

Water and Watersheds

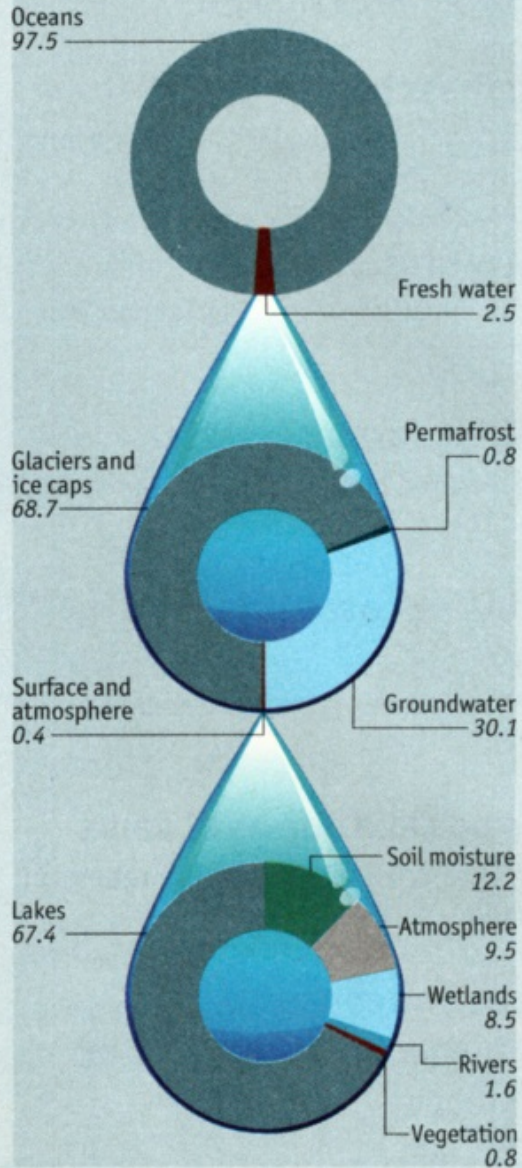


KYMN - Spring 2021 - Chris Barton and Amanda Gumbert

Status of Water Resources

Where the water comes from...

Global water resources, %



LAW OF CONSERVATION OF MASS

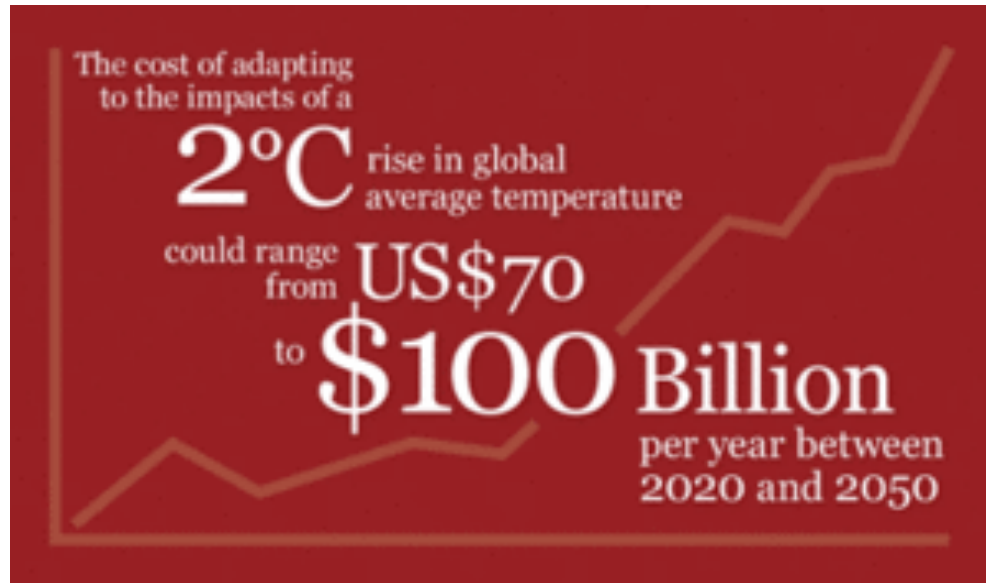


Water resource issues and problems

- population/water scarcity/distribution
- irrigation/ag use
- climate change
- wetlands & riparian areas
- deforestation impacts
- flooding
- erosion & land degradation
- water pollution
- ground water
 - quantity
 - quality
- watershed management

Status of Water Resources

Climate Change



Of this cost, between US\$13.7 billion (drier scenario) and \$19.2 billion (wetter scenario) will be related to water, predominantly through water supply and flood management.

Status of Water Resources

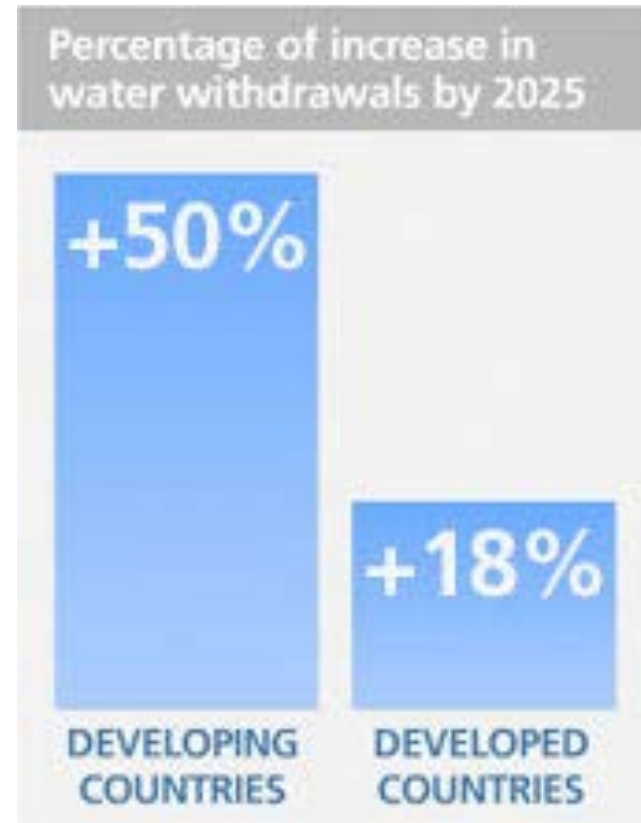
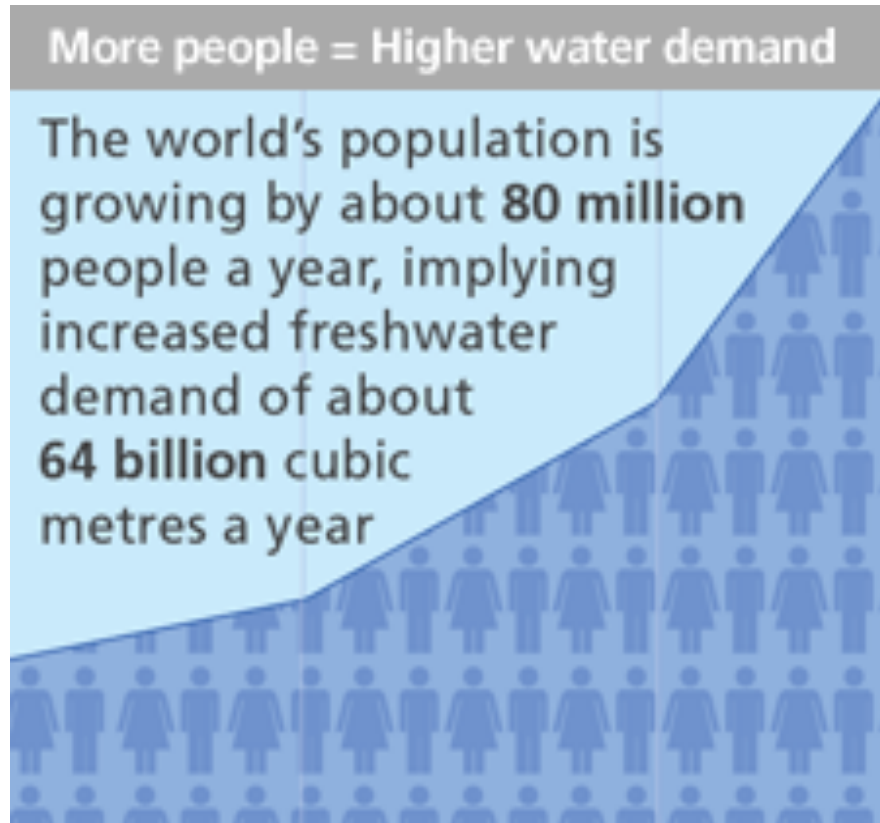
Pollution



Every day, 2 million tons of human waste are disposed of in water courses.

