

1. Please identify the state and local agencies that are responsible for protecting the water quality and water quantity for each of the three spring systems you selected and detail their responsibilities.

Many state and local agencies are responsible for protecting the water quality and quantity of Florida's springsheds. In general, the agencies and their responsibilities include:

- **Florida Department of Environmental Protection** – water quality assessment, permitting, and monitoring of point (wastewater and septic systems) and non-point (agriculture) sources; development of water quality standards and criteria (TMDLs, BMAP, etc.)
- **Florida Department of Agriculture and Consumer Services, Soil & Water Conservation Districts, & Local Extension Offices** – facilitate implementation of agricultural best management practices; education and outreach
- **Florida Park Service** – managing spring state parks; monitoring spring health; recreation management; education
- **Water Management Districts** – surface and ground water quantity assessment; permitting and development of criteria (MFLs); monitoring; water conservation education
- **Florida Department of Health** – septic tank and drinking water assessment, monitoring, and permitting
- **Florida Geologic Survey, U.S. Geologic Survey** – water quantity research, monitoring and evaluation
- **Local Governments (Counties, Cities, & Towns)** – stormwater, wastewater, and public drinking supply management and protection; land use planning; parks and recreation; economic development
- **State Colleges & Universities** – water quality and quantity research and monitoring; education and outreach

A comprehensive list of the specific agencies involved in the protection and restoration of Ichetucknee, Rainbow, and Wakulla Springs, including their categorical roles and responsibilities, is provided in Table 1.

2. Please prepare a list of the stakeholder groups who are interested in being involved in restoration and protection for each of the three springs.

Stakeholders are persons, groups or organizations who affect or can be affected by a course of action. Protecting and restoring Florida's unique spring ecosystems will require a collaborative, public participation process wherein diverse stakeholders can work with state and local agencies to develop and implement strategic management actions that reduce the factors limiting spring health. Stakeholders involved in this process may include non-governmental organizations (NGOs) and interest groups (agricultural, civic, environmental, etc.), educators, research and monitoring entities, local businesses, and the media. A comprehensive list of the stakeholders involved in the protection and restoration of Ichetucknee, Rainbow, and Wakulla Springs and their categorical roles and responsibilities is provided in Table 1. The magnitude and diversity of the stakeholders and agencies (local, state, and federal) summarized in Table 1 highlights the fact that it will "take a village" to protect and restore the ecological processes and functions of Florida's springs and springsheds.

Table 1. Summary of state and local agencies, stakeholder groups and their roles and responsibilities in water quantity, water quality, restoration, and protection of Ichetucknee, Rainbow, and Wakulla Springs.

Stakeholder Roles & Responsibilities	Ichetucknee Springs	Rainbow Springs	Wakulla Springs
Agencies (Local, State & Federal) and Stakeholders			
Water quantity and quality management and protection (including stormwater, wastewater, septic tanks, and/or drinking water supply)	City of Lake City Columbia County Health Department Florida Dept. of Environmental Protection Florida Dept. of Health Florida Dept. of Transportation Suwannee River Water Management District Town of Fort White	Alachua County City of Dunnellon City of Williston Florida Dept. of Environmental Protection Florida Dept. of Health Florida Dept. of Transportation Levy County Marion County Southwest Florida Water Management District Suwannee River Water Management District	City of Crawfordville City of Tallahassee City of Woodville Florida Dept. of Environmental Protection Florida Dept. of Health Georgia Environmental Protection Division Leon County Northwest Florida Water Management District Tallahassee Aquifer Protection Program U.S. Environmental Protection Agency Wakulla County
Land use planning	Columbia County City of Lake City Florida Dept. of Community Affairs North Central Florida Regional Planning Council Town of Fort White	Alachua County Planning Department City of Dunnellon, Community Development Dept. City of Williston Planning Department Florida Dept. of Community Affairs Levy County Planning Department Marion County Planning Department Marion Smart Growth Coalition Smart Growth Coalition of North Central Florida Withlacoochee Regional Planning Council	City of Crawfordville Planning Department City of Tallahassee Planning Department City of Woodville Planning Department Florida Dept. of Community Affairs Leon County Wakulla County <i>*See additional local government entities in Economic Development section below</i>
Agricultural BMPs (best management practices)	Columbia County Extension Service Florida Dept. of Agriculture and Consumer Services Santa Fe Soil & Water Conservation District (SWCD)	Florida Dept. of Agriculture and Consumer Services Levy County SWCD Marion County Clean Farms Initiative Marion County SWCD	Florida Dept. of Agriculture and Consumer Services Leon County Extension Service U.S. Department of Agriculture
Parks & Recreation Management	Florida Park Service	Florida Agriculture Center & Horse Park FDEP, Greenways and Trails Dept. Florida Park Service Marion County Dept. of Parks & Recreation	Florida Park Service
Natural Resource Management	Florida Fish & Wildlife Conservation Commission	Florida Fish & Wildlife Conservation Commission Florida Department of Forestry Goethe State Forest	Florida Fish & Wildlife Conservation Commission Florida Department of Forestry U.S. Fish & Wildlife Service U.S. Forest Service
Springs RM&E (research, monitoring & evaluation)	Florida Bureau of Invasive Plants Florida Geological Survey Karst Environmental Services Sdii-Global Suwannee River Water Management District U.S. Geological Survey University of Florida Wetland Solutions, Inc.	DB Environmental Florida Geological Survey Southwest Florida Water Management District Suwannee River Water Management District U.S. Geological Survey University of Florida Wetland Solutions, Inc.	H.T. Odum Florida Springs Institute The Hydrogeology Consortium (HC) U.S. Geological Survey Wakulla Springs Basin Working Group Woodville Karst Plain Project

Table 1, continued. Summary of state and local agencies, stakeholder groups and their roles and responsibilities in water quantity, water quality, restoration, and protection of Ichetucknee, Rainbow, and Wakulla Springs.

