Water: Florida's Lifeblood

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Outline

- Opener: Water homework exercises
- Presentation: "Water: Florida's Lifeblood"
- Circle question
- Discussion

Water Homework Discussion

1. Discussion about experiences filling out data log for historic water consumption.
2. Thoughts about sustainability action plans for conserving water.
   - Goals/actions
   - Barriers
   - Solutions
   - Individual/household
   - Community

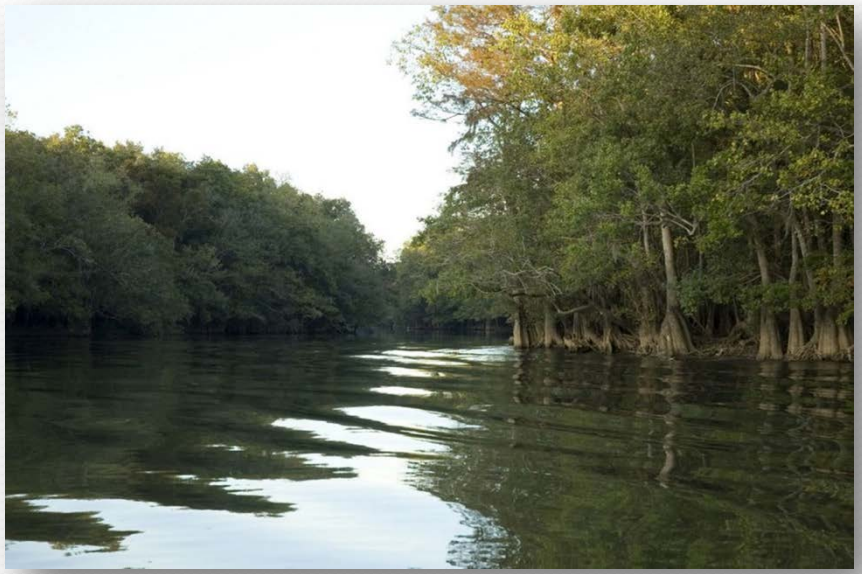
Illustration: Microsoft

Goals

- **Learning** Goals
  - Increase understanding of status and trends of Florida's water quantity and quality
  - Understand your role in conserving Florida's water and maintaining water quality
- **Action** Goals
  - Identify strategies to reduce water consumption and protect water quality
    - Choose elements to add to your personal water sustainability plan

Presentation Outline

- Florida's freshwater resources
  - Status and trends for quantity and quality
  - Challenges
  - Policy directions
  - What you can do



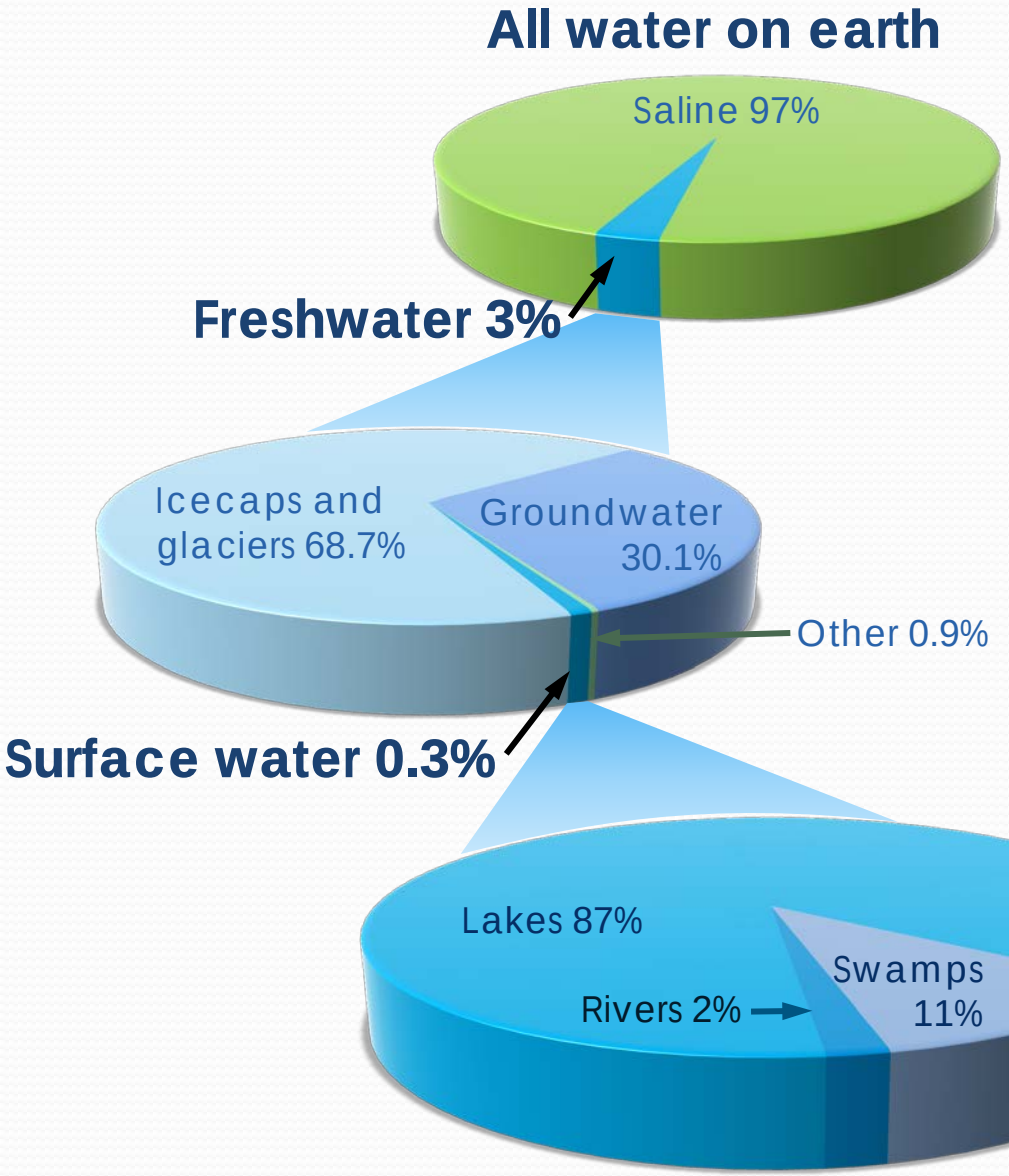
Owl Creek, tributary of Apalachicola River
Photo: K. Ziewitz

Florida's Freshwater

"The pressures of population growth, its accompanying development, and 70 million tourists a year are impacting the state's freshwater, ground water, and saltwater resources ... Major challenges include: maintaining overall water quality and supplies, protecting public health, satisfying competing and rapidly increasing demands for finite quantities of fresh water, minimizing damage to future water reserves, and ensuring healthy populations of fish and wildlife."

— Florida Department of Environmental Protection,
Integrated Water Quality Assessment for Florida, 2014

Where on Earth is the Water?



"...if all the water on Earth could be put into a gallon jug, the quantity readily available for human use would be equal to about one tablespoon."

