

Stormwater Management for New Jersey Municipalities

Rutgers Cooperative Extension Water Resources Program

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What happens to the rain?



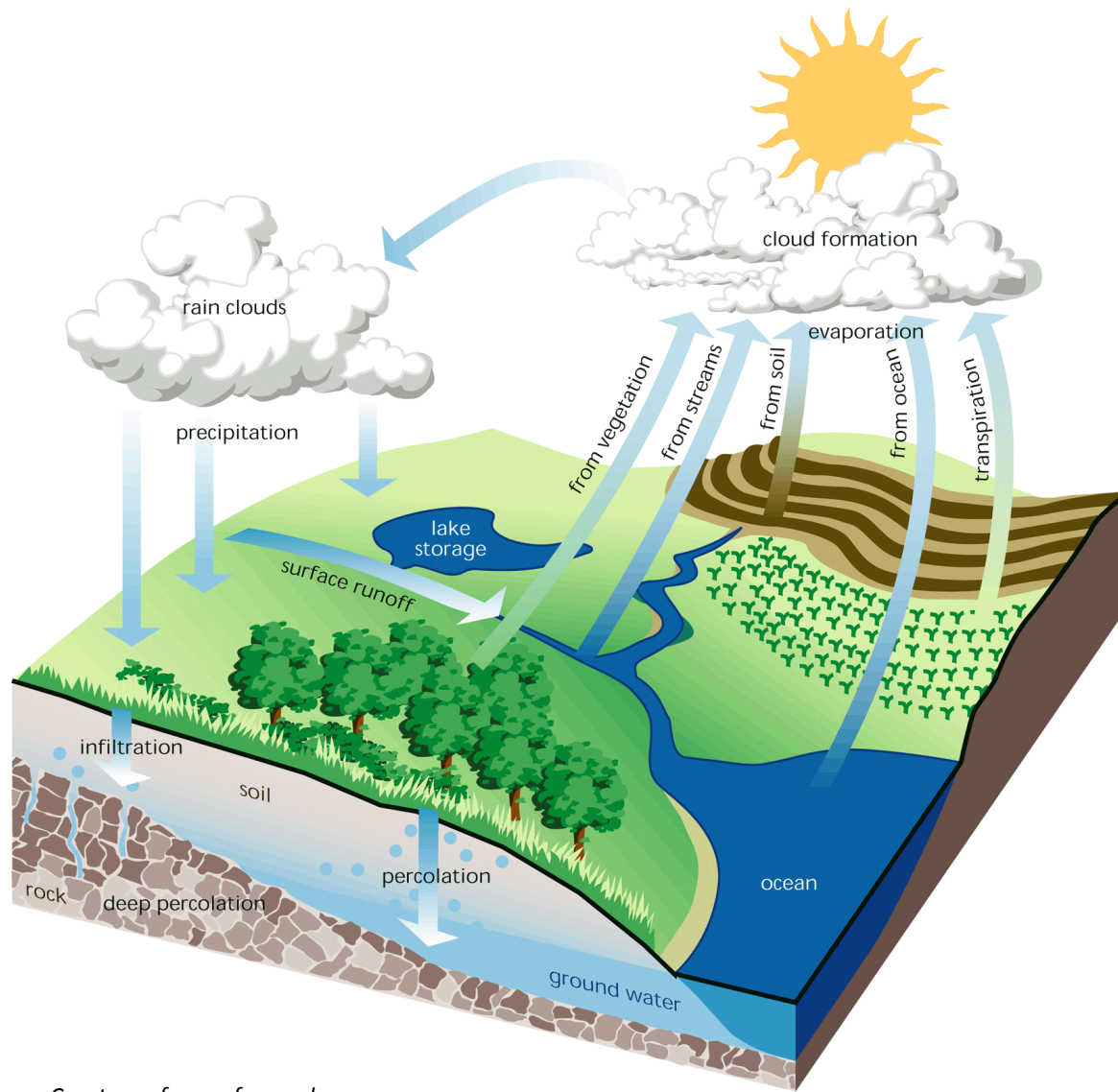
It runs off of rooftops and pavement...

What is stormwater runoff?



Stormwater is the water from rain or melting snows that can become “runoff,” flowing over the ground surface and returning to lakes and streams.

