Free Workshop
Using Rain Barrels and other
Waterscapes to Maintain the Balance

KEYSTONE
Clean Water Team

Presentation April 24, 2023
Carbon County Environmental Education and Outreach

Protecting Our Groundwater / Surface Water Resources
By Working as a Community

KNOW YOUR H2O™
Water Research Center

Document- Copyright Issues

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http://www.bfenvironmental.com

http://www.water-research.net
http://www.knowyourh20.com

B.F. Environmental Consultants Inc.

- Professional Consulting Services in the areas of water quality, soils, stormwater, geology, aquifer analysis, and land-development.
- Baseline – Chain-of-Custody
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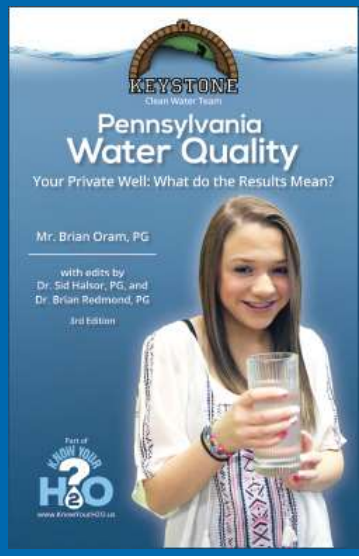
PACleanwater.org

Keystone Clean Water Team (501 c3)

Private Well Owner Education
Source Water Protection Issues
Alternative, Renewable, and Homegrown Energy Issues
Training Young Adults and Children about Energy and The Environment
Citizen Groundwater and Surface Water Database
Natural Gas and Baseline Water Testing – Training Professionals
Hazards in the Community – “Neighborhood Environmental Reports”

http://www.knowyourh20.com



The Message of the Know Your H20 Program

- Get On the Path to Clean Water
  - Learn
  - Diagnose /Test
  - Act
  - Share

Please Visit Us at:
http://www.knowyourh20.com
"Need a Community Page?"

Presented by:

Mr. Brian Oram, Professional Geologist (PG),
Soil Scientist, Licensed Well Driller,

Know Your H20
http://www.knowyourh20.com

and

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http://www.bfenvironmental.com

KNOW YOUR H20 – UPDATED OUR SURFACE WATER QUALITY INDEX CALCULATOR

The KnowYourH2O™ Team has updated our Surface Water Quality Index Calculator

Using the book, Field Manual for Water Quality Monitoring, the National Sanitation Foundation surveyed 142 people, representing a wide range of positions at the local, state, and national level, about 35 water quality tests for possible inclusion in an index. Nine factors were chosen and some were judged more important than others, so a weighted mean is used to combine the values.

GO TO: Look Under Get Tools
https://www.knowyourh2o.com/outdoor/outdoor

KNOW YOUR H20 BLOG

https://www.knowyourh2o.com/indoor/water-blog

Wildlife and Lead Poisoning - Lead is not Just a Problem for Humans

Protect Yourself and Your Pets from Harmful Algal Blooms (HABs)

EPA Announces Lower Health Advisory Levels for Drinking Water for PFOA, GenX, PFAS, and other Forever Chemicals

WellSeal™ Gives Well Owners and Well Drillers Peace of Mind About Groundwater and Drinking Water Safety.

Stormwater Management for Homeowners

We are looking for “Guest” Blog Posts!

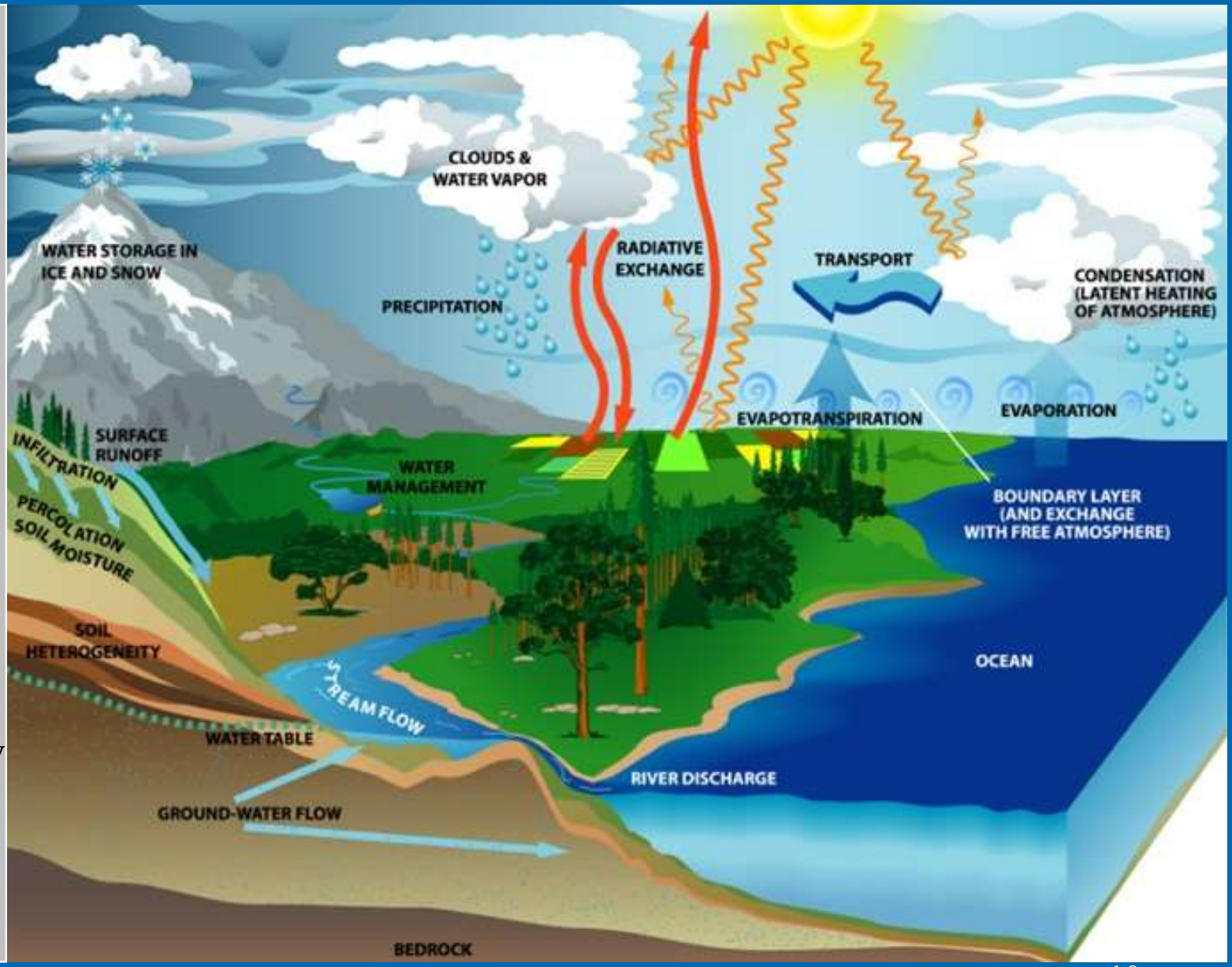
Agenda for Talk

- The Water Cycle
- Groundwater and Stream Flow
- Individual Stormwater Management Concepts
- Maintaining the Balance
- Other Programs
- Q & A Session

