

“Keep the Rain from the Drain”

Doing Your Part to Save the Planet

*Presented to the Sierra Club
on March 13, 2018*

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RUTGERS
New Jersey Agricultural
Experiment Station



Rutgers Cooperative Extension

Rutgers Cooperative Extension (RCE) helps the diverse population of New Jersey adapt to a rapidly changing society and improves their lives through an educational process that uses science-based knowledge.

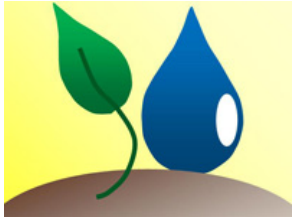




Water Resources Program



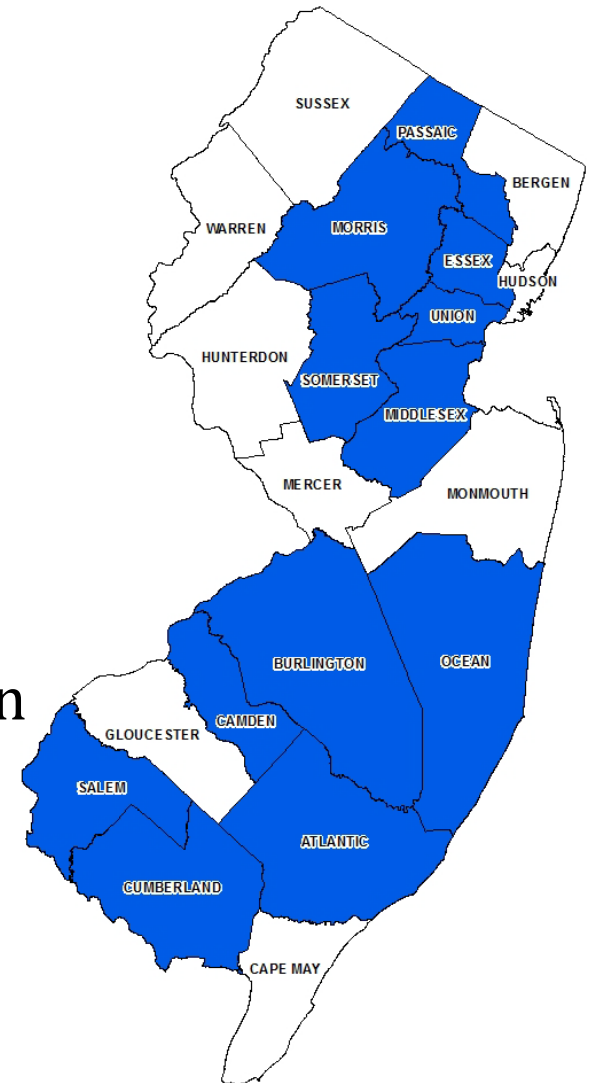
Our mission is to identify and address community water resources issues using sustainable and practical science-based solutions.



Environmental County Agents

The Environmental County Agents teach people new skills and information so they can make better informed decisions and improve their businesses and personal lives.

- Michele Bakacs, Middlesex and Union
- Pat Rector, Morris and Somerset
- Amy Rowe, Essex and Passaic
- Mike Haberland, Camden and Burlington
- Sal Mangiafico, Salem and Cumberland
- Steve Yergeau, Ocean and Atlantic



STORMWATER BASICS

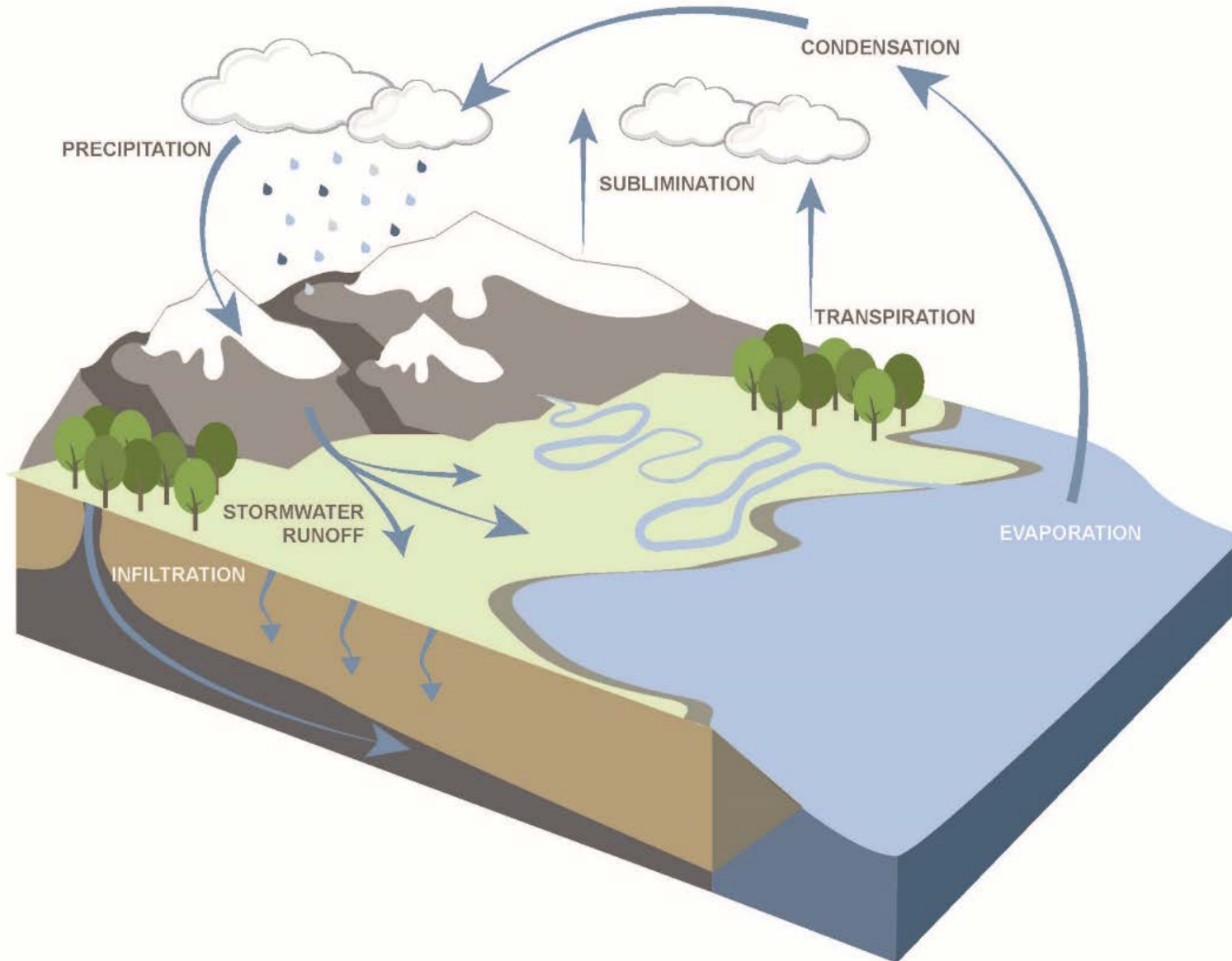


What is stormwater?



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 Natural Hydrologic Cycle



WHERE DOES PRECIPITATION GO?

1. It can *run off*



*Courtesy of Texas Watershed Stewards, Texas
A&M AgriLife Extension*

WHERE DOES PRECIPITATION GO?