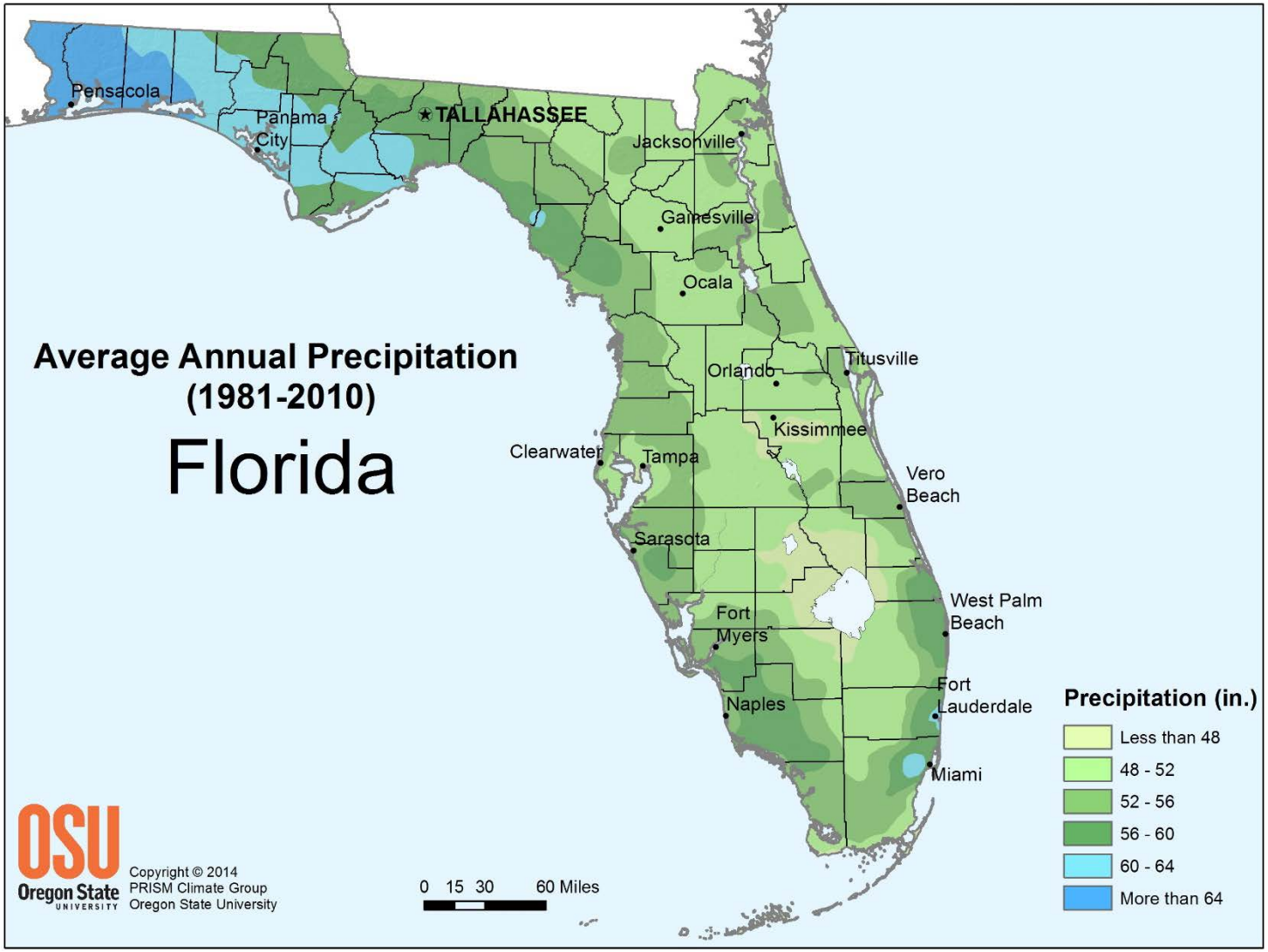
Data: U.S. Geological Survey
Graphic: http://www.pacificwater.org

Florida's Freshwater Resources

- 1,700 streams and rivers (11,000 miles)
- 7,800 freshwater lakes
- 700 springs
- 11 millions acres of wetlands
- Underlying aquifers

Wakulla River
Photo: K. Ziewitz

Florida's Annual Rainfall, 1981-2010



U.S. "Inland" Waters

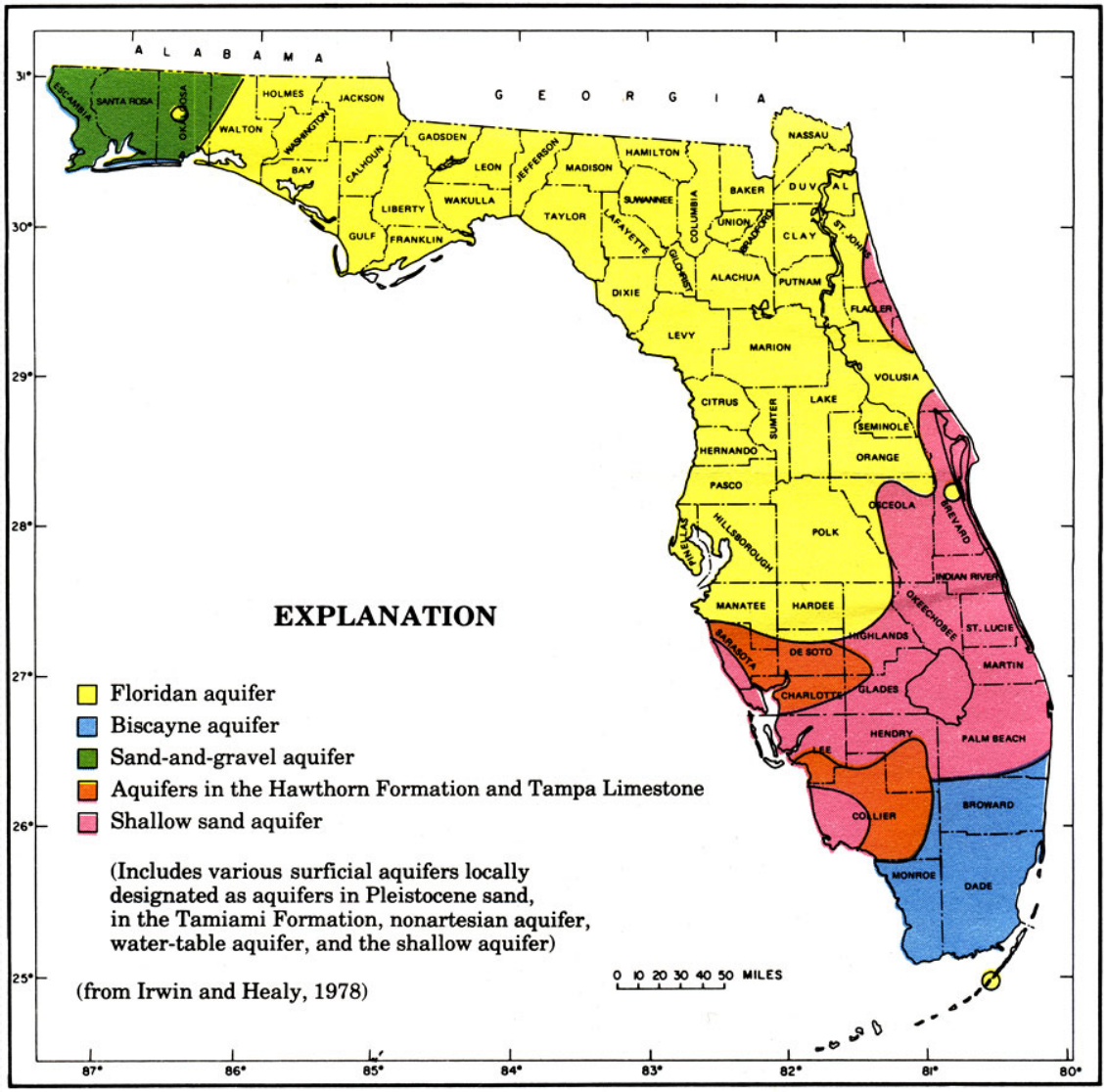
State	Land Area (sq mi)	Water Area (sq mi)	Percent area, water
Rhode Island	1,034	182	17.6%
District of Columbia	61	7	11.5%
Louisiana	43,204	4,562	10.6%
Florida	**53,625**	**5,027**	**9.4%**
North Carolina	48,618	4,052	8.3%
Maryland	9,707	768	7.9%
Maine	30,843	2,314	7.5%
Massachusetts	7,800	486	6.2%
Minnesota	79,627	4,763	6.0%
New Jersey	7,354	436	5.9%
Delaware	1,949	91	4.7%
Vermont	9,217	400	4.3%
New York	47,126	1,989	4.2%
Wisconsin	54,158	1,997	3.7%
New Hampshire	8,953	328	3.7%
South Carolina	30,061	1,064	3.5%
Michigan	56,539	2,001	3.5%
Connecticut	4,842	171	3.5%
Alaska	570,641	19,304	3.4%
Utah	82,170	2,727	3.3%
Virginia	39,490	1,282	3.2%
Washington	66,456	1,715	2.6%
North Dakota	69,001	1,698	2.5%
Georgia	57,513	1,412	2.5%
Kentucky	39,486	921	2.3%
Tennessee	41,235	909	2.2%

State	Land Area (sq mi)	Water Area (sq mi)	Percent area, water
Arkansas	52,035	1,143	2.2%
Texas	261,232	5,616	2.1%
Alabama	50,645	1,058	2.1%
Oklahoma	68,595	1,304	1.9%
California	155,779	2,833	1.8%
South Dakota	75,811	1,305	1.7%
Mississippi	46,923	769	1.6%
Illinois	55,519	820	1.5%
Missouri	68,742	965	1.4%
Pennsylvania	44,743	563	1.3%
Ohio	40,861	474	1.2%
Idaho	82,643	926	1.1%
Oregon	95,988	1,068	1.1%
Montana	145,546	1,494	1.0%
Indiana	35,826	361	1.0%
West Virginia	24,038	192	0.8%
Iowa	55,857	416	0.7%
Wyoming	97,093	720	0.7%
Nevada	109,781	791	0.7%
Nebraska	76,824	524	0.7%
Hawaii	6,423	42	0.7%
Kansas	81,759	520	0.6%
Colorado	103,642	452	0.4%
Arizona	113,594	396	0.3%
New Mexico	121,298	292	0.2%