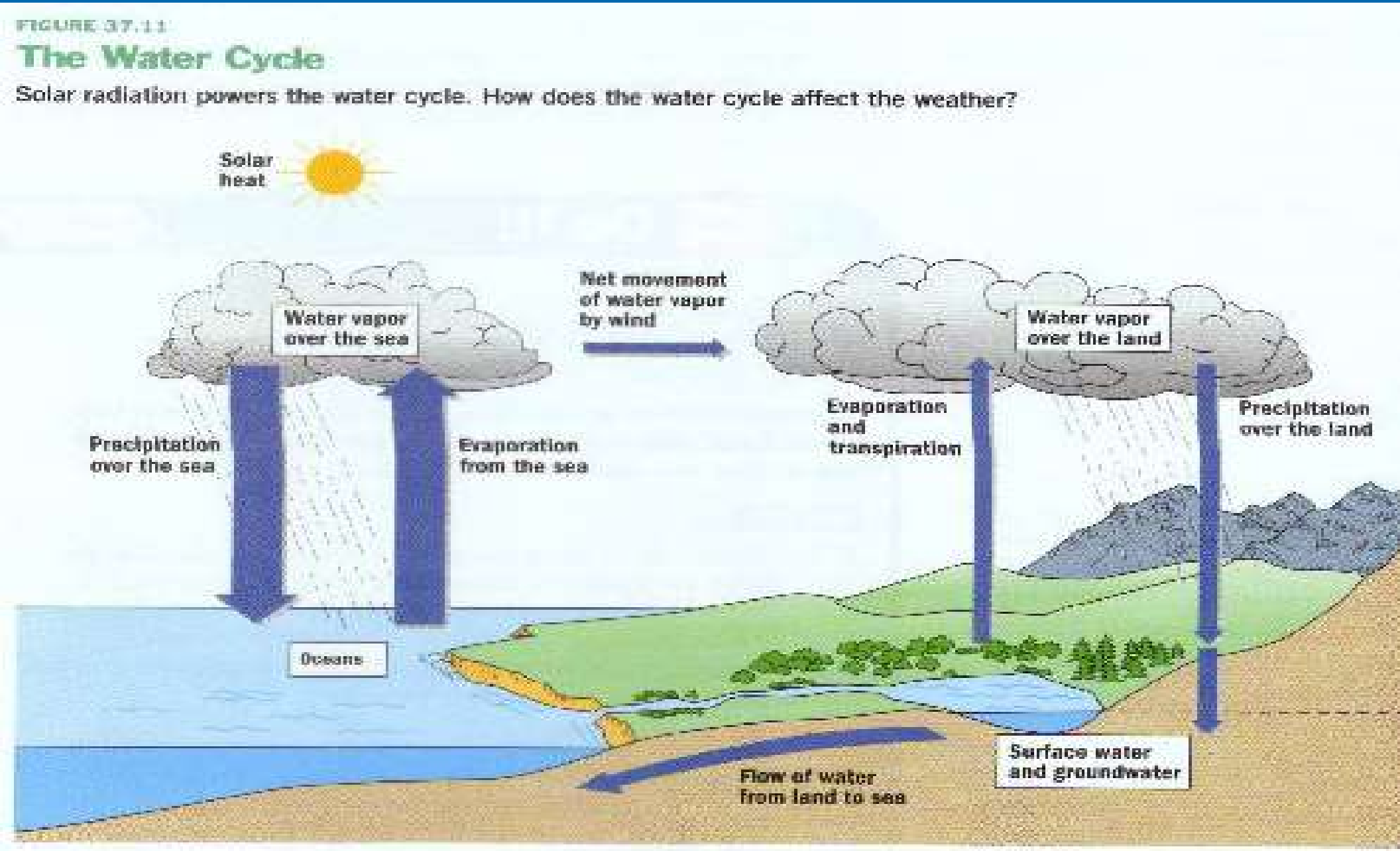
Components of the Water Cycle

<u>First The Ins</u>
Solar Energy Input
Precipitation
Condensation
Well Injection
Irrigation

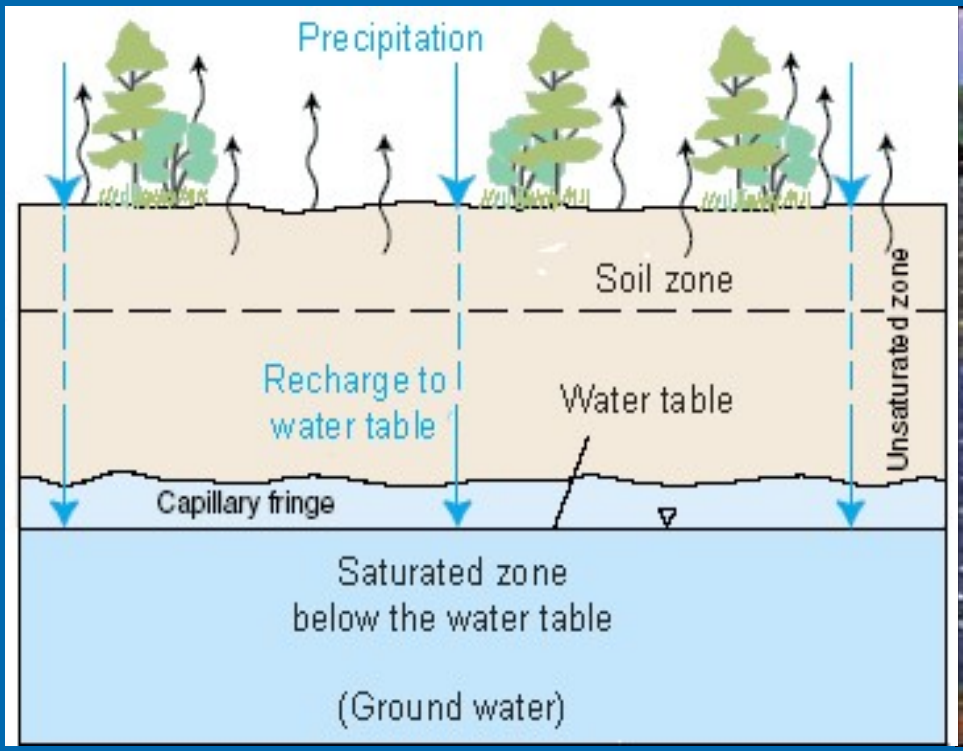
<u>The Outs</u>
Evaporation
Transpiration
Infiltration
Percolation
Runoff
Groundwater Flow
Surface Water Flow
Well Pumping