Stakeholder Roles & Responsibilities	Ichetucknee Springs	Rainbow Springs	Wakulla Springs	
	<i>Agencies (Local, State & Federal) and Stakeholders</i>			
Economic Development	Columbia County Tourist Development Council Fort White Chamber of Commerce Lake City Chamber of Commerce	Dunnellon Chamber of Commerce Levy County Tourist Development Council Nature Coast Business Development Ocala/Marion County Chamber of Commerce Ocala/Marion County Visitors and Convention Bureau	City of Tallahassee (FL) Gadsden County (FL) Jefferson County (FL) Leon County (FL)	Wakulla County (FL) Decatur County (GA) Grady County (GA) Thomas County (GA)
Education	Columbia County Extension Service Fort White High School Karst Environmental Productions University of Florida	Chipola College Eckerd College North Marion High School Silver River Museum & Environmental Education Center University of Florida	Florida A&M University Florida State University Leon County Extension Service	
Interest Groups / Non-Governmental Organizations	1000 Friends of Florida Current Problems Florida Defenders of the Environment Four Rivers Audubon Friends of Ichetucknee Springs State Park NSS Cave Diving Section Save our Suwannee Sierra Club Three River FNPC, Inc	Audubon of Florida Florida Defenders of the Environment Florida Thoroughbred Breeders & Owners Association Florida Thoroughbred Farm Charities Florida Thoroughbred Farm Managers, Inc. Florida Yards and Neighborhoods Friends of the Rainbow Springs State Park Keep Marion Beautiful Marion County Audubon Society Marion County Citizen’s Coalition Marion County Horseman’s Association Rainbow River Conservation Rainbow Springs Property Owner’s Association The Karst Conservancy The Nature Conservancy	1000 Friends for Florida Apalachee Audubon Society Big Bend Sierra Club Clean Water Network Florida Native Plant Society Florida Public Interest Research Group Florida Trail Association, Apalachee Chapter Florida Water Environment Association Friends of Wakulla Springs Lake Watch Private landowners Talquin Electric The Nature Conservancy, Florida Chapter	
Local Businesses	Columbia Livestock Market Dive Rite Hunter Printing Company S&S Food Stores The Wheeler Agency	ABI Marketing and Promotions Aqua Pure Water & Sewage Service, Inc. Debra Childs Woithe, Inc. Glass River Gallery McBride Land and Development Co. Raymond James Reora, Inc. Tillman and Associates Engineering Wild Florida Adventures	Hazlett-Kincaid, Inc. McGlynn Laboratories, Inc Talquinn Water and Wastwater, Inc.	
Media/Press	Gainesville Sun High Springs Herald High Springs Observer	LakeCityJournal.com Lake City Reporter	Equine Publications The Ocala Star Banner	Riverland News WUFT
	<i>Not identified in Hallas 2010 or FSI 2011.</i>			

Sources: Florida Springs Institute (FSI). 2011. Wakulla Spring – An Adaptive Management Strategy: Working Draft. Available at <http://floridaspringsinstitute.org/pages/wakulla-spring-recovery-plan>.
 Gregory, D.A. 2010. Rainbow Springs Restoration Plan, Marion County, Florida. Available at http://floridaspringsinstitute.net/restorationplans/Rainbow_Gregory.pdf.
 Hallas, M.K. 2010. Wakulla Springs Restoration Plan. Available at http://floridaspringsinstitute.net/restorationplans/Wakulla_Hallas.pdf.
 Pandion Systems, Inc. 2009. Rainbow Springs Basin Working Group, Annual Report. Available at <http://www.pandionsystems.com/LinkClick.aspx?fileticket=xcqFJ3e2IzA%3d&tabid=113>.
 Zavoyski, B. 2010. Ichetucknee Springs Restoration Plan.

3. Compare and contrast the springsheds for your three springs. How large are they? What are the dominant land uses? How have they changed over the past 50 years? Please include maps if available.

The Ichetucknee, Rainbow and Wakulla Springs springsheds are varied in their size and land use composition. Ichetucknee is the smallest springshed with an area of approximately 371 square miles. The dominant land uses in Ichetucknee springshed are upland forest (44%; pine plantation and coniferous forest), agriculture (23%), and urban/residential (18% including transportation and utilities). From 1977 to 2004, land uses in the Ichetucknee springshed have changed from rural agricultural/forestry to urban land uses and pine plantations (FSI 2012) (Table 2, Figure 1).

