

Applied Geography for sustainable Living

FOCUS



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**Geography may not change the world,
but it will change the way you see it.**

A Grassroots Approach to Integrated Watershed Management: Doing Right in an Unjust World (with actions at your home)



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Contents

1. Integration

Using the Geographic Systems Model to systematically study Nature with a focus on watersheds.

2. Watershed

Terrestrial surfaces the water flows over and through powered by gravity.

3. Management

Education, and science in particular, helping you to understand the various local pollution sources of your drinking water and what you can do at home to prevent pollution and improve the value of your home and community.

4. Actions at Your Home

You have a role in making sure your water is safe to drink.

This presentation is given in the spirit that the full power of knowledge is realized only when it is shared. --*unknown*



Functional Definitions*

Integrated: Combined comprehensively and holistically into a system to nurture synergy using both linear and non-linear thinking.

Watershed: Any terrestrial surface intercepting and conducting liquid water to move horizontally or vertically under the influence of natural forces.

Management: The human activity of allocating resources (e.g., people, time, materials, money, etc.) for the mutual benefit of society and the environment for long-term sustainability.





This is an Applied Geography for Sustainable Living (AppGeog) presentation

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Advisory Note

This presentation is formatted for viewing on a single computer screen by a few people.



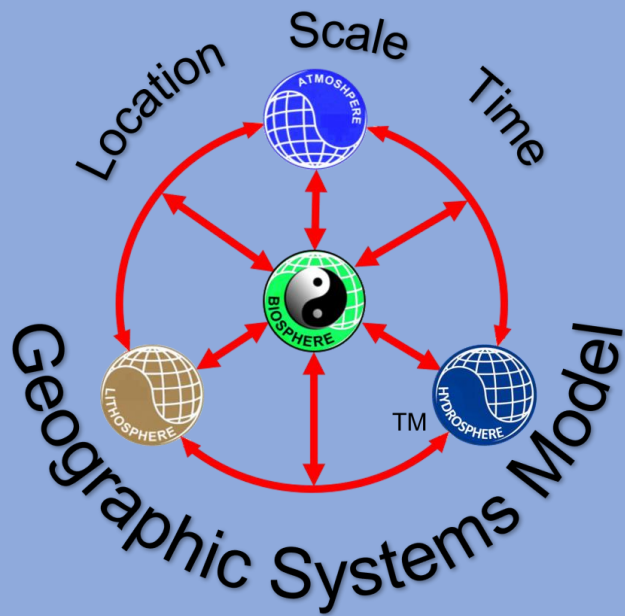
For large group presentations, a narrator should read the slides with text not readily legible to the audience.



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The Geographic Systems Model



This is a conceptual model of the Earth (e.g., air, water, land, and living organisms). It includes all life, physical, and social sciences to study the distribution of phenomena on Earth.

The arrows are reminders of the world is highly interconnected. The model can be used anywhere on Earth, at any level of detail and time of year or hour of the day.



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Note: The [Geographic Systems Model](#) is a framework to systematically compare/contrast places on Earth.

Key Geographic Concepts

Location: In geography, latitude, longitude, and elevation. In mathematics, X, Y, and Z.

Scale: On maps, it is the ratio of the distance on the map to the distance on the ground. It also refers to the level of detail of a study (e.g., global, regional, local or macro, micro, nano, etc.).

Time: In geography, seasonal/diurnal, or chronological (e.g., past, present, future). Change over time is of interest to geographers.

Note: To think geographically is to think in four dimensions: latitude, longitude, elevation, and time. Geography views the world in a spatial-temporal framework or a space-time continuum.

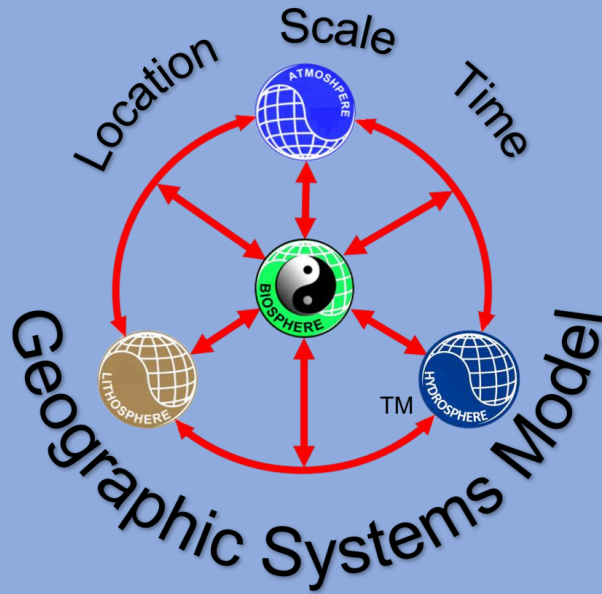
FFI: Geographic Systems Model [#1](#) [#2](#)



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The Geographic Systems Matrix



Organizing observations with the Geographic Systems Matrix (one for each place) makes it easy to compare and contrast different places (or the same place at different times of day or seasons) to find patterns in distributions. It is interesting to see the different ways people interact with their environments (i.e., physically and socially) even when living in the same or similar locations.

Location		
Scale		
Time		
Atmosphere		
Hydrosphere		
Lithosphere		
Biosphere	Flora	
	Fauna	
	People	



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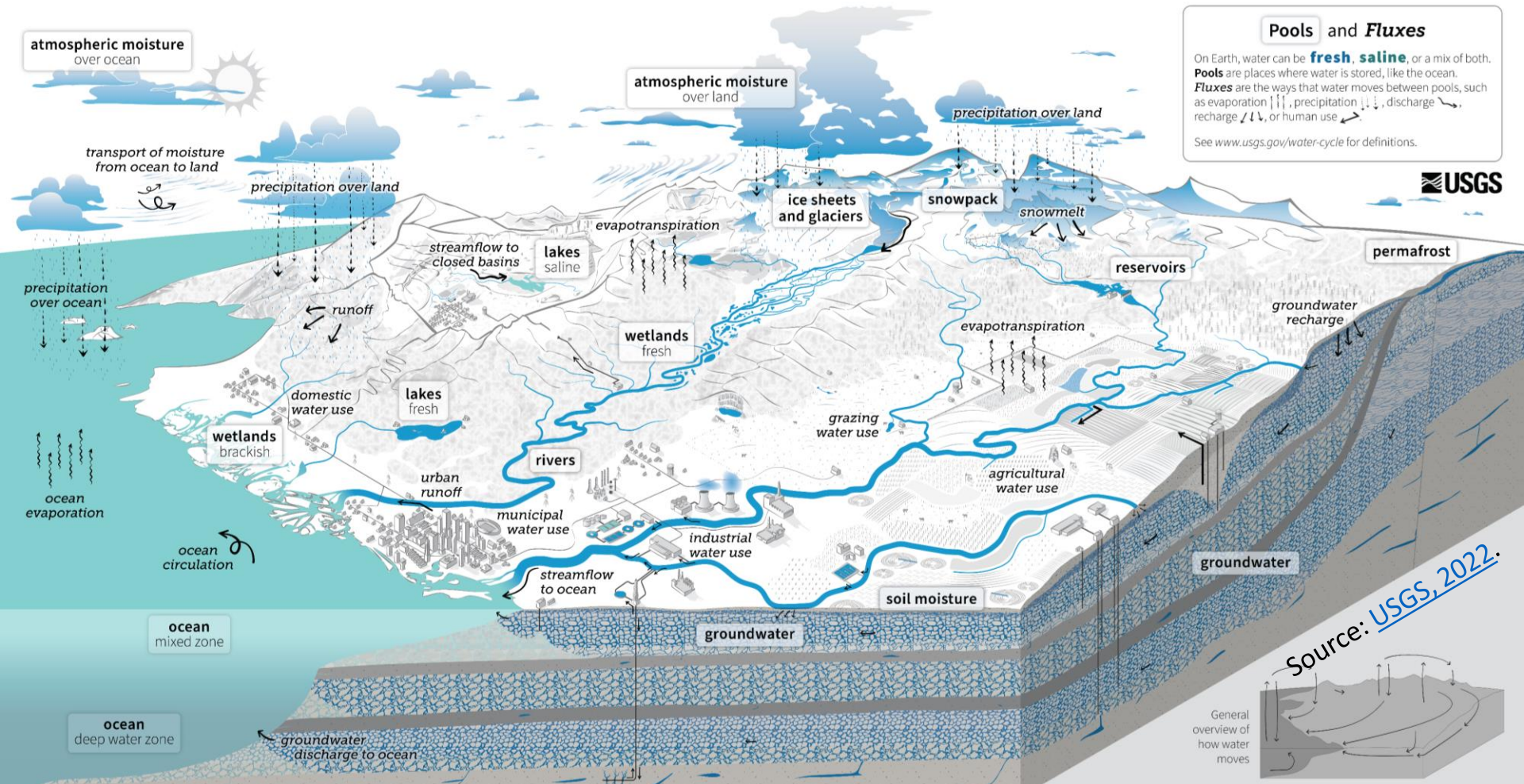
The Biosphere is the realm of all living organisms on Earth. People are shown as a green version of the Vitruvian Man superimposed on a Yin-Yang symbol (a reminder of the non-linear dynamic balance of forces in the world). People are surrounded by their culture which is the window through which they perceive the world. Different cultures have different perceptions. Perceptions are not right or wrong; they are just different.



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The Water Cycle

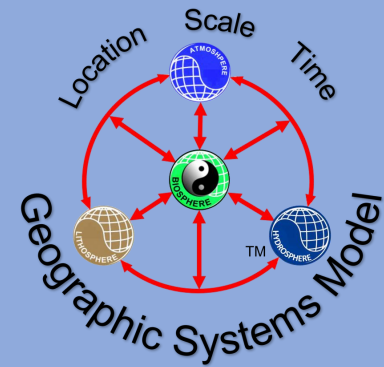


Water vaporized from the Earth's surface can return as rain, snow, or ice and can be changed from solid to liquid. The cycle repeats and water is recirculated on Earth.

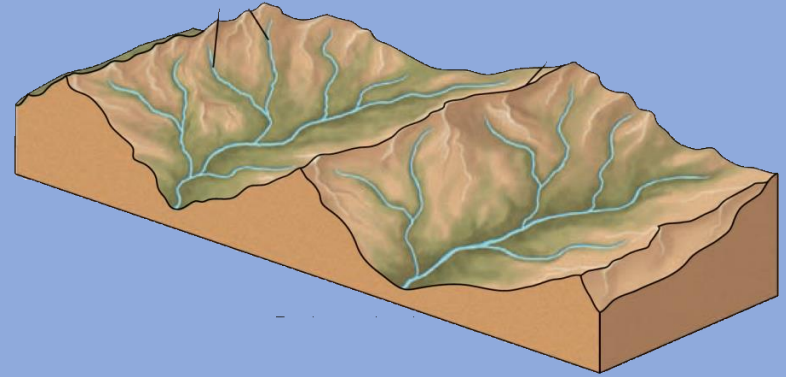


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A Watershed is a Landscape Feature



Atmosphere		
Hydrosphere		
Lithosphere	Structure	
	Process	
	Slope	
	Drainage	
Biosphere	Flora	
	Fauna	
	People	



The structural geologic processes shape the land causing it to have slopes (i.e., different surfaces and angular orientations). Water on the surface drains off the slopes under the influence of gravity flowing overland or in channels (streams). Moving water can carry soil downstream (erosion). A drainage basin is another term for a watershed.



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A Watershed with External Drainage



The red line is the drainage divide, a ridge (high point) between watersheds. The area inside the red line is the watershed with external drainage. Rain falling over this area will flow into the streams and out of the watershed.