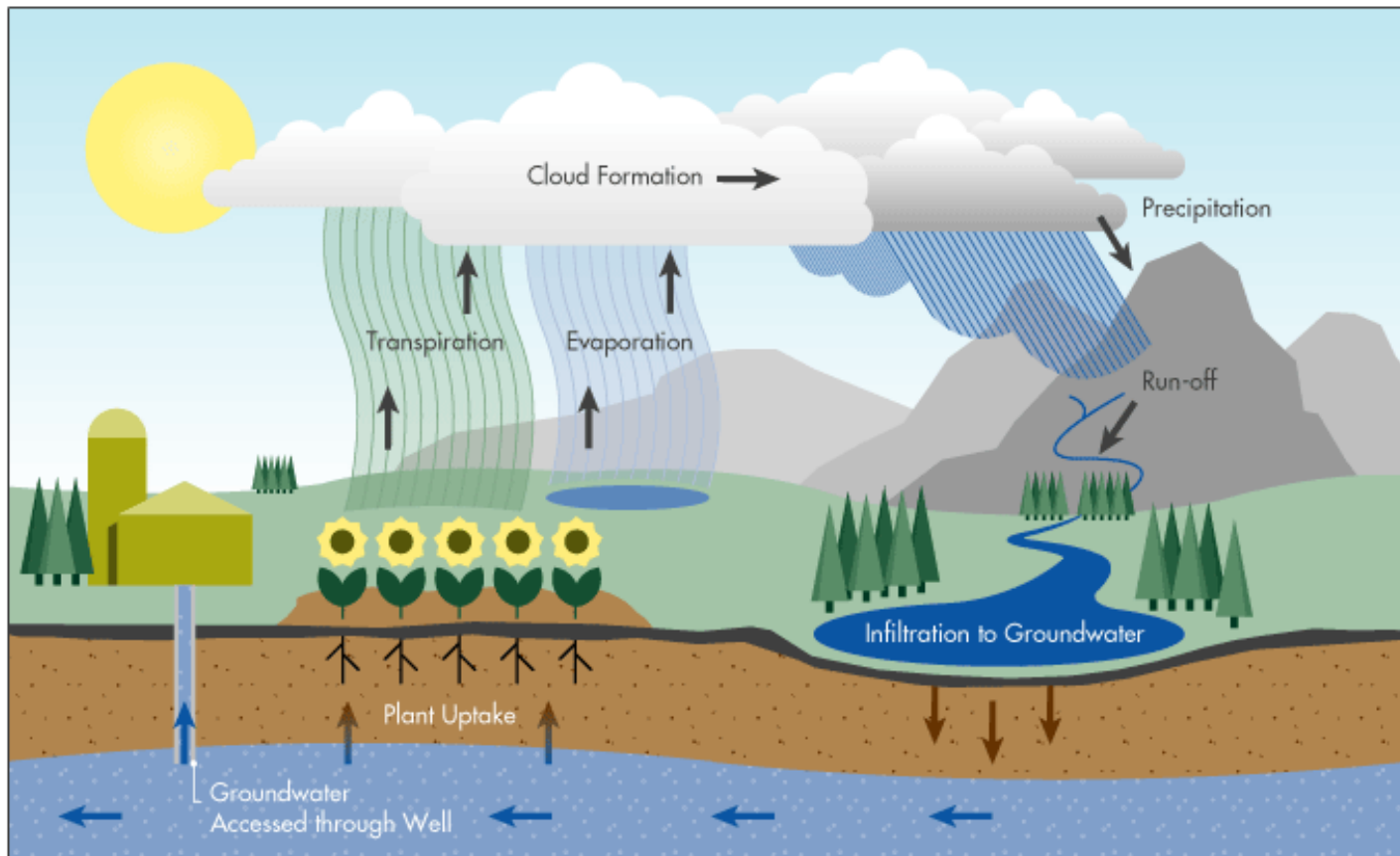
2. It can be *absorbed* by plants and used for photosynthesis and other biological processes



Courtesy of Texas Watershed Stewards, Texas
A&M AgriLife Extension

WHERE DOES PRECIPITATION GO?

3. It can *infiltrate* through the soil surface and percolate downward to groundwater *aquifers*



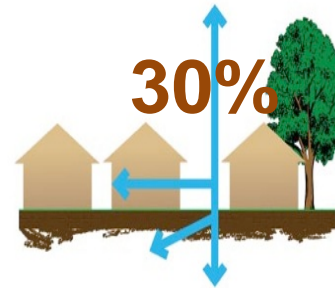
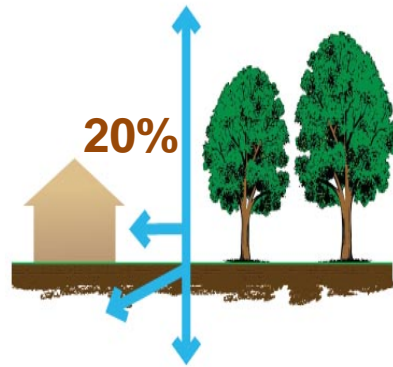
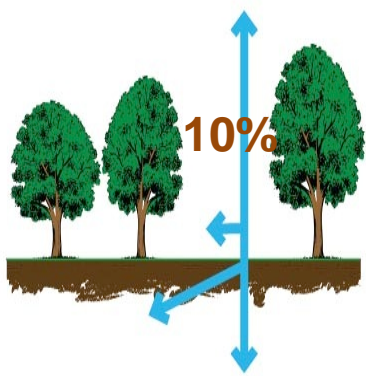
WHERE DOES PRECIPITATION GO?