The Rainbow Springs springshed is approximately 735 square miles. Current (2009) dominant land uses include agriculture (including row crops, pastures, and horse farms) at 44%, upland forest (including silviculture) at 32% and urban/residential (including at transportation and utilities) at 24%. Since 1944, agricultural and urban/residential land uses have increased significantly; the percent of forested uplands has declined significantly (Table 2, Figure 2).

Wakulla Springs is the largest springshed of the three, with an area of 1,569 square miles. Current (2006-2008) dominant land uses in the springshed include upland forests (53%), water/wetlands (23%), agriculture (19%), and urban/residential (12%) (Table 2, Figure 3). Although historic land use data was not available for this springshed it can be assumed from the land use trends for Ichetucknee and Rainbow Springs that upland forested lands and possibly wetlands have declined, while agricultural and urban land uses have increased over time.

Table 2. Summary of springshed characteristics for Ichetucknee, Rainbow and Wakulla Springs.

Springshed Characteristics	Ichetucknee Springs	Rainbow Springs	Wakulla Springs
Area (square miles)	371	735	1,569
Land Use Percentages H: Historic, C: Current	H: 1977, C: 2004	H: 1944, C: 2009	H: data not available*, C: 2006-2008
Agriculture	H: 26%, C: 23%	H: 15.8%, C: 44%	C: 19%
Barren Land/Special Classification	N/A	N/A	C: 2%
Communication/Transportation/Utilities	H: --, C: 2%	H: 0.1%, C: 1%	C: 1%
Prairie, Scrub, Rangelands	H: --, C: 3%	H: 3 %; <1%	C: 2%
Upland - Forested	H: 60%, C: 44%	H: 79%, C: 32%	C: 53%
Urban/Residential/Future Residential	H: 3.4%, C: 16%	H: 0.1%, C: 23%	C: 12%
Water/Wetlands	H: 11%, C: 11%	H: 2%, C: <1%	C: 23%

*Wakulla Springs historic land use data was not provided in Hallas 2010 or FSI 2011. Current land use percentages reflect springshed land uses in Florida and Georgia.

- Sources: Florida Springs Institute (FSI). 2011. Wakulla Spring – An Adaptive Management Strategy: Working Draft. Available at <http://floridaspringsinstitute.org/pages/wakulla-spring-recovery-plan>.
- Florida Springs Institute (FSI). 2012. Ichetucknee Springs Restoration Plan. Prepared for the Ichetucknee Springs Working Group. Available at <http://floridaspringsinstitute.org/pages/ichetucknee-springs-and-river-restoration-act>.
- Gregory, D.A. 2010. Rainbow Springs Restoration Plan, Marion County, Florida. Available at http://floridaspringsinstitute.net/restorationplans/Rainbow_Gregory.pdf.
- Hallas, M.K. 2010. Wakulla Springs Restoration Plan. Available at http://floridaspringsinstitute.net/restorationplans/Wakulla_Hallas.pdf.
- Normandeau Associates, Inc. 2011. Draft Restoration Plan for the Rainbow Springs and River. Prepared for the Florida Department of Environmental Protection, Ground Water and Springs Protection Section. Available at http://www.floridasprings.org/downloads/florida_149_eyqeajyd.pdf.
- Wetland Solutions, Inc (WSI). 2010. An Ecosystem-Level Study of Florida's Springs. FWC Project Agreement No. 08010. Available at http://wetlandsolutionsinc.com/files/paper_reports/Springs_Ecosystem_Study_Final%20022610.pdf.
- Zavoski, B. 2010. Ichetucknee Springs Restoration Plan.