Status of Water Resources

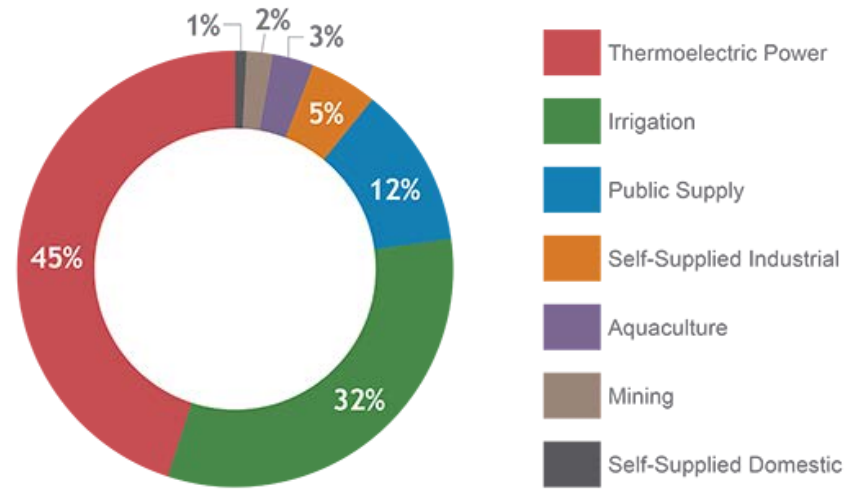
Availability



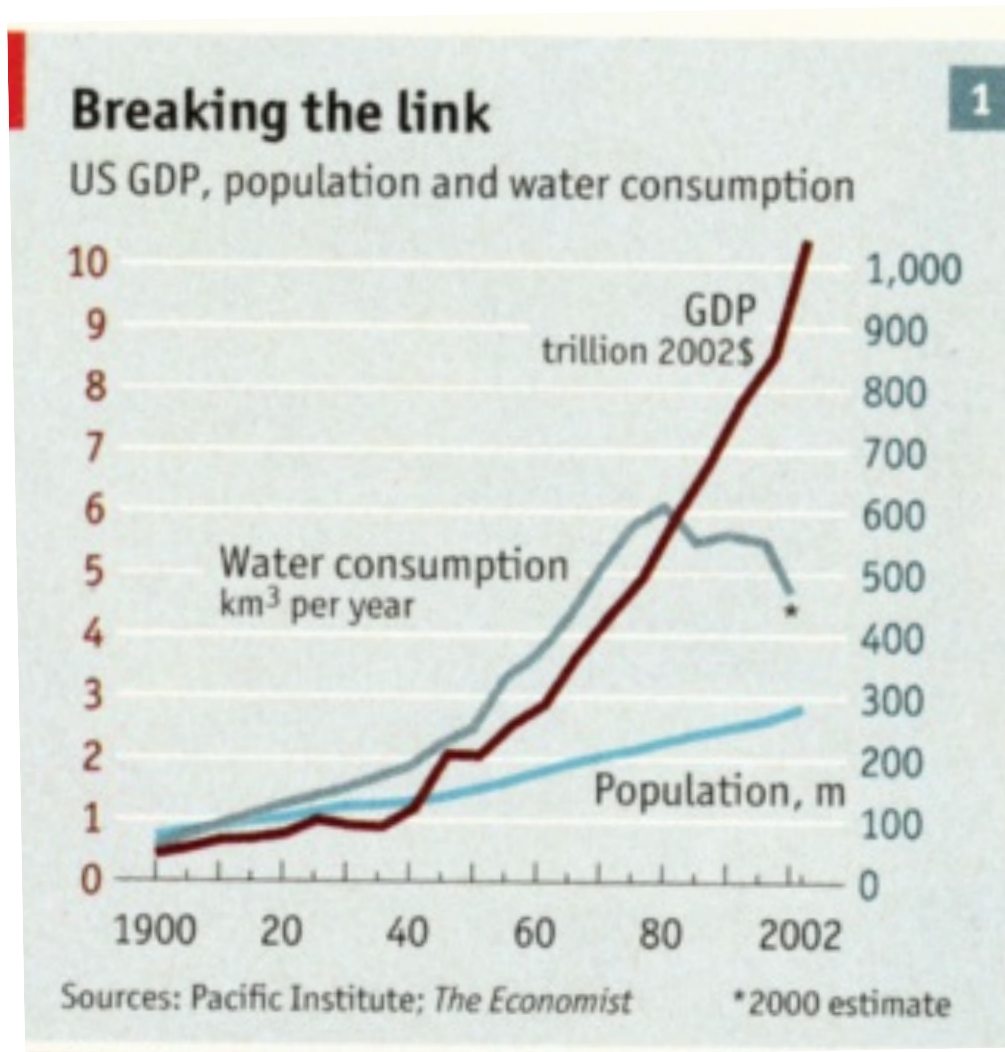
Water Use



U.S. Freshwater Withdrawals (2010)

