

# Developing a Water-Wise Landscape

Gary Wade  
UGA Cooperative Extension

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- ## Local/Regional/National Issues
- Public Outreach & Education Needs:
    - Soil and Water Resource Conservation
    - Invasive Species Awareness
    - Tree and Wildlife Preservation
    - Recycling, Composting, Grass-cycling
    - Sustainable Agro-ecosystems

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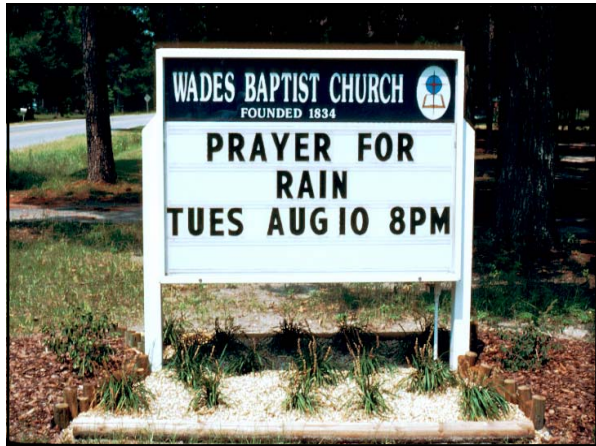
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**News**

### Drought Dries Up Homeowners' Wells

Reported by: [Tiffany Cochran](#)  
Web Editor: [Michelle King](#)  
Last Modified: [9/29/2007 3:51 PM](#)

Imagine not being able to bathe, wash dishes or even wash clothes at home. It is a predicament a Douglas County family is facing, they said, because of the severe drought.

They said it has literally caused their well to dry up.

"We have jets for dishwashing. We have a big jug here for brushing teeth and stuff," said David West.

Since August 11, David and Cathy West's well has gone dry, leaving them with very little water. The couple said the state's severe drought conditions have led to this. They said they have been inconvenienced ever since.

"We have not been able to take showers," said Cathy. "We have to wash our clothes, take showers with family — thank goodness we have people around here where we can do that."

The Wests are now trying to get the Douglasville-Douglas County Water and Sewer Authority, or WSA, to allow them to connect with the county water service — even circulating a petition.

"There are three of us around here who can't drink our water," Cathy said. "We need county water down this road. And it's awful where we get petitions up, people want it, but they won't hook it up."


Peter Frost is the executive director of WSA. He said past experience has taught the county to make sure the homeowners will connect financially to a project like this. So far, only six of 18 residents have signed on.

"I'm sympathetic to these people that have wells going dry," Frost said. "But the point is, we'd soon run out of money if we dropped everything to get water to those few people."

The West family is hoping for a solution sooner, rather than later.

Frost said he'd like to give the effort a little more time to generate more interest, and give more residents a chance to join the county water service, if they choose to connect to it.

**Video Available!**  
[Tiffany Cochran reports](#)



The West family has to resort to bottled water to have enough to cook with.

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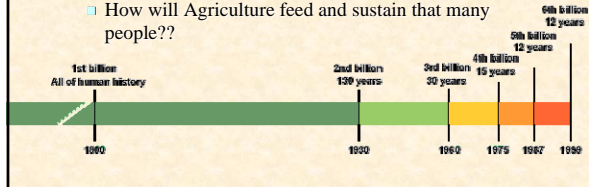
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## Globalization...“The Big Picture”



- World Population Today: 6.5 Billion People
  - Increasing at 2 Billion every 25 years
  - Prediction: In the next 50 years, the world may reach a maximum sustainable population of 10 Billion people...
  - How will Agriculture feed and sustain that many people??



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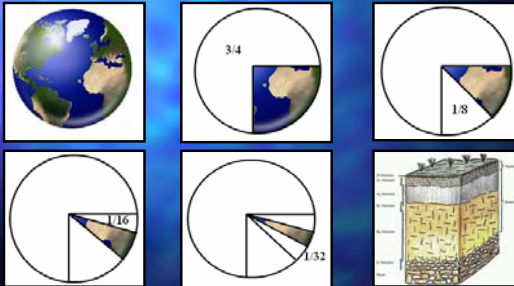
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## Soil Conservation



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## Facts About Water

- We have the same amount of water on earth today as we did when the earth was created.
- Of all the earth's water, 97.5% is salt water located in the oceans and seas.
- 2% of the earth's water is tied up in polar ice sheets in Antarctica and Greenland.
- Less than 1% of the earth's water is fresh water available for drinking, bathing, cleaning, cooking, manufacturing, and growing agricultural crops.