The Hydrologic Cycle



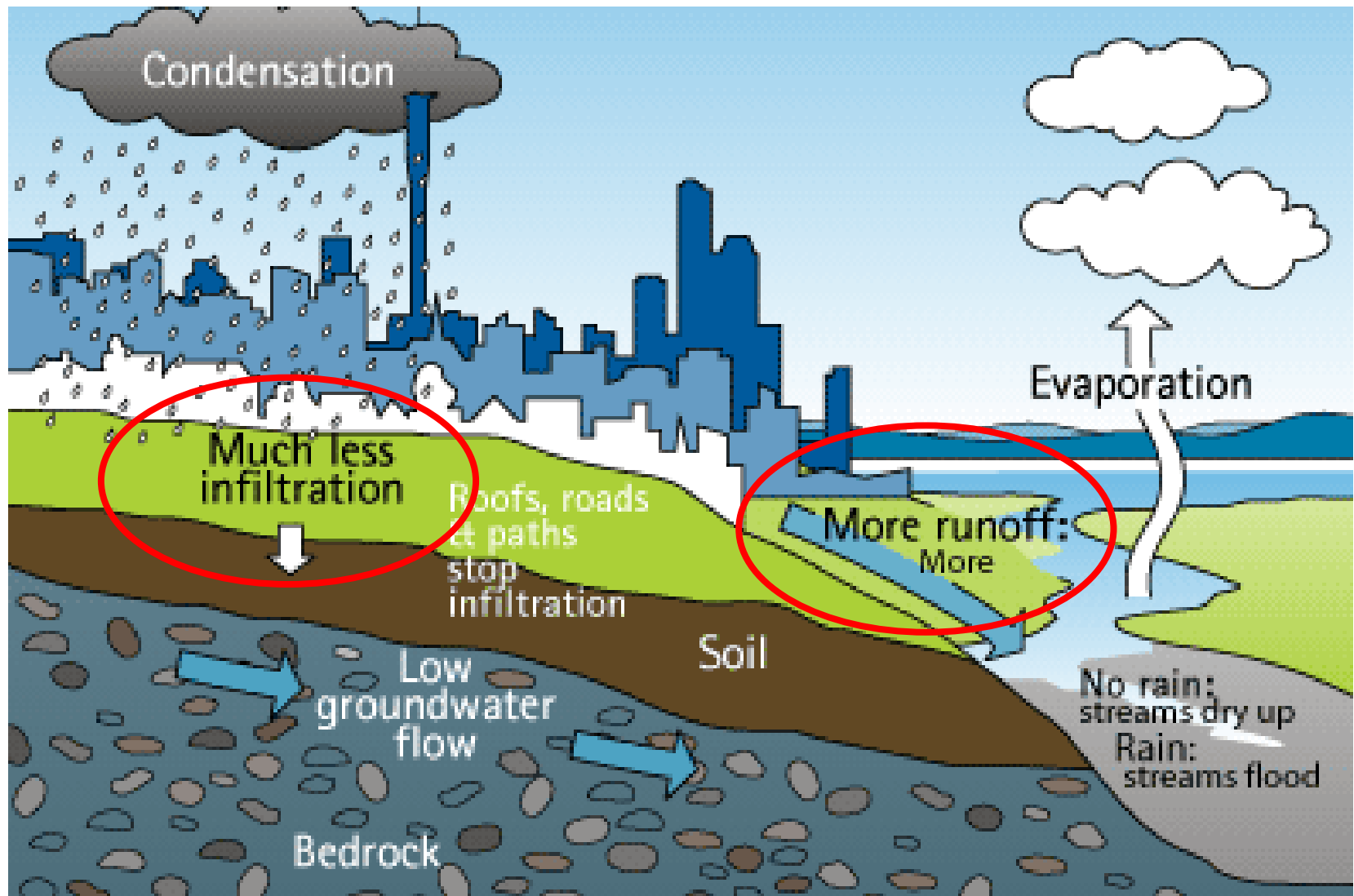
Courtesy of www.fgmorph.com

Many factors influence the effects of rainfall and stormwater runoff

- Rate of rainfall
- Topography of the land
- Soil conditions
- Density of vegetation
- Amount of urbanization...how much land is now covered with roadways, houses, parking lots, and more



The Urban Hydrologic Cycle



1st Attempt at Stormwater Management

Capture all runoff, pipe it, and send it directly to the river . . . prior to mid 1970's



2nd Iteration of Stormwater Management

Capture runoff, detain it, release it slowly to the river...mid 1970's to 2004

- Detain peak flow during large storm events for 18 hours (residential) or 36 hours (commercial)
- Reduce downstream flooding during major storms
- Use concrete low flow channels to minimize erosion, reduce standing water, quickly discharge low flows
- Does not manage runoff from smaller storms allowing stormwater to pass through the system
- Directly discharges stormwater runoff to nearby stream, waterway, or municipal storm sewer system (at a controlled/managed rate)



3rd Generation of Stormwater Management

- Reduce stormwater runoff volume
- Reduce peak flows and flooding
- ...**and**....
- Maintain infiltration and groundwater recharge
- Reduce pollution discharged to local waterways



abc Action News, August 27, 2012



New Jersey's Stormwater Regulations

Municipal

“Phase II”

NJPDES

Stormwater

Permitting Rules

N.J.A.C. 7:14a

Stormwater

Management

Rules

N.J.A.C. 7:8

NJ Stormwater Regulations

Municipal “Phase II” NJPDES Stormwater Permitting Rules (N.J.A.C. 7:14a)

- Municipalities and large public complexes must obtain NJPDES permits for their storm sewer system
- Permittees must develop, implement, and enforce a stormwater program that protects water quality
- Permittees must prepare and implement a Stormwater Pollution Prevention Plan (SPPP):
 - Municipal stormwater management plan
 - stormwater control ordinance
 - public education program

Stormwater Management Rules (N.J.A.C. 7:8)

- Sets forth stormwater management goals for new development:
 - Reduce flood damage
 - Protect water quality
 - Minimize increases in runoff
 - Reduce soil erosion
 - Protect public safety through proper design and operation of stormwater management basins
 - Maintain groundwater recharge
- Sets forth the required components of regional and municipal stormwater management plans

Municipal Stormwater Permitting Rules

- General NJPDES Permits for Discharges of Stormwater for Municipal Separate Storm Sewer Systems (MS4s)

*NJPDES = New Jersey Pollution
Discharge Elimination System*

- Published February 2, 2004
- Effective April 1, 2004

General Stormwater Permits

- Four NJPDES General Permits
 - Tier A Municipalities
 - Coastal or Urban Municipalities
 - Tier B Municipalities
 - Rural Municipalities
 - Public Complex
 - County, State, Interstate, and Federal Agencies
 - 2 or More Buildings, 1000 or More People, and 6 or More H/D
 - Highway Agency
 - County, State, Interstate, and Federal Agencies
 - Highways, Streets, Bridges, Tunnels, Maintenance Facilities, Service and Rest Area

General Stormwater Permits

- All General Permits Require
 - Development of Stormwater Pollution Prevention Plan (SPPP)
 - Description of BMPs
 - Implementation of Statewide Basic Requirements (SBRs)
 - SBRs Vary with General Permit
 - Additional Measures may also be Required and Optional Voluntary Measures
 - Design Standard – Storm Drain Inlets

Tier A General Permit State-Wide Basic Requirements (SBRs)

- Develop a Stormwater Pollution Prevention Plan (SPPP)
- Post-Construction Stormwater Management for New Development and Redevelopment
- Local Public Education on Stormwater Impacts
- Prohibit Improper Disposal of Waste
- Illicit Connection Elimination and Outfall Mapping
- Solids and Floatable Controls
- Maintenance Yard Operations
- Employee Training

Post-Construction Stormwater Management

- Requires Adoption of a Stormwater Management Plan
 - 12 months from Effective Date of Permit Authorization
- Requires Adoption of a Stormwater Control Ordinance
 - 12 months from Plan Completion
 - Commercial and Industrial Projects
- In Accordance with Stormwater Management Rules and Residential Site Improvement Standards (RSIS)
 - Design and Performance Standards
 - Operation and Maintenance
 - RSIS Incorporated NJAC 7:8 on Feb 2, 2004

Stormwater Management Rule Compliance

- Municipal Review Projects:
 - Projects Subject to Municipal Land Use Law
 - Major Development Projects
 - Residential
 - Commercial
 - Industrial
 - Municipal
- Stormwater Best Management Practices (BMPs) are Operating and Maintained

Questions?

Background....Why we should care about how stormwater is managed?

Linking stormwater to flooding, recharge, and pollution...What is impervious cover?

It is the roads, rooftops, parking lots, and other hard surfaces that do not allow stormwater to soak into the ground.



