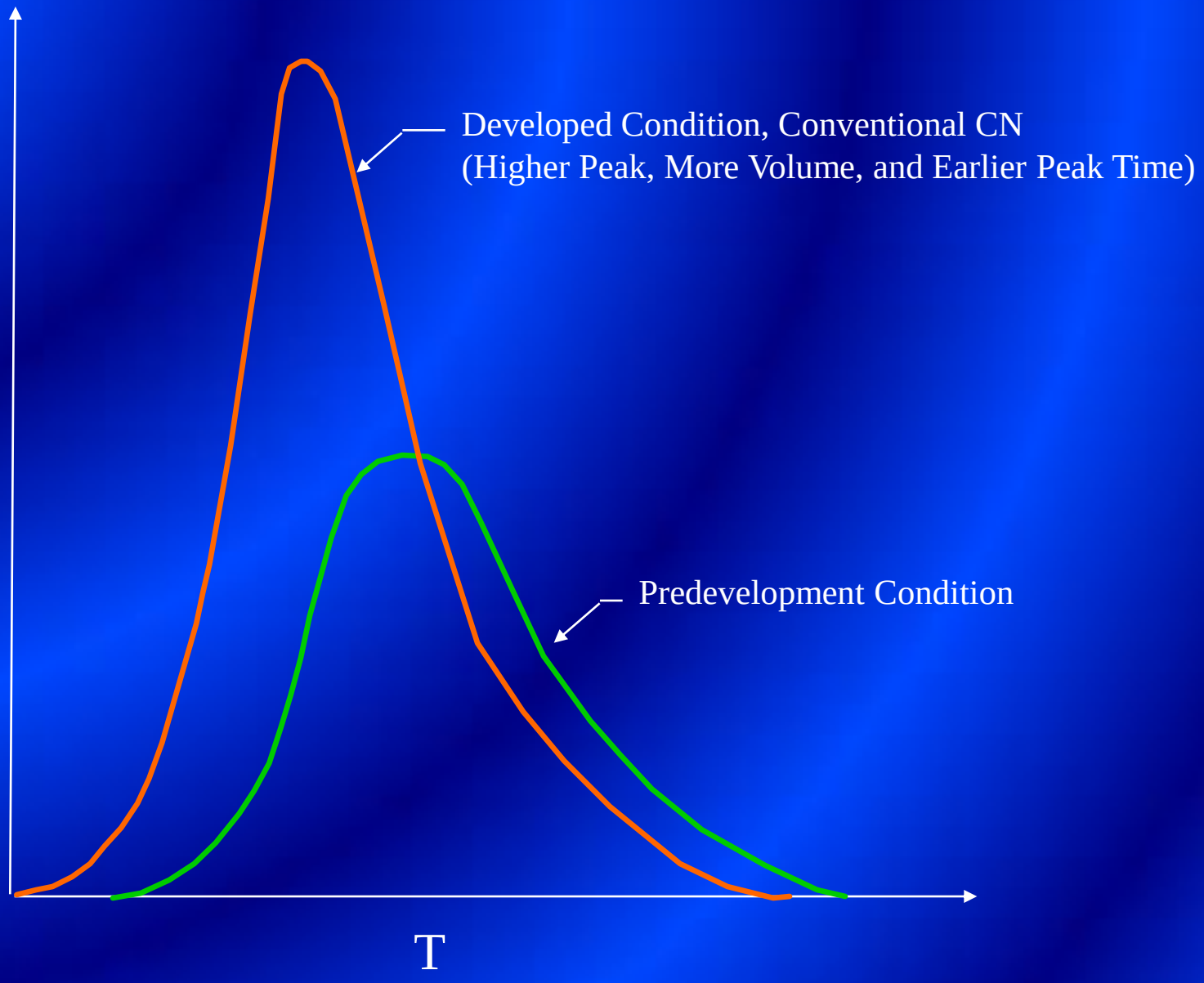


~10% Impervious Surfaces

As a Watershed Develops, there is More and More Impervious Cover (and as a result, more and more runoff)