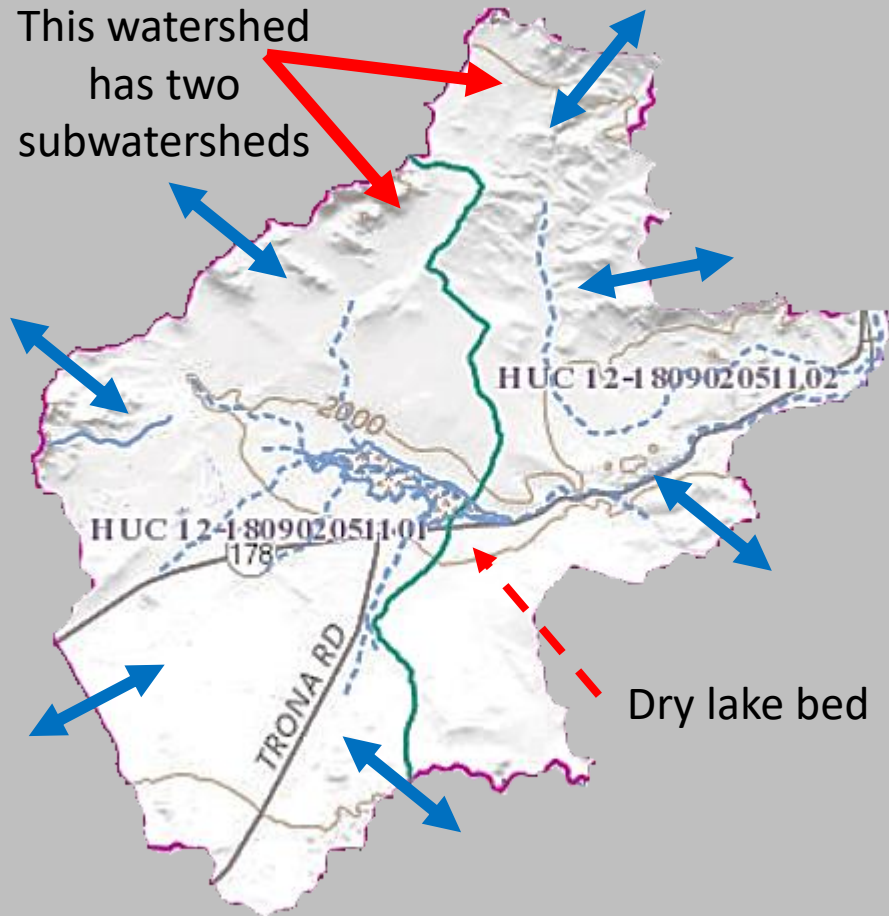


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Note: A watershed with external drainage has water flowing out of the watershed.

A Watershed with Internal Drainage

This watershed
has two
subwatersheds



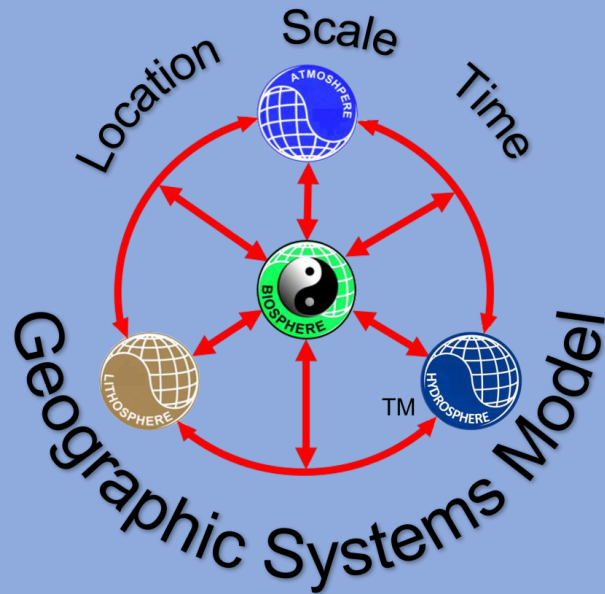
The red line is the drainage divide where water will flow in either direction in one or another watershed. In this case, the streams do not flow out of the watershed. If there is more rain than evapotranspiration, a lake may form. If there is more evapotranspiration than rain, there may be a dry lake.



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Note: A watershed with internal drainage does not have water flowing out of the watershed. .

Viewing a Watershed Holistically



Use the geographic systems matrix to systematically describe the natural and human aspects of the watershed. Indigenous people consider humans as part of the natural landscape. Western science separated humans from Nature. This disconnect explains why some Westerners try to “conquer” or control Nature.

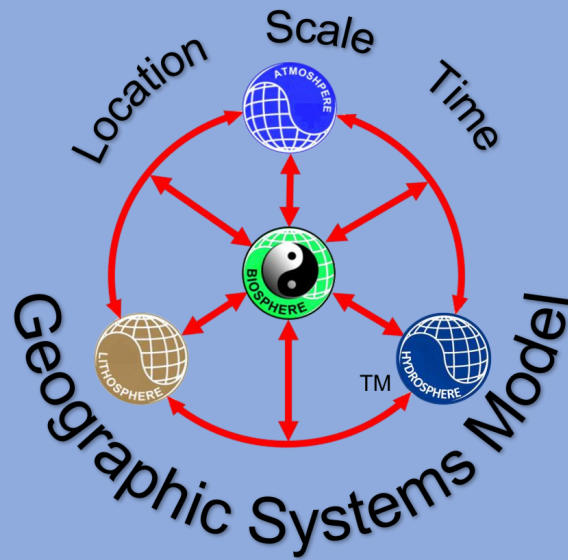
Atmosphere	Weather, climate	
Hydrosphere	Fresh, brackish, salt	
Lithosphere	Landforms, soils	
Biosphere	Flora	Plants
	Fauna	Animals
	People	Humans



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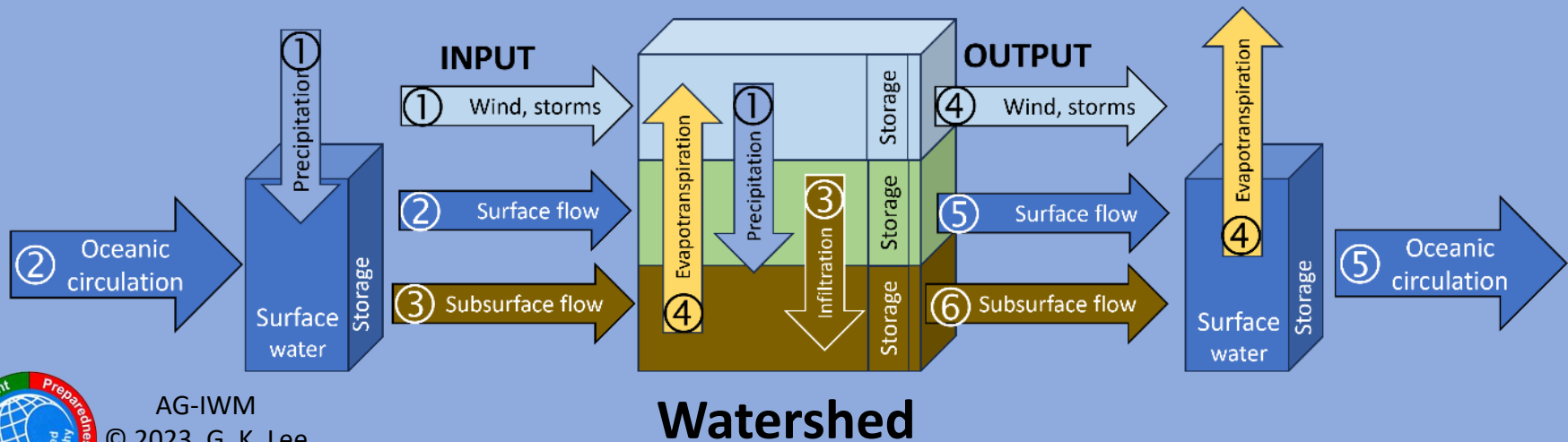
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Basic Water Movement



The block diagram below shows the possible ways water can get into and out of or be stored in a watershed.

Try following the water paths between the environmental spheres in the geographic systems model.



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Managing a Watershed

Nature Composes



People in Nature Co-exist



People in Built Areas Impose



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You can strive to master understanding and working with Nature, or you can strive to master Nature by imposing your will and fighting against Nature. **Hint:** Nature has been around a lot longer than people. --G. Lee

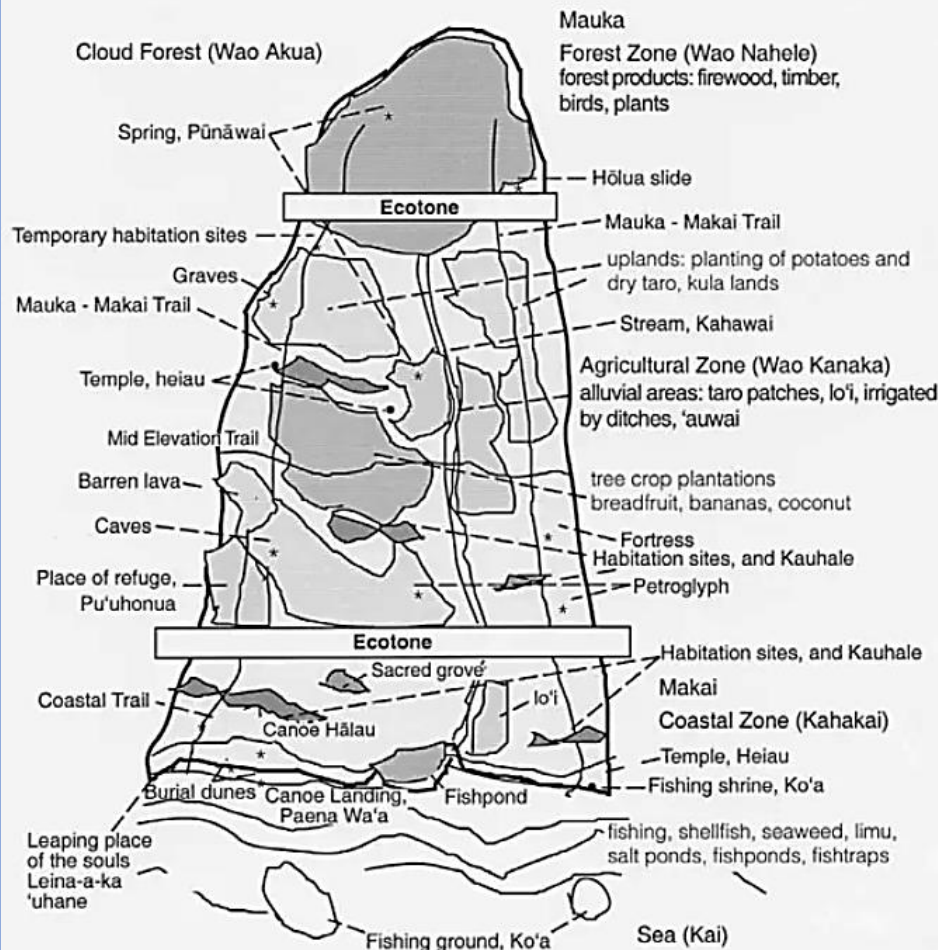


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Note: Indigenous people tend to live closer to Nature in smaller groups and traditionally have a more subsistence lifestyle.