Table: U.S. Geological Survey; data: U.S. Census Bureau

Where's the Water in Florida? *Aquifers*

Image: http://fcit.usf.edu/florida/maps/pages/8900/f8936/f8936.htm



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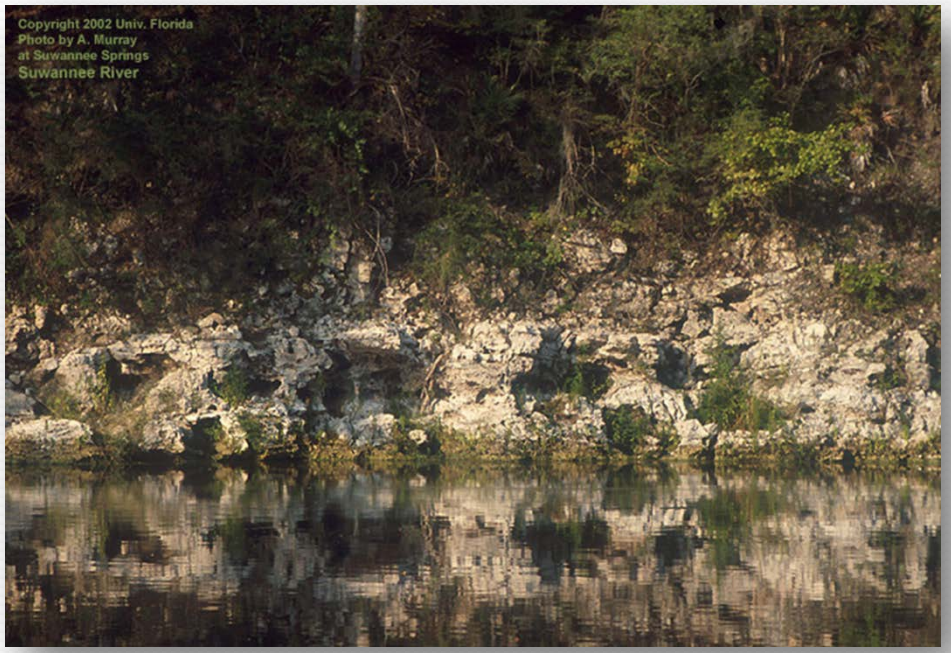
Florida's "Karst" Topography

- "Swiss cheese" limestone
- Forms close connection between surface and ground water



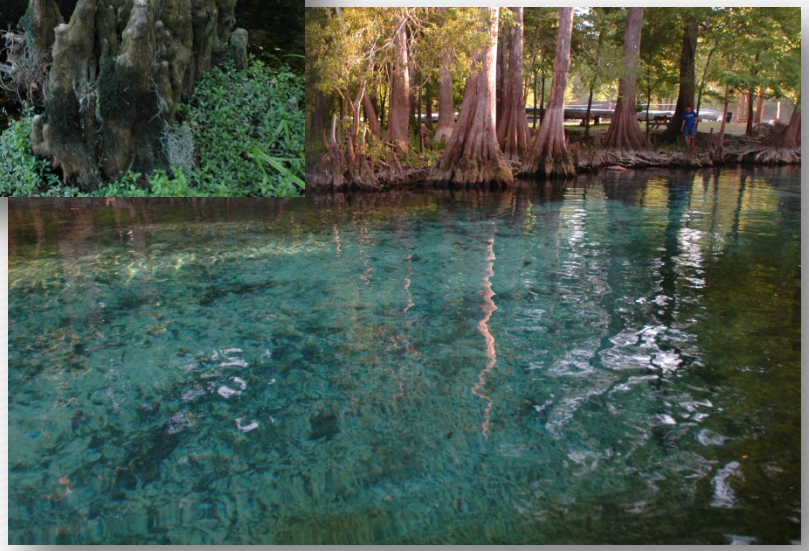
Karst on Suwannee River
Photo: A. Murray, UF

Florida's "Karst" Topography

- Sinkholes are a prominent feature

Photo: Randall Orndorff, U.S. Geological Survey

Florida's Gems: Natural Springs



Photos: Ginnie Springs.
Josh Wickham. UF/IFAS

Photo: Swimmers at Fanning Springs.
Tara Piasio UF/IFAS

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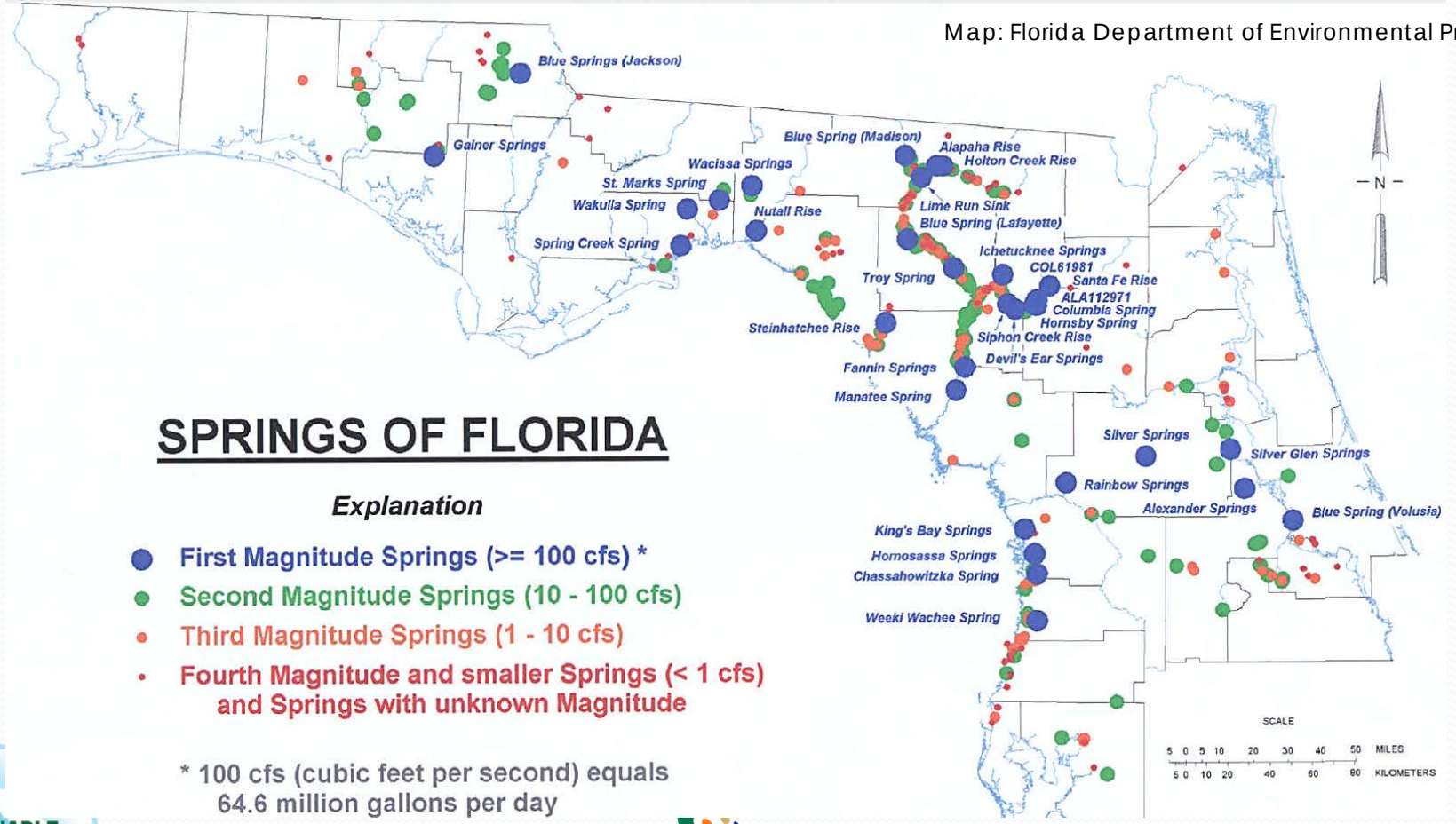
Florida's Gems: Natural Springs

Map: Florida Department of Environmental Protection



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Snapshots of Historic Water Use in Florida

- 1955:
  - ~2.2 billion gallons per day of fresh groundwater and surface water
  - Population: 3.9 million
- 2010:
  - ~6.4 billion gallons per day of fresh groundwater and surface water
  - Population: 18.8 million