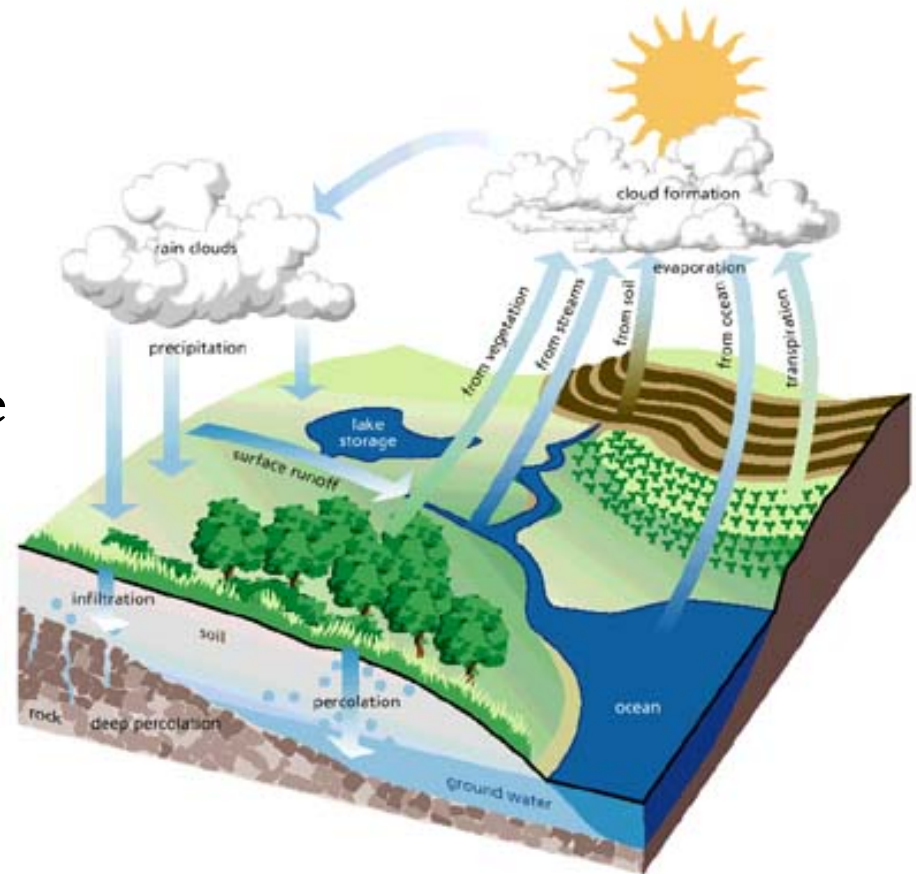


Water Consumption Trends

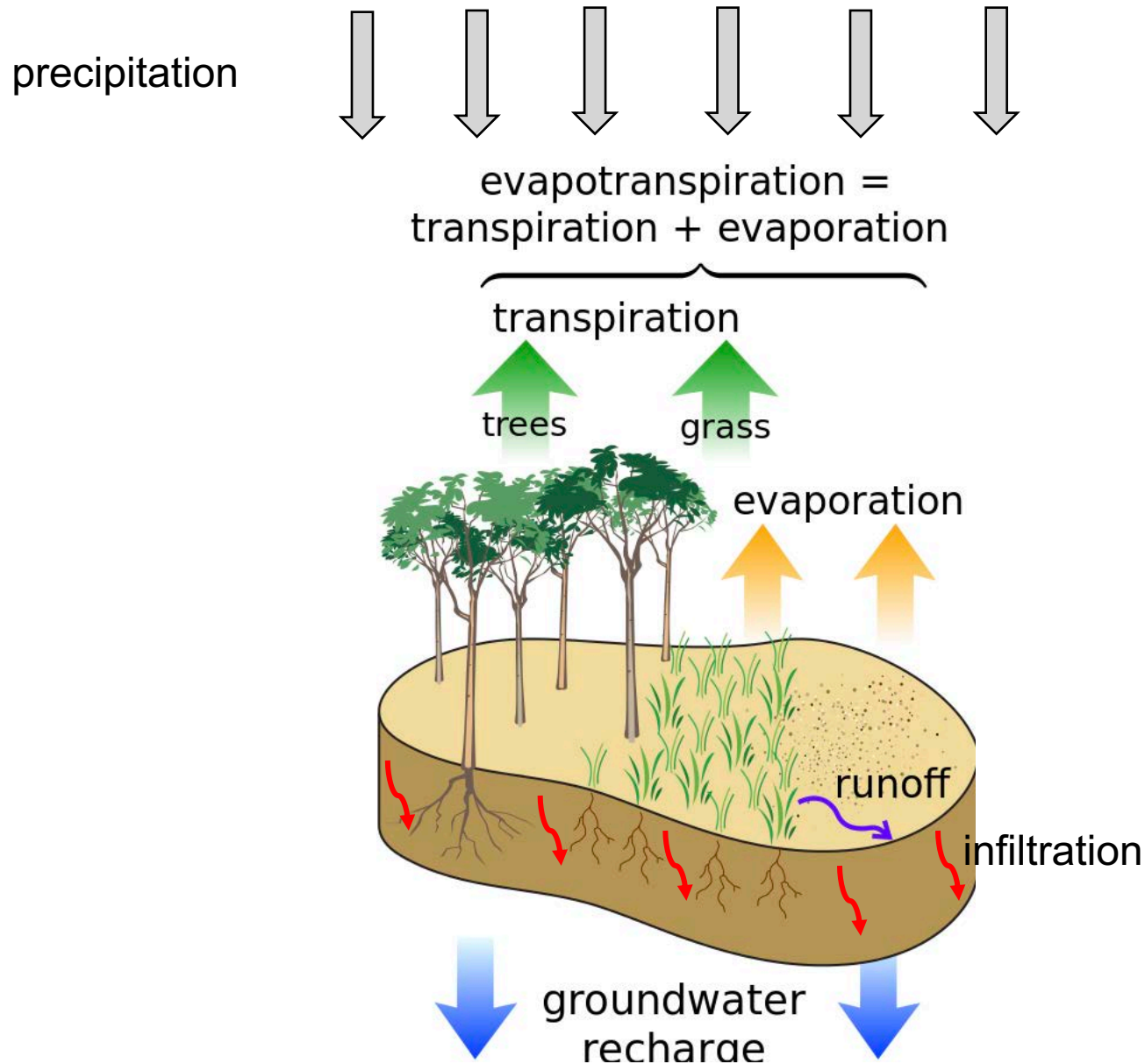


Hydrologic Cycle

- The processes and pathways involved in the circulation of water from land and water bodies to the atmosphere and back again (follows *law of mass conservation*).
- Fundamental definition
 - hydrologic balance or water budget
 - $\text{Inputs} - \text{Outputs} = \Delta\text{Storage}$

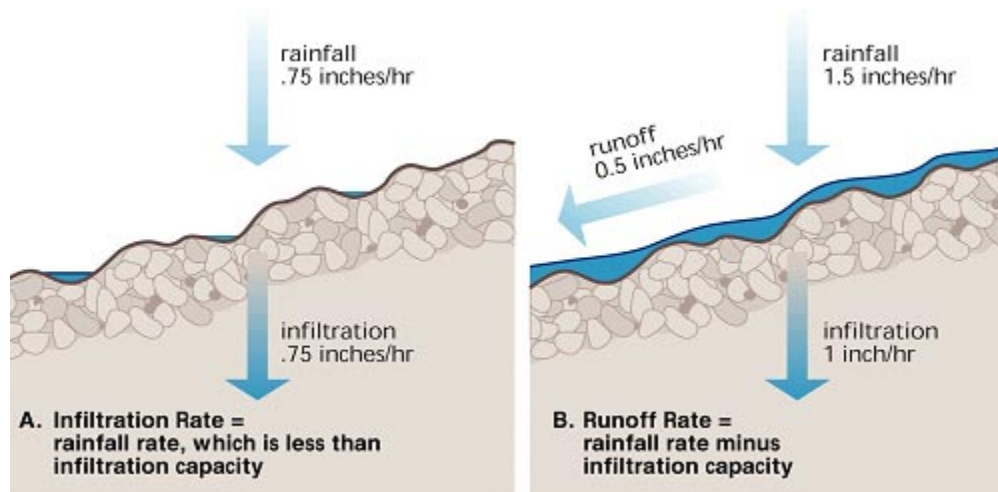


Water in the Terrestrial Environment



Factors that Influence Infiltration and Runoff

- Infiltration rate, rainfall intensity and soil type

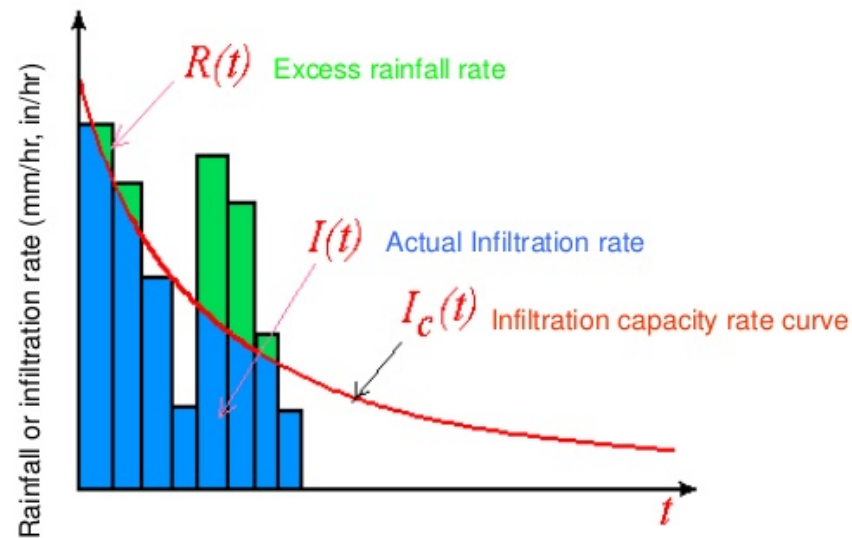


Infiltration is the process by which water on the ground surface enters the soil.

