

# Stormwater 101: The Basics

An Introduction to the NPDES  
Stormwater Program



Nikos Singelis, EPA HQ  
Thelma Murphy, EPA Region I  
John Kosco, Tetra Tech, Inc.

# Guide to Our Webcasts

For Technical Support click the “Help” button

- ▶ **To Ask a Question** - Type your question in the text box located in the lower left-hand corner of your screen and click on the “Submit Question” button
- ▶ **To Answer Poll Question** – Click on the radio button to the left of your choice and click submit. Do not type your answer in the “Ask a Question” box
- ▶ **To See Closed Captioning** – Turn your pop-up blocker off and click on the “closed captioning” button
- ▶ **To Complete the Survey** – Turn off your pop-up blocker
- ▶ **To Obtain a Certificate** – Watch 1 hour and 30 minutes of the webcast and then click “Download Certificate.” If you are in a room with multiple attendees please wait until the last slide to obtain the URL to customize your own certificates

# Topics for Today's Webcast

- ▶ Effects of stormwater runoff
- ▶ Stormwater regulatory framework
- ▶ Municipal Program
- ▶ Construction Program
- ▶ Industrial Program

# Nationwide Urban Runoff Program (NURP)

- ▶ Conducted by EPA between 1979 and 1983
- ▶ First comprehensive study of urban runoff pollution across U.S.
- ▶ Found high levels of heavy metals and fecal coliform in urban runoff
- ▶ Also found high concentrations of TSS and nutrients
- ▶ Used as a basis for 1987 amendments to CWA which added stormwater permitting requirements

# Effects of Stormwater Runoff

- ▶ Water quality impacts
  - Pollutant sources
  - Pollutant impairments
- ▶ Water quantity impacts
  - Increased runoff/reduced infiltration
  - Changes to stream geomorphology
  - Impacts to aquatic habitat

# Why is Stormwater a Problem?

Urban Runoff is the Source of Problems in:

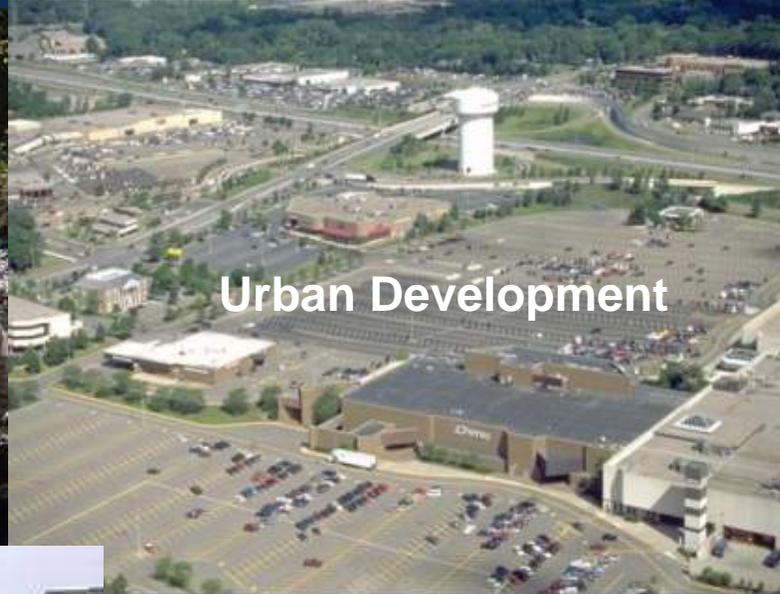
- ▶ 34,871 miles or 13% of all Impaired Rivers and Streams
- ▶ 1,369,327 acres or 18% of all Impaired Lakes
- ▶ 5045 square miles or 32% of all Impaired Estuaries

\* The National Water Quality Inventory 2000. Note this report describes the quality of assessed waters. Many of the nation's rivers, lakes and estuaries remain unassessed. The percentages above are based on assessed waters only.

# Water Quality Impacts: Pollutant Sources



Construction



Urban Development



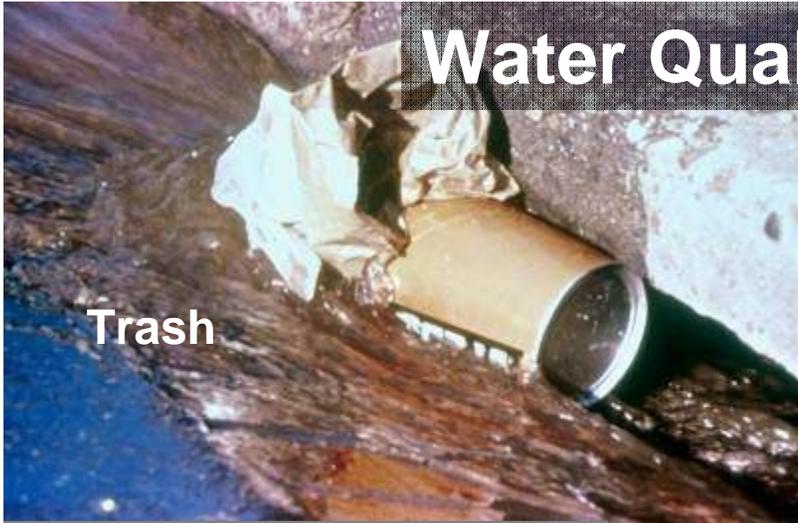
Residential



Industrial/Commercial

888 27 7887

# Water Quality Impacts: Pollutants



Trash



Heavy Metals



Nutrients



Sediment

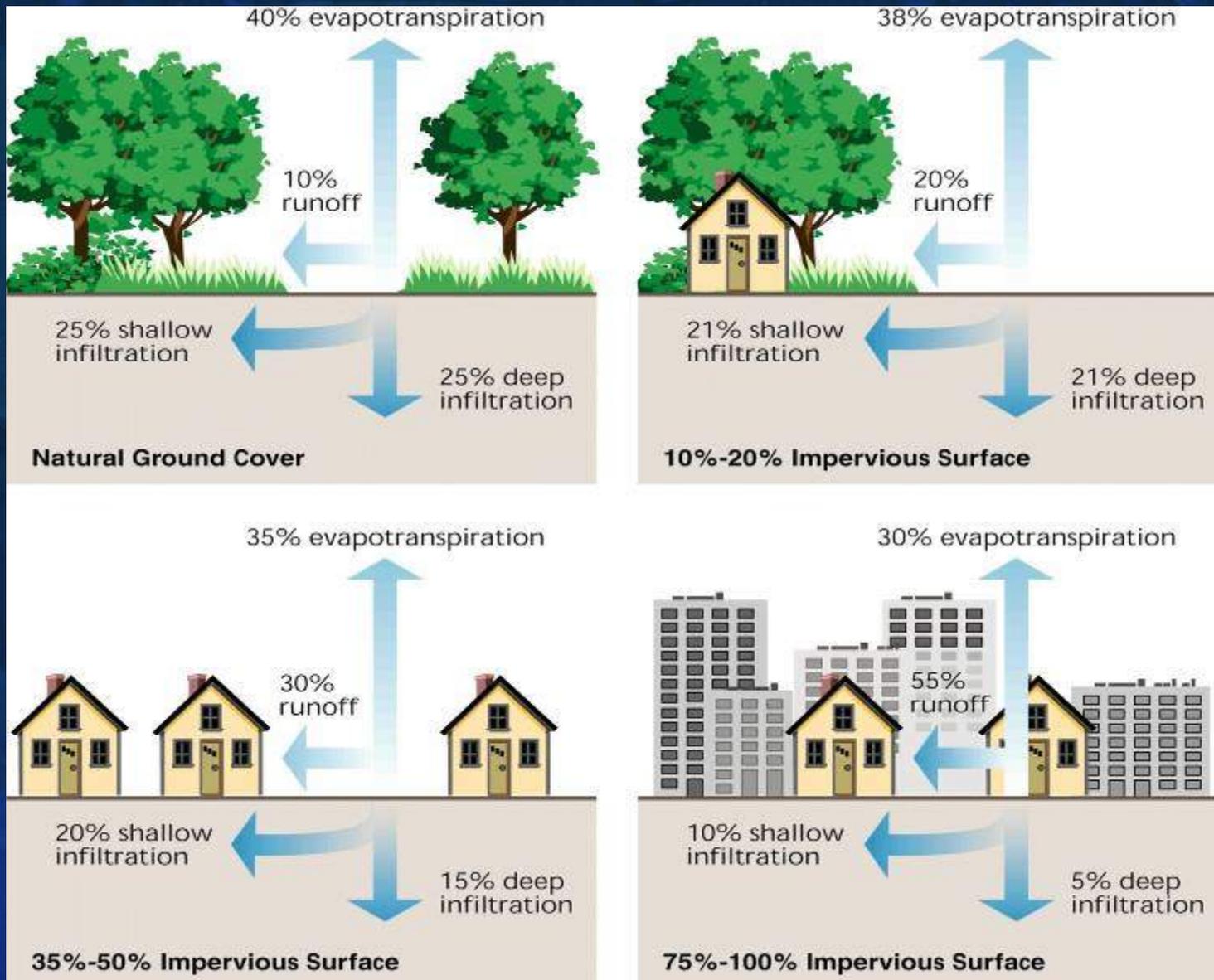


Pathogens



Oil and Grease

# Water Quantity Impacts: Increased Runoff/Reduced Infiltration



# Water Quantity Impacts: Changes to Stream Geomorphology



- ▶ Increased stormwater volume and velocity
- ▶ Results in stream widening and down-cutting
- ▶ Decreased baseflow
- ▶ And more flooding!