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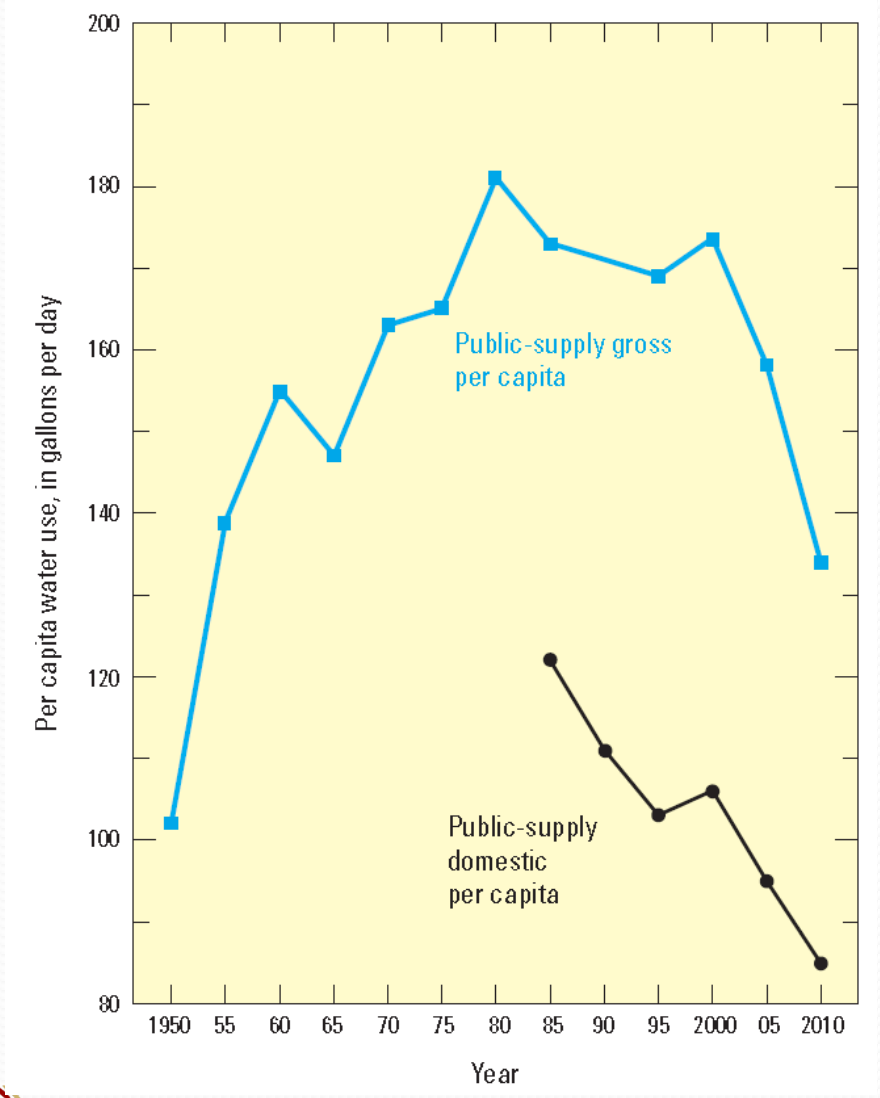
Per Capita Water Use Trends

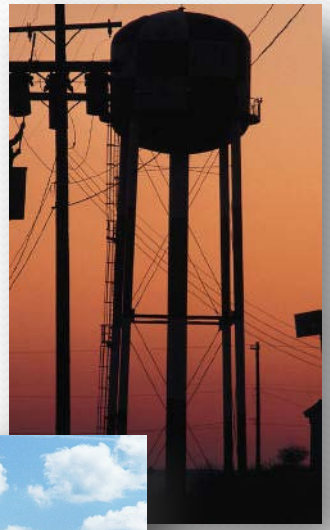
Historcal public-supply gross and domestic per capita water use in Florida, 1950-2010

Source: Figure 9 from Marella, R. L. (2014). *Water Withdrawals, Use, and Trends in Florida, 2010*



Where Do We Use It?

1. Agriculture
2. Public supply
3. Power plants



Photos: Microsoft

Pivot irrigation on Florida farm

Photo: Thomas Wright IFAS

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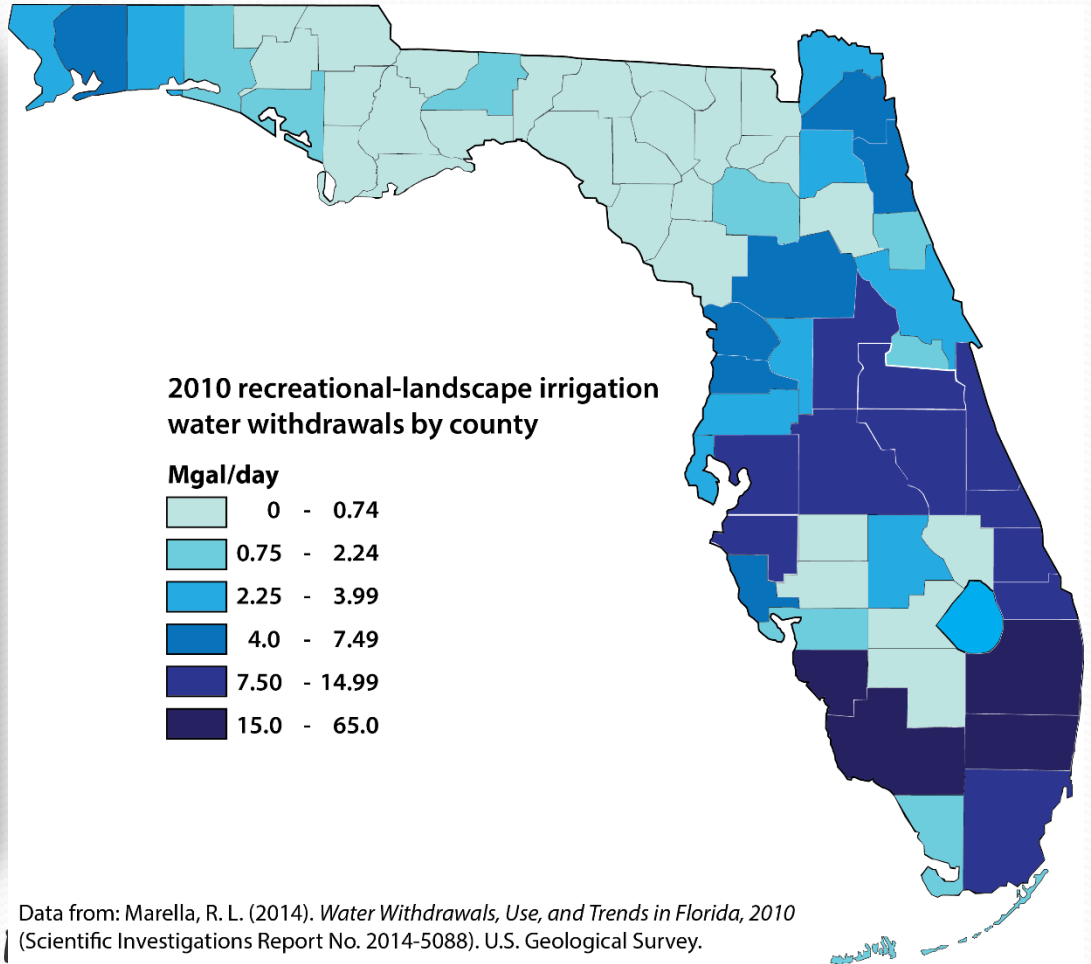
Impacts of Recreational Water Use