4. It can *evaporate*



Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

The Impact of Development on Stormwater Runoff



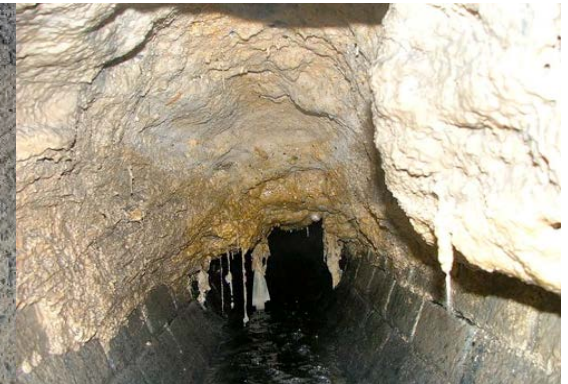
More development



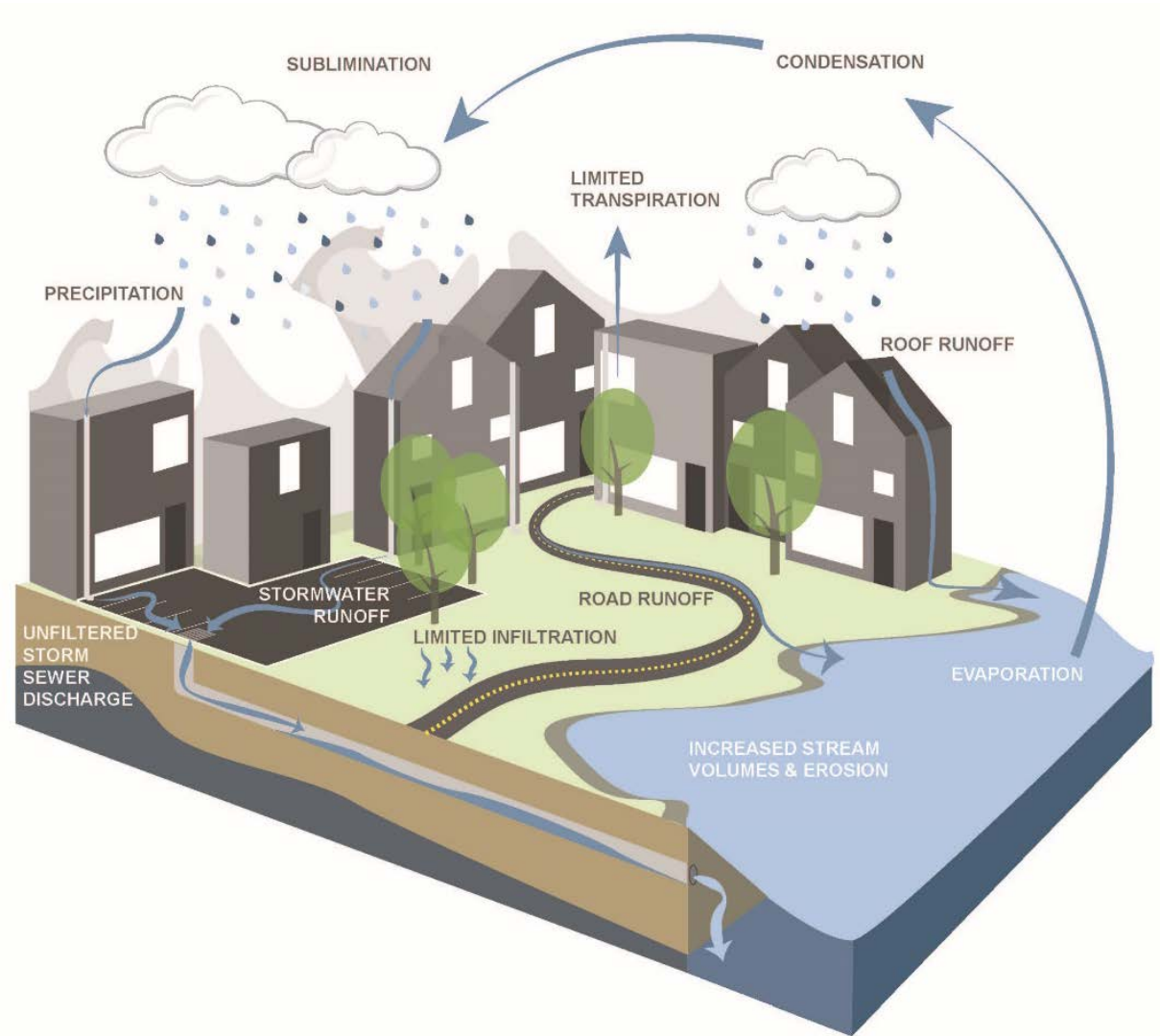
More impervious surfaces



More stormwater runoff

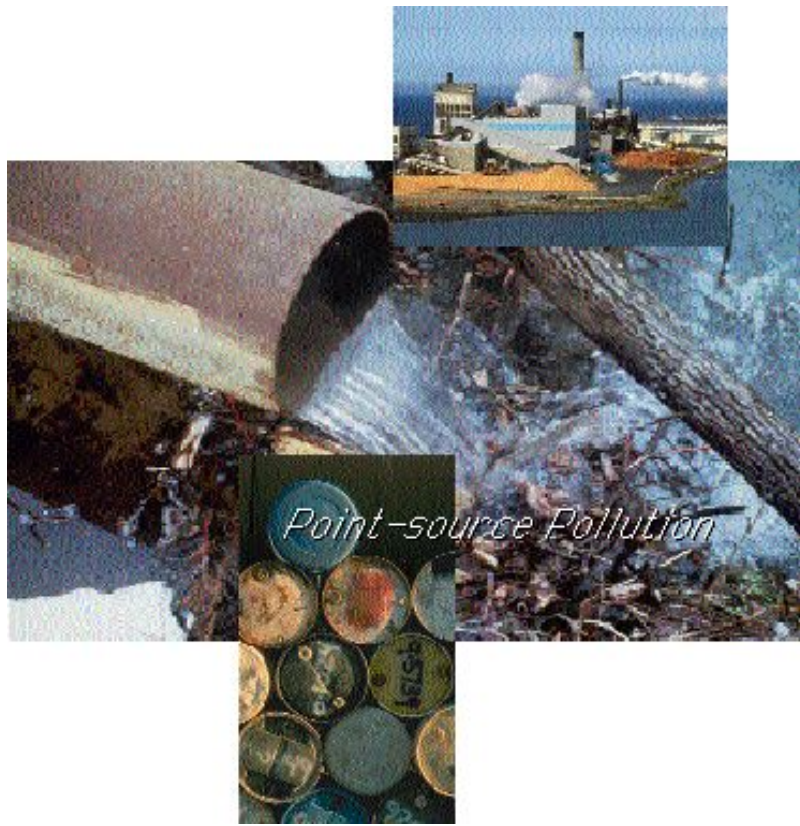


The Urban Hydrologic Cycle



WATER POLLUTION SOURCES

POINT SOURCE POLLUTION



NONPOINT SOURCE POLLUTION



POINT SOURCE POLLUTION

- Comes from a specific source, like a pipe
- Factories, industry, municipal treatment plants
- Can be monitored and controlled by a permit system (NPDES)



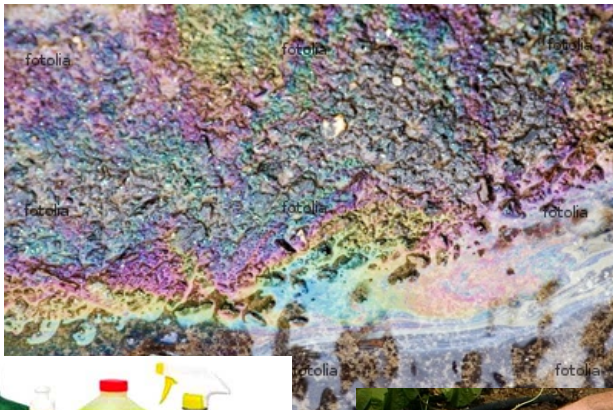
NONPOINT SOURCE POLLUTION (NPS)

- Associated with stormwater runoff
- Runoff collects pollutants on its way to a sewer system or water body
- It 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



Impacts from Changing the Landscape

Hydrologic Effects:

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



History of Stormwater Management



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



STORMWATER MANAGEMENT





It is all about
controlling runoff
from impervious
surfaces



Addressing impervious cover



Can we eliminate it?

Can we change it?



Can we disconnect it?

Can we reuse it?



Eliminate it!



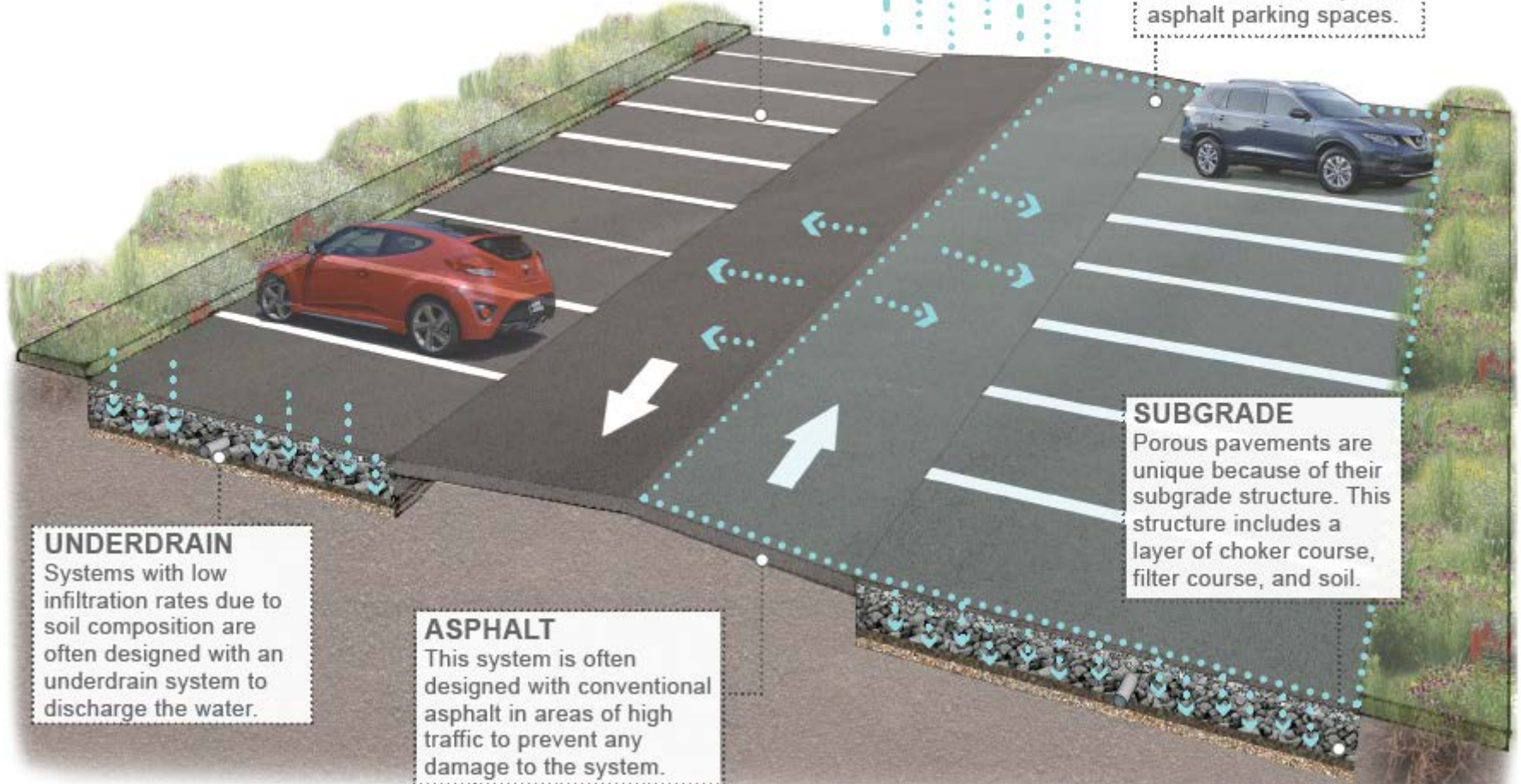
Change it!