# Water Quantity Impacts: Changes to Aquatic Habitat

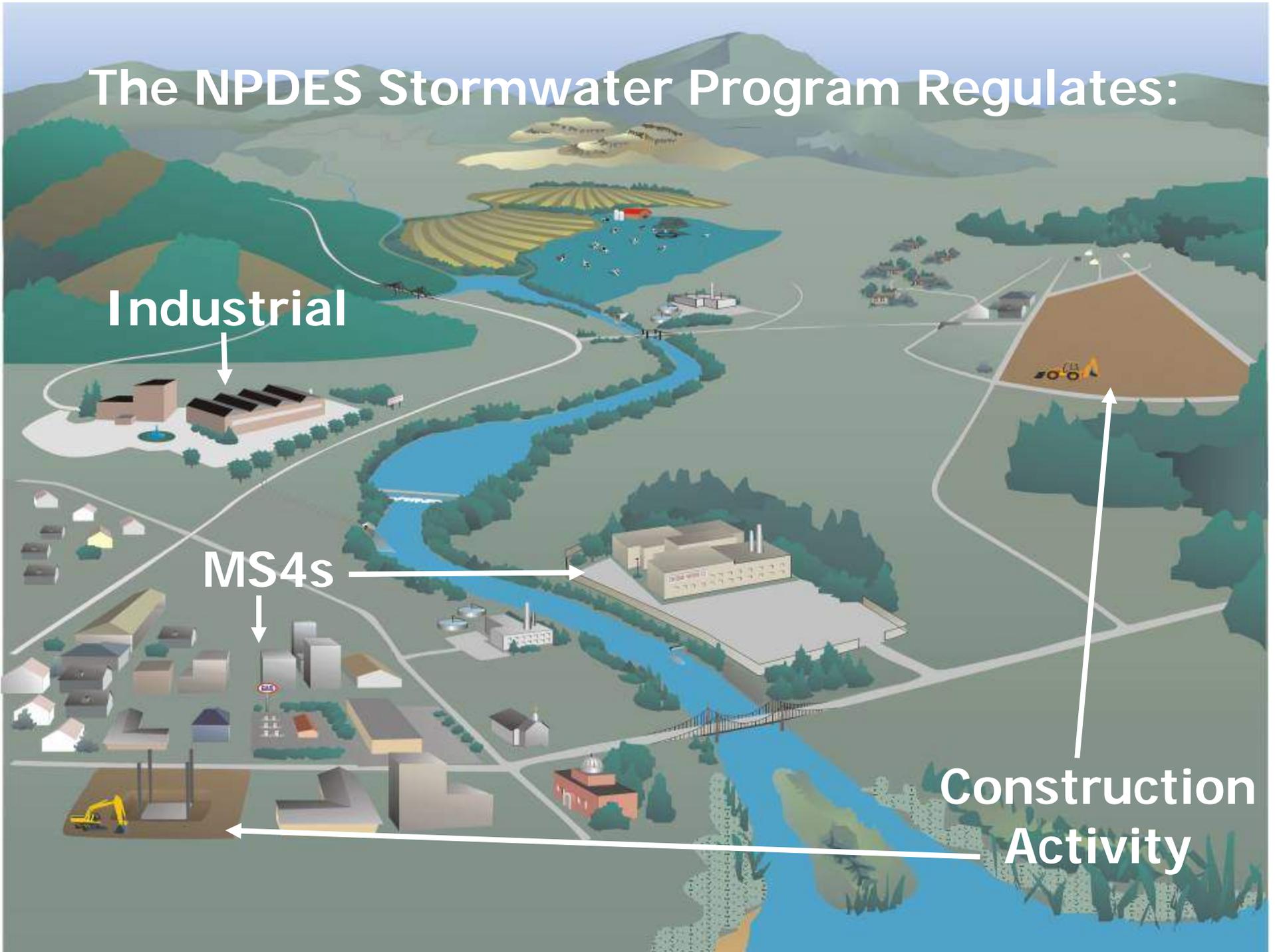
- ▶ Reduced aquatic habitat because of increased stormwater volumes and velocity
- ▶ Increased stream temperatures
- ▶ Excess sediment smothers spawning beds and submerged aquatic vegetation
- ▶ Heavy metal bioaccumulation
- ▶ Reduced dissolved oxygen levels due to excessive nutrients and growth of plants/algae

# The NPDES Stormwater Program Regulates:

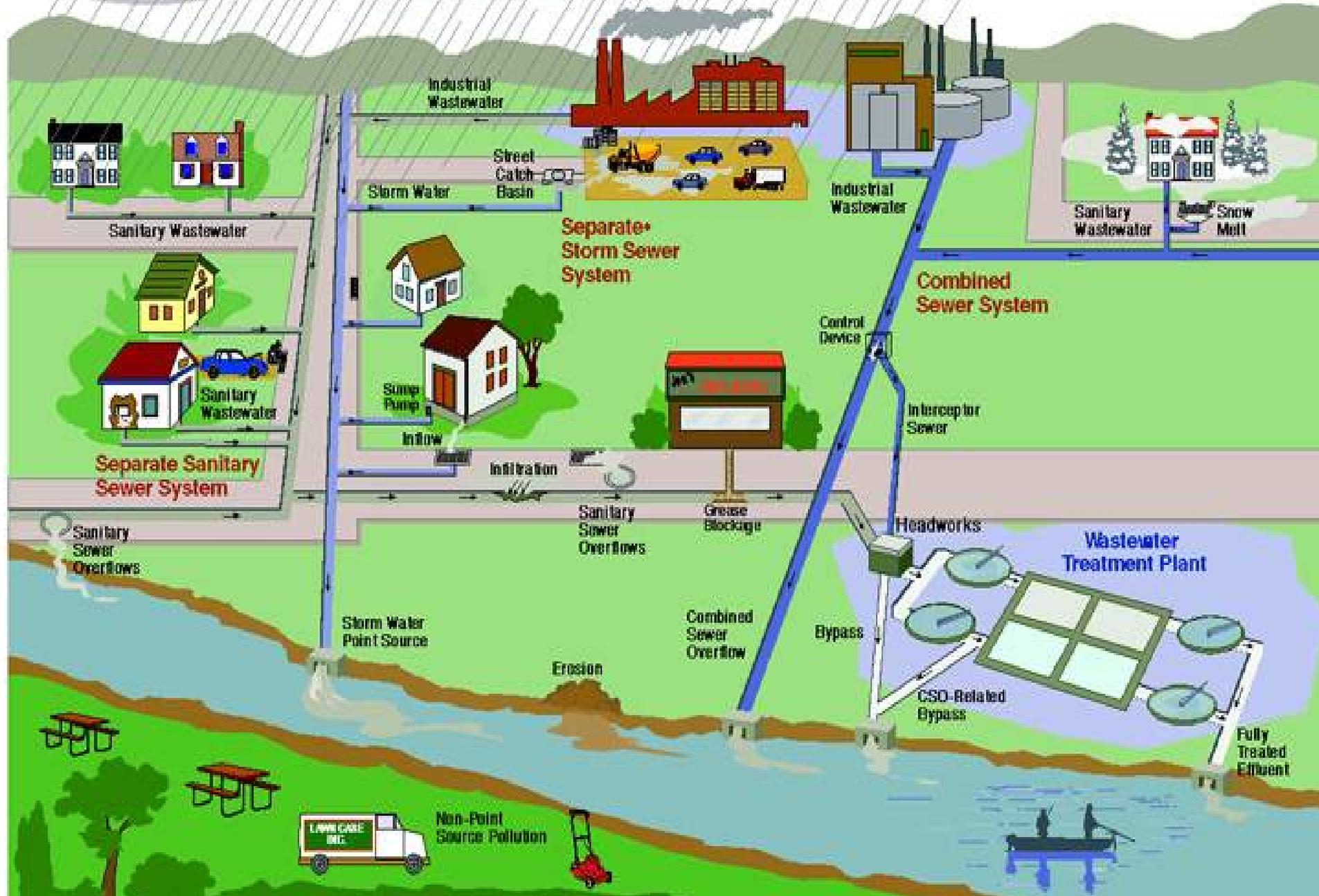
Industrial

MS4s

Construction Activity



# Urban Wet Weather Flows



# Regulatory History

- ▶ Before 1987 stormwater considered a non-point source and not regulated
- ▶ Water Quality Act of 1987 required NPDES permitting of certain stormwater discharges
  - Medium and large municipalities (serving over 100,000 persons)
  - Industrial activities
  - Others, as determined by EPA, "to protect water quality"

# CWA Section 402(p)

- ▶ 402(p)(2) included:
  - Existing permitted facilities
  - Industrial activity
  - MS4s serving >250,000 people
  - MS4s serving >100,000 people
  - Others as determined by the permitting authority
- ▶ (p)(3)
  - Permit requirements, including MEP for MS4s
- ▶ (p)(4)
  - Application requirements, dates
- ▶ (p)(5)
  - Studies to determine who else to regulate
- ▶ (p)(6)
  - Regulations, reflecting results of studies (5)

# Stormwater Regulations

## ▶ Phase I regulations:

- 40 CFR 122.26
- 55 FR 47990, November 16, 1990
- [www.epa.gov/npdes/regulations/stormwater\\_phase1\\_rule.pdf](http://www.epa.gov/npdes/regulations/stormwater_phase1_rule.pdf)