- provides a surface for accumulation of pollutants
- leads to increased polluted runoff and flooding
- inhibits recharge of groundwater

Linking Stormwater to Flooding, Recharge, and Pollution



NJ.com, August 28, 2011

More Imperviousness = More Runoff + Higher Peak Flows + Increased Nonpoint Source Pollution + Less Groundwater Recharge

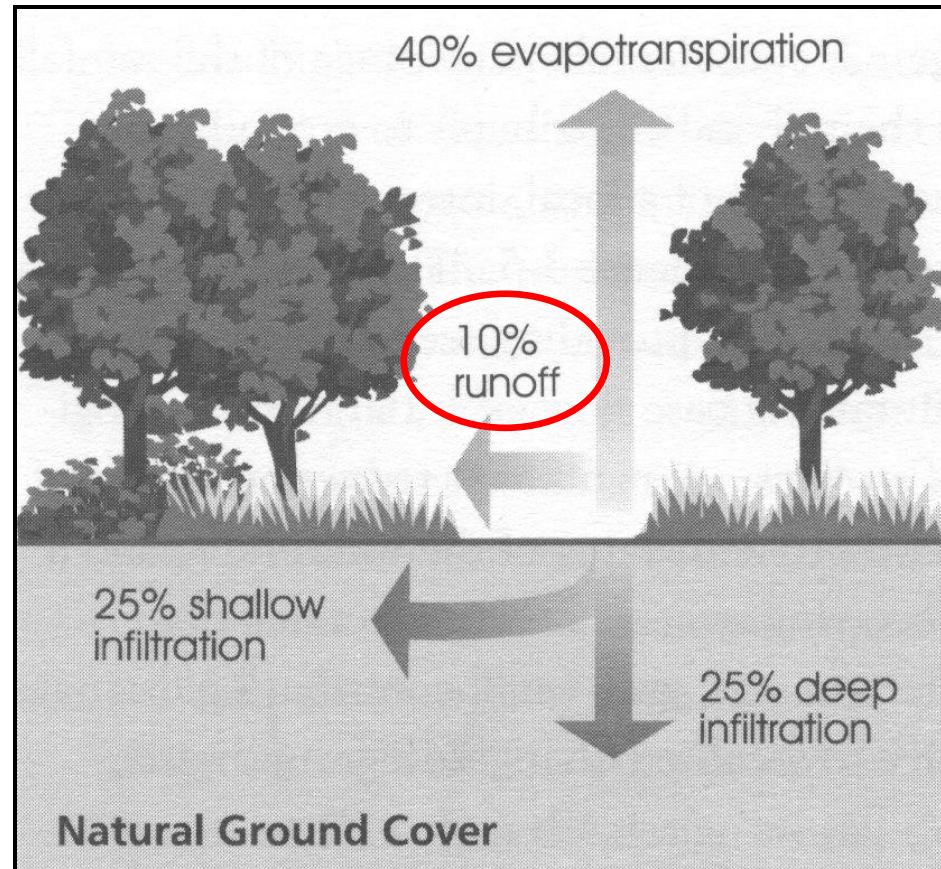
Impacts from a Changing Landscape

Hydrologic Effects

- Disruption of natural water balance
- Increased flood peaks
- Increased stormwater runoff
- More frequent flooding
- Increased bankfull flows
- Lower dry weather flows