The Hawaiian Ahupua'a System



This traditional Hawaiian land tenure system was based on water for agriculture because

- 1) each Mokupuni (island) had
- 2) Mokus (districts) usually a Ko'olau (windward, wet) and Kona (leeward, dry) district,
- 3) subdivided into Ahupua'a (vertical zones of rainfed and irrigated agriculture extending from the mountains to the sea. An Ahupua'a is a complete ecological system shaped like a pie slice of an island.

FFI: Land Titles of Hawaii



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Advisory Note



Ancient Hawaiian culture relied on oral traditions to transmit information through time. The arrival of Europeans in 1778 set

the stage for cultural conflict in the islands that persists to this day, especially over land ownership. It centers on the oral traditions of the native people regarding their laws vs. Western laws in written records. The Western culture (science and technology) makes their culture dominant and sets the context that non-Western cultures are presumed to be inferior. AppGeog prefers to study Nature and natural systems as a point of reference for sustainable living.



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Differences of Environments

The table below is a general summary comparing and contrasting the environmental settings of people living close to Nature vs. people living in constructed areas.

			Natural	Constructed	
			Indigenous	Urban/Suburban	Rural
Geographic Systems Matrix	Location		More Natural	Highly Built	Less Built
	Scale		More Local	Local to Regional	Local to regional
	Time		Seasonal	Manipulated seasonal	
	Atmosphere		More Natural	Polluted	Less Polluted
	Hydrosphere		More Natural	Polluted; Processed	Polluted; Some processed
	Lithosphere		More Natural	Highly changed	Moderately changed
	Biosphere	Flora	More Natural	Much less natural	Mostly cultivars
		Fauna	More Natural	Mostly domesticated & feral-domesticated	Mostly domesticated
People		Smaller groups	High density	Dispersed	

Note: Indigenous people tend to live closer to Nature with lower technology and a more traditional subsistence lifestyle.



Differences of Social Organization

The table below is a general summary comparing and contrasting the social organization of people living close to Nature vs. in constructed areas. Modern studies in anthropology and sociology can be eye opening.

	Natural	Constructed	
	Indigenous	Rural	Urban/Suburban
Mode	Egalitarian	Patriarchal	Patriarchal Bureaucratic Hierarchy
Who	Elders, Council	Household head	Elected government officials
What	Group decisions	Family decisions	Community decisions
When	As needed	As needed	As needed and by manufactured consent*
Where	Local	Local	Remote; apart from the <u>general public</u>
How	Group	Individual or group	A select group of decision-makers
Why	Group Survival	Will of the leader	For the benefit of the rich and powerful at the expense of the poor and voiceless*

* [Chomsky, N. \(2017\); Herman, E.S. & Chomsky, N. \(2011\).](#)



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Existing Laws & Regulations

Federal/ National	International/ Interstate
State	
County	
City	
Local	
Civic/NGO	

Water Resources regulations depend on the U.S.

Environmental Protection Agency enforcing the Clean Water Act of 1972 using permits for water withdrawals, waste discharging, and setting water quality

standards. All levels of government harmonize with federal regulations. The implementation depends on local conditions, budgets, and the outcomes of court cases, as well as changes in water supply and demand over time.



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Institutions Needed for Implementation

In many places money is the main measure of value. In less developed places, impoverished and marginalized people may not have access to social institutions for funding watershed management programs.

	Natural	Constructed		
	Indigenous	Industrial		
Governance/Administration	The people / community, usually by direct contact and interaction with little to no outside help or financing. *	Federal, state, county, city, and local government with their attendant bureaucracies		
Legal/Legislative				
Financial		Grants	Federal, state, county, city, and local governments; private sources, NGOs	
		Taxes	Federal, state, county, city, and local governments	
		Fundraising	NGOs, Local special events	
		Private	Landowners pay for work on their land.	

Note: *The alternative is the AppGeog no-cost/low-const, no-tech/low-tech appropriate technology [Community-based Education](#) approach.



Perceptions of Management

This summary table contrasts general differences in governance methods for people living in a more natural vs. constructed environment.

	Natural	Constructed
	Indigenous	Industrial
Social Order	Egalitarian; Horizontal	Patriarchal; Hierarchical Top-Down
Gender	Egalitarian	Male dominant
Management Decision-making	Communal. for the general welfare	Select Group for special interests
Childcare	Communal	Nuclear and single parent
Value Measure	Social Cooperation	Money
Residential mobility	Mobility between kinship and non-kinship groups promotes collaboration*	Ethnic residential segregation persists and deters inclusiveness in society**

* ([UCL, 2022](#)). ** ([Taeuber & Taeuber, 2009](#))



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Basic Grassroots Watershed Issues

From a grassroots perspective, watershed management (including stormwater) is based on dealing the two basic water problems: too much water (floods) and too little water (droughts).



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Note: Many climate change models show an increased frequency of severe weather events (e.g., heavy rains, floods, and droughts).

Grassroots Watershed Management

If you own the land, you need to protect it.

If you don't own the land, you need to use it to eat and feed your family first so you can survive.

A swab is used for preparatory cleaning for a fresh start. In a watershed, this starts with protecting the soil to reduce erosion, soil damage, and to improve its moisture retention and fertility. For water, you must slow its movement on the land and store it in the soil. Protecting and promoting biodiversity improve soil fertility and moisture retention.

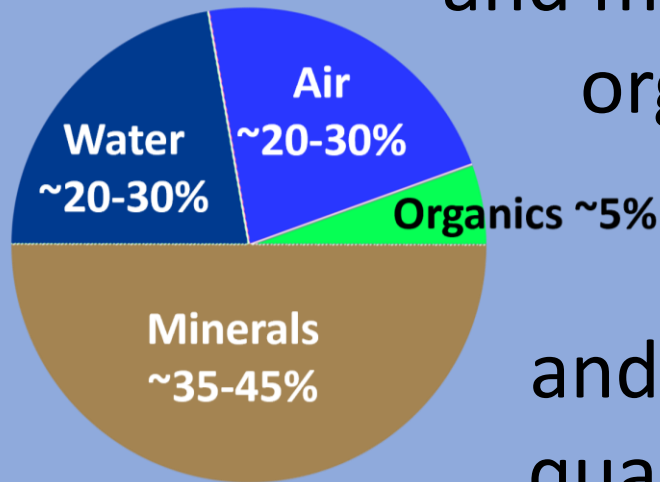
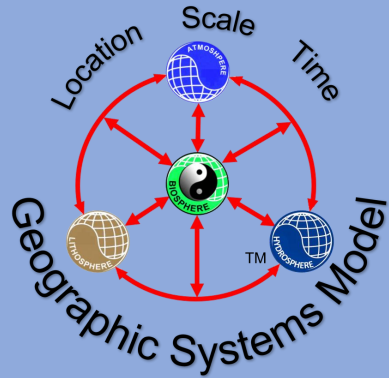
Soil,
Water,
And
Biodiversity



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Soil is the Soul of the Watershed



Soil is the culmination of the abiotic and the biotic components of climate (heat and moisture of the atmosphere and hydrosphere, interacting with the rocks and minerals of the lithosphere) and the organic matter of the biosphere.

The watershed's slope orientation, drainage, land cover, land use, and climate, affect the water quantity, quality, and availability over time. This is the holistic view of a watershed.







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Protecting the Soil Protects the Watershed

Erosion removes soil from the watershed, disturbs the biosphere, reduces water quantity and availability, degrades water quality, and reduces the usefulness of the land.

Hardly Visible		Very Visible	
Rain Drop Impact; no water channel flow.		Water flowing in a channel.	
Splash Erosion	Sheet Erosion	Rill Erosion	Gully Erosion
			

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FFI: [AppGeog Recognizing Soil Erosion](#)
([Intro. To AppGeog Soil Management Methods](#))

Slow, Hold, and Conserve Water

1. Slowing the flow of water reduces its erosive power, and gives it more time to soak into the ground.
2. Improving soil texture and structure helps to increase water infiltration and soil moisture retention rates to improve drought resilience.
3. This in turn improves soil health and chemistry resulting in enhanced plant chemistry interaction (aka fertility) without the use of chemical fertilizers.



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FFI: [AppGeog Reducing Soil Erosion](#)
([Intro. To AppGeog Soil Management Methods](#))

Basic Soil Erosion Mitigations

Cover all bare soil from direct exposure to wind, rain, snow, ice, and sunlight.



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([Intro. To AppGeog Soil Management Methods](#))

Improve Soil to Resist Erosion

Maintain healthy soil organisms by not using chemicals like herbicides (weed killers), pesticides (bug killers), fertilizers, or spilling hazardous materials on the soil.

Herbicides

Pesticides

Fertilizers

**Hazardous
Chemicals**



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FFI: [AppGeog C.O.M.P.O.S.T. #1](#) [#2](#) [#3](#)
([Intro. To AppGeog Soil Management Methods](#))

Water Quality: Who's Responsibility



Images from the Internet: Educational free use clause

Don't Be Your Own Worst Enemy

You drink and use water every day. Do you know or just assume you know the answers to these questions?

Yes No

- ☐ ☐ Do you know its source?
- ☐ ☐ Do you know it is safe to drink?
- ☐ ☐ Did you clean and purify it before use?
- ☐ ☐ Do you know where your dirty water goes?
- ☐ ☐ Could you clean dirty water for your use?

Note: Very few of us know enough to make and deliver clean drinking water for use in our homes. Yet we seldom think of the thousands of invisible workers who make sure we get safe water to use every day.

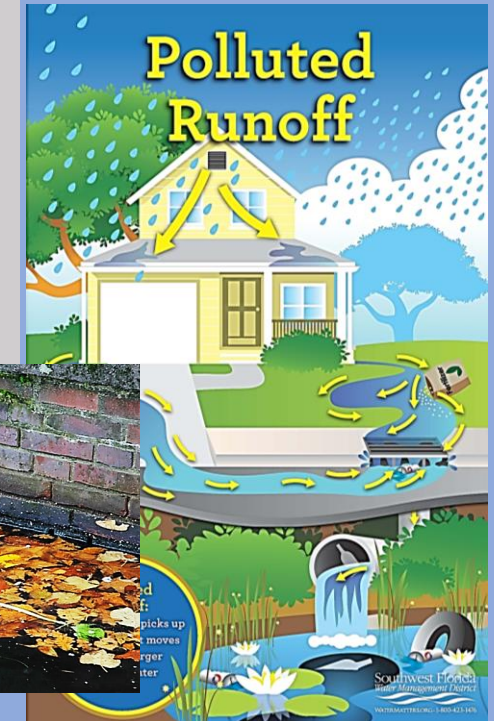
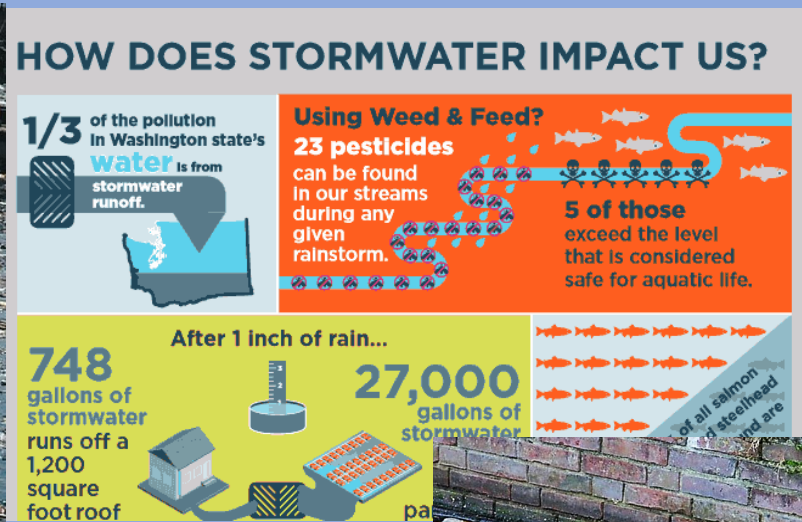


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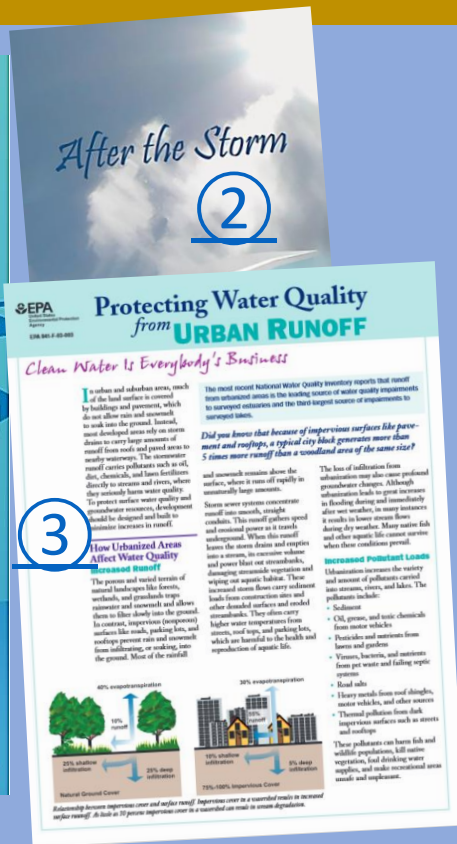
Does Stormwater Pollute Your Drinking Water?