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## Facts About Water

- 61% of our drinking water in the U.S. comes from surface water supplies (streams, lakes, rivers) while 39% comes from groundwater (underground aquifers).
- In Georgia, 75% of our drinking water comes from surface water, while 25% comes from ground water.

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## Facts About Water

- We only need about 15 gallons of water per day per person for drinking, bathing and cooking, yet per capita water consumption in the U.S. exceeds 100 gallons/day.
- If every household in the U.S. saved just 1 gallon of water a day, we would save 120 million gallons of water per day, enough water for a city the size of Jacksonville, FL.

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## Water Consumption Facts: How Thirsty is our Nation?

- It takes 800,000 gallons of water to grow one acre of cotton.
- It takes 35 gallons of water to grow, irrigate, process and cook 1 serving of rice.
- It takes 65 gallons of water to process 1 glass of milk.
- 39,000 gallons of water are used to manufacture a new car.
- One flush of a toilet uses as much water as the average person in the developing world uses in a whole day!

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**Worldwide**

Global Demand for fresh water will double every 20 years

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**Worldwide**

12 billion people by the year 2100. Fifty percent of the population will reside in mega cities of 12 to 15 million.

Demand for land, fresh water and other resources will escalate.

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**Worldwide**

One in Five people worldwide lack access to safe drinking water.

More than 2.2 million people, mostly in developing countries, die each year from diseases associated with poor water quality and sanitary conditions.

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## Worldwide

Worldwide renewable water resources available per person decreased by 50% between 1960 and 1998.

Another 50% reduction is projected by 2025.

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In the United States, over two-thirds of the population resides in metropolitan areas.

In Georgia, over half of our state's population resides in just 24 of our 159 counties.

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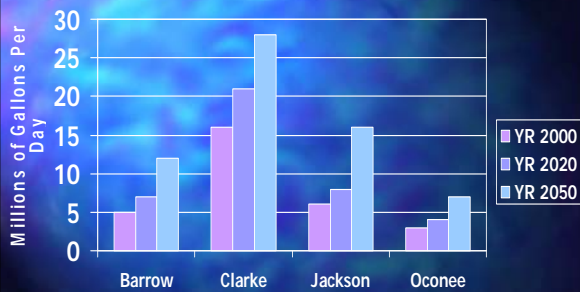
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## Projected Water Demands in Barrow, Clarke, Jackson and Oconee Counties



Water demand is not limited to only urban counties!

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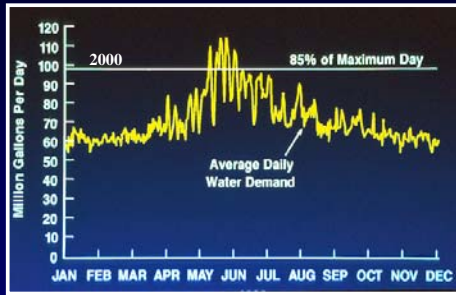
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### Water Demand for Cobb Marietta Water Authority



Water restrictions are imposed when demand exceeds 85% of the maximum daily pumping capacity.

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Average residential water use increases 30% - 50% during the summer months when citizens turn on their outdoor irrigation systems

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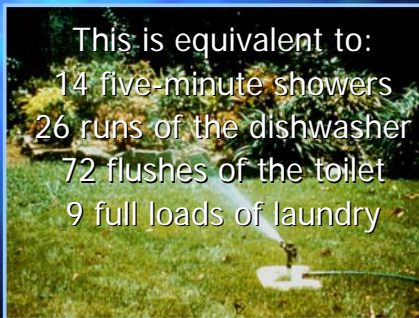
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One portable lawn sprinkler operating 1 hour uses 360 gallons of water



This is equivalent to:  
14 five-minute showers  
26 runs of the dishwasher  
72 flushes of the toilet  
9 full loads of laundry

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## Water Conservation Measures

- Summer Surcharge: Rate increases 25% to 100% when use exceeds average winter consumption.
- Rationing: Odd/Even outdoor watering
- Bans on Outdoor Use
- EDUCATION