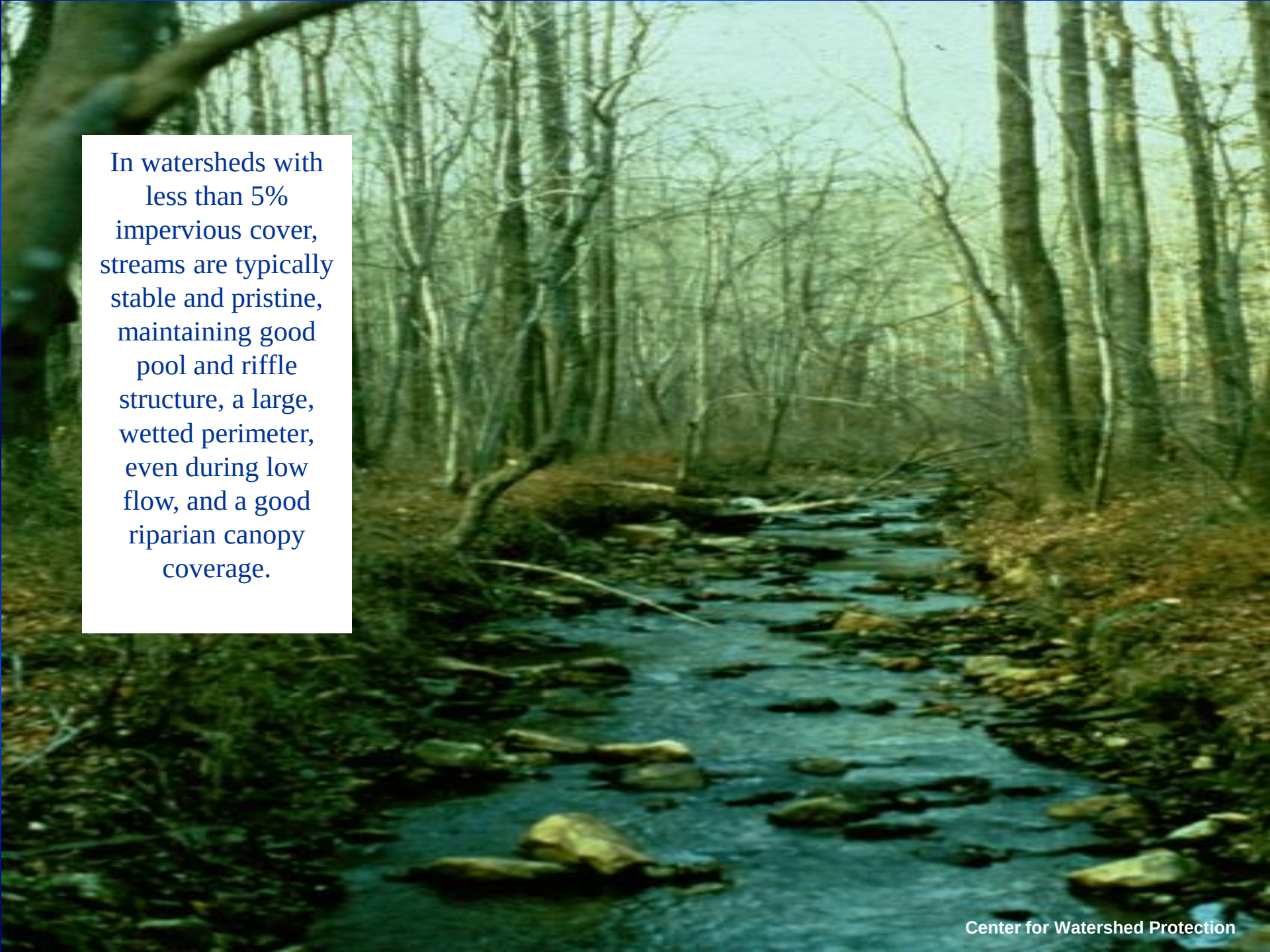

~ 75% Impervious Surfaces
Center for Watershed Protection

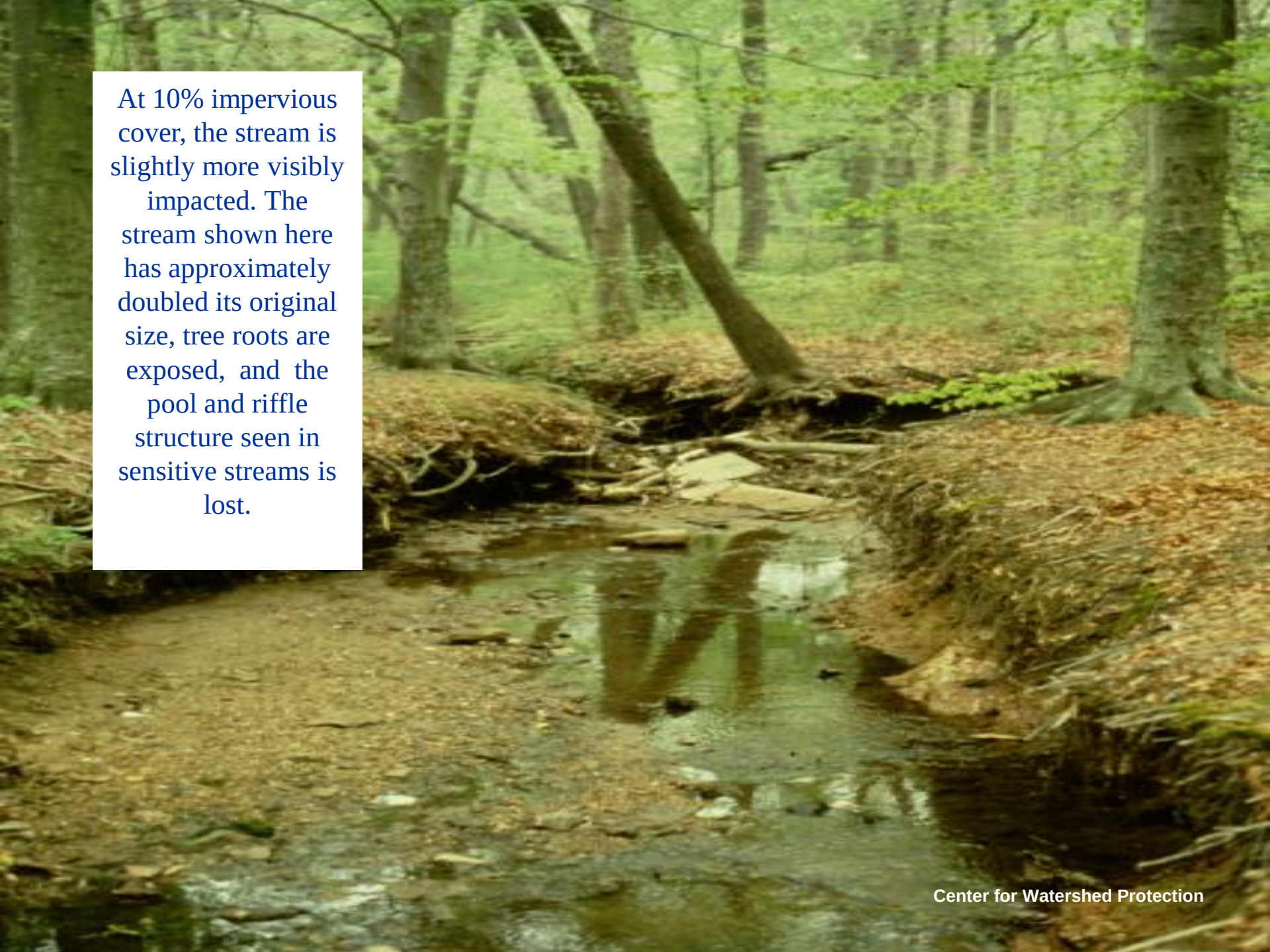
Increased Run-off Changes Stream Flow Characteristics