Rain falls on everything in the storm area and washes chemicals, trash, oil, soil, bacteria, and microbes in stormwater from your yard into the streets, storm drains, and streams.



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Non-Point Source Pollution (NPS)



Since the Clean Water Act was passed in 1972, most of the major industrial polluters have been identified and the cleanup began. Today, NPS is the major source of water pollution.

*If you have or use anything that gets wet in the rain, **you** could be a part of the NPS problem.*

FFI: Click on the number to get the publication



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We Need You to Do Your Part



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Water, like air, is necessary for nearly all living organisms to survive. About 46% of the world's people cannot get clean drinking water daily. Don't take your clean water for granted. Appreciate your easy access to it. Respect the workers who make your clean water possible and do your part to stop water pollution from your yard and home.



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Adapting Farm Actions for Your Yard

Many of the no-cost/low-cost, no-tech/low-tech soil and water management methods used on small rural subsistence farms can be



adapted suburban and urban yards and homes to reduce pollutants from yards getting into stormwater and into the streets, storm drains, and streams.



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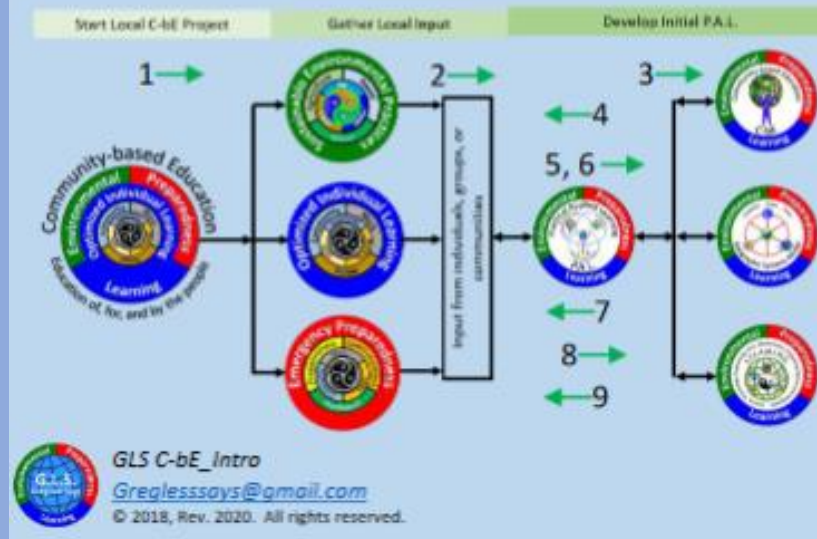
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Many Actions Can Be Practical School Lessons

Many actions and activities can be adapted and used as classroom lessons rather than doing sample problems from a textbook.

GLS Cb-E P.A.L. development process begins with gathering local input (relative to GLS Divisions) to develop a draft lesson to meet a specific community need. The diagram below summarizes the major steps in the P.A.L. development process. Revisions and updates are made as local conditions change. Thus, the lessons are always relevant.



General P.A.L. Process

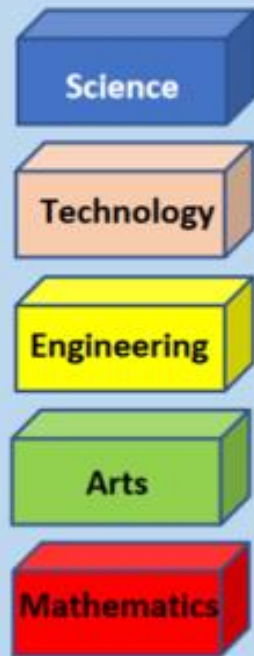
1. Start C-bE Project
2. Gather Local Input
3. Develop Draft P.A.L.
4. Beta Test P.A.L.
5. Evaluate Beta results
6. Revise (if needed)
7. Finalize
8. Review & Update as needed.
9. Finalize Update



Community-based Education for Integrated Watershed Management

Traditional School Bureaucracy

Traditional segmented single subject classes create an artificial compartmentalization of knowledge. This added layer of difficulty hampers a student's ability to see how the bodies of knowledge interconnect. It limits their understanding. Also, students are not active in the community while learning.



GLS Community-based Education Method

GLS C-bE lessons use Science, Technology, Engineering, Arts, Mathematics Integrating Nature &



Geography simultaneously outdoors in the community. It uses Teach-backs and community service projects. to verify competency

and comprehension rather than written examinations. Students can actively contribute to the community while learning.

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FFI: AppGeog [Community-based Education](#)



STEAMING Rather than STEM/STEAM



S.T.E.A.M.I.N.G. (Science, Technology, Engineering, Arts, Mathematics Integrating Nature and Geography) gets students outside the box of the classroom. This encourages them to learn and think outside the box.

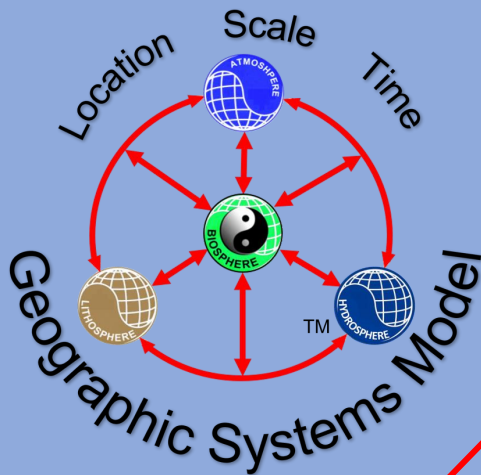
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Know Your Local Natural Situation



Use the Geographic Systems Model and Matrix to organize.

Location: Get geologic, topographic, soil, and hydrologic maps of your place.

- <https://www.google.com/earth/about/versions/>
- <https://www.usgs.gov/tools/national-map-viewersoil>

Location		
Scale		
Time		
Atmosphere		
Hydrosphere		
Lithosphere		
Biosphere	Flora	
	Fauna	
	People	

Atmosphere: Get climate and climate change data for your place.

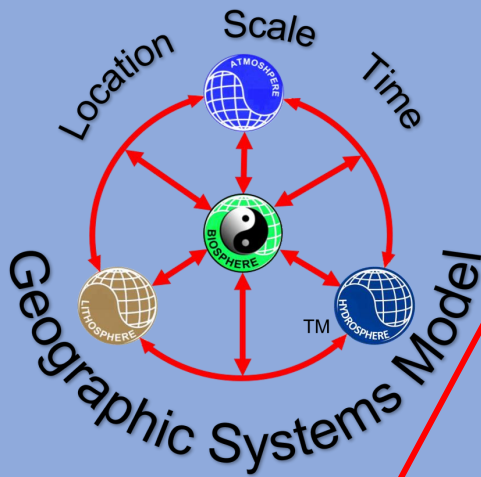
- <https://www.usclimatedata.com/>
- <https://www.climate.gov/maps-data#dataset-gallery-block>



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Know Your Local Natural Situation



Hydrosphere: Get your watershed info.
(get to the smallest size watershed unit
for your home)

- <https://mywaterway.epa.gov/community>
- <https://apps.nationalmap.gov/viewer/>

Location		
Scale		
Time		
Atmosphere		
Hydrosphere		
Lithosphere		
Biosphere	Flora	
	Fauna	
	People	

Lithosphere: Get topographic and land
use/cover, and soils info near your
home.

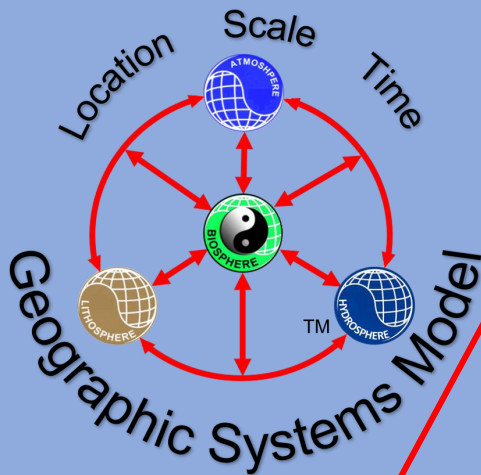
- <https://apps.nationalmap.gov/viewer/>
- <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>



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Know Your Local Natural Situation



Biosphere: Get your ecosystem info for your area

- <https://www.epa.gov/ecoresearch/level-iii-and-iv-ecoregions-continental-united-states>
- Also check your state Dept. of Natural Resources

State, County, & Local Government:

Key concerns are water quality and stormwater management.

Know Your Drinking Water Source and

Quality: You should get an annual water quality report from your local water company that also states the water source(s) of your drinking water.