The Impact of Development on Stormwater Runoff

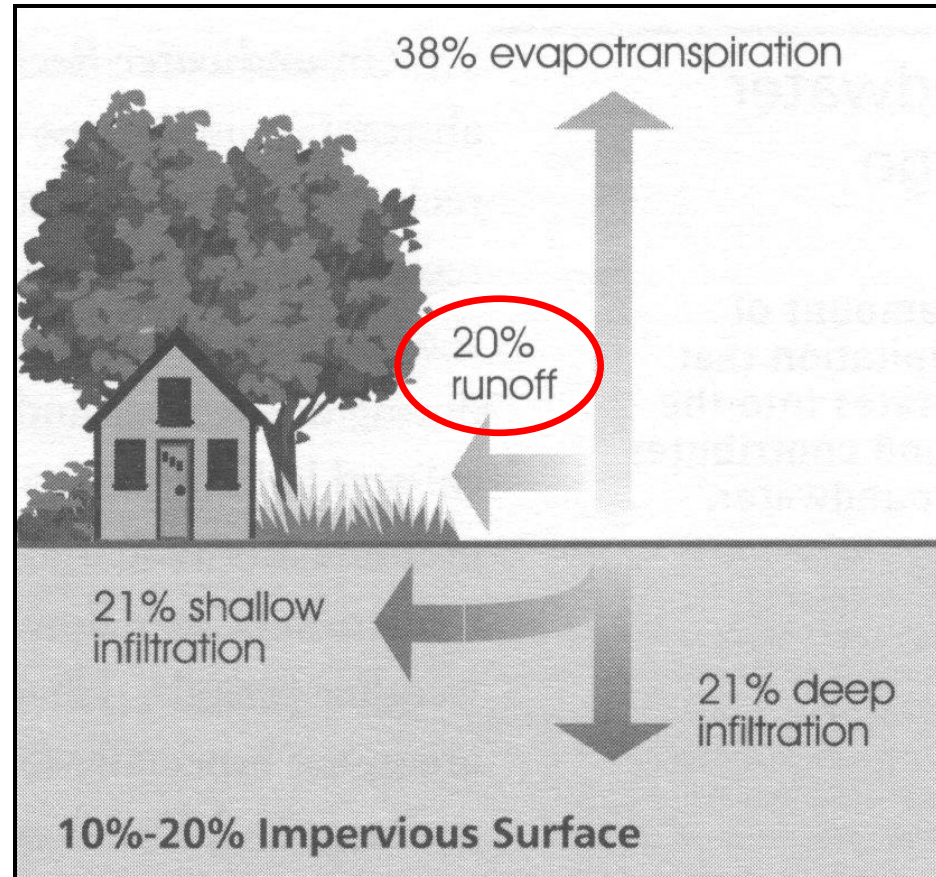
natural
conditions



Center for Watershed Protection

The Impact of Development on Stormwater Runoff

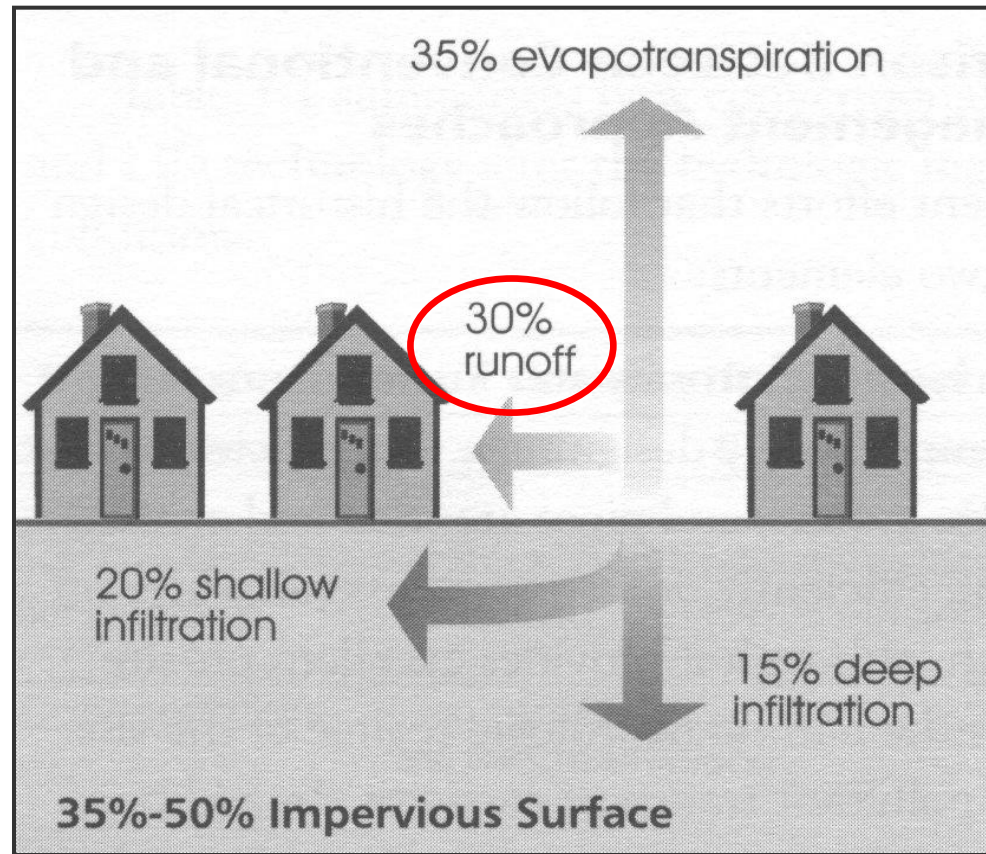
low density
development



Center for Watershed Protection

The Impact of Development on Stormwater Runoff

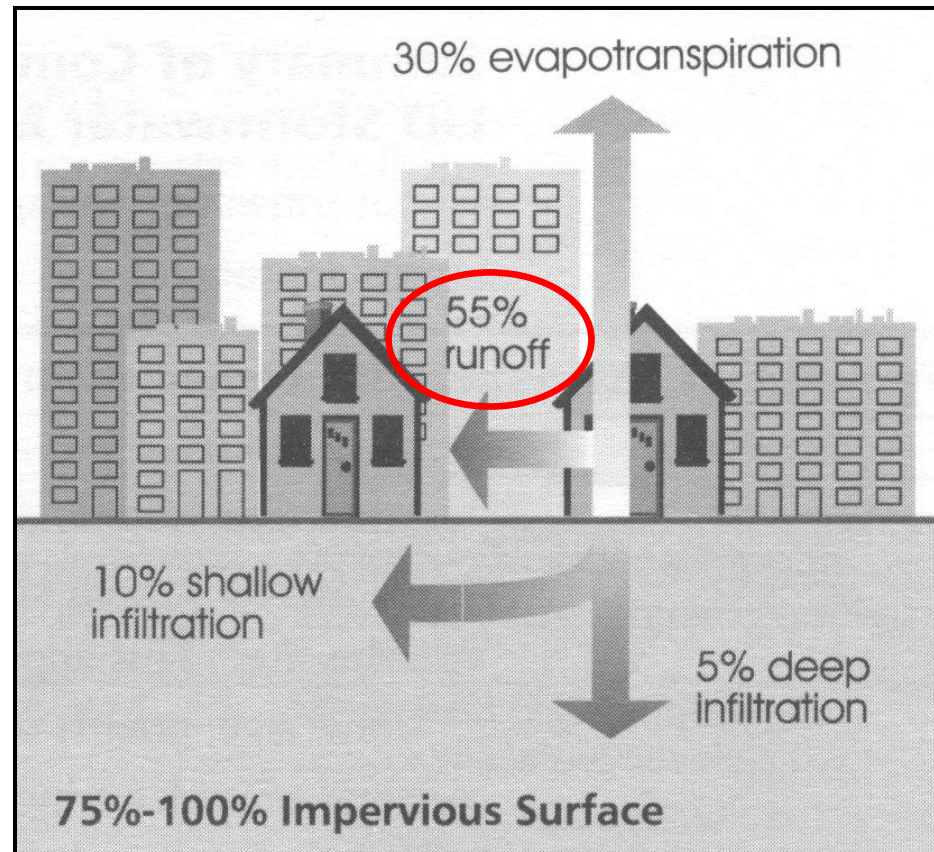
medium
density
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Center for Watershed Protection

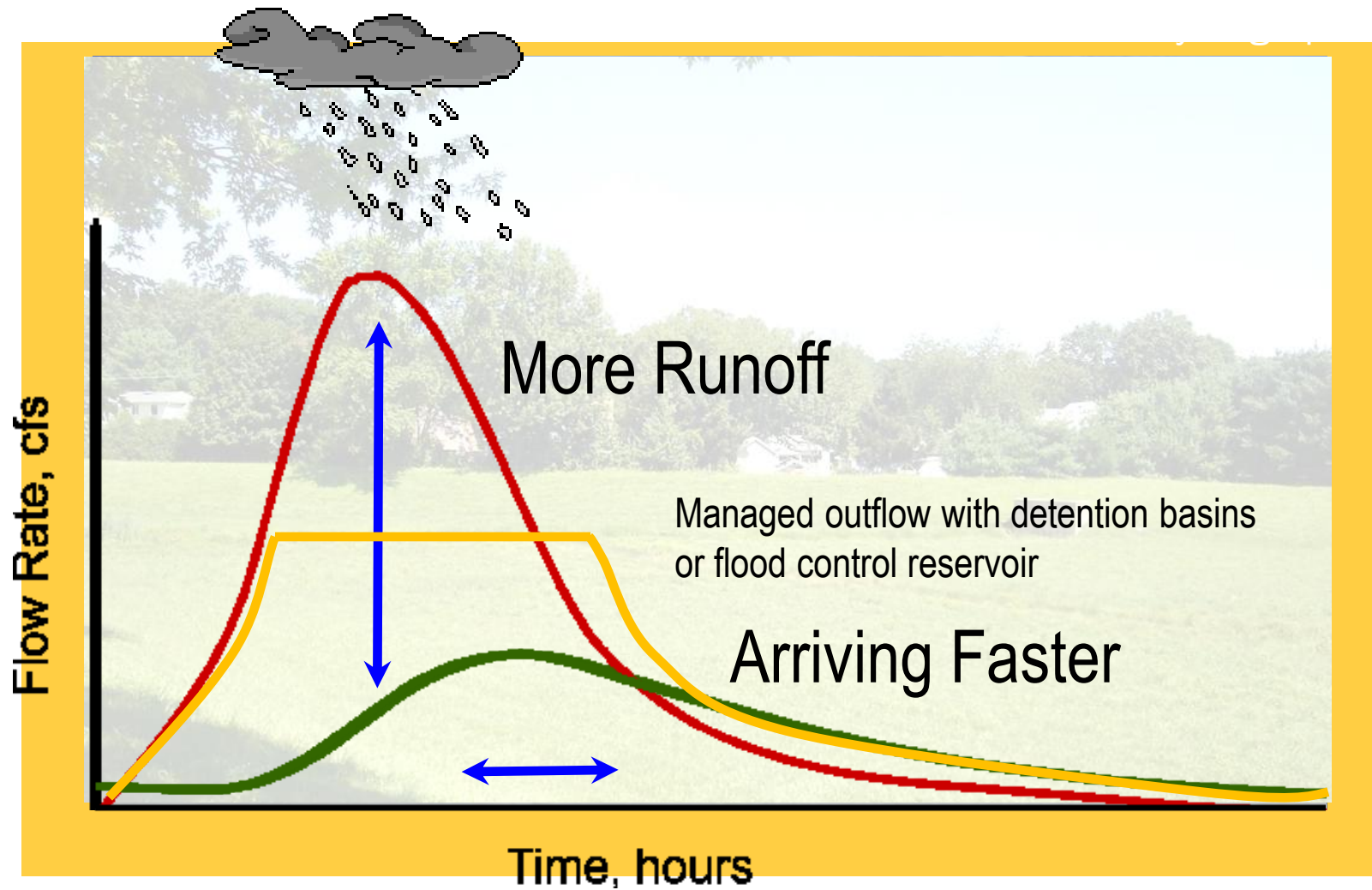
The Impact of Development on Stormwater Runoff