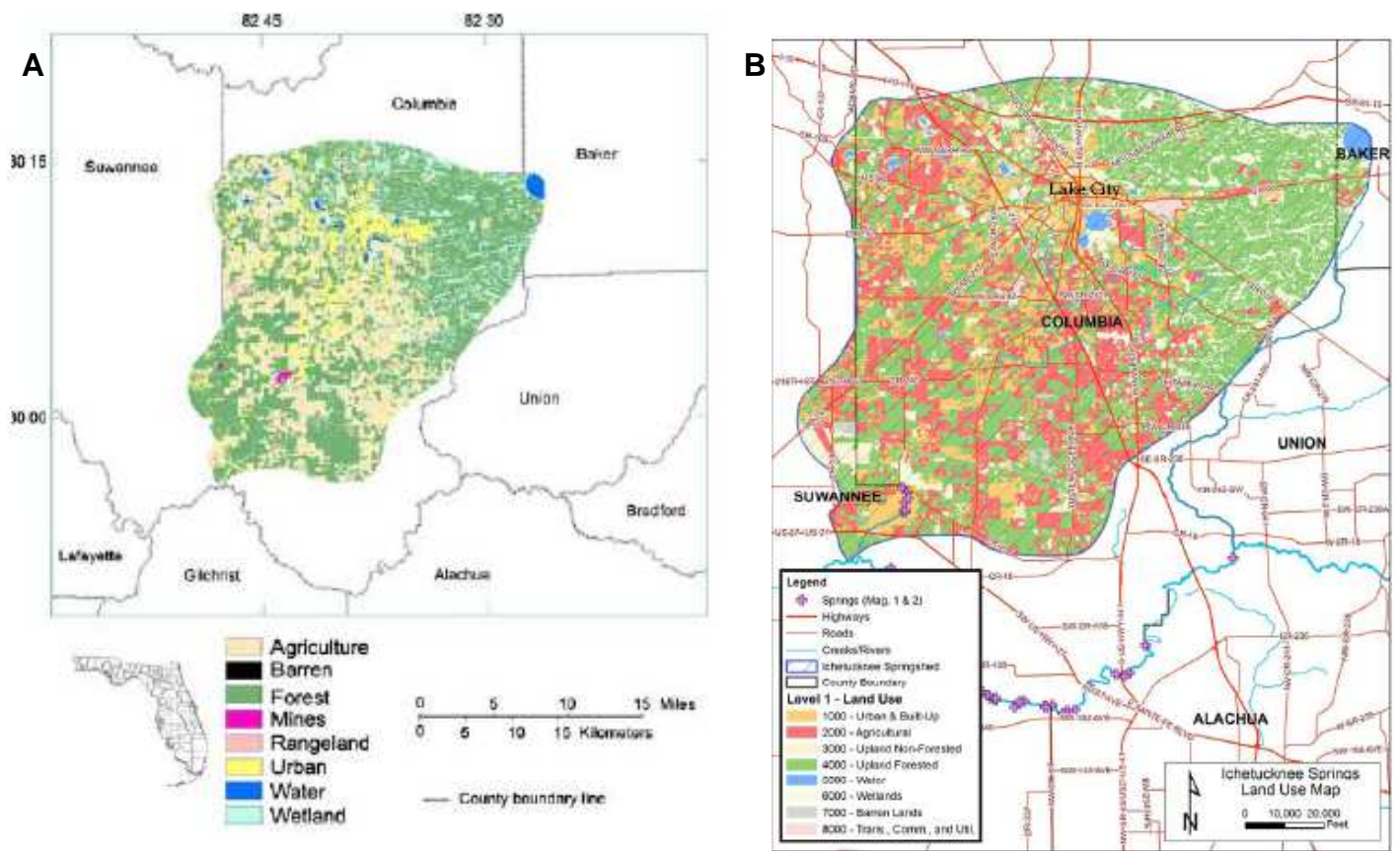


Figure 1. Land use within the Ichetucknee Springs springshed in (A) 1977 and (B) 2004 (Zavoyski 2010; FSI 2012).

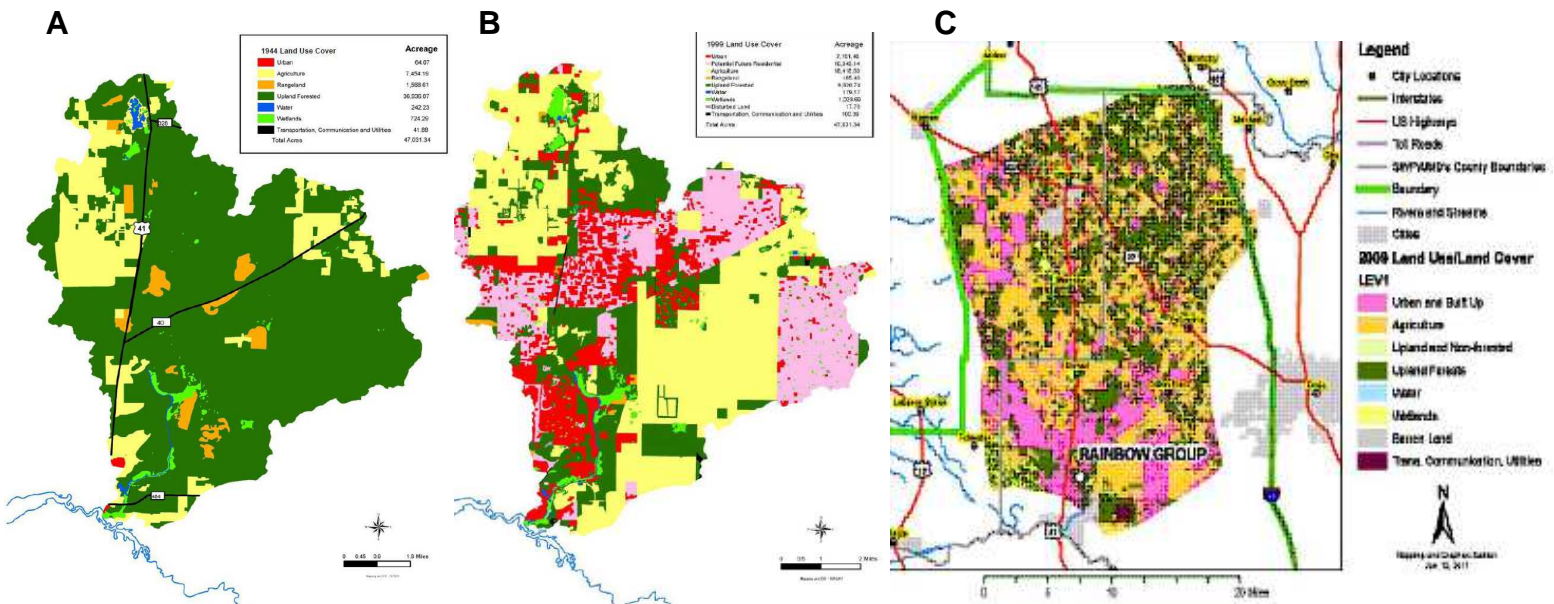


Figure 2. Land use within the Rainbow Springs springshed in (A) 1944, (B) 1999, and (C) 2009 (Gregory 2010; Normandeau 2011).