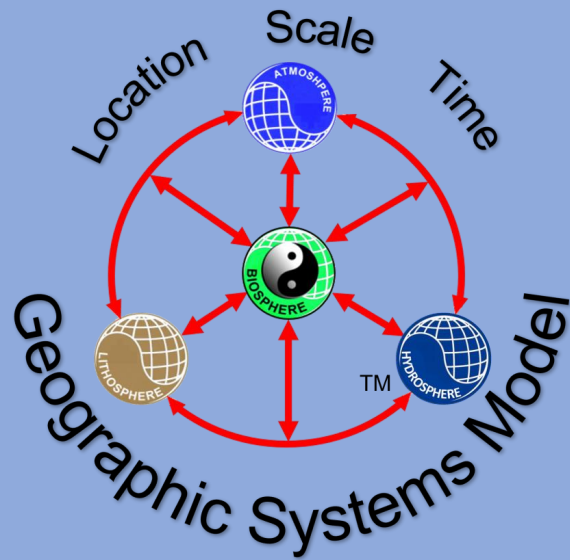
Location		
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Atmosphere		
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Lithosphere		
Biosphere	Flora	
	Fauna	
	People	



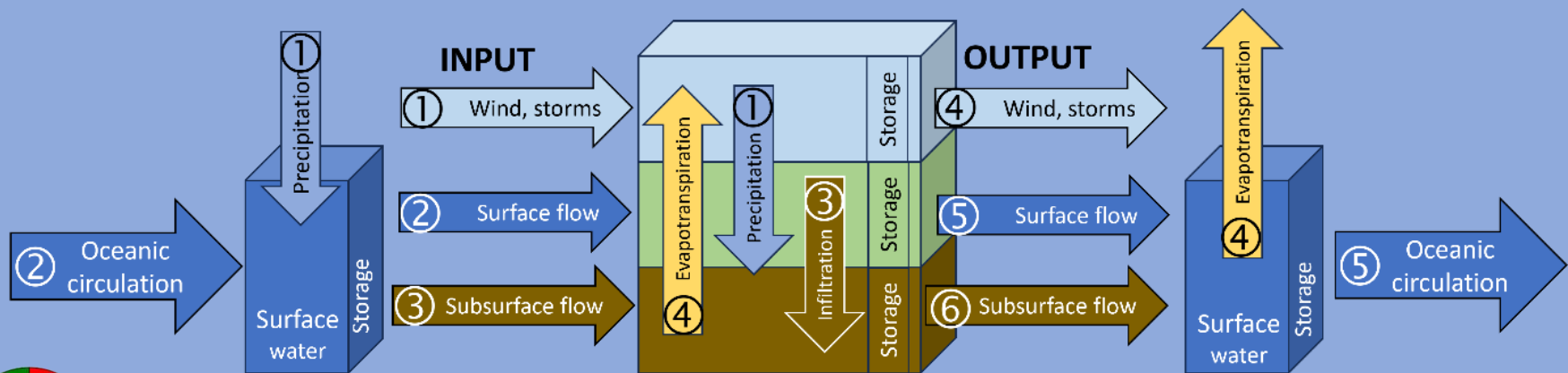
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How Does Water Move in Your Yard?



Use your knowledge of the Water Cycle, and the geographic systems model to see all the ways water can get to, from, and be stored in your yard. Then you can see how and where you can slow it and let it soak into the soil.

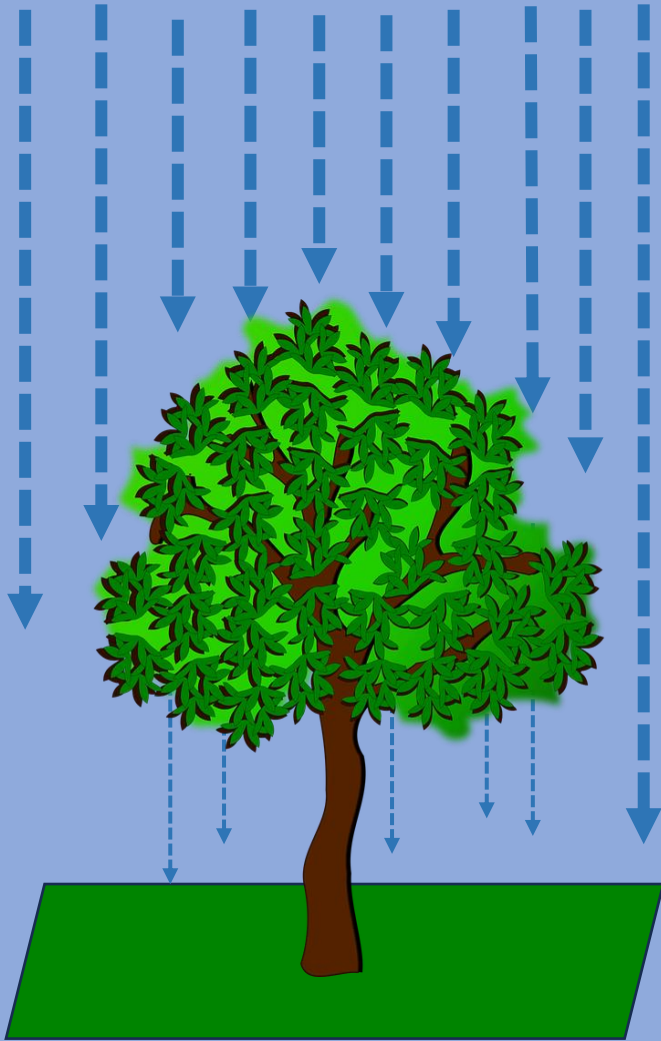


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Watershed

Benefits of Planting Trees



Planting trees benefits the water, air, soil, and you.

Water	<ul style="list-style-type: none">• Intercepts rain keeping some from reaching the ground.• Hold water in tree canopy; loses most to evaporation after the rain.• Anchors the soil; shades the house, reduces summer air conditioning cost; improves property value.• Leaves can be composted to improve the soil.
Air	<ul style="list-style-type: none">• Absorbs CO₂ and gives off oxygen.• Reduces noise pollution.• Helps clear up air pollution.• Reduces the urban heat island effect.
Soil	<ul style="list-style-type: none">• Anchors, <u>aerates</u> and shades the soil.• Supports mycelium growth.• Support soil structure and water penetration of the soil.• Leaves can be composted to improve soil.
Homeowner	<ul style="list-style-type: none">• Shades home in summer, reduces air conditioning use.• Protects home from strong winds.• Some trees can provide food.• Adds value to homeowner and neighborhood via beautification and privacy.



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Catch, Slow, Soak, and Clean Water

Catch rainwater and use it in your yard.

Get a barrel to catch water from the gutters.

Make a swale or a rainwater garden to catch the rain and let it soak into the ground. These can be done at minimal cost and can help improve property value.

Rain Barrel



Swale



Rainwater Garden



Images from the Internet: Educational free use clause



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Note: Some soil organisms can neutralize pollutants and clean the stormwater.

Composting for Soil Improvement

Composting improves soil texture, structure, and chemistry (and the health of soil organisms). It increases soil moisture retention capacity and can help cut the cost of water to maintain your yard and increase drought resistance. It also saves money by not buying lawn care chemicals that can pollute stormwater. For optimum results, do simple soil tests of your yard (see links below) and use the fallen tree leaves to make compost (see links below). All these activities make great hands-on science lessons for young and elderly folks.



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FFI: Basic Soil Testing [W2.4](#) [W2.5](#) ; Compost [W4.1](#) [W4.2](#) [W4.3](#) ;
[Making Compost](#); [Intro. To Soil Management Methods](#)

Replace Impermeable Surfaces

Use open pavers instead of solid paved driveways, patios, and walkways to let rainwater soak into the soil. This reduces polluting stormwater runoff getting to the streets, storm drains, and streams. Some open pavers let grass grow, making the surface cooler, and reducing home air conditioning costs.

Driveway



Patio



Walkway



Images from the Internet: Educational free use clause

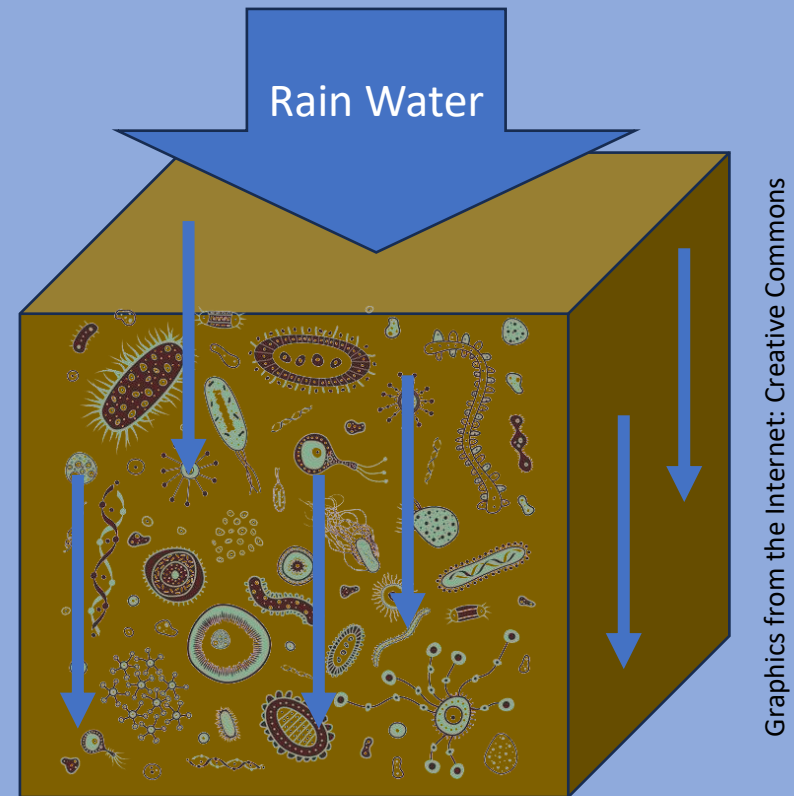


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Note: Some soil organisms can neutralize pollutants and clean the stormwater.

Natural Stormwater Cleaning & Increased Drought Resistance

Rainwater soaking into healthy soil contacts a diverse community of soil organisms. Some can neutralize pollutants to naturally clean the water.



Graphics from the Internet: Creative Commons

Note: All this cleaning is done without adding chemicals, is free of charge to the homeowner making the yard more drought-resistant and better able to support plant growth.



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Keep Pollutants Out of Your Yard

The law may not require you to pick up your pet poo in your yard, but keeping a clean yard keeps pollutants out of the stormwater flowing off your yard.



Images from the Internet: Educational free use clause



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Question: Do you know how much poop your pet produces in a year?

Stop Using These in Your Yard

Do not use chemicals like herbicides (weed killers), pesticides (bug killers), fertilizers, or spilling hazardous materials in your yard. Then they cannot get into stormwater running off your yard into the streets, storm drains, and streams.

Herbicides



Pesticides



Fertilizers

**Hazardous
Chemicals**



Photos from the Internet: Creative Commons



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FFI: Compost [W4.1](#) [W4.2](#) [W4.3](#) ; [Making Compost](#);
([Intro. To AppGeog Soil Management Methods](#))

Replace Grass with Low-Maintenance Ground Covers



Replace your grass lawn with low-maintenance ground covers to get rid of gas-powered yard care equipment and control weeds without chemicals. There are ground covers of sunlit and shaded areas of your yard. Some are sturdy enough to withstand being repeatedly driven on and some are drought tolerant to cut down on your water use.



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FFI: Low-maintenance ground covers [#1](#) [#2](#) [#3](#) [#4](#)

Location

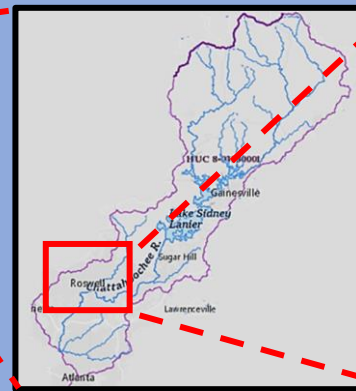
Know your “big picture” water connection. For example, let’s look at Duluth, GA.