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**XERISCAPE**

(Pronounced Zera-scape)

**Coined in Colorado in 1981**

**From the Greek Word "Xeros", which means dry**

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## Seven Steps of Xeriscape

- Planning and Design
- Soil Analysis
- Appropriate Plant Selection
- Practical Turf Areas
- Efficient Irrigation
- Use of Mulches
- Appropriate Maintenance

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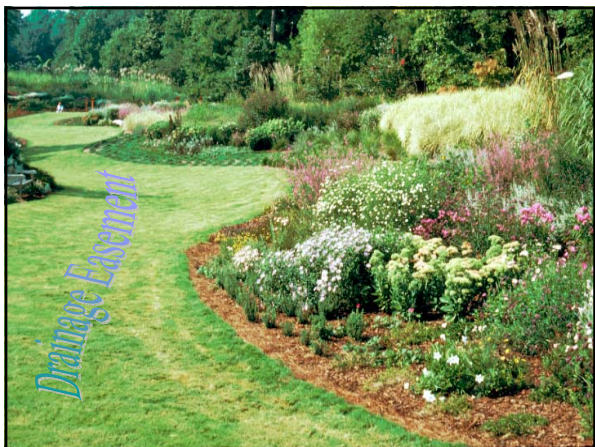
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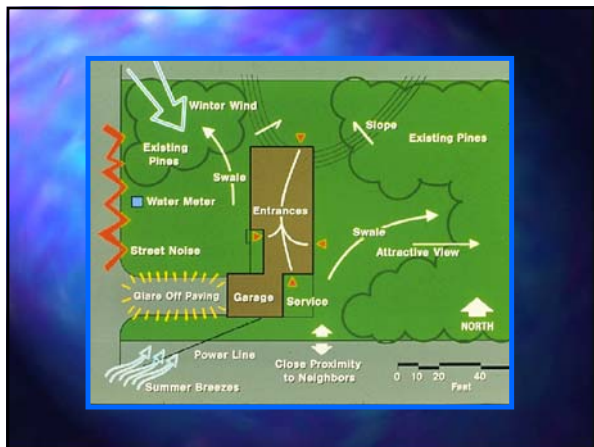
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## Divide the Landscape into Three Water-use Zones

- High Water-use Zone (Oasis Zone)
- Moderate Water-use Zone (Transition Zone)
- Low Water-use Zone (Xeric Zone)

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### High Water-use Zone (Oasis Zone)

Small "high-impact" or high visibility area of the landscape where plants are provided their optimum water requirement at all time

Entrance to the home or business

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### Moderate Water-use Zone (Transition Zone)

Plants are watered during establishment. Then, once established, they are watered only when they show signs of water stress.

Azaleas, dogwoods, redbuds,  
herbaceous perennials

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Low Water-use Zone (Xeric Zone)

Once established, plants are provided no supplemental irrigation, except during periods of extreme drought

- Juniper
- Crape Myrtle
- Yaupon Holly
- Oaks
- Native Areas

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10% of the landscape is irrigated regularly  
30% of the landscape is irrigated on demand  
60% of the landscape is not irrigated

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Shade helps reduce water loss in the landscape



Shaded areas may be 10 to 15 degrees cooler!

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### Goal of Water Wise Landscapes