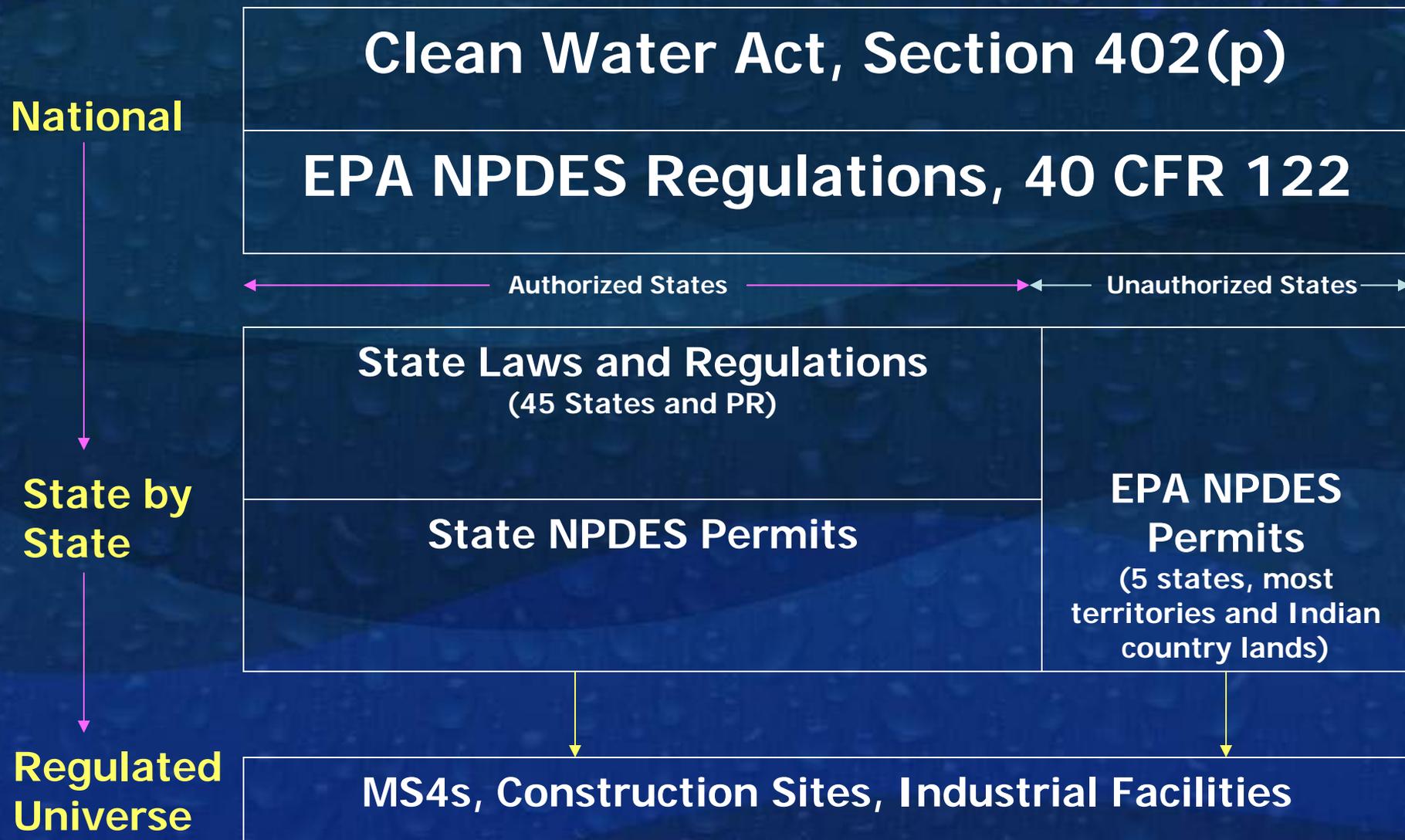
## ▶ Phase II regulations:

- 40 CFR 122.26, 122.30-37, 122.44, 123.35
- 64 FR 68722, December 8, 1999
- [www.epa.gov/npdes/regulations/phase2.pdf](http://www.epa.gov/npdes/regulations/phase2.pdf)

# Basis of Phase II Regulation

- ▶ 1995 Report to Congress, EPA determined that small municipalities also needed regulation
- ▶ *NRDC v. EPA* Decision on Phase II drove regulation of small construction and expansion of no-exposure

# Regulatory Framework



# NPDES Permits

**All “point” sources  
“discharging  
pollutants”  
into “waters of the  
U.S.”**



**Must obtain  
an NPDES  
permit from  
an authorized  
state or EPA**

# Point Sources vs. Non-Point Sources

- ▶ Stormwater has expanded the definition of “point source”
- ▶ Some stormwater remains covered as “non-point source”
  - Agricultural
  - Small MS4s outside urbanized areas

# NPDES Permits

Generally:

- ▶ Individual permits = one permit, one facility
- ▶ General permits = one permit, many facilities
  
- ▶ NPDES permits can be issued for a maximum of five years

# The “Phases”

## ▶ Phase I – 1990

- Medium and large municipalities (over 100,000)
- Industrial activity (11 categories, including construction over 5 acres)
- Category 11 (light industry – only if exposure)

## ▶ Phase II – 1999

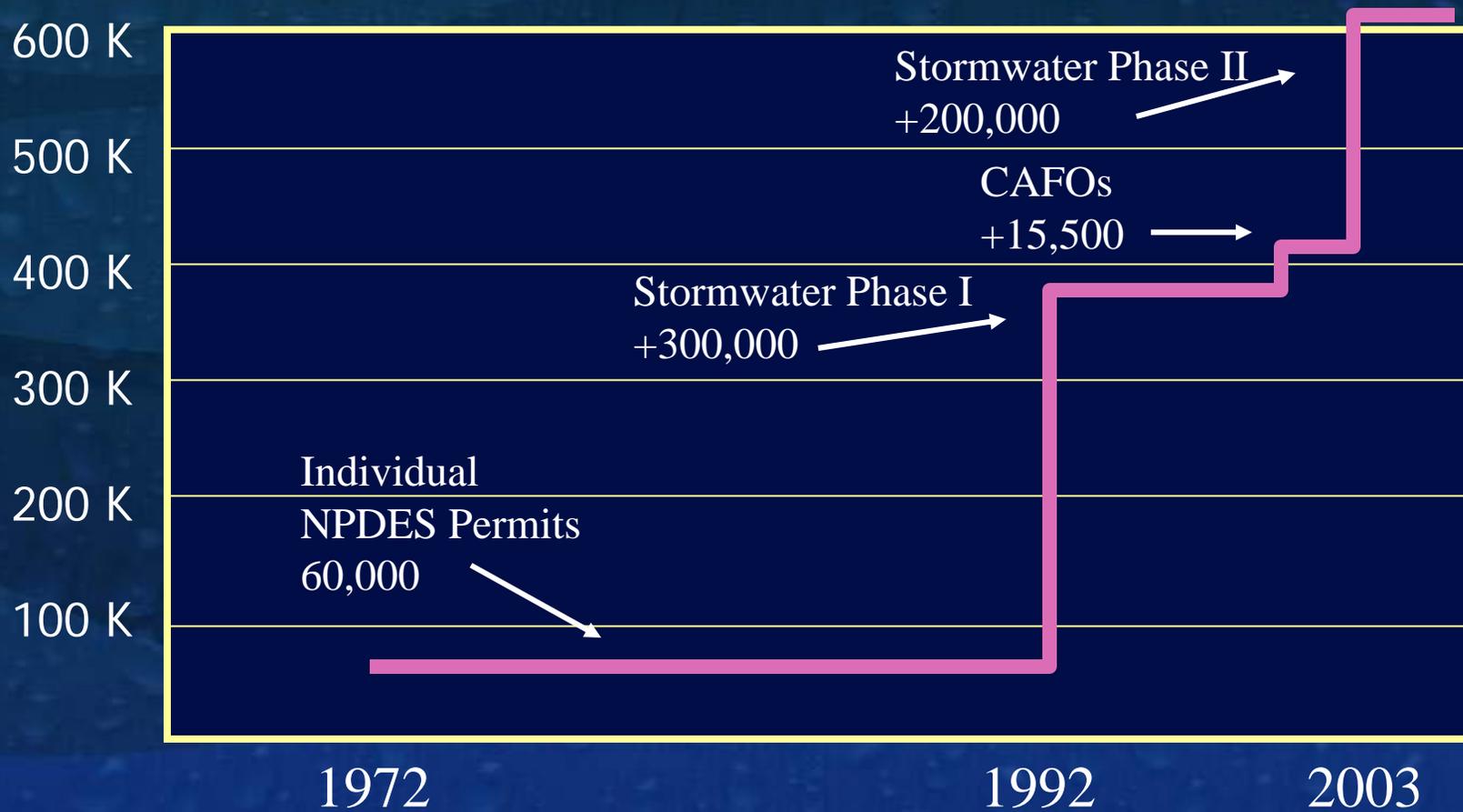
- Smaller municipalities in “urbanized areas”
- Construction sites (1-5 acres)
- “No exposure” revised and expanded, including notice

# Quiz Answer #1

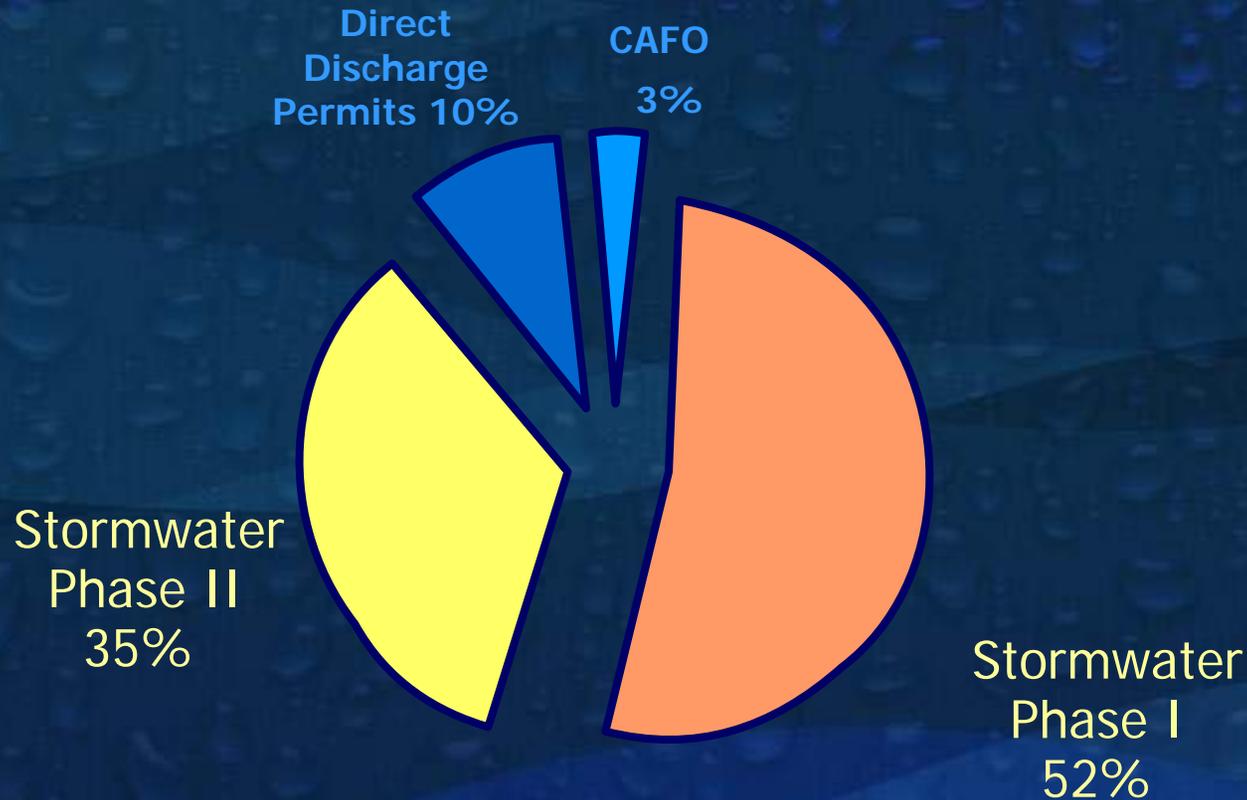
- ▶ The Stormwater Phase II regulations were finalized and issued in what year?
  - 1992
  - 1998
  - *1999*
  - 2003
- ▶ The Phase II regulations were finalized on December 8, 1999 and became effective on March 10, 2003