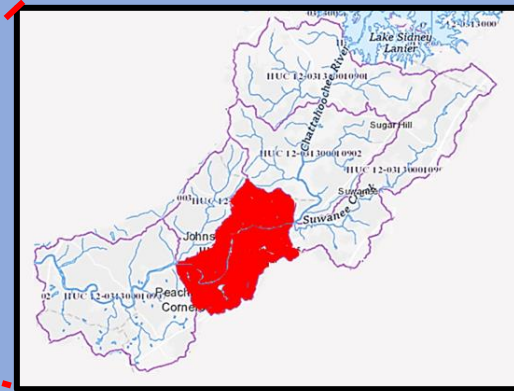
Hydrologic Regions



ACF* River System



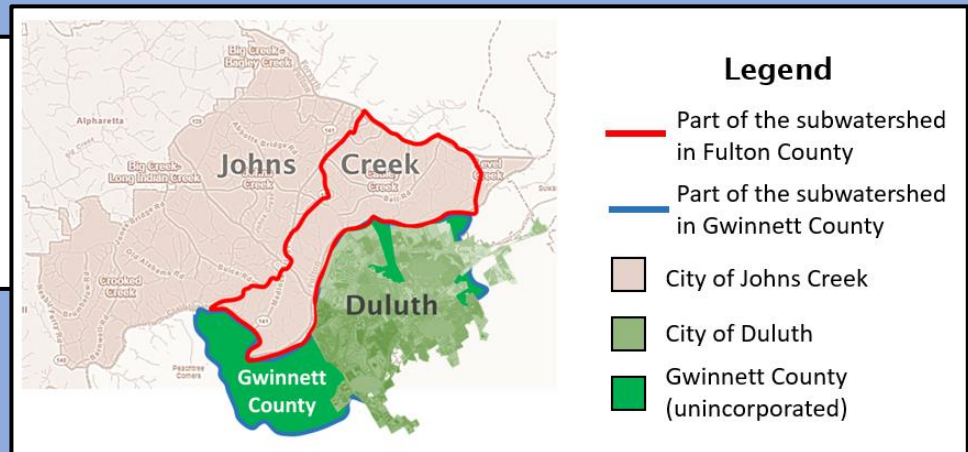
Chattahoochee R. Upper Subbasin



Cauley Creek - Chattahoochee R. Subwatershed

*Apalachicola-Chattahoochee-Flint

The Cauley Creek- Chattahoochee R. Subwatershed (CC-CRS) is under Gwinnett County and the cities of Johns Creek and Duluth, GA.



Modified public domain graphics.

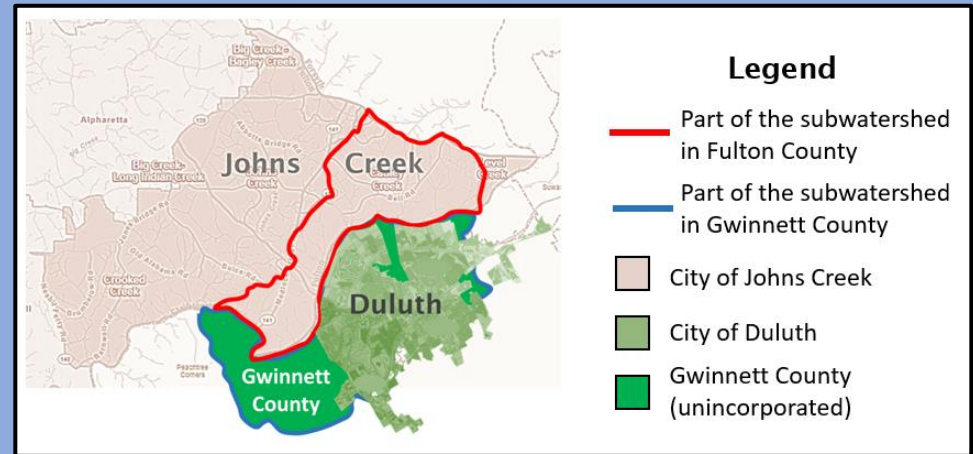


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Scale

Scale is about the size and level of detail. For example, residential lawns in Duluth are about 3% of the CC-CR subwatershed area, with impermeable surfaces that are about 1%. Though these amounts seem small, the type of pollution from residential areas can have a significant effect on the local waterways.



Modified public domain graphics.

Place		Area	Typical home	Sq m	
CC-CRS		250.5 km ²	Roof	119 m ²	182 m ²
Duluth		25.47 km ²	Driveway	63 m ²	
12,794 homes	Lawn	7.97 km ²	Yard	623 m ²	
	Roof	2.33km ²	Residential lawns are 3% of the CC-CRS area, and impermeable surfaces are 1%.		
	Driveway				



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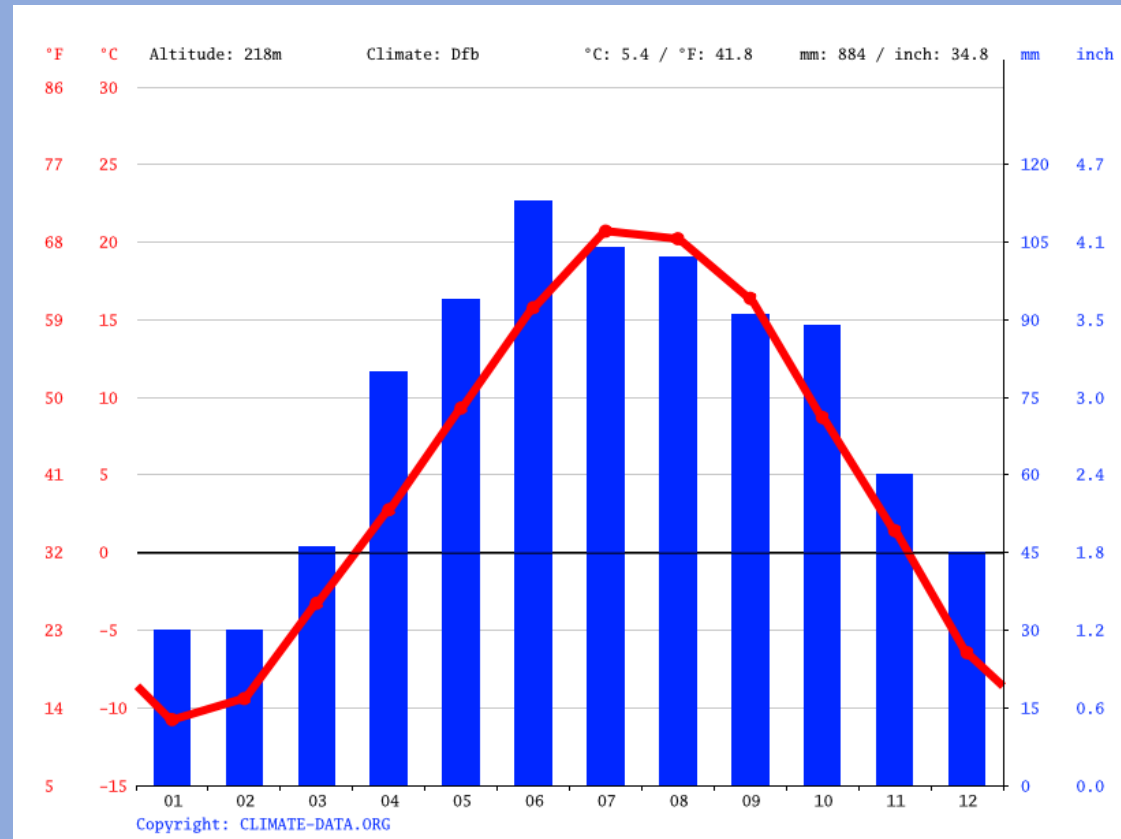
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Time

Rainfall varies seasonally. For Duluth, stormwater events can often occur from Spring through Fall.

Look for climate and climate change data for your place.

- <https://www.usclimatedata.com/>
- <https://www.climate.gov/maps-data#dataset-gallery-block>



Winter

Spring

Summer

Fall

Win.

Modified graphics from the Internet: Creative Commons



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Map Your Yard

General Layout

The general layout of your yard shows the dimensions of the yard, the location of your home, all paved surfaces, the property boundaries, the street, trees, hedges, garden beds, and any natural waterways.



Graphics from the Internet: Creative Commons



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Map Your Yard (cont'd)

Slope Angle

The slope should be away from your house and not onto your neighbor's property. The rainwater should drain into a waterway or the street. Simple math and hand tools let you measure and map the slope of your yard. Then you can plan to slow the flow and make swales to let the water soak into the ground. If the slope is more than 10%, slow it down so it can soak into the ground.



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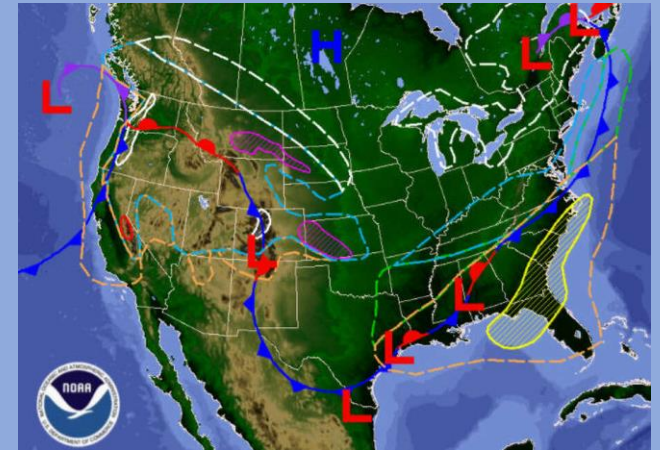
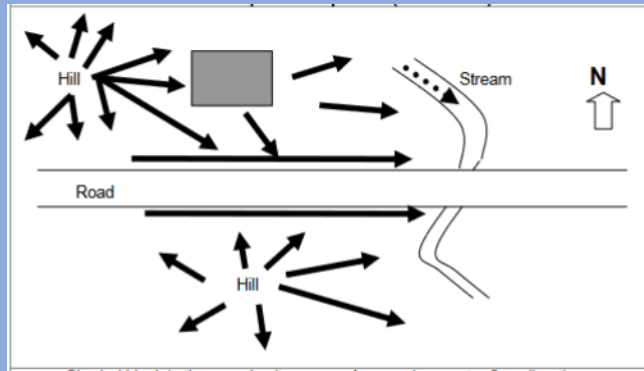
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FFI: [Leveling Survey](#)
[Natural Terrain Study Guide](#), p. 15

Map Your Yard (cont'd)

Slope Aspect

As you look down the slope, use a magnetic compass to know the direction the slope faces. Then note the direction storms will approach your house to help you know where to plant trees to block the wind.



Graphics from the Internet: Creative Commons



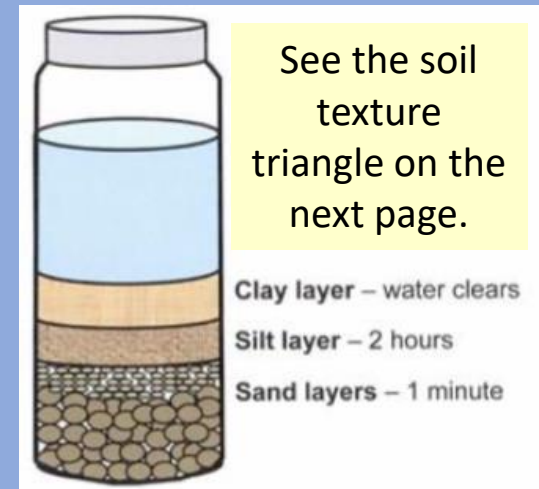
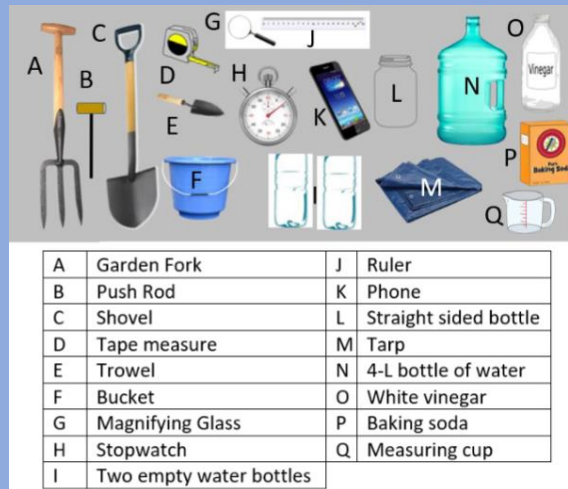
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FFI: [Natural Terrain Study Guide](#), p. 16

