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Welcome!

Green Infrastructure Curriculum & Training

SIP the Green Juice!

Session 1: Overview of Green Infrastructure

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Today's Speakers

CHRISTOPHER B. BURKE ENGINEERING, LLC

Sheila McKinley

CURRY & ASSOCIATES, INC.
CONSULTING ENGINEERS & ARCHITECTS

Sarah Hudson

JRM Environmental

Robin Feller

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Three Sessions

1. **Overview of Green Infrastructure**
2. Policies, Incentives, and Funding for Green Infrastructure
3. Implementation of Green Infrastructure

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Training Objectives:

- Allow Green Infrastructure in your codes and ordinances
- Promote Green Infrastructure in your community
- Implement Green Infrastructure projects and celebrate success

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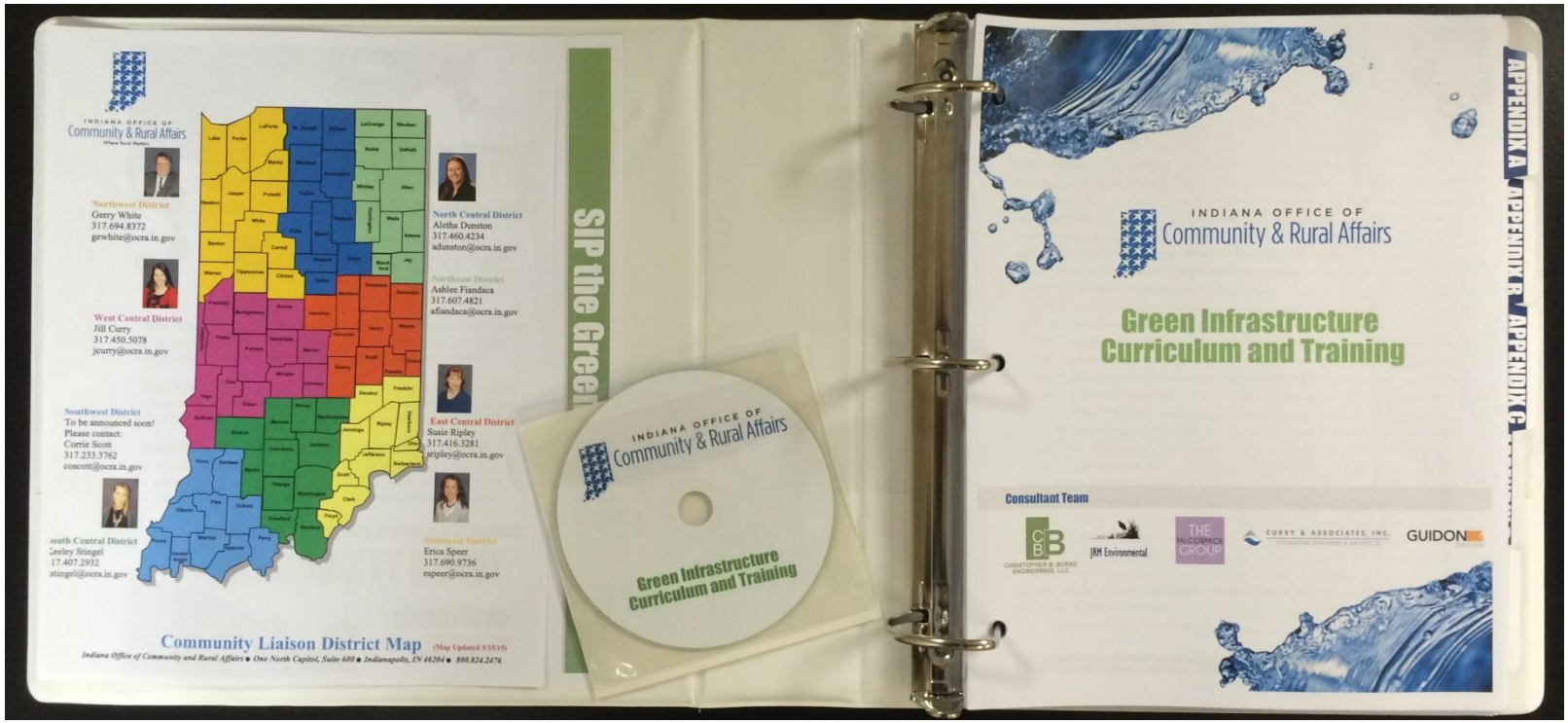
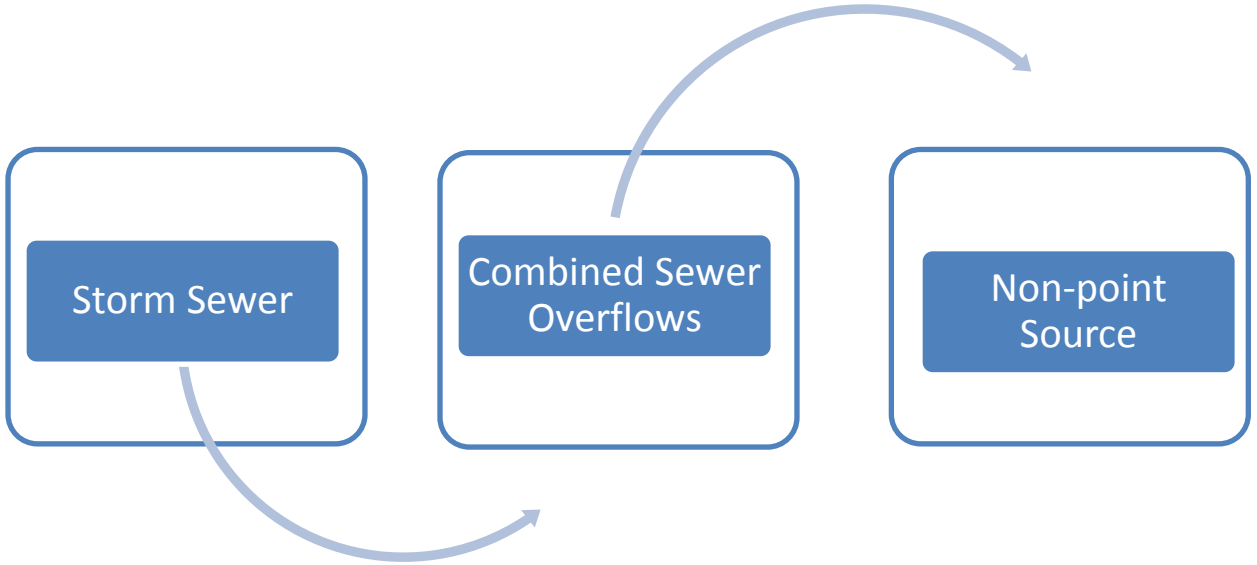
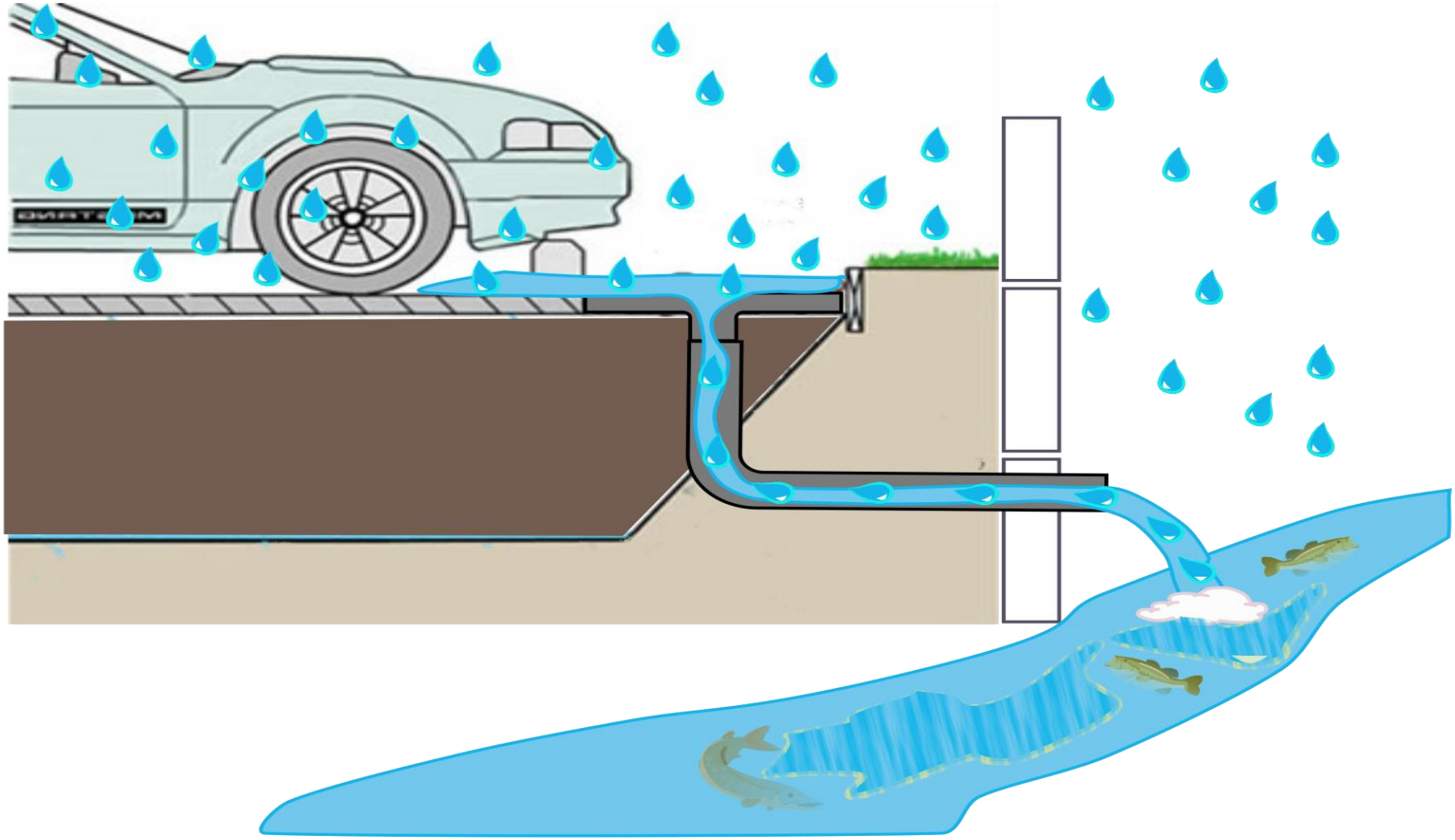
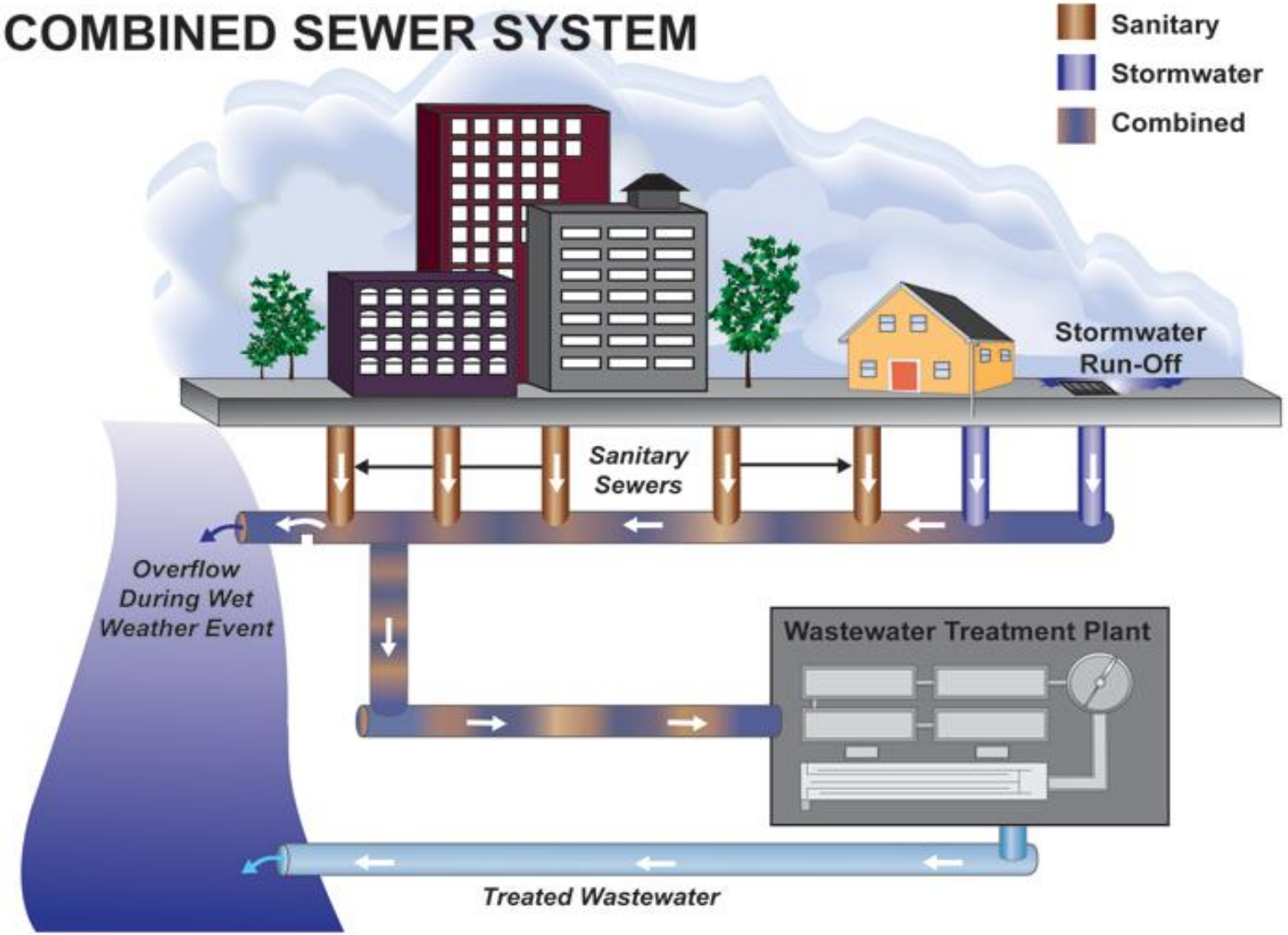
Training Materials:

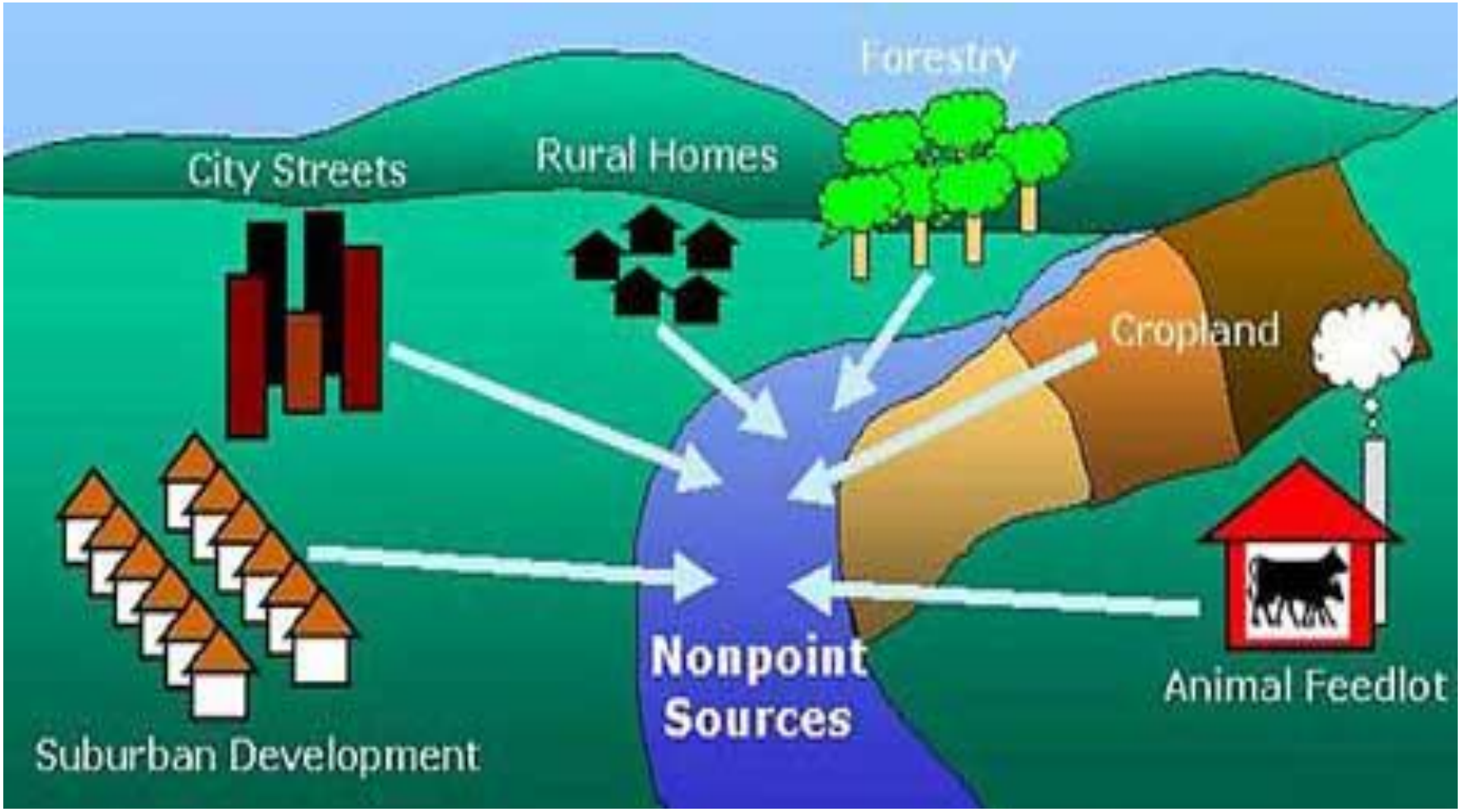


Stormwater Sources






COMBINED SEWER SYSTEM
Sanitary
Stormwater
Combined
Stormwater Run-Off
Sanitary Sewers
Overflow During Wet Weather Event
Wastewater Treatment Plant
Treated Wastewater