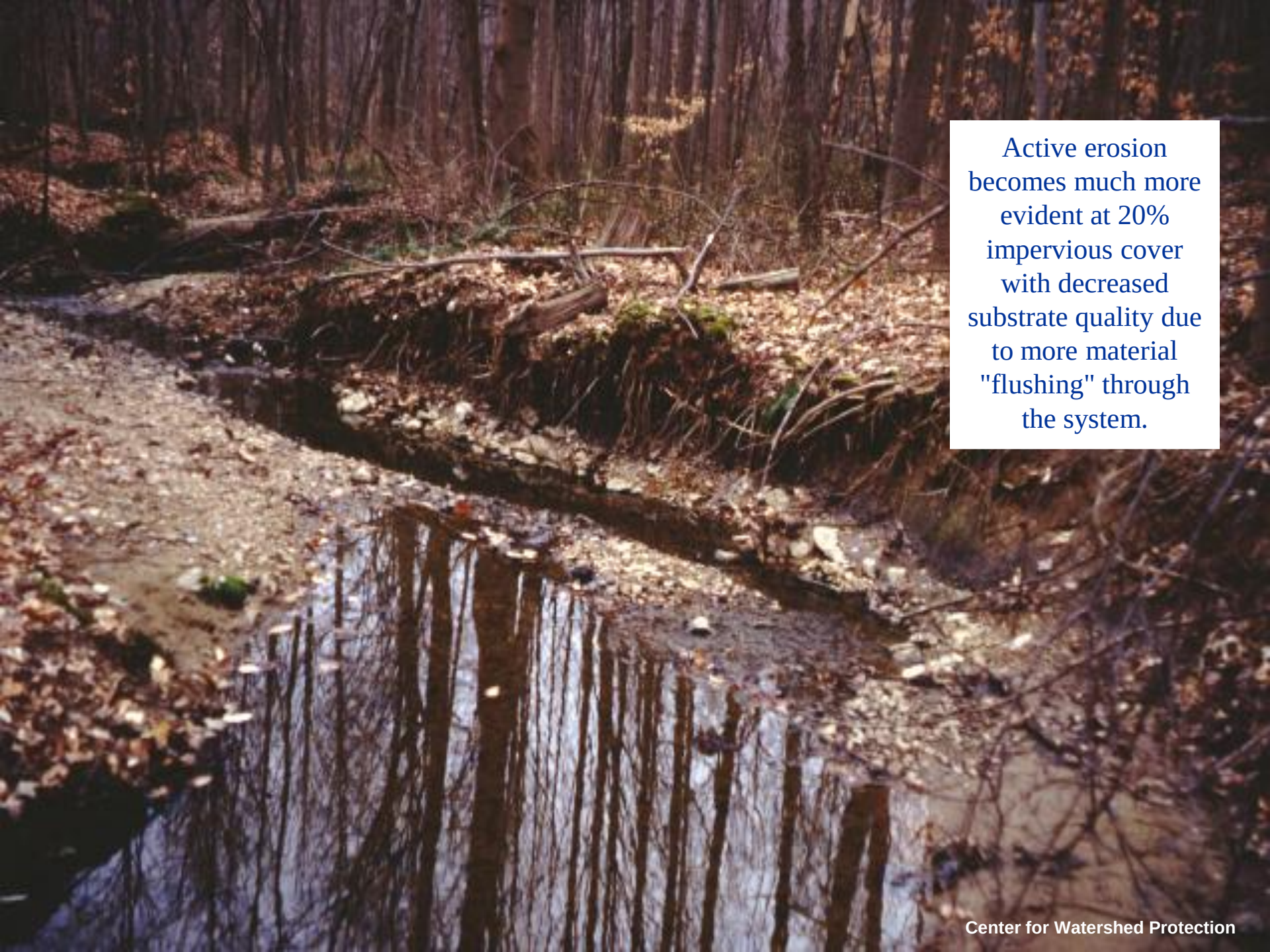


Effects of Higher Flow Volumes and Higher Flow Velocities…

- Stream widening and erosion
- Decreased channel stability
- Reduced fish passage
- Loss of pool-riffle structure
- Lower summer base flows
- Loss of riparian tree canopy
  - Temperature impacts
- Decreased substrate quality
  - Embeddedness (fine sediments become embedded into the coarse substrate)


In watersheds with less than 5% impervious cover, streams are typically stable and pristine, maintaining good pool and riffle structure, a large, wetted perimeter, even during low flow, and a good riparian canopy coverage.
Center for Watershed Protection