# Growth of the NPDES Program (Number of Facilities or Sources)



# Universe of NPDES Facilities



Stormwater Permittees make up 87% of the Permitted Universe

# Quiz Answer #2

- ▶ Virtually every day, EPA and other federal agencies publish documents in the Federal Register. A cite for such a document could be something like 64 FR 68722. This FR number means that this document is a:
  - Regulation
  - Permit
  - Law
  - Either a regulation or a permit
- *Who knows!*
- ▶ The federal government publishes many documents in the Federal Register, including proposed and final regulations, permits, and notices. Notices may be for public meetings, review of guidance documents, and many other purposes.

# Quiz Answer #3

- ▶ The acronym “CFR” (as in 40 CFR 122) appears as a reference in many places. CFR indicates that this document is a:
  - Permit
  - *Regulation*
  - Law
  - Either a regulation or a permit
  - Who knows!
- ▶ CFR is the Code of Federal Regulations

# Questions



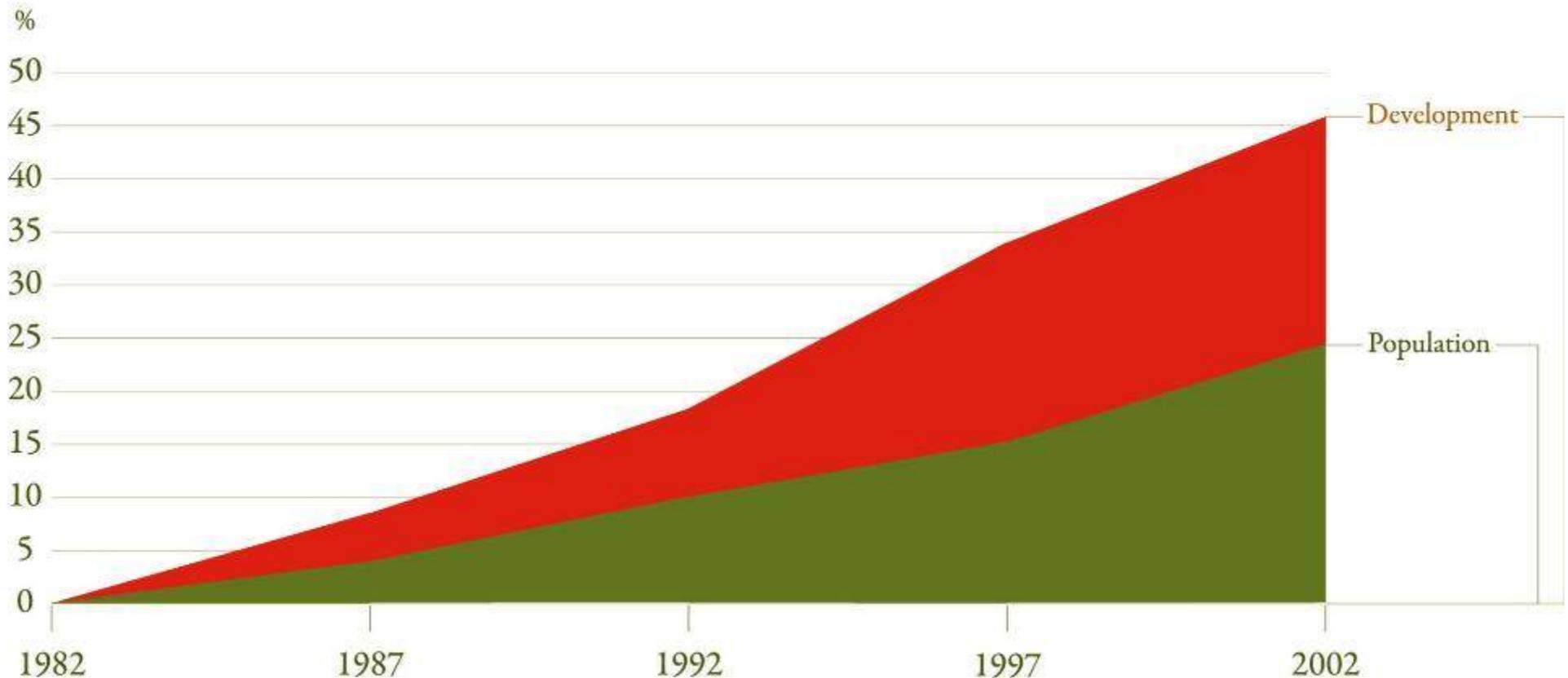
# Permitting Framework

- ▶ Three parts of the stormwater program
  - Municipal
  - Construction
  - Industrial
- ▶ All three emphasize pollution prevention and minimizing exposure
- ▶ Best Management Practice (BMP) focus to limit exposure of pollutants to stormwater rather than “treatment systems”