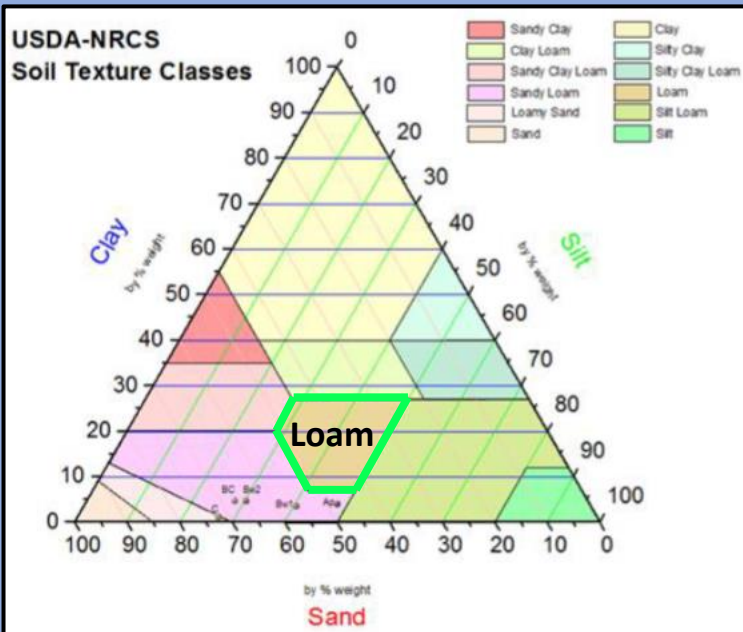
Test Your Soil

Start testing the soil where your slope survey indicates 1) a natural water flow path or a planned flow path, and 2) where you can make a swale. The goal is to improve the soil water infiltration rate and the soil's moisture retention capacity.



Improve Your Soil

Compost is the optimum and natural way to get your soil to be a loam. This will increase the soil's ability to resist erosion, hold more moisture, support healthy soil organisms and plant growth, and improve drought resilience.



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FFI: Basic Soil Testing [W2.4](#) [W2.5](#); Compost [W4.1](#) [W4.2](#) [W4.3](#); [Making Compost](#); [Intro. To Soil Management Methods](#)

Assess Your Yard for Pollutants

Take this short assessment and be green and clean!

Do you use commercial chemicals to kill weeds and pests?

☐ **No** ☐ **Yes** Please stop using them. Alternatives to try: [#1](#) [#2](#) [#3](#) [#4](#) [#5](#) [#6](#)

Do you use commercial chemical fertilizers?

☐ **No** ☐ **Yes** Please stop using them.
Make compost [W4.1](#) [W4.2](#) [W4.3](#) ; [Making Compost](#)

Do you use other hazardous chemicals in and around your yard?

☐ **No** ☐ **Yes** Please stop using them. Properly store them ([#1](#) [#2](#)) and be prepared for accidental spills: [#1](#) [#2](#) [#3](#)

If you have pets, do you pick up and properly dispose of their poo?

☐ **Yes** ☐ **No** Please clean up after them and consider these options: [#1](#) [#2](#) [#3](#) [#4](#)

Do you have a grass lawn?

☐ **No** ☐ **Yes** Please find ways to stop or reduce/replace your grass lawns with these alternatives [#1](#) [#2](#) [#3](#) [#4](#)

Stormwater from your roof, driveway, and yard can be easily polluted by chemicals and pet wastes. Do your part and don't pollute.



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Dogs & Owners Do; Cats & Owners Don't

Pet fecal (poop) wastes are a source of bacteria and viruses that contaminate stormwater. There are some dog poo calculators available ([#1](#) [#2](#) [#3](#)). Some states and cities have laws requiring dog owners to be responsible for cleaning up pet waste. Though cat feces (poop) are also sources of diseases and pollute stormwater, cats and their owners do not have similar laws ([#1](#) [#2](#) [#3](#)).



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Assess Your Yard for Impermeable Surfaces

Reduce impermeable surfaces at your home to do your part to reduce stormwater runoff from your property.

Do you know the total roof area of all the buildings on your property?

☐ **Yes** ☐ **No** If not, please measure and calculate it.*

Do you collect rainwater from your roof and gutters?

☐ **Yes** ☐ **No** If not, please consider these alternatives: [#1](#) [#2](#) [#3](#) [#4](#)

Do you know the total area of your driveway?

☐ **Yes** ☐ **No** If not, please measure it and calculate it.*

Is your driveway permeable to water?

☐ **Yes** ☐ **No** If not, please consider these alternatives: [#1](#) [#2](#) [#3](#) [#4](#)

Do you know the total area of other paved surfaces on your property?

☐ **Yes** ☐ **No** Please measure and calculate them.*

Are these other paved surfaces permeable to water?

☐ **Yes** ☐ **No** If not, please consider these alternatives: [#1](#) [#2](#) [#3](#)

Do you control stormwater runoff from your yard?

☐ **Yes** ☐ **No** Please review the previous slides and do your part to reduce nonpoint pollution of stormwater from your yard. FFI: [#1](#) [#2](#) [#3](#)

*If you have a stormwater utility in your area, these areas are probably used in your fee calculations.



Reason\$ to Manage Your \$tormwater Runoff

If you plant tree\$, you get the\$e return\$:

- \$hade to \$ave on \$ummer home cooling co\$t\$.
- Tree\$ increa\$e property and neighborhood real e\$ate value\$.
- Tree\$ help improve \$oil moi\$ture retention. This reduce\$ lawn watering co\$t\$.
- If you plant fruit/nut tree\$, you get some food \$ecurity and \$ave on grocerie\$.
- Leave\$ and fallen fruit\$ give\$ you material\$ for making compo\$t, \$aving your from buying fertilizer\$.



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Reason\$ to Manage Your \$tormwater Runoff

If you \$low \$tormwater flow in your yard, you get the\$e return\$:

- It gives water more time to \$oak into the ground.
- It reduce\$ your lawn watering co\$t\$.
- It make\$ your yard more drought re\$i\$tant and help\$ retain your property value.



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Reason\$ to Manage Your \$tormwater Runoff

If you make and u\$e compo\$t, you get the\$e return\$:

- You \$ave money by not busing herbicide\$, pesticide\$, and fertilizer\$ and related tools.
- It help\$ reduce co\$t\$ from adver\$e effect\$ of lawn chemical\$ to you and your family.
- It increa\$e\$ \$oil moi\$ture retention and make\$ your cost\$ to water your lawn.



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Reason\$ to Manage Your \$tormwater Runoff

If you decrea\$e impervious\$ \$urface\$, you get the\$e return\$:

- Your home \$tay\$ cooler in \$ummer\$, reducing air conditioning co\$t\$.
- It increa\$e\$ \$oil moi\$ture retention and make\$ your co\$t\$ to water your lawn.
- Eliminate\$ un\$lightly cracked driveway\$, patio\$, and walk\$ that decrea\$e\$ property value.
- Make\$ your home more environmentally \$ound and can increa\$e re\$ale value.



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Reason\$ to Manage Your \$tormwater Runoff

If you u\$e low-maintenance ground cover\$ to replace your gra\$\$ lawn, you get the\$e return\$:

- \$ave on your water bill for lawn care.
- \$ave money by not buying ga\$-powered lawn care equipment.
- \$ave money by not buying herbicides\$.
- \$ome ground covers are \$turdy enough to replace imperviou\$ sidewalks and driveway\$.



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Reason\$ to Manage Your \$tormwater Runoff

If you clean up your pet's wa\$te, you get the\$e return\$:

- Your yard and garden bed\$ won't \$mell.
- Your vegetable garden can be \$afer and more \$anitary (think cat\$ burying poo there).
- In the long-term, reduced \$tormwater pollution reduces the amount of cleanup needed for your drinking water \$upply.

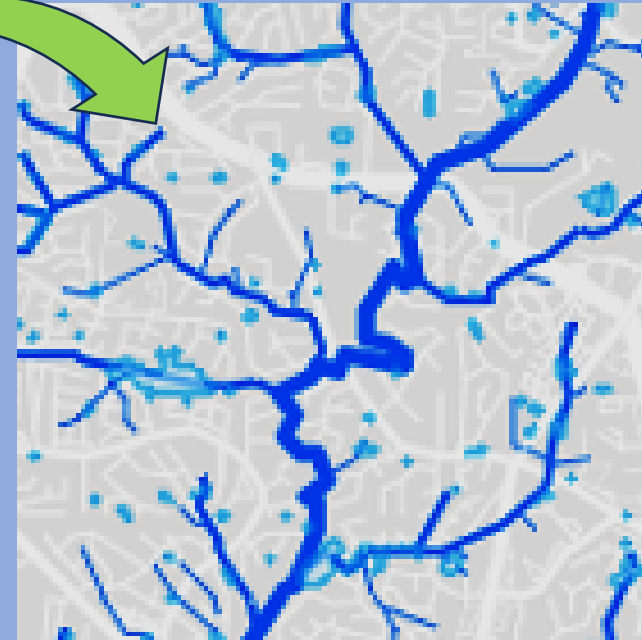


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Expand Your Horizons

After doing your home, get your neighbors to do their part. Then look at your watershed. Everyone needs and uses water, so everyone must do their part to ensure we can all have clean safe water to survive and thrive.



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Taking the effort from home to the neighborhood
and on to the watershed.

Neighborhood Challenges

If your neighborhood floods: Get the city to help you estimate stormwater runoff for the neighborhood. Then estimate how much could be slowed from getting to the storm drains by homeowner actions. If the neighborhood efforts reduce flooding, it is a direct benefit to the neighborhood.

Get the city to agree on a stormwater reduction target in exchange for a) a property tax rebate, b) stormwater utility credit, or some other incentive to motivate homeowner participation.



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Neighborhood Challenge #1

If your neighborhood floods: Get the city to help you estimate stormwater runoff for the neighborhood. Then estimate how much stormwater could be slowed from getting to the storm drains by homeowner actions. If the neighborhood efforts reduce flooding, it is a direct benefit to the neighborhood.

Get the city to agree on a stormwater reduction target in exchange for a) a property tax rebate, b) stormwater utility credit, or some other incentive to motivate homeowner participation.



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Neighborhood Challenge #2

Yard/Driveway make-over: Using the same stormwater data from challenge #1, get the city and water utility to estimate the value of replace lawns, walks, and driveways with low-maintenance ground cover or open pavers to reduce water use for lawns, reduce impervious surfaces, and reduce urban heat island effects and air pollution by eliminating gas-powered yard-care equipment.

Get the city to agree on a) a property tax rebate, b) stormwater utility credit, or some other incentive to motivate homeowner participation.



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Neighborhood Challenge #3

Improve your neighborhood with tree planting: Get the city or power company to help you estimate summer electricity use in your neighborhood. Then estimate how much electrical could be reduced planting trees and the benefit to the city for reducing air pollution and stormwater runoff.

Get the city and utility to collaborate and provide matching funds to get trees for homeowners to plant. Improved property tax values/revenues help the city to recoup initial costs and sustain funding the tree planting program. Or negotiate some other incentive to motivate homeowner participation.



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Is anyone Upstream from You?