Factors that Influence Infiltration and Runoff

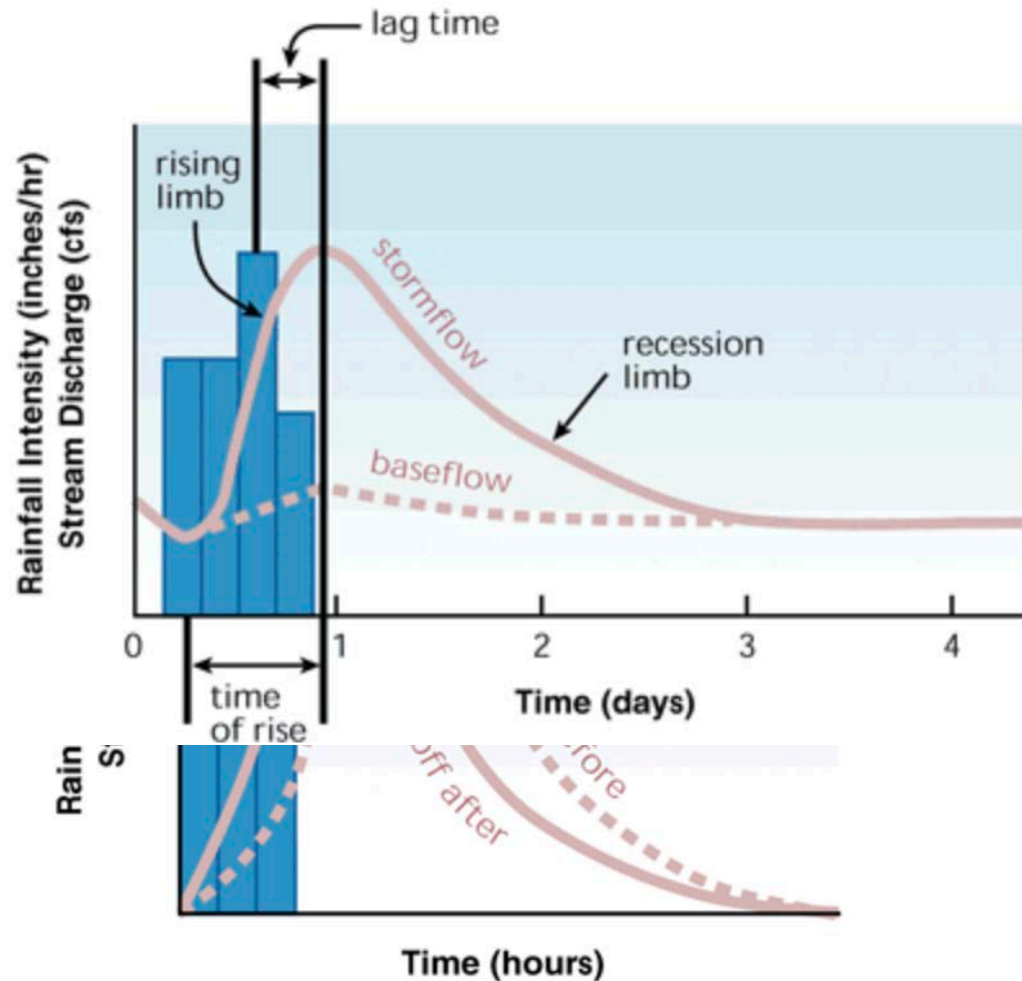
- Precipitation

Infiltration and excess rain



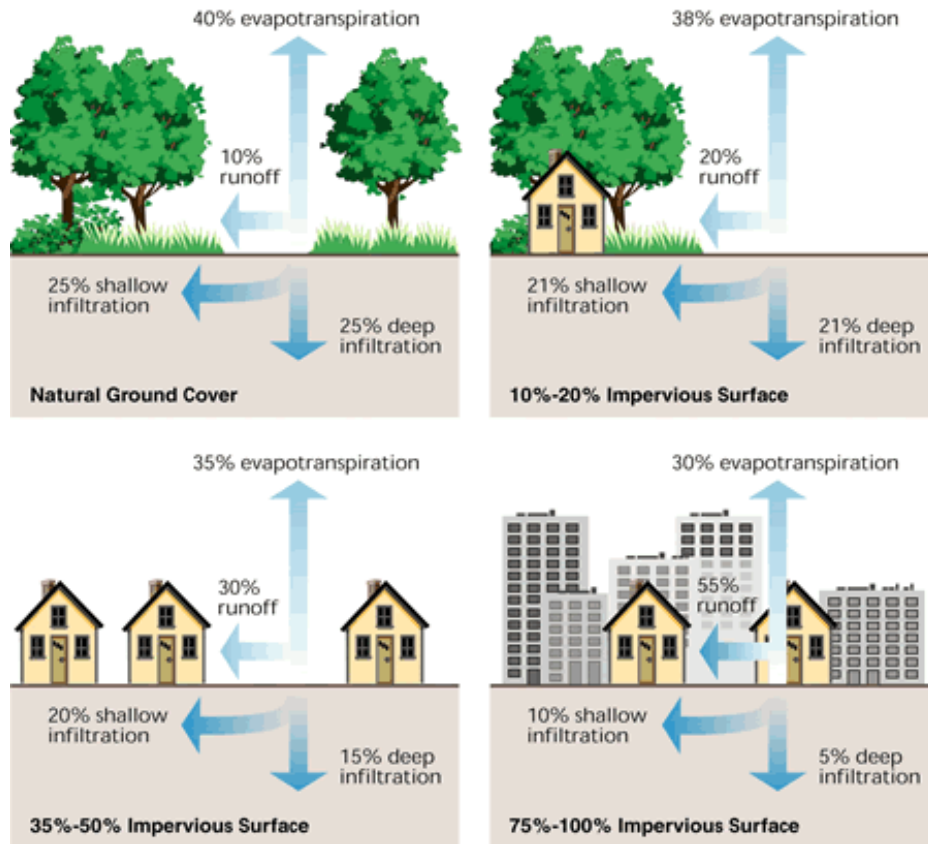
Streamflow Hydrograph

- Vegetation



Factors that Influence Infiltration and Runoff

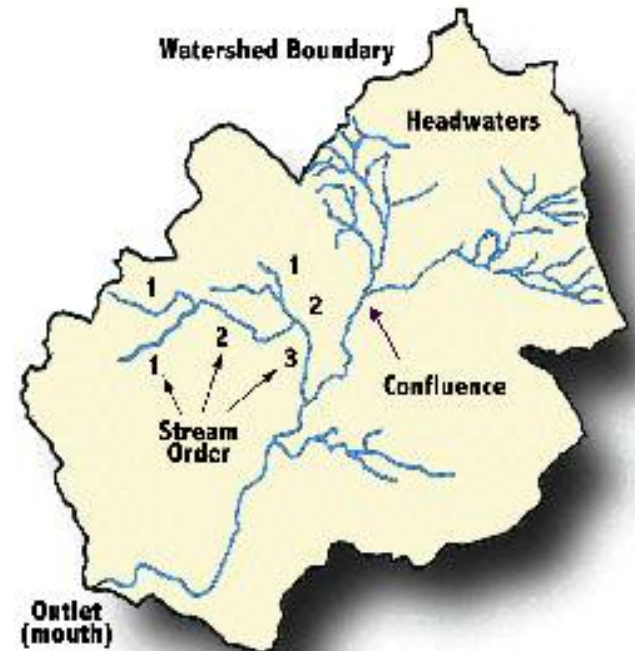
- Land Cover/ Land Use



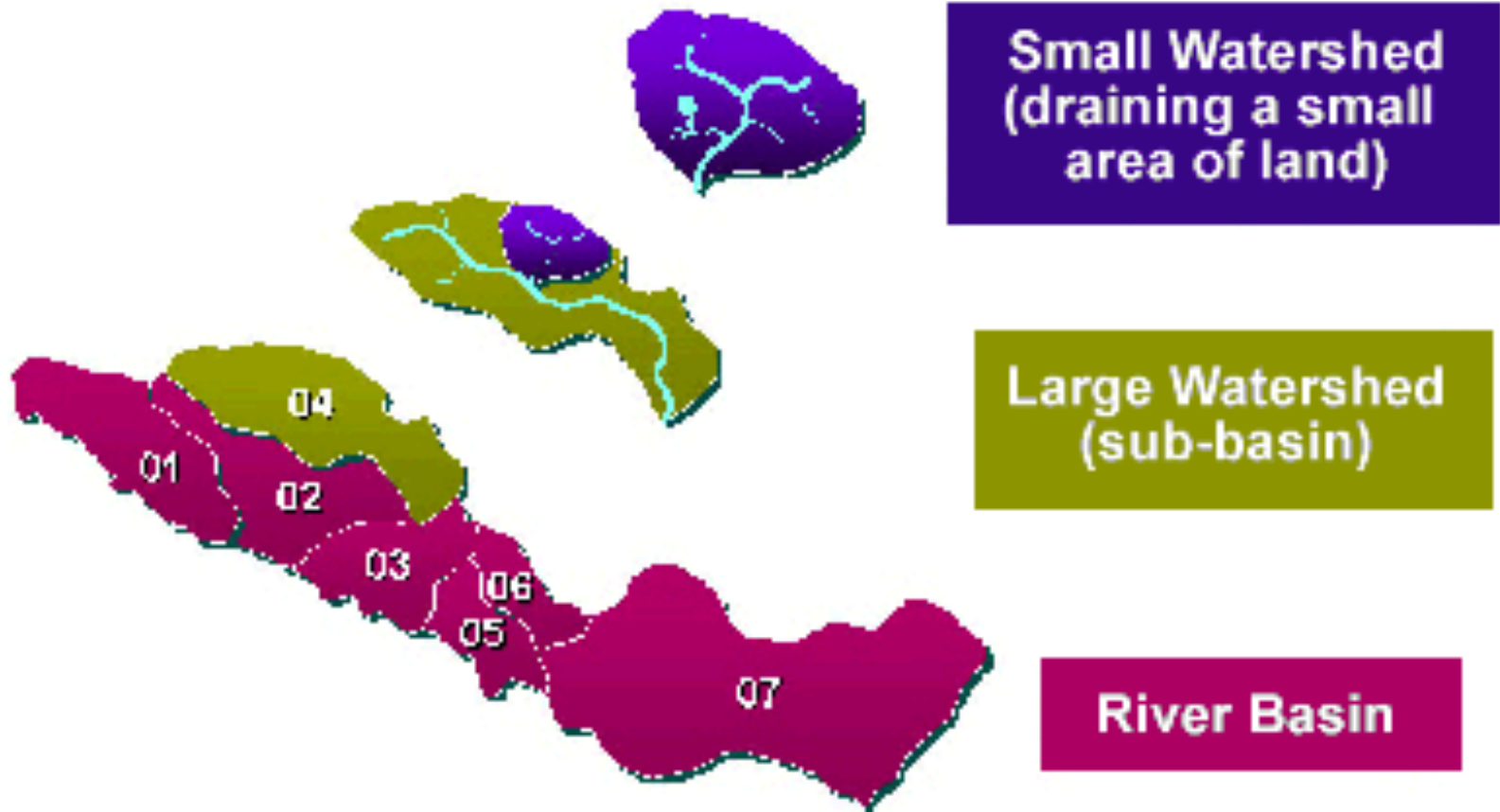
<https://runoff.modelmywatershed.org/>