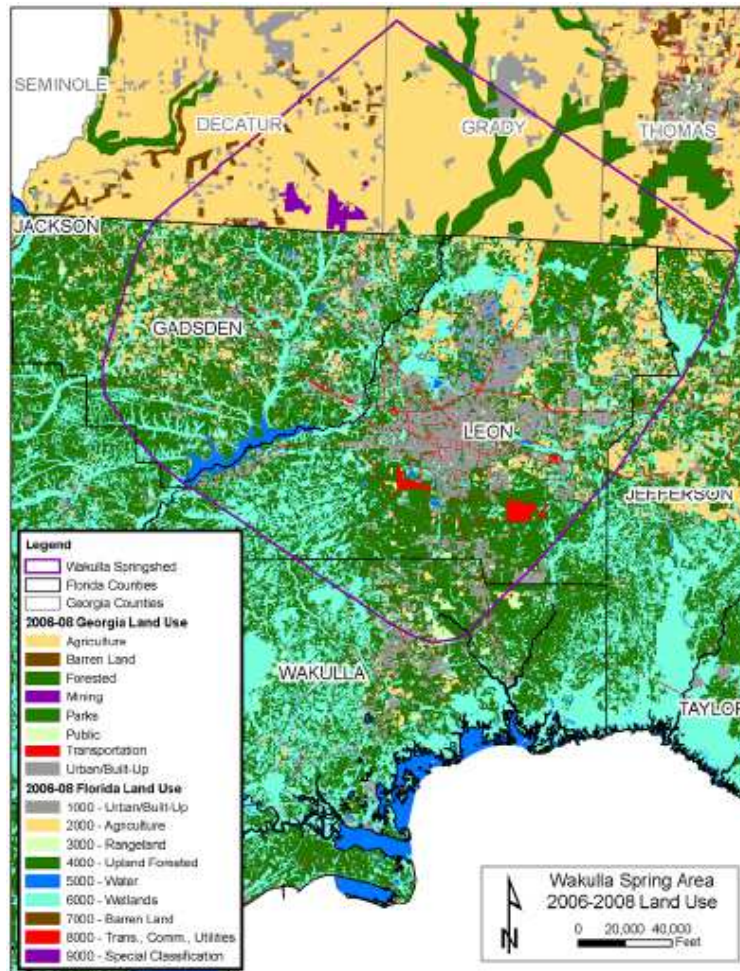


Figure 3. Land use for Wakulla Springs recharge area based on 2006 – 2008 data (FSI 2011).

4. ***What is the current average nitrate concentration and recent flows in your three selected springs? What are the historic pre-development flows and nitrate levels for each spring? Estimate the historic and current nitrate load in each spring (concentration x flow) in tons of N per year.***

Historic and current nitrate concentrations (mg/L), spring flows (MGD), and nitrate loads (tons/year) for Ichetucknee, Rainbow, and Wakulla Springs are summarized in Table 3, below. Historic (1975) nitrate concentration and flow data were obtained from Scott et al. 2004. Current nitrate concentration and flow data is based on 2008-2009 measurements reported in WSI 2010. Since 1975, nitrate loading to Ichetucknee, Rainbow, and Wakulla Springs has increased by 130%, 84%, and 435%, respectively (Table 3). Increased land use conversion from native forests to intensive agriculture and urban/residential land uses have increased nitrate-nitrogen loading to these springsheds. See the responses to question 3 (above) and question 5 (below) for detailed information regarding land use changes (Table 2, Figures 1 – 3) and the relative source contributions to nitrate loads (Figure 4) in Ichetucknee, Rainbow, and Wakulla Springs.

Table 3. Summary of historic and current nitrate loads for Ichetucknee, Rainbow and Wakulla Springs.

Spring	Historic (1975)			Current (2008 – 2009)			Percent Change in Nitrate Load
	Nitrate-N (mg/L)	Flow (MGD)	Nitrate Load (tons/year)	Nitrate-N (mg/L)	Flow (MGD)	Nitrate Load (tons/year)	
Ichetucknee	0.37	161.63	93.88	0.66	208.79	216.36	↑130%
Rainbow	0.17	493.21	131.65	1.75	88.33	242.70	↑84%
Wakulla	0.25	252.10	98.96	0.48	702.54	529.47	↑435%

Load Equation: (Flow, MGD) (Nitrate-N concentration, mg/L) (8.34 lbs/gallon) (0.182621099 tons/yr)

Sources:

Scott, T.M., et al. 2002. First Magnitude Springs of Florida. Florida Geological Survey Open File Report No. 85. Tallahassee, Florida.
 Wetland Solutions, Inc (WSI). 2010. An Ecosystem-Level Study of Florida's Springs. FWC Project Agreement No. 08010. Available at
http://wetlandsolutionsinc.com/files/paper_reports/Springs_Ecosystem_Study_Final%20022610.pdf.

5. Estimate the percent contribution of each of the following land uses to the current nitrate loads at your three springs: atmospheric sources, agricultural sources, and urban/industrial sources.