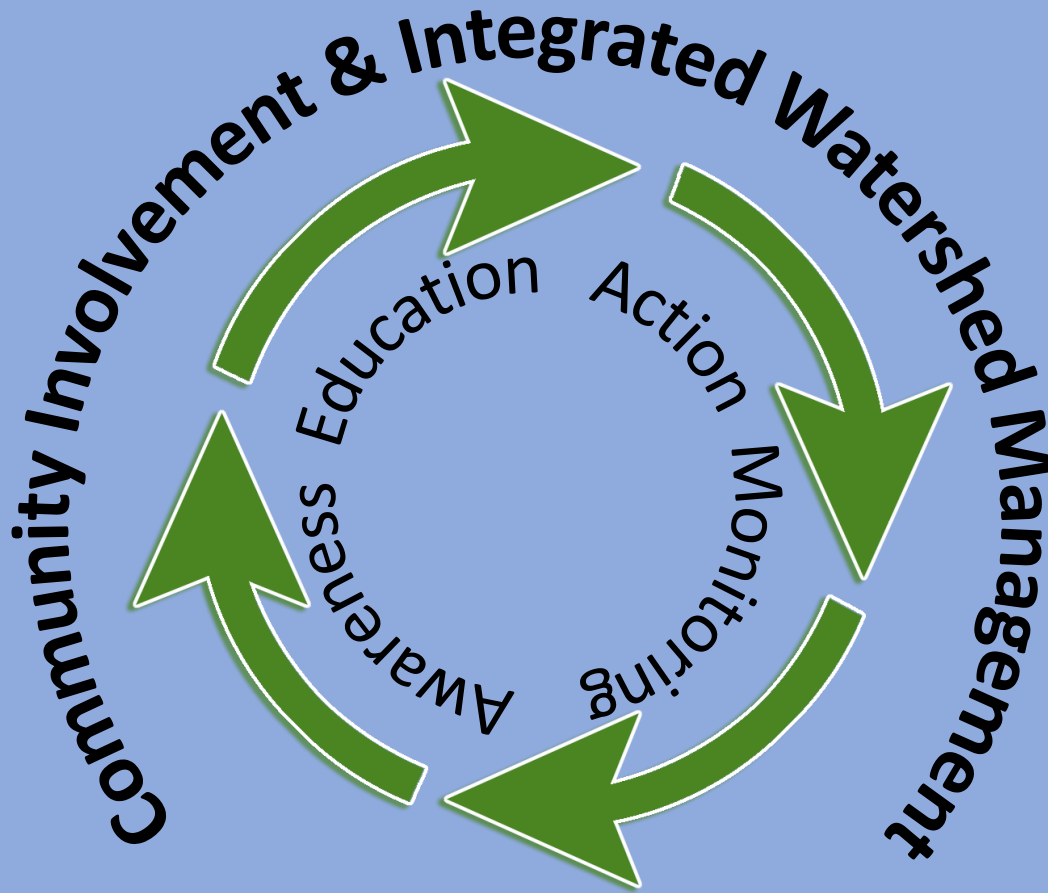
Your efforts to not pollute can be undone by upstream pollution sources. All downstream users are affected by those upstream from them. This is why water resource management requires collaboration and cooperation so everyone can get clean safe drinking water.



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Protecting the Watershed

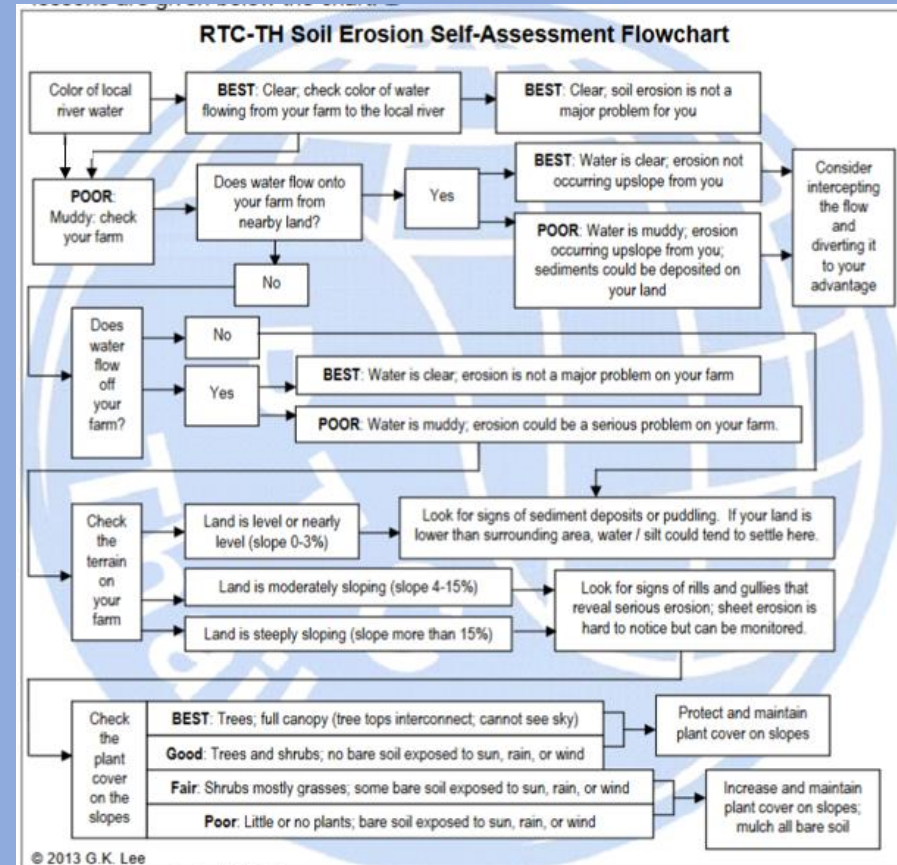


Integrated Watershed Management requires constant effort because the environment, society, and the world are forever changing. Local governments may not have enough staff or money to do the work by themselves. Residents have a vested interest in ensuring getting clean drinking water.



Any Erosion in the Watershed?

Soil is the soul of the watershed. Soil erosion robs the watershed of its soul, so learn to check for erosion. Stormwater erodes soil and causes rivers and streams to appear muddy. This degrades both water quality and the form and functions of streams and rivers.



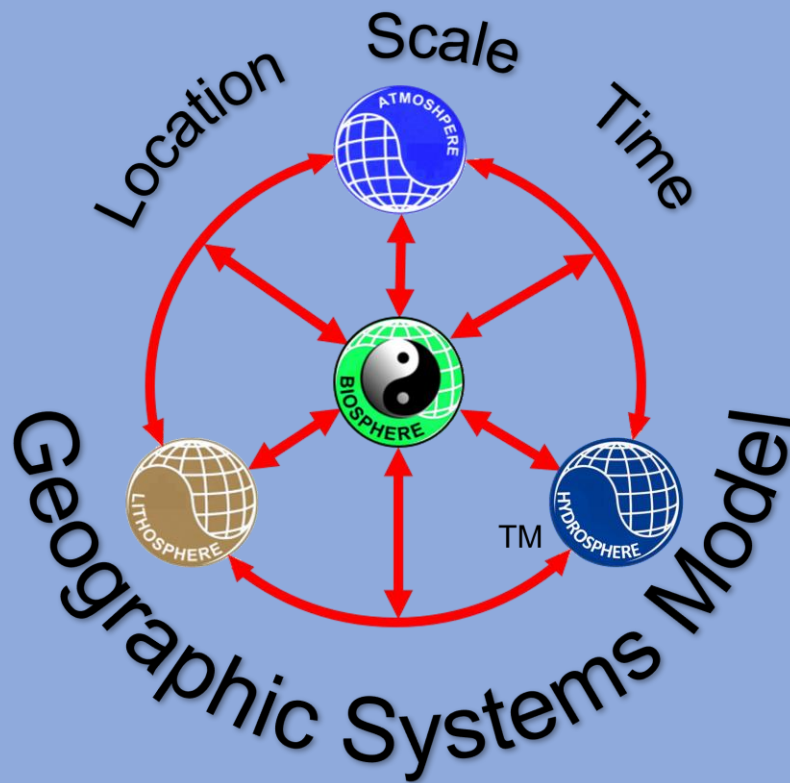
Source: [2013 RTC-TH Apr Update 2](#)



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Everything is Connected

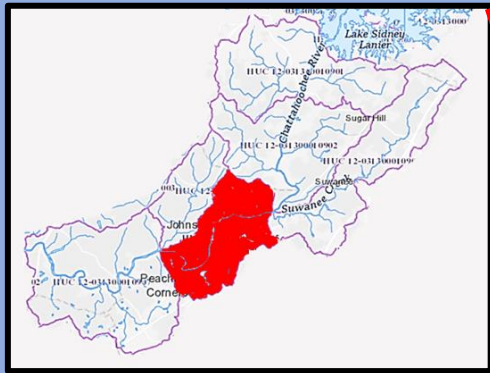


This brings us back to where we started this presentation. But there is still more to be done, and it starts with you. You may feel that your effort at home is just one tiny drop in the ocean. How can it make a difference? Well, imagine you are very thirsty and don't have any water at all. Then ask yourself if you'd like a drop of water.

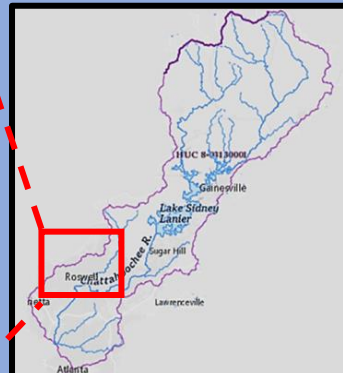


Remember Your Connections

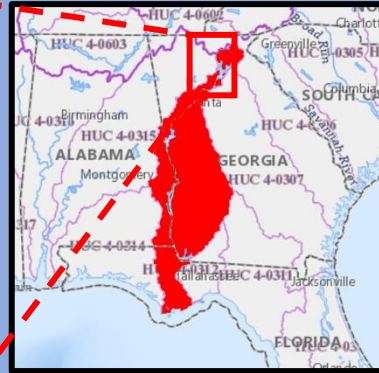
A home in Duluth, GA in the CC-CR subwatershed is connected to a river basin and system. Polluted stormwater could eventually flow through Georgia, Alabama, and Florida and get into the Gulf of Mexico.



Cauley Creek -
Chattahoochee R.
Subwatershed



Chattahoochee R.
Upper Subbasin



ACF River System



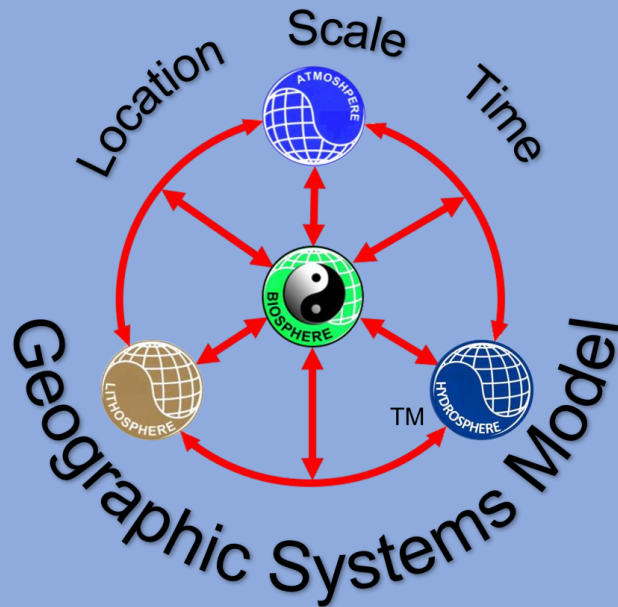
Hydrologic Regions

What you do with your water affects
everyone downstream from you.

Modified public domain graphics.



For More Information



Geography may
not change the
world, but it will
change the way
you see it.



Greg Lee
Applied
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Founder



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Geography may not change the world, but it will
change the way you see it. –G. K. Lee

The End

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