urban
development



Center for Watershed Protection

The Science of Stormwater



Stormwater and Groundwater Recharge

- Traditional stormwater management provides **NO** opportunity for groundwater recharge.
- Infrastructure dumps water directly into the local waterways

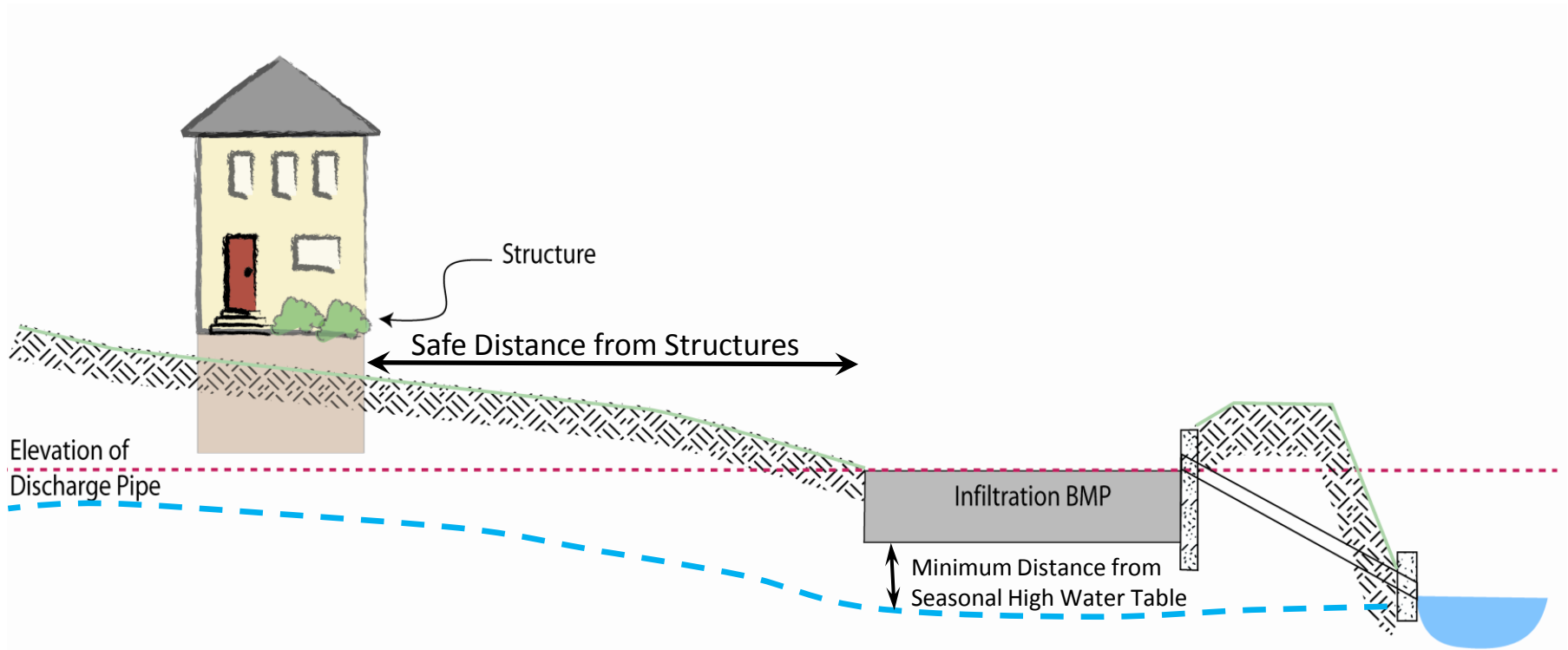


Groundwater Recharge Requires...

- Healthy soils
 - Permeability
 - Hydraulic conductivity
- Vertical separation from seasonable high water table or groundwater table
- Suitable distance from foundations, basements and septic systems



Groundwater Recharge...



Stormwater and Water Quality

What is nonpoint source pollution?

Pollutant build up and wash off are affected by land use.

- Imperviousness increases runoff
- Changes in land use impact pollutant build up



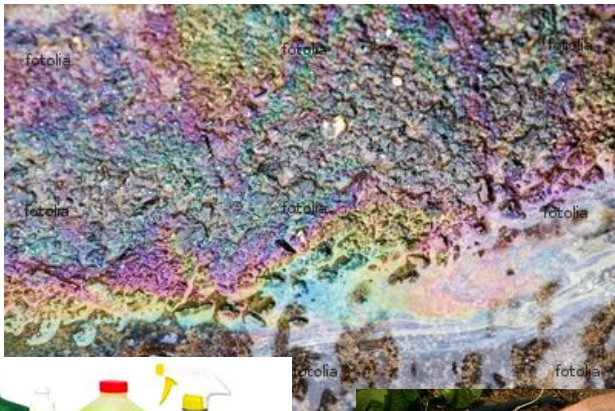
Nonpoint Source Pollution

- Nonpoint Source (NPS) Pollution is pollution associated with stormwater runoff
- NPS occurs when runoff collects pollutants on its way to a collection system or water body
- NPS pollution cannot be traced to a direct discharge point such as a wastewater treatment facility



Examples of NPS

- Oil and grease from cars
- Fertilizers
- Animal waste
- Grass clippings
- Septic systems
- Sewage leaks
- Household cleaning products
- Litter
- Agriculture
- Sediment



Impact of NPS

- Fish and wildlife
- Recreational water activities
- Commercial fishing
- Tourism
- Drinking water quality



Important Consideration

Connected Impervious Surfaces

VS.