Atmospheric deposition contributes 8%, 17% and 26% of the total nitrogen (TN) load to the groundwater of Ichetucknee, Rainbow, and Wakulla Springs, respectively (Figure 4). Agricultural sources – such as animal wastes, cattle production, fertilized crops, improved pasture, and horse farms- contribute 54%, 80%, and 9% of the TN load to groundwater discharging from Ichetucknee, Rainbow, and Wakulla Springs, respectively. These percentages are consistent with the land use characteristics of the springsheds, where the Ichetucknee and Rainbow Springs springsheds contain more agricultural land than the urbanized Wakulla Springs springshed. Urban/industrial sources include wastewater treatment facility residuals (WWTF; biosolids), fertilized yards, septic tanks, sprayfields, and sewage/WWTF effluent. Urban/industrialized sources of TN are predominant (56%) in the Wakulla Springs springshed and less prevalent – 28% and 3% - in the Ichetucknee and Rainbow Springs springsheds, respectively (Figure 4).

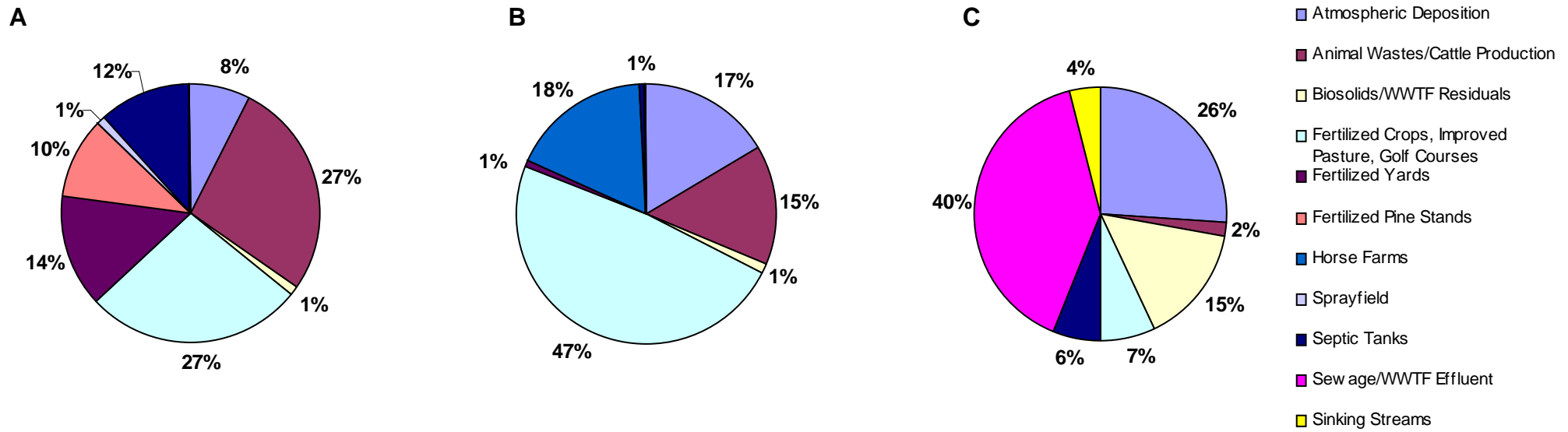


Figure 4. Relative contribution of total nitrogen (TN) loads from different sources to the groundwater discharging from (A) Ichetucknee Springs, (B) Rainbow Springs, and (C) Wakulla Springs (data from Zavoytski 2010, Gregory 2010, and Hallas 2010, respectively).

6. Estimate the percent contribution of each of the following to the observed changes in flows at your three springs: changes in rainfall, changes in land use, agricultural water uses, urban water uses, and industrial/commercial water uses.

Rainfall is the primary source of groundwater recharge for Florida's springs. Aquifer recharge rates are influenced by land uses, soil permeability, and subsurface geology. Although annual rainfall totals have remained relatively unchanged over the last century, land use and water use practices have changed runoff and recharge processes within the Floridan Aquifer system, including the Ichetucknee, Rainbow, and Wakulla Springs springsheds. A detailed description of land use changes for Ichetucknee, Rainbow, and Wakulla springs is provided in the response to question 3 above. Increased water withdrawals (from all sources) and altered points of discharge (e.g., interbasin transfers where water is withdrawn from a springshed but discharged to another springshed/watershed) contribute to aquifer recharge declines, and resulting declines in aquifer levels, potentiometric surfaces, springshed area, and spring flows (Figure 5). Increasing urban/residential land uses increase the amount of impervious surfaces within a springshed, which subsequently decreases infiltration (recharge) and increases surface runoff (flashy hydrology) and pollutant loading to springsheds. Estimated long-term flow declines for the Ichetucknee, Rainbow, and Wakulla Springs are 29%, 10%, and 10%, respectively (Table 4). Increased population growth is projected for each of the springsheds through 2055. Unless more stringent land and water use management actions are implemented to protect Florida's springsheds and watersheds (e.g., delineating and enforcing springshed protection areas, revising and enforcing MFLs, setting water conservation standards and codes, establishing reuse programs, promoting low-impact development, etc.), increased land use conversion, increased water withdrawals, and decreased spring and river flows are anticipated for the foreseeable future.