**Reduce and minimize the size of the area irrigated and the frequency of irrigation**

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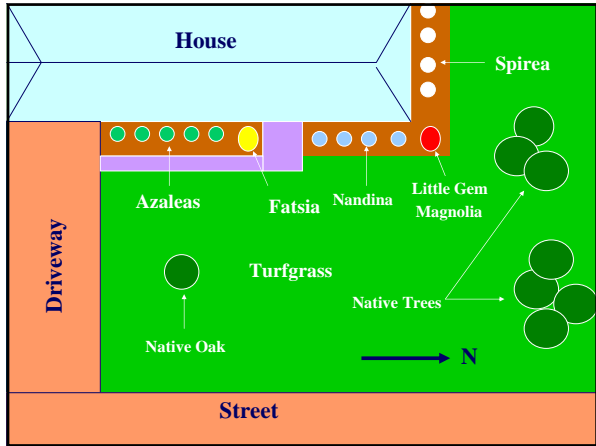
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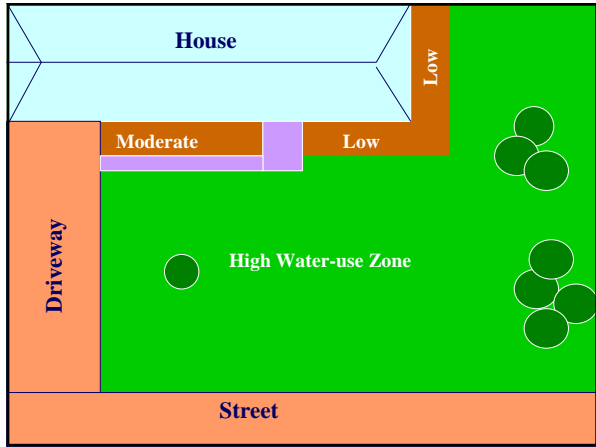
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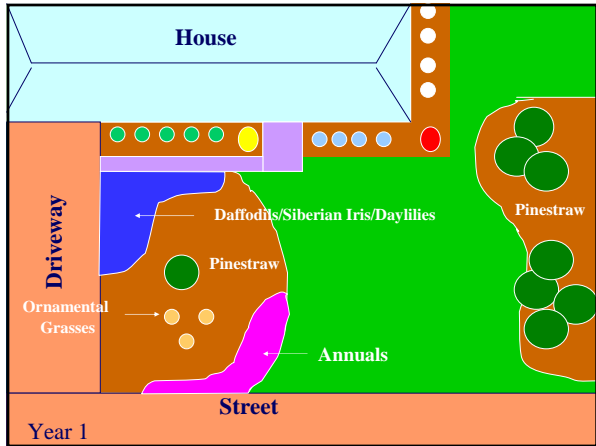
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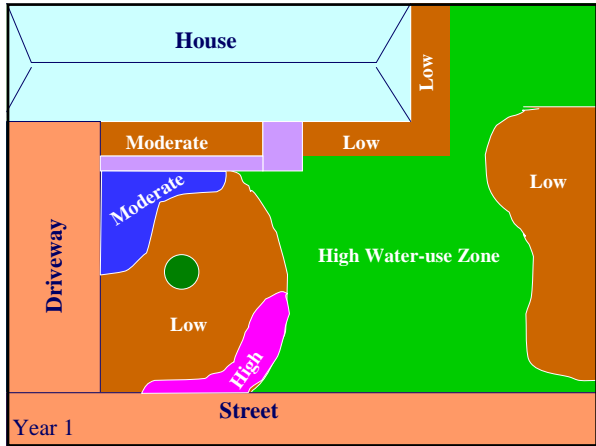
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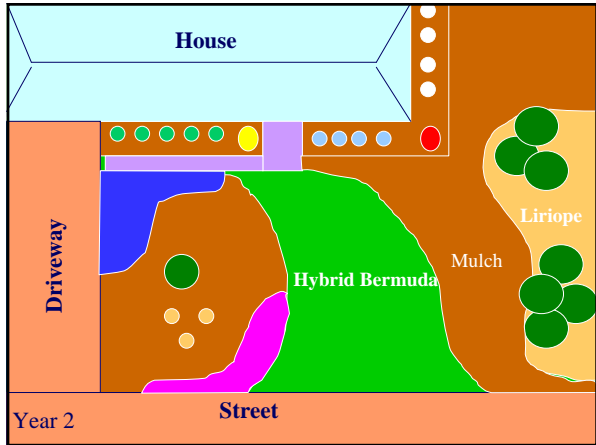