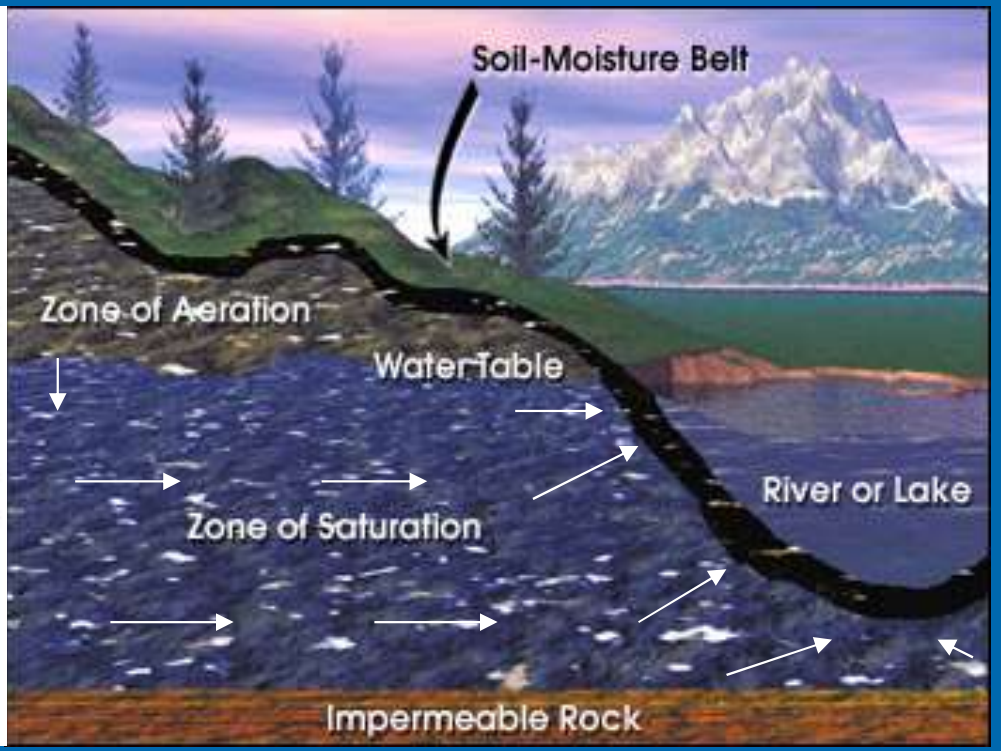


The Water Cycle
Powered by the Sun- Solar Power

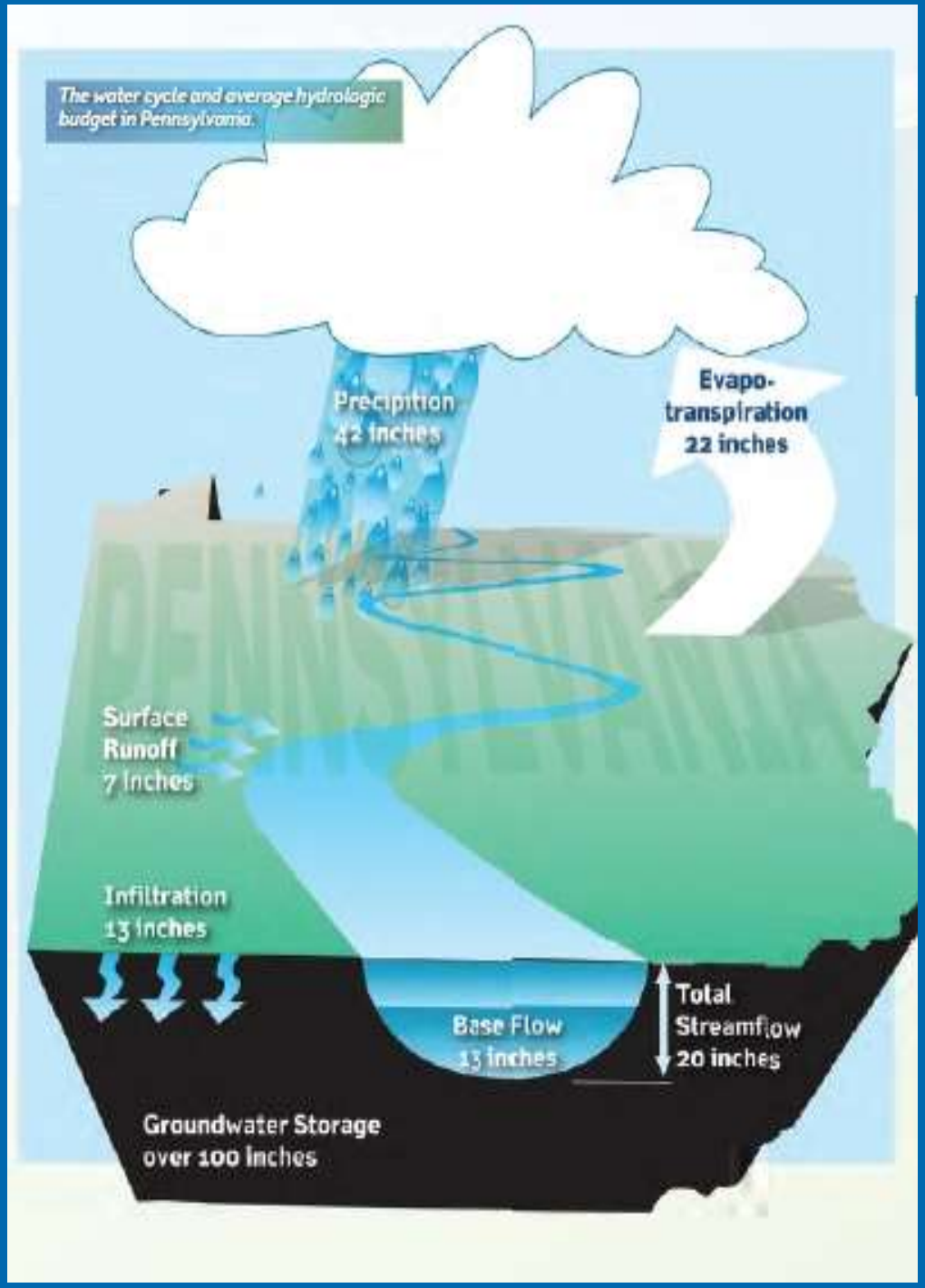


Groundwater
Zone of Saturation





Our Groundwater and Streams are Connected



Water Budget for PA

In

Precipitation – 42 inches

Out

Evapotranspiration – 22”

Total Streamflow – 20”

- Baseflow – 13”
- Surface Runoff – 7”

Therefore, 65% of streamflow is groundwater discharge.

Other

Storage in Groundwater

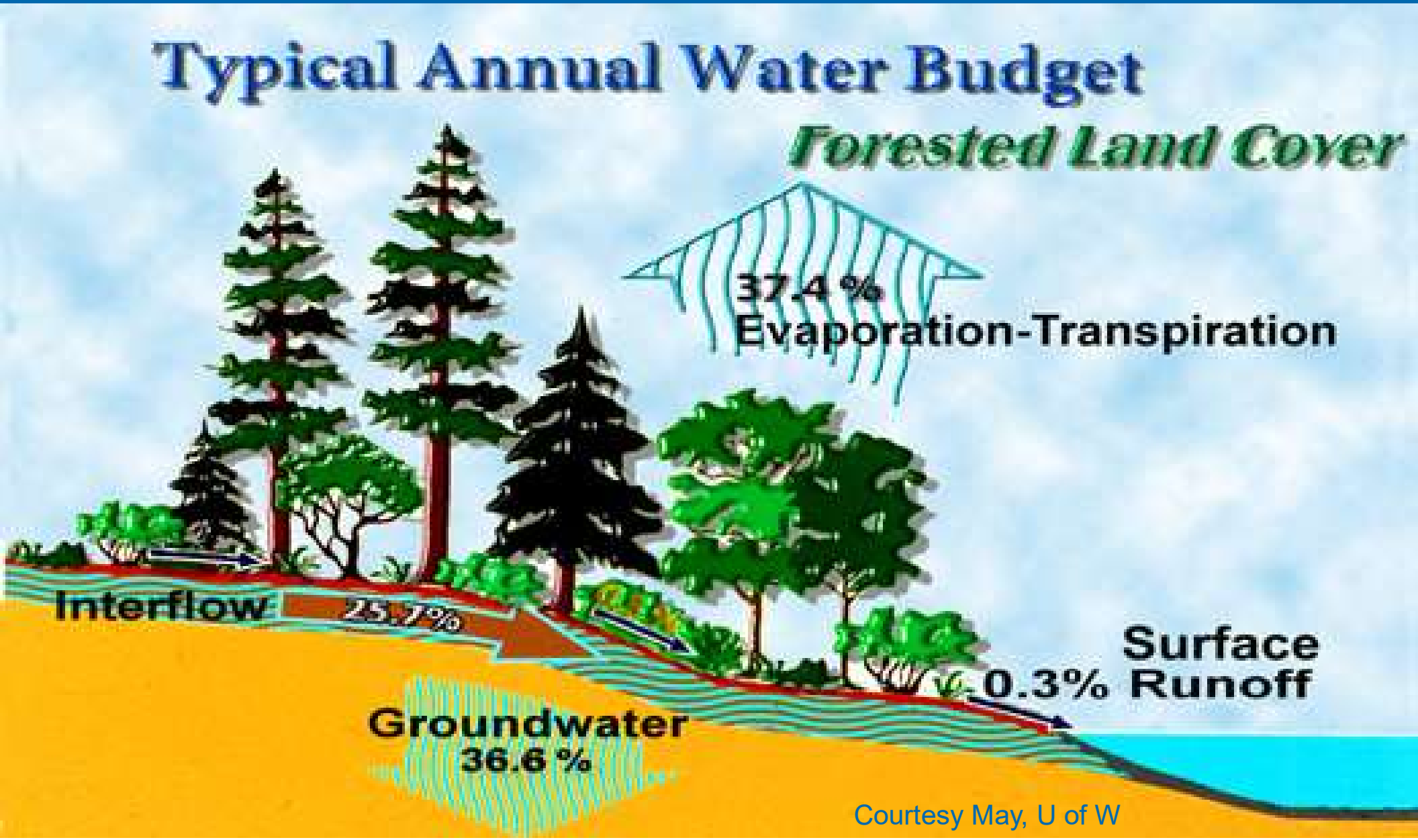
Aquifers over 100 inches*

* This is our “Water” Cushion.

Runoff / Overland Flow and Land-Use

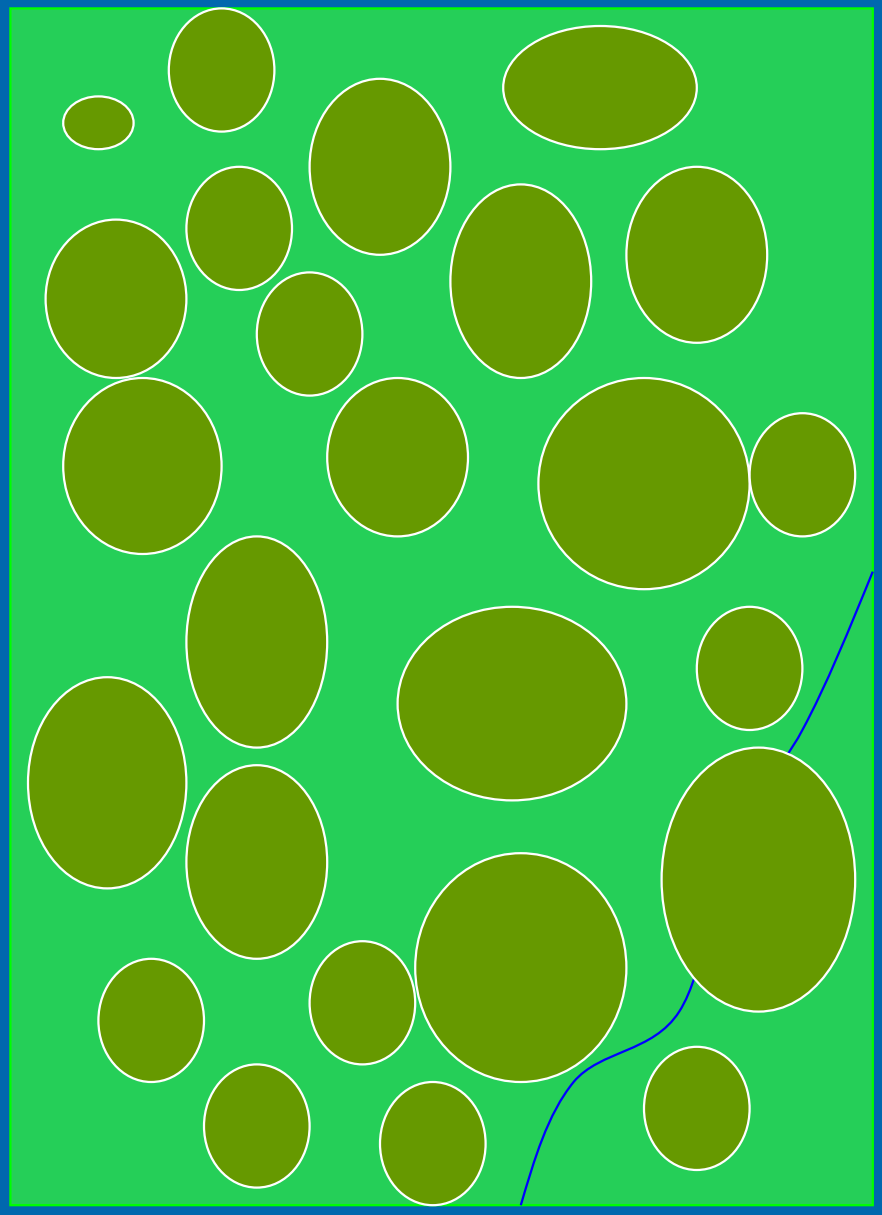
When Rainfall Rate Exceeds Infiltration
More Runoff and Less Groundwater Recharge.