At 10% impervious cover, the stream is slightly more visibly impacted. The stream shown here has approximately doubled its original size, tree roots are exposed, and the pool and riffle structure seen in sensitive streams is lost.
Center for Watershed Protection



Active erosion becomes much more evident at 20% impervious cover with decreased substrate quality due to more material "flushing" through the system.

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Stream Channel Erosion

Pollutants in Stormwater Discharges

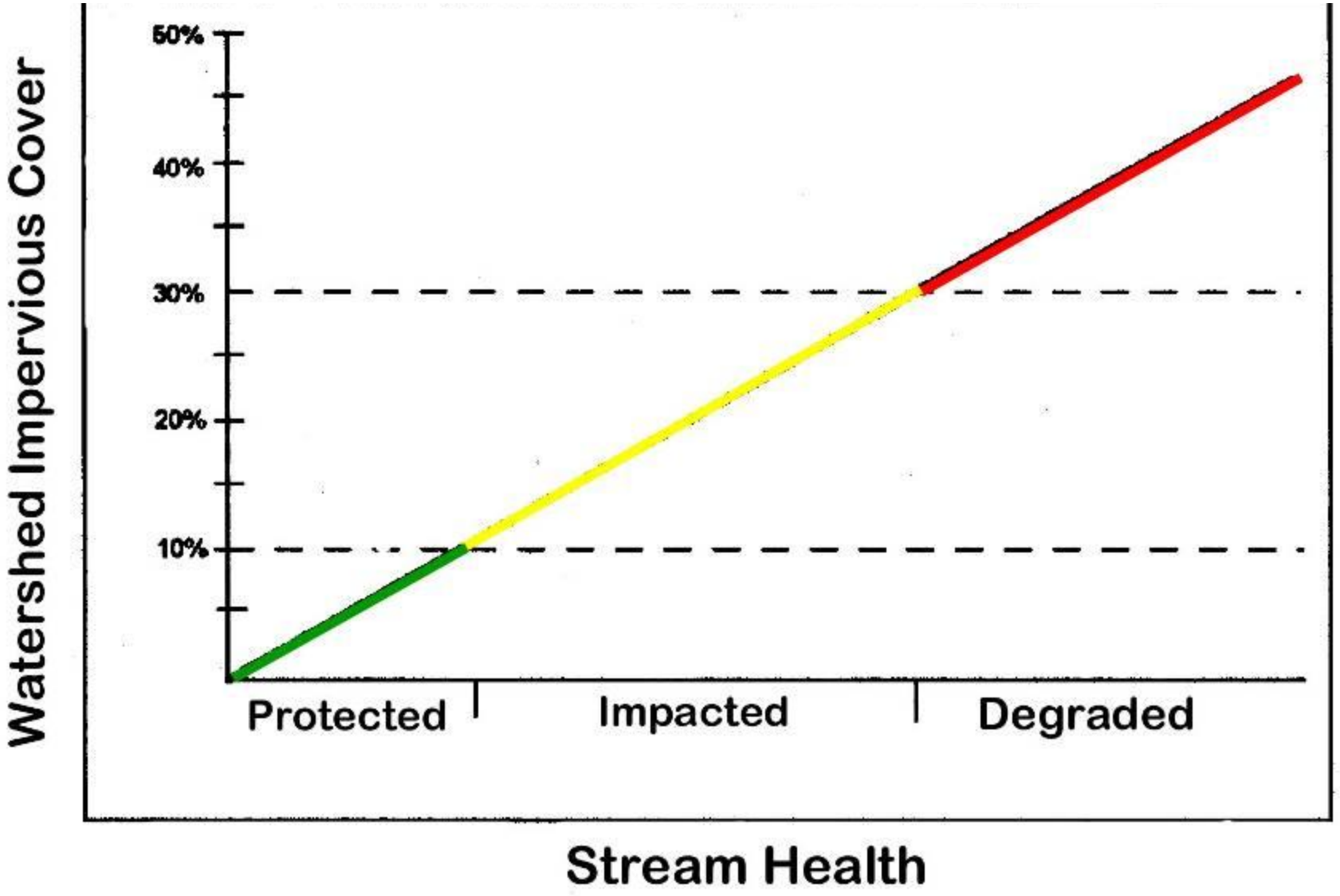
Nutrients
Pathogens
Sediment
Toxic Contaminants
Oil and Grease
Thermal Stress