Forestry
City Streets
Rural Homes
Cropland
Nonpoint
Sources
Animal Feedlot
Suburban Development

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Grey to Green

GREY

- Aggregate flooding
- Pipe construction
- Increases pollutants

GREEN

- Sensitive to environment
- Natural elements
- Drainage patterns

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Allow: Grey to Green

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Allow: Grey to Green

- Codes and ordinances shape development
- Create incentives for change
- Scale applications in accordance with your community's vision

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Promote: Grey to Green

How many of you have heard the term “Green Infrastructure” before?

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Green Infrastructure

- Uses the natural characteristics of soil and vegetation to capture and treat stormwater runoff where it falls

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Promote: Grey to Green

- Change conventional planning and engineering approach
- Identify benefits, opportunities and limitations
- Avoid costs by substituting Green for Gray

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Promote: Grey to Green

Improves Community Resiliency by:

- Thinking long term
- Reducing traditional infrastructure cost such as costly sewer separation
- Reducing the number of CSO events

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Stormwater Pollutants: Sediment

Sources

Impacts

Builds up in waterways

Costs to Dredge waterways

Interferes with aquatic life (reproduction)

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Stormwater Pollutants: Nutrients

Sources	*Impacts*
	Algae in ponds and lakes Cost to treat algae Contaminates drinking water Dead zones in the Gulf of Mexico

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Stormwater Pollutants: Chemicals

Sources	*Impacts*
	Toxic to aquatic life and can build up in the environment Contaminate drinking water sources Increases water treatment costs

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Stormwater Pollutants: Oil & Grease

Sources	*Impacts*
	Affects evaporation from body of water into atmosphere Can be toxic to aquatic life and humans

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Stormwater Pollutants: Metals

Sources	*Impacts*
	Builds up in fish tissue and causes fish consumption advisories (especially mercury) Stays a long time in the environment Incorporates itself into the food chain

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Stormwater Pollutants: Litter

Sources	*Impacts*
	Injure wildlife Unsightly

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Implement: Grey to Green

- Case studies and demonstration projects
- Identify partners and colleagues
- Think BIG, start SMALL

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Implement: Grey to Green

- Coordinate details and responsibilities
- Encourage and inspire innovation
- Use regulations as a catalyst for action

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Implement: Grey to Green

How many of you are familiar with the NPDES and/or MS4 Program?

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Section 402 of the Clean Water Act

- USEPA lead Federal agency
- Established NPDES Program
- State developed local requirements etc
- IDEM permitting and enforcement

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327 IAC 15-5 “Rule 5”

Construction related activities that disturb one or more acres of land

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327 IAC 15-6 “Rule 6”

Point source runoff exposed to industrial processes that discharge into a MS4 or waters of the state

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327 IAC 15-13 “Rule 13”

Stormwater discharges within urbanized areas that are identified as MS4s

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Rules You Can Use

Do Federal, State and local regulations encourage traditional techniques or green infrastructure?

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Traditional Stormwater Management

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Traditional Stormwater Management