Hydrology Under Natural Conditions



Courtesy May, U of W

1 acre Parcel



Forested Area – 1 acres

Rainfall – 42 ac-inches
1,140,500 gallons per year

Evaportranspiration – 22 inches
597,388 gallons per year

Runoff (5%) – 2.1 inches

Recharge – 17.9 inches

Baseflow to Stream (75%) – 13.4 inches

Total Stream Flow (13.4 + 2.1 = 15.5 inches)

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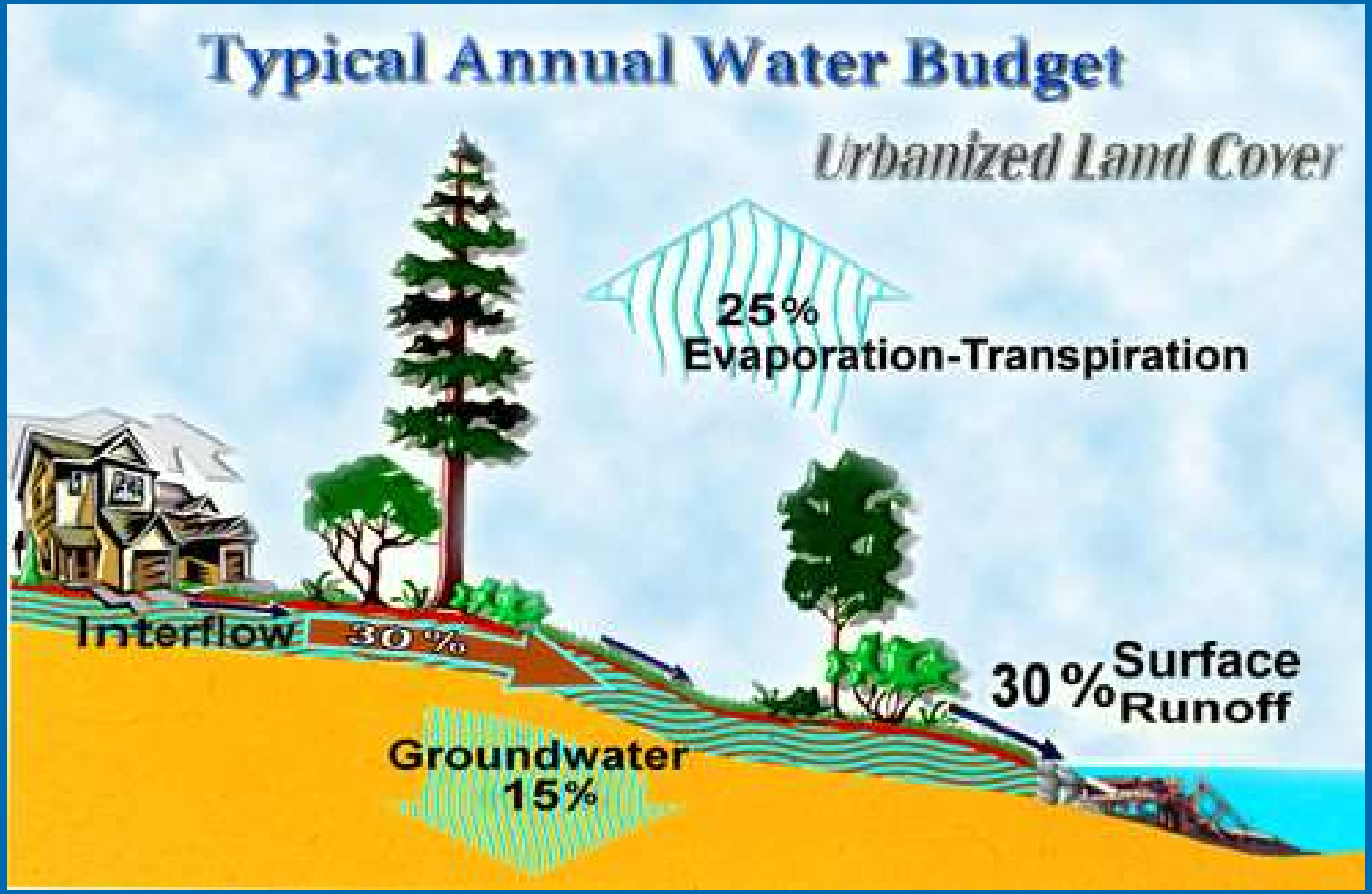
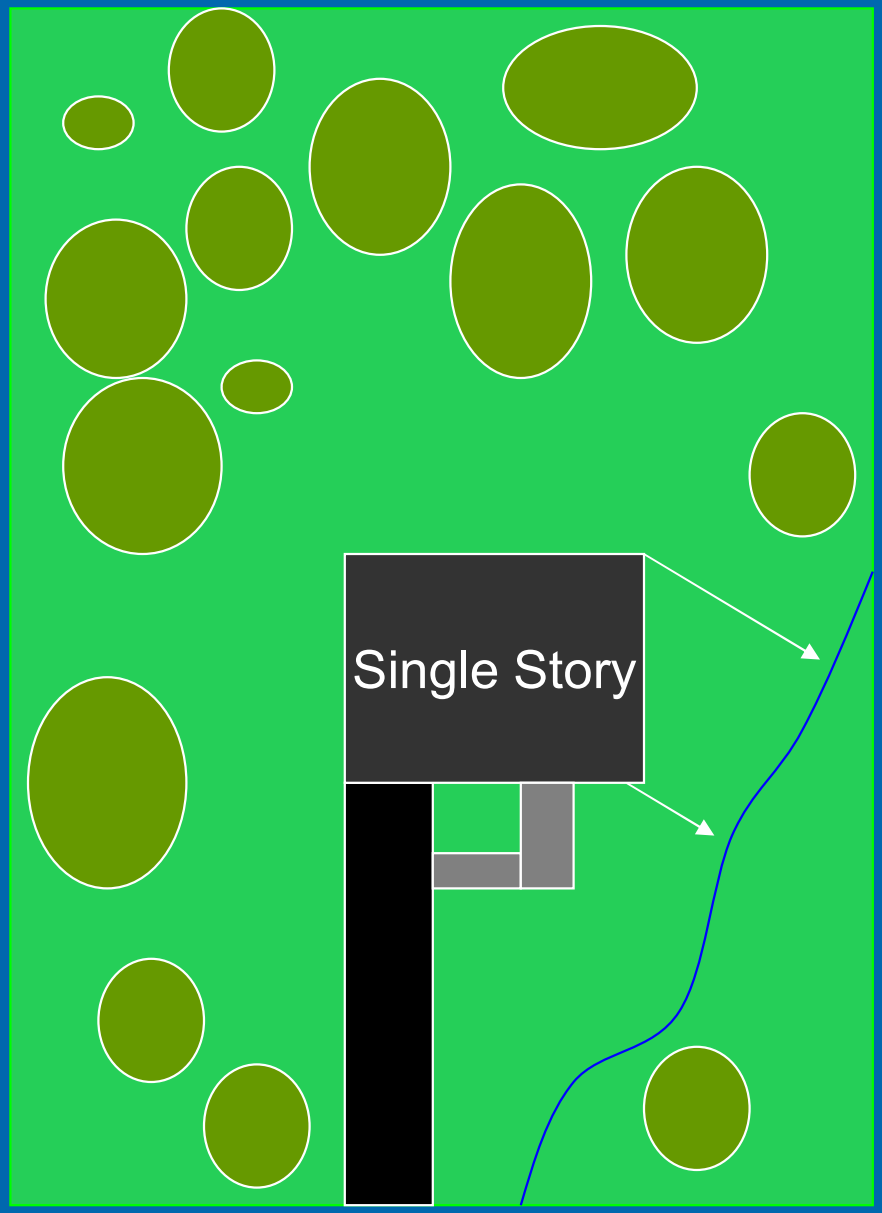
Developed Conditions



1 acre Parcel



Forested Area – 75%
Lawn – 15%
House and Pavement – 10 %

Rainfall – 42 ac-inches
1,140,500 gallons per year

Evaportranspiration – 18 inches

Runoff (23 %) – 10 inches

Recharge – 14 inches

Baseflow to Stream – 10 inches

Total Stream Flow (10 + 10 = 20 inches)

25% increase in stream flow, but 500% increase in runoff.