POROUS ASPHALT

It is common to design porous asphalt in the parking stalls of a parking lot. This saves money and reduces wear.

DRAINAGE AREA

The drainage area of the porous asphalt system is the conventional asphalt cartway and the porous asphalt in the parking spaces. Runoff from the conventional asphalt flows into the porous asphalt parking spaces.



UNDERDRAIN

Systems with low infiltration rates due to soil composition are often designed with an underdrain system to discharge the water.

ASPHALT

This system is often designed with conventional asphalt in areas of high traffic to prevent any damage to the system.

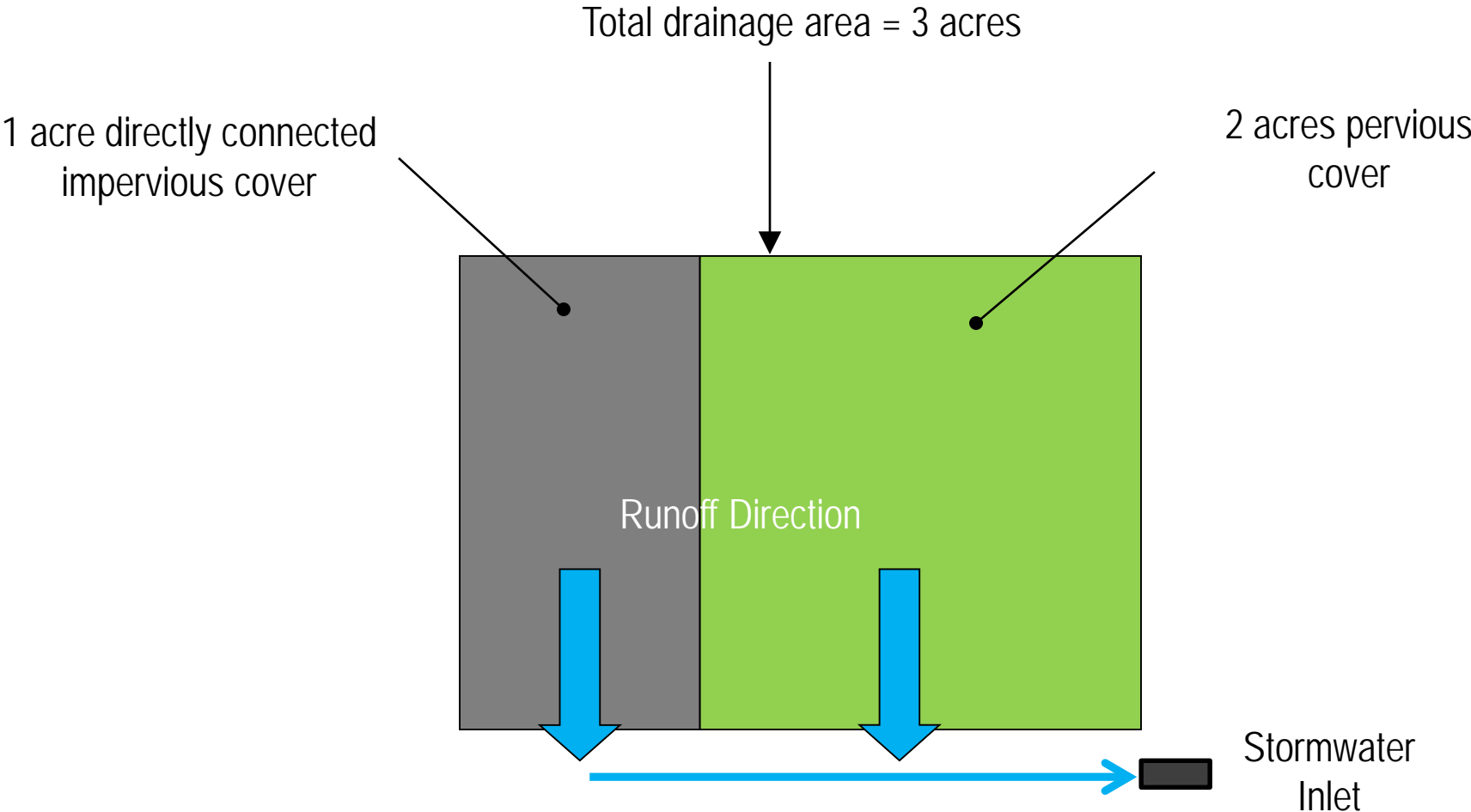
SUBGRADE

Porous pavements are unique because of their subgrade structure. This structure includes a layer of choker course, filter course, and soil.

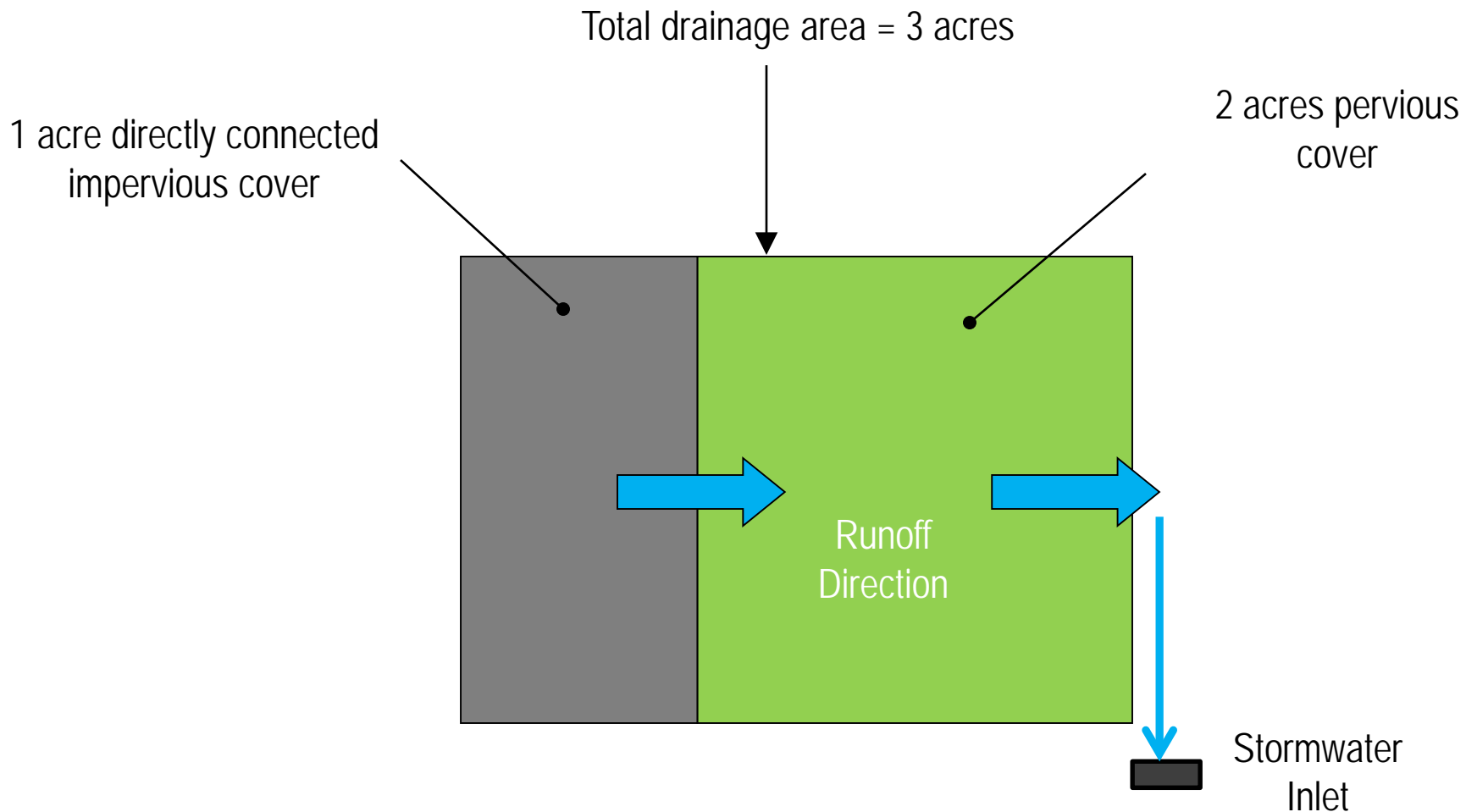
Disconnect It!