Disconnected Impervious Surfaces

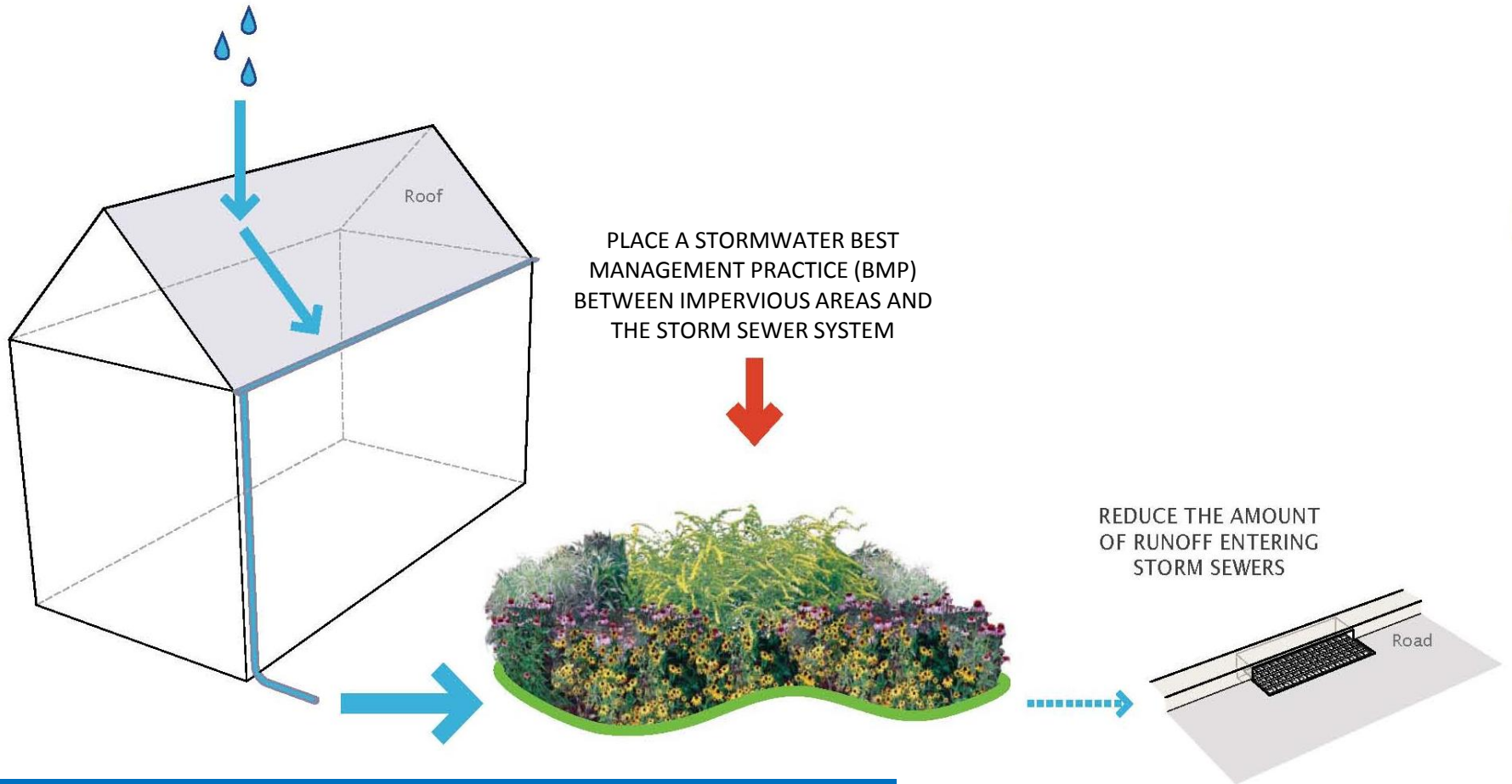
Connected vs. Disconnected



Connected or Disconnected?



The Solution...



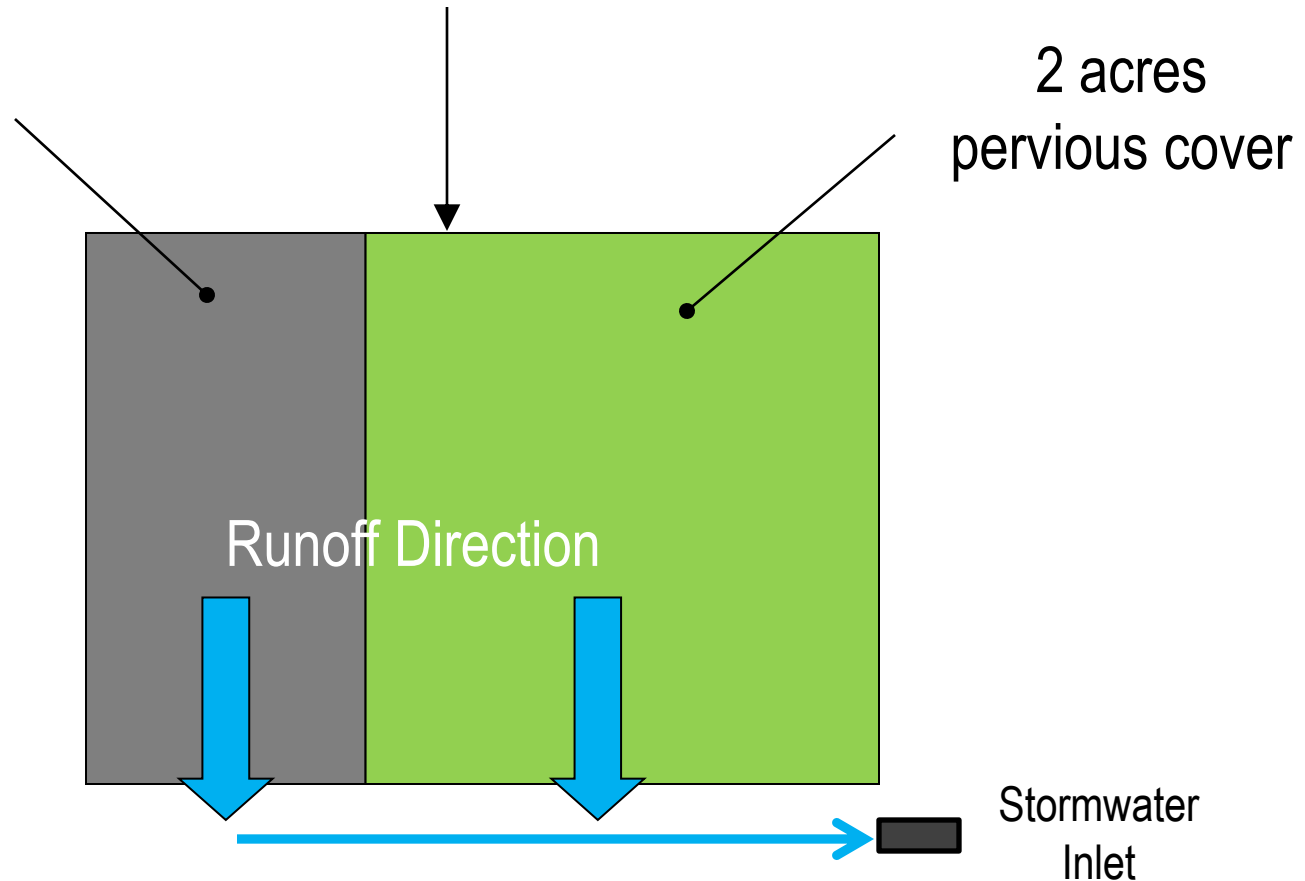
Rooftop runoff is now “disconnected” from flowing directly into the storm sewer system