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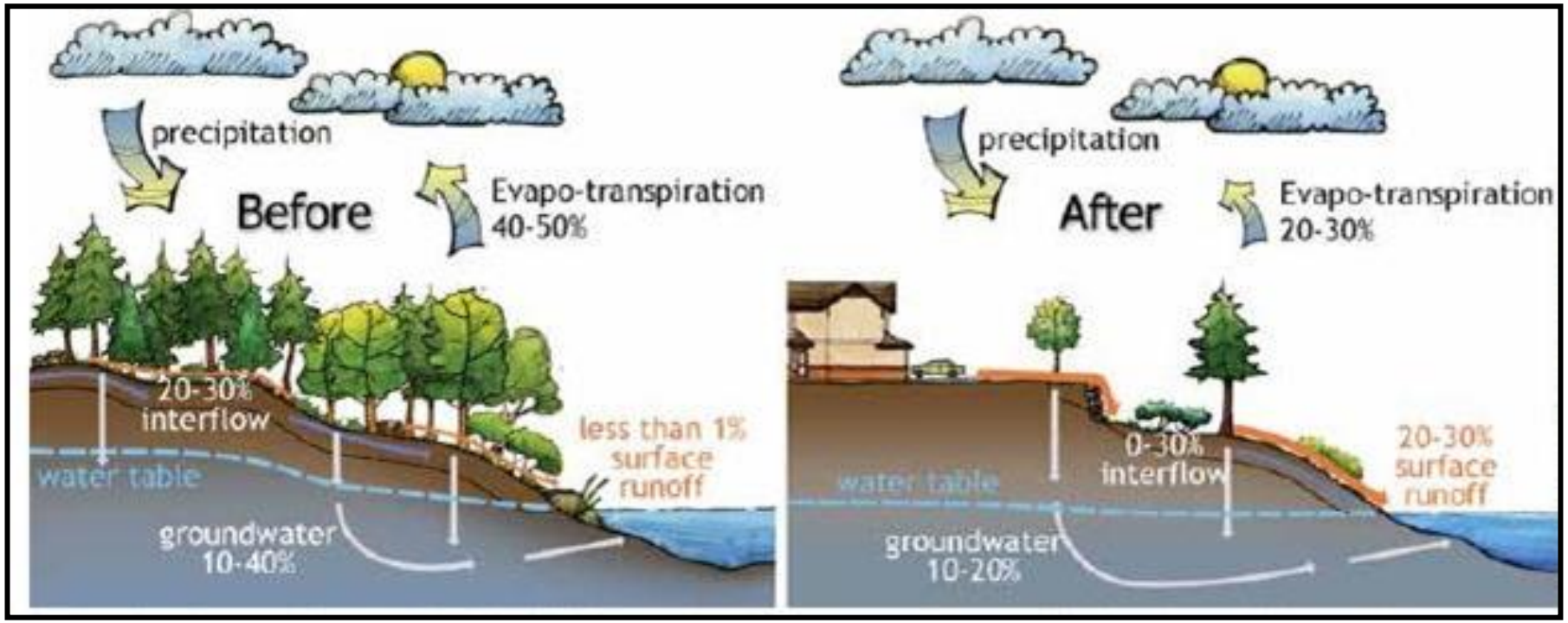
Traditional Stormwater Management



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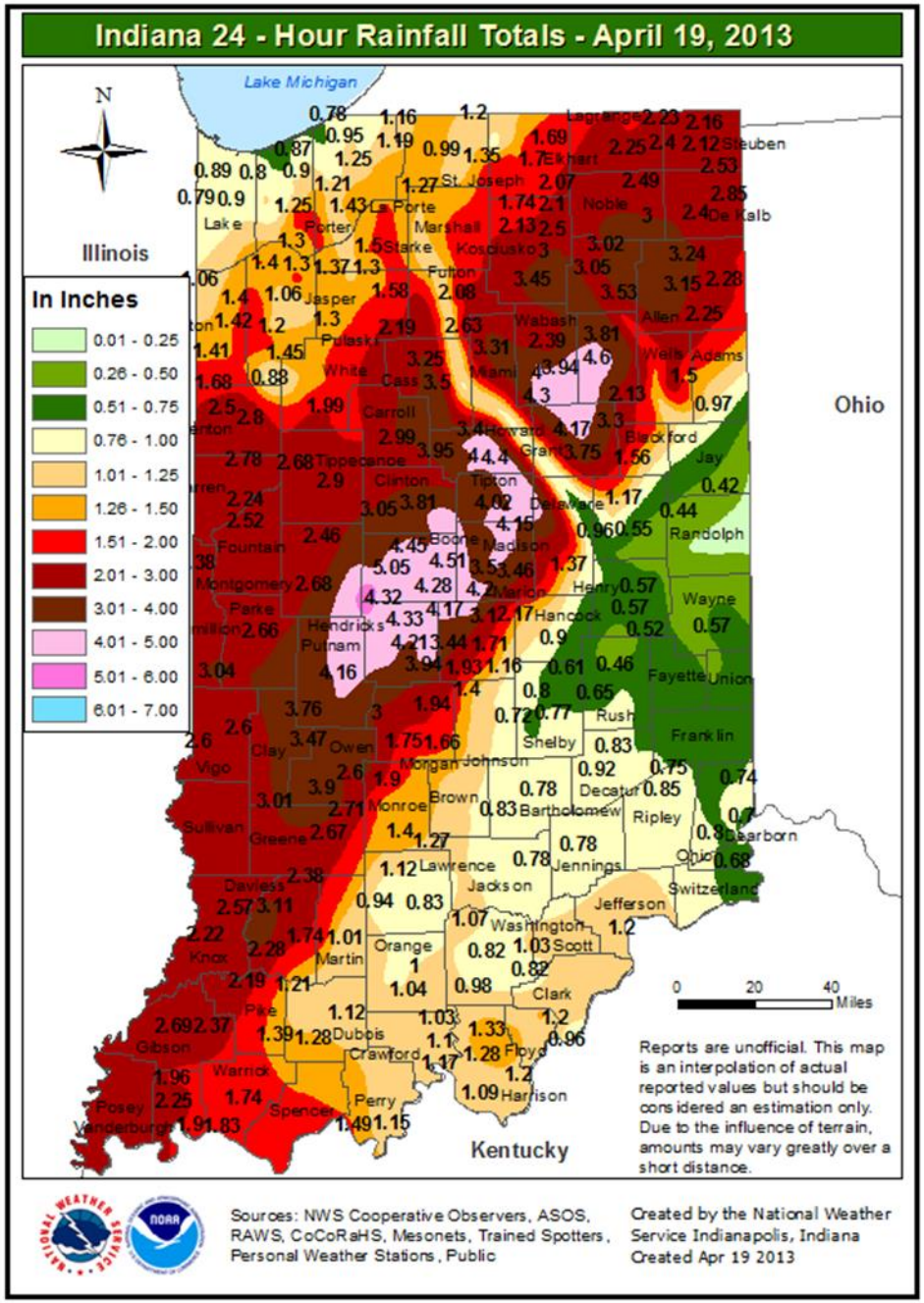
Is there a better way to manage stormwater runoff?