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

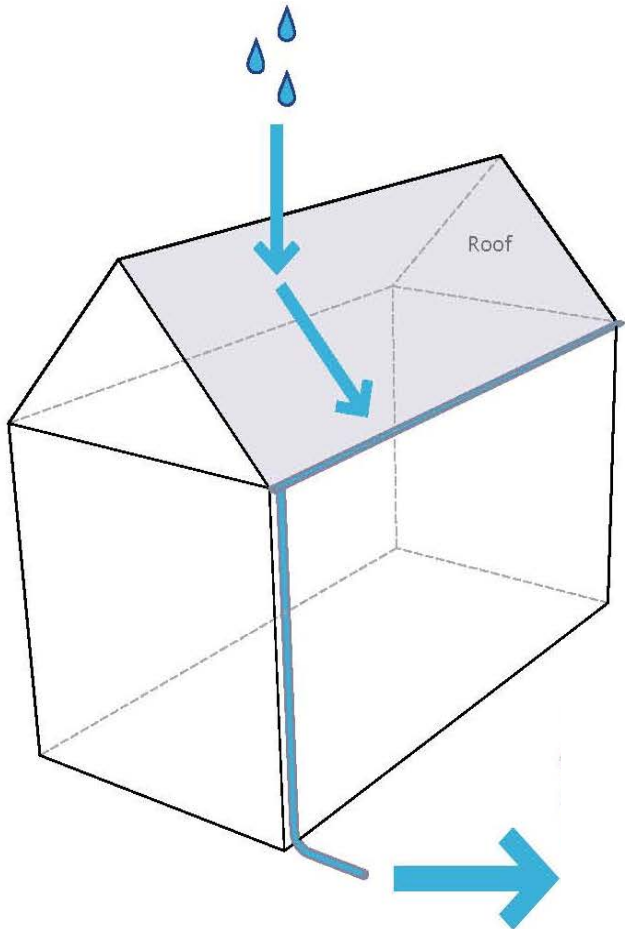


For 1.25 inch storm, 581 cubic feet of runoff = **4,360 gallons**



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

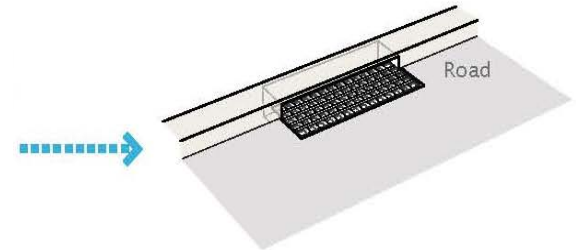
Reuse it!



Disconnect your
downspout by installing a
rain barrel



REDUCE THE AMOUNT
OF RUNOFF ENTERING
STORM SEWERS

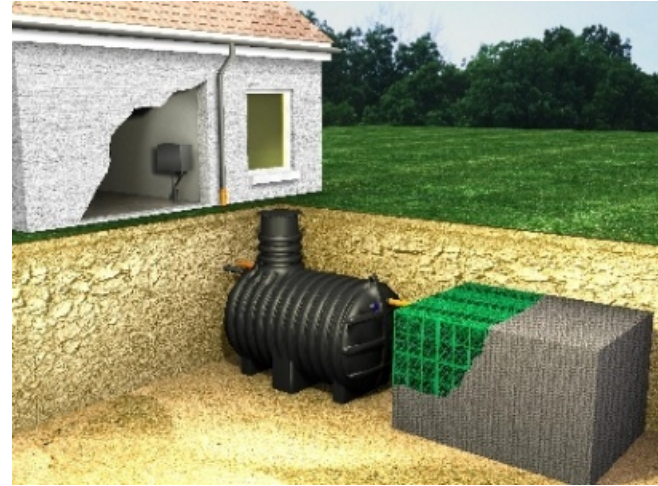


Impervious area is now "disconnected" from flowing directly into the storm sewer system

So Many Barrels to Choose From...



Or Larger Rainwater Harvesting Systems...



Green Infrastructure

...an approach to stormwater management that is cost-effective, sustainable, and environmentally friendly.

Green Infrastructure projects:

- capture,
- filter,
- absorb, and
- reuse

stormwater to maintain or mimic natural systems and treat runoff as a resource.

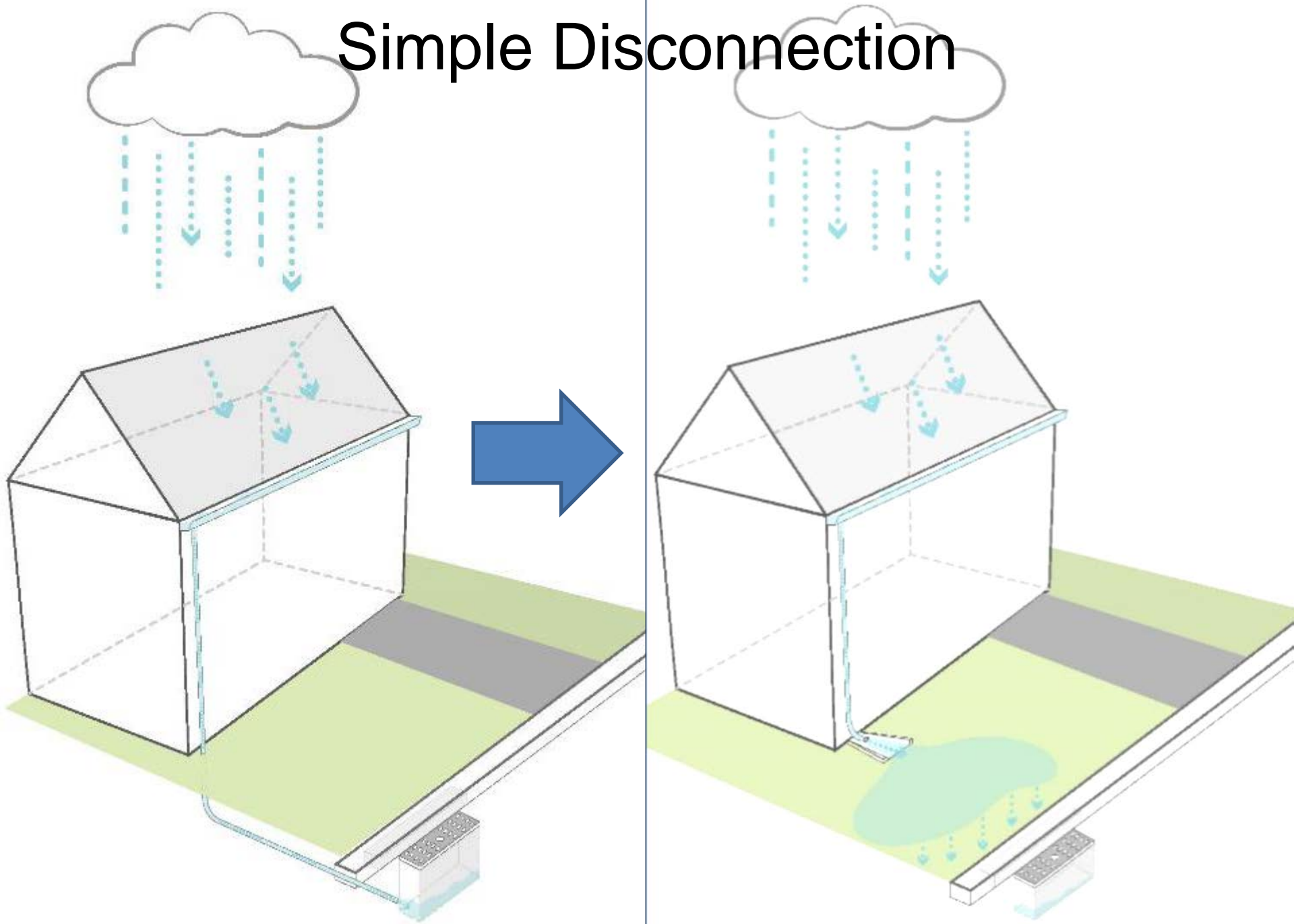


Green Infrastructure includes:

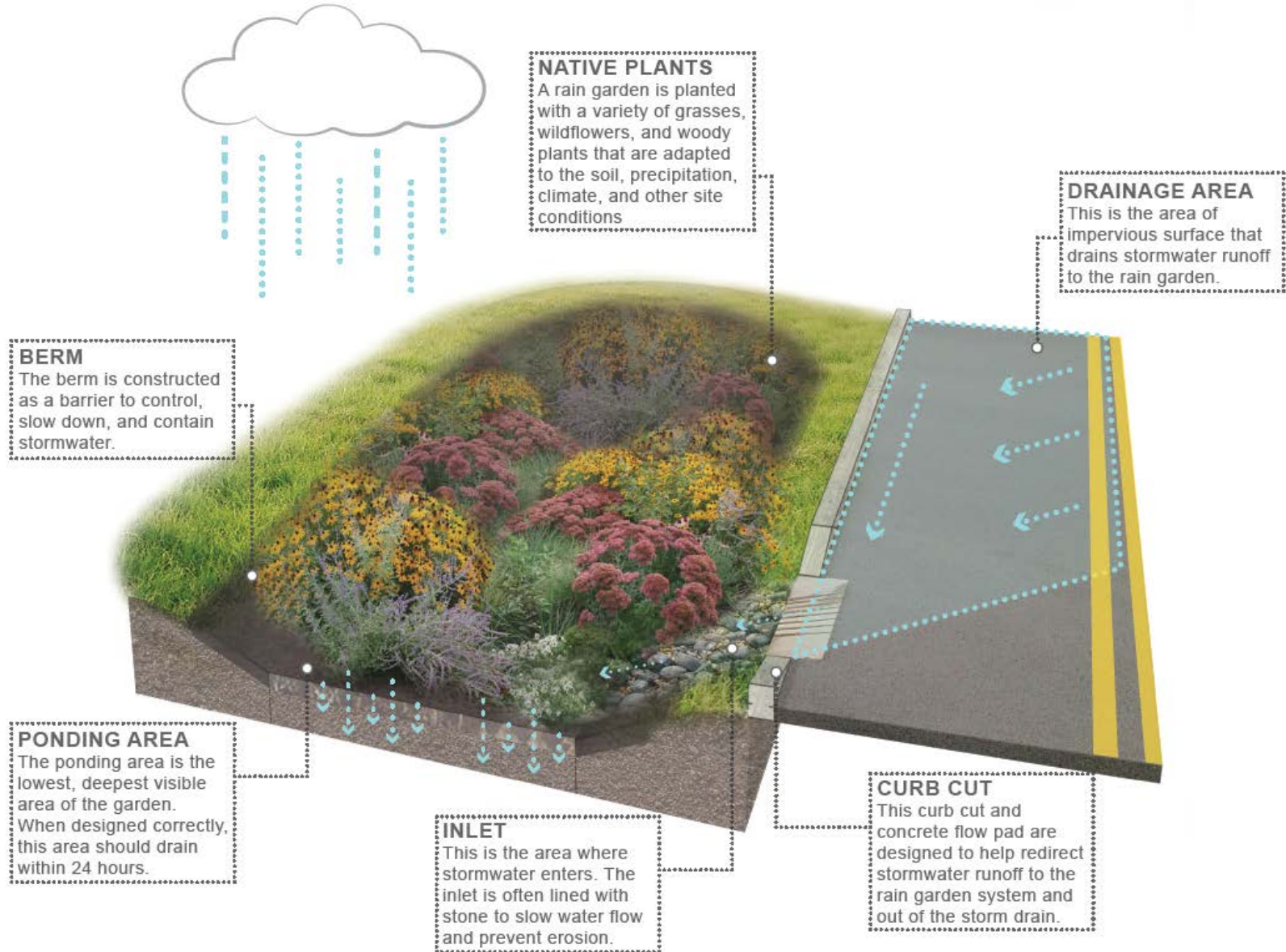
- Green Roofs
- Rainwater Harvesting
- Tree Filter/Planter Boxes
- Rain Gardens/Bioretenention Systems
- Permeable Pavements
- Vegetated Swales or Bioswales
- Natural Retention Basins
- Green Streets



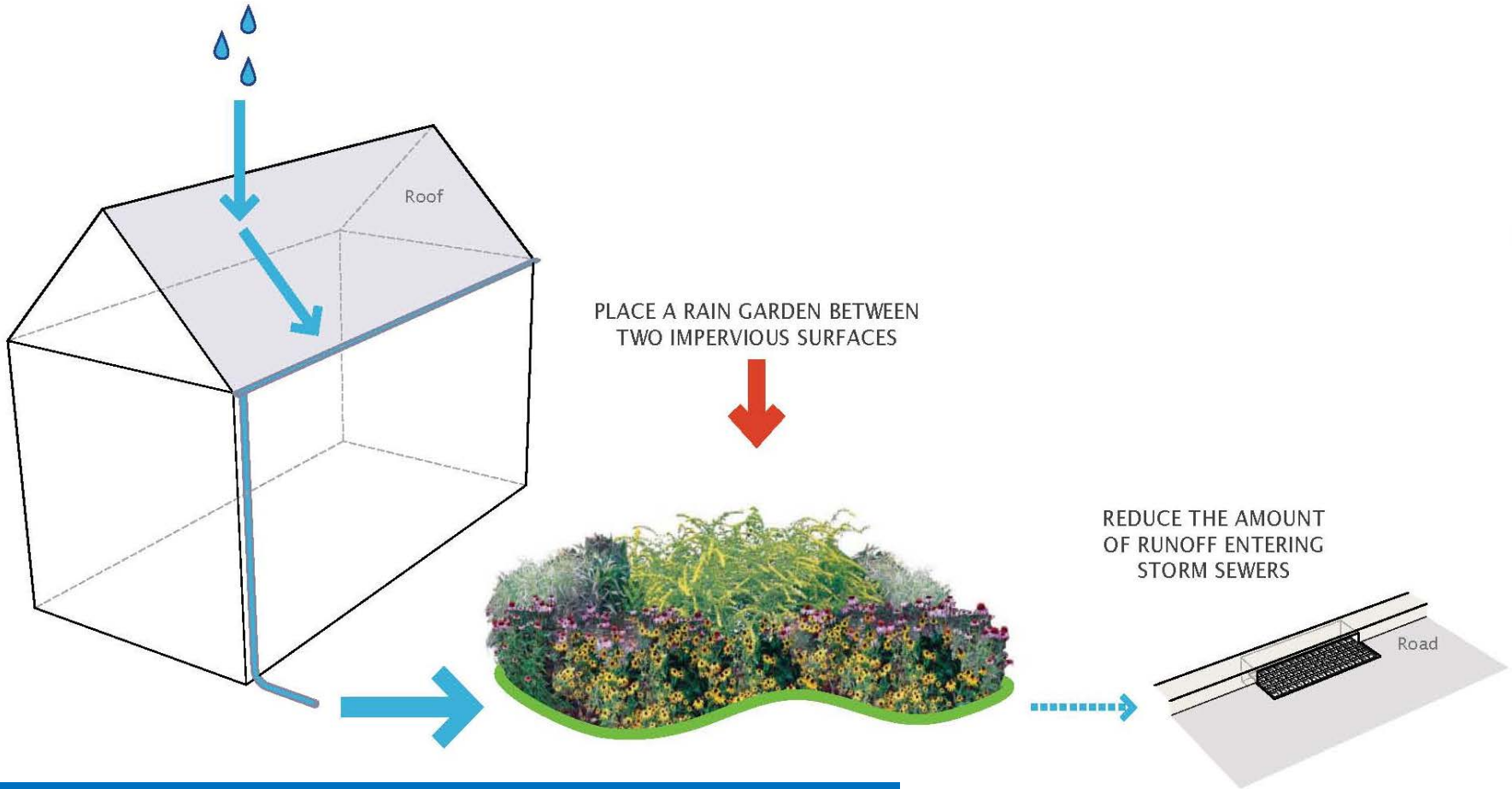
Simple Disconnection



Bioretention Systems/Rain Gardens



Disconnection with Rain Gardens



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

Lots of Rain Gardens







Rain Garden
This garden is designed to capture and filter rainwater from the roof of the building. The plants in this garden are selected for their ability to absorb and filter pollutants from the water. The garden is located in a high-traffic area and is designed to be both functional and aesthetically pleasing.