For 1.25 inch storm, 3,811 cubic feet of runoff = **28,500 gallons**

Total drainage area = 3 acres

1 acre directly
connected
impervious cover

2 acres
pervious cover

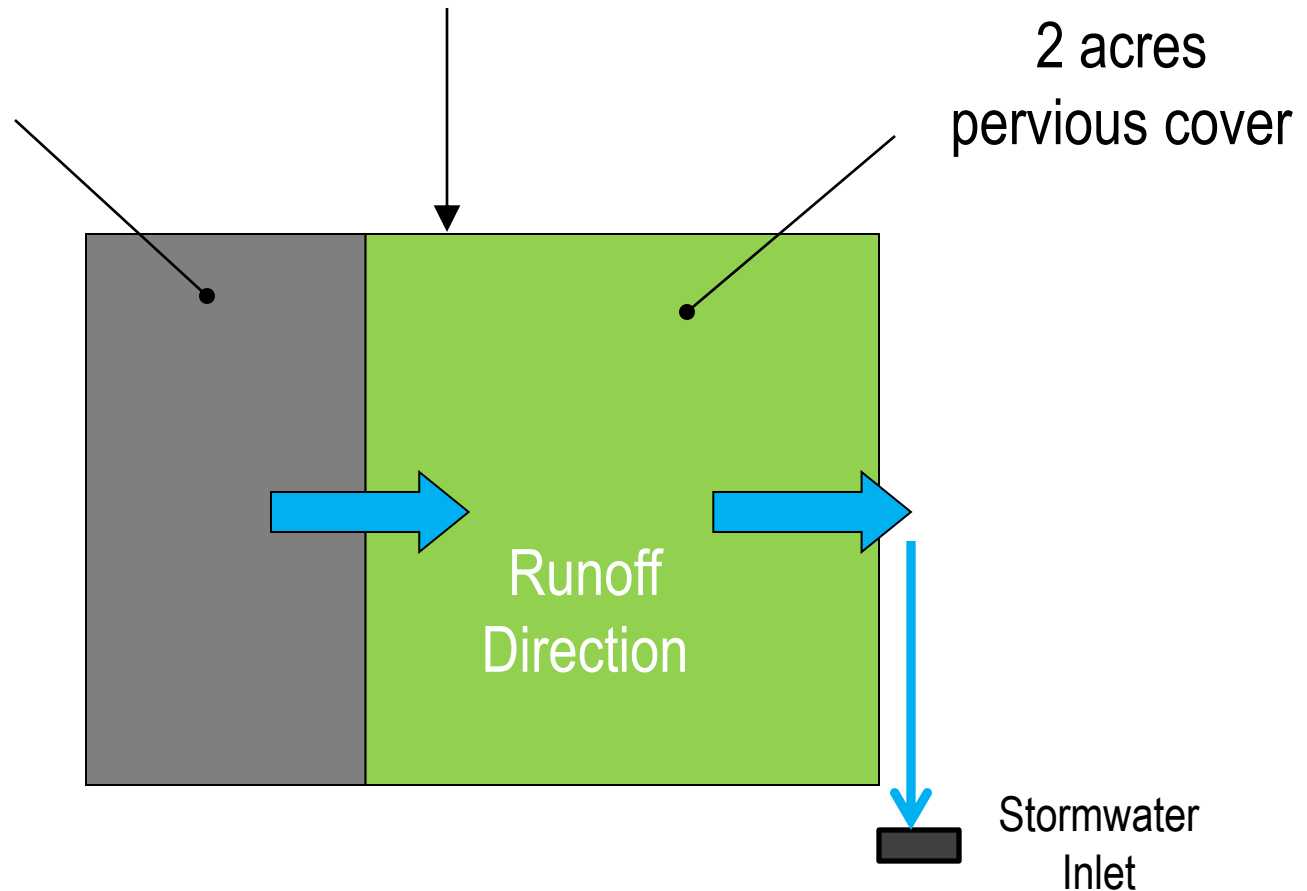


For 1.25 inch storm, 581 cubic feet of runoff = **4,360 gallons**

Total drainage area = 3 acres

1 acre directly
connected
impervious cover

2 acres
pervious cover



	Volume of Runoff		
Design Storm	Connected (gallons)	Disconnected (gallons)	Percent Difference
1.25 inches (water quality storm)	28,500	4,360	85%

Impervious area is now “disconnected” from flowing directly into the storm sewer system

Table 3-3: New Jersey 24-Hour Rainfall Frequency Data
Rainfall amounts in Inches

County	Rainfall Frequency Data						
	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Atlantic	2.8	3.3	4.3	5.2	6.5	7.6	8.9
Burlington	2.8	3.4	4.3	5.2	6.4	7.6	8.8
Camden	2.8	3.3	4.3	5.1	6.3	7.3	8.5
Cape May	2.8	3.3	4.2	5.1	6.4	7.5	8.8
Cumberland	2.8	3.3	4.2	5.1	6.4	7.5	8.8
Gloucester	2.8	3.3	4.2	5.0	6.2	7.3	8.5
Hudson	2.7	3.3	4.2	5.0	6.2	7.2	8.3
Hunterdon	2.9	3.4	4.3	5.0	6.1	7.0	8.0
Mercer	2.8	3.3	4.2	5.0	6.2	7.2	8.3

	Volume of Runoff		
Design Storm	Connected (gallons)	Disconnected (gallons)	Percent Difference
1.25 inches (water quality storm)	28,500	4,360	85%
5.0 inches (10-year storm)	219,915	185,365	16%

Questions?