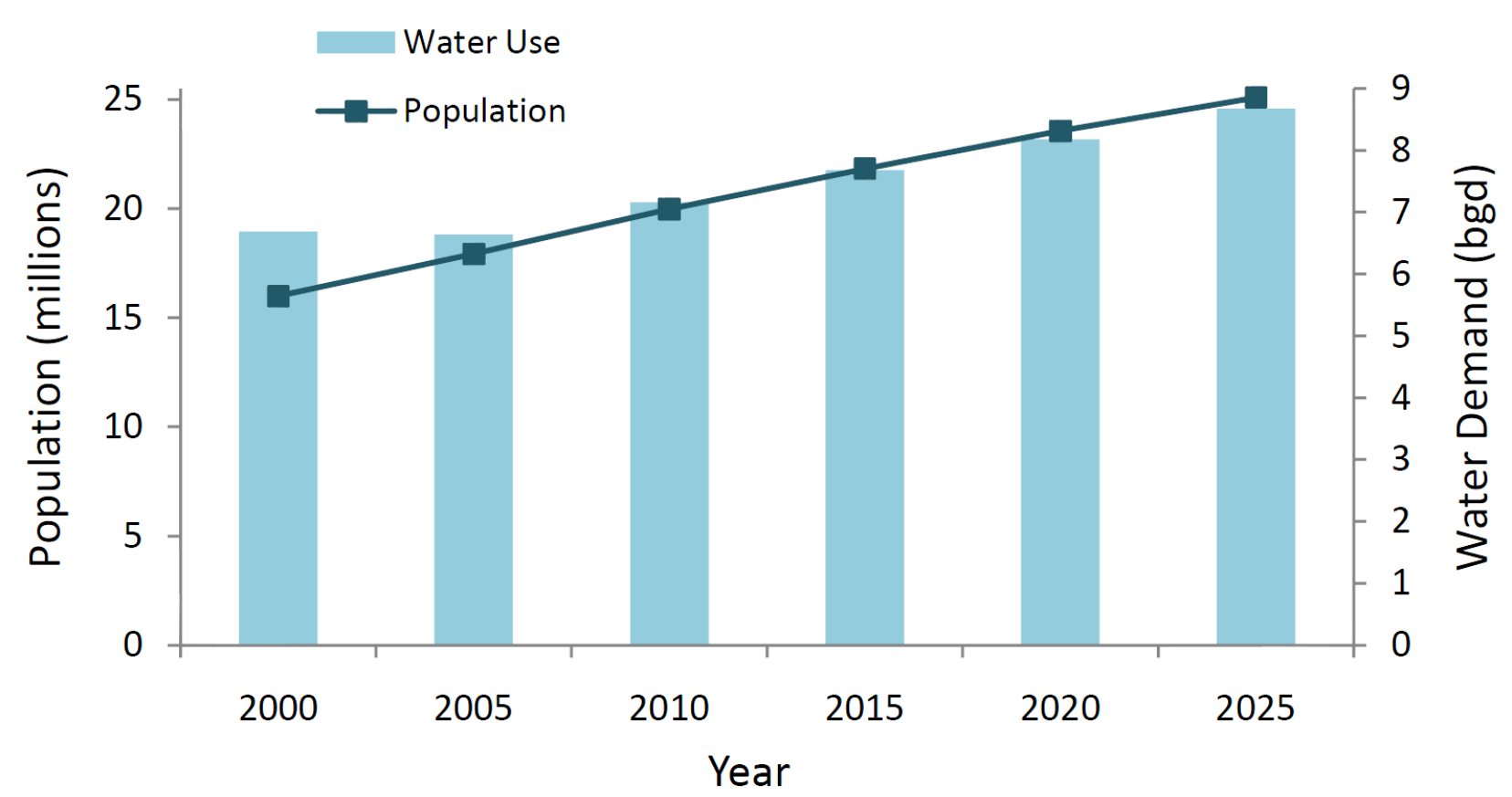
Photo: Thomas Wright, UF/IFAS



Data from: Marella, R. L. (2014). *Water Withdrawals, Use, and Trends in Florida, 2010* (Scientific Investigations Report No. 2014-5088). U.S. Geological Survey.

Graph: Florida Department of Environmental Protection, *Sustaining Our Water Resources*, 2010

Projected Water Use in Florida



Effects of Freshwater Overuse

- What will be the effects of continued increase in use of freshwater?

Withlacoochee River dock during drought.
Photo: Sally Lanigan, UF/IFAS.

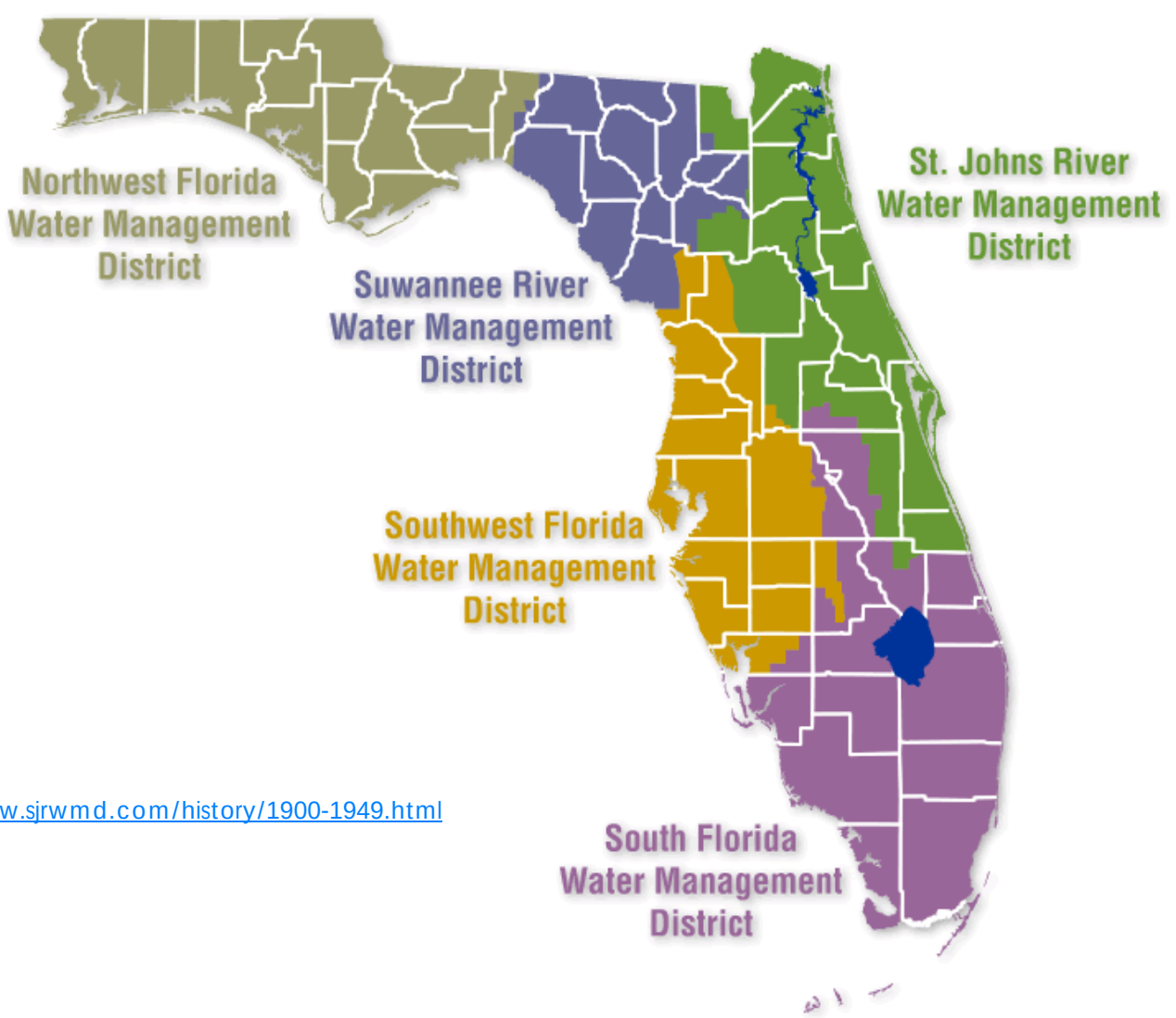
Effects of Freshwater Overuse

- Overuse has already caused:
  - Rates of consumption exceeding replenishment (net depletion) in parts of South and East Florida
  - Tampa Bay area "water wars"
  - Saltwater intrusion
  - Dried up lakes and sinkholes
  - Damage to natural environments and aquatic wildlife

Projected Impacts of Climate Change

- Expected warming
  - Increase in evaporation losses
  - Likely increase in water demand
- Increased frequency and intensity of extreme weather events
  - Increase in occurrence of droughts or heat waves
  - Increase in heavy rainfall events and stormwater runoff
- Sea level rise
  - Increase in occurrence and rates of salt water intrusion

Florida's Water Management Districts



Map: http://www.sjrwmd.com/history/1900-1949.html

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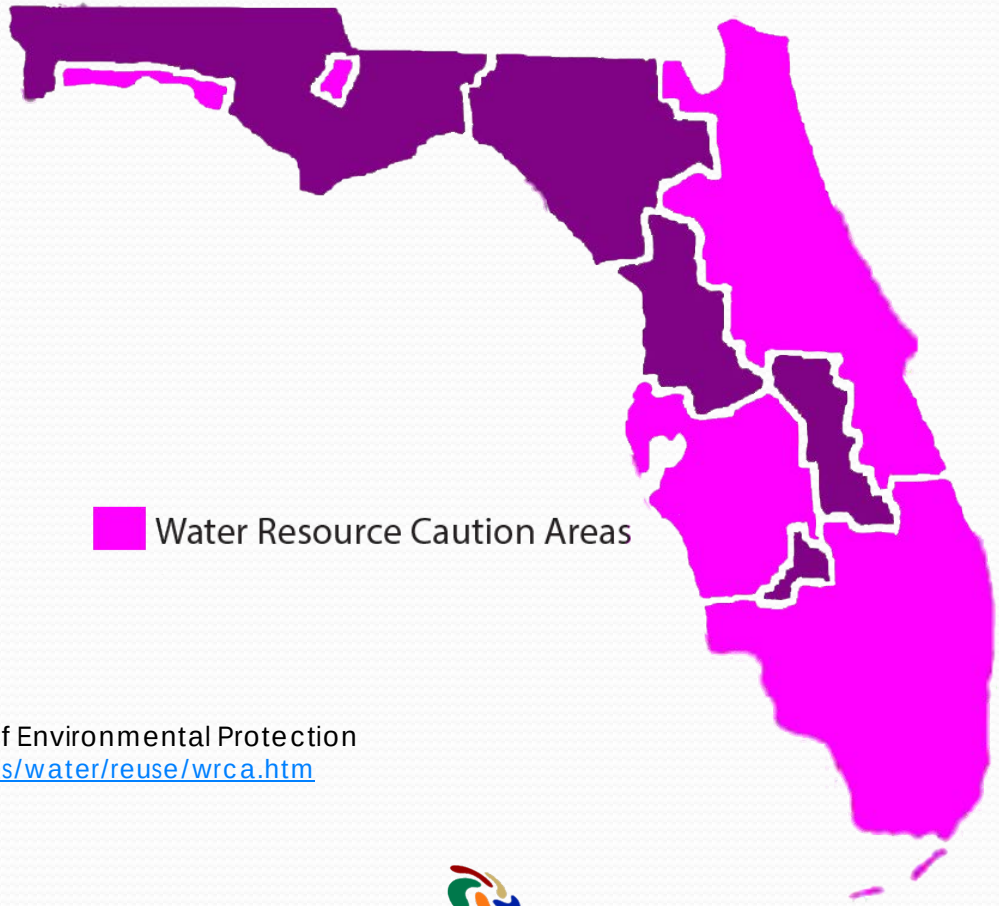
Water Resource Caution Areas