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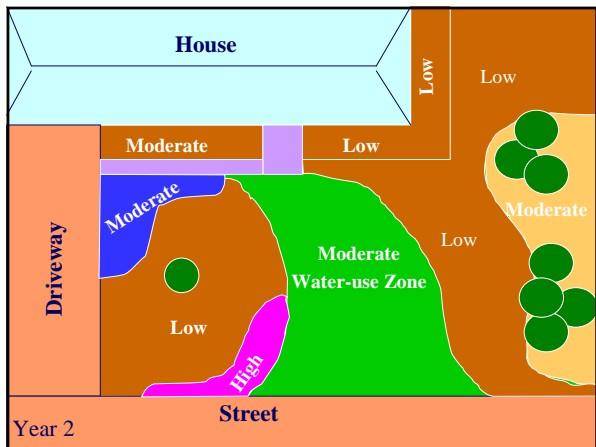
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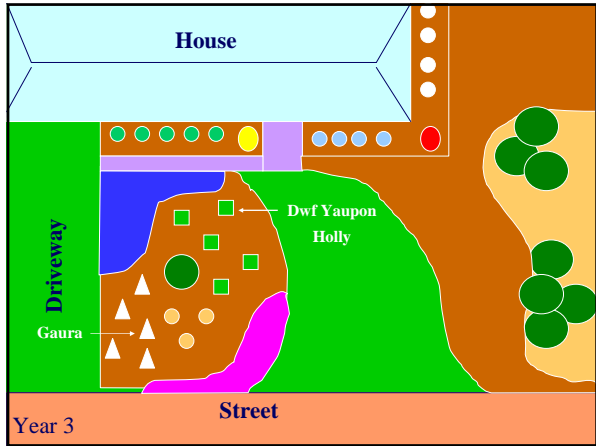
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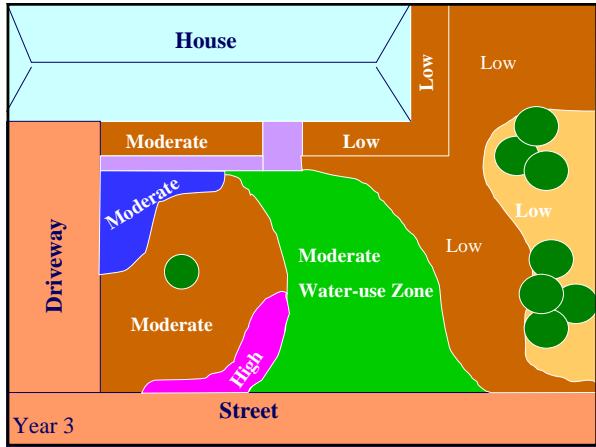
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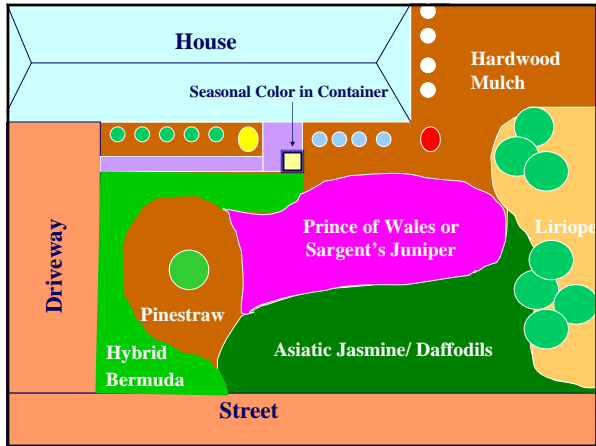
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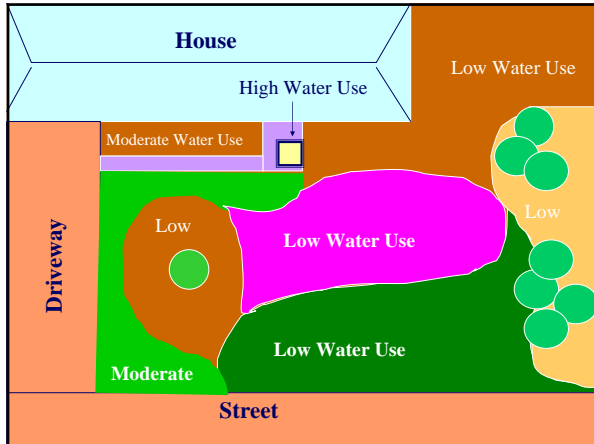
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### Don't Guess...Soil Test!