# Municipal Stormwater

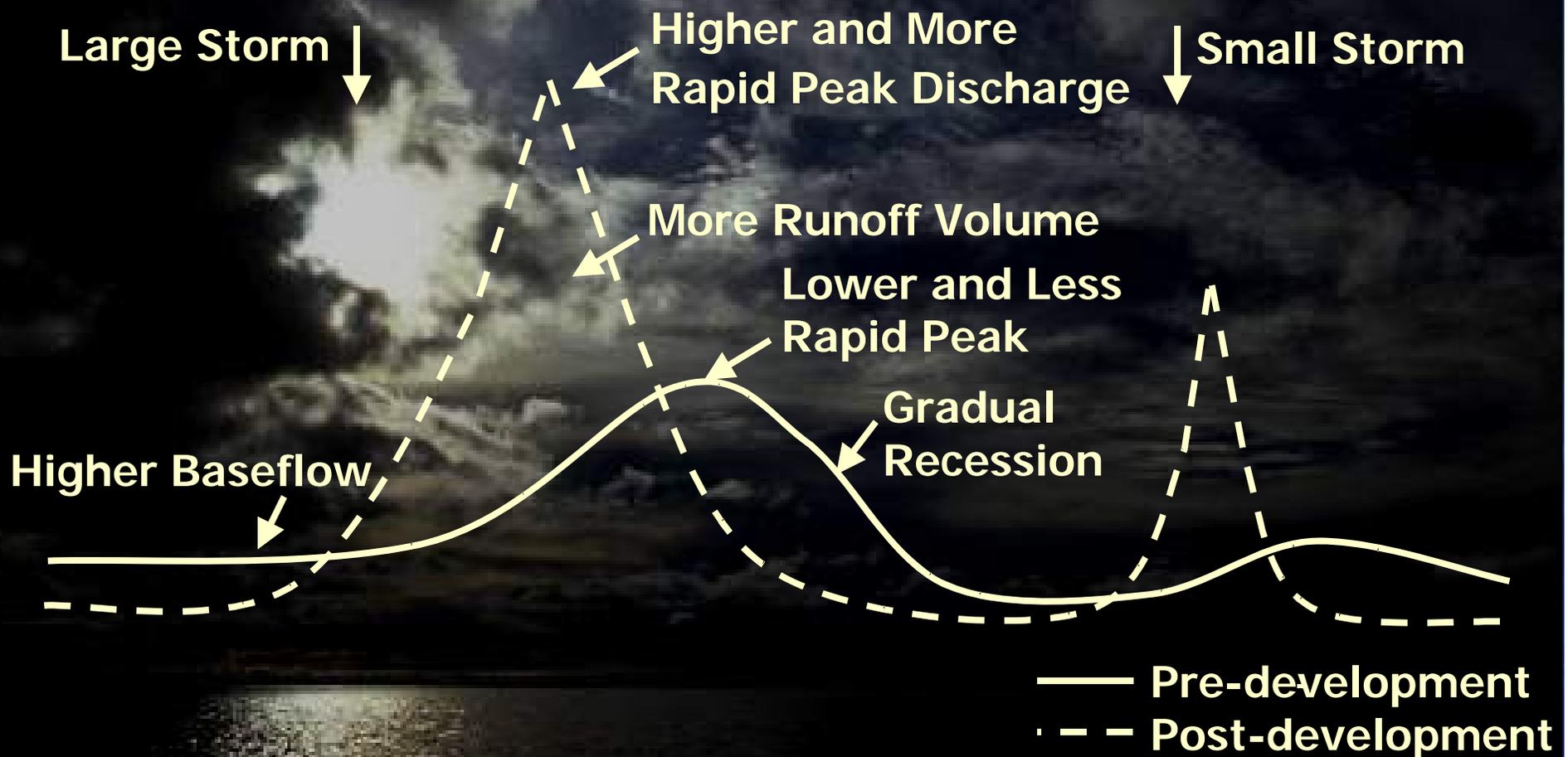


# Land Development and Population Growth in the US, 1982-2002

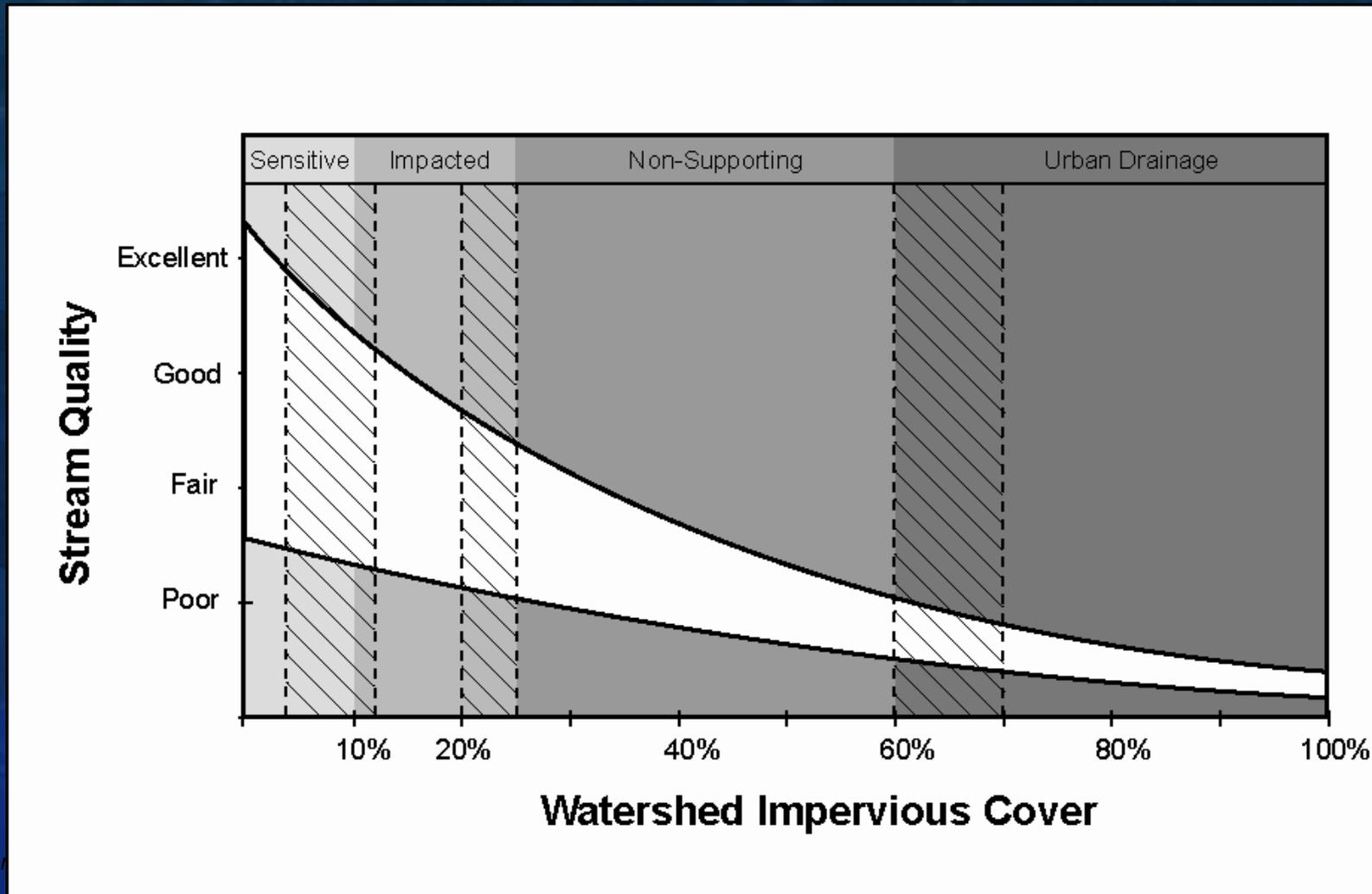


It's how and where we are growing that are driving our significantly increasing rate of land consumption, not domestic population growth.

# Consequences of Development to Urban Streams



# Generalized Relationship Between Impervious Cover and Stream Quality



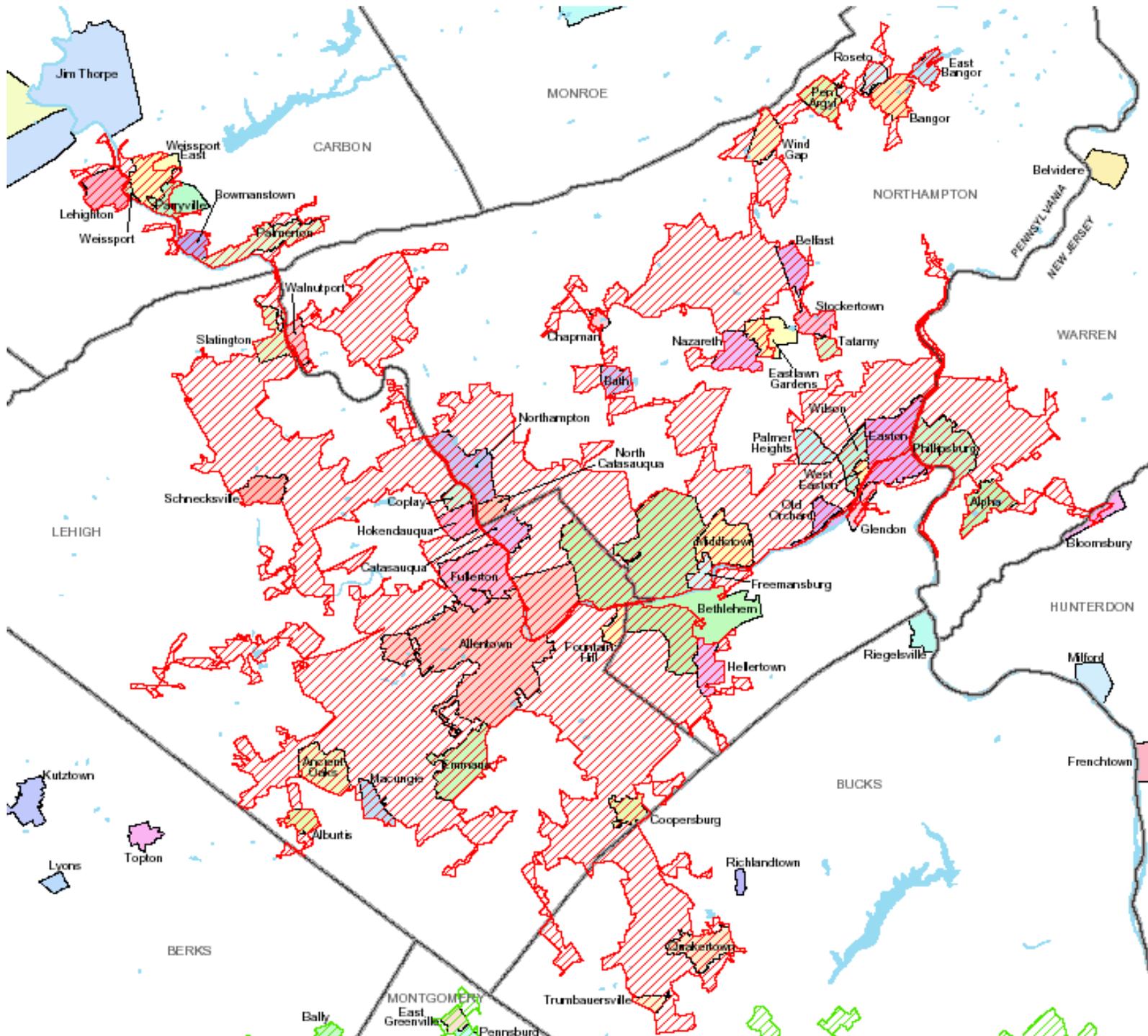
# What is an MS4?

- ▶ A municipal separate storm sewer system (MS4) is:
- ▶ A conveyance or system of conveyances... owned by a state, city, town, or other public entity that discharges to waters of the U.S. and is:
  - designed or used for collecting or conveying stormwater
  - not a combined sewer
  - not part of a Publicly Owned Treatment Works (POTW)

This is an MS4!



# Allentown - Bethlehem, PA - Urbanized Area Storm Water Entities as Defined by the 2000 Census



## 2000 Census Urbanized

- Allentown - Bethlehem, PA - NJ
- Philadelphia, PA - NJ -
- Municipal Boundaries
- County Boundaries
- Major Waterbodies

SOURCE:  
US Census Bureau TIGER data, 2000 Cen

PROJECTION:  
State Plane Coordinate System - Pennsylv  
Horizontal datum - NAD83

MAP DESIGN:  
September 23, 2002



# Phase I Coverage

- ▶ Covers municipalities (and portions of...) with populations over 100,000
- ▶ Many interconnected small MS4s also permitted
- ▶ Approximately 275 permits covering 1,000 MS4s have been issued



# Phase I Program

- ▶ Extensive two-part permit application
- ▶ Stormwater management program must reduce the discharge of pollutants to the maximum extent practicable (MEP)
- ▶ Requires monitoring
- ▶ Individual permits to be issued by
  - May 1993 for large MS4s
  - May 1994 for medium MS4s

# Phase II Coverage

- ▶ Covers more than 5,000 smaller MS4s in “urbanized areas”
- ▶ Urbanized areas based on decennial census (e.g., 2000, 2010, etc.)
- ▶ Permitting authorities can also designate additional small MS4s that are outside of urbanized areas
- ▶ Includes non-traditional MS4s within urbanized areas, such as:
  - Military bases
  - Public universities
  - Prisons, etc.