What is a Watershed?

Topographically delineated area drained by a stream system - that is, the total land area above some point on a stream or river that drains past that point. The watershed is a hydrological unit that is often used for planning and management of natural resources. (Catchment)



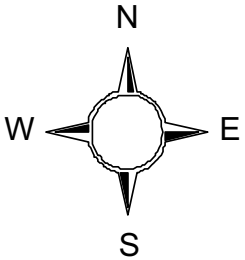
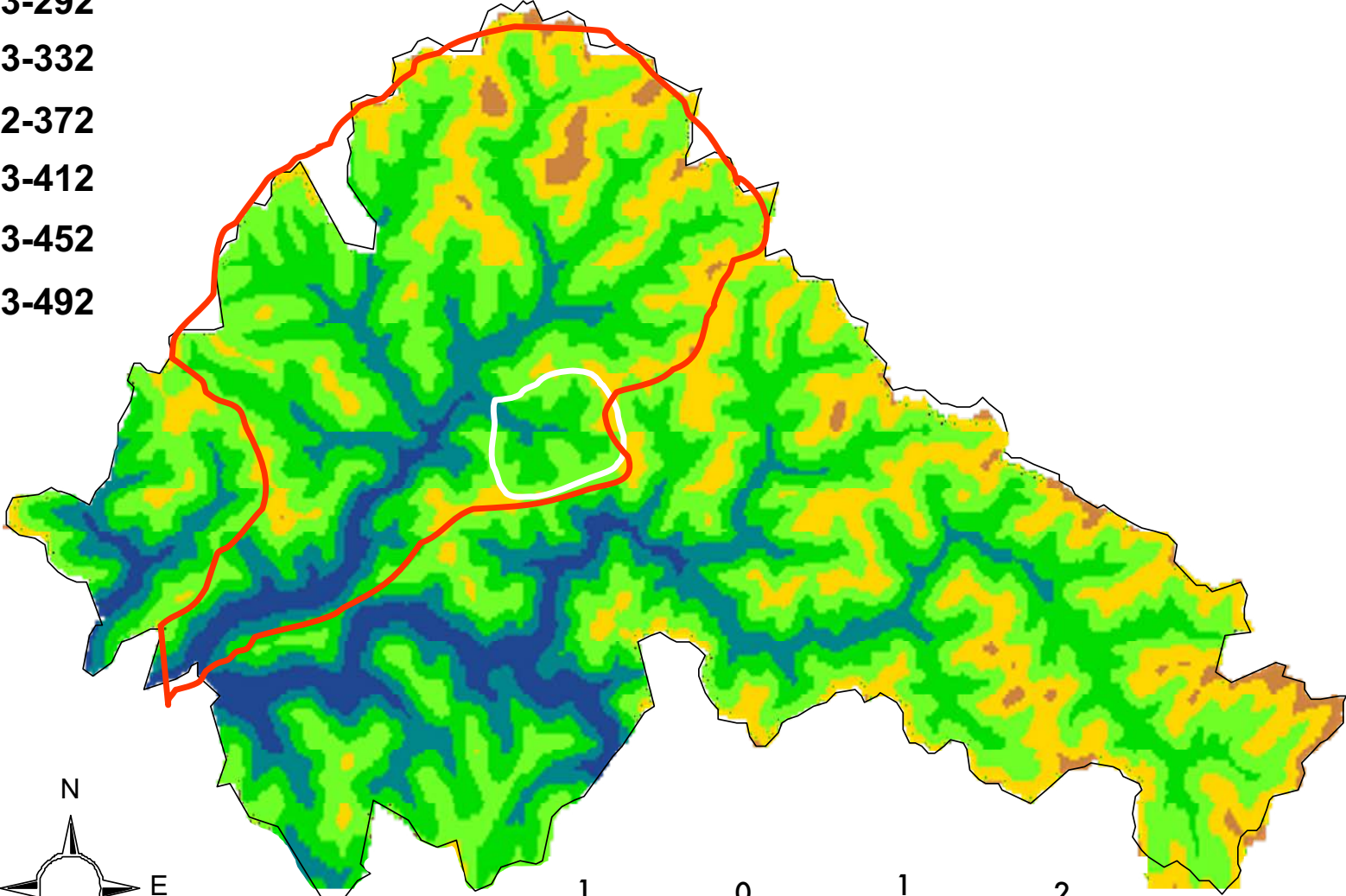
Watersheds Vary in Size