Table 4. Summary of springshed hydrology and water use characteristics for Ichetucknee, Rainbow and Wakulla Springs.

Springshed Hydrology & Water Use Characteristics	Ichetucknee Springs	Rainbow Springs	Wakulla Springs
Springshed Area, square miles	371	735	1,569
Median Rainfall, inches/year (in/year)	51	56	20
Average Floridan Aquifer Recharge Rate, in/yr (within the springshed boundary)	12.9	15.2	4.5
Total Water Withdrawals, million gallons/day (Years)	42.0 mgd (2000 – 2005)	86.5 mgd (2005)	42.5 mgd (FL)* (1990 – 2010)
Water Use Percentages			
<i>Agriculture</i>	63%	20%	8.2%
<i>Commercial/Industrial/Mining</i>	5%	2.3%	2.3%
<i>Public Supply & Domestic Self-Supply</i>	30%	69%	80.7%
<i>Recreation</i>	1%	7.4%	3.0%
<i>Hydropower</i>	1%	1.7%	5.7%
Estimated Average Percent Decline in Springshed Discharge (from historic conditions)	29%	10%	10%

*Estimated total current groundwater withdrawal in the combined Georgia/Florida Wakulla Springshed is ~75 MGD (FSI 2011).

- Sources:
- Florida Springs Institute (FSI). 2011. Wakulla Spring – An Adaptive Management Strategy: Working Draft. Available at <http://floridaspringsinstitute.org/pages/wakulla-spring-recovery-plan>.
- Florida Springs Institute (FSI). 2012. Ichetucknee Springs Restoration Plan. Prepared for the Ichetucknee Springs Working Group. Available at <http://floridaspringsinstitute.org/pages/ichetucknee-springs-and-river-restoration-act>.
- Gregory, D.A. 2010. Rainbow Springs Restoration Plan, Marion County, Florida. Available at http://floridaspringsinstitute.net/restorationplans/Rainbow_Gregory.pdf.
- Hallas, M.K. 2010. Wakulla Springs Restoration Plan. Available at http://floridaspringsinstitute.net/restorationplans/Wakulla_Hallas.pdf.
- Normandeau Associates, Inc. 2011. Draft Restoration Plan for the Rainbow Springs and River. Prepared for the Florida Department of Environmental Protection, Ground Water and Springs Protection Section. Available at http://www.floridasprings.org/downloads/florida_149_eyqejyd.pdf.
- Zavovyski, B. 2010. Ichetucknee Springs Restoration Plan. Available at http://floridaspringsinstitute.net/restorationplans/Ichetucknee_Zavovyski.pdf

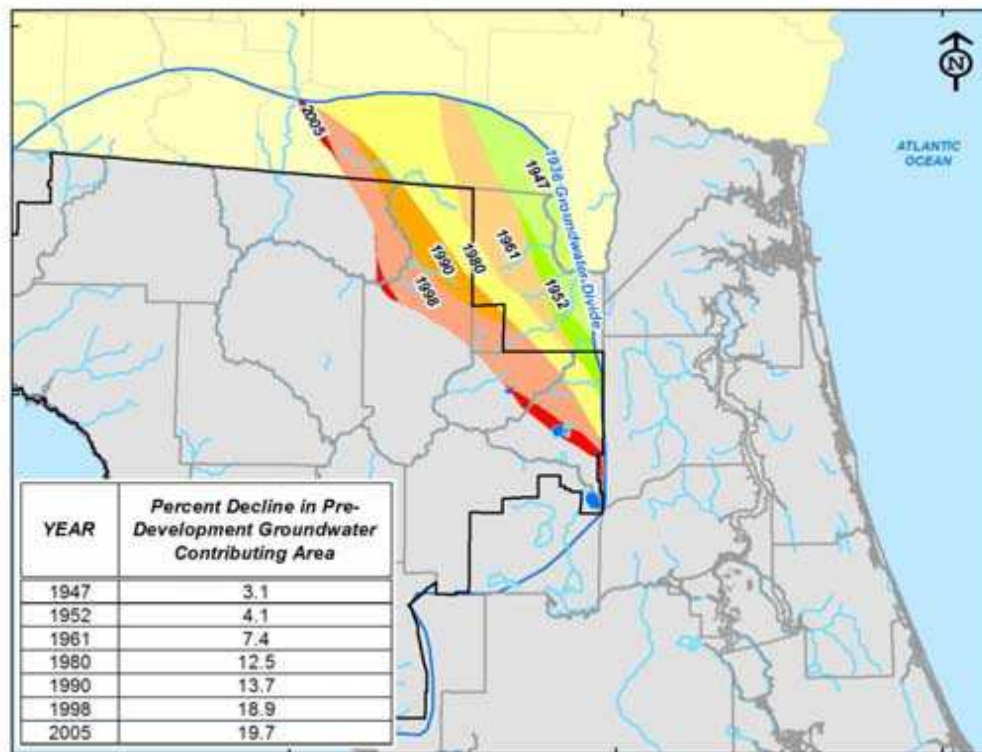


Figure 5. Estimated decline from 1936 to 2005 in the land area inside and outside of the SRWMD that recharges the groundwater basin feeding springs along the Suwannee, Withlacoochee, Alapaha, and Santa Fe rivers [FSI 2012 (from SRWMD 2011)].