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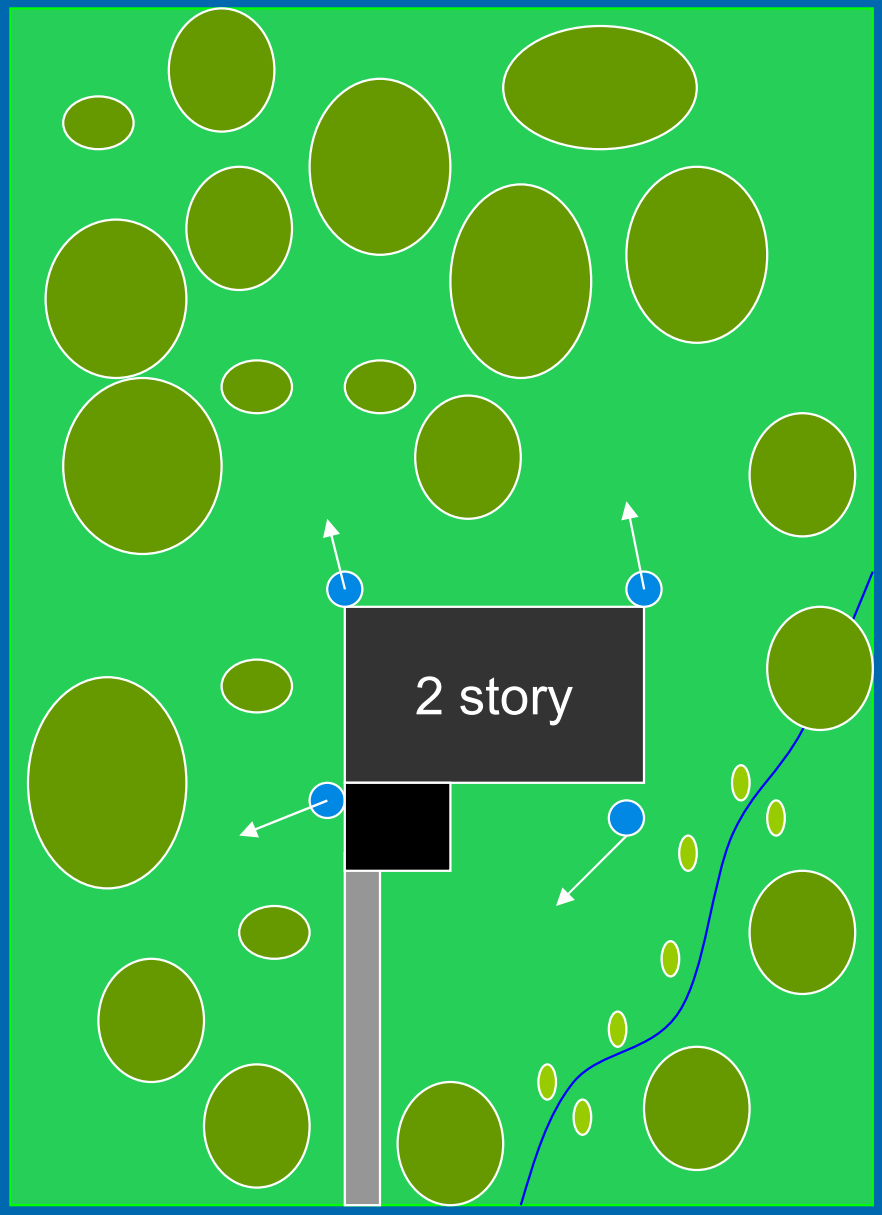
How Can We Change ?

- Baby Steps
  - Change Development Practices and Maintain Native Vegetation (Remove Pavement)
  - Use Rainwater Capture Systems for outside water uses (Rain Barrel / Water Feature).
  - Use Water Features and Bioretention Systems
  - Use Rainwater Capture for More Uses
  - Going to a Green Roof System

1 acre Parcel



Forested Area – 80%
Lawn – 10% (native vegetation)
House and Pavement – 10 %

Rainfall – 42 ac-inches
1,140,500 gallons per year

Evapotranspiration – 20 inches

Add 4- 80 gallon Barrels / Gravel Driveway – capture portion of 2-year storm and divert discharges to overland Flow.

Runoff (18 %) –7.5 inches

Recharge – 14.5 inches

Baseflow to Stream – 10.8 inches

Total Stream Flow (10.8 +7.5 = 18.3 inches)

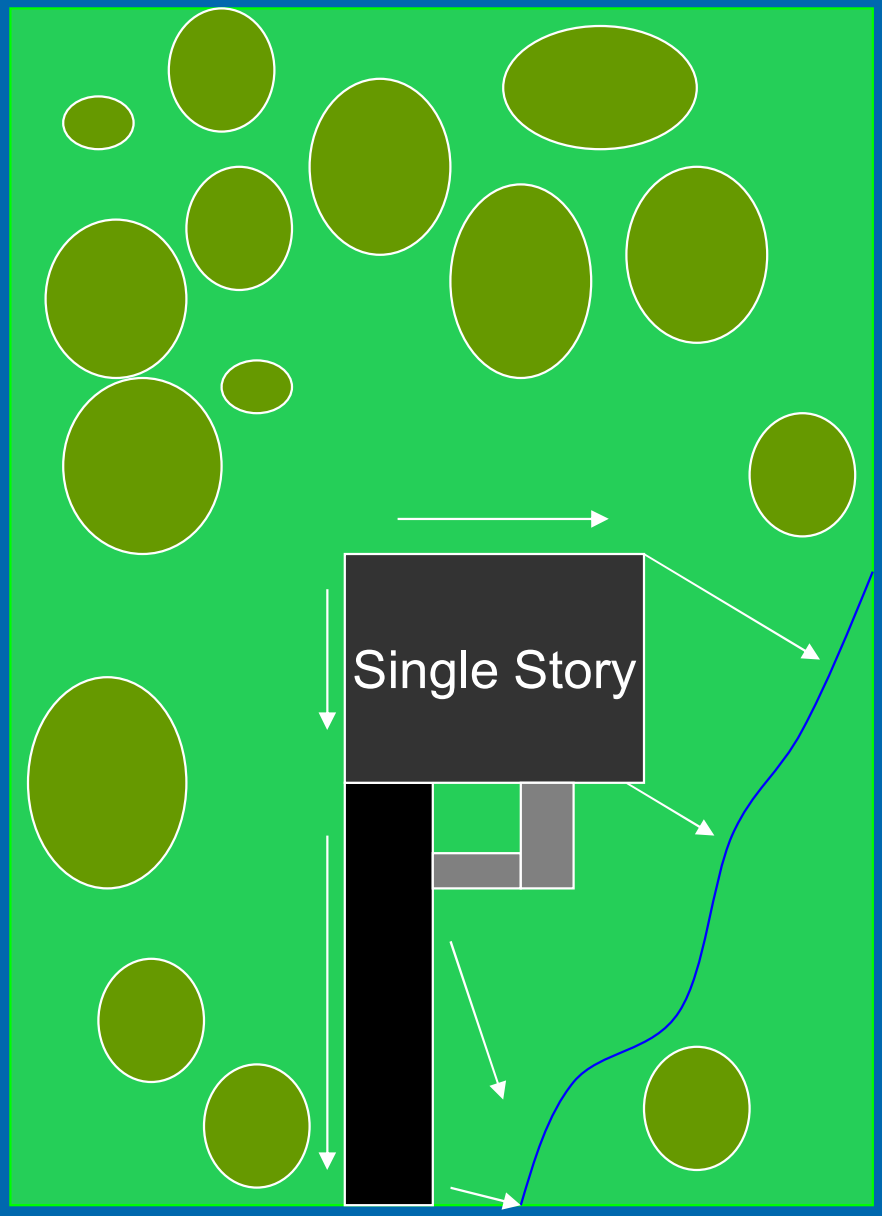
That is down from a 500% increase !

18% increase in stream flow, but 280% increase in runoff.