HUC = Hydrologic Unit Codes

ROBINSON FOREST

Elevation (m)



Stream Classification

Often we need ways to classify stream systems for watershed management purposes, so that we can predict:

1. stream behavior
2. sediment and chemical relationships
3. extrapolate info collected on one site to another
4. framework for communication among stream and watershed managers

Stream Types

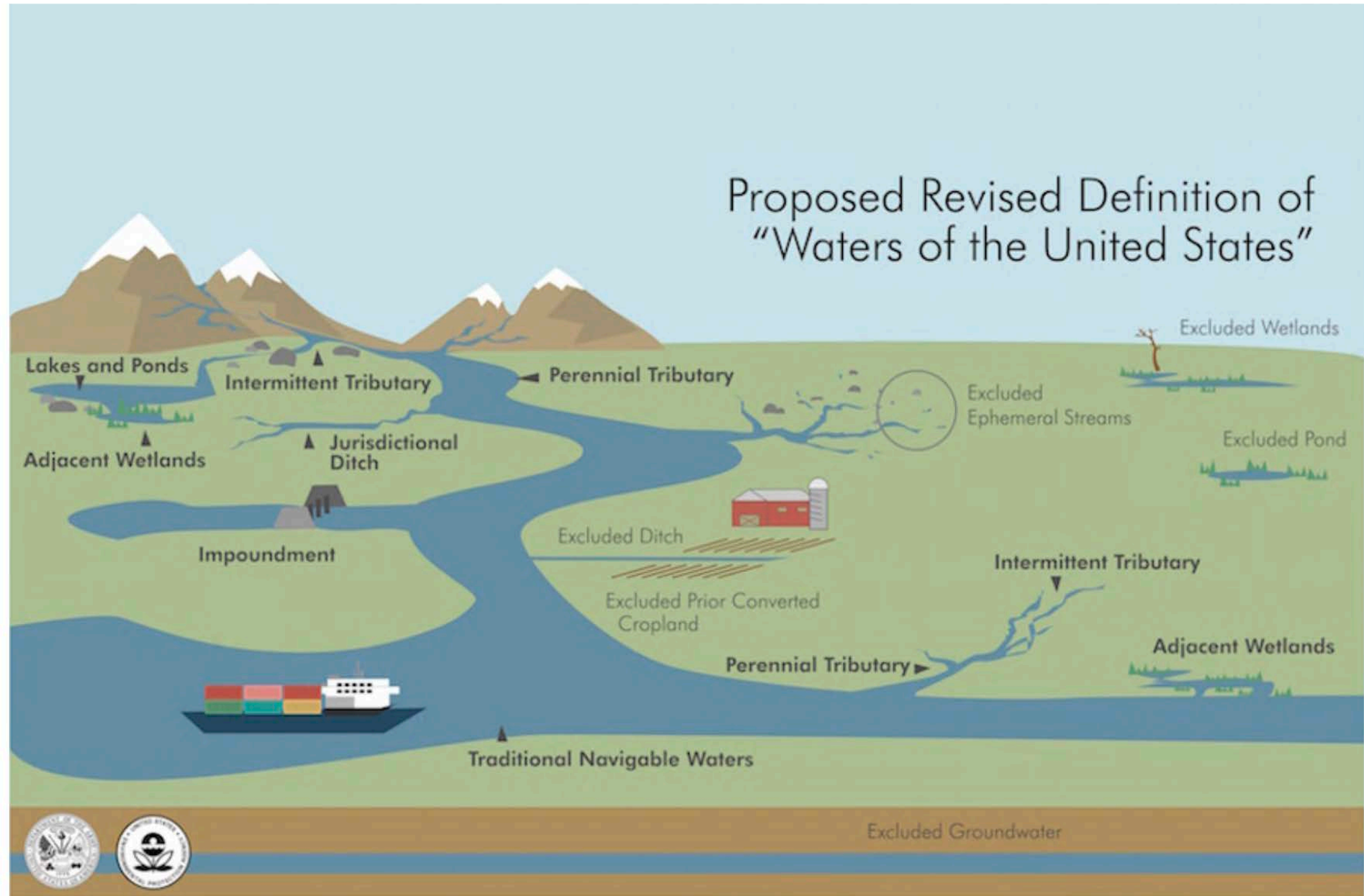
Flow Permanence:

1. Ephemeral
2. Intermittent
3. Perennial



WOTUS

Proposed Revised Definition of "Waters of the United States"



* For illustrative purposes only. Proposed jurisdictional waters in bold.



Surface mining: Valley Fills



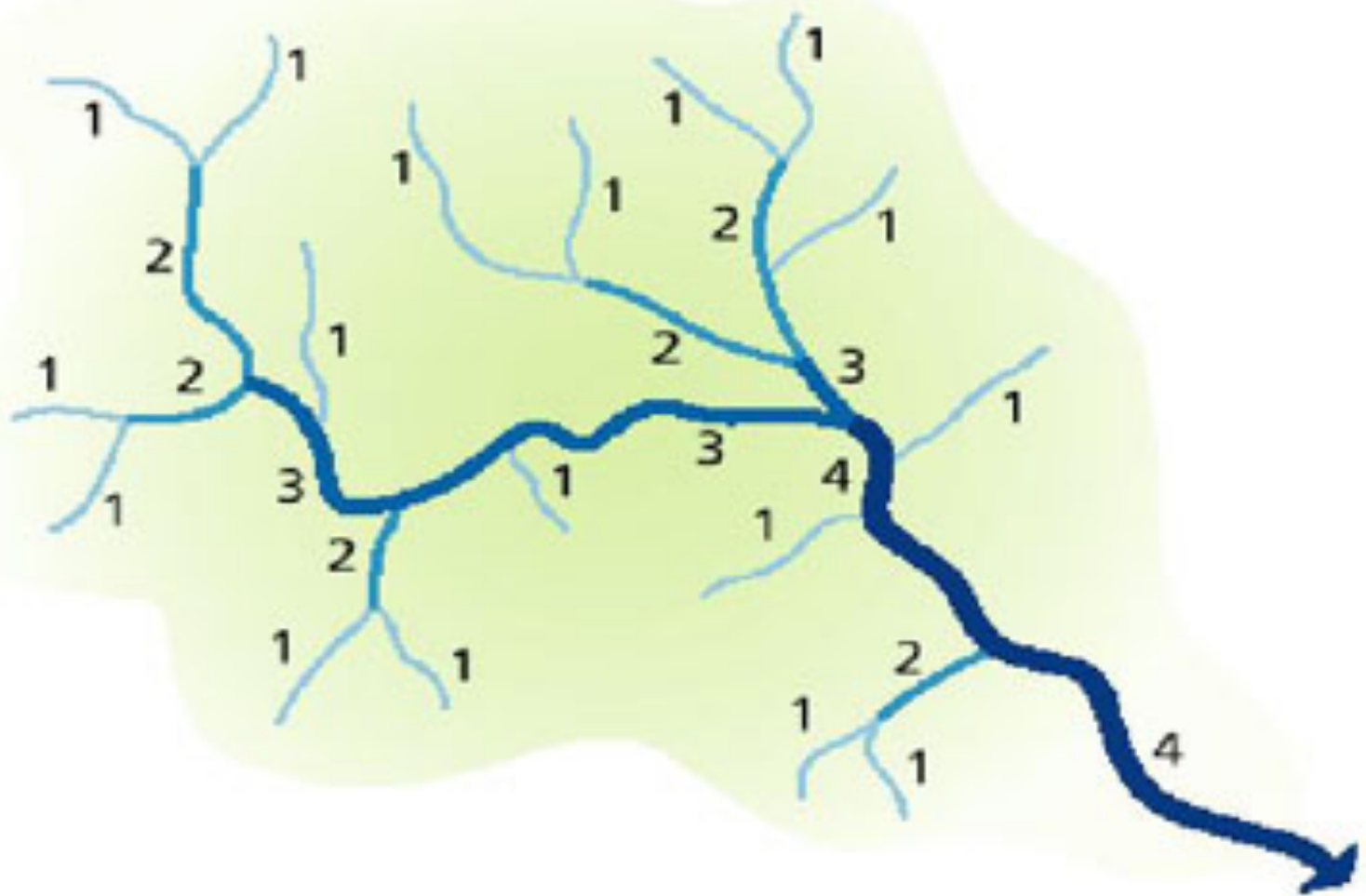
Ditches!