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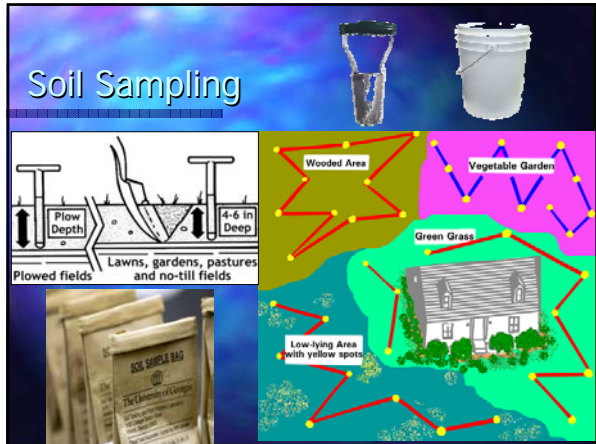
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## How Much Amendment to Use?

25% by Volume  
 3 inches incorporated to a 12 – inch depth  
 1 cu. yd. / 100 sq. ft. = 3 in. on soil surface  
 1 cu. yd. = 27 cu. ft. = Nine 3 cu. ft. bags or 13 – 2 cu. ft. bags / 100 sq. ft.

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Use only decomposed organic material  
(right) as a soil amendment



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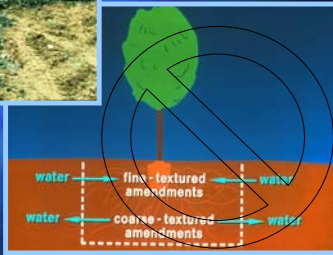
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Incorporate organic  
matter uniformly  
into the top 12  
inches



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More plants are killed in  
Georgia from over-watering  
than from drought

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### Possible Solutions to Poorly-drained Soils

- Plant on raised beds
- Deep cultivation
- Install sub-surface drainage
- Select appropriate plants

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### Select Plants Adapted to the Site and the Stresses of the Environment

Drought tolerance is important, but also consider potential insect and disease problems, sunlight and soil requirements.

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Chastetree  
*(Vitex agnus-castus)*

Chinese Pistache  
Hollies  
Japanese Zelkova

**Trees**



Little Gem Magnolia  
*(Magnolia grandiflora Little Gem)*

Lacebark Elm  
Trident Maple  
Crape Myrtle

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Forsythia  
*(forsythia intermedia)*

Spirea  
Mahonia  
Dwarf Yaupon Holly

**Shrubs / Ornamental Grasses**



Maidengrass  
*(Miscanthus sinensis)*

Aucuba  
Barberry  
Chinese Holly

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Blue Rug Juniper  
*(Juniperus horizontalis Blue Rug)*

Asiatic Jasmine  
Daylily  
St. John's Wort

**Ground Covers/Vines**



Liriope  
*(Liriope muscari)*

Honeysuckle  
Carolina Jessamine  
Wintercreeper Euonymus

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Gaura  
Black-eyed Susan  
Russian Sage

*Wormwood*  
*Artemisia 'Powis Castle'*

**Herbaceous Perennials**

*Sedum 'Autumn Joy'*

Red Hot Poker  
Rosemary  
Agave

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Baby's Breath  
Verbena  
Annual Periwinkle

Globe Amaranth  
(*Gomphrena globosa*)

**Annuals**

Creeping Zinnia  
(*Zinnia linearis*)

Dusty Miller  
Gazania  
Portulaca

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### Drought Tolerance of Turfgrasses

Hybrid Bermuda		Most
Zoysia		
Centipede		
Fescue		Least

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## For Help Selecting Adapted Plants

- Visit your local nurseryman
- Contact your local county Extension office
  - 1-800-ASK-UGA1
- Visit the following web site: [www.ces.uga.edu](http://www.ces.uga.edu)

Click on Publications and Look for:

*"Coping with Watering Restrictions in the Landscape"*  
*"Xeriscape: A Guide to Developing a Water Wise Landscape"*  
*"Landscape Plants for Georgia"*  
*"Lawns in Georgia"*

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## Plants Don't Save Water

*People Save  
Water !*

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## Use Turfgrass for a Purpose

- Aesthetic Value (Welcome Mat)
- Recreational Surface
- Erosion Control

Minimize the amount of irrigated turfgrass

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## Avoid Using Irrigated Turfgrass Just to Fill Space



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George Washington's  
Mt. Vernon Estate

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### Recommended Number of Sheep per 3,000 sq. ft. of Lawn Area

<u>Desired Height</u>	<u># of Sheep</u>
1- inch	3
2-inches	2
3-inches	1

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Adjust timers frequently according to changes in rainfall patterns