Map: Florida Department of Environmental Protection
http://www.dep.state.fl.us/water/reuse/wrca.htm

Water Resource Caution Areas

- Increased use of reclaimed water helps stem problems
- Caveat: reclaimed water may contain elevated levels of nutrients (nitrogen and phosphorous)

Reclaimed water in Orange County.
Photo: Milt Putnam, IFAS

Other Water Supply Alternatives

- Drilling new well fields
- Diverting surface water to reservoirs
- Aquifer storage and recovery
- Desalination

Tampa Bay Water's
15.5 billion gallon reservoir
Photo: Tampa Bay Water

What about Desalination?

Tampa Bay Water's desalination plant.
Photo: www.swfwmd.state.fl.us

Desalination membranes
at Tampa Bay Water's plant.
Photo: Tampa Bay Water

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The Energy-Water Nexus

- Lots of energy is required to move water or to heat it.
- Lots of water is required to produce energy.

Therefore, saving water saves energy, and saving energy saves water!

- Saving energy while saving water also cuts down on greenhouse gas emissions.

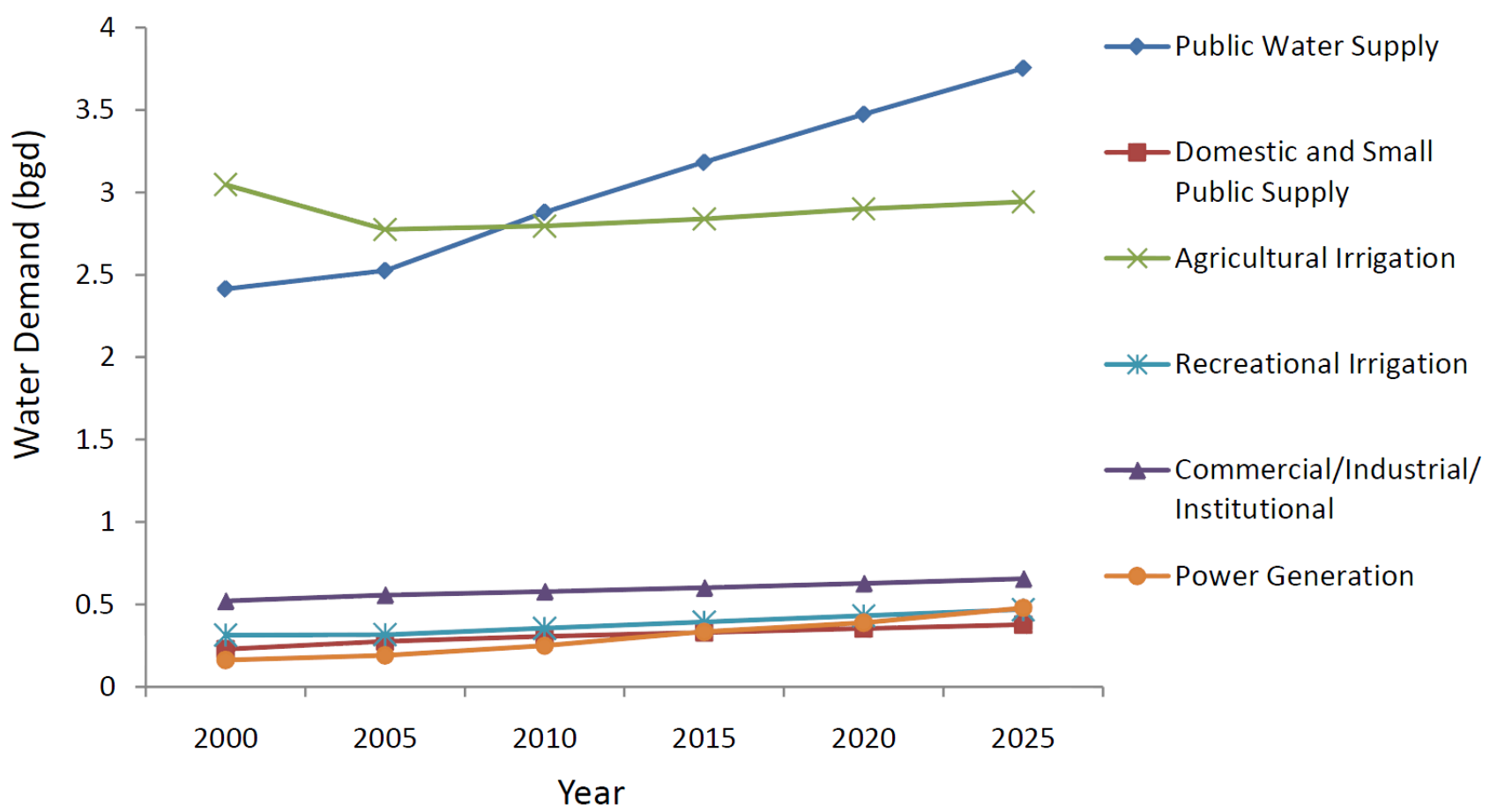
Conservation Solutions

- Less expensive than supply side projects
- Leaves more water in ecosystems and for recreation
- Important part of future water plans for state

Photos: UF/IFAS

Graph: Florida Department of Environmental Protection, *Sustaining Our Water Resources*, 2010

Residential Use is Key



Promoting Water Conservation

- What about price structure? Consider these relative costs:
  - Cost of tap water in Gainesville (July 2010):
    - $0.00256 per gallon
  - Cost of gasoline (July 2010):
    - $2.56 per gallon
  - Cost of typical carbonated beverage:
    - $8 per gallon
  - Cost of water in Myanmar (July 2010):
    - $0.0384 per gallon (15 times as much as in US)

Tap water is 1,000 times cheaper than gasoline and 3,000 times less expensive than soda!