7. Please describe any structural modifications that affect the health of your three springs and describe any impairments that are caused by these modifications.

Structural modifications and infrastructure at Ichetucknee Springs State Park includes concrete swimming areas (wall and walkway), wooden swimming docks, boardwalks, and wooden access steps to tubing areas. Structural modifications at Rainbow Springs State Park include a concrete swimming area with steps, a slate pathway, and wooden canoe dock. Wakulla Springs State Park includes a two-story swimming/diving platform, two single-level swimming platforms, a large glass bottom boat docking facility, concrete walls and paved walkways, and a park lodge. Structures bordering these springs (such as concrete walls, swimming areas, and pathways) create sheer, hardened interfaces between a spring and its uplands. Impervious surfaces surrounding the spring (such as paved trails/paths, parking lots, concession areas, lodging facilities) create zones of decreased infiltration and increased runoff to the spring, thus altering spring hydrology and water quality. While structural modifications may improve visitor access to Florida's springs, these modifications increase recreational impacts to these fragile ecosystems by encouraging clustering of dense human uses within the spring. Such impacts can be mitigated by limiting the types of activities and the number of users with the spring and spring run.

8. Compare and contrast recreational uses in your three springs. Approximately how many people visit per year? Please assess the importance of and effects of recreational impacts in the three springs.

More than 150,000 people visit Ichetucknee, Rainbow and Wakulla Springs State Parks each year (Table 5). The parks provide a variety of facilities and recreational activities for park visitors. In-water recreational activities that are common among the three springs include bathing, snorkeling, swimming, and wading. Canoeing/kayaking, fishing, and tubing are popular in-water activities at Ichetucknee and Rainbow Springs, while guided boat tours are very popular at Wakulla Springs. Additionally, Ichetucknee Springs is a popular scuba-diving destination and power boating is popular

at Rainbow Springs. Out-of-water recreational activities that are common among the three springs include sitting, sunbathing, and walking (Table 5). While these State Parks provide a recreational outlet for visitors and economic development benefits for local communities, visitors are “loving Florida’s springs to death” (B. Knight, 2012 class lecture). In-water recreational activities (swimming, wading, boating, anchoring boats, snorkeling, etc.) damage aquatic vegetation by trampling, tearing, and/or uprooting plants, resulting in decreased vegetative cover and species diversity. In-water recreational activities also increase water turbidity and therefore reduce water clarity. Maintaining visitor access to Florida’s springs is important for raising awareness about these unique ecosystems. However, managing recreation at Florida’s springs is critical for their long-term protection and restoration. Best management practices (BMPs) may include limiting the types of uses (e.g., restricting power boats to river reaches rather than the spring pool/spring run; restricting people to floating watercraft such as tubes and canoes/kayaks to reduce wading activity) and limiting the number of users (e.g., Ichetucknee Headspring visitor limits and access closures). If necessary, recreational management plans for the Ichetucknee, Rainbow, and Wakulla Springs should be revised to incorporate more stringent rules and BMPs that promote low-impact recreational access. Such plans should include an associated enforcement strategy (for peak usage times, designated swimming areas, etc.) to ensure the health and safety of the springs and its visitors.

Table 5. Summary of recreational uses at Ichetucknee, Rainbow and Wakulla Springs.

Recreational Characteristics	Ichetucknee Springs	Rainbow Springs	Wakulla Springs
Approximate Average Annual Attendance (years)	172,050 (1983 – 2010)	154,100 (1993-2008)	177,640 (1987 – 2008)
Activity Type			
<i>Bathing</i>	X	X	X
<i>Boating (power boats)</i>		X	
<i>Camping</i>		X	
<i>Canoeing/Kayaking</i>	X	X	
<i>Fishing</i>	X	X	
<i>Guided Boat Tours</i>			X
<i>Lodging</i>			X
<i>Picnicking</i>		X	X
<i>Scuba Diving</i>	X		
<i>Sitting</i>	X	X	X
<i>Snorkeling</i>	X	X	X
<i>Sunbathing</i>	X	X	X
<i>Swimming</i>	X	X	X
<i>Tubing</i>	X	X	
<i>Viewing</i>		X	X
<i>Wading</i>	X	X	X
<i>Walking</i>	X	X	X

Sources: Florida Springs Institute (FSI). 2011. Wakulla Spring – An Adaptive Management Strategy: Working Draft. Available at <http://floridaspringsinstitute.org/pages/wakulla-spring-recovery-plan>.

Florida Springs Institute (FSI). 2012. Ichetucknee Springs Restoration Plan. Prepared for the Ichetucknee Springs Working Group. Available at <http://floridaspringsinstitute.org/pages/ichetucknee-springs-and-river-restoration-act>.

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Wetland Solutions, Inc. (WSI). 2011. Ichetucknee River, Florida Assessment of the Effects of Human Use on Turbidity. Final report prepared for Three Rivers Trust FNPC. Available at http://www.floridasprings.org/downloads/florida_97_perkczyn.pdf.

Zavovyski, B. 2010. Ichetucknee Springs Restoration Plan. Available at http://floridaspringsinstitute.net/restorationplans/Ichetucknee_Zavovyski.pdf