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A low-cost rainfall sensor will prevent the irrigation system from running during rain



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Timer Faucet Connection



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Target irrigation to plants that show signs of stress

- Gray/green Color
- Wilting
- Dying Branches

Use a hand-held hose with water breaker or sprinkler can to target irrigation to plants that need water

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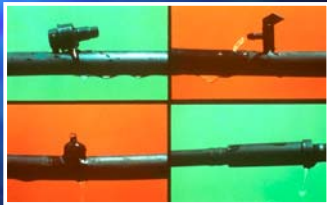
## Drip Irrigation

Uses 30% to 50% less water than sprinkler irrigation

Avoids spraying foliage so diseases are less likely to occur

No spray drift

Only need to water 25% of the root area



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For most efficient use of water, irrigate between 9 pm and 9 am to avoid evaporative loss of water.

Avoid light, frequent irrigation because it encourages shallow rooting and increases water demand of the plant.

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## Benefits of Mulch

- Prevents evaporative water loss from the soil
- Prevents soil-borne diseases
- Insulates the roots of plants from extreme heat and cold
- Reduces weed competition

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## How Much Mulch To Apply?

3 to 5 inches is sufficient

1 bale of pine straw covers approximately 50 sq. ft.

9 - 3 cu. ft. bags or 13 - 2 cu. ft. of bark mulch will cover 100 sq. ft. to a 3-inch depth

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Landscape fabrics under mulch helps prevent weeds and conserves moisture in the soil



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Avoid Frequent Flushes of Vegetative Growth Brought on by:

- Over-Fertilization
- Pruning
- Frequent Irrigation

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## Fertilization

- Target fertilization to plants that need it. Established trees and shrubs may not need to be fertilized annually.
- Use slow-release forms of nitrogen (Urea formaldehyde, IBDU, Sulfur-coated urea)
- Use low rates of fertilizer
- Limit fertilization during dry periods

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## Too Much Nitrogen

- Increases pest problems
- Increases top growth
- Reduces root growth
- Increases pruning requirements
- Increases run-off into groundwater

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Prune by selective thinning  
instead of shearing



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## Grasscycling

Let the Clips Fall Where they May

Clippings  
Help Hold  
Moisture  
in the soil

Clippings  
DO NOT  
Cause  
Thatch



Clippings  
Add  
Nitrogen  
Back  
to the  
Soil

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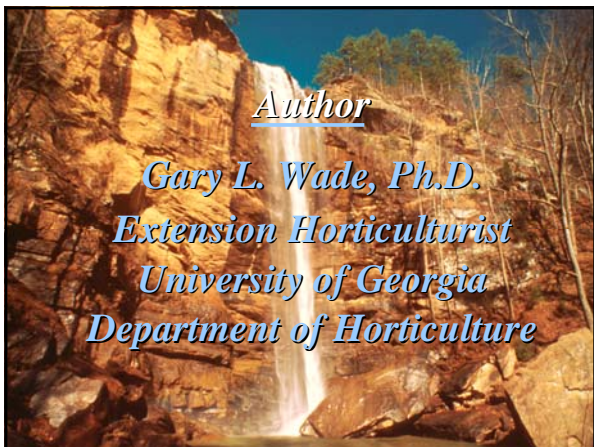
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## Consider the Economic Benefits of Water-wise Landscapes

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## Water/Sewage Rates in Athens/Clarke County

Water: \$1.83/100 cu. ft.  
Sewage: \$1.41/100 cu. ft.  
100 cu. Ft. x 7.45 = 745 gallons  
 $\frac{\$1.83}{745 \text{ gal.}} = \frac{x}{1,000 \text{ gal.}}$

Water: \$2.46/1000 gallons    Sewage: \$ 1.89/1000 gallons

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## Assumptions

**1 inch of water = 600 gal./1,000 sq. ft.**

### High Water-use Zones:

1 in. water 4 times/mo: Mar. -Oct., then 1 in. water 1 time/mo: Nov. -Feb.

### Moderate Water-use Zones:

1 in. water 2 times/mo: March - Oct;  
then no water: Nov. -Feb.

### Low Water-use Zones:

No supplemental irrigation

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## Projected Water Cost/1000 sq. ft.