# Urbanized Areas in the U.S.



- 464 UAs
- 5,000+ Communities
- 197 million people
- 70% of the population
- 2% of the land area

# Phase II Program

- ▶ Permitting authority issues general permit (in most instances)
- ▶ MS4s develop stormwater management programs to reduce pollutants to the maximum extent practicable (MEP)
- ▶ Monitoring not included as a critical component initially

# Municipal Permit Coverage

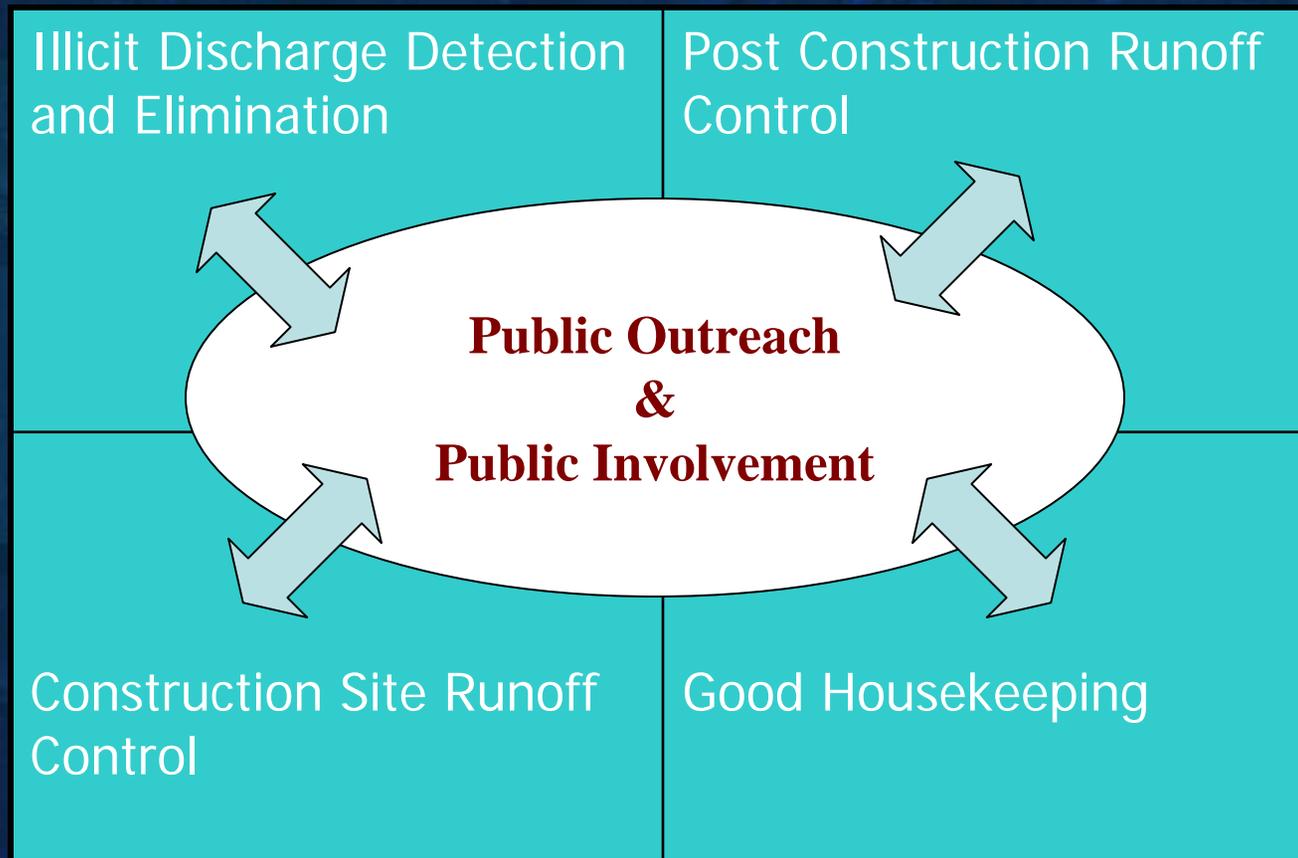
- ▶ MS4s submit a Notice of Intent (NOI) addressing the six basic elements or “minimum control measures”
  - An NOI is a form that is used to notify the permitting authority (authorized state or EPA) that the regulated entity (MS4, construction site, or industrial facility) is eligible for coverage under a NPDES general permit
- ▶ Permitting authorities must review and take public comment on MS4 NOIs

# Six Minimum Measures

- ▶ Public Education and Outreach
- ▶ Public Involvement and Participation
- ▶ Illicit Discharge Detection and Elimination
- ▶ Construction Site Runoff Control
- ▶ Post-Construction Stormwater Management for New and Re-development
- ▶ Pollution Prevention/Good Housekeeping for Municipal Operations



# Public Education & Involvement



Public Education/Involvement touches all the other minimum measures

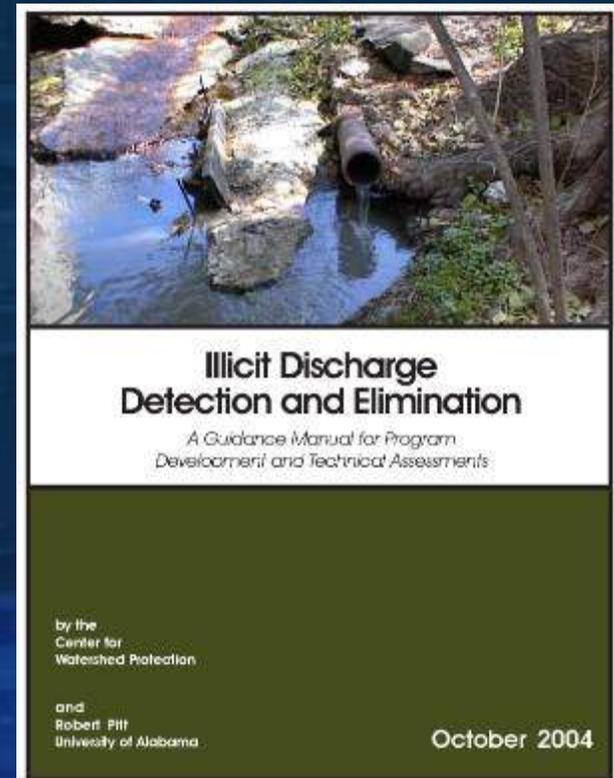
# Public Education

- ▶ Implement a public education program; distribute materials about impacts of stormwater discharges
- ▶ See EPA's *Getting In Step* manual for outreach campaigns
- ▶ [www.epa.gov/owow/watershed/outreach/documents/](http://www.epa.gov/owow/watershed/outreach/documents/)



# Illicit Discharge Detection and Elimination (IDDE)

- ▶ Ordinance
  - Definition and limits
  - Ability to stop discharges/correct problems
  - Access
  - Fines and Penalties
- ▶ System map
- ▶ Assessment of sub-watershed potential
- ▶ Dedicated staff trained
- ▶ Tracking system
- ▶ Public education, e.g., hotline



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

# Construction

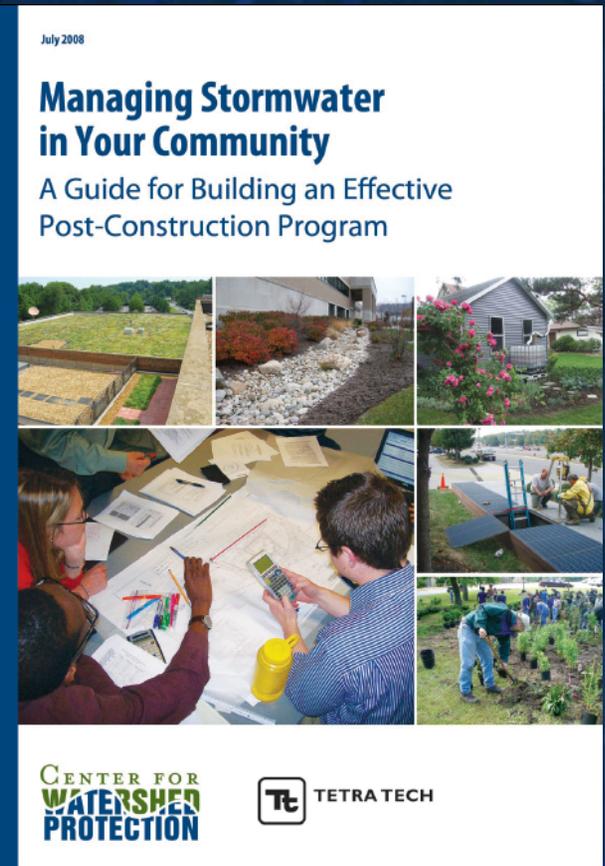
- ▶ Ordinance in place
  - Sediment and erosion
  - Good housekeeping/ pollution prevention
  - Submit plans for review
  - Fines and penalties
- ▶ Plan review process
  - Trained staff
  - Integrated with post-construction review
- ▶ Inspection
  - Inventory and tracking of sites
  - Ability to respond to citizen complaints
  - Schedules, routine vs. targeted
- ▶ Education
  - Builders and developers, citizens, staff



*Not a SWPPP!*

# Post-Construction

- ▶ Develop, implement, and enforce a program to address stormwater runoff from new development and redevelopment projects
- ▶ Ordinance covering new development and redevelopment
  - Requirements for plan review
  - Reference design criteria
  - Maintenance requirements
  - Fines and penalties
- ▶ Developed or adapted design criteria, which include low impact BMPs
- ▶ Plan review process with trained staff
- ▶ Maintenance program
- ▶ Trained inspection staff



Coming Soon!  
[www.cwp.org](http://www.cwp.org)

# Municipal Operations

- ▶ Develop a program to prevent stormwater pollution from municipal operations
  - Training for employees
  - Standard operating procedures
  - Covers parks, building and fleet maintenance, construction, roads, streets, parking lots, maintenance yards, waste transfer stations, etc.