Increased quantity

Decreased quality

NEMO

Stormwater Volumes and Pollutant Loads Result in Water Quality Degradation



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Existing Programs/Requirements to Address Stormwater Discharge Volumes

Wisconsin NR 151

- **NR151 Performance standards include requirements for total suspended solids, peak flow, infiltration**
- **Infiltration. This performance standard requires that a portion of the runoff volume be infiltrated:**
  - **Residential – 90 percent of pre-development infiltration volume**
  - **Non-residential – 60 percent of predevelopment infiltration volume**
- **To protect groundwater, the WI standards identify areas where infiltration is discouraged**
- **This post-construction program reduces stormwater discharge volumes**

New Jersey

The New Jersey Stormwater Management Rules require that a "major development" project must comply with one of the following groundwater recharge requirements:

- ***Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual preconstruction groundwater recharge volume for the site; or***
- ***Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the 2-year storm is infiltrated***

West Virginia MS4 Permit

Municipalities must implement a program to protect water resources by requiring all new and redevelopment projects to control stormwater discharge rates, volumes, velocities, durations and temperatures

The first 1 inch of rainfall must be 100% managed with no discharge to surface waters

Runoff volume reduction can be achieved by using green infrastructure

West Virginia – Incentives for Sustainable Development Practices

A *credit* of 0.2 inches from the one inch runoff reduction standard may be applied to any of the following types of development:

- **Redevelopment**
- **Brownfield redevelopment**
- **High density (>7 units per acre)**
- **Vertical Density (Floor to Area Ratio of 2 or >18 units per acre)**
- **Mixed use and Transit Oriented Development (within ½ mile of transit)**

Reductions are additive up to a maximum reduction of 0.75 inches for a project that meets four or more criteria

What Measures Could Be Implemented to Reduce Stormwater Discharges and CSOs?

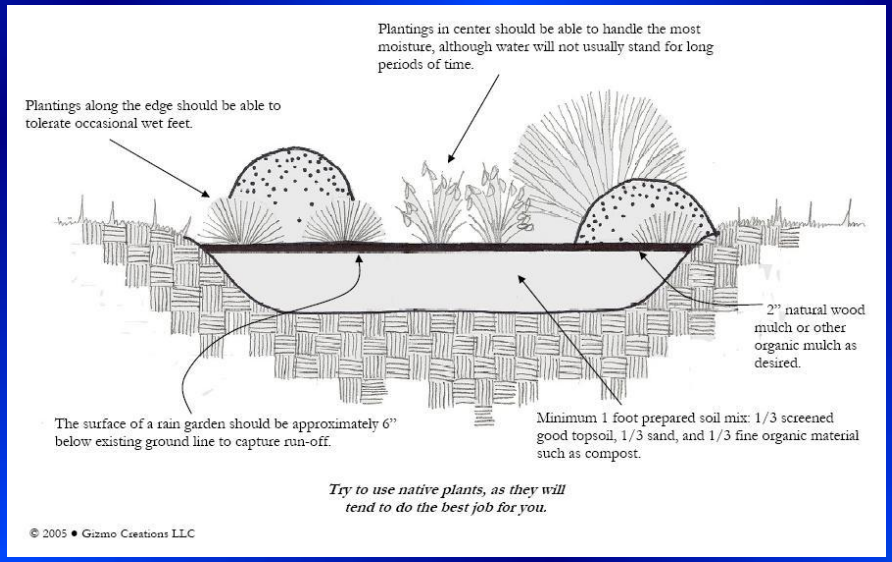
Green infrastructure practices to manage stormwater

- Increase Infiltration
- Increase Evapotranspiration
- Harvest and Re-use Stormwater
- Reduce Volume of Runoff