Stream Ordering

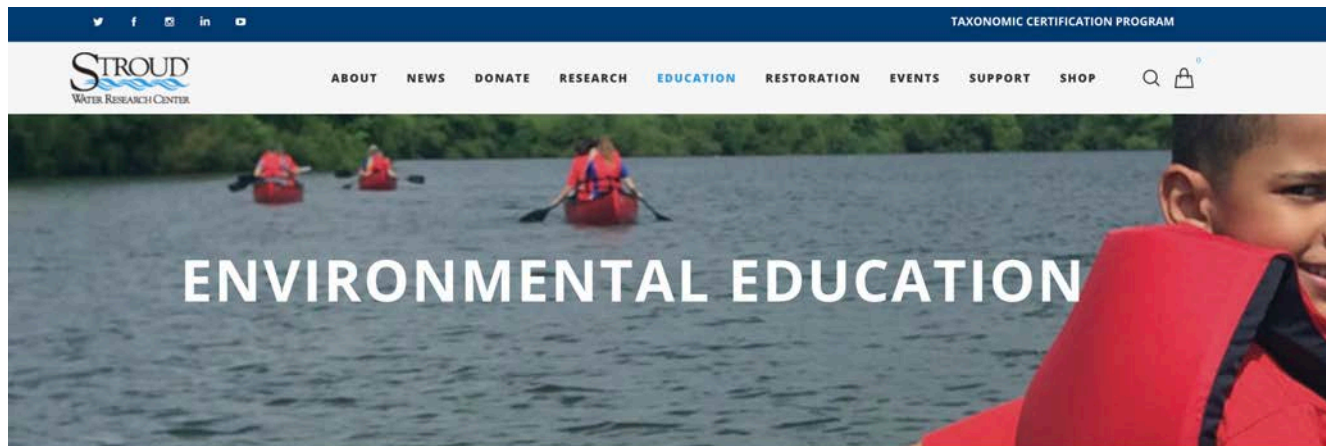
A method of classifying, or ordering, the hierarchy of natural channels within a watershed was developed by Horton (1945). Several modifications of the original stream ordering scheme have been proposed, but the modified system of Strahler (1957) is probably the most popular today.

Stream Ordering



Watersheds

<https://stroudcenter.org/education/>



[HOME](#) / [ENVIRONMENTAL EDUCATION](#)

A Watershed Approach to Education

Stroud™ Water Research Center's education department interprets the research of our scientists. Our programs are multidisciplinary and oriented to a wide audience. We hope that through exposure to our programs and information, people will be motivated to become responsible stewards of freshwater resources.

Our educators have developed extensive resources for educating adults and students grades 4 and up about watersheds and their importance. On-site and off-site [school](#) and [scout](#) programs, [professional development workshops](#), and [community and family programs](#) are just some of the available options.



Stroud Center - WikiWatershed

MODEL MY WATERSHED



Model storms and compare conservation or development scenarios.

MONITOR MY WATERSHED



Share your water-quality data and explore data from other sources.

RUNOFF SIMULATION



Explore how land use and soil determine stormwater runoff.

ENVIRODIY



Join a community for do-it-yourself environmental monitoring.

LEAF PACK NETWORK



Learn about your stream's health by performing a leaf pack experiment.

WATER QUALITY MOBILE APP



Enhance stream study and monitoring activities with a mobile app.

<https://modelmywatershed.org/>

Protecting Water Resources

(Minimizing Pollution Footprint)



Protecting Water Resources

(Maintain Riparian Zones)

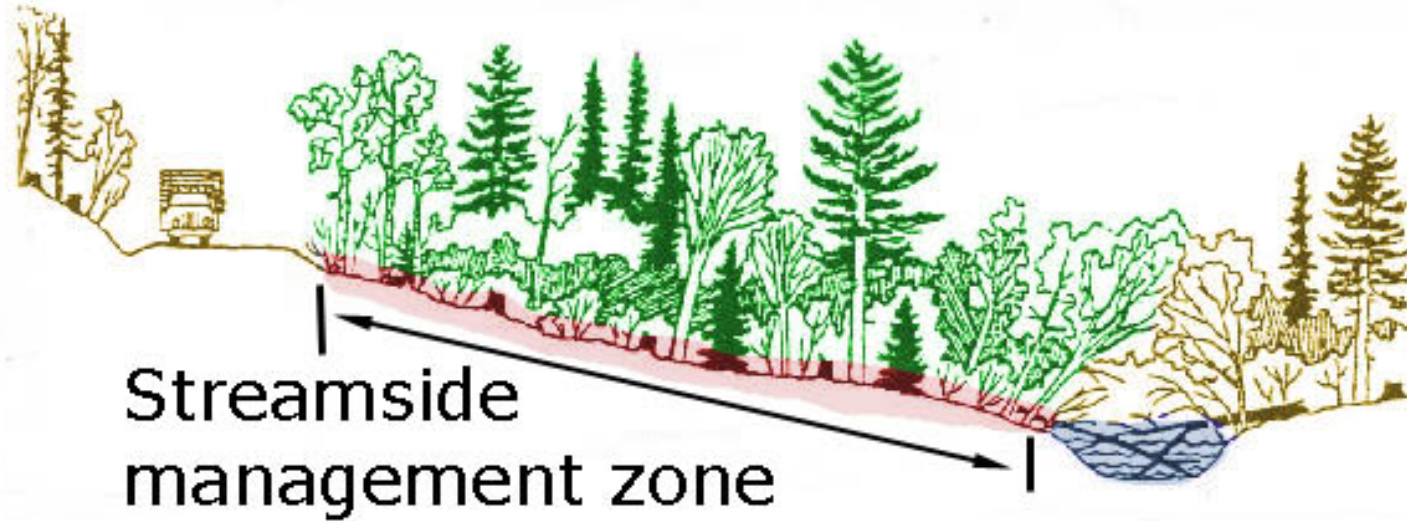
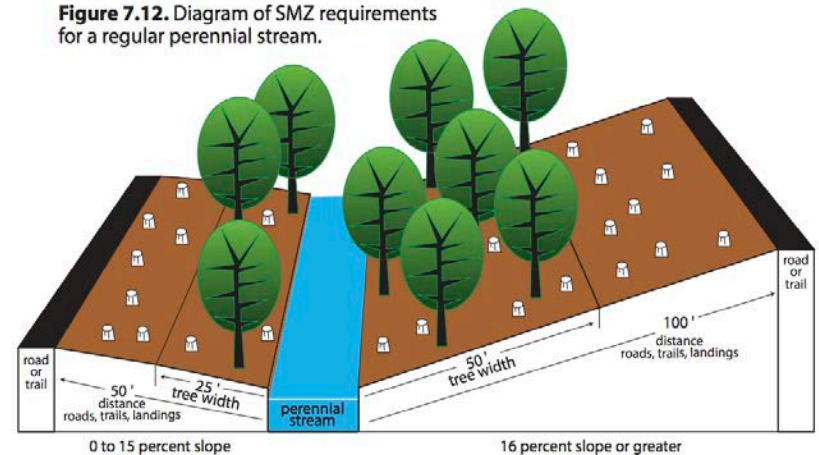


Figure 7.12. Diagram of SMZ requirements for a regular perennial stream.