- *Hosta*
- *Heuchera*
- *Sparganium*
- *Scilla*
- *Salix*
- *Sparganium*
- *Scilla*
- *Salix*





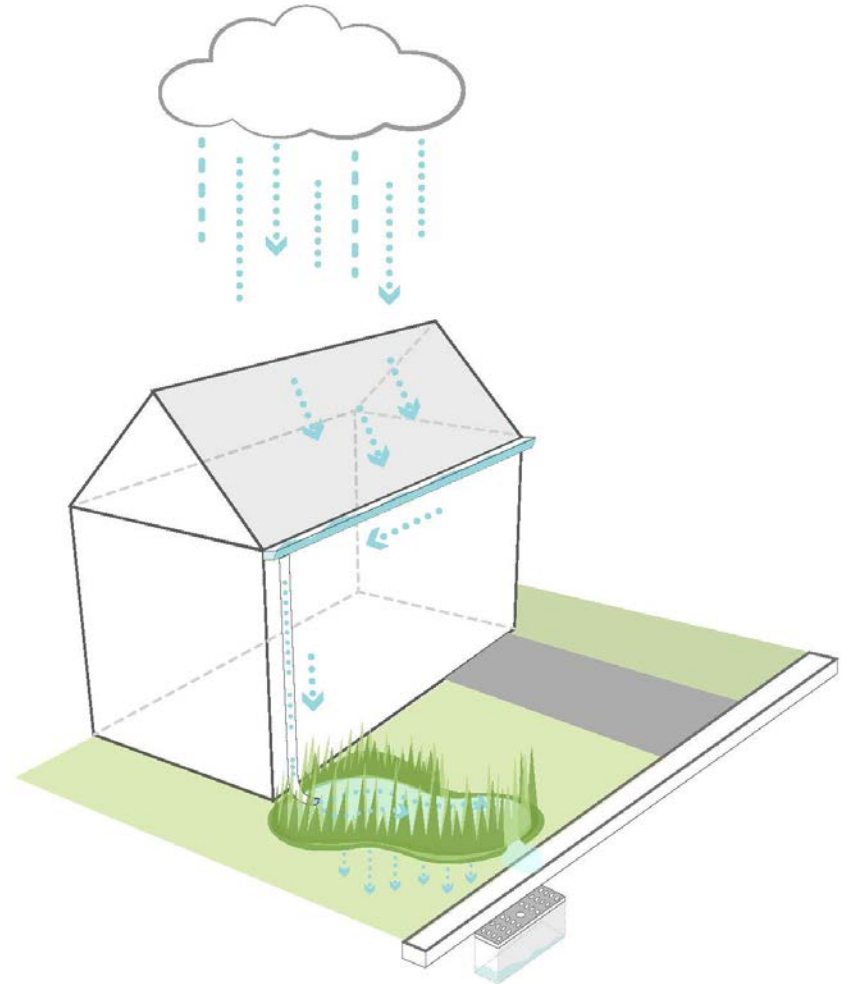
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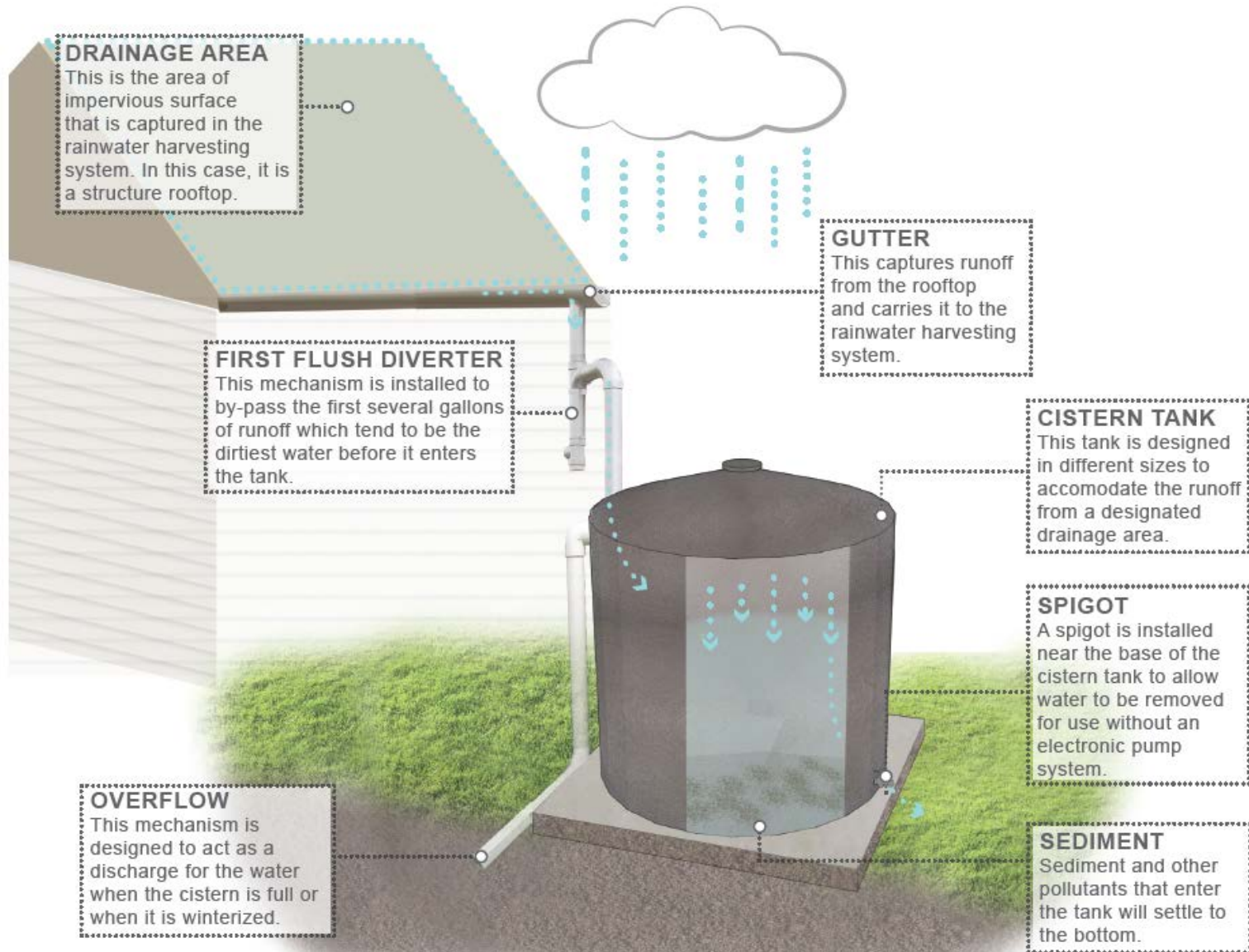


Bioretention Systems/Rain Gardens

- Rain gardens can be implemented throughout communities to begin the process of re-establishing the natural function of land.
- They offer one of the quickest and easiest methods to reduce runoff and help protect our water resources.



Rainwater Harvesting Systems









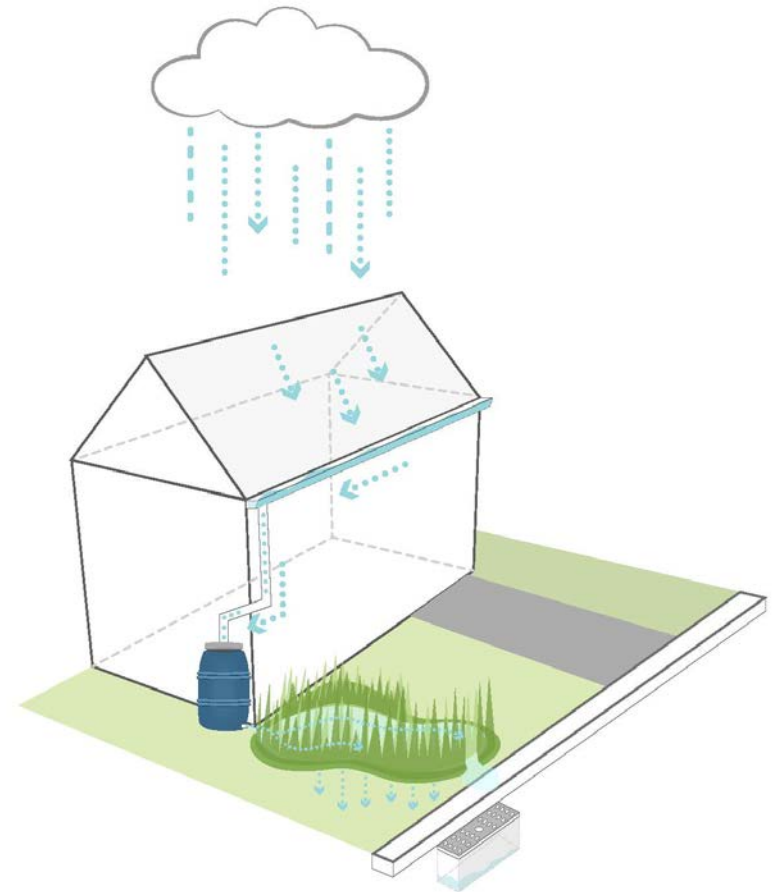






Rainwater Harvesting Systems

- These systems are often paired with other green infrastructure practices to increase their storage capacity or efficiency.
- Are commonly paired with a vegetative system to capture the overflow from the system once it has reached full capacity.