# Industrial (Phase I only)

- ▶ Program to monitor and control pollutants in stormwater from industrial facilities
  - Procedures for inspections and implementing control measures
  - Monitoring program for industrial facilities



# Shared Responsibility

- ▶ The regulations, 40 CFR 122.35, allow for MS4s to share responsibility for the implementation of the six minimum measures
  - May share (e.g., nearby MS4s may pool resources and develop shared programs)
  - May rely on others (e.g., a city or town may rely on a county that is implementing a program that meets permit requirements)

# MS4 Permitting Summary

## ▶ Phase I

- Most permits now in second, third or even fourth permitting cycle

## ▶ Phase II

- Small MS4s were required to apply for permit coverage by March 10, 2003
- Small MS4s have five years to get programs fully up and running

## ▶ Both require annual/periodic reports



# Quiz Answer #4

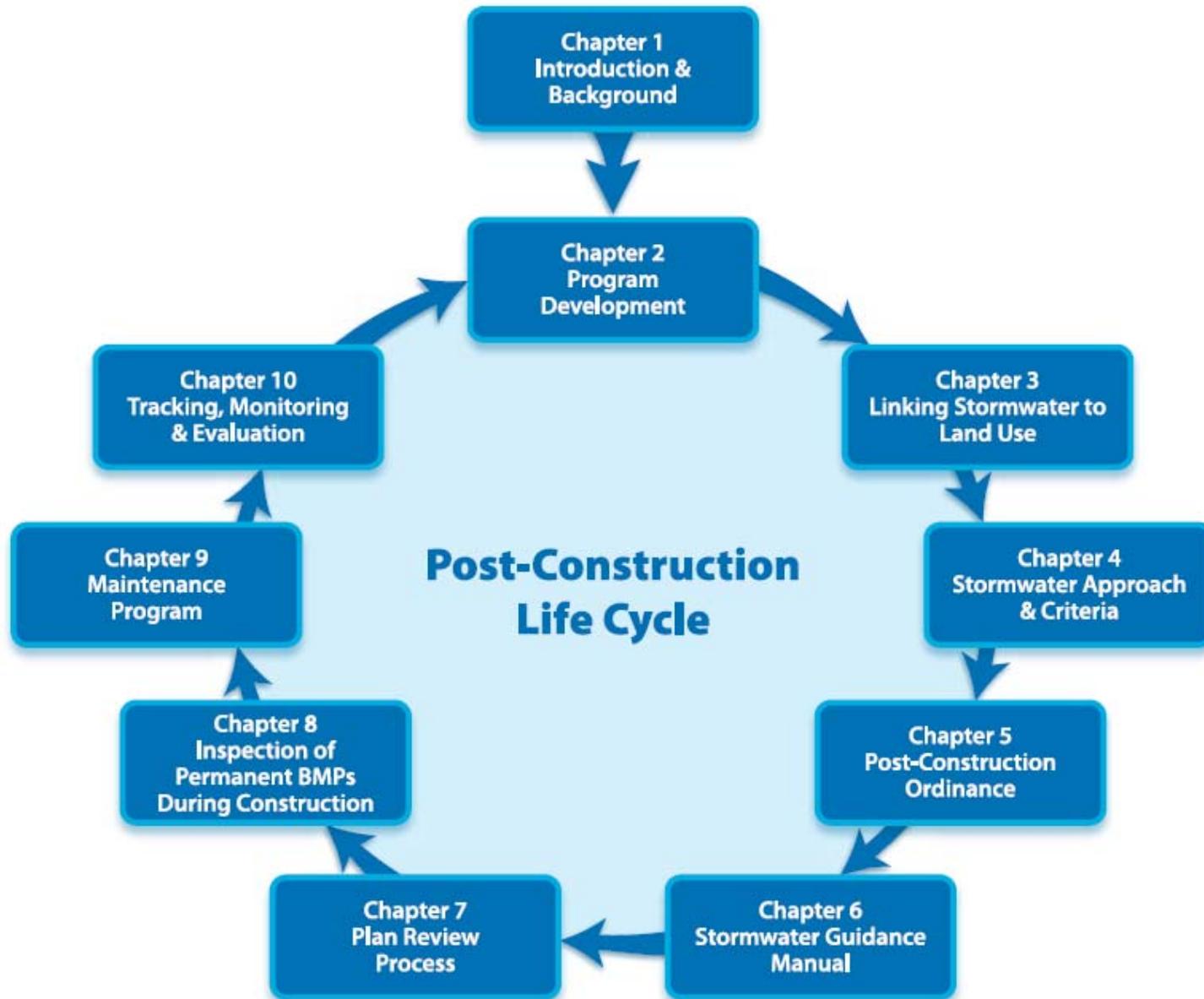
- ▶ The Phase II regulations provide the following time frame for MS4s to fully set up their programs after they get permit coverage:
  - 2 years
  - 3 years
  - *5 years*
  - 8 years
  
- ▶ Permitting authorities had until March 10, 2003 to issue permits.\* MS4s then had 90 days to obtain permit coverage and five years to set up their programs

\* A number of permitting authorities missed this deadline.

# Post-Construction Guidance

- ▶ Center for Watershed Protection is leading an effort to develop a comprehensive guide for Phase II communities
  - Will include detailed guidance on program setup, creating an ordinance, sizing criteria, smart growth, low impact development, etc.
  - Will include a variety of tools, including manual builder, model ordinance, performance bond tool, self-audit tool, etc.
- ▶ Publication Summer 2008
- ▶ [www.cwp.org](http://www.cwp.org) or [www.epa.gov/npdes/stormwater](http://www.epa.gov/npdes/stormwater)

# Post-Construction Guidance



# Questions



# Construction Activities





**Construction  
Activity**

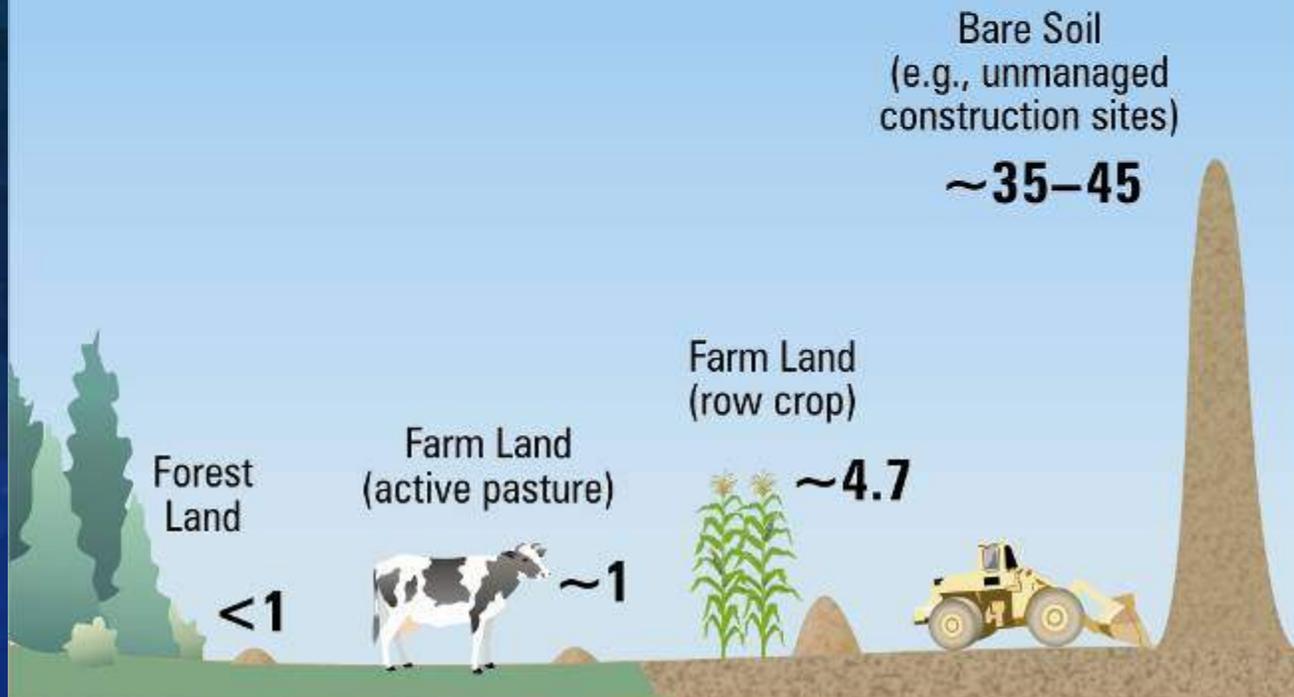
# Construction Overview

- ▶ The number of construction sites covered varies widely each year
  - In 1999, EPA estimated that approximately 400,000 construction sites would be covered by the Phase I and II program
- ▶ The primary pollutant is sediment
  - Other pollutants include, trash and debris, chemicals (in paints, concrete washout, etc), oil and grease, etc.