Rain Barrel Concepts

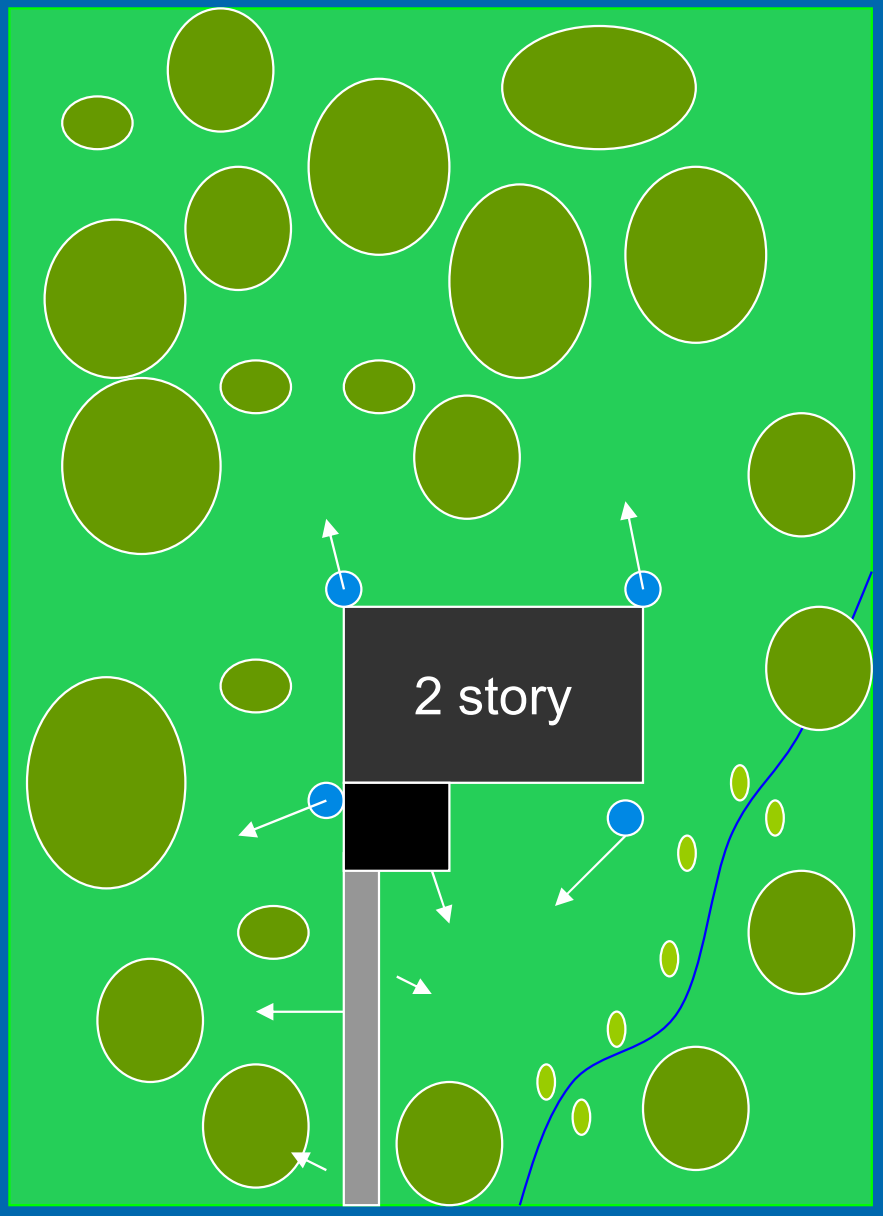
Single Multiple – Add More.

Conventional Development



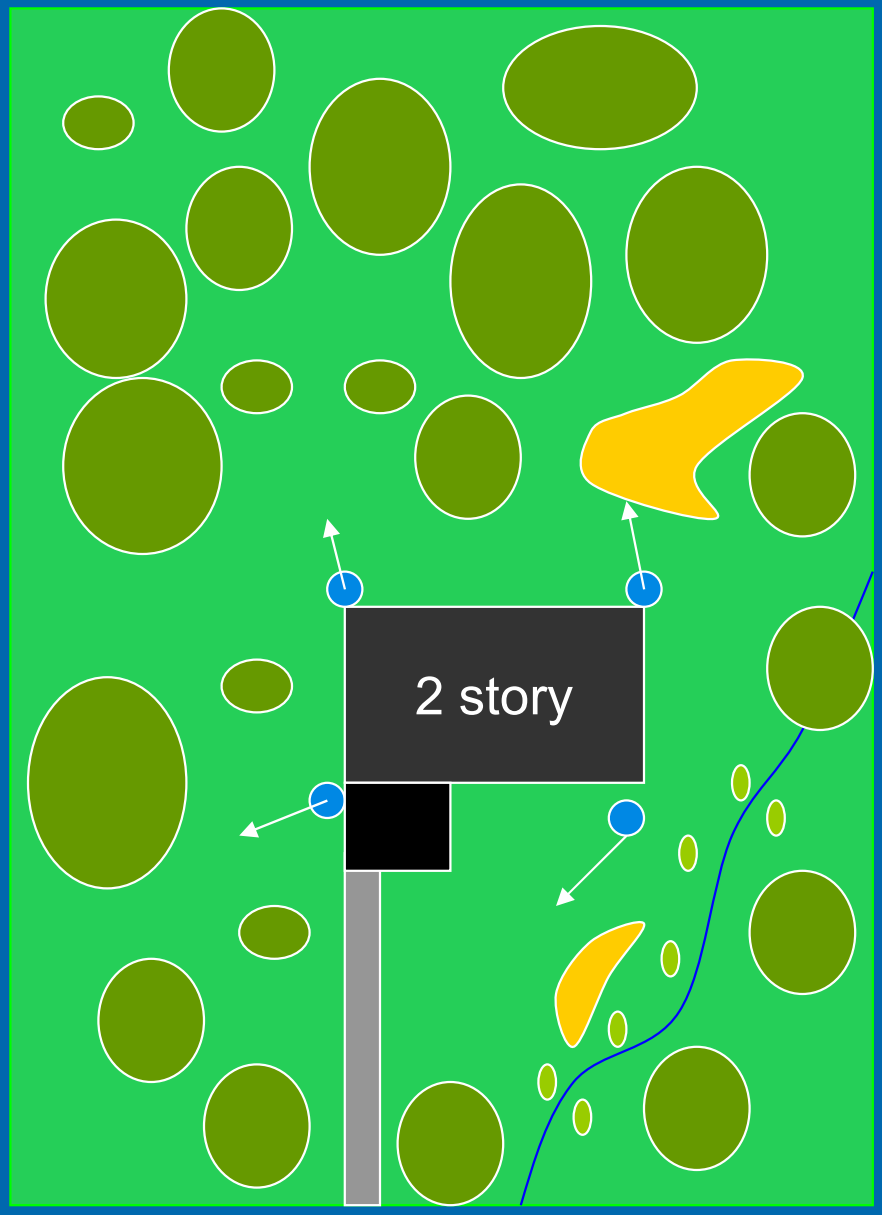
Maintain the Forest – Loss the “Lawn”

Reduced Impact



50% Reduction in Runoff

1 acre Parcel



Forested Area – 80%
Lawn – 10% (native vegetation)
House and Pavement – 10 %

Rainfall – 42 ac-inches
1,140,500 gallons per year

Evaportranspiration – 21 inches

Add 4- 80 gallon Barrels / Gravel Driveway – capture portion of 2-year storm and divert discharges to Overland Flow and add Bioretention Structures.