Infiltration Practices

Rain Gardens

Maplewood, MN



Burnsville, MN

Rain Gardens Throughout a Neighborhood

Parking Lots

Not so good

drain

Good – Run-off from the parking lot can be absorbed by the plants and soil

Center for Watershed Protection

H.B.Fuller Company Parking Lot (MN)

- Reduced storm water discharges by 73%
- Reduced sediment discharge by 94%
- Reduced phosphorus loading by 70%


Permeable Pavement Parking
Morton Arboretum, Lisle, IL

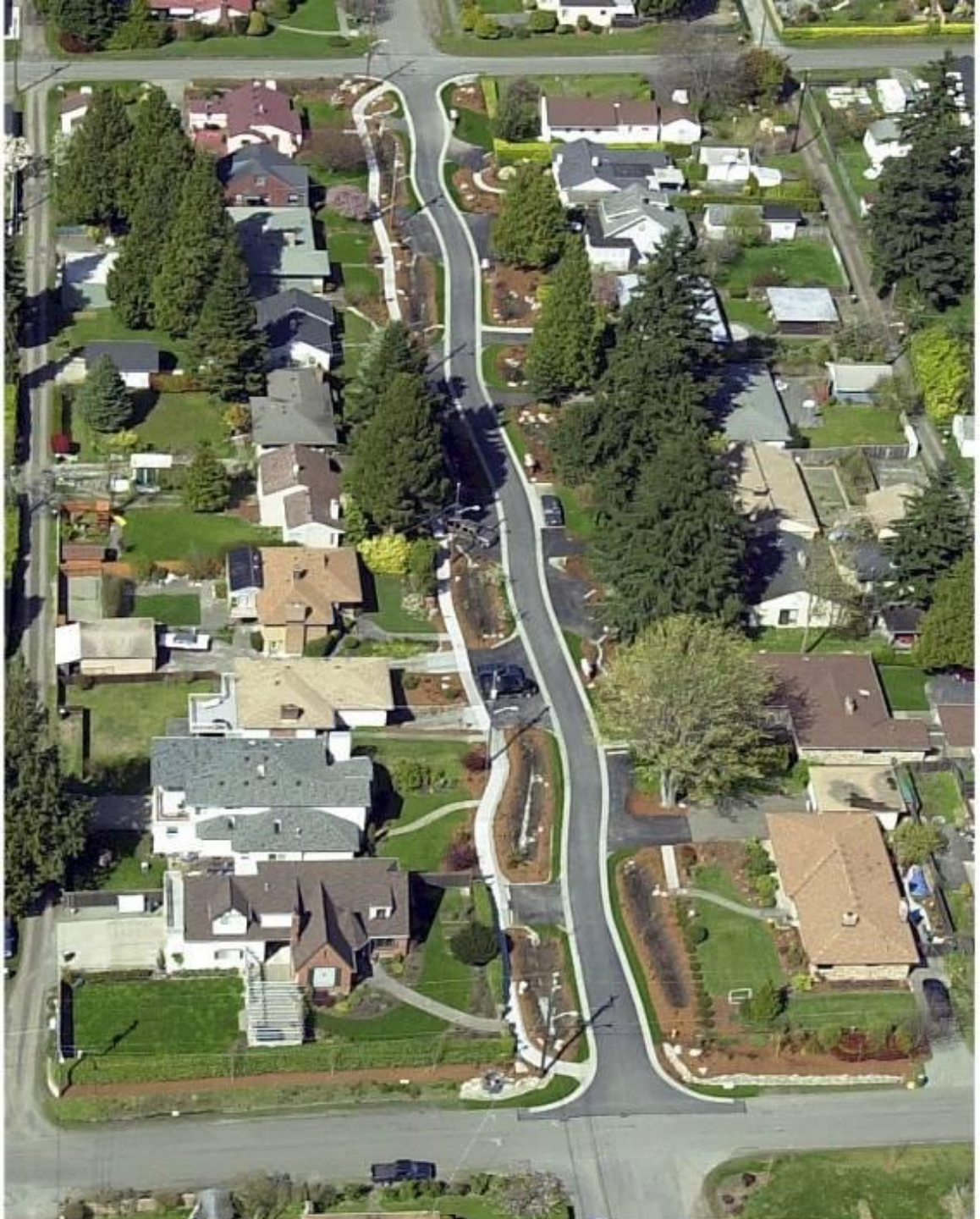
Fat Street

Street Widths

Skinny Street

Street Retrofits – Narrower Streets + Swales

Seattle Street – After

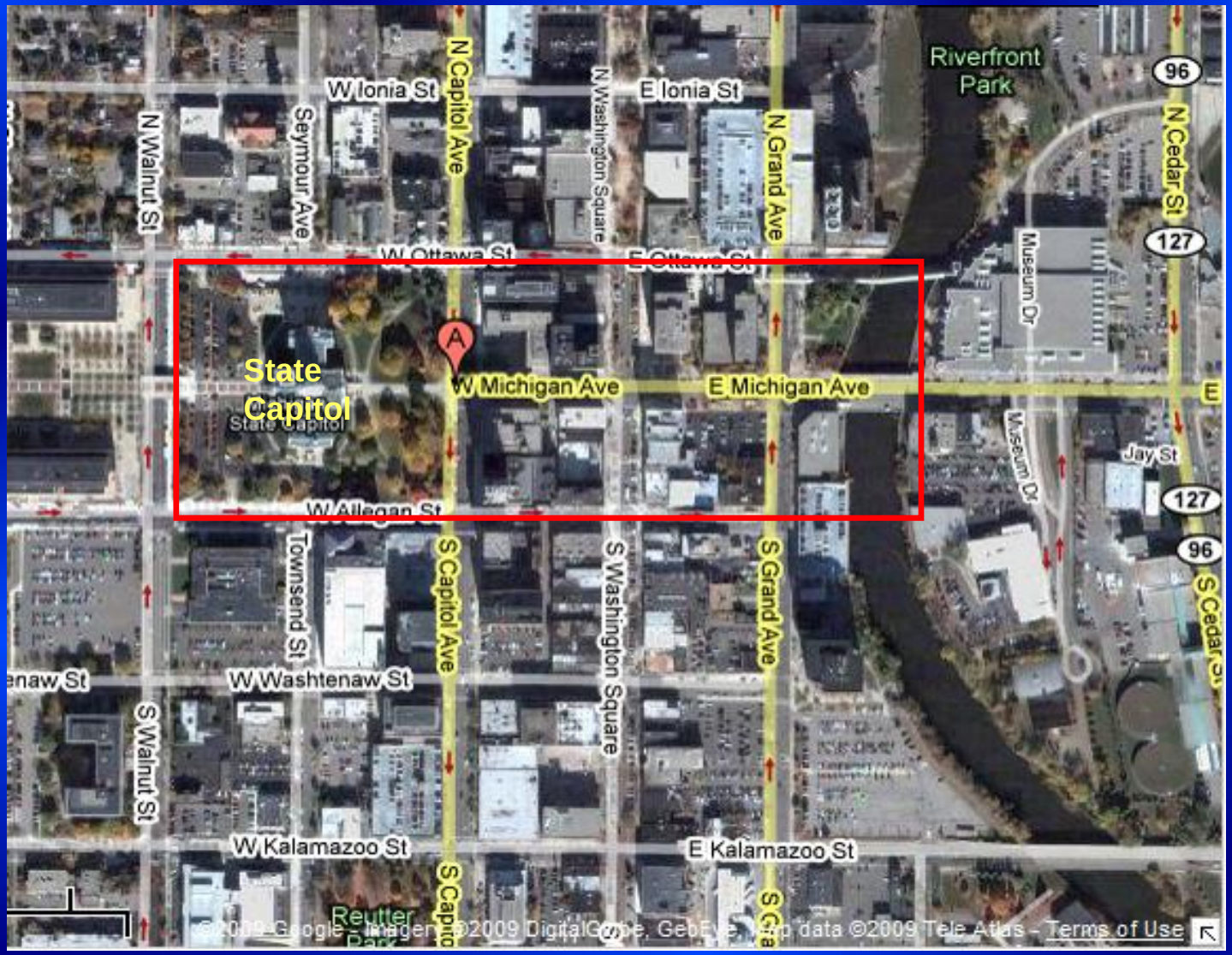


Seattle street retrofit monitoring results for two years:

98-99%

reduction in total runoff volume

Michigan Avenue, Lansing, MI



Michigan Avenue

TetraTech and C2AE

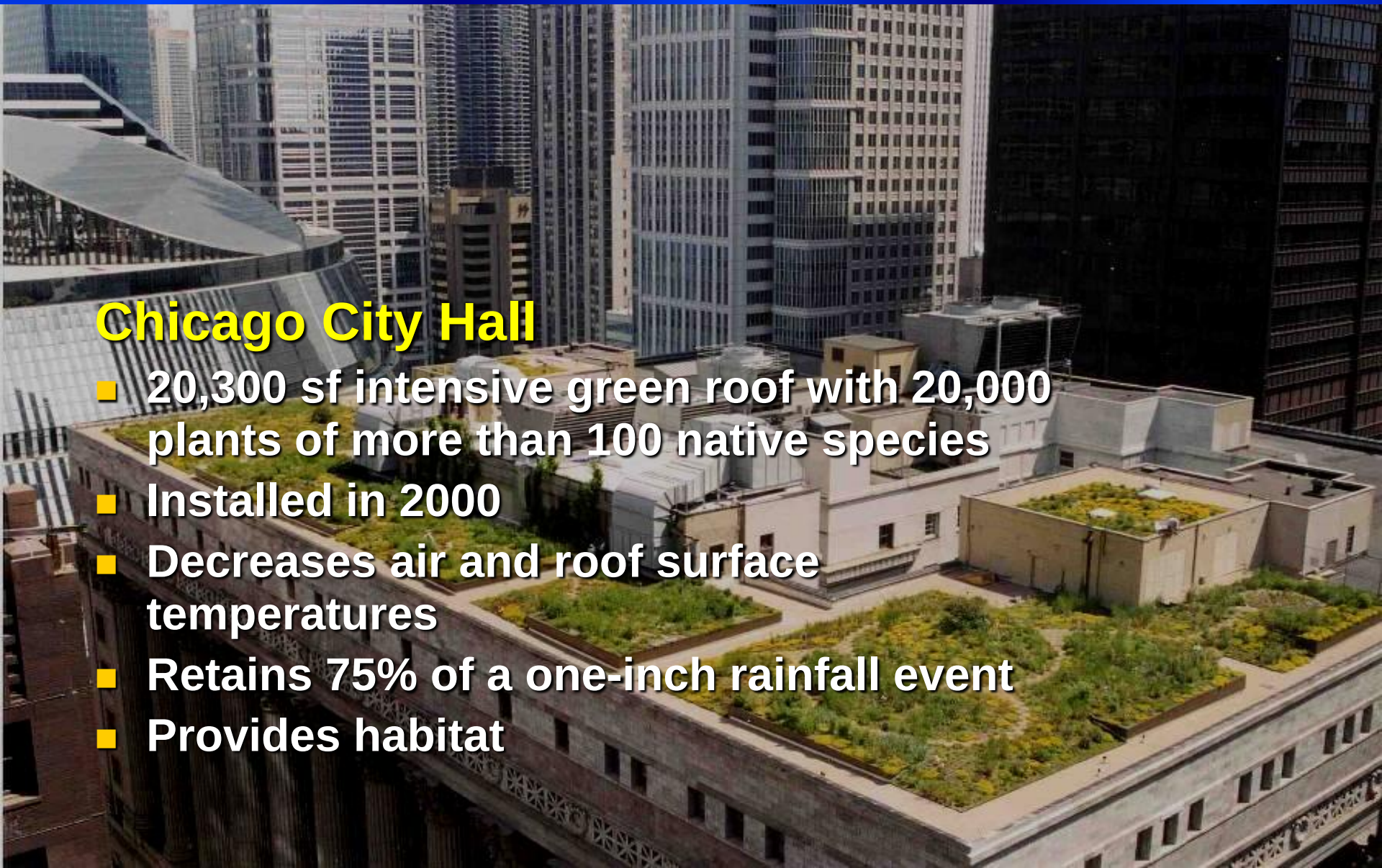

JESUS
SAVES
CLASSIC WINES

TetraTech

Michigan Avenue

- 4 city blocks, both sides
- Typical garden, no overflow for 1-inch event
- 600 block north side, no overflow for 4.1-inches (25-year event)
- $122/square foot

Green Roofs



Chicago City Hall

- 20,300 sf intensive green roof with 20,000 plants of more than 100 native species
- Installed in 2000
- Decreases air and roof surface temperatures
- Retains 75% of a one-inch rainfall event
- Provides habitat

Extensive Green Roof

Light and Relatively Inexpensive

Highland Gardens, Milwaukee, WI

Storing and Reusing Rainwater

Cisterns

Costs

Green vs. Grey Infrastructure

Project	Conventional vault cost estimate*	Rain garden cost
Bloedel Donovan Park parking lot (4400 ft^3 wet vault)	$52,800	$12,800
City Hall parking lot (2300 ft^3 wet vault)	$27,600	$5,600

* City of Bellingham's estimate using approximate cost of $12.00/ft3 for an in-ground storage and treatment device and based on construction costs for similar projects in the Bellingham area

Reining in the Rain, City of Bellingham, WA 2004

EPA Study: Reducing Stormwater Costs through Low Impact Development Strategies and Practices

- Background on LID
- Discussion of benefits and costs
- Case studies
  - 17 projects
  - LID costs vs. traditional stormwater management on a site or neighborhood scale

Key Findings

- In most cases LID designs showed cost savings over traditional stormwater designs
- Capital cost savings ranged from 15% to 80%

Other Economic Benefits

- The New Kensington Community Development Corporation and the Pennsylvania Horticultural Society implemented green retrofit measures in a community area in Philadelphia
- NKCDC and PHS converted unsightly abandoned lots with “clean & green” landscapes of mowed grass, ringed with trees
- Significant economic impacts from these green retrofits:
  - Vacant land improvements resulted in surrounding housing values increased by as much as 30%
  - New tree plantings increased surrounding housing values by approximately 10%
- This translated to a $4 million gain in property values through tree plantings and a $12 million gain through lot improvements

Up Next

The Role of Codes and Ordinances in Water Quality and Non-Point Source Reduction

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Tetra Tech, Inc.