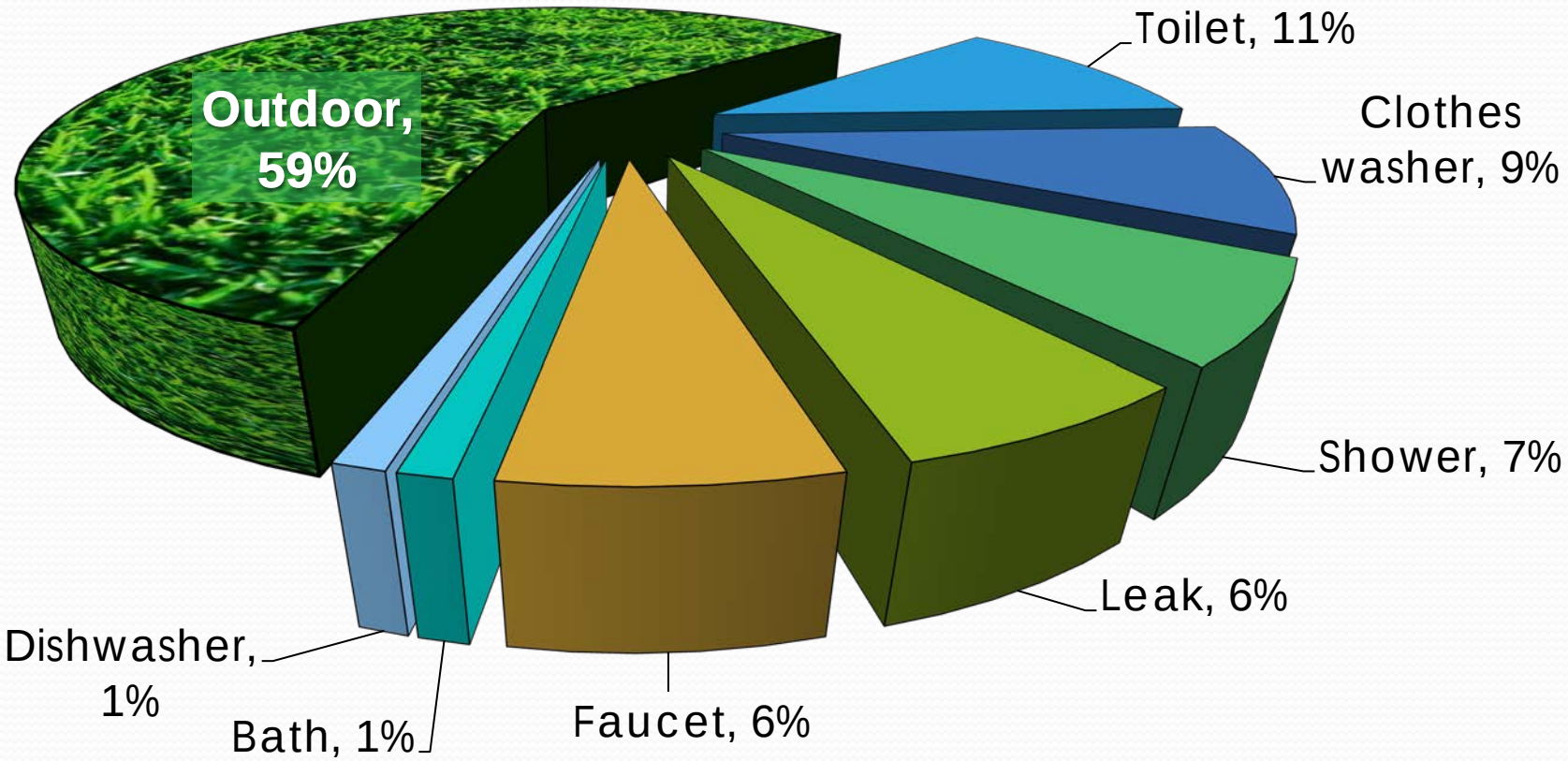
Promoting Water Conservation

- Other ways to promote conservation?
  - Regulation
  - Incentives
  - Social marketing
- Which one(s) do you think are most effective?

Where To Start?

Reduce *outdoor* water use.

Residential Average Water Use



Graph: American Water Works Association Research Foundation, *End Uses of Water*

Outdoor Water Conservation Principles

- Reduce (best):
  - Reduce or eliminate irrigated area
  - “Hydro-zone” and plant for establishment irrigation only
  - Reduce irrigation window
  - Use “smart irrigation controllers”
  - Check for and repair leaks

Outdoor Water Conservation Principles

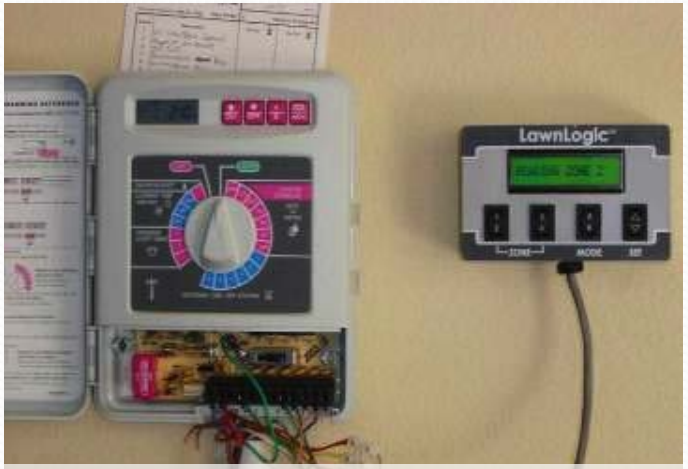
- Reuse (good):
  - Rain harvesting and stormwater reuse
    - Rain barrels or cisterns, rain gardens, etc.
  - Gray water reuse from shower/bath/sinks, etc.

Example: Madera Model Home

Roof to Tank

Exfiltration Tank

Reinforced Turf for Parking



Smart Irrigation Controllers

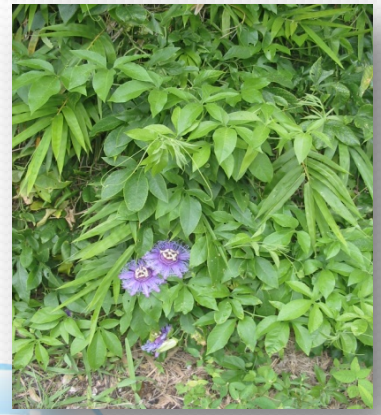
Florida-friendly Plants

Rain Garden

Photos: Program for Resource Efficient Communities / UF - IFAS

Florida-Friendly Landscaping Goals

- Reduce water consumption
- Protect water quality
- Maintain hydrological integrity
- Design for both humans and wildlife



Photos: K. Ziewitz

Florida-Friendly Landscaping Core Principles

- Right plant, right place
- Water efficiently
- Fertilize appropriately
- Mulch
- Attract wildlife
- Manage yard pests responsibly
- Reduce stormwater runoff
- Recycle
- Protect the waterfront

See *The Florida Yards & Neighborhood Handbook* for details!

Water-Wise Options...

- Homes with no turf to water

Indoor Water Conservation Priorities

- Tame the toilet:
  - Old ones: 8 gallons per flush (gpf); new ones are 1.6 gpf or less.
  - Consider “high efficiency toilets.”

Dual flush toilet: Uses 0.8 to 1.6 gpf

Photo: Sonoma County Water Agency

Composting toilet: Uses 0 gpf!

Photo: Environmental Protection Agency

Indoor Water Conservation Priorities

- Stop leaks:
  - Toilet flapper valves often leak.
- Switch to ENERGY STAR™ qualified washers.
- Install faucet aerators and low-flow showerheads.
  - Also, check for leaks while you are at it.

What About Water Quality?

- Florida Department of Environmental Protection describes Florida *groundwater* quality as "predominantly in good condition", however...
  - Nutrient levels are increasing in some areas
  - Bacteria (as total coliform) is increasing
  - Salinity is rising

What About Water Quality?

- Of 369 lakes tested between 1999-2008:
  - 52 improving;
  - 260 stable;
  - 57 degrading

For 966 lakes, trends were unknown

Photo. K. Ziewitz

Sources of Pollution

- Point sources
  - Industrial plant discharges
  - Wastewater treatment plant discharges
  - Underground storage sites

Photo: JunkDzine

Sources of Pollution

- Non-point sources
  - Agriculture
  - Septic tanks
  - Stormwater runoff
  - Fertilizer
  - Urban development
  - Pet waste

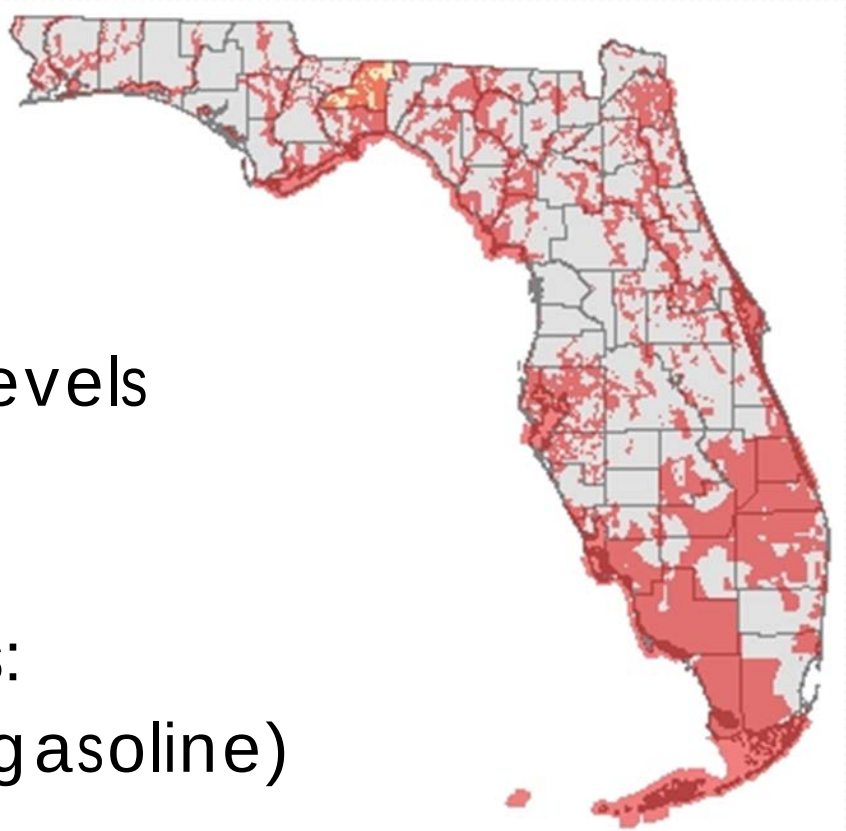
Photo: Microsoft

What are "Impaired Waters"?