Runoff (13 %) –5.5 inches

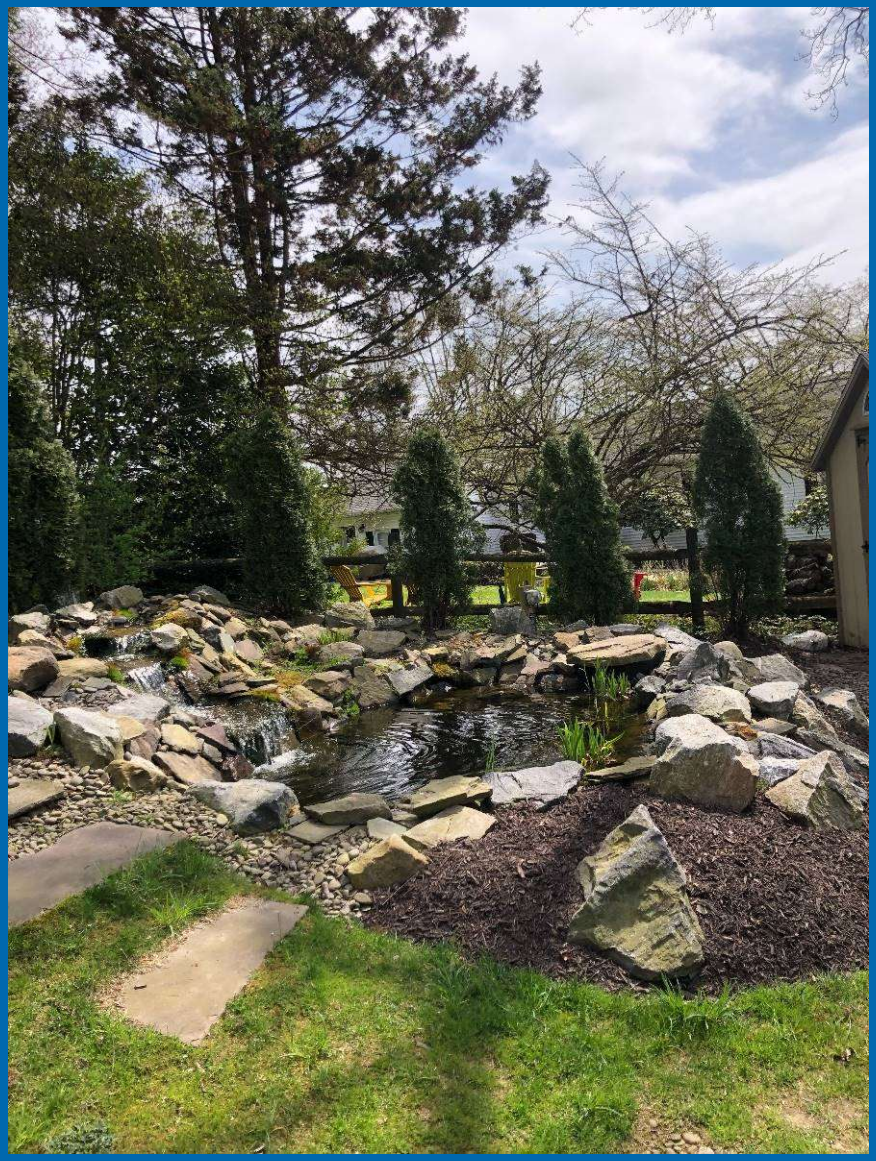
Recharge – 15.5 inches

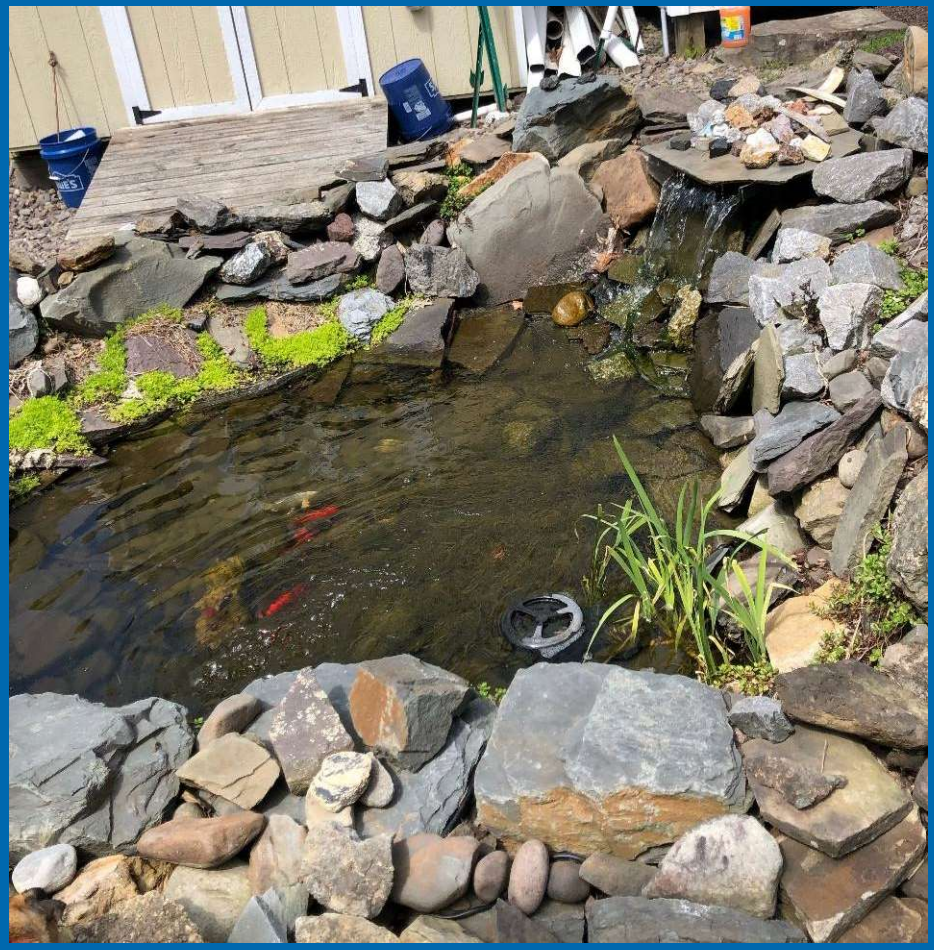
Baseflow to Stream (75%) – 11.6 inches

Total Stream Flow (11.6 +5.5 = 17.1 inches)

6% increase in stream flow, but 40% Increase in runoff.

MY OFFICE





Rain Barrels – Native Vegetation/ Landscape, Plus Runoff Diverted to Water Features and Subsurface Storage

Bio-Retention Systems

Surface Berms

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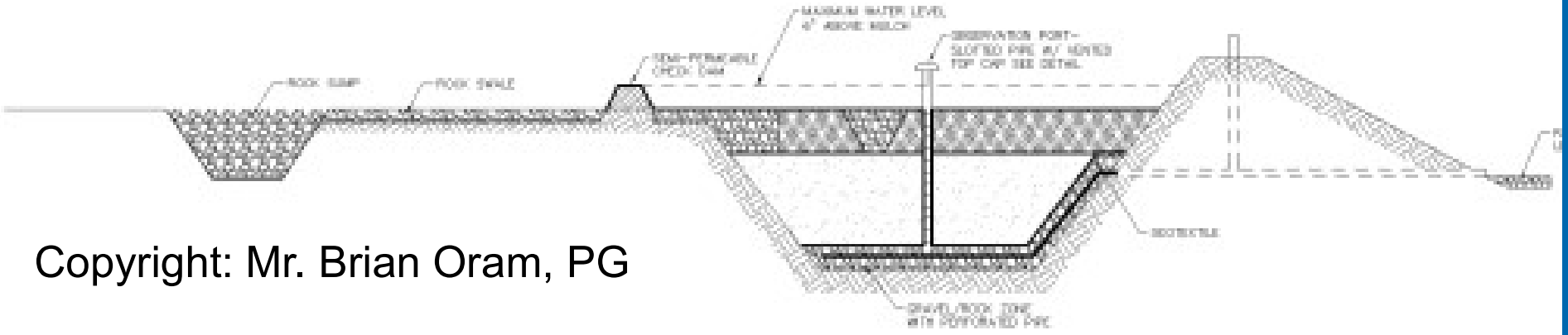

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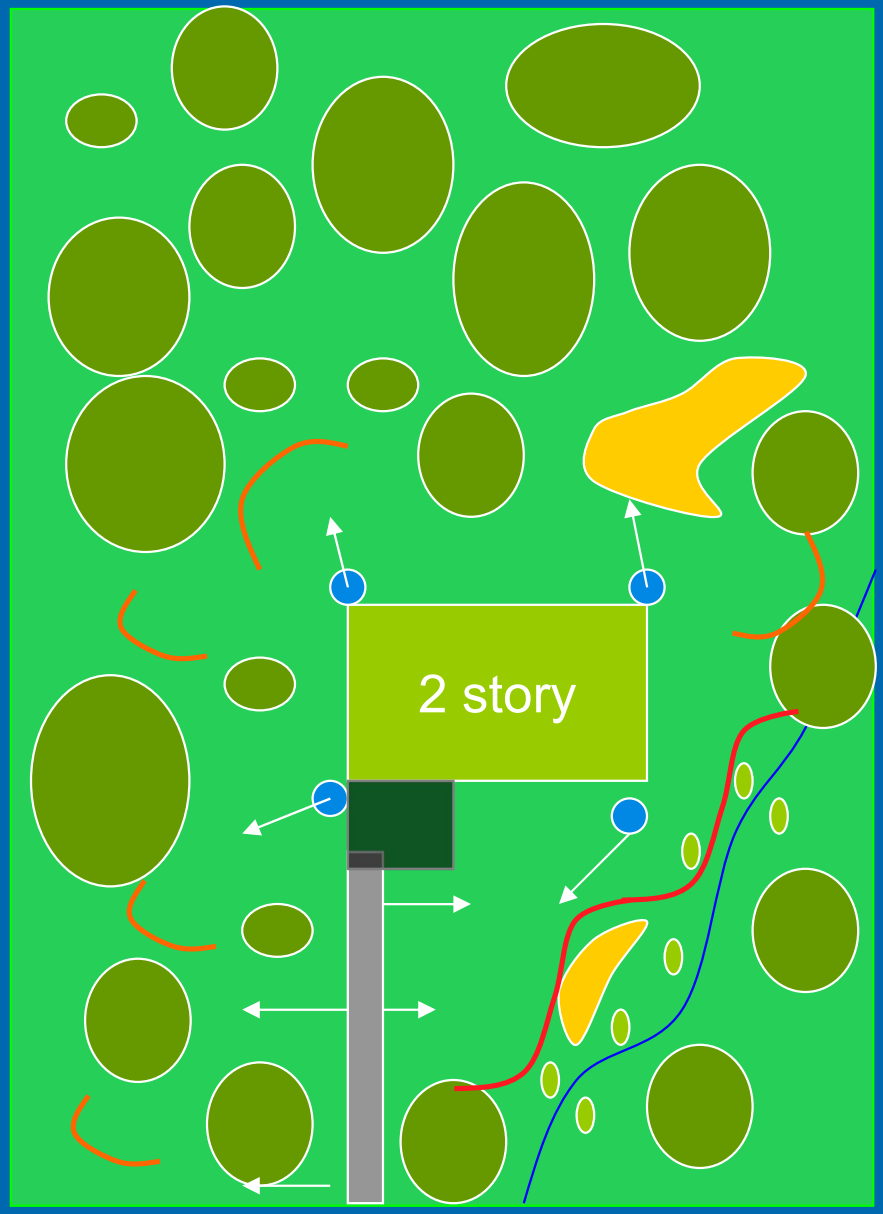
Green Roof