Stormwater Management

Key Objectives

- Use nonstructural management strategies
- Protect communities from increases in stormwater volume and peak flows as a result of new development
- Maintain groundwater recharge
- Protect waterways from pollution carried in stormwater runoff



NJ.com, August 28, 2011

New Jersey Stormwater Management Rules

- Rules apply to any “Major Development” defined as a project disturbing more than 1 acre or increasing impervious surfaces by $\frac{1}{4}$ acre or more
- Design and Performance Standards established in NJAC 7:8-5, for:
 - Nonstructural Stormwater Management Strategies
 - Stormwater Quantity
 - Groundwater Recharge
 - Stormwater Quality
 - Stormwater Maintenance Plan

Nonstructural Strategies

- Plan the project using Low Impact Development (LID) Principles
- Collect, infiltrate and where possible reuse stormwater near its source
- Capture runoff from small storm events in vegetated systems to protect water quality and promote recharge
- Minimize and disconnect impervious surfaces

Water Quantity Performance Standards

Water Quantity

- Demonstrate that post-development 2, 10, and 100-year storm event hydrographs do not exceed pre-development hydrographs

or

- Demonstrate that hydrograph peaks will not increase and that increase in volume or change in timing won't increase flood damage downstream

or

- Design BMPs so that 2, 10, and 100-year pre-development hydrographs are reduced to 50%, 75%, and 80%, respectively
 - 2-year rainfall (2.3 inches)
 - 10-year rainfall (5.0 inches)
 - 100-year rainfall (8.3 inches)

Groundwater Recharge Performance Standards

Groundwater Recharge

- Maintain 100% of average annual groundwater recharge volume

or

- Infiltrate increase in the post development runoff volume for the 2-year storm

Water Quality Performance Standards

Water Quality

- Install BMPs to reduce at least 80% of total suspended solids (TSS) loads
- Install BMPs to provide nutrient removal to maximum extent feasible

<u>BMP</u>	<u>TSS Removal Rate</u>
Bioretention	90%
Constructed Wetlands	90%
Forested Buffers	70%
Extended Detention Basin	40-60%
Infiltration Structure	80%
Sand Filter	80%
Vegetative Filter Strip	50%
Wet Pond	60-90%

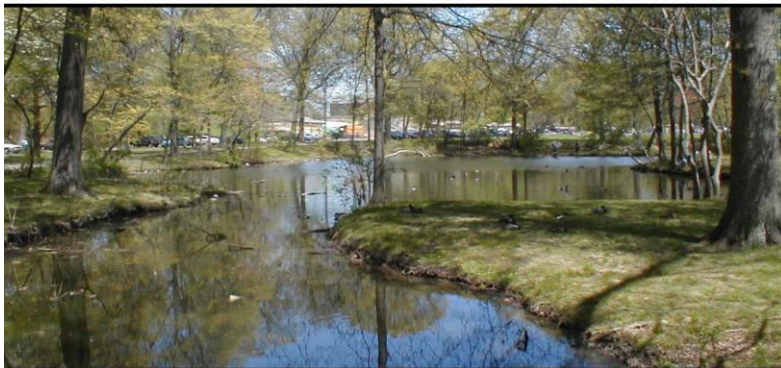
SOURCE: NJ Stormwater Management Rules
and BMP Manual

NJ Stormwater Guidance



Tier A

Municipal Stormwater Guidance Document
NJPDES General Permit No NJ0141852



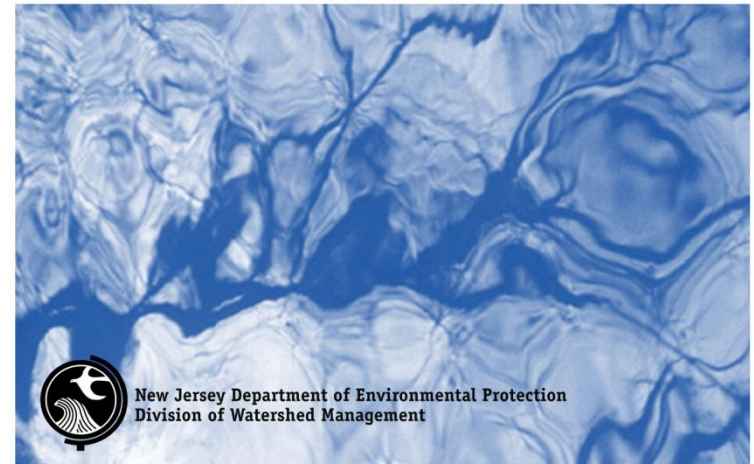
New Jersey Department of Environmental Protection
Division of Water Quality
Municipal Stormwater Regulation Program



New Jersey

Stormwater

Best Management Practices Manual



New Jersey Department of Environmental Protection
Division of Watershed Management

For more information, visit: www.njstormwater.org

As municipal officials...what is NOT your responsibility...

- You do NOT need to know how to meet required nonstructural management strategies
- You do NOT need to know how to design or use BMPs
- You do NOT need to know how to maintain BMPs

The Role of Municipal Officials...

- You need to know how to ask the right questions of the professionals and the applicant
- Clearly understand that all applicants have to satisfy standards for:
 - Nonstructural Stormwater Management Strategies
 - Stormwater Quantity
 - Groundwater Recharge
 - Stormwater Quality
 - Stormwater Maintenance Plan
- Have confidence that your questions have been adequately answered by the professionals and the applicant so that approval can be given

What's Next?

- Developing an awareness of nonstructural stormwater management strategies
 - What do they look like?
 - How do applicants demonstrate they used them?
- What questions do you need to ask to ensure that applicants have complied with the water quantity, groundwater recharge and water quality requirements?
- What is needed from applicants to ensure that their stormwater management systems will be maintained and maintenance will not become a burden on the Township?

What's Next?

- How do applicants demonstrate that they satisfied the safety requirements for stormwater structures?
- Can the municipality grant a variance or exemption from the stormwater design and performance standards?

A checklist will be provided that will help municipal officials ask the right questions to ensure applicants have complied with the State stormwater management regulations, thereby protecting the township's residents from additional flooding, protecting waterways from becoming more polluted, and protecting the township from future law suits.

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