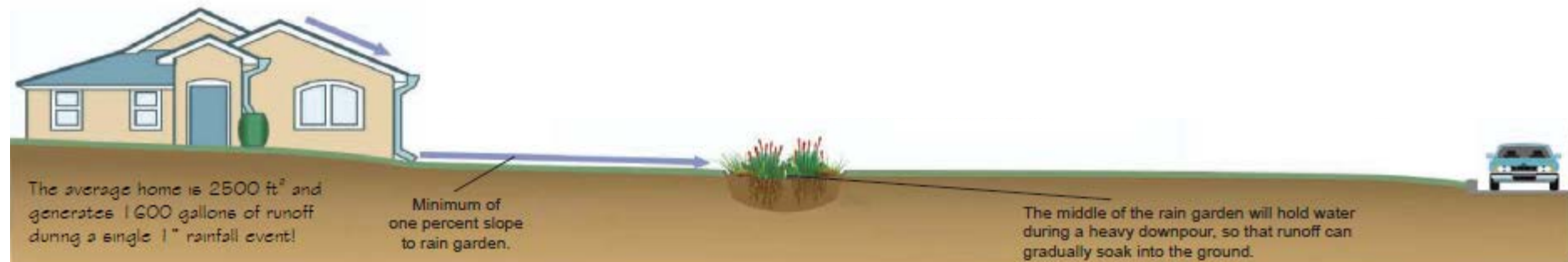
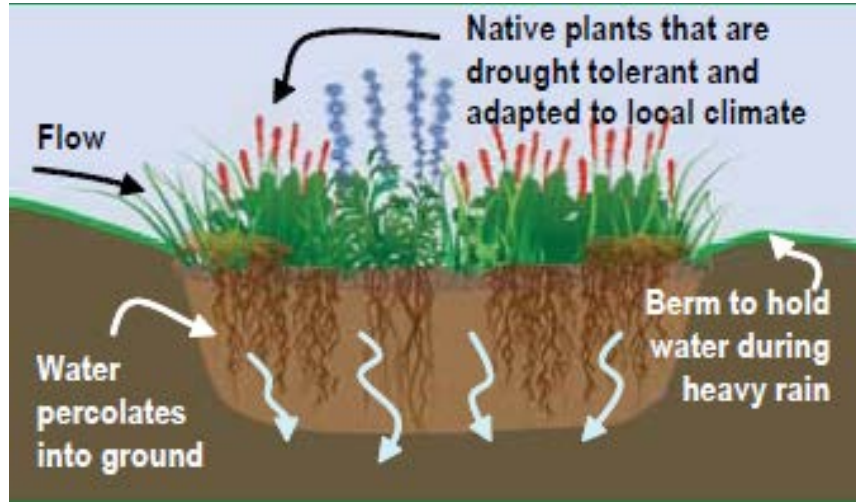
Protecting Water Resources

(Slow Runoff – Green Roofs)



Protecting Water Resources

(Slow Runoff – Rain Gardens)



Protecting Water Resources

(Water Harvesting)



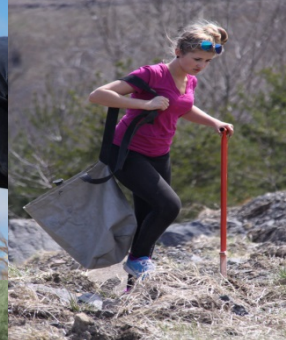
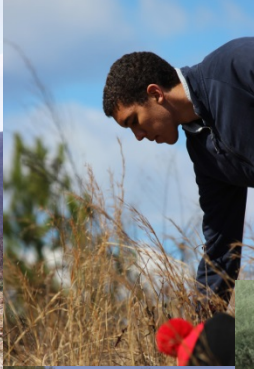
Plant Trees!

(Bringing Back the Forest)

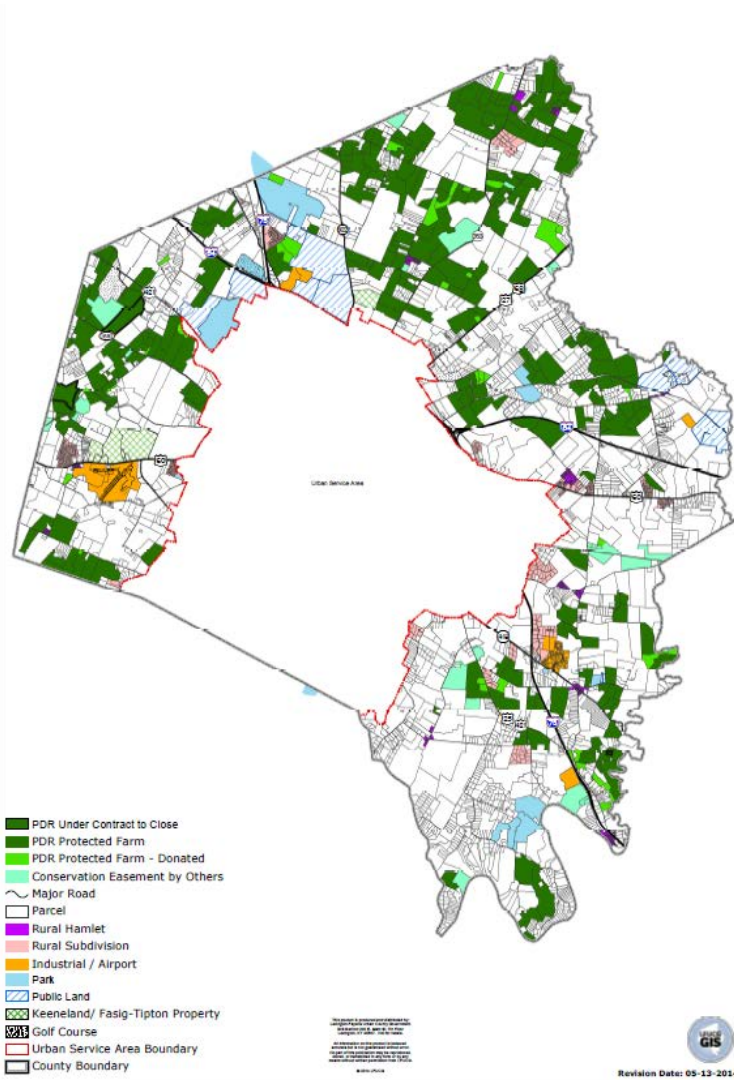
2009-2020:

- >2,000 partner organizations
- >20,000 volunteers
- >3.3 million trees planted
- 5,000 acres in 8 states and +++





Protecting Water Resources (Green Space Preservation)



Purchase of Development Rights

Protecting Water Resources