Water Zone	Water Cost	Sewage Cost	Total Cost
High Water-use Zone	\$53.14	\$40.82	\$93.96
Moderate Water-use Zone	\$23.62	\$18.14	\$41.76

**Total : \$135.72**

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## Potential Savings

Convert 1/3 of a 1/2 acre lot from High to Low Water Use,  
**SAVE \$588.18/yr.**

Convert 1/3 of a 1/2 acre lot from Moderate to Low Water Use,  
**SAVE \$266.42/yr.**

Total Potential Savings: **\$849.59/yr.** on water and sewage

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## Comparative Cost of Converting 1000 sq. ft. of Irrigated Area to Mulch or Groundcover Plants

**Pine Straw @ \$3/bale**

1 bale covers approx 50 sq. ft to a 3-inch depth  
20 bales/1000 sq. ft. x \$3/bale = **\$60**

**Asiatic Jasmine Groundcover @ 24-inch centers**

Liner plants (2 1/4-inch pots) @ \$0.75/pot

250 plants/1000 sq. ft. x \$0.75/plant = \$187.50

+ 20 bales of pine straw (2-inch depth) @ \$3/bale = \$60

**Total Cost = \$247.50**

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Comparative Cost of Converting 1000 sq. ft. of Irrigated Area to Mulch or Groundcover Plants

**Juniper Groundcover @ 4 ft. centers =**  
63 plants/1000 sq. ft.  
63 plants @ \$4/plant = \$252  
+ 20 bales of pinestraw @ \$3/bale = \$60  
**Total Cost = \$312**

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Comparative Cost of Converting 1000 sq. ft. of Irrigated Area to Mulch or Groundcover Plants

Pine Straw	\$60.00
Asiatic Jasmine	\$ 247.50
Juniper	\$312.00
Water + Sewage (high water-use zone)	\$93.96

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**Xeriscape not  
only saves  
water...  
It Saves Money!**

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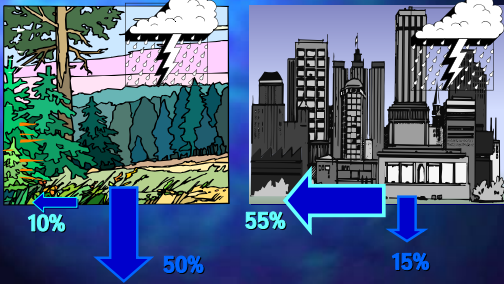
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## Development Impacts on the Water Cycle



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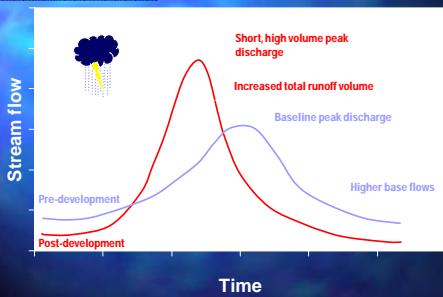
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## Storm Hydrograph



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## Impervious surfaces



- Inhibit recharge of groundwater
- Prevent natural processing of pollutants in soil, plants
- Provide a surface for accumulation of pollutants
- Provide an express route for pollutants to waterways



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### Pollutants To Streams That Result from Development of Land

- Nutrients
- Pathogens
- Sediment
- Toxic contaminants
- Debris
- Thermal Stress

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### The Traditional Approach

**Methods:**  
Conveyance and detention

**Goal:**  
Minimize flooding

- Little water quality control
- Flooding sometimes becomes worse
- Detention ponds can be ugly

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## Greenspace & Water Quality

**Greenspaces:**

- └ Promote infiltration
- └ Decrease runoff
- └ Provide buffers
- └ Filter pollutants



**WHERE**

- Between impervious surfaces and streams
- Between impervious areas






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## Importance of Infiltration

- Preserves natural hydrology
  - Reduces runoff and flooding
  - Maintains base flows
- Cleans water, removing pollutants
  - Inexpensive water quality control
  - Can be virtually 100% effective
- The only **sensible** method which can solve the stormwater problem



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## On-site vs. Regional Approaches

**On-site:** Manage stormwater as close to the source as possible



A residential "rain garden"



North Carolina Regional Detention Pond

**Regional:** Rely on large, regional detention facilities




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**Green is good!**



- For stormwater mngt.
- For psychological health
- For aesthetics



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