Traditional vs. Green Approach


Indiana 24 - Hour Rainfall Totals - April 19, 2013
Lake Michigan
N
Illinois
Ohio
Kentucky
In Inches
0.01 - 0.25
0.26 - 0.50
0.51 - 0.75
0.76 - 1.00
1.01 - 1.25
1.26 - 1.50
1.51 - 2.00
2.01 - 3.00
3.01 - 4.00
4.01 - 5.00
5.01 - 6.00
6.01 - 7.00
Lake
Porter
La Porte
St. Joseph
Elkhart
Lagrange
Steuben
Noble
De Kalb
Starke
Marshall
Kosciusko
Fulton
Jasper
Pulaski
White
Cass
Wabash
Miami
Wells
Adams
Allen
Carroll
Howard
Grant
Blackford
Jay
Tippecanoe
Clinton
Tipton
Delaware
Randolph
Fountain
Boone
Madison
Montgomery
Parke
Hendricks
Putnam
Marion
Henry
Hancock
Wayne
Rush
Fayette
Union
Franklin
Shelby
Vigo
Clay
Owen
Morgan
Johnson
Decatur
Brown
Bartholomew
Ripley
Dearborn
Ohio
Switzerland
Sullivan
Greene
Monroe
Jennings
Jackson
Jefferson
Daviess
Lawrence
Washington
Scott
Knox
Martin
Orange
Clark
Pike
Dubois
Crawford
Floyd
Gibson
Warrick
Perry
Harrison
Posey
Vanderburgh
Spencer
0 20 40 Miles
Reports are unofficial. This map is an interpolation of actual reported values but should be considered an estimation only. Due to the influence of terrain, amounts may vary greatly over a short distance.
Sources: NWS Cooperative Observers, ASOS, RAWS, CoCoRaHS, Mesonets, Trained Spotters, Personal Weather Stations, Public
Created by the National Weather Service Indianapolis, Indiana
Created Apr 19 2013

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Green Infrastructure includes:

1. Low Impact Development
2. Better Site Design
3. Source-control Practices

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1. Low Impact Development (LID)

- Preserve the natural systems and hydrologic functions of a pre-development site
- Reduced land clearing cost, infrastructure cost, enhanced property values and aesthetics

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2. Better Site Design

- Minimize amount of impervious cover or disturbed area and allow for stormwater disconnection
- Site conditions, development codes, and site layout

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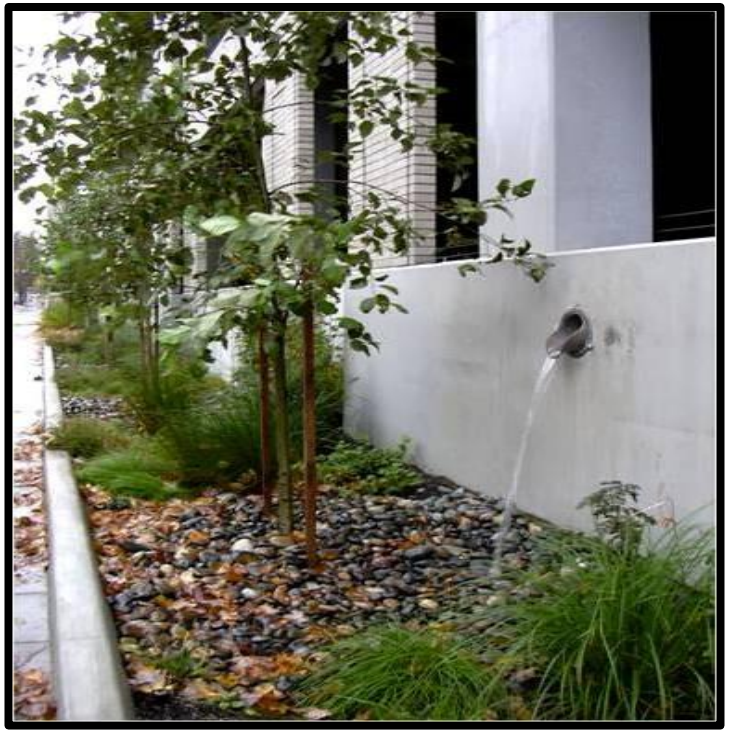