# Sediment is the Primary Pollutant at Construction Sites

## Typical erosion rates for land-based activities

(soil loss from various land areas, in tons per acre per year)



# Stormwater Construction Program is Designed to:

- ▶ Prevent or minimize impact of construction
- ▶ Minimize erosion during construction
- ▶ Control sedimentation
- ▶ Control other wastes at the site



# Standards for Construction Sites

- ▶ Stormwater discharges from construction sites must meet two CWA standards:
  - Technology-based standards – generally Best Available Technology (BAT)
  - Water quality-based standards – must meet water quality standards

# Regulated Construction Activities

- ▶ Large construction (>5 acres) in category (x) of industrial activity
- ▶ Small construction (1-5 acres) in stand alone section (Phase II)
- ▶ “Definition” of construction
  - Clearing, grading or excavating

# Common Plan

- ▶ Includes activities that maybe on smaller parcels of land but are part of a larger, common plan of development or sale
  - A common plan includes drawings, plans, advertising materials, subdivision plans, etc.
  - A common plan may describe activities that will occur on different schedules



# Construction Waivers

- ▶ Waivers available for small construction only
  - Low-erosivity waiver, available in certain areas and certain times of the year when rainfall is predicted to be low
  - Water-quality/TMDL waiver

# Qualifying Local Programs

- ▶ The regulations at 122.44(s) allow permitting authorities to recognize strong local construction program in their CGPs
  - Possible streamlining of requirements for construction site operators
  - No additional burden for local programs

# Construction Permitting

- ▶ EPA Construction General Permit (CGP)
  - Initially issued in 1992
  - Reissued in 1998, 2003, and 2008
- ▶ Authorized states issue their own CGPs

# Quiz Answer #5

- ▶ EPA issues a Construction General Permit (CGP). This permit:
  - Applies to construction sites nationally
  - *Applies only to construction sites in certain areas where EPA remains the permitting authority*
  - Provides minimum requirements for all states, including states that are authorized to implement the NPDES permitting program
  - Both B and C
  - Both A and C

# What is a SWPPP?

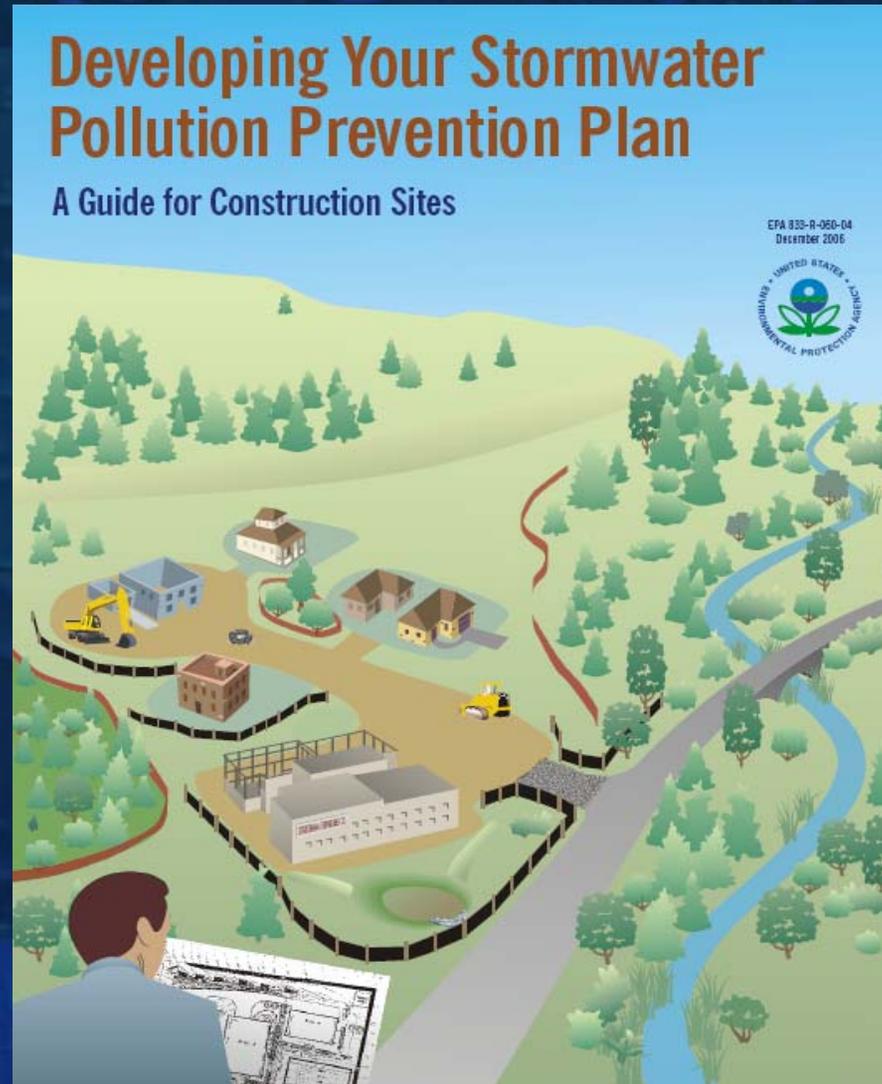
*A Stormwater Pollution Prevention Plan is a detailed plan that:*

- ▶ Identifies potential sources of sediment and stormwater pollution at the construction site
- ▶ Describes practices to reduce pollutant runoff from the site
- ▶ Identifies procedures the operator will implement to comply with the terms and conditions of the NPDES permit



***This is not a SWPPP!***

# EPA SWPPP Guide



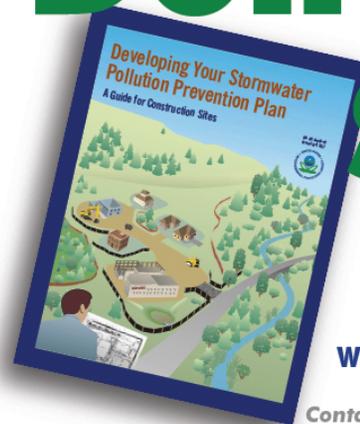
[www.epa.gov/npdes/swppppguide](http://www.epa.gov/npdes/swppppguide)

# EPA SWPPP Resources

- ▶ EPA's SWPPP Guide
- ▶ SWPPP Template (MS Word)
- ▶ Self-Inspection Form
- ▶ Example SWPPPs -- Completed SWPPPs for two hypothetical projects
  - Residential
  - Commercial
- ▶ [www.epa.gov/npdes/swpppguide](http://www.epa.gov/npdes/swpppguide)

**Attention Construction Site Operators!**

# Don't Skip the SWPPP!



If you're required to get coverage under an EPA or state construction general permit, this new EPA guidance will help you develop a complete stormwater pollution prevention plan (SWPPP).

[www.epa.gov/npdes/stormwater/swppp](http://www.epa.gov/npdes/stormwater/swppp)

Contains: SWPPP Guide, SWPPP Template, Inspection Form

# Quiz Answer #6

- ▶ How many levels of NPDES stormwater requirements does a construction company have to comply with?
  - EPA (1)
  - *State or EPA and Local, if applicable (1 or 2)*
  - EPA, State, and Local (3)
  - Only Local (1)
- ▶ Either an authorized state or EPA issues a CGP. Also, EPA regulations and permits require MS4s to regulate construction sites within their jurisdictions

# Industrial Stormwater Program Overview



# Industrial Activity



# Industrial Stormwater

- ▶ Approximately 100,000 facilities covered
- ▶ Pollutants vary by industrial activity, but include:
  - Metals
  - Organic chemicals
  - Suspended solids
  - Oil and grease
  - And many others

# Industrial Activities

- ▶ Covers 11 categories of industrial activities
- ▶ Related to manufacturing, processing, or materials storage areas
- ▶ Includes federal, state, and municipally-owned and operated facilities
- ▶ Industrial facilities with “no exposure” of their industrial activities or materials to stormwater are not required to have permit coverage. Must certify no-exposure

# Standards for Industrial Facilities

- ▶ Stormwater discharges from industrial sources must meet two CWA standards:
  - Technology-based standards – generally Best Available Technology (BAT)
  - Water quality-based standards – must meet water quality standards

# Industrial Stormwater Controls

Like the rest of the stormwater program:

- ▶ Stormwater Pollution Prevention Plans (SWPPPs) are the key to the industrial stormwater program
- ▶ Generally, industrial stormwater control relies on Best Management Practices rather than end-of-pipe controls

# Regulated Industrial Categories

- ▶ Facilities Subject to Standards (i)
- ▶ Heavy Manufacturing (ii)
- ▶ Mining/Oil and Gas (iii)
- ▶ Hazardous Waste Facilities (iv)
- ▶ Landfills (v)
- ▶ Recycling Facilities (vi)
- ▶ Steam Electric Power Plants (vii)
- ▶ Transportation Industries (viii)
- ▶ Sewage Treatment Plants (ix)
- ▶ Large Construction (x)
- ▶ Light industry (xi)

# Industrial Activities: Light Industry (Category xi)

- ▶ Identified by SIC code
- ▶ Many may qualify for “No Exposure”
- ▶ Phase I - no exposure were simply exempt
- ▶ Phase II - no exposure modified to require notification



# What is the “No Exposure” Provision?

- ▶ Original no exposure exemption
  - Only available to category (xi) facilities with no exposure
  - No certification required
- ▶ 9th Circuit Court Decision
  - Remanded for further rulemaking
- ▶ Final Phase II Rule
  - No exposure provision
    - ▶ Applies to all categories, except construction
    - ▶ Requires certification of no exposure

# EPA's Multi-Sector General Permit (MSGP)

- ▶ Developed using industry-specific data from Phase I group application process (60,000+ applicants)
- ▶ Consolidated industry data into 29 industry sectors with tailored requirements
- ▶ Focuses on development and implementation of stormwater pollution prevention plans
- ▶ Published in 1995, again in 2000
- ▶ Reissuance pending
  
- ▶ Authorized states issue their own general permits

# Quiz Question #7

- ▶ 80% removal of total suspended solids (TSS)
  - Is a Clean Water Act requirement that applies to all discharges including stormwater
  - Is a Clean Water Act requirement that applies to wastewater treatment plants
  - *Cannot be found in the CWA and doesn't apply to NPDES stormwater*
  - Is a regulatory requirement that EPA added to the NPDES stormwater program

# Questions



# Next Webcast

- ▶ CWP's *New* Guide for Building an Effective Post-Construction Program
  - With David Hirschman and John Kosco
- ▶ September 3, 2008 12-2 ET
  - Registration will open approximately two weeks prior at [www.epa.gov/npdes/training](http://www.epa.gov/npdes/training)

# Participation Certificate

If you have multiple attendees, click the link to download the certificate to your computer. You can type the attendees name in the name field and then print the certificate.

[www.epa.gov/npdes/webcasts/  
certificate/stormwater101\\_certificate.pdf](http://www.epa.gov/npdes/webcasts/certificate/stormwater101_certificate.pdf)