Green Grid System

1 acre Parcel



Porous Pavers

Forested Area – 80%
Lawn – 10% (native vegetation)
House and Pavement – 10 %

Rainfall – 42 ac-inches

Evaportranspiration – 24 inches

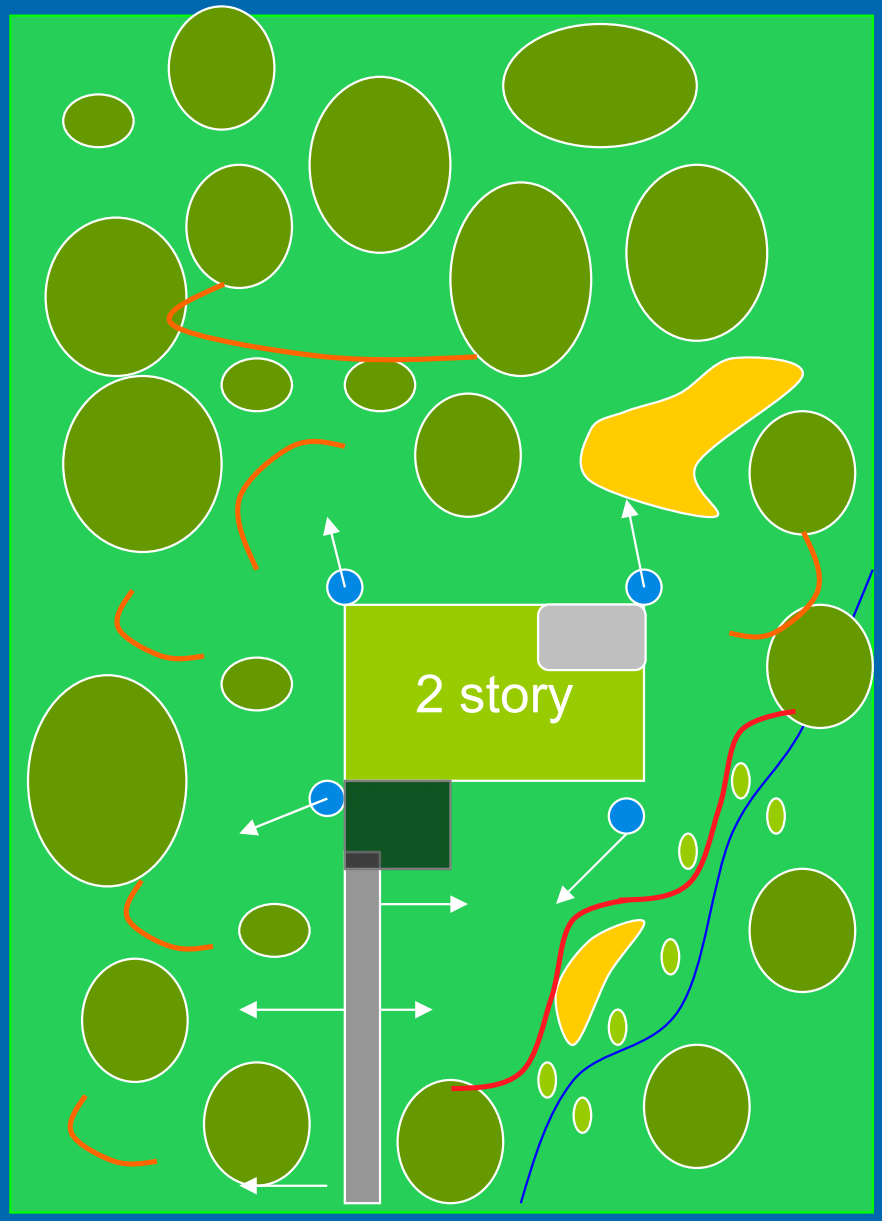
Added: More Porous Driveway, Green Roof, and surface berms

Runoff (7 %) –2 to 3 inches
Recharge – 15 inches

Baseflow to Stream (75%) – 11 inches
Total Stream Flow (11 +3 = 15 inches)

2% increase in stream flow, but 1 to 2 % increase in runoff.

1 acre Parcel



Property will be wetter longer !

To get back ZER0 for a runoff of only 2.1 inches.

Would require a **water reuse** approach.

5.5 inches – 2.1 inches = 3.4 acre-in
3.4 acre – in = 92,300 gallons
Equivalent to 250 gallons per day.

This is the average daily water usage for a Single Family Home.

Long-term Solution – <u>Could be a Third Pipe System</u>

Solution were a portion of the rainwater is used to flush toilets and irrigate lawns. This gets us to virtually – Zero Change in Net Water Budget.

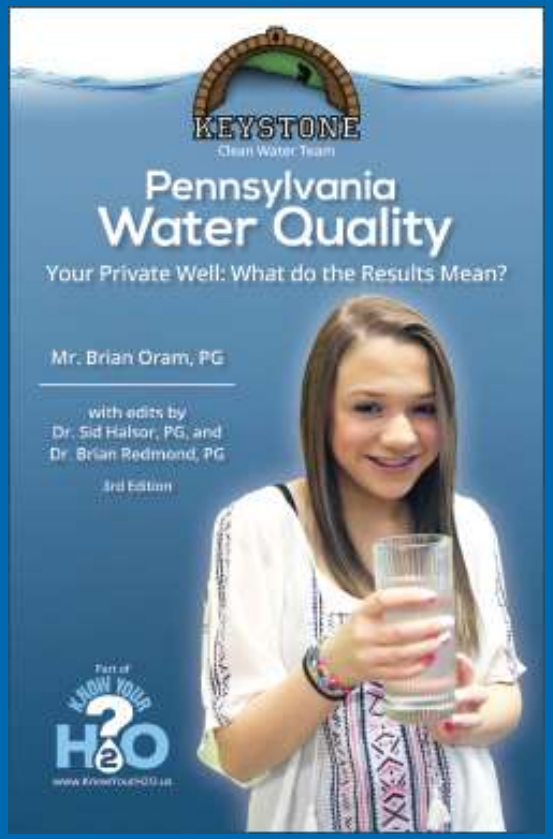
What About Existing Developed Areas ?

1. The runoff from one acre of paved parking generates the same amount of annual runoff as:

a) 36 acres of forest
b) 20 acres of grassland
c) 14 acre subdivision – 2 acre lots
d) 10 acre subdivision – 0.5 acre lots

All of the above – Does this mean we are missing a possible effective means of "turning" back the stormwater clock. Maybe we need to consider – "greening" some of the existing impervious areas.

We All Live Downstream – Our Drinking Water is Connected



The goal of this booklet is to help educate and inform citizens on issues related to water conservation, ensuring that private water supply systems produce safe drinking water for your family, protecting the long-term quality of our streams and drinking water sources, and helping you to understand the potential sources of pollution to our water resources.

”Your Guide very helpfully for me and my constituents who own private wells… and is an instructive guide to me as a policy maker as I strive to protect our water supply”
– PA State Representative

Order online - https://www.keystone.carbonwaters.org

RECOMMENDED READING
OTHER TOPICS TO CONSIDER

1. Hot Topics – “Forever Chemicals” in “Us”, “Consumer Goods” and the Environment – search “PFOS” https://www.knowyourh2o.com/search-page

2. “**Unsettled: What Climate Science Tells Us, What It Doesn't, and Why It Matters** by Steven E. Koonin | Apr 27, 2021

3. Septic System Management – “Podcast Pike County With Brian Oram” https://carbonwaters.org

4. Global Warming-Alarmists, Skeptics and Deniers: A Geoscientist Looks at the Science of Climate Change
Paperback – Illustrated, January 20, 2012.

5. New Book - Hot Talk, Cold Science: Global Warming’s Unfinished Debate (2021)