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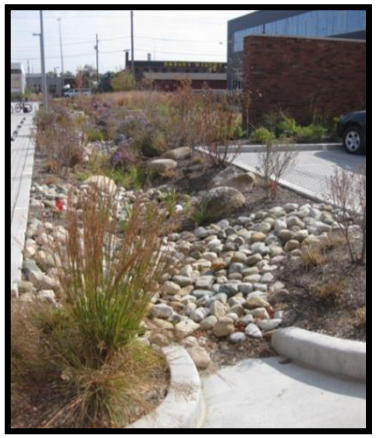
3. Source-control Practices

- Engineered methods to mimic natural processes and characteristics plants and soil
- Bioretention/rain gardens, permeable pavement, tree/planter box, green/blue roof, and rainwater harvesting



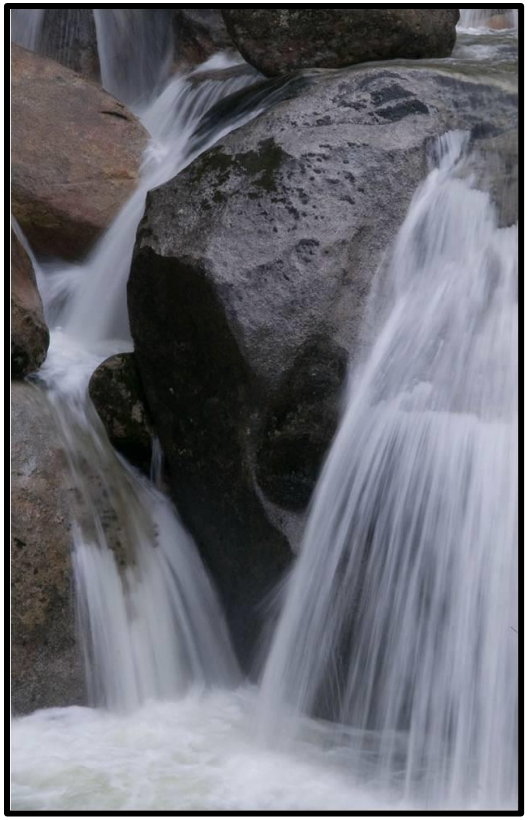
Not New Technology…

GREEN ROOFS

PERMEABLE PAVERS

RAINWATER HARVESTING

Benefits of Green Infrastructure



WATER QUALITY
& QUANTITY

COMMUNITY

AIR QUALITY

HABITAT & WILDLIFE

ENERGY &
CLIMATE CHANGE

Benefits of Green Infrastructure

Benefit	Reduces Stormwater Runoff				Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO_2	Reduces Urban Heat Island	Improves Community Livability					Improves Habitat	Cultivates Public Education Opportunities
	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding								Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture		
Practice										CO_2								
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	◒	●	◒	◒	●	●
Tree Planting	●	●	●	●	○	◒	○	●	●	●	●	●	●	●	●	◒	●	●
Bioretention & Infiltration	●	●	●	●	◒	◒	○	○	●	●	●	●	●	◒	◒	○	●	●
Permeable Pavement	●	●	●	●	○	◒	●	◒	●	●	●	○	○	●	○	○	○	●
Water Harvesting	●	●	●	●	●	◒	○	◒	◒	◒	○	○	○	○	○	○	○	●

● Yes ◒ Maybe ○ No

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Drivers for Green Infrastructure

1. Regulatory Requirements
2. Infrastructure
3. Drainage Problems
4. Quality Of Life

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Grey to Green

- When nature is better than concrete
- Balance green and grey infrastructure


produce

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Call to Action

1. Allow Green Infrastructure
2. Promote Green Infrastructure
3. Implement Green Infrastructure

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Virtual Tour

- 12 Indiana Green Infrastructure Case Studies
- Localized flooding, street flooding, CSO, sustainable site design
- Problem, solution, project cost, funding source, benefits, permits needed, photos