- "Impaired" waters do not meet water quality standards for the respective "designated use:"
  - Class I: Potable water supplies (drinking water)
  - Class II: Shellfish propagation or harvesting
  - Class III*: Fish consumption, recreation, propagation & maintenance of a healthy, well-balanced population of fish & wildlife
  - Class IV: Agricultural water supplies
  - Class V: Navigation, utility, and industrial use

Florida's "Impaired Waters"

- Florida's most common water quality problems:
  - Excess nitrogen
  - Excess phosphorous
  - Low dissolved oxygen levels
  - Fecal coliform bacteria
  - Mercury pollution
- Other common pollutants:
  - Hydrocarbons (oil and gasoline)
  - Grass clippings



Source: Florida Department of Environmental Protection

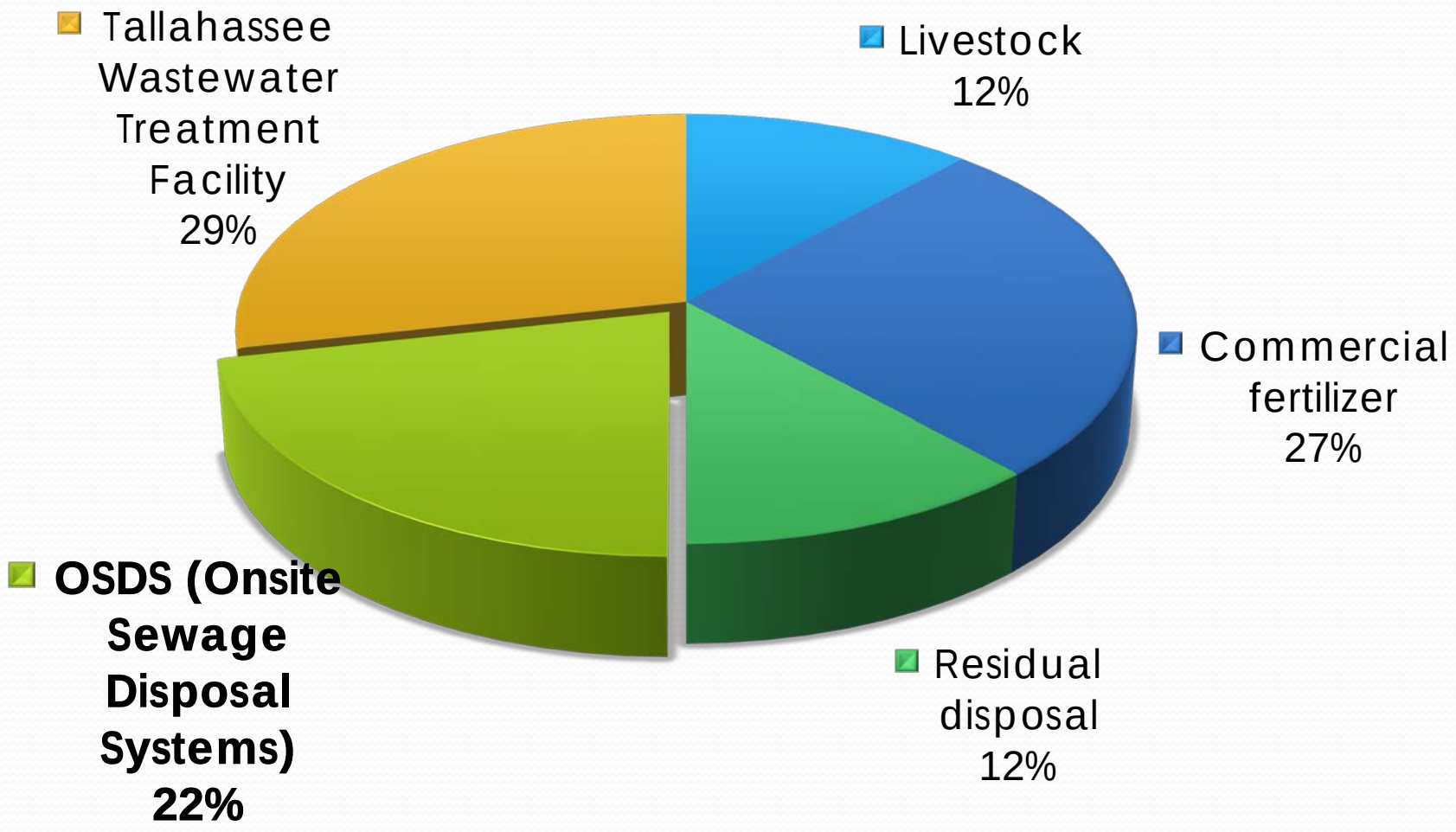
Harmful Algal Bloom

Photo: Chris Williams,
courtesy of St. Johns Riverkeeper

What Can I Do?

- Maintain septic tanks
  - Pump out regularly (~every 3 years).
  - Avoid overwhelming the system.
  - Dispose of household cleaners or pharmaceuticals properly.
  - Don't drive over the drainfield.
  - Consider installing a new, performance-based nitrogen-reducing unit.

Case Study:
Nitrogen Sources from Human Activity in Wakulla & Leon Counties



Graphic: Wes MacLeod UF/IFAS

Relative contribution from Anthropogenic Sources 1990-1999
Average nitrogen loading. Nitrogen from atmospheric deposition is assumed to be taken up by vegetation and is not included in the pie diagram. Chellette, Pratt and Katz, 2002.

Florida's Water Management Districts

- **Basin Management Action Plans** (BMAPs) – developed by Florida Department of Environmental Protection and stakeholders to allocate reductions necessary to meet the Total Maximum Daily Load (TMDL).
- Citizens can get involved – contact your water management district.

So, What Can I do to Protect Water Quality?

- Use fertilizer very carefully
  - Is it needed?
  - If so, what nutrients are needed?
  - If using inorganic fertilizers, choose slow-release products.
  - Clean up any spills.
  - Don't fertilize before predicted rains.
  - Avoid "weed and feed" products.
  - Keep at least a 10-foot low maintenance zone by water bodies.
  - Avoid irrigation run-off.

What Can I do to Protect Water Quality?

Photo:
Washington State
Puget Sound Action Team

Other Ways to Protect Water Quality

- Limit use of hazardous substances, including toxic household cleaners and pesticides
- Clean up pet wastes
- Don't flush medicines down the sink or toilet

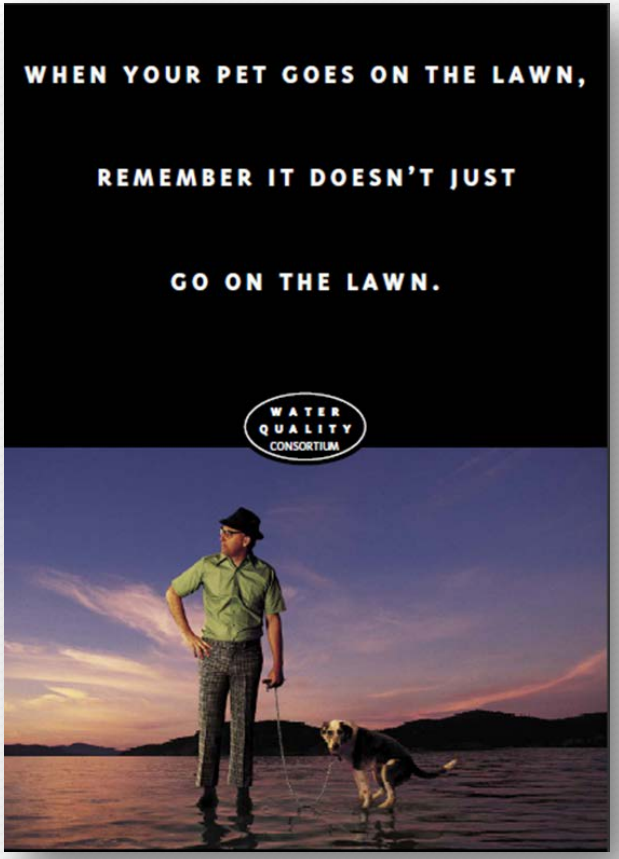


Photo: Washington State Puget Sound Action Team

Landscape-Greenhouse Gas Connections

Photo: Microsoft

Photo: Pierce Jones,
Program for
Resource Efficient Communities

Photo: Josh Wickham, UF/IFAS

Circle Question

What is one of your favorite Florida water spots?

Have you seen this place change over time?

If so, what factors are causing the change?

Discussion Questions

- Do you think Floridians are prepared to face water shortages? How serious is your community about water conservation?
- Water expert Sandra Postel writes that we need to be more conscious of the "water cost" of our daily activities and make better choices, from dietary choices to landscaping. How can "water costs" be made more visible?

Discussion Questions

- What are some obstacles to reducing the amount of water used for lawn watering?
- Considering options to promote conservation—regulation, pricing, incentives, social marketing—which ones do you think are most effective?
- What are some ways you have begun to think about water differently?
- What else would you like to discuss about water?

End of Presentation

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