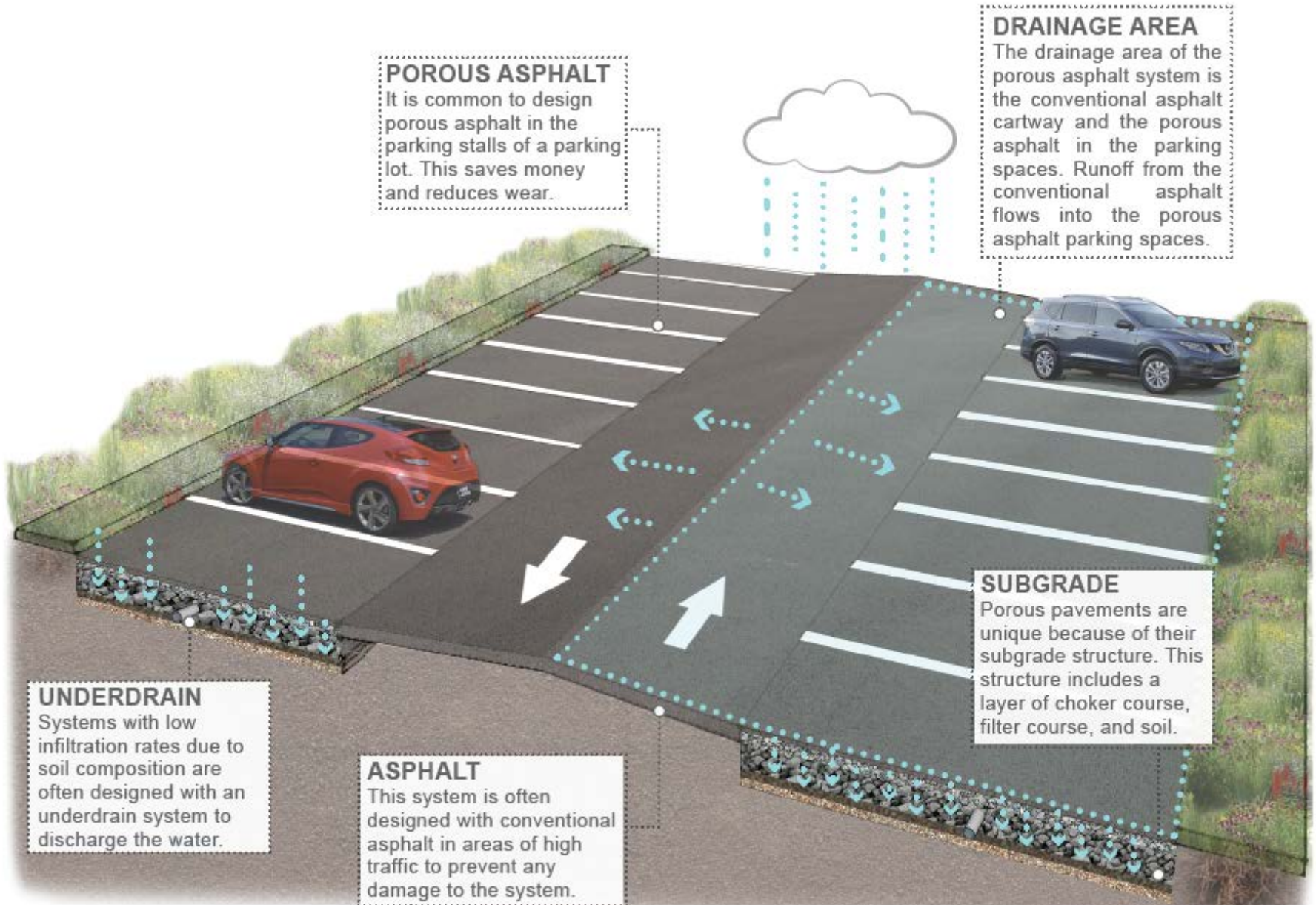
Permeable Pavements

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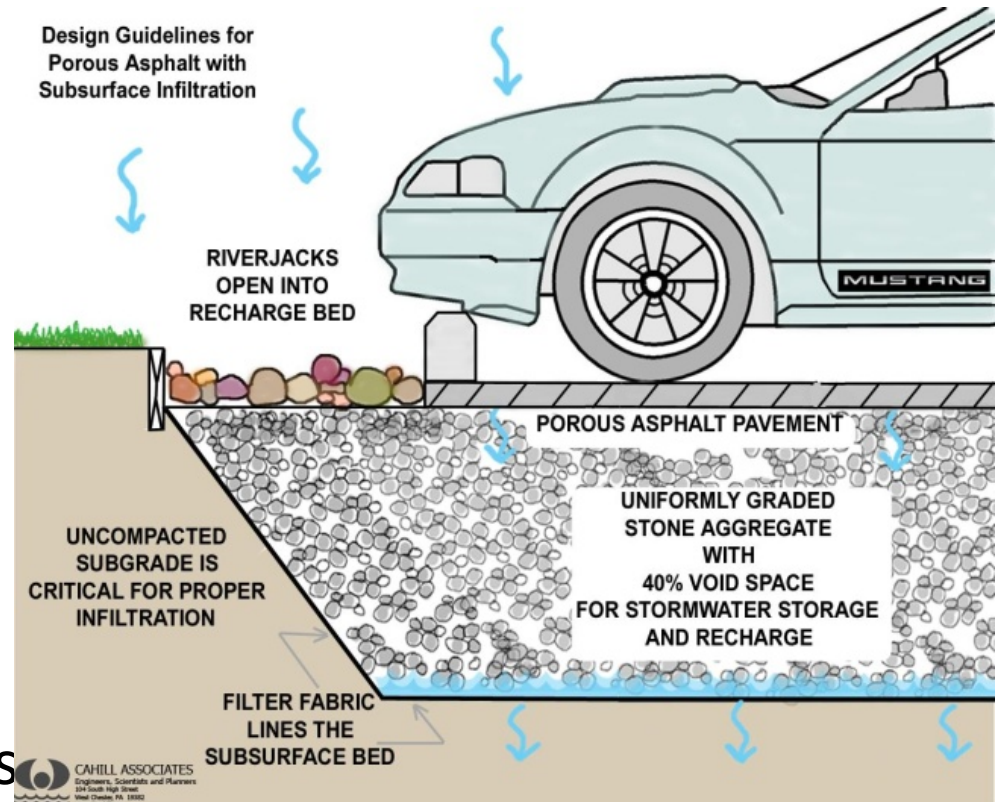
- Underlying stone reservoir
- Porous asphalt and pervious concrete are manufactured without "fine" materials to allow infiltration
- Grass pavers are concrete interlocking blocks with open areas to allow grass to grow
- Ideal application for porous pavement is to treat a low traffic or overflow parking area



ADVANTAGES

- Manage stormwater runoff
- Minimize site disturbance
- Promote groundwater recharge
- Low life cycle costs, alternative to costly traditional stormwater management methods
- Mitigation of urban heat island effect
- Contaminant removal as water moves through layers of system

COMPONENTS



Porous Asphalt





Grass Pavers



**The great aim of education is
not knowledge but action.**

- Herbert Spencer

So take some action!

- Disconnect your downspout
- Install a rain barrel
- Build a rain garden
- Pave your driveway with porous asphalt
- Now get all your neighbors to do follow your example